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# Icebergs: A Bibliography Relevant to Eastern Canadian Waters

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May 1986

# ICEBERGS: A BIBLIOGRAPHY RELEVANT TO EASTERN CANADIAN WATERS

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# INTRODUCTION

## Background

This bibliography is the third in a series of bibliographies to be prepared by the ESRF/ASTIS project on the priority subjects of the Environmental Studies Revolving Funds. The purpose of the ESRF/ASTIS Project is to enhance the ASTIS database in some of the ESRF priority subjects and, in addition, to produce the printed bibliographies themselves, in order to provide a central source of environmental and social information relating to the Canada Lands. ESRF research on icebergs is coordinated by the ESRF Icebergs Program Study Committee.

## Scope of the Bibliography

This bibliography contains works about icebergs off the east coast of Canada and the west coast of Greenland. The geographic area covered is all waters from Baffin Bay south to the Grand Banks and out into the North Atlantic. Because the techniques used to study and alter iceberg behaviour throughout the Polar Regions are applicable to eastern Canadian waters, relevant works on these subjects from other areas have been included.

The bibliography does not include works on the properties of glacier ice in general, nor any aspects of glaciers other than iceberg calving. Works that contain a significant amount of information on icebergs are included even if the scope of the work is quite broad and icebergs are a relatively small part of it. For this reason some general works on sea ice which also contain information on pack ice, ice floes, etc. are included. Works on ice scouring by icebergs in eastern Canadian waters are included, and this bibliography therefore overlaps to some extent with the ESRF/ASTIS *Ice Scour Bibliography* (ESRF Report 010). The bibliography contains some general works which have global application in the areas of iceberg towing, remote sensing of icebergs, iceberg surveying and measuring techniques, and technological developments used to combat the problem of iceberg scouring.

## Comprehensiveness of the Bibliography

This bibliography contains 1135 citations. It is as comprehensive as its relatively short preparation time would allow. Relevant documents were located through a search of the ASTIS online bibliographic database and the

Ocean Engineering Information Centre at Memorial University, followed by retrospective searches of the following databases: ASFA (Aquatic Sciences and Fisheries Abstracts), Boreal, Boreal Northern Titles, Compendex, Cold, Environment, Geoarchive, Georef, Inspec, NTIS, Oceanic Abstracts, RESORS (Canada Centre for Remote Sensing), and Water Resources Abstracts. Printed bibliographies on sea ice were also consulted where appropriate. Whenever possible the actual documents were obtained and examined for relevance before preparing citations and abstracts. Some documents could not be obtained in time to do this, and so, provided they were clearly relevant and an unambiguous citation was available, were indexed sight-unseen. Such citations contain the note "Document not seen by ASTIS" and usually have no abstract or location code.

There are undoubtedly some works which should be in this bibliography but which have been missed. We would ask the reader's help in locating them. The bibliography should eventually find its way into the hands of many of the world's iceberg researchers. We would ask you to check to see if everything that you and your organization have published on icebergs in eastern Canadian waters is included. Please inform us of any missing items, and, if convenient, please send us a copy.

ESRF/ASTIS will continue to work to include items overlooked, to locate cited items not yet examined, and to report newly published material. A continually updated online version of the bibliography is available in the ASTIS database which is publicly available through QL Systems Ltd. Relevant material can be retrieved online in ASTIS by searching the subject terms beginning "Iceberg" or "Icebergs". These terms have been further subdivided to provide the user with more specific information where appropriate. A search on these terms will also yield additional citations that were too general to be added to the bibliography.

## Organization of the Bibliography

In the main section of the bibliography citations are sorted by author. Works of multiple authorship are listed under their first author and cross-referenced from their other authors. Citations with no author appear at the beginning of the bibliography. An author's works are sorted by title. The bibliography contains four indexes which refer back to the main section of the bibliography by citation number. Terms in the Subject and Geographic Indexes are taken from the ASTIS Subject and Geographic Thesauri. Documents listed under specific terms (e.g., "Notre Dame Bay, Newfoundland") are not automatically posted under broader terms (e.g., "Labrador Sea"). Leading articles (A, The, Le, etc.) are removed in the Title Index. The Serial Index allows documents to be found under the title of the serial or other larger work in which they appeared.

## Availability of Documents

The last line of most citations (i.e. the line preceding the abstract) contains a location code indicating where the document may be obtained on interlibrary loan. The standard Canadian interlibrary loan codes are used. Most documents which have location codes have one or more of the following codes:

AC — W.R. Castell Central Library, 616 Macleod Trail, S.E., Calgary, Alberta, Canada T2G 2M2. Telephone (403) 266-4606.

ACU — Interlibrary Loan Office, Room 218, Library Tower, University of Calgary, Calgary, Alberta, Canada T2N 1N4. Telephone (403) 220-5967.

BVAU — University of British Columbia, Library, 1956 Main Mall, Vancouver, British Columbia, Canada V6T 1Y3. Telephone (604) 228-2211.

NFSM — University Library, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1C 5S7. Telephone (709) 737-8000.

NFSMO — Ocean Engineering Information Centre, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1B 3X5. Telephone (709) 737-8377.

NFSFCF — Newfoundland and Labrador Institute of Fisheries and Marine Technology, P.O. Box 4920, St. John's, Newfoundland, Canada A1C 5R3. Telephone (709) 726-5272.

NSDB — The Library, Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia, Canada B2Y 4A2. Telephone (902) 426-6224.

OOCCR — Canada Centre for Remote Sensing, Department of Energy, Mines and Resources, 2464 Sheffield Road, Ottawa, Ontario, Canada K1A 0Y7. Telephone (613) 990-5870.

OON — Interlibrary Loan and Photocopy Service, CISTI, Bldg. M-55, National Research Council Canada, Montreal Road, Ottawa, Ontario, Canada K1A 0S2. Telephone (613) 993-1585.

OONL — National Library, Reference Services, 395 Wellington Street, Room 272, Ottawa, Ontario, Canada K1A 0N4. Telephone (613) 992-0474.

OTY — Scott Library, York University, 4700 Keele Street,

Downsview, Ontario, Canada M3J 2R2. Telephone (416) 667-2100.

SSU — Library, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0. Telephone (306) 244-4343.

Please give the full citation when ordering.

Documents, with or without location codes, may also be available from their publishers.

# INTRODUCTION

## Présentation

Cette bibliographie est la troisième d'une série de bibliographies prévues par le project FRÉE/ASTIS sur les sujets prioritaires des Fonds renouvelables pour l'étude de l'environnement. En plus d'assurer la publication de ces bibliographies, le projet FRÉE/ASTIS vise à augmenter la base de données ASTIS dans chacun des sujets prioritaires des FRÉE, afin de former une source centrale de renseignements environnementaux et sociaux portant sur les terres du Canada. La recherche des FRÉE sur les icebergs est coordonnée par le Comité de programme d'étude des icebergs.

## Portée de la bibliographie

Cette bibliographie contient des ouvrages sur les icebergs au large de la côte est du Canada et de la côte ouest du Groenland. La région géographique concernée englobe toutes les eaux depuis la baie de Baffin jusqu'oux Grands Bancs et s'étend jusque dans l'Atlantique Nord. Comme les techniques utilisées pour l'étude et la modification du comportement des icebergs dans les régions polaires peuvent être appliquées dans les eaux à l'est du Canada, les textes pertinents portant sur ces sujets dans d'autres régions ont été inclus. La bibliographie ne comprend pas les textes sur les propriétés de la glace de glacier en général, ni ceux traitant de tout autre aspect des glaciers sauf celui du vêlage des icebergs. Les écrits qui contiennent une quantité importante de renseignements sur les icebergs sont inclus même si leur portée est plutôt large et si les icebergs n'en forment qu'une petite partie, ce qui explique la présence de quelques ouvrages généraux sur la glace maritime qui traitent aussi du pack, des floes, etc. Les travaux sur le râclage par iceberg dans les eaux à l'est du Canada paraissent dans la bibliographie, ce qui entraîne un léger chevauchement avec la bibliographie FRÉE/ASTIS sur l'affouillement par les glaces (*Ice Scour Bibliography*, FRÉE rapport 010). La bibliographie contient certains textes généraux qui ont une application globale dans les domaines du remorquage d'icebergs, de la télédétection d'icebergs, des techniques de levé et de mesure d'icebergs et des développements technologiques aidant à combattre le problème du râclage par icebergs.

## Étendue de la bibliographie

Cette bibliographie contient 1135 entrées. Elle est aussi complète que sa période de compilation relativement courte l'a permis. Les documents pertinents furent localisés lors d'une recherche de la base de données bibliographiques informatisée d'ASTIS et de l'Ocean Engineering Information Centre de l'université Memorial, suivie de recherches rétrospectives des bases de données suivantes: ASFA (Aquatic Sciences and Fisheries Abstracts), Boreal, Boreal Northern Titles, Compendex, Cold, Environment, Geoarchive, Georef, Inspec, NTIS, Oceanic Abstracts, RESORS (Centre canadien de télédetection) et Water Resources Abstracts. Des bibliographies pertinentes publiées sur la glace maritime furent aussi consultées. Lorsque ce fut possible, les véritables documents furent examinés quant à leur pertinence avant la préparation des entrées et des résumés. Certains documents ne purent être obtenus à temps et furent donc indexés sans être examinés, à la condition qu'ils soient clairement pertinents et qu'une entrée non-équivoque soit disponible. De telles entrées ont reçu la notation «Document not seen by ASTIS» et ne contiennent en général aucun résumé ou code d'accès.

Il existe sûrement des travaux qui devraient figurer dans cette bibliographie mais que nous n'avons pu localiser. Nous prions nos lecteurs de nous aider à le faire. La bibliographie sera, avant longtemps, examinée par la plupart des chercheurs s'intéressant aux icebergs. Nous vous prions donc de vérifier si tout ce que vous et votre groupe de recherche avez publié au sujet des icebergs dans les eaux à l'est du Canada s'y trouve inclus. Veuillez nous aviser de tout texte manquant et, si possible, nous en faire parvenir un exemplaire.

FRÉE/ASTIS continuera à rechercher les textes manquants, à localiser les ouvrages cités non-examinés et à signaler le nouveau matériel publié. Une version automatisée et continuellement mise à jour de la bibliographie peut être obtenue de la base de données ASTIS, disponible par l'entremise de QL Systems Ltd. Le matériel pertinent peut être obtenu de la base de données ASTIS sous des rubriques commençant par les termes «Iceberg» ou «Icebergs». Ces termes ont été encore subdivisés afin de permettre au chercheur l'accès à plus de renseignements spécifiques au besoin. Une recherche de ces termes donnera aussi les entrées additionnelles qui étaient trop générales pour leur inclusion dans la bibliographie.

## Organisation de la bibliographie

Dans le corps principal de la bibliographie, les entrées sont classées sous le nom de l'auteur. Les ouvrages écrits par plusieurs auteurs sont catalogués sous le nom du premier auteur et contiennent les renvois aux autres auteurs. Les citations sans auteur paraissent au début de la bibliographie. Les travaux d'un même auteur sont classés par titre. La bibliographie contient quatre index qui reportent le lecteur au corps de la bibliographie par indicatif d'entrée. Les termes dans les index de sujets et de sites géographiques proviennent du dictionnaire de sujets et de sites géographiques d'ASTIS. Les documents classés sous une rubrique spécifique (par exemple, «Notre Dame Bay, Newfoundland») ne sont pas automatiquement classés sous une rubrique plus générale (par exemple, «Labrador Sea»). Les articles en début de titre (A, The, Le, etc.) ne paraissent pas à l'index des titres. L'index des périodiques permet de trouver un document sous le titre du périodique ou de l'ouvrage dans lequel il fut publié.

## Accès aux documents

La dernière ligne de la plupart des entrées (c'est-à-dire la ligne précédant le résumé) contient un code d'accès signalant l'endroit où le document peut être obtenu par prêt entre bibliothèques. Les codes standards canadiens de prêts entre bibliothèques sont utilisés. La majorité des documents dotés d'un code ont un ou plusieurs des codes suivants:

AC — W.R. Castell Central Library, 616 Macleod Trail, S.E., Calgary, Alberta, Canada T2G 2M2. Téléphone (403) 266-4606.

ACU — Interlibrary Loan Office, Room 218, Library Tower, University of Calgary, Calgary, Alberta, Canada T2N 1N4. Téléphone (403) 220-5967.

BVAU — University of British Columbia, Library, 1956 Main Mall, Vancouver, British Columbia, Canada V6T 1Y3. Téléphone (604) 228-2211.

NFSM — University Library, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1C 5S7. Téléphone (709) 737-8000.

NFSMO — Ocean Engineering Information Centre, Memorial University of Newfoundland, St. John's, Newfoundland, Canada A1B 3X5. Téléphone (709) 737-8377.

NFSFCF — Newfoundland and Labrador Institute of Fisheries and

Marine Technology, P.O. Box 4920, St. John's, Newfoundland, Canada A1C 5R3. Téléphone (709) 726-5272.

NSDB — The Library, Bedford Institute of Oceanograhy, P.O. Box 1006, Dartmouth, Nova Scotia, Canada B2Y 4A2. Téléphone (902) 426-6224.

OOCCR — Centre canadien de télédetection, Ministère de l'energie, des mines et des ressources, 2464 Sheffield Road, Ottawa, Ontario, Canada K1A 0Y7. Téléphone (613) 990-5870.

OON — Institut canadien de l'information scientifique et technique, Conseil national des recherches, Montreal Road, Ottawa, Ontario, Canada K1A 0S2. Téléphone (613) 993-1210.

OONL — Bibliothèque nationale, 395 Wellington Street, Ottawa, Ontario, Canada K1A 0N4. Téléphone (613) 992-0474.

OTY — Scott Library, York University, 4700 Keele Street, Downsview, Ontario, Canada M3J 2R2. Téléphone (416) 667-2100.

SSU — Library, University of Saskatchewan, Saskatoon, Saskatchewan, Canada S7N 0W0. Téléphone (306) 244-4343.

Veuillez donner l'entrée complète lorsque vous faites une demande de prêt.

Les documents avec ou sans codes d'accès peuvent aussi être éventuellement obtenus chez leurs éditeurs.

1

**Anomalous propagation in radar.**

(Nautical magazine, v.175, June 1956, p. 350-352)

(International hydrographic review, v. 33, no. 2, Nov. 1956, p. 119-121)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 179981.*

Several instances are noted of non-detection of nearby objects at sea due to sub-refraction of the radar signal. This condition is particularly prevalent where the air temperature is much below that of the sea. A pocket of sub-refraction may develop in the vicinity of icebergs which makes detection by radar unreliable in some cases. (AB)

2

**Arctic exploration : the Labrador case.**

(Ship & boat international, v. 33, no. 9, Sept. 1980, p. 13, 15, ill.)

From a paper read by Jean Gerard Napoleoni and Marc Jozan, of the Offshore Department, Total France, at the Petromar '80 Conference.

*ASTIS document number 176613.*

NFSM

... The presence of icebergs is a very challenging factor of offshore Labrador and extensive work was carried out to improve a very scanty pre-existing knowledge. Dynamically positioned drill ships proved to be the only viable solution to the iceberg problem. On the ships, ice observers are on duty 24 hours a day, using visual and radar observation to plot the drift of all icebergs within 12 nm of the ship. Icebergs are referenced so that it is later possible to use drift trajectories in conjunction with iceberg measurements and ocean and wind data to study the physics of the drift. When a berg is thought too menacing it is towed away using a tug permanently standing by for the purpose. Down time on drilling due to icebergs was thus kept at a very low level (0 to 5%) during the four months of the season (July to October). Icebergs were also the main worry in planning production since they not only prevent any fixed or anchored structures from being used but also, because their keels scour the sea floor, they can destroy subsea production equipment. Under the chosen production scheme, a dynamically positioned platform of the 'spar' type (Dypospar) is used for production and storage. Should any iceberg come too close, the platform lifts part of its riser and moves off location. Crude oil is exported by shuttle tankers. Essential subsea equipment such as well heads and manifolds are located in excavations deeper than the maximum expected iceberg scour. Flowlines are flexible and are not specially protected. ... (Au)

3

**Below-mud line well completion system lessens iceberg, anchor, trawl damage.**

(Ocean industry, v. 13, no. 11, Nov. 1978, p. 64-65, ill.)

*ASTIS document number 167274.*

NFSMO

Damage to subsea completion systems from anchoring, bottom trawling or icebergs represents a constant threat in prime offshore production areas. ... To lessen the possibility of a spill or blowout from such an accident, Cameron Iron Works designed the Caisson Completion System which houses the critical pressure-containing components within a caisson conductor pipe beneath the ocean floor. This procedure significantly reduces the above-mudline height of the completion system. ... (Au)

4

**Berg slicer cuts problems down to manageable size.**

(Offshore resources, v. 3, no. 2&3, May/June 1985, p. 9)

*ASTIS document number 167487.*

ACU, NFSMO

Ice Engineering Ltd. of St. John's has just finished the first test of a device to slice icebergs into two or more manageable chunks. The iceberg slicer is an electrically heated wire, one-eighth of an inch thick, that carries 20,000 watts of electricity. As the hot wire melts downward through the ice, glycol antifreeze is released, to prevent the resulting crack from refreezing. Dr. Peter Gammon, project manager for Ice Engineering Ltd., says that the first test of the hot wire technology was made on a 200,000-ton berg that was grounded in Witless Bay near St. John's in April 1985. The wire was deployed by crews who boarded the iceberg from a helicopter. During the test, the hot wire sliced vertically through 40 feet of ice in about four hours, partly cutting off a 4,000-ton fragment of ice from the berg. Unfortunately, it was not possible to complete cutting operations before nightfall of the test day, so the fragment at first remained attached to the main berg. However, within two days, the separated fragment finally calved off the mother berg. Dr. Gammon thinks that the hot wire method is much better than explosives to break up medium to large icebergs. The iceberg fracturing apparatus produces clean-cut, manageable pieces of predictable size, which can be towed safely. By contrast, the use of explosives shatters a berg into an unpredictable number of pieces of variable size, often producing bergy bits and growlers that simply multiply ice management problems. If an explosive charge planted within an iceberg should fail to detonate, the iceberg then becomes a floating bomb. Finally, the use of explosive charges, that are large enough to break up icebergs could result in large kills of fish and marine mammals. ... (Au)

5

**Big bet in iceberg alley.**

(Drilling, v. 37, no. 5, 1976, p. 78-80, col. ill.)

Condensed from Our Sun, publication of Sun Oil Co. Text by Ryan L. Enderle. Photos by Charles Morris.

*ASTIS document number 182818.*

AC

The Pelican, the first of a new class of drill ship developed by the Compagnie Francaise Des Petroles, is uniquely suited for drilling in the Labrador Sea. She has a reinforced hull and is fitted for work at temperatures approaching 0 degrees F. The best feature of the dynamic positioning system is the ability of Pelican to shear off her drillstring and abandon the site in minutes should a moving iceberg pose a threat. The instant a sizeable iceberg gets within a 25-mi radius of the Pelican, they start to chart its trail and plot its drift. A heavily-powered tugboat Orkney Shore, stands about two to three mi off the Pelican ready to tow away any berg that looks as if its on a collision course with the Pelican. The Captain and 11-man crew can encircle and tow away any berg up to 100 million tons. If they can't handle one, the Pelican "moves off hole". Reconnect time is only four hours. There is continually one person on iceberg watch. On some days the radarscope is filled with bergs surrounding the drillship, at other times they may not see an iceberg for a week. With thousands of icebergs calving off glaciers along the west coast of Greenland and making their 1000-mi journey down Davis Strait each year the presence of icebergs is a constant threat to offshore oil drilling operators in iceberg alley. (ASTIS)

6

**$Billions to flow from east coast oil if icebergs dodged.**

(Resource development, v. 13, no. 1, Spring 1981, p. 5)

*ASTIS document number 171794.*

ACU, NFSMO

Projections for the Hibernia field offshore Newfoundland were moved up earlier this year from one billion to 1.85 billion barrels of oil at a 50 per cent probability level. There is estimated to be about two trillion cubic feet of gas. The revised estates make Hibernia the largest field in Canada. ... The problems and some solutions to making a Hibernia into a producer were outlined at a recent provincial symposium on production and transportation systems for the Hibernia discovery. The major threat is ice and in the following half dozen pages the experts from Mobil reveal their proposals.

(Au)

7
**Canada's Hibernia transportation debate still going strong.**
(Offshore engineer, 1981 [ 4] Apr., p. 41-42, ill.)
*ASTIS document number 169048.*
ACU

This article reviews various considerations pertinent to the development of the Hibernia discovery. Problems associated with the design and construction of offshore pipelines, considerations of production platform options, and the iceberg threat to east coast offshore production platforms and pipelines are discussed. In general "it appears that far more hardcore engineering design data are needed for icebergs, primarily on their maximum credible mass and speed, and on the strength of the ice itself", says Wilson Russel from the province's Petroleum Directorate. The conclusion to date is that although installation of a line to shore is feasible, its safe operation is not feasible in view of the high risk of scour damage by the icebergs which could cross Hibernia's entire 320-360 km length. (Au)

8
**Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts.**
[Halifax, N.S.] : Bedford Institute of Oceanography, 1986.
32 leaves ; 28 cm.
Abstracts only.
*ASTIS document number 182060.*
ACU

The 56 papers presented at the Canadian East Coast Sea Ice Workshop [in January 1986] cover various aspects of pack ice, sea ice cover and icebergs, and the effect ocean currents, winds, and temperature have upon sea ice. Many of the papers are concerned with prediction modelling of iceberg distribution and sea ice forecasting in an attempt to more effectively time offshore drilling activities along the east coast. (ASTIS)

9
**Citations from the INSPEC data base : sea ice (1975 – Nov. 82).**
Ottawa : Canadian Institute for Scientific and Technical Information, 1983.
3 microfices ; 11 x 15 cm.
*ASTIS document number 175250.*
ACU

This bibliography consists of citations on sea ice and icebergs. Access to this bibliography is both by subject and title index. These citations cover observations and measurements of the properties, movement, and distribution or location of sea ice and sea ice meltwater. Age delineation and dynamic seasonal response of sea ice are considered as well as its palaeoclimatic and recent climatic significance. Coverage is worldwide, with much attention focused upon polar regions. This bibliography contains 237 citations. (ASTIS)

10
**Concrete platform developed for iceberg regions.**
(Oilweek, v. 34, no. 28, Apr. 5, 1983, p. S4, ill.)
*ASTIS document number 169013.*
ACU

Concrete Platform Specialist Norwegian Contractors and its partners in North Atlantic Contractors are continuing to gear up for possible construction assignments on the Canadian east coast. Apart from work to prepare a building site on the Newfoundland coast, the joing venture has unveiled an innovative gravity base structure (GBS) for use in ice-infested waters, as well as concluding a deal with Lavalin Inc. for detailed engineering design support. Backing these efforts is the unique expertise built up from design and delivery of eight North Sea platforms by Norwegian Contractors, a consortium of Norway's three leading construction firms. ... (Au)

11
**The continual problem of icebergs in Grand Banks.**
(Oilweek, v. 32, no. 8, Mar. 30, 1981, p. A18-A19)
*ASTIS document number 168980.*
ACU

... Icebergs are not the only environmental hazard bedevilling the final scripting of the Hibernia development scenario. ... The famed Grand Banks fog, a possible hazard when towing icebergs, can be expected frequently from the interaction of the cold Labrador and warm Gulf streams. Ice, if not icebergs, will be a continual problem. Superstructure icing will hamper supply boats, while sea ice concentrations might sabotage iceberg towing operations. Such ice, rafted into ridges several metres thick, has fortunately been weakened by near melting temperatures. Observations over the last 19 years have recorded serious concentrations – ice covering 10% or more of the Hibernia area – only three times. ... Most research has been done on bergs off Labrador. The Hibernia area has not been hit by icebergs in the last two years, a serious limitation in compiling site specific data. ... While icebergs are a definite danger off Labrador ("iceberg alley"), the number crossing the Hibernia area can only be loosely gauged by studying historical data. Supply boats and helicopters servicing the semi-submersibles operating at Hibernia take different routes each time, but so far little precise information is available about the drift path of icebergs across the southern Grand Banks. ... While a collision is the important criteria in establishing the viability of the fixed platform option, depth of iceberg scour determines the fate of any pipeline scheme. Research on scouring has been going on at Memorial University since 1975, but data is only now becoming available to encourage confident decision-making. (Au)

12
**Cost-cutting arctic platform designs.**
(Ocean industry, v. 20, no. 3, Mar. 1985, p. 37-39, ill.)
*ASTIS document number 170135.*
NFSMO

Skanska solutions for shallow and deepwater developments in the Arctic include four gravity based structures (GBS) and an artificial island with a base of frozen soil. [It also includes an iceberg resistant design which] ... relies on chains and fendering to handle million-ton ice masses [chain-star.] ... (Au)

13
**Current, wind both affect iceberg drift, studies show.**
(Oilweek, v. 24, no. 13, May 14, 1973, p. 56, 57, ill.)
*ASTIS document number 169021.*
ACU

... A positional grid system has been developed by Drs. R.T. Dempster and A.A. Bruneay as a first predicting tool to be used until a better understanding of iceberg drifting makes a more sophisticated model feasible. It is designed to enable operators to determine the probable path of 'bergs in the vicinity of an offshore rig and how and when to take preventive action. ... To make a start on this complex problem, the [University of Newfoundland's] ... faculty of engineering decided to cencentrate on the main factors controlling the drifting and undertook a detailed study, in August, 1972, using a shore-based radar installation at Saglek, Labrador, to plot the meandering of 110 icebergs. At the same time, the Bedford Institute, with the Canadian Armed Forces, collected oceanographical and meteorological data in the area, including measurement of currents, salinity, temperature and depth profiles, plus acoustical profiles and stereo photographs to determine the size and shape of icebergs. ... The proposed grid system ... can be set up using current data, and when used by a rig operator, should cover a

smaller area (Dempster suggested a 10 mile radius) and be on a larger scale. Information about currents in the area should be collected, preferably over a period of several months before drilling starts, by tracking drogues designed for use at various depths or by current meters. In the grid diagram the rig is located at X and the line Y-Y is considered the zero time line. The lines drawn upstream from the zero line represent the time needed for an iceberg to travel to the zero line and are based on the speed of the current, or a slightly higher speed if a built-in safety factor is required. The tidal current at Saglek is shown in a series of hourly vectors called a current rose, and Dempster explained the method to predict the path of an iceberg at point A on the 15 hour line. ... (Au)

**14**

**La derive des icebergs dans les eaux de Terre-Neuve et sa prevision [The drift of icebergs in the waters of Newfoundland and the surrounding area].**

(Bulletin – Met-Mar Maritime, Direction de la Meteorologie, Section Meteorologie, Boulogne, no. 90, Jan. 1976, p. 17-23, ill., maps)

Text in French.

*ASTIS document number 163015.*

NFSMO

The article relates the number of icebergs passing the 48th parallel to the environmental conditions recorded. (NFSMO)

**15**

**Despite icebergs, rigs work off Canada.**

(Offshore, v. 34, no. 10, Sept. 1974, p. 55, map)

*ASTIS document number 163023.*

NFSMO

Two drillships working off Labrador and Newfoundland have continued successful operations despite the worst iceberg season in 30 years. ... During a one week period, 33 icebergs were reported at one drill site. In the area around the Labrador Sea, the icebergs have not divided into smaller units, or growlers, which is the normal procedure by the time they reach the Grand Banks. At one point, bergs of more than four million tons were reported in the area. ... The problem of predictions becomes more serious further south because fleets of icebergs have been known to turn around and drift back along the same course from which they came. ... The federal Ice Central issues daily reports as to the movement of icebergs and growlers, which are smaller icebergs. It is also the responsibility of each vessel in the area to maintain its own surveillance of the icebergs. (Au)

**16**

**The DIGS '85 field program.**

(C-CORE news, v. 10, no. 3, Nov. 1985, p. 2-3, ill.)

*ASTIS document number 181773.*

ACU, NFSMO

The Dynamics of Iceberg Grounding and Scouring (DIGS '85) Program was the largest concerted research project undertaken by the Centre this year .... The work was carried out during the summer off the coast of Labrador from the chartered vessel Polar Circle to document the dynamic behaviour and the processes of scouring and grounding. Wind, current and tidal fluctuation data were collected to calculate the driving forces on each iceberg. Instrument packages designed and built at C-CORE were placed on selected icebergs to measure accelerations, attitudes and orientation changes through the grounding cycles. Four bergs were studied in detail and will be the subject of scientific and engineering papers. The size and shape of the monitored icebergs were determined .... These data will be used to calculate forces exerted on the seabed by grounded iceberg keels. .... Observations were made, from the manned submersible, of the scours produced by these iceberg groundings and of other fresh scours. (Au)

**17**

**DIGS '85 will study iceberg scouring.**

(Offshore resources, v. 3, no. 2&3, May/June 1985, p. 10)

*ASTIS document number 167495.*

ACU, NFSMO

A major field program is to be undertaken off the coast of Labrador this summer. This program, to be called DIGS-85, is to document the dynamics and processes of iceberg grounding and scouring through the study of about four actual groundings. Data to be collected include: forces exerted on the seabed by icebergs, the character and depth of the resultant sediment response, and data for the validation of ice scour models. ... The following work plan is proposed. About four grounded icebergs will be tracked and monitored. This will be carried out from a research vessel using ship radar and side-scan sonar to measure iceberg shape and draft. A sensor package will be deployed by helicopter to measure iceberg motion. The sedimentary backfill and current scour during the iceberg scouring event will be monitored from an unmanned submersible and towed camera. After the scouring event, a manned submersible will be used to examine the scour in detail and to retrieve seabed samples. Other ocean and climatic measurements will be made during the scouring event. ... The cost of performing and supporting the DIGS-85 geotechnical program is expected to range up to $250,000, while the logistics and support costs an additional $500,000. A final report on this study is expected by March 1986. (Au)

**18**

**Distribution of North American and Greenland ice at the end of June 1959.**

(Marine observer, v. 29, no.186, Oct. 1959, p. 196-197)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180106.*

Plots the occurrence and distribution of ice floes and bergs. Data on the breakup of field ice and movement of pack ice in Davis Strait, Baffin Bay and approaches to Hudson Bay are given. (AB)

**19**

**Drillers fight worst iceberg season for 30 years off Canadian East Coast.**

(Oilweek, v. 25, no. 26, Aug. 12, 1974, p. 9, ill.)

*ASTIS document number 172120.*

ACU, NFSMO

The sister ships, Pelican and Havdrill, are making full use of their dynamic positioning capability in iceberg alley. The drillships are dodging a profusion of icebergs off Labrador and Newfoundlamd, in a season said to be the worst in 30 years. The Pelican has moved off location at least five times and further south, the Havdrill has disconnected twice. ... (Au)

**20**

**Drillship eases dangers from icebergs.**

(Oil & gas journal, v. 73, no. 19, May 12, 1975, p. 38-40, ill., map)

*ASTIS document number 171190.*

ACU

Eastcan official tells OTC how dynamically-positioned vessel, Pelican, saved Labrador drilling program after anchored rig had failed. [This technology is thought to be helpful for other ice-plagued regions.] ... In addition to eliminating problems and loss of time in anchoring, the dynamic positioning capabilities of the drillship Pelican permitted quick disconnection and reconnection of the vessel. The two characteristics are of prime importance in the area where icebergs are the most critical factor associated with oil exploration. ... [The 1973 iceberg data recorded from the drillship is also included along with a narrative of the iceberg towing operation.] (Au)

21

**Dynamic Iceberg Grounding and Scouring Experiment (DIGS).**
(C-CORE news, v. 10, no. 1, Mar. 1985, p. 5)
*ASTIS document number 167070.*
ACU, NFSMO

C-CORE and the Geological Survey of Canada, Bedford Institute of Oceanography, are planning a major field program off eastern Canada for the summer of 1985 with support from Environmental Studies Revolving Fund (ESRF). The experiment will correlate iceberg movement and seabed disruption in the Grand Banks and Labrador Sea regions through the examination of up to six case histories of iceberg/seabed interaction. During the experiment measurments will be made of the following: (1) iceberg forces on the seabed; (2) effects of the seabed on iceberg motion; (3) hydrodynamic sediment redistribution during actual scouring events; and (4) scour degradation with time. The program's objectives are: (1) to predict ice scour depth and sediment disruption so that more effective protection may be designed for pipelines and wellheads; and (2) to understand processes of ice/seabed interaction and to integrate the information into an improved model of seabed penetration by icebergs. ... (Au)

22

**East coast's ideal tug described.**
(Resource development, v. 13, no. 1, Spring 1981, p. 21)
*ASTIS document number 171824.*
ACU, NFSMO

Design recommendations for the ideal supply and anchor handling vessel for Canada's East Coast offshore play have been presented by the leading operators who report a shortage of suitable vessels. ... The Crosbie team have prepared specifications for the ideal East Coast support vessel. These include features to cope with the area's unique hazards such as improved heating and ice removal equipment and a storage winch to accommodate 1,200 metres of polypropolene rope for iceberg towing. (Au)

23

**Eastcan stepping up activity this season with third drilling unit for iceberg alley.**
(Oilweek, v. 27, no. 14, May 17, 1976, p. 20, 22, ill., map)
*ASTIS document number 162922.*
ACU, NFSMO

The article reviews Total Eastcan's proposed drilling activities for 1976 which include iceberg towing. (NFSMO)

24

**Eastcoast operators ready to "calfrope" icebergs.**
(Oilweek, v. 22, no. 12, May 10, 1971, p. 52)
*ASTIS document number 171328.*
ACU, NFSMO

During the last week in May or the first week in June, Eastcoast Petroleum Operators Association will start on a second project which involves "calf-roping" of icebergs and towing them. Basically the iceberg dynamics experiment will seek to determine whether an iceberg can be deflected predictably, safely and with a reasonable degree of success. ... Using MV Percy M. Crosbie, the operators will attempt to tow a number of various sized bergs. They hope to determine behaviour under tow, establish value for drag coefficients and try to determine a reliable means to estimate iceberg mass and the factors which affect drift. They will study movement and current conditions and attempt to predict movement. An aircraft will be employed to take aerial photographs to keep track of the towed icebergs. ... The "roping" will be done with some type of net with which an iceberg can be encompassed so that a bridle can be attached for towing. It may be necessary to anchor the net to a buoy. Oceanographic and weather data will be collected with a view to determining whether it is feasible to predict the path of an iceberg. The actual path will be tracked to determine what path it follows in relation to the prediction. It is hoped to develop a prediction method which will indicate how much power is required and in what direction. ... The iceberg towing project arose out of a successful tow of a small one by MV Eastcan. Other projects are in various stages of study. EPOA will make people available for assistance in preparing government regulations on environmental control and other aspects of offshore operations. ... In the field of icebergs there are many unknown factors. For example there is no information about the extent to which icebergs actually touch the ocean floor. The towing study project is considered a major start in developing data for technological conclusions. ... (Au)

25

**Eastern arctic sea ice analyses, 1972-1975.**
Washington, D.C. : Fleet Weather Facility, 1976.
210 p. : maps ; 22 x 35 cm.
Charts distributed weekly.
*ASTIS document number 178691.*
NFSMO

This publication contains an accumulation of weekly analysis charts for sea ice in the eastern arctic for 1972 to 1975. These analyses include the location of the ice pack edge, positions of major icebergs, and occasionally the ages and growth stages of pack ice. (ASTIS)

26

**Fighting ice.**
(Ocean industry, v. 13, no. 10, 1978, p. 144, 146, ill.)
*ASTIS document number 176540.*
NFSMO

Researchers have been trying to find ways to destroy icebergs for more than 60 years, mostly without success. The Arctic Petroleum Operators' Association sponsored a field operation to study crater, bench and controlled-splitting blasting and blasting in water under the ice. Another objective of the project was to develop a lightweight shothole drill for placing charges, to establish load factors for ice during bench blasting and to find out if ice islands under shock loading become unstable. ... Gases such as ammonia, hydrogen chloride, sulfur dioxide and volatized ammonium chloride can be used in a novel method of ice destruction employed by the Memorial University of Newfoundland and the Newfoundland Oceans Research and Development Corp. This means of destroying ice is designed for small-scale applications, including drilling holes in icebergs to allow anchoring of a towing system, drilling of a cavity for explosive demolition of icebergs, deicing of surface structures on ships, slotting of ice sheets for projects such as pipelaying, cutting a hole from below the ice for submarines to surface, de-icing of canal locks and providing lubrication for icebreakers at the ship/ice interface. ... (Au)

27

**Fog, gales, 'bergs are problems for eastern offshore operators.**
(Oilweek, v. 24, no. 13, May 14, 1973, p. 22, ill.)
*ASTIS document number 170429.*
ACU

The offshore oil industry is facing "a severe challenge" in Eastern Canadian operations .... Dr. Warner points out, however, that although many of the Canadian East Coast environmental conditions are similar to those encountered in the North Sea, the common hazards of cold water, fogs and gales are complicated by Canadian iceberg, drift ice and hurricane conditions. Dr. Warner explained some of the considerations the industry is, or will have, to take into account. ... (Au)

28

**Glacier chasers.**
(All hands, no.520, May 1960, p. 8-9, ill.)
*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180149.*

Reviews the U.S. Coast Guard ice patrol program in the North Atlantic. Bombing of bergs by armor-piercing type thermite bombs is to be tried in 1960; stranded bergs are to be mined by landing parties. (AB)

**29**

**Hibernia options still open.**

(Offshore engineer, 1983 [11] Nov., p. 33-34, ill.)

*ASTIS document number 171352.*

ACU, NFSMO

[This article illustrates the] proposed Hibernia development with a single concrete platform capable of resisting icebergs by sheer mass. It carries 30 to 40 wells and suports a deck load of 40,000 t. Ten-well subsea templates are sites for further wells. Oil moves via one or two tanker loading systems, with gas either re-injected or piped to shore. Flowlines are left vulnerable to scour. ... The Hibernia location is not in the direct line of 'iceberg alley', and its latitude of 47 N means that the bergs which do reach that far south are in the late stages of deterioration. Nevertheless it is estimated that 1,000 to 1,500 bergs may cross that latitude each year, concentrated in the February to July season. The maximum credible size of berg at Hibernia is put at around 10 to 12 million tonnes. However, the most critical design load could come from considerably smaller bergs because of the higher speeds they can attain. ... (Au)

**30**

**How big are the bergs?**

(Oilweek, v. 24, no. 13, May 14, 1973, p. 56, ill.)

*ASTIS document number 168998.*

ACU

... For the past three years, the Faculty of Engineering of Memorial University of Newfoundland has been conducting extensive research into new technologies and techniques which could be employed in the offshore operations in the area. One interesting experiment has involved the towing of icebergs. This type of research is showing immediate benefits for the drilling rigs. Newfoundland is fully aware of the impact of offshore exploration, development and production on its economy and our experience to date has provided some exciting indications of what the future holds and for what we must prepare ourselves .... The province is situated in an ideal and unique geographic location. It is the centre of offshore exploration on the east coast of Canada and is the jump off point to the waterways to the Arctic. ... The province is rapidly becoming the focal point of marine research activities related to the oil industry. Memorial University of Newfoundland has a continuing research program underway in its Faculty of Engineering. [The port facilities of Newfoundland and the refinary are other attractive features the province has to offer.] (Au)

**31**

**Hunting icebergs.**

(Exide topics, v. 30, no. 2, Mar.-Apr. 1956, p. 2-3, ill., map)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 179965.*

Contains a brief popular account of the work of United States Coast Guard vessels and aircraft for the International Ice Patrol. The Labrador Current collects as many as 7,500 sizeable bergs each year; course is plotted of the 50-1400 which cross the 48th parallel, and where shipping is warned. Function of the electric storage battery in communications and shipping generally is stressed. (AB)

**32**

**Ice and iceberg monitoring system being developed.**

(Oilweek, v. 33, no. 40, Nov. 8, 1982, p. 43)

*ASTIS document number 172251.*

ACU, NFSMO

An all Weather Radar System to detect and monitor sea ice and icebergs at distances up to 150 kilometres is being developed by Battelle-Columbus Laboratories as part of a group study being supported by Canterra Energy Ltd., Petro-Canada Exploration Inc. and Mobil Research and Development Corp. The system is expected to be simple and inexpensive to operate and capable of receiving and processing clutter free data. ... (Au)

**33**

**Ice and its drift into the North Atlantic.**

(Oceanic abstracts (Bethesda, Md.), v. 11, no. 2, Apr. 1974, p. 73)

Abstract only.

Paper published in U.S. Defense Mapping Agency. Hydrographic Center. Pilot chart, Apr. 1973, 10 p.

*ASTIS document number 183806.*

ACU

Every spring and summer, ice drifts southward along the Labrador and Newfoundland coasts into the North Atlantic Ocean. It consists of glacial ice and sea ice. Glacial ice, in the form of icebergs, presents the greatest menace to trans-Atlantic shipping. The majority of icebergs that reach the Grand Banks of Newfoundland originate from the glaciers in west Greenland, with only a small percentage from east Greenland. Icebergs persist longer than sea ice and drift farther S and E, occasionally to the tail of the Grand Banks and on rare occasions as far S and E as Bermuda and the Azores. Iceberg drift patterns and navigational means for avoiding ice are described. (Au)

**34**

**Ice Centre prepares for RADARSAT.**

(Arctic news record, v. 3.3, Fall/Winter 1984/85, p. 46-47)

*ASTIS document number 164488.*

ACU

The Ice Centre of the Atmospheric Environment Service is in the midst of a three-pronged development period that will enable it better to satisfy the users' needs it anticipates will make themselves felt as of the latter 80s. Its sea ice reconnaissance arm is being strengthened with the addition of a state of-the-art SLAR in one of the two Electra aircraft it has operated for several years. A Dash 7 airplane with two of the advanced SLARS will soon be acquired for iceberg surveillance. These will provide a net increase and improved quality of ice data before the overall pattern of Arctic shipping changes. ... Forecasting is extending from being heavily sea ice related to iceberg surveillance beginning next year in August and continuing with increased flights during the East Coast iceberg season. A total iceberg program is in way of development, with observations, oceanographic and meteorologic data to produce forecasts and prognosis. The basic output will be a free service from Environment Canada like the weather reports, but site specific forecasts will be charged to the operator. ... (Au)

**35**

**Ice conditions in areas adjacent to the North Atlantic Ocean from July to September 1977.**

(Marine observer, v. 48, no.259, 1978, p. 37-41, ill.)

References.

*ASTIS document number 182613.*

NFSCF

The charts on pages 39 to 41 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys Ballot's law can therefore be applied to determine the direction of the wind anomaly.) Southern

and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text. ... (Au)

36
**Ice conditions on Grand Banks affect offshore oil operations.**
(Oil & gas journal, v. 66, no. 36, Sept. 2, 1968, p. 182-184, maps)
*ASTIS document number 171506.*
ACU

... It is in regard to the feasibility of platform structures that the implications of sea ice on the Grand Banks becomes most dramatic. On the basis of historical records, a preliminary evaluation has been made of the ice conditions and loadings to be expected for bottom-supported platforms in various areas on the Grand Banks. ... The most dramatic phenomenon associated with the Grand Banks area is the normal occurrence of icebergs .... The big question always is when and where will the bergs be found. ... In order to help resolve the question of occurrences vs. sightings, a careful study of the sightings records was made. ... Integrated into this analysis was knowledge developed by the Ice Patrol regarding the normal as well as exceptional drift rates displayed by icebergs. ... (Au)

37
**Ice in the seas.**
(The waters of the sea / P. Groen. – London ; Toronto : D. Van Nostrand, 1967, Ch. 3, p. 70-121, ill., maps)
*ASTIS document number 176583.*
NFSM

Chapter 3 includes an extensive description of icebergs, their formation, shape and drift patterns in the Arctic Ocean and North Atlantic Ocean. The physics of sea ice is also included. (NFSMO)

38
**Ice in the world ocean.**
(General oceanography / by G. Dietrich, K. Kalle, W. Krauss, G. Siedler. – New York : J. Wiley, 1980, section 5.5, p. 238-250, ill.)
*ASTIS document number 85456.*
ACU

Monitoring and forecasting the distribution of ice in the ocean is of great importance with a view to the commercial utilization of many sea areas. For this purpose, knowledge on the physical properties of sea ice is required, as well as on the processes of ice formation, on the types of ice occurring in the ocean, and on the statistics of the geographical distribution of such types of ice. [This chapter discusses all this as well as the different kinds of surveillance of ice distribution, such as those provided by various Ice Patrol Services.] (Au)

39
**Ice patrol Dash 7 readied for 1985 east coast debut.**
(Offshore resources, v. 2, no. 2, Mar./Apr. 1984, p. 63, 64, 66, ill.)
*ASTIS document number 141275.*
ACU, NFSMO

Advanced radar surveillance and data communication equipment is being developed by three Ontario firms as part of construction of an iceberg monitoring airplane commissioned by the federal government for use off Canada's East Coast. The aircraft may result in an extra 10 days being added to the East Coast drilling season as well as providing incidental information of value to petroleum explorationists. ... The flying patrol laboratory is being built at a projected cost of about $30 million by deHavilland Aircraft of Canada Ltd. in Downsview, Ontario, based on its Dash 7 model and incorporating an innovative laser profilometer to measure ice contours, side-looking-airborne radar (SLAR) for ice detection, and a high-speed data link to provide rapid transmission of information to ships compelled to navigate ice-strewn waters. The plane is expected to begin service in the fall of 1985. ... (Au)

40
**Iceberg alley provides troublesome environment for exploration.**
(Oilweek, v. 28, no. 14, May 16, 1977, p. 13, 16, ill.)
*ASTIS document number 172243.*
ACU, NFSMO

Iceberg Alley is the term given to one of the most difficult drilling regions in Canada, and the problem of exploration, coupled with eventual production, is being tackled with enthusiasm, imagination – and lots of money. [This article discusses some of the methods used to overcome iceberg and production problems along the Canadian east coast.] Icebergs present a unique environmental factor along the Canadian east coast as a potential threat to the safety of drilling and production installations. ... (Au)

41
**Iceberg dynamics.**
(C-CORE news, v. 10, no. 2, July 1985, p. 4, ill.)
*ASTIS document number 170194.*
ACU, NFSMO

Research at C-CORE into iceberg dynamics has been proceeding in two main thrusts: the motion of small icebergs, bergy bits and growlers in ocean waves; and the dynamics of large icebergs in contact with the seabed. The ESRF funded DIGS Experiment (Dynamics of Iceberg Grounding and Scouring), scheduled for August, 1985, on Makkovik Bank in the Labrador Sea, provides a unique opportunity to obtain full scale data on both of these important phenomena. The direct measurement of wave-induced ice motion was proven to be feasible in a pilot program conducted in July, 1984, in Byron Bay, Labrador (see C-CORE News, Vol. 9, No. 3). ... The measured motion of scouring icebergs will be used, together with data obtained on seabed disruption to provide case studies for the calibration of iceberg scour models (see C-CORE News, Vol 10, No. 1 for DIGS Experiment description). The measured small ice mass motion will be used to verify mathematical and physical models describing the motion of such masses in random seas. These programs represent attempts to obtain the first full scale data relevant to complete iceberg scouring events, and wave-induced bergy bit and growler motion. (Au)

42
**Iceberg fragmentation through stress induction.**
(C-CORE news, v. 10, no. 2, July 1985, p. 7, ill.)
*ASTIS document number 170224.*
ACU, NFSMO

A great deal of work, both theoretical and applied, has gone into developing methods of fragmenting icebergs. A practical method has not yet been identified. It is felt that this is largely due to the somewhat haphazard approach taken to the problem. A more systematic attack focussed on inherent weakness present in the ice mass should yield more satisfactory results. It is likely that stresses within the ice mass are the most universal source of such weaknesses. These stresses will derive from several sources and will vary widely in magnitude and distribution within the iceberg. The principal sources of stresses are [discussed.] ... (Au)

43
**The iceberg hunters.**
(Surveyor, v. 7, no. 2, 1973, p. 20-25, ill., map)
*ASTIS document number 163112.*
NFSMO

For sixty years, the U.S. Coast Guard's International Ice Patrol has

been reporting the iceberg hazard that menaces trans-Atlantic shipping. The article reports on the activities of the International Ice Patrol. (Au)

**44**
**Iceberg hunters use microwave radiometry.**
(Electronic design, v. 1, no.???, Jan. 4, 1967, p. 58, 60, ill.)
*ASTIS document number 167258.*
NFSMO

... icebergs are microwave transmitters. ... this characteristic of the floating masses of ice is giving their presence away to searchers flying in fog, rain and other conditions of poor visibility. ... [The article briefly describes the operational microwave system of the United States Coast Guard (International Ice Patrol) used to detect icebergs.] (Au)

**45**
**Iceberg patrol to get new aircraft.**
(Oilweek, v. 34, no. 16, May 23, 1983, p. 23)
*ASTIS document number 172162.*
ACU, NFSMO

Ottawa plans to spend $37 million on a new de Havilland Dash-7R extended-range turboprop as well as advanced sensing equipment that will improve Environment Canada's iceberg patrol capability. The new aircrtaft will join late next year the two Lockheed Electras currently leased by the department for monitoring pack ice and berg movement in the Arctic and off the east coast, as well as in the Great Lakes and the Gulf of St. Lawrence. The department estimates the Dash-7R will add roughly 500,000 square kilometres to the patrol's annual coverage. A key improvement, thanks to the new sensing gear, will be the ability to do sensing at night, vital during the long northern winter. ... (Au)

**46**
**Iceberg scour studies in Davis Strait.**
(C-CORE news, v. 8, no. 2, July 1983, p. 4-5)
*ASTIS document number 148237.*
ACU, NFSMO

A joint C-CORE-AGC-Canterra Energy Ltd. iceberg scouring/seabed study of the continental shelf off southeast Baffin Island was initiated in July 1981. Results from this 1981 pilot study formed the basis of a report to Canterra Energy and will be published as a C-CORE Technical Report. Salient features of the report are summarized. (Au)

**47**
**Iceberg threat at Hibernia worse than normal.**
(Oilweek, v. 34, no. 11, Apr. 18, 1983, p. 5-6)
*ASTIS document number 172138.*
ACU, NFSMO

... Mobile Oil's three wildcats offshore Newfoundland remain suspended as the rigs West Venture, Sedco 706 and Zapata Ugland are anchored southeast of the province waiting out iceberg concentrations that according to Ice Central are "much worse than normal." According to Mobil the three rigs each have two anchors out at 46 N, 50 W and are waiting on conditions as dozens of bergs, growlers and bergy bits float in the vicinities of the Hibernia I-46, North Dana I-43 and Rankin M-36 Wells. Poor weather conditions have prevented aircraft from making accurate counts of the bergs, but a spokesman at Ice Central reported one berg only eight nautical miles from the Hibernia I-46 location on April 14, and said, "there are hundreds of ice pieces to the north of the wells." At one time last week, pack ice had covered the Hibernia region, however the ice has now broken up and dissipated. There is no indication when the rigs may safely return to their locations. (Au)

**48**
**Iceberg towing.**
(Ocean industry, v. 18, no. 1, Jan. 1983, p. 9, ill.)
*ASTIS document number 136867.*
NFSMO

Zapata carries out iceberg surveillance and towing in 'Iceberg Alley' at [the] northern end of Labrador Sea. [This article describes their towing procedures.] (Au)

**49**
**Iceberg towing procedures in the Atlantic.**
(Ocean industry, v. 16, no. 8, 1981, p. 66-67, ill.)
*ASTIS document number 176567.*
NFSM

This article describes the towing procedures used for icebergs and the problems encountered. Data was collected to monitor the forces used to tow the bergs and was fed into a computer model to help indicate what pulling forces should be used. (NFSMO)

**50**
**Iceberg tracking and towing : the protection of offshore structures and a fresh water supply (Jan 66 – Jul 81).**
[Storrs, Conn. : New England Research Application Center] [publisher] ; Ottawa : CISTI [distributor], 1981.
2 microfiches ; 11 x 15 cm.
(NTIS PB81-871675)
Citations from the Oceanic Abstracts Data Base.
*ASTIS document number 180017.*
OON

The tracking of icebergs by means of remote sensing is reviewed in terms of protection of offshore structures and transport of oil by pipeline or tanker. The transport of icebergs to arid regions as a fresh water source is also reviewed with respect to thermal insulation and heat transfer. (Contains 127 citations). (Au)

**51**
**Icebergs.**
(Hibernia Development Project environmental impact statement. Volume IIIa : Biophysical assessment / Mobil Oil Canada, Inc. – [S.l. : Mobil Oil], 1985, p. 72-80, ill.)
*ASTIS document number 183768.*

The subject of Section 3.1.3.3 of the Hibernia Development Project E.I.S. is icebergs off the east coast of Canada. Within this section the subjects of iceberg movement, distribution, origin, deterioration, scouring, melting, and physical properties are discussed. Iceberg draft, as a feature of iceberg size, is also considered. (ASTIS)

**52**
**Icebergs : Davis Strait.**
(Marine observer, v. 50, no.269, 1980, p. 108)
*ASTIS document number 177644.*

10 August 1979. At approximately 1300 GMY several stationary echoes were observed on the radar screen; between fog patches they were identified as icebergs. During the next 24 hours numerous icebergs, sometimes as many as 20 at one time, were observed on the 12-mile range of the radar – the largest sighted were about 1000 metres long, 100 metres wide and 30 metres high – these were tabular bergs. All the icebergs made good radar targets showing up at least 6 n. mile distant. Bergy bits and growlers were also observed; these usually appeared in the radar screen at a distance of 1 or 2 n. mile. Most of the icebergs were weathered, had sharp edges and were dark blue in colour around the water-line. The final sighting of the icebergs was made at 1300 on the 11th when the vessel was in the Hudson Strait. ... (Au)

53
**Icebergs as ships.**
(Engineer, London, v.181, June 7, 1946, p. 517-518)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178829.*

Contains a history of the wartime project (code name "Habbakuk") to reinforce icebergs for airplane landing fields; with discussion of the mixture of ice and wood pulp known as "pykrete", and the designs for its use in constructing floating airdromes; a project never carried through. (AB)

54
**Icebergs pose major challenge to east coast oil and gas development.**
(Canadian energy news, v. 1, no. 26, 1980, p. 208)
*ASTIS document number 176486.*
NFSM

A production and transportation conference at St. John's, Newfoundland, was told in mid February that much more needs to be known about icebergs that infest Newfoundland waters before Canadian oil and gas offshore discoveries can be considered commercial propositions. An entire session of the technical conference focused on transportation and production systems for the Hibernia field. [Some of the opinions expressed by speakers at this conference are conveyed in this brief summary.] ... (Au)

55
**Icebergs reveal their secrets.**
(Geos (Ottawa), v. 11, no. 2, Spring 1982, p. 5, ill.)
*ASTIS document number 172286.*
ACU

How can wellheads and pipelines in the Canadian Arctic be protected from the mammoth icebergs that scour and gouge the ocean bottom? Creases and furrows one to 10 m deep and 75 to 100 m wide criss-cross parts of the seabed, and many of these gouges are made by icebergs. As the Hudson steamed south in western Baffin Bay in mid-October, 1981, the navigator plotted the position on the radar-scope and calculated the drift of icebergs within a range of about 50 km. Within two days we counted 379. ... The studies took seven hours and included cores and 'grab' samples of the sandy mud overlying bedrock on the seabed. ... (Au)

56
**Imagine an iceberg bigger than U.S. Navy.**
(Offshore environment : a frontier to conquer. Forum update, Summer 1984, p. 6-7, ill.)
*ASTIS document number 163104.*
NFSMO

The article briefly discusses the ice problems on the East Coast of Canada and in the High Arctic. (NFSMO)

57
**Industry gains on arctic water drilling.**
(Oil & gas journal, v. 76, no. 20, May 15, 1978, p. 36-37)
*ASTIS document number 171174.*
ACU, NFSMO

... Five wells totalling 35,662 ft of hole have been drilled off western Greenland. Water depths have ranged from 338 ft to 1,453 ft. Three of the wells were drilled under contract by Sedco-one with the Sedco 445 rig and two with the Sedco 709. Offshore drilling is limited by ice packs, icebergs, and weather as well as government regulations. Sedco has demonstrated that with good planning, no emergency operations or quick releases are necessary. Sedco suggests that the experience to date should prompt government agencies to relax timing requirements and permit steady, yearly exploration. ... During Sedco's 81-day drilling period, 82 icebergs varying in size from 8,000 to 7.5 million tons were sighted and tracked at locations within a 25-mile radius of the drill site. The largest iceberg was 600-by-600 ft and extended 200 ft above and 500 ft below the water. During the season, 18 icebergs were towed away from the drill site with service vessels. To tow icebergs, a tow boat releases 4,000 ft of 60-ton polypropylene floating rope. The rope is towed in a complete circle and then picked up and made fast to a tow wire rope. The vessel pulls with a steady 5,000-7,000 hp in order to divert the course of the drifting iceberg. ... Sedco vessels use a quick release, acoustic reentry subsea system to avoid approaching icebergs. ... (Au)

58
**International ice observation and ice patrol service in the North Atlantic Ocean, 1946-50.**
(Polar record, v. 6, no. 46, July 1953, p. 817-821)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178748.*
ACU

Contains a chronological summary of ice patrol activities. Includes names of ships and commanding officers of the patrol, types of aircraft used, and services rendered. In addition to oceanographic work an "iceberg census" was carried out in 1948 and 1949 in Baffin Bay and Davis Strait. (AB)

59
**The International Ice Patrol.**
(Marine observer, v. 51, no.271, Jan. 1981, p. 20-31, ill., maps)
*ASTIS document number 173398.*
NFSMO

The history of the International Ice Patrol (IIP) and the services the organization provides to the shipping community in the North Atlantic Ocean are presented. Ice and iceberg conditions are described together with the identification and tagging procedures used by the IIP for iceberg management. (NFSMO)

60
**The International Ice Patrol.**
(Naval research reviews, v. 20, no. 8, Aug. 1967, p. 23-25, ill.)
*ASTIS document number 183792.*
ACU

The U.S. Coast Guard responsible for the Ice Patrol since 1914 has increased its research to oceanographic observations, linking of iceberg detection techniques with weather satellite photo reconnaissance, development of radiometric iceberg detection, use of large oceanographic buoys to monitor ocean currents and brightly colored calcium chlorite bombs to make icebergs. Observations of the Ice Patrol and collaborating USCG weather ships are being computer processed for use in construction of a dynamic model of the North Atlantic. (ASTIS)

61
**International Ice Patrol services 1969.**
(Mariners weather log, v. 13, no. 2, Mar. 1969, p. 55-56, ill.)
*ASTIS document number 180874.*

... The primary objective of the International Ice Patrol is to provide timely information and advance warning to shipping of the extent and limits of icebergs and sea ice in the North Atlantic Tracks in the vicinity of the Grand Banks. ... The Ice Broadcasts by NIK will contain a request for shipping to report any ice sighted. Ship reports of ice and weather in the Grand Banks area are an indispensible source of ice, oceanographic, and meteorological data. They materially assist the International Ice Patrol in determining ice conditions and in disseminating ice information to shipping. When reporting icebergs, ships are requested to describe

the shape and provide an estimate of the size. The berg description is required to identify and track the individual bergs, while the size assists in determining their eventual deterioration. Common nomenclature used by the Ice Patrol is: Growler - under 4 ft high, less than 20 ft long; Bergy Bit – 4-20 ft high, 20-50 ft long; Small Berg – 20-50 ft high, 50-200 ft long; Medium Berg – 50-150 ft high, 200-400 ft long; Large Berg ... – over 150 ft high, over 400 ft long. Whenever any dimension falls into a larger size, that size is used. In addition to ice-sighting reports during the ice season, all ships are urged to take regular 4-hr reports to Radio Station Argentia (NIK) during the ice season when within latitudes 40 to 50 N and longitudes 42 to 60 W, including ship's position, course, speed, visibility, sea temperature, and wind. The importance of these reports cannot be overemphasized. ... It is realized that ships with but one radio operator may find it impractical to report every 4 hr. It is therefore suggested that the reports be prepared every 4 hr as requested and held in abeyance until the single radio operator is on watch. ... (Au)

62
**International Ice Patrol west Greenland glacier and oceanographic survey, 1968.**
(Polar record, v. 14, no. 92, 1969, p. 643-644)
*ASTIS document number 171085.*
ACU

During the second half of July 1968, USCGC Eastwind, Captain C.W. Bailey, carried out the first of a series of planned annual cruises and the first glacier survey conducted by the International Ice Patrol since 1940. ... The objects of the 1968 work were: (a) to obtain a comparison of the numbers of icebergs calved by several of the major ice producing glaciers of west Greenland; (b) to survey ice concentrations and environmental conditions affecting the discharge and drift seaward of icebergs from the parent glacier; (c) to survey glacier fronts for comparison with previous records to determine advance or recession. Glaciers surveyed were: (from north to south) Umiamako Isbrae, Rinks Isbrae, Store Gletscher, Lille Gletscher, Torsukatak, Kangilerngata Sermia, Eqip Sermia and Jakobshavn Isbrae. A Laser rangefinder was used, supplied by the United States Electronics Command. Air photographs were taken of the coastal area between lat 58 N and Thule. Oceanographic work in Davis Strait and in Greenland fjords included water analyses, the collection of benthic samples and bottom photography. (Au)

63
**Marine radar evaluation.**
(Ice community newsletter, v. 4, no. 1, Apr. 1985, p. 7)
*ASTIS document number 166804.*
ACU, NFSMO

Viatec Marine Systems will be continuing an evaluation of X- and S-band marine radars for iceberg detection in 1985. The project, funded by the Environmental Studies Revolving Funds (ESRF) will involve radars mounted on a ship. A similar study in 1984 used a drilling rig as a base. The mobility of the ship will allow a greater number of icebergs to be measured in a wide range of environmental conditions. It is hoped that a large number of icebergs will be monitored in the Grand Banks area during a three-week study period. (Au)

64
**Mobil's iceberg studies.**
(Eastern offshore news, v. 4, no. 2, July 1982, p. 3)
*ASTIS document number 171581.*
ACU, NFSMO

Mobil Oil Canada, Ltd. has embarked on a three-component ice measurement program in 1982 under the direction of its Development Projects Group. Ice Strength Tests are to be performed on eight tons of ice cut in May from a large iceberg which was near Nain, Labrador. ... Iceberg Aerial Reconnaissance is the third ice measurement program. ... (Au)

65
**Moving mountains of ice.**
(Compressed air, v. 90, no. 9, Sept. 1984, p. 16-19, ill.)
*ASTIS document number 171069.*
NFSMO

When icebergs break loose and head for shipping lanes and oil drilling rigs, the potential of a sea disaster exists; efforts are being made to make iceberg alley safe. [This paper describes the towing procedure for icebergs which has been developed by NORDCO Ltd.] (Au)

66
**NASA, NOAA satellites photograph giant iceberg.**
(Aviation week & space technology, Apr. 25, 1977, p. 42-43, ill.)
*ASTIS document number 180882.*

Giant iceberg almost the size of Rhonda Island was photographed on Jan. 31 by NASA's Landsat-2 spacecraft ... from an altitude of 570 mi. and on the same day by the National Oceanic and Atmospheric Administration's NOAA-5 weather satellite from an altitude of 900 mi. ... The iceberg, located near Palmer Peninsula in the Antarctic, is 45 mi. long and 25 mi. wide. Its depth is estimated at between 750-1,000 ft. The iceberg has drifted 1,800 mi. along the Antarctic coast, and it is feared that it may enter the open sea east of South America and pose a hazard to shipping. It contains sufficient fresh water to supply Washington, D.C., for an estimated 5,000-7,000 years or the state of California for 1,100 years. In August, 1975, the large iceberg struck the Larsen Ice Shelf of Antarctica, breaking off another iceberg ... 13-x-36 mi. in size. The Navy has been tracking the larger iceberg for the past 10 years. (Au)

67
**New sea ice information system ready.**
(Offshore resources, v. 3, no. 2&3, May/June 1985, p. 12-13)
*ASTIS document number 167509.*
ACU, NFSMO

The Canadian Sea Ice Information System (CSIIS) is a powerful new system for archiving, retrieving and analyzing data on sea ice and icebergs in Canadian waters. Quantitative data are presented either as statistical summaries of results or as raw data. ... A problem with conducting sea ice research in Canada until now has been that results of previous studies are scattered in unpublished manuscripts, files, and in-house reports held by a wide variety of government agencies, universities, and company libraries. The Canadian Sea Ice Information System consolidates all this information into a single source. It includes all non-propriertary information from Polar Shelf, COGLA, AES, the Labrador Group, EAMES, the Beaufort Sea Project and other sources. The CSIIS is a user-friendly, menu-driven system. That is, it offers the user a progressive series of choices about which area of the data base he wishes to use. Menu 1 is geographical area. The user can choose among data bases for the Beaufort Sea, Northwest Passage, Davis Strait, Baffin Bay, Hudson Bay, Labrador Sea, Scotian Shelf, Grand Banks or Gulf of St. Lawrence. Alternatively, the user may define the area of interest by a grid of latitudes and longitudes. The second menu is by time period, and is similarly flexible to user needs. The third menu selection is by ice type, in which the user indicates whether he is interested in sea ice or in icebergs and ice islands. ... The information may be presented as raw data, author-generated statistics, histograms or text. The information in proprietary reports is indicated by an abstract. The information in the CSIIS is continuously updated at C-CORE, the Centre for Cold Ocean Research at Memorial University. ... (Au)

68
**NORDCO offers technical expertise to industry through applied R & D.**

(Offshore report. Oilweek, v. 30, no. 21, June 2, 1979, p. O6-O10, ill.)
*ASTIS document number 168734.*
ACU, NFSMO

This article discusses Nordco, a service company and consulting service, representing most of the marine-related engineering, operational and scientific disciplines, which is supported by a group of field and laboratory technicians with extensive experience in northern marine operations and oceanographic measuring equipment. The company operates in the following areas: sea ice (including computer modelling, growth and decay, coverage and drift, type and topography, thickness, hardness, and salinity and density); icebergs (including long range satellité tracking, short range radar tracking, draft sounding and profiling, mass and volume estimations and scour detection and measurement); oceanography (including wave data recording, wave spectrum analysis, determination of significant wave height, current speed and direction, tidal monitoring, ocean circulation modelling and dispersion analysis). (ASTIS)

69
**Not even threatening icebergs will deter the search for hydrocarbons.**
(Offshore, v. 37, no. 11, Oct. 1977, p. 48, 50, 53-55, ill., map)
*ASTIS document number 163830.*
NFSMO

The article describes the search for hydrocarbons in the Davis Strait. (NFSMO)

70
**Un nouveau systeme de detection des icebergs [New system of iceberg detection].**
(Navigation, v. 1, no. 3, July 1953, p. 99)
Text in French.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179760.*

Contains note on an instrument, invented at Woods Hole Oceanographic Institution, which may be able to detect icebergs when thick fog or clouds prevent visual observation. The device measures length of the radiation wave emitted by the sea and compares it with a sample of sea water of known temperature contained in the instrument. (AB)

71
**Offshore activity must await more iceberg data, CSEG told.**
(Oilweek, v. 24, no. 9, Apr. 16, 1973, p. 24-26)
*ASTIS document number 169005.*
ACU

For the first time, the oil industry has to face the hazards of drifting icebergs as it attempts to tap the Atlantic Continental Shelf – but industry has insufficient information on the subject. "The need for information pertinent to the requirements of a developing offshore industry in eastern and northern Canadian waters now far exceeds the purposes for which the International Ice Patrol was established, even though much of the information collected by it is, and will be, of great use," Dr. Angus A. Bruneau told the 1973 national conference in Calgary of the Canadian Society of Exploration Geophysicists. ... Previously, concern with icebergs has been related to the safety of shipping, Bruneau pointed out. But potential development and production of reserves which might be discovered under the Continental Shelf has changed the type and amount of data required on iceberg movements and behavior. ... Among the problems to be solved are: distance of iceberg and the time it needs to travel measured over hours and hundreds of meters not miles; prediction of winds, which are quite unpredictable off the East Coast; prediction of the influence of winds on specific icebergs, given their shape and the water current situation; and prediction of iceberg shapes and size (needed to know how to deflect or pull). To design installations capable of withstanding any conceivable impact needs, as a starter, an estimate of the maximum kinetic energy and mass of any colliding berg in the area of operation. Also the shape of the berg must be known to assess likely points of impact and design the installation accordingly. ... Deflecting icebergs from a collision course by towing them onto a different course needs assurance that the results are predictable. The operation would have to be possible under any condition and feasible on even the largest bergs which may endanger the operation. So far data on bottom scouring by icebergs is still lacking. ... (Au)

72
**Oil production among icebergs is target of pioneering study.**
(Offshore engineer, supplement, Dec. 1977, p. 24-25, ill.)
*ASTIS document number 173452.*
NFSMO

The French oil company, Total CFP, is carrying out an investigation of offshore artric production methods. The project GERTH is developing a seasonal surface-based production system for oil through the ice-free period. The platform will be mobile to move off station when forced to do so by an iceberg. The subsea equipment will be sited in hollows excavated on the seabed where it will be safe from scour by icebergs. (NFSMO)

73
**On ice patrol.**
(Electronics, v. 37, no. 13, Apr. 6, 1964, p. 27, ill.)
*ASTIS document number 171590.*
ACU

When the Coast Guard cutter Evergreen left Boston last month to patrol the North Atlantic shipping lanes a one-bay computer, made by the Digital Equipment Corp., was aboard. ... The computer's primary job will be the determination of drift and the melting rate of ice, but it will also help them plot currents to determine the location of fishing grounds, which are often found where a cold current merges with a warm current. ... The main job of the patrol is to find and track icebergs that float down into the Atlantic Ocean ship mutes. Aerial reconnaissance and radar, besides visual sightings from ships, are the prime sources of information. To do a real job of alerting ships, the ice patrol must also operate as an oceanographer. The Coast Guard, which has very few oceanographers, would like to find out whether its computer can be operated by a trained enlisted man. If the experiment works, 30 weather and ice-patrol ships may be computer-equipped. ... (Au)

74
**On the trail of the $100-million iceberg.**
(Industrial research, v. 19, no. 9, Sept. 1977, p. 60, 62, 64, 66, 70, 72, ill.)
*ASTIS document number 163295.*
NFSMO

The article discusses the potential of using icebergs for freshwater and the problems encountered in towing large bergs. (NFSMO)

75
**The perils of iceberg alley.**
(Marine engineering/log (1979), v. 85, no. 11, 1980, p. 88, 90)
*ASTIS document number 176516.*
NFSMO

The article briefly describes a government/industry program to identify the appropriate combination of electronic sensor equipment to give early detection of icebergs. (NFSMO)

76
**Petroleum Directorate comments on ice danger.**
(Oilweek, v. 34, no. 9, Apr. 4, 1983, p. 22-27)
*ASTIS document number 172154.*
ACU, NFSMO

The Newfoundland Petroleum Directorate has made some observations and comments on various aspects of the shutdown and abandonment procedures on the Sedco 706 semisubmersible, drilling North Dana I-43, and West Venture drilling Hibernia I-4006, during the nine days from Feb. 12-20 .... According to the directorate, "conditions on the Grand Banks during February can be termed abnormal due to a significant increase in the number of icebergs in the drilling area. The International Ice Patrol reported approximately 120 berg sightings south of 48 N. The average since 1900 is nine for February." The report said the greatest danger associated with iceberg encroachment is that the operator may not have sufficient time or abilities to secure the well properly, hang off, disconnect, pull or shear anchor lines and move off the location before impact with the ice. A further concern is the potential impossibility of evacuating a rig by either supply vessel or helicopter due to severe weather conditions. ... (Au)

77
**Platform design counters iceberg threat.**
(Ocean industry, v. 18, no. 2, Feb. 1983, p. 83-84, 86, ill.)
*ASTIS document number 130966.*
NFSMO

The paper describes the design of a concrete fender ring which would shield vulnerable offshore production facilities against the impact of even the most massive icebergs. (Au)

78
**Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971.**
[Halifax, N.S. : Maritime Command Headquarters, 1971?].
v, 175 leaves : ill. : 28 cm.
References.
Cover title: Proceedings of the Canadian Seminar on Icebergs, 6 and 7 December, 1971 held at Maritime Command Headquarters, Halifax, Nova Scotia.
*ASTIS document number 160113.*
NFSMO, ACU

The Canadian Seminar on Icebergs was held because of the growing interest in icebergs off the Canadian east coast as related to oil exploration and probable future oil production activities. As the Seminar was the first of this type to be held in Canada, it was intended to be primarily of Canadian content and participation. The main objectives of the Seminar were to uncover the information available on icebergs, to determine the iceberg research and surveillance activities underway and planned, and to discover areas where knowledge is lacking and where future studies should be directed. (Au)

79
**Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 Apr., 1980.**
Cambridge : International Glaciological Society, 1980.
iv, 136 p. : ill., maps ; 30 cm.
(Annals of glaciology, v. 1, 1980)
Reviewed by document number 167100, Icebergs : technology for the future / H.W. Huppert published in Nature, v. 285, May 8, 1980, p. 67-68.
References.
*ASTIS document number 167088.*
ACU, NFSMO

... The hopes of many nations to expand their industrial and agricultural productivity have always been linked to the conventional water resource facilities they have in their own lands. It is also known that some of the countries who at present possess a sufficient supply of water for their existing industries foresee difficulties in the future for any further expansion. For this reason the idea of utilizing icebergs for the provision of water was proposed. After thorough investigations we decided to carry out extensive studies and practical field work to feed us with proper information and data before proceeding with the main project. Since the formation of Iceberg Transport International Ltd. two years ago, we had carried out research work, practical experiments, and investigations on various aspects such as routing and transfer optimization of icebergs. ... The main aim of this conference is to promote the exchange of scientific knowledge on the subject so that eventual transfer of icebergs becomes a feasible means of providing mankind with fresh water from new resources whenever the conventional ones are in shortage or cannot meet with our demand from fresh water. ... (Au)

80
**Profiling icebergs.**
(CRREL benchnotes, no. 6, Nov. 1977, p. 6-7, ill.)
*ASTIS document number 172030.*
ACU, NFSMO

It's well-known that most of an iceberg is hidden beneath the water's surface, and for this reason it's been quite difficult to determine the structure of these large masses of floating ice. Recently Austin Kovacs, a civil engineer at CRREL, has investigated a method to study iceberg structure by the use of a portable radar system. ... The graphic recorder produces a visual record of the reflections, and from the resulting profile, the depth of the iceberg can be calculated. ... (Au)

81
**Prospects tremendous off east Canada.**
(Oil & gas journal, v. 79, no. 1, Jan. 5, 1981, p. 115-116, maps)
*ASTIS document number 171344.*
ACU, NFSMO

Canada's vast 3,500-mile east coast offshore theater could contain 50% more recoverable oil and almost three times as much recoverable gas as Alaska's giant Prudhoe Bay field. ... the most promising oil area is the Grand Banks, east of Newfoundland, where the Hibernia discovery is capable of producing 20,000 bo/d, the best oil well yet in the country, on or offshore. He estimates the Grand Banks, which includes Hibernia, could contain 10 billion bbl of oil and 15 trillion cu ft of gas. ... Hibernia lies in one of the world's most forbidding marine frontiers. In addition to sea conditions similar to the North Sea, the presence of icebergs and sea ice add another dimension to development plans. It is estimated that the probability of an iceberg striking a fixed platform at Hibernia is in the order of once every 4-8 years, assuming the berg cannot be towed away before it nears the platform area. Sea bed equipment and flow lines must also be protected from icebergs. Wave heights of more than 40 ft are common during the winter season and are seldom less than 8 ft. The production system chosen must be capable of withstanding the attack of sea ice and collison by an iceberg weighing up to several million tons, or it must be capable of being moved out of the area when threatened by sea ice or icebergs. Projects and transportation systems studied include: (1) Bottom supported drilling, producing, and storage platforms of concrete and steel. (2) An integrated ship-shape production, storage, and shipping facility. (3) Semisubmersible floating production, facilities, and associated oil storage facilities. (4) Shuttle tankers and a pipeline to move the crude to shore. ... (Au)

82
**Prototype monitoring system designed for Coast Guard.**
(Sea technology, v. 20, no. 7, July 1979, p. 39)

*ASTIS document number 171298.*
ACU

The Charles Stark Draper Laboratory (CSDL), Cambridge, Mass., is designing a prototype self-contained salinity/temperature/depth profiling system scheduled for delivery to the U.S. Coast Guard this fall. One system application will be prediction of iceberg locations. ... Design goals for the new system include increasing the period between calibrations to one year, reducing the complexity of calibration, and designing lighter and self-contained equipment. Fabrication of the pressure hull from titanium is expected to reduce maintenance and weight, and allow operations to 6000 m. ... The CSDL system will use a microprocessor in the measurement system to self-calibrate each data sample to minimize errors. The Ocean Sampling System (OSS) consists of three units. The underwater unit (FISH) is battery operated from rechargeable NICAD cells. The FISH Interface Subunit, when connected to the FISH, provides battery charge, heater and auxiliary power. The Digital Computation Subunit is used as a "smart terminal" for conversing with the FISH, and for data reduction and permanent data storage on magnetic tape. (Au)

**83**
**Research projects.**
(C-CORE news, v. 8, no. 3, Nov. 1983, p. 6-7, ill.)
Contents: Iceberg research. – Iceberg frequency response experiment off Labrador. – Ice properties : winter field program.
*ASTIS document number 171255.*
ACU, NFSMO

Recent research at C-CORE has focused on discovering more about the properties of ice itself. Deborah Diemand has attempted to determine the range of ice temperatures to be expected in glacial ice masses found in the Grand Banks area. Since the strength of glacial ice is so strongly dependent on its temperature, the warming of icebergs as they proceed toward the Grand Banks is of interest to those involved in offshore activities in berg-infested waters off Newfoundland. Bore hole readings obtained on 10 icebergs in the St. John's area showed that as the sea water temperature increased, the thermal profiles of ice became markedly steeper. That is, the cold interior ice approached the surface as expected. Other iceberg work included Jim Lebver's wave tank tests on scaled down models of relatively small ice masses to determine how such bergy bits would behave in heavy seas with wave lengths much larger than the ice dimensions. It was found that these small ice masses – approximately 10,000 tonnes – behave like fluid particles in long waves and develop very high instantaneous velocities. A research program is planned for the coming year to obtain field data on bergy bit motions to confirm the laboratory findings and to obtain more data on bergy bit temperatures and their relation to the mechanical properties of the ice. Other ongoing research is aimed at defining the frequency responses of Labrador and Grand Banks icebergs to understand and predict the nature of interaction and man-made structures. They also hope to be able to distinguish grounding and scouring icebergs which are still in motion. (ASTIS)

**84**
**Risk assessment & pipeline trench depths.**
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 231-244)
References.
*ASTIS document number 148474.*
NFSMO

... [This paper reviews those papers presented at the Workshop on Ice Scouring which covered methods of calculating pipeline trench depths to avoid the ice scouring problem.] The methods can be divided into three general categories involving: (1) measurements or observations of the seabed soils (2) ice keels statistics (3) ice scour statistics. ... (Au)

**85**
**Science seeks way to predict path of icebergs ahead of time.**
(Offshore, v. 32, no. 1, Jan. 1972, p. 32-33)
*ASTIS document number 163058.*
NFSMO

... Dr. Angus Bruneau ... discussed some of the problems presented by bergs ... [for offshore oil exploration.] (Au)

**86**
**Sea monitoring : advanced radar gives sharp image.**
(Offshore resources, v. 2, no. 2, Mar./Apr. 1984, p. 62-63, ill.)
*ASTIS document number 141267.*
ACU, NFSMO

... The ability of STAR-1 and various Side-Looking Airborne Radar (SLAR) systems to supplement other iceberg information is currently being studied with the goal of developing an improved iceberg detection system, reveals INTERA Technologies, STAR-1s developer. This research is being funded by the Environmental Studies Revolving Fund of COGLA and involved a major field experiment in the first week of April. ... STAR-1 was developed in response to a requirement at Dome for a new surveillance sensor for its Beaufort Ice Management System. It has been used successfully in that program and in others from the Bering Sea to the Sverdrup Basin to the Labrador Sea in the past six months. The STAR-1 is the first Synthetic Aperture Radar (SAR) to be developed specifically for ice reconnaissance. It was designed following five years of research with a system operated by the Canadian Centre for Remote Sensing. This work identified the most advantageous trade-offs between resolution, swath width, and system size, weight and cost. The result is a system that has a resolution of 6 m by 12 m, and can image a swath on the surface of 50 km in width. ... (Au)

**87**
**Sea-ice information services in the world.**
Geneva, Switzerland : Secretariat of the World Meteorological Organization, 1981.
iv, 108p. : ill., charts ; 28cm.
([Publication] – World Meteorological Organization, no. 574)
ISBN 92-63-10574-X.
Appendices.
*ASTIS document number 87173.*
ACU, NFSMO

... Advances in communications, the advent of aircraft observations and routine reporting created the basis for the development of sea-ice information services by several nations by the mid-1950s. The first international sea-ice conferences were held and the Commission for Marine Meteorology established a working group concerned with sea-ice affairs. Since that time many further strides forward have been made both in observational and processing techniques, and information services are provided now as routine for all the commonly frequented sea-ice regions. This publication has been designed to describe these as they are today, and to provide clear factual details of the sources, background, preparation and presentation of these services. The publication consists of two parts: Part I – A description of the nature of sea ice, methods of observation, and the basis of ice information services; Part II – A listing of the sea-ice information services available from seventeen nations, given regionally, and in each case detailing: (a) Organization; (b) Data acquisition; (c) Output products; (d) Forecasts; (e) Publications; (f) Mailing address. (Au)

88
**Ship in the ice : NORDCO gathers ice pack information.**
(Ocean industry, v. 12, no. 9, Sept. 1977, p. 198-201, ill.)
*ASTIS document number 182710.*
NFSMO

The Newfoundland Oceans Research and Development Corp. Ltd. (NORDCO) gathered data in February of 1977 from onboard the icebreaker MV Arctic Explorer. The dense cover of drifting arctic pack ice and local ice which extends 200 miles from the Newfoundland coast during winter poses a serious threat to exploration and future production of offshore hydrocarbons. Experiments conducted will allow scientists to determine design parameters for ships operating in ice-congested areas, to ascertain the effect of weather on ice movement, and to check the accuracy of meteorological data available for the Labrador Sea. Information on storms, currents, icebergs, and pack ice, and their effects on fixed and moving vessels was also obtained. Estimates of Newfoundland's offshore reserves range from 18 trillion FT3 of gas and 2 billion BBL of oil up to 150 trillion FT3 of gas and 10 billion BBL of oil. (ASTIS)

89
**Supply ships tow bergs away from drillship off Labrador.**
(Oilweek, v. 24, no. 39, Nov. 12, 1973, p. 22-23, ill.)
*ASTIS document number 171310.*
ACU, NFSMO

The technique of towing icebergs was put to the practical test last summer in the Labrador Sea when supply vessels attending the drillship Pelican successfully deflected bergs heading for the vessel on three occasions. (Au)

90
**Survey of iceberg sightings in a section of the Strait of Belle Isle.**
(Iceberg study, volume II – section 7 / W.E. Markham. – [Halifax, N.S. :Ice Forecasting Control, 1968], 13 p.)
Iceberg study prepared by summer student in the Ice Forecasting Control Office.
*ASTIS document number 163775.*
NFSMO

A composite picture for the three years is given by plotting all the reported positions [of icebergs] on the map and dividing the region in three equal parts: from 56:20 to 56:37 W, from 56:37 to 56:54 W and from 56:54 to 57:10 W. The ratio of position reports for those three parts is 4:2:10 W. The ratio of position reports for those three parts is 4:2:1. Icebergs are also more numerous in the northern part of the strait. Those in the northern half outnumber those in the southern half by 5 to 2. ... (Au)

91
**TERMPOL assessment of Melford Point : volume I.**
[S.l. : s.n., 1981?].
1 v. (loose-leaf) : ill., maps, tables ; 28 cm.
Appendices.
References.
Text in English and French.
*ASTIS document number 153613.*
ACU

The Arctic Pilot Project is a proposal written and compiled by Petro Canada outlining the movement by ship of liquefied natural gas (LNG) from Melville Island in the Canadian Arctic to Melford Point in the Strait of Canso. Petro Canada is part of a consortium of companies comprised of: Alberta Gas & Trunk Pipeline Limited; Dome Petroleum Limited; Melville Shipping Limited; and Trans Canada Pipeline Limited. This study was prepared following an objective assessment and evaluation of the Arctic Pilot Project proposed marine transportation system. Recognized criteria and measurement techniques contained in the Code of Recommended Standards for the Prevention of Pollution at Marine Terminals (Termpol Code) and the LNG Supplement to the Termpol Code, were applied in the assessment process. The process is referred to as the Termpol Assessment Process (TAP) and is described as an established methodology for measuring and evaluating marine transportation systems from the perspective of the ship (vehicle). The assessment identifies particular alternatives or modifications to the proponent's proposal which specifically or generally improve ship safety aspects of the proposed transportation system. The study relates to the proposed routes to be followed by LNG carriers and extends from the parallel of 60 N in the Labrador Sea to Melford Point in the Strait of Canso. ... The basic plan of the Arctic Pilot Project includes a regasification plant and terminal to be owned and operated by Trans Canada Pipelines Limited. One of two possible sites being considered for the location of these facilities is Melford Point in the Strait of Canso. (Au)

92
**TERMPOL code assessment of the Arctic Pilot Project (northern component) (August 1981).**
[S.l. : s.n., 1981?].
1 v. (loose-leaf) : ill., figures, tables ; 28 cm.
Appendices.
*ASTIS document number 153605.*
ACU

The attached three part report is a technical assessment of the Arctic Pilot Project (Northern Component) in accordance with the prescriptions of the voluntary TERMPOL Code process. The three parts of the report are:- (1) Ship Safety and Accessibility; (2) Terminal Design and Operations; and (3) Environmental and Socio-Economic matters. (Au)

93
**Towing icebergs as part of arctic offshore feasibility study.**
(Hydrospace, v. 3, no. 5, Oct. 1970, p. 42-43, ill.)
*ASTIS document number 162981.*
NFSMO

As part of a feasibility study on offshore operations in Arctic regions, Marine Exploration Ltd. (MAREX) of Cowes, Isle of Wight, participated in a reconnaissance during April 1970 of Southwest Greenland by Compagnie Francaise des Petroles (CFP). ... The reconnaissance was part of a continuing study of offshore operations in Arctic Regions implemented by CFP, in which MAREX have been acting as chief consultants, the object being to test theories and carry out practical experiments in a region where many types of sea ice were to be found. ... Icebergs were seen which were aground in depths of over 150 m and having displacements of five million tons, but these would be dwarfed by the largest ones recorded. MAREX carried out a dive near a grounded iceberg in order to study its shape and discover whether it had deformed the sea bed when it ran aground. This was successful and was aided by the excellent underwater visibility .... Another experiment was that of taking bottom samples in different locations. This was accomplished with the aid of a simple dredge sampler designed and constructed by MAREX. ... Samples were taken over a wide area and were taken back to CFP's laboratories for analysis. It was at once evident, however, that the composition of the sea bed was not as had been expected. A clear pattern of the distribution of bottom material emerged as a result of this operation. One possible way of preventing an iceberg approaching an offshore drilling site is to tow it away and allow it to drift past the site at a safe distance. ... A floating iceberg was selected for the experiment and a towline attached to it with the aid of a small outboard motor boat. The survey ship was used to provide the towing force, this being measured. ... The experiment was a success and the results agreed well with those obtained by calculation. ... (Au)

94
**Towing techniques battle costly iceberg problems.**

(Offshore report. Oilweek, v. 30, no. 21, June 2, 1979, p.O16-O17, ill.)
*ASTIS document number 168815.*
ACU, NFSMO

... Ice and iceberg surveillance and protection operations are carried out by a team of more than 50 people servicing eight rigs offshore Newfoundland and Labrador, plus four drillships in the Beaufort Sea. ... MacLaren Marex pioneered work on the iceberg problem off Greenland in 1970, when initial attempts to deal with bergs included such schemes as shelling them or blowing them up with explosives. It became directly involved in 1971 and since then has provided iceberg surveillance and protection for all rigs operating offshore Labrador, for all but one rig during the offshore Greenland program and for three of four summer drilling seasons in the Beaufort Sea. Based in St. John's, more than 80% of the staff are Newfoundlanders. An ice surveillance and protection team consists of two observers on each rig who locate and track bergs, gather data on ice movement, including weather, and provide the strategy and information to deal with any threat to rig operation. ... If towing is required, and MacLaren Marex has documented more than 250 successful tows, the supply boat encircles the berg with a towline which was developed by the company and has particular characteristics of stretch and chafe resistance, floats and will not "melt" when extreme loads tend to fuse the fibres together. The towing vessel can exert an effective bollard pull of 80 – 100 tons. Because a berg's centre of buoyancy and mass can change radically as it melts or breaks up, towing operations can run into difficulties. Icebergs can capsize or roll over. The observers determine the size of the icebergs by analysis of photographs and other data, because size helps to determine the effects of wind, waves and currents. And when drilling is being carried out in relatively shallow waters, the depth of a berg becomes important because it could ground on the seabed and present an ongoing threat, or rip out wellhead installations. ... (Au)

95
**Travaux de l'escouade occidentale. Ergebnisse der Schweizerischen Gronlandexpedition, 1912-1913, Pt. III [The work of the western party. Results of the Swiss Greenland Expedition, 1912-1913, Pt. 3].**
(Schweizerische Naturforschende Gesellschaft. Denkschriften, bd. 53, 1920, p. 229-307, ill.)
English summary.
Text in French.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179035.*

Contains chapters on the cartographic work of this party (which included, besides the author, August Stolberg and W. Jost) on the inland ice at Nunapkigdlinga, glacial terrain, movement, ablation and texture of the inland ice, cryoconite, the glaciers at Disko, icebergs, and mosquitoes, with two notes on a grave and a rock cavern as possibly related to the Kivitok. (AB)

96
**U.S. Coast Guard use of the Argos Data Collection System for monitoring and tracking of icebergs.**
(Iceberg research, 1985, no. 11, Oct., p. 13-15, ill.)
References.
*ASTIS document number 183644.*
ACU, NFSMO

The Argos Data Collection System (DCS) became an integral part of the US Coast Guard's monitoring and tracking of icebergs in the Grand Banks region of Newfoundland, when in 1978 its International Ice Patrol (IIP) adopted the use of satellite-tracked drifting buoys for providing sea current measurements for its iceberg drift forecasting model. The model is used in producing the twice-daily radio broadcasts of Ice Patrol Bulletin, warning transatlantic mariners of the iceberg hazard during the spring and summer months of each year. ... The long-term drift of icebergs in Baffin Bay and the Labrador Sea has been studied by the U.S. Coast Guard's Research and Development Center, also in Groton, Connecticut. For this project a number of satellite-tracked ice buoys were parachuted onto icebergs in Baffin and Disko Bays. These buoys were tracked to determine their average velocities and to chart the principal paths that icebergs follow on their journey to the Grand Banks of Newfoundland. From this study it was learned that an average iceberg travelled the 1100 nautical miles from Cape Dyer, Baffin Island to 50 degrees N at the northern end of the Grand Banks in 190 days. Many icebergs do not successfully complete the journey, being driven into shallows by winds and becoming grounded. (Au)

97
**The varied and unpredictable faces of arctic ice.**
(Offshore engineer, supplement, Dec. 1977, p. 8-10, ill., map)
*ASTIS document number 176699.*
NFSMO

This summary presents a general guide to various types of ice found in the Arctic and in the Labrador Sea. The extent of sea ice, the drift, and scouring of icebergs are described. (NFSMO)

98
**1965 ice patrol ended.**
(Mariners weather log, v. 7, no. 4, July 1965, p. 121, ill.)
*ASTIS document number 177423.*
OON

... The season, which began in late February, was ended because it was found that the chance of ice hazards to vessels traveling the major northern shipping lanes had vanished. The Coast Guard stated that only 80 icebergs, compared with a normal total of 380, had entered trans-Atlantic lanes off Newfoundland. Monthly aerial survey flights to northern waters along western Greenland were helpful in keeping tabs on iceberg drift. This year for the first time arrows tipped with dye were used to mark bergs to determine drift and deterioration. The marking program was hailed a success; one berg was hit 60 ft. above the waterline and the dye remained visible for 10 days. However, the marking effort was hampered by the low number of bergs sighted. (Au)

99
**1985 submersible program.**
(C-CORE news, v. 10, no. 3, Nov. 1985, p. 3-5, ill.)
*ASTIS document number 181781.*
ACU, NFSMO

This year C-CORE made greater use of submersibles than ever before. Three submersible cruises were completed this summer and fall. Vaughn Barrie and Chris Woodworth-Lynas were with the PISCES IV submersible investigating fresh iceberg scours as part of the DIGS field program in August. ... Bill Collins, Chris Pereira and Jack Clark (C-CORE's Director) were with the Canadian Forces' submersible SDL-1 and its support vessel HMCS CORMORANT working around the Hibernia area making further investigations in a 10 m deep iceberg pit. In mid to late October Bill Collins and Vaughn Barrie were in the Hibernia region again with the MV PANDORA II and the PISCES IV submersible. ... (Au)

## A.H. GLENN AND ASSOCIATES

100
**Meteorological – oceanographic factors affecting offshore petroleum operations on the Grand Banks** / A.H. Glenn and Associates. Pan American Petroleum Corporation [Sponsor].
New Orleans, La. : A.H. Glenn and Associates, 1964.
101 leaves : ill., maps ; 28 cm.
*ASTIS document number 181900.*

NFSMO

This report presents the results of [a review] ... of meteorological – oceanographic factors of interest in the planning, design, and operation of offshore petroleum operations on the Grand Banks (offshore Newfoundland). The report consists of the following nine sections: 1. Normal Winds 2. Normal Waves 3. Normal Tides 4. Maximum Storm Winds 5. Maximum Storm Tide and Wave Characteristics 6. Storm Wave Forces 7. Normal and Maximum Currents 8. Fog Frequency and General Meteorological Data 9. Ocean Ice [:Icebergs, Sea Ice and Superstructure Icing.] ... (Au)

## A/S HOYER-ELLEFSEN

**See:** 621.

## ABELING, A.B.

**See:** 451.

## ABERNATHY, B.F.

**101**

**The Eastcoast Petroleum Operators Association** / Abernathy, B.F.

(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 84-99)

*ASTIS document number 160253.*

NFSMO, ACU

The paper describes the EPOA organization and in particular, the iceberg project which the organization has supported. (NFSMO)

## ABOULAZM, A.F.

**102**

**Drift of icebergs affected by wave action** / AboulAzm, A.F.

St. John's, Nfld. : Faculty of Engineering and Applied Science, Memorial University, 1982.

x, 58 leaves : ill. ; 28 cm.

Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1982.

References.

*ASTIS document number 162906.*

NFSMO

The wave drift force acting on freely floating icebergs has been analysed. This wave drift force was included together with other environmental forces acting on an iceberg for drift modelling to predict its drift patterns. The wave drift force was calculated using the wave diffraction theory and the singularity distribution method. ... The wave drift force was derived by taking the time average of the second-order wave forces on the iceberg. The computed wave drift force was then added to other environmental forces acting on the iceberg to form the differential equations of motion for translation in a horizontal plane. The iceberg trajectory can be found by solving the equations of motion numerically with the time step integration technique. This study has shown that the wave drift force acting on an iceberg is significant and has the same order of magnitude as other environmental forces. Including the wave drift force in the drift model has improved the accuracy of predicted paths of icebergs. This was verified by comparing the observed and predicted trajectories of two icebergs with and without the wave drift effect. (Au)

**103**

**Estimation of iceberg's draft can be made from visible part** / AboulAzm, A.F.

(Resource development, v. 13, no. 3, Winter 1981/82, p. 16-17, figures)

*ASTIS document number 139645.*

ACU, NFSMO

... Based on iceberg statical stability criteria, a simple model has been developed and presented in this paper to estimate the maximum possible draft associated with any iceberg. This model makes use of the characteristics of only the above-water portion of the iceberg which can be obtained from aerial photography and/or ship, shore measuring stations. ... Parameters involved in this method are the moment of inertia of waterplane, above-water volume of the iceberg, and the height of the center of volume of the above-water portion of the iceberg. The method has been tested by comparing the calculated maximum drafts with the drafts obtained from field measurements of a limited number of icebergs. Results have shown ... that the measured drafts are always within the upper bound established by equation .... This suggests the use of this model for obtaining the first estimate of the iceberg draft. ... (Au)

**See also:** 522.

## ABRAMOVICH, D.

**104**

**Performance of Salm/shuttle-tanker production/transportation systems in a hostile environment** / Abramovich, D.

(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 110-121, ill.)

References.

Alternate title: Performance of shuttle tankers in a hostile environment.

*ASTIS document number 149454.*

NFSMO

Development of the Hibernia field oil production/transportation system presents design challenges and economic considerations that closely resemble experiences encountered in developing the Thistle field in the U.K. Sector of the North Sea. The principal similarities between these two development plans lie in the environmental conditions that prevail in the Hibernia field and the North Sea and in the economic benefits realizable by bringing in oil production at the earliest possible point in the oilfield development program. The design concept, installation procedure, and transport operation used for initially handling the Thistle field production may be valuable guidelines for implementing oil production and transportation systems in the Hibernia field. (Au)

## ACKERMAN, A.A.

**105**

**Arctic ice and its navigation** / Ackerman, A.A.

(Popular science monthly, v. 35, Sept. 1889, p. 677-685)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 178764.*

ACU

Description of kinds of ice encountered in Baffin Bay and Smith Sound, and in the arctic waters north of Bering Strait, with some remarks on ships and their manner of penetrating the ice. (AB)

## ACKERMANN, H.J.

**See:** 951.

## ACKLEY, S.F.

**See:** 297.

## ACRES CONSULTING SERVICES

**106**
**Influence of small icebergs on semisubmersibles** / Acres Consulting Services. Newfoundland and Labrador. Petroleum Directorate [Sponsor].
St. John's, Nfld. : Acres Consulting Services, 1983.
2 v. (various pagings) : ill. ; 28 cm.
Bibliography: p. 136-139.
Partial contents: Volume 2. Appendices.
*ASTIS document number 170470.*
NFSMO

The technical report investigates the effects of the impact of small icebergs on semisubmersibles. Topics covered are (a) Ice and semisubmersible motion, (b) Ice/Structure Interaction, (c) Design features. The use of a new impact model which accounts for the hydrodynamic behaviour of the striking object, the global flexibility of the platform and the local force penetration behaviour of the striking object and the platform at the zone of impact is described. (NFSMO)

## ADAMOWSKI, K.

**See:** 212, 777.

## ADEY, A.W.

**107**
**Radio-frequency radiometry as a remote sensing technique in maritime reconnaissance and marine sciences in a northern environment** / Adey, A.W. Reed, G.N.
Ottawa : Communications Research Centre, 1973.
iii, 19 p. : ill. ; 28 cm.
(CRC technical note, no.660)
References.
*ASTIS document number 172170.*
ACU

The note discusses the application of the RF radiometry technique to the general maritime reconnaissance and marine sciences role in the Canadian North. It includes results of tests carried out with a helicopter-borne, multichannel, UHF radiometer in August 1972 in the Hudson Strait and Labrador Coast areas. Radiation data were obtained during flights over ships, ocean and fresh water, pack ice, icebergs, glaciers and land features. These initial results were encouraging, in demonstrating the potential of the technique, not only in direct support of maritime operations through aiding in detection and identification of features of interest, but with possible application in areas such as hydrology and glaciology. (Au)

**108**
**UHF radiometer for remote sensing of ships, sea ice, icebergs and the northern environment** / Adey, A.W. Reed, G.N.
(Canadian aeronautics and space journal, v. 19, no. 10, Dec. 1973, p. 528-530, ill.)
References.
*ASTIS document number 163040.*
NFSMO, ACU

This paper presents some results of flight tests with a radio frequency (RF) radiometer designed for maritime reconnaissance, sea ice, iceberg detection, and marine sciences in the Canadian North. The equipment was fitted in a helicopter flown over the Strait of Belle Isle, and over Hudson Strait in August 1972. ... (Au)

## AHUJA, H.N.

**See:** 285, 286.

## AINSLIE, A.R.

**109**
**Icebergs and drilling operations** / Ainslie, A.R. Duval, J.J.
(Canada's continental margins and offshore petroleum exploration. – Calgary, Alta. : Canadian Society of Petroleum Geologists, 1975, p. 841-852, ill.)
References.
*ASTIS document number 163740.*
NFSMO

This paper describes a research and development program which resulted in the development of methods for carrying out drilling operations in waters where icebergs are present. ... (Au)

**110**
**The towing of icebergs to protect offshore drilling platforms** / Ainslie, A.R. Jewett, P.E.
Cowes, England : Marine Exploration Ltd., 1970.
1 microfiche : ill., maps ; 11 x 15 cm.
*ASTIS document number 161748.*
NFSMO

... The purpose of this report is to determine whether the towing of icebergs to protect drilling rigs is practicable, to provide details of equipment and operating procedures and to determine the conditions under which such operations will be economically viable. ... The report is divided into several sections, dealing with different aspects of the subject. Section 2 deals with the environmental conditions of Southwest Greenland which are relevant to towing operations. Section 3 consists of towing calculations, the results being presented graphically, while Section 4 describes the methods and equipment required. The information from Sections 2, 3, and 4 is used as the basis for Section 5, in which practical details of operating procedures are given. (Au)

**See also:** 363.

## ALDWINCKLE, D.S.

**111**
**Prediction of structural damage, penetration and cargo spillage due to ship collisions with icebergs** / Aldwinckle, D.S. Lewis, F. Lewis, K.J.
London : Lloyd's Register of Shipping, [1984?].
15 p. : ill. ; 28 cm.
(Lloyd's Register of Shipping, no. 88)
Appendix.
References.
*ASTIS document number 178179.*

NFSMO

This paper describes the development of a model to estimate the damage extent and pollution consequences resulting from high energy ship collision with icebergs. A brief review is made of iceberg sizes. Reference is made to recent plans for the transportation of energy and mineral resources from the Arctic. Also reviewed are some statistics on damage to Ice Classed ships obtained from Lloyd's Register's database. The higher energy ship collision scenario is described as well as the assumptions, limitations and methods involved in analysing this complex problem in a relatively simplistic way. The energy absorbed in structural deformation is determined as a function of the collapse distance for ships designed to existing Rules and Regulations. These results are generalized from several representative ships, and a correlation relating the energy absorption characteristics to the main ship parameters and Ice Classes is given. The paper concludes that the application of these ship iceberg collision models in a simulation capability to predict the probability of encountering hazardous ice, should help understand the likely penetration and cargo spillage, and discusses briefly the possible trends in future design requirements for Arctic marine safety. (Au)

## ALLAIRE, P.E.

112
**Stability of simply shaped icebergs** / Allaire, P.E.
(Journal of Canadian petroleum technology, v. 11, no. 4, Oct./Dec. 1972, p. 21-25, ill.)
References.
*ASTIS document number 162850.*
NFSMO, ACU

... This study analyses the stability of sixteen simply shaped icebergs chosen to approximately correspond to above-water classifications given by the Ice Patrol. The results indicate that the stability depends largely on the above-water characteristics of the berg and is relatively independent of the below-water shape. For the shapes chosen, the minimum stable ratio of waterline width to above-water height is approximately 6:1 for blocky or tabular shapes, 4:1 for drydock shapes, 3.8:1 for dome shapes and 1.8:1 for pinnacled shapes. Based solely on the above-water characteristics, which are easily measured, these figures may provide a quick estimate of stability which could be essential in the field. First, the type of berg is determined from the Ice Patrol classifications. Second, the ratio of waterline width (smallest waterline dimension) to approximate height is calculated. Finally, if this ratio is near the minimum stable ratio for this particular class, the iceberg is probably close to instability. With sufficient field experience, a towing crew may be able to determine when special precautions are necessary. (Au)

## ALLAN, A.I.

113
**Iceberg scour damage risk assessment : Labrador Sea and Grand Banks** / Allan, A.I.
[S.l. : s.n., 1985].
[14] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163422.*

This presentation ... [reviews] some of the recent work done by Petro-Canada to assess the risk of iceberg scour damage to subsea installations and pipelines. The final objective of this work is to determine the burial depths or alternate protective measures required to provide an acceptable level of scour damage risk for subsea facilities required for development of Petro-Canada operated discoveries in the Labrador Sea and the Grand Banks. An overview of the risk assessment approach will be reviewed. Differences in risk assessment for intra-field subsea facilities and pipelines to shore will be discussed. Methodologies for determining the probability of iceberg scour damage will be outlined. ... (Au)

## ALLAN, A.J.

**See:** 897.

## ALLEN, J.H.

114
**An analysis of the effect of bottom scouring icebergs** / Allen, J.H.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 110-111, figure)
*ASTIS document number 148784.*
ACU, NFSMO

Dr. Allen initially discussed several aspects of iceberg investigation carried out during the "Dawson" cruise in May, 1971, including their movement, detailed shape and changes in surface topography, geological effects, marine life in, on, and around the bergs, and effects on the adjacent water and bottom. Current meters and cameras were placed at various depths from the surface to the bottom near the path of a moving iceberg and measurements and photographs were taken as the berg moved past. Local currents around the berg were noted. These photographs and others taken by scuba divers showed progressive rounding off of submerged portions of the icebergs and local erosion to give a pitted effect. Several slides illustrated the topography of the submerged surfaces. It was noted that small bubbles were given off continuously from the underwater ice surfaces and that this could explain the nature of sonar echoes obtained. ... Results on grounding of bergs and their tracks or bottom scouring were inconclusive. One berg was observed to be definitely grounded but it was caught between two shoals and no track was discernible. ... (Au)

115
**Cruise report, C.S.S. Dawson, June 2-June 12, 1971** / Allen, J.H.
St. John's, Nfld. : Memorial University, Faculty of Engineering, 1971.
37 leaves : ill. ; 28 cm.
*ASTIS document number 149152.*
NFSMO

[The purpose of the cruise off the north east coast of Newfoundland and in Conception Bay was] to study various parameters of icebergs, especially iceberg motion and iceberg grounding and to carry out other data-gathering operations including geological and biological sampling. (Au)

116
**Iceberg study, Saglek, Labrador including cruise report C.S.S. Dawson, August 7-August 26, 1972 : initial report** / Allen, J.H.
St. John's, Nfld. : Memorial University of Newfoundland, Faculty of Engineering and Applied Science, 1972.
ix, 92 leaves : ill. ; 28 cm.
Initial report.
*ASTIS document number 149446.*
NFSMO

The 1972 iceberg research programme was carried out along a coastal strip off Saglek Bay in northern Labrador, 30 miles in

North/South direction and 60 miles East/West .... The study was conducted from land, sea, and air. ... The physical parameters measured were evaluated in conjunction with observed iceberg movement in the study area. A definite relationship between the parameters and the berg tracks was recognized. (Au)

**See also:** 264, 269, 270, 280.

## ALLISON, I.

**117**

**Observations of water mass modification in the vicinity of an iceberg** / Allison, I. Kerry, K. Wright, S.

(Iceberg research, 1985, no. 9, Jan., p. 3-9, ill.)

References.

*ASTIS document number 166774.*

ACU, NFSMO

Measurements of water salinity and temperature profiles to 500 m depth were made at various close distances around two icebergs during Antarctic Division marine science cruises in 1981/82 and 1982/3. Evidence of modification of the near surface water was found several hundreds of metres from both icebergs. The T-S relationship of water around the first iceberg, which was in circumpolar deep water, suggests that convection alongside the iceberg is responsible for some of the observed changes, and that melt is occurring at considerable depth. The convection also decreases the depth of the pycnocline close to the iceberg. In contrast, the second iceberg, which was in cold shelf water, was melting only at depths above the seasonal halocline. There was no deep convention alongside the iceberg and the T-S relationship of the near surface water around the iceberg can be explained simply in terms of mixing of the melt with the initial seawater above the halocine. In this case the pycnocline is deepened and strengthened by the addition of the iceberg melt. Other water characteristics that appear to be associated with the iceberg were observed around the second iceberg. (Au)

## AMERICAN METEOROLOGICAL SOCIETY

**See:** 1133.

## AMOCO CANADA PETROLEUM COMPANY

**118**

**Iceberg drift predictions** / Amoco Canada Petroleum Company.

Calgary, Alta. : Amoco Canada Petroleum Co. Ltd., 1973.

10 leaves : figures ; 28 cm.

*ASTIS document number 132853.*

NFSMO

The project consisted of the preparation of a report by the Research Department on the hazards of operating in iceberg infested waters. It also discussed the techniques of predicting iceberg drift and the probability of impact with a fixed object. (Au)

## AMOS, C.L.

**119**

**The frequency of ice scouring on the northeastern Grand Banks of Newfoundland using the interrelationship of scours and bedform migration** / Amos, C.L. Barrie, J.V.

(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum - Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 220-221)

Abstract only.

References.

*ASTIS document number 148466.*

NFSMO

There are several lines of evidence to suggest that the seabed in the vicinity of the Hibernia discovery is mobile under certain conditions. High resolution sidescan records have revealed sand ribbons, sand ridges, sand waves and two and three dimensional megaripples (Lewis and Barrie, 1981). These features can only be generated by unidirectional flows at velocities of between 60-120 cm/sec. Sequential photography reveal asymmetrical, wave-formed oscillatory ripple marks after severe storms, above 110 m, which are subsequently degraded by browsing echinoderms and bivalves. The inferrence is that the smaller bedforms observed on the sidescan records are modern and migrate periodically across the shelf, presumably during periods of intense storms. The migration of these bedforms tend to cover older features, such as ice scours, with the result that an area may appear free of scouring. This same approach can be used in relating iceberg scours and the otter board trawl marks. (Au)

**See also:** 646.

## AMY, W.L.

**120**

**The floating menace; the icebergs of Labrador** / Amy, W.L.

(Canadian magazine, v. 38, no.???, Apr. 1912, p. 513-519, ill.)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 178772.*

Journalist's account of bergs seen in the coastal waters of Labrador Sea. (AB)

## ANDERSEN, H.S.

**121**

**The Labrador Current between Hamilton Inlet and the Strait of Belle Isle, July 1968** / Andersen, H.S.

Washington, D.C. : U.S. Coast Guard Oceanographic Unit, 1971.

v, 57 p. : ill. ; 28 cm.

(Oceanographic report - United States. Coast Guard, no. CG 373- 41)

Appendix.

References.

*ASTIS document number 180661.*

ACU, NFSMO

In July and August 1968, the Coast Guard Oceanographic Unit conducted a cruise aboard the USCGC Evergreen to monitor the movements and deterioration of an iceberg and associated meteorological and oceanographic conditions. Only the results of the oceanographic observations are presented. Four oceanographic sections were occupied across the Labrador Current between Hamilton Inlet and the Strait of Belle Isle. Analysis of the surface dynamic topography and selected isopycnal surfaces indicates strong topographic control of the currents in this area. The temperature distribution along the southernmost section suggests that the coldest component of the shelf band of the Labrador Current passed landward of the area under study, reinforcing previously published information that the shelf band of the Labrador Current bifurcates east of Hamilton Inlet. (Au)

## ANDERSON, C.

122
**The flow of icebergs along the Canadian East Coast** / Anderson, C.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 52-61)
References.
*ASTIS document number 160229.*
NFSMO, ACU

Icebergs have always been a meanace to ocean-going vessels off the Canadian East Coast .... with increased activity in offshore oil exploration, icebergs present a new problem because a stationary oil rig, unlike a moving ship, can take very little avoiding action. The prime concern [for offshore oil exploration] is ... the flux of icebergs passing a fixed point instead of the number that might be present on a particular day. The resulting flow model which has been developed uses data extracted from reports of the International Ice Patrol and estimates the monthly flux of icebergs across latitude lines at one degree intervals. ... (Au)

## ANDERSON, I.

123
**Iceberg deterioration model** / Anderson, I.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, 1983 season. Bulletin – United States. Coast Guard, no. 69, 1984, p. 67-73, ill.)
Appendix C.
References.
*ASTIS document number 161292.*
ACU, NFSMO

The ICEPLOT computer program used by the International Ice Patrol (IIP) to predict the positions of reported icebergs depends on iceberg size. It is well known that icebergs drifting south in the IIP operating area (between 40 N-52 N and 57 W-39 W) deteriorate. The need for an iceberg deterioration model has existed for some time. ... The two planned uses of the deterioration model are to change the size of the iceberg as it melts so the berg could be drifted more accurately and to remove the iceberg from the list of active bergs when it has completely melted. Until more evaluations of the model have been completed, the model will be used only to "flag" bergs that have accumulated a "melt" greater than 175% of their original length. Presently the model is run once a day. ... (Au)

124
**Oceanographic conditions on the Grand Banks during the 1983 international ice patrol season** / Anderson, I.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, 1983 season. Bulletin – United States. Coast Guard, no. 69, 1984, p. 51-66, ill.)
Appendix B.
References.
*ASTIS document number 160989.*
ACU, NFSMO

The 1983 Ice Patrol season marked the first time the International Ice Patrol (IIP) was able to operationally track an iceberg by satellite over an extended period of time (up to three months). This was accomplished in cooperation with the U.S. Coast Guard Research and Development Center by "tagging" three icebergs with TIROS Arctic Drifters (TAD). For the first time, realtime TIROS Oceanographic Drifter (TOD) information was used to permanently modify regions of the IIP historical current file. During the 1983 season, seven TIROS Oceanographic Drifters (TOD) were deployed in the IIP operating area. The realtime current information obtained from the TOD drifts was used weekly to temporarily modify the IIP historical current field. The procedure used in this modification is described in detail in Summary (1982). With one exception, all of the TODs and TADs were air-dropped from a Coast Guard HC-130 aircraft during regular ice reconnaissance flights ... The exception was TOD #2634 which was deployed from the USCGC NORTHWIND during cruise IIP-1-83. The main purposes of this cruise were to gather environmental data for comparison with that obtained from Fleet Numerical Oceanography Center (FNOC) and to obtain iceberg deterioration data. (For results of this cruise see Appendix C.). (Au)

**See also:** 770, 771.

## ANDERSON, J.O.

125
**Expendable data buoys for oceanographic, meteorological and tracking applications** / Anderson, J.O.
(Marine Technology "The decade of the oceans" Sixteenth Annual Conference. – Washington, D.C. : Marine Technology Society, 1980, p. 25-30, ill.)
References.
*ASTIS document number 176885.*
NFSMO

A family of expendable data buoys that transmit data via the TIROS-N and NOAA-A satellites has been developed. They have been used for data gathering tasks in all of the world's oceans. Five members of the family are discussed in this paper. The first is an open ocean drifting buoy that has been equipped with a variety of sensors as well as a drogue system for ocean current tracking. Another buoy described is designed to operate in temperatures to –50 degrees C and is built in configurations for parachute drop or for manual installation onto sea ice. A third version provides a capability for making long-term measurements of in-water parameters in ice covered seas using a buoy that can be dropped by parachute into open leads for subsequent freeze-in. In the fourth buoy, a miniaturized open ocean buoy in a "tracking only" configuration is coupled with a heavy steel dart and automatically deployed tether system to provide an air launched iceberg tracker. The last buoy to be discussed uses the Navy NAVSAT satellite, a microcomputer system and the TIROS/ARGOS data link to enable users to monitor ice movement with an accuracy of about 100 m. (Au)

## APPLEBY, J.R.

126
**Iceberg studies, parts I and II** / Appleby, J.R. Maes, M.A.
Calgary, Alta. : Det norske Veritas, 1983.
124 p.
(Det norske Veritas. Technical report, no. 83- 8522)
Limited distribution within Det norske Veritas.
*Document not seen by ASTIS.*
*ASTIS document number 184209.*

Hydrocarbon exploration and production in cold ocean areas requires that possible iceberg impact be recognized as a design condition for offshore installations and marine vessels. Part I of this report describes the state-of-the-art of iceberg technology. This covers the occurrence, distribution, movement, and physical characteristics of these features. In addition, the detection and control of icebergs is discussed. In Part II various forms of available data are used to identify possible impact scenarios with regards to ice-structure collision. The associated risks of such impacts are described, and the limitations and perspective of the analyses are discussed. Much of this study is innovative work and it provides a basis for the development of decision theoretic rules for

the design of structures and vessels in ice-infested waters. (Au)

## AQUITAINE COMPANY OF CANADA LIMITED

See: 449, 537.

## ARCHIBALD, D.C.

127
**Aerial sea ice observing and reconnaissance, St. Lawrence River, the Gulf of St. Lawrence, and coastal waters of Newfoundland 1961** / Archibald, D.C. Monsinger, M.N. Kilpatrick, T.B.
Toronto : Meteorological Branch, 1962.
157 p. : maps.
(Circular – Canada. Meteorological Branch, 3591)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180386.*

Includes maps and descriptions of ice conditions along the Labrador coast on ten days during May 25-June 27, as observed on medium-range flights out of Gander, Nfld. Various concentrations of winter and polar ice formed a belt adjacent to the coast; bergs were general. Open water was observed along the coast and along the eastern ice edge in late June. (AB)

## ARCTIC PILOT PROJECT (CANADA)

128
**Arctic Pilot Project environmental statement, supplementary information** / Arctic Pilot Project (Canada).
[S.l.] : Arctic Pilot Project [publisher] ; Calgary, Alta. : Pallister Resource Management Ltd. [distributor], 1979.
6 microfiches : ill., maps ; 11 x 16 cm.
Cover title: Arctic Pilot Project.
*ASTIS document number 157244.*
ACU

... This document is a compilation of supplementary information prepared by Arctic Pilot Project consortium personnel and their consultants. It has been prepared specifically to address the issues outlined in the "Guidelines for the Completion of the Environmental Assessment for the Arctic Pilot Project" issued by the Environmental Assessment Panel in September, 1979. ... The responses have been organized into three sections. Part A responses 1 – 9 cover supplementary information related to the general issues raised by the Panel and government agencies. Part B responses 1 – 28 provide supplementary material on the Melville Island Component required by the Panel and commented upon by government agencies. Responses B29 –32 cover additional information on the component requested by government agencies only. Part C responses 1 – 19 provide supplementary material on the shipping component required by the Panel and commented upon by government agencies. Responses C20 – 25 provide additional information on this component requested by government agencies only. (Au)

129
**Icebergs in the Strait of Belle Isle and approaches** / Arctic Pilot Project (Canada).
[S.l. : s.n.] ; Calgary, Alta. : Pallister Resource Management Ltd. [distributor], [198-?].
3 microfiches ; 11 x 16 cm.
Appendices.
References.
Cover title: Arctic Pilot Project.
*ASTIS document number 157317.*
ACU, NFSMO

Due to concerns raised in respect to icebergs within the Strait the Arctic Pilot Project decided to further augment the data base in respect to iceberg concentrations within the Strait of Belle Isle. Due to the possible impact on safety of LNG carrier traffic through the Strait the Arctic Pilot Project has obtained additional data on iceberg concentrations. This document does not attempt to address aspects in relation to oceanographic data like wind regime, wave heights and tides as this has been addressed in the Arctic Pilot Project "Integrated Route Analysis", revised 1981 edition. ... Iceberg bulletins for the Strait of Belle Isle and approaches issued by Ice Central in Ottawa from the period November, 1974 to December 1980 were examined to estimate the number of icebergs present in the Strait. ... (Au)

130
**Integrated route analysis** / Arctic Pilot Project (Canada).
(Arctic Pilot Project : integrated route analysis, April 1981 / Arctic Pilot Project (Canada). – [S.l. : Arctic Pilot Project (Canada)], 1981, v. 3, (various pagings), ill., maps)
Chiefly maps.
*ASTIS document number 157082.*
ACU

The third volume of the Integrated Route Analysis consists of appendices to the material presented in volumes one and two, and is comprised chiefly of maps. The large, folded maps of various scales are as follows: Davis Strait, West Parry Channel and Viscount Melville Sound, East Parry Channel, Barrow Strait and Lancaster Sound, Baffin Bay, Strait of Belle Isle, Labrador Sea, Pointe Amour to Cape Whittle and Cape St. George. (ASTIS)

131
**Physical aspects of the route areas** / Arctic Pilot Project (Canada).
(Arctic Pilot Project : integrated route analysis, April 1981 / Arctic Pilot Project (Canada). – [S.l. : Arctic Pilot Project (Canada)], 1981, v. 1, ch. 2, p. 1-522., ill., maps)
References.
Glossary of ice nomenclature: p. 501-516.
*ASTIS document number 157040.*
ACU

The route has been divided into several geographic areas. In this chapter the physical aspects of each of these areas are discussed. These are hydrography, ice, sea and weather conditions, icebergs and navigational hazards. (Au)

## ARCTIC SCIENCE AND TECHNOLOGY INFORMATION SYSTEM

132
**Ice scour bibliography** / Arctic Science and Technology Information System. Goodwin, C.R. Finley, J.C. Howard, L.M. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF [publisher] ; Calgary, Alta. : AINA [distributor] : Pallister Resource Mgt. Ltd. [distributor], 1985.
xi, 99 p. ; 28 cm.
(Environmental Studies Revolving Funds report, no. 010)
ISBN 0-920783-09-0.
Also available on microfiche.
*ASTIS document number 180904.*
ACU, NFSMO

This bibliography is the first in a series of bibliographies to be

prepared by the ESRF/ASTIS Project on the priority subjects of the Environmental Studies Revolving Funds. ... Ice scour is defined as the disturbance of the bottom sediments of a water-body by floating ice. Ice scour therefore does not include the effects of non-floating ice such as glaciers, grounded ice shelves, ice rises, or ice ride-up. ... This bibliography only includes works on ice scour itself, and not on related subjects such as the properties and distribution of sea ice and icebergs, characteristics of bottom sediments, terramechanics, or current scour. The bibliography includes a small number of works on ice scour in the intertidal zone and the biological effects of ice scour. Works that describe iceberg or sea ice groundings are included even if the scour marks themselves are not investigated or mentioned. Works that contain a significant amount of information on ice scour are included even if the scope of the work is quite broad and ice scour is a relatively small part of it. Proprietary works, such as wellsite surveys, are not included. No geographic restrictions were made in selecting works for the bibliography, although the fact that mostly English-language literature was examined means that information from Scandinavia and the Soviet Union is probably under-represented. ... This bibliography contains 379 citations. ... The citations in this bibliography have been grouped in a series of categories as shown in the Table of Contents. Those works that describe ice scour conditions in specific locations have been grouped geographically. ... Within each category citations are sorted by first author. Citations with no author appear at the beginning of the category. An author's works are sorted by title. The bibliography contains five indexes which refer back to the main section of the bibliography by citation number. ... (Au)

## ARCTIC SCIENCES LIMITED

133

**Data report no.2 : Satellite-tracked drifting buoy movements in Baffin Bay and Lancaster Sound, 1978-1979** / Arctic Sciences Limited. Fissel, D.B. Petro-Canada [Sponsor].
Sidney, B.C. : Arctic Sciences Ltd., 1981.
11 microfiches : ill., figures, tables ; 10x16cm.
(Eastern Arctic Marine Environmental Studies)
Appendices.
References.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
EAMES order no. EN20.
*ASTIS document number 82511.*
ACU, NFSMO

As part of an extensive program of physical oceanographic studies carried out in 1978 and 1979 on behalf of Petro-Canada, Arctic Sciences Limited deployed drogued satellite-tracked buoys in western Baffin Bay and Lancaster Sound. The tracks of these buoys and their associated computed velocities are presented in this report. These data will be used, together with simultaneous measurements of other types of physical oceanographic, wind and ice data, in the analysis of the circulation patterns of eastern Lancaster Sound and western Baffin Bay. The resulting knowledge of this circulation will be applied to the development of oil, iceberg and sea-ice trajectory models required for proposed offshore exploratory drilling for oil and gas. (Au)

134

**Data report no.5 : Nearshore studies of the physical oceanography of Cape Warrender, Cape Fanshawe and Cape Hay, 1979** / Arctic Sciences Limited. Birch, J.R. Petro-Canada [Sponsor].
Sidney, B.C. : Arctic Sciences Ltd., 1981.
3 microfiches : ill., figures, maps, tables ; 10 x 16 cm.
(Eastern Arctic Marine Environmental Studies)
Appendices.
References.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
EAMES order no. EN23.
*ASTIS document number 82546.*
ACU, NFSMO, NSDB(ENV.)

... Arctic Sciences Limited conducted an extensive program of physical oceanographic studies in western Baffin Bay ... three nearshore zones were determined to be of particular interest .... Cape Warrender, Cape Fanshawe, and Cape Hay .... Cape Warrender was chosen because it is in this region that (much of) the intrusive flow into Lancaster Sound appears to break away from the coast and turn across the Sound. Cape Fanshawe was of interest for similar reasons. ... Cape Hay was chosen largely because of the important bird colony there. An oil spill entering Lancaster Sound could follow the intrusive flow across the Sound and could ultimately pass close to Cape Hay. Consequently, it was felt that the nearshore area at Cape Hay should be studied closely in order to answer such questions as: how long might a slick remain near the bird colony, and how close to shore could the oil come. ... (Au)

135

**Data report no.7 : Satellite-tracked iceberg movements in Baffin Bay and Lancaster Sound, summers 1978 and 1979** / Arctic Sciences Limited. Fissel, D.B. Petro-Canada [Sponsor].
Sidney, B.C. : Arctic Sciences Ltd., 1981.
5 microfiches : ill., figures, photos., tables ; 10x16cm.
(Eastern Arctic Marine Environmental Studies)
Appendices.
References.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
EAMES order no. EN25.
*ASTIS document number 82562.*
ACU, NFSMO

... icebergs in Baffin Bay and Lancaster Sound were tracked using satellite-positioned platforms placed on top of the icebergs. The iceberg tracks were used to determine iceberg velocities and patterns of movements in an area where exploratory drilling for oil and gas has been proposed. (Au)

136

**The ice environment of eastern Lancaster Sound and northern Baffin Bay** / Arctic Sciences Limited. Marko, J.R. Petro-Canada [Sponsor].
[Ottawa : DIAND, 1982].
xxv, 213 p. : figures, tables ; 28 cm.
(Environmental studies – Canada. Northern Environmental Protection and Renewable Resources Branch, no. 26)
(Eastern Arctic Marine Environmental Studies)
ISBN 0-662-12085-X.
Appendices.
Bibliography: p. 193-201.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
*ASTIS document number 88455.*
ACU, NFSMO

The sea-ice and iceberg-related components of the 1978-1979 Petro-Canada-EAMES environmental programs have made major contributions to our knowledge of the Lancaster Sound-Baffin Bay ice cover. ... The present report integrates the new results with earlier data and interpretations to provide a current state of knowledge description of the Lancaster Sound-western Baffin Bay ice environment. ... information was sought on the numbers, physical dimensions, trajectories and general histories of icebergs and on the distributions and movements of sea-ice. ... The results considered here include: 1) descriptions of seasonal changes in the

ice cover in terms of fractional coverage of the surface, ice-thickness, -age and -floe sizes. Emphasis was placed upon representation of a year-to-year variability usually in terms of estimated mean and extremal conditions. Identifications were made of location and extents of landfast/consolidated ice and the ranges of dates associated with its formation, break-up and clearing. 2) descriptions of the seasonal sea-ice motions including their spatial- and time-dependences and their relationships to the atmospheric and oceanographic driving forces. 3) quantitative physical data on the regional iceberg population. ... (Au)

137
**Iceberg conditions at the Dundas exploratory drilling site : background and evaluation** / Arctic Sciences Limited. Marko, J.R. Pallister Resource Management Ltd. [Sponsor].
Calgary, Alta. : CMO Lancaster Sound Joint Venture, 1983.
iv, 36 p. : figures, tables ; 29 cm.
(Consolidex Magnorth Oakwood Lancaster Sound Joint Venture. Resource Management Plan support document, no. RMPSD10)
References.
Also available on microfiche.
*ASTIS document number 121371.*
ACU, NFSMO

This report outlines the results of previous studies of icebergs in Lancaster Sound and the adjacent sector of Baffin Bay commencing with the extensive 1978 and 1979 EAMES field studies. The source of the icebergs, their type, size, trajectories, and velocity are discussed resulting from radar-, aerial-, and satellite-tracking studies. Near-surface water circulation is summarized. The feature at the Dundas drill site of alternative southerly and southwesterly flow vectors is described. The contingency plan regarding the avoidance of drillship-iceberg collisions at the Dundas site is described in terms of alert zones with their distinctive management responses. The presence of multi-year and year-old sea ice is noted. The special problems associated with surveillance/environmental monitoring, berg deflection (towing) and a command/communications centre are discussed. Finally, the research needs are specified to fill knowledge gaps prior to any Dundas site exploration drilling. (ASTIS)

138
**Iceberg modelling off Canada's East Coast : a review and evaluation** / Arctic Sciences Limited. Marko, J.R. Fissel, D.B. Lemon, D.D. Petro-Canada [Sponsor].
Sidney, B.C. : Arctic Sciences Ltd., 1983.
249 p. : ill. ; 28 cm.
Appendices.
References.
*ASTIS document number 181986.*

The search for offshore oil and gas off Labrador and Newfoundland has been accompanied by the development of increasingly sophisticated models for predicting iceberg trajectories. Although considerable experience and expertise has been gained on this topic, meaningful comparisons of predicted (or hindcast) and iceberg trajectories have not encouraged faith in model predictions. The objective of this study is to determine the underlying causes of the differences between model output and iceberg movements, evaluate the importance of each factor contributing to the uncertainties and recommend priorities in future research and development to most effectively improve iceberg modelling results. ... Based on a thorough literature review, a total of fifteen iceberg models are described and compared. Attention is given to the utility of each model in an ice management system; to the formulation of each forcing term in the model; and to the individual requirements in the way of environmental and iceberg input data. ... (Au)

## ARNOLD, U.C.

**See:** 666.

## AROCKIASAMY, M.

139
**Dynamic responses of moored semi-submersibles in an ice environment** / Arockiasamy, M. Reddy, D.V. Muggeridge, D.B.
[S.l. : s.n.], 1983.
16 p. : figures, tables ; 28 cm.
Appendices.
References.
Paper presented at Structures '83, Congress and Exhibition, ASCE Annual Convention, Houston, Texas, U.S.A., October 17-21, 1983.
*ASTIS document number 131636.*
NFSMO

The paper deals with the dynamic response of moored semi-submersibles to forces imposed on it by ice-floes and bergy-bit/growler impacts. Ice forces on the vertical columns of the semi-submersibles are determined using a strain-rate, temperature and (ice-thickness)/(column diameter) ratio dependent force formulation. Three different analytical approaches are suggested for the solution of semi-submersible bergy-bit impact problem and numerical results obtained using one approach. The semi-submersible chosen for numerical example is similar to SEDCO 700 Series. The global and local structural responses are obtained for forces imposed on it by ice-floes and bergy-bits. (Au)

140
**Semisubmersible response to transient ice forces** / Arockiasamy, M. EL-Tahan, H.W. Swamidas, A.S.J. Russell, W.E. Reddy, D.V.
(Ocean engineering, v. 11, no. 5, 1984, p. 463-490, ill.)
References.
*ASTIS document number 171077.*
NFSMO

The paper presents an analytical and experimental study on the transient response of semisubmersibles to bergybit impact and the strength of bergybit ice to high strain-rate loadings. Two approaches have been proposed for the solution of the semisubmersible-bergybit interaction problem, one using the energy approach and the other using the conventional structural dynamics approach with initial velocity conditions. In addition the local behaviour of the impacted regions have been analysed for deformation and failure. Numerical results have been given for local behaviour of an impacted column and global behaviour of semisubmersible-bergybit system. Experimental study has been reported on the impact strength of iceberg ice at strain rates of 0.001 m, 0.01 m; the indentation impact strength of ice is found to be 3-4 times the uniaxial compressive strength, at the same strain rate. (Au)

**See also:** 377, 738, 851, 852, 854, 903, 997.

## ARSENAULT, L.D.

141
**Iceberg detection by airborne radar : results of CCRS Mobil experiment, spring 1983** / Arsenault, L.D. Benoit, J.R. Gray, A.L. Wong, M.
(Proceedings of the Ninth Canadian Symposium on Remote Sensing, August 14-17, 1984, St. John's, Newfoundland /

Edited by S.M. Till and D. Bajzak. – Ottawa : Canadian Aeronautics and Space Institute, 1984, p. 99-107, ill.)
References.
*ASTIS document number 176800.*
NFSMO

Convair-580 Synthetic Aperture Radar (SAR) imagery of icebergs and pack ice obtained at the Hibernia site in the spring of 1983, is described and discussed. Examples of imagery illustrating detectability problems, such as icebergs present in an open pack situation; and identification problems, such as differentiation of small bergs, boats, and pack ice are shown. Meteorological, ocean, and iceberg data were collected by the Mobile-concentrated vessel, the Polaris V. Under the conditions encountered during the experiment, which included 'moderate' sea states and moderate to high winds, icebergs were detectable in open water. However, when the iceberg was surrounded by pack ice, the absence of radar contrast between the iceberg and sea ice usually prevented detection. The imagery obtained support the expectation that as the radar incidence angle is increased, then the iceberg-water radar contrast and, therefore, detectability of smaller icebergs and growlers will also increase. No apparent change in iceberg-pack ice contrast is observable over the normal range of radar incidence angles used by the CCRS synthetic aperture radar; however, a special flight supported the contention that the only approach to the airborne detection of smaller icebergs and bergy bits in pack ice is to use large incidence (shallow grazing) angles. (Au)

**142**
**SIR-B Labrador Experiment** / Arsenault, L.D.
(Ice community newsletter, v. 4, no. 1, Apr. 1985, p. 4-6)
*ASTIS document number 166790.*
ACU, NFSMO

One of the Canadian experiments during the shuttle mission in October 1984, was to evaluate the detection and discrimination of icebergs in open water by L-band SAR, at look angles approximating those of RADARSAT. After several launch delays, Laurence Gray managed to reassemble a comprehensive group of aircraft and ships to gather extensive supporting data in the Labrador Sea area near 53-56 N. (1) CV-580 with X- and L-band SAR, scatterometer, photography; (2) DND Aurora with verification of all targets, photography; (3) Mobil King Air with visual observations and mapping camera; (4) AES Electra, ice reconnaissance with SLAR in period before and during mission; (5) M.V. Polaris V, leased by Dobrocky Seatech Ltd., surface measurements of iceberg characteristics, ocean wave/current regime using two wave-rider buoys and photography; (6) C.C.G. vessel Skidegate, surface measurements of icebergs, sea state, weather, photography. (Au)

**See also:** 812, 891, 892, 894.

## ARUNACHALAM, V.M.

**143**
**A review of interaction of icebergs with offshore structures** / Arunachalam, V.M. Bobby, W. Muggeridge, D.B. Stacey, R.A.
(Behaviour of Offshore Structures, 4th, International Conference, Delft, Netherlands, July 1-5, 1985, proceedings. – Amsterdam : Elseviers Science , 1985, p. 693-703, ill., maps)
References.
*ASTIS document number 178080.*
NFSMO

... For the Hibernia field, the designer has to consider the combined interaction of the conventional environmental parameters with the icebergs and the offshore structure, in the estimation of the design forces. Of importance in this context is the occurrence of icebergs, their size and shape distribution, their drifting pattern, the ability to detect them under different sea states, their motion in the absence and presence of offshore structures and actual iceberg impact forces should a collision occur. In this paper, a review of the state-of-the-art information on iceberg characteristics in the light of the design requirements of the offshore structures, and their interaction with other physical environmental parameters is presented. The results of recent model experiments on the motion of free floating model icebergs in regular waves are summarized, along with the motion of the model icebergs in the vicinity of a large gravity based model structure. (Au)

## ASHTON, G.D.

**See:** 297.

## ATLANTIC RICHFIELD COMPANY

**See:** 1098.

## AUBERGER, J.F.

**144**
**Preparation du Pelican a la campagne du Labrador [Preparation of the Pelican for cruises in Labrador]** / Auberger, J.F. Verlet, J.
(Le petrole et le gaz arctiques : problemes et perspectives = Arctic oil and gas : problems and possibilities. Contributions du Centre d'etudes arctiques, 12, v. 1, 1975, p. 263-267)
Text in French.
*ASTIS document number 177113.*
ACU, NFSMO

La Compagnie Francaise des Petroles possesses a petroleum exploration permit off the coast of Labrador. Some drilling is forseen for the year 1973 and La Compagnie Francaise des Petroles has obtained the agreement of its associates to use the drillship Pelican during July, August, September and October. An average of 5 to 10 icebergs or growlers have however been observed in July in an area of 10 miles around the drilling location, during an earlier cruise by the drillship Typhon in 1971. This average drops to 1 to 2 during the months of August, September and October. The special design features and radar equipment for iceberg detection are described. The technique of iceberg towing and the hazard of icing are also considered. (ASTIS)

## AUDETTE, M.

**See:** 556.

## B.P. OIL AND GAS LTD.

**See:** 706, 707.

## BAILEY, W.B.

**145**
**A review of U.S. Coast Guard published data on icebergs in the North Atlantic** / Bailey, W.B.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command

Headquarters, 1971?], p. 30-47, ill., maps)
This is part of a paper by USCG Captain R.P. Dinsmore, U.S. Coast Guard Headquarters, Washington, D.C. which was presented at the ICNAF Symposium on Environmental Conditions in the Northwest Atlantic, 1960-1969.
*ASTIS document number 160202.*
NFSMO, ACU

The paper reviews the movement of icebergs from Greenland down the east coast of Canada and the data gathered by the International Ice Patrol for south of 48 degrees N. Covered also are methods of detection of icebergs including radar and satellite. (NFSMO)

## BAJZAK, D.

**146**
**Thermal mapping of water envelopes surrounding icebergs** / Bajzak, D.
(Second Canadian Symposium on Remote Sensing, University of Guelph, Guelph, Ontario, Canada, April 29-May 1, 1974 : theme : The operations of remote sensing and benefits to Canada / Edited by G.E. Thompson. – Ottawa : Second Canadian Symposium on Remote Sensing for the Canadian Remote Sensing Society, 1974, v. 2, p. 574-579, ill.)
References.
*ASTIS document number 176737.*
ACU, NFSMO

... The main objective of this investigation is to gather information on melt water and on the movement of icebergs. This investigation is being carried out on large scale thermal imagery. Two infrared line scan maps of each of five icebergs and their vicinity were obtained using a Reconoflax XIII-A instrument from an altitude of 160 meters. The elapsed time between the start of corresponding consecutive strips was three minutes, while the angle between these strips varied from 70 to 190 degrees. The obtained imagery was digitized with a scanning micro-densitometer using positive transparencies of thermal maps. Then computer drawn density contour maps were produced from the digitized imagery. These maps were analysed to observe the rotation and minute movement of an iceberg, the distribution of melt and mixed water and the change in patterns of relative water surface temperature. The results indicate that thermal mapping is an excellent tool in obtaining relative surface temperature distribution map of water bodies. (Au)

## BALL, P.

**147**
**Environmental data requirements for a real time iceberg motion model** / Ball, P. Gaskill, H.S. Lopez, R.J.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering Under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 3, p.1369-1378, figures)
(C-CORE publication, no. 81- 9)
References.
*ASTIS document number 132136.*
ACU, NFSMO

Motion data for more than 250 icebergs from two sites in the Labrador Sea have been analyzed. A principal method in the analysis has been the use of a computer program which recreates the simultaneous dynamic motions of all the bergs at a given site for a given period of time. This enables us to address questions such as: To what extent are the motions of bergs which are present at the same time and close together highly correlated? As the distance between bergs increases, what is the rate at which the motion correlations fall off? To what extent do shape and/or gross size influence motions? What environmental data is required for the prediction of icebergs motions, and what are the appropriate space scales on which the data should be collected. Partial answers to these and other questions are given. (Au)

**148**
**Iceberg motion : an analysis of two data sets collected at drill sites in the Labrador Sea** / Ball, P. Gaskill, H.S. Lopez, R.J.
[St. John's Nfld. : Memorial University of Newfoundland, Centre for Cold Ocean Resources Engineering, 1983].
xii, 121 p. : figures, tables ; 28 cm.
(C-CORE publication, no. 81- 2)
(C-CORE publication. Technical report)
References.
*ASTIS document number 133094.*
NFSMO

This report analyses iceberg motion based on two large data sets collected on an operational basis by Total Eastcan during the summers of 1974 and 1979. Chapter 2 discusses the types of data used in the study and the organization of this data. Chapter 3 uses the data to decipher the gross characteristics of iceberg motion; attention is given to finding the sources of the observed variability in the motion. Chapter 4 considers the problem of using the observed berg motions to study the ocean. Chapter 5 discusses various methods for modelling iceberg motions; several differential equations models are studied in detail; methods for evaluating a forecasting model are discussed. Chapter 6 discusses the future development of a hazard forecasting system and outlines further experimental work. Many outstanding questions are raised throughout the report. (Au)

## BANKE, E.G.

**149**
**A hindcast study of iceberg drift on the Labrador coast** / Banke, E.G. Smith, S.D.
Dartmouth, N.S. : Atlantic Oceanographic Laboratory, Ocean Science and Surveys, Atlantic, Dept. of Fisheries and Oceans, c/o Bedford Institute of Oceanography, 1984.
(Canadian technical report of hydrography and ocean sciences, no. 49)
Appendices.
References.
*ASTIS document number 170500.*
NFSMO

A hindcast model simulates the movement of icebergs under the influence of winds, currents and Coriolis force. Air and water drag coefficients are optimized to give the best fit to the tracks of thirty-seven icebergs observed near drilling rigs off the coast of Labrador. Winds and currents appear to be of comparable importance in influencing iceberg drift velocity. ... The hindcast drift model is also used to estimate the bottom drag forces required to stop an iceberg in the observed scour distance identified by sidescan sonar. (Au)

**150**
**Iceberg avoidance research is tricky** / Banke, E.G.
(Offshore resources, v. 1, no. 4, Winter 1983, p. 14-15)
References.
*ASTIS document number 139637.*
ACU, NFSMO

... The dynamic iceberg drift model developed at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, by Dr. S.D. Smith has been applied to a number of selected iceberg drift tracks

in order to reach conclusions on the following: (a) Suitability of operational data for hindcast modelling of iceberg drift tracks. (b) Quantity of data required to estimate drag coefficients from drift track. (c) Effect of rotating wind drag direction relative to wind direction. (d) Variability of drag coefficients of icebergs, as estimated by hindcast modelling. (e) Relative influence of winds and currents in causing iceberg drift. (f) Effectiveness of actual towing of icebergs, as opposed to modelled tracks with tow force deleted. (g) Estimates of bottom-scouring forces during an observed grounding event. ... Despite valiant efforts, (including Martec's adaption of the model to run on a mini computer) to make dynamic modelling of iceberg drift a useful tool on offshore drill rigs, general acceptance of modelling by the oil industry has been slow .... (Au)

151
**Measurements of towing drag on small icebergs** / Banke, E.G. Smith, S.D.
(Oceans '74 : IEEE International Conference on Engineering in the Ocean Environment. – New York : Institute of Electrical and Electronic Engineers, Inc., 1974, v. 1, p. 130-132, ill., map)
References.
*ASTIS document number 163694.*
ACU, NFSMO

Three small icebergs have been towed and the towing forces have been measured to determine form drag coefficients. The mean drag coefficient, CW = 1.2, agrees with laboratory values for circular cylinders at similar Reynolds numbers. ... In addition to allowing estimation of the towing force required to tow a particular iceberg, the drag coefficient is a parameter in the iceberg drift models of WOLFORD and SMITH .... (Au)

152
**Wind forces on icebergs** / Banke, E.G. Smith, S.D.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 156-160, ill)
*ASTIS document number 162779.*
NFSMO, ACU

The paper discusses briefly mathematical studies of wind forces on icebergs. (NFSMO)

**See also:** 963, 964.

## BARDWELL, W.S.

153
**Newfoundland and Labrador pilot, vol. II, comprising the eastern coast of Newfoundland from Cape Saint Francis to Cape Bauld; Belle Isle; and the eastern and northeastern coasts of Labrador from Cape Saint Charles to Cape Chidley** / Bardwell, W.S.
8th ed.
London : Hydrographic Dept., Admiralty, 1953.
xlv, 655 p. : ill., charts (some folded).
Appendices list ports available for under-water repairs; principal ports, with particulars of depths, etc.; spots suitable for magnetic observations.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179744.*

This edition supercedes Arctic Bibliography, No. 6098 and Supplement No. 7 (1951). It has a more detailed description of formation of sea ice, ice movement, International Ice Patrol Service, ice limits and seasons, and icebergs; also a section on ice navigation (p. 27-39). Sailing directions for the Labrador coast (p. 365-591) include more detailed treatment of the Hamilton Inlet-Lake Melville region (p. 457-88). (AB)

## BARNES, C.A.

154
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1946** / Barnes, C.A. Challender, E.R. Soule, F.M. Read, G.H.
Washington, D.C. : U.S. Coast Guard, 1947.
iii, 188 p., [54] folded leaves of plates : charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 32)
Mostly maps and charts.
*ASTIS document number 181080.*
ACU, NFSMO

In December 1941, based on then-existing war conditions and disruption to normal maritime commerce and practices in the North Atlantic, the President approved the recommendation of the Commandant of the Coast Guard for suspension of the International Service of Ice Observation and Ice Patrol. With the passing of these extraordinary conditions the International Ice Patrol was resumed early in 1946. This does not mean that ice conditions were not observed or reported during the seasons of 1942-45, but the methods used and the extent of the area involved were altered to fit the naval needs and facilities of nations at war. In this report of the International Service of Ice Observation and Ice Patrol for the 1946 season a description of ice conditions and a tabulation of collected ice information are made available for the war years in as near the usual form as the sources and peculiar circumstances surrounding its collection permit. [The tables of ice reports are divided into various subdivisions which indicate vicinity and detailed location of the ice. As well as iceberg sightings, observations were made on pack ice and ice cover.] ... (Au)

**See also:** 977.

## BARNES, H.T.

155
**Experimenting with icebergs** / Barnes, H.T.
(Marine observer, v. 4, no. 41, 1927, p. 91-93, ill.)
*ASTIS document number 160059.*
NFSMO

The report describes the first work to fragment an iceberg by the means of thermal stress. The stress was introduced into the iceberg by thermite. (Au)

156
**Ice engineering** / Barnes, H.T.
Montreal : Renouf Publishing Co., 1928.
364 p. : ill.
Contents: 1. Equilibrium of the ice-water system. 2. Physical constants of ice. 3. Rate of growth and melting of surface-formed ice, infrared absorption, various kinds of ice. 4. Theories of formation of anchor ice. 5. Frazil ice. Winter ice floods. 6. Ice remedial work, use of steam, thermit, hot water, calcium chloride and other chemicals. 7. Ice pressure and expansion. 8. Ice navigation and ice breaking. 9. Conservation of heat in lakes and rivers for ice prevention, evaporation, power houses and power canals. 10. Glacier ice and icebergs.

Bibliography.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178780.*

A fundamental and exhaustive treatment of the physical properties and behavior of fresh-water ice, based on laboratory and field investigations. (AB)

**157**
**Icebergs and their location in navigation** / Barnes, H.T.
(Nature, v. 89, no.2225, June 20, 1912, p. 411-414, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179647.*
ACU

"Abridged from a discourse delivered at the Royal Institution on" May 31, 1912, this is a concise statement of origin, movements, and limits of North Atlantic ice; notes on surface temperature of Labrador Current, Pettersson's theory of ice melting, also use of, and experiments with microthermometers for locating ice. (AB)

**158**
**The rise of temperature associated with the melting of icebergs** / Barnes, H.T.
(Nature, v. 90, no.2250, Dec. 12, 1912, p. 408-411, ill.)
*ASTIS document number 162795.*
NFSMO, ACU

The field measurements taken on icebergs in the Strait of Belle Isle showed that it is the rise in temperature which is the direct action of the melting iceberg. ... the presence of the ice causes a zone of water of higher temperature to accumulate for a considerable distance about it. (Au)

**159**
**Some physical properties of icebergs and a method for their destruction** / Barnes, H.T.
(Proceedings of the Royal Society of London. Series A. Mathematical and physical sciences, 114, 1927, p. 161-168)
*ASTIS document number 160067.*
NFSMO, ACU

The paper describes the purity of iceberg ice, and the amount and quality of air compressed into the berg. The experiments to fragment bergs using thermite are also described. (NFSMO)

## BARRIE, J.V.

**160**
**Data report of the Hekja wellsite marine survey undertaken during CSS Hudson cruise no. HU81-045 October, 1981** / Barrie, J.V. Woodworth-Lynas, C.M.T. Pereira, C.P.G.
St. John's : Centre for Cold Ocean Resources Engineering, 1982.
vi, 50 p. : figures, tables ; 28 cm.
(C-CORE publication, no. 82- 2)
(Data report – Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
ISBN 0-88901-081-1.
Appendices.
References.
*ASTIS document number 105074.*
ACU, NFSMO

This report concerns the acquisition and some initial interpretation of raw data during a marine survey in the vicinity of the Hekja wellsite off Loks Land, southwest Baffin Island on the CSS Hudson. ... Raw data collected included bottom sediment grabs, gravity and piston core samples, camera transects, shallow and deep tow sidescan transects, bathymetry, HUNTEC DTS high resolution seismic reflection transects, air-gun seismics and an iceberg log. Also presented are some preliminary observations made while the data was being collected. (Au)

**161**
**Down on the Labrador Shelf : visual examination of iceberg scouring** / Barrie, J.V.
(C-CORE news, v. 7, no. 2, June 1982, p. 2-3, ill.)
*ASTIS document number 148245.*
ACU, NFSMO

This article describes a descent in the untethered self-propelled submersible Pisces IV, operating from the research vessel Pandora II. Main objectives were to investigate seafloor actively disrupted by grounding keels of icebergs and to note degradation of scour marks by superimposed current regime and benthic biological activity, to provide ground truth for acoustic geophysical data, to note sedimentary environments and describe a sample section of bedrock outcrop. (ASTIS)

**162**
**Grand Banks pits : description and postulated origin** / Barrie, J.V.
[S.l. : s.n., 1985].
[6] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166570.*

In the summer of 1984 C-CORE had the use of the SDL 1 submersible of the Canadian Navy primarily to set up a sediment transport study site and to extend our regional knowledge of the area. A secondary goal was to investigate some of the interesting features that had been observed on the seafloor during earlier geophysical surveys. These features, which have been called amongst other things pits, depressions and pockmarks are located on the outer shelf of the Grand Banks in the Hibernia area. They were first discovered in the area in 1980 and many more features have been observed since during wellsite surveys. The pit selected for this study was originally discovered in 1980 in 90 metres of water. (Au)

**163**
**Ice scour : methods of analysis** / Barrie, J.V. Woodworth-Lynas, C.M.T.
(A short course on the sediment stability of Canadian shelves, March 9-10, 1982 / Edited by J.V. Barrie. C-CORE publication, no. 82- 10, 1984, p. 83-96)
(C-CORE publication. Technical report)
*ASTIS document number 149950.*
NFSMO

The understanding of scour frequency and the mechanism of the ice/seabed interaction is critical to design criteria for seabed installations. The paper discusses a number of methods for analyzing iceberg scours. (NFSMO)

**164**
**Iceberg grounding review from wellsite observations** / Barrie, J.V. Lynas, C.M.T. Gidney, G. Canada. Geological Survey [Sponsor].
St. John's, Nfld. : Memorial University of Newfoundland, Centre for Cold Ocean Resources Engineering, 1982.
ii, 38 p. : ill. ; 28 cm.
(Open file – Geological Survey of Canada, no. 880)

(C-CORE publication, no. 82- 7)
(Contract report – Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
Appendices.
References.
*ASTIS document number 133264.*
ACU, NFSMO

This study was carried out to analyze and assess the behaviour of grounding icebergs on the Labrador Continental Shelf. Iceberg observation data collected by MAREX are analyzed using a special computer program, BRGPRT. BRGPRT was designed by C-CORE based on an earlier program, IMCVIE, developed by Ball et al (1980). Preinterpretation shows that at two well sites icebergs ground preferentially on bank edges but elsewhere grounding appears to be random. ... Iceberg data was collected and entered into logs by MAREX for all the well studies in this report.... Icebergs detected by radar were given an identification number, and positions were noted approximately every hour by recording time, range (in nautical miles) and bearing (relative to true north). Comments on height, width, draft, shape and a subsequent estimation of mass were noted if the iceberg was in visual contact. Additional comment such as calving and rolling events and iceberg towing ties were also noted. ... Concurrent with iceberg obervations meteorological and sea condition data were collected at hourly intervals and at most drill sites current meter data was collected. (Au)

**165**
**Iceberg grounding studies** / Barrie, J.V. Lewis, C.F.M.
(C-CORE news, v. 5, no. 1, Jan. 1980, p. 7-8, ill.)
*ASTIS document number 148105.*
ACU, NFSMO

A research program to study iceberg scouring on the Labrador Shelf has been ongoing since 1976 .... The most recent field activity for this joint program of the Geological Survey of Canada, through its Atlantic Geoscience Centre (AGC), and C-CORE was carried out as part of Cruise 79-019 of the CSS Hudson of the Bedford Institute of Oceanography. ... The objectives of our participation in this cruise were to investigate the present situation at two previously surveyed locations on the Shelf, and to seek out icebergs in the process of scouring and investigate the nature of the resulting seabed disruption. This second objective would be a matter of opportunity. One of the areas to be resurveyed was on Makkovik Bank, in the region of the Total Eastcan Exploration Ltd. Bjarni well. ... The other area, on Saglek Bank, was investigated in 1976 for Total, and in 1977 and 1978 by BIO and C-CORE. We were to resurvey these two areas with overlapping side scan sonar and high resolution seismic profiling systems, and to collect cores, sediment samples, photographs and bottom current meterings along the survey lines. ... (Au)

**166**
**Iceberg pits : description and postulated origin** / Barrie, J.V. Collins, W.T.
(14th Arctic Workshop : Arctic land-sea interactions, 6-8 November, 1985, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. – Dartmouth, N.S. : Bedford Institute of Oceanography, 1985, p. 90)
Abstract only.
*ASTIS document number 176320.*
ACU

Circular depressions or pits up to 10 m deep are found below 80 m water depth on the Northern Grand Banks of Newfoundland. One particular pit, 100 m wide, originally discovered in October 1980, east of Hibernia was relocated in October 1984. Two submersible dives were carried out to investigate this pit. A series of two events are postulated for the formation of this feature. Morphologically, its overall 'amphitheater' shape, a steep back (south) wall and two side walls, (surrounded by a berm) and a shallow sloping north entrance suggests the formation was a result of the grounding of an iceberg. Subsequently, bearing capacity failure is hypothesized to explain the deep (10 m), oversteepened nature of the pit and the 10-15 degree dip of the clay beds towards the centre of the feature. The hard clays that lie directly below the thin surficial sand with pebble armour are likely of Tertiary to early Pleistocene age. The feature is partially infilled and probably was deeper originally. Two passes with the Huntec DTS system in 1980 and two passes with a 3.5 kHz system in 1984 showed a total pit depth between 5 to 7 m compared to the actual depth of 10 m. It is possible that the pits documented on the Grand Banks could be underestimated by between 30 to 50% due to limitation of profiling systems over such steep-walled features. (Au)

**167**
**Iceberg-seabed interaction (northern Labrador Sea)** / Barrie, J.V.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 71-76, figures)
(C-CORE publication, no. 80- 3)
References.
*ASTIS document number 61107.*
ACU, NFSMO

... Side-scan sonograph mosaics from the northern Labrador Shelf were constructed for two bathymetric interbank areas. They reveal that both relict ice bottom gouging and modern iceberg scouring have taken place at water depths greater than 180 m. ... The dominant scour trend is north-south, reflecting the Labrador Current. Impedance of icebergs by bottom interaction is primarily a function of the gross iceberg size and shape, sediment encountered by the keel, and prevailing current. For modern scouring, frequencies of detectable impact decrease exponentially with increasing scour depth, and scour depth is inversely proportional to the sediment shear and compressive strengths. (Au)

**168**
**Sediment transport and iceberg scour preservation and degradation, eastern Canadian shelf** / Barrie, J.V.
[S.l. : s.n., 1985].
[4] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166529.*

In this short presentation I am going to discuss the problem of the actual preservation and degradation of scours. This process is critical in many of the analyses we shall be discussing at this workshop. I hope to suggest methods of how the degradation process can be monitored both during and immediately after scouring takes place and in the long term. (Au)

**169**
**Sedimentary processes and the preservation of iceberg scours on the eastern Canadian continental shelf** / Barrie, J.V.
Espoo, Finland : Technical Research Centre of Finland, 1983.
(Seventh International Conference on Port and Ocean Engineering Under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 4, p. 635-653, figures)
(C-CORE publication, no. 83- 6)
References.
*ASTIS document number 133272.*
ACU, NFSMO

Iceberg scours, the physical evidence of grounding icebergs, are

observed over much of the eastern Canadian continental shelf. The degree of preservation or degradation of these scours (which can define scour age) depends on the type of sediments, their physical and geotechnical properties and the hydrodynamic regime that the sediments are exposed to. Evidence drawn from sediment textures, mineralogical analyses, submersible observations, acoustic geophysical surveys and from the hydrodynamic environment demonstrate that the rate of scour degradation is determined primarily by wave-induced oscillatory motion and to a lesser extent, by unidirectional currents at the seabed and the sediment available for deposition. Assuming that the hydrodynamic processes can be quantified, then scour frequencies and rates of scour degradation can be determined more accurately; these quantitative parameters are based on scour morphology as interpreted from the existing scour data base. Three defined scoured environments are compared, including examples from the Davis Strait, the Labrador Shelf and the Grand Banks of Newfoundland. (Au)

**170**
**Sedimentology of two Labrador banks** / Barrie, J.V.
Lynas, C.M.T.
(C-CORE news, v. 6, no. 1, Apr. 1981, p. 5-6, ill.)
*ASTIS document number 172367.*
ACU, NFSMO

... C-CORE is participating jointly with the Atlantic Geoscience Centre at Bedford Institute in a continuing research program to study iceberg scouring on the Labrador shelf (C-CORE News, Vol. 5, no. 1). As the first step towards understanding the sedimentological processes on southern Saglek Bank and Makkovik Bank, a detailed sedimentological analysis of 22 grab samples from the scoured areas of both banks was undertaken by Glen Gilbert of C-CORE. ... (Au)

**See also:** 119, 298, 301, 453, 566, 568, 643, 644, 646, 819, 1116.

## BARRY, R.G.

**171**
**Research on snow and ice** / Barry, R.G.
(Reviews of geophysics and space physics, v. 21, no. 1, Feb. 1983, p. 765-776)
Bibliography.
*ASTIS document number 171514.*
ACU

This review, unlike its predecessor [Martinelli et al., 1979], is an intentionally selective survey of recent advances in selected areas of snow and ice research. I have chosen to concentrate on studies relating to large-scale aspects of the cryosphere and to consider their wider significance for other disciplines. Results obtained by new measurement techniques and the application of remote sensing methods are also stressed. At the same time, the broad lines of advance in glaciological research, as represented in books, conference themes, and major field or laboratory programs, are noted and a detailed bibliography is appended. ... [The following are the major areas of consideration: snow and ice distribution and remote sensing, sea ice dynamics, icebergs, glaciers and ice sheets, cryosphere-climate interactions, cryospheric responses to CO2-induced climatic changes, snow and ice properties, and snow in motion.] (Au)

## BASCHIN, O.

**172**
**Die Beeinflussung der Temperatur des Meerwassers durch die Nachbarschaft von Eisbergen [The influence of icebergs on the temperature of sea water]** / Baschin, O.
(Annalen der Hydrographie und maritimen Meteorologie, bd. 41, Aug. 1913, p. 414-417)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178799.*

Brief summary of (then) current knowledge, on this subject, based on review of published literature, especially papers following the Titanic disaster in Apr. 1912. (AB)

## BASMACI, Y.

**173**
**Strength of icebergs during transport** / Basmaci, Y.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 191-198, ill.)
References.
*ASTIS document number 161837.*
ACU, NFSMO

An iceberg drifting or being transported across the ocean experiences both oscillations or rigid-body responses and vibrations or elastic-body responses as the result of wave – induced dynamic loading. The magnitude of the resulting wave bending moment, shear force and roll are calculated and the strength and stability of iceberg under rough sea conditions are checked. The analysis is based upon the theory of Korvin – Kroukovsky. Different iceberg length, width and depths are considered under extreme sea conditions. In the design of mooring cable systems the plastic properties of ice and regelation need to be considered, metal piles and bollards are shown to move in the direction of applied force and as a result the mooring cable systems will not perform its function. Thus, either fiber ropes surrounding the iceberg can be used or the pile systems and the bollards must be manufactured from a material having poor thermal conductance. (Au)

## BASS, D.W.

**174**
**Added mass and damping coefficient for certain 'realistic' iceberg models** / Bass, D.W. Sen, D.
(Cold regions science and technology, v. 12, no. 2, Apr. 1986, p. 163-174, ill.)
References.
*ASTIS document number 184586.*
ACU, NFSMO

With the increasing sophistication of modelling that involves iceberg motions and interactions, a need for greater accuracy in the calculation of hydrodynamic coefficients such as damping and added mass arises. This paper presents such coefficients for a variety of 'realistic'shapes using three dimensional potential flow techniques. (Au)

**175**
**Analysis of iceberg impacts with gravity base structures at Hibernia** / Bass, D.W. Gaskill, H.S. Riggs, N.P.
(Proceedings of the Fourth International Offshore Mechanics and Arctic Engineering Symposium / Edited by J.S. Chung et al. – New York : American Society of Mechanical Engineers, 1985, p. 255-259, ill.)
References.
*ASTIS document number 163279.*
NFSMO

In this paper a simple three-degrees-of-freedom model of an iceberg/gravity base structure collision is described and the results of calculations with this model presented. The model treats the general problem, including eccentric, oblique impacts with icebergs having a variety of underwater profiles. The results of the calculations, together with environmental data are used to develop a "most likely" scenario for a significant iceberg/structure collision in the Hibernia region. Estimates of the peak force are presented. (Au)

176
**Computer simulation of iceberg instability** / Bass, D.W. Peters, G.R.
(Cold regions science and technology, v. 9, no. 2, July 1984, p. 163-169, figures, table)
References.
*ASTIS document number 143987.*
ACU, NFSMO

The possibility of an iceberg rolling to an orientation of deeper draft and colliding with the sea-bed has important implications for the offshore oil and gas industry on the Grand Banks of Newfoundland. In this paper that possibility is given substance. An interactive computer program was used to study a class of icebergs that increase their draft by as much as 50% on being perturbed from a position of near unstable equilibrium. (Au)

177
**Draft estimation of icebergs** / Bass, D.W.
[St. John's, Nfld. : Memorial University of Newfoundland, 1980].
7 p. : ill. ; 28 cm.
Unpublished report.
*ASTIS document number 175153.*
NFSMO

The hypothesis that the length of an iceberg is greater than its draft has a theoretical foundation based on the stability of the berg. The emphasis in this paper is on the need for more appropriate data to analyze properly draft estimate hypotheses. (NFSMO)

178
**Hydrodynamic forces and iceberg stability** / Bass, D.W. Peters, G.R.
[S.l. : s.n., 1985].
[5] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
Presentation summarised by Dr. T.R. Chari.
References.
*ASTIS document number 163465.*

... [This paper briefly covers a project involving] a computer simulation of a basic iceberg shape representing a stable berg. Portions of this basic shape are sliced off and the new stable position is computed. In the course of this work, some interesting results were obtained which indicate that the draft of an iceberg could be increased by as much as 50% through instability, rolling and rotation. ... (Au)

179
**Iceberg crater chains and scour up and down slope** / Bass, D.W. Woodworth-Lynas, C.M.T.
[S.l. : s.n., 1985].
[10] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166588.*

An iceberg crater chain is the term given to a scour feature which occurs randomly on the seafloor in areas affected by iceberg scouring. They have been observed on several sidescan mosaics that have been produced for the Labrador Shelf. As yet this type of feature has not been observed on the Grand Banks. Crater chains occur in linear or curvilinear groups with crater diameter decreasing along the length .... Each chain consists of usually no more than six craters and may be linked together or spaced apart. Outlines of the crater on the seafloor may clearly indicate that the keel shape of the scouring berg plays a very important part in determining crater morphology. Both linked and unlinked crater chains may be associated with one or both ends of a normal scour. (Au)

180
**Stability of icebergs** / Bass, D.W.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 43-47, figures)
References.
*ASTIS document number 61050.*
ACU, NFSMO

The tendency of icebergs to roll or heel over is well-known, and so the potential hazards and difficulties of towing unstable icebergs may be appreciated. It follows that there is a need for both accurate and approximate techniques for determining the stability of an iceberg. (Au)

## BATES, C.C.

181
**Development of the U.S. Navy's ice forecasting service, 1947-1953, and its geological implications** / Bates, C.C. Kaminski, H.S. Mooney, A.R.
Washington, D.C. : Hydrographic Office, [1954?].
23 p. : maps.
Mimeographed.
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179728.*

An historical outline is given of ice forecasting services of various countries from the 1840's (Denmark and Finland) to the present, with emphasis on services along the Northern Sea Route of the U.S.S.R. and on the International Ice Patrol in the North Atlantic. Study of sea ice in the North American Arctic was begun by the U.S. Hydrographic Office in 1947. Until 1950 ice reconnaissance was carried out by ship. Aerial reconnaissance was made during U.S. and Canadian military operations in 1950 and 1951, and was expanded in the Canadian Arctic Islands region and Labrador Sea-Baffin Bay-Davis Strait in 1952 and 1953. The 1953 program (which included 250,000 miles of reconnaissance) is described, with notes on ice conditions in the Canadian Eastern Arctic. The forecasting program has been devoted mainly to problems of coverage and ice thickness. Short and long range forecasting is briefly described and future research problems are noted. (AB)

## BATTIKHA, M.

**See:** 1078.

## BAUER, A.

**182**

**Influence de la dynamique des fleuves de glace sur celle de l'inlindsis du Groenland [Influence of the ice-stream movement on the inland ice of Greenland]** / Bauer, A.

(Publication – International Association of Scientific Hydrology, no. 54, 1961, p. 578-584, ill.)

References.

English summary.

Text in French.

*ASTIS document number 173711.*

ACU

The dynamics of the Greenland ice sheet are influenced by the movement of the ice-streams, because their bloc-movement and ice discharge is larger than ice melting. The travel time of snow until the sea is estimated to be about 2000 years. (Au)

**183**

**Interpretation des resultats obtenus sur les vitesses des glaciers du Groenland; commentaires de stereogrammes des glaciers du Groenland [Interpretation of the results obtained on the velocities of the Greenland glaciers; comments on the stereograms on the Greenland glaciers]** / Bauer, A.

(Bulletin – Societe francaise de Photogrammetrie, no. 3, Nov. 1961, p. 15-24, ill., map)

Reprinted in: Expeditions polaires francaises, Expedition glaciologique internationale au Groenland 1957-1960, Realisation technique, 1961. Publication no. 226.

Text in French.

*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180238.*

Notes the central zone of the Greenland Inland Ice as the most active, with 20 large glaciers discharging into Disko and Umanak Bays. Measurement of the velocity of these glaciers (as described by M. Carbonnell, q.v.) was required for determining their discharge and the mass balance of the entire central zone. Their rapid movement is exemplified in Store Idbrae, near the southeast corner of Umanak Bay, with a mean velocity of 11.4 m. per day much greater than that of the Mer de Glace (Mt. Blanc), about 0.5 m/day. The 11 stereo pairs show various aspects of glacier fronts, icebergs, and the ablation zone of the Inland Ice. Comments are made on Jakobshavn Glacier among others; and on several photos of the Inland Ice indicating changes with altitude. (AB)

## BEATON, A.P.

**184**

**Ice forecasting in Canada** / Beaton, A.P.

(Arctic news record, v. 2.1, Aug. 1983, p. 8-11, ill., map)

*ASTIS document number 174505.*

ACU, NFSMO

... Canada has more ice and ice of a greater variety to deal with than any other Arctic nation. Her ice forecasting services are being developed to the extent needed to provide adequate information for activities stretching from the Scotian Shelf to the Arctic Islands. Ice information and forecast are provided by the Atmospheric Environment Service (AES) of Environment Canada .... The AES charters two specially equipped Electra aircraft for ice reconnaissance, fitted with visual observing stations, sideways looking and forward looking radars, and laser profilometers. Charts of ice conditions produced in flight are transmitted by radiofacsimile to the Ice Centre in Ottawa, and also to ships with appropriate facsimile recorders in the general area where the aircraft are flying. The Ice Centre also receives, in near real time, imagery from the NOAA, GOES, and LANDSAT satellities. ... In making predictions of ice conditions, forecasters rely heavily on their own knowledge and experience, but are also guided by computer models of ice dynamics. In determining short term changes in ice distribution for the daily forecasts, a model incorporating the air and water stress on the ice, the Coriolis force, sea surface tilt, and internal ice resistance forces is used. As input, this model requires values of initial ice concentration and thickness at each grid point as well as the surface winds over the period of the forecast. ... At the present time, the AES provides a limited iceberg information service, but has been active in collecting data to generate an iceberg archive for the east coast area. With the increases in offshore hydrocarbon exploration in this area, and likely production from the Hibernia oil field before the end of the decade, provision of a full iceberg surveillance and prediction service will begin in the near future. This, again, will concentrate on the larger scale distribution and drift of icebergs, and leave the site-specific and small scale service provision to private operators. (Au)

**185**

**Winter ice conditions – eastern Canadian waters** / Beaton, A.P.

(Arctic news record, v. 3.2, Sept. 1984, p. 45-46, col. ill.)

*ASTIS document number 174599.*

ACU, NFSMO

... This winter was particularly cold across the eastern Canadian sub-Arctic. Accumulated freezing degree day totals for the period November 1983 to April 1984 ranged from 119% to 133% of normal values from Clyde on the east coast of Baffin Island right down to southeastern Labrador. This resulted in ice thickness along the coast consistently greater than normal throughout the winter. During the winter months, a low pressure system established itself just west of Greenland. ... This produced a stronger than normal southward drift of thick ice down the Labrador and Newfoundland coasts. Ice began to appear along the Labrador coast in late November, about 2 weeks earlier than normal, and spread rapidly southward thereafter. ... during the early spring, heavy ice pressure created interminable problems for Newfoundland coastal operators. ... As if the sea ice was not enough of a menace, this past season has seen an unusually large number of icebergs drift down 'Iceberg Alley' into the main shipping lanes. According to International Ice Patrol figures, 1538 icebergs had drifted south of 48N by the end of May. The difficulties experienced along the east coast this year, although worse than usual, are by no means exceptional. ... Although reasonably accurate projections of mean conditions using analogue techniques can be made, accurate and definitive forecasts of ice conditions for more than a few days in advance must wait for an improvement in long-range wind and temperature forecasts. ... (Au)

## BEDFORD INSTITUTE OF OCEANOGRAPHY

**See:** 540, 541, 542.

## BENEDICT, C.P.

**186**

**Controlling iceberg roll/stability during towing around drillships** / Benedict, C.P. Lewis, J.K.C. Dinn, G.J. Learning, F.R.

(Thirteenth Annual Offshore Technology Conference 1981, proceedings. – Dallas : Offshore Technology Conference, 1981, v. 3, p. 109-114)

(OTC paper, 4076)

References.

*ASTIS document number 116440.*

ACU, NFSMO

Positive and effective management of icebergs around drillrigs on the Canadian East Coast is limited by deficiencies in iceberg

handling – iceberg roll under tow. ... The troublesome bergs are normally in the range of 50-500,000 tons. Conventional floating polypropylene towing hawsers compound latent instabilities by applying a torque component (other netlike towing geometries control roll for only smaller bergs but tangle during deployment and recovery). Field iceberg survey data was collected and on the basis of Lagragian computer analysis a large sample of simulated bergs were towed from random stable floating positions. Through these energy formulations the maximum "critical" tow force (before roll) was computed .... This paper reports the results achieved in ... computer prediction of maximum allowable bollard tow force for iceberg towing with ... tensiometer monitoring of actual bollard pull. ... (Au)

**187**

**A description of Project ICE (Iceberg Cross-Section Echo)** / Benedict, C.P.

(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 115-123, ill)

References.

*ASTIS document number 160296.*

NFSMO, ACU

This report is based on the six month duration for which Project ICE (Iceberg Cross-Section Echo) – the measurement of the profile of icebergs – has been underway. It deals specifically with the underwater profiles of free floating icebergs. The particular region of interest is the North Atlantic area off the east coast of Canada. Initially, the Labrador coastline will be the specific area. (Au)

**188**

**Dimensional modelling of icebergs** / Benedict, C.P.

(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 299-306)

Reference.

*ASTIS document number 164178.*

ACU, NFSMO

This paper describes three theoretical shape models for a subset of icebergs typical of the Eastern Arctic. Methods for approximating the shapes of reasonably well-behaved surfaces are given. Shape related iceberg parameters are discussed in terms of the models and the integrals necessary to compute mass, centre of gravity, centre of buoyancy, and moments of inertia are shown to be computational procedures directly applicable to small shipboard computers. Iceberg orientational stability is discussed from the points of view of metacentric height and potential energy. (Au)

**189**

**Iceberg incursion probabilities into subsea structures** / Benedict, C.P. Lewis, J.K.C.

(The Seventh International Conference on Port and Ocean Engineering Under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 1, p. 273-279, figures)

References.

*ASTIS document number 129607.*

NFSMO

This paper presents a method for describing analytically the distribution of iceberg drafts at a particular latitude and of combining this with site bathymetry and iceberg flux data to calculate incursion probabilities and mean times between incursions as a function of site design parameters. (Au)

**190**

**Icebergs : a drilling and production challenge** / Benedict, C.P.

(Petroleum engineer international, v. 49, no. 2, Feb. 1977, p. 32, 34, 38, ill.)

References.

*ASTIS document number 171166.*

NFSMO

... Experience indicates that there is no single optimal strategy that can be applied throughout development. Decisions between the various options will ultimately depend upon (a) location, bathemetry and sediments and (b) population and size distributions of icebergs for the given region. Duval anticipates the biggest problem as being that of protecting bottom equipment against the effects of a grounding iceberg. The survival time of subsea installations will depend on the probability of scouring which, in turn, will depend on the number of icebergs of critical draft in the region of interest. In anticipation of a requirement for iceberg dimensional data, and as part of a comprehensive environmental information base, Total Eastcan Exploration Ltd. has acquired iceberg data, including draft information, at certain of their drilling locations. The first draft information was recovered in 1974 at the Gudrid location using iceberg measurement techniques developed earlier by the author within the faculty of engineering at Memorial University of Newfoundland. Results from this program constitute the base line data on iceberg dimensional and, in particular, draft information. The same techniques have been used subsequently to capture data at other locations along the Labrador Coast. ... (Au)

**191**

**Icebergs and Canadian East Coast exploration** / Benedict, C.P.

[St. John's, Nfld. : Faculty of Engineering and Applied Science, Memorial University, 1976].

ii, 15 leaves : ill. ; 28 cm.

Draft submitted for presentation at the 31st Annual Petroleum Mechanical Engineering Conference, Mexico City, Sept. 1976.

References.

*ASTIS document number 162914.*

NFSMO

This paper describes icebergs in relation to Canadian East Coast drilling activity. Measurement systems are described, together with base line data on iceberg drafts recovered during the 1974 drilling season and reported here for the first time. (Au)

**192**

**Measurements of icebergs and the existing data base** / Benedict, C.P. Lewis, J.K.C.

(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 28-35)

References.

*ASTIS document number 155080.*

NFSMO

The paper briefly describes methods of iceberg measurement. (NFSMO)

**193**

**Project ICE : Iceberg Cross-section Echo** / Benedict, C.P.

St. John's, Nfld. : Memorial University of Newfoundland, Faculty of Engineering and Applied Science, 1972.

52 p. : ill., map ; 28 cm.

References.

*ASTIS document number 163309.*

NFSMO

This report is based on the three week duration of the Dawson Cruise for which the measurement of the profiles of icebergs has been undertaken. It deals specifically with the underwater profiles of free floating icebergs. The particular region of interest is the North Atlantic area off the east coast of Canada. ... (Au)

194
**A towing concept for small icebergs** / Benedict, C.P.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 334-338, ill.)
References.
*ASTIS document number 161926.*
ACU, NFSMO

This paper describes a new harness system for ... [towing] icebergs away from drilling operations on the East Coast of Canada. (Au)

195
**Underwater profiling of icebergs** / Benedict, C.P.
(Proceedings of the Second International Conference on Port and Ocean Engineering under Arctic Conditions / Edited by T. Karlsson. – Reykjavik, Iceland : University of Iceland, Dept. of Engineering and Science, 1973, p. 601-607, ill.)
References.
*ASTIS document number 163686.*
NFSMO

This paper deals with the measurement of the profiles of icebergs; specifically with the underwater cross sections of free floating icebergs. Experimentation is being conducted off the east coast of Canada. A designed stage of the underwater profile system incorporating practical operating knowledge gained from previous experimentation has been realized. A dual channel sonar was procured and an acoustical range finder employed. Correlation of the data obtained provide an approximation of overall shape. In the scheme, a transducer was lowered and raised while being rotated in a horizontal plane. The iceberg is outlined in this way from a succession of stations on a 200 meter circumference about the berg. Information on the overall configuration will assist in any endeavours threatened with iceberg collisions. (Au)

**See also:** 207, 535, 544, 545, 652, 653, 654, 655, 657.

## BENNETT, G.

**See:** 656.

## BENNETT, R.E.

196
**Voyages to Churchill** / Bennett, R.E. Findlay, A.
(Marine observer, v. 26, no.173, July 1956, p. 161-162)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179949.*

Contains report on the navigation and ice conditions experienced by the S.S. Essex Trader (Capt. Bennett) on two voyages to Churchill, Canada in 1955. The first voyage (from Hull) began on July 24 and the second (from London) on Sept. 1. A list of icebergs sighted on the second voyage including size, discription, geographical coordinates, and distance seen by radar is included. (AB)

## BENOIT, J.R.

197
**Ice and ice management on the Grand Bank** / Benoit, J.R. Ransom, J.A.N. Dello Stritto, F.J.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 1-2)
Abstract only.
*ASTIS document number 182087.*
ACU

... icebergs break off the edges of northern glaciers and arrive on the Grand Bank typically between March and July. On average, 34 icebergs reach the Hibernia area annually; however, wide year to year variations from the average may occur. Deterioration of icebergs due to warm temperatures and wave erosion is rapid at Hibernia, where the mean mass is about 600,000 tonnes and the expected maximum mass is on the order of 6 million tonnes. Typical drift speeds are 0.3 to 1.0 m/s. The 1983 and 1984 iceberg seasons were particularly severe, with several times the average number of icebergs occurring. Hydrocarbon exploration has been continuing in the ice infested waters of the Grand Bank for the last two decades. However, only in the last 5 years have operations been conducted year round. A well executed ice management program has facilitated this year-round presence, which is likely to continue now that Mobil has submitted its plans to develop production facilities at the Hibernia field. ... The major components of the ice management program for exploration operations are long range forecasting, surveillance, monitoring and avoidance. ... The ice management system developed for exploration is sufficiently flexible to be adapted to production operations. There is, however, a major difference between the current Grand Bank exploration drilling platform and the type of production platform being proposed by Mobil and its partners. ... Based on numerous investigations of the physical properties of sea ice and icebergs, Mobil has designed a concrete structure which can resist impacts from sea ice and icebergs with a high degree of safety and confidence. GBS support facilities including loading platforms, shuttle tankers, and logistics and support vessels will also incorporate a degree of ice strengthening to permit safe and efficient operation. However, these facilities require the support of the ice management program. (Au)

198
**Iceberg scours I** / Benoit, J.R. Chari, T.R. EL-Tahan, M.S.S.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 148-160, ill.)
References.
*ASTIS document number 150746.*
NFSMO

... This paper will review the present knowledge on the mechanics of iceberg scouring. Recent work has been performed in the Beaufort Sea and on the Canadian Eastern Seaboard and will be reviewed. Although very little data have been gathered to understand how the wind, currents and waves affect the scouring process, a review of existing knowledge will be presented. Furthermore, one of the most important parameters in estimating the effects of scouring is information on the draft of an iceberg. A method of estimating the draft will be presented. Finally, a review of the available mathematical and laboratory models for iceberg scour studies will be presented. The physics of each model and their limitations will be discussed. (Au)

199
**Iceberg scours I : Mechanics, environmental and geotechnical factors** / Benoit, J.R. EL-Tahan, M.S.S. Chari, T.R.

[S.l. : s.n., 1982?].
12 leaves : ill. ; 28 cm.
Copy obtained from Mona El-Tahan, Fenco Newfoundland, Box 8246, St. John's, Nfld. A1B 3N4.
References.
*ASTIS document number 182729.*

... The scouring of the sea floor by an iceberg has been of concern to the oil industry for the past four years as the development of production systems becomes more and more important. The magnitude of the problem is obvious from Figure 1, which shows the number of yearly iceberg count crossing the 48 N parallel. The threat of an iceberg disrupting a subsea installation has attracted both engineers and researchers to investigate the mechanism by which an iceberg can scour the ocean floor. At this time, the studies have been mostly limited to a theoretical approach with some of the results applied to model test in small tanks. The Ocean Engineering Research Group at Memorial University has been one of the first to investigate iceberg scouring under the direction of the third author. Some of the work done at Memorial University is presented in this paper. Side scan sonar recordings of the sea bottom in the Arctic Ocean and off the Labrador Coast have shown evidence of very active scouring. Scours in the order of 30 m wide and between 1 and 30 m deep have been measured in the Labrador Sea in water depths of up to 275 m. The length of some of these scours have been measured up to 3 km. (Au)

**See also:** 141.

## BERENGER, D.M.

**200**
**Ice conditions affecting offshore hydrocarbon production in the Labrador Sea** / Berenger, D.M. Wright, B.D.
(Intermaritec-80, conference report / Edited by C. Kruppa and G. Clauss. – Hamburg Messe und Congress GmbH, 1980, p. 390-402, figures, tables)
References.
*ASTIS document number 68314.*
NFSMO

... ice conditions in the Labrador Sea are described and the results of sea ice and iceberg research programs carried out by the Labrador Group since the early 1970's are highlighted. The sea ice studies include field data acquisition on the physical and mechanical properties of first and multi-year ice present in the area along with its movement. The iceberg information, collected in conjunction with the exploratory drilling program, consists of data on the physical properties of icebergs and their motion characteristics. The large variability in ice conditions is shown to be a significant factor affecting the design of offshore hydrocarbon production systems for the Labrador Sea. (Au)

**See also:** 1094, 1125, 1125.

## BERRY, O.P.

**See:** 451.

## BETIN, V.V.

**201**
**Spasob instrumental'nykh avianabliudenii nad materikovymi l'dami v more = A method of instrumental aerial observations on land ice in the sea** / Betin, V.V. Zhadrinskii, S.V. Uralov, N.S. Slessers, M. [Translator].
Washington, D.C. : Navy Hydrographic Office [publisher] ; Springfield, Va. : NTIS [distributor], 1961.
12 leaves ; 28 cm.
(Translation – United States. Naval Oceanographic Office, 122)
Translated from: Spasob instrumental'nykh avianabliundenii nad materikovimi l'dami v more / V.V. Betin, S.V. Zhadrinskii, and N.S. Uralov published in Meteorologiia i gidrologiia, 1959, no. 5, p. 51-54.
*ASTIS document number 177687.*

The measurement of the size and height of icebergs, and also huge hummocks and stamukhi, by means of an aerial perspective angle measuring instrument is discussed and the degree of accuracy in the measurements is determined. Also the advantages of the method in aerial reconnaissance flights is pointed out. (Au)

**202**
**Sposob instrumental'nykh avianabliudenii nad materikovymi l'dami v more [A method of instrumental aerial observation of land ice at sea]** / Betin, V.V. Zhadrinskii, S.V. Uralov, N.S.
(Meteorologiia i gidrologiia, 1959, no. 5, p. 51-54)
English summary.
Text in Russian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180076.*
ACU

Outlines procedures for measuring the surface body of an iceberg and fixing its position with an optical device used in aerial ice reconnaissance in the Baltic since 1957. The instrument registers the aircraft's speed and measures angles between flight course and edges of the object; the iceberg's dimensions and its distance from the observer are then determined by elementary trigonometric computations. (AB)

## BIRCH, J.B.

**See:** 711.

## BIRCH, J.R.

**See:** 134, 712, 713.

## BLACKWOOD, C.L.

**See:** 240.

## BLAKE, W.

**203**
**Iceberg concentrations as an indicator of submarine moraines, eastern Queen Elizabeth Islands, District of Franklin** / Blake, W.
(Paper – Geological Survey of Canada, 77- 1B, p. 281-286,

ill.)
References.
*ASTIS document number 150711.*
NFSMO

At a number of localities in southeastern Ellesmere Island and on Coburg Island ... submarine moraines are delineated by concentrations of stranded icebergs or, in shallower water, by rafted floes of sea ice. Although the situation varies from year to year, in a general way photographs taken in late spring or early summer, before breakup, are the most useful. ... In areas where detailed soundings have been carried out and hydrographic charts are available (cf. Liestol, 1972), submarine moraine ridges can be discerned without recourse to indirect methods; but in more remote and less-studied Arctic regions, mapping of moraines by the stranded icebergs aligned along them is a useful tool, as Loken (1973) has demonstrated already off the northeastern coast of Baffin Island. Investigations of the submarine moraines in the northern part of the Canadian Arctic Archipelago are just commencing as part of a long-term project of deciphering the glacial history and geochronology of this vast region. The purpose of this report is to illustrate a few examples of the type of occurrence described above. (Au)

## BLASCO, S.M.

**See:** 647.

## BLENKARN, K.A.

**204**
**Ice conditions on the Grand Banks** / Blenkarn, K.A. Knapp, A.E.
(Ice seminar : a conference sponsored by the Petroleum Society of C.I.M. Calgary, Alberta, May 6-7, 1968. Special volume – Canadian Institute of Mining and Metallurgy, 10, 1969, p. 61-72, ill.)
Appendices.
References.
*ASTIS document number 168769.*
ACU, NFSMO

Weather and other meteorological conditions obviously have a profound influence on offshore petroleum operations. In the Grand Banks area off Newfoundland, the normal complement of weather hazards is augmented by the threat of icebergs and the occasional presence of sea ice fields. The normal mode of drilling and producing operations for offshore areas involves the construction of permanent working platforms connected to the ocean floor. It is in regard to the feasibility of platform structures that the implications of ice on the Grand Banks become most dramatic. On the basis of historical records, a preliminary evaluation has been made of the ice conditions and loadings to be expected for bottom-supported platforms in various areas on the Grand Banks. The preliminary evaluation, described in this paper, leads to some tentative conclusions. For much of the Grand Banks area, the likelihood of iceberg collision is not great, and berg collision will not always cause catastrophic platform loss. For areas where only relatively open sea ice fields occur, the resulting ice forces do not pose major design problems. However, for areas where close-pack, consolidated fields are expected, design ice forces may exceed 10,000,000 pounds. Confirmation of these conclusions requires additional information, as outlined in the paper. (Au)

**205**
**Protection of offshore structure from icebergs** / Blenkarn, K.A. [Inventor]. Knapp, A.E. [Inventor]. Pan American Petroleum Corporation [Assignee].
Ottawa : Patent Office, 1970.
15 leaves : ill. ; 28 cm.
(Canadian patent documents, no.840081, Apr. 28, 1970)
*ASTIS document number 163414.*
NFSMO

This invention is related to means for protecting offshore structure from icebergs. It relates especially to fending systems for stopping or changing direction of a moving iceberg. ... (Au)

## BLIDBERG, D.R.

**206**
**An integrated, acoustic, seabed survey system for water depths to 2,000 feet** / Blidberg, D.R. Porta, D.W.
(Eighth Annual Offshore Technology Conference : 1976 proceedings. – Dallas, Tex. : Offshore Technology Conference, 1976, v. 3, p. 447-464, ill.)
(OTC paper, 2655)
References.
*ASTIS document number 170160.*
ACU, NFSMO

An integrated acoustic seabed survey system was used during the summer of 1975 in water depths of approximately 320 meters off the Coast of Labrador. A single towed vehicle housed dual channel side scan transducers, preamplifier, a variable frequency sub-bottom profiling array, a 200 kHz high resolution echo sounder transducer and all interconnecting cables to mate with a single double armored multiconductor tow cable. Equipment on board included a heavy duty winch with slip rings and remote control, all necessary electronic components and recorders and a 90 kHz "over-the-side" echo sounder to measure overall water depth. The system was successfully employed in a survey off Labrador, for the purpose of locating and mapping iceberg scours. ... (Au)

## BOBBY, W.

**See:** 143, 309, 434, 854, 903, 907.

## BOE, B.D.

**207**
**"Another hypothesis about iceberg draft" by L.D. Brooks : discussion** / Boe, B.D. Benedict, C.P.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 353-354)
Discussion of ASTIS document number 55549, Another hypothesis about iceberg draft / L.D. Brooks in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 241-252.
*ASTIS document number 172855.*
ACU, NFSMO

This paper puts forward the conjecture that the draft of an iceberg is not greater than its length, where the length is taken to be the maximum waterline dimension. The conjecture is tested against experimental data as well as theoretical shape models. ... In attempting to prove a theorem of this kind, theoretical arrangements are important because the hypothesis is that much more plausible if it applies to the worst possible cases. However, a theoretical iceberg model should satisfy the same hydrostatic conditions as an actual iceberg must; in particular, it should be stable. Thus the stability analysis performed by the author is a necessary facet of the overall theoretical process. ... The iceberg dimensional data in this paper represents, by far, the most extensive

sample reported to date. (Au)

## BOETES, R.

208
**Iceberg alarm system** / Boetes, R. Sukhov, B.P. Crocker, R.W. Russell, W.E.
(Oceans '78 : the ocean challenge : Fourth annual combined conference sponsored by the Marine Technology Society and the Institute of Electrical and Electronics Engineering, Council of Oceanic Engineering, Washington Section, September 6-8, 1978, Sheraton-Park Hotel, Washington, D.C. – New York : IEEE, 1978, p. 682-685, ill.)
References.
*ASTIS document number 163961.*
NFSMO

This paper proposes a hydro-acoustical alarm system that will warn personnel on drillships, production platforms or support vessels about approaching icebergs with sufficient draft to endanger bottom installations. The system would basically consist of two underwater units anchored such that the horizontal line between them defines the alarm limit. The principle of operation is described and black diagrams are presented. (Au)

## BOGORODSKII, A.V.

209
**Instrument studies of the submerged parts of icebergs of the southern ocean** / Bogorodskii, A.V. Popov, I.K.
(Physical charcteristics of geographical processes in polar regions / Edited by V.V. Bogorodskii and A.V. Gusev. Draft translation – U.S. Army. Cold Regions Research and Engineering Laboratory, 702, 1979, p. 78-82, ill.)
(Trudy – Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, v.359, 1978, p. 118-138, ill.)
Source: Proceedings, Arctic and Antarctic Scientific Investigations Institute, vol. 359, 1978, p. 118-138.
Reference.
*ASTIS document number 182796.*
ACU, NFSMO

... Instrumental determination of the draft of icebergs in the waters of the Southern Ocean and measurement of the temperature and salinity of the surface water layer near the icebergs for calculation of the intensity of melting and determination of their approximate lifetime were programmed for the first time on the 24th voyage of the research vessel "Professor Vize". A sonar method was used for this purpose. (Au)

## BOGORODSKII, P.V.

**See:** 832.

## BOGORODSKII, V.V.

210
**Simulation of the scattering of underwater sound by sweet ice specimens immersed in artificial sea water** / Bogorodskii, V.V. Smirnov, S.A. Sinitsyn, V.L.
(The physics of ice / Edited by V.V. Bogorodskii. Trudy – Leningrad. Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, v.295, 1971, p. 146-152, figures)
On microfiche.
Translation.
References.
Paper presented at Symposium on Ice Physics held at the Arctic and Antarctic Scientific Research Institute in June 1968.
*ASTIS document number 129100.*
NFSMO

... So far, the acoustic method is the only one suitable for observing the submerged part of the iceberg from a distance and for measuring the displacement, the shape, and the mass of the submerged part. Simulation measurements are particularly important in this respect, in view of the very limited opportunities for a comparison of the acoustic results with objective physical characteristics of icebergs. This difficulty is further aggravated by the considerable variety of iceberg shapes, the differences in the conditions of their existence, and the diversity of structure and micro- and mesotopography of the submerged part. Experiments using models ... make it possible to alter temperature and other conditions and to correlate the measurement results with the experimental conditions, while keeping the size and shape of ice fragments constant. These model measurements constitute an integral part of iceberg research. The experiment described in this paper was carried out in July 1966 in the sea-water pool of the AANII using special technique and equipment. The measurements were carried out for spherical, cubic, and cylindrical ice specimens, prepared by freezing fresh water in containers of appropriate shape at –15 degrees C. ... (Au)

## BOHREN, C.F.

211
**Colors of snow, frozen waterfalls, and icebergs** / Bohren, C.F.
(Journal of the Optical Society of America (1930), v. 73, no. 12, Dec. 1983, p.1646-1652)
References.
*ASTIS document number 171719.*
ACU

Snow presents more than just a uniformly white face. Beneath its surface a vivid blueness, the purity of which exceeds that of the bluest sky, may be seen. This subnivean blue light results from preferential absorption of red light by ice; multiple scattering by ice grains, which is not spectrally selective, merely serves to increase the path length that photons travel before reaching a given depth. Although snow is usually white on reflection, bubbly ice, which can be found in frozen waterfalls and icebergs, may not be. To a first approximation, bubbly ice is equivalent to snow with an effective grain size that increases with decreasing bubble volume fraction. Ice grains in snow are to small to give it a spectrally selective albedo, but the much larger effective grain sizes of bubbly ice can give it bluish-green hues of low purity on reflection. ... The purpose of this paper is to discuss these observations within the framework of a simple theory. Because this theory has been discussed critically elsewhere, it is only outlined here, and this is done primarily to give confidence that it may be extended into realms where it has not been applied previously. (Au)

## BOLDUC, P.A.

212
**Stochastic characteristics of the severity of iceberg season** / Bolduc, P.A. Murty, T.S. Adamowski, K.
(Proceedings : Symposium on Modeling of Transport Mechanisms in Oceans and Lakes, Canada Centre for Inland Waters, Burlington, Ontario, 6-9 October, 1975. Manuscript report series – Marine Sciences Directorate (Ottawa), no. 43, 1977, p. 277-283, ill.)
References.
*ASTIS document number 161659.*
NFSMO, ACU

The methods of spectral analysis are used to analyze the time series of iceberg drift south of 48 N of latitude in northwest Atlantic Ocean. The results indicate that the iceberg drifts occur with regular periodicity (accounting for 70% of total variability), to a lesser extent are time dependent (auto-regressive components account for about 16% of variability), and the remaining variability (equal to approximately 14%) is purely random. No significant trends were detected in the iceberg drift time series. (Au)

**See also:** 777, 778.

## BOONE, L.R.

**213**

**A prediction regarding the Humboldt Current** / Boone, L.R.
(Science, v.110, no.2867, 1949, p. 642-644)
Discussed in ASTIS document 179698, Arctic ice drift and the Humboldt Current, / F.M. Soule Science, v..112, no. 2898, July 1950, p. 61-62.
Bibliography.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179655.*
ACU

Contains a discussion of factors assumed to be responsible for abnormalities in the Humboldt Current (a cold current flowing north, among the Peruvian and Chilean coasts). Tides coming down from the Arctic, and conditions causing the drift of icebergs to very low northern latitudes (43 N) coupled with similar factors in the Antarctic may account for great anomalies in this current. The author claims that 3 years after abnormal North Atlantic iceberg conditions, their supposed effect is felt in the Humboldt Current. (AB)

## BOOTH, A.D.

**See:** 525.

## BOURKE, R.H.

**See:** 430, 986.

## BP CANADA INC.

**See:** 697.

## BP EXPLORATION CANADA

**See:** 687, 688, 703, 704, 705, 708.

## BRAKE, L.

**See:** 1078.

## BRETT, C.P.

**214**

**Project Westmar : a shallow marine geophysical survey on the west Greenland continental shelf** / Brett, C.P.
Zarduski, E.F.K.
[Kobenhavn] : Gronlands Geologiske Undersogelse, 1979.
27p. : ill., figures, maps ; 24cm.
(Rapport – Gronlands Geologiske Undersogelse, nr. 87)
References.
*ASTIS document number 37354.*
ACU

An extensive shallow geophysical survey has been carried out on the West Greenland continental shelf between 64 deg. and 69 deg. 30 sec. N. Preliminary interpretation of the data reveals that between 64 deg. and 67 deg. 30 sec. N at least, the entire shelf was glaciated to its western margin during the Pleistocene, the glaciation processes leaving a variable (<20-200 m thick) cover on the Tertiary sedimentary wedge underlying the shelf. A morphological relationship exists between the degree of sea floor roughness and the types of glaciation forms. The distribution and contacts of the three main shallow bedrock units in the area (Precambrian gneisses, Lower Tertiary volcanics and Tertiary sediments) are delineated. Widespread prograding is observed in sediments along the shelf margin. Extensive iceberg scouring of the sea floor is observed north of 67 deg. 30 sec. N reaching a maximum water depth of 340 m. (Au)

## BRODSKY, R.F.

**215**

**Proceedings of the Workshop Panel on Locating Icebergs + Remote Sensing** / Brodsky, R.F. Poulin, A.O.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 704-711)
*ASTIS document number 161942.*
ACU, NFSMO

The proper application of available techniques of Remote Sensing can provide considerable important aid to the Iceberg [Utilization] Project. The state-of-the-art is such that no new developments will be necessary; however, in order to validate anticipated results, a modest experimental program must be undertaken. Remote Sensing methods can readily locate "best candidate" icebergs ... can ... assist ... by tracking and determining the weathering characteristics of "test" icebergs. ... can ... assist in early testing to determine the true magnitude of Coriolis forces ... vital to assess the towing problem. ... [and] in an operational sense ... can assist by observing sea states, recommending best routes, and determining "weathering" effects during tow. ... most of the Remote Sensing work will be done by aircraft (and possibly helicopter) over-flights. ... several sensor types must be employed, along with considerable "in situ" measurements in the early experimental program. ... a highly specialized and advanced support satellite could provide invaluable assistance to the program. ... (Au)

## BROOKE, J.

**216**

**Tracking icebergs from air helps save ships and lives** / Brooke, J.
(The Polar times, no.100, June 1985, p. 8-9, ill.)
*ASTIS document number 183660.*
ACU

The author discusses the role played by the International Ice Patrol in the detection of icebergs and the protection of ships from these menaces within the Labrador Sea and North Atlantic shipping lanes. Iceberg reconnaissance now relies on planes backed with radar, satellites and computers, although traditional iceberg reportings from ships are still an integral part of iceberg

identification and detection. The Ice Patrol has in recent decades also become quite active in the destruction of icebergs and experimental methods of identifying icebergs for tracking purposes. Some of this work is also discussed. (ASTIS)

## BROOKS, L.D.

**217**

**"Airborne radar sounding of arctic icebergs" by J.R. Rossiter [discussion]** / Brooks, L.D. Sabins, F.F.

(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 357-358)

Discussion of ASTIS document number 31798, Airborne radar sounding of arctic icebergs / J.R. Rossiter in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 289-305.

*ASTIS document number 172901.*

ACU, NFSMO

... I believe the near-term utility of radar systems in the Arctic will be limited to research efforts as opposed to operational applications. The major limitation is the uncertainty that the deepest point of the berg has been "seen" by the radar system. In addition to the energy scattering referred to by the authors, reflection and refraction are primary contributors to this uncertainty. Reflection is particularly a problem in the relatively small and irregular-shaped Arctic icebergs when compared to the large, tabular Antarctic bergs. Similar radar systems have been used to sound Antarctic bergs with success (Kovacs 1977). The authors could have amplified their discussion of these problems, including the effects of beam width and helicopter speed. The statement concerning greater output power needs qualification. Obviously, for a given radar system, increased power will yield increased penetration. However, the two systems used in this experiment have different center frequencies (80 Mhz and 840 Mhz), and a system with higher frequency will have less penetration, for a given power output (i.e., the skin-depth effect). Therefore, their statement should include an estimate of the compensating effect of increasing power while increasing the frequency. Another topic needing further discussion is that of dielectric constant. Icebergs can certainly be nonhomogeneous, depending on temperature gradients in the berg, age, and deterioration. Also affecting homogeneity will be both frozen and open cracks in the berg and possible laminations in the ice from its parent glacier. In conclusion, I believe the radar systems hold some promise for successful sounding of icebergs; however, more field work is acquired to determine the effects of the problems discussed and to compare drafts determined by radar with drafts determined from other systems. (Au)

**218**

**Another hypothesis about iceberg draft** / Brooks, L.D.

(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 1, p. 241-252, ill.)

References.

*ASTIS document number 55549.*

ACU, NFSMO

... This paper presents a hypothesis relating iceberg draft to the maximum horizontal dimension of the iceberg in the waterline plane. This dimension is called iceberg length, and is readily obtainable with standard shipboard equipment (e.g., radar and sextant). The hypothesis is tested with measured iceberg drafts which were measured with various sonar devices. The hypothesis is also evaluated on the basis of stability analyses for several idealized iceberg shapes. (Au)

**219**

**Discussion by K. Magnor and R. Zorn on "Another hypothesis about iceberg draft" : author's reply** / Brooks, L.D.

(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 352)

Discussion of ASTIS document number 55549, Another hypothesis about iceberg draft by L.D. Brooks in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18 1979, proceedings, v. 1, p. 241-252.

Reference.

*ASTIS document number 172839.*

ACU, NFSMO

I agree with Manor and Zorn that it is more correct, physically, to correlate draft with width than draft with length. However, the field measurements do not indicate a clear relationship between draft and width, and my objective was to simply relate an above water dimension to draft, as indicated by field measurements. ... As I related during my presentation, I have conducted additional theoretical analyses based on the work of Benedict (1979). The results of these analyses are very supportive of my hypothesis. In particular, the one theoretical shape that violated the hypothesis ... has a more stable orientation (rotated 117 degrees) and in this other orientation it does not violate the hypothesis. In conclusion, I believe that with a more accurate measurement of iceberg length, such as with calibrated, Polaroid-type photography from a helicopter, an offshore operator can get a good estimate of maximum possible draft from the hypothesis: iceberg draft should not exceed the length. (Au)

**220**

**Iceberg and current drift using the Nimbus 6 Satellite** / Brooks, L.D.

(Ninth Annual Offshore Technology Conference 1977, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1977, v. 1, p. 279-286, ill., maps)

(OTC paper, 2759)

References.

*ASTIS document number 163856.*

ACU, NFSMO

Four drift buoys, two tethered to icebergs and two with current drogues, were deployed in Davis Strait, West Greenland. Each buoy was equipped with a transmitter that was tracked by the Nimbus-6 Satellite System. Position data were received from the System on an average of eight times per day. Drift speed histograms and drift tracks from two of the buoys are presented in this paper. A basic conclusion is that drift buoys tracked by the Nimbus-6 System offer a reliable, all-weather, long-term method for the collection of Lagrangian current data. Such data are applicable to investigations of iceberg drift and oil spill movement. (Au)

**221**

**Iceberg dimensions** / Brooks, L.D.

(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum - Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 148-154, ill.)

References.
*ASTIS document number 148393.*
NFSMO

An iceberg's maximum horizontal dimension in the waterline is defined here as "length", and its draft as the depth below the waterline to its deepest point. Obviously, as an iceberg deteriorates and rolls to new equilibrium positions, its length and draft constantly change. Iceberg lengths have been readily determined by measuring the distance to the iceberg with a rangefinder (radar or optical) and the included angle with a sextant. Iceberg drafts have been inferred from above-water dimensions, assumed from water depth around grounded icebergs, and directly measured with dragline, diver, radar, and sonar. The quantity of these direct measurements is quite limited, and many are not in the public domain. Because of the relative difficulty and uncertainty in measuring iceberg draft, a simple relationship between maximum possible draft (not necessarily actual draft) and above-water dimensions was sought. The application of this relationship was intended solely for operational situations and not for scientific or engineering purposes. (Au)

222
**"Iceberg investigations along the west coast of Greenland" by J. Dietrich [discussion]** / Brooks, L.D.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 346-347)
Discussion of ASTIS document number 172847, Iceberg investigation along the west coast of Greenland / J. Dietrich, et. al. in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 221-239.
References.
*ASTIS document number 172863.*
ACU, NFSMO

The authors have presented a good review of the iceberg studies conducted offshore West Greenland by the petroleum concessionaires and the Ministry for Greenland. Another good source of data on icebergs in this area is the U.S. Coast Guard's International Ice Patrol; particularly, their annual reports and a paper by Murray (1969). Unfortunately, the data bases of both International Ice Patrol and the present study are biased spatially due to the method of data collection. Ice Patrol's data are concentrated around the flight lines of the reconnaissance aircraft, and the present study's data are concentrated around the track lines of the weather ships and particularly the positions of the drill rigs. ... There are also temporal biases in these data bases. Iceberg densities, masses and drifts are going to vary from season to season and from year to year. ... The large scale iceberg movements reported are in good agreement with those reported by Brooks (1977) from a similar satellite-tracked-buoy experiment in the same area. ... complex systems of drift patterns and ocean currents clearly indicate an investigator's dilemma in understanding iceberg drift. ... (Au)

## BROWN, R.

223
**On the physical structure of Greenland** / Brown, R.
(Royal Geographical Society, London. Arctic geography and ethnology, 1875, p. 1-74)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178810.*

Contents: 1. Greenland coast line. 2. Interior of Greenland. (Expeditions of the 18th-19th centuries). 3. Greenland glaciers and sea ice. 4. Glacier system of Greenland. 5. Action of sea ice. 6. Rise and fall of the Greenland coast. 7. Application of the facts regarding arctic ice actions as explanatory of glaciation and other ice remains in Britain. 8. On the formation of fiords. 9. Northern termination of Greenland. 10. Debatable points regarding the physical structure of Greenland. (AB)

224
**Voyage of the iceberg** / Brown, R.
Toronto : James Lorrimer & Co., 1983.
152 p. : ill. ; 24 cm.
ISBN 0-88862-656-8.
Fiction.
*ASTIS document number 178136.*

There is only one iceberg that has gripped the imagination of the world, one iceberg that has humbled the arrogance of men who believe in technology, one iceberg that tells us of the wonders and dangers of the North Atlantic Ocean. That iceberg sank the Titanic. This remarkable book tells the story of that iceberg's journey from the day it was "calved" into Baffin Bay until it crippled the Titanic eighteen months later. Richard Brown's quiet, compelling prose describes the rich natural and human world through which the iceberg travelled. It is the story of the Sierapaluk, the one surviving band of Inuit in the far northwest corner of Greenland, facing a life so harsh that the elderly simply wander off to die when food runs short; of the last surviving bowhead whale, a sixty-foot giant whose massive tail every whaler in the North Water fears; of men like Osbert Clare Forsyth-Grant, a buccaneering Scot who takes enormous risks with his ship and crew on the arctic ice-and pays for it with his life; and of the outport men who stream to St. John's each winter, pleading for a berth on the sealing ships and a chance to strike it rich on "The Main Patch." Through these lives, and many more, the Iceberg passes on its way to the Grand Banks and fateful meeting with the Titanic. ... As a stunned world struggles to recover from the shock of this unprecedented disaster, another berg breaks off in Jacobshavn Ice Fiord and drifts out towards Baffin Bay. And so, the voyage of the Iceberg begins again. ... (Au)

## BRUNEAU, A.A.

225
**Engineering and economic implications of icebergs in the North Atlantic** / Bruneau, A.A. Dempster, R.T.
(Oceanology International 72, 19/24 March 1972, Brighton, England : conference papers. – London : BPS Exhibitions, 1972, p. 176-180, ill., maps)
References.
*ASTIS document number 176893.*
NFSMO

This paper examines some of the special requirements in offshore exploration which are imposed by moving icebergs. Some alternatives to existing types of structures are presented. These include deflection of icebergs, mobile offshore structures, strengthening of existing operations and in-bottom operations where installations are protected by natural or man made ridges. (NFSMO)

226
**Iceberg dynamics project report** / Bruneau, A.A. Dempster, R.T.
[Calgary, Alta. : Amoco Canada], 1972.
7 microfiches : figures, tables ; 11 X 16 cm.
(Eastcoast Petroleum Operators' Association project no. 2. Report, no. 1-3)
Appendices.
Contents: Volume 1: Experimental equipment and supplies. – Volume 2: Observations, data and analysis. – Volume 3. Iceberg towing procedures.

*ASTIS document number 115789.*
ACU, NFSMO

In Volume I of this report a description of the experiment [Iceberg dynamics : experimental equipment and procedures] has been presented, together with an indication of the ways in which we set about obtaining the necessary information on currents, wind, berg form and drift and towing behaviour of the bergs towed. In [Volume 2] ... the relevant data and analyses are presented and an indication of the limitations that should be imposed on the interpretation of these analyses given. [In Volume 3] ... we shall describe ... some of the significant factors affecting the drift of an iceberg, to provide background information that will aid a platform operator in his decision ... [to either deflect the iceberg or move the rig.] (Au)

**227**
**Iceberg features, motions and towing problems** / Bruneau, A.A. Dempster, R.T.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 124-127, ill.)
*ASTIS document number 160300.*
NFSMO, ACU

The paper briefly describes the decision making process involved in the handling of a berg to be towed, and the IIP data used in the theoretical studies. (NFSMO)

**228**
**Iceberg towing for oil rig avoidance** / Bruneau, A.A. Dempster, R.T. Peters, G.R.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 379-388, ill.)
References.
*ASTIS document number 161934.*
ACU, NFSMO

The results of engineering experiments on the towing of Arctic Icebergs off Eastern Canada are described. Seven icebergs were towed, ranging from 85 to 292 thousand tons. ... It was generally shown that it was feasible to capture and tow icebergs up to a size limit determined by the ship available. ... (Au)

**229**
**Icebergs over the Canadian continental shelf** / Bruneau, A.A.
[S.l. : s.n., 1973?].
22 p. : ill. ; 28 cm.
Presented at 1973 C.S.E.G. National Convention, "Canada's North – an information update", April, 1973.
*ASTIS document number 161675.*
NFSMO

The sources of information on the drift and behaviour of icebergs in the North Atlantic are reviewed, and some of the more important aspects of iceberg drift, distribution, deterioration, and general behaviour are described. Much of the information now available has been collected and organized to be of use to North Atlantic shipping interests, and is limited both in the areas for which it is available and in the kind of detail that is required by offshore petroleum operators. Their problem will be to deal with the dangers presented by drifting icebergs which may collide with fixed operations, as opposed to the problem of safely navigating ships through areas in which icebergs are essentially stationary. Some of the specific requirements of this industry with respect to information concerning the drift and behaviour of icebergs are described and current work underway related to these requirements is briefly presented. (Au)

**See also:** 335.

## BRYANT, A.

**230**
**Floating structures and mooring cable systems – industry practice** / Bryant, A.
(Symposium on Offshore Mechanics and Cold Ocean Engineering held in Calgary, Alberta, June 13-15, 1983, preprints. – St. John's, Nfld. : Memorial University of Newfoundland, Continuing Engineering Education Centre, 1983, 45 leaves, figures)
*ASTIS document number 127671.*
NFSMO

[This paper discusses] the applicability of the concept [of floating structures and mooring cable systems] in ice-infested waters; environmental loads; design considerations for stability, motion and structural responses and fatigue; choice of mooring system and design features; shutdown of operations and workability curves, coping with icebergs [in towing operations.] (Au)

## BUCKLEY, J.R.

**See:** 329.

## BUCKLEY, T.J.

**See:** 483, 487, 792, 862.

## BUDD, W.F.

**231**
**Antarctic iceberg melt rates derived from size distributions and movement rates** / Budd, W.F. Jacka, T.H. Morgan, V.I.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 103-112, ill.)
References.
*ASTIS document number 172383.*
ACU, NFSMO

The melt rates of Antarctic icebergs derived by Morgan and Budd (1978) were based primarily on the distribution of iceberg concentrations, data on iceberg size distribution being limited. Recently, more detailed data have been obtained, especially north of lat 60 S which allow more precise calculations of the changes in size during drifting. ... The aim of the present study was to determine the distribution of both concentration and size of icebergs at different stages along drift routes in order to examine processes of deterioration and decay. Furthermore, statistics for regular tabular icebergs were compared with those for irregular ones in order to evaluate the separate effects of melting, breakage, and rollover. ... (Au)

## BUDINGER, T.F.

232
**Iceberg detection by radar** / Budinger, T.F.
(International ice observation and ice patrol service in the North Atlantic Ocean, season of 1959 / T.F. Budinger, R.P. Dinsmore, P.A. Morrill and F.M. Soule. Bulletin – United States. Coast Guard, no. 45, 1960, p. 49-97, ill.)
(Contribution – Woods Hole Oceanographic Institution, no. 1093)
References.
*ASTIS document number 174785.*
ACU, NFSMO

The behaviour of ice to electromagnetic radiation is analyzed to determine the reliability of radar as an iceberg detection instrument. From absolute quantitative measurements, quantitative generalizations, and theoretical considerations the following results were obtained: 1. Iceberg ice on the Grand Banks has a reflection coefficient of approximately 0.33 and reflects radar waves 60 times less than a ship of equivalent physical cross-sectional area. 2. The maximum range of radar contact is proportional to the fourth root of the physical cross-sectional area of icebergs. A statistical relation derived from 152 observations shows that growlers normally cannot be detected at ranges over 4 miles. 3. The Grand Banks and contiguous areas of the North Atlantic Ocean exhibit conditions of subnormal radar propagation during the spring months when fog and ice hazards are most prevalent. 4. Waves over 4 feet in height might obscure a dangerous growler .... 5. Ice is not frequency sensitive. The response of ice to S- and X-bands is the same. Furthermore, there is practically no difference in the response of sea water to S- and X-bands. 6. The use of sector scan, trained radar operators, and constant surveillance of the radar scope increases the probability of detecting ice by radar. 7. Commercial radar in common use on the ships of the world today cannot be relied upon for the detection of all dangerous icebergs or fragments thereof drifting in the North Atlantic Ocean. This instrument definitely is an aid but it does not provide an assurance against the presence of all floating ice which might sink a ship upon collision. (Au)

233
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1959** / Budinger, T.F. Dinsmore, R.P. Morrill, P.A. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1960.
vii, 154 p. : ill., maps (15 folded) ; 24 cm.
(Bulletin – United States. Coast Guard, no. 45)
References.
*ASTIS document number 174769.*
ACU, NFSMO

Between 5 March and 17 July 1959, the International Ice Patrol operated in the North Atlantic Ocean to serve the safety of ships traversing the recognized shipping lanes in the vicinity of the Grand Banks of Newfoundland. This marks the fortieth such occasion of this service which has been conducted annually since 1913, except during wartime years, by operating forces of the United States Coast Guard. The 1959 iceberg year was a severe one. Approximately 693 bergs drifted southward of the 48th parallel of Latitude during the year thus making it the 12th most active in records dating back to 1900 and the second heaviest since 1945. ... (Au)

234
**Wind effect on icebergs** / Budinger, T.F.
[Woods Hole, Mass. : Woods Hole Oceanographic Institution], 1960.
36 leaves : ill., ; 28 cm.
References.
*ASTIS document number 163147.*
NFSMO

The effect of wind on iceberg movement has been studied both theoretically and experimentally. Wind induced movement is often masked by the steady and persistent geostrophic current; however, these studies indicate that the combined effect of windage and wind induced current is sufficient to cause movements of considerable magnitude. The relation between wind speed and the movement imparted to an iceberg for velocities between 10 and 50 knots is linear and given by: Viceberg = 0.03 K x Wind where K is a constant for different iceberg shapes. The movement is directed 50 degrees to the right of the surface wind. New data are presented which corroborate the constant 0.013 in Ekman's empirical equation for the velocity of wind driven current. The controversial subject of iceberg underbody dimensions is explored. The average iceberg is shown to have a draft about 3 times its height. (Au)

## BUINITSKII, V. KH.

235
**New way of determining thicknesses of antarctic icebergs** / Buinitskii, V. Kh. Dmitrash, Zh. A. United States. Joint Publications Research Service [Translator].
Hanover, N.H. : Cold Regions Research and Engineering Laboratory [publisher] ; Springfield, Va. : NTIS [distributor], 1973.
1 microfiche : ill. ; 11 x 15 cm.
(Draft translation – U.S. Army Cold Regions Research and Enginering Laboratory, 403)
(NTIS AD-769 726)
Translated from: O novom metode opredeleniia tolshichiny antarticheskikh aisbergov, from Vestnik Leningradskogo Universiteta (Herald of Leningrad University), Geology and Geography series, v. 18, no. 3, 1971, p. 127-132.
References.
*ASTIS document number 174114.*
NFSMO

A new method of determination of the Antarctic iceberg's thickness is described in this paper. It is proved that if iceberg's altitude is known, its thickness may be found. (Au)

## BULLARD, R.P.

236
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1960** / Bullard, R.P. Dinsmore, R.P. Franceschetti, A.P. Morrill, P.A. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1961.
vii, 114 p., [12] folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 46)
Appendices.
*ASTIS document number 181307.*
ACU, NFSMO

This bulletin is No. 46 in the series of annual reports on the International Ice Patrol and covers the season of 1960. It is divided into two parts. The first is a report of the observation operations which extended from 11 March to 30 June 1960. Ship, aircraft and communication activities are described in detail and special sections deal with observed monthly ice conditions, experiments in iceberg demolition and statistics on ice and sea temperature reports for 1960. The second part comprises a preliminary presentation of the oceanographic data collected during 1960. Included are charts of dynamic topography of the sea surface (ocean current maps), tables of oceanographic data, and a brief discussion of the results of the season's four oceanographic surveys and the post-season research cruise in the Labrador Sea. ... (Au)

237
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1961** / Bullard, R.P. Franceschetti, A.P. Morrill, P.A. O'Hagan, R.M. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1963.
vii, 82 p., [14] folded leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 47)
*ASTIS document number 181315.*
ACU, NFSMO

This bulletin ... is divided into two parts. The first is a report of the observation operations which extended from 23 February to 28 June 1961. Ship, aircraft and communication activities are described and special sections deal with observed monthly ice conditions and statistics on ice and sea temperature reports for 1961. The second part comprises a preliminary presentation of the oceanographic data, a brief discussion of the results of the season's four oceanographic surveys, the postseason research cruise in the Labrador Sea and a report of the results of a program for collection of current data using moored current meters. ... The 1961 iceberg year was a light one with approximately 115 bergs drifting southward of the 48th parallel of latitude during the year as compared to 253 in 1960 and 693 in 1959. ... (Au)

238
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1962** / Bullard, R.P. Corwin, N. Driggers, V.W. Franceschetti, A.P. Lenczyk, R.E. McGill, D.A. O'Hagan, R.M. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1963.
vii, 153 p., [10] folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 48)
References.
*ASTIS document number 181323.*
ACU, NFSMO

... This bulletin is divided into two parts. The first is a report of the patrol operations which extended from 6 March to 22 June 1962. Aircraft and communication activities are described and special sections deal with observed monthly ice conditions and statistics on ice and sea temperature reports for 1962. The second part deals with physical oceanography in the Grand Banks region and the Labrador Sea. Included are charts of dynamic topography of the sea surface demonstrating the ocean current, tables of oceanographic data and a brief discussion of the results of the season's four oceanographic surveys and the special postseason research cruise in the Labrador Sea, Davis Strait and Baffin Bay. ... This was a light ice year for the Grand Banks region. An estimated 120 bergs drifted south of 48 N., as compared to the 50-year average of 370. The number of bergs drifting south of 48 N was almost exactly the same as 1961, but this year was marked by a greater number of bergs drifting east along the north slope of the Grand Banks causing more potential threat to the shipping tracks. ... (Au)

## BURKHART, M.D.

**See:** 1104.

## BURMESTER, H.

239
**Radaranzeige von Eisbergen [Radar observation of icebergs]** / Burmester, H.
(Seewart, bd. 21, heft 6, Dec. 1960, p. 234-238)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180157.*

Discusses the poor reflecting properties of ice to radar waves as compared to other solids: the strength of the echo from an iceberg may amount to only 1/60 that received from a ship of equal size. The mean detection range for bergs and growlers in the North Atlantic is graphed as a function of their reflecting surface area. Other factors having a reducing effect on the detection range are also discussed: rain, fog, swell. Growlers give the poorest echoes and pose the greatest danger to navigation. (AB)

## BURNS, B.A.

**See:** 672.

## BURSEY, J.O.

240
**The climate of the Labrador Sea** / Bursey, J.O. Sowden, W.J. Gates, A.D. Blackwood, C.L.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 938-951, maps)
References.
*ASTIS document number 178055.*
ACU, NFSMO

Topics discussed in the paper are (a) synoptic patterns (b) atmospheric pressure, (c) winds, (d) air temperature, (e) sea temperature, (f) precipitation, (g) visibility, (h) ice climate including icebergs, and (i) freezing spray. (NFSMO)

## BURT, J.C.

241
**The battle of the bergs** / Burt, J.C.
(Natural history, v. 65, no. 4, Apr. 1956, p. 186-191, ill., maps)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179957.*
ACU

Contains account of the origin, formation and movement of icebergs in the North Atlantic. Activities of the International Ice Patrol in the Grand Banks of Newfoundland area are described. The practicality of towing large bergs to relief of drought-stricken areas is discussed. (AB)

## BUSH, A.J.

242
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1953** / Bush, A.J. Lenczyk, R.E. Murray, J.E. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1955.
xi, 138 p., [10] folded leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 39)
*ASTIS document number 181021.*
ACU, NFSMO

The authority for and the duties of the International Ice Patrol are described. The forces assigned to the International Ice Patrol during the 1953 ice season are listed. A description of the aerial ice reconnaissance carried out by the International Ice Patrol during the 1953 ice season is presented. ... Portrayal is made of ice conditions during 1953 in the vicinity of Newfoundland and the

influence thereon of meteorological factors. The 1953 ice season in the North Atlantic was characterized for the third successive year by the small number of bergs which drifted south of 48 N. Although the southern and eastern limits reached by the pack ice were about normal to the third week in March, a marked recession of those limits then followed. The steamer routes in the Gulf of St. Lawrence and the Strait of Belle Isle were opened unusually early. The lightness of the ice season may be attributed in part to the influence of certain meteorological conditions, namely, strong easterly winds which drove the pack ice and the bergs therein toward the coasts of Newfoundland and Labrador and into the bays and the absence of westerly winds of sufficient strength to drive the ice back into the Labrador Current before the ice melted. ... (Au)

**243**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1954** / Bush, A.J. Lenczyk, R.E. Murray, J.E. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1955.
ix, 168 p., [14] folded leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 40)
Mostly tables.
*ASTIS document number 181048.*
ACU, NFSMO

The authority for, mission and method of carrying out the mission of the International Ice Patrol are described. ... The aerial ice observation conducted by the International Ice Patrol and communications with shipping and certain agencies ashore are described in detail. Tables of statistics concerning these operations are presented. Ice conditions during 1954 in the waters off Newfoundland are portrayed. Ice reports received by the International Ice Patrol are shown in tabular form and also by means of monthly ice charts. The 1954 ice season in the Grand Banks area was marked by a return to fairly average berg conditions after three successive light ice years. About 312 bergs drifted south of the 48th parallel during the season as compared with 404, the average annual number for the period 1900-53. With respect to pack ice the season was briefer than normal, and the pack did not reach south of the 47th parallel at any time. In the Gulf of St. Lawrence and St. Lawrence River the pack ice broke earlier than usual. Except for the Strait of Belle Isle, all the gulf and river routes were clear by 22 April. The Strait of Belle Isle was open to all shipping on 22 June, although caution was advised because of a scattering of bergs in the strait. ... (Au)

**244**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1955** / Bush, A.J. Murray, J.E. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1956.
ix, 114 p., [12] folded leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 41)
*ASTIS document number 181005.*
ACU, NFSMO

The authority for, mission, forces assigned and method of operation of the International Ice Patrol during the 1955 ice season are described. Statistics are presented in connection with the aerial ice observation and communications conducted by the International Ice Patrol in 1955. Ice reports received by the International Ice Patrol during the year are tabulated. A general description of ice conditions in the Newfoundland area is given. Only 61 bergs drifted south of the 48th parallel during 1955, as compared with the 1900-1955 average, 396 bergs. The distribution of these bergs was abnormal. No bergs were found along the east slope of the Grand Banks or in the Flemish Cap area. The duration of the pack ice in the Grand Banks area was about normal, but the extent of the pack to the south and east of the Newfoundland coast was subnormal. Except for the Strait of Belle Isle, all routes to ports in the Gulf of St. Lawrence and St. Lawrence River were clear by 16 April. The Strait of Belle Isle route was navigable by 12 June. ... (Au)

**245**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1956** / Bush, A.J. Murray, J.E. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1957.
ix, 100 p., [11] leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 42)
Mostly tables.
*ASTIS document number 181226.*
ACU, NFSMO

The authority for, mission, forces assigned and method of operation of the International Ice Patrol during the 1956 ice season are described. Aerial ice observation and communications statistics are presented. All ice reports made to the International Ice Patrol in 1956 are tabulated. A general month-by-month description of ice conditions in the Newfoundland area is given. Only 80 bergs drifted south of latitude 48 N during the year, a low figure in comparison with 1900-1956 average, 391 bergs. The most southerly berg of the season was reported 28 May in 44 55 N., 49 22 W. The duration and maximum extension of the pack ice to the south and east of the Newfoundland coast were subnormal. ... (Au)

## BUTT, K.A.

**246**

**HF radar technology transfer project – evaluation phase** / Butt, K.A. Jeans, P.K.
St. John's : Centre for Cold Ocean Resources Engineering, 1981.
viii, 136p. : ill., figures ; 28cm.
(C-CORE publication, no. 81- 14)
(C-CORE publication. Technical report)
Appendices.
Bibliography: p.121-126.
*ASTIS document number 84034.*
ACU, NFSMO

A high frequency surface wave radar system known as Coastal Ocean Dynamics Applications Radar (CODAR) is examined for potential application to Canadian ocean resources engineering. The system, as developed by the National Oceanic and Atmospheric Administration (NOAA) is capable of mapping large area (60 x 60 km) surface currents remotely from a land base in near real time. A functional description including the system's novel phase measuring technique applied in combination with modern computer technology to direction finding is provided. CODAR is described as an appropriate foundation on which to begin Canadian development of HF surface wave radar systems. A technology transfer program is outlined with potential application to operational floating ice related problems. (Au)

## CADWALDER, J.

**247**

**Moving ice** / Cadwalder, J.
(Frontiers (Philadelphia), v. 43, no. 1, Sept. 1978, p. 20-22)
*Document not seen by ASTIS.*
*ASTIS document number 183458.*

## CALLAHAN, J.T.

**See:** 308.

## CAMMAERT, A.B.

**248**

**Impact of icebergs on offshore gravity and floating platforms** / Cammaert, A.B. Wong, T.T. Curtis, D.D.

(The Seventh International Conference on Port and Ocean Engineering under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 4, p. 519-536, ill.)

(VTT symposium, 38, p. 519-536, ill.)

References.

*ASTIS document number 163783.*

NFSMO

The potential collision of icebergs with floating or bottom-fixed structures remains one of the most serious obstacles to the production of oil from the Hibernia field, offshore Newfoundland. Various analytical techniques are presented for the calculation of impact loads. For gravity platforms the influence of the contact face and the effect of variable ice crushing strength as a function of strain rate and penetration depth are investigated. A simple one-degree-of-freedom model is formulated for the case of a bergy bit colliding with a semisubmersible. Several typical case studies are analyzed and motion characteristics are presented. The basis of development of a three-degree-of-freedom iceberg/structure interaction model is also discribed. Such a model incorporates plastic deformation of the iceberg, elastic/plastic deformation of the structure, platform excursions, and flexibility of the mooring system. (Au)

**249**

**Impact of large ice floes and icebergs on marine structures** / Cammaert, A.B. Tsinker, G.P.

(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 2, p. 653-662, ill.)

References.

*ASTIS document number 163864.*

NFSMO

In recent engineering studies it has been necessary to calculate the impact of large ice features on various types of marine structures. A simple approach was developed which relates kinetic energy dissipation to progressive crushing of the ice. When a large ice floe or iceberg collides with a massive structure the contact zone will fail by crushing, and will increase in size as the resisting force is steadily increased. The kinetic energy is then decreased until an equilibrium point is reached. An analysis of an ice floe impact on a sluice gate will first be presented to illustrate the methods. The particular case of a "blocky" iceberg colliding with either a cylindrical or a conical gravity platform will them be analyzed. For typical iceberg characteristics and structure dimensions, it will be demonstrated that a gravity structure could be designed to withstand iceberg loadings. The effect of structure movements will also be considered. (Au)

**See also:** 309.

## CAMPBELL, W.J.

**250**

**Geophysical studies of floating ice by remote sensing** / Campbell, W.J. Weeks, W.F. Ramseier, R.O. Gloersen, P.

(Journal of glaciology, v. 15, no. 73, 1975, p. 305-328, ill., maps)

References.

*ASTIS document number 171697.*

ACU, NFSMO

This paper presents an overview of recent remote-sensing techniques as applied to geophysical studies of floating ice. The current increase in scientific interest in floating ice has occurred during a time of rapid evolution of both remote-sensing platforms and sensors. Mesoscale and macroscale studies of floating ice are discussed under three sensor categories: visual, passive microwave, and active microwave. The specific studies that are reviewed primarily investigate ice drift and deformation, and ice type and ice roughness identification and distribution. ... The interest in floating ice by the community of geophysically oriented scientists has blossomed in the last few years. Investigations of climate variations have laid new stress on the need to treat the atmosphere-ocean-ice-land system as a whole and to acquire sequential synoptic data on the large floating and grounded ice masses that are involved in a complex feedback process with atmospheric and oceanic circulation. ... The recent efforts by many nations to rapidly exploit oil resources in the Arctic and sub-Arctic and to extend the navigable season in ice-infested waters has placed further emphasis on the need for ice observations by remote sensing. Iceberg tracking by satellite has been done by using both sequential imagery and positioning platforms-measurements which are needed for the possible towing of icebergs as a water resource and for preventing them from colliding with man-made structures. ... Therefore, we wish in this paper to discuss recent developments in remote sensing of floating ice by means of visible, passive microwave, and active microwave techniques, the way they have been used in recent experiments such as BESEX (Bering Sea Experiment), the AIDJEX pilot studies, and Skylab, and what new possibilities are in the offing. (Au)

**251**

**An integrated approach to the remote sensing of floating ice** / Campbell, W.J. Ramseier, R.O. Weeks, W.F. Gloersen, P.

(Third Canadian Symposium on Remote Sensing / Edited by G.E. Thompson. – Ottawa : Canadian Aeronautics and Space Institute, 1975, p. 39-72, ill.)

(Proceedings of the International Astronautical Congress, 26th, Lisbon, September 21-27, 1975 / Edited by L.G. Napolitano. – Oxford : Pergamon Press, 1977, p. 445-487, ill.)

(International Council for the Exploration of the Sea / Hydrography Committee. – [S.l. : s.n.], 1975, [92] p., ill.)

References.

*ASTIS document number 174718.*

ACU, NFSMO

The current increase of scientific interest in all forms of floating ice – sea ice, lake ice, river ice, ice shelves and icebergs – has occurred during a time of rapid evolution of both remote-sensing platforms and sensors. The application of these new research tools to ice studies has generally been both piecemeal and sporadic, partly because the community of ice scientists has not kept up with the rapid advances in remote sensing technology and partly because they have not made their needs known to the space community. This paper seeks to help remedy the latter shortcomming. The remote sensing requirements for floating ice studies are given, and the capabilities of various existing and future sensors and sensor combinations in meeting these requirements are discussed. The disirable future sensors are also discussed from both the research and operational points of view. (Au)

**252**

**Ocean eddy structure by satellite radar altimetry required for iceberg towing** / Campbell, W.J. Cheney, R.E. Marsh, J.G. Mognard, N.M.

(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 211-221, ill., map)

References.
*ASTIS document number 164100.*
ACU, NFSMO

... Recent oceanographic research indicates ... that most of the ocean momentum is probably involved in intense rings, formed by meanders of the large streams, and in mid-ocean eddies. ... The successful towing of icebergs is dependent on the ability to locate, measure, and track ocean rings and eddies. To accomplish this systematically on synoptic scales appears to be possible only by using satellite-borne radar altimeters. Ocean current and eddy structures as observed by the radar altimeters on the GEOS-3 and Seasat-1 satellites are presented and compared. ... (Au)

253
**Ocean topography by radar altimetry for iceberg towing** / Campbell, W.J. Cheney, R.E. Marsh, J.G. Mognard, N.M.
(Geological Survey (U.S.) professional paper, 1175, 1980, p. 243)
Abstract only.
*ASTIS document number 170666.*
NFSM, NFSMO

The towing speeds of large tabular icebergs to be used as a water resource will be approximately 1 kn above ambient ocean currents. Recent research has shown that the oceans are primarily made up of many meandering eddies rather than large steady-state streams like the Kuroshia and the Gulf Stream. ... [The authors] have shown how satellite radar altimetry can be used to locate, measure and track these midocean eddies. Because icebergs rotate at speeds as great as 2 kn, the only apparent approach to sucessful iceberg towing is by preferential eddy jumping along proposed towing routes. (Au)

**See also:** 1080.

## CANADA OIL AND GAS LANDS ADMINISTRATION

**See:** 714.

## CANADA. ARCTIC MARINE OILSPILL PROGRAM

**See:** 631, 733.

## CANADA. ATMOSPHERIC ENVIRONMENT SERVICE

**See:** 414, 415.

## CANADA. ATMOSPHERIC ENVIRONMENT SERVICE. METEOROLOGICAL SERVICES RESEARCH BRANCH

**See:** 412.

## CANADA. CENTRE FOR REMOTE SENSING

**See:** 735.

## CANADA. ENVIRONMENT CANADA

**See:** 550.

## CANADA. ENVIRONMENTAL EMERGENCY BRANCH

**See:** 734.

## CANADA. ENVIRONMENTAL EMERGENCY BRANCH. RESEARCH AND DEVELOPMENT DIVISION

**See:** 631.

## CANADA. GEOLOGICAL SURVEY

**See:** 164.

## CANADA. TRANSPORT CANADA. RESEARCH AND DEVELOPMENT CENTRE

**See:** 544, 545.

## CANADIAN COAST GUARD

**See:** 312.

## CANADIAN COAST GUARD. MARINE CASUALTY INVESTIGATIONS

254
**Report of investigation into the circumstances attending the collision with an iceberg of the Panamanian registered vessel "Canadian Bulker" off the east coast of Newfoundland, June 15, 1982** / Canadian Coast Guard. Marine Casualty Investigations.
[Ottawa : Canadian Coast Guard], 1982.
(Canadian Coast Guard. Investigation report, no. 261)
(Transport Canada report, no.TP1624)
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184144.*

## CANADIAN HYDROGRAPHIC SERVICE

255
**Pilot of arctic Canada** / Canadian Hydrographic Service.
1st ed.
Ottawa : Queen's Printer, 1959.
2 v. (xxiv, 183; xi, 434 p.) : ill., maps (some folded).
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180084.*

Basic work. Original sources, air photographs, as well as published

data were used in preparation of this work which provides, besides standard sailing directions, extensive information on physical features and conditions of the area, each volume thoroughly indexed. Vol. 1 presents information on charts, lights, signals, radio, etc. of general interest to mariners; outline of the physiography, population, transportation, communications, economic development, administration, vegetation and wildlife of the Canadian Arctic; review of its exploration and search for the Northwest Passage (p. 31-72); account of ice, including glossary, formation, bergs, navigation, use of explosives, etc, if beset (p. 73-100); description (p. 101-134) of the Northwest Passage (four routes), submarine topography, tides, currents, ice conditions, weather and climate, including maps. Appended is gazetteer of approx. 4000 place names with geographic coordinates; and (p. 166) wind-chill scale. Vol. 2 contains descriptions and directions for the coasts and adjacent sea areas of the Canadian Eastern Arctic (east of approx. 100 W long) north of Hudson Bay. The Greenland West coast from Cape York to Cape Stanton 82 13 N 57 10 W, is described along with adjacent waters, Baffin Bay, Smith Sound, Kane Basin, Kennedy Channel, and Robeson Channel. Included are the coasts of the Canadian mainland and islands contiguous to Hudson Strait (northern side), Hudson Bay (northern side), Foxe Channel and Foxe Basin, Fury and Hecla Strait, Davis Strait (western side), Baffin Bay (western side), Lancaster Sound, Barrow Strait (eastern side), Prince Regent Inlet and Bellot Strait, Gulf of Boothia and Committee Bay, the Northern Waterway from Baffin Bay to Lincoln Sea, Jones Sound, Norwegian Bay (eastern part), and Eureka Sound. Climatological tables for 17 stations are provided. (AB)

## CANOCEAN ENGINEERING LTD.

**256**

**Petroleum production from Lancaster Sound, a study of the application of technology to resource development** / CanOcean Engineering Ltd. Pallister Resource Management Ltd. Consolidex Magnorth Oakwood Joint Venture [Sponsor].

Calgary, Alta. : CMO Lancaster Sound Joint Venture, 1983.

96 leaves : figures, tables ; 29 cm.

(Consolidex Magnorth Oakwood Lancaster Sound Joint Venture. Resource Management Plan support document, no. RMPSD08)

Appendix: Deepwater wells survey.

References.

Revised version July 1983 of original, January 1983.

Also available on microfiche.

*ASTIS document number 121452.*

ACU, NFSMO

... The purpose of the study is to provide evidence of the industry's ability to work in deep water within the arctic conditions of Lancaster Sound, and to provide preliminary information on a conceptual production field development scenario for Lancaster Sound. The report provides evidence of deepwater accomplishments through a historic overview of technology advancements to ever increasing water depths in the areas of platform design, drilling and subsea completion systems, pipelining technologies and field maintenance. The report includes a summary of the physical environment of Lancaster Sound. ... The hypothetical development scenario discussed for Lancaster Sound, depicts a subsea completion system producing via subsea pipelines to a shore processing facility and delivers the oil to market using an icebreaker oil tanker transportation system. The development scenario is based on the current trends for deepwater production systems, remote arctic processing and transportation systems, and on state-of-the-art technology for deepwater developments. ... The main concerns with an arctic deepwater production development deal with economics, capital and operating costs and equipment performance reliabilities. To overcome these concerns industry must acquire field proven data on these subjects through actual research and small development programs and full scale pilot projects. Industry is actively involved in all three of these aspects. ... If a prolific oil reservoir in Lancaster Sound was confirmed today, industry could respond to the challenge and have the field in full production in a safe and environmentally compatible mode within ten years. (Au)

## CANPOLAR CONSULTANTS LTD.

**257**

**Evaluation of iceberg detection systems** / Canpolar Consultants Ltd. Mobil Oil Canada Ltd. [Sponsor].

[S.l.] : Mobil Oil Canada Ltd., 1984.

Report proprietary to Hibernia Joint Venture Participants.

Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.

*Document not seen by ASTIS.*

*ASTIS document number 184179.*

The objective of this study is to review all methods and instumentation for iceberg detection, specifying the existing limitations, and discussing possible improvements to increase the range and ability of the foregoing to detect icebergs. This is performed with the ultimate goal of developing a system for iceberg detection with 100% reliability. All presently available methods and instrumentation for iceberg detection are addressed in the study, including those that could potentially be used with future development. This instrumentation is critically reviewed for availability, past use in iceberg detection, approximate cost of purchase, and operation and limitations for iceberg detection. Discussions on the limitations of the instrumentation to detect iceberg stresses on the physical evnvironment and the iceberg size limitations [are also included.] (Au)

**See also:** 722, 891.

## CARLSON, W.S.

**258**

**Ice survey by the U.S. Coast Guard** / Carlson, W.S.

(Science, v.168, no.3927, Apr. 17, 1970, p. 396-397, map)

References.

*ASTIS document number 171964.*

ACU

... The outlet glaciers on the west coast in the Northeast Bay and Disko Bay areas were the subject of study by the U.S. Coast Guard in the summer of 1968. ... These glaciers are the principal sources of icebergs, many of which find their way into the North Atlantic shipping lanes. Between 1928 and 1935 the Coast Guard expeditions to Greenland identified 21 major iceberg-producing glaciers. ... In 1968 nine ... glacier fronts were charted and bench marks established for future surveys. Observations included an inventory of glacier size, type distribution, and movement. ... A study of available maps and of aerial photographs taken for use in map-making would doubtless yield additional valuable information about the extent of iceberg production of the glaciers under study. The bench marks that have been established will be useful in the continuation of this important work. (Au)

## CARR, G.L.

**259**

**Frederic Edwin Church : the icebergs** / Carr, G.L.

Dallas [Tex.] : Dallas Museum of Fine Arts, 1980.

109 p. : ill. (some col.) ; 23 x 28 cm.

Introduction by D.C. Huntington.

References.

*ASTIS document number 172499.*

ACU

Almost as extraordinary as the inherent art historical and esthetic importance of Frederic Church's The Icebergs has been the romantic tale of its initial popular success and later disappearance in the back hall of a school for boys in Manchester, England . Its subsequent reappearance and gift to the citizens of Dallas is at least as dramatic and surprising an event as the earlier chapters of the story. ... In a way, Church was not only the student but also the teacher. The observations of the behavior of arctic light and color which he presented in the broadside for The Icebergs may well have been unique in 1861, for Church saw better than others had seen. To the scientifically inclined, his art exerted a double appeal. It pictured what had formerly been known only through visual discoveries, such as the optical causes of the seeming darkness and somberness of hue of sky and water in the presence of icebergs. Church's "absolute experiences," so one critic put it, insured the "truth" to be discerned on the canvas. ... [This book is a tribute to the artist and his work, as well as a window into 19th century thought in America, providing insight into the social climate of this time period.] (Au)

## CARSEY, F.

**260**
**SIR-B iceberg observations** / Carsey, F.
(EOS (Washington), v. 66, no. 40, Oct. 1, 1985, p. 684, ill.)
*ASTIS document number 177695.*
ACU

... As it happened, the SIR-B mission experienced difficulty with its data link to a geostationary relay satellite and with the SIR-B radar transmitter, with the consequences that the total amount of data taken was only about one fifth of what was planned and that the data quality was impaired in comparison to what had been anticipated. The result was that no iceberg synthetic aperture radar (SAR) images off the Canadian coast and very limited sea ice SAR images in the southern ocean were acquired; however, a few interesting SAR images of the southern ocean icebergs were acquired, and a few of these are shown .... (Au)

## CARTER, H.H.

**261**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1948** / Carter, H.H. Challender, E.R. Cheney, L.A. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1950.
v, 118 p., [30] folded leaves of plates : charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 34)
*ASTIS document number 179663.*
ACU, NFSMO

It is estimated that 523 bergs drifted south of 48 N. during 1948. This compares with the 49-year average, 1900 through 1948, of 433. The outstanding feature of the 1948 season was the fact that although a greater than average number of bergs drifted south of 48 N., only a few actually entered track C and only one reached track B. The one reaching track B was a ship report and is doubtful. ... To summarize, a greater than average number of bergs drifted south of the 48th parallel. Further southward progress was impeded to the extent that a relatively small number, possibly 10 to 15, drifted south of westbound track C, and only one and possibly none reached track B. The relationship between this deficiency of bergs reaching southerly positions and the location of the northern boundary of the Atlantic Current is discussed elsewhere in this Bulletin in the section dealing with the oceanography of the Grand Banks region. The total amount of field ice in the St. Lawrence area was somewhat less than usual. ... In general the deficiency of sea ice in this region was due in part to a westward displacement of the eastern limits of the sea ice during the months of February, March, April, and May. In addition the southern limits of the sea ice were displaced to the northward during the months of February, April, and May. March was approximately normal with regard to the southern limits. In the Grand Banks region the total amount of field ice was less than usual. [The results of the Baffin Bay iceberg census are also reported.] ... (Au)

## CARTER, W.J.

**See:** 642.

## CARTWRIGHT, G.

**262**
**A journal of transactions and events during a residence of nearly sixteen years on the coast of Labrador; containing many interesting particulars both of the country and its inhabitants, not hitherto known** / Cartwright, G.
Newark, England : Allin and Ridge, 1792.
3 v. (287, 505, 263 p.) : maps.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180165.*
ACU

Contains almost daily entries, Mar. 30, 1770-Dec. 18, 1786, made during six sojourns in Labrador, at various localities along the coast 52 18-53 48 N. Weather conditions, topography, coasts and harbors, inland forests, vegetation and soils, wildlife, birds and fish, icebergs, travel conditions, etc. are recorded as observed. Author's daily life, his business dealings in codfish, salmon, oil, whalebone, and furs, his explorations, trapping, hunting and gardening experiences are described. His trading and social relationships with the Eskimo and Montagnais Indians are recounted; their clothing, dwellings, implements, customs, and characteristics are depicted in detail. Five Eskimos accompanied Cartwright to England in 1772, their experiences and reactions to London, and the English countryside are related. En route back to Labrador, they contracted smallpox and only one survived. During his fourth sojourn on the coast, in Aug. 1778, Cartwright was plundered by an American ship, the Minerva. A description of the natural history of Labrador (v.3, p. 220-39) and temperature observations made three times daily in F. are appended to the journal. A glossary of approx. 135 English terms common in Labrador is included. (AB)

## CHALLENDER, E.R.

**263**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1947** / Challender, E.R. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1949.
61 p., [14] folded leaves of plates : charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 33)
*ASTIS document number 181170.*
ACU, NFSMO

The 1947 ice season was unusually light, with a total of 63 bergs estimated to have drifted south past the 48th parallel. Of these, three drifted far enough south to menace the effective North Atlantic Track Agreement steamer lanes. Although the season lasted until 23 July, the situation was never critical enough to warrant the formal inauguration of the continuous surface vessel patrol. Ice observation, as in 1946, was carried out with a combination of air and surface craft. Again shortages of trained personnel and equipment prevented the resumption of the oceanographic program of the International Ice Patrol. In the absence, therefore, of detailed oceanographic observations it is only possible to deduce the current situation by inference from other indicators such as ice distribution and berg drifts. Some unusually rapid drifts were noted, one berg in particular maintaining an average speed of about 30 miles a day during its voyage along the

entire eastern edge of the Grand Banks during June. It is considered fortunate that such a current pattern coincided with a dearth of bergs. The destruction of nearly all of the year's crop of bergs is described as being the result of an unusual prevalence of on-shore winds along the Newfoundland and Labrador coasts during February and early March. This feature is discussed with reference to the barometric pressure distribution which existed in the area from November 1946 through June 1947. (Au)

**See also:** 154, 261, 976.

## CHARI, T.R.

**264**

**An analytical model and laboratory tests on iceberg sediment interaction** / Chari, T.R. Allen, J.H.

(Oceans '74 : IEEE International Conference on Engineering in the Ocean Environment. – New York : Institute of Electrical and Electronic Engineers, Inc., 1974, v. 1, p. 133-136, figures)

References.

*ASTIS document number 148792.*

ACU, NFSMO

... This paper describes a laboratory phase of the iceberg grounding studies currently in progress. (Au)

**265**

**Environmental factors affecting iceberg scour estimates** / Chari, T.R. Peters, G.R. Muthukrishnaiah, K.

(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 223-229, ill.)

References.

*ASTIS document number 148210.*

ACU, NFSMO

The mechanics of iceberg grounding can be modelled mathematically and scour sizes estimated. However, such estimates will not be realistic unless the various environmental parameters influencing the phenomenon are determined to a reasonable degree of accuracy. The scouring potential of an iceberg depends on its size, shape, drift velocity and the drag coefficient. Similarly, the scour size depends on the sediment type, its shear strength and the bathymetry. This paper describes the mathematical model and the influence of the different variables on the scour size estimates. A correlation is attempted between the model and reported scour observations. (Au)

**266**

**Estimates of iceberg scour depths** / Chari, T.R. Peters, G.R.

St. John's : Faculty of Engineering and Applied Science, Memorial University of Newfoundland, 1981.

11p. : ill., figures, tables ; 28cm.

(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 178-188, ill.)

References.

*ASTIS document number 69515.*

NFSMO

The maximum depth of iceberg scour at any location can be estimated using the basic concepts of geotechnical engineering and the principle of energy balance. The water depth will, to a large extent, control the magnitude of the scour problem by limiting the size of the berg likely to ground. The shape of the iceberg keel, the type of the seabed sediment and the coefficient of hydrodynamic drag between the iceberg and ocean currents are the major factors influencing the scour size. (Au)

**267**

**Geotechnical aspects of iceberg scours on ocean floors** / Chari, T.R.

(Canadian geotechnical journal, v. 16, no. 2, May 1979, p. 379-390, ill., map, photos.)

Appendix.

Bibliography: p. 386-387.

*ASTIS document number 31860.*

ACU, NFSMO

... This paper describes a simple analysis for iceberg grounding and scouring of ocean floors. Theoretical and laboratory results are presented and compared with the limited field data available at present. (Au)

**268**

**Ice scour modelling** / Chari, T.R.

[S.l. : s.n., 1985?].

[4] leaves : ill. ; 28 cm.

Proceedings in press.

Paper presented at Workshop on Ice-Seabed-Structure Interaction, Second Canadian Conference on Marine Geotechnical Engineering, Halifax, N.S., Canada, June 7-11, 1982.

Photocopy.

*ASTIS document number 159727.*

NFSMO

Dr. Chari discusses certain aspects of modelling iceberg scours and testing the model in a laboratory tank, and how different types of models play a role in predicting iceberg scours. (ASTIS)

**269**

**Iceberg grounding – a preliminary theory** / Chari, T.R. Allen, J.H.

(Applications of solid mechanics : proceedings of the Symposium held at the University of Waterloo June 26 and 27, 1972 / Edited by R.G. Charlwood, D.S. Weaver and B. Tabbarok. – Waterloo, Ont. : University of Waterloo, Solid Mechanics Division, 1972, p. 81-95, ill.)

References.

*ASTIS document number 149594.*

NFSMO

...An understanding of the mechanics of grounding of icebergs is of considerable importance in planning the exploitation of resources from Canada's Eastern seaboard. The paper considers a regular prismatic shaped iceberg grounding on the fluvial marine sediments typical of Newfoundland waters. It is shown that the kinetic energy would be absorbed by horizontal shear into the sediments and a preliminary theory is presented. Some of the problems associated with analysis of iceberg grounding are discussed. ... It is possible to estimate the zone of gouging of an iceberg under idealized conditions, but further work on the value and influence of the various parameters is required before it can find practical application. (Au)

**270**

**Iceberg grounding problems in the North Atlantic** / Chari, T.R. Allen, J.H.

(Proceedings of the Second International Conference on Port and Ocean Engineering under Arctic Conditions / Edited

by T. Karlsson. – Reykjavik, Iceland : University of Iceland, Dept. of Engineering and Science, 1973, p. 608-616, ill.)
References.
*ASTIS document number 149586.*
NFSMO

This paper outlines some aspects of grounding icebergs, and describes an analytical model for a simple, block-shaped idealized berg. Initial laboratory test results show that the assumptions in the analytical model of iceberg scouring are correct for the front face and bottom. Further tests are being undertaken. (NFSMO)

271
**Iceberg scour factors on eastcoast production** / Chari, T.R.
(Drilling Canada, v. 2, no. 4, July/Aug. 1981, p. 55-56, ill.)
*ASTIS document number 149527.*
NFSMO

The article briefly describes the problems of scouring icebergs in an area of potential hydrocarbon development, the approaches used for examining and evaluating the scour problem, and future reseach projects. (NFSMO)

272
**Iceberg scour studies in medium dense sands** / Chari, T.R. Green, H.P.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 2, p.1012-1018, figures, table)
References.
*ASTIS document number 148121.*
ACU, NFSMO

The problem of iceberg scours on Canada's east coast is a major hazard in the extraction of the offshore hydrocarbon resources. Various production systems which take into account the severe environmental factors such as the heavy seas, ice and icebergs are under consideration for the Hibernia field on the Grand Banks. In any system, all seafloor structures are to be located below the zone of iceberg scours. However, the estimation of the maximum scour depths is still an aspect of the problem not fully understood. A model for iceberg scouring in clays has been suggested earlier and is now modified to include cohesionless soils. Laboratory tests were conducted with a 50 cm wide model, using medium dense sand as the representative seabed material. Results of these experiments are discussed. (Au)

273
**Iceberg scours III** / Chari, T.R.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 161)
Abstract only.
*ASTIS document number 150754.*
NFSMO

The maximum depth to which a grounding iceberg scours the seafloor depends on factors such as the iceberg size, the type of the seabed, and other environmental factors such as the bathymetry and ocean currents. Mathematical analysis and physical model tests show that a grounding iceberg creates a zone of disturbance during the scouring process below the bottom of the scour trench. Soil pressure is developed during such a disturbance. This phenomenon has to be considered in the design of seabed structures and in the computation of the safe burial depths. The magnitude of the soil pressure below a scouring iceberg depends on the actual mechanics of ploughing. ... (Au)

274
**Iceberg threat to ocean floor structures** / Chari, T.R. Muthukrishnaiah, K.
(Proceedings : IAHR Symposium on Ice Problems, 5th, Lulea, Sweden, 7-9 August, 1978, pt. 1. – Lulea, Sweden : International Association for Hydraulic Research, 1978, p. 421-434, ill.)
References.
*ASTIS document number 149810.*
NFSMO

... This paper describes a model for the ocean floor scouring by icebergs. ... A schematic of the types of iceberg threat and possible preventive measures is presented .... A theoretical model and the laboratory verification of the scouring mechanics of an iceberg of idealized shape are described. Reported measurements of actual scours on the ocean bottom are as long as 3 km and 6 meters deep. Calculations using the proposed model compare very well with actual measurements reported. ... (Au)

275
**Memorial University of Newfoundland engineering studies** / Chari, T.R.
[S.l. : s.n., 1985].
[16] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
References.
*ASTIS document number 163473.*

This presentation is a review of research on iceberg scour modelling that has been ongoing for several years in the Faculty of Engineering and Applied Science at Memorial University. The focus of this talk is the rolling of icebergs and the subsequent forms that are left on the seabed. [Research utilized mathematical and physical models to predict effects on bottom sediments and pipelines]. (Au)

276
**Model studies of iceberg scouring** / Chari, T.R.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 775-783, ill.)
References.
*ASTIS document number 149551.*
ACU, NFSMO

... Iceberg threat to an offshore operation could be in the form of a direct hit or scouring of the ocean floor in the process of grounding. Published observations as well as surveys conducted by exploration companies suggest the presence of definite scour marks on the surface sediments. Scours 3 km. long have been reported (Harris and Jollymore 1974) and attributed to icebergs. However, these scours may not be recent and could have been caused by large icebergs thousands of years ago. To establish the relevance of the measured scour sizes to the present day iceberg sizes, an understanding of the process and mechanics of scouring is necessary. Analytical and laboratory modelling of iceberg scouring is one of the current projects in Ocean Engineering research at Memorial University. Some of the results are presented in this paper. The possibility of occurrence of long scours for present day iceberg sizes is explained in the light of the proposed model. (Au)

277
**Model studies of ocean floor scouring by icebergs** / Chari, T.R. Muthukrishnaiah, K.
(Proceedings of the Conference on Applied Techniques for

Cold Environments, Anchorage, Alaska, 17-19 May, 1978. – New York : American Society of Civil Engineers, 1979, v. 2, p. 828-839, figures)
References.
*ASTIS document number 149020.*
ACU, NFSMO

... On the Canadian east coast, where oil and gas finds are encouraging, these icebergs pose, not only a threat of a direct hit with the offshore rigs, but also scouring of the ocean bottom installations in the process of grounding. Instances where icebergs damaged B.O.P. stacks of exploration wells and transatlantic cables have been reported. Side-scan sonar observations indicate the possibility of scour lengths in the order of kilometers and as deep as 5 to 6 meters. To understand the mechanism of iceberg scouring, an idealized iceberg was assumed to gouge into a uniformly sloping ocean floor. The consequent length and depth of the scour was computed by equating the initial energy of the iceberg to the resistance of the ocean floor soil. The same model was tested in a laboratory tank. The model was instrumented and towed into an artificially formed soil slope. Soil pressure on the different faces of the model was continuously monitored. From the laboratory results, the analytical model was indirectly validated. Calculations using the proposed hypothesis for the ocean floor scouring by icebergs compare well with actual scour measurements, giving further credibility to the model, under assumed conditions. Details of the iceberg scour model and the laboratory results are presented in this paper. (Au)

**278**

**A model study of iceberg scouring in North Atlantic** / Chari, T.R. Guha, S.N.
(Tenth Annual Offshore Technology Conference, 1978 : proceedings. – Dallas, Tex. : Offshore Technology Conference, 1978 : v. 4, p.2319-2326, ill.)
References.
*ASTIS document number 149535.*
ACU, NFSMO

... This paper describes an analytical model for the iceberg scouring in which an idealized berg ploughs into a gentle slope of soft ocean-floor soil. Theoretical equations were obtained for the scour size. An instrumented laboratory model was pushed into an artificial slope of soft sediment in a glass-sided tank, thus reproducing the scouring phenomenon. These experiments verified the assumptions of the analytical model. Results obtained for the above model compare well with the scour sizes reported for typical weak surficial sediments. It is hoped that prediction of maximum scour depths would help placing bottom installations well below the zone of possible damage. Description of the analytical model, the details of laboratory tests, as well as the correlation of the measured and predicted values are given in this paper. Extension of this analysis for possible protection of production platforms from a direct iceberg hit also is indicated. (Au)

**279**

**A model study of iceberg scouring in the North Atlantic** / Chari, T.R.
(Journal of petroleum technology, v. 32, no. 12, Dec. 1980, p.2247-2252, figures)
References.
*ASTIS document number 90921.*
ACU, NFSMO

A model has been developed to predict the maximum depth of iceberg scour in the north Atlantic Ocean. A prior knowledge of the environmental parameters – such as the bathymetry, seabed properties, iceberg dimensions, and ocean current data – would be required to compute safe burial depth for blowout preventer stacks and pipelines. (Au)

**280**

**Resistance of sediments to iceberg scouring** / Chari, T.R. Allen, J.H.
(New frontiers in geotechnical engineering : preprints of papers, Twenty-seventh Canadian Geotechnical Conference, Edmonton, 1974. – [S.l. : s.n.], 1974, p. 1-12, figures, table)
References.
*ASTIS document number 149616.*
NFSMO

Operators on the Canadian Atlantic Offshore face an additional marine problem in the form of icebergs. ... Side scan sonar images reveal long marks on the sea floor believed caused by bottom dragging bergs. Some of these marks have been reported to be as deep as 6.5 m and 3 km long. This paper describes the laboratory experiments conducted to understand the soil failure pattern during iceberg grounding. (Au)

**281**

**Some geotechnical aspects of iceberg furrows** / Chari, T.R. Green, H.P. Reddy, A.S.
[S.l. : s.n., 1985?].
[4] leaves : ill. ; 28 cm.
Proceedings in press.
Paper presented at the Second Canadian Conference on Marine Geotechnical Engineering, Halifax, N.S., 7-11 June 1982.
References.
*ASTIS document number 159689.*
NFSMO

The maximum depth of iceberg scour is an important parameter to be evaluated in the design of any production scheme for the Hibernia oil field on the Grand Banks. Such an evaluation is complicated because of the multitude of variables such as the iceberg size, hydrodynamic effects, hydrostatic stability factors and the geotechnical properties of the seabed all of which influence the scouring phenomenon. Apart from the sediment properties like the shear strength, density and seabed slope, an additional geotechnical phenomenon of importance during the gouging of the seafloor is the mass disturbance of the soil below the scour. This factor is important in the design of burial depths for sea bottom installations. Two different techniques of analyses of a geotechnical model for iceberg furrows are given in this paper. The results are compared with laboratory data. Tests with instrumented model pipelines buried below simulated iceberg scours are described and their implication for actual field conditions discussed. (Au)

**282**

**Some geotechnical aspects of iceberg grounding** / Chari, T.R.
[St. John's, Nfld.] : Memorial University of Newfoundland, 1975.
xvi, 181 leaves : ill., figures, tables ; 28 cm.
Appendices.
Bibliography: p. 162-169.
Thesis (Ph.D.) – Memorial University of Newfoundland, 1975.
*ASTIS document number 148504.*
NFSMO

... An understanding of the interaction of an iceberg with the continental shelf surface sediment during the process of grounding is needed to establish safe design standards for bottom structures in offshore drilling operations. Knowledge of icebergs, their size, shape and drift, is still very limited and so is the engineering behaviour of the surface sediment of the oceans. In this thesis, the behaviour of an iceberg of idealized shape is analyzed while it grounds in a uniform slope of very weak and compressible sediment. An expression was derived for the theoretical size of the scour that could be caused and this was substantiated by laboratory

experiments. A tiltable towing tank was fabricated in which a 9 inch wide plexiglas model of the idealized iceberg was tested. Forces and pressures on the model were measured during the process of its scouring into an artificially sedimented slope. The frontal soil resistance was found to be the predominating force confirming the assumptions made. ... Scour sizes, computed and compared with reported side-scan observations off the Newfoundland coast showed that the predictions made by the analytical model are realistic. (Au)

**See also:** 198, 199, 475, 476, 667, 840.

## CHARLESWORTH, J.K.

**283**
**Drift ice** / Charlesworth, J.K.
(The Quaternary era, v. 1, 1957, p. 177-208, ill., maps)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180033.*

"The types, characteristics, and origin of drift ice are treated in detail. Two types are distinguished: land ice which is discharged into the sea and which comprises icebergs and river ice, and sea ice. The formation, structure, types, dimension, distribution, and weathering of icebergs are discussed, and the effect of sea ice on the discharge of icebergs and their movement is considered. Sea ice is classified into: primary growth types comprising ice crystals, slush, ice-rind, sludge-ice, pancake-ice, fast ice, young or bay ice, level ice, shore-ice, and (partly) ice foot; and secondary types formed by deformation of primary types, including ice field, ice flow, glacons, growlers, cakes, lumps or fragments, brash, honeycombed ice, hummocks, pack-ice, and paleocrystic ice. The processes of formation of each type are described. The formation of lake and river ice, their structural characteristics, and factors determining freeze-up and breakup are discussed, and special attention is given to anchor ice." (AB)

## CHEEMA, P.S.

**284**
**Analysis of the recorded data on the drift of icebergs** / Cheema, P.S.
St. John's, Nfld. : Memorial Univeristy of Newfoundland, 1976.
101 p. : ill., maps ; 28 cm.
Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1976.
Appendices.
Bibliography: p. 99-101.
*ASTIS document number 164003.*
NFSMO

... A kinematic model has been developed to analyse the drifts of icebergs. In this model, the berg velocity is expressed as a function of the resultant surface current velocity averaged over the draft of an iceberg. An analysis of the data on the sightings of icebergs in successive locations published by the International Ice Patrol for the period 1950 – 56 has been made. Suggested improvements in the reports of sightings of icebergs based on the analysis are: 1. First order approximation of the draft. 2. Precise locations of icebergs in degrees, minutes and seconds. 3. Timings of successive sightings of icebergs. 4. Estimation of errors in locating icebergs and positioning the observation vessels. 5. Detailed measurements of ocean currents. 6. Data for tidal currents. With these improvements in data collection and more rigorous analysis, a closer correlation between the computed and observed drifts of icebergs can be obtained. The knowledge gained can be useful in mitigating the severity of their hazards. (Au)

**285**
**Computer simulation of iceburg [sic] drift** / Cheema, P.S. Ahuja, H.N.
(Ninth Annual Offshore Technology Conference 1977, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1977, v. 3, p. 565-572, ill.)
(OTC paper, 2951)
References.
*ASTIS document number 163937.*
ACU, NFSMO

International Ice Patrol has been keeping records of sightings of icebergs off Newfoundland and Labrador coasts since the Titanic sank in 1913. The objective of the sightings was to warn the ships of the potential danger. In modern times ... icebergs ... pose a serious problem to offshore operations on Canadian Eastern Continental Shelf. ... A kinematic model of icebergs that also employs the Monte Carlo simulation technique has been developed to analyze the drifts of icebergs. In this model, the berg velocity is expressed as a function of the resultant surface current velocity averaged over the draft of an iceberg. An analysis of the data on the sightings of the iceberg in successive locations published by the International Ice Patrol for the period 1950 to 1956 has been made. A draft/depth ratio curve developed for this geographical region. Conclusions drawn for suggested improvements to the reports on sightings are similar to the changes already made by the International Ice Patrol in 1976. ... (Au)

**286**
**Drift of icebergs in the Grand Banks** / Cheema, P.S. Ahuja, H.N.
(Ocean engineering, v. 5, no. 2, 1978, p. 95-103, ill.)
Reviewed by document number 122817, Comment on "Drift of icebergs in the Grand Banks" / D.G. Mountain, R.M. Hayes, and R.W. Scobie in Ocean engineering, v. 6, 1979, p. 549-550.
References.
*ASTIS document number 162809.*
NFSMO, ACU

Canada's eastern continental shelf has been the focal point of an extensive search for hydrocarbons in recent years. International petroleum companies have spent millions of dollars in explorations during this time. Off the Newfoundland and Labrador coasts, 42 wildcat wells have been drilled. One of the major hostile elements to the oil drilling rig operators in this region is the threat of drifting icebergs. (Au)

**See also:** 852, 853.

## CHENEY, L.A.

**287**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1949** / Cheney, L.A. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1951.
vii, 116 p., [3] folded leaves of plates : ill., maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 35)
Mostly tables.
*ASTIS document number 181188.*
ACU, NFSMO

... The ice conditions were such in 1949 that ... a patrol was not necessary and weather conditions were such that the service of ice observation could be carried out by aircraft alone. An Ice Patrol Office with a staff of ice observers and communication personnel was maintained at the U.S. Naval Operating Base, Argentia, Newfoundland. ... Using both visual and radar search methods ...

aircraft carried out searches of the ice-infested areas. At times it was impossible to observe the Grand Banks area due to heavy fog. During these periods merchant vessels traversing the area supplied the ice patrol with invaluable information by reporting radar targets which were possible bergs. ... The season of 1949 was marked by a scarcity of icebergs. ... Actually, only 47 bergs came south of 48 N. for the entire season. ... Bergs which did arrive in the vicinity of latitude 48 N., were small and eroded, and on an average did not last much over 4 days after arriving in this latitude off the eastern slope of the Grand Banks. Several times in March and April, groups of five or more bergs threatened to drift into this region only to disappear within 5 days of their sighting. Elsewhere in this Bulletin there is a discussion of weather and its possible effect upon the movement and attrition of icebergs during and immediately preceding the 1949 season. (Au)

**288**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1950** / Cheney, L.A. Soule, F.M.

Washington, D.C. : U.S. Coast Guard, 1951.

vii, 127 p., [19] folded leaves of plates : ill., charts, maps ; 24 cm.

(Bulletin – United States. Coast Guard, no. 36)

*ASTIS document number 181013.*

ACU, NFSMO

... The distribution of bergs was normal for this year with one exception. In March, bergs were reported just to the west of Flemish Cap and one was reported east of 45 W., in that vicinity. Bergs continued to move into this area and at the end of April at least 16 had been reported east of 45 W., in the Flemish Cap area. May had 14 bergs reported east of 45 W., and the most easterly berg of the season was reported 19 May in 47 20 N, 39 17 W. By mid-June it was evident that the ice threat in the Grand Banks area for the season of 1950 had virtually disappeared and the activities of the ice patrol were terminated for the season of 1950 on 26 June. The total number of bergs estimated south of the 48th parallel for 1950 was 460 as compared with a 50-year average of 433. (Au)

**See also:** 261.

## CHENEY, R.E.

**See:** 252, 253.

## CHEUNG, H.

**See:** 355.

## CHEVALIER, B.

**See:** 1096.

## CHIKOVSKII, S.S.

**289**

**The thermal influence of land ice upon the supercooling of sea water** / Chikovskii, S.S.

(Problems of the Arctic and the Antarctic, v. 33-35, 1973, p. 59-69, ill.)

(Problemy Arktiki i Antarktiki, v. 33-35, 1970, p. 59-69, ill.)

Translation.

References.

*ASTIS document number 171832.*

ACU, NFSMO

Based on data from ice observations in antarctic waters, equations for the heat conductivity of icebergs and shelf ice were solved. The thermal conditions of sea water are due to a cooling effect of sea ice and its low winter air temperature. As an iceberg calves, its outside temperature acquires that of the surrounding water. The rate of cold outflow varies according to the iceberg thickness, and to the initial temperature. The cold outflow in shelf ice occurs only through two sides. Therefore, this process is 4 times slower than in icebergs, where cold flows out from four sides. (ASTIS)

## CHIRIVELLA, J.E.

**290**

**Hydrodynamics of icebergs in transit** / Chirivella, J.E. Miller, C.G.

(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 315-333, ill.)

References.

*ASTIS document number 161918.*

ACU, NFSMO

The physical phenomena responsible for the different forces acting on an iceberg in transit are reviewed. A rationalization on the most convenient frames of reference to evaluate hydrodynamic and Coriolis forces is established and two geostrophic invariants are identified. The near flowfield that characterizes iceberg drag and lift is discussed, and the concept of geostrophic lift is introduced. Throughout the discussion, special emphasis is given to the mathematical methods of attack on the topics enumerated above. (Au)

## CHRISTIAN, D.

**291**

**Observations from an iceberg in Freshwater Bay, St. John's** / Christian, D. Diemand, D. Lever, J.H. Parsons, B. Snellen, J.B. Stander, E. Woodworth-Lynas, C.M.T.

St. John's, Nfld. : Memorial University of Newfoundland, Centre for Cold Ocean Resources Engineering, 1984.

13 p. : figures ; 28 cm.

(C-CORE publication, no. 84- 6)

(Data report – Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)

ISBN 0-88901-108-7.

References.

*ASTIS document number 138665.*

ACU, NFSMO

A medium sized tabular iceberg was aground outside St. John's harbour for about two weeks in April, 1983. This berg and two others were located in extensive pack ice in Freshwater Bay. On April 15th eight researchers from C-CORE were landed on the berg by helicopter and carried out the several experiments described below. The winds were very light and an ocean swell was virtually subdued by pack ice producing ideal experimental conditions during our visit to this berg on our doorstep. In all, six experiments and observations were carried out during the two hour visit. These included measurements of: (i) the internal temperature of the berg, (ii) induced acoustic emissions and (iii) keel profile using impulse radar; the sampling of: (i) sediment-rich berg ice and (ii) of crack ice; and observations of bergy bit motion. (Au)

## CLAASSEN, J.P.

**See:** 1053.

## CLAFF, C.L.

**See:** 929.

## CLARK, P.

**See:** 429.

## CLARKE, G.K.C.

**See:** 890.

## CLIFFORD, W.F.

**292**
**Experimental determination of melting rates of ice moving in seawater** / Clifford, W.F. Erman, R.J.
Springfield, Va. : National Technical Information Service, 1979.
3 microfiches : ill., photos. ; 10.5x15cm.
(NTIS AD-A-070 367)
Thesis (M.Sc) – Naval Postgraduate School, Monterey, California, 1979. – 219p.
Appendices.
Bibliography.
*ASTIS document number 50970.*
ACU, NFSMO

Large, fresh-water ice blocks (0.5m x 1.25m x 5m) were towed in Monterey Bay at speeds in range from 0.7 to 1.2 knots. Experimental objectives included measuring regression rates of ice surfaces, wake temperature, turbulent thermal boundary layer, ice interior temperature profile, and observation of shape changes over the melting period. ... Measured regression rates at several points on the ice blocks were compared to theoretical predictions using a turbulent flow ice ablation model .... Temperature profiles in the ice interior and ice-water boundary layer were used in a one-dimensional energy balance across the melting interface. Ice ripples, observed on all ice block tests, are important for both heat transfer and drag considerations. Wavelengths of the ripples were measured .... (Au)

**293**
**Measurement of thermal conduction within a large fresh water ice block being towed in sea water** / Clifford, W.F. Erman, R.J. Fuhs, A.E. Stolfi, R.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 265-272, ill.)
References.
*ASTIS document number 164135.*
ACU, NFSMO

Large blocks (2500 kg) of fresh water ice were towed in sea water at speeds of approximately one knot. Thermocouples were frozen into the ice. The temperature profile was measured within the blasting ice block as a function of time and distance from the ice/water interface. A temperature gradient in the ice of 14.5 degrees C/cm was found at the ice/water interface. A theory was developed which calculates the temperature within the ice in good agreement with measured values .... A significant contribution of this paper is a set of thermal boundary layer profiles. The measurements are extremely valuable to theoreticians who want to model the problem of melting ice. (Au)

**See also:** 430, 986.

## CLINTON, J.D.

**294**
**How icebergs affect exploration and development activities offshore** / Clinton, J.D.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 19-21)
*ASTIS document number 160199.*
NFSMO, ACU

The paper discusses the iceberg threat on the east coast, iceberg trajectories, and the probabilities of collision by icebergs with mobile drilling units. (NFSMO)

## CLOUTER, M.J.

**See:** 433.

## COACHMAN, L.K.

**See:** 796, 927, 930.

## COCHKANOFF, O.

**295**
**Contribution on the inclusion of certain terms in the equations used in the simulation for the prediction of ice movement** / Cochkanoff, O.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 153-155)
*ASTIS document number 162760.*
NFSMO, ACU

... The problems ... [in] the construction of an effective mathematical model for the simulation of the movements of an iceberg in ocean currents [are discussed.] ... (Au)

**296**
**Simulation techniques in the prediction of iceberg motion** / Cochkanoff, O. Graham, J.W. Warner, J.L.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 135-152)
*ASTIS document number 162752.*
NFSMO, ACU

The paper describes a mathematical model to simulate iceberg motion. Analog computer techniques were applied to the theoretical data and motion curves derived. (NFSMO)

## COLBECK, S.C.

**297**

**Snow and ice** / Colbeck, S.C. Thorndike, A.S. Whillans, I.M. Hodge, S.M. Ackley, S.F. Ashton, G.D.

(Reviews of geophysics and space physics, v. 13, no. 3, July 1975, p. 435-441)

References: p. 475-487.

*ASTIS document number 170143.*

ACU

... This report is divided into seven sectioned covering snow, sea ice, ice sheets, glaciers, ice physics, river and lake ice, and applied glaciology. It describes the most important work done in the United States since the last quadrennial report. The bibliography included in each section lists all work published since the last quadrennial report. (Au)

## COLLINS, W.T.

**298**

**Iceberg scouring and sediment dynamics on the Labrador Shelf** / Collins, W.T. Barrie, J.V. Woodworth-Lynas, C.M.T.

(Program with abstracts – Geological Association of Canada (1980), v. 9, 1984, p. 54)

Abstract only of paper presented at the Joint Annual Meeting of the GAC and MAC.

*ASTIS document number 149543.*

NFSMO, ACU

The use of manned submersibles allows for an opportunity to view directly seabed features which have only been detected by acoustic mapping. Since 1980 two submersible investigations have been carried out in areas over the Labrador Continental Shelf. A video tape of preliminary results is presented together with a review of past work. Emphasis is placed on the phenomenon of iceberg scouring and the effect of local hydrodynamic activity on the surficial sediments. (Au)

**299**

**Icebergs and sediment transport as hazards related to the production of oil and gas off the east coast of Canada** / Collins, W.T.

(Newfoundland journal of geological education, v. 7, no. 3, Dec. 1983, p. 19-26, figures)

(C-CORE publication, no. 83- D)

References.

*ASTIS document number 141690.*

ACU, NFSMO

Commercial recovery of oil and gas from the sediments off the east coast of Canada is drawing near .... Before this can happen, however, specific problems related to the emplacement of any fixed structure on or just below the seabed must be dealt with. Icebergs, evident along most of the Labrador and Newfoundland coastline today, present a serious hazard to shipping. When the forces moving these bergs drive them into shallower water, such as the Grand Banks, their keels may come into contact with the seabed and engineering systems therein. An ancillary problem facing producers of offshore hydrocarbons is the stability of the surficial sediment. What is the likelihood of the top few metres of sediment being eroded and transported under the influence of near-bottom currents, waves and unstable slopes? (Au)

**300**

**Norploy '82 cruise report August, 1982** / Collins, W.T. Diemand, D.

St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, Memorial University, 1983.

vi, 31 p. : figures, tables ; 28 cm.

(C-CORE publication, no. 83- 4)

(Cruise report – Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)

ISBN 0-88901-094-3.

Appendices.

References.

*ASTIS document number 115479.*

ACU, NFSMO

Sediment stability under the influence of both iceberg interaction and wave and current hydrodynamics is a topic of considerable interest to offshore operators. It must be taken into consideration in the design and emplacement of engineering systems in the waters off Eastern Canada. The purpose of the Norploy '82 cruise was to make direct observations, from the Canadian Armed Forces manned submersible SDL-1, of seafloor features, paying particular attention to iceberg scours and sediment stability. Sidescan sonar survey lines and bottom samples were taken to determine and investigate dive sites. The internal temperatures of icebergs are also of considerable interest as they relate to both the age of the bergs and to their mechanical properties. ... it was hoped that Norploy '82 would provide us with an opportunity to obtain this information as well as data on the size distribution of the bergs. (Au)

**301**

**Preliminary submersible observations of an iceberg pockmark on the Grand Banks of Newfoundland** / Collins, W.T. Barrie, J.V.

(Iceberg research, 1985, no. 10, Apr., p. 24-27, ill., maps)

(C-CORE publication, no. 85- 12)

References.

*ASTIS document number 171409.*

ACU, NFSMO

In October of 1984 the Centre for Cold Ocean Resources Engineering ... in cooperation with the Canadian Forces and the Geological Survey of Canada, carried out manned submersible operations on the Grand Banks of Newfoundland .... There were two primary objectives of this cruise. The first was to document the rates of sediment transport on the Banks; the second was to look in detail at seabed features, specifically circular depressions or pits, which could prove hazardous to the development of hydrocarbon production facilities in this area. The latter will be the focus of this paper. ... The feature is located within an area of thin surficial sand with pebble armour (Barrie et al, 1984) overlying hard clays likely to be late Tertiary to early Pleistocene in age. ... A series of events are postulated to explain the formation of this feature. Morphologically its overall 'amphitheater' shape with steep back (south) and side walls surrounded by a berm and a less-steep sloped northern wall suggests that the depression was formed by a grounding iceberg. ... Cone-shaped depressions that occur in unconsolidated fine sediments at the seabed have been defined as "pockmarks" (Josenhans et al, 1979). King and McLean (1970) first described pockmarks on the Scotian Shelf as originating probably from the erosion of clay at the seabed initiated by the ascension of gas or water. Other mechanisms for the formation of pockmarks have been proposed. These include selective melting of buried permafrost and surface wave activity (McQuillin et al, 1979). Each of the mechanisms can result in subsequent soil failure which, depending on the surficial geology, may produce a pockmark. In this case the combination of a grounded iceberg and high surface wave activity could have led to soil failure. This feature could then tentatively be classified as an "iceberg pockmark". (Au)

**See also:** 166.

## COMFORT, G.

**302**
**Review of ice scour models** / Comfort, G. Graham, B.
[S.l. : s.n., 1985].
[6] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163481.*

... [This paper reviews] the results of a recently completed ESRF [Environmental Studies Revolving Funds] study in which ... [the authors] evaluated several deterministic ice scour models. The scope of this project included: (1) a review of all the available models, (2) the compilation of available ground truth data and (3) a calibration type study in which ... [the models were exercised] by the introduction of ground truth data. ... (Au)

## CONSOLIDEX MAGNORTH OAKWOOD JOINT VENTURE

**See:** 256.

## CORGNET, J.-L.

**See:** 362, 627.

## CORKUM, D.A.

**303**
**Performance of formula for predicting the iceberg count off Newfoundland** / Corkum, D.A.
(Journal of applied meteorology, v. 10, no. 3, June 1971, p. 605-607)
References.
*ASTIS document number 161322.*
ACU, NFSMO

The need for closer agreement between the computed and observed deviations in the total berg count as well as for more detailed projections of the iceberg distribution ... demands a closer evaluation of winter temperatures ... and of the winds which affect the transport of the bergs southward, as well as a study of the Labrador Current ... A separate analysis of both the winds and Current should also help to distinguish between the different types of expected bergs. ... Finally, the available supply of bergs to the north that have not begun their southeastward drift or, indeed, the number calved from the Greenland glaciers should also be considered. ... (Au)

**See also:** 922.

## CORRIHER, H.A.

**See:** 451.

## CORWIN, N.

**304**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1963** / Corwin, N. Driggers, V.W. Franceschetti, A.P. Lenczyk, R.E. McGill, D.A. O'Hagan, R.M.
Washington, D.C. : U.S. Coast Guard, 1964.
vii, 356 p., [30] folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 49)
Mostly tables.
Appendix.
References.
*ASTIS document number 181331.*
ACU, NFSMO

.. This bulletin is divided into two parts. The first is a report of the ice patrol operations from 7 March to 21 June 1963. Aircraft and communication activities are described and special sections deal with observed monthly ice conditions and statistics on ice and weather reports from shipping for 1963. There is also a special section on preseason northern iceberg surveys. The second part comprises a presentation of the oceanographic data collected during the 1963 ice season in the Grand Banks region and the Labrador Sea. Included are charts of dynamic topography of the sea surface (ocean current maps), tables of oceanographic data, and a brief discussion of the results of each survey. ... With the publication of the report for the 1964 season, this bulletin will be revised in format. ... The report of the operational phase of the International Ice Patrol Service, including the narrative report of activities and ice conditions and descriptions of research into the operational problems, will continue to be published in this series. The sections describing the physical oceanography of the Grand Banks region and the Labrador Sea and oceanographic research will be published separately in a recently established series: U.S. Coast Guard Oceanographic Reports, CG-373. ... In 1963, for the 44th year since 1913, the International Ice Patrol was conducted on the North Atlantic Ocean in the vicinity of the Grand Banks of Newfoundland by U.S. Coast Guard operating forces. Full services of the International Ice Patrol were provided from 6 March to 21 June. Ice observation was conducted by aircraft from 13 January through 23 July. An estimated 25 bergs drifted south of 48 N. during the year as compared to the annual average of 392 bergs since 1900, labeling 1963 as a very light iceberg year. ... (Au)

**See also:** 238, 604.

## COULBOURN, W.C.

**305**
**Some applications of photography, thermal imagery and X band side looking radar to the coastal zone** / Coulbourn, W.C.
(Tools for Coastal Zone Management, Feb. 14-15, 1972, Washington, D.C. – Bethpage, N.Y. : Grumman Ecosystems Corp., [1972], p. 59-65)
*ASTIS document number 176591.*
NFSM

... I will report on work done by various engineers at Grumman and Associates. Specifically, I will describe an outfall detection program conducted for the U.S. Army Corps of Engineers, New York District; an experimental flight program over the Patuxent River, Maryland, for the state of Maryland; side looking radar applied to iceberg detection, and also recording current or roughness patterns on the water surface; and a development at Grumman called a Digital Photometric Mapper. (Au)

## COURAGE, D.

See: 413.

## COX, G.F.N.

306
**Interdisciplinary Panel statements. Engineering interactions** / Cox, G.F.N.
(Cold regions science and technology, v. 2, Apr. 1980, p. 342-354)
*ASTIS document number 177628.*
ACU, NFSMO

Icebergs and multiyear ice are the major impediments to engineering efforts and transportation in most of the SSIZ [seasonal sea ice zone]. The problem is particularly acute in Baffin Bay, Davis Strait, Labrador Sea area, and the drilling areas of the Beaufort Sea, together with shipping lanes to those areas. ... In the case of ship movements, collision with multiyear ice or icebergs is generally catastrophic and there is a definite need to be able to detect low saline ice about 1 km ahead of the vessel in times of low visibility. Ship-mounted acoustic or radar techniques may be a promising method to accomplish this. However, much more information is required on the characteristics of icebergs and multiyear ice to allow an engineering solution to their breaking, diversion or destruction. ... A knowledge of and the ability to forecast and hindcast the movement and deformation of pack ice, fast ice, and icebergs are essential for the safe transportation or operation of drill ships and other structures in the SSIZ. Hindcasting may give a historical perspective of ice movement. The ultimate aim must be to develop accurate mathematical models and overall operational forecasting systems that can assimilate observations and produce model predictions in a timely manner for operators. ... Icebergs are a special problem in Baffin Bay, Labrador Sea, Greenland Sea and Southern Oceans, as are ice islands in the Beaufort Sea. These can be separated into open-water and ice-enclosed conditions. Predictions must be made for motions over distance on the order of tens of kilometers, and precision becomes more important as distance shortens. Iceberg properties needed to accomplish these predictions are: draft, shapes and drag coefficients. Winds and currents throughout the column, from sail through to keel, are the driving forces. (Au)

## CROCKER, R.W.

See: 208, 991.

## CROCKER, W.

See: 792.

## CURRIE, B.W.

307
**Evaluation of the effect of ground-based radar parameters on the echoes from landfast sea ice** / Currie, B.W. Haykin, S. Lewis, E.O.
(Proceedings of the Ninth Canadian Symposium on Remote Sensing, August 14-17, 1984, St. John's, Newfoundland / Edited by S.M. Till and D. Bajzak. – Ottawa : Canadian Aeronautics and Space Institute, 1984, p. 67-74, ill., map)
*ASTIS document number 176770.*
NFSMO

The Communications Research Laboratory of McMaster University and the Department of Fisheries and Oceans are engaged in a research program to improve the usefulness of surface-based radar for the surveillance of sea ice. This paper presents results of Arctic experiments conducted support of this research. A variety of radars were operated in an area of landfast sea ice, and their video recorded and analyzed. The effects of the radar parameters of resolution, frequency, and polarization are discussed, together with sample radar images. Some values of normalized radar cross-section are given for iceberg, multi-year, and first-year ice present in the landfast ice zone. Calculation of the like to cross-polarized cross-section ratio shows that cross-polarization significantly increases the differentiation between multi-year or iceberg ice and first-year sea ice. The paper concludes with a brief description of the coherent X-band ice imaging radar being constructed by McMaster. (Au)

**See also:** 504, 650, 722, 896.

## CURRIE, N.C.

308
**Microwave/millimeter wave measurements of sea ice** / Currie, N.C. Callahan, J.T. Lott, R.C.
(Proceedings of the 1984 IEEE National Radar Conference. – New York : IEEE, 1984, p. 32-36, ill.)
References.
*ASTIS document number 177660.*

An experiment was performed at S- through Ku- bands to measure the reflectivity properties of sea ice at low angles. First year and multiyear ice as well as icebergs were measured to determine the frequency and polarization dependent properties of the backscatter. The depression angles available varied from 6 degrees to 0.2 degrees. The preliminary results indicate that X and Ku- bands have possibilities for discriminating between first year and multiyear ice, and comparison of parallel and cross polarized returns also appears promising as a discrimination techniques. ... The primary purpose of the experiment was to determine unique signatures of multiyear ice and icebergs which will allow descrimination of these ice types from first year ice at low depression angles from a shipboard platform. ... The experiment was conducted at a remote radar site located on the Borden Pennisula of Baffin Island, Northwest Territory, Canada. Data were collected for VV, HH, and HV polarizations for specific ice features such as exposed icebergs, multiyear ice, smooth first year ice, and rough first year ice. Data were collected in digital form and consisted of range profiles of ice features of interest in which the range gate was positioned under computer control. ... Extensive ground truth data were collected on the sea ice in conjunction with the radar data including photographic documentation and core samples. These data will be correlated with the measured radar reflectivities as a part of the data analysis. ... The field of view for the measurement included Adams Island, a large iceberg, and several small icebergs as well as a number of areas of suspected multi-year ice. ... (Au)

## CURTIS, D.D.

309
**Numerical analysis of impact of small icebergs on semisubmersibles** / Curtis, D.D. Cammaert, A.B. Wong, T.T. Bobby, W.
(Proceedings : Third International Specialty Conference Cold Regions Engineering "Northern resource development", April 4, 5 and 6, 1984, Edmonton, Alberta / Edited by D.W. Smith. – Montreal : Canadian Society for Civil Engineering, 1984, v. 1, p. 415-430, ill.)
References.
*ASTIS document number 176931.*
NFSMO

Icebergs pose a major threat to offshore oil production in the Hibernia field. Bergy bits (visualized as the size of a small cottage)

may drift or be propelled by waves into an exploratory drilling vessel. Bergy bits are especially troublesome because they may not be detected during storm conditions yet they could inflict considerable damage to a semisubmersible. The iceberg/semisubmersible collision model considers three global and two local degrees-of-freedom for both objects. A force-penetration curve is specified for the iceberg and semisubmersible at the collision point, thus the equations of motion may be solved throughout time with the collision force computed by the program. The local force-penetration relations for the iceberg are determined using the principle of conservation of energy assuming a crushing failure mode. The local force-penetration curves for the semisubmersible depend on the impact point. Impact-susceptible members include columns, bracings and pontoons. The interaction model was used in a parametric analysis which considered variations in iceberg mass, force-penetration curve (impact point) and iceberg velocity. The parametric analysis revealed that the semisubmersible receives considerable damage before anchor pullout occurs. (Au)

**See also:** 248.

## D'APOLLONIA, S.J.

**310**

**Iceberg scour data maps for the Grand Banks of Newfoundland between 46 degrees N and 48 degrees N /** d'Apollonia, S.J. Lewis, C.F.M.

Dartmouth, N.S. : Atlantic Geoscience Centre, G.S.C., Bedford Institute of Oceanography, 1981.

12 p. : ill., maps ; 28 cm.

(Open file – Geological Survey of Canada, no. 819)

References.

Scale: 1:25,000.

*ASTIS document number 150665.*

NFSMO

... [A] computerized data base has been developed under contract at the Atlantic Geoscience Centre, Geological Survey of Canada, to facilitate the organization and analysis of measured iceberg scour parameters. Because of the high level of interest in the ice scouring problem regarding planning and development of the Hibernia oil discovery on the northeast Grand Bank of Newfoundland, these measurements are being released now in advance. The maps in this open file show posted values from the ice scour data base for the northern Grand Banks region between 46 degrees N and 48 degrees N, and 46 degrees W to 54 degrees W at a scale of 1:250,000. Four maps of the northeast Grand Banks ... between 46 degrees N and 48 degrees N and 46 degrees W and 50 degrees W are compiled showing values of maximum scour depth, maximum scour width, per cent seabed disturbance and scour occurrences Km-2 respectively. The same parameters are shown in a similar set of four maps for the northwest Grand Banks ... between 46 degrees N and 48 degrees N and 50 degrees W and 54 degrees W. It is expected that future editions of these maps will incorporate additional data currently under analysis. (Au)

**311**

**A numerical model for calculating long term frequency and spatial distribution of iceberg grounding events /** d'Apollonia, S.J. Lewis, C.F.M.

[S.l. : s.n., 1985].

[17] leaves : ill. ; 28 cm.

Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.

Indexed from a preliminary draft, July 1985.

Proceedings to be published as an ESRF Report in late 1985.

References.

*ASTIS document number 163430.*

This model simulates mean long term iceberg grounding events in terms of given iceberg flux, iceberg keel draft and bathymetry. ... The range of water depth plus an allowance for scouring depth and iceberg draft changes due to tilt and roll is applied to the given frequency distribution of iceberg drafts to determine the proportion of bergs that interact with the seabed as grounding events in each cell. Options in the model simulate decline of berg population and decrease in berg draft due to iceberg loss and ablation processes. ... This model was applied to the northeastern Grand Banks of Newfoundland between 46 degrees and 48 degrees N and 47 degrees and 50 degrees W, an area which encompasses the main route of iceberg drift in the Labrador Current around Grand Banks. Good agreement was found between patterns of the predicted spatial distribution of groundings and the density of ice scour occurrences mapped from acoustic survey data. ... (Au)

## DALEY, C.G.

**312**

**Hazardous ice atlas of arctic Canada /** Daley, C.G. Edworthy, J.T. Canadian Coast Guard [Sponsor].

[Ottawa : Canadian Coast Guard], 1983.

19 leaves : maps ; 28 cm.

*ASTIS document number 181897.*

NFSMO

An atlas of hazardous ice conditions for shipping in the Canadian Arctic has been prepared for Transport Canada, Canadian Coast Guard (Northern). The conditions presented represent monthly estimates of typical conditions for pressure ridges, multi-year ice and glacial ice throughout the Arctic. The estimates are based substantially on observed data where available, and on concensus projections to 'fill the gap'. ... Three forms of ice represented in this Atlas are hazardous due to the fact that they can potentially induce very high forces and pressures on ships. These three forms are pressure ridges, multi-year ice and glacial ice (icebergs and associated bergy bits and growlers). As well 'special features' such as ice islands and icebergs outside the main iceberg zones are listed. ... (Au)

## DANISH HYDRAULIC INSTITUTE

**313**

**Environmental conditions offshore west Greenland. Vol. IV : Icebergs /** Danish Hydraulic Institute.

Horsholm, Denmark : Danish Hydraulic Institute, 1979.

1 v. (various pagings) : ill. ; 28 cm.

Appendices.

*ASTIS document number 164186.*

NFSMO

Before the beginning of offshore petroleum exploration in the Davis Strait off West Greenland in 1975 ... only very scarse information existed concerning iceberg conditions in the area of interest. ...Environmental studies were performed during the years 1975-78, in general covering the season from May/June through October/November. A great deal of these studies were concentrated on iceberg conditions. During the years 1976-78 all weather ships and drill rigs working offshore West Greenland were performing a Standard Iceberg Measuring (SMI) Programme, comprising iceberg count every 3 hours, iceberg tracking and observations of icerg dimensions (height, length, width, draft, mass and type). Special iceberg tracking programmes studying large scale drift and local movements were also initiated. The large drift was studied in 1976, 1977 and 1978 using satellite positioned buoys and the small scale drift was studied in 1977 using a local Motorola positioning system. This report presents the results of the analysis of above mentioned iceberg studies. (Au)

## DANSGAARD, W.

314
**The isotopic composition of natural waters with special reference to the Greenland ice cap** / Dansgaard, W.
Kobenhavn : [Nyt Nordisk Forlag Arnold Busck], 1961.
120 p. : ill., maps.
(Meddelelser om Gronland, bd.165, nr. 2, 1961, ill., map)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180246.*
ACU

Reports measurements of O-18 and deuterium in samples of ocean water, fresh water, atmospheric water vapor, and precipitation from tropical to polar climates. Correlations were found between air temperature and the O-18 content of fresh waters and of precipitation; the isotopic latitude-effect in precipitation is shown along the West Greenland coast and at high altitudes on the icecap. Measurments of the isotopes in glacier ice were made during the Arctic Institute Greenland Expedition in 1958. Seasonal variations, with air temperature, in O-18 and deuterium are shown to be preserved for several hundred years in an iceberg and a temperate glacier. Formation sites on the icecap were determined for each of 11 icebergs by correlating its O-18 measurement with the mean annual air temperature distribution. Distances and velocities of travel by these icebergs from formation sites to outlet glaciers are calculated; a faster turnover is indicated for the icecap than was hitherto considered. Correlation is shown between the ages of the icebergs and their O-18 contents. (AB)

315
**Isotopic distribution in a Greenland iceberg** / Dansgaard, W. Nief, G. Roth, E.
(Nature, v.185, no.4708, Jan. 23, 1960, p. 232, ill.)
*ASTIS document number 170658.*
ACU

... The samples investigated were collected during the North American Arctic Institute Greenland Expedition 1958 headed by Dr. P.F. Scholander. The deuterium analyses were made at Centre d'Etudes Nucleaires de Saclay ... while the oxygen-18 measurements were carried out at the University of Copenhagen .... The samples were all taken from one piece of ice emitted from the Ingnerit glacier in West Greenland (70 9 N.) This piece was part of a larger amount of ice the average age of which has been determined by Scholander and co-workers by means of the carbon-14 method .... The piece of ice in question was white with mostly round bubbles. Three parallel layers of clear ice were situated 33 and 25 cm. from each other. The samples were taken along a line perpendicular to these layers. ... (Au)

316
**The origins and velocities of icebergs determined by O-18 and C-14 analysis** / Dansgaard, W.
(Physical geography, 1961, p. 40-47, ill.)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180262.*

Describes sampling technique and measurements of the O-18 content of icebergs; then demonstrates a close correlation between the annual means of the air temperature and of the O-18 content of the precipitation. The part of the Greenland Inland Ice producing the iceberg can be determined from the O-18 measurements, and rate of movement of the ice by C-14 datings of Nutt and Scholander, q.v. Weighted mean velocity is 154 ± 15 m/yr., for eight ice samples. (AB)

**See also:** 930.

## DARCHEN, J.

317
**Les icebergs de l'Atlantique Nord [The icebergs of the North Atlantic]** / Darchen, J.
(La meteorologie, v. 6, no. 8, 1977, p. 145-170, ill., maps)
References.
Text in French.
*ASTIS document number 163031.*
NFSMO

The paper reviews the source, movement and deterioration of icebergs in the North Atlantic. Methods of surveillance of icebergs are also reviewed. (NFSMO)

318
**Les icebergs de l'Atlantique nord [The icebergs of the North Atlantic]** / Darchen, J.
(Bulletin – France. Secretariat general a l'aviation civile et documentation, no. 34, 1964, p. 23-41, ill., maps)
References.
Text in French.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180440.*

Describes the origin of the icebergs on the coasts of Greenland and Baffin Island and their transport by the East Greenland, West Greenland and Labrador Currents. Types of icebergs are illus, and the mean annual number observed 1900-1962 is graphed. Studies of icebergs are considered briefly and methods of their destruction evaluated. Sources of information concerning icebergs are reviewed. (AB)

## DARWIN, C.R.

319
**On the power of icebergs to make rectilinear, uniformly-directed grooves across a submarine undulatory surface** / Darwin, C.R.
(The collected papers of Charles Darwin / Edited by P.H. Barrett. – Chicago [Ill.] : University of Chicago Press, 1977, v. 1, p. 252-255)
Originally printed in: London, Edinburgh, and Dublin philosophical magazine and journal of science, v. 10, 1855, p. 96-98.
References.
*ASTIS document number 149640.*
ACU, NFSM

Having been induced to believe, with many geologists, that certain continuously scored and polished surfaces of rock were due to icebergs, and not to glaciers, I have nevertheless always felt much difficulty in understanding how long, rectilinear scratches, running in one given direction across an undulatory surface, could have been thus formed. Others have felt this same difficulty, and it has been advanced as an insuperable difficulty by the opponents of iceberg action. The following considerations, though possessing little or no novelty, have in my own case removed the difficulty. ... may we not feel almost certain, that, moulding itself like a glacier (of which it originally was a portion), but owing to its water-logged state and little downward pressure moulding itself more perfectly than a glacier, it would slide straight onwards over considerable inequalities, scratching and grooving the undulatory surface in long, straight lines? In short, if in our mind's eye we look at an iceberg, not as a rigid body (as has hitherto been always my case) which would be deflected or broken up when driven against any submarine obstacle, but as a huge semi-viscid, or at least flexible mass floating on the water, I believe much of the difficulty will be removed which some have experienced in understanding how rectilinear grooves could be formed continuously running, as if regardless of the outline of the surface, up and down moderately steep

inequalities, now existing as hills on the land. ... (Au)

## DAVIDS, R.C.

320
**Drilling among the icebergs** / Davids, R.C.
(The lamp (New York), v. 62, no. 1, Spring 1980, p. 2-7, ill., map)
*ASTIS document number 171930.*
ACU

At work in the Davis Strait, floating SEDCO 709 ... is a self-propelled, computerized drilling rig designed for deepwater exploration. Common hazards in the area are icebergs which follow currents south, frequently [imperilling] ... drilling rigs, ... [which] must be diverted by workboats. ... I was invited to visit this rugged frontier where Esso Resources Canada Limited, a wholly owned Imperial subsidiary, was drilling an exploratory well. ... (Au)

## DAVIDSON, L.W.

321
**The long range prediction of iceberg season severity using empirical orthogonal functions** / Davidson, L.W.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 4)
Abstract only.
*ASTIS document number 182095.*
ACU

Can long time series (>30 years) of monthly gridded fields of MSLP, 700 mb height, 700-1000 mb thickness and/or surface air temperature be successfully employed to predict the annual flux of icebergs across latitude 48 degrees N? The method of empirical orthogonal function (EOF) analysis has been employed to characterize the dominant modes in anomalies of the atmospheric fields. Linear and multiple regressions have been performed between selected EOF coefficients and the annual iceberg flux to isolate apparent correlations at time lags of one to 12 months and for averaging intervals of one to 24 months. Iceberg flux forecast models developed on the basis of these correlations are described. The results of hindcast-mode applications for the years 1953 to 1982 and of a forecast-mode application for 1985 are presented and interpreted. Forecast quality is quantitatively assessed and is compared to the work of other investigators who employ "brute force" statistical methods. (Au)

322
**Sea ice and iceberg conditions on the Grand Banks affecting hydrocarbon production and transportation** / Davidson, L.W. Denner, W.W.
(Oceans '82, conference record. – New York : Marine Technology Society & Institute of Electrical and Electronics Engineers, 1982, p.1236-1241, figures, tables)
References.
*ASTIS document number 131881.*
NFSMO

Possible hydrocarbon production on the Grand Banks of Newfoundland, associated with the Hibernia discovery, has intensified interest in sea ice and iceberg conditions in this region. It is the seasonal presence of sea ice and icebergs which distinguishes the Grand Banks from other harsh environment hydrocarbon production regions. In this paper, the seasonal patterns of sea ice and icebergs around eastern Newfoundland and on the Grand Banks are described. Sea ice is discussed in terms of areal, age, floe size and thickness distributions, and of deformation processes. Icebergs are described in the context of seasonal distributions, size and deterioration. Features of the sea ice and iceberg regimes which affect hydrocarbon production and transportation are identified. The application of ice forecasting, ice detection and ice management techniques to hydrocarbon related operations on the Grand Banks is then outlined. (Au)

## DAVIES, J.F.

323
**Exploratory drilling : operations capability from Labrador to Lancaster Sound** / Davies, J.F. Kljucec, N.M. Petro-Canada.
(Journal of Canadian petroleum technology, v. 20, no. 4, Oct./Dec. 1981, p. 111-115, figures)
*ASTIS document number 82147.*
ACU, NFSMO

Exploratory drilling along the Labrador Shelf dates back to 1971, when Leif L-38 was drilled and abandoned. Since that time, many problems have been encountered, many lessons have been learned and significant technological advances have made it possible to operate seasonally in a safe, efficient and even routine manner. The current operating methods require the most sophisticated drilling equipment in order to work safely in the unique environment of the area. It is north of Davis Strait, in Baffin Bay and Lancaster Sound, that more severe sea-ice and iceberg conditions occur, requiring a further refinement in operating methods. This paper will outline current operating practices and principles followed by the approach being taken to provide the capability for future exploratory drilling operations. (Au)

## DAVIS, H.L.

**See:** 376, 378.

## DAVISON, D.S.

324
**Statistical modelling techniques for iceberg motion in west Baffin Bay** / Davison, D.S. McKenna, R.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 37)
Abstract only.
*ASTIS document number 168947.*
ACU, NFSMO

A statistical modelling procedure was developed for iceberg motions in the west Baffin Bay and Lancaster Sound region. The historical trajectories are modified by auto-correlations with an iceberg's previous motion history, and by cross-correlations with motions of recent icebergs in the same region. This technique is independent of forcing functions and requires as input only a time series of iceberg motion. The technique is complementary to a simultaneous deterministic solution based upon estimates of iceberg characteristics and of the forcing functions. The success of a statistical correlation technique depends upon the level of persistence and on the number density of recent iceberg trajectories, which enable the cross-correlations to remain at sufficiently high levels. In the west Baffin Bay and Lancaster Sound region, a comparison was made of the integral time and space scales for the Lagrangian iceberg motions and the Eulerian ocean current values. The data showed the Eulerian time scales were greater than the Lagrangian time scales. The implications were that ocean current eddies should not be viewed as typical turbulent eddies in a mean transport current, but rather as transient, geographically restricted fluctuations. Consequently, the cross-correlations with motion of recent icebergs in the vicinity was a better predictor of iceberg motion than auto-correlations. (Au)

## DAWE, B.J.

**See:** 1073.

## DAWE, B.R.

**325**
**Ground wave iceberg radar** / Dawe, B.R.
(C-CORE news, v. 10, no. 2, July 1985, p. 3-4, ill.)
*ASTIS document number 170186.*
ACU, NFSMO

The remote Sensing Group has mounted a major research program to demonstrate the feasibility of using ground wave radars as ice hazard remote sensors. These radars have the potential of long range target detection, over the traditional radar horizon, and all weather operation. The considerable analytical modelling ability of the Group is the basis of this research program. Using analytical techniques developed by Dr. Walsh for a general formulation of electromagnetic scattering from rough surfaces, backscattered Doppler dependent cross-sections have been estimated for both the ocean surface (Dr. S.K. Srivastava) and iceberg or ice edge targets. The transmission losses have been estimated using a rough spherical earth propagation model. These analyses have enabled the development of a comprehensive soft-ware detection model for ground wave Doppler radars. ... During the summer of 1984, C-CORE conducted an iceberg detection experiment at Byron Bay, Labrador (C-CORE News, Vol. 9, No. 3). The purpose of this experiment was to confirm the predictions of the software detection model. ... Numerous nine minute data sets (2048 point time series) were collected on magnetic tape (for post collection processing) with icebergs located in the receive antenna beam width. Shape and size estimates for the iceberg as well as wind speed and direction measurements were made at the time of the experiment. By using this information simulated Doppler spectra were computed using the software detection model. These simulated spectra were compared with received Doppler spectra processed by the CODAR system, on a target signal to noise power density ratio basis. ... The predicted results show excellent agreement with the measured data, leading to a degree of confidence in the proposed iceberg detection model. ... (Au)

**326**
**LANDSAT for the study of icebergs in the Baffin Bay-Labrador Sea area** / Dawe, B.R. Gustajtis, K.A. Wedler, E. Worsfold, R.D.
[St. John's, Newfoundland : C-CORE, 1978].
16p. : figures ; 28cm.
(C-CORE publication, no. 78- 10)
Preprint for Fifth Canadian Symposium on Remote Sensing, Victoria, B.C., August 28-31, 1978.
References.
*ASTIS document number 16640.*
ACU, NFSMO

... The results showed that conclusive iceberg identification can not be made using LANDSAT images alone. The integration of LANDSAT data into an iceberg monitoring system making use of aircraft reports and ship or shore-based radar reports appears to be feasible. ... (Au)

**See also:** 792.

## DAY, J.M.

**327**
**Icebergs used and theory with suggestions for the future** / Day, J.M.
(Desalination : comprising the second volume of the proceedings of the First International Conference on Iceberg Utilization for Fresh Water Production, Weather Modification, and Other Applications, Iowa State University, Ames, Iowa, October 2-6, 1977, v. 29, no. 1-2, Apr.-May 1979, p. 25-40, ill.)
References.
*ASTIS document number 162930.*
ACU, NFSMO

The use of icebergs as a refrigerant and a water source is reviewed, together with the sequence of events leading up to the present. The methodology of each iceberg theorist is presented and a comparison summarized. The events and opinions emerging from the first iceberg meeting at Rensselaerville, New York, in 1974 are stated. Suggestions are made which could solve some of the problems facing this technology and a new approach to processing and delivery outlined. Finally a "raison d'etre" is sought to justify this activity. (Au)

## DAY, T.

**328**
**Paleomagnetic observations from core samples taken from an iceberg scour** / Day, T.
[S.l. : s.n., 1985].
[3] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163490.*

Paleomagnetism is usually used in the dating of sediments or in correlating the dates of sediments. The normal method on core samples is to measure the remnant magnetism inclination or declination at several locations along the core. ... [The author has] tried to extend this principle and use remnant magnetism as a strain marker. ... the remnance is used to determine the depth beneath the bottom of an iceberg scour that the deformation extends to. ... (Au)

## DE LANGE BOOM, B.R.

**329**
**Iceberg motion in Lancaster Sound and northwest Baffin Bay, summer 1978** / De Lange Boom, B.R. MacNeill, M.R. Buckley, J.R.
(Eastern Arctic Marine Environmental Studies Program / Edited by N. Sutterlin. Arctic, v. 35, no. 1, Mar. 1982, p. 219-233, ill. figures, tables)
(Eastern Arctic Marine Environmental Studies)
References.
*ASTIS document number 83160.*
ACU, NFSMO

A radar station on Hope Monument, Devon Island, N.W.T., was operated from 7 July 1978 to 24 September 1978 to track the movement of icebergs in eastern Lancaster Sound and northwestern Baffin Bay. ... The data were processed by computer to provide a statistical picture of the iceberg motions as well as tracks of individual bergs. The mean circulation pattern of the ice was well defined and variations about the mean did not greatly change the general form of the pattern. The dominant feature of the flow was a stream of icebergs moving with a mean speed of about 40 cm/s southward along the east coast of Devon Island from north of Philpots Island to Cape Sherard and then westward to Cape Warrender. At Cape Warrender, the bergs turned toward the centre of Lancaster Sound with directions ranging from southwest to southeast and average speeds up to 50 cm/s. East of the coastal stream in Baffin Bay, the icebergs moved slowly (<25 cm/s)

westward to join the coastal stream, while south of the stream at the entrance to Lancaster Sound two large persistent eddies were observed. In Baffin Bay, variations in the flow field appeared to be in response to direct meteorological forcing while in Lancaster Sound no evidence of this response was found. The variations in iceberg motion in the sound appeared to be caused by changes in the currents. (Au)

## DE LUC, A.

330
**Von den Eisbergen und Gletschern in der Baffins-Bay [The icebergs and glaciers of Baffin Bay]** / de Luc, A.
(Annalen der Physik, bd. 69, 1821, p. 149-156)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179019.*

From a lecture, edited by L.W. Gilbert, based on material drawn from Sir John Ross' A voyage of discovery [etc.] 1819, q.v. (AB)

## DE ST. O. ISAACSON, M.

331
**Iceberg interactions with offshore structures** / de St. O. Isaacson, M.
(Civil engineering in the arctic offshore : proceedings of the Conference Arctic '85 / Edited by F.L. Bennett and J.L. Machemehl. – New York : American Society of Civil Engineers, 1985, p. 276-284, ill.)
References.
*ASTIS document number 163970.*
NFSMO

The present paper reviews various aspects of the general problem of iceberg interaction with offshore structures. This includes the component problems corresponding to iceberg drift in open water, iceberg drift in the vicinity of a large offshore structure, wave-induced motions of a berg, and the impact of an iceberg with an offshore structure. For smaller ice masses, the effect of a large structure on the berg's trajectory, as well as the wave-induced motions of a berg, are both important problems which have received relatively little attention. The greatest difficulties in force and motion predictions are due to uncertainties in iceberg configurations and in ice properties, rather than due to the simulation of the physical processes involved. (Au)

## DE VRIES, H.

**See:** 930.

## DEAN, A.M.

332
**Electromagnetic subsurface measurements** / Dean, A.M.
Hanover, N.H. : U.S. Army Cold Regions Research and Engineering Laboratory, 1981.
[24] p. : ill. ; 28 cm.
(Special report – U.S. Army. Cold Regions Research and Engineering Laboratory, 81- 23)
*ASTIS document number 171212.*
ACU, NFSMO

In 1974 personnel at the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) began using an impulse radar system to profile accumulations of ice forms. Through field experience the system has been modified so that it can be effectively used as a profiling system, in a ground or airborne configuration, in certain high-noise environments. The system can penetrate fresh water and media with a high water content. For instance, frazil and brash ice accumulations with approximately 50% water have been profiled to a depth of 25 to 35 ft. As a result of the CRREL modifications, the system has found extensive and varied applications as a low-level remote sensing tool. Applications include profiling ice accumulations (including ice jams), river beds, sheet ice, permafrost, subsurface ice masses, river bank revetments through air-entrained water, snow covers, sea ice, icebergs, and peat bogs. Limited laboratory work has also shown that the impulse radar system may be able to detect oil and gas under sea ice. Selected applications and data are presented. ... (Au)

## DEFANT, A.

333
**Physical oceanography** / Defant, A.
Oxford : Pergamon Press, 1961.
2 v. (xvi, 729; viii, 598 p.) : ill., maps.
In preparation 1925-1945, revised, brought up-to-date and translated from German 1957-1960.
Reviewed by K.F. Bowden in Deep-sea research Jan./Feb. 1962, p. 79-80.
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180254.*

Describes the three-dimensional structure and movements, material and energy characteristics of the hydrosphere. Physical and chemical properties of sea water, regional variations in the oceanographic factors and their periodic variations are dealt with, also different types of ocean currents and the periodic movements of the water in waves, tides and related phenomena. Sea ice, its formation, terminology, physical and chemical properties, ice conditions in the Arctic and Antarctic, are treated in chap. 8, p. 243-84. Glaciation in polar areas and icebergs, the effect of polar-ice conditions on the atmospheric and oceanic circulation, chiefly in the North Atlantic, are also discussed. Theoretical and regional treatment of ocean circulation includes polar currents of the northern hemisphere, also the stratospheric or deep circulation, p. 662-69, 680-93. Treatment of tides includes the discussion of the Sea of Okhotsk, Bering Sea, White Sea, and the North Polar Basin and data from five arctic harbors. (AB)

## DEHN, W.S.

**See:** 1103.

## DELLO STRITTO, F.J.

**See:** 197.

## DEMPSEY, J.

**See:** 891.

## DEMPSTER, R.T.

334
**Characteristics of iceberg mechanics** / Dempster, R.T.
(Physics and mechanics of ice, papers / Edited by Per Tryde. – New York : Springer-Verlag, 1980, p. 38-50, figures)
References.
*ASTIS document number 56570.*

ACU, NFSMO

Data on iceberg size characteristics, iceberg towing and iceberg drift from experiments conducted offshore Newfoundland are presented and discussed. The general outline of operational procedures which can be used by oil rig operators to avoid iceberg collision is described. (Au)

335

**Dangers presented by icebergs and protection against them** / Dempster, R.T. Bruneau, A.A.

[S.l. : s.n., 1973].

17 leaves : ill., maps ; 28 cm.

Paper presented at the "Arctic Oil and Gas : Problems and Possibilities" Conference, LeHavre, 2-5 May, 1973.

*ASTIS document number 164194.*

NFSMO

The paper describes (a) the nature of the iceberg problem, (b) factors influencing iceberg motion (c) iceberg drift data and (d) simple first order mean drift prediction. (NFSMO)

336

**The measurement and modeling of iceberg drift** / Dempster, R.T.

(Oceans '74 : IEEE International Conference on Engineering in the Ocean Environment. – New York : Institute of Electrical and Electronic Engineers, Inc., 1974, v. 1, p. 125-129, ill., maps)

References.

*ASTIS document number 172197.*

ACU, NFSMO

Detailed motion of icebergs has been measured for two successive years using a radar. A comprehensive monitoring of the environmental factors affecting iceberg motion was carried out during one of the years. There are significant correlations between a simple kinematic model to predict the motion of icebergs instead of the more commonly used dynamic model. Large scale disturbances such as atmospheric presure systems can noticeably affect drift characteristics. ... (Au)

337

**Tactical iceberg management** / Dempster, R.T.

(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 162)

Abstract only.

*ASTIS document number 155136.*

NFSMO

The characteristics of iceberg motion under natural forces and towing in the vicinity of offshore structures, and how these may be estimated is the subject of the lecture. The significant environmental factors (currents, wind and bathymetry) and iceberg parameters (mass, drag, coefficient, area perpendicular to flow and response time) and the interaction of these are discussed. ... Methods which can be practised in the field using measurements made with standard operational equipment and instrumentation are demonstrated using a non-dimensional form of Newton's second law of motion corrected for the rotational effect of the earth (coriolis effect). The solution to this equation illustrates the inherent compatibility of dynamic and kinematic modelling techniques to predict drift. The dimensionless coefficients of the equation, formed by the iceberg parameters, provide an opportunity to comment on the sensitivity of iceberg motion to variations in the parameters. Finally, the results of actual towing experiments and the solutions to the equation of motion are discussed in relation to one another. (Au)

**See also:** 225, 226, 227, 228, 854, 972.

## DENNER, W.W.

338

**Labrador Ice Dynamics Experiment (LIDEX)** / Denner, W.W. Keliher, T.E.

(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.21, [03] p., ill.)

Microfiche.

*ASTIS document number 178390.*

ACU

... One of the most pressing areas has been the lack of current observations especially of the powerful Labrador Current, and sea ice and iceberg drifts rate off Labrador in the winter season. In order to meet this need, the idea of an ice dynamics experiment was brought forth. ... In order to provide the necessary guidance of such a large experiment both a financial management panel to handle the financing aspects and a scientific panel to handle the technical aspects have been set up. As well it is anticipated to have a LIDEX office set up at Memorial University of Newfoundland to provide a central focus point for the various organizational aspects of the experiment, especially if some cross-pollenization can be carried out with ICEX and MIZEX programs. A pilot program for LIDEX is planned for March 1981 with the installation of satellite reporting drift buoys, which would be supported by the National Science and Engineering Research Council of Canada. It is also planned to carry out spot current measurements through the ice as well as meteorological measurements when possible. It is also anticipated to have a numerical sea ice model ready for testing at this time. The main portion of LIDEX is planned for winter 1981/1982, however, the difficulty of organizing the large effort may force a delay until winter 1982/83. This main experiment would be more extensive than the pilot experiment with an initial proposal to include bottom mounted, long-term experiment with an initial proposal to include bottom mounted, long-term current measurements, integration with remote sensing, and more extensive iceberg monitoring. The program would also concentrate on the study of processes occurring at the ice edge. (Au)

**See also:** 322, 430, 433, 986, 1082.

## DESBRANDES, R.

339

**United States patent : Method and device for determining the geometrical outline of the underwater part of icebergs and the draught thereof** / Desbrandes, R. [Inventor]. Institut Francais du Petrole [Assingee].

[Washington, D.C. : Patents and Trademark Office], 1980.

14 leaves : ill. ; 28 cm.

(U.S. patent documents, no.4,208,731, June 17, 1980)

*ASTIS document number 163333.*

NFSMO

This method comprises laying onto the water bottom at least one line of acoustic transducers which are put in energized condition when an iceberg is approaching the location of this line. Acoustic signals are then sequentially transmitted from at least one of said transducers, some of them being reflected by the underwater part of the iceberg and sensed by acoustic receivers located on both sides of the transmitter on the transducer line. The outline of the underwater portion of the iceberg and its draught are determined by automatically drawing the geometrical envelopes of a system of

ellipsoids whose foci are the transmitter and the different receivers. (Au)

## DET NORSKE VERITAS

340
**Iceberg – arctic tanker collision study** / Det norske Veritas. Maes, M.A. Lantos, S. Dome Petroleum Limited [Sponsor].
[Calgary, Alta.] : Det norske Veritas, 1983.
Report proprietary to Dome Petroleum Ltd.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184160.*

The eccentric beam-on collision between an Arctic tanker with a specified initial sway and yaw rate, and a wedge-shaped iceberg is investigated. The force-deformation relationship for the ship's side was determined and used in two dynamic collision models, taking into account stiffness nonlinearities and hydrodynamic forces. (Au)

## DHALLUIN, M.

341
**Investigations on the currents influencing ice motion** / Dhalluin, M.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 89-93, ill., figures)
References.
*ASTIS document number 61123.*
ACU, NFSMO

Several factors contribute to the natural drift of an iceberg, and among these, currents play an important part in the translation and rotation. ... an iceberg behaves as a current integrator due to its draught and it is assumed to drift under the action of a "mean" current. In order to measure the mean current, five drogued buoys were launched in July-August 1979. These buoys were located by Argos satellite transponders. ... (Au)

## DI TELLA, V.

342
**Production system in arctic waters by using a fully integrated TSG platform** / Di Tella, V. Sebastiani, G.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 1, p. 39-48, ill., maps)
References.
*ASTIS document number 172405.*
ACU, NFSMO

The problem of installing a fixed platform for continuous production systems in arctic waters might be solved in some cases by using suitable auxiliary systems as a defense against ice action. In other cases it might be economically convenient to interrupt the production and recover the platform in danger time intervals. These cases can be solved by a production system based on the use of the Tecnomare Steel Gravity (TSG) platform, modified to assure quick positioning and connection on a proper subsea completion and manifolding system, and very quick recovery in case of danger. ... The paper deals with the technical aspects relevant to [the solution of the iceberg and ice scouring problem.] ... (Au)

## DICKINS (D.F.) ENGINEERING CONSULTING

343
**Environmental impact statement – volume 3 : tanker routes and ice regime** / Dickins (D.F.) Engineering Consulting. Dome Petroleum Limited [Sponsor].
Vancouver, B.C. : D.F. Dickins Engineering Consulting, 1981.
1 microfiche : figures, tables ; 11 X 15 cm.
(Beaufort E.I.S. reference work, no. RWI13)
Appendices.
References.
Cover title: Beaufort Sea production environmental impact assessment, ice conditions along arctic tanker routes.
*ASTIS document number 108316.*
ACU, NFSMO

This summary document describes the important characteristics of the different sea ice regimes along eastern and western Arctic tanker routes originating in the Canadian Beaufort Sea. The text contains information drawn from a wide variety of sources, but relies heavily on descriptions of ice conditions along actual "best" shipping routes selected through studies since 1977, rather than overall regional summaries, more applicable to pollution assessment and exploration. Sea ice statistical data along with other supporting information is provided on a regional basis in an Appendix – Physical Environment. (Au)

## DIEHL, C.H.H.

**See:** 557.

## DIEMAND, D.

344
**Iceberg fragmentation by thermal shock** / Diemand, D.
(Iceberg research, 1984, no. 8, Oct., p. 8-10, ill.)
(C-CORE publication, no. 85- 2)
References.
*ASTIS document number 157538.*
ACU, NFSMO

Attempts at destroying icebergs have been numerous and varied. Perhaps the most studied technique has involved the use of explosives including AN/FO (ammonium nitrate with fuel oil), metallized ammonium nitrate, gelatin dynamite and others. ... A variation on this theme includes bombing which was tried by the U.S. Coast Guard in 1960. In one test 20 1000 lb (450 kg) bombs were dropped on a single iceberg over a one week period. ... The end result of 12,000 lbs of bombs on this berg was that it tilted a little. ... In fact there has only been one report of a successful attempt to break up an iceberg. In 1927, Prof. H.T. Barnes of McGill University travelled to Twillingate, Newfoundland with a quantity of thermit which he detonated on three icebergs he found there. The first he estimated to be about 150 m square and 30 m high. One hundred pounds (45 kg) of thermit in a 1 m deep hole was ignited, the immediate result being a great deal of fire and flame being thrown more than 40 m into the air while "great masses" of ice were thrown off the sides of the berg. A great deal of cracking was also apparent and continued for hours after the firing of the thermit. By the following day a major portion of the berg had cleaved off on a plane "almost across the thermit hole" (Barnes, 1927). Two other bergs in the area were similarly treated and yielded similar results. The explanation, put forward for the success of Barnes' thermit trial was that the very high heat produced by the thermit caused massive thermal shock within the mass of ice which ultimately resulted in its disintegration, much as

glass can be fragmented by extreme temperature changes. ... (Au)

345
**Iceberg mass loss mechanisms and their implications for deterioration modelling** / Diemand, D. Lever, J.H.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 4)
Abstract only.
*ASTIS document number 182109.*
ACU

Many iceberg deterioration models have been developed recently to supply a need by offshore operators to predict the numbers and sizes of icebergs likely to impinge on a specific area of interest such as a drilling site or wellhead. The more sophisticated models incorporate many environmental parameters such as wind direction and speed, currents, waves, air and water temperatures, etc., as well as factors intended to account for mass loss due to melting and calving. These factors are based on ablation rates as determined by laboratory studies, field observations and theoretical considerations are reliable to a degree. They are predicted on the belief that mass loss in icebergs is a result of two mechanisms: melting and calving of small fragments. Observations on Makkovik Bank during the summer of 1985 make it clear that this is only partly true and that major calving events such as ram loss and iceberg splitting are quite common and should be accounted for in any deterioration model, as failure to do so will result in underestimation of numbers and overestimation of sizes. Various mass loss mechanisms were documented and will be discussed in terms of their implications for iceberg deterioration, model design, and interpretation of existing iceberg population data. (Au)

346
**Iceberg temperatures in the North Atlantic – theoretical and measured** / Diemand, D.
(Cold regions science and technology, v. 9, no. 2, July 1984, p. 171-178, figures, table)
Reference.
*ASTIS document number 143995.*
ACU, NFSMO

... According to the theory presented here the original temperature of an iceberg at the time of calving will be retained in the central region of the ice mass for years afterwards due to the low thermal conductivity of the ice. There is considerable evidence suggesting that this core temperature may be in the range of –15 degrees to –20 degrees C for icebergs in the North Atlantic. While these bulk temperatures may be masked in icebergs in water at temperatures less than about 1 degree C, due to the warming of the outer layers of the ice, these layers will be removed by ablation in warmer water and the surface of the berg will tend to approach the cold core. Thermal profiles were obtained of several icebergs in the St. John's, Newfoundland area during the spring and summer of 1983 which support this theory. Due to the strong dependence of glacial ice strength on its temperature, this finding is of considerable importance to those involved in the design of offshore structures and seabed installations in berg-infested waters. (Au)

347
**Iceberg temperatures, preliminary report** / Diemand, D.
St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, Memorial University, 1983.
vi, 35 p. : figures, table ; 28 cm.
(C-CORE publication, no. 83- 5)
(C-CORE publication. Technical report)
ISBN 0-88901-096-X.
References.
*ASTIS document number 115487.*
ACU, NFSMO

The engineering properties of freshwater ice are largely dependent on its temperature. As virtually nothing is known of the temperature range of icebergs along the coasts of Newfoundland and Labrador a study was undertaken to try to predict the range to be expected in this area and to measure the temperatures of several icebergs to confirm these predictions. While the findings to date are by no means exhaustive, there is a strong suggestion that the bulk temperatures of icebergs in the areas considered may fall in a range of roughly –15 degrees to –20 degrees C. (Au)

348
**Measurement of iceberg temperatures** / Diemand, D.
(Iceberg research, 1983, no. 5, July, p. 3-16, ill.)
(C-CORE publication, no. 83- 17)
References.
*ASTIS document number 157686.*
ACU, NFSMO

... The physical and mechanical properties of ice depend to a very great extent on its temperature .... It follows from this that a knowledge of the range, median and mode of the temperatures of the iceberg population on the Labrador Shelf is of considerable importance to engineers and scientists concerned with potential collisions. This information is unknown at present. ... The temperature of a berg depends primarily on three factors: (1) its original temperature at the time it calved from its parent glacier, (2) the temperature of the water it has been in and (3) how long it has been at sea. ... [This paper discusses the experimental work ongoing in an attempt to discover temperature values for freshly calved icebergs off Ellesmere Island and temperature values for icebergs off southern Labrador and the Grand Banks. This work attempts to test the hypothesis that an iceberg in this region will be no less cold or hard than one freshly calved in Baffin Bay.] (Au)

349
**A shoulder-launched projectile for subsurface measurement of iceberg temperatures** / Diemand, D.
(C-CORE publication, no. 84- 18)
(Proceedings of the Workshop on Ice Penetration, June 12-13, 1984 at U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, N.H. Special report – U.S. Army. Cold Regions Research and Engineering Laboratory, 84- 33, p. 197-207, ill.)
Photocopy.
References.
*ASTIS document number 167479.*
ACU, NFSMO

It is commonly believed that in the event of a collision between a marine structure or vessel and an iceberg .... [that] The extent of damage sustained by such a collision will depend to a great extent on the mechanical properties of this surface ice and, these properties, in turn, are strongly dependent on the temperature of the ice. In the past it was assumed that this near-surface ice would be relatively warm and in fact structure designs were based on a conservative estimate of –5 degrees C. A theory was developed at C-CORE (Diemand, 1984) which suggested that surface temperatures were likely to be considerably colder than this ... and a field program was undertaken in 1983 to test this hypothesis. Thermal profiles were taken on icebergs in the St. Johns, Newfoundland, area between April and July. ... Preliminary tests were conducted using dummy heads and heavy cotton string instead of lead wires. ... Later tests were conducted on icebergs. The successful tests resulted in penetration depths in the neighborhood of 300 mm and usually within an angle of 30 degrees from vertical. ... The primary obstacle to be overcome is seen to be breakage of the body of the projectile and the retrieval cord. ... It is felt that this concept will prove valuable in future iceberg temperature investigations, especially those concerning small unstable ice masses which are intractable using existing techniques. ... Further applications of this projectile may include short term tagging investigations using tracking transmitters. (Au)

350
**Temperatures of near shore icebergs in the St. John's area, 1983** / Diemand, D.
St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, Memorial University, 1984.
iv, 55 p. : ill., maps ; 28 cm.
(C-CORE publication, no. 84- 14)
ISBN 0-88901-124-9.
Appendix.
Reference.
*ASTIS document number 157520.*
ACU, NFSMO

... This study was undertaken in part to test the hypothesis that the bulk temperature of iceberg ice will remain unchanged from that of its parent glacier due to the insulating quality of the ice itself. It was also hoped to discover the range of bulk temperatures to be expected in the iceberg population in Newfoundland water. (Au)

**See also:** 291, 300, 637, 638, 642.

## DIETRICH, J.

351
**Iceberg investigation along the west coast of Greenland** / Dietrich, J. Zorn, R. Nielsen, A.H.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 1, p. 221-239, ill., maps)
*ASTIS document number 172847.*
ACU, NFSMO

... Both the Ministry for Greenland represented by the Greenland Technical Organization and the Petroleum Industry have conducted extensive measuring programmes, which were primarily aimed at determining the frequency of occurrence of icebergs near the petroleum concession areas. The iceberg dimensions and the large and small scale patterns of movements were also studied. The measuring programmes, methods and measuring equipment are described in the paper. Typical results of the investigations include iceberg characteristics, geographical iceberg density distribution and correlation between large scale iceberg movements and current and wind measurements. (Au)

**See also:** 793.

## DILLON, M.J.

**See:** 744.

## DINN, G.J.

**See:** 186.

## DINSMORE, R.P.

352
**Ice and its drift into the North Atlantic Ocean** / Dinsmore, R.P.
(Symposium on Environmental Conditions in the Northwest Atlantic, 1960-1969. Special publication – International Commission for the Northwest Atlantic Fisheries, no. 8, 1972, p. 89-128, ill., maps)
References.
*ASTIS document number 182788.*
ACU

A chronological review is made of sea and berg ice conditions prevailing over the Northwest Atlantic Ocean during the last half century. Emphasis is placed on maximum and minimum conditions. Attempts are made to correlate conditions with periodic cycles and meteorological conditions. A discussion is presented of the development of ice reports and observation techniques from shipboard reports through aerial reconnaissance and satellite observation. The observation is made that earlier, more severe, records are based on a paucity of ship data which, however scarce, are often duplicative and resulted in the interpretation of heavier ice conditions than modern ice reconnaissance will substantiate. The developing usage of satellite observations and remote sensing imagery shows the need for new approaches to ice reporting and codes. This development also must keep pace with the increasing need for ice information by the oil, fishing and sea transportation industries. (Au)

353
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1957** / Dinsmore, R.P. Morse, R.M. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1958.
ix, 131 p., [18] folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 43)
Mostly tables and charts.
*ASTIS document number 181269.*
ACU, NFSMO

... A general month-by-month description of ice conditions in the Grand Banks of Newfoundland area is given. A summary of ice conditions in the Gulf of St. Lawrence and Strait of Belle Isle is included. The most outstanding features of the 1957 ice season were the severity of the ice conditions and the employment of ships as a surface patrol for the first time since 1950. The widespread and prolonged ice season, evaluated as approximately 2.4 times heavier than average, make this year appear notable in the annals of the International Ice Patrol. A total of 931 known icebergs drifted south of the 48th parallel and 31 of these reached below 43 N. The two dynamic topographic charts resulting from the season's current surveys and the dynamic topography found at the Bonavista triangle during the post season cruise are discussed with respect to surface circulation. Temperature-salinity relationships of the Labrador Current water, Atlantic Current water and mixed water, found in the Grand Banks region during 1957, are compared with mean T-S curves for the period 1948-57. ... (Au)

354
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1958** / Dinsmore, R.P. Morse, R.M. Soule, F.M.
Washington, D.C. : U.S. Coast Guard, 1960.
ix, 99 p., [8] folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 44)
*ASTIS document number 181277.*
ACU, NFSMO

The authority for, mission, forces assigned and method of operation of the International Ice Patrol during the 1958 ice season are described. Aerial ice observation and communications statistics are presented. All ice reports made to the International Ice Patrol in 1958 are tabulated. A general month-by-month description of ice conditions and sea surface temperatures in the Grand Banks of Newfoundland area are given. A summary of ice conditions in the Gulf of St. Lawrence and Strait of Belle Isle is included, as is a

summary of the post-war opening dates of these seaways. The most outstanding feature of the 1958 ice season was that only one iceberg drifted south of the 48th parallel, thus constituting one of the lightest ice years in the history of the International Ice Patrol. This berg was reported on 18 July 1958 in 46 48 N, 47 46 W. The duration and maximum extension of the pack ice in the Labrador and Newfoundland areas were extremely subnormal. ... (Au)

**See also:** 233, 236.

## DIXIT, B.

355
**Airborne remote sensing program for the Arctic Pilot Project** / Dixit, B. Cheung, H.
(Proceedings – Canadian Symposium on Remote Sensing, 6th, Halifax, Nova Scotia, 21-23 May, 1980 / Edited by Thomas J. Alfoldi. Ottawa : Canadian Aeronautics and Space Institute, [1980], p. 571-573, figures)
References.
*ASTIS document number 69744.*
NFSMO

The Arctic Pilot Project (APP) is designed to produce and liquefy approximately seven million cubic metres of natural gas per day and move it to Eastern Canadian markets in icebreaking ships. ... The evaluation of hull design and various components is done using scale models and is analyzed in ARCTRANS (a transit simulator program). The remote sensing program described here was undertaken to provide input to the environmental model of ARCTRANS. ... A program was set up in November 1977 to measure ice parameters ... and iceberg concentrations. The program includes nine such overflights using the Atmospheric Environment Service Electra aircraft, fitted with SLAR, laser profilometer (LP), IRLS, airborne radiation thermometer (ART) and Vinten cameras ... In addition, several trained ice obsevers of the Ice Patrol are onboard to construct ice maps based on thse sensors and supplemented by visual observations. ... (Au)

## DMITRASH, ZH. A.

356
**O metodike opredeleniia v more kolichestua aisbergov = Method for determining iceberg quantities in the sea** / Dmitrash, Zh. A.
(Vestnik – Leningrad. Universitet. Geologiia-geografiia, v. 18, no. 3, Sept. 1969, p. 158-169, ill.)
References.
English summary.
Text in Russian.
*ASTIS document number 177598.*

The article deals with the methods of studying the distribution of icebergs on sea surface. The author criticises the concept adopted by the Arctic and Antarctic Research Institute. He also states that the best method of observation of the distribution of icebergs is the method of the radiolocation survey. (Au)

**See also:** 235.

## DOME PETROLEUM LIMITED

**See:** 340, 343.

## DONALDSON, P.B.

357
**Melting of antarctic icebergs** / Donaldson, P.B.
(Nature, v.275, no.5678, Sept. 28, 1978, p. 305-306)
References.
*ASTIS document number 170640.*
ACU, NFSMO

... In this note some initial studies of iceberg melting are reported and some of the problems involved in further investigations are considered. Above-sea surface melting is probably due to solar radiation and wind-enhanced convection. Under-sea melting may occur through turbulent natural convection. This should be increased by iceberg surface discontinuities, iceberg wallowing or by release of entrapped air bubbles on melting. Calving could result from side undercutting by wave action, differential melting along cracks and low density areas, stress on underwater shelves formed through layered melting or thermal stress-induced disintegration following calving in warm water. ... (Au)

## DORIS, C.G.

**See:** 1128.

## DRAKE, B.

358
**Radar monitoring of surface and internal glacial flow and iceberg movement** / Drake, B. Jackson, P.L. Larson, R.W. Sivertson, W.E.
(Proceedings of the Twelfth International Symposium on Remote Sensing of Environment, 20-26 April, 1978, Center for Remote Sensing Information and Analysis. – Ann Arbor, Mich. : Environmental Research Institute of Michigan, 1978, v. 2, p.1115-1126, ill.)
References.
*ASTIS document number 170399.*
ACU

A new concept for remotely monitoring glacial flow and iceberg movements uses synthetic aperture radar (SAR), passive surface radar reflecting targets, surface and buried electromagnetic (EM) transponders, and surface Data Collection Platforms (DCO's). Both surface and internal glacial flow vectors and rates can be determined, and individual icebergs can be tracked. ... The movements of icebergs will be monitored by the periodic imaging by SAR of arrays of radar targets placed on the surfaces of the ice. In this way, the net rates and vectors of the movements of many icebergs can be systematically determined. Transponders and DCP's are not used for monitoring iceberg movement. ... Year-around tracking of icebergs will yield information about the dynamic properties and circulation patterns of the polar oceans. This information is important for several scientific disciplines, as well as being valuable for the safety of shipping traffic. ... Individual icebergs are now tracked using aircraft and ship visual recognition, dye marking, aerial photography, Landsat and meteorological satellite images, transponders and non-microwave satellites, and shore-based X-band radar. These methods have many of the same limitations as the methods used to determine glacial flow. (Au)

## DRIGGERS, V.W.

**See:** 238, 304.

## DUNBAR, M.J.

359
**Marine transportation and High Arctic development : a bibliography** / Dunbar, M.J.
[Ottawa] : Canadian Arctic Resources Committee, 1980.
162p. ; 28cm.
Companion volume to the Proceedings of the Symposium on Marine Transportation and High Arctic Development : Policy Framework and Priorities, Montebello, P.Q., 21-23 March, 1979.
*Document not seen by ASTIS. Citation from MRIS.*
*ASTIS document number 60569.*
ACU, NFSMO

... The work opens with a lively review of deficiencies and achievements in eighteen different areas of arctic research. There follow over 1000 carefully-itemized bibliographic entries divided among the following subject areas: Physical Oceanography, Sea Ice and Icebergs, Sediment, Birds and Mammals, Biological Production, Ice Biota, Plankton, Benthos, General Ecology, Microbiology, Fish and Fisheries, Environmental Impact Studies, Coastal Studies, Climate and Weather, Technology, Oil and Gas, Other Pollutants, and Socio-economic Issues. (MRIS)

360
**Petermann Gletscher : possible source of a tabular iceberg off the coast of Newfoundland** / Dunbar, M.J.
(Journal of glaciology, v. 20, no. 84, 1978, p. 595-597, ill., map)
References.
*ASTIS document number 168742.*
ACU, NFSMO

In a recent letter to Nature (Robe and others, 1977) the authors presented five consecutive pictures of a tabular iceberg off the Grand Banks of Newfoundland taken by the U.S. Coast Guard in May-June 1976. It had a rippled surface pattern, and when first seen it was about 0.19 sq km in area. This type of iceberg, as the authors pointed out, is very rare in this area, and they mentioned three possible sources: the ice shelves of northern Ellesmere Island, Humboldt Gletscher, and Petermann Gletscher. Having spent considerable time in Nares Strait ... over the last seven years in the course of a study of its ice regime, I am of the opinion that the evidence is overwhelmingly in favour of Petermann Gletscher .... Humboldt Gletscher produces high blocky bergs of relatively small areal extent, most of which appear to ground in eastern Kane Basin and stay there. The Ellesmere ice shelves are more likely sources, but their surface pattern is different, simpler, and on a larger scale. Furthermore there were no ice islands observed in Nares Strait up to the end of August 1974 or in the spring of 1975, and no report of any break-out from the ice shelves. Petermann Gletscher, on the other hand, has a low flat tongue and exactly the surface characteristics of the berg photographed by the U.S. Coast Guard, and there is evidence of calving activity in 1974. ... (Au)

## DURAND, C.

**See:** 556.

## DUTHINH, D.

361
**The head-on impact of an iceberg on a vertical, gravity based structure** / Duthinh, D.
[S.l. : s.n., 1984?].
12 leaves : ill. ; 28 cm.
Paper presented at the Specialty Conference on Computer Methods in Offshore Engineering, Halifax, N.S., 1984.
References.
*ASTIS document number 178020.*
NFSMO

An energy model is developed and used to study the mechanics of impact between an iceberg and a fixed gravity structure. During the impact, the kinetic energy of the berg is consumed in crushing the ice as well as straining elastically the structure and its foundation. With the assumption of a constant ice crushing strength, the amount of energy dissipated in ice crushing is proportional to the volume of ice crushed, whereas the contact force is proportional to the projection of the contact area normal to the direction of penetration of the berg. In general however, the ice crushing strength is a function of contact area, depth of penetration and strain rate. The results show that load attenuating indentors are very effective in reducing the impact load and cause iceberg crushing to absorb most of the impact energy. In this regard, wedge shaped indentors appear superior to cylindrical ones. The results also show that the shape of the impacting berg and the foundation compliance affect the impact load significantly. (Au)

## DUVAL, B.C.

362
**Exploratory drilling on the Canadian continental shelf, Labrador Sea** / Duval, B.C. Corgnet, J.-L. Duval, J.J.
(Journal of petroleum technology, v. 28, no. 4, Apr. 1976, p. 372-378, ill., map)
References.
*ASTIS document number 171158.*
ACU, NFSMO

The ice pack, icebergs, and meteorology are among the factors making exploratory drilling in the Labrador Sea difficult. After an unsuccessful attempt at operations with a conventionally anchored vessel, a technological breakthrough occurred with the use of a dynamically positioned drillship. (Au)

## DUVAL, J.J.

363
**Arctic offshore problems examined** / Duval, J.J. Ainslie, A.R. Taylor, D.J.
(Petroleum engineer international, v. 42, no. 11, Oct. 1970, p. 14, 16, 18, ill.)
*ASTIS document number 176630.*
NFSMO

A summary of the problems encountered in arctic drilling is presented. These are icing, icebergs and pack ice. These problems were studied as part of a three year program by two French companies. (NFSMO)

364
**Iceberg tracking from an oil exploration platform in Labrador waters** / Duval, J.J.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. - [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 80-83)
*ASTIS document number 160245.*
NFSMO, ACU

The paper describes the iceberg observation system operating on the Typhoon, and the data which were collected. (NFSMO)

365
**Icebergs : a new problem for oil exploration and production** / Duval, J.J.
(Earth Science Symposium on Offshore Eastern Canada, Ottawa, February 1971 / Edited by P.J. Hood. Paper - Geological Survey of Canada, 71- 23, 1973, p. 639-652)
References.
*ASTIS document number 172421.*
ACU, NFSMO

In offshore Eastern Canada and Western Greenland, the sea ice limits the drilling season for floating platforms and during the drilling season a major danger is the threat of icebergs. When an iceberg is coming towards the drilling ship, and if a decision is made to move off site, drilling operations must be stopped at a certain time before the drilling platform can be moved. This time multiplied by the speed of the icebergs provides the concept of warning distance. It is necessary to detect all the icebergs trespassing the warning area. The path of an iceberg is very erratic and it is difficult to predict its short-term route and to make the subsequent decision to move or not. It is feasible to tow the icebergs before they enter the warning area but provisions must also be made to move should there be a failure in the towing operations. During the winter, there are the cumulative problems of ice plus icebergs. For development of oil or gas fields, the use of permanent platforms is not feasible. A suggested solution is to drill in the summer and to use submarine completion, separation and pipes. This submarine equipment must be protected from the scouring of icebergs. (Au)

366
**Production system is planned for iceberg infested waters** / Duval, J.J. Mercier, G. Morin, P.
(World oil, v.190, no. 4, Mar. 1980, p. 81-84, 86, figures)
*ASTIS document number 149039.*
ACU, NFSMO

Off the east coast of North America, drifting icebergs are a hazard to conventional production facilities and thus, new techniques will be required. As described here, it will be necessary to use a highly mobile, floating platform and excavations to protect subsea equipment from scour by grounded icebergs. (Au)

367
**A seasonal oil production scheme for ice-infested waters [Part 2]** / Duval, J.J. Mercier, G. Morin, P.
(Ocean industry, v. 15, no. 1, Jan. 1980, p. 19-20, 25-26, ill.)
*ASTIS document number 149691.*
NFSMO

Deepwater production systems currently used in conventional seas generally consist of floating supports and subsea wellheads. They are not adapted to production in Arctic seas. A new design has been considered. ... The production Christmas tree is installed in an excavation and is designed to have its top located 5 m below the mudline beyond the range of scouring icebergs in the morainic soils. The tubing hangers are located in a 1-m dia. casing approximately 17 m below the bottom of the silo. (Au)

368
**Systeme de production saisonniere d'huile en zones arctiques marines a icebergs [A seasonal production scheme for an oil field in arctic iceberg infested waters]** / Duval, J.J. Mercier, G. Morin, P.
(Proceedings - World Petroleum Congress, 10th, Bucharest, 9-14 September, 1979. - London : Heyden, [1980], v. 3, p. 15-22, figures)
English abstract.
Text in French.
*ASTIS document number 66613.*
ACU, NFSMO

To be capable of producing an oil field during the sea ice free season in iceberg infested waters (such as the Labrador Sea) a research programme has resulted in the design of a production scheme. The bottom facilities such as Christmas tree, manifold and riser base are iocated in excavations so that their top level cannot be touched by the deepest iceberg keel. All surface supports (production, storage, tankers) are designed to be mobile and capable of quick disconnection and reconnection in order to avoid collision with an iceberg while on location. The entire scheme of production is described with special emphasis on the techniques of excavation in a morainic soil. (Au)

**See also:** 109, 362.

## DYKE, M.

**See:** 642.

## EASTCAN EXPLORATION LTD.

**See:** 411, 446, 447, 448, 535, 690, 691, 692, 693, 694, 695, 696, 698.

## EBBESMEYER, C.C.

369
**Description of iceberg probability between Baffin Bay and the Grand Banks using a stochastic model** / Ebbesmeyer, C.C. Okubo, A. Helseth, J.M.
(Deep-sea research. Part A. Oceanographic research papers, v. 27A, 1980, p. 975-986)
*ASTIS document number 135836.*
NFSMO

A stochastic model is used to describe the number of icebergs annually carried southward of given latitudes between Baffin Bay (70 to 77 degrees N) and the Grand Banks (48 degrees N). The number of icebergs per year at 48 degrees N (1900 to 1977) is shown to be a random sequence and exponentially distributed. The distribution is an agreement with a model in which the annual iceberg count consists of random fluctuations superimposed on a linear decay with latitude. Confirmation of the predicted linear dependence is shown by observations. Some estimates of the number of years between large iceberg counts at 48 degrees N are provided. (Au)

## EDWARDS, N.C.

370
**International Ice Patrol operations** / Edwards, N.C. Murphy, D.L.
[S.l. : s.n.], 1985.
[7] leaves : ill. ; 28 cm.
Paper presented at the Arctic Oceanography Workshop, Bay St. Louis, Miss., 11-14 June, 1985.
Photocopy obtained from author.
References.
*ASTIS document number 184217.*

Since 1914, the International Ice Patrol (IIP) has been conducted by the U.S. Coast Guard, to provide the North Atlantic Mariner with a warning of hazardous icebergs in the region of the Grand Banks of Newfoundland. During the iceberg season, March to August, IIP conducts iceberg reconnaissance flights using HC-130 aircraft equipped with the AN/APS-135 Side Looking Airborne

Radar (SLAR) over those fog-covered, storm-tossed waters. Radio broadcasts and facsimile charts of the limits of all known hazardous ice are originated by Commander, International Ice Patrol ... from an operations center in Groton, Connecticut. ... Once an iceberg has been sighted, its location, size, and shape are entered into a computer drift model that is used to estimate the subsequent motion of the iceberg. ... The drift model combines the effects of water drag, air drag, the Coriolis acceleration, and sea surface slope to determine the iceberg acceleration. ... A second numerical model is used to estimate the deterioration of an iceberg after its initial sighting. The model uses water temperature, wave height, and wave period to calculate iceberg deterioration (approximately 85 percent of iceberg deterioration is due to wave effects). Water temperature and wave data are provided every 12 hours by FNOC. ... The International Ice Patrol research program addresses the three major technical areas of the operations: detection, drift and deterioration. The programs are briefly described .... (Au)

371

**Report of the International Ice Patrol for 1984 and 1985** / Edwards, N.C.

(Ice community newsletter, v. 4, no. 1, Apr. 1985, p. 9-10)

*ASTIS document number 166820.*

ACU, NFSMO

From 22 March to 7 September 1984, the International Ice Patrol (IIP), a unit of the U.S. Coast Guard, conducted airborne iceberg surveillance of the waters around the Grand Banks. Using Coast Guard HC-130 aircraft deployed out of Gander, Newfoundland, 476 flight hours were logged on 78 ice reconnaissance sorties. As during the previous year, the AN/APS 135 SLAR was used successfully to detect icebergs which in prior years have gone undetected. The SLAR accounted for 49 percent of all 1984 iceberg sightings. A total of 2202 icebergs were estimated south of 48 N latitude for the season. This record number of icebergs south of 48 N was the result of colder than normal conditions and increased detection due to the participation in the Bergsearch '84 experiment sponsored by the Environmental Studies Revolving Funds (ESRF) administered by the Canada Oil and Gas Lands Administration. After flying 71 passes on surface verified icebergs, data analysis indicated that the SLAR was very effective in detecting icebergs greater than 10 m in length in moderate to calm seas, and had a repeatability of +/-10 percent. Consequently, in an environment where visual search conditions exist only 50 percent of the time, SLAR has greatly enhanced iceberg detection. ... (Au)

372

**Side-looking airborn radar detection and identification of icebergs** / Edwards, N.C. Thayer, N.B.

(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 5)

Abstract only.

*ASTIS document number 182117.*

ACU

The International Ice Patrol (IIP) has searched the southeastern, southwestern and southern limits of the Grand Banks of Newfoundland for hazardous icebergs using visual ship and aircraft reconnaissance techniques for seventy years. Since 1983, the AN/APS-135 side-looking airborne radar (SLAR) has been flown by HC-130 Hercules aircraft from Gander, Newfoundland to provide effective all-weather iceberg surveillance over a 35,000 n/sq m ocean area daily. From the BergSearch '84 and the Evergreen '85 experiments, SLAR detection capability has been determined. Iceberg detection decreases with increasing sea state, increasing lateral range, greater incidence angles, smaller target size and with up or down sea imaging. The typical fluctuations in iceberg target detections are +/- 10 percent and SLAR detections of small, medium and large icebergs are at the 95 percent confidence level. Correct identification of small icebergs and slow moving ships is a real problem for all icebergs entering the patrol area eventually become small, then growlers and many fishing vessels continue to work the Grand Banks year round. The data indicates that experienced SLAR operators can discriminate between ambiguous targets only with 55 percent confidence. Therefore, IIP has adopted specific search procedures to reduce the percentage of ambiguous targets and maintain a most effective SLAR iceberg reconnaissance program for the fog and storm laden Grand Banks. (Au)

## EDWORTHY, J.T.

**See:** 312.

## EHRLICH, N.A.

373

**Ice and icebreakers** / Ehrlich, N.A. Welsh, J.P.

(Advanced Concepts and Techniques in the Study of Snow and Ice Resources : an interdisciplinary symposium / Compiled by H.S. Santeford and J.L. Smith. – Washington, D.C. : National Academy of Sciences, 1974, p. 235-243, ill.)

*ASTIS document number 172650.*

ACU, NFSMO

Contained in this discussion are some of the reasons for U.S. Coast Guard involvement in ice and icebreaking research. Also presented are some examples of the problems encountered in obtaining measurements of the physical properties of ice for engineering use. Included in the discussion is a limited account of Coast Guard applications of remote sensing techniques to ice research. ... The Coast Guard has conducted experiments with the AN/DRP-2 Side Looking Airborne Radar (SLAR) to obtain information on the spatial distribution of sea ice features and for iceberg detection. The major advantage of SLAR for obtaining information is its all-weather capability. This is particularly advantageous for iceberg detection off the Grand Banks of Newfoundland. This area is often zero visibility because of fog. Recent Coast Guard efforts to evaluate SLAR ... for the International Ice Patrol have resulted in a report (Farmer, 1972) clearly demonstrating the capability of this SLAR to provide imagery from which icebergs and ships can be identified and positioned relative to the aircraft flight path. ... (Au)

## EL KASSAS, I.A.

374

**Potential application of remote sensing in locating and tracking of antarctic icebergs** / El Kassas, I.A.

(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Perganon, 1978, p. 146-157)

References.

*ASTIS document number 172413.*

ACU, NFSMO

... The main objective of this paper is to present that information which the remote sensing techniques can supply to help in locating and tracking specific Antarctic icebergs for towing them to where they could be used as a fresh water resource. A comprehensive review of the essential scientific principles of the effective remote sensing systems is briefly given with their evaluation in the light of their operational potentiality to obtain the necessary accurate information. The applicability, advantages and disadvantages of each sensor are presented to enable the planner for icebergs utilization to select the best fit sensing technique. ... (Au)

## EL-TAHAN, H.W.

375
**Evaluation of a model for predicting the drift of iceberg ensembles** / EL-Tahan, H.W. Venkatesh, S. EL-Tahan, M.S.S.
[S.l. : s.n., 1986].
8 leaves : ill. ; 22 cm.
Photocopy.
Copy obtained from Mona EL-Tahan, Fenco Newfoundland, Box 8246, St. John's, Nfld. A1B 3N4.
To be published by OMAE in 1986.
Paper will be presented at 1986 OMAE Workshop, China, April 23-26, 1986.
References.
*ASTIS document number 182737.*

This paper describes the evaluation of a model for predicting the drift of iceberg ensembles. The model was developed in preparation for providing an iceberg forecasting service off the Canadian east coast north of about 45 N. It is envisaged that one to five day forecasts of iceberg ensemble drift will be available. Following a critical examination of all available data, ten data sets containing up to 404 icebergs in the Grand Banks area off Newfoundland were selected for detailed study. The winds measured in the vicinity of the study area as well as the detailed current system developed by the International Ice Patrol were used as inputs to the model. A discussion on the accuracy and limitations of the input data is presented. Qualitative and quantitative criteria were used to evaluate model performance. Applying these criteria to the results of the computer simulations, it is shown that the model provides good predictions. The degree of predictive success varied from one data set to another. The study demonstrated the validity of the assumption of random positioning of icebergs within a grid block, especially for ensembles with large numbers of icebergs. It was found that an 'average' iceberg size can be used to represent all icebergs. The study also showed that in order to achieve improved results it will be necessary to account for the deterioration (complete melting of icebergs), especially during the summer months. (Au)

376
**Factors controlling iceberg drift and design of an iceberg drift forecast system** / EL-Tahan, H.W. EL-Tahan, M.S.S. Davis, H.L. Venkatesh, S.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 103-134, ill.)
(Seventh International Conference on Port and Ocean Engineering under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 3, p. 263-281, ill.)
(VTT symposium, 38, p. 263-281, ill.)
References.
*ASTIS document number 155128.*
NFSMO

The objectives of the study are to gain a better understanding of the characteristics of iceberg motion and the factors controlling iceberg drift, and to develop an iceberg ensemble drift forecast system to be operated by the Canadian Atmospheric Environment Service. An extensive review of field and theoretical studies on iceberg behaviour, the factors controlling iceberg motion and the modelling of iceberg drift has been carried out. Long term and short term behaviour of icebergs are critically examined. A quantitative assessment of the effects of the factors controlling iceberg motion is presented. The study indicated that wind and currents are the primary driving forces. Coriolis Force and ocean surface slope also have significant effects. As for wave forces and waves, only the higher waves have a significant effect. Iceberg drift is also affected by iceberg size characteristics. Based on the findings of the study a comprehensive computerized forecast system to predict the drift of iceberg ensembles off Canada's east coast has been designed. The expected accuracy of the forecast system is discussed and recommendations are made for future improvements of the system. (Au)

377
**Strength of iceberg and artificial snow ice under high strain rates and impact loads** / EL-Tahan, H.W. Swamidas, A.S.J. Arockiasamy, M. Reddy, D.V.
[S.l. : s.n., 1984].
[8] p. : figures, tables ; 28 cm.
Paper presented at 3rd International Symposium on Offshore Mechanics and Arctic Engineering, New Orleans, La., Feb. 12-16, 1984.
*ASTIS document number 130915.*
NFSMO

The study examines the behaviour of iceberg and artificial snow ice under impact and multiaxial stress conditions, and the strengths are measured under various strain rates and confining conditions. The properties and behaviour of artificial snow ice is compared with those of iceberg ice to see if the snow ice can be used as a substitute for iceberg ice when the latter is not available. Three types of tests were carried out on both types of ice, viz., uniaxial compressive, indentation and impact tests, and the results are presented. Density measurements and crystallographic analysis were also carried out on both snow and iceberg ice. (Au)

**See also:** 140, 381, 382, 383, 385, 413, 738, 851.

## EL-TAHAN, M.S.S.

378
**Correlation between iceberg draft and above water dimensions** / EL-Tahan, M.S.S. Davis, H.L.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 130-147, ill.)
References.
*ASTIS document number 148407.*
NFSMO

Previous studies to correlate iceberg draft with its above water dimensions are reviewed. Their findings are tested using data on measurements of over 200 icebergs. The correlation between the draft and the length, width, height and mass of each of these icebergs is presented. The analysis indicated that the upper limit of iceberg draft is its length or 1.5 times the width. The lower limit was 0.25 its length or 0.4 its width. A simple emperical expression to relate the height of an iceberg to its draft/height ratio for each type of iceberg was obtained, based on the measured data. (Au)

379
**Deterioration of icebergs** / EL-Tahan, M.S.S. Venkatesh, S.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 6)
Abstract only.
*ASTIS document number 182125.*
ACU

The paper describes a series of theoretical and field studies to

estimate the deterioration of Arctic icebergs. A model to estimate mass loss rate and life expectancy is described in detail. The deterioration mechanisms considered are solar radiation, buoyant convection, forced (water and air) convection, wave erosion and calving of the resulting overhanging slab. A quantitative assessment of deterioration mechanisms is presented. Verification of the predicted mass loss is presented using published data as well as the results of a field study designed specially for this purpose. Estimates of life expectancy and percentage of 'lost' icebergs are presented as a function of their mass, latitude and month of the year and are compared with IIP observations and the results of observations made on hundreds of icebergs on the Grand Banks. The paper also presents the results of a study carried out to investigate the effect of iceberg deterioration on the prediction of the drift of iceberg ensembles. It was found that accounting for iceberg loss due to melting significantly improved the quality of iceberg ensemble drift predictions. (Au)

**380**

**Documentation of iceberg groundings** / EL-Tahan, M.S.S. Moran, K.
[S.l. : s.n., 1985].
[4] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166545.*

The objective of this ESRF supported study was to compile all the iceberg grounding information pertaining to the East Coast of Canada, Grand Banks, Labrador Shelf and Baffin Bay regions in an attempt to understand where icebergs ground, and why they ground? In this presentation I will describe several of the data sets produced by this study and discuss the criteria that was established to identify groundings. This will be followed by a review of some very preliminary data analyses that have been conducted. (Au)

**381**

**Documentation of iceberg groundings** / EL-Tahan, M.S.S. EL-Tahan, H.W. Moran, K.
[S.l : s.n., 1982?].
[8] leaves : ill. ; 28 cm.
Copy obtained from Mona EL-Tahan, Fenco Newfoundland, Box 8246, St. John's, Nfld. A1B 3N4.
*ASTIS document number 182745.*

The objective of this ESRF supported study was to compile all the iceberg grounding information pertaining to the East Coast of Canada: the Grand Banks, Labrador Shelf and Baffin Bay regions. In this paper, several of the data sets compiled by the study will be discussed with emphasis on the criteria that were established to identify groundings. These will be followed by a review of some data analyses that have been completed. (Au)

**382**

**Estimation of iceberg draft** / EL-Tahan, M.S.S. EL-Tahan, H.W.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 135-145, ill.)
(Oceans '82, conference record. – New York : Marine Technology Society & Institute of Electrical and Electronics Engineers, 1982, p. 689-695, ill.)
References.
*ASTIS document number 150720.*
NFSMO

Previous studies to correlate iceberg draft with its above water dimensions are reviewed. Their findings are tested using data on measurements of over 200 icebergs. The correlation between the draft and the length, width, height and mass of each of these icebergs is presented. The analysis indicated that the upper limit of iceberg draft is its length, 1.5 times its width, or 10.5 times its height. The lower limit was 0.25 its length, 0.4 its width, or its height. A simple empirical expression to relate the height of an iceberg to its draft/height ratio for each type of iceberg was obtained, based on the measured data. The expected error involved in estimating iceberg draft using the empirical expressions and the degree of confidence in the estimated value are evaluated. (Au)

**383**

**Forecast of iceberg ensemble drift** / EL-Tahan, M.S.S. EL-Tahan, H.W. Venkatesh, S.
(Fifteenth Annual Offshore Technology Conference 1983, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1983, v. 1, p. 151-158, figures)
(OTC paper, 4460)
References.
*ASTIS document number 127213.*
NFSMO

The objectives of the study are to gain a better understanding of the characteristics of iceberg motion and the factors controlling iceberg drift, and to develop an iceberg ensemble drift forecast system to be operated by the Canadian Atmospheric Environment Service. An extensive review of field and theoretical studies on iceberg behaviour, and the factors controlling iceberg motion has been carried out. Long term and short term behaviour of icebergs are critically examined. A quantitative assessment of the effects of the factors controlling iceberg motion is presented. The study indicated that wind and currents are the primary driving forces. Coriolis Force and ocean surface slope also have significant effects. As for waves, only the higher waves have a significant effect. Iceberg drift is also affected by iceberg size characteristics. Based on the findings of the study a comprehensive computerized forecast system to predict the drift of iceberg ensembles off Canada's east coast has been designed. The expected accuracy of the forecast system is discussed and recommendations are made for future improvements to the system. (Au)

**384**

**Modelling of iceberg drift** / EL-Tahan, M.S.S.
St. John's, Nfld. : Memorial University of Newfoundland, 1980.
xi, 72 p. : ill., map ; 28 cm.
Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1980.
*ASTIS document number 163210.*
NFSMO

The need for a numerical model to predict iceberg drift arises primarily due to the hazards that icebergs present to the drilling vessels and platform in the offshore areas near Newfoundland and Labrador. A dynamic model has been developed and used to study the behaviour of icebergs under different wind and current conditions. The forces considered are due to wind, current, Coriolis effects, pressure gradients (ocean surface slope) and the acceleration of water body surrounding the icebergs. Two different techniques were used to solve the coupled non-linear differential equations of motions: i) analog computer simulation and ii) digital computer using 4th-order Runga-Kutta method. ... The detailed wind and current data measured in-situ near the icebergs, [near Saglek, Labrador] provided a unique opportunity to verify the model and to study the effect of each of the environmental forces. Several trajectories are obtained after excluding each one of the environmental forces used in the model in order to appreciate its effect on the drift of icebergs. ... This study has demonstrated the importance of each of the environmental forces included in the model. A good prediction of an iceberg drift trajectory is only possible if all the environmental forces are accounted for and

detailed wind and current data in the immediate vicinity of the iceberg as well as good estimates of iceberg parameters are available as input to the model. (Au)

385
**Validation and quantitative assessment of the deterioration mechanisms of arctic icebergs** / EL-Tahan, M.S.S. Venkatesh, S. EL-Tahan, H.W.
(Proceedings of the Third International Offshore Mechanics and Arctic Engineering Symposium / Edited by V.J. Lunardini. – New York : American Society of Mechanical Engineers, 1984, v. 3, p. 18-25, ill.)
References.
*ASTIS document number 176850.*
NFSMO

In this paper the important mechanisms affecting the deterioration of Arctic icebergs are modelled based on parameterizations developed for the International Ice Patrol. The model simulations of the deterioration of three icebergs in the Grand Banks/Labrador Sea area off the Canadian east coast are compared with observations. The model paramterizations provide a reasonable approximation of iceberg deterioration with best results being obtained where detailed observations of the above-water and underwater portions of the iceberg are available enabling accurate estimations of iceberg mass and the parameters needed for the model. A quantitative assessment of the deterioration of icebergs in the Grand Banks/Labrador Sea area is also carried out for each month of the year when the sea surface temperature was above zero. Wave erosion is found to be the major deterioration mechanism. Wave erosion and the resulting calving of overhanging slabs together account for more than 80% of the deterioration rate. A small iceberg drifting on the Grand Banks could lose up to one third of its mass in one day. (Au)

**See also:** 198, 199, 375, 376, 413, 973, 1061.

## ELIZAROV, A.A.

386
**O mezhgodovykh kolebaniiakh intensivnosti Labradorskogo i Zapadno-Grenlandskogo techenii o vozmozhnosti prognoza temperaturnykh usolvii v promyslovykh raionakh severo-zapada Atlanticheskogo okeana [On the year-to-year fluctuations in intensity of the Labrador and West Greenland currents and on possibility of temperature prognosis in the commercial areas of the northwest Atlantic Ocean]** / Elizarov, A.A.
(Okeanologiia, v. 2, no. 5, 1962, p. 796-809, ill., maps)
References.
Text in Russian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180270.*
ACU

Analyzes standard sections across both currents for which most data are available from the International Ice Observation and Ice Patrol Service and the Murmansk Prospects Survey for 1936-1941, 1948-1959 and 1961. Average temperatures of the 0-200 m. layer are calculated for April 15, May 15, June 15, and for some sections also July 15; and their year-to-year fluctuations are characterized. Temperature fluctuations of the Newfoundland – Labrador – Greenland area waters are compared with the Norwegian and Barents Sea temperatures and a direct relation is established, which has prognostic value. Negative temperature anomalies in the Labrador Current area correspond to positive temperature anomalies in the Nordkapp and Murman Current areas. Interrelation exists also in regard to the intensity of these currents. Prognosis of temperature conditions in the Newfoundland and Labrador region and of ice drift south of 48 N is outlined. (AB)

## ELLIS, T.S.

**See:** 877, 878, 879.

## ELLIS, W.S.

387
**Tracking danger with the Ice Patrol** / Ellis, W.S. Holland, J.R. [Photographer].
(National geographic, v.133, no. 6, Jan.-June 1968, p. 780-793, ill.)
*ASTIS document number 172014.*
ACU

The author describes the U.S. Coast Guard's operation (Ice Patrol) whose objective it is to record and communicate information on iceberg location to nearby ships in Newfoundland waters. The Coast Guard routinely "bombs" icebergs with red dye for quick identification in drift-pattern studies. (Au)

## ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN

388
**Areas imaged during Project SAR 77 using the ERIM four channel radar** / Environmental Research Institute of Michigan. Larson, R.W. . Liskow, C. Rawson, R.F. Shuchman, R.A. Smith, F. United States. Office of Naval Research [Sponsor].
St. John's, Newfoundland : C-CORE, 1977.
59 p. : ill., maps, charts ; 28 cm.
(C-CORE publication, no. 77- 30)
(Project SAR '77. C-CORE field data report, no. 1)
Mostly charts, maps and tables.
*ASTIS document number 9083.*
ACU, NFSMO

This field report describes the data collected by the Environmental Research Institute of Michigan for the Investigation of the Characterization of Sea Ice and Icebergs Using the ERIM X- and L-Band Airborne Synthetic Aperture Radar. ... This report is intended to provide potential data users with an index of the information available and a method of retrieving the data from the data file. ... (Au)

## ENVIRONMENTAL RESEARCH INSTITUTE OF MICHIGAN. RADAR AND OPTICS DIVISION

389
**Investigation of the characterization of sea ice and icebergs using the ERIM X-L Band Airborne Synthetic Aperture Radar** / Environmental Research Institute of Michigan. Radar and Optics Division. Rawson, R.F. Smith, F. Liskow, C. Shuchman, R.A. Larson, R.W. Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering [Sponsor].
Ann Arbor, Mich. : Environmental Reseearch Institute of Michigan, Radar and Optics Division, 1977.
iii, 131 p. : ill., maps ; 28 cm.
(Field data report – Environmental Research Institute of Michigan. Radar and Optics Division, EM-77- 1155)
Appendix.
*ASTIS document number 167150.*

NFSMO

This field report describes the data collected by the Environmental Research Institute of Michigan for the Investigation of the Characterization of Sea Ice and Icebergs using the ERIM X- and L-Band Airborne Synthetic Aperture Radar. This report is designed to provide potential data users with an index of the information available and a method of retrieving the data from the data file. (Au)

## ENVIRONMENTAL STUDIES REVOLVING FUNDS (CANADA)

**See:** 132, 413, 543, 792, 891, 1063, 1064.

## ERANTI, E.

390
**Introduction to ice problems in civil engineering** / Eranti, E.
Lee, G.C.
Buffalo, N.Y. : Center for Cold Regions Engineering, Science, and Technology, N.Y. State University, 1981.
1 v. (various pagings) : figures, tables ; 28 cm.
([Report] – New York. State University, Buffalo. Center for Cold Regions Engineering, Science, and Technology, 81-1)
Appendix.
References.
*ASTIS document number 130907.*
NFSMO

The report summarizes the present day knowledge on ice problems as they are related to civil engineering practice. It includes a description of ice covers and icebergs, deformation and strength properties of ice, bearing capacity, ice forces on structures, and ice control and structural design. (NFSMO)

## ERICKSON, R.

**See:** 1053.

## ERMAN, R.J.

**See:** 292, 293, 430, 986.

## ETTLE, R.E.

391
**Iceberg drift observations** / Ettle, R.E.
(EOS (Washington), v. 53, no. 1, Jan. 1972, p. 398)
Paper presented at the American Geophysical Union Annual Meeting, 53rd, Washington, D.C., April 17-21, 1972.
Abstract only.
*ASTIS document number 162965.*
ACU

... Eight iceberg trajectories observed during 1965, 1967, and 1968 have been subjected to preliminary analysis. The data were obtained by tracking the icebergs relative to fixed reference markers using visual bearings and radar ranges. Speed ratios (iceberg speed/wind speed) and drift angles (iceberg direction-wind direction) were calculated for each half hour of iceberg trajectory. Below wind speeds of 10 knots icebergs were observed moving at random drift angles up to 180 degrees either side of the down-wind direction. At wind speeds greater than 10 knots the icebergs generally moved within 60 degrees of the down-wind direction. In both cases the majority drifted to the right of the wind. At wind speeds greater than 10 knots the speed ratios varied from 0.0 to 0.07 while at wind speeds below 10 knots the speed ratios were occasionally much larger. Thus at low wind speeds the effect of permanent currents and older wind driven currents predominate over wind drag and new wind driven currents. At wind speeds over 10 knots the wind has a significant affect on the drift of an iceberg. (Au)

392
**Observed iceberg drift** / Ettle, R.E.
[S.l. : s.n., 1972?].
12 leaves : ill., ; 28 cm.
Paper presented at the Fifty-third Annual Meeting, American Geophysical Union, Sheraton-Park Hotel, Washington, D.C.
References.
*ASTIS document number 163716.*
NFSMO

Coast Guard Oceanographic Unit has obtained data on iceberg drift in support of International Ice Patrol. Preliminary analyses of these data using basic statistics show wide variability and point out the need for numerical modeling to predict iceberg drift. Eight separate iceberg drift trajectories obtained from three icebergs, tracked in 1965, 1967, and 1968 respectively, were of suitable quality for analysis. ... [Data on drift and mass of the icebergs were collected. Also observed were wind speeds and subsurface currents.] ... In conclusion, at low wind speeds (<10 kts) the effect of permanent currents, tidal currents, or older wind driven currents predominate over wind drag and new wind driven currents. At wind speeds over 10 knots the wind has a significant effect on the drift of an iceberg. The calculated mean values of speed ratio and drift angle represent reasonable estimates. The calculated values of drag coefficient ratio represent a gross estimate. (Au)

393
**Oceanography of the Grand Banks region of Newfoundland and the Labrador Sea in 1970, April-October 1970** / Ettle, R.E. Wolford, T.C.
Washington, D.C. : U.S. Coast Guard [publisher] ; Springfield, Va. : NTIS [distributor], 1972.
3 microfiches : ill., maps ; 11 x 15 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 56)
(NTIS AD-774 500)
Mostly tables.
Appendix.
References.
*ASTIS document number 174122.*
NFSMO

In support of International Ice Patrol, four cruises were conducted of the Grand Banks of Newfoundland and the Labrador Sea during 1970 to study ocean currents that affect the drift of icebergs. The dynamic topography of the Labrador Current and its environs showed significant departure from normal, but there was general agreement between the dynamic topographies relative to the 1000 and 3000 decibar surfaces. Variations at standard section A3 were greater than those at standard section A2. Downwelling was observed at standard section A3 at the same time the Labrador Current showed a strong acceleration in calculated geostrophic velocity. Direct current measurements on the continental shelf showed a strong tidal influence. STD data from analog traces were compared with those from a Digital Data Logger; significant differences were found. (Au)

394
**Statistical analysis of observed iceberg drift** / Ettle, R.E.
(Arctic, v. 27, no. 2, June 1974, p. 121-127, figures, tables)
*ASTIS document number 102636.*

ACU, NFSMO

Eight iceberg trajectories observed by the U.S. Coast Guard during 1965, 1967, and 1968 have been subjected to preliminary analysis. The data were obtained by tracking the icebergs relative to fixed reference markers using visual bearings and radar ranges. Speed ratios and drift angles were calculated for each half hour of iceberg trajectory. It was found that at low wind speeds the effects of permanent currents, older wind-driven currents, and tidal currents predominate over wind drag and new wind-driven currents, whereas at wind speeds of over 10 knots the wind has a significant effect on the drift of an iceberg. The ratio of the drag coefficient for the iceberg's above-water portion to the drag coefficient for its submerged portion was found to range fr 1.5 to approximately 7. (Au)

## EVANS, D.D.

395
**A point target model for the synthetic aperture radar detection of ships and ice conditions during a swell** / Evans, D.D.
(IEEE transactions on antennas and propagation, v. AP- 27, no. 1, Jan. 1979, p. 30-34, ill.)
References.
*ASTIS document number 170402.*
ACU, NFSMO

A running swell affects the synthetic aperture radar (SAR) imagery of ships, smaller icebergs, and other floating objects because the targets signal is no longer matched with the azimuth processor. This effect is analyzed analytically and numerically for the case of conventional image processing. (Au)

## F.F. SLANEY & COMPANY

**See:** 410.

## FABRICIUS, J.

**See:** 793.

## FABRICIUS, O.

396
**Otto Fabricius' "On the floating ice in the northern waters"** / Fabricius, O.
(Geographical review, v. 45, no. 3, July 1955, p. 405-415)
Introduction by Richard H. Dillon.
References.
Text (in English, translator unknown) of a manuscript in the Sir Joseph Banks Collection of the Sutro Branch, California State Library, San Francisco. Its content is similar to that of Om driv-iisen i de nordlige vande og fornemmelig i Davids-Straedet (On the floating ice in northern waters, and principally in Davis Strait) pub. in Danske videnskabernes selskabs Skrifter, 1788. del. 3, p. 65-84, diagr. (copy in DLC).
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179809.*
ACU

Fabricius describes the origin and appearance of three types of ice found in Baffin Bay-Davis Strait: (1) "mountains" (icebergs), (2) "blocks" (smaller pieces originating from bergs or from same source), and (3) "flat ice" (sea ice). He also deals with the source and direction of ocean currents in the Greenland Sea and their relation to ice conditions in Davis Strait. (AB)

## FADER, G.B.

397
**A reconnaissance study of the surficial geology of the Grand Banks of Newfoundland** / Fader, G.B. King, L.H.
(Paper – Geological Survey of Canada, 81- 1A, p. 45-81, figures)
References.
*ASTIS document number 148644.*
ACU, NFSMO

The results of a reconnaissance study of the surficial and near-surface bedrock marine geology of the Grand Banks of Newfoundland are presented. On the basis of high-resolution seismic reflection profiles, sidescan sonograms, and bottom samples, the position of a Late Wisconsin low sea level stand is tentatively identified at 110-120 m. Above these depths, glacial sediments were eroded and redistributed during the Holocene transgression. Stable areas of lag gravel and large patches of sand have been deposited. Iceberg furrows occur at the seabed and are up to 5 m deep. On the basis of the distribution and stratigraphic relationships of the surficial sediments, it is suggested that above a 110 m depth the iceberg furrows were formed during the last 10,000-12,000 years and that these furrows may represent the total number developed during this time interval. (Au)

**See also:** 646, 649, 999.

## FAIRBRIDGE, R.W.

398
**Encyclopedia of oceanography** / Fairbridge, R.W. [Editor].
New York : Reinhold, 1966.
1021 p. : ill., maps.
(Encyclopedia of earth sciences, v. 1)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180548.*

Articles on the various seas differ in content, but in general they include discussion of bathymetry, meteorology, tides, currents, water masses, geologic history, sediments, and in some cases, biologic oceanography and geomorphology. References follow each of the entries. Articles pertaining strictly to arctic and subarctic areas are: (1) Aleutian current, by T. Ichiye. (2) Arctic Ocean, by N.A. Ostenso. (3) Barents and White Seas, by M.V. Klenova. (4) Beaufort Sea, by N.A. Ostenso. (5) Bering Sea, by G.G. Shor, Jr. (6) Canadian Arctic Archipelago and Baffin Bay, by A.E. Collin and B.R. Pelletier. (7) Chukchi Sea, by K. Hunkins and P.A. Kaplin. (8) East Siberian Sea, by A.S. Ionin. (9) Greenland Sea, by R.W. Fairbridge and T. Ichiye. (10) Gulf of St. Lawrence, by C. Keen, J.E. Blanchard and M.J. Keen. (11) Hudson Bay and approaches, by A.E. Collin and B.R. Pellitier. (12) Icebergs, by I.I. Schell. (13) Irminger current, by T. Ichiye. (14) Irminger Sea, by R.W. Fairbridge. (15) Kara Sea, by R.W. Fairbridge. (16) Labrador current, by N.B. Plutchak. (17) Labrador Sea, by T. Ichiye. (18) Laptev Sea, by A.S. Ionin. (19) Norwegian Sea, by R.W. Fairbridge and T. Ichiye. (20) Okhotsk Sea, by V.P. Petelin. (21) Sea ice, by N. Untersteiner. (22) Sea ice transportation, by R.W. Fairbridge. (23) Seamounts (including guyots), by H.D. Palmer. (AB)

## FALCONER, R.K.H.

**See:** 645, 647.

## FALES, E.D.

**399**
**World's biggest moving job - icebergs!** / Fales, E.D.
(Popular mechanics, v.149, no. 1, Jan. 1978, p. 47-51, 106, ill.)
*ASTIS document number 178128.*

This article describes methods of towing icebergs devised at Memorial University in Newfoundland and tested in the North Atlantic. The original impetus for the project came from the need to protect offshore oil platforms from iceberg floes but such technology would be applicable for towing icebergs to arid regions for use as drinking water, "floating freezers," and weather control devices. (ASTIS)

## FALKINGHAM, J.C.

**400**
**The iceberg information service of Environment Canada** / Falkingham, J.C.
[S.l. : s.n.], 1986.
4 leaves ; 28 cm.
Paper presented at the Canadian East Coast Workshop on Sea Ice, Halifax, N.S., 7-9 Jan., 1986.
*ASTIS document number 182079.*

The Expanded Ice Information Services Program that was initiated by the federal government in 1983 has two main objectives - to extend the present sea ice information service to support year-round navigation in the Arctic and to establish an iceberg information and advisory service for the East Coast. The timetable calls for the former objective to be in place in the next decade, and for the latter to be operational in 1986. This paper specifically addresses the iceberg program being developed by the Atmospheric Environment Service (AES). (Au)

**401**
**The iceberg information service of Environment Canada** / Falkingham, J.C.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. - [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 7)
Abstract only.
*ASTIS document number 182141.*
ACU

The Expanded Ice Information Services Program approved by the federal government in 1983 has two major initiatives - the extension of the present sea ice information service to support year-round navigation in the Arctic and the implementation of an iceberg information service for the East Coast. This paper specifically addresses the latter of these two initiatives. The iceberg program is being developed for implementation in June 1986. It is comprised of three major elements - iceberg reconnaissance, analysis and prediction, and climatology. The planned operation of each of these elements is described with particular emphasis on the mechanisms to make information available to users. Particular attention is paid to real-time analysis and prediction and the Iceberg Analysis and Prediction System (BAPS) which is being developed to support this service. A description of the system is presented along with proposed information products that will be produced. In addition to the traditional forms of product dissemination via facsimile and marine radio, BAPS will support dial-in access by users' computer equipment. Details of planned access mechanisms and product formats are presented. (Au)

## FANCK, A.

**402**
**Werden und Vergehen eines Eisberges [The birth and passing of an iceberg]** / Fanck, A.
(Berge der Welt, bd. 7, 1952, p. 43-56, ill., map)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179817.*
ACU

Contains a description of the genesis, movements, changes in size and shape of icebergs originating on the west coast of Greenland. The forces, internal and external, causing these changes are also discussed. (AB)

**See also:** 505.

## FARMER, L.D.

**403**
**Photogrammetric determination of iceberg volumes** / Farmer, L.D. Robe, R.Q.
(Photogrammetric engineering and remote sensing, v. 43, no. 2, Feb. 1977, p. 183-189, ill.)
References.
*ASTIS document number 163406.*
NFSMO, ACU

Determination of the deterioration rate of icebergs is dependent on the volume of the iceberg. By using parallax measurements made at randomly selected points on a stereo iceberg image, it is possible to compute iceberg volume to within ± 10 percent. Mean parallax values were correlated with a parallax/height relationship derived from oblique photographs. (Au)

**404**
**Volumetric measurements of icebergs** / Farmer, L.D. Robe, R.Q.
(Photogrammetric engineering and remote sensing, v. 42, no. 6, June 1976, p. 823)
Paper presented at the 42nd Annual Meeting of the American Society of Photogrammetry, Washington, D.C., February 22-28, 1976.
Abstract only.
*ASTIS document number 168300.*
ACU

Determination of the deterioration rate of icebergs is dependent on the volume of the iceberg. Using parallax measurements made at randomly selected points on a stero iceberg image, it is possible to compute iceberg volume to within ± 10 percent. Mean parallax values were correlated with a parallax/height relationship derived from oblique photographs. (Au)

**See also:** 584, 874, 875, 1014, 1119.

## FASTOOK, J.L.

**405**
**Finite element analysis of calving from ice fronts** / Fastook, J.L. Schmidt, W.F.
(Annals of glaciology, v. 3, 1982, p. 103-106, ill.)
References.
*ASTIS document number 182761.*

ACU, NFSMO

The Antarctic ice sheet has almost no net annual ablation on its surface, so most mass losses are by iceberg calving along its perimeter, which may be either grounded in shallow water or floating in deep water. An ice cliff forms along the perimeter in both cases. Wave action undercuts ice margins in the tide-water zone along beaches, and causes coastal calving if the rate of undercutting compares with the forward ice velocity. If the ice velocity is sufficiently greater, the ice sheet advances into deeper water and becomes afloat at depths of 200 to 300 m (Robin 1979). A floating ice shelf then forms and icebergs calve along the ice front. Iceberg calving along this ice front may be due to several causes (Holdsworth 1977, Robin 1979). Since iceberg calving, either from ice shelves or in the tidewater zone of beaches between ice shelves, is the principal ablation mechanism of the Antarctic ice sheet, it is important to understand calving dynamics quantitatively. This paper presents the results of a finite-element examination of calving along floating margins of the ice sheet. (Au)

## FEAZEL, C.T.

**406**

**Major iceberg-producing glaciers of west Greenland** / Feazel, C.T. Kollmeyer, R.C.

(Sea ice : proceedings of an international conference sponsored by the National Research Council of Iceland [and] the Bauer Scientific Trust, Reykjavik, Iceland, May 10-13, 1971 / Edited by T. Karlsson. R.r. – National Research Council, Reykjavik, '72- 4, p. 140-145, ill., maps)

References.

*ASTIS document number 163945.*

ACU, NFSMO

The papers reports on a survey to ascertain which glaciers are active iceberg-producers and to measure advance or retreat of the glacier termini. (NFSMO)

**407**

**Where Greenland's glaciers meet the sea** / Feazel, C.T.

(Oceans, v. 6, no. 2, Mar.-Apr. 1973, p. 38-43, ill.)

*ASTIS document number 171360.*

ACU

The article reports on the 1971 U.S. Coast Guard's survey conducted in Jakobshavn Fjord, Greenland. The goal of the present series of surveys is to be able to predict long-term changes in rates of iceberg production. (ASTIS)

## FEDOSOV, M.V.

**408**

**Issledovanie uslovii formirovaniia pervichnoi produktivnosti v Severo-Zapadnoi Atlantike [Investigation into conditions of primary-productivity formation in the northwest Atlantic]** / Fedosov, M.V.

(Trudy – Moscow. Vsesoiuznyi Nauchno-Issledovatel'skii Institut Morskogo Rybnogo Khoziaistva i Okeanografii, 1962, p. 125-135, maps)

References.

English summary.

English translation of entire volume available.

Text in Russian.

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180467.*

Discusses the area, water masses and their temperature and salinity, currents, runoff and meltwater from icebergs, and primary production. The high primary production in the shelf and slope areas is due to river discharges and meltwater and their nutrients; the primary productivity of the deep waters is attributed to oceanic phytoplankton. (AB)

**409**

**Usloviia formirovaniia pervichnykh kormovykh resursov okeana [Conditions for the formation of primary food resources in the ocean]** / Fedosov, M.V.

(Trudy – Moscow. Vsesoiuznyi Nauchno-Issledovatel'skii Institut Morskogo Rybnogo Khoziaistva i Okeanografii, v. 57, 1965, p. 145-160, maps)

References.

Text in Russian.

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180475.*

Presents a study with empahsis on biogenic resources entering the sea from the land through the runoff and through the atmosphere (rain, winds). The largest amount of this material is obtained by the Arctic Ocean and northern Indian Ocean. Somewhat smaller quantities go into the Atlantic, and in the other areas much less. The effects upon primary productivity, of deep waters, currents, convergence and divergence, and of icebergs are also dicussed. (AB)

## FENCO CONSULTANTS LIMITED

**410**

**An Arctic atlas : background information for developing marine oilspill countermeasures** / Fenco Consultants Limited. F.F. Slaney & Company.

[Ottawa : Fisheries and Environment Canada], 1978.

1v. (various pagings) : maps, charts, tables ; 29x48cm.

(Arctic Marine Oilspill Program report, EPS-9-ED-78- 1)

Submitted to Research and Development Division, Environmental Research Branch, Environmental Impact Control Directorate, Environmental Protection Service.

References.

*ASTIS document number 8575.*

ACU, SSU, NFSMO

... Five principal categories of information relevant to oilspill countermeasures have been treated, these being: Geology and Petroleum Development, Meteorology and Oceanography, Ice, Biology, and Social. Generally a mapped format has been employed, with explanatory graphs and tables inserted where necessary. ... (Au)

**411**

**Iceberg impact effects on drillship** / Fenco Consultants Limited. German & Milne (Firm). Eastcan Exploration Ltd. [Sponsor].

[Toronto, Ont.] : Fenco, 1971.

1 microfiche : figures, tables ; 11 X 16 cm.

(Eastcoast Petroleum Operators' Association project no. 4. Report)

Appendices.

References.

*ASTIS document number 115797.*

ACU, NFSMO

... The present report summarizes the studies made ... on the following items: 1. Estimates are given of forces resulting from the collision of a growler with a drillship, specifically of the 'Pelican' type, whether moored or dynamically positioned. The size of the growler and its velocity at impact have been varied so as to define critical conditions for ice impact on the drill vessel. 2. The ability of the hull structure to withstand forces resulting from impact of an ice growler of specified mass and drift velocity has been evaluated. ... (Au)

## FENCO NEWFOUNDLAND LIMITED

412

**Development of an operational iceberg deterioration model : final report** / Fenco Newfoundland Limited. Canada. Atmospheric Environment Service. Meteorological Services Research Branch [Sponsor].
[St. John's, Nfld.] : Fenco Newfoundland Ltd., 1983.
vii, 110 leaves : ill., maps ; 28 cm.
Bibliography: p. 106-110.
*ASTIS document number 178209.*
NFSMO

... The Atmospheric Environment Service is currently developing a comprehensive computerized system for forecasting the day-to-day drift of iceberg ensembles off Canada's East Coast. The accuracy of predicting the numbers and positions of icebergs that may pose a threat to offshore and shipping activities depends not only on reliable drift data but on dependable estimates of life expectancy as well. Therefore, iceberg deterioration is an integral part of iceberg forecasting. Estimates of iceberg melt rates are important for predicting the number and approximate size of bergs remaining in an ensemble after some period of time has elapsed, particularly during the summer months when deterioration rates can be up to 30% of berg mass per day. ... (Au)

413

**Documentation of iceberg groundings** / Fenco Newfoundland Limited. EL-Tahan, M.S.S. EL-Tahan, H.W. Courage, D. Mitten, P.T. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF [publisher] ; Calgary, Alta. : Pallister Resource Mgt. Ltd. [distributor], 1985.
x, 162 p. : ill., map ; 28 cm.
(Environmental Studies Revolving Funds report, no. 007)
ISBN 0-920783-06-6.
Appendices.
References.
Also available on microfiche.
*ASTIS document number 172146.*
ACU, NFSMO

The study provides a comprehensive documentation of iceberg groundings off Canada's east coast. Sophisticated criteria to identify and verify grounding events have been developed. A data base containing iceberg tracking data and related information has been compiled. The data base includes data on 2,728 icebergs tracked at well-site locations by drill-rig radars, 868 icebergs tracked by shore-based radars off Newfoundland and Labrador and in Baffin Bay, 40 icebergs tracked by satellite in Baffin Bay and the Labrador Sea for periods up to 309 days, and about 65,000 iceberg sightings reported by the International Ice Patrol (United States Coast Guard). ... For a specific site the frequency of groundings varied widely from year to year. Of the 40 icebergs tracked by satellite telemetry, only three were never grounded. The grounding durations were up to 100% of the tracking time with an average value of 47%. About half of the icebergs tracked by well-site and shore-based radars were grounded for periods of longer than two days. The longest grounding duration was 31 days for the well-site data, and 295 days for icebergs tracked by satellite. About 75% of the grounded icebergs had masses in the range one to 20 million tonnes. The largest iceberg grounded in the Labrador Sea had a mass of 25 million tonnes while a grounded iceberg in Baffin Bay was reported to have a mass of 54 million tonnes. ... Very few grounding events could be identified in the Grand Banks area owing to the lack of adequate iceberg tracking data for this area. (Au)

414

**The factors controlling iceberg drift and design of an iceberg drift prediction system** / Fenco Newfoundland Limited. Canada. Atmospheric Environment Service [Sponsor].
[Downsview, Ont. : Environment Canada, Atmospheric Environmental Service], 1982.
217 p.
Citation from: Ships navigating in ice : a slected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184020.*

Fenco Newfoundland Limited completed an extensive review of field and theoretical studies on iceberg behaviour, and factors controlling iceberg motion was carried out. Long-term and short-term behaviour of icebergs was critically examined. A quantitative assessment of the effects of the factors controlling iceberg motion was presented. Based on the findings of the study a comprehensive computerized forecast system to predict the drift of iceberg ensembles off Canada's east coast has been designed. (Au)

415

**Iceberg deterioration study** / Fenco Newfoundland Limited. Canada. Atmospheric Environment Service [Sponsor].
[St. John's, Nfld. : Fenco Newfoundland Ltd.], 1983.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184055.*

Fenco Newfoundland Limited undertook a study of the iceberg deterioration process off Canada's east coast and developed an operational model to predict iceberg deterioration rates on a daily basis. Based on an extensive review of the literature a computerized deterioration model was developed. The computer program, BERGMELT, can be used for prediction or hindcast analysis of iceberg mass loss under different combinations of steady or unsteady environmental conditions. Model simulations of the deterioration of three icebergs in the Grand Banks/Labrador Sea area off Canada's east coast were compared with observations. A quantitative assessment of the deterioration of icebergs in the Grand Banks/Labrador Sea area was also carried out. (Au)

416

**Iceberg size and physical/mechanical properties review** / Fenco Newfoundland Limited. Mobil Oil Canada Ltd. [Sponsor].
[St. John's, Nfld. : Mobil Oil Canada Ltd.], 1981.
Proprietary report for Mobil Oil Canada Ltd.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184101.*

Fenco Newfoundland Limited completed a study to provide the necessary input for studies on the viability and design of the production system concepts for the Hibernia oil field. The physical and mechanical properties of icebergs, iceberg drift-velocity, and the size parameters of icebergs were investigated. (Au)

417

**Iceberg stability** / Fenco Newfoundland Limited. Petro-Canada Exploration Inc. [Sponsor].
[St. John's, Nfld. : Fenco Ltd.], 1982.
Proprietary report for Petro Canada Exploration Inc.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report –

Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184110.*

Fenco Newfoundland Limited undertook detailed analysis on the data collected during the 1980 drilling season to develop criteria for determining iceberg stability, investigate the correlation between iceberg draft and above-water shape, study the relative effects of the different environmental forces on icebergs, check the accuracy of existing models for iceberg drift prediction and make recommendations for improvements to the models. The effects of stability and sea state on towing and tow effectiveness with respect to tow force and cost were addressed. (Au)

**418**
**Study of iceberg properties** / Fenco Newfoundland Limited. Mobil Oil Canada Ltd. [Sponsor].
St. John's, Nfld. : Fenco Ltd., 1982.
Proprietary report for Mobil Oil Canada.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184136.*

A study was carried out by Fenco Newfoundland Limited to obtain data on the mechanical and physical properties of icebergs. A field program was undertaken during which in situ measurements were made and ice specimens were collected. Field activities included borehole jack strengths tests, ice core temperature measurement, and iceberg size measurement. The samples were transported to St. John's where laboratory testing of specimens was carried out. Laboratory tests included flexural strength, uniaxial compressive strength, triaxial compressive strength and direct shear strength. (Au)

## FILLON, R.H.

**419**
**Grain-size variations in North Atlantic non-carbonate sediments and sources of terrigenous components** / Fillon, R.H. Full, W.E.
(Marine geology, v. 59, no. 1/4, 1984, p. 13-50, ill., maps)
References.
*ASTIS document number 171980.*
ACU

Fine-silt to medium-sand grain-size spectra of the carbonate-free fractions of 115 sea bed samples from the northern North Atlantic, the Labrador Sea and Baffin Bay can be explained as mixtures of five distinct end-members. The five end-members resemble combinations of grain-size modes which are characteristic of till-matrix (Dreimanis and Vagners, 1972). Therefore the ultimate source of most of the terrigenous deep-sea sediments in the study area is probably the veneer of glacial comminution products of the surrounding continents. Three sand-rich end-members exhibit patterns of distribution that are largely compatible with the modern transport of ice-rafted debris as inferred from iceberg drift observations. ... Ice-rafting by icebergs calved from Greenland glaciers, the reworking of glacigenic sediments on the Iceland-Faeroes Ridge and injection of turbid glacial meltwater into deep Baffin Bay from West Greenland fiords are suggested as the principal means of introduction of clastic particles into the sediment distribution (redistribution) budget of the deep North Atlantic. (Au)

**See also:** 1059.

## FINDLAY, A.

**See:** 196.

## FINLAYSON, D.

**See:** 792.

## FINLEY, J.C.

**See:** 132.

## FINNEY, G.

**See:** 492.

## FISSEL, D.B.

**See:** 133, 135, 138, 711.

## FJELD, S.

**420**
**Safety evaluations of field development concepts** / Fjeld, S.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 292-302, ill.)
*ASTIS document number 178047.*
NFSMO

Procedures and acceptance criteria for safety evaluations of field development plans at conceptual design level are summarized. Main hazards to be considered, site specific for the Hibernia field, have been discussed together with possible measures for protection against these hazards. Apart from iceberg collison it seems that ship collisions, evacuation of the crew in accidental conditions and accidental oil pollution should be paid special attention. (Au)

## FLOW RESEARCH INC.

**See:** 549.

## FOLDVIK, A.

**421**
**Flow around icebergs** / Foldvik, A. Gammelsrod, T. Gjessing, Y.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 67-70, figures)
(Publication – Norwegian Antarctic Research Expeditions (1978-79), no. 25)
References.
*ASTIS document number 61093.*
ACU, NFSMO

During the Norwegian Antarctic Research Expedition 1978-79, two

experiments were carried out to measure flow around icebergs. Drogues were equipped with surface markers constructed to drift with the flow at various levels down to 260 m. They were tracked by a helicopter and a Motorola positioning system. As expected, the surface-layer (0 to 20 m) flow was wind-induced, but even at greater depths a relative motion of a few cm/s between the water and the iceberg was measured. Such measurements are important for the determination of drag on icebergs and for melting and erosion processes. (Au)

422
**Measurements of oscillations and flexure of icebergs** / Foldvik, A. Gammelsrod, T. Gjessing, Y.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 29-30, ill.)
References.
*ASTIS document number 61026.*
ACU, NFSMO

... direct measurements of oscillations were carried out on 15 icebergs using a tiltmeter with an accuracy of ± 10 microrad. The amplitude of the oscillations varied from zero to about 1,000 microrad. The zero amplitude indicates that the berg was grounded .... The observed oscillation periods ranged from 16 to 50 s. The observed oscillation periods and the calculated values based on the dimensions and mean density of the bergs were compared and the results are discussed. The flexure of the berg was measured with a theodolite and stakes. ... (Au)

423
**Measurements of the radiation temperature of antarctic icebergs and the surrounding surface water** / Foldvik, A. Gammelsrod, T. Gjessing, Y.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 19-22, ill.)
(Publication - Norwegian Antarctic Research Expeditions (1978-79), no. 23)
References.
*ASTIS document number 164054.*
ACU, NFSMO

During the Norwegian Antarctic Research Expedition 1978-79, temperature measurements of a number of icebergs and the surrounding surface water were made, using an aiborne precision radiation thermometer. All icebergs were embedded in cold water-masses with temperatures generally below 0 degrees C and thus the observed temperature anomalies were relatively small, Delta T = 1 deg. Examples of the influence of icebergs on the sea surface temperature including a possible example of upwelling will be shown. The temperature of the snow-covered iceberg surface was almost constant with individual variations Delta T = 0.2 deg. Local minima indicative of snow-covered crevasses were observed. (Au)

## FONG, R.K.T.

See: 1053.

## FORT, G.

See: 684.

## FOSSUM, B.A.

See: 594.

## FOTHERGILL, N.

424
**Radar detection of ships in ice strewn waters** / Fothergill, N.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. - [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 100-108)
*ASTIS document number 160261.*
NFSMO, ACU

... This paper will deal with the operational measurements of ships and icebergs using radar. ... [A field trial was conducted in 1971 off the coast of Labrador. The results of the trial are given in this paper]. (Au)

## FRANCESCHETTI, A.P.

See: 236, 237, 238, 304.

## FRAZIER, K.

425
**Is there an iceberg in your future?** / Frazier, K.
(Science news, v.112, no. 19, Nov. 5, 1977, p. 298-300, ill.)
*ASTIS document number 170410.*
ACU

The idea of towing antarctic icebergs to coastal deserts for water in undergoing a strong revival. Some of the enormous technical problems associated with such a task are described: attaching multi-tug towlines, towing, insulating or encasing, cutting into smaller sections, and trapping meltwater. A pilot program of towing two small instrumented antarctic icebergs in tandem the 8,000 mi to southern California has been proposed to test alternative theories of insulation, harnessing and transport as applied to larger icebergs for future use. (ASTIS)

## FREDERKING, R.

426
**Ice behaviour around a small arctic island** / Frederking, R. Sanderson, T. Wessels, E. Inoue, M.
(The Seventh International Conference on Port and Ocean Engineering Under Arctic Conditions. - Espoo, Finland : Technical Research Centre of Finland, 1983, v. 2, p. 875-887, figures)
(DBR paper, no. 1149)
(NRCC - National Research Council of Canada, no. 22804)
References.
*ASTIS document number 130095.*
NFSMO, ACU

Adams Island, 200 m in diameter and about 3 km offshore in Lancaster Sound, has been established as a site for studying ice interaction processes. Preliminary surveys of ice and environmental conditions over the winter 1981/82 showed ice features reflecting a short-term pile-up as well as long-term thrust on the island. Associated ice pressures were in the range 40-400 kPa. Information on first-year ice cover, icebergs and multi-year floes was also collected. (Au)

## FREEMAN, R.F.

427
**Birds eye 6-69, 5-17 September 1969** / Freeman, R.F. Rankin, R.D.
Washington, D.C. : Naval Oceanographic Office, 1970.
iii, 140 p. : ill., maps ; 28 cm.
(Informal report – United States. Naval Oceanographic Office, NOO-IR-70- 12)
Appendices.
*ASTIS document number 171573.*
ACU

BIRDS EYE 6-69 was a regularly scheduled Arctic Ocean ice reconnaissance mission covering the Canadian Archipelago, Baffin Bay, and the area west of Banks Island from 5 to 17 September 1969. Ice observations contained in this report were made under daylight conditions. Weather conditions were excellent west of Banks Island and throughout Parry Channel; conditions elsewhere varied from poor to good. Remnant ice in Baffin Bay exceeded extreme conditions depicted in H.O. Publication 705 (Oceanographic Atlas of the Polar Seas). Parry Channel was ice free from Baffin Bay to near Resolute; however, icebergs existed in eastern Lancaster Sound. Seven to eight oktas of heavily puddled ice existed in Viscount Melville Sound and M'Clure Strait with some refreezing. Lesser concentrations occurred within 30 nautical miles of Prince of Wales Strait. Shelf ice fragments were sighted within the pack ice. The icebreaking tanker SS Manhattan was located near 74 36 N, 104 30 W. Ice data obtained in the Canadian Archipelago and Polar Basin areas during April and May 1969 are also included in this report. (Au)

## FRITZ, S.

428
**Nogle iagttagelser om isforholdene paa Gronlands sydvestkyst [Observations of ice conditions on the southwest coast of Greenland]** / Fritz, S.
(Geografisk tidsskrift, bd. 5, 1881, p. 78-81)
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178837.*

Discussion of the East Greenland Current, icebergs, drifting ice and fiord ice. (AB)

## FUGLEM, M.K.

429
**Iceberg collision probabilities by simulation** / Fuglem, M.K. Hotzel, I.S. Clark, P.
[S.l. : s.n., 1984?].
13 leaves : ill. ; 28 cm.
Paper presented at the Specialty Conference on Computer Methods in Offshore Engineering, Halifax, N.S., 1984.
References.
*ASTIS document number 177997.*
NFSMO

Oil and gas production systems proposed for the Grand Banks off Canada's east coast must have means for handling iceberg problems. This can be achieved by designing either to avoid icebergs or to absorb loads arising during collisions. In order to develop a safe and efficient system it is critical to have accurate information on the number of icebergs that will approach a platform and on the sizes, shapes and speeds of these icebergs. Because risks associated with icebergs may be increased by environmental conditions such as waves and visibility these factors must also be considered. The quality of iceberg and environmental data in the Grand Banks is sparse and information on the motions of icebergs in the region is almost non-existent. This paper describes how a computer simulation model was designed to make the best possible use of the data that is available and how it has been applied to preliminary evaluations of production development systems. Uses of the simulator include the estimation of design collision loads for gravity based platforms and evaluation of the downtime to floating systems due to iceberg avoidance. (Au)

## FUHS, A.E.

430
**Experiments involving melting of a large ice block towed in sea water** / Fuhs, A.E. Stolfi, R. Erman, R.J. Clifford, W.F. Denner, W.W. Wang, P.C.C. Bourke, R.H. Griffin, O.M.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 249-264, ill.)
References.
*ASTIS document number 164127.*
ACU, NFSMO

... iceberg life and track prediction require knowledge of the melting rates of fresh water ice moving in sea water. Melting rates were measured by towing a large ice block at a speed of approximately 1 knot .... For an ice block with a length of 16 feet, melting rates ranging from 27.5 in/hour at the bow to 8.1 in/hour at the stern were observed in one test for the following conditions: sea water temperature, 61 degrees F; average tow velocity, 1.5 ft/sec; and a turbulent boundary layer. Ice ripples were observed along the sides of the ice block .... Temperature was measured in the wake behind a large ice block during the towing; the measurements supported a tandem tow of two large ice blocks. ... (Au)

**See also:** 293, 986.

## FUJISHIMA, K.

**See:** 593.

## FULL, W.E.

**See:** 419.

## FURUHOLMEN, T.

**See:** 621.

## GADE, H.G.

431
**Melting of ice in sea water : a primitive model with application to the antarctic ice shelf and icebergs** / Gade, H.G.
(Journal of physical oceanography, v. 9, no. 1, Jan. 1979, p. 189-198, figures)
References.
*ASTIS document number 54330.*
ACU, NFSMO

... The present analysis is an attempt to describe effects of melting ice on sea water under the condition of no convection, i.e., the transfer of salt and heat in the water is confined to molecular and turbulent diffusion. An important consequence of the theory is that

the results are valid also for cases with free convection in the water provided that convection in the boundary layer does not contribute to the heat and salt budgets. ... (Au)

## GAGNON, R.E.

**See:** 434.

## GAKKEL, IA.IA.

**432**

**Instruktsiia dlia proizvodstva nabliudenii nad l'dami s korablia [Instructions for making observations on ice floes from a ship]** / Gakkel, Ia.Ia.

Moskva : Izd-vo Glavsevmorputi, 1944.

48 p.

Third edition of work published in 1939 and 1940, Posibiia i rukovodstva (Handbooks and Manuals) no. 9, issued by the Main Administration of the Northern Sea Route.

Text in Russian.

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 178845.*

Tells what different ice forms look like, how to determine their speed and direction of drift; how to keep an ice log. (AB)

## GAMMELSROD, T.

**See:** 421, 422, 423.

## GAMMON, P.H.

**433**

**Elastic constants of artificial and natural ice samples by Brillouin spectroscopy** / Gammon, P.H. Kiefte, H. Clouter, M.J. Denner, W.W.

(Journal of glaciology, v. 29, no.103, 1983, p. 433-460, figures, tables)

References.

*ASTIS document number 147087.*

ACU, NFSMO

The method of Brillouin spectroscopy has been used to measure the dynamic elastic moduli of local homogeneous regions in ice samples representing four different environments of formation. These included artificial ice frozen from distilled water, clear monocrystalline glacial ice, bubbly lake ice, and sea ice. The samples studied were found to have identical local elastic properties. Accordingly the elastic properties of homogeneous monocrystalline ice have been found not to vary with sample age, with impurities present at the time of freezing, or with crystal quality. The bulk elastic properties of ice remain, of course, subject to modification by different crystal grain textures and the presence of inclusions of various sorts. Because the elastic constants obtained in the present work are subject to smaller overall uncertainty than values measured previously, it is believed that they are the most reliable obtained to date. The values at -16 degrees C were determined to be c11 = 139.29 ± 0.41, c12 = 70.82 ± 0.39, c 13 = 57.65 ± 0.23, c33 = 150.10 ± 0.46, c44 = 30.14 ± 0.11 (units of 100,000,000 N/sq m or kbar). A full range of derived elastic parameters for monocrystalline ice and for homogeneous isotropic polycrystalline ice has been calculated. (Au)

**434**

**Physical and mechanical properties of icebergs** / Gammon, P.H. Gagnon, R.E. Bobby, W. Russell, W.E.

(Fifteenth Annual Offshore Technology Conference 1983, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1983, v. 1, p. 143-150, figures, tables)

(OTC paper, 4459)

References.

*ASTIS document number 127205.*

NFSMO

Physical and mechanical characteristics of iceberg ice were studied from samples collected near the shores of eastern Newfoundland. Although the physical characteristics show considerable diversity, iceberg ice has some common features and is generally porous, lacks significant concentrations of dissolved materials, contains internal cracks and has an irregular interlocking grain structure. A review of mechanical testing of ice was carried out and an experimental setup was devised to reduce effects of improper contact between specimen and loading apparatus. Uniaxial compressive strength for iceberg ice was determined and compared with that for lake ice. The strength of iceberg ice was higher than that of lake ice but Young's Modulus for lake ice was higher. (Au)

**See also:** 543.

## GARRETT, C.J.R.

**435**

**Analysis and prediction of iceberg trajectories** / Garrett, C.J.R. Middleton, J.F. Majaess, F. Hazen, M.

(Iceberg research, 1985, no. 10, Apr., p. 31-32)

Abstract only.

Internal report available from the Dept. of Oceanography, Dalhouse University, Halifax, Canada B3H 4JI, published Feb. 1985, 86 p.

*ASTIS document number 171468.*

ACU, NFSMO

Extensive analyses are carried out on trajectory data from icebergs tracked near five drilling locations off Labrador (Tyrk P-100, Rut H-11, Bjarni O-82, Gudrid H-55, Bonavista C-99). The analyses comprise: (a) tidal analysis of the data and comparison with results derived from nearby current meters; (b) the influence of wind on iceberg motion, by computing the correlation between berg velocity and wind velocity; (c) after removal of the tide, an analysis of mean flow and velocity variance for each drill site, and tests for homogeneity of the data by comparing results from the four quadrants, and for isotropy by examining the correlation between orthogonal velocity components; (d) detailed Eulerian statistics of the residual velocity field relative to the mean flow; (e) a Lagrangian analysis, based on deriving the Lagrangian velocity autocorrelation function for each wellsite. The results provide valuable estimates of horizontal eddy diffusivity on the Labrador Shelf and, in combination with the Eulerian results, provide some insight into the fluid dynamics of the turbulent flow field; (f) Finally, the statistical prediction scheme of Garrett (Iceberg Research 7, 3-7, 1984) is discussed in more detail. (Au)

**436**

**Analysis and prediction of iceberg trajectories** / Garrett, C.J.R. Middleton, J.F. Majaess, F. Hazen, M.

[Halifax, N.S. : Dept. of Oceanography, Dalhousie University, 1985].

86 p., [45] p. of plates : ill., maps ; 28 cm.

Unpublished report obtained from author, C. Garrett, Dept. of Oceanography, Dalhousie University, Halifax, N.S. B3H 4J1.

Appendices.

References.

*ASTIS document number 182893.*
ACU

Moving icebergs constitute a significant hazard for drilling platforms engaged in a search for oil and gas in some offshore regions of Eastern Canada. It is thus of considerable importance to predict the future trajectory of an iceberg .... The oil industry has collected extensive data, over the last decade, on the trajectories of icebergs within about 50 km of numerous drillships off the Labrador coast. We have examined much of this data as part of a study that has had, as its main objective, the determination of an improved prediction scheme for iceberg trajectories. In the course of our work we realized that the data sets contained valuable information of more general oceanographic interest. ... The purpose of the present report is (a) to meet a requirement of the DS and S contract that has provided partial support for our work, (b) to provide some of the results, of our analyses, that are worth preserving but are not of sufficient scientific interest for publication in detail in scientific or engineering journals, and (c) to describe techniques and results that are not as complete or well-developed as we would like, but which should provide useful guidance for anyone embarking on a similar study. (Au)

**437**
**Statistical prediction of iceberg trajectories** / Garrett, C.J.R.
(Iceberg research, 1984, no. 7, Mar., p. 3-7)
References.
*ASTIS document number 157740.*
ACU, NFSMO

... The purpose of this short note is to point out that, if the statistics of iceberg motion, such as autocorrelations of velocity for a single iceberg, or cross-correlations of the velocities of different icebergs, are known from analysis of many trajectories, then a standard statistical approach leads to formulae for the optimum estimate of the future velocity, or position, of an iceberg. Just as importantly, this approach also provides a value for the root mean square error to be expected if the optimum formula is used. In particular, it will be shown that if the trajectory or an iceberg is being predicted using only the previous trajectory, and if the autocorrelation function for the iceberg velocity falls off exponentially with increasing time lag (as is approximately true if one removes tidal and inertial currents), then the optimum prediction and its root mean square error assume simple forms that clearly illustrate the strengths and limitations of the statistical approach. ... (Au)

**438**
**Statistical prediction of iceberg trajectories** / Garrett, C.J.R.
(Cold regions science and technology, v. 11, no. 3, Nov. 1985, p. 255-266, ill.)
References.
*ASTIS document number 182842.*
ACU, NFSMO

The unpredictability of low frequency currents in the ocean reduces the practicality of iceberg trajectory prediction using deterministic models. However, an optimum statistical model may be developed in which the future velocity of an iceberg (other than the predictable part due to wind, mean flow or tides) is a weighted sum of previous (measured) velocities. The weights are related to the Lagrangian velocity autocorrelation function. The scheme may be used to predict error bars as well as future positions. The theory is outlined in this paper and extended to allow for noise and inertial waves. For appropriate parameter values it is found that there is little value in using more than a one-term predictor, i.e. one based solely on the most recently measured velocity. It is shown how the scheme could also be used to predict, approximately, the probability that a given iceberg will enter a circle of specified radius around a wellsite within a specified time. (Au)

**439**
**Tidal currents and eddy statistics from iceberg trajectories off Labrador** / Garrett, C.J.R. Middleton, J.F. Hazen, M. Majaess, F.
(Science, v.227, no.4692, Mar. 15, 1985, p.1333-1335, ill., map)
References.
*ASTIS document number 171956.*
ACU

Extensive data sets on iceberg trajectories off the coast of Labrador are shown to contain valuable information on tidal currents, the effect of wind on iceberg motion and the properties of the low frequency eddies. Statistical properties of the data can be related to theoretical ideas on two-dimensional turbulence and the relationship of Eulerian to Lagrangian velocity statistics. Spinoffs include an estimate of the cross-shelf mixing rate and a statistical prediction scheme for iceberg trajectories. (Au)

**See also:** 741, 742.

## GASKILL, H.S.

**440**
**Forecasting iceberg drift : a comparative study** / Gaskill, H.S. Terry, B. Riggs, N.P.
(Iceberg research, 1984, no. 7, Mar., p. 8-13, ill.)
References.
*ASTIS document number 157759.*
ACU, NFSMO

The purpose of this note is to describe briefly some results of comparative studies on iceberg drift forecasting presently underway at NORDCO [Newfoundland Oceans Research and Development Corp.] The results are of significance since the information contained in iceberg drift forecasts enters into a variety of decisions affecting operations at an offshore drill site in iceberg infested waters. So far as we know, it is the only such comparative study of the forecasting capacity of various models which resides in the public domain. The forecasting systems being evaluated are the type of mechanistic system driven by environmental data measured at a drill site, a statistically based system proposed by Garrett (1983) and a system developed by the authors. The methodology consists of making about 1000 test forecasts using data collected for Canterra and its partner companies at the South Hopedale well site during the 1983 drilling season. The forecasts are of 12 hours duration, the relevant time period for support of a drilling operation in the area of the Labrador shelf. A number of different statistics which measure the forecasting ability of the various systems have been generated. ... (Au)

**441**
**A new technique for iceberg drift prediction** / Gaskill, H.S. Rochester, J.
(Cold regions science and technology, v. 8, no. 3, Mar. 1984, p. 223-234, figures, tables)
This report appeared prior to publicaiton as a preprint under the title: Ocean currents from iceberg drift.
References.
*ASTIS document number 142069.*
ACU, NFSMO

In this paper we present a preliminary study on a new technique for forecasting iceberg motion. The technique is based on using the past motions of icebergs to generate the currents required by a model for predicting those past observed motions. These currents are then used to forecast the motions of other icebergs passsing through the same area at a later time. In addition, consideration – within the limits of our data set – is given the relationship between the current obtained from the models and the actual currents

present in the ocean. Of particular interest is the spatial variability of the derived currents and the implications of this variability for predicting future iceberg motions. (Au)

442
**New ways to forecast iceberg drift** / Gaskill, H.S.
(Offshore resources, v. 2, no. 3, May/June 1984, p. 25-26)
References.
*ASTIS document number 176575.*
NFSM

With the advent of petroleum exploration activities in Arctic and sub-Arctic offshore waters the threat of an interaction between moving sea ice and/or icebergs with an exploration or production facility has become a real possibility. Most recently, the news, contained reports of sea ice threatening the moored semisubmersible John Shaw on location in the Hibernia field off Newfoundland. For obvious reasons, the operators of the John Shaw and others would like to be able to accurately predict whether sea ice will become a genuine hazard; i.e., will, in fact, move across the site of their operation. Moreover, if the sea ice is to move across the site, they would also like to know when this event will take place so that timely preventive measures can be taken. In the remainder of this article we will discuss some new approaches to ice drift forecasting. While the thrust will be directed at forecasting iceberg drift, many of the techniques discussed could also be applied to forecasting the motion of sea ice. (Au)

443
**A non-deterministic model of populations of iceberg scour depths** / Gaskill, H.S. Nicks, L. Ross, D.I.
[S.l. : s.n., 1985].
[3] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
Abstract only.
*ASTIS document number 163503.*

In this paper a non-deterministic model of iceberg scour depth distributions is developed. The model employs data on an initial distribution of scour depths, annual iceberg scour rates and annual sedimentation rates to generate populations of 'observable' iceberg scour depths, such as can be obtained from present day deep tow seismic data. ... As a test of the predictive capabilities of the model, iceberg scour data from three sites on the Grand Banks are analyzed and an annual scour rate determined. This rate is compared to an annual scour rate derived from iceberg arrival rates and size exceedence data for the region. Very good agreement is found. (Au)

444
**A non-deterministic model of populations of iceberg scour depths** / Gaskill, H.S. Nicks, L. Ross, D.I.
(Cold regions science and technology, v. 11, no. 2, Sept. 1985, p. 107-122, ill., map)
References.
*ASTIS document number 174475.*
ACU, NFSMO

In this paper a non-deterministic model of iceberg scour depth distributions is developed. The model employs data on an initial distribution of scour depths, annual iceberg scour rates and annual sedimentation rates to generate populations of 'observable' iceberg scour depths, such as can be obtained from present-day deep-tow seismic data. Relationships between initial and observed populations are established. These theoretical relationships provide a basis from which a variety of inferences regarding present day iceberg scour rates, depth exceedence probabilities, etc. can be inferred from an existing data base of iceberg scour depths. In particular, we show how these inferences can in turn be used to generate design criteria for pipelines and gloryholes in seabeds subject to scour from icebergs or sea ice. As a test of the predictive capabilities of the model, iceberg scour data from three sites on the Grand Banks are analysed and an annual scour rate determined. This rate is compared to an annual scour rate derived from iceberg arrival rates and size exceedence data for the region. Very good agreement is found. (Au)

445
**Tactical iceberg management II - drift forecasting** / Gaskill, H.S. Terry, B.
(Iceberg Management in Offshore Exploration, Production and Transportation. - [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 37-80, ill.)
References.
*ASTIS document number 155101.*
NFSMO

Iceberg management in support of offshore drilling operations is essentially a problem of managing information and resources: one collects iceberg position data and environmental data and from this data extracts information on how best to utilize the resource of the iceberg towing vessel so as to keep icebergs clear of the drilling location. This paper discusses the role of the ice management specialist, with particular reference to the use of drift forecasting models as an aide in determining the optimal allocation of resources. Drift forecasting from a regional, as well as local, perspective will be described. Several theoretical approaches to iceberg drift modelling will be reviewed. Operational problems encountered by an ice management specialist will be discussed, with emphasis on how these problems relate to drift forecasting. The unique approach to real time iceberg drift forecasting, developed by the authors for NORDCO, will be outlined. Case studies, based on the use of the NORDCO forecasting approach in support of drilling operations during the past ice season off Labrador will be presented. Finally, future directions in real time iceberg drift forecasting will be proposed. (Au)

**See also:** 147, 148, 175, 792.

## GATES, A.D.

**See:** 240.

## GEERLOF, H.

**See:** 1096.

## GENKIN, V.A.

**See:** 586.

## GEOMARINE ASSOCIATES LTD.

446
**Bjarni wellsite bathymetry and iceberg scours** / Geomarine Associates Ltd. Eastcan Exploration Ltd. [Sponsor].
Halifax, N.S. : Geomarine Associates Ltd., [1976].
[x], 137 leaves : ill., maps (folded) ; 28 cm.
Appendices.
References.
Seven maps folded in pocket.

*ASTIS document number 149365.*
NFSMO

In August, 1975, Geomarine Associates participated in an iceberg scour and bathymetry study of three well sites on the Labrador Shelf. ... Subsequent to the field survey, Geomarine was contracted to produce a final report of bathymetry and ice scours on the Bjarni Survey Site. The [Bjarni] well site is situated on Makkovik Bank in 139.0 m of water at 55 degrees 30' 29.35" N, 57 degrees 42' 05.52" W, about 65 km from Cape Harrison .... The Bank is one of several separated from the Labrador Coast by the Labrador Marginal Trough and from each other by transverse channels or "saddles." They are composed of thick, Pleistocene deposits overlying Tertiary and older strata. The survey grid is approximately a diamond-shaped area with the long axis of the diamond lying in an east-west direction. The survey was carried out from August 2-6, 1975. A total of 489.2 km of data was retrieved .... From the geophysical data retrieved, maps of contoured bathymetry and iceberg scour locations were produced, originally at a 1:5,000 scale and subsequently at a 1:20,000 scale for easier handling and interpretation. A composite map with bathymetry and scours superimposed at scale 1:20,000 was produced from these. Statistics on iceberg scouring were compiled and presented in tables and appendices and an interpretation made of the results. Included also in the appendices is the side-scan sonar data log for the survey area which was not available in time for inclusion in the Operations Report ... (Au)

**447**
**Gudrid wellsite iceberg scours** / Geomarine Associates Ltd. Eastcan Exploration Ltd. [Sponsor].
Halifax, N.S. : Geomarine Associates Ltd., [1976].
[xi], 116 leaves : ill, maps (folded) ; 28 cm.
Appendices.
References.
Four maps folded in pocket.
*ASTIS document number 149357.*
NFSMO

In August, 1975, Geomarine Associates participated in an iceberg scour and bathymetry study of three well sites on the Labrador Shelf. ... Subsequent to the field survey, Geomarine was contracted to produce a final report of ice scours on the Gudrid Survey Site. The [Gudrid] well site is situated on the Cartwright Saddle in 299 m of water at 54 degrees 54' 30.30" N, 55 degrees 52' 32.22" W. Cartwright Saddle is one of a series of troughs linking the Labrador Marginal Trough ... to the continental slope and dividing the Labrador shelf up into a series of banks. The trough is thought to have been originally formed by river-downcutting during Pleistocene low sea level stands and subsequently overdeepened by glacial action .... The survey grid is approximately a rectangle-shaped area with the long side of the rectangle lying in a north-south direction. The survey was carried out from August 10-12, 1975. ... From the geophysical data retrieved, maps of iceberg scour locations were produced, at a 1:20,000 scale. Statistics on iceberg scouring were compiled and presented in tables and appendices and an interpretation made of the results. Included also in the appendices is the side-scan sonar data log for the survey area which was not available in time for inclusion in the Operations Report .... (Au)

**448**
**Snorri wellsite bathymetry and iceberg scours** / Geomarine Associates Ltd. Eastcan Exploration Ltd. [Sponsor].
Halifax, N.S. : Geomarine Associates Ltd., [1976].
[xii], 130 leaves : ill., maps (folded) ; 28 cm.
Appendices.
References.
Eight maps folded in pocket.
*ASTIS document number 149373.*
NFSMO

In August, 1975, Geomarine Associates participated in an iceberg scour and bathymetry study of three well sites on the Labrador Shelf. ... Subsequent to the field survey, Geomarine was contracted to produce a final report of bathymetry and ice scours on the Snorri Survey Site. The [Snorri] well site is situated on Nain Bank in 141.0 m of water at 57 degrees 19' 44.52" N, 59 degrees 57' 44.37" W, about 90 km from Cape Kiglapait, the nearest land .... The Bank is one of several separated from the Labrador Coast by the Labrador Marginal Trough and from each other by transverse channels or "saddles". They are composed of thick, Pleistocene deposits overlying Tertiary and older strata .... The survey grid is approximately a diamond-shaped area with the long axis of the diamond lying in NE-SW direction. The survey was carried out from August 7-8, 1975. A total of 118.3 km of data was retrieved .... From the geophysical data retrieved, maps of contoured bathymetry and iceberg scour locations were produced at a 1:10,000 scale. Two composite maps with bathymetry and scours superimposed at scale 1:10,000 were produced from these. Statistics on iceberg scouring were compiled and presented in tables and appendices and an interpretation made of the results. Included also in the appendices is the side-scan sonar data log for the survey area which was unavailable when the operations report was written. (Au)

## GEONAUTICS LIMITED

**449**
**Side scan sonar survey Hekja site and vicinity** / Geonautics Limited. Aquitaine Company of Canada Limited [Sponsor].
St. John's, Nfld. : Geonautics Limited, 1980.
[2], 40 leaves : ill. ; 28 cm + 2 charts (folded).
Includes 15 photographs of ice scours.
Charts: Scale 1:10,000.
Report and charts in portfolio.
*ASTIS document number 149918.*

The 1980 Hekja well head site was successfully located in approximately 350 meters using a sidescan sonar. After a careful assessment of each line, layback corrections were made in relation to seabed features, to the well head (1979 and 1980) and to an older known well attempt (1979). Even though the prevailing currents and tidal streams dramatically influenced the scanning positions of the sonar fish, the final corrected version of the survey lines is most precise. The high illustrative quality of the sonograms provided an excellent record of the scour nature around Hekja. Of the 281 scours interpreted 48.4% were longer than 500 meters, 63.0% were deeper than 1.5 meters and 59.5% had widths in the range of 20 to 30 meters. The dominant orientation is NE - SW (concordant to the currents). Exceptionally good examples of iceberg ground marks are observed. The overall data provides an impressive base for future analyses, especially in reference to exploration installations in the deep waters of the northern sites. (Au)

## GEORGI, J.

**450**
**Otto Fabricius und andere uber die Eisverhaltnisse auf Gronland mit einem Exkurs auf den Jakobshavner Gletscher [Otto Fabricius and others on the ice conditions on Greenland, with an excursion to Jakobshavns Isbrae]** / Georgi, J.
(Polarforschung, bd. 4, heft. 1/2, 1960, p. 79-91, ill., map)
References.
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180181.*
ACU

Translation into German of p. 407-411 of No. 39758 with explanatory remarks and comments on some of the iceberg descriptions in view of more recent investigations; also excerpt from the German version of Poul Egede's No. 4369, on iceberg

observations in Jakobshavns Isfjord. (AB)

## GEORGIA INSTITUTE OF TECHNOLOGY

**451**

**Radar reflectivity of sea targets, volume 1** / Georgia Institute of Technology. Corriher, H.A. Berry, O.P. Weatherington, R.D. Abeling, A.B. United States. Office of Naval Research. Air Programs [Sponsor].

Washington, D.C. : Dept. of Navy, Office of Naval Research, Air Programs [publisher] ; Springfield, Va. : NTIS [distributor], 1967.

2 microfiches : ill. ; 11 x 15 cm.

(NTIS AD-829-538)

Appendices.

References.

*ASTIS document number 174106.*

NFSMO

Volume I of this two-volume survey presents a broad overview of the state of knowledge of radar reflectivity of sea targets. All forms of targets are considered, including ships and boats, submarines, periscopes and snorkels, wakes, buoys, icebergs, and splashes. Also discussed are the statistical properties of returns, glint, and camouflage. Several approximate theories which have been advanced to explain the radar return of sea targets are reviewed and compared, and additional theoretical work is reported which indicates that there are serious limitations inherent in the commonly used coherent model. The effective cross-section of a target on a reflective surface is emphasized as being the product of the inherent ("free space") cross-section times F4, the fourth power of the pattern propagation factor. Suggestions ... made for interpreting World War II cross-section varies for present-day systems studies. It is recommended that extensive experimental measurement data be obtained on a few targets rather than fragmentary data on many targets. This should lead to better understanding of the general problem and, eventually, to possible techniques for predicting the radar cross-sections of sea targets. (Au)

## GERMAN & MILNE (FIRM)

**See:** 411.

## GERWICK, B.C.

**452**

**Development of a structural concept to resist impact from multiyear ice floes, ridges, and icebergs** / Gerwick, B.C. Potter, R.E. Rojansky, M.

(Sixteenth Annual Offshore Technology Conference 1984, proceedings. - Dallas, Tex. : Offshore Technology Conference, 1984, v. 3, p. 193-201, ill., map)

(OTC paper, 4799)

References.

*ASTIS document number 163902.*

NFSMO

Large multi-year ice features and icebergs may have masses ranging up to 20 million tons or more and may move in the open water at speeds up to 1 knot, thus developing tremendous kinetic energy. A stepped structure concept has been developed to resist these impacts and to transfer the resultant forces and moments into the foundation thus developing a relatively high concentrated reaction force against the ice tending to spall and split it, thus causing a multi-modal failure of the ice, as well as using up kinetic energy at a relatively controlled rate. Calculated ice forces and ice failure modes will be presented. ... (Au)

## GIDNEY, G.

**See:** 164.

## GILBERT, G.R.

**453**

**Provenance and sedimentary processes of ice scoured surficial sediments, Labrador Shelf** / Gilbert, G.R. Barrie, J.V.

(Program with abstracts – Geological Association of Canada (1980), v. 8, 1983, p. A75)

Abstract only.

*ASTIS document number 148750.*

ACU, NFSMO

Iceberg scour marks are evident over much of the Labrador Continental Shelf. The preservation/degradation potential of these features depends on the nature of surrounding sediments and the intensity of the hydrodynamic forces they are exposed to. Mineralogical and textural analysis of grab samples from southern Saglek and Makkovik Bank reveal information concerning sediment provenance and post-glacial sedimentary processes affecting these ice scoured surficial sediments. Heavy mineral and lithic fragment analysis indicate sediment origin from Precambrian terrains of Labrador, evidenced by igneous and high grade metamorphic rock assemblages. Clastic sedimentary and low grade metamorphic rocks are notably absent. Fossiliferous carbonate fragments identify a secondary sediment derivation from northern Greenland and/or the Canadian Arctic Islands through iceberg rafting. The sedimentary environments of Saglek and Makkovik Bank differ based on hydraulic equivalence relationships, texture, acoustic geophysical data and submersible observations. Southern Saglek represents a low energy environment with little evidence of sediment reworking except towards the seaward Bank margin. The well defined dense distribution of linear and curvilinear iceberg scours are well preserved. Conversely, the areally smaller and shallower Makkovik Bank is intensely disturbed by short linear and pit scours. Degradation of the scour marks by hydrodynamic reworking is evident and can be predicted from hydraulic equivalence relationship of the surficial fine sand sediment. (Au)

## GILLESPIE, R.T.

**See:** 588, 818.

## GIRARD, D.

**454**

**Underwater inspection of icebergs** / Girard, D.

(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 283-289, ill.)

*ASTIS document number 161888.*

ACU, NFSMO

During different phases of iceberg utilization, it will be necessary to gather and maintain an accurate knowledge of the submerged part of the iceberg. This would involve divers, manned submersibles and remote-controlled vehicles. These three different means of going below the surface of the seas would bring an important contribution to the successful utilization of icebergs. (Au)

## GIVEN, D.

**455**
**More performance and scope from latest RCVs** / Given, D.
(Offshore services, v. 12, no. 6, June-July 1979, p. 49-51, ill.)
*ASTIS document number 173258.*
NFSM

Recent technological advances, work capabilities, and remaining design weaknesses and possible solutions are discussed. Of the 65 or so systems available, nearly 1/2 appeared in the past year. Greatest use is for remote underwater viewing. Various recent models and their capabilities are described. "NORDCO, Canada, is testing the feasibility of an unmanned vehicle to provide sub-surface profiling data on icebergs. Since icebergs may ground and destroy equipment on the sea bottom, the offshore oil industry requires iceberg draught data to estimate the probability of such a problem. Should the iceberg present that risk, it could be towed or pushed to a "safe" course. Finally, the vehicles will be asked to do more undersea work such as removal of debris or recover equipment. Several models equiped with manipulators are obviously capable to do such work." (ASTIS)

**456**
**Remote vehicles extend their global track record** / Given, D.
(Offshore services and technology, v. 13, no. 5, May 1980, p. 27-31, ill.)
*ASTIS document number 173304.*
NFSM

[Recent designs in unmanned, submersibles, remote control vehicles (RCV) are surveyed with emphasis on their activities. Generally, the trend is away from all-purpose to specific-purpose designs. Tasks range from torpedo and other ordinance recovery, measurement of iceberg drafts clearing pipeline right-of-way and placing bottom charges, to a variety of bottom search, survey, recovery, and work operations. Designs of various models are reviewed.] ... More concerned about giant icebergs floating down the Labrador Strait and through the promising oil and gas fields off the Canadian coast, NORDCO, St. John's, Newfoundland, successfully demontrated that an iceberg's draught could be measured accurately using an unmanned vehicle. Once the extent of the submerged portion is determined and a projected track is plotted, the potential hazard to undersea offshore equipment can be assessed. Should there be a strong possibility of interference and damage, the iceberg could be towed or pushed to a new and safe course. NORDC conducted this notable demonstration with a Scorpio vehicle ... with slight modifications to its sonar system. ... (Au)

## GJESSING, Y.

**See:** 421, 422, 423.

## GLOERSEN, P.

**See:** 250, 251, 1135.

## GLYNN, J.E.

**See:** 515, 516.

## GOBLOT, R.

**457**
**Le detournement des icebergs [Diverting icebergs]** / Goblot, R.
(Quebec science, v. 16, no. 5, Jan. 1978, p. 36-40, ill.)
Text in French.
*ASTIS document number 181994.*
QQUQ

Diverting masses of ice several million tonnes represents a considerable challenge for the petroleum industry. This overview discusses the ways in which some of the research, past and present, undertaken by petroleum producers, attempts to manage icebergs: iceberg towing, prediction models, iceberg fragmentation, early warning detection systems, and iceberg draft measurement using sonar. (ASTIS)

**458**
**Diverting icebergs from Labrador oil rigs** / Goblot, R.
(Canadian geographical journal, v. 94, no. 3, June/July 1978, p. 52-57, ill. (part. col.))
*ASTIS document number 2607.*
ACU, NFSMO

This paper describes how oil exploration companies tow away icebergs that threaten their oil rigs. It also describes the drift of icebergs, their size and numbers found in the North Atlantic. (ASTIS)

**459**
**Les icebergs, menace du petrole offshore [Icebergs, menace to offshore oil]** / Goblot, R.
(Geos (Ottawa), 1977 [3] Fall, p. 9-11, col. photos.)
English summary.
Text in French.
*ASTIS document number 418.*
ACU, NFSMO

An unpredictable danger in offshore drilling is the passing of icebergs in the exploration area. Each rig has to cope with as many as 30 icebergs during a normal drilling season, and with the problems of expensive operation shutdown or the loss of costly equipment. What do crews do when danger is close: just hope the 100,000 ton iceberg, moving at 15 km per day, will pass by, move the rig quickly, or tow the iceberg away. ... (Au)

## GODDARD SPACE FLIGHT CENTER

**See:** 847.

## GOEDECKE, E.

**460**
**Die aussergewohnliche Nordatlantische Eissaison 1957 [The unusual North Atlantic ice season 1957]** / Goedecke, E.
(Seewart, bd. 19, heft 1, Feb. 1958, p. 26-31, maps)
References.
Text in German.
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180092.*

Compares the number of bergs observed south of 44 N between 45 and 55 W during each year 1950-1957, and tabulates the southernmost positions. (AB)

## GOMINHO, L.

**See:** 1055.

## GOODMAN, D.J.

**461**
**The flexural response of a tabular ice island to ocean swell** / Goodman, D.J. Wadhams, P. Squire, V.A.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 23-27, figures)
References.
*ASTIS document number 61018.*
ACU, NFSMO

Measurements of surface strain and vertical heave responses to swell were made on a tabular ice island in Kong Oscars Fjord, east Greenland, in September 1978. ... The results show that the ice island flexes and heaves in response to the longest component only of the forcing wave field, at periods above 16 s, and with a mean strain amplitude of the order of 5 x .0000001. The results are compared with theoretical calculations of the response of a thick floating beam. In the light of the theory, the flexural behaviour of tabular icebergs and sea-ice floes is considered and their critical size ranges in relation to sea state are estimated. (Au)

## GOODMAN, R.H.

**462**
**Radar techniques in the measurement of floating ice thickness** / Goodman, R.H. Outcalt, E.E. Narod, B.B.
(4e Symposium canadien sur la teledetection a l'hotel Loews le Concorde, a Quebec, May 16, 17, 18, 1977 = 4th Canadian Symposium on Remote Sensing at Loews le Concorde, Quebec, May 16, 17, 18, 1977. - Ottawa : Canadian Aeronautics and Space Institute, 1977, p. 459-462)
References.
*ASTIS document number 182311.*
ACU

Two models of airborne downward looking radars have been used to measure sea ice thicknesses. An experimental 36 cm high power directional radar developed at the University of British Columbia, and a GSSI "ESP" radar were mounted on a Puma helicopter to measure ice thicknesses off of the Labrador coast. The capabilities of each system were investigated to measure sea ice thickness. The 36 cm radar's capabilities were studied with particular application to thick multiyear ice and iceberg measurements, while the GSSI radar's capabilities were investigated with emphasis on the measurement of thinner ice, below the minimum range of the 36 cm radar. Typical data will be presented and analysed. (Au)

**See also:** 501.

## GOODWIN, C.R.

**See:** 132.

## GRAHAM, A.H.

**463**
**Radar aids detection of floating ice** / Graham, A.H.
(Air-sea safety, v. 1, no. 2, Dec. 1946 - v. 2, no. 1, Jan. 1947, p. 12-15, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178853.*

Account of a U.S. Coast Guard mission in the ice patrol seasons 1945-46, to collect quantitative data as to the operational and technical performance of electronic equipment in the detection of floating ice, with summary of the conclusions reached. (AB)

## GRAHAM, B.

**See:** 302.

## GRAHAM, J.W.

**See:** 296.

## GRANDE, N.

**464**
**Iceberg stability and draft changes** / Grande, N. Guillaud, Ch.
(Proceedings : Third International Specialty Conference Cold Regions Engineering "Northern resource development", April 4, 5 and 6, 1984, Edmonton, Alberta / Edited by D.W. Smith. - Montreal : Canadian Society for Civil Engineering, 1984, v. 1, p. 459-471, ill.)
References.
An errata can be found in volume 3 on pages 1180-1187, illustrations included.
*ASTIS document number 177245.*
NFSMO

... In the past, it was assumed that icebergs with drafts in excess of the maximum bathymetric depth would be stranded until such time as the iceberg lost enough mass, by means of ablation to allow it to float clear. However, with the use of the side scan sonar, scour marks have been found in bathymetric "valleys". For an iceberg to scour in water deeper than its draft at the time it crossed the bathymetric rise, something must have caused the iceberg to change its orientation in the water to a new stable position with increased draft. This paper will analyze the problem, determine the methods by which such a phenomena may occur, and quantify the draft changes that may be expected. A computer model was developed to analyze the stability and energy conditions of a floating body. This model was used to determine the possible stable conditions as well as the energy needed to rotate an iceberg from one stable position to another. Four basic iceberg shapes (tabular, wedge, pyramid and drydock) and two draft change mechanisms (interaction with the sea bottom and calving) were analyzed. The method described in this paper may be applied to any site with relative ease. (Au)

## GRANT, A.C.

**465**
**Comments on surficial aspects of the Labrador Shelf region** / Grant, A.C.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. - [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 3-15, ill., maps)
*ASTIS document number 160156.*
NFSMO, ACU

This talk deals with surficial aspects of the continental shelf off

Labrador and eastern Newfoundland. In terms of the iceberg hazard in this region the submarine physiography and the nature of the surficial deposits will be crucial factors in the design of any permanent sea-floor installation. (Au)

## GRANT, D.A.

**466**
**Iceberg tracking off the Labrador coast by aircraft of Maritime Command, 1970-1971** / Grant, D.A.
Halifax, N.S. : Maritime Command, Operational Research Branch [publisher] ; Springfield, Va. : NTIS [distributor], 1971.
1 microfiche : ill. ; 11 x 15 cm.
(Report - Maritime Command. Operational Research Branch, no. 8/71)
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. - [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 62-79, ill., maps)
Annexes.
Appendix.
References.
*ASTIS document number 161713.*
NFSMO

This report gives an account of iceberg tracking off the Labrador coast during selected periods in July 1970, and in July 1971. The iceberg marking and tracking was carried out by Canadian Forces Argus and Tracker aircraft of Maritime Command. The iceberg rate of movement observed in 1970 was approximately one knot, but in 1971 there was no discernible movement by any of the icebergs marked for tracking observations. The density of icebergs also appeared to be significantly higher in 1971 than in 1970. A description of the various types of iceberg marking dye used during 1970 and 1971 is given. Conclusions regarding the most suitable dyes for marking and for durability have been drawn. (Au)

## GRAVES, G.V.A.

**467**
**International Ice Patrol** / Graves, G.V.A.
(Marine observer, v. 23, no.160, 1953, p. 109-110, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179736.*
NFSCF

Contains brief survey of duties of the Patrol. Ice observation and oceanographic work are carried out by U.S. Coast Guard with two B-17 bombers and a cutter; merchant ships provide additional information. Twice-daily bulletins are broadcast to shipping during the ice season. Charts of sea surface temperatures and currents are prepared and oceanographic surveys made in Baffin Bay and Labrador Sea. Records of icebergs calving from West Greenland galciers and of those drifting south of 48 N are kept. Investigation of sensitivity of radar to ice is being made. (AB)

## GRAY, A.L.

**468**
**The influence of incidence angle on microwave radar returns of "targets" in an ocean background** / Gray, A.L.
Hawkins, R.K. Livingstone, C.E. Lowry, R.T. Larson, R.W. Rawson, R.F.
(Proceedings of the Thirteenth International Symposium on Remote Sensing of Environment, 23-27 April 1979, Ann Arbor, Michigan. - Ann Arbor, Mich. : Environmental Research Institute of Michigan, 1979, v. 3, p.1815-1837, ill.)
References.
*ASTIS document number 177288.*
ACU, NFSM

Signal-to-clutter ratios (SCR) have been measured as a function of incidence angle and polarization for a number of icebergs and ships. This has been accomplished using a dual polarized, fan beam doppler scatterometer and the ERIM X/L synthetic aperture radar (SAR). Diagrams illustrating the peak signal to average clutter for two bergs measured with the scatterometer have been plotted as a function of incidence angle. This has been complemented by SCR measurements made with the X/L SAR for specific bergs under different conditions. Using the known (Jones et al, 1977) dependence of average back-scatter on wind speed, the SCR for a model berg has been estimated as a function of wind speed. These results illustrate clearly the difficulty of detecting icebergs in high sea states using a satellite radar with a relatively small incidence angle. Ship backscattering data is presented which shows that, although ships normally appear to be better reflectors of microwave radiation than icebergs, the signal-to-clutter ratio can still be quite low for small values of incidence angle. The variability and statistics of the radar cross section of either ships or icebergs is not well understood and, consequently, an accurate description of detectability as a function of incidence angle and sea conditions is, as yet, difficult to obtain. (Au)

**See also:** 141, 812, 892, 1092.

## GRAY, E.

**469**
**East coast prospects examined** / Gray, E.
(Offshore, v. 22, no. 3, Mar. 8, 1971, p. 26-29, 49, ill., maps)
*ASTIS document number 168882.*
ACU, NFSMO

Geology and petroleum prospects of continental shelf off the Atlantic Coast, stretching 3,500 miles from the Gulf of Maine to the head of Baffin Bay in the more than half a million square miles of Arctic, were examined in 38 technical papers presented to Earth Science Symposium on offshore eastern Canada .... Papers and keynote addresses outlined the economic and strategic implications of potential petroleum resources off the east coast; provided further indication of large petroleum potential; focused attention on the potential of a new area of interest, Baffin Bay strectching between Baffin Island and Greenland (but failed to discuss the problems of exploring and producing an area ice covered most of the year) and claimed that restrictive national policies could seriously retard economic development of the potential offshore petroleum resources. ... Some indication of the still unsolved problems of oil exploration and production posed by the hazard of icebergs over much of the continental shelf off the east coast was outlined at the symposium by Jean Duval [who recognized, that to drill safely in the eastern offshore, new technology and drilling techniques will have to be devleoped. He feels the best concept for iceberg waters would be a self-propelled semi-submersible with dynamic positioning. He also recognizes the importance of iceberg detection and early warning systems along with an effective iceberg towing program. He recognizes iceberg scouring as the most serious problem to be considered in the protection of wellhead equipment from icebergs that grind along the seafloor, and recommends the breakup of all icebergs that could ground on the field.] (Au)

## GRAY, L.

**470**
**Depression angle study, SURSAT report, no. 2** / Gray, L.
(SURSAT Ice Experiment report : Surveillance Satellite

Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.7, [15] p., ill.)
Microfiche.
References.
*ASTIS document number 178373.*
ACU

Off shore oil or gas production will not be feasible without weather and hazard information which should include repetitive mapping and tracking of icebergs and sea ice as well as meteorological and sea state information. The safety and efficiency of shipping in the Arctic, off the Canadian east coast and off Greenland depends also on timely weather and sea ice information. Imaging radar systems are not viewed, correctly, as an essential element in providing this information. Whether in fact a particular radar can adequately fulfil its desired function depends upon the parameters which describe the radar. This SURSAT report is concerned with the influence of one such radar parameter, the depression angle, on the usefulness of the radar imagery for civilian, coastal, ocean and sea ice reconnaissance. The objectives of the SURSAT experiment (#79) were twofold: (a) To measure the contrast or signal to clutter ratio (SCR) of "targets", particularly ships and icebergs in the ocean as a function of depression angle. (b) To examine the relative merits of steep (satellite, >10 degrees) versus shallow (aircraft, <5 degrees) depression angle radar imagery for sea ice mapping. ... (Au)

**471**
**West Greenland Sea Ice Experiment SURSAT report, no. 1** / Gray, L. Gudmandsen, P. Overgaard, S. Skou, N. Sondergaard Pedersen, F.
(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.6, [40] p., ill.)
Microfiche.
References.
*ASTIS document number 178365.*
ACU

On 10 April 1979 five aircraft, a helicopter and the Danish vessel "Ingolf" participated in a very successful Danish, Canadian, American and British remote sensing experiment. The initiative and planning for the West Greenland Sea Ice Experiment had been carried out by the Technical University of Denmark in order to study and demonstrate the capabilities of different microwave remote sensors to provide information of the extent, type and thickness of sea ice [especially icebergs], particularly to those concerned with shipping. ... This experiment represents one of the few undertaken in the marginal ice zone under conditions typical of those which can be encountered by shipping along the west coast of Greenland. This is, of course, important to both Canada and Denmark as being the proposed route for the transport of natural resources, even liquified natural gas, out of the Canadian Arctic. ... (Au)

**See also:** 894.

## GREAT BRITAIN. METEOROLOGICAL OFFICE

**472**
**Marine observer** / Great Britain. Meteorological Office.
Vol. 1 (Jan. 1924)- .
London : Published for the Meteorological Office by H.M. Stationary Office, 1924- .
v. : ill., maps ; 25-32 cm.
Quarterly.
References.
Partial contents: The marine observers' log .... – Aurora notes .... – Ice conditions in areas adjacent to the North Atlantic Ocean ....
*ASTIS document number 173983.*
NFSCF

The Marine Observer is a quarterly periodical. Each issue contains sections on "Ice conditions in areas adjacent to the North Atlantic Ocean", "Aurora notes", and "The marine observers' log". Charts display the actual and normal ice edges, sea-surface and air temperatures and surface pressure anomalies so that the abnormality of any month may be readily observed. Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). Abnormally frequent sightings in any given month are discussed. (ASTIS)

## GREELY, A.W.

**473**
**Arctic exploration, with reference to Grinnell Land** / Greely, A.W.
(Proceedings – Royal Geographical Society, new ser., v. 8, Mar. 1886, p. 156-176)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178861.*
ACU

Lecture delivered extemporaneously before the society, Dec. 1885, followed by discussion from the members, p. 172-76. Includes views on the boundaries of Grinnell Land (then not known to be part of Ellesmere Island), on its glaciers and their role in the iceberg complex of northern waters, and a moving account of the hardships and the perils endured by members of the Lady Franklin Bay Expedition, 1881-1884. (AB)

## GREEN, H.P.

**474**
**Geotechnical modelling of iceberg-seabed interaction** / Green, H.P.
[St. John's, Nfld.] : Memorial University of Newfoundland, 1984.
xv, 165 leaves : ill. ; 28 cm.
Appendices.
Bibliography.
Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1984.
*ASTIS document number 149160.*
NFSMO

... In this thesis an experimental approach was taken to physically model the iceberg scour process in a 14 m x 3 m x 1 m towing tank. Cohesionless soil at a uniform slope and with controlled properties was used as the representative seafloor material. Iceberg models 500 mm wide and a pipeline model 122 mm diameter were instrumented and used in a test programme aimed primarily at examining the interaction of the iceberg model and the soil and delineating the influence of the scour process below the incision depth. ... The tests indicate that the zone of soil disturbance extends below the keel of the scouring iceberg. This zone of influence should be accounted for in the design of all buried installations in the Newfoundland and Labrador offshore region. (Au)

475
**Iceberg scouring and pipeline burial depth** / Green, H.P. Reddy, A.S. Chari, T.R.
(The Seventh International Conference on Port and Ocean Engineering Under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 1, p. 280-288, figures, table)
References.
*ASTIS document number 129615.*
NFSMO

Seabed disturbance due to ploughing by iceberg keels is a recognized phenomenon which threatens offshore operations along the Eastern Canadian Continental Shelf. This threat to seafloor installations such as well heads, pipelines and foundations is a factor to be taken into account in the design of production systems. Determining the maximum depth of scour is difficult due to the many variables including iceberg size, stability, driving forces and the geotechnical properties of the seabed. This paper considers the geotechnical aspects of the problem and the evaluation of the seabed resistance to displacement due to ice content. ... Two theoretical approaches to soil resistance, the method of trial wedges and the method of characteristics are compared with experimental results. Another phenomenon of importance during the scour process is the mass disturbance of the soil below the scour. Tests were conducted with an instrumented pipeline model to investigate the effect of iceberg model front face inclination on soil pressures generated below the scour zone. The implications of the result in determining the safe burial depths are discussed. (Au)

476
**Sediment compaction below iceberg furrows** / Green, H.P. Chari, T.R.
(Oceans 81, conference record, volume one : the ocean ... an international workplace, Boston, Massachusetts, September 16-18, 1981. – [New York : Institute of Electrical and Electronics Engineers, 1981], p. 223-227, ill.)
References.
*ASTIS document number 150770.*
NFSMO

Scouring of the seabed by icebergs and ice keels is a phenomenon unique to the cold oceans. The threat to buried offshore structures and installations from such a process is obvious. Laboratory experiments and field observations show that the sediment outside the actual scour is also subjected to some degree of movement, compression and compaction. This paper describes the experiments in the laboratory and the analysis of the pressures measured on a pipeline model buried at different depths below the gouge bottom. (Au)

**See also:** 272, 281.

## GREISMAN, P.

**See:** 622.

## GRENVILLE, D.M.

**See:** 970.

## GRIFFIN, O.M.

477
**Heat, mass and momentum transfer effects on the ablation of icebergs in seawater** / Griffin, O.M.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 229-244, ill.)
References.
*ASTIS document number 161845.*
ACU, NFSMO

... a short review is given of the methods recently developed at NRL [Naval Research Laboratory] for the prediction of the velocity, temperature and salinity distributions which result from the laminar flow, forced convection melting of glacial ice in seawater. This melting model is then employed as the basis for a simple turbulent flow, forced convection model for the ablation of tabular icebergs. Predictions of the melt rate, interfacial salinity and melting temperature depression at various locations along a slab are made for typical values of towing speeds, water temperatures, ice temperatures and salinities likely to be encountered by the NPS investigators. (Au)

478
**Heat, mass, and momentum transfer during the melting of glacial ice in sea water** / Griffin, O.M.
(Journal of heat transfer, v. 95, ser. C, no. 3, Aug. 1973, p. 317-323, ill.)
Paper no. 73-HT-3 presented at the ASME-AIChE Heat Transfer Conference, Atlanta, Ga., August 5-8, 1973.
*ASTIS document number 181838.*
ACU

The velocity, temperature, and concentration distributions near a melting surface of glacial, or pure, ice in saline water are determined for laminar flow conditions using integral techniques. Estimates are made of the relative thicknesses of the momentum, thermal, and mass diffusion boundary layers for a variety of the appropriate flow and thermal parameters. These findings are applied to the melting of glacial ice in sea water, but they also are applicable to other systems in which heat, mass, and momentum transfer occur simultaneously with phase transformation. The speed of sound at constant pressure in sea water is a function of temperature and salinity, and the variation of sound speed with changing environmental conditions plays an important role in underwater acoustic propagation. The results of the heat and mass transfer analyses are employed to determine the sound speed profiles within the temperature and salinity boundary layers near the melting glacial ice for free-stream water temperatures of 5 and 10 deg. C. (Au)

**See also:** 430.

## GROISSMAYR, F.B.

479
**Schwere und leichte Eisjahre bei Neufundland und das Vorwetter [Severe and light ice years in the Newfoundland region and the weather which preceded them]** / Groissmayr, F.B.
(Annalen der Hydrographie und maritimen Meteorologie, bd. 67, Jan. 1939, p. 26-30, ill.)
Text in German.

*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178870.*

Using data from the International Ice Patrol on the ice season on the Newfoundland Grand Banks, 1880-1926, and correlating temperature statistics, the author proposes a formula for forecasting icebergs, based on preceding temperature conditions. (AB)

## GUDMANDSEN, P.

**See:** 471, 677.

## GUHA, S.N.

**See:** 278.

## GUIGNE, J.Y.

**480**
**Review of deep water scours in the Davis Strait and its relevance to present day activity** / Guigne, J.Y. Ross, D.I. Westergard, H.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum - Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 155-167, ill.)
References.
*ASTIS document number 148415.*
NFSMO

... A major objective of the study was to evaluate the extent and nature of iceberg scouring in the area. The deep water and strong currents required a careful assessment of each line to evaluate layback and side movement corrections for the towed fish. The high illustrative quality of the sonograms provided an excellent record of the nature of scouring around the Hekja Wellsite. Of the 281 scours interpreted 48.4 percent were longer than 500 metres, 63.0 percent were deeper than 1.5 metres and 59.5 percent had widths in the range of 20 to 30 metres. The dominant orientation was NE - SW, concordant to the currents. The sonograms provided a surprisingly wide catalogue of distinct iceberg scour marks which suggested at least initially, a range of ages from relict to recent time. However, the absence of observed icebergs with keel depths capable of scouring in these water depths raises serious questions on the relevance of using the physical characteristics of iceberg scours in assessing the question of age. This also questions the reliability of interpreting the relative age of scours found in the shallower areas of the Eastern Canadian seaboard based solely on scour characteristics as interpreted off Sidescan Sonar data. (Au)

## GUILLAUD, CH.

**See:** 464.

## GUNSTON, D.

**481**
**Mastering the iceberg** / Gunston, D.
(Nautical magazine, v.185, no. 4, Apr. 1961, p. 228-231)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180289.*

Describes types of bergs, their frequency in the North Atlantic, hazard to navigation; work of the International Ice Patrol. (AB)

**482**
**Reducing the iceberg menace** / Gunston, D.
(Nautical magazine, v.167, Jan. 1952, p. 21-23)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179973.*

"Approx. 300-400 icebergs from the polar ice mass and Greenland glaciers are recorded annually, having traveled about 1800 mi. over a period of three years, when they reach the shipping lanes. Bergs are most dangerous in June and generally disappear by Aug. Small pieces which have reconsolidated into a flow are called brash, larger pieces: growlers." (AB)

## GUSTAJTIS, K.A.

**483**
**An average spring iceberg density distribution along the Labrador coast** / Gustajtis, K.A. Buckley, T.J.
St. John's, Nfld. : C-CORE, Memorial University, [1977?].
1 map : col. ; 84 x 63 cm. folded to 29 x 23 cm.
Natural scale 1:1,200,000 (Lat. 57 00 N.), Mercator projection.
*ASTIS document number 183962.*
NFSMO

This map was compiled on the basis of 11 northern survey flights by the International Ice Patrol (U.S. Coast Guard) during the months of February, March and April, 1963-1977 along the Labrador coast. The relative concentrations of icebergs are presented ranging from negligible through to extreme. (ASTIS)

**484**
**Iceberg population distribution study in the Labrador Sea** / Gustajtis, K.A.
St. John's : C-CORE, 1979.
ix, 41 p. : ill., 4 maps (in pocket) ; 28 cm.
(C-CORE publication, no. 79- 8)
(Data report - Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
Accompanied by four maps: An average iceberg density distribution along the Labrador coast / K.A. Gustajtis and T.J. Buckley. - Contents: [1] Spring. - [2] Summer. - [3] Fall. - [4] Winter.
References.
*ASTIS document number 29246.*
ACU, NFSMO

The annual flux of between 500 and 2500 icebergs along the Labrador coast, have given this extremely promising hydrocarbon region the dubious distinction of being called 'iceberg alley'. ... This report describes the methodology used to produce distribution maps of icebergs in the Labrador offshore from historical iceberg positional data for the years 1963 to 1976 inclusive. A first generation attempt is made to analyze the distribution and predict the probability of an iceberg collision with an offshore structure in this region. (Au)

**485**
**Iceberg scour survey, Labrador Shelf** / Gustajtis, K.A.
(C-CORE news, v. 2, no. 4, Nov. 1977, p. 7-8, ill.)
*ASTIS document number 148180.*
ACU, NFSMO

This article describes the iceberg scouring work commenced during a four-month study of the marine environment of the Canadian Eastern Arctic and the Labrador Sea, aboard the Canadian oceanographic vessel CSS Hudson (July 1977). To assess the threat of present iceberg scouring to prospective sea-bottom installations it is necessary to determine the present rate of scouring since scours reported may be relic features formed during the last ice age. To

conduct seismic surveys over areas which could be re-surveyed in subsequent years, it was decided to use acoustic transponders as markers anchored on the seabed, to facilitate accurate repositioning in the subsequent year. Three parallel lines 1.0-1.5 km apart and 150 km long were run across Saglek Bank at the northern extreme of the continental shelf off Labrador. The actual mapping of scours was carried out using the HUNTEC Deep Tow Sub-bottom (DTS) Profiler. (ASTIS)

**486**
**Iceberg scouring on the Labrador Shelf, Saglek Bank** / Gustajtis, K.A.
St. John's, Nfld. : C-CORE, 1979.
xiv, 89p. : ill., maps, photos. ; 28cm.
(C-CORE publication, no. 79- 13)
(C-CORE publication. Technical report)
ISBN 088901-024-2.
References.
*ASTIS document number 38172.*
ACU, NFSMO

... Using available draft to height ratios for icebergs in the Labrador Sea, a theoretical scour rate curve as a function of water depth was developed. A study area on Saglek Bank, off northern Labrador was taken as a representative example of the Labrador Continental Margin and a detailed surficial seismic survey was carried out in 1977. All iceberg scours were mapped in three essentially adjacent areas, each about 2x5 kilometres in extent. ... A comparison of high resolution seismic data from 1976 proved inconclusive in the detection of any new or previously undetected scours in the study area. (Au)

**487**
**A seasonal iceberg density distribution along the Labrador coast** / Gustajtis, K.A. Buckley, T.J.
St. John's, Nfld. : Memorial University of Newfoundland, Centre for Cold Ocean Resources Engineering, 1977.
13 p. : figures ; 28 cm.
(C-CORE publication, no. 77- 23)
Cover title.
Reprint of C-CORE publication, no. 77-23.
Paper presented at Fourth International Conference on Port and Ocean Engineering under Arctic Conditions, St. John's, Nfld., September 26-30, 1977.
References.
Partial contents: An average winter iceberg density distribution along the Labrador coast. – An average spring iceberg density distribution along the Labrador coast. – An average summer iceberg density distribution along the Labrador coast. – An average fall iceberg density distribution along the Labrador coast.
*ASTIS document number 133060.*
ACU, NFSMO

From January 1963 to February 1977, the International Ice Patrol (U.S. Coast Guard) had carried out 65 aerial reconnaissance flights north of 52 degrees N latitude along the Canadian East Coast to aid them in assessing the potential of the upcoming iceberg season in the Grand Banks region off eastern Newfoundland. Using the archived original flight charts from these northern surveillance flights, 26,000 individual iceberg sighting locations were tabulated in terms of latitude and longitude to the nearest minute, as well as any size or shape designations. Using SYMAP, a computer mapping program for analyzing spatial data, a series of four seasonal iceberg density distribution maps were generated with a resolution size of 0.25 degrees of latitude and longitude (225 square nautical miles). Density distribution trends substantiate the controlling effects of the Labrador current, and identify iceberg high regions that may reflect catchment areas due to bathymetry. (Au)

**See also:** 326, 631, 893, 895.

## GUY, E.V.

**488**
**Canadian Sea Ice Information System** / Guy, E.V.
(C-CORE news, v. 10, no. 2, July 1985, p. 2-3, ill., map)
*ASTIS document number 170178.*
ACU, NFSMO

Development of the Canadian Sea Ice Information System (CSIIS) has recently been completed. The system is currently being readied for on-line access late in the summer of 1985. CSIIS is a database and information system which will enable scientists and engineers to gain access to ice data collected from various consultant, industry and government reports. Both qualitative and quantitative information can be retrieved. ... The user may request data from a selection of 10 pre-defined geographical areas (e.g. Beaufort Sea, Davis Strait, etc.) or may specify a user-defined area by entering the latitude and longitude coordinates of that region. Data for sea ice, icebergs/ice islands, and artifically-thickened ice platforms are available; the time period for the data request can be varied to accommodate any range of days, weeks, or months for a given year, or range of years. Information is available for distribution, movement, morphology, physical properties, and mechanical properties data classes, with each class subdivided into a number of relevant attributes. ... (Au)

**See also:** 891, 892.

## HACHEY, H.B.

**489**
**Oceanography and Canadian Atlantic waters** / Hachey, H.B.
Ottawa : Queen's Printer, 1961.
6, 120 p. : ill., maps.
(Bulletin – Canada. Fisheries and Research Board, no.134, 1961)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180297.*

Reviews developments over the years in the study of the area north of 40 N and west of 40 W including the Eastern Canadian Arctic. Introductory outline of the submarine topography is followed by a review of oceanographic research, basic principles, circulation (in the western North Atlantic) of the Labrador Current, etc.; atmospheric circulation, interaction between the sea and the atmosphere, ice and ice problems, particularly icebergs off Labrador and in the Grand Banks area. Oceanography of the different areas is outlined, as are Canadian problems and organization for research. Need for a comprehensive work on the arctic and North Pacific waters also is stressed. The extensive bibliography includes a special section of selected references. (AB)

## HALL, J.C.E.

**See:** 544, 545.

## HAMMER, R.R.J.

**490**
**Om de store isfjaeldes dannelse [On the formation of large icebergs]** / Hammer, R.R.J.
(Geografisk tidsskrift, bd. 12, 1894, p. 18-25)
Text in Danish.

*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178888.*
ACU

Challenge of K.J.V. Stennstrup's article Hvorledes dannes de store esfaelde? q.v., and discussion of observations on the Jakobshavn Glacier in support of Rink's theories on calving. (AB)

## HAMMETT, D.S.

**491**
**Drilling in hostile environments : offshore** / Hammett, D.S.
(Proceedings – World Petroleum Congress, 10th, Bucharest, 9-14 September, 1979. – London : Heyden, [1980], v. 2, p. 229-241, figures, photos., table)
*ASTIS document number 66575.*
ACU

This paper presents the past, present and future drilling activities in hostile offshore environments. Specifically presented are technical and operational achievements that were necessary to drill from floating vessels in open areas where high seas and strong winds are common. Drilling experiences in ocean environments with strong currents, hurricanes/typhoons and sea ice/iceberg conditions, are also presented. The special equipment developed in the past five years for these hostile environments, i.e. BOP, dynamic stationing and drilling procedures are discussed. Also, the experience of the petroleum industry while operating offshore in: Deepwater (8000 ft); Drilling (40 ft wave); Stay on Location (100 ft waves); Hold against (100 knot winds); Conduct Subsea Drilling (4 knot currents); Drilling in ice infested waters (icebergs) are a part of this technical presentation. (Au)

**492**
**Drilling offshore western Greenland – ice** / Hammett, D.S. Finney, G.
(Tenth Annual Offshore Technology Conference, 1978 : proceedings. – Dallas, Tex. : Offshore Technology Conference, 1978, v. 1, p. 119-128, ill., maps)
(OTC paper, 3059)
References.
*ASTIS document number 176877.*
NFSMO

... This paper presents the pre-engineering and operating experience of two vessels used in the summer of 1977 to drill three wells within an 81-day period while dealing with the hostile, remote environment of Greenland. During the 81-day drilling period, 82 icebergs, varying in size from 8 thousand to 7.5 million tons, were sighted and tracked at locations within a 25-mile radius of the SEDCO drilling sites. (Au)

**493**
**Harsh environment drilling** / Hammett, D.S.
(Offshore U.K. : papers presented at the Institute of Petroleum 1984 Annual Conference held in Aberdeen on 31st May and 1st June, 1984 / Edited by J.T.C. Hay. – [S.l. : Institute of Petroleum, 1984], p. 224-243, ill.)
*ASTIS document number 170496.*
NFSMO

... Offshore drilling has been challenged by water depth, currents, tides, waves, wind, icebergs, pack ice, ice floes and distances. ... [The paper reviews the ocean environments, the evolution of technology to operate in these environments and some of the experiences of the operators.] (Au)

**494**
**Semi-submersible operating experience, rough seas and occasional icebergs** / Hammett, D.S.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 70-90, ill., map)
*ASTIS document number 164020.*
NFSMO

... The following topics give an outline of ... presentation. 1. Canada and worldwide operation – description. 2. Semi-submersible experience – operating limits/risks. 3. Ocean environments – wave/motions – ice/impact. 4. Ice technology offshore – drilling/producing. 5. Floating production facilities – use semi-submersible. [and] 6. Technology and related experience Hibernia – go with experience which has alternatives .... (Au)

## HARDY, I.A.

**See:** 837.

## HARMON, D.J.

**495**
**The Canadian sea ice guide – an overview** / Harmon, D.J. Roche, C. Ruck, C.G.
St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, Memorial University, 1984.
8 leaves : ill., map ; 28 cm.
(C-CORE publication, no. 84- 11)
Paper given at the 1984 National Engineering Conference Week, Halifax, N.S., May 20-25, 1984 sponsored by the Canadian Society of Civil Engineering.
References.
*ASTIS document number 157511.*
ACU, NFSMO

This paper summarizes a project presently being undertaken by C-CORE which is scheduled to be completed by March, 1985. The intent of the project is to abstract, compile and synthesize available ice data from Canadian waters which is relevant to loads on offshore structures and to the design and operations of vessels. The end product will be a hardcopy synthesis of the available data and a computerized database. (Au)

## HARRIS, I.M.

**496**
**Iceberg furrow marks on the continental shelf northeast of Belle Isle, Newfoundland** / Harris, I.M. Jollymore, P.G.
(Canadian journal of earth sciences, v. 11, no. 1, Jan. 1974, p. 43-52, figures)
References.
*ASTIS document number 148288.*
ACU, NFSMO

Side-scan sonar imagery indicates the presence of numerous large-scale furrows on the continental shelf northeast of Belle Isle, Newfoundland. The furrows are attributed to the ploughing action of bottom-dragging icebergs. They are typically linear troughs bordered by raised shoulders with an average width of about 30 m, a maximum observed depths of 6.5 m, and a maximum length of at least 3 km. Considered collectively, the furrows have a pronounced north-south trend, which probably reflects the general southerly

drift of icebergs in the Labrador Current. (Au)

497
**Iceberg marks on the Labrador Shelf** / Harris, I.M.
(Offshore geology of eastern Canada. Volume 1. – Concepts and applications of environmental marine geology / Edited by B.R. Pelletier. Paper – Geological Survey of Canada, 74- 30, p. 97-101, ill.)
References.
*ASTIS document number 143421.*
ACU, NFSMO

Sonar depth-sounding and side-scanning results indicate that marks formed by the dragging of icebergs over the sea bottom are widespread but not uniformly distributed on the continental shelf and upper continental slope off Labrador and northeastern Newfoundland. Typically, the marks are linear furrows (troughs bordered by raised shoulders). Their distribution and preservation on the sea bottom are determined by the drift behaviour of the icebergs, the bottom topography, and the extent to which the marks are buried beneath sediments or eroded by bottom currents. (Au)

498
**Under-water diamond drill trial and support survey northeast of Belle Isle, Newfoundland** / Harris, I.M.
(Paper – Geological Survey of Canada, 73- 1A, p. 109-110, ill.)
References.
*ASTIS document number 148679.*
ACU

A two-day program (Oct. 1-2, 1972, on board CSS DAWSON) of diamond-drilling, seismic reflection profiling and sonar side-scanning was carried out northeast of Belle Isle, Newfoundland .... The seismic profiling was used to distinguish the structure and seismic characteristics of the bedrock and the approximate depth of overburden along the survey lines. The seismics and sonar side-scanning together allowed inferences regarding the general nature of the substrate and provide a basis for selecting drill sites. The side-scan sonar records revealed numerous linear features on the sea floor, commonly several miles in length and apparently caused by the grounding of icebergs. ... (Au)

**See also:** 817.

## HARVEY, M.J.

**See:** 1063, 1065, 1066.

## HARWOOD, T.A.

499
**The iceberg problem** / Harwood, T.A.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 1-12)
*ASTIS document number 160130.*
NFSMO, ACU

[The author presents an] Mr. Harwood observed that the Seminar Agenda itself gave a suitable summary of the areas of interest in Iceberg problems. He then went on to give a narrative overview of some of these [iceberg] problem areas which are of general interest. (Au)

500
**An overview of methods of iceberg tracking** / Harwood, T.A.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 50-51)
*ASTIS document number 160210.*
NFSMO, ACU

[The paper briefly discusses] ... iceberg tracking methods in two categories, off berg methods and on berg methods. ... (Au)

## HAWKINS, J.R.

501
**A case study of an ice regime in the eastern Arctic : the drilling of Esso-Hudson Bay GJOA G-37** / Hawkins, J.R. Goodman, R.H. Royal, R.W.
[S.l. : s.n., 1983].
32 leaves : figures ; 28 cm.
Preprint of a paper presented at the Sea Ice Management Seminar, St. John's, Newfoundland, 15-18 November, 1983.
*ASTIS document number 131172.*
NFSMO

In 1979, Esso Resources Canada Limited conducted an exploratory drilling program in two regions of Canada's East Coast. ... Since this was the first deep water well drilled in the Canadian Arctic, extensive environmental, biological, oceanographic, meteorological and iceberg studies were undertaken in the Davis Strait and Flemish Pass regions for planning and regulatory approvals. Due to this extensive preplanning, no time was lost because of weather, icebergs, or pack ice. An environmental monitoring program and a weather forecasting system for supporting the offshore drilling operations were operational during the drilling of the well. This paper summarizes Esso's experience from drilling the Davis Strait well, Esso H.B. GJOA G-37. (Au)

## HAWKINS, R.E.

**See:** 812.

## HAWKINS, R.K.

**See:** 468.

## HAYES, R.M.

502
**Iceberg tagging and drift study, International Ice Patrol cruises 1974** / Hayes, R.M. Robe, R.Q. Scobie, R.W.
(Oceanography of the Grand Banks region of Newfoundland, March 1974-October 1974 / C.R. Weir, R.M. Hayes, R.Q. Robe and R.W. Scobie. Oceanographic report – U.S. Coast Guard, no. CG 373- 74, 1978, p. 5-41, ill., maps)
References.
*ASTIS document number 164038.*
NFSMO, ACU

Iceberg tagging and drift experiments were conducted near the Grand Banks of Newfoundland in April and June 1974. Results of these experiments, which were an attempt to tag icebergs by encircling them with a floated line with RDF transmitters for

relocation and identification, show that this method is not feasible. During storms the line parted from both strain and chafing. When weather was fair the iceberg would work free of the line circle, probably by rolling over or under the line and out of the circle. ... (Au)

503
**Oceanography of the Grand Banks region of Newfoundland in 1973** / Hayes, R.M. Robe, R.Q.
Washington, D.C. : U.S. Coast Guard, 1978.
x, 448 p. : ill. ; 28 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 73)
Appendix.
References.
*ASTIS document number 172464.*
ACU, NFSMO

Three oceanographic cruises were conducted aboard USCGC EVERGREEN (WAGO 295) during the 1973 Ice Patrol season. ... The cruises were undertaken to support Commander, International Ice Patrol and were intended for use in computer predictions of iceberg drift on the Grand Banks of Newfoundland .... In addition to the occupation of hydrographic stations along Ice Patrol standard sections ... three Intensive Dynamic Surveys were conducted during the third cruise for the verification of a mathematical model of the Labrador Current when in the vicinity of the Grand Banks (Kollmeyer, 1975). Two near-bottom current meter moorings were deployed in two separate locations during two different periods along the continental slope for an investigation of temporal variations in the Labrador Current at depth .... In addition to the Ice Patrol data contained herein, eight Standard Sections (A2, A3, and A4) occupied from January through November of 1973 ... are included in the data listings. (Au)

**See also:** 761, 870, 1085.

## HAYKIN, S.

504
**A phased array radar for iceberg detection** / Haykin, S. Currie, B.W.
Hamilton, Ont. : MacMaster University, 1984.
(C R L report series, no.121)
*ASTIS document number 183784.*
OOCCR

**See also:** 307, 722.

## HAZEN, M.

**See:** 435, 436, 439.

## HEIGHWAY, J.E.

**See:** 715.

## HEIM, A.A.

505
**Blaublatter und Gletscherkorn [Blue bands and glacier grain]** / Heim, A.A. Fanck, A.
(Berge der Welt, bd. 7, 1952, p. 59-66, ill.)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179825.*

"Blue bands [of very clear, hard ice which crisscross arctic glaciers and icebergs] are attributed by Franck to pressure spots or slip bands which may occur within the ice in any direction. The bands are formed at great depths within glaciers by a slow process of pressure or displacement of the ice masses, which releases heat and causes the ice to melt. The meltwater refreezes and the blue band increases in thickness. The thichness is nearly always uniform, varying between one cm. and two m. Icebergs consisting of deep blue, crystalline ice are described, and their formation is explained on the basis of the same theory." (AB)

## HEINRICH, W.

506
**Canadian patent : Method of deflecting ice at upright columns submerged in water of stationary or floating structures in marine areas in which the occurrence of ice may be expected, and ice deflector assembly therefor** / Heinrich, W.
Ottawa : Patent Office, 1979.
25 p. : ill. ; 28 cm.
(Canadian patent documents, no.1050287, Mar. 3, 1979)
*ASTIS document number 170100.*
NFSMO

The present invention relates to a method of deflecting ice at upright columns submerged in water of stationary or floating structures in marine areas in which the occurrence of ice may be expected .... an ice deflector assembly including an oscillating mass in the form of an annular body surrounding the column whereby this mass may be oscillated in the longitudinal direction of the column, i.e. upwardly and downwardly. ... [has already been proposed.]. (Au)

## HELBIG, J.A.

**See:** 938.

## HELL, J.

507
**Meeresgletscher und Eisberge [Sea glaciers and icebergs]** / Hell, J.
(Alpen, Jahrg. 24, no. 9, Sept. 1948, p. 324-329, ill.)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179833.*

Contains information on the largest glaciers of the earth; the icecap and glaciers of Greenland and Spitsbergen; fluctuation in glacier size during the past millenium; speed of Alpine glaciers and of those on Greenland and Spitsbergen; genesis and size of icebergs; latent life (anabiosis) in rock ice. (AB)

## HELLAND, A.T.

508
**Om de isfyldte fjorde og de glaciale dannelser i Nordgronland [On the ice fiords and glacial formations in northern Greenland]** / Helland, A.T.
(Archiv for matematik og naturvidenskab, bd. 1, 1876, p. 58-125, ill. (some folded))
Brief report in French was published in Association francaise

pour l'avancement des sciences. Competes rendus, 1878, pub. 1879. Sess. 7, p. 588-591.
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178896.*

Based on a journey from Egedesminde (68 42 9 N) to Kangerdlugssuaq Fiord (71 15 N) made June-Aug. 1875, including the Disko Bay region and Jakobshavn Ice Fiord. [This paper] contains a brief description of the mountains along this section of Greenland's west coast, and of the inland ice; detailed notes on glaciers and ice-filled fiords, including speed of glacier movement and formation of icebergs; on ice fields and their formations, and on glacial formations. (AB)

**509**
**Ueber die Gletscher Nordgronlands und die Bildung der Eisberge [On the glaciers of North Greenland and the formation of icebergs]** / Helland, A.T.
(Gesellschaft fur Erdkunde zu Leipzig. Mittheilungen, 1877, p. 25-36, ill.)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178900.*

Observations (made during a trip along the coast of the Umanak District (68 42 – 71 15 N) in June-Aug. 1875) on the ice-filled fiords, the glaciers (size, movement of the ice) and the kinds of ice found in West Greenland waters. (AB)

## HELSETH, J.M.

**See:** 369.

## HEMMINGSEN, E.A.

**See:** 927, 930.

## HENGEVELD, H.G.

**510**
**Iceberg baseline study 1981** / Hengeveld, H.G.
Ottawa : Atmospheric Environment Service, 1981.
28 p. : ill., maps ; 28 cm.
Photocopy.
Appendix.
References.
*ASTIS document number 183580.*
OOCCR

Information on the temporal and spatial distribution of icebergs in the Labrador Sea to date remains sporadic and deficient with respect to both quality and quantity. This deficiency stems from a continuing unavailability of a comprehensive baseline iceberg data-gathering activity in this region. With increasing marine activities in the Labrador Sea, particularly relating to offshore resource exploration, an improved awareness of the nature and extent of the environmental hazards posed by icebergs in these waters is becoming imperative. (Au)

**511**
**Iceberg distribution along the Labrador coast as determined by Side Looking Airborne Radar** / Hengeveld, H.G.
Mudry, D.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 36)
Abstract only.
*ASTIS document number 168904.*
ACU, NFSMO

During the summer and fall of 1981, a series of monthly SLAR flights was undertaken along the Labrador Coast to determine the distribution of icebergs in the Labrador Sea. The analysis of these data, as well as analysis of SLAR data collected over this area during the winter and spring seasons between 1978 and 1981 has provided an initial data base for evaluation of population distribution and seasonal variations. The paper will present the results of analysis of this data base. (Au)

## HESTER, L.H.

**See:** 1103.

## HILDENBRAND, R.N.

**See:** 582.

## HIND, H.Y.

**512**
**Notes on some geological features of the northeastern coast of Labrador** / Hind, H.Y.
(Canadian naturalist, new ser., v. 8, 1878, p. 227-240, 262-278)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178918.*

The area discussed extends from Sandwich Bay, 53 45 N to Ukkasiksalik, 55 55 N. Contents: Area description. Rock cleavages. Pan ice. Extent of pan ice work. Glacial striae and glacial clays. Icebergs. Formation of boulder clays. The marine climate. The crystalline limestones of the Laurentian series. Symmetrical structure of the strata. Concretionary structure. Boulders and outliers Upper Laurentian or Labrador series. Permanent snow drifts. Influence of wind on composition of drifts. Mechanical effects produced by snow drifts. Amount of snow fall in northeastern America. Direction and force of winds. Influence of snow drifts as geological agents. (AB)

## HNATIUK, J.

**See:** 728, 1126.

## HODGE, S.M.

**See:** 297.

## HODGINS, D.O.

**See:** 630, 938.

## HODGSON, G.

**513**
**Design of an ice scour repetitive mapping network** / Hodgson, G.
[S.l. : s.n., 1985].
[6] leaves ; 28 cm.

Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163554.*

Geonautics Limited is presently evaluating conditions pertinent to the design of a repetitive seafloor mapping network for the east coast. The initial work has been directed at compilation of data to forecast the occurrence of iceberg groundings. Data on bathymetry, iceberg flux and density distribution, iceberg draft distribution and currents have been input to the Atlantic Geoscience Centre modelling program and predicted groundings derived. The model studies are being carried out for the northeast Grand Banks and for the Labrador Shelf. ... (Au)

## HOLBURN, J.G.

**See:** 731.

## HOLDSWORTH, G.

**514**
**Iceberg** / Holdsworth, G.
(The Canadian encyclopedia. – Edmonton, Alta. : Hurtig Publishers, 1985, v. 2, p. 859-860, col. ill., map)
*ASTIS document number 184942.*
ACU

This concise presentation on icebergs includes calving mechanisms of parent glaciers responsible for the formation of icebergs, the physical appearance of icebergs, their occurrence globally and dimensions, and iceberg dynamics and stability. More briefly described are possible applications of icebergs (research platform; fresh-water supply) and iceberg hazards in the northern hemisphere, especially the threat they pose to offshore oil and gas production and marine transportation. (ASTIS)

**515**
**Iceberg calving from floating glaciers by a vibrating mechanism** / Holdsworth, G. Glynn, J.E.
(Nature, v.274, no.5670, Aug. 3, 1978, p. 464-466, ill.)
*ASTIS document number 161900.*
NFSMO, ACU

Observations of Antarctic super tabular icebergs, which can exceed 100 km on a side, have shown that their origin can frequently be traced to previously existing super ice tongues, which are a class of massive seawards-extending ice shelves. ... Because the calvings do not generally occur along a line coincident with the gounding line, where, under normal tidal flexure the stresses are greatest, and because multiple fracturing is observed we have sought a nontidal theory for ice-tongue fracture. A mechanism for generating significant bending stresses at locations along an ice tongue far from the grounding zone is by vibration of the glacier in a mode higher than the fundamental. In this report, we outline an approximate analysis of the modes of free vibration of a buoyant, elastic, tapering ice tongue floating in shallow water of variable depth. ... (Au)

**516**
**A mechanism for the formation of large icebergs** / Holdsworth, G. Glynn, J.E.
(Journal of geophysical research, v. 86, no. C 4, Apr. 20, 1981, p.3210-3222, figures)
Appendices.
References.
*ASTIS document number 67423.*
ACU, NFSMO

The calving of floating glaciers to form icebergs is a major form of ice loss from the Antarctic ice sheet. Disintegration of massive, unconfined, seaward extending ice shelves or glacier tongues gives rise to the largest type of iceberg, some of which have horizontal dimensions exceeding 100 km. Several ice tongues are known to exhibit a quasi-cyclic pattern of calving and subsequent regrowth. A mechanism that would seem to explain this type of calving behavior is based on the vibrational characteristics of the system of a buoyant ice plate floating in shallow water. ... For relatively high modes of oscillation, low level, but sustained cyclic bending stresses may lead to crack propagation and subsequent fatigue failure in the ice. The contribution of other mechanisms which induce tensile stresses in the ice are considered to be very important in an overall view of the calving problem, and some of these mechanisms are discussed in relation to the vibration mechanism. It is possible to view the proposed vibration mechanisms as a trigger which raises the resultant stresses in the ice to the point where fracture will occur. (Au)

**517**
**Some mechanisms for the calving of icebergs** / Holdsworth, G.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 160-175, ill.)
References.
*ASTIS document number 161810.*
ACU, NFSMO

This paper reviews several mechanisms whereby calving of icebergs may occur. An ice-shelf or ice-tongue may fracture in a number of locations, evidently in all cases, primarily as a result of the induction of a bending moment superimposed on the normal expansive creep of the floating slab. The bending may occur (a) at the hinge-line; (b) at the seaward margin; or (c) at some intermediate location. Hinge-line calving may be caused by the geometry of the bedrock in the hinge (flotation) zone, or by the action of the tides, or a combination of these two effects. Marginal calving can be explained by a process of continuous downwarping of the frontal ice-cliff, due to the imbalance there between the "hydrostatic" stress in the ice and the sea water pressure. Icebergs thus produced will be strongly prismatic and generally tilted. Calving at intermediate distances might be explained by the action of alternating bending stresses set up as the slab vibrates in a particular mode due to ocean wave excitation. Because these stresses are cyclic and because crevasses occur in floating glaciers, the magnitude of the stresses needed for failure may be quite small. (Au)

**See also:** 665, 666.

## HOLLAND, J.R.

**See:** 387.

## HOOD, A.D.

**518**
**An analysis of radar ice reports submitted by Hudson Bay shipping (1953-1957)** / Hood, A.D.
Ottawa : NRC, 1958.
9 leaves : ill. ; 27 cm.
(Bulletin – Canada. National Research Council. Division of

Electrical Engineering, ERB- 467)
(NRCC – National Research Council of Canada, no. 4692)
*ASTIS document number 175102.*

Reports on radar detection of ice, submitted by Hudson Bay shipping, have been analyzed to determine the value of radar in reducing the navigational hazard in ice-infested waters. The seasonal change in ice conditions has been investigated and the most dangerous sections of Hudson Strait have been located. The limits of the ice hazard have been well defined and the maximum ice concentration is located in a 450-mile section of the Hudson Strait route. Reports on the radar detection of all formations have established the dangerous types of ice and the fact that sea clutter, in excess of 1000 yards, is present most of the time. Radar is a definite asset in ice navigation provided it is operated with an appreciation of its limitations in detecting small targets in sea clutter. Short ranges, under 10,000 yards, are preferred for the detection and tracking of dangerous ice, such as bergy bits and growlers. All formations of berg size were detected at a minimum range of 10,000 yards, and the leading edge of floes and field ice may be detected at ample range for evasive action. A ship will encounter about 50 per cent less ice in Hudson Strait during the latter half of the shipping season. (Au)

## HOOPER, R.

519
**Biological features in the iceberg environment** / Hooper, R.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 112)
*ASTIS document number 160270.*
NFSMO, ACU

High concentrations of plankton and bird life were noted near icebergs. This is thought to be due to nutrients in the iceberg itself. This is one mechanism for getting nutrients below the thermocline. The nitrates which were observed are thought to be atmospheric in origin. (Au)

## HOPKINS, R.M.

**See:** 810.

## HOTZEL, I.S.

520
**Icebergs : their physical dimensions and the presentation and application of measured data** / Hotzel, I.S. Miller, J.D.
(Proceedings of the Second Symposium on Applied Glaciology held in New Hampshire, USA, 23-27 August, 1982. Annals of glaciology, v. 4, 1983, p. 116-123, figures, tables)
References.
*ASTIS document number 119776.*
ACU, NFSMO

A knowledge of the dimensional characteristics of icebergs off the east coast of Canada is required for both scientific and engineering purposes. To fulfil this need, hydrocarbon exploration in the region has been supported by a program aimed at collecting morphometric data on icebergs. In addition to providing operational support for activities such as iceberg towing, this program has yielded information which will be useful for the engineering design of offshore structures. Functional relationships between the dimensions of icebergs are presented and ratios between the linear dimensions are examined. These ratios are used to calculate preliminary values for draft and mass on the Grand Banks and are demonstrated to give reasonable values for draft of icebergs off Greenland. (Au)

521
**Relationships between measured iceberg dimensions** / Hotzel, I.S. Miller, J.D.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 114-129, ill.)
References.
*ASTIS document number 148490.*
NFSMO

Iceberg morphometry is an important consideration in both the modelling and operational support aspects of ice scouring. The safe design and operation of bottom founded offshore structures particularly requires accurate estimates of draft distribution. Of the commonly measured iceberg dimensions, draft determination is the most difficult, time consuming and costly. Owing to these problems, therefore, draft measurements have not been collected as frequently as iceberg above water dimensions. In order to evaluate the distributions of draft researchers have in the past attempted to relate selected above water dimensions to the draft. Robe (1975) described the relationship of height to draft as a power curve. More recently Brooks (1981) determined, that a fairly good relationship exists between waterline length and draft and that it is unusual to find drafts larger than the waterline length. The present study shows the relationships between the various length parameters and to a limited degree indicates their applicability. Data used in the analysis were assembled from data collected at drilling rigs operating during the operating seasons (June to October) of 1971-1978. Only simple relationships between draft, width, length and mass are considered. The data were not broken down by iceberg type classification. (Au)

**See also:** 429, 745, 746.

## HOWARD, L.M.

**See:** 132.

## HOWES, W.L.

**See:** 1049.

## HSIUNG, C.C.

522
**Iceberg drift affected by wave action** / Hsiung, C.C. AboulAzm, A.F.
(Ocean engineering, v. 9, no. 5, 1982, p. 433-439, figures, table)
References.
*ASTIS document number 131628.*
NFSMO

A mathematical model to predict iceberg drift pattern has been developed, which includes the wave drift force, in addition to the other conventional force components such as forces due to wind, current, Coriolis effect, and geostrophic effect. Trajectories of two icebergs were computed first with the wave effect then without the wave effect. All were compared with the observed results from the field. The model with the wave effect shows a significant improvement in the correlation. (Au)

**See also:** 851.

## HUDSON STRAIT EXPEDITION

**523**
**Report of the Hudson Strait Expedition, to December 31, 1927** / Hudson Strait Expedition.
Ottawa : F.A. Acland, King's Printers, 1928.
76 p. : ill., 5 charts (folded).
Report addressed to the deputy minister of marine, and signed by N.B. McLean, officer-in-charge, Hudson Strait Expedition.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178934.*

Progress report, Feb.-Dec. 1927, of an expedition of which the complete report was published subsequently as Report ... 1927-28, pub. 1929, q.v. (AB)

**524**
**Report of the Hudson Strait Expedition, 1927-28. N.B. McLean, officer in charge.** / Hudson Strait Expedition.
Ottawa : F.A. Acland, King's Printer, 1929.
221 p. : ill., charts.
Appendices: 1. Logs of the Stanley, 1927, and the Montcalm, 1928. 2. Location of bases. 3.-6. Plans of routine and special flights, bases A, B, and C. 7. Meteorological observations on the Stanley July 17-Nov. 25, 1927. 8. Meteorological observations on the Montcalm, June 24-Nov. 14, 1928. 9. Ice observations at bases A, B, and C., 1927-28. 10. Meteorological observations (for same). 11. Water temperatures from the Montcalm, June 24-Nov. 14, 1928.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178926.*

Report addressed to the deputy minister of marine, by N.B. McLean, officer-in-charge, of an expedition, Feb. 11, 1927-Nov. 1928, organized under an advisory board representing the Depts. of Marine and Fisheries, National Defense, and Railways and Canals, to obtain information on ice conditions and safe navigation in Hudson Strait. Includes notes on equipment, stores, and personnel; description of bases: Port Burwell, Wareham Bay, and Nottingham Island; of flying operations, ice conditions, fog, icebergs, charting and tidal investigations. (AB)

## HUDSON, R.D.

**525**
**A method to measure iceberg impact areas remotely on a large structure** / Hudson, R.D. Booth, A.D.
(Iceberg research, 1983, no. 6, Nov., p. 13-17)
References.
*ASTIS document number 157732.*
ACU, NFSMO

... This paper proposes the use of instrumentation remote from the impact site, to reduce the enormous cost of covering a wall with pressure cells (or other impact sensors), and to eliminate damage during the collision process. An upward-looking sonar string (ULSS) is proposed. This technique (1), used together with a 3-dimensional mapping program commonly run on an HP 9845 computer, enables a 3-D analysis of the impact to be modelled, the contact area to be deduced, and the contact pressures to be calculated. This paper investigates the likely causes of measurement error in the proposed technique, makes recommendations as to how these errors may be minimised by suitable selection of instruments, and offers an overall estimate of the likely % error of the system. (Au)

## HUGGETT, Q.J.

**526**
**Identification of ice-rafted and other exotic material in deep-sea dredge hauls** / Huggett, Q.J. Kidd, R.B.
(Geo-marine letters, v. 3, no. 1, 1983/1984, p. 23-29, ill.)
References.
*ASTIS document number 176508.*
NFSMO

It is often difficult to distinguish in situ material from exotic clasts in rock dredge hauls from deep ocean sites. A study of ice-rafted material in the northeast Atlantic Ocean has been undertaken for which a set of criteria has been established for the identification of glacial erratics. These criteria may be divided into two categories. The first is for criteria based on direct evidence visible on individual clasts, for example, striations and faceting. The second is for inferred evidence drawn from complete dredge hauls, for example, variations in the thickness of manganese coatings. ... Drifting icebergs have transported trapped rock material over many parts of the North Atlantic and other high latitude oceans since at least the early Pleistocene. As they melt, icebergs drop the incorporated material onto the seafloor which produces a characteristic deposit that contains glacial erratics. ... (Au)

## HULT, J.L.

**527**
**Applicability of ERTS to antarctic iceberg resources** / Hult, J.L. Ostrander, N.C.
Santa Monica, Calif. : Rand Corp., 1973.
iii, 24 p. : ill. ; 31 cm.
(Rand paper series – Rand Corporation, P- 5137)
References.
*ASTIS document number 177156.*
OTY

... The objectives of this investigation were to explore the applicability of ERTS to (a) determine the Antarctic sea-ice and environmental behavior that may influence the harvesting of icebergs, and (b) monitor iceberg locations, characteristics and evolution. A very limited imagery sampling of portions of the western Antarctic was scheduled. to collect data on cloud-cover obstruction, the capability to monitor and assess sea-ice behavior, the ability to distinguish and measure iceberg characteristics, and the general topographic surveillance capabilities of the ERTS system in the Antarctic environment. The results from ERTS-1 imagery are described in the next section. This is followed by a section on ERTS system potential which treats: live imagery, thermal and micro wavelengths, sea-ice behavior and iceberg evolution, tactical harvesting information, claiming and monitoring service, entitlements to Antarctic iceberg resources, and economical potentials for ERTS. (Au)

**See also:** 846, 847.

## HUNTSMAN, A.G.

**528**
**Arctic ice on our eastern coast** / Huntsman, A.G.
Toronto : [s.n.], 1930.
12 p. : charts.
(Bulletin – Canada. Biological Board of Canada, no. 13, 1930)
*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 178942.*

Brief account of the course of icebergs: Baffin Bay-Davis Strait-Grand Banks of Newfoundland-Strait of Belle Isle. Includes notes of their origin and seasonal behavior. (AB)

## HUPPERT, H.E.

529

**Ice blocks melting into a salinity gradient** / Huppert, H.E. Turner, J.S.

(Journal of fluid mechanics, v.100, pt. 2, 1980, p. 367-384, ill.)

References.

*ASTIS document number 170704.*

ACU, NFSMO

In our previous qualitative paper, it was shown that when a vertical ice surface melts into a stable salinity gradient, the melt water spreads out into the interior in a series of nearly horizontal layers. The experiments reported here are aimed at quantifying this effect, which could be of some importance in the application to melting icebergs. Experiments have also been carried out with heated and cooled vertical walls at larger Rayleigh numbers R than those of previous experiments. The main result is that for most of our experiments there is no significant difference between these three cases when properly scaled. ... (Au)

530

**Icebergs : technology for the future** / Huppert, H.E.

(Nature, v.285, no.5760, May 8, 1980, p. 67-68)

Review of document number 167088, Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, UK, 1-3 April 1980, published in Annals of glaciology, v. 1, 1980.

*ASTIS document number 167100.*

ACU, NFSMO

The article reviews the papers presented at The Use of Icebergs Conference. (NFSMO)

531

**The melting of ice in cold stratified water** / Huppert, H.E. Josberger, E.G.

(Journal of physical oceanography, v. 10, no. 6, June 1980, p. 953-960, figures, table)

References.

*ASTIS document number 65153.*

ACU, NFSMO

We consider the melting of ice in cold water vertically stratified with salt. The study extends previous investigations of ice melting in cold water at uniform salinity and in warm water with a salinity gradient. We find, in agreement with the results of the latter study, that the meltwater spreads out in a series of horizontal layers. ... The convective plume that formed in the lower region penetrated into the upper region, while a series of horizontal layers in the upper region extended beyond the plume. We conclude the paper with a discussion of the application of our experimental results to oceanographic conditions. (Au)

532

**On melting icebergs** / Huppert, H.E. Turner, J.S.

(Nature, v.271, no.5640, Jan. 5, 1978, p. 46-48, ill.)

References.

*ASTIS document number 171379.*

ACU, NFSMO

... One suggestion for melting icebergs is to run each iceberg aground in water approximately 250 m deep, the mean depth of Antarctic icebergs. A relatively shallow pen would then be built around the iceberg and it is conjectured that the melt water will rise, without much mixing, into the pen, from where it will be siphoned off for subsequent use. Neshyba claims, however, that melt water produced by icebergs may be responsible for a large amount of upwelling and mixing in the Antarctic's Weddell Sea. He asserts that as the melt water rises up the side of an iceberg, it entrains a sizeable quantity of warmer, saltier water from the environment. Neshyba calculates that an average-sized iceberg is thus responsible for a vertical volume transport into the upper layer of the Weddell Sea of 3.3 x 10 cu cm/s. ... We show here that both may be in error. ... We have carried out a series of experiments in which ice is inserted into a salinity gradient, and the preliminary results are reported here. ... (Au)

533

**The physical processes involved in the melting of icebergs** / Huppert, H.E.

(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 97-101, figures)

References.

*ASTIS document number 61140.*

ACU, NFSMO

The causes of iceberg deterioration can be discussed under three broad headings: wave-induced melting at the water line; breaking; and melting at the top, bottom, and sides. A short summary of current understanding under the first two headings is presented. It is then argued ... that the melt rate at the sides of a tabular Antarctic iceberg is likely to exceed that at the top and bottom. The behaviour of the entraining plume which forms at the side of an iceberg when it melts in water of uniform salinity is outlined. Another form of convection, occurring when the ambient water is stratified, is then described; in this case the melt water spreads out in a series of almost horizontal layers. Finally, field observations on iceberg melting are discussed. (Au)

## HUSSEINY, A.A.

534

**Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977** / Husseiny, A.A. [Editor].

New York ; Toronto : Pergamon Press, 1978.

xix, 759 p. : figures, tables ; 26 cm.

ISBN 0-08-022916-6.

Appendices.

This conference was published in two parts. Part 1, Iceberg Utilization was published as a monograph by Pergamon. Part 2 was published as a volume of the periodical Desalination.

*ASTIS document number 116424.*

ACU, NFSMO

... Here is a compilation of the most advanced research in iceberg utilization, interdisciplinary in approach and international in scope. All phases of the subject are covered: locating, tracking and selection of icebergs; the physical properties of icebergs; methods of transport; economic, ecological, legal and organizational aspects; iceberg protection; and the utilization of icebergs for water, weather modification and power. ... (Au)

## ICE CONCEPTS ENGINEERING LTD.

535
**Engineering procurement specification for alternative iceberg draft measurement systems** / Ice Concepts Engineering Ltd. Benedict, C.P. Eastcan Exploration Ltd. [Sponsor].
St. John's, Nfld. : Ice Concepts Engineering Ltd., 1976.
[100] leaves : figures ; 22 X 28 cm.
Appendices.
*ASTIS document number 132942.*
NFSMO

This report specifies two bottom mounted iceberg draft measurement systems of varying complexity. The specifications are derived from the accumulated experience with surface based iceberg draft measurement systems summarized in Part 1. The operational aspects of the new submersible systems are discussed in Part 2 which further defines the new requirements imposed by the unique deployment technique in the path of an advancing iceberg. Based on these detailed requirements, Part 3 specifies a family of three fixed beam digital systems, Part 4 specifies a totally analogue system with a graphic output and Part 5 describes a scanning system using a sophisticated hydrophone array. Each of the configurations is compared in Part 6 against overall system performance requirements. (Au)

## ICE ENGINEERING LTD.

536
**Arctic Iceberg Dimension Project : final report** / ICE Engineering Ltd. Petro-Canada [Sponsor].
[St. John's, Nfld. : Ice Engineering Ltd.], 1978.
66 p. : ill. ; 22 x 28 cm.
References.
*ASTIS document number 164062.*
NFSMO

The Arctic Iceberg Dimension (AID) Project was ... a comprehensive survey of the High Arctic offshore environment prior to proposed drilling operations. The AID project involved a dimensional study of a sample of bergs [including grounded bergs] in the vicinity of Cape Sherard, Devon Island. The survey was carried out in August, 1978, from a base at Cape Sherard with a twin engine helicopter fitted for offshore reconnaisance and sonar deployments. The report contains the dimensional data recovered on a sample of 35 icebergs surveyed and includes a discussion of their implications for iceberg management. (Au)

537
**Hekja production : Iceberg incursion and scour risk analysis** / ICE Engineering Ltd. Aquitaine Company of Canada Limited [Sponsor].
[St. John's, Nfld. : ICE Engineering Ltd.], 1981.
45 leaves, [36] leaves of plates (some folded) : ill., map ; 28 cm.
References.
*ASTIS document number 182028.*

The principal objective of this report is to quantify the risk to seafloor-mounted production facilities at the Hekja site from iceberg incursion and scour. This is achieved by documenting the sources of deep-draft icebergs, and examining the factors which determine their transport to Hekja. A secondary objective is to delineate the completeness of the data relevant to large berg calving and transport and to formulate a program to refine this data where necessary. ... On the basis of this study, subsea completions on the Hekja site will not be limited by iceberg incursio'. As part of the terms of the study, and in keeping with the significance of the conclusion, the contractor has delineated the limitations and deficiencies in the model. The principal limitation stems from a lack of precise data, and it is therefore proposed that a selective program of measuring and monitoring critical bergs and their source glaciers be implemented. It is anticipated that this will involve direct field measurements which in addition to supporting the iceberg transport model with accurate data will supply the confidence necessary to proceed with permanent bottom - situated production facilities. This field program is described in section 10. The level of effort required involves approximately $1,000,000 per year for three years. The proposed program offers the basis for refining critical berg production rates and transport processes, and thus bringing a further level of confidence to the conclusions we have reached on the implications of icebergs for oil and gas production. The results would benefit production design at any of the eastern Canadian Arctic and Labrador sites with depths in excess of 300 metres. (Au)

538
**Ice conditions status report 1980** / ICE Engineering Ltd. Newfoundland and Labrador. Petroleum Directorate [Sponsor].
[St. John's, Nfld. : Newfoundland and Labrador Petroleum Directorate, 1980?].
*Document not seen by ASTIS.*
*ASTIS document number 183733.*

539
**Iceberg ice : Physical characteristics, uniaxial compression testing** / ICE Engineering Ltd. Newfoundland and Labrador. Petroleum Directorate [Sponsor].
[St. John's, Nfld. : Petroleum Directorate], 1982.
ii, 75 leaves, [19] leaves of plates : ill. ; 28 cm.
Appendices.
Bibliography: p. 73-75.
*ASTIS document number 183903.*
ACU

Icebergs, seaborn fragments of glaciers, are a common occurrence in the northern waters of Labrador and also, though not as frequent, on the Grand Banks of Newfoundland. These bergs originate from Arctic glaciers primarily on the west coast of Greenland. Icebergs exhibit tremendous variety in abundance, shape, size, and in their calving and ablation. Berg trajectories are difficult to predict as is their tendency to roll due to instability resulting from non-uniform ablation. ... Iceberg ice is thought to have undergone little change since leaving its source glacier although some cracking and crystal annealing have undoubtedly taken place. Though the drift velocities of icebergs are typically less than .3 m/sec their mass enables them to possess enormous kinetic energies and gives them the ability to exert forces of hundreds of thousands of tons on any object in their path. ... When referring to the physical properties of complex crystaline materials such as iceberg ice, certain terms are useful for the purpose of characterization. Texture refers to the shapes and sizes of individual grains and inclusions within a polycrystalline aggregate. The term fabric is used to describe crystallographic axis orientation of grains in an aggregate. The optic axis or c-axis is the axis of hexagonal symmetry of an ice crystal. Foliation refers to a series of alternating plane layers of clear and bubbly ice, and sometimes to alternate layering of fine and coarse-grained ice. The strength of ice denotes a stress level at which point detrimental and permanent change occurs in a test sample. Failure refers to the point in a mechanical test when the specimen breaks and separates. ... The ice used in this study comes from five grounded icebergs. Three were small highly deteriorated icebergs in the Twillingate, Nfld. area; one was in the vicinity of Outer Cove, near St. John's; and one was near the entrance to the St. John's narrows. (Au)

**540**

**Iceberg survey Grand Banks - Hibernia, Newfoundland** / ICE Engineering Ltd. Bedford Institute of Oceanography [Sponsor].
[S.l.] : ICE Engineering Ltd., 1984.
1 v. (various pagings) : ill. ; 28 cm.
Appendices.
References.
*ASTIS document number 170488.*
NFSMO

The objective of this project was to survey icebergs in the Grand Banks/Hibernia area off Newfoundland during a two week period [in June 1984.] ... the following categories of iceberg data ... collected [were] (A) Linear dimensions: sail height, waterline length, waterline width and draft. (B) Iceberg volumes, masses and underwater profiles. (C) Iceberg above water and below water cross sectional areas. ... Seven icebergs were encountered during the cruise and data were collected for each of these bergs (some twice). The masses of the bergs ranged from 19 kilotonnes to 2,100 kilotonnes. Drafts ranged from 31 to 120 meters. ... (Au)

**541**

**Iceberg survey Grand Banks - Hibernia, Newfoundland** / ICE Engineering Ltd. Bedford Institute of Oceanography [Sponsor].
[S.l.] : ICE Engineering Ltd., 1985.
1 v. (various pagings) : ill. ; 28 cm.
Appendices.
References.
*ASTIS document number 177946.*
NFSMO

The objective of this project was to survey icebergs in the Grand Banks/Hibernia area off Newfoundland during a two week period. It was required that the following categories of iceberg data be collected: (A) Linear dimensions: sail height, waterline length, waterline width and draft. (B) Iceberg volumes, masses and underwater profiles. (C) Iceberg above water and below water cross sectional areas. ... The survey equipment was loaded on the CSS Dawson in Dartmouth, Nova Scotia on April 22, 1985 for a 14-day cruise to the Grand Banks area. Four icebergs were encountered during the cruise and data were collected for each of these bergs. The masses of the bergs ranged from 4.4 kilotonnes to 2,000 kilotonnes. Drafts ranged from 12 to 130 meters. ... (Au)

**542**

**Iceberg survey, Strait of Belle Isle, Newfoundland** / ICE Engineering Ltd. Bedford Institute of Oceanography [Sponsor].
[Dartmouth, N.S. : Bedford Institute of Oceanography, 1983].
*Document not seen by ASTIS.*
*ASTIS document number 183490.*

**543**

**Methods for the fracturing of icebergs** / ICE Engineering Ltd. Gammon, P.H. Lewis, J.C. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF, 1985.
x, 91 p., [6] leaves of plates : ill. ; 28 cm.
(Environmental Studies Revolving Funds report, no. 011)
ISBN 0-920783-10-9.
Appendices.
References.
Also available on microfiche.
*ASTIS document number 182265.*
ACU, NFSMO

This study investigates one aspect of the general problem of iceberg management in support of the development of offshore petroleum resources. Specifically, the problem of iceberg size reduction through iceberg fracturing is addressed. ... Present iceberg management has two parts: detection and towing. Improvements in the current procedures for both of these have been considered, and are likely feasible. In fact, as will be seen, part of our field test in this program is relevant to enhanced towing. However, other approaches to iceberg management have been considered. One of these, historically the first to be attempted, is the demolition, fracture, or most generally the "enhanced ablation" of icebergs. This report will show that iceberg fracture is not only feasible, but can almost certainly be developed into an effective operational tool for iceberg management. Why indeed should it be thought desirable to fracture icebergs, assuming that it proved practicable to do so on a routine operational basis, or even as part of an emergency procedure? Inappropriately applied, the fracture of an iceberg would leave two or more large ice masses to be managed rather than one, and, furthermore, large ice masses which might conceivably pose greater hazards, individually, than the original berg. To provide an answer to the above question, it is useful to distinguish between two aspects of iceberg management: tactical and strategic. We distinguish between iceberg hazards on that basis, and, rather arbitrarily, distinguish on the basis of time: tactical methods are those relevant when the iceberg is within approximately twenty-four hours, or within radar range, of the drillrig or oilfield; strategic methods are those applicable to icebergs further away. (Au)

**544**

**A study of iceberg detection for marine navigation** / ICE Engineering Ltd. Benedict, C.P. Hall, J.C.E. Canada. Transport Canada. Research and Development Centre [Sponsor].
Montreal, Quebec : Transport Canada, Research and Development Centre, 1979.
viii, 200 leaves : ill., maps ; 28 cm.
(Transport Canada report, no.TP2409)
Appendices.
Bibliography: p. 147-160.
*ASTIS document number 163252.*
NFSMO

A study of a variety of sensors for ship-based detection of icebergs and other ice obstacles is reported. The formation, distribution and ablation of icebergs are discussd as well as relevant ice properties. The state of the art of a range of technologies including radar, sonar, infrared and low light television is included. Program requirements for evolving a ship-based detection system are developed for a multi-sensor detection system. This follows from the report conclusion that no single sensor has sufficient performance to cover all weather possibilities. (Au)

**545**

**A study of iceberg detection for marine navigation : summary report** / ICE Engineering Ltd. Benedict, C.P. Hall, J.C.E. Canada. Transport Canada. Research and Development Centre [Sponsor].
Montreal, Quebec : Transport Canada, Research and Development Centre, 1980.
vii, 13 leaves : ill. ; 28 cm.
(Transport Canada report, no.TP2424)
Also available in French.
*ASTIS document number 163260.*
NFSMO

A study of a variety of sensors for ship-based detection of icebergs and other ice obstacles is reported. The state of the art of a range of technologies including radar, sonar, infrared and low light television is included. Program requirements for evolving ship-based detection are developed for a multi-sensor system. This follows from

the report conclusion that no single sensor has sufficient performance to cover all weather possibilities. (Au)

## ICEBERG TRANSPORT INTERNATIONAL LTD.

See: 760.

## IMPERIAL OIL LIMITED

See: 547, 674, 1010.

## INGRAM, L.F.

546
**Measurements of explosion-induced shock waves in ice and snow, Greenland, 1957 and 1958** / Ingram, L.F.
Vicksburg, Miss. : Army Engineering Waterways Experiment Station [publisher] : Sprinfield, Va. : NTIS [distributor], 1960.
ix, 21 p. : ill. ; 28 cm.
(Miscellaneous paper - United States. Army. Engineer Waterways Experiment Station, no. 2-399)
*ASTIS document number 182338.*
NFSMO

Pressure-time histories of shock waves, both above and below the surface, were obtained in the proximity of high-explosive charges detonated in ice and snow. Measurements with piezoelectric gages were obtained from 15 explosions in glacial ice and 36 explosions in deep snow. Four different charge types, with weights ranging from 2.5 to 160 lb, were fired. Charge positions ranged from above the surface to a depth of 23.10 ft below the surface. The resulting pressure, impulse, and shock-velocity data exhibited considerable scatter when plotted as a function of reduced distance. At distances of 2 to 20 ft from the charge, the mean shock velocities were 11,500 fps in ice and 4200 fps in snow. Peak pressure values measured in ice were much lower than those that would be expected at comparable distances in water. Pressure waves resulting from charges detonated in snow were severely attenuated as compared with those resulting from free-air bursts. Complete tabulations of the data are presented. (Au)

## INKSTER, D.R.

See: 669.

## INNOVATIVE VENTURES LTD.

547
**Davis Strait ice survey** / Innovative Ventures Ltd. Van Ieperen, M. Imperial Oil Limited [Sponsor].
[Calgary, Alta. : Distributed by APOA], 1978.
4 microfiches : ill., figures, tables ; 11 X 15 cm.
(APOA project no. 140 : Davis Strait ice survey (November-December 1977). Report, no. 1)
*ASTIS document number 138576.*
ACU, NFSMO

[The report] describes the field studies performed during the 1977 ice incursion period in southern Davis Strait with the M.V. Lady Johnson II as a base of operations. The report includes the data collected from the ice buoys deployed on floes in Davis Strait and the concomitant measurements of ice properties and the meteorological observations performed on the vessel. The ship's log and an ice log which documents ice type and iceberg locations are also included. (Au)

## INOUE, M.

See: 426.

## INSTITUT FRANCAIS DU PETROLE

See: 339.

## INTERA ENVIRONMENTAL CONSULTANTS

548
**Arctic Pilot Project : remote sensing overflight data acquisition and reduction program (November 1977 - May 1978)** / Intera Environmental Consultants. Melville Shipping Limited [Sponsor].
Ottawa : Intera Environmental Consultants Ltd. [publisher] ; Calgary, Alta. : Pallister Resource Management Ltd. [distributor], [1978?].
3 microfiches : ill. ; 11 x 16 cm.
Appendices.
References.
*ASTIS document number 157252.*
ACU

A remote sensing project has been undertaken to provide the environmental portion of the ARCTRANS System Performance Model with detailed ice information for the prediction of the performance of the marine transportation components of the Arctic Pilot Project. This report summarizes the results of the remote sensing program. ... The objectives of the program may be summarized as follows: (1) To acquire a comprehensive inventory of ice statistics from remote sensing data between Bridport Inlet on Melville Island and the southern limit of the ice edge in Baffin Bay, during a winter season. (2) To develop a data base of ice pressure ridge parameters for the analysis of their temporal and spatial distributions for the same area, and to provide the System Performance Model with compatible ice ridge statistics. (3) To identify and study the frequency and size of icebergs along the proposed shipping route. (4) To study ice types and coverage along the shipping route with a particular emphasis on the identification of Multi-Year ice. (5) To assess the utility of the sensor complement for the generation of useful ice information. (Au)

549
**An iceberg motion prediction model for Lancaster Sound and west Baffin Bay** / Intera Environmental Consultants. Flow Research Inc. Petro-Canada [Sponsor].
[Calgary, Alta. : Petro-Canada], 1980.
204 p.
*Document not seen by ASTIS.*
*ASTIS document number 183741.*

550
**Imagery analysis of side-looking airborne radar (SLAR) from the Labrador Sea area 1978-1980 for iceberg statistics** / Intera Environmental Consultants. Canada. Environment Canada [Sponsor].
[Ottawa] : Ice Centre Environment Canada, Ice Climatology and Application Division, 1982.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report - Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184098.*

Magnetic tape containing iceberg data obtained by analysis of SLAR imagery from C-GNDZ along the Labrador and Newfoundland coasts during the period 1978 through 1980. The data consists of iceberg numbers, time sighted, latitude/longitude, grid reference and dimensions when possible for approximately ninety (90) SLAR flights at the 100 km scale. ASCII 9 track 800 BPI format. A report is available in four volumes consisting of catalogue, discussion, statistics and hard copy of data base. (Au)

## ISACHSEN, G.I.

551
**Das palaokrystische Eis [The paleocrystic ice]** / Isachsen, G.I.
(Petermanns geographische Mitteilungen, bd. 52, 1906, p. 13-19)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179841.*
ACU

Knowledge of paleocrystic ice since Nares introduced the term in 1876, is reviewed. Paleocrystic icebergs (here termed "floebergs"), their distribution, drift, shape, structure, dimensions and various theories on their origin; and observations made by the Fram Expedition in 1989-1902 are described. Analysis of available data indicates that the floebergs probably originate as icebergs calved from glaciers of the Sherard-Osborn and Petermann Fiords which drift S. around Greenland where in the W. they jam in the Robeson Channel or run aground and obstruct the drift of polar ice. Glacier ice as well as polar ice becomes extremely old because of favorable local meteorological conditions. (AB)

## JACK, R.L.

**See:** 941.

## JACKA, T.H.

**See:** 231.

## JACKSON, P.L.

**See:** 358.

## JEANS, P.K.

**See:** 246.

## JENSSEN, D.N.

**See:** 621.

## JEWETT, E.

552
**Towing icebergs to protect drilling rigs in the Arctic** / Jewett, E.
(Ocean industry, v. 13, no. 4, Apr. 1978, p. 44-48, ill., map)
*ASTIS document number 167029.*
NFSMO

The article reviews methods of moving icebergs by pushing, prop-wash and floating towline methods. A new concept for towing smaller bergs is proposed, using a 7 ft. diameter suction cup (DAK). (NFSMO)

## JEWETT, P.E.

553
**Maintaining a drilling platform on-station in iceberg infested waters** / Jewett, P.E.
Cowes, England : Marine Exploration Ltd., 1970.
2 microfiches : ill., maps ; 11 x 15 cm.
Appendices.
*ASTIS document number 161756.*
NFSMO

... This study has looked at the question of iceberg drift, as opposed to the drift of pack ice. Many of the techniques used in berg drift analysis and prediction are applicable to drifting pack ice, but essentially, there is a large difference between the two. ... Presented here is both a manual for predicting iceberg drift behaviour, and a specification for standards of equipment, equipment housing, measurements and daily records. These last are required to ensure that maximum value is gained from berg observation experience. ... Some interest has been indicated in using a computer as an aid for iceberg tracking and for making drift predictions. We have made some initial investigations on this matter and have determined that some degree of computerisation is possible. It also appears feasible to have a computer linked with a radar or accoustic detection system for completely computerised berg tracking and drift forecasting. ... This study does not offer a complete method for predicting berg drift with accuracy. Parts I and II of the report are for general planning purposes; they give specifications for equipment and personnel. Part II is for the use and reference of the Ice Observer. Sections 7 and 8 deal mainly with the drift behaviour of icebergs. The appendix has the series of charts and diagrams used in iceberg drift analysis. Examples are given in the Supplement at the end of the report. (Au)

**See also:** 110.

## JOB, J.G.

554
**Numerical modelling of iceberg towing for water supplies – a case study** / Job, J.G.
(Journal of glaciology, v. 20, no. 84, 1978, p. 533-542, figures, table)
References.
*ASTIS document number 19810.*
ACU, NFSMO

The towing of unprotected icebergs from the Antarctic continent (66 deg. S.) to latitude 38 deg. S. has been simulated using an explicit hydrodynamic model and an extended two-dimensional melting model. ... the rate of deterioration in the warm waters indicates that protection would be required for longer journeys. The towing simulation was most sensitive to north-south current components, the total towing distance, and the rate of iceberg deterioration. Efforts directed towards locating suitable icebergs in the region of 50 deg. S. to 60 deg. S., and towards increasing knowledge of the changing current patterns in the Southern Ocean would be most valuable, as would a knowledge of the mechanisms and rates of deterioration of icebergs in warm seas. (Au)

## JOHNSTON, C.E.

555

**Special cruise - ice observation. Report July 9 to July 28 - ice observation by the "Seneca"** / Johnston, C.E.

(Bulletin - United States. Coast Guard, no. 3, 1915, p. 33-35)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 178950.*

NFSMO

Account of a "cruise in waters adjacent to Labrador and Greenland for the purpose of observing conditions governing the origin of the ice which annually appears on the Banks of Newfoundland." This was the first time such an investigation was ordered by the Ice Observation Service. Similar special research was done in 1928 by the Marion and General Greene, and in 1940 by the Northland. Includes brief notes on the icebergs at the lower end of Davis Strait, and the ice conditions which were so severe as to prevent the Seneca from reaching Greenland. (AB)

## JOLLYMORE, P.G.

**See:** 496.

## JONASSON, W.B.

556

**An ice hazard detection system - preliminary investigations** / Jonasson, W.B. Durand, C. Audette, M.

(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. - Quebec City, Quebec : Universite Laval, 1981, v. 3, p.1227-1236, ill.)

Reviewed by ASTIS document number 183989, An ice hazard detection system - preliminary investigation by W.B. Jonasson and C. Durand [discussion] / J.B. Mercer and J. Rossiter in POAC 81, p. 1237-1238.

References.

*ASTIS document number 183970.*

ACU, NFSMO

With the increasing hydrocarbon development in ice infested waters there has come a need to upgrade and enhance existing methods of ice detection. Recognizing this requirement, a co-operative venture between the Transportation Development Centre and Petro-Canada Exploration Inc. was established to evaluate the effectiveness of available remote sensing devices to detect icebergs, icefloes, bergybits and growlers. A research vessel, the M/V Polarhav, was equipped with X-band (3 cm) and S-band (10 cm) marine radars, an infrared imaging scanner and a variable depth towed sonar system. The vessel operated in the Lancaster Sound, Jones Sound and northern Baffin Bay regions during the open water season of 1980 and performed detailed studies of a selected inventory of ice hazards representative of the area. The sensor observations were supported by an extensive groundtruthing program (including sidescan sonar draught measurements, stereo aerial photography and target visits) and a complimentary program of oceanographic and meteorological observations. A description of the project scope, hardware, and field deployment is presented. (Au)

## JONES, G.H.S.

557

**Iceberg tracking off Labrador** / Jones, G.H.S. Diehl, C.H.H.

(Nature, v.229, no.5281, Jan. 15, 1971, p. 189-190, ill.)

*ASTIS document number 162787.*

ACU, NFSMO

The article reports on the method of iceberg tracking through the use of dye marking on the bergs. (NFSMO)

## JORDAAN, I.J.

558

**Risk and safety of offshore production systems** / Jordaan, I.J. Nasseri, T.

(Conference on Canadian Offshore Drilling & Downhole Technology (CODD), September 12-14, 1983, Chateau Lacombe, Edmonton, Alberta. - [Calgary : CODD], 1983, [20] p., ill.)

References.

*ASTIS document number 161632.*

NFSMO

The salient features of two potential types of production systems are described. These are floating platforms with quick disconnect mechanisms and bottom-founded structures that have been proposed for the development of Hibernia oil field .... The probability-based method of defining and implementing design criteria to obtain an acceptable level of safety is discussed. As icebergs present the most serious hazard that could threaten platforms designed for installation in Hibernia, the survivability of the alternative systems in the event of their collision with icebergs is addressed. There are many uncertainties attending the problem of evaluating the risk and consequences of iceberg-structure collisions. Decision theory will be proposed as an effective means of incorporating the significance of such uncertainties in devising a basis for deciding between the contending concepts. Furthermore, the question safety can be treated most satisfactorily as a problem of decision theory, specifically that branch of the theory dealing with risk analysis. Some illustrative examples related to probabilities of iceberg impact are given and the use of decision analysis in formulating design rules is treated. The two candidate production systems mentioned above are used in an example in which the risks are compared. The ideas presented in the first part of the paper are applied in this example. (Au)

**See also:** 678.

## JOSBERGER, E.G.

559

**The effect of bubbles released from a melting ice wall on the melt-driven convection in salt water** / Josberger, E.G.

(Journal of physical oceanography, v. 10, no. 3, Mar. 1980, p. 474-477, photo.)

References.

*ASTIS document number 47520.*

ACU, NFSMO

The buoyancy created by the release of air bubbles from melting glacial ice walls results from both the upward drag of the bubbles and the density defect caused by the steady-state distribution of bubbles in the water. Calculations using typical antarctic ice bubble concentrations and Southern Ocean temperatures and salinities show that the bubble buoyancy is comparable to the dilution for vertical ice length scales greater than 100 m. A comparison of laboratory experiments ... shows two additional bubble effects. First, the bubbly ice melts in an irregular fashion that produces indentations in the ice which measure 20 mm long, 25 mm wide and 5 mm deep, while the bubble-free ice melts smoothly. Second, the ice-water interface salinity in the bubbly case is higher than in the bubble-free case. Finally, the observed melt rates lie within 10% of the observed melt rates from the bubble free experiments. (Au)

560
**Iceberg melt-driven convection inferred from field measurements of temperature** / Josberger, E.G. Neshyba, S.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 113-117, figures, table)
References.
*ASTIS document number 61158.*
ACU, NFSMO

An expendable bathythermograph (XBT) survey around an iceberg ... shows that iceberg melt-driven convection significantly alters the surrounding water properties ... by a general cooling of the water in the upper 40 m by as much as 3 deg and by the formation of isothermal layers with a 5 m vertical-length scale in the pycnocline. Both of these effects become more pronounced as the distance to the iceberg decreases. ... Synoptic surface surveys around the iceberg show the existence of melt plumes containing water of a lower temperature than the adjacent water, and these plumes are detectable at distances of 0.5 km. Concentrated rhodamine placed at depths of 14 and 18 m adjacent to an ice wall sloping downward at a 30 deg angle flowed upward along the ice. The dye reached the surface immediately next to the ice in 240 s and 540 s, respectively, to give a characteristic upward velocity of approximately 0.07 m/s. The dye then dispersed outward away from the iceberg until it was no longer visible. (Au)

561
**A laboratory and field study of iceberg deterioration** / Josberger, E.G.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 245-264, ill.)
Appendix: Wave-induced heat transfer to an iceberg / S. Martin, E. Josberger and P. Kauffman.
References.
*ASTIS document number 161853.*
ACU, NFSMO

Vertical ice walls in warm sea water deteriorate from the action of natural convective boundary layers. A cooperative field study with the International Ice Patrol shows that in 4 degree C sea water melt-driven upwelling occurs adjacent to an iceberg. The effects of the iceberg on the water column were to lower the temperature and salinity by 3.0 degrees C and 0.5 per mille. In the laboratory this process was modeled using fresh water bubble-free ice sheets immersed in sodium chloride solutions of oceanic salinities and temperatures. The observed flow field next to the ice face was laminar at the bottom, then went through a region of transition and finally became fully turbulent further up the ice. The length of the laminar layer for oceanic conditions has a maximum length of 0.5 m, at which point the saline Grashof number reaches a critical value 2 x 10**8 and the flow becomes turbulent. Measurements of the melt rate and the ice/water interface temperature in the turbulent regime show uniform temperatures and a melting rate that varies slowly in the vertical; this greatly facilitates theoretical modeling of the flow. For subpolar water temperatures, 0 degrees to 5 degrees C, the experiments show the melt rate to be of the order 0.1 m/day; for tropical water temperatures, 25 degrees C, the melt rate is of the order 2.5 m/day. (Au)

562
**A laboratory and theoretical study of the boundary layer adjacent to a vertical melting ice wall in salt water** / Josberger, E.G. Martin, S.
(Journal of fluid mechanics, v.111, Oct. 1981, p. 439-473, ill.)
References.
*ASTIS document number 172391.*
ACU, NFSMO

In an experimental and theoretical study we model the convection generated in the polar oceans when a fresh-water ice wall melts in salt water of uniform far-field temperature T and salinity S. ... Vertical ice walls in the world ocean occur for both sea and glacier ice. For first and multi-year sea ice, which at the beginning of the melt season have salinities less than 4 per mille, the vertical length scales range from 0.5 to 4 m. For glacier ice or icebergs, the vertical length scales are typically 100 m for the North Atlantic icebergs, and 250 m for the Antarctic icebergs. For sea ice, melting occurs during the polar summer for ice floating in seawater which is warmed above its freezing point by solar radiation. For icebergs, melting occurs throughout the year once the icebergs are advected into seawater with temperatures above freezing. Because of the difficulty in doing field measurements near large ice masses and at the ice edge, investigators use laboratory experiments to understand the melt-driven convection. ... (Au)

563
**Laminar and turbulent boundary layers adjacent to melting vertical ice walls in salt water** / Josberger, E.G.
Arlington, Va. : U.S. Office of Naval Research, Arctic Program, 1979.
3 microfiches : ill., figures, plates, tables ; 11 x 15 cm.
(NTIS AD-A-071 809)
Thesis – University of Washington, Seattle, Washington, 1979.
Appendices.
Bibliography : p.150-152.
*ASTIS document number 80608.*
ACU, NFSMO

To determine the effect of a melting ice wall on the surrounding water properties in the ocean, I performed a field program adjacent to an iceberg in the North Atlantic Ocean.... Not all ice in the oceans is in the form of icebergs; sea ice covers most of the Arctic Ocean.... sea ice contains salt; first-year ice may have a salinity as high as 20% while multiyear ice usually has a salinity of 2%. The low multiyear ice salinity allows the results of this study to be applied to most sea ice melting phenomena. ... Vertical natural convection adjacent to ice walls occurs in the polar oceans over a wide range of length scales driven by a wide range of ambient temperatures and salinities. To understand fully the role of ice in physical oceanography of the polar oceans, the fluid dynamics of this convection must be studied. In the following ... I discuss first the equation of state and the freezing point dependence of seawater; second, the dimentional analysis applicable to the flow next to a melting vertical ice wall. (Au)

564
**The oceanographic impact of melting icebergs and marine ice shelves** / Josberger, E.G.
(Iceberg research, 1982, no. 1, May, p. 4-9, figures)
References.
*ASTIS document number 131997.*
NFSMO, ACU

Laboratory studies have shown that melting vertical ice walls can generate a wide variety of convective flows, depending on the ambient temperature, salinity, and vertical density structure. Extrapolation of the laboratory studies to the oceanic case provides the basis for interesting predictions on the effect of melting icebergs and marine ice shelves. However, the large difference in vertical-length scales between the laboratory and the ocean makes the extrapolation suspect. Verification of the laboratory studies await the appropriate field measurements .... (Au)

**See also:** 531, 787, 937.

## JOSENHANS, H.W.

**565**

**DIGS : regional geology and seabed dynamics at the proposed iceberg scour impact study site** / Josenhans, H.W.

[S.l. : s.n., 1985].

[4] leaves ; 28 cm.

Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.

Indexed from a preliminary draft, July 1985.

Proceedings to be published as an ESRF Report in late 1985.

*ASTIS document number 163651.*

[This paper] ... describes the geology of the Makkovik setting and [shows] why this site was selected for the DIGS (Dynamics of Iceberg Grounding and Scouring) experiment. ... [A scour mark and its degradation is also described.] ... (Au)

**566**

**DIGS-85 : Dynamics of Iceberg Grounding and Scouring : Observation of iceberg scour marks by manned submersible** / Josenhans, H.W. Barrie, J.V. Woodworth-Lynas, C.M.T. Parrott, D.R.

(14th Arctic Workshop : Arctic land-sea interactions, 6-8 November, 1985, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. - Dartmouth, N.S. : Bedford Institute of Oceanography, 1985, p. 92)

Abstract only.

*ASTIS document number 176362.*

ACU

Direct observations of fresh and relict iceberg impact and scour sites were performed using the manned submersible PISCES IV in conjunction with the DIGS-85 experiment, on Makkovik Bank, Labrador. Detailed inspections were made of several sites identified by the DIGS-85 study as iceberg grounding sites and fresh scour marks. Observation of an iceberg scour feature which had been formed just five days prior to the dive showed fragments of ice imbedded in the seafloor. Degradation of the scour feature by bottom currents and macro-benthos had already begun indicating a high rate of erosion of the scour berms on this portion of the Labrador Shelf. A scour identified on a 1979 side scan sonar survey on Saglek Bank was resurveyed to a submersible dive. The scour was readily identified on the sonar records and a relatively new scour which cross-cut the original was discovered. A previous resurvey of the site in 1982 showed no evidence of the new scour. Submersible observations on the scours showed the original scour had undergone considerable modification by currents and macrobenthos. The fresh scour cut through the original and showed fragmented boulders (volcanic) in the scour trough. It is proposed that these boulders were fragmented in place. Inspections of both fresh and relict iceberg grounding sites were made in over-consolidated glacial tills as well as unconsolidated glaciomarine silts. The character of the sediment exerts considerable influence on both the formation of the fresh scour and the rate of degradation of the scours. (Au)

**567**

**Pockmarks on the Labrador Shelf triggered or caused by iceberg scouring** / Josenhans, H.W. Zevenhuizen, J.

[S.l. : s.n., 1983].

[6] leaves : ill., map ; 28 cm.

Paper presented at the Geotechnical Practice in Offshore Engineering Conference, 27-29 Apr., 1983, Austin, Tex.

*ASTIS document number 159662.*

Pockmarks are cone shaped depressions on the seafloor that are thought to be formed by venting gas or water. These features have been found worldwide occurring in unconsolidated fine sediments frequently in association with areas of hydrocarbon potential. Within the study area pockmarks range in size up to 100 m wide and 7 m deep and some occur in a unique association with iceberg scour marks. Extensive sidescan sonar and high resolution seismic reflection profile data shows pockmarks immediately adjacent to the lateral embankments (rims) of iceberg scour marks. High resolution profile data indicates that gas charged sediments frequently occur close to and in one example directly beneath a pockmark. A repeated association of pockmarks adjacent to iceberg scour marks suggests a causal relationship in which the grounded iceberg triggers release of the interstitial gas to form a pockmark. Alternatively, a moving grounded iceberg may compact and over pressure the unconsolidated sediment to force interstitial pore water out along areas of greater permeability or weakness within the sediment to form a pockmark-like feature adjacent to the scour mark. The association of pockmarks with seabed morphology sediment type, shallow gas occurrence, and local stratigraphy is described. (Au)

**568**

**Preliminary results of submersible observations on the Labrador Shelf** / Josenhans, H.W. Barrie, J.V.

[Ottawa : Geological Survey of Canada, 1982].

(Paper - Geological Survey of Canada, 82- 1B, p. 269-276, figures)

(C-CORE publication, no. 82- 1)

(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum - Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 100, ill.)

References.

*ASTIS document number 133230.*

ACU, NFSMO

... Side-scan sonar and high resolution Huntec profiles suggest a relationship between iceberg scour mark morphology and sediment properties that warrants more detailed investigation by submersible. Also submersible observations of the local seabed dynamics are necessary to determine the degradation rate of scour marks in order to ultimately establish their recurrence interval. In October 1981 the use of the Pisces IV manned submersible provided visual and photographic documentation of the seabed within the Bjarni area ... and provided a vehicle for precise surficial sampling in iceberg-scoured terrain and over areas of bedrock outcrop. Our three main objectives were to: (1) investigate areas of the seafloor that have been actively disrupted by the grounding keels of icebergs and to note the degradation of these scour marks by the superimposed current regime and benthic biological activity; (2) provide ground truth for the acoustic data and note the modern sedimentary environment in terms of erosion or deposition: and (3) describe and sample a section of Tertiary (?) outcrop. ... (Au)

**569**

**Seafloor dynamics on the Labrador Shelf** / Josenhans, H.W. Zevenhuizen, J.

[S.l. : s.n., 1984?].

1 leaf ; 28 cm.

Abstract only.

Photocopy.

Paper presented at Sedimentology of Shelf Sands and Sandstones, Calgary, Alberta, June 1984.

*ASTIS document number 159670.*

Recent geological-geophysical studies on the Labrador Shelf demonstrates very dynamic bottom conditions over 70% of the shelf area and extending to depths of 230 m. A variety of sediment reworking processes which affect the seafloor are described but the most important agent - iceberg scouring - is emphasized. A series of oriented bottom photographs (colour) taken every 14 metres

along a 6 km transect show a clearly defined "fresh" keel mark cut through a lag gravel and into the underlying gravelly silty clay substrate of Makkovik Bank. Transects taken from Saglek and Nain Banks in similar water depths ranging between 140 and 160 m also showed one "fresh" keel-mark per 6 km of seafloor photographed. On Saglek Bank a detailed synthesis of high resolution acoustic data, sidescan sonar and age determinations from piston core samples suggests complete iceberg reworking of all shelf areas shallower than 152 m within the last 10,000 years. Another important dynamic process on the shallow (<165 m) areas of the shelf is winnowing by bottom currents. ... The evidence for strong current winnowing and the very clearly defined keel marks suggest that "fresh" may represent days or months. The recurrence interval of modern iceberg scouring on the Labrador Shelf could be determined by measuring the rate of scour degradation by current winnowing for a given area and relating the number of partially degraded scours of a known age to the number of fresh scours with the same area. ... Contemporary deposition is mainly limited to water depths > 300 m in the transverse saddles, the marginal trough and shelf edge. Additional, but relatively minor, processes affecting the sea bottom are: ice rafting, reworking by macrobenthos and slumping. (Au)

**See also:** 999.

## JOZAN, M.M.

570
**"Iceberg investigations along the west coast of Greenland" by J. Dietrich and "Another hypothesis about iceberg draft" by L. Brooks : discussion** / Jozan, M.M.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 355)
Discussion of ASTIS document number 172847, Iceberg investigation along the west coast of Greenland / J. Dietrich, et. al. in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 221-239; and ASTIS document number 55549, Another hypothesis about iceberg draft / L.D. Brooks in POAC 79 proceedings v. 1, p. 241-252.
*ASTIS document number 172880.*
ACU, NFSMO

Most measurements of iceberg draft have been made with the well known side scan sonar method: a conventional side scan sonar is lowered from the surveying ship in a vertical position. Its free rotation will allow a 360 degree scanning of the horizontal plan. The descent along the iceberg side is followed until the backscattered pulse disappears on the record. The depth of immersion of the sonar at this point is assumed to be the local draft. ... The Labrador Group ... decided this year to do field truthing of the above method which remains the best operational answer to draft measurements. The survey, still underway, uses a remote controlled submersible equipped with sonar, depth sounder and attitude sensors. The submersible navigates under the berg keel. The measurement is computed as the difference between immersion and sonar range, and can be considered as the true measurement (as long as calibration is correctly done). The above result is then compared to extensive side scan sonar measurements. Early results indicate that most of the time, the side scan sonar measurement will be within 5-10% of the submersible measurement. However, this needs confirmation, and at that time, but only at that time, side scan sonar measurements done in the past five years could be validated. (Au)

**See also:** 780, 987, 1094.

## JUDGE, C.W.

571
**To hunt an iceburg [sic] – microwave radiometry** / Judge, C.W.
(Geo marine technology, v. 1, no. 3, Feb. 1965, p. 29-31, ill., map)
References.
*ASTIS document number 163180.*
NFSMO

... One new iceberg detection method being explored by USCG is the use of airborne microwave radiometry. The microwave radiometer senses thermal radiation which ... is emitted by all bodies whose temperature is above absolute zero. ... This system was installed on board a USCG R&D aircraft. Test flights were made over Lake Michigan, off the coasts of Labrador and Newfoundland, and over Delaware Bay. Of primary interest were the effects of icebergs, ships, and land. ... The results were encouraging. ...USCG contracted with Sperry Microwave Electronics Co. to design and build an operational system suitable for its use. ... Two systems are to be installed aboard C-130B aircraft by August 1965. They will receive a technical evaluation during the late summer of 1965 and an operational evaluation during the 1966 ice season. The use of these radiometers should provide Commander, International Ice Patrol, with more complete information on the location of icebergs during those times when severe fog prevents visual detection. ... (Au)

## KAMINSKI, H.S.

572
**Distribution of ice in Baffin Bay and Davis Strait** / Kaminski, H.S.
Washington, D.C. : [Hydrographic Office], 1954.
49 p. : maps.
(Miscellaneous publication – United States. Hydrographic Office, no. 15891, Apr. 1954)
(Technical report – United States. Hydrographic Office, TR-13, Feb. 1955)
Reprinted with minor corrections as U.S. Hydrographic Office, TR-13, Feb. 1955.
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179752.*

Contains reports based on aerial reconnaissance, ship and shore observations, and some historical data from exploratory voyages. Currents and general circulation of waters of the region are described, then ice conditions from the Thule region southward to the northern coast of Labrador are dealt with for different seasons of the year. Dates of formation and break-up, types of ice, and ice topography are described, with additional information on iceberg distribution. Maps show ice distribution and types during each month of the year. Information was prepared as guide for planning aircraft emergency landings and other operations in the region. (AB)

573
**Distribution of ice in Baffin Bay and Davis Strait** / Kaminski, H.S.
Washington, D.C. : [U.S. Coast Guard], 1955.
vii, 32 p. : ill., maps.
(Technical report – United States. Hydrographic Office, TR-13, Feb. 1955)
Reprinted with minor corrections as U.S. Hydrographic Office TR-13, Feb. 1955.

Contains reprint, with minor corrections, of Arctic Bibliography, No. 35519, ASTIS document number 179752 : Distribution of ice in Baffin Bay and Davis Strait / H.S. Kaminski. – Washington, D.C. : Hydrographic Office, 1954.
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179850.*

Contains reports based on aerial reconnaissance, ship and shore observations, and some historical data from exploratory voyages. Currents and general circulation of waters of the region are discribed, then ice conditions from the Thule region southward to the northern coast of Labrador are dealt with for different seasons of the year. Dates of formation and break-up, types of ice, and ice topography are described, with additional information on iceberg distribution. Maps show ice distribution and types during each month of the year. Information was prepared as guide for planning aircraft emergency landings and other operations in the region. (AB)

**See also:** 181.

## KANWISHER, J.W.

**See:** 928, 929.

## KAPLAN, H.R.

574
**Coast Guard starts 1965 International Ice Patrol** / Kaplan, H.R.
(Nautical magazine, v.193, no. 5, 1965, p. 287-288)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180602.*

In 1965, experiments in iceberg tracking will include use of high-intensity dye fired from the vessel Evergreen and further study on the origin and characteristics of the Labrador Current. A brief history of the patrol, established in 1914, is included. (AB)

575
**The International Ice Patrol, a memorial to the Titanic** / Kaplan, H.R.
(Mariners weather log, v. 11, no. 3, May 1967, p. 87-88, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180556.*

A brief account of the operations of this patrol, with description and illus of the technique of tracking icebergs off Labrador coast by marking with aerially dropped dye bombs. Research into characteristics of the Labrador current is reviewed. Efforts to destroy icebergs have failed and surveillance is considered the only feasible procedure in the foreseeable future. (AB)

## KATUNIN, M.

576
**Osobennosti plazaniia sredi aisbergov [Navigating among icebergs]** / Katunin, M.
(Morskoi flot, v. 5, May 1968, p. 19, ill.)
Text in Russian.
*ASTIS document number 182389.*

Navigation difficulties in the antarctic waters, south of the 40th parallel to the South Pole, are due to strong storms, bad visibility and mainly to the great number of icebergs. Icebergs occur from the 60th parallel to the South. Big ones can be detected at a distance of 15 to 18 miles by radiolocators. But the small ones can only be seen from 1 to 1 1/2 miles, and in some places, like in Ross Sea, they can accumulate in large quantities (from 25 to 100 separated from each other by only 1 to 2 miles). Navigation is very hazardous without good instruments and practical knowledge, even in good weather and good visibility. The speed of the icebergs (which can be up to 2 or 3 knots) depends on it's shape. The big pyramidal ones are subject to the current; they can go against the wind; they produce a clear echo signal and can easily be detected. But the columnar icebergs have a very good sailability and their movements depend on the wind. The small icebergs move with the wind and the current and are very unpredictable. The columnar and small icebergs produce a very faint echo-signal and are difficult to detect without constant observation of the radiolocation. (ASTIS)

## KAVING, V.V.

**See:** 586.

## KAWASAKI, T.

**See:** 593.

## KEELEY, M.A.

577
**Experts follow floating menaces** / Keeley, M.A.
(Offshore, v. 41, no. 9, Aug. 1981, p. 54-66, ill.)
*ASTIS document number 176672.*
NFSMO

Icebergs – the floating enemies of offshore production operations – will play a significant role in development work planned for coastal Canada. Because of this, scientists have begun researching the various threats carried by bergs. (Au)

## KELIHER, T.E.

**See:** 338.

## KENNEDY, J.F.

578
**Ripple formation at ice-flow interfaces : potential effects on iceberg transport** / Kennedy, J.F.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 276-282, ill.)
References.
*ASTIS document number 161870.*
ACU, NFSMO

... Presented ... is an analytical model of ice-ripple formation on icebergs, and interpretation of the theoretical results together with the results of related experimental and theoretical studies ... a discussion of the potential effects of ice ripples on iceberg transport [is also included.] (Au)

## KENT, A.

See: 1063.

## KERRY, K.

See: 117.

## KETCHEN, H.G.

579
**Iceberg populations south of 48 N since 1900** / Ketchen, H.G.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1977. Bulletin – United States. Coast Guard, no. 63, 1978, p. C-1-C-6, ill.)
Appendix C.
Mostly illustrations and tables.
*ASTIS document number 166260.*
ACU, NFSMO

... a breakdown by month of the estimated number of bergs crossing 48 N since 1900. ... [is provided as well as a] bar graph of the estimated numbers of icebergs crossing 48 N during each year since 1900. ... For the period 1900 through 1977 the median of the annual iceberg counts is 279, while the average is 383. For the period 1946 through 1977, the corresponding median is 107 while the average is 300. ... (Au)

580
**Observations of sea surface temperatures in the vicinity of the Grand Banks** / Ketchen, H.G.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1976. Bulletin – United States. Coast Guard, no. 62, 1977, p. 77-82, ill.)
Appendix E.
References.
*ASTIS document number 166936.*
ACU, NFSMO

The paper describes three methods to collect sea surface temperatures, and considers the effect of iceberg melting on ocean temperature. (NFSMO)

581
**Thermal studies of the Grand Banks Gulf Stream slope using airborne radiation thermometers and satellite data** / Ketchen, H.G. La Violette, P.E. Worsfold, R.D.
[St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, 1977].
[18] p. : table, figures ; 28 cm.
(C-CORE publication, no. 77- 11)
References.
Presented to the 4th Canadian Symposium on Remote Sensing, Quebec City, May 1977.
*ASTIS document number 130400.*
NFSMO, ACU

... The programme involved the analysis of: airborne radiation thermometer data, surface data from ships, [and] NOAA satellite data. The aim of the project was the correlation of the three sources of data to determine the feasibility of establishing a method to determine iceberg deterioration rates. Several error correction methods were tested to determine the most suitable method for correcting airborne radiation thermometer data for use in a computer mapping programme to determine surface temperature contours. ... It is planned to continue testing other error correction methods and to computerize the data so near synoptic maps can be generated that can be used for determining iceberg deterioration. The feasibility of determining the remaining life of a berg was well demonstrated. (Au)

582
**Unusual iceberg sighting** / Ketchen, H.G. Hildenbrand, R.N.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1977. Bulletin – United States. Coast Guard, no. 63, 1978, p. D-1-D-2, map)
Appendix D.
*ASTIS document number 166278.*
ACU, NFSMO

... [The map] shows the maximum mean iceberg limit and reported unusual iceberg sightings. ... (Au)

## KETCHUM, R.D.

583
**Dual frequency radar ice and snow signatures** / Ketchum, R.D.
(Journal of glaciology, v. 29, no.102, 1983, p. 286-295, figures)
References.
*ASTIS document number 140392.*
ACU, NFSMO

Dual frequency (X-band and L-band) synthetic-aperture radar imagery of sea ice is examined to show the differences between the bands and their complementary nature for resolving ambiguities in interpretation. High backscatter at X-band from visibly smooth thin ice is not observed at L-band. One hypothesis is that the high X-band backscatter may be caused by a reflective layer at the snow/ice interface. A second hypothesis is that the high X-band backscatter may be caused by moisture in the snow. A third hypothesis states that the phenomenon may be due to snow flowers. High backscatter at L-band is observed for slush on open water. The return is very weak at X-band, thus allowing distinction of slush by comparing L-band and X-band images. High intensity, but only partial returns from icebergs at L-band have been observed. The hypothesis is that internal iceberg/sea-water reflections are occurring. Some signals are directed away from the antenna, other reinforced signals are returned, producing very bright images. Occasionally, time-delayed signals are returned causing a false image at far range from the iceberg. The conclusion is that L-band is a poor choice for studies of iceberg distribution and size, but a good choice for iceberg detection because of the high reinforced returns from many icebergs and the low return from the adjacent sea ice. The penetration and subsequent signal loss of L-band in glacial ice, when compared to high X-band returns, may be useful to map glacierized land masses. (Au)

584
**Eastern Arctic SURSAT SAR ice experiment : radar signatures of sea ice features** / Ketchum, R.D. Farmer, L.D.
Mississippi : Naval Ocean Research and Development Activity [publisher] ; Springfield, Va. : NTIS [distributor], 1980.
1 microfiche : ill., map ; 11 x 15 cm.
(NORDA technical note, no. 68)
(NTIS AD-A-090 629)
(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche

collections, 83- 0993, section 5.2, [42] p., ill., map)
References.
*ASTIS document number 173991.*
NFSMO, ACU

Evaluation of X- and L-band steep angle synthetic aperture radar (SAR) sea ice imagery taken in Baffin Bay and Davis Strait in April 1979 has shown that description and discrimination of first-season ice types can be difficult because of ambiguous radar returns. Ambiguous returns seen on X-band radar imagery are attributed to snow cover. The data have indicated that changes in snow properties due to melting and refreezing cause development of a highly reflective medium to the 3 cm X-band radar. The 25 cm L-band radar is not noticeably affected by the observed phenomena, thus correlation of coincident X- and L-band imagery often resolves interpretation ambiguities on the X-band imagery caused by the snow effects. ... Ice ridge identification and discrimination was often poor due to the obscuring effects of background clutter associated with above-suggested backscattering phenomena. Small ridge sizes versus system resolution and steep angles of incidence also reduce ridge identification capabilities. Some icebergs produced time-delayed L-band signals, indicating internal reflections within the iceberg. Iceberg/water interface reflections rather than volume scattering are an indication. L-band radar cannot be depended upon for iceberg identification, since icebergs may be only partially imaged or not imaged at all by this frequency. (Au)

## KEYES, C.R.

**585**
**Glacial tills and iceberg drifts** / Keyes, C.R.
(Pan-American geologist, v. 49, no. 5, June 1928, p. 369-372)
*ASTIS document number 180890.*
BVAU

The author discusses the use and appropriateness of the term drift found in scientific literature with respect to discussions on glacial tills and icebergs, "no matter what we intend to give meaning whenever we use the generic term drift, we tacitly admit an iceberg origin however qualified we attempt to be in arguing for glacier-debris. ... In the interests of precise scientific expression, therefore, the sooner we abandon the term drift as designating glacial moraine the better it will be." ... (ASTIS)

## KHITKOV, IU.V.

**586**
**The radar detection of ice floes** / Khitkov, Iu.V. Genkin, V.A. Kaving, V.V.
(Sudostroenie, no. 1, 1984)
Availability: East-West Engineering Design Studies Reg.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
Text in Russian.
*Document not seen by ASTIS.*
*ASTIS document number 184195.*

The radar reflecting properties of an object depend upon its "effective reflecting surface". Lack of firm knowledge of the magnitude of the "specific effective reflecting surface" of ice has made it difficult, in the past, to stipulate the power and types of radars for the effective detection of ice floes. The authors have conducted an evaluation of this characteristic of ice floes and present their findings with discussion of the difficulties of detection. The doppler rejection of interference due to sea surface movement is discussed. The conclusions of this paper are that icebergs (defined as floes higher than 5 metres above the water) are detected at about 60% of the distance of detection of ships of comparable height. Ice floes are detected at 10 to 30% of the distance of the radio horizon under conditions of normal refraction. Radar transmitters of 160 dB of power will assure the detection of floes at distances down to 3 km. For the best detection of floes against a background of water movement, wavelength of 10 cm is recommended. For the detection of ice in general the wavelegth should be 3 cm. This implies that ice class ships should be provided with sets capable of both wavelengths. Doppler methods of selection give better definition of ice conditions. (Au)

## KIDD, L.A.

**See:** 1119.

## KIDD, R.B.

**See:** 526.

## KIEFTE, H.

**See:** 433.

## KILPATRICK, T.B.

**See:** 127.

## KINDLE, E.M.

**587**
**Observations on ice-borne sediments by the Canadian and other arctic expeditions** / Kindle, E.M.
(American journal of science, ser. 5, v. 7, Apr. 1924, p. 251-286, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178977.*
ACU

Notes on the "tundra climate" prevailing in the North American Arctic, on wind transportation of sediment to sea ice, difference in the melting of sea and fresh-water ice, on floe and berg ice (including its occurrence, behavior and geologic work), life on sea ice. (AB)

## KING, E.L.

**588**
**Regional iceberg scour distribution and variability, eastern Canadian continental shelf** / King, E.L. Gillespie, R.T.
[S.l. : s.n., 1985].
[4] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166510.*

The Ice Scour Data Base that presently exists at Bedford Institute was initially established in 198? by Mike Lewis and Steve d'Apollonia using PERD funding. This presentation describes an update of that data base which was contracted to Geonautics Limited and funded out of the ESRF. The original data base involved an analysis of regional sidescan and Huntec DTS profiler records for the entire Canadian seaboard from Lancaster Sound to the Grand Banks of Newfoundland and included the Baffin Island

and Labrador Sea regions. The contract awarded to Geonautics to update this data base involved an analysis of any remaining regional data from both Government Institutions and Industry. (Au)

## KING, L.H.

589
**Relict iceberg furrows on the Laurentian Channel and western Grand Banks** / King, L.H.
(Canadian journal of earth sciences, v. 13, no. 8, Aug. 1976, p.1082-1092, figures)
References.
*ASTIS document number 148520.*
ACU, NFSMO

A side-scan sonar survey along the western bank of the Laurentian Channel and on the western Grand Banks revealed the occurrence of iceberg furrows that are probably of Late Pleistocene age. The occurrence of furrows in the Gulf of St. Lawrence is significant in that it helps to date iceberg furrows along the northeast Newfoundland-Labrador margin of the northwest Atlantic, provides data on the history of deglaciation of the offshore area of the Atlantic Provinces, provides a means of evaluating sea level curves, and provides additional evidence for the broad regional extent of the Late Pleistocene shoreline at 115 to 120 m. (Au)

**See also:** 397, 646.

## KIRBY, M.E.

590
**Applications of Robert's gradient operator for the digital enhancement of icebergs from SAR imagery** / Kirby, M.E.
(Proceedings of the Seventh Canadian Symposium on Remote Sensing, September 8-11, 1981, Winnipeg, Manitoba / Edited by W.G. Best and S.-A. Weselake. – Ottawa : Canadian Aeronautics and Space Institute, 1981, p. 436-442, ill.)
References.
*ASTIS document number 177270.*
ACU

Previous attempts at automatically extracting icebergs from SAR imagery using conventional digital image processing techniques revealed a number of problems when working in the predominantly spectral domain. The emphasis in the spectral domain has centred around assumptions related to Gaussian distributions. However, radar imagery of ice is often characterized by Rayleigh and exponential distributions with significantly varying degrees of signal to clutter ratios. It has been found that there is often a very low signal to clutter ratio for icebergs in pack ice. This low ratio makes it difficult or impossible to automatically identify icebergs primarily on the basis of spectral characteristics. It became necessary to explore methods which emphasize the spatial aspects of the data sets. One of many such approaches emphasized the 'edgeness' related to a feature of interest. In this study the concept of edgeness was explored in order to enhance the borders of the icebergs using the Robert's Gradient Operator. This paper discusses the details of the gradient operator in relation to its utility as an operational method for enhancing icebergs from a digital SAR array. A number of actual SAR images of icebergs were used to demonstrate the stages in the application of the Robert's Gradient Operator. (Au)

591
**Digital image analysis of SAR imagery for the detection of icebergs** / Kirby, M.E.
(Proceedings – Canadian Symposium on Remote Sensing, 6th, Halifax, Nova Scotia, 21-23 May, 1980 / Edited by Thomas J. Alfoldi. Ottawa : Canadian Aeronautics and Space Institute, [1980], p. 249-262, figures, tables)
(Iceberg research, 1982, no. 2, Sept., p. 6-18, ill.)
(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.14, [13] p., ill.)
References.
Also available on microfiche.
*ASTIS document number 69680.*
NFSMO, ACU

... numerical models are being developed to predict the probabilities of iceberg encounters with drill rig platforms and ships. The important factors in the prediction models are the initial detection of the icebergs followed by the processing of the resulting iceberg information as inputs to the prediction models. In order for the prediction models to adequately incorporate the iceberg information in a real-time forecast mode of operational use, suitable quantitative spatial data must be generated. One of the fastest means for creating quantitative iceberg files would involve the automated analysis of remote sensing data sets. ... Reliance on active systems, such as synthetic aperture radars (SAR) has thus become increasingly important. In the spring of 1979 extensive 4 channel SAR data sets over iceberg infested waters were obtained as part of the SURSAT program. Portions of this imagery were digitized and analyzed on the CCRS Image Analysis System in an effort to evaluate the utility of present image processing methods for isolating icebergs for future incorporation into iceberg prediction models. (Au)

592
**Iceberg detectability problems using SAR and SLAR systems** / Kirby, M.E. Lowry, R.T.
(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.13, [33] p., ill.)
Paper also presented at the 5th Annual W.T. Pecora Symposium : Satellite Hydrology, Sioux Falls, South Dakota, June 10-15, 1979.
Also available on microfiche.
*ASTIS document number 163813.*
NFSMO, ACU

The application of synthetic aperture radar (SAR) and real aperature side-looking airborne radar (SLAR) systems for the identification of icebergs involves an understanding of the complicated interactions between the radar beams and the multi-faceted bergs. This paper summarizes the major problems that have been encountered in iceberg census research from selected portions of SLAR and SAR airborne experiments that were recently conducted. ... Since little radar iceberg data have been gathered from space satellites, the airborne systems offer attractive simulation possibilities. These systems have been used here to address such topics as iceberg detectability in relation to resolution, depression angle, sea clutter, and iceberg size and type. (Au)

**See also:** 669, 1092.

## KITAMI, E.

593
**Iceberg collision with semi-submersible drilling unit** / Kitami, E. Fujishima, K. Taguchi, Y. Nawata, T. Kawasaki, T. Sakai, F.
(IAHR Ice Symposium 1984, Hamburg, August 27-31, 1984, proceedings. – [Hamburg : International Association for Hydraulic Research], 1984, v. 2, p. 45-53, ill.)
References.
*ASTIS document number 167053.*
NFSMO

This paper describes the investigation results concerning the structural safety at [the] colliding [of] a semi-submersible drilling unit with the bergy bits. It was concluded that the semi-submersible drilling unit would endure a collision with a few thousand tons of bergy bit. ... (Au)

## KLEIN, K.

**See:** 1101.

## KLEPSVIK, J.O.

594
**Studies of icebergs, ice fronts and ice walls using side-scanning sonar** / Klepsvik, J.O. Fossum, B.A.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 31-36, figures, tables)
References.
*ASTIS document number 61034.*
ACU, NFSMO

During the Norwegian Antarctic Research Expedition of 1978-79, a number of experiments were carried out using side-scanning sonar techniques for under-water mapping of icebergs, ice fronts, and ice walls, and for studies of active ploughing areas off ice fronts. This paper presents the techniques and some results, together with views on operational and environmental aspects of using side-scanning sonar in the Antarctic. ... (Au)

## KLJUCEC, N.M.

**See:** 323.

## KNAPP, A.E.

**See:** 204, 205.

## KOCH, L.

595
**The Danish three-year expedition to King Christian X Land** / Koch, L.
(Geographical review, v. 23, no. 4, Oct. 1933, p. 599-607, maps)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178985.*
ACU

Account (in brief) of the seasonal climatic changes, the geology of the region, the icebergs and glaciers, and the archeological investigations. (AB)

596
**The east Greenland ice** / Koch, L.
(Meddelelser om Gronland, bd.130, nr. 3, 1945, ill., maps)
Bibliography.
Contents: 1. Ice terminology. Geographical types of ice and their distribution in the Greenland waters; pack ice. 2. Recent ice observations in East Greenland. Fiord and land ice, and land water along the northeast coast; drift ice in the fiords in summer; glaciers of East Greenland from northernmost point to Angmagssalik, and their production of icebergs. 3. The East Greenland ice in the present century. Quantity of ice in the Atlantic, 1898-1938. (Details of melting, of the ice belt, velocity of drift, and observations from Scoresby Sound and Angmagssalik). 4. Statistical treatment of the ice around Iceland and southern Greenland. (Early and recent literature; ice west and east of Cape Farewell). 5. Ice conditions in the past centuries. Ice around Iceland during the last eleven hundred years; in south Greenland in the Middle Ages; the period between the extinction of the Norsemen and development of whaling; the whaling period; Eskimo archeology and climate.
Reviewed by I.I. Schell in Arctic, Sept. 1949, v. 2, p. 120-22.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178993.*

Based, in part, on the author's experience with various expeditions to East Greenland over a period of twenty-five years, traveling by ship, on sledge, in open water, and through, or over ice. The last "three chapters form the main theme of the paper and deal with the year-to-year, or longer interval variations in the ice in that part of the Arctic around east and southern Greenland and Iceland." – I.I. Schell. (AB)

597
**Some new features in the physiography and geology of Greenland** / Koch, L.
(The Journal of geology, v. 31, no. 1, Jan.-Feb. 1923, p. 42-65, ill.)
*ASTIS document number 172430.*
ACU

The discussion covers the following topics: (1) The orography of Greenland, (2) altitudinal conditions of the inland ice cap, (3) the formation of icebergs, (4) the orographic elements of Greenland, (5) the Greenland fiords, and, (6) the origin of the depression. Information on icebergs spotted at Jacobshavn is also included. (ASTIS)

## KOERNER, R.M.

598
**Glacier studies** / Koerner, R.M.
(Canadian geophysical bulletin, v. 34, 1981, p. 159-167)
Bibliography: p. 163-167.
*ASTIS document number 175161.*
ACU

Glacier studies in Canada in 1981 showed an increased move toward applied, rather than academic, studies. EM&R continues its work on ice cores especially with respect to palaeoclimates. ETH Zurich drew its field work on mass balance measurements to a conclusion after many years in the north. NHRI of DOE and Karl Ricker Ltd. concentrated on the Cordillera with mass balance/hydrology oriented studies. The University of Minnesota's work on the Barnes Ice Cap continued, while the Universite du Quebec developed equipment for studying CO2 in ice core bubbles.

The Scott Polar Research Institute of Cambridge, England successfully tested very high resolution radio echo sounding equipment in northern Ellesmere Island. And Memorial University of Newfoundland conducted search on iceberg dynamics, drift, scouring, decay, and impact probabilities. (ASTIS)

## KOLLMEYER, R.C.

599
**An examination of vertical sampling methods and their influence on dynamic height calculations** / Kollmeyer, R.C.
(Oceanography of the Grand Banks region of Newfoundland in 1965 / R.C. Kollmeyer, T.C. Wolford and R.M. Morse. Oceanographic report – United States. Coast Guard, no. CG-373- 11, 1966, p. 65-70)
References.
*ASTIS document number 170712.*
ACU, NFSMO

The primary objective of the Ice Patrol surveys is to gather dynamic height information on the Labrador Current and Gulf Stream off the Grand Banks of Newfoundland for the purpose of predicting iceberg drift from geostrophic current maps. Dynamic heights are calculated from temperature and salinity measurements of the water at various depths. ... A continuous sampling device which gives a very great or unlimited number of data points such as to provide an unbroken record of temperature and salinity through the entire column is ideal, eliminating problems arising from Nansen bottle spacing altogether. The measurement accuracies of such a device, as they apply to dynamic height calculation, was examined and the results comprise the latter part of this paper. (Au)

600
**Iceberg deterioration** / Kollmeyer, R.C.
(Oceanography of the Grand Banks region of Newfoundland in 1965 / R.C. Kollmeyer, T.C. Wolford and R.M. Morse. Oceanographic report – United States. Coast Guard, no. CG 373- 11, 1966, p. 41-63, ill.)
References.
*ASTIS document number 182346.*
ACU, NFSMO

The problem of iceberg deterioration is an intimate part of iceberg forecasting. Accurate predictions of the positions of icebergs depends not only on reliable drift data but dependable estimates of life expectancy as well. The paper reviews previous work on iceberg deterioration. A theoretical examination of the heat transfer mechanisms of a berg is presented, and based on the equations given, a statistical approach to iceberg deterioration is discussed. (NFSMO)

601
**Labrador Current computer model : a report on completion of size expansion and suggested operational implementation** / Kollmeyer, R.C.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1977. Bulletin – United States. Coast Guard, no. 63, 1978, p. B-1-B-5, ill., map)
Appendix B.
*ASTIS document number 166251.*
ACU, NFSMO

A hydrodynamic numerical predictive computer model of the Labrador Current off the Grand Banks of Newfoundland was completed and tested against collected data in 1974. This model had 4 layers with an area of one degree square of latitude. The region modeled was located at 43 51 N, 49 20 W. This model was further tested in June 1975. For these tests, the model successfully predicted the current induced environmental changes in temperature and salinity distribution for an eight day period. Further work has been completed on the model (January-July 1977) in the form of larger area coverage, two degree square of latitude, and an increase to six layers. In addition, the model has been made ready for operational testing and use by International Ice Patrol by development of a data handling system that allows direct input of the vertical distribution of temperature and salinity from hydrographic casts. This work is reported .... (Au)

602
**Oceanography of the Grand Banks region and the Labrador Sea in 1964** / Kollmeyer, R.C. O'Hagan, R.M. Morse, R.M.
(Oceanography of the Grand Banks region and the Labrador Sea in 1964 / R.C. Kollmeyer et al. Oceanographic report – United States. Coast Guard, no. CG 373- 10, 1965, p. 1-24, ill., maps)
References.
*ASTIS document number 168718.*
ACU, NFSMO

A series of oceanographic surveys was conducted ... during the spring and summer of 1964. A summary of the location and extent of each survey follows. ... A preliminary study of iceberg drift and deterioration was accomplished between 14-21 May. Special observations and nine oceanographic stations were taken in the vicinity of 45 42 N, 49 05 W on the Grand Banks. A study of the impingement of the Atlantic Current Water onto the eastern slope of the Grand banks was attempted. ... (Au)

603
**Oceanography of the Grand Banks region of Newfoundland in 1965** / Kollmeyer, R.C. Wolford, T.C. Morse, R.M.
Washington, D.C. : United States Coast Guard Oceanographic Unit, 1966.
vii, 157 p. : ill., maps ; 26 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 11)
Mostly tables.
References.
*ASTIS document number 168700.*
ACU, NFSMO

Three oceanographic surveys were conducted in the vicinity of the Grand Banks of Newfoundland in support of International Ice Patrol operations 1965. Measurements of temperature and salinity obtained from serial Nansen bottle observations were used to determine the dynamic topography, a principal factor in studying the most probable drift of icebergs endangering shipping in this area. A short check survey of one standard section was conducted during the season in order to detect any short term changes in the Labrador Current. Subsequent analysis of selected oceanographic sections was accomplished to calculate the volume flow and heat transport through these sections. In addition, an isentropic analysis was undertaken in order to make a comparison with the circulation deduced from the dynamic topography. A change in vertical sampling technique was attempted in order to define more accurately the maximum and minimum points in the distribution of temperature and salinity. Studies of iceberg deterioration and specific drift factors were initiated during Ice Patrol 1964 and were continued during 1965 with some increase in emphasis. (Au)

604
**Oceanography of the Labrador Sea in the vicinity of Hudson Strait in 1965** / Kollmeyer, R.C. McGill, D.A. Corwin, N.
Washington, D.C. : U.S. Coast Guard, 1967.
vi, 34 p. : ill. ; 28 cm.

(Oceanographic report – United States. Coast Guard, no. CG 373- 12)
References.
*ASTIS document number 172456.*
ACU, NFSMO

An oceanographic expedition to the western Labrador Sea, under the control of the International Ice Patrol Section of the Coast Guard Oceanographic Unit, Washington, D.C., was conducted during July and August of 1965. The purpose of the expedition was to gather quantitative physical and chemical data from the upper reaches of the Labrador Current. ... Recent findings as to seasonal and annual variations in temperature and volume flow of the Labrador Current has initiated new thoughts concerning spring iceberg threat predictions on the Grand Banks. Fluctuations in the heat and volume transport of the Labrador Current, coupled with the variations in available icebergs during the spring, tend to cause the iceberg threat of one year to differ sharply from another. Iceberg mortality during transit from north to south, particularly along the coast of Labrador, is greatly influenced by the temperature and velocity of the Labrador Current. ... Smith (1937) points out that variations in the amount of light, low salinity water available along the Labrador coast will cause variations in the velocity of both the boundary current filaments and the inshore water mass that carries the icebergs south. Likewise the temperature of this water not only influences the current velocity but also dictates the deterioration rate of the icebergs as they are transported south. An understanding of the origin and control of this characteristic water mass will ultimately allow perfection of ice season severity predictions when combined with knowledge of the count of available icebergs which are to be transported south. (Au)

**605**
**West Greenland glaciers : iceberg sources** / Kollmeyer, R.C.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 25-28, ill.)
References.
*ASTIS document number 161764.*
ACU, NFSMO

The glaciers of Western Greenland have been the source of icebergs which annually threaten the North Atlantic shipping lanes. These glaciers have been under observation by the Coast Guard's International Ice Patrol since 1928. Since 1958, more intensive surveys of the glaciers have been carried out. These surveys have included aerial photographic documentation as well as shore visits and measurements of their present position. Tide water glaciers of the Disco Bay region to as far north as the Humboldt glacier of Kane Basin have been observed to produce icebergs ranging up to 1 km in length. In several instances aerial photography has recorded individual icebergs in the multiple kilometer category. (Au)

**606**
**West Greenland outlet glaciers : an inventory of the major iceberg producers** / Kollmeyer, R.C.
(World glacier inventory, proceedings / International Workshop on the World Glacier Inventory, Riederalp, Switzerland, 17-22 September, 1978. – [Washington, D.C. : International Association of Hydrological Sciences, 1980]. IAHS-AISH publication, no. 126, p. 57-65, ill.)
References.
*ASTIS document number 45780.*

... In 1968 the US Coast Guard commenced an examination of the major iceberg producing glaciers along the west coast of Greenland. This programme, called the West Greenland Glacier Survey, is attempting to visit and revisit every major outlet glacier along the western edge of the ice sheet. Terminus locations have been surveyed along with height measurements on 27 major outlet glaciers. A total of 59 glaciers have been photo-documented. Most of the glaciers exhibit retreat. (Au)

**607**
**West Greenland outlet glaciers : an inventory of the major iceberg producers** / Kollmeyer, R.C.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 175-181, ill., maps)
References.
*ASTIS document number 164070.*
ACU, NFSMO

... in 1968 a program called the West Greenland Glacier Survey was established to resume the research of the sources of the North Atlantic icebergs. ... Future planning and budgeting for International Ice Patrol as well as planning for the possibility of greater arctic shipping activities required a reinspection of the general productivity of the glaciers that produce the icebergs which hazard shipping. ... The ... objectives of the ... Survey are ... (a.) To survey the west Greenland iceberg producing tidewater glaciers and compare the data thus obtained with earlier records to ascertain the advance or recession of the glaciers, changes in iceberg production rates, and future trends. (b.) To determine the total annual number of icebergs calved from the major west Greenland glaciers and the regularity of production to allow further investigation of the causes of annual number variation of icebergs found on the Grand Banks. (c.) To survey the environmental conditions affecting the discharge and drift seaward of icebergs from the parent glaciers. This includes fjord configuration, sill depth and coastal circulation. (d.) To provide a carefully obtained pictorial and data documentation of the present state of the outlet glaciers .... (Au)

**See also:** 406, 868.

## KOMEN, M.

**See:** 1053.

## KORNERUP, A.N.

**608**
**Minder fra en rejse; Sydgronland [Recollections from a journey in south Greenland]** / Kornerup, A.N.
(Geografisk tidsskrift, bd. 2, 1878, p. 11-17)
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179000.*

Descriptions of plant and animal life, climate and communication in the Julianehaab District, icebergs in the fiords, drift ice in the waters outside the fiords; also incidents from the Danish Expedition to Julianehaab District, 1876. (AB)

## KOTIUKH, A.A.

**609**
**Mathematical and visual evaluation of radar echo reflections from ice and icebergs** / Kotiukh, A.A.
(Vestnik – Leningrad. Universitet. Geologiia-geografiia, v. 6, no. 1, 1982, p. 76-82)
Report proprietary to Hibernia Joint Venture Participants.
Citation from: Ships navigating in ice : a selected

bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
Text in Russian.
*Document not seen by ASTIS.*
*ASTIS document number 184187.* (Au)

## KOVACS, A.

**610**
**"Airborne radar sounding of arctic icebergs" by J.R. Rossiter [discussion]** / Kovacs, A.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 356)
Discussion of ASTIS document number 31798, Airborne radar sounding of arctic icebergs / J.R. Rossiter in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 289-305.
*ASTIS document number 172898.*
ACU, NFSMO

The authors have demonstrated the feasibility of using two airborne echo sounding systems, operating in the radio frequency range, for determining the sail height and thickness of irregularly shaped icebergs found in the waters along the Canadian east coast. It is apparent from their results that additional field echo sounding measurements of icebergs of known thickness are essential to verify the echo sounding measurement results. ... I wish to call attention to one minor point concerning paragraph two on page seven, where the authors make reference to "Archimedes' Principle." The iceberg measured had an apparent sail height to keel depth ratio of 1:4.3. For a tabular iceberg with vertical sides, horizontal bottom and a specific gravity of 0.91 Archimedes' Principle would give a height to depth ratio of about 1:7.8 if the iceberg were drifting in sea water with a specific gravity of 1.03. The iceberg measured had an irregular shape, and since its overall dimensions were not measured its volume below versus above sea level was not determined. Therefore, reference to the iceberg's flotation satisfying the law of buoyancy was not determined and seems out of order. (Au)

**611**
**Iceberg thickness and crack detection** / Kovacs, A.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 131-145, ill.)
Also available as a reprint from CRREL.
References.
*ASTIS document number 161640.*
NFSMO, ACU

Results obtained with an impulse radar system used to profile the thickness of and detect cracks in a tabular iceberg in McMurdo Sound, Antarctica, and an ice island in the Beaufort Sea near Flaxman Island, Alaska, are presented. Graphic records are shown of the radar impulse travel time which clearly reveal, for the first time, the bottom relief of each ice formation. Also detected in the antarctic iceberg was an echo signature from an infiltration-brine layer. The impulse radar signature of a 3-m wide crevasse in the McMurdo Ice shelf is also shown. The time of flight of the radar impulse in the ice island is compared with a 24.05-m drill hole measurement of the ice thickness. The effective velocity of the radar impulse in the ice island was found to be 0.16 m/ns and the effective dielectric constant of ice to be 3.5. The findings show that tabular icebergs are flawed by cracks or crevasses which could be expected to propagate through the ice when an iceberg reaches the edge of the pack where it is subject to stresses induced by sea swell and waves. (Au)

**612**
**Iceberg thickness profiling** / Kovacs, A.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 766-774, ill.)
References.
*ASTIS document number 163910.*
NFSMO, ACU

Results obtained with an impulse radar system used to profile the thickness of a tabular iceberg in McMurdo Sound, Antarctica, and an ice island in the Beaufort Sea near Flaxman Island, Alaska, are presented. Graphic records are shown of the radar impulse travel time which clearly reveal, for the first time, the bottom relief of each ice formation. Also detected and shown are echo signatures from internal cracks and an infiltration-brine layer. The time of flight of the radar impulse in the ice island is compared with a 24.05-m drill hole measurement of the ice thickness. The effective velocity of the radar impulse in the ice island was found to be 0.16 m/ns and the effective dielectric constant of the ice to be 3.5. (Au)

**613**
**Iceberg thickness profiling using an impulse radar** / Kovacs, A.
(Antarctic journal of the U.S., v. 12, no. 4, Oct. 1977, p. 140-142, ill.)
References.
*ASTIS document number 172375.*
ACU

... I used an impulse radar system to obtain continuous profiles of the relief and lateral extent of the brine infiltration layer in the McMurdo Ice Shelf and of saline ice growth on the bottom of the Koettlitz Glacier tongue (Kovacs and Gow, 1975, 1977). The impulse radar also was taken to a 100 to 500 meter tabular iceberg drifting in McMurdo Sound ... to determine if the system could be used to measure the thickness of icebergs. ... This study has shown that thickness profiling of an iceberg is possible. One might obtain similar results from the air by mounting the antenna on a helicopter, as did Kovacs (1977) when using impulse radar to measure the thickness of first-year and multi-year sea ice in the Arctic. ... (Au)

**614**
**Icebergs : an overview** / Kovacs, A.
Hanover, New Hampshire : Cold Regions Research and Engineering Laboratory, 1979.
ii, 7p. : ill. ; 27cm.
(Special report – U.S. Army. Cold Regions Research and Engineering Laboratory, 79- 21)
Cover title.
References.
*ASTIS document number 36170.*
ACU, NFSMO

Icebergs are discussed and categorized according to their size, shape, composition and color. A general overview of iceberg-producing areas in the Arctic and Antarctic is given, and their drift and deterioration are discussed. (Au)

**See also:** 727, 728.

## KRAKOWSKI, E.

615
**Estimation of iceberg volume by aerial photogrammetry** / Krakowski, E. Leavitt, E. Spring, W.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 37)
Abstract only.
*ASTIS document number 168920.*
ACU, NFSMO

Under contract to Mobil Research and Development Corporation, INTERA conducted three aerial reconnaissance missions in the spring of 1981 to photograph icebergs in stereo. A total of 92 icebergs were photographed off the east coast of Newfoundland and Labrador. This paper describes the technique used to estimate the iceberg volume and presents one iceberg as an example. Icebergs were contoured at one-metre intervals and digitized. A computer model transformed the data to a grid system and estimated above water volume. Total volumes were calculated by application of Archimedes Principle. The maximum height, length, width, waterline area and above-water centre of gravity were also computed. Based on previous studies, keel depths were estimated. These proved to vary substantially and tended to exceed charted water depths. Various errors in the volume calculation were identified. The greatest error was attributed to the aircraft altitude. Recommendations for future reconnaissance are discussed. (Au)

## KRISTENSEN, M.

616
**Automatic collection of tilt and strain data from tabular icebergs** / Kristensen, M. Squire, V.A.
(Proceedings of the Second Symposium on Applied Glaciology held in New Hampshire, USA, 23-27 August, 1982. Annals of glaciology, v. 4, 1983, p. 147-151, figures, table)
References.
*ASTIS document number 119822.*
ACU, NFSMO

... The purpose of this paper is, firstly, to communicate some of our experiences with an earlier type of automatic data collection platform, and, secondly, to show that the substantial amount of tilt and strain data available from this station is unsuitable for data analysis. We discuss aspects of the data collected by the first of the three automatic stations, paying particular attention to the quality of the recorded strain and tilt data. It is shown that an unfortunate choice of instrument sensitivity and range severely limits the usefulness of the collected data, and that limitations in the data sampling regime make data analysis by conventional statistical methods very difficult. Several changes are proposed for the design of future data collection platforms for tabular icebergs, and some suggestions are made about data sampling. As this paper only concerns iceberg research, we do not discuss investigations of sea-ice drift made in the same area. (Au)

617
**Field experiments on antarctic tabular icebergs** / Kristensen, M. Orheim, O. Wadhams, P.
(Polar record, v. 20, no.128, May 1981, p. 445-457, ill.)
References.
*ASTIS document number 172278.*
ACU, NFSMO

It is well known that tabular icebergs breaking off antarctic ice shelves quickly deteriorate when they move near the Antarctic Convergence. Some of this deterioration can be explained by lateral and bottom melting of the icebergs, and by localized calving of overhanging cliffs along their sides, but the principal mechanisms by which tabular icebergs break up are not fully understood. To investigate some of the problems, the authors organized an expedition to the South Atlantic during the 1980-81 Antarctic summer season: the aim was to study the dynamical behaviour of tabular icebergs in response to the sea state. ... (Au)

618
**Modelling of antarctic tabular icebergs in ocean waves** / Kristensen, M. Squire, V.A.
(Proceedings of the Second Symposium on Applied Glaciology held in New Hampshire, USA, 23-27 August, 1982. Annals of glaciology, v. 4, 1983, p. 152-157, ill.)
References.
*ASTIS document number 170690.*
ACU, NFSMO

The prediction of the motions of a tabular iceberg in a seaway is a problem which cannot be solved with a simple approach. The main difficulty lies in the size and mass of the iceberg, which produce frequency-dependent hydrodynamical effects as it moves in the water. Specifically, any solution must take into account both the added inertia and the generation of surface waves caused by the motions of the berg. Early attempts at modelling, which did not include these terms, could not accurately predict the complicated response behaviour seen in field data. In this paper we discuss some modifications to a two-dimentional simulation of floating bodies in waves, which must be applied when the motions and the hydrodynamical pressures beneath tabular icebergs are required. (Au)

619
**Preliminary results from an instrumented iceberg in the Antarctic** / Kristensen, M. Orheim, O.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 96, ill.)
Abstract only.
Reference.
*ASTIS document number 170593.*
ACU, NFSMO

A data collection platform was placed near the centre of a 950 m x 800 m near-rectangular iceberg in the Weddell Sea on February 1979. Meteorological conditions and the dynamic behaviour of the iceberg were recorded for every three hours over a one-year period. The following parameters were measured: barometric pressure, wind speed and direction, air and snow temperatures, and iceberg heading, tilt, and strain. ... The platform was deployed at lat. 70 5 S., long. 20 3 W. ... Tilt and strain were sampled 20 times at intervals of 6 sec. This measuring sequence was repeated every three hours. The date were stored and transmitted over the TIROS-N/NOAA satellite, which provided approximately 13 passes per day for transmission of data. Eight of these gave the location of the iceberg. Analysis has been carried out of the tilt and strain data from the instrumented iceberg for the period 4 February to 4 May 1979. ... (Au)

620
**Tabular icebergs in ocean waves** / Kristensen, M. Squire, V.A. Moore, S.C.
(Nature, v.297, no.5868, June 24, 1982, p. 669-671, figures)
References.
*ASTIS document number 127485.*
NFSMO, ACU

...We present here some preliminary results from a recent (January 1982) field season on board HMS Endurance during which two tabular icebergs of very different shape were studied in detail. The data augment the results of a similar season of work which took place in 1981 near the South Sandwich and South Orkney Islands. Instruments to measure rigid body motions and strain gauges to

determine wave-induced bending were deployed at the surface centre of the two icebergs visited, wile a Waverider buoy simultaneously monitered the ocean wave-energy spectrum. The precise underwater shape of each iceberg was determined by flying a 60-MHz radar (developed for use over land ice) in a grid pattern across the surface of the iceberg. By this means a complete three-dimensional picture of the iceberg could be inferred. The results show that icebergs tend to act as low-pass filters and inhibit short period waves. Furthermore, they selectively resonate at certain wave periods; the strain data, in particular, indicate unexpectedly large flexure which cannot be explained by simple bending alone. Finally, the geometry of icebergs can be such as to render them unstable and liable to turn over. ... (Au)

**See also:** 806.

## KURE, G.

621
**United States patent : Offshore platform structure intended to be installed in arctic waters, subjected to drifting icebergs** / Kure, G. [Inventor]. Jenssen, D.N. [Inventor]. Naesje, K. [Inventor]. Furuholmen, T. [Assignee]. A/S Hoyer-Ellefsen [Assignee]. Selmer, F. [Assignee].
[Washington, D.C. : Patents and Trademark Office], 1984.
8 p. : ill. ; 28 cm.
(U.S. patent documents, no.4,470,725, Sept. 11, 1984)
*ASTIS document number 170119.*
NFSMO

An offshore platform structure, particularly intended to be installed in waters where drifting icebergs frequently appear, the platform structure being intended to be founded in a sea bed and comprises a substructure, a superstructure rigidly affixed to the substructure, and extending vertically up and above the sea level supporting a deck superstructure at its upper end. The horizontal cross-sectional area of the substructure is substantially greater than that of the superstructure. The substructure rigidly supports a fender structure, the fender structure comprising an outer peripherally arranged wall and an inner cylindrical wall the inner and outer wall being rigidly interconnected by means of a plurality of vertical and/or horizontal partition walls, dividing the fender structure into a plurality of cells or compartments. The fender structure is arranged in spaced relation with respect to the superstructure. (Au)

## LA VIOLETTE, P.E.

**See:** 581.

## LAKE, R.A.

622
**Iceberg melt during the arctic winter** / Lake, R.A. Greisman, P.
(EOS (Washington), v. 58, no. 12, Dec. 1977, p.1152-1153)
Abstract only.
*ASTIS document number 181854.*
ACU

Winter temperatures at d'Iberville Fjord, Ellesmere Island average about −35 degrees C. The sea temperature at 80 m depth may apprroach −1.7 degrees C, well below the freezing point of fresh water. However, underwater ablation of icebergs continues through the winter months driven by the thermodynamics of ice-water-salt mixtures. Fresh ice is in equilibrium with the sea at the freezing point of the sea water. Icebergs or glaciers tend to continue to melt until the liquid phase is at the liquidus. Subsurface ablation will cause an iceberg to slowly settle in the water as isostatic equilibrium is maintained. During winter, sea ice adhering to an iceberg will bend downward as the iceberg sinks lower in the water. Direct measurement of this deflection adjacent to a small iceberg indicated an ablation rate of 10 cm/mo. Independent glaciological studies of a nearby ice shelf give similar ablation rates. The melt rate of ice in water is proportional to the product of the Nusselt number and the elevation of the far field sea temperature above its freezing point, delta T. Josberger and Martin have shown that for most oceanic cases the natural buoyant boundary layer adjacent to melting ice is turbulent. Under these conditions of entrainment the Nusselt number is proportional to delta T 4/3 and the ablation rate is proportional to delta T 7/3. This strong dependence of the melt rate on the far field temperature explains the clear upwelling found in Muir Inlet in S.E. Alaska (Matthews and Quinlan 1975) and the lack of definitive evidence for upwelling in d'Iberville Fjord. (Au)

## LANGHORNE, P.

**See:** 897.

## LANTOS, S.

**See:** 340.

## LAPP, D.J.

623
**The detection of icebergs in a sea-ice background using AES SLAR** / Lapp, D.J.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 36)
Abstract only.
*ASTIS document number 168874.*
ACU, NFSMO

The detection of icebergs on a routine operational basis is likely to become part of the AES Ice Branch mandate for ice reconnaissance and forecasting services. This study has examined the performance of the SLAR in identifying icebergs in a sea-ice matrix, considered to be a different problem from that of detecting icebergs in open water. Identification of icebergs in sea ice on SLAR depends upon system parameters, target and background characteristics as well as operational considerations. System parameters investigated included depression angle, aspect angle, scale and resolution. Important target and background characteristics include iceberg size and shape, as well as the proximity of icebergs to other features such as ridges, leads, islands and other bergs. Perhaps most important for berg identification on a routine basis are the operational considerations, most notably the interpreter and the SLAR operator. (Au)

**See also:** 845, 891, 892, 894.

## LARSON, R.W.

624
**The use of SAR systems for iceberg detection and characterization** / Larson, R.W. Shuchman, R.A. Rawson, R.F. Worsfold, R.D.
(Proceedings of the Twelfth International Symposium on Remote Sensing of Environment, 20-26 April, 1978. – Ann Arbor, Mich. : Center for Remote Sensing Information and Analysis, Environmental Research Institute of Michigan, [1978], v. 2, p.1127-1147, ill.)

References.
*ASTIS document number 177261.*
ACU, NFSM

During February and March, 1977, a synthetic aperture radar (SAR) program was conducted on the East Coast of Canada using a 3 cm and 23 cm dual polarization SAR system. Data obtained from this program has been used to demonstrate the capability of SAR for the detection and identification of icebergs. Results from the analysis and interpretation of the 3 cm and 23 cm SAR imagery are presented. These results include imagery and quantitative measurements, demonstrating the detectability of icebergs in a variety of sea ice clutter backgrounds. Using imagery having resolution of 3 meters by 3 meters, it is possible to estimate iceberg by using the detail of the iceberg shadow. The information obtained from this program can be used for the design of future operational SAR systems for iceberg detection and characterization. (Au)

**See also:** 358, 388, 389, 468, 672.

## LASKOW, V.

**625**
**Ship-ice interaction models, designer's approach** / Laskow, V.
[S.l. : s.n.], 1982.
1 v. (various pagings) : figures ; 28 cm.
Appendices.
Presented at Arctic Section of SNAME, Calgary, Alberta, May 15, 1982.
*ASTIS document number 131725.*
NFSMO

Four basic models of ship-ice interaction are developed: head-on collision with an iceberg, bow on impact on semi-infinite ice field, glancing impact on growler and beaching on grounded ice. Parameters influencing the interaction are defined, analysed and discussed. Among them are maximum force, contact area, impact duration, decelerations and velocities. The influence of repeated rams, friction, restoring forces, and degrees of match between ship hull and ice form is assessed. A detailed analysis of size and geometry of the ship as it influences interaction parameters is performed. The models can provide ship designers with a tool for the rational assessment and selection of ship parameters and its operational mode in an early design stage. (Au)

## LATOUCHE, C.

**626**
**La sedimentation au Quaternaire recent dans le "Northwest Atlantic Mid-Ocean Canyon" - Apport des donnees mineralogiques et geochimiques = Recent Quaternary sedimentation in the "Northwest Atlantic Mid-Ocean Canyon" - A mineralogical and geochemical contribution** / Latouche, C. Parra, M.
(Marine geology, v. 29, 1979, p. 137-164, ill., maps)
References.
English abstract.
Text in French.
*ASTIS document number 182320.*
ACU

A mineralogical (clay minerals and other minerals) and geochemical (Fe, Ti, P, Mn, Ba, Sr, Zn, Cu, Ni, Pb, Rb, Zr, S) study was made of four cores of Quaternary sediments from the "Northwest Atlantic Mid-Ocean Canyon". A group of common characteristics has been noted for each climatic episode. Some more specific characteristics have also been identified. During the cold period (Wurm), the materials are mainly terrigenous detrital ... carried from the nearby continental platform by turbidity currents. The almost complete lack of other inputs can be explained by a blockage of the main circulation of North Atlantic water masses during the glacial period. During the warm period (Riss-Wurm and Holocene interglacials), the sedimentary material inputs were more complex: the terrigenous detrital deposits (similar to the Wurm ones), are mixed with new materials (rich in montmorillonite, plagioclase feldspars, augite, epidote and characterized by montmorillonite and plagioclase feldspars/trace elements correlations). They could have come from volcanic areas such as Iceland, Reykjanes Ridge or the Gibbs fracture and could have been carried by "Norwegian deep-sea waters". Biogenetic carbonate fine-grained materials brought in surface water by the Gulf Stream are also abundant. Furthermore, the Gulf Stream seems to be responsible for montmorillonitic clay minerals input from southern areas toward northern areas. Finally, the coarser-grained materials, ice-rafted by icebergs, can be important in high latitudes (especially southeast of Cape Farewell). Thus, the sedimentary evolution of "the Northwest Atlantic Mid-Ocean Canyon" during the recent Quaternary can be explained both by climatic changes and the nature of the sedimentary sources which successively contributed to the deposits. It gives information concerning the hydrological characteristics of the studied area since 120,000 years. ... (Au)

## LAUNAIS, MM.J.

**627**
**Exploration petroliere de l'offshore au Labrador [Petroleum exploration off the coast of Labrador]** / Launais, MM.J. Corgnet, J.-L. Verdier, J.
(Annales des mines, v.183, no. 5, May 1977, p. 29-42, ill., map)
Summary in English.
Text in French.
*ASTIS document number 162990.*
NFSMO

The article discusses the environmental problems encountered by Total Eastcan Exploration off the coast of Labrador while drilling for oil. The logistic problems of operation in this regime are also addressed. (NFSMO)

## LEARNING, F.R.

**See:** 186.

## LEAVITT, E.

**See:** 615.

## LEBEDEV, V.L.

**628**
**The measurement of objects in open sea with the aid of photography** / Lebedev, V.L. Slessers, M. [Translator].
Washington, D.C. : Naval Oceanographic Office, 1970.
[12] p. : ill. ; 28 cm.
(Translation - United States. Naval Oceanographic Office, 192)
Translation of Izmereniye predmetov v otkrytom more s ponosh'yu fotografirovaniya from Trudy Gesudarstvennogo Okeanograficheskogo Instituta, no. 40, Moscow, 1957.
*ASTIS document number 172022.*
ACU

By analyzing various methods used in determining the sizes of

objects in the sea, notably icebergs and floes, it is found that the photographic method yields most accurate and quick results. ... The relationship between the sizes of photographic images and natural objects is discussed in detail, defining mathematically the functions of focal length, inclination of camera toward the object to be photographed, the elevation of the camera above mean sea level and the effect of ship motion on the distortion of the true size of objects. The empirical formulas and correction of errors ... for the improvement of the accuracy of the method are derived, examined and compared with the results of actual measurements. The photographic method was suggested by the author during the eighth cruise of the Whaling Fleet "Slava." In addition to icebergs, the sizes of ice floes and whale fountains were determined by this method. Approximately 200 photographs of icebergs and sea ice were taken during the ninth cruise. Many icebergs were photographed several times for the purpose of verification. Differences exceeding 10% were not observed. The ice objects were photographed from the captain's bridge. (Au)

## LEBLANC, L.

629
**Producing in iceberg lanes** / LeBlanc, L.
(Offshore, v. 40, no. 11, Oct. 5, 1980, p. 56-58, 61-62, ill.)
*ASTIS document number 166995.*
NFSMO

Alternative production schemes for offshore Newfoundland and Labrador are discussed. These are floating and fixed systems. The floating system proposed is one with semisubmersible production units, on-site tanker storage and tanker transport. The fixed systems proposed are as follows: (a) a gravity structure on submerged gravel mound, (b) subsea production direct to pipeline, (c) bottom-supported platforms with iceberg-towing vessels, and (d) single-well offshore production system. (NFSMO)

## LEBLOND, P.H.

630
**Iceberg psychodynamics** / LeBlond, P.H. Hodgins, D.O.
(Iceberg research, 1985, no. 10, Apr., p. 28-29, ill.)
References.
*ASTIS document number 171433.*
ACU, NFSMO

... Theory of iceberg motion is in a state of confusing complexity reminiscent of pre-Copernican astronomy, and a new start is needed. ... an explanation of the typical path of a drifting iceberg ... in terms of superimposed tidal and inertial oscillations of the oceanic upper layer is very reminiscent of Ptolemaic planetary epicycles, and we suspect that for icebergs, as for planets, there may well exist a simpler explanation. Our Newton's Apple, the accidental clue which led us to iceberg psychodynamics, was the comment made by a frustrated iceberg tracker: "They seem to move with a mind of their own!" This, then, is our hypothesis: "Icebergs do have minds of their own." We have been inspired by it in unravelling the mysteries of iceberg motion. ... We now re-examine iceberg drift from our new vantage point. The drift of an iceberg is its life line, from calving ... through an adult life of hazardous meandering, to a gradual death by dissolution. It is no longer surprising that the path of an iceberg might be difficult to squeeze into the Procrustean Bed of Newtonian mechanics. A particular iceberg will react to its environment according to its past history, present mood, and its perception of how present predicaments affect its eventual fate. Understanding the life cycle of an iceberg is thus particularly relevant to our theory. ... Recognition of self-awareness in icebergs and of their responsiveness to their environment opens the door to possible communication between them and us. ... This new field opens up wide opportunities for psychologists, linguists and behaviourists to join the ranks of engineers and natural scientists in studying well-funded environmental problems. (Au)

**See also:** 911, 913.

## LEDREW, B.R.

631
**Oil spill scenario for the Labrador Sea** / LeDrew, B.R.
Gustajtis, K.A. Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering. Canada. Environmental Emergency Branch. Research and Development Division [Sponsor]. Canada. Arctic Marine Oilspill Program [Sponsor].
[Ottawa : Environmental Protection Service, Dept. of the Environment], 1979.
iv, 675 p. : ill., figures, maps, tables ; 28 cm.
(Economic and technical review report, EPS 3-EC-74- 4)
(C-CORE publication, no. 78- 2)
(C-CORE publication. Technical report)
References.
References.
*ASTIS document number 37885.*
ACU, NFSMO

This study develops a scenario following a large oil spill from a blowout of an exploratory well in the Labrador Sea. Scenario development leads to the delineation of gaps in pertinent baseline information and serves to identify the applicability and inadequacies of available countermeasure techniques. ... Twelve study topics are presented as input to the scenario narrative. ... the physical environment (emphasis on ice); resource utilization practices (potential, immediate and direct impact); factors peculiar to the area and that influence blowout probability; the behaviour of oil as it rises from the seabed and as it interacts with ice; the environmental prediction and logistics capability of the Labrador area to support a major countermeasures effort; and finally, an appraisal of the Canadian state of response preparedness. ... Recommendations are made of approaches to achieve the objectives of the Arctic Marine Oilspill Program (AMOP) insofar as it applies to the Labrador Sea. (Au)

## LEE, G.C.

**See:** 390.

## LEE, J.J.

632
**Melting of a vertical ice wall by natural convection into pure or saline water** / Lee, J.J.
St. John's, Nfld. : Memorial University of Newfoundland, Faculty of Engineering and Applied Science, 1979.
116 leaves : ill. ; 28 cm.
Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1979.
References.
*ASTIS document number 178063.*
NFSMO

A steady state two dimensional finite difference analysis is presented for the heat, mass and momentum transfer resulting from the initial portion of a semi-infinite vertical ice sheet melting into pure or saline water by natural convection. Results of the analysis are presented for free stream temperatures from 0 deg. C to 24 deg. C and salinities from 0% to 35%. They include streamlines, velocity profiles, temperature profiles, local Nusselt numbers and mean Nusselt numbers for plate length of 0.7632 m. Overall, the results show three distinct flow regimes: steady unidirectional upward flow, steady unidirectional downward flow, and dual flow. The solution method is convergent for the unidirectional regimes,

and mostly non-convergent for dual flows. Since the solution method is capable of accounting for local recirculations, this suggests that the dual flow regime may be transitory in nature. (Au)

## LEMON, D.D.

**See:** 138.

## LENCZYK, R.E.

633
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1964** / Lenczyk, R.E.
Washington, D.C. : U.S. Coast Guard, 1965.
vii, 109 p., 34 folded leaves of plates : ill., charts, maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 50)
*ASTIS document number 181340.*
ACU, NFSMO

This bulletin is the annual report of the International Ice Patrol Service for 1964. The operations of the International Ice Patrol for 1964 including aircraft and communications activities are described. Monthly ice conditions and statistics on ice and weather reports from shipping for 1964 are reported. Preseason and post season activities including the 1964 preseason northern ice surveys and the 1964 post season ice surveys are described. There is a special section on weather including a discussion of the correlation of meteorological elements and the severity of the Grand Banks iceberg season. A discussion of the future of the International Ice Patrol is also included. ... With the publication of this report, this bulletin will be revised in format. ... The report of the operational phase of the International Ice Patrol Service, including the narrative report of activities and ice conditions and descriptions of research into the operational problems, will continue to be published in this series. The sections describing the physical oceanography of the Grand Banks region and the Labrador Sea and oceanographic research will be published separately in a recently established series: U.S. Coast Guard Oceanographic Reports, CG-373. (Au)

634
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1965** / Lenczyk, R.E.
Washington, D.C. : U.S. Coast Guard, 1965.
vii, 43 p., [12] folded leaves of plates : ill., charts ; 24 cm.
(Bulletin – United States. Coast Guard, no. 51)
*ASTIS document number 180831.*
ACU, NFSMO

... Aerial ice observation and communication statistics are presented. All ships reporting ice and weather to the International Ice Patrol in 1965 are tabulated. A month-by-month general description of ice conditions for the Grand Banks area is given. Only 76 bergs drifted south of latitude 48 degrees N. during the season, a low figure in comparison with the 1900-1965 average of 377 bergs. The most southerly berg of the season was reported 28 May in 42 43 N., 51 54 W. The duration and maximum extension of the pack ice to the south and east of the Newfoundland coast was subnormal. ... (Au)

**See also:** 238, 242, 243, 304.

## LEVER, J.H.

635
**DIGS : ice dynamics** / Lever, J.H.
[S.l. : s.n., 1985].
[6] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163635.*

[This paper outlines procedures developed during the DIGS (Dynamics of Iceberg Grounding and Scouring) experiment that are useful in monitoring iceberg motion during a scouring event.] ... A sensor package was developed for these measurements .... This unit is approximately one metre in diameter and includes a six degree of freedom sensor package with three linear accelerometers, two tilt sensors and a compass. The sensor outputs are recorded directly on an eight channel tape deck and the entire package is enclosed in a water tight sealed hemisphere. The package can be deployed by helicopter on to very small ice masses. This package was field tested off Labrador [in summer 1984] .... (Au)

636
**LIMEX '87 – a pilot study** / Lever, J.H.
(Ice community newsletter, v. 5, no. 1, May 1986, p. 4-6)
*ASTIS document number 184934.*
ACU

LIMEX '87, scheduled for March, is the first in a series of field investigations designed to examine the conditions and processes associated with the Labrador ice pack in its region of maximum southerly advance. The collaborative project has been designed to combine remote sensing with in-situ measurements of ice, atmosphere and ocean parameters. ... Beginning with the 1987 pilot study, the LIMEX experiments will quantify the physical characteristics and processes affecting both sea ice and iebergs within the pack and changes with proximity to the ice edge. The ice processes investigation is closely linked to the oceanographic and remote sensing programs. ... The relative movement of icebergs with respect to the pack will be documented using rdio/radar buoys. The combination of data on sea ice movement, strength and concentration will be used to estimate the importance of pack ice driving loads on icebergs. The deterioration of icebergs within the study region will be documented using aerial stereophotographs. Multiplication of bergs through calving/splitting will be noted, and airborne radar detection of bergs in pack ice and open water will be compared with photographic records. (Au)

637
**Measurement of instantaneous motions of ice masses at sea : 1984 pilot program** / Lever, J.H. Diemand, D.
(POAC 85 : the Eighth International Conference on Port and Ocean Engineering under Arctic Conditions, Narssarssuaq, Greenland, September 7-14, 1985, proceedings. – [Copenhagen, Denmark] : Danish Hydraulic Institute, 1985, v. 2, p. 988-997, ill.)
(C-CORE publication, no. 85- 13)
References.
*ASTIS document number 181790.*
ACU, NFSMO

The paper describes a six degree-of-freedom instrument package used to measure and record instantaneous ice movement, as a means to investigate the influence of ocean waves on iceberg motion. The package was deployed on several bergy bits and growlers in Byron Bay, near Cape Harrison, Labrador. A waverider buoy was used to obtain wave climate measurements in the area. Despite the calm sea conditions, wave-induced berg motion was successfully recorded. The roll behaviour of two unstable icebergs was also measured. (Au)

638
**A model study of the wave-induced motion of small icebergs and bergy bits** / Lever, J.H. Reimer, E.M. Diemand, D.

St. John's, Nfld. : Memorial University, Centre for Cold Ocean Resources Engineering, 1984.
[9] p. : figures, tables ; 28 cm.
(C-CORE publication, no. 84- 7)
References.
*ASTIS document number 141747.*
ACU, NFSMO

Wave tank studies were conducted to determine the kinematics of "small" ice masses in storm waves typical of the Grand Banks region (10-14 sec. periods, 12-15 m heights). The models tested spanned the range of full scale masses from growlers and bergy bits (10-1,000 tonnes), to small icebergs (10,000-100,000 tonnes). In open water, models smaller than 1/13 wavelength behaved essentially as particles of fluid. The corresponding full scale kinetic energies associated with such motions could exceed 10,000,000 Joules. Models approximately 1/2 wavelength in size could attain energies in the surge direction in excess of 1,000,000,000 Joules, largely through wave diffraction effects. Significant heave resonance motions were also seen. Tank studies additionally revealed that wave-driven ice-structure impacts of substantial energy could occur, although wave diffraction from the structure could also have a considerable influence on nearby ice motion. The conclusion is reached that wave-induced motion of small ice masses represents a significant environmental hazard to the operation of offshore structures in ice infested waters. (Au)

**639**
**Wave action may turn small bergs into serious hazard to structures** / Lever, J.H.
(Offshore resources, v. 2, no. 3, May/June 1984, p. 28, ill.)
*ASTIS document number 56030.*
NFSMO, ACU

A joint program was initiated between the author and C-CORE to determine the extent to which waves affect iceberg motion, and to determine whether the motion of bergy bits in storm waves constitutes a potentially significant environment hazard to offshore operations. [This article summarized the wave tank tests.] (Au)

**640**
**Wave action on icebergs and bergy bits** / Lever, J.H.
(C-CORE news, v. 9, no. 1, Mar. 1984, p. 2-3, ill.)
Complete results of this experiment were presented by the author at the Offshore Mechanics and Arctic Engineering Symposium, New Orleans, February 1984.
*ASTIS document number 172359.*
ACU, NFSMO

... A joint program was initiated between the author and C-CORE to determine the extent to which waves affect iceberg motion, and to determine whether the motion of bergy bits in storm waves constitutes a potentially significant environmental hazard to offshore operations. With the assistance of Deborah Diemand, of C-CORE, a series of scale model tests were conducted in the wave tank of the Faculty of Engineering and Applied Science. Ice models of various sizes and shapes were monitored in waves representative of storm conditions on the Grand Banks (10-14 second periods with 12-15 metre heights). ... (Au)

**See also:** 291, 345, 642.

## LEWIS, C.F.M.

**641**
**DIGS : Dynamics of Iceberg Grounding and Scouring Experiment** / Lewis, C.F.M.
[S.l. : s.n., 1985].
[4] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163643.*

[This paper outlines the objectives of DIGS (the Dynamics of Iceberg Grounding and Scouring Experiment).] ... One important objective will be to determine the iceberg forces on the seabed and secondly to determine the seabed response to those forces. A third objective is to determine the effects of the seabed on iceberg motion and trajectory. Fourthly, to observe the possible hydrodynamic/sediment redistribution effects during the scouring event and finally to provide the opportunity to study a scour mark of known age and to determine its degradation with time. ... (Au)

**642**
**DIGS-85 : Dynamics of Iceberg Grounding and Scouring : Iceberg and seabed mapping observations** / Lewis, C.F.M. Parrott, D.R. Lever, J.H. Diemand, D. Dyke, M. Carter, W.J. Stirbys, A.F.
(14th Arctic Workshop : Arctic land-sea interactions, 6-8 November, 1985, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. – Dartmouth, N.S. : Bedford Institute of Oceanography, 1985, p. 93)
Abstract only.
*ASTIS document number 176370.*
ACU

A major field program supported by the Canada Environmental Studies Revolving Funds, was undertaken off the coast of Labrador during the summer of 1985 to document the dynamics and processes of iceberg grounding and scouring. Data on three groundings were collected. ... These data are used to calculate forces exerted on the seabed by grounded iceberg keels. The resultant scouring of the seafloor was investigated through surveying with high resolution seismic, side scan sonar and towed camera systems. Documentation of iceberg deterioration was obtained and temperatures of freshly calved bergy bits were recorded. ... The field experiment has resulted in the collection of a unique data set containing the driving forces acting on free-floating and grounded icebergs; iceberg size and shape; resultant motion of the iceberg; and observations of the seabed scours produced. Video coverage of a grounded iceberg that rolled and subsequently floated free was obtained, and it is believed that one of the grounded icebergs surveyed was in the process of forming a pit (an isolated grounding feature). In all, full documentation was obtained for 3 icebergs in contact with the seabed in water depths ranging from 107 to 170 m. These were grounding and pitting events; as yet we lack information on scouring events (i.e. events that produce long linear scour marks). Lesser information was obtained on 9 other icebergs and several more groundings were inferred. Future plans include collection of geotechnical data in the scoured areas for model studies. (Au)

**643**
**Geological evidence of iceberg groundings and related seafloor processes in the Hibernia discovery area of Grand Bank, Newfoundland** / Lewis, C.F.M. Barrie, J.V.
St. John's, Nfld. : Memorial University of Newfoundland, 1982.
ii, 32p. : figures ; 28cm.
(C-CORE publication, no. 81- 8)
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 146-177, ill.)
References.
*ASTIS document number 86908.*

ACU, NFSMO

Interpretation of the northeastern area of Grand Bank seabed based on high resolution seismic reflection profiles; side scan sonar imagery; bottom photography, sample and current metering; and engineering boreholes generally supports the surficial geology model of Fader and King (1981) and shows further evidence that the Hibernia area seabed is subject to iceberg scouring and intermittent sediment transport. ... A sparse population of relatively fresh looking ice scours comprising linear and curvilinear furrows and circular pits occurs throughout the region and is believed to represent the cumulative record of iceberg impacts within the past 10,000 years (Holocene) when late Wisconsin low sea level had risen sufficiently to allow icebergs to drift onto the Bank. ... Between 140 and 70 metres water depth on the margin of the Bank there is an upslope decrease in scour depths, widths, abundance and seabed disturbance. This is thought to arise as a result of a decrease in iceberg size and flux toward the Grand Bank margin away from the major iceberg source – the main branch of the Labrador current flowing around the northeast corner of Grand Bank. Scour depths may also be limited in shoaler water by the occurrence of the over-consolidated Tertiary unconformity near the seabed surface and by intermittent sedimentary infilling. (Au)

644

**Ice scour studies on the Labrador Shelf** / Lewis, C.F.M. Barrie, J.V.

(Proceedings – Workshop on Research in the Labrador Coastal and Offshore Region, Goose Bay, Labrador, September 4-6, 1980 / Newfoundland Institute for Cold Ocean Science. [St. John's, Nfld.] : Memorial University of Newfoundland, 1980, p. 264-265)

(C-CORE publication, no. 80- 13)

*ASTIS document number 73598.*

ACU, NFSMO

Numerous furrows in unconsolidated surficial deposits have been revealed by side scan sonar transects during geological reconnaissance of the Labrador Shelf by the Atlantic Geoscience Centre over the last decade. The furrows, tens of metres wide, are generally attributed to sediment gouging by bottom-dragging icebergs and represent a menace to potential offshore wellheads and pipelines. Three types of study are currently in progress to clarify the nature of this scouring process. 1. Regional Distribution of Ice-Scour Features ... 2. Site Investigation and Time Series Mapping [and] 3. Modern Iceberg Grounding Dynamics ... (Au)

645

**Iceberg scour abundance in Labrador Sea and Baffin Bay, a reconnaissance of regional variability** / Lewis, C.F.M. MacLean, B. Falconer, R.K.H.

(Proceedings : First Canadian Conference on Marine Geotechnical Engineering = Comptes rendus : Premiere Conference Canadienne sur le Genie Geotechnique Marin / Edited by W.J. Eden. – Montreal, Quebec : The Canadian Geotechnical Society, 1980, p. 79-94, ill.)

References.

*ASTIS document number 149578.*

NFSMO

This preliminary reconnaissance of the shelves of Baffin Bay and Labrador Sea, using a medium range side-scanning sonar, has revealed the diversity in regional abundance of iceberg scours. In general the number of iceberg impacts and scour marks tend to decrease with increasing water depth. This is expected because deep draft icebergs are scarcer than shallow draft icebergs. However, deeper draft icebergs appear to scour more deeply and longer with each impact. ... On a regional scale, iceberg scours are most abundant and best developed on the Canadian shelves of Baffin Bay and Labrador Sea where icebergs are naturally concentrated from West Greenland glaciers by a cyclonic gyral circulation. ... Iceberg scour is scarce on the southwestern Greenland shelf where the north-flowing West Greenland current carries relatively few icebergs (Murray, 1969). Scour is common farther north where numerous icebergs, fed from West Greenland glaciers, are drifting north and west. In general, the ice scour distribution correlates with major ocean currents and iceberg drift routes. On a local scale the variability in scour abundance, form and orientation is high. ... (Au)

646

**Iceberg scouring and sediment dynamics : seabed processes in the Hibernia area, Grand Banks of Newfoundland** / Lewis, C.F.M. Barrie, J.V. Fader, G.B. King, L.H. Amos, C.L.

(Maritime sediments and Atlantic geology, v. 18, no. 1, 1982, p. 54-55)

*ASTIS document number 176524.*

NFSMO

The Hibernia area of northeastern Grand Banks in 80 m of water depth is subject to iceberg scouring and intermittent hydrodynamic sediment transport, according to evidence on high resolution seismic reflection profiles, sidescan sonar records, bottom photographs, current meter data, sediment analyses, borehole results and submersible observations. ... (Au)

647

**Reconnaissance of iceberg scour on the shelves of Labrador Sea and Baffin Bay** / Lewis, C.F.M. Blasco, S.M. Falconer, R.K.H.

(Program with abstracts – Geological Association of Canada, v. 2, 1977, p. 32)

Abstract only.

*ASTIS document number 149349.*

ACU, NFSMO

Side-scan sonar transects, totalling 1000 km approximately, were obtained in 1976 across the continental shelves of northern Labrador Sea and northern Baffin Bay including Lancaster Sound. Iceberg scour tracks, where present, are the dominant feature of the seafloor micro relief. They occur as long, persistent, curvilinear single tracks, with younger tracks often superimposed on older tracks, where scour is abundant, or as short, crater-like marks. The former are characteristic of the northern Labrador and northern Baffin Is. shelves and may be favoured by a continuous cover of unconsolidated shelf sediment and by flat banks or slopes whose contours parallel the general direction of iceberg drift. The latter type are noted on the Greenland side of northern Baffin Bay and are believed to reflect a hard or sloping seafloor, possibly with little unconsolidated sediment cover. Minor bathymetric features control scour abundance; scour is virtually absent in shallow closed depressions on bank tops and is highly concentrated on the northern flanks of cross-shelf ridges. Scour abundance diminishes with increasing water depth with approximate limits of at least 100 m in Lancaster Sound and at least 275 m on Baffin and Labrador shelves. The general distribution of ice scour occurrences correlates with known ocean currents and iceberg drift routes. Scour is scarce on the southwestern Greenland shelf where the north-flowing West Greenland current carries relatively few icebergs. Scour is common farther north where icebergs, fed from Greenland glaciers, are drifting north and west. Scour is most abundant on the Canadian shelves where icebergs are concentrated and swept southwards by the persistent Baffin Bay and Labrador currents. (Au)

648

**Report on cruise BIO no. 81-012, CSS Baffin, May 22-28, 1981** / Lewis, C.F.M.

Dartmouth, N.S. : Bedford Institute of Oceanography, 1981.

1 v. (various pagings) : ill. ; 28 cm.

Appendices by J.A.M. Hunter, C. Waboso, R. Burns, R. Good, T.R. Chari, W.G. Smith, J.V. Barrie, C. Lynas, K. Asprey.

*ASTIS document number 149560.*
NFSMO

The specific objectives of the cruise were: (1) measurement of seismic velocities and layer thicknesses in representative sediment facies of northeast Grand Bank; (2) trials of Memorial University free-fall penetrometer in northeast Grand Bank sediments; (3) collection of seabed samples, photographs and sidescan imagery for study of surficial sediment distribution, bedforms and sediment mobility, and resistance to iceberg scouring; (4) acquisition of sidescan imagery to assess iceberg scouring activity near Hibernia and across central Grand Bank (a potential southern pipeline route). ... (Au)

649
**Submersible observations of iceberg furrows in glacial till, northeast Newfoundland Shelf : and in sand and gravel, Grand Banks of Newfoundland** / Lewis, C.F.M. Fader, G.B.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 101)
Abstract only.
*ASTIS document number 148377.*
NFSMO

Observations from the research submersible PISCES IV of relic iceberg furrows in glacial till on the Northeast Newfoundland Shelf in water depths of 180 m, show that the troughs of the furrows are very flat and consist of well-sorted, angular, cobble-sized clasts. Large boulders are compressed into the substrate. Furrows are abundant, virtually saturating the seabed surface. Most furrows are less than 100 m in width, their shoulders or berms marked by linear ridges of exposed boulders projecting one to five metres above the adjacent furrow troughs. The berms slope more steeply inward toward the troughs than outward. A conspicuous paucity of sediment in the troughs of the furrows indicates that little deposition of sediment by ice rafting or other mechanisms has taken place since the furrows were formed. Observations of iceberg furrows in water depths of 80 m on the Grand Banks of Newfoundland in the Hibernia discovery area across a sand and gravel seabed show that the furrows are less numerous and much less well defined, even though they are inferred to be younger. The icebergs appear to have broken through a gravel lag exposing underlying pebbly sand which has subsequently been developed into small sand waves, or mega ripples. The berms of the furrows are approximately 0.5 m or less in height. A furrow was observed which continued for 50 m and terminated in a circular depression "iceberg pit", formed as the iceberg ceased to move in a linear direction. These observations are documented with video recordings. (Au)

**See also:** 165, 310, 311.

## LEWIS, E.O.

650
**Surface-based radar classification and detection of ice** / Lewis, E.O. Currie, B.W.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 14)
Abstract only.
*ASTIS document number 182168.*
ACU

This paper discusses the results of several experimental programs undertaken by the Department of Fisheries and Oceans and McMaster University to improve the classification and detection of ice at sea using a surface-based radar system. The experimental programs have been carried out from a site overlooking Lancaster Sound during periods of a full ice cover and during periods of open water. ... In this paper, the effects of the radar parameters of resolution, frequency, and polarization are discussed, together with sample radar images. Some values of normalized radar cross-section are given for iceberg, multiyear, and first-year ice present in the landfast ice zone. Calculation of the like- to cross-polarized cross-section ratio shows that cross-polarization significantly increases the differentiation between multiyear or iceberg ice and first-year sea ice. During an open water experiment conducted in September of 1984, a dual-polarized X-band radar and a digital recording system were used to record the radar returns from icebergs, 'bergy bits', and growlers (iceberg fragments). Based on results of previous work, emphasis was placed on the polarization properties of the return; in particular, comparison of horizontally- and vertically-polarized returns, as well as cross-polarized components. Physical measurements of the iceberg targets, sea surface, and meteorological conditions were taken. Results presented are values of the normalized radar cross-section for both like- and cross-polarized returns for a number of ice targets. The effect of the various polarizations is discussed. The nature of the returns shows the use of cross polarization [to] enhance target detection performance of the radar. (Au)

**See also:** 307, 896.

## LEWIS, F.

**See:** 111.

## LEWIS, J.C.

651
**On the numerical characterization of iceberg shape** / Lewis, J.C.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 15)
Abstract only.
*ASTIS document number 182176.*
ACU

A fundamental difficulty in the attack on problems related to icebergs, whether these are applied or fundamental, is the quantitative characterization of iceberg shape. This paper discusses areas in which this difficulty arises, and reviews several approaches to quantitative characterization of shape. It is argued that the roughness of an iceberg on specified length scales is of particular use for this purpose. A definition is given which quantifies the intuitive concept of roughness. This roughness measure can be defined and calculated at each point of the iceberg surface, and so can be applied to part or to all of the surface, and can be averaged over ... any part of the surface, or part thereof, to give a global measure of the roughness of the part of the surface as a function of the length scale. Several examples are presented, and a computational method for determining the roughness from level contours is outlined. (Au)

**See also:** 543.

## LEWIS, J.K.C.

652
**Burial parameters : an integrated approach to limit overdesign** / Lewis, J.K.C. Benedict, C.P.

(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 189-206, ill.)
References.
*ASTIS document number 149993.*
NFSMO

... This paper begins with a review of iceberg properties relevant to engineering design on the Grand Banks. Routine engineering calculation of scour depth and frequency, and burial parameters such as glory hole depth and trenching depth, will necessitate a computer simulation scheme which combines an iceberg shape and motion model with a tested geotechnical model. With a site-specific draft distribution and iceberg flux this can be run to generate scour depth distribution for 50 years of icebergs, or the 50 year overpressure at a stated depth below the seafloor. The four steps to be taken so that engineering calculations of burial parameters can eventually be made on routine basis are: measure iceberg drafts; instrument an iceberg seafloor impact sequence; simulate the impact with the seafloor on a computer; combine the above with shape and motion models, and draft and flux, in an overall iceberg motion/scour simulator. (Au)

653
**Iceberg detection for Canadian frontier production** / Lewis, J.K.C. Benedict, C.P.
(Thirteenth Annual Offshore Technology Conference 1981, proceedings. – Dallas : Offshore Technology Conference, 1981, v. 3, p. 115-122, figure)
(OTC paper, 4077)
References.
*ASTIS document number 116459.*
ACU, NFSMO

This paper specifies the operational requirements for ship-based sensor system for reliable all weather detection and avoidance of ice obstacles for two applications: (i) for station keeping at northerly drillsites and production sites; (ii) for large, high-speed LNGC's as planned in the Arctic Pilot Project. ... Radar, sonar, IR, and low-level light detectors are analyzed for their detection capability. Each sensor is discussed in terms of the transmitting channel or medium and ice target characteristics peculiar to that sensor, including dependence of target strength on berg size and shape. The capabilities and deficiencies of currently available sensor hardware are discussed, both separately and for use in multisensor systems. Finally a field program to obtain sensor parameters is briefly reviewed. (Au)

654
**Iceberg tow response** / Lewis, J.K.C. Benedict, C.P.
(The Seventh International Conference on Port and Ocean Engineering Under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 1, p. 300-309, figure)
References.
*ASTIS document number 129631.*
NFSMO

Icebergs provide a significant environmental challenge to economic offshore drilling. In this paper, iceberg response during towing at frontier drilling sites is predicted, in terms of practical tow forcing functions. (Au)

655
**Icebergs on the Grand Banks : oil and gas considerations** / Lewis, J.K.C. Benedict, C.P.
(World oil, v.192, no. 1, Jan. 1981, p. 109-114, figures, tables)
References.
*ASTIS document number 149322.*
ACU, NFSMO

As hydrocarbon production on the Grand Banks comes nearer, demands for ice technology are moving into a new era. Ice prediction and management capabilities, almost static over the nine year exploration phase, will have to become highly cost effective and mature rapidly for the production phase. This article is an introduction to current knowledge of iceberg movements, mechanical properties relevant to structural design, and the four components of iceberg management – detection, track prediction, pre-tow surveying and towing – as they affect offshore drilling and production operations. (Au)

656
**Monte Carlo calculations of iceberg draft changes caused by roll** / Lewis, J.K.C. Bennett, G.
(Cold regions science and technology, v. 10, no. 3, Nov. 1984, p. 1-10, ill.)
References.
*ASTIS document number 150568.*
ACU, NFSMO

Draft changes in iceberg roll have been investigated using a Monte Carlo technique for generating iceberg shapes of constant, polygonal cross section. Stability is assessed from the potential energy curves calculated assuming vertical but not rotational hydrostatic equilibrium. No modelling of the roll dynamics has been included. The draft changes are approximately normally distributed, with increases almost as probable as decreases. Extreme draft changes (defined to be those in excess of 20%) are not uncommon. The mean draft change, standard deviation, skewness and kurtosis depend on the number of sides in the berg model, and on the ratio of berg ice density to seawater density. In particular the fraction of extreme draft changes is a sensitive function of this ratio. (Au)

657
**Use of draft distribution for evaluating iceberg incursion probability** / Lewis, J.K.C. Benedict, C.P.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 168)
Abstract only.
*ASTIS document number 148423.*
NFSMO

Before offshore hydrocarbon deposits can be developed commercially, the probability of iceberg scouring and incursion into subsea production facilities must be evaluated. Such information is an essential component in specifying the design parameters related to the platforms and/or subsea systems to be used in recovery of oil and gas. This paper presents a method for describing analytically the distribution of iceberg drafts at a particular latitude, and of combining this with site bathymetry and iceberg flux data to calculate iceberg incursion probabilities and mean times between incursions as a function of site design parameters. (Au)

**See also:** 186, 189, 192.

## LEWIS, K.J.

658
**Estimation of iceberg collision damage and pollution consequences** / Lewis, K.J.
London : Lloyd's Register of Shipping, 1984.

(Lloyd's Register of Shipping, Hull Structure. Report, no. 84/ 9)
Availability of this report is restricted.
Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184152.*

This report describes the development of a model to estimate iceberg collision damage and pollution consequence for ships operating in the Arctic. The model has been used to derive a correlation between the energy absorbed in structural deformation, the bow collapse distance, the ship size parameters and ice class. This correlation and the results of the consequence model are presented. Their applicability and limitations are discussed. (Au)

**See also:** 111.

## LIEN, R.L.

659
**Sea bed features in the Blaaenga area, Weddell Sea, Antarctica** / Lien, R.L.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 2, p. 706-716, ill.)
References.
*ASTIS document number 150681.*
NFSMO

Data for this contribution were gathered during two expeditions in the summer seasons 1967/77 and 1978/79, and consist of records with echo sounder and side-scan sonar. From these data we have constructed a tentative bathymetric map of the area, and the sea floor has been classified into four groups of sea bed features. Two of these are well known and widely described in the literature: plough marks from grounded icebergs, and conventional undisturbed sea bed. The other two, in spite of a comprehensive study, are not found in the literature. These features consist of a washboard pattern, and a hummocky, mosaiclike, sea bed pattern. The different features are described and shown on record sections. Further some record sections with special phenomena such as tracks of wobbling icebergs, arresting icebergs, multi-keeled icebergs etc. are shown. Finally the different patterns and phenomena will be discussed with reference to their process of formation. (Au)

## LISKOW, C.

**See:** 388, 389.

## LIVINGSTONE, C.E.

**See:** 468, 812.

## LIVINGSTONE, W.

660
**Ice scour research : long term plan** / Livingstone, W.
[S.l. : s.n., 1985].
[11] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163570.*

[This paper outlines the ESRF Ice Scour Committee's long term research plan.] ... The sea bottom ice scour committee is unique in the sense that ice scour has been identified and perceived as a priority topic in both the Beaufort Sea and the east coast offshore regions. ... In presenting the plan the ice scour committee has taken a very simple approach. The plan is broken down into two components aimed at providing answers to basic questions with regard to ice scour. In other words, how deep are the scours, and how often do they occur? (Au)

## LOEWE, F.

661
**Calving from floating glaciers : comments on Dr. N. Reeh's paper** / Loewe, F.
(Journal of glaciology, v. 8, no. 53, June 1969, p. 321-322)
Review of ASTIS document number 171883, On the calving of ice from floating glaciers and ice shelves / N. Reeh in Journal of glaciology, v. 7, no. 50, 1968, p. 215-232.
References.
*ASTIS document number 171638.*
ACU, NFSMO

This letter to the editor suggests that Dr. Reeh's paper on 'Calving from floating glaciers' does not fully cover all the processes leading to such an elaborate theory. Discrepancies are discussed. (ASTIS)

662
**Das gronlandische Inlandeis nach neuen Feststellungen = New light on the Greenland ice sheet** / Loewe, F.
(Erdkunde, Bd. 18, Heft 3, 1964, p. 189-202, ill.)
References.
English summary.
Text in German.
*ASTIS document number 171603.*
ACU

Some references to important publications on the physico-geographical conditions of the Greenland ice sheet are given. ... Recently an extremely accurate profile across the ice sheet has been established by levelling. The mean height of the surface is 2100-2150 m (7000 ft), the greater height close to 3300 m (11,000 ft). The thickness of the ice has been measured by seismic and gravimetric methods at many places. The mean thickness is 1500-1600 m (5000 ft), with a maximum of 3400 m (11,150 ft) ... The total ablation by runoff of melt water is much smaller than the total accumulation. Iceberg formation nearly accounts for the difference. The east coast is much less productive of icebergs than the west coast. The Greenland ice sheet is presently not markedly diminishing; it may be stable or even slightly increasing. ... (Au)

## LOGSDON, T.

663
**Satellite tracking of icebergs** / Logsdon, T.
(Aurora, no. 15, Mar. 1985, p. 23-24, ill.)
*ASTIS document number 167037.*
ACU, NFSMO

This article outlines the hazards involved in tracking icebergs remotely by radar and satellite. Because of the high degree of accuracy and its continuous availability, the Global Positioning System could provide an unusually attractive method for, tracking icebergs. The GPA can provide precise and reliable tracking now with eventual capacity for continuous, real time monitoring of the hazardous icebergs that cut across the North Atlantic shipping lanes. (ASTIS)

## LOIRE, R.

See: 881.

## LOKEN, O.H.

664
**Bathymetric observations along the east coast of Baffin Island : submarine moraines and iceberg distribution** / Loken, O.H.
(Earth Science Symposium on Offshore Eastern Canada, Ottawa, February 1971 / Edited by P.J. Hood. Paper – Geological Survey of Canada, 71- 23, 1973, p. 509-519, figures)
Cover title.
References.
*ASTIS document number 148300.*
ACU, NFSMO

Detailed studies of the submarine trough which extends across the continental shelf off Clyde Inlet show that a terminal moraine lies across the outer part of the trough and that there is further evidence of four (4) other ice marginal positions, all seaward of the present shoreline. The oldest submarine feature is correlated with a supramarine moraine. The irregular topography of the trough differs sharply from the very smooth bottom topography on either side. The submarine moraine along the northwest side of the Clyde trough forms a barrier to the southward flowing icebergs which become stranded, thus accounting for the well-known field of icebergs characteristic of the Cape Christian area; which has an important stabilizing influence on the ice cover in the area. Studies of this naturally stabilized ice cover will be relevant to plans for artificially constructed ice islands in other areas. (Au)

665
**Iceberg studies in the Glaciology Division, Environment Canada** / Loken, O.H. Ommanney, C.S.L. Holdsworth, G.
(Sea ice : proceedings of an international conference sponsored by the National Research Council of Iceland [and] the Bauer Scientific Trust, Reykjavik, Iceland, May 10-30, 1971 / Edited by T. Karlsson. R.r. – National Research Council, Reykjavik, '72- 4, p. 146-151, ill., map)
References.
*ASTIS document number 163805.*
ACU, NFSMO

... The Glaciology Division ... has started a project to determine the geographical distribution of Canadian tidewater glaciers and to assess the rate of calving from selected typical glaciers. ... This paper briefly reviews the current studies. ... Our study can be divided into 3 phases .... The first phase is an inventory of all tidewater glaciers, the second a study of the mechanics of the calving process itself and the third a study of the rate of ice discharge from various glaciers and of the distribution of icebergs in selected areas. (Au)

666
**Iceberg studies in the glaciology subdivision** / Loken, O.H. Ommanney, C.S.L. Holdsworth, G. Arnold, U.C.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 128-134)
References.
*ASTIS document number 162744.*
NFSMO, ACU

... [The studies of the Glaciology subdivision] can be divided into four parts. The first is an inventory of all tidewater glaciers, the second a study of the mechanics of the calving process itself, the third a study of the rate of iceberg discharge from various glaciers and the fourth is a study of the distribution of icebergs in selected areas. ... (Au)

## LOPEZ, R.J.

667
**Hydrodynamic effects on iceberg gouging** / Lopez, R.J. Chari, T.R. Moore, E. Peters, G.R. Zielinski, A.
(Cold regions science and technology, v. 4, no. 1, Jan. 1981, p. 55-61, figures)
Appendix.
References.
*ASTIS document number 59730.*
ACU, NFSMO

A model of a grounding iceberg which takes into account the soil resistance and the hydrodynamic drag is formulated. Based on analytical investigations and numerical results, a simple and accurate estimator for gouge length is proposed. The calculations reveal that the hydrodynamic drag on grounding icebergs may have significant influence on the total gouge length. A numerical criterion which defines the range of iceberg parameters and ocean bottom characteristics for which drag effect cannot be neglected is established. (Au)

**See also:** 147, 148.

## LOSEV, K.S.

668
**Estimation of run-off from antarctic and Greenland ice sheets** / Losev, K.S.
(Symposium on the Hydrology of Glaciers, Cambridge, 7-13 September 1969. Publication – International Association of Scientific Hydrology, no. 95, 1973, p. 253-254)
References.
*ASTIS document number 172642.*
ACU

Consideration of the evidence on the calving of icebergs from the antarctic ice sheet suggests that the estimates of ice loss which have been used in previous estimates of antarctic mass balance are too low. A new estimate, based on three different methods, suggests that the combined output from Greenland and antarctic ice sheets is more than 3000 cu km per year. (Au)

## LOTT, R.C.

See: 308.

## LOWRY, R.T.

669
**Ice and iceberg studies using state-of-the-art remote sensing** / Lowry, R.T. Inkster, D.R. Kirby, M.E.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979,

proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 551-569, photos.)
References.
*ASTIS document number 56154.*
ACU, NFSMO

... Preliminary results agree with other workers that X-band SARs show great practical benefits in operational ice and iceberg reconnaissance roles. Work is underway to establish the optimum radar parameters and operating and interpretation techniques. The detection of oil in ice infested waters, while very difficult with SAR, has been studied using UV and IR scanners in conjunction with photography. ... Work is underway to use remote sensing systems to provide data for use in the development, fine tuning and verification of both sea ice and iceberg dynamics models. ... In addition, remote sensing data is being used to predict the operational characteristics of Liquid Natural Gas tankers .... Areas of current work are outlined as are problems solved and those remaining to be solved. (Au)

670
**Iceberg mapping in Lancaster Sound with Synthetic Aperture Radar** / Lowry, R.T. Miller, J.D.
(Iceberg research, 1983, no. 6, Nov., p. 3-9, ill.)
(8e Symposium canadien de teledetection et 4e Congres de L'Association quebecoise de teledetection, 3-6 mai 1983, Montreal, Quebec = 8th Canadian Symposium on Remote Sensing and 4th Conference of L'Association quebecoise de teledetection, May 3-6, 1983, Montreal, Quebec / Edited by K.P.B. Thomson and F. Bonn. – Saint-Foy, Quebec : L'Association quebecoise de teledetection, 1984, p. 239-246, ill.)
References.
*ASTIS document number 157716.*
ACU, NFSMO

... In October 1979, an experiment was conducted to assess the feasibility of using the X-band wide-swath, synthetic aperture radar (SAR), called the SAR-580, to map ice hazards in support of marine activity. This project was conducted by Intera Environmental Consultants Ltd. (INTERA) and Petro-Canada Exploration Inc. (PETRO-CANADA), in the mouth of the Northwest Passage in Lancaster Sound. There were three main objectives to this study: 1. To study the ability of the SAR-580 to map ice hazards in the area chosen. 2. To study the utility of SAR to detect and identify ice hazards of different sizes and types under a variety of conditions. 3. To study the possibility of reidentifying and tracking ice hazards from one day to the next. ... (Au)

671
**Synthetic aperture radar imagery of iceberg calving in Melville Bay** / Lowry, R.T.
(Iceberg research, 1984, no. 8, Oct., p. 23, ill.)
*ASTIS document number 182435.*
ACU, NFSMO

The image ... is an example imagery collected by the STAR-1 synthetic aperture radar developed by Intera Radar Systems Ltd., Calgary. The STAR-1 50 km swath width image was collected on 9 June 1984 during the support missions for the early spring probe of the M.V. Arctic. The image, taken looking at the coast of Greenland in Melville Bay (top of photograph), shows icebergs in shorefast ice and the glacier calving into the bay. The glacier in the upper left shows two mechanisms for iceberg formation. The central tongue of the outflow is floating out onto the sea, and gradually breaking off to float away as very large tabular icebergs of 1 km or more in extent. On either side of the major tongue glacial ice cliffs show where the ice breaks off and falls into the water producing many more, but typically smaller icebergs. The sea ice has begun to break up in the lower part of the image, and in a few weeks all the icebergs will be freed to drift with the West Greenland Current, around Baffin Bay and into the North Atlantic. (Au)

**See also:** 468, 592, 672, 1092.

## LYDEN, J.D.

672
**Synthetic Aperture Radar imagery of ocean waves in sea ice** / Lyden, J.D. Burns, B.A. Shuchman, R.A. Lyzenga, D.R. Larson, R.W. Lowry, R.T.
[S.l. : s.n., 1982?].
[13] leaves : figures, tables ; 28 cm.
Paper presented at the International Symposium on Remote Sensing of Environment. Second Thematic Conference, Remote Sensing for Exploration Geology, Fort Worth, Texas, December 6-10, 1982.
References.
*ASTIS document number 129283.*
NFSMO, ACU

The pressure for energy independence and the natural resources of the Arctic make year-round geological exploration in this region a high priority. A major obstacle to the achievement of this goal is the lack of real-time information on sea ice, – including its dimensions and dynamics. The age or thickness of ice determines the class of ship or icebreaker needed to safely navigate and its fuel consumption. The movement of ice masses will influence decisions regarding location and scheduling of drilling operations, as well as actions to suspend activity at certain ice-threatened sites. This movement of sea ice can be caused by wind shear, ocean currents, surface gravity waves, or a combination of all three. This paper investigates the ability of synthetic aperture radar (SAR) to image ocean surface gravity waves as they propagate into and through sea ice. Also presented are brief discussions on the ability of SAR to detect ice types of various thicknesses and icebergs. (Au)

## LYNAS, C.M.T.

**See:** 164, 170.

## LYZENGA, D.R.

**See:** 672.

## M'KEEVOR, T.

673
**A voyage to Hudson's Bay, during the summer of 1812. Containing a particular account of the icebergs and other phenomena which present themselves in those regions. Also, a description of the Esquimeaux and North American Indians, their manners, customs, dress, language, &c. &c. &c.** / M'Keevor, T.
Toronto : Canadian House, 1968.
78 p., 5 leaves of plates : ill. ; 22 cm.
A voyage to Hudson's Bay, during the summer of 1812. Containing a particular account of the icebergs and other phenomena which present themselves in those regions. Also, a description of the Esquimeaux and North American Indians, their manners, customs, dress, language, &c. &c. &c. / by Thomas M'Keevor. – London : Printed for Sir Richard Phillips and Co., Bride-Court, Bridge-Street, 1819.
*ASTIS document number 180645.*

This fascinating diary of M'Keevor's voyage to Hudson's Bay

provides interesting insights into early cultural contact among natives and anglo-Saxons during the nineteenth century. Along the way, sightings of icebergs and encounters with wildlife are also reported. Detailed descriptions of icebergs are given and discussions on iceberg formation are attempted. (ASTIS)

## MACDONALD, D.

**See:** 792.

## MACLAREN ATLANTIC LIMITED

674
**Report on ice and meteorological observations in the Davis Strait during April, May and June 1977** / MacLaren Atlantic Limited. Imperial Oil Limited [Sponsor].
[Calgary : Distributed by APOA], 1977.
3 microfiches : ill., figures, maps, tables ; 11x16cm.
(APOA project no. 138 : Environmental investigations and analysis in Davis Strait - second half 1977. Report, no. 13)
(Eastern Arctic Marine Environmental Studies)
Appendices.
References.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
EAMES order no. ES49.
*ASTIS document number 26557.*
ACU, NFSMO

The aims for the ice work were given as carrying out ice observations whenever the ship entered ice during the voyage. Observations were to include: Ice - coverage (in tenths); floe sizes; snow cover; description of raised edges; ridging and rafting; type - multi-year, first year, etc.; slush between floes; specific sitings of multi-year ice, heavy ridging, etc.; some representative photos to be taken. Icebergs - location and description; estimate size wherever possible; photos if possible. ... Meteorological observations were to be taken throughout the cruise at 3-hour invervals in accordance with Atmospheric Environment Services supplementary ship's weather reporting procedures. (Au)

## MACLEAN, B.

675
**Bedford Institute of Oceanography cruise report : CSS Hudson - 84-035 phase II, September 11 - September 28, 1984** / MacLean, B.
[S.l. : s.n., 1984].
[9] leaves : maps ; 28 cm.
Unpublished BIO Cruise Report.
*ASTIS document number 159654.*

... Principal objectives of the program were as follows: 1) investigate with Sea Marc sediment features associated with Western Boundary Undercurrent along SE-NW transect on continental slope east of Saglek Bank to outer edge of shelf off Hudson Strait. 2-a) with Sea Marc, examine ridge features (morainal or giant ice scours) on the outer part of the shelf off Hudson Strait; b) carry out brief (few hours) Huntec survey in inner part of area (a) and; c) obtain six cores of the sediments. 3) Carry out brief Huntec transect and core stratified sediments northeast of Resolution Island. 4) Conduct Sea Marc transect seaward from Loksland through Hekja and Raleigh exploratory well localities on outer part of shelf into 2500-300 m of water to examine variations in iceberg scour characteristics and topography with changing seabed material and depth, maximum seaward depth limits of iceberg scour features, possible slump features, and Western Boundary Undercurrent sediments. 5) investigate with Sea Marc probable morainal sediments, 200 m terrace feature, iceberg scour characteristics and paleochannels (?) at north side of Saglek Bank. 6) investigate with Sea Marc glacial and bedrock features in Cartwright Saddle area including possible slump feature along SE ridge of Harrison Bank. ... Line 2 indicated the presence of subparallel iceberg scours or glacial ice sole marks that trend east-west on the outer part of the shelf off Hudson Strait. ... Line 3 east of Loksland showed that many scours on the central part of the intensely ice-scoured southeast Baffin Shelf seabed display a pronounced east-west orientation. ... Line 4 revealed parallel iceberg scours or icesheet sole marks in 275 m of water on the northeast edge of Saglek Bank that locally display a preferred orientation which is subparallel to bathymetric contours. Orientation of scours on the eastern part of the bank is more random. ... (Au)

676
**Geology of the Baffin Island shelf** / MacLean, B.
(Quaternary environments, eastern Canadian Arctic, Baffin Bay and west Greenland / Edited by J.T. Andrews. - London : George Allen and Unwin Ltd., [1985?], [17] leaves, ill.)
Monograph in press.
Photocopy.
References.
*ASTIS document number 159557.*

Iceberg scour marks are observable on sidescan sonar records and high resolution seismic profiles across the sediment covered areas of the Baffin shelf down to depths of some 500 m or greater (e.g., Lewis et al., 1980). Some of these features are believed to be relict, other are the product of present day iceberg groundings. Although depth of water, iceberg size, seabed gradient, current regime, etc. are factors in the frequency of grounding and iceberg ploughing capability, various acoustic data and follow-up observations from the submersible Pisces IV indicate that depth of scouring into the seabed is also very much related to the hardness and resistance of the various seabed sediment types. ... (Au)

**See also:** 645, 837, 838, 999.

## MACNEILL, M.R.

**See:** 329.

## MADSEN, S.N.

677
**SAR-580 - Greenland campaign & analysis of speckles statistics** / Madsen, S.N. Gudmandsen, P.
(Investigators preliminary report September 1983 : proceedings of the SAR-580 Investigators Workshop / Edited by J.W. Trevett. - Ispra, Italy : Commission of the European Communities, Joint Research Centre, 1983, chapter 4, p. 37-50, ill.)
Appendices.
References.
*ASTIS document number 181978.*
OOCCR

In connection with the European SAR-580 Campaign a proposal was issued to investigate two areas in South Greenland, one area over land with mountains and glaciers and another over sea with icebergs and sea ice. The investigations are related to three disciplines or applications. Glaciology/Hydrology, Geology/Cartography, Sea Ice/Icebergs, with the objectives of studying (a) the possibility of delineating snow accumulation patterns and estimating the water equivalent of snow accumulation on glaciers (b) application of passive markers on the inland ice and

ice-free areas for cartographical applications (c) the possibility of applying SAR data for geological purposes (d) sea ice mapping and classification, iceberg detection and identification (e) various procedures of data processing including signal statistics, image rectification and stereo applications. In support of the SAR measurements other measurements were carried out on the ground and the sea ice as well as airborne measurements. This paper gives a brief account on the SAR-580 Campaign activities. However, still awaiting useful digital SAR data from the test areas no conclusions have been arrived at. The main part of this paper describes preliminary investigations of the return signal statistics of data from other test areas in preparation of the analysis to be undertaken when the Greenland data becomes available. (Au)

## MAES, M.A.

678
**Probabilistic analysis of iceberg loads on offshore structures** / Maes, M.A. Jordaan, I.J.
(IAHR Ice Symposium 1984, Hamburg, August 27-31, 1984, proceedings. – [Hamburg : International Association for Hydraulic Research], 1984, v. 2, p. 175-188, ill.)
References.
*ASTIS document number 167061.*
NFSMO

... loading of structures offshore eastern Canada by icebergs poses a unique environmental problem. The present paper is devoted to a probabilistic evaluation of such loads. First, problems related to iceberg density and occurrence are addressed, together with the relationship of these factors to flux and directionality of motion. Data on the factors just outlined is used to develop arrival rates of icebergs. It is shown that iceberg loading may be treated analogously to a compound Poisson process. In the evaluation of the loads, the mass, velocity and size (width) must be treated as random. Models for these, based on an empirical analysis of data, are developed. The deduction of probability distribution for mass, velocity and size given a collision is shown and that these are updated versions of the distributions for randomly chosen icebergs. Finally, return periods for calculated kinetic energies are developed, based on a calculation procedure for ice loads which uses the mass and velocity combinations together with added mass. ... (Au)

**See also:** 126, 340.

## MAGNOR, K.

679
**"Another hypothesis about iceberg draft" by L.D. Brooks : discussion** / Magnor, K. Zorn, R.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 349-351, ill.)
Discussion of ASTIS document number 55549, Another hypothesis about iceberg draft / L.D. Brooks in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 241-252.
*ASTIS document number 172782.*
ACU, NFSMO

[This is a discussion of] ... the paper: Another Hypothesis about Iceberg Draft, by Larry D. Brooks. In the ... paper, results are included from draft analyses, performed partly on the same iceberg data by Danish Hydraulic Institute .... (Au)

**See also:** 1132.

## MAIER, D.C.

**See:** 868, 871, 872.

## MAJAESS, F.

**See:** 435, 436, 439.

## MALCOLM, A.H.

680
**Tracking the giant ice cubes** / Malcolm, A.H.
(The Polar times, no. 94, June 1982, p. 12, ill.)
*ASTIS document number 172073.*
ACU

The article describes a day of iceberg watching from a U.S. Coast Guard Plane patrolling the east coast of Canada. (ASTIS)

## MAMO, A.C.

681
**United States patent : Method for moving icebergs in a body of water and related apparatus** / Mamo, A.C. [Inventor].
[Washington, D.C. : Patent and Trademark Office], 1982.
7 leaves : figures ; 28 cm.
(U.S. patent documents, no.4,320,989, Mar. 23, 1982)
References.
*ASTIS document number 136778.*
NFSMO

A low cost method for transporting an iceberg from one location to another in a body of water without the need of boarding, or physical pushing or pulling contact therewith. The method involves the releasing of a large volume of air bubbles underwater in specific proximity to a portion of the floating iceberg. The bubbles are formed by allowing air to escape from openings in a submerged tube structure to form a shroud or wall of many bubbles. The bubbles are released in such areas as to provide bubble envelopment of a portion of the subsurface of the iceberg. Primarily, this raises the water surface of a peripheral portion of the iceberg to result in an increase in pressure and movement of the iceberg away from the bubble-enveloped side of the iceberg. (Au)

## MANADRILL DRILLING MANAGEMENT INC.

682
**"Draft" : An evaluation of ice management systems in support of eastern Canada offshore exploratory drilling operations** / Manadrill Drilling Management Inc. Royal Commission on the Ocean Ranger Marine Disaster (Canada) [Sponsor].
[Ottawa] : Royal Commission on the Ocean Ranger Marine Disaster [publisher] ; Calgary, Alta. : Pallister Resource Management Ltd. [distributor], 1984.
2 microfiches : ill. ; 11 x 16 cm.
(Royal Commission on the Ocean Ranger Marine Disaster (Canada). RCOR, 3)
Also available in hardcopy.
*ASTIS document number 183890.*
ACU

The objective of this report is to provide an assessment of the

adequacy of current ice management programs, used in support of exploratory drilling operations in eastern Canadian waters, in respect to the prime issue of human safety. The assessment includes a review of operational limitations of mobile offshore drilling systems and the technical limitations of ice surveillance systems. ... The study is ... largely based on a series of interviews with knowledgeable individuals ... . These included representatives of the exploration companies, the drilling and support vessel contractors, the physical environmental data collection and forecasting service groups and the governmental regulatory agencies. ... detection, tracking, deflection and orderly departure make up the general requirements for a safe operation. The detailed elements of the general operating package should include: 1. Overall operating philosophy dedicated to avoiding contact with ice. 2. Surveillance network with the prime purpose to detect ice and to track particular ice events once they are detected. 3. Ice deflection capability to divert ice that has the potential of encroaching on the location. This includes iceberg towing procedures and prop-washing procedures for smaller pieces of ice. 4. Avoidance action plan outlining the sequence of events to be followed when ice enters each of a series of concentric alert zones surrounding a MODU. ... 5. Hang off and release procedures ... outlining the steps, and their timing, necessary to execute an orderly temporary abandonment or suspension of the well. 6. Anchor retrieval procedures covering the sequence of events to be followed to ensure an orderly departure from the location for those MODUs which rely on conventional anchors for their station keeping capability. 7. Emmergency procedures ... to conduct an emergency release from the well, and a quick release of the anchors in the case of a moored vessel, when ice is detected inside a vessel's emergency alert zone. ... (Au)

## MANGOR, K.

**683**

**Iceberg conditions offshore Greenland** / Mangor, K. Zorn, R.
(Iceberg research, 1983, no. 4, Apr., p. 4-20, ill., maps)
Appendices.
*ASTIS document number 157678.*
ACU, NFSMO

The present article has been prepared mainly on the basis of environmental data collected by the Greenland Technical Organization (GTO) and the petroleum industry in connection with the petroleum exploration off West Greenland during the years 1976 and 1977. The extensive field programmes for the environmental investigations were designed by a committee set up by GTO. During the period 1975 and 1978 field measurements were performed off West Greenland in a programme entitled 'Environmental Conditions Offshore West Greenland' and during the years 1980 and 1981 measurements were performed off East Greenland for the 'Environmental Studies Offshore East Greenland' programme. ... (Au)

## MARCE, R.P.

**684**

**The experience and results obtained with the "Pelerin" and "Pelican" in deep or hostile seas** / Marce, R.P. Fort, G.
(New technologies for exploitation of oil and gas reserves. – London : Graham & Trotman, 1979, v. 2, p. 952-976, ill.)
*ASTIS document number 163007.*
NFSMO

The paper reports on the operation of the drillships, the PELICAN and PELERIN, and includes their work on the coast of Labrador. (NFSMO)

## MARINE CONSULTANTS

**See:** 690.

## MARINE ENVIRONMENTAL SERVICES LIMITED

**685**

**Arctic environmental observations – M/V Arctic Explorer** / Marine Environmental Services Limited.
[Calgary : Distributed by APOA, 1974].
2 microfiches : ill., tables ; 11x16cm.
(APOA project no. 78 : Environmental data gathering program – Baffin Bay, Davis Strait and Arctic Islands.)
*ASTIS document number 26727.*
ACU, NFSMO

The purpose of this project was to obtain meteorological, oceanographic and ice data in the study region. A trained meteorological, oceanographic and ice observer was placed aboard the MV Arctic Explorer while it was conducting seismic surveys in Baffin Bay and the eastern Arctic Islands during the 1974 open water season. The data collected has been processed and summarized into an environmental data report. (Au)

**686**

**Environmental conditions in Baffin Bay and Davis Strait including presentation of data collected during summer 1972** / Marine Environmental Services Limited.
[Calgary : Distributed by APOA, 1972].
2 microfiches : tables ; 11 x 16 cm.
(APOA project no. 35 : Environmental study of the Baffin Bay-Davis Strait region. Report, no. 2)
Appendices.
References.
*ASTIS document number 24503.*
ACU, NFSMO

To present existing environmental data of the Canadian portion of the Baffin Bay – Davis Strait Region in a format suitable for use in planning exploration and development activities in this frontier region. All existing environmental data was studied by Marex and summarized in useful charts and diagrams. In addition, an observer was placed aboard a seismic vessel working in the area in the summer of 1972. This data added significantly to the limited amount of quantitative data available and forms an important part of the report. [Includes information on iceberg densities and percent of icebergs that are grounded.] (Au)

**687**

**Environmental observations offshore Labrador 1976 : appendix 2 : iceberg observations** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
22 leaves : ill. ; 28 cm.
Cover title: Appendix 2 : Iceberg observations : environmental observations offshore Labrador 1976.
*ASTIS document number 167231.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the SEDCO J semi-submersible drilling rig while working off the coast of Labrador. (NFSMO)

**688**

**Environmental observations offshore Labrador 1976 : appendix 3 : iceberg towing logs** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].

Calgary, Alta. : Marine environmental Services, 1977.
21 leaves : ill. ; 28 cm.
*ASTIS document number 167223.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the SEDCO J semi-submersible drilling rig while working off the coast of Labrador. (NFSMO)

689
**Handbook of drillship stationkeeping in iceberg areas** / Marine Environmental Services Limited. Total Eastcan Exploration Ltd. [Sponsor].
[S.l. : s.n., 1974 or 1975].
113 p. : figures, tables ; 21 cm.
Prepared for Total Eastcan by Marex, Isle of Man, in approximately 1974 or 1975.
Appendices.
*ASTIS document number 132837.*
NFSMO

This Handbook of Drillship Station-Keeping for Iceberg Areas has been written for the purpose of assisting Meteorological and Ice Observers in performing their duties in an efficient, uniform and effective manner. ... The time taken and the expense involved in moving a drilling rig to avoid iceberg collision makes prediction of their drift important. Equally important are means of increasing the detection range of icebergs, principally with radar and means of protecting a rig by towing icebergs with offshore supply boats. These aspects of the problem are discussed here and, where applicable, the reader is referred to other publications which are intended to be used in conjunction with this Handbook. As an operational handbook, this is the central book of a series of four publications. The other publications of this series are entitled: Iceberg Towing Manual, Iceberg Drift Prediction, [and] Environmental Conditions Offshore Labrador, Summer 1971. ... (Au)

690
**Iceberg observations : D.V. Pelican and Zapata Ugland environmental observations offshore Labrador 1976** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor]. Marine Consultants.
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
108 leaves : ill. ; 28 cm.
Appendix 3.
Cover title: Environmental observations offshore Labrador 1976 : appendix 3 : iceberg observations.
*ASTIS document number 167207.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillships Pelican and Zapata Ugland when the vessels were operating offshore Labrador. Listings are given of all logged iceberg positions as determined from the radar. Some position fixes had to be relayed from the towing vessels due to problems with the radar systems on Petrel and Zapata Ugland. Berg size and shape information is given for the majority of the bergs which were seen visually. These icebergs were measured by sextant, using the radar to give the range of the berg. (NFSMO)

691
**Iceberg observations : D.V. Petrel environmental observations offshore Labrador 1976** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
188 leaves : ill. ; 28 cm.
Appendix 3.
Cover title: Environmental observations offshore Labrador 1976 : appendix 3 : iceberg observations.
*ASTIS document number 167193.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship Petrel when the vessel was operating offshore Labrador. Listings are given of all logged iceberg positions as determined from the radar. Some position fixes had to be relayed from the towing vessels due to problems with the radar system on Petrel. Berg size and shape information is given for the majority of the bergs which were seen visually. These icebergs were measured by sextant, using the radar to give the range of the berg. (NFSMO)

692
**Iceberg towing logs : D.V. Pelican, D.V. Petrel, and Zapata Ugland environmental observations offshore Labrador 1976** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
85 leaves : ill. ; 28 cm.
Appendix 4.
Cover title: Environmental observations offshore Labrador 1976 : appendix 4 : iceberg towing logs.
*ASTIS document number 167215.*
NFSMO

The iceberg towing logs presented in this appendix give particulars of each of the towing operations. (NFSMO)

693
**Offshore Labrador : appendix 3 : iceberg observations : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Pelican for Eastcan Exploration Ltd.** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor]. Total Petroleum Canada Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1976.
78 leaves : ill. ; 28 cm.
*ASTIS document number 167096.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship Pelican when the vessel was operating offshore Labrador. Listings are given of all logged iceberg positions as determined from the radar. Some position fixes had to be relayed from the towing vessels due to problems with the radar systems on Pelican. Berg size and shape information is given for the majority of the bergs which were seen visually. These icebergs were measured by sextant, using the radar to give the range of the berg. (Au)

694
**Offshore Labrador : appendix 3 : iceberg observations : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Sedco 445 for Eastcan Exploration Ltd.** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1976.
77 leaves : ill. ; 28 cm.
*ASTIS document number 163139.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship Sedco 445 when the vessel was operating offshore Labrador. Listings are given of all logged iceberg positions as determined from the radar. Berg size and shape information is given for the majority of the bergs which were seen visually. These icebergs were measured by sextant, using the radar to give the range of the berg. (Au)

695
**Offshore Labrador : appendix 4 : iceberg towing logs : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Pelican for Eastcan Exploration Ltd.** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor]. Total Petroleum Canada Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1976.
1 v. (various pagings) : ill. ; 28 cm.
*ASTIS document number 167126.*
NFSMO

The Iceberg Towing Logs presented in this Appendix give particulars of each of the towing operations that were carried out during the season. When studying these logs, reference should be made to the Iceberg Observation fixes of each iceberg. The vessels used for towing and stand-by work were Orkney Shore and Shetland Shore. Both vessels were equipped with synthetic line towing systems. The towing work was co-ordinated by Marex personnel working as Meteorological and Ice Observers on the drillship Pelican. These Towing Logs also briefly define the iceberg situation and environmental conditions prior to, and during the towing operations. (Au)

696
**Offshore Labrador : appendix 4 : iceberg towing logs : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Sedco 445 for Eastcan Exploration Ltd.** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor]. Total Petroleum Canada Ltd. [Sponsor].
Calgary, Alta. : Marine environmental Services Ltd., 1976.
53 leaves : ill. ; 28 cm.
*ASTIS document number 167134.*
NFSMO

The Iceberg Towing Logs presented in this Appendix give particulars of each of the towing operations that were carried out during the season. When studying these logs reference should be made to the Iceberg Observation Logs. (Appendix 3), which give all the position fixes of each iceberg. The vessels used for towing and stand-by work were Orkney Shore and Shetland Shore. Both vessels were equipped with synthetic line towing systems. The towing work was co-ordinated by Marex personnel working as Meteorological and Ice Observers on the drillship Sedco 445. These Towing Logs also briefly define the iceberg situation and environmental conditions prior to, and during the towing operations. (Au)

697
**Offshore Labrador : environmental conditions. Summer 1972** / Marine Environmental Services Limited. BP Canada Inc. [Sponsor].
[Calgary, Alta. : Marine Environmental Services Ltd., 1972].
33 leaves : ill., map ; 28 cm.
*ASTIS document number 181919.*
NFSMO

During the summer of 1972, the seismic vessel, Andromede, surveyed along the coast of Newfoundland and Labrador from 48 degrees N. Weather observations (wind, visual weather, temperature and pressure), wave height and direction, and iceberg observations were made. The iceberg observations included distribution, density, mass of the berg, and iceberg height about the waterline. (NFSMO)

698
**Offshore Labrador : environmental conditions. Summer 1975** / Marine Environmental Services Limited. Eastcan Exploration Ltd. [Sponsor]. Total Petroleum Canada Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1975.
81 p. : ill., maps ; 28 cm.
Appendices.
Contents: Appendix 1 – Meteorological and oceanographic data. – Appendix 2 – Sea temperature profiles and current profiles. – Appendix 3 – Iceberg observations. – Appendix 4 – Iceberg towing log.
*ASTIS document number 167118.*
NFSMO

During the Summer of 1975, the drillships Pelican and Sedco 445, operated by Eastcan Exploration Ltd., carried out oil exploration work offshore Labrador. During the season, Pelican carried out drilling operations at three different locations: Freydis, Karl Sefni and Cartier. Sedco 445 operated at the Snorri location throughout the whole season. ... The immediate purpose of the work on the drillships was to provide an iceberg watch for the drilling operations and to co-ordinate iceberg towing operations. The secondary purpose was to keep a record of the environmental conditions in order to develop a long-term understanding of the severity of conditions in the area. This report summarises the data collected by the two drillships during the 1975 drilling season, and compares it, wherever possible, with all other data collected to date. Reference is made throughout to our 1973 and 1974 Reports on the Environmental Conditions Offshore Labrador. [During the Drilling season (1975), 54 icebergs and bergy bits were tracked at Freydis and Karl Sefni by the Pelican. At Snorri, 51 icebergs were tracked by the Sedco 445.] (Au)

699
**Offshore Labrador summary report, summer 1973** / Marine Environmental Services Limited. Total Eastcan Exploration Ltd. [Sponsor].
Calgary [Alta.] : Marine Environmental Services Ltd. [publisher] ; Ottawa : Dept. of Energy Mines and Resources Canada, COGLA [distributor], 1973.
1 v. (various pagings) : ill. ; 28 cm.
Appendices.
*ASTIS document number 163287.*
NFSMO

... This report gives a summary of Marex activities [in offshore Labrador] during the 1973 Pelican operations. The period covered is from the 25th July to the 13th October, while Pelican was on location, and from the 13th October to the 12th November, when m/v Tem, chartered by Eastcan to act as a weather ship, continued measurements after Pelican left the area. The main topics covered are measurements and measurement schedules (Section 2), instrumentation (Section 3), chronology of the work (Section 4), and iceberg work (Section 5). Recommendations and conclusions derived from this year's work are given in Section 6. There are four appendices separate to this report. These cover the meteorological and oceanographic data collected (Appendix 1), sea temperature profiles (Appendix 2), the iceberg observations (Appendix 3), and the accounts of the iceberg towing operations (Appendix 4). Analysis of the data listed in the appendices is presented in a separate report, "Offshore Labrador Environmental Conditions, Summer 1973". The analysis report also incorporates data collected in the area during the summers of 1971 and 1972. (Au)

700
**Offshore Labrador summary report, summer 1974 : appendix 3 : iceberg observations** / Marine Environmental Services Limited. Total Eastcan Exploration Ltd. [Sponsor].
[Calgary, Alta. : Marine Environmental Services Ltd., 1974].
[300] leaves : ill. ; 28 cm.
*ASTIS document number 181927.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship 'Pelican' when the vessel was operating offshore Labrador. Listings are given of all logged iceberg

positions. Drift tracks are shown for bergs seen over a sufficient period of time. Berg size and shape information is given on the bulk of the bergs seen visually. ... (Au)

701
**Offshore Labrador summary report, summer 1974 : appendix 4 : iceberg towing logs** / Marine Environmental Services Limited. Total Eastcan Exploration Ltd. [Sponsor].
[Calgary, Alta. : Marine Environmental Services Ltd., 1974].
55 leaves : ill. ; 28 cm.
*ASTIS document number 181935.*
NFSMO

As an addition to the Iceberg Observation presented in Appendix 3, the Iceberg Towing Logs give particulars on each of the protective iceberg towing operations that were carried out. The vessel employed for stand-by and towing work was the 'Atlantic Shore' which was equipped with a synthetic line towing system and a "small berg" net system. The towing work was co-ordinated by Marex personnel working as Meteorological and Ice Observers on the 'Pelican'. The towing logs presented here briefly define the iceberg situations prior to, and in the course of, the towing operations. They also give the environmental conditions during the period in which the operations were conducted. (Au)

702
**Offshore Labrador 1976** / Marine Environmental Services Limited. Total Eastcan Exploration Ltd. [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
85 p. : ill., map ; 28 cm.
Appendix.
*ASTIS document number 167185.*
NFSMO

During the summer of 1976, the drillships Pelican and Petrel and the semi-submersible Zapata Ugland, operated by Eastcan Exploration Ltd., carried out oil exploration work offshore Labrador. During the season, Petrol carried out drilling operations at two different locations: Cabot and Varazzano. Pelican also operated at two locations, Snorri and Karl Sefni; and the Zapata Ugland remained at one location, Herjolt, throughout the season. ... This report summarises the environmental data collected by the Pelican, Petrel and Zapata Ugland during the 1976 drilling season and compares it, wherever possible, with all the other data collected to date. Reference is made throughout to our 1973, 1974 and 1975 reports on the Environmental Conditions Offshore Labrador. ... (Au)

703
**Offshore Newfoundland & Labrador : appendix 3 : iceberg observations : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Havdrill for B.P. Exploration (Canada) Ltd.** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1976.
56 leaves : ill. ; 28 cm.
*ASTIS document number 167169.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship Havdrill when the vessel was operating offshore Labrador and Newfoundland. Listings are given of all logged iceberg positions as determined from the radar. Some position fixes had to be relayed from the towing vessels. Berg size and shape information is given for the majority of the bergs which were seen visually. These icebergs were measured by sextant, using the radar to give the range of the berg. (Au)

704
**Offshore Newfoundland & Labrador : appendix 4 : iceberg towing logs. Summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Havdrill for B.P. Exploration (Canada) Ltd.** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1975.
22 leaves : ill. ; 28 cm.
*ASTIS document number 181960.*
NFSMO

The iceberg Towing Logs presented in this Appendix give particulars of each of the towing operations that were carried out during the season. When studying these logs, reference should be made to the Iceberg Observation Logs, (Appendix 3), which give all the position fixes of each iceberg. The vessels used for towing and stand-by work were Irvin Birch and Valiant Service. The vessels were equipped with one synthetic line towing system, which was transferred each time to the vessel on duty. The towing work was co-ordinated by Marex personnel working as Meteorological and Ice Observers on the drillship Havdrill. These Towing Logs also briefly define the iceberg situation and environmental conditions prior to, and during the towing operations. (Au)

705
**Offshore Newfoundland & Labrador : summary report of environmental observations. Summer 1975, prepared by Marex on D.V. Havdrill for B.P. Exploration (Canada) Ltd.** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].
Calgary, Alta. : Marine Environmental Services, Ltd., 1976.
10 p. : ill. ; 28 cm.
*ASTIS document number 167142.*
NFSMO

During the summer of 1975 the drillship Havdrill, operated by B.P. Exploration Canada Ltd., carried out exploration work offshore Newfoundland and Labrador. B.P. contracted Marine Environmental Services Ltd. (Marex) to carry out ice observation and meteorological data gathering for this operation. 1975 was the second year for such observation work for the Havdrill. This work met three important needs, the foremost of which was the iceberg watch and towing service to protect the drillship from icebergs. The second was to make accurate weather observations, which were sent to the meteorological office at Gander to aid the making of weather forecasts, particularly for the Havdrill working area. The third was to conduct a detailed environmental data acquisition programme to build up long-term information on the environmental character of the area. ... (Au)

706
**Offshore Newfoundland summary report summer 1974 : appendix 3 : iceberg observations** / Marine Environmental Services Limited. B.P. Oil and Gas Ltd. [Sponsor].
[Calgary, Alta. : Marine Environmental Services Ltd., 1974].
[236] leaves : ill. ; 28 cm.
*ASTIS document number 181943.*
NFSMO

The iceberg observations presented here were collected by Marex personnel working on the drillship 'Havdrill' when the vessel was operating offshore Newfoundland. Listings are given of all logged iceberg positions. Drift tracks are shown for all bergs observed over a sufficient period. Berg size and shape information is given on the bulk of the bergs seen visually. ... (Au)

707
**Offshore Newfoundland summary report summer 1974 : appendix 4 : iceberg towing logs** / Marine Environmental Services Limited. B.P. Oil and Gas Ltd. [Sponsor].
[Calgary, Alta. : Marine Environmental Services Ltd., 1974].
20 leaves : ill. ; 28 cm.
*ASTIS document number 181951.*
NFSMO

As an addition to the Iceberg Observations presented in Appendix 3, the Iceberg Towing Logs give particulars on each of the protective iceberg towing operations that were carried out. Two vessels were employed for the towing work: 'Hudson Service' and 'Valiant Service'. The first of these was the principal stand-by and iceberg towing vessel, equipped with synthetic line towing equipment. The towing work was co-ordinated by Marex personnel working as Meteorological and Ice Observers on 'Havdrill'. The towing logs presented here briefly define the iceberg situations prior to, and in the course of, the towing operations. They also give the environmental conditions during the period in which the operations were conducted. (Au)

708
**Summary : environmental observations : environmental observations offshore Labrador 1976** / Marine Environmental Services Limited. BP Exploration Canada [Sponsor].
Calgary, Alta. : Marine Environmental Services Ltd., 1977.
8 p. : ill. ; 28 cm.
Cover title: Offshore Labrador 1976 summary : environmental observations.
There are three appendices separate to this report which contains: – appendix 1 – Meteorological and oceanographic data. – Appendix 2 – Iceberg observations. – Appendix 3 – Iceberg towing operation.
*ASTIS document number 167240.*
NFSMO

During the period 15th August – 3rd November 1976 the semi-submersible drilling rig Sedco J was operated offshore Labrador by B.P. (Canada) Ltd. Marine Environmental Services Ltd. (Marex) were contracted to provide Ice and Meteorological Observers for the operation. The Marex Observers ... principal function was to observe, plot the course of, and initiate and supervise towing of icebergs that represented a threat to the rig. They also attempted to interpret the behavior of icebergs in terms of the driving forces in order to make reasonable predictions upon which supervisory personnel could base operational decisions. ... [1976 was a relatively light year for icebergs.] (Au)

709
**Wind, waves, weather and icebergs in Baffin Bay and Davis Strait, summer 1972** / Marine Environmental Services Limited.
[Calgary : Distributed by APOA, 1972].
1 microfiche : tables ; 11x16cm.
(APOA project no. 35 : Environmental study of the Baffin Bay-Davis Strait region. Report, no. 1)
Mostly tables.
*ASTIS document number 24490.*
ACU, NFSMO

Presents tabulated data on winds, waves, weather and icebergs collected by the vessel m/v Hans Egede during the 1972 seismic operations in the Baffin Bay and Davis Strait regions. (ASTIS)

## MARKHAM, W.E.

710
**Atlas des glaces littoral de l'est canadien [Atlas of coastal sea ice off eastern Canada]** / Markham, W.E.
Toronto : Environment Canada, 1980.
viii, 98 p. : ill., maps ; 28 cm.
ISBN 0-660-90658-9.
Appendices.
Bibliography: p. 83-84.
Text in French.
*ASTIS document number 180483.*

This publication presents an analysis of ice conditions in the Gulf of St. Lawrence and the waters off Newfoundland. Presented are details regarding the location, the abundance, and the nature of sea ice and icebergs, and also their changes and fluctuations between the winter and spring months. Also included is information regarding meteorology and oceanography of this sector making the atlas a good reference source for ice navigation. (ASTIS)

## MARKO, J.R.

711
**Iceberg severity prediction revisited** / Marko, J.R. Fissel, D.B. Birch, J.B.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 15-16)
Abstract only.
*ASTIS document number 182184.*
ACU

Safe and efficient exploration and production of hydrocarbons off Canada's east coast requires a reliable method of predicting iceberg season severity. Past schemes to provide such a capability 3 to 6 months ahead of the peak spring/early summer iceberg flux on the Grand Banks have concentrated on establishing statistically impressive relationships between suspect iceberg count data and various combinations of atmospheric parameters usually associated with drift-parallel and drift-perpendicular wind speeds. In view of the apparent lack of success of such methods, a new effort was initiated which emphasized the use of upstream sea-ice data. Initial intentions to establish linkages to severity through the common elements of sea ice- and iceberg-advection were frustrated by the lack of adequate iceberg survey data and the large amount of digital processing needed to obtain meaningful sea ice advection data from satellite imagery. Nevertheless strong correlations were readily apparent between the mid-winter spatial extent of sea ice in Davis Strait and the severity of the following southern iceberg season. ... Moreover, no evidence was found for the occurrence of a severe iceberg season in the absence of January ice extent above a reasonably well-defined threshold value. Correlations with offshore winds and land station records were also examined to explain the occasional occurrence of anomalously low iceberg numbers and to determine the relative efficiency of the interrelated sea ice extent- and coastal air temperature-parameters as predictors of iceberg severity. ... An overall severity prediction strategy is suggested which takes into account the major study results. (Au)

712
**A study of long-term satellite-tracked iceberg drift in Baffin Bay and Davis Strait** / Marko, J.R. Birch, J.R. Wilson, M.A.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 36)
Abstract only.
*ASTIS document number 168890.*
ACU, NFSMO

As part of the Petro-Canada/EAMES environmental studies, the trajectories of twenty-one icebergs were recorded in western Baffin Bay and Davis Strait using the Nimbus and Tiros satellite positioning systems. The resulting data indicated a tendency for bergs to follow the rapid flowing core of the southerly Baffin Current, which parallels the contours of the bottom topography over the steep portions of the continental slope. Significant deviations from the overall southerly drift trend were noted, corresponding to intrusions in eastern Lancaster Sound and over several large submarine canyons that cross the continental shelf of the eastern coast of Baffin Island. The latter diversions appear to be the major mechanisms for bringing bergs into shallow enough to allow groundings and entrapment by subsequent growth of the landfast ice zone. Studies of individual berg immobilization events indicated that the greater portion of a berg's north-to-south travel time is spent within the landfast ice. Exceptionally rapid net drifts appear to be associated with bergs that were located seaward of the landfast zone at the end of the late summer-early fall period of ice-free coastal conditions. Data on berg residence times suggests the average duration of berg drift between Lancaster Sound and Hudson Strait may be in excess of three years. (Au)

713

**A study of long-term satellite-tracked iceberg drifts in Baffin Bay and Davis Strait** / Marko, J.R. Birch, J.R. Wilson, M.A.

(Eastern Arctic Marine Environmental Studies Program / Edited by N. Sutterlin. Arctic, v. 35, no. 1, Mar. 1982, p. 234-240, figures)

(Eastern Arctic Marine Environmental Studies)

References.

*ASTIS document number 83240.*

ACU, NFSMO

Long-term, satellite-tracked iceberg trajectories were analyzed relative to the larger spatial and temporal scales of iceberg drift in Baffin Bay and Davis Strait. Berg movements were concentrated in the core of the Baffin Current which flows along the continental slope in a primarily southerly direction. The net rate of southward movements was found to be governed by a combination of grounding and landfast ice entrapment which tended to be of particular significance in areas of the coastal shelf adjacent to major submarine canyon systems. (Au)

**See also:** 136, 137, 138.

## MARSH, J.G.

**See:** 252, 253.

## MARTEC LIMITED

714

**Iceberg statistics from drill ship data** / Martec Limited. Canada Oil and Gas Lands Administration [Sponsor].

[Ottawa] : Environment Ice Centre, Ice Climatology and Applications Division, 1982.

134 p.

Citation from: Ships navigating in ice : a selected bibliography, volume 2, 1980-1984 / J.C. Joba. Report - Transportation Development Centre (Canada), TP-3855E, 1985.

*Document not seen by ASTIS.*

*ASTIS document number 184128.*

Magnetic tape containing iceberg data collected from 23 oil rigs on the Labrador and Newfoundland Shelf for the period 1973 to 1979. This data consists of time of observation, range of iceberg from drill ship, description and/or size parameters when available and information as to whether a berg was towed. Statistics of iceberg motion were generated and correlations to other environmental parameters investigated and are available in this document. (Au)

## MARTHALER, J.G.

715

**Radar image processing of real aperture SLAR data for the detection and identification of iceberg and ship targets** / Marthaler, J.G. Heighway, J.E.

(Proceedings of the 5th Canadian Symposium on Remote Sensing / Edited by A. MacEwan. - Ottawa : Canadian Aeronautics and Space Institute [distributor], 1978, p. 483-494, ill., map)

*ASTIS document number 163708.*

NFSMO, ACU

This paper describes the development of an iceberg detection and identification capability utilizing a moderate resolution real aperture SLAR system. The development program was in response to a U.S. Coast Guard operational requirement for an all-weather remote sensing system to locate icebergs in the vicinity of the Grand Banks of Newfoundland (International Ice Patrol). The system consists of a Motorola APS-94D SLAR interfaced with a NASA developed Radar Image Processor (RIP). The SLAR/RIP system allows the application of specifically designed computer algorithms to digitized radar signal returns to provide geometrically correct video image display and data recording, and automatic target detection and location. Algorithms are under development to perform iceberg and ship target differentiation. The SLAR/RIP system concept, hardware and capabilities are discussed. A test and evaluation program to develop confidence limits in the SLAR/RIP system's ability to detect and differentiate between targets is described. Quantitative data of iceberg and ship targets collected during 1976 and 1977 are examined. Characteristic signal return differences are shown. ... (Au)

## MARTHINSEN, A.

716

**Devices prevent ice damage to trusses of semi** / Marthinsen, A.

(Offshore, v. 45, no. 4, Apr. 1985, p. 103-104, ill.)

*ASTIS document number 170151.*

NFSMO

The paper discusses two new concepts to protect semisubmersibles against damage by ice or icebergs. The first is an expendable truss that extends horizontally between the ends of the pontoons. The second is an ice-deflector. The combination of the two systems can offer protection for both moderate and extreme ice bodies. (NFSMO)

## MARTIN, S.

**See:** 562.

## MASTERSON, D.M.

717

**Pack ice in the Labrador Sea** / Masterson, D.M. Wright, B.D.

(Proceedings of Workshop on Sea Ice Ridging and Pile-up, 22-24 October, 1980, Calgary, Alberta. Technical memorandum - Associate Committee on Geotechnical Research (Ottawa), no. 134, 1982, p. 85-95, figures, table)

*ASTIS document number 122394.*
ACU, NFSMO

Recent exploratory drilling on Canada's Labrador Shelf has been encouraging and production feasibility studies are currently underway. However, the production of hydrocarbon reserves from this area will require unique solutions to the problems associated with its hostile environment. Because of this, extensive research has been carried out to define the environmental constraints and to determine design criteria for offshore production systems. A major factor affecting the design of these systems is the ice regime of the Labrador Sea, comprised of icebergs and a seasonal ice cover. Here, some of the physical and mechanical properties of the sea ice cover are described along with its movements. (Au)

## MAUVIEL, F.

718
**Iceberg dynamical modelling** / Mauviel, F.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 123-127, figures)
References.
*ASTIS document number 61174.*
ACU, NFSMO

Experimental tests were carried out on model icebergs. Natural drift tests with a 1:100 scale model on Brienzer See, Switzerland, show the effects of various environmental conditions. Froude similitude formed the basis for these tests. Other experiments, carried out with a 1:60 model ... show the need for information obtained at this scale, and include assessments of the drag coefficients for various model shapes with or without insulation skirts on the model, the effects of added mass and rotation of the model, and steering possibilities. (Au)

## MCCAULEY, J.

**See:** 1053.

## MCCELLAND, J.J.

719
**Iceberg prediction charts issued by the International Ice Patrol** / McCelland, J.J. Sturm, F.
(Iceberg research, 1983, no. 3, Feb., p. 12-13, ill.)
References.
*ASTIS document number 157660.*
ACU, NFSMO

During the iceberg season in the Labrador Sea and Grand Banks of Newfoundland the International Ice Patrol, operated by the United States Coast Guard, issues daily charts by radiofax. An example from the 1982 season is shown below. The charts show the predicted positions of all icebergs in the region, classified according to size, and the transmissions can be received by anyone with a fax receiver. ... The prediction program is very important because conditions in the Labrador Sea are sometimes so bad that the most recent sighting of a given iceberg may be 2-3 weeks old. The program, developed by the U.S. Coastguard Oceanographic Unit, predicts iceberg drift using wind data obtained twice daily from Fleet Numerical Ocoeanography Center, Monterey, California, and average current data obtained from a long series of oceanographic cruises (the most recent of which have been carried out by USCG 'Evergreen'). Inevitably this means that short term current variations associated with eddies or a change in wind forcing are not taken into account, which introduces some error. ... A program now under development uses wave height and sea water temperature data to compute the survival time of an iceberg of known initial size. After this time the berg is deleted from the plot; at present a large safety factor is added to the computed survival time. ... (Au)

## MCDONALD, W.F.

720
**Smith on the scientific results of the Marion Expedition of 1928, to Davis Strait and Baffin Land** / McDonald, W.F.
(Monthly weather review, v. 59, Nov. 1931, p. 428-430)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179027.*
ACU

Meteorological and oceanographical influences which govern iceberg movement and variation and general ice conditions in the waters off northeastern North America and Greenland are discussed, on the basis of Smith's oceanographic survey while with the International Ice Patrol, 1928. (AB)

## MCGILL, D.A.

**See:** 238, 304, 604.

## MCINTOSH, J.A.

**See:** 1119.

## MCINTYRE, A.

**See:** 898.

## MCINTYRE, N.F.

721
**Environmental forces on a fixed platform and the ability of the platform to resist them** / McIntyre, N.F.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 52-58, ill.)
*ASTIS document number 178039.*
NFSMO

The paper examines the environmental forces in the Hibernia region which will be associated with gravity base platforms, both steel and concrete. The most critical environmental values are the mass and velocity of icebergs. (NFSMO)

## MCKENNA, R.

**See:** 324.

## MCLAREN, E.J.

**See:** 891.

## MCMASTER UNIVERSITY. COMMUNICATIONS RESEARCH LABORATORY

722
**Iceberg detection using marine radar** / McMaster University. Communications Research Laboratory. Currie, B.W. Haykin, S. Canpolar Consultants Ltd. [Sponsor].
Hamilton, Ont. : McMaster University, 1984.
40, [17] p. : ill. ; 28 cm.
(C R L internal report series, no.122)
References.
*ASTIS document number 182524.*
OONL

This report pertains to a study performed for CANPOLAR Consultants Ltd. (Toronto) under a contract entitled "Mobil Oil Hibernia Iceberg Detection System Evaluations". The report addresses four issues relating to the problem of iceberg detection in open water using a marine radar. In Section 2 we present a review of the literature on the subject. In particular, the review includes a brief discussion of the pertinent radar theory on multipath, propagation effects (including the ducting problem), radar cross-section for icebergs, and experimental results on iceberg detection using radar. In Section 3 we present a review of three McMaster/DFO data bases, two of which were collected on field trips conducted at DFO's Border Radar Station in the northern tip of Baffin Island during March 1981 and May 1983, and the third one was collected on a M/V Arctic trip made during October 1983. In Section 4 we review the three radar discriminants (amplitude, polarization and Doppler) that can be used for target detection. Finally in Section 5 we present recommendations on (a) theoretical modelling of radar returns from icebergs, (b) new data collection, and (c) radar apparatus. (Au)

## MCMILLAN, S.

**See:** 1053.

## MCRUER, W.H.

723
**Berg Analysis and Prediction System (BAPS)** / McRuer, W.H.
(Ice community newsletter, v. 4, no. 1, Apr. 1985, p. 8-9)
*ASTIS document number 166812.*
ACU, NFSMO

The Ice Branch, is in the process of initiating BAPS. The second aircraft has been equipped with a SLAR and a third SLAR equipped aircraft will become available this year. Iceberg observations are now provided in coded form by telex to users. During 1986, improved aircraft data systems and communication links should make iceberg data available in the Ice Centre data base, within two to four hours after observation and therefore available to users in near-real time. This data will be retrievable in operator and machine-readable format at remote terminals. A series of user products is being planned. These will be in addition to the currently available raw reports. Planned products are shown .... The products will be available in standard data file formats and in digital graphics form. (Au)

## MELLOR, D.C.

724
**Deflection of icebergs by anchors** / Mellor, D.C.
(Cold regions science and technology, v. 3, no. 1, May 1980, p. 87-88)
*ASTIS document number 67482.*
ACU, NFSMO

The author discusses a technique to deflect an iceberg using its own momentum, by utilizing anchors and anchor cable. (ASTIS)

725
**Iceberg deflection with anchors** / Mellor, D.C.
[Woods Hole, Mass.] : Woods Hole Oceanographic Institution, Dept. of Ocean Engineering, 1984.
71 p. : ill., maps ; 28 cm.
Appendices.
References.
*ASTIS document number 163201.*
NFSMO

A method for deflecting icebergs away from offshore structures with drag embedment anchors is studied and evaluated. The report focuses on petroleum exploration in the Labrador Sea, where icebergs drift south with the Labrador Current, threatening floating drilling rigs. Characteristics of the bergs, originating in Western Greenland, are reviewed, including: drift patterns, approximate speeds, flux rates, berg shapes, sizes, deterioration and stability. The existing method for iceberg control, towing, is evaluated and compared to anchor deflection. Analyses of motion for both methods are performed, giving expected towing/deflection times, terminal velocities, and forces. Anchor behavior under veer of horizontal pull is tested as a simulation of iceberg swing. ... The conclusion drawn is that deflection of icebergs with anchors looks promising in theory as an effective method for moving medium and large bergs away from offshore structures. ... (Au)

## MELLOR, M.

726
**Controlled perimeter blasting in cold regions** / Mellor, M.
Hanover, N.H. : Army Cold Regions Research and Engineering Laboratory, 1975.
v, 24 p. : ill. ; 27 cm.
(Technical report – Corps of Engineers, U.S. Army, Cold Regions Research and Engineering Laboratory, 267)
Appendix.
References.
*ASTIS document number 168726.*
ACU, NFSMO

The general principles of pre-split blasting and smooth blasting are described, and practical procedures that have been developed for work in common rocks are reviewed systematically. The topics covered include shothole spacing, charge weight per unit length of shothole, decoupling ratio, adjustments for explosive type and rock type, and weight of explosive per unit face area. Relevant properties of frozen rocks, frozen soils, and ice are compared with those of common unfrozen rocks, and appropriate adjustment of blast design is discussed. Interim relationships for the design of controlled perimeter blasting in frozen soils and massive ice are put forward, recognizing that additional experimentation is required. Special problems in controlled blasting of ice are discussed. These include effects of wet holes, delayed removal of burden, and submerged burden. Special attention is given to the cutting of ice islands and icebergs. An appendix describes an operation in which the face of the ice wharf at McMurdo Sound was trimmed by pre-split blasting. (Au)

727
**Destruction of ice islands by explosives** / Mellor, M. Kovacs, A.
[Calgary : Distributed by APOA], 1972.
1 microfiche : ill., figures ; 11x16cm.
(APOA project no. 36 : Ice islands destruction – Beaufort Sea. Report, no. 1)

References.
*ASTIS document number 24511.*
ACU, NFSMO

Purpose: To determine the feasibility of destroying or reducing the size of an ice island threatening a future offshore structure. Three grounded ice islands bergy bits in Mackenzie Bay were subjected to explosives set in varying quantities, depths, and patterns. Methods of rapidly drilling and placing explosives were employed. Tests for optimum bench width were conducted. (Au)

728
**Destruction of ice islands with explosives** / Mellor, M.
Kovacs, A. Hnatiuk, J.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 753-765, ill.)
References.
*ASTIS document number 182583.*
ACU, NFSMO

Past attempts at explosive demolition of icebergs and ice islands are reviewed, and more recent studies are described. Relevant properties of ice are compared with those of typical rocks, and data are given for crater blasting in ice and in rocks. Ice island destruction is analyzed for schemes involving: (1) crater blasting, (2) blasting in water underneath the ice, (3) bench blasting, and (4) controlled presplit blasting. The analyses favor crater blasting as the most practical method of attack for small bergs and ice islands. (Au)

729
**High-force towing** / Mellor, M.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 231-240, ill.)
References.
*ASTIS document number 164119.*
ACU, NFSMO

Operational experience of iceberg towing is accumulating in the seas near Labrador and Greenland. Current capabilities can be extended as required, with towline forces exceeding 50 tons, and perhaps up to 100-150 tons. For work in relatively shallow water, kedging against bottom anchors might offer significant advantages. Towing Antarctic icebergs may be a very difficult task. With a towing resistance of 1000 tons, it is not really feasible to pull from a single vessel with a single hawser, nor is it feasible to winch against a drogue or seabed anchor through a single cable. For the short term, the most practical arrangement seems to be towing (or pushing) by several conventional tugs, with the number of tugs being reduced as the iceberg reduces its size and shapes itself hydrodynamically. The alternatives to screw propulsion do not seem appealing. A conceivable alternative to high-force towing is low-resistance icebergs. There are hopes that a berg under tow would eventually streamline itself by melting, but it might be worth speeding up this process by some preliminary cutting, especially if a berg of the right size and shape does not present itself. The required technology is available Weeks and Mellor 1978, but the economics have not been worked out. (Au)

730
**Subsea trenching in the Arctic** / Mellor, M.
Hanover, New Hampshire : Cold Regions Research and Engineering Laboratory, 1981.
iv, 38p. : ill., figures, tables ; 28cm.
(CRREL report, 81- 17)
References.
*ASTIS document number 82287.*
ACU, NFSMO

Environmental conditions are described for the continental shelf of the western Arctic, and for the shelf of Labrador and Newfoundland. Special emphasis is given to the gouging of bottom sediments by ice pressure ridges and icebergs, and an approach to systematic risk analysis is outlined. Protection of subsea pipelines and cables by trenching and direct embedment is discussed, touching on burial depth, degree of protection, and environmental impact. Conventional land techniques can be adapted for trenching across the beach and through the shallows, but in deeper water special equipment is required. The devices discussed include hydraulic dredges, submarine dredges, plows, rippers, water jets, disc saws and wheel ditchers, ladder trenchers and chain saws, routers and slot millers, ladder dredges, vibratory and percussive machines, and blasting systems. Consideration is given to the relative merits of working with seabed vehicles, or alternatively with direct surface support from vessels or from the sea ice. (Au)

**See also:** 1079, 1081, 1083.

## MELVILLE SHIPPING LIMITED

731
**Navigation among icebergs** / Melville Shipping Limited.
Holburn, J.G. Mobil Oil Canada Ltd. [Sponsor].
[St. John's, Nfld. : Mobil Oil Canada Ltd.], 1983.
Proprietary to Hibernia Joint Venture Participants.
Citation from: Ships navigating in ice : a slected bibliography, volume 2, 1980-1984 / J.C. Joba. Report – Transportation Development Centre (Canada), TP-3855E, 1985.
*Document not seen by ASTIS.*
*ASTIS document number 184004.*

The objective of this study was to determine the existence of any statutory constraints and operating guidelines which may influence the year-round operation of ships to, from and within the Hibernia oil field. One of the alternatives under consideration by Mobil Oil Canada, Ltd. is the use of a fleet of oil tankers to transport the oil from Hibernia to the mainland using a rigorous loading schedule throughout the year. One of the principal obstacles to the continuity of production is seen to be the disturbance of the ship loading schedule by disruption to navigation due to the presence of icebergs and other ice hazards in the shipping area. The consultant investigated Canadian statutory instruments and guidelines which may be relevant to and provide constraints upon the year-round operation of ships in the Hibernia area. Also, the requirements and guidelines of selected foreign governments and experience canvassed from private and public operators of ships are documented. (Au)

**See also:** 548.

## MEMORIAL UNIVERSITY OF NEWFOUNDLAND. CENTRE FOR COLD OCEAN RESOURCES ENGINEERING

732
**C-CORE annual report 1980-81** / Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering.
St. John's, Nfld. : C-CORE, Memorial University of Newfoundland, 1981.
16 p. : ill. ; 28 cm.
*ASTIS document number 133078.*
ACU, NFSMO

This is the sixth Annual Report of the Centre for Cold Ocean

Resources Engineering. During the past year the emphasis has been directed toward iceberg behaviour and seabed soil mechanics, radars and the oil and ice interrelationship. The need for further study of the behaviour of ice as a material and the investigation of ice/structure interactions has been identified and is still a C-CORE priority. The objective of the seabed engineering program has been to investigate the influence of iceberg, wave and current stresses on bottom sediments in the Hibernia/Ben Nevis region of the Grand Banks, in order to estimate critical values for seabed stability. A very significant outcome of the HF Radar study is the acceleration of C-CORE's research interest in adapting this type of radar sensor for remote detection of ice hazards. The oil in ice program has demonstrated that a laser detector for airborne identification of oil contamination in ice is a viable concept. Within the sea ice engineering program an analytical and modelling study of iceberg motions in the Labrador Sea was completed, this study was directed towards the development of hazard forecasting systems. The research plan for 1981-82 is to cover the following areas: (1) engineering specification of loads and risks, which includes sea ice mechanics, measurement of forces in sea ice, ice as a construction material, iceberg collision avoidance, and marine sediment gouging by icebergs; (2) Remote identification and measurement, including measurements by HF radar and iceberg track prediction; and (3) environmental impact on forecast resource development, made up of various oil and sea ice tracking, detection and countermeasure programs. (Au)

733
**Investigation of the use of microwave systems in detecting and monitoring oil slicks over ice and ice-infested waters - Phase II and III report** / Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering. Parashar, S.K. Roche, C. Worsfold, R.D. Canada. Arctic Marine Oilspill Program.
St. John's, Newfoundland : C-CORE, 1979.
viii, 62p. : ill., charts, tables ; 28cm.
(C-CORE publication, no. 79- 4)
(Contract report - Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
Supported by the Canada Centre for Remote Sensing as part of the Arctic Marine Oil Spill Program.
References.
*ASTIS document number 22250.*
ACU, NFSMO

Two ice regimes, one corresponding to waves in ice, and the other depicting an iceberg, were selected for further study under the C-CORE AMOP Phase III contract. The results obtained from the manual and digital analysis of 4-channel SAR imagery of these regions are presented and discussed in terms of their relevance to the potential of detecting oil pollution in the ice environment through SAR. The digital analysis consisted of generating histograms, statistics, clutter to noise-ratios and gray-tone reproduction. ... (Au)

734
**Microwave systems for detecting oil slicks in ice-infested waters : phases II and III** / Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering. Canada. Environmental Emergency Branch [Sponsor].
[Ottawa : Environmental Protection Service, Dept. of the Environment], 1980.
x, 63, 64p. : figures, tables ; 28cm.
(Economic and technical review report, EPS 3-EC-80- 3)
ISBN 0-662-50930-7.
References.
Text in French and English.
*ASTIS document number 60208.*
ACU, NFSMO

Two ice regimes, one corresponding to waves in ice and the other depicting an iceberg, were selected for analysis of the potential of microwave systems for detecting oil in an ice regime. The results obtained from the manual and digital analysis of 4-channel SAR imagery of these regions are presented and discussed in terms of their relevance to the potential of detecting oil pollution in the ice environment through SAR. ... (Au)

735
**Satellite Ocean-Related Imagery Applications Program : final report** / Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering. Canada. Centre for Remote Sensing [Sponsor].
St. John's, Newfoundland : C-CORE, 1979.
xxix, 487p. : ill., figures, maps, tables ; 28cm.
(C-CORE publication, no. 79- 6)
(Contract report - Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
*ASTIS document number 24996.*
ACU, NFSMO

The Satellite Ocean-Related Imagery Applications Program developed procedures to handle and process NOAA and LANDSAT satellite data ... for ocean-related application areas - sea ice distribution, sea surface temperature distribution, iceberg/ocean vessel detection and identification, and coastal and offshore mapping. ... Significant procedures and products created in the program included automatic geographic gridding for quicklook imagery, creation of temperature-related NOAA imagery and look-up tables, automatic detection and plotting of satellite-found 'objects', and the creation of CCT-imagery. Problems remain in some of these techniques and products and further development work is required for some. These are described in the report. ... (Au)

**See also:** 389, 631, 738, 785.

## MEMORIAL UNIVERSITY OF NEWFOUNDLAND. CONTINUING ENGINEERING EDUCATION CENTRE

736
**Iceberg management in offshore exploration, production and transportation** / Memorial University of Newfoundland. Continuing Engineering Education Centre.
[St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982].
1 v. : figures, tables ; 28 cm.
Preprints of papers presented at the Seminar on Iceberg Management in Offshore Exploration, Production and Transportation, St. John's, Nfld., Nov. 8-10, 1982.
*ASTIS document number 133019.*
NFSMO

Preprints of papers presented at the Seminar on Iceberg Management in Offshore Exploration, Production and Transportation were concerned with iceberg climatology, forecasting, detection and surveillance of icebergs, collision avoidance, iceberg measurements, detection of seabed ice scour, and protection of Hibernia production transportation systems from icebergs. (ASTIS)

737
**Safety management for offshore exploration** / Memorial University of Newfoundland. Continuing Engineering Education Centre.
[St. John's, Nfld. : Memorial University, Faculty of

Engineering and Applied Science, 1982].
1 v. (various pagings) : figures, tables ; 28 cm.
Seminar held at St. John's Nfld., June 15-17, 1982.
*ASTIS document number 132829.*
NFSMO

The papers presented at this seminar describe the hazards in offshore operations, particularly those in ice infested waters, and review the current state-of-the-art technology of warning and monitoring methods employed on the rig to safely manage drilling rigs in various high risk situations. (NFSMO)

## MEMORIAL UNIVERSITY OF NEWFOUNDLAND. FACULTY OF ENGINEERING AND APPLIED SCIENCE

738
**Strength of iceberg and artificial snow ice under simulated impact loads** / Memorial University of Newfoundland. Faculty of Engineering and Applied Science. Arockiasamy, M. EL-Tahan, H.W. Swamidas, A.S.J. Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering [Sponsor]. Newfoundland and Labrador. Petroleum Directorate [Sponsor].
St. John's, Nfld. : Faculty of Engineering and Applied Science, Memorial University of Newfoundland, 1983.
viii, 137 p. : ill. ; 28 cm.
*ASTIS document number 170127.*
NFSMO

The report presents the findings of an experimental study on the strength of iceberg and artificial snow ice under simulated impact loads. The iceberg ice was obtained from a 'mother' berg which was drifting slowly around St. John's during the months of June and July 1982. The artificial snow ice was produced by mechanical means .... After a brief review of the earlier work done on snow, glacier and iceberg ice, the method of acquisition and preparation of the iceberg and snow ice samples for testing is discussed. The relevant details of the testing machine and procedure are incorporated to bring out the validity of results in the high strain range. ... Altogether, the report presents results of 117 strength tests on ice, 63 of them in uniaxial compression (21 on iceberg ice and 42 on snow ice) and 54 for indentation strengths. (Au)

## MERCER, B.

**See:** 891.

## MERCER, J.B.

739
**An ice hazard detection system – preliminary investigation by W.B. Jonasson & C. Durand [discussion]** / Mercer, J.B. Rossiter, J.R.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 3, p.1237-1238)
Review of ASTIS document number 183970, An ice hazard detection system – preliminary investigations / W.B. Jonasson, C. Durand and M. Audette in POAC 81, p. 1227-1236.
*ASTIS document number 183989.*
ACU, NFSMO

This discussion contains the responses to the following questions: 1. How was the marine radar calibrated and were you able to accurately determine the radar cross sections of the ice targets? 2. Over what range and in what seastates were targets being observed? 3. Are there any sensors (of those tested) which you would not consider useful for shipborne ice hazard detection? 4. What other sensors should be considered for future ice hazard detection programs? (ASTIS)

## MERCIER, G.

**See:** 366, 367, 368.

## MERKLINGER, H.M.

740
**Summertime acoustic conditions in Baffin Bay** / Merklinger, H.M.
(The Journal of the Acoustical Society of America, v. 58, supplement no. 1, Fall 1975, p.S121)
Paper presented at the Acoustical Society of America, 90th Meeting, San Francisco, California, 3-7 November 1975.
Abstract only.
*ASTIS document number 168750.*
ACU

Noise measurements made in Baffin Bay during the summers of 1972 and 1973 indicated that noise levels were generally higher than in the North Atlantic. Two distinct types of ice-related noise were identified. Loud crashes having a roughly RC-shaped spectrum were observed to result from the rolling and breakup of icebergs. A steady, white noise was observed in the presence of ice debris. Attempts to relate steady noises with stable icebergs failed. During both years seismic survey operations contributed significantly to the average noise levels at low frequencies. (Au)

## MIDDLETON, J.F.

741
**Analysis and prediction of Labrador Shelf iceberg trajectories** / Middleton, J.F. Garrett, C.J.R.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 18)
Abstract only.
*ASTIS document number 182192.*
ACU

An analysis of 1,093 iceberg trajectories allows the influence of tides, wind and eddy motions on iceberg movement to be quantified. Principal results include a shelf diffusivity of about 10,000 sq/m/sec, eddy length and time scales of 30 km and 40 hrs and downwind iceberg drift at 1.8% of the local wind speed. A stochastic model for the prediction of trajectories is developed and allows for the inherent predictability of shelf eddy motions, which in saddle regions may contribute 80% of the iceberg velocity variance. The implementation of the predictive model for the Hibernia region of the Grand Banks is outlined. (Au)

742
**A kinematical anaylsis of polarized eddy fields using drifter data** / Middleton, J.F. Garrett, C.J.R.
[S.l. : s.n., 1986?].
35 p., [9] p. of plates : ill., map ; 28 cm.
Photocopy provided by author, C. Garrett, Department of Oceanography, Dalhousie University, Halifax,. N.S. B3H 4J1.
In press: Journal of Geophysical Research.
Appendix.

References.
*ASTIS document number 182877.*

A kinematic formalism for the Eulerian and Lagrangian analysis of drifter data is developed for homogeneous, isotropic, two-dimensional flows which exhibit a preferred sense of rotation. Principal results include a new measure of rotation h*, defined from orthogonal velocity components, which is related to the covariance of horizontal divergence and rate of change of vorticity. An analogous Lagrangian correlation hL may indicate a rotational sense opposite to h* due to the preferential sampling by drifters of regions of previous net covergence which are regions of cyclonic vorticity for quasi-geostrophic motions. These kinematic results are illustrated by an analysis of 197 iceberg trajectories from the Labrador shelf, which do indeed show opposite rotational senses for h* and hL. (Au)

**See also:** 435, 436, 439.

## MILLER, B.L.

**See:** 941.

## MILLER, C.G.

**See:** 290.

## MILLER, J.D.

743
**An assessment of iceberg recurrence intervals in the Grand Banks** / Miller, J.D.
(Proceedings of the First Offshore Mechanics/Arctic Engineering/Deepsea Systems Symposium / Edited by J.S. Chung. – New York : American Society of Mechanical Engineers, 1982, v. 2, p. 237-242, figures, tables)
Unpublished internal report under alternate title: An extreme value analysis of iceberg flux.
References.
*ASTIS document number 130699.*
NFSMO

The yearly variation in the numbers of icebergs present within a particular region confronts engineers with serious design considerations. They require a knowledge of the magnitude and frequency of the iceberg fluxes to be encountered within the design life of a structure. An analysis of the variation of the frequency of icebergs crossing 48 degrees N over a period of 94 years is presented. The data is employed with an extreme value model to evaluate recurrence intervals and occurrence probabilities for iceberg flux magnitude. Some material is presented to define the confidence limits that may be placed on these flux estimates over periods of time similar to the estimated lifetimes of proposed engineering structures. (Au)

744
**Ice management in the Labrador Sea** / Miller, J.D. Dillon, M.J.
(Journal of Canadian petroleum technology, v. 23, no. 4, Aug. 1984, p. 45-49, ill.)
*ASTIS document number 168521.*
ACU, NFSMO

The Labrador Sea is known as a hostile environment to all forms of marine activities. The region is buffetted by numerous storms every year which bring high winds, severe seastates and superstructure icing. For vessels attempting to navigate through the region the presence of icebergs present a year round hazard and sea ice, present during the winter and spring months, restricts the trafficability of vessels. It is in this environment that the Labrador Group of Companies has undertaken an extensive program of exploratory drilling over the last decade. To date, some 23 wells have been drilled by this consortium, primarily on the offshore banks and the saddles between these banks. To ensure a safe and successful drilling operation, special attention has been given to the environmental constraints and programs have been developed to minimize their effect. In this paper we will present some of the aspects of the iceberg problem and the ice management techniques in place to deal with them. (Au)

745
**Iceberg flux estimation in the Labrador Sea** / Miller, J.D. Hotzel, I.S.
(Proceedings of the Third International Offshore Mechanics and Arctic Engineering Symposium / Edited by V.J. Lunardini. – New York : American Society of Mechanical Engineers, 1984, v. 3, p. 298-304, ill., maps)
References.
*ASTIS document number 163724.*
NFSMO

Estimates of the iceberg flux for the Labrador Sea region have been obtained using knowledge of the iceberg distribution in space and the transport of these icebergs by currents. The seasonal estimates of iceberg flux range from 1-7 icebergs per km per day, while the yearly values are of the order 6-15 icebergs per km per day. Bathymetrically zoned estimates range from 25-35 icebergs per km per year for the marginal trough through 5-13 icebergs per km per year for the bank and 5-9 icebergs per year for the slope. Drilling records provide a mean of 8.3 icebergs per km per year and a range, averaged over each drilling season, of 5-13 icebergs per km per year. (Au)

746
**Physical dimensions of icebergs in the Labrador Sea** / Miller, J.D. Hotzel, I.S.
(National Research Council of Canada Associate Committee on Geotechnical Research Workshop on Ice Scouring, 15-19 February 1982 / Edited by G.R. Pilkington. Technical memorandum – Associate Committee on Geotechnical Research (Ottawa), no. 136, 1985, p. 103-113, ill.)
*ASTIS document number 148482.*
NFSMO

The concerns of ice scour are the focus of this workshop and although this paper does not address the scouring process directly, it does provide information useful in defining the characteristics of one of the ice scour agents, the icebergs themselves. Although icebergs provide many interesting avenues of study, such as their sources, drift or deterioration, it is the intent here to provide summary data on the physical dimensions of the icebergs found in the Labrador Sea region. It is felt that the provision of these data to scour researchers will aid in the development of improved modelling efforts as well as increasing the overall understanding of the phenomenon. (Au)

747
**Tactical iceberg management III – collision avoidance** / Miller, J.D.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 81-102, ill.)
References.
*ASTIS document number 155110.*

NFSMO

This section deals with collision avoidance components of an ice management program. The following concerns are ... addressed: – A review of the time and space scales associated with an ice management program. – The distinction between the activity of iceberg deflection and the techniques employed. – The concept of alert zones, their dependence on drilling activity and their influence on the status of that activity. – Deflection strategy and implementation. – A review of existing deflection techniques, specifically towing and washing. – Problems associated with deflection – hardware and operational. – Characterization of success. – Characterization of vessels, ropes etc. – Measures of towing activity – numbers of tows, attempts, duration, connect times, etc. (Au)

**See also:** 520, 521, 670.

## MITTEN, P.T.

**See:** 413, 1061.

## MOBIL OIL CANADA LTD.

**See:** 257, 416, 418, 731.

## MOGNARD, N.M.

**See:** 252, 253.

## MONAHAN, D.

**See:** 1059.

## MONSINGER, M.N.

**See:** 127.

## MONTFORT, L.

**748**
**Towage of an iceberg** / Montfort, L.
(Desalination : comprising the second volume of the proceedings of the First International Conference on Iceberg Utilization for Fresh Water Production, Weather Modification, and Other Applications, Iowa State University, Ames, Iowa, October 2-6, 1977, v. 29, no. 1-2, Apr.-May 1979, p. 79-95, ill., map)
*ASTIS document number 162949.*
ACU, NFSMO

The paper reviews the technical considerations for iceberg towing. (NFSMO)

## MOONEY, A.R.

**See:** 181.

## MOORE, E.

**See:** 667.

## MOORE, R.K.

**See:** 1053.

## MOORE, R.P.

**749**
**Utility of microwave radiometers for the identification and location of icebergs** / Moore, R.P.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 108-122, ill.)
*ASTIS document number 161780.*
ACU, NFSMO

... This paper discusses the utility of ... [microwave radiometers] for the identification and location of icebergs and potential icebergs. ... discussions in this paper will center on millimeter wave imagers, particularly those operating between 30 and 40 GHz as these have produced the best imagery. ... (Au)

## MOORE, S.C.

**See:** 620.

## MORAN, K.

**750**
**DIGS : geotechnical aspects** / Moran, K.
[S.l. : s.n., 1985].
[6] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163660.*

This paper describes the equipment to be used in measuring the geotechnical aspects of the DIGS (Dynamics of Iceberg Grounding and Scouring) experiment. Equipment and instruments will include a Pisces submersible, a cone penetrometer, possibly a Nordco core drill and an offshore positioning system, acclerometers and temperature sensors, and possibly an acoustic sonobuoy. (ASTIS)

**See also:** 380, 381.

## MORGAN, C.W.

**751**
**Iceberg distribution in Baffin Bay and the Labrador Sea as determined from preseason ice patrol flights by the United States Coast Guard** / Morgan, C.W.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1970. Bulletin – United States. Coast Guard, no. 56, 1971, p. 28-72, ill., maps)

References.
*ASTIS document number 166847.*
ACU, NFSMO

Data from the preseason flights show that patterns of iceberg concentration are generally the same from year to year, although there are usually changes in the overall level of concentration. Patterns of iceberg concentration in Baffin Bay indicate that the movement of icebergs directly across Baffin Bay may be as important as the route north through Melville Bay. Analysis of the dissipation of a large positive iceberg anomaly off Cape York during the period 1966-69 indicates that it takes about 3 years for a heavy accumulation of icebergs in northern Baffin Bay to clear out. Analysis of the February data indicates that there is a fair positive correlation (0.61) between iceberg concentrations observed on the February flight and the severity of the iceberg season on the Grand Banks. There is also fair positive correlation (0.77) between the southernmost extent of icebergs observed on the February flight and the date when icebergs arrive on the Grand Banks. (Au)

752
**Icebergs of west Greenland** / Morgan, C.W.
(Sea frontiers, v. 16, no. 6, Nov.-Dec. 1970, p. 328-336, ill., maps)
*ASTIS document number 176621.*
NFSMO

The article describes the origin of the icebergs of the North Atlantic Ocean, their drift pattern and the number of bergs found. (NFSMO)

753
**Keeping track of Labrador's icebergs** / Morgan, C.W.
(Ocean industry, v. 6, no. 5, May 1971, p. 10-11, ill., map)
*ASTIS document number 163066.*
NFSMO

The article reports on the work of the International Ice Patrol on the coast of Labrador. (NFSMO)

754
**Oceanography of the Grand Banks region of Newfoundland in 1967** / Morgan, C.W.
Washington, D.C. : United States Coast Guard Oceanographic Unit, 1967.
ix, 209 p. : ill., maps ; 26 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 19)
Mostly tables.
References.
*ASTIS document number 168696.*
ACU, NFSMO

Three cruises conducted off the Grand Banks of Newfoundland in support of International Ice Patrol in April, May, June, and July of 1967 obtained measurements of temperature and salinity from a salinity/temperature/depth recorder and from Nansen bottle observations. These data were used to draw temperature and salinity profiles across standard sections, and to calculate surface dynamic topography and volume flow through the sections. Dynamic calculations were based on a reference level of 1,000 meters. The cruises occupied standard section A3 a total of 12 times during the ice season and the data indicated that the volume flow of the Labrador Current showed large fluctuations with time, reaching a maximum of 11 sverdrups (10**6 cu m/sec) in early May. The study of iceberg drift and deterioration, which was initiated in 1964, was also continued. [The Ice Patrol cruises continued the practise of conducting calibration surveys initiated in 1966 because they yield better data for the prediction of iceberg movement in the Grand Banks area.] (Au)

## MORGAN, D.

755
**Ice not the only obstacle in Hibernia's path** / Morgan, D.
(Offshore engineer, 1986 [ 2] Feb., p. 27-28, ill.)
*ASTIS document number 184250.*
ACU, NFSMO

Sea ice and icebergs are the design considerations that distinguish Newfoundland's Grand Banks from the other harsh offshore environment in which Mobil has built up considerable experience over the years – the North Sea. But they are by no means the only challenges facing the company as it embarks this year on a period of intense design activity aimed at bringing first Hibernia oil ashore in 1992. ... 'Many unique challenges, some not yet identified, will have to be met in order to achieve the production start-up target for Canada's first offshore project' .... One obvious, but unspoken challenge ... was the mega-project's sensitivity to oil price uncertainties. ... Another major area of uncertainty was cleared up last September with Mobil's declaration that a concrete gravity base structure was its preferred development option .... Loads associated with combined events (for example, an iceberg impact in combination with high wave conditions) will be considered in the GBS detailed design. According to Wes Abel, however, preliminary studies indicate that 'the probability of extreme conditions occurring in combination is extremely low, since the worst periods for waves and for icebergs do not coincide'. Waves are at their highest in winter, while the peak of the iceberg season (about 50% of all sightings) is in May. 'Information gathered from ice-related technical studies has permitted considerable improvements and refinements in the design of the GBS to enable it to withstand the maximum anticipated ice forces at Hibernia,' says Abel. ... (Au)

## MORGAN, V.I.

**See:** 231.

## MORIN, P.

**See:** 366, 367, 368.

## MORRILL, P.A.

**See:** 233, 236, 237.

## MORRISON, J.

756
**Aerial iceberg hunt pace quickens as east offshore oil activity builds** / Morrison, J.
(Oilweek, v. 23, no. 21, July 10, 1972, p. 19, 22, ill.)
*ASTIS document number 167959.*
ACU, NFSMO

"As the pace of oil exploration quickens in the Arctic and the ice-prone offshore regions on the Grand Banks and north from Newfoundland, more and more attention is being paid to keeping track of ice movement." In respose to this growing need, the Ice Division, Central Services Dirctorate, at the Downsview, Ontario, Atmosheric Environment Service of the federal Department of the Environment, expects to expand its service. The author discusses several remote sensing techniques which are expected to greatly enhance efforts in iceberg detection. (ASTIS)

## MORSE, R.M.

**See:** 353, 354, 602, 603.

## MOSBY, O.

757
**From the northwestern North Atlantic** / Mosby, O.
(Norsk geografisk tidsskrift, bd. 7, hefte 5-8, 1939, p. 253-272, ill., maps)
Bibliography.
Maps show bathymetry, dynamic topography, Labrador Current.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179043.*
ACU

The chief oceanographer of the International Ice Patrol of 1931, on the General Greene in Baffin Bay, Davis Strait and the Newfoundland waters, remarks on weather, icebergs and pack ice, depths and currents, (especially the Labrador Current, with maps and profiles), temperature and salinity of Hudson Strait. (AB)

758
**Isforholdene i den nordvestlige del av Atlanterhavet [The ice conditions in the northwest Atlantic]** / Mosby, O.
(Naturen, Arg. 56, 1932, p. 208-229, ill., maps)
Text in Norwegian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179868.*

"The origin, drift and distribution of pack ice and icebergs are discussed. The sources of about 7,000 bergs from West Greenland are tabulated. Drift and temperature conditions in the Labrador Current are graphically presented as based on measurements of July 1931. The number of icebergs south of 48 N lat. is tabulated for each month of 1900-1931 and shown in curves for 1880-1930. The correlation coefficient (0.85) between the number of bergs and the magnitude of pack ice is explained and the influence of the atmospheric pressure gradient is discussed. The life cycle of icebergs including shape, height, depth in water, size and weight is described." (AB)

759
**Pa jakt efter isfjell i Atlanteren [Hunting icebergs in the Atlantic]** / Mosby, O.
(Polar-arboken, 1935, p. 33-47, ill.)
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179051.*

Outline of the history, purpose, and work of the International Ice Patrol, by its chief oceanographer. (AB)

## MOUGIN, G.L.

760
**United Kingdom patent application : a large-scale protective device for tabular icebergs or floating structures** / Mougin, G.L. [Inventor]. Iceberg Transport International Ltd.
[London : Patent Office], 1979.
7 leaves : figures ; 28 cm.
(U.K. patent application, GB 2,006,122 A)
*ASTIS document number 136557.*
NFSMO

... A large-scale protective device in accordance with the invention comprises an assembly of two types of unit, rigid cylindrical floating towers ... and elastic connecting units ... consisting of elastomer tubes. The generatrices of these elastic connecting units are in contact with vertical stiffeners ... of the floating towers. These vertical stiffeners also serve to maintain cylindrical deflector rings ... of the floating towers one above another in a stacked configuration. (Au)

## MOUNTAIN, D.G.

761
**Comment on "Drift of icebergs in the Grand Banks"** / Mountain, D.G. Hayes, R.M. Scobie, R.W.
(Ocean engineering, v. 6, no. 5, 1979, p. 549-550)
Review of ASTIS document number 162809, Drift of icebergs in the Grand Banks / P.S. Cheema and H.N. Ahuja in Ocean engineering, v. 5, 1978, p. 95-103.
References.
*ASTIS document number 162817.*
NFSMO, ACU

The paper gives the author's reservations concerning the iceberg drift model used by Cheema and Ahuja. (NFSMO)

762
**Iceberg drift prediction by the International Ice Patrol** / Mountain, D.G.
(Joint IOC/WMO Seminar on Oceanographic Pruducts and IGOSS Data Processing and Services Systems. - [Moscow : Republique socialiste federative sovietique de Russie, 1979], p. 299-317, ill., map)
Photocopy obtained from the Library of Congress, Washington, D.C.
*ASTIS document number 184306.*

As a U.S. Coast Guard mission the International Ice Patrol produces forecasts of sea ice and iceberg locations in the western North Atlantic Ocean to warn ships at sea of ice danger. ... The iceberg drift prediction requires the use of forecasted surface winds and forecasted near surface currents, making it a second level product. A new system developed for iceberg drift prediction uses prognosis wind data supplied every twelve hours by the U.S. Naval Fleet Numerical Weather Central. The near surface currents are then forecasted using the sum of a geostrophic and wind-driven current. The geostrophic component is determined from conductivity/temperature/depth (CTD) surveys in the van of the icebergs. The data are processed real-time at sea to yield dynamic height values and surface geostrophic currents, which are sent by radio message to Commander, International Ice Patrol. If no recent surveys are available, an historical average data file is used. The wind-driven component in four layers is calculated by solution of a time-dependent Ekman equation forced by the local wind history. Using these imputs, the iceberg drift is predicted by solving differential equations which balance the iceberg acceleration with the water drag, the wind drag, and the Coriolis acceleration. Improved methods of iceberg detection and drift prediction represent both increased safety for lives at sea and economic benefit for commerical users of the product. Techniques being considered and tested for future operational use, including remote sensing and the tracking of buoys by satellite are discussd. (Au)

763
**Oceanography of the Grand Banks region of Newfoundland 1975** / Mountain, D.G.
Washington, D.C. : United States Coast Guard Oceanographic Unit, 1978.
vii, 356 p. : ill., maps ; 26 cm.
(Oceanographic report - United States. Coast Guard, no. CG 373- 75)
Mostly tables.

Appendix.
References.
*ASTIS document number 168688.*
ACU, NFSMO

During 1975 five oceanographic cruises were made by the U.S. Coast Guard to the Grand Banks region. During April (IIP-1-75) a large anticyclonic eddy was observed between the Labrador Current and the North Atlantic Current. The eddy appeared to move southward and rejoin the North Atlantic Current. Six occupations of standard section A3, spaced throughout the year, revealed a relatively smooth pattern of variation for the Labrador Current with maximun southward transport and minimum water temperature in April changing to minimum transport and maximum temperature in November. However, repeated occupation of standard section A1 over a 54 hour period indicated that large variations in the Labrador Current transport do occur over short time scales. ... These observations were made in support of Commander, International Ice Patrol to aid in the prediction of the drift of icebergs into the North Atlantic. ... (Au)

764
**On predicting iceberg drift** / Mountain, D.G.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 273-282, ill., maps)
References.
*ASTIS document number 164143.*
ACU, NFSMO

A model to predict the drift of an iceberg has been developed and tested for operational use by the International Ice Patrol. Differential equations which balance the iceberg acceleration with the water drag, the air drag, the Coriolis acceleration, and a sea surface slope term are solved by a fourth order Runge-Kutta technique. ... Testing of the model using observed drifts of icebergs indicates that the model error remains relatively constant for drift periods of up to three weeks duration. ... (Au)

## MUDIE, P.J.

765
**Palynology as a method for dating ice scours** / Mudie, P.J.
[S.l. : s.n., 1985].
[8] leaves : ill., map ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 167460.*

Preliminary studies sponsored by PetroCanada indicate that palynology can be applied to dating of ice scours to a precision of about ±1,000 years. However, its application requires that two conditions be met: (1) The scour must contain progressively accumulated muds that can be cored; (2) A regional palynostratigraphy must first be established for both onshore and marine sediments. In the Northeast Newfoundland Shelf region, the palynological method indicates a period of possible disruption between 8,000 and 3,400 years B.P. (before present) with an interpreted age of 3,400 years B.P. for a furrow scour at 183 m water depth off Conception Bay. The method shows another period of possible disruption between 12,000 and 9,500 years B.P. with an interpreted age of 9,500 to 10,000 years B.P. for a crater-like scour feature at 260 m water depth in Notre Dame Bay. (Au)

**See also:** 837.

## MUDRY, D.

**See:** 511, 995.

## MUGGERIDGE, D.B.

766
**POAC 77 : proceedings** / Muggeridge, D.B. [Editor].
St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1978.
2 v. : figures, tables ; 28 cm.
ISBN 0-920568-00-9,0920568-01-7.
References.
Fourth POAC conference held conference held at St. John's, Nfld., Sept. 26-30, 1977.
*ASTIS document number 132144.*
NFSMO

... Eighty-four technical papers were presented in three concurrent sessions (A, B, and C). Six invited papers and three summary papers were given in plenary sessions. Each session considered a separate range of topics as follows: (A) platform design, port and ocean engineering and marine transportation; (B) sea ice, ice mechanics, ice forces and icebergs; (C) offshore development, environmental considerations, physical oceanography, remote sensing, data collection and processing. ... (Au)

**See also:** 139, 143, 851, 903, 904, 944, 945.

## MULCAHY, M.

767
**Mission impossible : International Ice Patrol** / Mulcahy, M.
(Sea technology, v. 17, no. 6, June 1976, p. 26-28, ill.)
*ASTIS document number 172006.*
ACU

... This writer accompanied a limited "upstream reconnaissance" mission of the International Ice Patrol from April 13-17, 1976, in surveillance between Newfoundland and Greenland. ... The aerial mission, originating here in a Lockheed C-130 Hercules aircraft surveyed an area between 51 N to 57 N latitude, and between 55 W to 58 W longitude. ... The ice observers sight, classify and plot icebergs encountered. ... In the ice recon mission described, the grand total of potentially dangerous bergs sighted was 18, bringing the total number of them known to have exited the sea ice for the year to around 40. ... (Au)

## MUNRO, R.G.

768
**Aquit et al Hekja 0-71 – "an operational success"** / Munro, R.G.
(Conference on Canadian Offshore Drilling & Downhole Technology (CODD), September 14-16, 1981, Hotel MacDonald, Edmonton, Alberta. – Calgary, Alta. : CODD, 1981, [p. 45-50], ill., maps)
*ASTIS document number 132764.*
NFSMO

During the 1979 and 1980 summer drilling seasons off the southeast coast of Baffin Island, Aquitaine Company of Canada Ltd. ... drilled and tested the first offshore discovery well in the Davis Strait .... By successfully drilling and evaluating the penetrated horizons on the Hekja structure, the capability for exploration off Canada's eastern coast has been extended further north. The paper will highlight the successes of the Hekja project

and detail the major operational problems in drilling and testing in the harsh environment of this frontier area. ... The probability of icebergs and a water depth of 350 metres dictated the use of a dynamically positioned vessel. The drillship Ben Ocean Lancer was contracted and was supported by two iceberg towing supply vessels and one larger capacity vessel for fuel, water and bulk transport. ... (Au)

769
**First Davis Strait discovery overcomes offshore hazards** / Munro, R.G.
(World oil, v.194, no. 5, Apr. 1982, p. 85-91, ill., maps)
*ASTIS document number 172111.*
ACU, NFSMO

In spite of icebergs – as many as 50 have appeared on the drillship's radar at once – unpredictable currents and frustratingly brief drilling seasons, the first discovery well was completed recently in the Davis Strait. The success of this well, known as Hekja 0-71, has opened the waters off the northeastern coast of Canada to more exploration. This is the story of how that well was drilled, the problems encountered and how they were overcome. (Au)

## MURPHY, D.L.

770
**An evaluation of the International Ice Patrol drift model** / Murphy, D.L. Anderson, I.
[S.l. : s.n., 1986].
[23] leaves : ill. ; 28 cm.
References.
*ASTIS document number 182354.*

The movement of four icebergs, three tracked by a surface vessel and one tracked by a satellite-tracked platform deployed onto the iceberg, is used to test the accuracy of International Ice Patrol (IIP) iceberg drift model. The drift data represent drift periods from 2.5 to 4.5 days duration and various dynamical regimes. Comparison is made between model solutions made using two sets of environmental inputs. The first consists of historical current data based on many years of hydrographic surveys and wind data derived from large scale atmospheric model. The second consists of on-scene measurements of wind and local currents. The current data were determined from the movement of freely-drifting satellite-tracked buoys deployed in the vicinity of icebergs. The results show that if only historical current data and large-scale wind data are used to drive the model, the errors can be substantial even for drifts of short duration. In one case the observed error was 75 km after only 2.5 days of drift. In all four cases using on-scene measured data improved the model accuracy; in two of the cases the error was halved. (Au)

771
**Iceberg drift model evaluation** / Murphy, D.L. Anderson, I.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 19)
Abstract only.
*ASTIS document number 182206.*
ACU

Experience with the International Ice Patrol (IIP) iceberg drift model suggests that the primary cause of prediction errors lies in the wind and current data used to drive the model. The model, which has been used operationally by IIP since 1979, predicts iceberg motion using equations based on a balance between iceberg acceleration, water and wind drag, Coriolis acceleration, and a term representing sea surface slope. Recently acquired iceberg drift data permits the quantification of the model prediction errors. The movement of six icebergs, three tracked by a surface vessel and three tracked by satellite-tracked platforms deployed onto the iceberg, is used to test the accuracy of the model predictions. The drift data represent drift periods from 3 to 21 days duration and various dynamical regimes. Comparison is made between model solutions made using two sets of environmental inputs. The first consists of historical current data based on many years of hydrographic surveys and wind data derived from large scale atmospheric model. The second consists of on-scene measurements of wind and local currents. The current data were determined from the movement of freely-drifting satellite-tracked buoys deployed in the vicinity of icebergs. (Au)

**See also:** 370.

## MURPHY, G.

772
**Small scale modeling of iceberg transport** / Murphy, G.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 292-300)
References.
*ASTIS document number 161896.*
ACU, NFSMO

... the most complex and challenging problem [in iceberg transport] is that of the actual transport. The magnitude of forces required, the possibility of fractures and fragmentation developing to cause the iceberg to roll in transit, the losses en route through melting, and possible insulation are all aspects for which answers must be obtained. One approach to solutions is to study the behavior of small scale models under the correct conditions in which significant parameters may be varied to optimize the solution, and to identify critical conditions. This paper presents the rational design of iceberg models for predicting necessary forces, hydrodynamic stability, and melting losses for icebergs of various configurations towed along selected routes. The analysis shows that the use of such small scale models can provide practical predictions for full scale design. (Au)

## MURRAY, J.E.

773
**The drift, deterioration and distribution of icebergs in the North Atlantic Ocean** / Murray, J.E.
(Ice seminar : a conference sponsored by the Petroleum Society of C.I.M. Calgary, Alberta, May 6-7, 1968. Special volume – Canadian Institute of Mining and Metallurgy, 10, 1969, p. 3-18, ill., maps)
*ASTIS document number 164011.*
ACU, NFSMO

The various parameters that affect the drift of icebergs from the glacial fronts to the North Atlantic are briefly discussed. These encompass the current systems of Baffin Bay, Labrador Sea and the Northwest Atlantic Ocean; wind, both local and long-range effects; the shape, size and draft of icebergs; and the general distribution of icebergs, as reported in sightings per area, for Baffin Bay and the Labrador Sea. (Au)

774
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1966** / Murray, J.E.
Washington, D.C. : U.S. Coast Guard, 1969.
viii, 27 p., [11] folded leaves of plates : ill. ; 24 cm.

(Bulletin – United States. Coast Guard, no. 52)
*ASTIS document number 180955.*
ACU, NFSMO

... Aerial ice observation and communication statistics are presented. All ships reporting ice and weather to the International Ice Patrol in 1965 are tabulated. A month-by-month general description of ice conditions for the Grand Banks area is given. Only 76 bergs drifted south of latitude 48 degrees N. during the season, a low figure in comparison with the 1900-1965 average of 377 bergs. The most southerly berg of the season was reported 28 May in 42 43 N., 51 54 W. The duration and maximum extension of the pack ice to the south and east of the Newfoundland coast was subnormal. ... (Au)

775
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1967** / Murray, J.E.
Washington, D.C. : U.S. Coast Guard, 1967.
52 p. : maps ; 26 cm.
(Bulletin – United States. Coast Guard, no. 53)
Cover title.
Mostly maps.
*ASTIS document number 168793.*
ACU, NFSMO

This Bulletin is No. 53 in a series of annual reports on the International Ice Observation and Ice Patrol Services and for the first time is reported on a season to season basis rather than on a calendar basis. ... Aerial ice observations and communication statistics are provided. All ships reporting ice and weather to the International Ice Patrol in 1967 are tabulated. Figures illustrating the ice conditions for the Grand Banks are included. Four hundred and forty one bergs drifted south of Latitude 48 degrees N. during the season. The most southerly berg of the season was reported on 23 May 1967 in position 43 14 N., 49 32 W. The duration and extension of the pack ice to the south and east of Newfoundland was below normal except along the east coast of the Avalon Peninsula where St. John's harbor was on occasion completely blocked by pack ice. Pre-season activities, including the 1966 northern ice surveys are illustrated. ... (Au)

776
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1968** / Murray, J.E.
Washington, D.C. : U.S. Coast Guard, 1968.
105 p. : maps (some folded) ; 26 cm.
(Bulletin – United States. Coast Guard, no. 54)
Cover title.
*ASTIS document number 168785.*
ACU, NFSMO

This Bulletin is No. 54 in a series of annual reports on the International Ice Observation and Ice Patrol Services. ... Aerial ice observation and communication statistics are presented. All ships reporting ice and weather to the International Ice Patrol in 1968 are tabulated. Figures illustrating ice conditions for the Grand Banks are included. Two hundred and nineteen bergs drifted south of latitude 48 degrees N. during the season. The most southerly berg of the season was reported on 12 May in position 42 27 N., 48 50 W. The duration and extension of the pack ice to the south and east of Newfoundland was well below average, the southernmost extension occurring on 26 April at 48 40 N., 52 30 W. ... (Au)

**See also:** 242, 243, 244, 245.

## MURRAY, J.J.

**See:** 851.

## MURTY, T.S.

777
**Iceberg movement in the North Atlantic Ocean** / Murty, T.S. Bolduc, P.A. Adamowski, K.
(Papers presented at the WMO Technical Conference on the Applications of Marine Meteorology to the High Seas and Coastal Zone Development, Geneva, 22-26 November 1976. [Publication] – World Meteorological Organization, no. 454, 1976, p. 295)
Abstract only.
*ASTIS document number 182800.*
ACU

The prediction of the movement of icebergs in the Northwest Atlantic Ocean is important not only for trans-Atlantic navigation but also for coastal engineering activities such as oil-drilling on the east coast of Canada. The iceberg season is mainly from March to July and on the average about 500 bergs cross southward of 48 degrees N (which is the northernmost latitude for trans-Atlantic shipping lanes). However, the number of bergs may vary from one season to another and it has been observed that the variation could be from zero to as high as about 2,000. The following parameters appear to be relevant for the prediction of the severity (i.e. number of bergs per season south of 48 degrees N): the supply of icebergs from glaciers on the west coast of Greenland, their transport into the northwest Atlantic Ocean by the Labrador current and their mortality rate during their southward drift. The following parameters are used as indicators: the summer air temperature at Upernivik (Greenland) – for iceberg supply; the sea level atmospheric pressure difference between Belle Isle (Newfoundland) and Ivigtut (Greenland) – for strength of the northwesterly winds and of the Labrador current; the air temperature at Torbay (Newfoundland) – for iceberg mortality rate; the sea surface temperature at Keywest (Florida) – for strength of the Gulf Stream which bars the southward drift of bergs. Various statistical models have been used here to predict the deterministic and the residual components of the iceberg severity. (Au)

778
**Prediction of the severity of iceberg season in northwest Atlantic Ocean** / Murty, T.S. Bolduc, P.A.
(1975 Offshore Technology Conference, May 5-8 – Houston, Texas, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1975, v. 3, p. 785-794, ill.)
(OTC paper, 2421)
References.
*ASTIS document number 163376.*
NFSMO, ACU

Simple prediction models were developed to determine severity of iceberg season in Northwest Atlantic Ocean. Multivariation and regression were used to relate severity to physical parameters such as summer air temperature at Upernavik (Greenland), atmospheric pressure difference between Belle Isle (Newfoundland) and Ivigtut (Greenland) and sea surface temperature at Key West (Florida). (Au)

**See also:** 212.

## MUTHUKRISHNAIAH, K.

See: 265, 274, 277.

## NAESJE, K.

See: 621.

## NANCE, C.T.

779
**Iceberg towing – Why not use the wind?** / Nance, C.T.
(Iceberg research, 1982, no. 1, May, p. 16-23, figures)
References.
*ASTIS document number 132012.*
NFSMO, ACU

Paper discusses the feasibility of using the wind and other ancillary equipment to propel icebergs. (NFSMO)

## NANCE, D.K.

See: 940.

## NAPOLEONI, J.-G.P.

780
**Arctic exploration : the Labrador case – production schemes and iceberg studies** / Napoleoni, J.-G.P. Jozan, M.M.
(Petromar 80 : petroleum and the marine environment / EUROCEAN. – London : Graham & Trotman Ltd., 1981, p. 225-242, figures, tables)
References.
*ASTIS document number 132543.*
ACU, NFSMO

... The presence of icebergs is a very challenging factor of offshore Labrador and extensive work was carried out to improve a very scanty pre-existing knowledge. This will be presented in more details, including theoretical drift modeling work and 1979 iceberg draft measurement campaign. (Au)

781
**The dynamics of iceberg drift** / Napoleoni, J.-G.P.
[Vancouver], 1979.
vi, 90 leaves : ill. ; 28cm.
Thesis (M.Sc.) – University of British Columbia, 1979.
Photocopy of typescript.
Bibliography: leaves. 59-63.
Appendix: Hot water drilling on a cold glacier / by Jean-Gerard P. Napoleoni and Garry K.C. Clarke. (Canadian journal of earth sciences, v.15, no.2, Feb. 1978, p. 316-321). – References.
*ASTIS document number 29440.*
ACU, NFSMO

This thesis presents numerical models constructed for the prediction of iceberg drift. ... A discussion of the different possible drift models is presented. After commenting on the numerical results obtained with these models, a method is proposed for analyzing the past trajectory of an iceberg in order to determine coefficients necessary for predicting its drift. Hot water drilling on a cold glacier / by Jean-Gerard P. Napoleoni and Garry K.C. Clarke: An open circuit hot water drill using a propane water heater and a gasoline-driven pump is described. The drill is designed to reach depths of 300 m in cold ice for holes of 3 cm in diameter. A maximum drilling rate of 120 m/hr was obtained during field tests, and a 220 m hole was drilled in four hours. (Au)

782
**Numerical models for the prediction of iceberg drift** / Napoleoni, J.-G.P.
(Proceedings – Conference on Use of Icebergs : Scientific and Practical Feasibility, 2nd, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 95)
Abstract only.
*ASTIS document number 61131.*
ACU, NFSMO

In order to avoid the risk of icebergs colliding with drilling vessels and installations in the Labrador Sea, it would be useful to predict iceberg drift. Relevant information on fluid dynamics is summarized, followed by a discussion of various drift models. After commenting on the numerical results obtained with these models, a method is proposed for analysing past trajectories of an iceberg in order to determine coefficients necessary for predicting its drift. The theoretical results are then compared with drift and sea-current and wind data obtained in the Labrador Sea. ... (Au)

## NAROD, B.B.

See: 462, 890.

## NASSERI, T.

See: 558.

## NAWATA, T.

See: 593.

## NAZAROV, V.S.

783
**Aisbergi Severnogo i IUzhnogo polusharii [Icebergs in the Northern and Southern hemispheres]** / Nazarov, V.S.
(Geografiia v skhole, god 23, no. 6, Nov.-Dec. 1960, p. 70-72, ill.)
Text in Russian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180190.*

Outlines the origin, drift, distribution and decay of icebergs; their areas of occurrence have decreased in both hemispheres since the beginning of the 20th century. (AB)

784
**Shkala dlia nabliudeniia nad aisbergami [A scale for iceberg observations]** / Nazarov, V.S.
(Meteorologiia i gidrologiia, 1959, no. 2, p. 54-55)
Text in Russian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180114.*
ACU

Suggests a 1-10 grading system for plotting and reporting iceberg density. (AB)

## NEBBIA, T.

**See:** 835.

## NESBITT-FRIIS, E.

**785**
**C-CORE annual report 1982-83** / Nesbitt-Friis, E. [Editor]. Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering.
St. John's, Nfld. : C-CORE, Memorial University of Newfoundland, 1983.
16 p. : ill., map ; 28 cm.
*ASTIS document number 168963.*
ACU, NFSMO

This is C-CORE's eighth Annual Report covering the period from April 1, 1982 to March 31, 1983. ... The three areas of research are Radar and Remote Sensing, Seabed and Ice Properties. The Oil in Ice program was wound down over the year and increasing emphasis was placed on the Ice Properties program. ... The first phase of the iceberg scouring study, undertaken in the region of the Davis Strait, where Canterra Energy Ltd. drilled the Hekja and Raleigh Wells, was completed. ... Members of the Seabed Group participated jointly on board the CSS Hudson with the Atlantic Geoscience Centre of the Geological Survey of Canada in iceberg scour studies and seabed investigations of areas of interest on the Labrador Shelf. In particular, sites of known iceberg groundings were examined to complete the data base for iceberg scour modelling of real events ... In 1982-83 the Ice Properties Group developed new techniques to measure the mechanical properties of ice. During two field trips to Tarsiut Island, N.W.T., acoustic techniques and an instrumented auger were employed to define the specific energy, relative hardness and consolidation of block ice in the surrounding rubble field. ... Since the temperature of an iceberg determines, to a great extent, the physical are mechanical properties of the ice, a preliminary study was undertaken to predict the range of temperatures one may expect in icebergs along the coasts of Newfoundland and Labrador and to measure the temperature of several bergs to confirm these predictions. .... Recent work includes the measurement of borehole temperatures of icebergs near St. John's .... These data will provide valuable information on the physical and mechanical properties of iceberg ice near the surface of the berg. ... similar work will be conducted on smaller glacial ice masses, such as bergy bits and growlers, which ... will provide a good idea of the damage potential of undetectable ice bodies to marine structures. (Au)

## NESHYBA, S.

**786**
**On melting icebergs** / Neshyba, S.
(Nature, v.275, no.5680, Oct. 12, 1978, p. 567)
References.
*ASTIS document number 172103.*
ACU

Huppert and Turner's laboratory studies of ice melt in warm, salt-stratified water, which demonstrate a system of tilted convection layers of melt mixture interleaved with ambient fluid, are useful in focusing research upon the complex phenomenon of iceberg melt but can not be extrapolated so directly to in situ Antarctic iceberg melting as the authors have done, for several reasons [which will be discussed.] ... A plausible extrapolation of the laboratory results of Huppert and Turner to the melting iceberg would state that the berg generates one such convective layer. A single cell convection was the basis of my earlier study on upwelling by icebergs. Even so, the existence of low horizontal temperature and vertical density gradients, compressed air bubbles in glacier ice and reduced thermal expansion effects, and velocity shear associated with berg motion severely limit the role of double-diffusion in iceberg melting (an exception might be the melting process of the bottom surface of the berg). (Au)

**787**
**On the estimation of antarctic iceberg melt rate** / Neshyba, S. Josberger, E.G.
(Journal of physical oceanography, v. 10, no. 10, Oct. 1980, p.1681-1685, figures)
References.
*ASTIS document number 65536.*
ACU, NFSMO

Estimates of Antarctic iceberg melt rates made from field observations, iceberg distribution statistics, laboratory experiments and theoretical studies give a wide range of values. Evaluation of the errors associated with each method allows for the quantitative first-order correction for both the effect of bubbles released from the melting ice on the convective heat transfer and the effect of other forms of iceberg deterioration besides sidewall melting. The results provide a best estimate for the melt rate of 5, 17 and 55 m/year at a temperature elevation above the freezing point of Td=2, 4 and 8 deg. C, respectively. Also the laboratory, theoretical and field observations indicate that the melt-rate dependence is proportional to Td**1.6. (Au)

**788**
**Upwelling by icebergs** / Neshyba, S.
(Nature, v.267, no.5611, June 9, 1977, p. 507-508, ill.)
Reviewed by ASTIS document 182290, upwelling by icebergs / R.Q. Robe in Nature, v. 271, no. 5646, Feb. 16, 1978, p. 687.
References.
*ASTIS document number 175080.*
ACU, NFSMO

A case is made for considering the influence of melting icebergs on the oceanographic characteristics of the Weddell Sea. In particular, the equivalent upwelling produced by melting must play a large factor in the supply of nutrients to the surface layers of this ocean. It might be, for example, that the slowly moving icebergs leave behind a trail of nutrient enhanced surface fluid. The need for testing such a hypothesis is clear. ... (Au)

**See also:** 560.

## NEWFOUNDLAND AND LABRADOR. PETROLEUM DIRECTORATE

**See:** 106, 538, 539, 738, 909.

## NEWFOUNDLAND OCEANS RESEARCH AND DEVELOPMENT CORPORATION

**789**
**Iceberg draft measurement Labrador Sea, 1979** / Newfoundland Oceans Research and Development Corporation. Total Eastcan Exploration Ltd. [Sponsor].
[St. John's, Nfld. : NORDCO, 1979].
*Document not seen by ASTIS.*
*ASTIS document number 183504.*

790
**Icebergs : a brief outline** / Newfoundland Oceans Research and Development Corporation.
St. John's, Nfld. : NORDCO Ltd., 1975.
iv, 23 leaves : ill., map, tables ; 28 cm.
References.
*ASTIS document number 163090.*
NFSMO

This paper is a general overview covering iceberg types, their drift, their desintegretation, and physical properties of iceberg ice. (NFSMO)

791
**A review of ice information for offshore eastern Canada** / Newfoundland Oceans Research and Development Corporation. Royal Commission on the Ocean Ranger Marine Disaster (Canada) [Sponsor].
[Ottawa] : Royal Commission on the Ocean Ranger Marine Disaster [publisher] ; Calgary : Pallister Resource Management Ltd. [distributor], 1984.
3 microfiches : ill., maps ; 11 x 16 cm.
(Royal Commission on the Ocean Ranger Marine Disaster (Canada). RCOR, 2)
Bibliography.
Also available in hardcopy.
*ASTIS document number 183881.*
ACU

The objective of this study ... is to critically assess the adequacy of available information on floating ice and structural icing as input to design criteria, operational procedures, and emergency response planning for eastern Canadian offshore exploratory drilling. The study also examines the adequacy of ice hazard detection systems required for safe conduct of drilling operations in the area. ... Icebergs are a significant factor in exploratory operations from the Grand Banks east of Newfoundland, to the northern limit of the study area. ... The data bases for flux, dimensions, mass, velocity and mechanical properties of icebergs are generally inadequate for definition of extreme events. In all areas there is insufficient data to reliably define the occurrence of growlers and bergy bits; to predict iceberg drift speeds during storm situations; and to estimate the mechanical properties of icebergs. ... improvements are required in the detection of small pieces of ice, both in terms of increased range and for tracking targets through sea clutter in the vicinity of the drilling platform. The most significant effect of sea ice on exploratory drilling activity in the study area is to limit the operating season. ... However, information on the mechanical properties of ice ... is sparse, so estimating possible damage to a vessel or drilling platform is difficult. The data base for ice loadings due to freezing sea spray and for atmospheric icing conditions ... is inadequate for calculation of extreme events as required for design load standards. ... [Recommendations for areas of further research and study are presented. It is felt that the results from the research will significantly improve the existing regulations, guidelines and operating manuals for offshore exploration on the east coast of Canada.] (Au)

792
**Underwater iceberg geometry** / Newfoundland Oceans Research and Development Corporation. Buckley, T.J. Dawe, B.R. Zielinski, A. Parashar, S.K. MacDonald, D. Gaskill, H.S. Finlayson, D. Crocker, W. Environmental Studies Revolving Funds (Canada) [Sponsor].
St. John's, Nfld. : NORDCO [publisher] ; Ottawa : ESRF [distributor], 1985.
1 v. (various pagings) : ill. ; 28 cm.
(Environmental Studies Revolving Funds report, no. 014)
ISBN 0-920783-13-9.
Appendices.
References.
Also available on microfiche.
*ASTIS document number 182273.*
ACU, NFSMO

... This report identifies and reviews all previous recorded measurements of the underwater portion of icebergs. Analysis of previous keel measurements show that, at best, only a general three-dimensional impression of the underwater shape can be obtained. Analysis of the data base also indicates that there is not a good functional relationship between the draft and the above-water parameters of icebergs and thus above-water dimensions form a poor basis for estimating iceberg draft. Factors affecting performance of an acoustic iceberg mapping system including frequency versus range and resolution, angle of incidence and beam bendering are investigated. The use of alternative sensors for iceberg mapping, primarily underwater low-light TV, lidars, and impulse radars, and it is concluded that because of the significant research and development required and the short operational ranges achievable that optical/electro-optical devices are not at present feasible sensors for underwater iceberg shape determination. Impulse radar deployed from a helicopter has potential as an iceberg draft measurement device. ... [These two types are the] TIMS1 (Towed Iceberg Mapping System 1) design ... [and] the TIMS2 design .... (Au)

**See also:** 905.

## NICKS, L.

**See:** 443, 444.

## NIEF, G.

**See:** 315.

## NIELSEN, A.H.

793
**Environmental conditions on the continental shelf off west Greenland** / Nielsen, A.H. Dietrich, J. Fabricius, J.
(Journal of petroleum technology, v. 30, no. 10, Oct. 1978, p.1381-1391, figures, tables)
(OTC paper, 2948)
(Paper – Society of Petroleum Engineers of AIME, SPE 6947)
Paper presented at the 9th Annual Offshore Technology Conference, Houston, May 2-5, 1977.
*ASTIS document number 54879.*
ACU, NFSMO

This paper describes the meteorological, hydrographical, and ice conditions of the Davis Strait, with particular emphasis on the west Greenland continental shelf, located from 63 deg. to 68 deg. N latitude. An analysis is presented of existing information and environmental data obtained during intensive data-collection programs conducted during the summer and fall of 1975 and 1976. (Au)

**See also:** 351.

## NOBLE, L.L.

794
**After icebergs with a painter: a summer voyage to Labrador and around Newfoundland** / Noble, L.L.
New York [etc.] : D. Appleton & Co., 1861.
xiv, 1 leaf, 336 p., 6 p. of plates : ill.
Also issued in London by Sampson Low and in New York by Appleton, 1862.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179060.*

Narrative of a trip in the summer of 1859, to waters around Battle Harbour, with an unnamed artist, who painted iceberg forms (examples in six lithographs included). (AB)

## NOLTE, K.G.

795
**North Atlantic sea ice survey** / Nolte, K.G. Trethart, M.E.
[Calgary, Alta.] : Amoco Canada Petroleum Company Ltd., [1971?].
1 microfiche : ill., figures, tables ; 11 X 16 cm.
(Eastcoast Petroleum Operators' Association project no. 1. Report)
*ASTIS document number 115770.*
ACU, NFSMO

During the period March 8 to 27, 1971 two Amoco personnel accompanied the sealing fleet into the North Atlantic pack ice to make general observations and collect data on the physical properties of the ice. ... This memorandum outlines the results of the project. Conclusions : (1) most of the ice observed offshore Labrador was first year ice. (2) ice ridges and icebergs are prevalent in the area. (3) average pan-size in the area was 60-70 feet in diameter. (4) offshore winds blowing towards land can put pressure on the field ice and cement the pans into a sheet covering many square miles. (5) ice thickness in the test area varied from one to four feet, but can be effectively increased by rafting. (6) the correlation of Brazil test data to data reported by other investigators is very good. (7) crystal structure in the ice tested was not well defined. ... The ice strength data obtained during March 1971 will be useful for offshore structure design parameters. ... (Au)

## NORLANDS PETROLEUMS LIMITED

**See:** 802.

## NUTT, D.C.

796
**Dissolved nitrogen in west Greenland waters** / Nutt, D.C. Coachman, L.K. Scholander, P.F.
(Journal of marine research, v. 19, no. 1, Mar. 15, 1961, p. 6-11, ill., map)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180327.*

Presents partial results obtained in 1958 from observations at about a dozen selected stations along the coast from Melville Bugt to Brede Fjord. Dissolved nitrogen content gradually decreases from north to south; glacier fronts and floating icebergs produced higher values in coastal waters. (AB)

797
**The drift of Ice Island WH-5** / Nutt, D.C.
(Arctic, v. 19, no. 3, Sept. 1966, p. 244-262, ill.)
*ASTIS document number 99937.*
ACU

Summarizes the final documentation of this drift from its calving from Ward Hunt Ice Shelf, North Ellesmere Island, winter 1961-62 until sightings of the remaining fragments in waters of Labrador and Newfoundland, summer 1964. The drift south from the Arctic Ocean indicates that the southward water transport through Nares Strait is discontinuous and, during summer 1963, was interrupted by pulses of surface water to the north and the development of a sluggish counterclockwise gyre in Kane Basin. By 1964, pieces of WH-5 were widely scattered by their irregular escape from Smith Sound and the vagaries of the Baffin and Labrador current systems. (Au)

798
**Gases in Greenland icebergs** / Nutt, D.C. Scholander, P.F.
(International Geographical Congress 1960. Physical geography, 1961, p. 205-216, ill., map)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180319.*

Summarizes the study of gas inclusions made on the Arctic Institute of North America Greenland Expedition 1958. The shipboard laboratory, prefabricated and set up on deck is described. Ice from 11 West Greenland glaciers from Melville Bugt to Bredefjord, 75-61 N was examined for age by C-14 dating, and for volume and composition of gas inclusions. Gas pressure determinations were made on 26 icebergs. Most samples were relatively young, less than 1000 yrs.; composition of the gas was close to that of air, but some alteration had apparently occurred after it was trapped by the ice. The volume of gas ranged from 3 to 8% of that of the ice. Pressure ranged from two-three to some 20 atmospheres. No correlation was found between bubble dimension and pressure, or between volume of gas trapped and composition or pressure. Results of the oxygen isotope studies were presented by W. Dansgaard, q.v. (AB)

**See also:** 926, 927, 928, 930.

## NYE, J.F.

799
**The use of catastrophe theory to analyse the stability and toppling of icebergs** / Nye, J.F. Potter, J.R.
(Proceedings – Conference on Use of Icebergs : Scientific and Practical Feasibility, 2nd, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 49-54, figures)
References.
*ASTIS document number 61069.*
ACU, NFSMO

As an iceberg melts, the resulting change of shape can cause it to list gradually or to become unstable and topple over suddenly. Similarly, when an iceberg breaks up some of the individual pieces may capsize. We have used Zeeman's analysis of the stability of ships which is based on catastrophe theory, to examine this problem. ... [it] gives a three-dimensional geometrical picture that enables one to see all the possible equilibrium attitudes of a given iceberg, whether they are stable or unstable, whether a stable attitude is dangerously close to an unstable one, and how positions of stable equilibrium can be destroyed as the shape of the iceberg evolves with time. ... The main purpose of this work is to suggest how the stability characteristics of any selected iceberg may be

investigated systematically. (Au)

## O'HAGAN, R.M.

See: 237, 238, 304, 602.

## O'LENIC, E.A.

**800**
**U.S. Navy global ice analysis and forecasting** / O'Lenic, E.A.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 123-130, ill.)
References.
*ASTIS document number 161799.*
ACU, NFSMO

The operational role of the Fleet Weather Facility, Suitland Ice Operations Department in ice analysis and forecasting on a global scale is presented, stressing Antarctic operations. Operational ice analysis and forecasting methods, imagery, ship routing, iceberg identification and tracking, and seasonal ice forecasting are discussed, with special emphasis on their availability and usefulness as planning tools. (Au)

**801**
**U.S. Navy global ice analysis and forecasting** / O'Lenic, E.A.
(Arctic sea ice. Glaciological data. Report GD- 1 and 2, 1978, p. 43-46, ill., map)
References.
*ASTIS document number 172235.*
ACU, NFSMO

The initial efforts in sea ice analysis and forecasting at the Naval Oceanographic Office (NAVOCEANO) in 1951 grew out of the need for sea ice support to MSTS (Military Sea Transportation Service) ships supplying DEW (Defense Early Warning) Line construction, starting with Thule Air Base. During this first year of heavy ship traffic in Baffin Bay, ice-inflicted damages to ships totaled 16 million dollars. The Navy Aerial Ice Observer program materialized in 1954, emphasizing ice analysis from aerial reconnaissance. During 1954 alone, over 2800 hours of aerial ice reconnaissance were flown to support expanded DEW Line construction. During the early 1960's, NAVOCEANO conducted PROJECT BIRDSEYE, an expanded ice reconnaissance program. As satellite resolution improved and data became routinely available, satellite imagery became the major data source for sea ice analysis. By 1972, a combination of low-resolution all-weather microwave satellite imagery, and high resolution visual and IR imagery, gave the Fleet Weather Facility Ice Operations Department a truly global, all weather, year-round sea ice analysis capability. ... (Au)

## O'NEIL, R.

See: 809.

## OAO CORPORATION

See: 845.

## OCEANOGRAPHIC SERVICES, INC.

**802**
**Wave and current measuring program in Lancaster Sound, summer 1976** / Oceanographic Services, Inc.
Norlands Petroleums Limited [Sponsor].
Santa Barbara, California : Oceanographic Services, Inc., 1977.
9 leaves : ill., figures, map, tables ; 29cm.
Appendices.
References.
Pallister order no. NR24.
*ASTIS document number 44474.*
ACU, NFSMO

The general movement of water and ice through Lancaster Sound is from west to east toward Baffin Bay. This is the result of cold Arctic water moving through Viscount Melville Sound and Wellington Channel under the influence of dominant north and northwest winds. ... There is a westward moving surface current along the northern boundary of the Sound. This water enters Lancaster Sound from Baffin Bay and it may carry icebergs that originate in Greenland and Ellesmere Island. This current is continuous to Barrow Strait and generally is 6-8 miles wide .... Direct current and wave measurements had not been made in this part of the ocean prior to the present investigation, largely because of prevailing severe ice conditions and the lack of need for this information. However, this knowledge is essential to successful offshore drilling operations and therefore, it was necessary for Norlands Petroleums Ltd. to obtain such measurements. ... No current information is available because the meters were lost. ... Wave data collected are summarized .... (Au)

## OKAMOTO, K.

See: 812.

## OKUBO, A.

See: 369.

## OLSEN, I.

**803**
**Den farlige Gronlandsis [The dangerous Greenland ice]** / Olsen, I.
(Autagagdliutit : Gronlandsposten, v.101, 1961, p. 22)
Text in Danish and Inuktitut.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180394.*

Cites observations of icebergs made aboard ships in North Atlantic during 1810-1828. Two wrecks are described. Many of the vessels lost probably hit icebergs. (AB)

## OMMANNEY, C.S.L.

**804**
**Bibliography of Canadian glaciology, 1975 – bibliography no. 1** / Ommanney, C.S.L.
Ottawa : Inland Waters Directorate, Water Resources Branch, [c1978].
1v. ; 28cm.
(Report series – Canada. Inland Waters Directorate, no. 59)
(Glacier inventory note, no. 10)
Annual.

1975 – Bibliography no.1- . compiled by C. Simon L. Ommanney.
*ASTIS document number 13145.*
ACU

The bibliography lists all snow and ice studies in Canada published or printed in 1975. References are given under the following major subject headings – general glaciology; glaciological instruments and methods; physics of ice; land ice, glaciers, ice shelves; icebergs, sea, river and lake ice; glacial geology; frost action on rocks and soil, frozen ground, permafrost; meteorological and climatological glaciology; snow. A geographical and an author index are also provided. (Au)

**See also:** 665, 666.

## ORHEIM, O.

**805**
**Are antarctic icebergs towable?** / Orheim, O.
(Arctic news record, v. 3.2, Sept. 1984, p. 36-38, col. ill.)
*ASTIS document number 174530.*
ACU

The author discusses the feasibility and considerations associated with towing antarctic icebergs. Some of the areas of particular concern to a towing project are iceberg size and towability, iceberg melting and stability during transit, and iceberg break-up due to swells. The Norwegian Polar Research Institute also provides a research vessel register form for recording iceberg information. There are now 20,000 icebergs in the database, most of which are classified by size and other factors. The distribution of icebergs is highly variable, as is the distribution of size. (ASTIS)

**806**
**Iceberg response to sea state** / Orheim, O. Wadhams, P. Kristensen, M.
(Iceberg research, 1982, no. 1, May, p. 10-15, figures)
An extended abstract for this complete text appears in Annals of glaciology, v. 3, p. 356.
References.
*ASTIS document number 132004.*
NFSMO, ACU

... results from the first expedition aimed specifically at field studies of motion of tabular icebergs in the open sea [are reported]. The results show that the icebergs act as low-pass filters on the ocean wave spectrum and that they may enter into resonant response. The icebergs show differing main response periods for bending, roll and heave and on-going theoretical studies show that this is related to the iceberg geometry and important effects of "added mass" and viscous and non-viscous damping. ... (Au)

**See also:** 617, 619.

## OSMER, S.R.

**807**
**ERTS-A evaluated** / Osmer, S.R.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1974. Bulletin – United States. Coast Guard, no. 60, 1975, p. 27-30)
Appendix D.
References.
*ASTIS document number 166863.*
ACU, NFSMO

[The author maintains that] ERTS-A imagery has limited International Ice Patrol application due to: (1) Resolution – ... provides identification of less than 1% of the icebergs of interest to the Ice Patrol. (2) Cloud cover – ... does not allow penetration by ERTS-A sensors. ... (3) Frequency of area coverage – ... does not allow for the continuous monitoring of icebergs and their drift .... (4) User availability – ... not suitable for immediate forecasting due to the great time lag in the user receiving the information. ... (Au)

**808**
**An evaluation of the airborne radiation thermometer for the International Ice Patrol** / Osmer, S.R.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1974. Bulletin – United States. Coast Guard, no. 60, 1975, p. 23-26, maps)
Appendix C.
References.
*ASTIS document number 166871.*
ACU, NFSMO

Late in the 1974 Season, an airborne radiation thermometer (ART) was made available to Commander, International Ice Patrol, and was deployed for utilization and evaluation by the Ice Patrol Detachment. ... [The data collected by the ART compared well with the temperature information presently being used by the IIP.] (Au)

**See also:** 993.

## OSTRANDER, N.C.

**See:** 527, 846, 847.

## OUTCALT, E.E.

**See:** 462.

## OVERGAARD, S.

**See:** 471.

## PALLISTER RESOURCE MANAGEMENT LTD.

**See:** 137, 256.

## PAN AMERICAN PETROLEUM CORPORATION

**See:** 100, 205.

## PAQUETTE, R.G.

**See:** 1082.

## PARASHAR, S.K.

**809**
**Potential of SAR in detecting and monitoring icebergs** / Parashar, S.K. Stapleton, G. Worsfold, R.D. O'Neil, R.

(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 195-210, ill.)
References.
*ASTIS document number 164097.*
ACU, NFSMO

... imaging radar systems are particularly useful for surveillance of the iceberg infested regions of the ocean. ... The ability of synthetic aperture radar (SAR) to achieve fine spatial resolution, from both spacecraft and aircraft altitudes... is more suitable in providing repetitive and timely coverage required for detecting and tracking icebergs. The detection of icebergs on SAR imagery is ... dependent on the presented contrast between it and its surroundings of open water or sea ice. The results obtained from the analysis of the 4-channel digital radar data of an iceberg imaged during Project SAR '77 are presented and discussed. ... an assessment of the capabilities and limitations of SAR in detecting and tracking icebergs is provided. (Au)

**See also:** 733, 792, 1053, 1054, 1123.

## PARRA, M.

**See:** 626.

## PARROTT, D.R.

**See:** 566, 642.

## PARSONS, B.

**See:** 291.

## PARSONS, R.C.

**810**
**A chemical method for ice destruction** / Parsons, R.C. Hopkins, R.M.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 779-810, ill.)
Appendix.
Reference.
*ASTIS document number 182770.*
ACU, NFSMO

A novel method for ice destruction is described in which ice is reacted with such gases as ammonia, hydrogen chloride, sulphur dioxide or volatized ammonium chloride. The associated equipment to deliver these reactants to the ice is very simple consisting only of nozzles, tanks, pressure regulating valves and hose. Using this equipment and ammonia as a reactant gas, drilling rates up to 210 cm/min. have been achieved. Because of the "salting effect" which occurs when the reactant gas dissolves in the melt water, refreezing is minimized. A wide range of applications for the method have been identified. These include drilling in icebergs for the placing of explosive charges or for the setting of anchor bolts for towing, deicing of ship superstructures, deicing of canal locks and the reduction of friction between the hull of an ice breaker and the ice surface. (Au)

## PEARSON, D.E.

**811**
**Iceberg trajectory speed evaluation for the Labrador Sea** / Pearson, D.E. Ro, C.-U.
(Proceedings of the Ninth Canadian Symposium on Remote Sensing, August 14-17, 1984, St. John's, Newfoundland / Edited by S.M. Till and D. Bajzak. – Ottawa : Canadian Aeronautics and Space Institute, 1984, p. 85-90, ill., map)
*ASTIS document number 176796.*
NFSMO

This study examines iceberg trajectory data recorded with marine radar at three wellsites in the Labrador Sea during 1980 and 1981. Iceberg trajectories were selected which contained a minimum of 24 continuous observations. The analysis includes velocity computations, trajectory analysis and a wellsite comparison to evaluate the spatial variability of iceberg drift in the Labrador Sea. Lastly, a regression analysis of iceberg size versus the maximum range of detection was conducted to quantify this relationship at show depression angles. The results indicate that iceberg drift speeds are similar for wellsites situated on the banks but are substantially higher for icebergs drifting in the saddle. Iceberg drift speeds do however remain relatively constant between observations at all three wellsites. Iceberg drift directions are very inconsistent between observations due to irregularities in the current regime created by the variable bathymetry on the banks. Consequently the resultant net daily drift of icebergs at the three wellsites are small compared to the mean iceberg drift speed. Preliminary results indicate that little correlation exists between iceberg size and the maximum range of detection. Further experimental research is required to validate these results. (Au)

**812**
**Radar detection of sea-ice ridges and icebergs in frozen oceans at incidence angles 0 deg. to 90 deg.** / Pearson, D.E. Livingstone, C.E. Hawkins, R.E. Gray, A.L. Arsenault, L.D. Wilkinson, T.L. Okamoto, K.
(Proceedings – Canadian Symposium on Remote Sensing, 6th, Halifax, Nova Scotia, 21-23 May, 1980 / Edited by Thomas J. Alfoldi. Ottawa : Canadian Aeronautics and Space Institute, [1980], p. 231-241, figures)
(SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs / Edited by R.O. Ramseier and D.J. Lapp. – [Ottawa] : Atmospheric Environment Service, 1981. Microlog, microfiche collections, 83- 0993, section 5.12, [13] p., ill.)
References.
Also available on microfiche.
*ASTIS document number 69671.*
NFSMO, ACU

Dual-polarized 13.3 GHz scatterometer data and X-Band SAR data, collected in the Beaufort Sea and in the eastern Arctic, during the SURSAT sea-ice experiment deployments in March 1979 and April 1979 respectively, have been analyzed to determine the radar contrasts (signal to sea-ice clutter) between sea-ice ridges and the surrounding sea ice in the Beaufort Sea and between icebergs and the surrounding sea ice in the eastern Arctic. The effects of radar resolution cell size on ridge detectability were examined using aerial photography to estimate ridge dimensions. Over the incidence angle range observed, the contrast between ridges and the surrounding sea-ice is nearly independent of incidence angle for all ice types. Cross-polarized radars produce larger ridge contrasts than like-polarized radars, with the largest contrasts and greatest polarization dependence being observed for rough first-year ridges in smooth first-year ice and the smallest contrasts and least polarization dependence being observed for multi-year ridges in multiyear ice. The contrast between icebergs and the first-year ice background is nearly independent of incidence

angle over the observed range. Cross polarized radars enhance iceberg detectability but synthetic aperture radars operated at satellite incidence angles are found to be unsuitable for iceberg detection. (Au)

813
**Summer distribution of icebergs and sea ice in northwestern Baffin Bay and Lancaster Sound** / Pearson, D.E.
(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 43)
Abstract only.
*ASTIS document number 168955.*
ACU, NFSMO

Historical SLAR (side looking airborne radar) imagery collected in northwestern Baffin Bay and Lancaster Sound during the summers of 1978 and 1979 were to determine the existence of temporal and spatial trends of sea ice and iceberg presence. Sixty SLAR images of the study area, comprising 319 grid squares of 150 sq km each, were analysed for ice floe dimensions and iceberg densities. The data were subsequently merged for two seasonal periods (May 1-July 31 and August 1-October 31) to provide a summary of the seasonal distribution of sea ice and icebergs. Thematic maps were generated depicting iceberg density and mean ice floe area variations within the study area. The resulting distributions are presented and significant trends identified. These interpretations and their relation to our current understanding of meteorological conditions, current circulation and bathymetry of the study area are presented. (Au)

814
**Summer distribution of icebergs in northwestern Baffin Bay and Lancaster Sound** / Pearson, D.E.
(8e Symposium canadien de teledetection et 4e Congres de L'Association quebecoise de teledetection, 3-6 mai 1983, Montreal, Quebec = 8th Canadian Symposiuom on Remote Sensing and 4th Conference of L'Association quebecoise de teledetection, May 3-6, 1983, Montreal, Quebec / Edited by K.P.B. Thomson and F. Bonn. – Saint-Foy, Quebec : L'Association quebecoise de teledetection, 1984, p. 253-260, ill.)
References.
*ASTIS document number 182133.*
ACU

Sixty SLAR images acquired during 1978 and 1979 in northwestern Baffin Bay and Lancaster Sound were analysed to obtain the spatial and temporal distribution of icebergs during the summer period. Icebergs were identified on the SLAR and their frequencies were recorded by grid cell for each image. Mean iceberg frequencies for each grid cell were subsequently compiled for the two summer periods, May 1 to July 31 and August 1 to October 31. Iceberg frequencies were subsequently converted to iceberg densities and two thematic maps of mean iceberg density were prepared to show the spatial and temporal trends that exist. The spatial distribution of icebergs in northwestern Baffin Bay is influenced by the current regime of the region. Although the highest iceberg densities were situated in the coastal regions near active glaciers, a corridor of higher iceberg densities exist within the core of the Baffin Bay current. The influence of the current regime on iceberg drift is also demonstrated during the period August to October when icebergs are deflected into the mouth of Lancaster Sound. The temporal distribution of icebergs in this region is largely controlled by changing atmospheric conditions. During the period May to July the persistence of sea ice cover impedes the drift of icebergs into and through the study area. However, during the period August to October warming atmospheric conditions result in the rapid deterioration of sea ice and a rapid increase in iceberg calving activity. Consequently, during the summer period a significant increase in iceberg density was recorded. (Au)

815
**Temperature, salinity and density profiles around icebergs in the Labrador Sea** / Pearson, D.E.
[Calgary : Petro-Canada], 1986.
[20] leaves : ill. ; 28 cm.
Photocopy.
References.
*ASTIS document number 182010.*
ACU

Past laboratory studies coupled with limited field work have confirmed that icebergs drifting in seawater will cool and freshen the surrounding water column (Allison 1984, Foldvik 1980, Josberger 1980). However, the nature and extent of this process must be clearly understood to model the degradation of icebergs around offshore platforms. To this end, a small survey was conducted in the Northern Labrador Sea during August 1984 to examine the local microclimate created by melting icebergs. Temperature and salinity profiles of the water column were acquired around several icebergs using a Neil Brown DRCM-2 current meter deployed from the research vessel MV Polaris V. This paper will examine the data obtained from two of these icebergs which are considered to be representative of the dataset. (Au)

816
**Temperature, salinity and density profiles around icebergs in the Labrador Sea** / Pearson, D.E.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 23)
Abstract only.
*ASTIS document number 182214.*
ACU

During August 1984 Petro-Canada conducted an Iceberg Dynamics program in the northern Labrador Sea. In conjunction with this project, temperature and salinity profiles were acquired around five icebergs. ... The influence of the iceberg on the surrounding water column was found to extend to a range of 300 metres from the iceberg. Icebergs trail a water plume that is slightly colder, and very slightly diluted compared with ambient ocean conditions. The surface layer is very stable and its areal extent is controlled by wave induced mixing. Beneath the surface layer, the temperature/salinity relationship of the water column around the icebergs suggest the development of two convection cells. A clockwise cell develops to a depth of 25-30 metres and draws colder, more saline water from depth towards the surface. Below this depth, an anticlockwise convection cell develops which draws warmer, less saline water to greater depth. The depth of this later cell is closely related to the draft of the iceberg. The convection which occurs next to the iceberg significantly cools the surrounding water column. This colder water column insulates the iceberg from the warmer temperatures of the surrounding ocean. This process requires careful consideration when estimating iceberg decay rates in ice infested waters. (Au)

## PELLETIER, B.R.

817
**Ice scour marks on the sea bottom off northern and eastern Canada** / Pelletier, B.R. Harris, I.M.
(First Symposium on the Geological Action of Drift Ice, Quebec, Canada, April 20-24, 1974 [sic]. Maritime sediments, v. 9, no. 3, Dec. 1973, p. 111)
Abstract only.
*ASTIS document number 149772.*
ACU

Sidescan sonar and conventional depth-sounding provide imaginary imagery which indicates the widespread occurrence of marks on the

sea bottom (formed by icebergs and pack ice running aground) off northern and eastern Canada. The marks typically have the form of linear furrows (troughs bordered by raised shoulders). Those that occur in the Arctic range in relief up to 10 m, in width from a few metres to several tens of metres, and in length up to 8 km. Those that occur in the eastern Canada offshore tend to be larger, as shown by their maximum observed dimensions (relief 10 m, width 250 m, and length 17 km). ... [Frequency of iceberg occurrence varies in the Arctic and eastern Canada offshore.] The Arctic occurrences are formed for the most part by the ploughing action of pressure-related structures in pack ice, whereas those off eastern Canada are formed primarily by bottom-dragging icebergs. (Au)

## PEREIRA, C.P.G.

### 818

**Davis Strait : marine geology, sedimentology, and iceberg scouring analysis** / Pereira, C.P.G. Gillespie, R.T.
St. Johns, Nfld. : C-CORE, 1985.
x, 46 p. : ill., map ; 28 cm.
(C-CORE publication, no. 85- 3)
*ASTIS document number 172820.*
ACU, NFSMO

The results of data analyses suggest that the surficial sediment at the Hekja-Ralegh survey area [in Davis Strait] was initially deposited in a proglacial marine environment, possibly beneath an ice shelf; iceberg scouring has since dislodged and redistributed the bottom sediment. Strong bottom currents have removed most of the surficial (top 5-10 cm) silt and clay which accounts for the paucity of such material. Iceberg rafting is probably responsible for the anomalous coarse gravel fraction found in many samples. Examination of the sediment cores indicate that scouring of the seabed is not a modern phenomenon at these water depths (225 to 400 cm). Cores show both sedimentological and micropalaeontological hiatuses, believed to indicate scouring, overlain by at least one half metre of undisturbed sediment interpreted as post-scour infill. Amino acid racemization of a core collected in 1981 at the Hekja site suggests a probable maximum age of 20,000 years BP. Correlation of the newly collected cores with the Hekja 1981 core suggests that the scouring events recognized in three of the cores range between 5,000 and 15,000 years in age. The scours found at this depth are almost certainly relict and most probably predate the Hall Ice advance of 10,760 years BP. (Au)

### 819

**Davis Strait iceberg scouring study** / Pereira, C.P.G. Woodworth-Lynas, C.M.T. Barrie, J.V.
St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, 1984.
x, 78 p. : ill., maps ; 28 cm.
(C-CORE publication, no. 84- 4)
(C-CORE publication. Technical report)
ISBN 0-88901-122-2.
References.
*ASTIS document number 167045.*
ACU, NFSMO

... Two iceberg scour mosaics were compiled from sidescan sonar records of the Hekja Wellsite and Hekja North areas. Iceberg cross-cutting relationships (as defined from the mosaics) were then examined to determine the relative ages and scour depths of the individual scours. Eight relative age groups of scours have been identified from both the Hekja Wellsite and the Hekja North mosaic areas. ... The HUNTEC DTS and airgun seismic profiles along with the sidescan sonograms identified a seabed feature at 320 m located above and adjacent to a well-defined, major geological contact zone. Its similarities to other worldwide occurrences led Woodworth-Lynas (1983a) to identify the feature tentatively as a mud volcano. Farther south on line A, at the same contact, a not dissimilar conical feature is recorded which is interpreted as an eroded, relict feature, not directly a consequence of any form of tectonism. ... Sediment analysis of the surface grab samples indicates coarser and predominantly biogenic sediment toward the shore with the proportion of fine-grained siliciclastic sediment increasing with water depth. Micropalaeontological and sediment analyses of two cores suggest a number of possible causes to explain geological events recorded in the cores. The results suggest that core #44 was probably cored from either the trough, the berm, or from an area immediately adjacent to a scour. Based on the data collected, the age of the scouring event recorded in the core is not older than 5000 years BP, and not younger than 2000 years BP. ... (Au)

### 820

**Determination of iceberg scoured sediment surfaces using quantitative microfaunal analysis** / Pereira, C.P.G.
(Proceedings of the 1st Semi-Annual SEPM Meeting, San Jose, Calif., Aug. 1984, p. 66, ill.)
Abstract only.
*ASTIS document number 159549.*
NFSMO

During multiparameter surveys of the southeastern Baffin Island continental shelf, iceberg scours (=plough marks) down to a water depth of 700 m (2100 ft) were clearly identified on the geophysical records. Icebergs are a hazard to drilling and icebergs with such deep draughts could have a very detrimental effect on the industry's offshore drilling program. Buried iceberg scour features have been determined by quantitative microfaunal analysis using the technique illustrated in the accompanying figure. Analysis to date indicates several occurrences of distinct microfaunal and sedimentological breaks in a number of cores examined. With reference to these deep sea scours an idea put forward suggests that these scours were in fact made by smaller icebergs when sea levels were considerably lower indicating that these features are relict. Radiocarbon data determinations for these breaks is currently underway and correlations with cores from other earlier sampled sites within the southeastern Baffin Island Shelf suggests that the breaks identified immediately predate the Hall ice age. (Au)

### 821

**Iceberg scouring in Davis Strait** / Pereira, C.P.G.
(C-CORE news, v. 7, no. 2, June 1982, p. 3-4, ill.)
*ASTIS document number 148253.*
ACU, NFSMO

This article outlines Pereira's and Woodworth-Lynas' work on the CSS Hudson from Resolute Bay to St. John's in the final stages of her circum-navigation of North America. Their objective was a marine geological survey off the southeast coast of Baffin Island. Canterra's earlier work indicated extensive iceberg scour features at a depth of 350 m. A C-CORE data report on the marine geological survey will be published. It is hoped to eventually define a sea-level curve for the area and possibly infer probable ages of iceberg scours. (Au)

### 822

**Iceberg scouring off the southeast Baffin Island continental shelf, eastern Canada, abstract results** / Pereira, C.P.G.
(Iceberg research, 1983, no. 3, Feb., p. 5-11, figures, table)
(C-CORE publication, no. 83- 1)
References.
*ASTIS document number 125040.*
NFSMO, ACU

... This study aims to determine the age of individual scours and/or the scoured seabed surface, both in relative and in absolute terms. Relative dating techniques used in the analysis are iceberg cross-cutting relationships and frequency distribution patterns (vide Woodworth-Lynas, a, in prep.). Determining the 'absolute' age (date) of a scour, made prior to the commencement of the present research interests in these seabed features is perhaps an

impossibility, but nevertheless radiometric dating of biogenic material from a core collected from within the scour should generate a working date .... However, too many varying factors, eg. strong cross currents, inaccurate navigation, ships' drift, etc., make the collection of a core from a scour (from a surface vessel), that had earlier been identified from sidescan mosaic, a very difficult task, especially at the water depths found at the Hekja Wellsite. ... (Au)

**See also:** 160.

## PERRY, R.E.

**823**
**A record of radar performance in ice conditions** / Perry, R.E.
(Journal of the Institute of Navigation, v. 6, no. 1, Jan. 1953, p. 74-85, ill., maps)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 178756.*

Contains extracts, July 27-Aug. 21/22, 1952, from a log kept by the writer, an engineer of Decca Radar Co. during a voyage on the S.S. North Anglia from Cardiff, Wales, to Churchill, Manitoba, and return. The movements of the various icebergs sighted and their effects on the radar picture are described, with drawings illustrating each iceberg, its height, angle of slope, the ship's line of approach, and the wind direction. The state of the atmosphere, abnormal effects due to visual refraction, and the operation of radar in the fogs encountered, are noted. It is concluded that the detection ranges of the icebergs "compare quite favorably with those from land of similar height," and that the slope presented to the radar beam is the most important factor in iceberg detection. Effects of air temperature and density changes on the radar beam are discussed, and the target qualities of land ice, growlers, floebergs, hummocks, floes or field ice, and leads briefly summarized. Observations and results are recorded on tables, and sketch maps show the ship's course with relation to the ice encountered. (AB)

## PETERS, G.R.

**824**
**Sea ice and icebergs** / Peters, G.R.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 41-59 ill., maps)
Bibliography: p. 52-56.
*ASTIS document number 163899.*
ACU, NFSMO

The search for oil and gas under northern waters has been at least partially responsible for a rapid increase in scientific and technological interest in sea ice and iceberg research. In this paper a general description of the research particularly pertinent to the Labrador Sea is given, with emphasis on areas of particular importance. (Au)

**825**
**Underwater profiles of icebergs** / Peters, G.R.
(Proceedings of the Canadian Seminar on Icebergs held at the Canadian Forces Maritime Warfare School, CFB Halifax, Halifax, Nova Scotia, Canada, December 6-7, 1971. – [Halifax, N.S. : Maritime Command Headquarters, 1971?], p. 113-114, ill.)
*ASTIS document number 160288.*
NFSMO, ACU

The paper describes a simple technique to measure the underwater shape of an iceberg. (NFSMO)

**See also:** 176, 178, 228, 265, 266, 667.

## PETERSEN, E.V.

**826**
**Pelican premieres in "iceberg alley", drilling new, plugging old Lief wells** / Petersen, E.V.
(Oilweek, v. 24, no. 26, Aug. 13, 1973, p. 9)
*ASTIS document number 172227.*
ACU, NFSMO

... Pelican spudded a new Atlantic offshore test, Leif N-48, at midnight August 1st for Eastcan Exploration Ltd. The new well is located a little more than a mile west-northwest of Leif E-38, the incomplete test drilled by the Typhoon in 1971. Severe ice conditions had forced Typhoon off the hole. The new drill ship, operated by Somaser, which is partly owned by Total CFP which also owns Eastcan, arrived on Tenneco et al Leif E-38 location July 25th. By August 1st, its crew had completed running cement plugs, removal and recovery of the old stock. The well was officially abandoned and the rig released at 1700 hours. By midnight Pelican had spudded the new location for Eastcan et al Leif N-48, at 54 17 46.98 N. latitude and 55 7 20.77 W. longitude. Both wells are in "Iceberg Alley" off the coast of Labrador, where weather and ice plagued earlier drilling operations. The Pelican was specifically designed for quick in-and-out operations in such areas and has dynamic positioning instead of the slower but traditional anchor mooring system. In addition, the new ship was designed to ride out higher waves – up to 15 feet – than conventional vessels and withstand constant wind velocities to 45 mph. [Some of the new design features are discussed.] ... (Au)

## PETERSEN, G.H.

**827**
**Biological effects of sea-ice and icebergs in Greenland** / Petersen, G.H.
(Polar oceans : proceedings of the Polar Oceans Conference held at McGill University, Montreal, May 1974 / Edited by M.J. Dunbar. – Calgary, Alta. : Arctic Institute of North America, 1977, p. 319-329, ill.)
References.
*ASTIS document number 168513.*
ACU, NFSMO

The biological effects of sea ice and icebergs on sedentary, intertidal and shallow water invertebrates were studied in West Greenland. North and West Greenland do not exhibit a directly comparable fauna. The ice foot protects the tidal zone from the sea ice, without affecting its zonation, and very rarely has a catastrophic effect. The organisms withstand months of freezing in the ice foot, followed by a shortened season of growth and reproduction. Sea ice scrapes only a few exposed areas lacking an ice foot. The occurrence of organisms in fissures is explained by circumstances other than this erosion (e.g. light, moisture). The shortened season for primary production and pelagic larvae reduces dispersal. Icebergs capsizing or collapsing produce a locally catastrophic effect; e.g. Mya Truncata and Balanus crenatus can be thrown on shore disturbing the Quaternary stratigraphy. Brackish upwelling around icebergs in sea water over 0 C raises deep water to the surface. ... (Au)

## PETRO-CANADA

828
**Offshore Labrador initial environmental assessment** / Petro-Canada.
Calgary, Alta. : Petro-Canada, 1982.
1 v. (various pagings) : figures, tables ; 28 cm.
Bibliography: p. 5-272 – 5-334, 6-80 – 6-98.
*ASTIS document number 125946.*
ACU, NFSMO

This document was prepared within the Environmental and Social Affairs and Offshore Engineering Sections of Petro-Canada, on behalf of the Labrador Group of Companies. The document describes the physical, biological and human environment of the coast and shelf of Labrador. It also outlines the procedures that the Labrador Group uses to explore for oil and gas on the Labrador Shelf, and suggests alternative methods that could be used to produce these hydrocarbons, should economic hydrocarbon reserves be found. The document describes how the Labrador environment affects offshore drilling operations, and how exploratory drilling could affect the environment. Finally, the document evaluates the environmental research that has already been completed on the Labrador Shelf, and identifies potential new directions that research might take. ... (Au)

**See also:** 133, 134, 135, 136, 138, 323, 536, 549, 938.

## PETRO-CANADA EXPLORATION INC.

829
**Field evaluation of sensors for development of ship-mounted ice hazard detection system** / Petro-Canada Exploration Inc.
[Ottawa : Transport Canada, 1983].
(Transport Canada report, no.TP3506E)
*Document not seen by ASTIS.*
*ASTIS document number 183482.*

**See also:** 417.

## PHILLIPS, D.W.

**See:** 914.

## PHILLIPS, S.M.

**See:** 1091.

## PINKSTER, J.A.

830
**Computation of first and second order wave forces on bodies oscillating in regular waves** / Pinkster, J.A. van Oortinerssen, G.
(Proceedings of the 2nd International Conference on Numerical Ship Hydrodynamics, University of California at Berkley. – [S.l. : s.n.], 1977, p. 136-156)
*Document not seen by ASTIS.*
*ASTIS document number 183709.*

## PIPER, D.J.W.

**See:** 999.

## POPE, A.

831
**Terradynamics as applied to ice** / Pope, A.
(Desalination : comprising the second volume of the proceedings of the First International Conference on Iceberg Utilization for Fresh Water Production, Weather Modification, and Other Applications, Iowa State University, Ames, Iowa, October 2-6, 1977, v. 29, no. 1-2, Apr.-May 1979, p. 17-23)
*ASTIS document number 168530.*
ACU, NFSMO

[This study was undertaken to shed some light on projectile penetration. Penetration was tested in soils, permafrost, and glacier ice.] ... Penetration in ice follows classical laws. Ice is always somewhat porous and thus may be compressed. Next to the body the pressure causes melting of the ice and the water layer and protects the vehicle's surface so that there is not the slightest damage to it, even to the paint. We did not do a parametric study on icebergs, but a conservative approach would be to start with an L/D of 10 and a W/A of 10 psi and see what happens. I appreciate that my audience has thought about icebergs a lot more than I, but if you don't mind an amateur conjecturing a little, here are some comments. I see six applications of high-speed penetration worth looking into. (1) To implant beacons for tracking. (2) To measure the thickness of sea ice to see if ice breakers will be able to get through. (3) To measure iceberg thickness. (Electronics is easier.) (4) To implant explosives to crack off pieces, or a glacier. (5) To implant anchor posts. (6) To survey the thickness of a wide glacier. ... [A discussion of each, from a penetration standpoint, follows.] (Au)

## POPOV, I.K.

832
**Use of side-looking sonar for surveying underwater surfaces** / Popov, I.K. Roslyakov, V.N. Bogorodskii, P.V.
(Problems of the Arctic and the Antarctic, v. 54, 1978, p. 108-111, ill.)
(Problemy Arktiki i Antarktiki, v. 54, 1978, p. 88-92, ill.)
Translation.
References.
*ASTIS document number 172260.*
ACU, NFSMO

Study of underwater surfaces of different kinds, such as the sea floor, the undersurface of ice cover, the underwater surface of icebergs and ice shelf barriers has great scientific and practical importance. Hydro-acoustic methods and devices are now widely used for this purpose. One comparatively new and efficient method of studying such surfaces is side scanning, which has been comparatively little used in scientific research. A working model of a side-looking sonar was developed and set up at the AANII. It was successfully tested under natural conditions and showed the potential for use for the above purposes. ... (Au)

**See also:** 209.

## PORRAS, A.

833
**Picture of the month : observation of icebergs from satellites** / Porras, A.
(Monthly weather review, v. 97, no. 5, May 1969, p. 405, ill., map)
*ASTIS document number 163074.*
NFSMO, ACU

These pictures clearly show the feasibility of using weather satellite pictures to locate large masses of ice and to follow their progress from day to day as protection in navigation. (Au)

## PORTA, D.W.

See: 206.

## POST, L.A.

834
**The role of the Gulf Stream in the prediction of iceberg distribution in the North Atlantic** / Post, L.A.
(Tellus, v. 8, no. 1, 1956, p. 102-111, ill.)
References.
*ASTIS document number 163341.*
NFSMO

A twenty-six year correlation is made between the yearly frequency fluctuations of icebergs south of the 48th parallel and the preseasonal sea surface temperature anomalies at Key West in the Straits of Florida and those of the Labrador Current three years later. Good agreement among these variables is attributed to (1) the immediate effect of the relative strength of Gulf Stream in barring the southward flow of bergs, and (2) the effect that varying strength of the Gulf Stream has upon the volume of warm water that escapes to the north, the effect in turn upon the rate of transport of icebergs, and the potential number eventually to be carried into the shipping lanes. An iceberg prediction table is offered, making possible a prediction for the current year by using the sea temperature anomaly at Key West for March of this year together with the anomaly of three years earlier. ... (Au)

## POTTER, J.R.

See: 799.

## POTTER, R.E.

See: 452.

## POULIN, A.O.

See: 215.

## POULSEN, M.B.

835
**Greenland's "place by the icebergs"** / Poulsen, M.B. Nebbia, T. [Photographer].
(National geographic, v.144, no. 6, Dec. 1973, p. 849-869, col. ill., maps)
*ASTIS document number 163767.*
ACU

This article describes the life of the residents of Illissat - Place by the Icebergs. The Jakobshavn region is noted for its fine dog teams and abundance of icebergs which calve from the enormously productive Jakobshavns Glacier. (ASTIS)

## POWELL, R.D.

836
**Iceberg calving and its influence on ice-proximal, subaqueous glacigenic lithofacies** / Powell, R.D.
(14th Arctic Workshop : Arctic land-sea interactions, 6-8 November, 1985, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. - Dartmouth, N.S. : Bedford Institute of Oceanography, 1985, p. 101-103)
*ASTIS document number 176400.*
ACU

... This paper presents a mathematical model which predicts that an iceberg calved above water level from the face of a tidewater front can either impact the floor or come sufficiently close, so that it or its preceding pressure wave could redistribute bottom sediment by sediment gravity-flows. The first part of the model considers the free-fall of the ice block through the air as a missile that loses most of its potential energy during impact by drag and creation of a wave as a heaved free-surface. ... The model describes the case of seracs spalling from the face above water level by Reeh-type calving (Reeh, 1969) from fracture propagation (Iken, 1977); a process that occurs continually at tidewater fronts. With time, quite a large volume of ice can be lost in this manner, and enough falls occur that the number of bergs which influence bottom sediment is quite large. Large sheets can also fracture above water level and when they descend vertically could likewise influence bottom sediment. Those that topple forward and shatter on impact can only influence bottom sediments indirectly by the surface wave produced. Icebergs that calve subaqueously then float to the surface may redistribute sediment if they were in contact with the bottom. That case is probably relatively minor compared with other calving cases, because most subaqueous ice is lost from melting by sea or lake water, rather than calving. (Au)

## PRAEG, D.B.

837
**Quaternary geology of the southeast Baffin Island continental shelf, N.W.T.** / Praeg, D.B. MacLean, B. Hardy, I.A. Mudie, P.J.
[S.l. : s.n., 1985].
ii, 65, [34] leaves : ill., maps ; 28 cm.
(Paper - Geological Survey of Canada, 85- 14)
GSC paper in press.
Photocopy.
References.
*ASTIS document number 159735.*
ACU

The Quaternary sediments of the southeast Baffin Island continental shelf have been investigated using acoustic data (Huntec DTS and 665 cubic cm air gun seismic profiles, sidescan sonograms, echograms) supplemented by sample control (grabs and cores). Four acoustic units have been defined and informally named: map-unit 1: Baffin Shelf Drift - unstratified diamictons generally <100 m thick but up to 300 m off Hudson Strait, which were deposited from grounded glacial ice, and which reach to the shelf edge in some areas; these sediments record repeated advances of galcial ice, of varied extent, of early late Foxe and older age; map-unit 2: Davis Strait Silt - sediments generally <10 m but up to 70 m thick, which are stratified where unscoured by grounding icebergs (Subunit A) and acoustically unstratified where scoured by grounding icebergs (Subunit B); these sediments record depostion from mid Foxe to Holocene time and contain microfossil evidence of

ice-proximal to ice-distal glacial marine environments; map-unit 3: Tiniktartuq Silt and Clay - stratified basin-fill sediments up to 10 m thick which directly overlie the stratified sediments of Davis Strait Silt Subunit A; these sediments indicate a change in depositional style in the late Foxe to Holocene; map-unit 4: Resolution Island Lag- subangular gravels and sands which occur in areas that appear largely devoid of cover to the limit of acoustic resolution (30-50 cm), and which may include areas of exposed bedrock; these sediments record current winnowing of areas of thin to discontinuous Baffin Shelf Drift or Davis Strait Silt. There in no evidence for a transgressive zone marking a relative sea level lowstand in the depths represented by the data (mainly >150 m). (Au)

838
**Quaternary sediments of southeast Baffin shelf** / Praeg, D.B. MacLean, B.
(Maritime sediments and Atlantic geology, v. 20, no. 2, Aug. 1984, p. 90-91)
*ASTIS document number 168505.*
ACU

Quaternary sediments of the southeastern Baffin Island continental shelf have been mapped using a combination of geophysical profiling systems .... Four main units have been delineated and informally named: (1) Baffin Shelf Drift: poorly sorted unstratified sediments up to 130 m thickness interpreted to have been deposited directly under grounded ice during the Pleistocene; (2) Cumberland Silt: moderately to poorly sorted sediments up to 30 m in thickness interpreted to have been variably deposited in ice proximal and ice distal environments during the Mid to Late Wisconsin. On acoustic profiles these sediments vary from well stratified to unstratified. The lack of stratification is due to extensive disruption by grounding icebergs; (3) Kaxodluin Silts and Clays: moderately sorted sediments in Frobisher Bay and Cumberland Sound up to 30 m in thickness, stratified on acoustic profiles, deposited during the Late Wisconsin-Holocene; (4) Lady Franklin Sand and Gravel: moderately sorted, acoustically unstratified, coarse sediments that form a thin veneer over bedrock or locally over till, interpreted to represent erosional lag deposits. ... The present seabed sediment surface reflects modification due to current winnowing and scouring by grounded icebergs. (Au)

## PRASAD, K.S.R.

839
**Analytical and experimental modelling of iceberg scours** / Prasad, K.S.R.
St. John's, Nfld. : Faculty of Engineering and Applied Science, Memorial University of Newfoundland, 1985.
170 p. ; 28 cm.
Thesis (M.Eng.) - Memorial University of Newfoundland, St. John's, Nfld., 1985.
*ASTIS document number 180815.*
NFSM

... This thesis is a continuation of the ongoing research on geotechnical aspects of iceberg scours. The earlier analytical model has been extended to incorporate the nonlinear velocity of the iceberg during scouring. This study examines the scouring potential of icebergs which roll due to instability, increase their draft, and penetrate the seabed before scouring. For a given iceberg, if such initial penetration depth is more than a certain upper bound, only a pockmark will be left on the seafloor. For initial penetration depths smaller than a certain lower bound, the resulting maximum scour depth would be as if there were no initial penetration of the seafloor. The influence of keel shape on the maximum depth gouged by an iceberg was studied experimentally. Six models of different keel shape were instrumented and pushed horizontally into a sloping sand bed. The measured front face resistance for each model was correlated with the computed values using available theoretical methods. The experimental results were extrapolated to the scour model. It is shown that the influence of keel shape on the estimated scour depth is within an acceptable range of variation and thus scour depths predicted using an idealized shape are realistic. (Au)

840
**Some factors influencing iceberg scour estimates** / Prasad, K.S.R. Chari, T.R.
(Proceedings of the Fourth International Offshore Mechanics and Arctic Engineering Symposium / Edited by J.S. Chung et al. - New York : American Society of Mechanical Engineers, 1985, p. 302-309, ill.)
References.
*ASTIS document number 159646.*
NFSMO

The phenomenon of seabed scouring by icebergs is a major threat to buried structures on the Canadian East Coast and is of immediate concern to the petroleum operators. The design of a suitable production and transportation system for the development of the Hibernia field is very much influenced by the potential size of iceberg scours. Several factors influence the theoretical estimates of scour size and some of these have been discussed in the mathematical and laboratory models proposed earlier. In this paper, an appraisal is made of the potential error in iceberg scour predictions caused by assuming a linear velocity variation during scour. The influence of an initial penetration of the iceberg prior to scour is examined. Upper and lower bounds of initial penetration depths are shown to exist which influence the resulting scour type. (Au)

## PULLEN, T.C.

841
**We smashed the Northwest Passage** / Pullen, T.C.
(Petroleum today, v. 11, no. 1, 1970, p. 16-21, ill., map)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180653.*

The Canadian representative on the 25 Aug - 8 Nov 1969 SS Manhattan voyage, Delaware-Halifax-Thule-Lancaster Sound-Barrow Strait-Prince of Wales Strait-Beaufort Sea-Pt Barrow and return, describes encounters with the icebergs in Baffin Bay, ice floes and polar bears across Parry Channel, inpenetrable ice-ridged floes in McClure Strait and weather conditions throughout the trip. (AB)

## PURCELL, G.J.

**See:** 907.

## QUEBEC (PROVINCE). MINISTERE DE L'ENVIRONNEMENT

**See:** 1052.

## QUIN, R.

842
**Total and its partners pioneer new methods off Greenland** / Quin, R.
(Northern offshore, v. 6, no. 3, Mar. 1977, p. 27-28, 40, ill.)
*ASTIS document number 177474.*

Rene Quin, the operations manager for Total Gronland Oie A/S, outlines Totals planned drilling operations off Greenland's west coast, and draws parallels between Greenland and the offshore Canadian East Coast situation, which they have also been involved

in. The major environmental barriers are ice and icebergs which Total has studied for four years. Total also carried out oceanographic surveys and has studied all the documents regarding factors such as meteorology, ice conditions, hydrological conditions, and the possible effect of oil activities on fisheries. (ASTIS)

## RAE, J.

**843**
**Lieutenant Greely on ice** / Rae, J.
(Nature, v. 33, no. 841, Dec. 10, 1885, p. 126-127)
(Nature, v. 33, no. 846, Jan. 14, 1886, p. 244-245, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179876.*
ACU

Contains remarks on Greely's lectures in Scotland on the U.S. Expedition to Lady Franklin Bay 1881-1884, particularly his theories on source and character of floebergs. Rae believes floebergs to be formed from the piling up of saline sea ice floes, from which some salt is later lost through downward filtering during the summer thaw. He described also sloping snow and ice accumulations, formed against cliffs, which may break away to form icebergs. (AB)

**844**
**On the formation of icebergs and ice action, as observed in Hudson's Bay and Straits** / Rae, J.
(Report - British Association for the Advancement of Science, no. 30, pt. 2, 1860, p. 174-175, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179884.*

Snow is blown over the steep southeast-facing cliffs of this region by northerly or northwesterly winter gales and deposited in deep drifts at the cliff foot on the ice. A seaward-sloping accumulation several hundred feet deep may be formed by late winter, becoming a solid mass of ice during the spring thaw. The ice then breaks off in large masses and drifts away. Manner in which stones from a shallow sea floor become embedded in sea ice and are transported great distances is also described. (AB)

## RAMSEIER, R.O.

**845**
**SURSAT Ice Experiment report : Surveillance Satellite Project Workshop on Active and Passive Microwave Measurements of Sea Ice and Icebergs** / Ramseier, R.O. [Editor]. Lapp, D.J. [Editor]. OAO Corporation. United States. National Aeronautics and Space Administration. ICEX Science and Applications Working Group [Sponsor].
[Ottawa] : Atmospheric Environment Service, 1981.
1 v. (various paging) : ill., figures, tables ; 28 cm.
Appencices.
References.
*ASTIS document number 73105.*
ACU, NFSMO

... A total of 22 papers are included. Some are extended abstracts of presentations made at the workshop while others were separate reports. The papers have been organized into several different subject areas: a. sea ice classification based on active and passive microwave systems; b. radar parameters vs. ice parameters; c. microwave signatures of ice morphological features; d. digital processing techniques and their evaluation; e. operational considerations and demonstrations; f. impulse radar for ice thickness; g. future experiments and sensors. ... (Au)

**See also:** 250, 251, 892, 894, 1123.

## RAND CORPORATION

**846**
**Applicability of ERTS for surveying antarctic iceberg resources** / Rand Corporation. Hult, J.L. Ostrander, N.C. United States. National Aeronautics and Space Administration [Sponsor].
Santa Monica, Calif. : Rand Corp. [publisher] ; Springfield, Va. : NTIS [distributor], 1973.
ix, 50 p. : ill., maps ; 28 cm.
(NASA contract report, 21905)
(NTIS AD-786 638)
This paper was prepared for the ERTS-1 Symposium at Washington, D.C., Dec. 10-13, 1973. It was derived from a condensation of Applicability of ERTS for surveying antarctic iceberg resources, by J.L. Hult and N.C. Ostrander, The Rand Corporation, R-1354-NASA/NSF, November 1973.
References.
*ASTIS document number 174025.*
NFSMO

This investigation explores the applicability of ERTS to (a) determine the Antarctic sea-ice and environmental behavior that may influence the harvesting of icebergs, and (b) monitor iceberg sampling in the western Antarctic between the Peninsula and the Ross Sea used in the analysis. It is found that the potential applicability of ERTS to the research, planning, and harvesting operations can contribute importantly to the glowing promise derived from broader scope studies for the use of Antarctic icebergs to relieve a growing global thirst for fresh water. Live Antarctic readout will permit timely acquisition of imagery on every orbital pass, which will be necessary to achieve adequate glimpses through the 80 percent cloud cover. Thermal sensor bands will provide coverage in daylight or darkness. Several years of comprehensive monitoring will be necessary to characterize sea-ice and environmental behavior and iceberg evolution. Live ERTS services will assist harvesting control and claiming operations and offer a means for harmonizing entitlements to iceberg resources. The valuable ERTS services will be more cost effective than other means and will be easily justified and borne by the iceberg harvesting operations. (Au)

**847**
**Applicability of ERTS for surveying antarctic iceberg resources : progress report for period February-April 1973** / Rand Corporation. Hult, J.L. Ostrander, N.C. Goddard Space Flight Center [Sponsor].
Santa Monica, Calif. : Rand Corp., 1973.
5 p. ; 28 cm.
(NASA contract report,132193)
*ASTIS document number 174017.*
NFSMO

Recognition and interpretation of icebergs proves to be easy when they are locked in sea or fast ice. They stand out in relief, particularly well in band 7. Recognition of isolated icebergs is much more difficult. Size, shape, interaction with sea ice, and change over time must then be used to help in positive indentification. There seems to be much less current and relative motion between icebergs and sea is much of the test sector than had been believed from available exploration information. However, most of this type of assessment must await the accumulation and analysis of the full season data. Several problems were associated with this test run. Because of the delay in contracting, the delivery of imagery was confused and delayed, leaving little opportunity to modify the request for imagery based on early results. The actual extent to which cloud cover prevails in the Antarctic seas was not

anticipated. A formidable problem of handling, cataloguing, displaying, and correlating thousands of images required early solution. Extension of this investigation is not possible, as ERTS-B has been postponed and recorder difficulties will probably not permit the acquisition of significant additional Antarctic imagery after March 1973 from ERTS-1. (ASTIS)

## RANEY, R.K.

See: 1092.

## RANKIN, R.D.

See: 427.

## RANSLEY, T.J.

848
**Glacier studies in the Umanak district West Greenland, 1950** / Ransley, T.J.
Copenhagen, Denmark : C.A. Reitzels Forlag, 1952.
17 p. : ill., map ; 28 cm.
(Meddelelser om Gronland, bd.136, nr. 2, 1952, p. 1-17, ill., map)
Appendices.
References.
*ASTIS document number 172316.*
ACU

The West Greenland coast between latitudes 69 and 73 North exhibits the most remarkable system of iceberg-forming glaciers in the northern hemisphere. ... The Kangerdluk, in latitude 71 35 N., is a fjord about 38 km long and 6 km wide which discharged into the Karrats Isfjord in the northern part of Umanak district .... in 1932 Ernest Sorge ... as a member of the German expedition led by Dr. Fank, penetrated the Kangerdluk several times. He measured the rate of advance of the Umiamako ice-front, fixed its position, and took soundings in the fjord right up to the front. ... In 1950 members of the British expedition fixed the position of the Umiamako ice-front again, and later, by means of an indirect land route ... reached the upper part of the Rinks Isbrae, where they measured its speed. ... (Au)

## RANSOM, J.

849
**Controlled ice and iceberg demolition : a progress report** / Ransom, J.
St. John's, Nfld. : Memorial University of Newfoundland, Faculty of Engineering and Applied Science, 1977.
21 p. : ill. ; 28 cm.
References.
*ASTIS document number 163082.*
NFSMO

... the ice demolition project is being carried out in three stages: Phase I) Feasibility and experiment design. Phase II) Demonstration of iceberg demolition. Phase III) Reporting and preparation of iceberg demolition manual. The first (1976-77) phase was subdivided into Part 1 (Alternative Demolition Schemes) and Part 2 (Implementation Procedure for Phase II). Part 1 has been completed and Part 2 is now in the final stages. [The report describes the three phases of the project and the progress made to date.] (Au)

## RANSOM, J.A.N.

See: 197.

## RAPLEY, C.G.

850
**Observations of sea ice and icebergs from satellite radar altimeters** / Rapley, C.G.
(Proceedings on Frontiers of Remote Sensing of the Oceans and Troposphere from Air and Space Platforms Symposium, Shoresh, Israel, May 14-23, 1984. – Huntsville, Ala. : George C. Marshall Space Flight Center, 1984, p. 527-536, ill.)
References.
*ASTIS document number 178357.*

Satellite radar altimeters can make useful contributions to the study of sea ice both by enhancing observations from other instruments and by providing a unique probe of ocean-ice interaction in the Marginal Ice Zone (MIZ). The problems, results and future potential of such observations are discussed. (Au)

## RAWSON, R.F.

See: 388, 389, 468, 624.

## READ, G.H.

See: 154.

## REDDY, A.S.

See: 281, 475.

## REDDY, D.V.

851
**Dynamic response of moored semisubmersible to bergy bit impact, irregular wave, wind, and current forces** / Reddy, D.V. Muggeridge, D.B. Swamidas, A.S.J. Arockiasamy, M. Murray, J.J. EL-Tahan, H.W. Hsiung, C.C.
(Fourteenth Annual Offshore Technology Conference 1982, proceedings. – Dallas, Tex. : Offshore Technology Conference, 1982, v. 4, p. 537-556, ill.)
(OTC paper, 4425)
References.
*ASTIS document number 163929.*
ACU, NFSMO

The paper describes initial studies on the motion and structural response of a typical semisubmersible to wind, wave, current and bergy bit impact forces. The semisubmersible is idealized as a space frame model, and the deck discretized using equivalent stiff beam elements and distributed member weights. Pierson-Moskowitz Davenport spectra are used for wave and wind forces respectively. The 100-year design criteria are based on available environmental parameters in the Hibernia region. Response to simulated wave excitation on a 1 to 70 model, in the wave tank at Memorial University of Newfoundland, agree well with the calculated values; wind and current forces are applied as static loads in the model. (Au)

852
**Monte Carlo simulation of iceberg impact probabilities** / Reddy, D.V. Arockiasamy, M. Cheema, P.S. Riggs, N.P.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 293-297, ill.)
References.
*ASTIS document number 164160.*
ACU, NFSMO

This paper presents a formulation for determining the uncertainties in the prediction of iceberg impacts with offshore structures at a particular location using a Monte Carlo simulation. Empirical Bayesian estimates of the probabilities of the TOP event (defined as the impact of an iceberg with an offshore structure) are made using a fault tree analysis. An available computer code, based on fault tree analysis, has been adapted for calculation of the iceberg impact probabilities. The procedure indicated for obtaining the uncertainties of prediction of iceberg impact with offshore structure can be used also when cut sets of current, wind, wave, and storm data are available instead of the drift angles. (Au)

853
**Simulation of iceberg shapes and their impact probabilities** / Reddy, D.V. Cheema, P.S.
(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. – Quebec City, Quebec : Universite Laval, 1981, v. 3, p.1381-1392, ill.)
References.
*ASTIS document number 163880.*
NFSMO, ACU

This paper presents the simulation of above-water and below-water iceberg profiles, and a formulation for determining the probabilities of iceberg impact. Both procedures are based on the Monte Carlo method. The parameters used for shape simulation are the the ratios: draft/height, draft at maximum below-water width/total draft, and below-water volume/above-water volume. For the impact problem, empirical Bayesian probability estimates are obtained using a Fault Tree analysis. (Au)

854
**Viscoelastic analysis of calving glaciers** / Reddy, D.V. Bobby, W. Arockiasamy, M. Dempster, R.T.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 37-41, figures, table)
References.
*ASTIS document number 61042.*
ACU, NFSMO

Calving of floating ice shelves is studied by a viscoelastic finite-element analysis. ... The bulk and shear moduli of the ice are represented by relaxation functions of the Prony series, which is a discrete relaxation spectrum composed of a constant and a summation of exponential terms. ... Numerical results are presented for various calving mechanisms. A computer code, VISICl, is developed by modifying a finite-element viscoelastic code, VISICE, for floating ice islands. The buoyancy of the water is taken into account by a Winkler spring model, with the spring force determined from displaced volume. Locations of crack initiation obtained from the analysis are used to predict the iceberg size immediately after calving. (Au)

**See also:** 139, 140, 377, 996.

## REDFIELD, W.C.

855
**Ice in the North Atlantic** / Redfield, W.C.
(Memoir of the dangers and ice in the North Atlantic Ocean / G.W. Blunt. – Washington, D.C. : [s.n.], 1868, p. 12-19, 1 map (folded))
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179990.*

The dangers of ice to navigation and the trend of polar-ice drifting are discussd on the basis of observations dating back to 1832. Ship reports on ice conditions are reproduced, including location of the ice, its extent, types, iceberg characteristics, and difficulties encountered. The effects of polar currents and the Gulf Stream on the drift and distribution of ice are examined in detail. Ice conditions in the North Atlantic from 1737-1859 are mapped. (AB)

## REED, G.N.

**See:** 107, 108.

## REEH, N.

856
**Calving from floating glaciers : reply to Professor F. Loewe's comments** / Reeh, N.
(Journal of glaciology, v. 8, no. 53, June 1969, p. 322-324)
This is a reply to a discussion of ASTIS document number 171883, On the calving of ice from floating glaciers and ice shelves / N. Reeh in Journal of glaciology, v. 7, no. 50, 1968, p. 215-232.
References.
*ASTIS document number 171620.*
ACU, NFSMO

In this reply to Loewe's comments on his original paper, Reeh addresses specific points which were used to dispute his original views on calving from floating glaciers. (ASTIS)

857
**On the calving of ice from floating glaciers and ice shelves** / Reeh, N.
(Journal of glaciology, v. 7, no. 50, 1968, p. 215-232, ill.)
Reviewed by ASTIS document number 171638.
References.
*ASTIS document number 171883.*
ACU, NFSMO

The deformation and the state of stress in the frontal part of a floating glacier is analysed by a method analogous with the beam theory, applied in engineering practice for determining stresses and deflections of a beam of an elastic material. Very rough approximations are made, the most severe being that of assuming the viscosity of the ice constant. Curves showing the progress in time of the deflections and the stresses in the frontal part of the glacier are given for the case of an infinitely wide glacier. The curves show, that the stresses are greatest at a cross-section situated at a distance of about the thickness of the glacier from the front, and that the stresses are of a magnitude which very likely will lead to fracture, resulting in the formation of an iceberg. It is shown that the magnitude of the icebergs as well as the frequency of the calving is a function of the thickness, the density, and the temperature of the glacier. Observations from nature supporting the theory are described. Finally other calving mechanisms for floating glaciers are briefly discussed. (Au)

## REIMER, E.M.

See: 638, 894.

## REMOTEC APPLICATIONS

858
**An assessment of impulse radar as an iceberg draft measurement tool** / Remotec Applications.
St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, 1982.
vi, 47 p. : figures ; 28 cm.
(C-CORE publication, no. 82- 8)
(Contract report – Memorial University of Newfoundland. Centre for Cold Ocean Resources Engineering)
Appendices.
References.
*ASTIS document number 113492.*
ACU, NFSMO

The potential use of impulse radar in iceberg draft measurement has been critically reviewed. The report includes a review of all pertinent theory and a description of a specific operational system developed by C-CORE. On theoretical grounds the airborne impulse radar system should be capable of sounding 250 meters of glacial ice, actual measurements to date have not exceeded 83 metres. It appears that the primary limitation on system performance may be the shape of a berg both above and below water. (Au)

## RENDELL, C.M.

See: 1111, 1113, 1115.

## RICHTER, S.

See: 1124.

## RIDGWAY, G.

859
**[Digging eastern Canada]** / Ridgway, G.
(Offshore engineer, 1980 [ 7] July, p. 51-57, ill., photos.)
Contents: Scrambling for environmental data on "The North Sea with icebergs" / G. Ridgway. – Caution the order of the day after initial euphoria over Hibernia. – Dome thrives on Beaufort challenge.
*ASTIS document number 49034.*
ACU, NFSMO

Players among Canada's community are concentrating on three offshore regions – the Beaufort Sea, the Atlantic off Newfoundland and Labrador, and the High Arctic islands. Development concerning the former two, which include research and development and production proposals, are reported .... (Au)

## RIDINGS, T.

See: 897.

## RIGGS, N.P.

860
**Iceberg drift observations in Lancaster Sound** / Riggs, N.P. Thangam Babu, P.V. Sullivan, M.A. Russell, W.E.
(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 283-291, ill., maps)
References.
*ASTIS document number 164151.*
ACU, NFSMO

... This paper is a report on some interesting findings issuing from a study of iceberg drift conducted by NORDCO during the summer of 1978 for Petro-Canada in support of planned drilling operations in Lancaster Sound. Specifically, the microscale trajectories of 10 selected icebergs are examined in relation to the environmental factors of current, wind, and the movement of storm systems. ... It appears that the present results, particularly some very unusual looping motions in the iceberg tracks, may be related to large scale turbulence generated by a sudden increase in currents in proximity to a coastline. The increase in current speed itself appears to result from the passage of a strong storm through the study area. ... (Au)

861
**The response of icebergs to ocean currents** / Riggs, N.P.
St. John's, Nfld. : Faculty of Engineering and Applied Sciences, Memorial University of Newfoundland, 1977.
26 leaves : ill. ; 28 cm.
References.
*ASTIS document number 163317.*
NFSMO

... The purpose of the present research is to uncover the response of almost submerged floating objects to a system of changing ocean currents such as that at Saglek. Of particular interest is the proposed investigation of the drag force experienced by a ventilated object in an accelerated current field which in the ocean is far more the rule than the exception. It is intended to accomplish this by means of a laboratory modelling study and the application of appropriate fluid dynamical theory. ... [This progress report discusses the theoretical background for the proposed work.] (Au)

862
**Tactical iceberg management I – detection and surveillance** / Riggs, N.P. Buckley, T.J.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 36)
Abstract only.
*ASTIS document number 155098.*
NFSMO

Practical surveillance and detection techniques and procedures, both for individual drilling station control and for regional control, are described. Emphasis is placed on the use of detection technology which is at present considered to be "state of the art" for year round marine operations in the North Atlantic. This will include marine radar, aircraft and marine surveillance, communications and navigation. The philosophy and objectives of surveillance are discussed, as applied to anchored drilling stations, those utilizing pure dynamic positioning, and, also, as they are applied to regional surveillance operations. Emphasis will be placed on the interface between marine/drilling operations and the surveillance system and on how the two effectively interact to minimize downtime. Normally encountered problems and difficulties will be addressed and there will be discussion of ongoing work to effect improvement of systems and enhancement of performance. (Au)

**See also:** 175, 440, 852, 904, 906, 944, 945.

## RINK, H.J.

863
**Danish Greenland, its people and products** / Rink, H.J.
London : H.S. King & Co., 1877.
xvii, 468 p., 16 leaves of plates : 1 map (folded).
Appendix: 1. On the glaciers and the origin of the floating icebergs. 2. Meteorology. 3. Geology and mineralogy. 4. Vocabulary of Eskimo words and names. 5. Antiquarian notes. 6. Miscellaneous notes (on population statistics, prices of Greenland wares, navigation). 7. Synopsis of the Greenland flora. 8. Synopsis of the Greenland fauna.
Translation, with some change and improvements, of Gronland, geografisk og statistisk beskrevet, Kjobenhavn, 1857; edited by Dr. Robert Brown.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179094.*

History, physical geography, temperature and geology of Greenland; its plant and animal life and economic activities; the Eskimos, their intellectual culture and Eskimo sketches of life in Greenland; Danes in Greenland, Danish trade and public institutions; districts and trading stations; with illustrations by Eskimos. (AB)

864
**Nogle bemaerkninger om indlandsisen og isfjeldenes oprindelse [Some remarks on the inland ice and the origin of their icebergs]** / Rink, H.J.
(Meddelelser om Gronland, bd.???, hefte 8, 1889, p. 271-279)
Summary in French.
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179108.*

Remarks on the origin of inland ice, and on divergent opinion concerning the rupture of glaciers and the formation of icebergs. (AB)

865
**Om indlandsisen of om frembringelsen af de svommende isfjaelde (efter de seneste iagttagelser) [On the inland ice and the formation of floating icebergs (according to the latest information)]** / Rink, H.J.
(Geografisk tidsskrift, bd. 1, 1877, p. 112-119, maps)
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179124.*

Contains descriptions of (1) Greenland icebergs, of calfing, "udskydning" (i.e. violent break-up), the quantity and distribution of icebergs; (2) ice fiords, inland ice; and (3) Jakobshavn Ice Fiord (in detail). (AB)

## RO, C.-U.

**See:** 811.

## ROBE, R.Q.

866
**Height to draft ratios of icebergs** / Robe, R.Q.
(Proceedings of the Third International Conference on Port and Ocean Engineering under Arctic Conditions / Convened by D.C. Burrell and D.W. Hood. – Fairbanks, Alaska : Institute of Marine Science, University of Alaska, 1976, v. 1, p. 407-415)
References.
*ASTIS document number 172324.*
ACU, NFSMO

A study of height to draft ratios of icebergs near the Davis Strait reveals ratios which range from 1:1.28 to 1:110.56. ... In this study icebergs with the greatest height have the largest height to draft ratios. That is to say the draft for tall icebergs is proportionally less than for low bergs. ... The purpose of this study was to see if the above water shape of icebergs was related in a significant way to the height to draft ratios for those bergs. Height-to-draft ratios were obtained for a total of 30 icebergs. (Au)

867
**Iceberg climatology** / Robe, R.Q.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 1-25, ill.)
References.
*ASTIS document number 155225.*
NFSMO

This lecture is a general discussion of the source, drift and fate of the icebergs which are produced by the Greenland ice cap. The discussion begins with a general description of iceberg types and sizes with a comparison of Arctic and Antarctic icebergs. Icebergs originate by calving from the floating portion of glaciers and ice shelves. Sizes vary with the size and structure of the parent ice mass. The largest Arctic icebergs, at their source, are on the order of kilometers in length while the iceberg calved by the Antarctic ice shelves are on the order of 10's of kilometers in length. From their source in Greenland icebergs have been tracked by a satellite system known as ARGOS. It was found that icebergs drifting along the Greenland coast rarely exceed 0.20 m/s and a more common speed is less than 0.10 m/s. Icebergs follow a coastwise path northward off the west coast of Canada. The speeds of the southward drift are higher than the northward drift with speeds up to 0.80 m/s. Speeds of 0.40 m/s are quite commonly found on the southward drift. Icebergs eventually deteriorate through mechanisms which transfer heat from the surrounding water mass, the effects of radiation and heat transfer above water being secondary. Icebergs complete their journey in the waters of the Grand Banks of Newfoundland or the Labrador Sea. The severity of the iceberg threat in the northwest Atlantic varies widely from year to year. In 1972 over 1500 icebergs drifted south of 48 degrees North while just six years earlier not a single one did. (Au)

868
**Iceberg deterioration** / Robe, R.Q. Maier, D.C. Kollmeyer, R.C.
(Nature, v.267, no.5611, June 9, 1977, p. 505-506, ill.)
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1976. Bulletin – United States. Coast Guard, no. 61, 1976, p. 60-64, ill., map)
References.
*ASTIS document number 159522.*
NFSMO, ACU

A very large tabular iceberg was observed as it drifted north-east of the Grand Banks of Newfoundland during May and June 1976. ... Photographs were taken of a large number of icebergs during the

1976 flights of the International Ice Patrol ... Among the photographs obtained are a unique series of five taken of the same iceberg over a period of 25 d ... [Because of the unusual shape of the iceberg, it was easily tracked. Its deterioration and its drift track are reported.] (Au)

**869**

**Iceberg drift and deterioration** / Robe, R.Q.

(Dynamics of snow and ice masses / Edited by S.C. Colbeck. – New York : Academic Press, 1980, chapter 4, p. 211-259, ill., maps)

References.

*ASTIS document number 164046.*

ACU, NFSMO

... [This chapter discusses] ... Icebergs and Their Sources,... Global Drift Patterns, ... Local Iceberg Drift, ... Deterioration, [and] ... Future Trends in Research .... (Au)

**870**

**Iceberg tagging and tracking project 1974** / Robe, R.Q. Scobie, R.W. Hayes, R.M.

(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1974. Bulletin – United States. Coast Guard, no. 60, 1975, p. 17-20, ill.)

Appendix A.

References.

*ASTIS document number 166880.*

ACU, NFSMO

... This project provided average drift vectors for six icebergs in the Grand Banks of Newfoundland area over a period of three to six days. ... Comparisons could then be made by IIP between the observed drift values and those predicted by computer model. ... (Au)

**871**

**Long-term drift of icebergs in Baffin Bay and the Labrador Sea** / Robe, R.Q. Maier, D.C. Russell, W.E.

(Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada / Edited by W.E. Russell. Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980, p. 183-193, ill., maps)

References.

*ASTIS document number 164089.*

ACU, NFSMO

During January and February 1978, six ADRAMS (Air Deployable Random Access Measurement System) ice buoys were dropped by parachute onto five icebergs, four in the vicinity of Cape Dyer, Baffin Island, and one northwest of Disko Island on the west coast of Greenland. These ice buoys transmitted a signal to the NIMBUS-6 satellite which could be used to compute position and local temperature. The ice buoys were tracked for periods which ranged from 138 days up to 202 days. The four icebergs along the Baffin Island coast were aground from 8% to 88% of the time observed. Maximum daily average speeds ranged as high as 0.60 m/s while modal speeds were generally less than 0.15 m/s. The drifts were generally coastwise in a southerly direction. The iceberg near Disko Island was aground 25% of the time observed and had a maximum daily average speed of up to 0.20 m/s with a modal value of between 0.05 to 0.10 m/s. The drift of this iceberg began erratically with the final 40 days strongly offshore toward the west. (Au)

**872**

**Long-term tracking of arctic icebergs** / Robe, R.Q. Maier, D.C.

[Groton, Conn.?] : U.S. Coast Guard Research and Development Center, 1979.

41p.

(Final report – United States. Coast Guard. Office of Research and Development, CGRT/DC- 8/79)

([Report] – United States. Coast Guard, USCG-D-36-79)

Also available on microfiche from NTIS.

References.

*Document not seen by ASTIS. Citation from MRIS.*

*ASTIS document number 40460.*

NFSMO

Seven Greenland icebergs were tracked, two in 1977 and five in 1978, using ADRAMS (Air-Deployable Random Access Measurement System) ice buoys. The ice buoys transmit a signal to the NIMBUS-6 satellite which is used in computing the buoy's position. ... two icebergs began near Disko Island, Greenland ... five began on the Baffin Island side of Baffin Bay near Davis Strait. The icebergs initially located near Disko Island did not appear to be influenced by any well-defined current system, the drift track of each was erratic and the drift speeds generally less than 0.20 m/s. The icebergs initially located along the coast of Baffin Island followed the prevailing currents southward. These icebergs drifted at speeds as high as 0.8 m/s with model speeds generally falling between 0.10 m/s and 0.20 m/s. Groundings occurred frequently, occupying 40 percent of the observed time. Data processing methods, accuracy of the ice buoy system, and a detailed analysis of each iceberg's drift is presented. It was estimated ... approximately 190 days are needed for an average size iceberg to travel the 1100 nautical miles from Cape Dyer, Baffin Island, to the outer limits of the Grand Banks of Newfoundland. (Au)

**873**

**Physical properties of icebergs : height to draft ratios of icebergs** / Robe, R.Q.

(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1975. Bulletin – United States. Coast Guard, no. 61, 1976, p. 70-77, ill.)

Appendix E.

References.

*ASTIS document number 166898.*

ACU, NFSMO

A study of height to draft ratios of icebergs near the Davis Strait reveals ratios which range from 1:1.28 to 1:10.56. The ratios of bergs dominated by their horizontal dimension average from 1:4.26 to 1:4.46. Bergs with a more vertical nature, such as pinnacle or drydock bergs, have ratios averaging from 1:2.31 to 1:2.41. The smallest ratios are found in domed bergs, which average 1:6.30. The highest berg studied was 59 meters high, and the berg with the greatest draft drew 161 meters. (Au)

**874**

**Physical properties of icebergs : total mass determination** / Robe, R.Q. Farmer, L.D.

(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1975. Bulletin – United States. Coast Guard, no. 61, 1976, p. 61-69, ill.)

Appendix D.

References.

*ASTIS document number 166901.*

ACU, NFSMO

Analysis of stereo pairs of twenty-two icebergs, in the region of Davis Strait, reveals that a reasonable estimate of total iceberg mass, in metric tons, can be arrived at by multiplying the gross dimensions of the icebergs (height x width x length) together and then multiplying this product by a factor of 3.01. This factor accounts for the density difference between seawater and fresh water ice; it also accounts for the average shape and mass distribution of icebergs. (Au)

875
**Physical properties of icebergs. Part I. Height to draft ratio of icebergs. Part II. Mass estimation of arctic icebergs** / Robe, R.Q. Farmer, L.D.
Washington, D.C. : Coast Guard [publisher] ; Springfield, Va. : NTIS [distributor], 1976.
1 microfiche : ill. ; 11 x 15 cm.
(NTIS AD-A-037 224)
Contents: Part I – Height to draft ratios of icebergs / R.Q. Robe. – Part II – Mass estimation of arctic icebergs / R.Q. Robe and L.D. Farmer.
References.
*ASTIS document number 177962.*
ACU

A study of height to draft ratios of icebergs near the Davis Strait reveals ratios which range from 1:1.28 to 1:10.56. The ratios of bergs dominated by their horizontal dimension, such as tabular or broken tabular icebergs, have average height to draft ratios of 1:4.46 and 1:4.26 respectively. Bergs with a more vertical nature, pinnacle or drydock bergs, have ratios averaging 1:2.31 and 1:2.41 respectively. The smallest ratios are found in domed bergs which average 1:6.30. If we assume that height to draft ratios of icebergs is characterized by a continuous distribution then using a Kruskal-Wallis one-way analysis of variance technique we can test the hypothesis that the average ratio of icebergs is not significantly different from gross visual shape classes. The result is that for the sample icebergs there is no significant difference. For summary purposes then the average of the averages (1:3.95) can be used as descriptive of the height draft ratio of icebergs regardless of visual shape class. Between the berg heights of 10 meter and 60 meters, which is the range of this sample, the height is related to the height to draft ratio by the power curve. Analysis of stereo pairs of twenty-two icebergs, in the region of Davis Straits, reveals that a reasonable estimate of total iceberg mass, in metric tons, can be arrived at by multiplying the gross dimensions of the iceberg (height x width x length) in meters together and then multiplying this product by a factor of 3.01. This factor accounts for the density difference between seawater and fresh water ice; it also accounts for the average shape and mass distribution of icebergs. (Au)

876
**Size frequency distribution of Grand Banks icebergs** / Robe, R.Q.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1976. Bulletin – United States. Coast Guard, no. 62, 1977, p. 58-59, ill.)
Appendix A.
References.
*ASTIS document number 166910.*
ACU, NFSMO

... During the 1976 IIP season a CA-14 aerial mapping camera was placed aboard the Ice Patrol aircraft for a period of 47 days. On these flights, a total of 104 icebergs and growlers were photographed. ... The frequency of icebergs versus horizontal cross-sectional area ... indicates a very strong peak for the small sizes. Icebergs less than 1,000 sq m (but greater than 10 sq m) account for 53 of the 104 icebergs in the sample. The frequency drops off rapidly as size increases. Icebergs in the interval 1,000 sq m to 2,000 sq m included only 12 icebergs and the range 2,000 sq m to 6,000 sq m 22 icebergs. Only 17 of the 104 icebergs were larger than 6,000 sq m. ... (Au)

877
**Tagging arctic icebergs** / Robe, R.Q. Ellis, T.S.
(Arctic bulletin, v. 2, no. 14, 1978, p. 329-333, ill.)
References.
*ASTIS document number 12785.*
ACU, NFSMO

Describes U.S. Coast Guard efforts in tracking icebergs, and the iceberg tether method of tagging icebergs for identification and relocation. (ASTIS)

878
**Tagging of arctic icebergs** / Robe, R.Q. Ellis, T.S.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1977. Bulletin – United States. Coast Guard, no. 63, 1978, p. A-1-A-8, ill.)
Appendix A.
References.
*ASTIS document number 166243.*
ACU, NFSMO

... drift and deterioration prediction require that many individual icebergs be studied over an extended period of time. These studies require that the researcher be certain he is working with the same bergs and not other icebergs in the same area. ... Over the years, IIP aircraft have repeatedly "bombed" bergs with dye to aid in their identification. This has limited utility because rolling and melting of the iceberg soon washes the color away. ... In 1974, the Coast Guard Oceanographic Unit began a project to determine the best way to tag an iceberg for identification and relocation. The first approach was to encircle a berg with a floating line .... of polypropylene .... Radar reflectors and a Radio Direction Finder transmitter were included as elements in the line. ... A similar experiment was carried out in 1976 (Brooks, 1977). After consultation with the Coast Guard, he used a much heavier line .... The array was tracked using the NIMBUS-6 satellite system, but no attempt was made to verify whether the iceberg remained with the transmitter. In 1975, the Coast Guard Research and Development Center tried a new approach to tethering an instrument package to a berg by using a large steel dart with a trailing line which attached to a floating instrument package. ... [The dart, line and instrument package are described.] ... (Au)

879
**Tagging of arctic icebergs : final report** / Robe, R.Q. Ellis, T.S. United States. Coast Guard. Office of Research and Development [Sponsor].
Springfield, Va. : National Technical Information Service, 1978.
iv, 12 leaves : ill., figures ; 28cm.
References.
*ASTIS document number 18066.*
ACU, NFSMO

An air-deployable iceberg tagging system has been developed for use from a C-130 aircraft. The system consists of a steel dart with a trailing buoyant line which can be attached to a floating instrument package. The system allows for considerable melting and rolling of the iceberg, but cannot survive calving in the vicinity of the dart. (Au)

880
**Upwelling by icebergs [discussion]** / Robe, R.Q.
(Nature, v.271, no.5646, Feb. 16, 1978, p. 687)
Review of ASTIS document 175080, Upwelling by icebergs / S. Neshyba in Nature, v. 267, no. 5611, June 9, 1977, p. 507-508.
*ASTIS document number 182290.*
ACU

Neshyba argues for the importance of iceberg melting below the thermocline in introducing nutrient rich water into the surface layer. I believe she overrates this effect. She assumes that icebergs melt as a single piece and does not even consider calving as part of the deterioration process. Icebergs that are protected from wave action by sea ice are observed to deteriorate little. Icebergs begin to undergo rapid deterioration when they emerge from the sea ice into

the open sea. Wave action progressively melts a groove at the waterline by turbulent mixing. I have observed these grooves to have a depth of up to 7-10 m. The sides of the iceberg then fail, producing a large number of small icebergs and 'growlers' and much fine brash. These small icebergs and growlers, which in most cases would be less than 30 m long and have a maximum draft of 20-23 m, are subject to the same erosional forces. Although no hard figures exist at this time, I would estimate that more than 80% of the melting of an iceberg takes place in a surface layer no deeper than 20 m which is in most cases shallower than the main thermocline. (Au)

**See also:** 403, 404, 502, 503, 906, 1040, 1041, 1085.

## ROBERTS, B.

**See:** 1124.

## ROBERTSON, F.P.

**881**
**Island design proposed for "iceberg alley" fields** / Robertson, F.P. Loire, R.
(Oil & gas journal, v. 79, no. 6, Feb. 9, 1981, p. 85-88, 93, ill.)
*ASTIS document number 161667.*
ACU, NFSMO

The article describes the design and associated costs of a man-made rock island (NORPEX) proposed for iceberg alley. The artificial island will provide a large platform above sea level and will resist icebergs. It could provide room for many direction wells, gas and oil separation, water injection and gas liquefication facilities, oil storage, living quarters for several hundred people, helioport berths for large tankers, and other facilities. (NFSMO)

## ROBERTSON, T.

**882**
**How they've mastered the iceberg menace** / Robertson, T.
(Maclean's magazine, v. 73, no. 7, 1960, p. 20-21, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180408.*
ACU

Outlines function of the Newfoundland-based International Ice Observation and Ice Patrol Service formed in 1914 to report iceberg hazards in the North Atlantic. The course of a typical berg is traced from the time its calving off the Greenland icecap to its destruction two years later off Labrador or Newfoundland. (AB)

## ROCHE, C.

**883**
**Iceberg tracking program Pointe Amour, Labrador, final report** / Roche, C. SNC-LAVALIN Newfoundland Limited [Sponsor].
viii, 71 p. : figures, tables, 28 cm.
(C-CORE publication, no. 80- 15)
(C-CORE publication. Technical report)
ISBN 0-88901-029-8.
Appendix.
*ASTIS document number 130427.*
NFSMO, ACU

A forty-four kilometer sector of the Strait of Belle Isle, centered on Pointe Amour, was monitored between June 1979 and June 1980 primarily to obtain a record of iceberg movements. Coverage of this area was maintained for 89 percent of the observation period using an X-band radar recorded by a 16 mm time-lapse camera. ... An estimate of the density of shipping moving through the Strait of Belle Isle was also obtained from the radar records. ... (Au)

**884**
**Pointe Amour iceberg tracking program** / Roche, C.
(C-CORE news, v. 6, no. 1, Apr. 1981, p. 8)
*ASTIS document number 172332.*
ACU, NFSMO

... A shore based radar installation, consisting of an X-Band marine radar and a 16 mm time lapse camera that was developed from the system C-CORE used on Gull Island (C-CORE News Vol. 4, no. 2), was used to obtain a twelve month record of iceberg movement and an estimate of the density of shipping from the lighthouse at Pointe Amour. ... (Au)

**See also:** 495, 733.

## ROCHELLE, W.R.

**885**
**Methods for protecting subsea pipelines and installations** / Rochelle, W.R. Simpson, D.M.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 253-269, ill.)
*ASTIS document number 149497.*
NFSMO

The hazards for subsea pipelines and installations are described. Methods currently being used to protect subsea pipelines and installations are discussed with the emphasis on various trenching methods and equipment. Technical data on progress rates for trenching and feasible depths of trench are given. Possible methods for protection against icebergs are discussed. A case for more comprehensive data on icebergs is presented. Should a pipeline become damaged, repair methods are noted. (Au)

## ROCHESTER, J.

**See:** 441.

## RODENWALD, M.

**886**
**Die Tendenzwende in der Eisberg-drift bei Neufundland = [Reversal trend in the iceberg drift near Newfoundland]** / Rodenwald, M.
(Meteorological and geoastrophysical abstracts, v. 27, no. 7, July 1976, p.1498)
Abstract only.
Published in: Freie Universitat Berlin. Institut fur Meteorologie und Institut fur Geophysikalische Wissenschaften, Meteorologische Abhandlungen, v. 1, no. 3, Mar. 1975, 3 p.
This paper is similar to one which appeared in the journal Wetterlotse, v. 329, no. 330, May/June 1974, p. 93-96 under the translated title of Trend-reversal of the Iceberg Frequency near Newfoundland.

*ASTIS document number 182150.*
ACU

The iceberg season of 1974 is examined in specific relation to the preceding years 1972 and 1973 and against the general trend in the annual number of icebergs in this century. The years 1972 and 1973 were marked by a total of 1587 and 843 icebergs; 1974 had 1334 icebergs. A decreasing trend in the annual number of icebergs has been evident since the beginning of this century. From a comparison of the iceberg season of 1974 with the seasons of 1972 and 1973 and of the antecedent circulation regimes of all three years, it is concluded that 1974 marks a reversal trend towards a period of increasing annual number of icebergs. (Au)

## RODMAN, H.

887
**Report of ice and ice movements in the North Atlantic Ocean** / Rodman, H.
Washington, D.C. : G.P.O., 1890.
26 p. : 12 charts, 4 maps (folded).
([Publications] – United States. Hydrographic Office, no. 93, 1890)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179612.*

Based on a special study made by Ensign Hugh Rodman, under orders from the Hydrographer, and carried out by observations and questionnaires to northern whalers, Newfoundland sealers, and others who spend the season in ice regions. Description of icebergs and field ice encountered in the North Atlantic on the Grand Banks of Newfoundland and nearby regions, a list of disasters due to ice, 1882-90; a table of average time of opening and closing of ports in the Maritime Provinces of Canada, and monthly charts of ice conditions on the Grand Banks, 1885. (AB)

## ROJANSKY, M.

888
**Open water ice-structure interactions** / Rojansky, M.
(Oceans '82, conference record. – New York : Marine Technology Society & Institute of Electrical and Electronics Engineers, 1982, p.1195-1200, figures)
References.
*ASTIS document number 131873.*
NFSMO

Prevailing environmental forces such as winds, waves, and currents, combined with the open water environment, make it possible for large ice floes or icebergs to acquire relatively high velocities (6 to 12 knots). ... This paper presents a systematic approach to the analysis of the open water, high speed ice-structure interactions. A numerical model is provided for the evaluation of the interaction forces and displacements. ...Finally, a single degree of freedom example is presented and pertinent design recommendations are derived. (Au)

**See also:** 452.

## ROSEBROOK, A.D.

889
**Oceanography of the Grand Banks region of Newfoundland April-August 1971** / Rosebrook, A.D.
Washington, D.C. : U.S. Coast Guard, 1974.
vi, 136 p. : ill. ; 28 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 60)
Appendix.
References.
*ASTIS document number 172472.*
ACU, NFSMO

Three cruises were conducted to the Grand Banks of Newfoundland during the 1971 International Ice Patrol season to determine the currents that affect the drift of icebergs. During a multiship survey in May, standard sections A2 and A3 were occupied concurrently on three different occasions separated by approximately 3 to 4 days. Calculated geostrophic volume transports at standard section A2 varied slightly between occupations, while sharp variations were observed at A3. Upwelling was observed at standard section A3 between the 20 May and 24 May occupations; a sharp decrease in volume transport resulted from the changes in the density structure observed along the continental slope. Direct current measurements made just west of the continental shelf break during the August post-season cruise showed an apparent tidal influence, while measurements along the western edge of the Labrador Current yielded current speeds of approximately one knot. (Au)

## ROSLYAKOV, V.N.

**See:** 832.

## ROSS, D.I.

**See:** 443, 444, 480.

## ROSSITER, J.R.

890
**Airborne radar sounding of arctic icebergs** / Rossiter, J.R. Narod, B.B. Clarke, G.K.C.
St. John's, Nfld. : C-CORE, 1979.
[24] p. : figures ; 28cm.
(C-CORE publication, no. 79- 10)
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 1, p. 289-305, figures)
Reviewed by ASTIS document numbers 172898 and 172901.
no=References.
*ASTIS document number 31798.*
ACU, NFSMO

Airborne radar was used in June 1978 to sound nine small-to-medium sized icebergs of various shapes near the coast of Labrador. Two different radar systems were used: a commercially developed monopulse system with a centre frequency of 80 MHz, and a glacier sounding radar operating at 840 MHz developed at the University of British Columbia. Each system was used from a Bell 206L helicopter, with the antennas mounted on the cargo hook next to the fuselage. Several passes were made over each iceberg at an altitude of 30 to 100 m above sea level. There was general agreement between results from the two radar systems. ... Airborne radar may offer a practical way to estimate quickly subsurface characteristics of icebergs. Simultaneous testing with other iceberg profiling techniques is required to validate its operational utility. (Au)

**891**

**Assessment of airborne imaging radars for the detection of icebergs** / Rossiter, J.R. Arsenault, L.D. Guy, E.V. Lapp, D.J. Wedler, E. Mercer, B. Dempsey, J. McLaren, E.J. Canpolar Consultants Ltd. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF [publisher] ; Calgary, Alta. : Pallister Resources Mgt. Ltd. [distributor], 1985.
xvii, 321 p. : ill. ; 28 cm.
(Environmental Studies Revolving Funds report, no. 016)
ISBN 0-920783-15-5.
Also available on microfiche.
References.
*ASTIS document number 184225.*
ACU, NFSMO

This experiment, named BERGSEARCH '84, was conducted ... to assess the capabilities of modern, airborne, imaging radars in the detection of icebergs in open water. ... [especially] growlers and bergy bits. ... three ... SLARs and two SARs [were assessed]. Ten major conclusions were reached in this study. 1. From the experiment the following estimates of average detectability for icebergs of various sizes were determined, both in significant wave heights below 2.9 m, and with comparison to available surface and airphoto information: Growlers (<100 sq m area) 10-50%, Bergy bits (100-300 sq m area) 60-80%, Small icebergs (300-2500 sq m area) 85-100%, Medium and large icebergs 100%. 2. ... target detectability (especially for growlers) increased with repeated passes. ... 3. Iceberg detectability decreased with increasing sea state, particularly for smaller targets. ... 4. Ships, icebergs, and small floes of sea ice generally do not display different radar target signatures on either SAR or SLAR analog imagery. ... 5. Smaller targets appeared to be more visible and to be more easily interpreted for lower-altitude SLAR passes. 6. Smaller icebergs, bergy bits, and growlers are slightly more likely to be detected looking in the crosswave direction. ... 7. Typical errors in positioning the aircraft of up to 5 km were found, which is probably inadequate for many offshore applications and for reidentification of targets. ... 8. The smallest iceberg targets are less than a single resolution cell in size for all the radars used. 9. Precipitation echoes were noted in 10-20% of the SLAR passes, but in few of the SAR passes .... 10. The dynamic range of scenes imaged is relatively high. ... Limited digital analysis carried out in this project showed that iceberg targets could be separated from ocean clutter on the basis of signal intensity 88% of the time with a 5% false alarm in sea states of 2-4 m. (Au)

**892**

**Detection of icebergs by airborne imaging radars** / Rossiter, J.R. Arsenault, L.D. Gray, A.L. Guy, E.V. Lapp, D.J. Ramseier, R.O. Wedler, E.
(Proceedings of the Ninth Canadian Symposium on Remote Sensing, August 14-17, 1984, St. John's, Newfoundland / Edited by S.M. Till and D. Bajzak. – Ottawa : Canadian Aeronautics and Space Institute, 1984, p. 39-47, ill.)
References.
*ASTIS document number 176753.*
NFSMO

Five airborne imaging radar systems, three real-aperature Side-looking Airborne Radars (SLAR) and two Synthetic Aperature Radars (SAR), were used during April 1984 to detect icebergs in open water. Surface truthing by a ship was supplemented by air photographs as weather permitted. This paper presents a preliminary interpretation of results. Percentage of detection was low (0-30%) for growlers, and increased to near 100% for medium and large icebergs. Detectability decreased with increasing sea state. Best detectability of small targets was cross-wave. Pass-to-pass variability in detectability was less than approximately ± 10%. Detectability using SLAR was somewhat better at lower altitudes. The radar targets of icebergs on imagery was small and hence easily missed or mistaken. No reliable method for discriminating between icebergs, ships, and sea ice has been uncovered using analogue imagery. (Au)

**893**

**Determination of iceberg underwater shape with impulse radar** / Rossiter, J.R. Gustajtis, K.A.
(Desalination : comprising the second volume of the proceedings of the First International Conference on Iceberg Utilization for Fresh Water Production, Weather Modification, and Other Applications, Iowa State University, Ames, Iowa, October 2-6, 1977, v. 29, no. 1-2, Apr.-May 1979, p. 99-107, ill.)
(C-CORE publication, no. 77- 24)
References.
Paper presented at International Confoerence and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, Oct. 2-6, 1977.
*ASTIS document number 162957.*
ACU, NFSMO

The measurement of iceberg underwater dimensions and features will be essential for safe and effective choice, preparation, and transportation of icebergs. An iceberg's subsurface shape affects its deterioration, its form drag, and its strength. Short pulse radar echo-sounding methods can be used to sound icebergs since polar fresh-water ice is highly transparent to radio signals. Available radar equipment can be used either from an aircraft or from the iceberg surface, and can provide reliable, easily interpreted, real-time results. These systems can measure iceberg thickness and can provide information about inhomogeneities, such as crevasses, but further work is required to be able to estimate subsurface shape. (Au)

**894**

**Iceberg detection by airborne radar** / Rossiter, J.R. Arsenault, L.D. Gray, L. Lapp, D.J. Ramseier, R.O. Reimer, E.M. Wedler, E.
(Offshore resources, v. 2, no. 2, Mar./Apr. 1984, p. 61)
*ASTIS document number 170577.*
ACU, NFSMO

Icebergs pose significant danger to both shipping and oil and exploration/production in areas off Canada's East Coast. Various airborne imaging radar systems, both real-aperture Side-looking Airborne Radar (SLAR)and Synthetic Aperture Radar (SAR), are being used operationally to detect icebergs. However, no data exist to determine (1) the limits of detectability for small pieces of ice under varying wind/sea conditions; and (2) optimum parameters for iceberg detection. The major gap in present data is lack of concurrent radar imagery and surface truth information. An experiment is being conducted during Spring 1984, under the auspices of the Canadian Environmental Studies Revolving Fund, to collect simultaneously airborne imagery and surface data of icebergs in open water. ... Surface truth will be provided by a dedicated vessel to record details of oceanographic, meteorologic and iceberg parameters and to collect close-up photography. High resolution and aerial photography will also be taken as weather permits. ... (Au)

**895**

**Iceberg sounding by impulse radar** / Rossiter, J.R. Gustajtis, K.A.
(Nature, v.271, no.5640, Jan. 5, 1978, p. 48-50, ill.)
(C-CORE publication, no. 77- 14)
References.
*ASTIS document number 5029.*
ACU, NFSMO

Knowledge of an iceberg's draft is essential for assessing its risk to

underwater installations, in predicting its drift, and for estimating its total bulk. Because of the highly irregular shape of icebergs, it is impossible to estimate an iceberg's draft directly from its above-water dimensions. Large tabular icebergs have been sounded using radio techniques. We report here that estimates of the draft of irregularly-shaped icebergs can also be obtained from the air quickly and accurately using short-pulse radar. A small iceberg in Twillingate Harbour, Newfoundland (49:40N, 54:46W) was sounded from a helicopter using impulse radar, on 11 June 1977. The result was verified by simultaneous measurement of the iceberg's draft using side-scan sonar. ... (Au)

**896**
**Radar cross-sections of two cold icebergs** / Rossiter, J.R. Currie, B.W. Lewis, E.O.
(Iceberg research, 1985, no. 11, Oct., p. 5-9, ill.)
References.
*ASTIS document number 183636.*
ACU, NFSMO

Radar cross-sections (sigma o) for two cold (below freezing and dry) icebergs were determined from S-band to Ka-band at local incidence angles of 24 degrees and 15 degrees. Values for sigma o range from −18 to −5 db. Depolarization appears strong so that cross-polarized values are only a few db below like-polarized. A slight increase in HH values of sigma o with radar frequency is suggested, but there are too few data points to verify any scattering mechanisms. (Au)

**897**
**Study of sea ice using impulse radar** / Rossiter, J.R. Langhorne, P. Ridings, T. Allan, A.J.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 1, p. 556-567, figures, table)
(C-CORE publication, no. 77- 15)
References.
*ASTIS document number 132152.*
ACU, NFSMO

Although sea ice presents one of the most serious obstacles to ocean engineering under Arctic conditions, techniques to measure and monitor its properties, such as thickness and strength, are still being developed. This ability is particularly important since the properties of sea ice vary dramatically both spatially and temporally. Impulse radar has been used by several researchers to study sea ice and icebergs .... The technique is being used routinely in the Arctic to measure ice thickness variations, although the electrical properties of the ice must be known in order to obtain an absolute thickness estimate. This paper presents results from studies made of first year fast ice near Newfoundland. Particular attention is given to estimating the electrical properties of ice using impulse radar. The complex reflection coefficient from the ice surface is determined using Fourier techniques, and this approach is a promising first step toward quick remote estimates of the electrical properties of sea ice in situ. These properties are significant, since both the electrical and the mechanical properties of sea ice are dominated by the influence of its brine volume fraction. (Au)

**See also:** 739.

## ROTH, E.

**See:** 315.

## ROYAL COMMISSION ON THE OCEAN RANGER MARINE DISASTER (CANADA)

**See:** 682, 791.

## ROYAL, R.W.

**See:** 501.

## RUCK, C.G.

**See:** 495.

## RUDDIMAN, W.F.

**898**
**The mode and mechanism of the last deglaciation : oceanic evidence** / Ruddiman, W.F. McIntyre, A.
(Quaternary research, v. 16, no. 2, 1981, p. 125-134, ill., maps)
*ASTIS document number 172308.*
ACU

... The most recent deglaciation provides a unique opportunity to compare the timing of meltwater and iceberg flow into the North Atlantic Ocean against that of ice-margin retreat and revegetation of North American and Scandinavia. In this paper we compare all of these C-dated records in order to deduce the nature of ocean/ice/atmosphere interactions during major deglaciations. (Au)

## RUFFMAN, A.

**899**
**Iceberg draft measurements off eastern Canada** / Ruffman, A.
(Iceberg research, 1983, no. 5, July p. 20-21)
*ASTIS document number 157708.*
ACU, NFSMO

Geomarine Associates will again be measuring iceberg height, draft and at times shape, for at least one of the two oil company operators off Labrador in 1983. Geomarine has done this in 1980 for PetroCanada, in 1982 for Canterra and in 1983 for PetroCanada. All drill rigs in the "iceberg alley" off Labrador maintain this capability on one of their rig supply boats for that part of the season when icebergs are present. Iceberg draft is measured using side-scanning techniques on an opportunity basis or whenever a berg approaches the drilling site. The concern is that if the berg forces a disconnect of the riser and departure of the drillship that the iceberg might have a deep enough draft to catch the blowout preventer if it is left on the hole. ... (Au)

**900**
**Of bergy bits and growlers** / Ruffman, A.
(Science, v.192, no.4234, Apr. 2, 1976, p. 7)
*ASTIS document number 160032.*
NFSMO, ACU

The article briefly discusses the problems encountered in ice infested waters with bergy bits and growlers, and the difficulty in detecting these small pieces of ice. (NFSMO)

## RUSSELL-HEAD, D.S.

**901**

**The melting of free-drifting icebergs** / Russell-Head, D.S.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 119-122, figures)
References.
*ASTIS document number 61166.*
ACU, NFSMO

Blocks of ice with the proportions of tabular icebergs have been observed melting in water of different temperatures and salinities. ... The melt rates obtained in the laboratory for icebergs in water of a low temperature match those inferred from population studies of Antarctic icebergs. The melt rate is proportional to the water temperature above the onset of freezing raised to the power 1.5 and melt rates at 18 deg. C are likely to be greater than one metre per day. (Au)

## RUSSELL, W.E.

**902**

**Current studies in the Labrador Current with respect to the motion of icebergs** / Russell, W.E.
St. John's, Nfld. : Memorial University of Newfoundland, 1973.
iv, 71 p. : ill. ; 28 cm.
Thesis (M.Eng.) – Memorial University of Newfoundland, St. John's, Nfld., 1973.
Appendix.
References.
*ASTIS document number 163244.*
NFSMO

Currents were measured in an area of the Labrador current off the Coast of Newfoundland. The measurements were made at four stations over a period of three days. ... The currents were found to be rotary in a clockwise direction. A comparison with theory showed that the near-surface currents were of an inertial nature ... A curve was constructed showing the form of the correlation between the rotary currents at different depths at one of the stations. ... A study of measured iceberg tracks showed that the loops sometimes made by icebergs would quite possibly be caused by inertial current effects. One particular track which included several loops was examined in detail. ... Geostrophic current profiles were constructed for a line near our research area. The oceanographic data used were obtained through ... [a number of sources.] ... It was hypothesized that a significant inertial current could result from a geostrophic current if the driving force behind the geostrophic current disappeared. (Au)

**903**

**Design aspects of offshore production platforms due to iceberg impact** / Russell, W.E. Bobby, W. Arockiasamy, M. Muggeridge, D.B.
[S.l. : s.n., 1984?].
18 leaves : ill. ; 28 cm.
Paper presented at the Specialty Conference on Computer Methods in Offshore Engineering, Halifax, N.S., 1984.
References.
*ASTIS document number 178004.*
NFSMO

One of the requirements in the design of an offshore production platform is an understanding of the physical environment and interaction with the platform. Extreme values of various environmental parameters need to be known, which must include icebergs in the North West Atlantic as a unique feature in the design of platforms. In this paper, two examples of iceberg structure interaction are presented as illustrations. Certain aspects of iceberg-concrete platform interaction and bergybit-submersible interaction are presented. (Au)

**904**

**Design parameters for sea ice and icebergs for offshore drilling/production systems** / Russell, W.E. Muggeridge, D.B. Riggs, N.P.
(Proceedings of the Eighth Canadian Congress of Applied Mechanics, Moncton, June 7-12, 1981. – [S.l. : s.n., 1981], p. 129-130)
*ASTIS document number 163821.*
NFSMO

Designers must consider the problems of sea ice and icebergs for offshore drilling systems. The paper briefly covers the important issues to be considered. (NFSMO)

**905**

**Iceberg Dynamics Symposium, June 4 and 5, 1979, St. John's, Newfoundland, Canada** / Russell, W.E. [Editor]. Newfoundland Oceans Research and Development Corporation [Sponsor].
St. John's, Nfld. : NORDCO, 1980.
[143] p. : ill., maps ; 27 cm.
(Cold regions science and technology, v. 1, no. 3 and 4, Feb. 1980)
Assistance provided by U.S. Coast Guard and Dept. of Industrial Development, Province of Newfoundland and Labrador.
References.
*ASTIS document number 168866.*
ACU, NFSMO

... The theme of the symposium, ICEBERG DYNAMICS, was intended to encompass all phenomena related to the motion of icebergs. Participants included scientists and engineers who had contributed to the understanding of the physical nature of iceberg drift and to the development of concepts or systems related to both utilization of icebergs and to protection of structures from iceberg impact. ... (Au)

**906**

**Local iceberg motion – a comparison of field and model studies** / Russell, W.E. Riggs, N.P. Robe, R.Q.
(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p. 784-798, ill.)
References.
*ASTIS document number 153800.*
ACU, NFSMO

This paper describes a joint research effort in the area of local iceberg drift, comprising a field study and the first stages in the construction of a workable and valid laboratory model. In the field study conducted by the United States Coast Guard, two icebergs were tracked for a number of days during June 1977 while drogues were used to measure currents in the vicinity. Iceberg mass estimates were made and underwater profiles were obtained. Other environmental factors such as wind velocity were measured. The technique is described and preliminary results are presented, including iceberg-drogue relative drift both for depth integrating drogues and shallow and deep drogues. The laboratory model is being constructed at Memorial University of Newfoundland and some tests have been made using spherical and cubical semi-immersed objects. The relevant fluid dynamical and modelling theory is discussed, and the experimental approach is described. Some drag coefficients in a restricted range of Reynolds Numbers

have been measured. Improvements to the model based on input from the field study are suggested. (Au)

907
**Protection of Hibernia production transportation systems from icebergs** / Russell, W.E. Purcell, G.J. Bobby, W.
(Iceberg Management in Offshore Exploration, Production and Transportation. – [St. John's, Nfld. : Memorial University, Faculty of Engineering and Applied Science, 1982], p. 163)
Abstract only.
*ASTIS document number 155144.*
NFSMO

The Hibernia field is situated some 165 n.m. east of St. John's, Newfoundland in 90 m of water. It is estimated to contain 1.9 million barrels of recoverable oil and 1.5 trillion cubic feet of recoverable solution gas and 0.5 trillion cubic feet of recoverable non-associated gas. Several alternatives exist for the production and transportation systems. The options are primarily between concrete gravity based platforms or floating semi-submersible platforms for production, and pipelines and tankers for transportation. The greatest environmental problem associated with these systems is icebergs. For each option, the iceberg problem must be identified and solutions must be found. The more significant of these are briefly summarized .... (Au)

**See also:** 140, 208, 434, 860, 871.

## RYAN, J.P.

908
**Electric dipole fields over a quarter space earth inhomogeneity and application to ice hazard detection** / Ryan, J.P. Walsh, J.E.
(Radio science, v. 20, no. 6, Nov.-Dec. 1985, p.1518-1528)
References.
*ASTIS document number 177989.*
ACU

An analysis of the fields generated by an electric dipole over a quarter space earth inhomogeneity is carried out. The results of this analysis have a particular application to the long-range detection of ice hazards such as multiyear ice, pressure ridges and icebergs. Navigation through Arctic regions and exploration in ice-infested waters are severely limited by the inability of conventional microwave marine radar to provide adequate detection capability. The analysis is based on a method of space and electric field decomposition in which Heaviside functions are used to decompose a three-dimensional space into regions having different electical properties. The region above impedance=0 represents free space and the region below represents two semi-infinite homogeneous media. Maxwell's equations are used to derive a partial differential equation for thee electric field for thee complete space. This partial differential field equation is decomposed into three field equations, one for each region, and a boundary equation. The boundary equation represents the conditions which the electric field must satisfy at each of the interfaces. In this manner, this technique provides its own boundary conditions. Selecting the appropriate spherical Green's function, the reesultant convolution type integral equations are simplified by using the boundary equation to eliminate half of the unknowns and taking the two-dimensional (spatial) Fourier transform. By assuming the refractive indices of the media below are large and taking the source field as the far field of a vertical electric dipole, the three field equations are reduced to a single algebraic equation. This equation is inverse Fourier transformed, and the resultant convolution integral equation is written in operation notation. The operator is formally inverted in the form of a Neumann series. By utilizing stationary phase integration and the Laplace transform, the series may be summed to give either the propagated field or the backscattered field. (Au)

909
**Iceberg detection capability, part I and II** / Ryan, J.P. Newfoundland and Labrador. Petroleum Directorate [Sponsor].
[St. John's, Nfld. : Petroleum Directorate, 1983].
2 v. (62; 19 leaves) : ill. ; 28 cm.
Part I revised 1985.
Appendices.
References.
*ASTIS document number 183474.*
ACU

The growing exploration activity offshore Newfoundland and Labrador in recent years has focused attention on a problem which has plagued navigators for many more years, that of iceberg detection. Industry, government and the university community have all been seeking solutions to this problem and as the result of diversified efforts it appears that a general solution to the problem may be available within the next five years. This two part study has been undertaken to ascertain present ice hazard detection capability. Part I includes an evaluation of existing and market available marine radar for their iceberg detection capability. Part II provides a survey of ongoing research in this field with reference to the goals, achievements and time frame for planned developments. (Au)

**See also:** 1063, 1064.

## SABATINI, R.R.

**See:** 951.

## SABBAGH, E.N.

**See:** 922.

## SABINS, F.F.

**See:** 217.

## SAKAI, F.

**See:** 593.

## SALISBURY, R.D.

910
**The Greenland Expedition of 1895** / Salisbury, R.D.
(The Journal of geology, v. 3, Nov.-Dec. 1895, p. 875-902, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179132.*
ACU

Descriptions, based on the author's observations, (made largely from the Kite during the trip to return Peary) on the coastal topography, the glaciers, evidence of previous glaciation, and evidence of recent uplift on the Greenland coast from Holsteinborg (67 N) to Inglefield Gulf, with notes on the Ellesmere and Baffin Island glaciers, and remarks (in full) of the icebergs of Baffin Bay and the

waters of North Greenland. (AB)

## SANDERSON, B.G.

**911**

**The cross-channel flow at the entrance of Lancaster Sound** / Sanderson, B.G. LeBlond, P.H.

(Atmosphere-ocean, v. 22, no. 4, Dec. 1984, p. 484-497, ill.)

References.

*ASTIS document number 182605.*

ACU, NFSMO

A westward current flows along the northern side of Lancaster Sound and an eastward current flows along the southern side. A cross-channel flow is commonly observed to link them near the eastern entrance of Lancaster Sound; this flow is modelled assuming inviscid flow and conservation of potential vorticity. It is shown that the westward decrease in depth is sufficient to cause a cross-channel flow that couples the inflow to the outflow. The modelled cross-channel flow takes place at a distance inside the entrance that is less than that observed for the surface current. Obviously stratification reduces the coupling of the surface current to the bathymetry. A more realistic result is obtained with the barotropic model if the bottom slope is halved. An inviscid mean barotropic flow out of the channel is also modelled and found to be concentrated on the southern bank in order to conserve potential vorticity. It seems that barotropic instability and friction would limit the narrowing of the flow. [The cross-channel is very evident in the drogue, current-flow pattern observed meter and iceberg tracks observed in 1978 and 1979 at the entrance of Lancaster Sound.] (Au)

**912**

**A Lagrangian description of drifter dispersion** / Sanderson, B.G.

Stony Brook, N.Y. : State University of New York, Marine Sciences Research Center, 1982.

xx, 197 leaves : ill. ; 29 cm.

Thesis (Ph.D.) – State University of New York, Stony Brook, N.Y., 1982.

Appendices.

References.

*ASTIS document number 183997.*

This dissertation investigates the usefulness of the Lagrangian form of the advection-diffusion equation for describing two-dimensional drifter dispersion in inland and coastal seas. The relative motion of particles is described by treating such motion as having deterministic and turbulent components. An approximate solution to the two dimensional advection-diffusion equation, with linear and nonlinear velocity gradients is obtained by considering a perturbation of the analytical solution for the Lagrangian form of the first order (only linear velocity gradients) advection-diffusion equation. Expressions for the first and second moments of a diffusing patch are found and interpreted physically. These results explain previously observed errors in dispersion predicted by the first order advection-diffusion equation. A method is developed that allows the dimensions and orientation of a drogue cluster to be accurately calculated from the initial cluster statistics and a time series of instantaneous Lagrangian deformations and diffusivities using the solution of the first order advection-diffusion equation. ... Significant correlations between displacements caused by different order Lagrangian deformations are found. The Lagrangian form of Richardson's equation is extended to consider linear Lagrangian deformations. The effect of first order Lagrangian deformations on neighbor diffusivities is calculated. Deviations from the four-thirds power law are not solely attributable to linear Lagrangian deformations. Some speculations are made about how neighbor diffusivities should be measured. (Au)

**913**

**Summer surface circulation and iceberg drift and dispersion at the junction of Lancaster Sound and Baffin Bay** / Sanderson, B.G. LeBlond, P.H.

(EOS (Washington), v. 64, no. 45, Nov. 8, 1983, p. 696)

(Iceberg research, 1983, no. 6, Nov., p. 21)

Abstract only.

*ASTIS document number 179914.*

ACU

A simple description of the reentrant intrusive flow at the junction of Lancaster Sound and Baffin Bay is presented. Intrusive flow into Lancaster Sound, along its northern side, has both baroclinic (coastline following) and barotropic (isobath following) components. This intrusive flow is deflected across and out of the sound (along its southern side), possibly by the relatively fresh water in the sound. From given data sets the surface circulation and iceberg motion can be divided into a deterministic component on which are superimposed temporally and spatially fluctuating features of a more stochastic nature. The predictability of iceberg movements is investigated for flow fields characteristic of time intervals of various lengths. Iceberg motion is assumed to be stationary (but not homogeneous) over these intervals, and iceberg dispersion (representative of the variability of trajectories) is calculated from the field of motion using both a solution of the Lagrangian diffusion equation (Okubo et al in prep.) and from the correlation coefficients that characterize a nonhomogeneous flow (Sanderson and Okubo in prep.). We examine the relative benefit gained by various levels of effort in monitoring the field of motion. (Au)

## SANDERSON, T.

**See:** 426.

## SAULESLEJA, A.

**914**

**Meteorological conditions and their impacts over the Northwest Atlantic in the 1970's** / Saulesleja, A. Phillips, D.W.

(Aquatic sciences and fisheries abstracts. Part 1. Biological sciences & living resources, v. 14, no. 1, Jan. 1984, p. 304)

Abstract only.

Paper published in Symposium on Environmental Conditions in the Northwest Atlantic during 1970-79. Science Council Studies. NAFO, no. 5, 1982, p. 17-32.

*ASTIS document number 180637.*

ACU

The decade of the 1970's was a period when anomalies or extremes in meteorological conditions had significant impacts on fisheries and other activities in the Northwest Atlantic. Higher wind speeds were more frequent, low pressure centers were fewer but deeper, and the winter circulation around the Icelandic Low was more intense than in the previous decade. Precipitation increased over eastern Canada in the last part of the decade, and record wet periods in 1979 and 1980 had a detrimental effect on the fishing industry in Newfoundland and Nova Scotia. Although recent global air temperatures indicate a warming trend, a cooling trend persisted over stations in the North Atlantic. Severe ice conditions off Newfoundland in the first half of the decade played havoc with the spring fishery, and record numbers of icebergs in the Grand Bank area presented great danger to ships operating in and crossing the region. (Au)

## SAYER, M.

915
**An evaluation of an optical technique for iceberg detection – I** / Sayer, M.
[Kingston, Ont. : Queen's University, Dept. of Physics], 1978.
6 p. ; 28 cm.
References.
*ASTIS document number 163350.*
NFSMO

[The paper considers two models for detection of icebergs, the first using the volume of light passing into the water via an iceberg, the second using scattered laser light for underwater ice detection.] The models considered on the basis of estimated parameters for arctic seawater do not suggest that a practical system for optical detection of icebergs could be implemented. The detection limit appears to be in the range of 100 to 200 m, a range which is likely to be insufficient for tanker operations and probably one where alternative methods of detection provide reliable data. (Au)

## SCHELL, I.I.

916
**Foreshadowing the severity of the iceberg season south of Newfoundland** / Schell, I.I.
(Bulletin – American Meterological Society, v. 21, Jan. 1940, p. 7-10)
Bibliography.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179140.*

Discussion of formulae defining relationships between oceanic circulation and severity of iceberg season, using the period 1927-39 as a test for the relative merits of the formulae. (AB)

917
**Further notes on foreshadowing the severity of the iceberg season south of Newfoundland** / Schell, I.I.
Woods Hole, Mass. : Woods Hole Oceanographic Institution [publisher] ; Springfield, Va. : NTIS [distributor], 1950.
1 microfiche : ill. ; 11 x 15 cm.
(Reference series – Woods Hole Oceanographic Institution, no. 50- 15)
References.
Partial contents: Comments on Schell, I.I. : On foreshadowing the severity of the iceberg season south of Newfoundland / Floyd M. Soule.
*ASTIS document number 161705.*
NFSMO

Considering only the transportation facilities afforded bergs during their final season's travel from Davis Strait along the Labrador coast to Newfoundland, and assuming that these facilities are provided by the atmospheric circulation, the author has aimed several indicators of this circulation and has related them to the number of bergs appearing in Newfoundland waters the following spring and summer. A strong outflow of air from the Arctic was considered to have been indicated directly by the baromtric pressure difference between Belle Isle and Ivigtut, and indirectly by the pressure drop from Bergen to Stykkisholm and by the air temperatures at Bermuda and Uppsala, and at St. John's with negative sign. The data exaimed covered the periods of the last 67 years for the Belle Isle-Ivigtut difference and the last 70 years for the other indicators. Each indicator was exaimed for the period as a whole and for the first and last halves of the period. The Bergen-Stykkisholm data showed a poorer relationship during the second half than during the first half, as did the St. John's data, while the Uppsala data showed an improving relationship. The author used the expression: + 0.13 delta (Belle Isle-Ivigtut) – 0.27 delta (St. John's) + 0.25 delta (Bermuda) + 0.17 delta (Uppsala) to give the departures from normal (4.8) of the iceberg crop on a scale of 10. ... When applied to the seasons of 1927 through 1949 this formula results in computed values which depart from observed values by 1.0 or more in 12 of the 23 years. Of those 12 cases 7 agree as to the sign of the computed and observed departures from normal. Thus, while this cannot be regarded as a forecast method there is some improvement over the Smith formulae. [Comments by Floyd M. Soule]. (Au)

918
**On the distribution of icebergs in the Northern Hemisphere with special reference to south of Newfoundland** / Schell, I.I.
(Proces-verbaux des seances, t. 2 : Travaux de la Commission de la Neige et des Glaciers. – [Oslo : General Assembly], 1948, p. 19-21)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180041.*

From iceberg counts off Newfoundland, 1880-1948, and observations off East Greenland and north of Siberia, drifting bergs in north polar waters are found more numerous in recent years, and this is attributed to widespread warming releasing them from the fiords and bays. In Baffin Bay and Davis Strait, however, bergs are freed by factors not directly related to pressures and temperatures in the North Atlantic; this affects berg distribution off Newfoundland, and complicates prediction of iceberg conditions in that area. Circulation of waters and bergs west of Greenland should also be studied in relation to the Newfoundland situation. (AB)

919
**On the iceberg severity off Newfoundland and its prediction** / Schell, I.I.
(Journal of glaciology, v. 4, no. 32, June 1962, p. 161-172, ill.)
References.
*ASTIS document number 163392.*
NFSMO, ACU

An analysis of the iceberg count off Newfoundland for the period 1880-1925 shows that stronger than usual north-westerly winds off the Labrador and Newfoundland coasts and relatively low temperatures over Newfoundland during the months from December to March lead to greater than average berg counts off Newfoundland in the following months, mainly April to June. Conversely, lighter than usual north-westerly winds and relatively high temperatures lead to lower than average berg counts in the following months. The relative strength of winds can be measured by the pressure difference between Belle Isle and Ivigtut. The relationship investigated provides a basis for predicting the berg count each year at the end of March. A comparison of the computed values of the berg count with the actual values on scale 0 to 10 for the following period 1927-61 shows marked agreement. It is further indicated that a more detailed representation of the winds, temperatures and other elements during the winter and early spring in that general area would lead to a closer relationship with the berg count and a broader basis for its prediction. (Au)

920
**On the iceberg severity off Newfoundland and its prediction each year** / Schell, I.I.
Medford, Mass. : Tufts University, 1960.
13 p : ill., charts.
(Tufts University meteorological studies)
Mimeograph copy.
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180203.*

Investigates fluctuation, 1879-1960, in number of icebergs crossing 48 N lat. southward. Correlations were found between the wind strength and direction during the months preceding the iceberg season (measured by mean pressures, Dec.-Mar. between Belle Isle and Ivigtut, Greenland); the air temperatures at St. John's, Newfoundland; and the berg count. Strong northwesterly winds pushed the icebergs southeast; weak northwesterly or east winds caused a drift towards the Labrador and Newfoundland coasts. (AB)

**921**

**The problem of the iceberg population in Baffin Bay and Davis Strait and advance estimate of the berg count off Newfoundland** / Schell, I.I.

(Journal of glaciology, v. 2, no. 11, Mar. 1952, p. 58-59)
(Contribution - Woods Hole Oceanographic Institution, no. 594)
References.
*ASTIS document number 162825.*
ACU, NFSMO

The iceberg population in Baffin Bay and Davis Strait is little known, yet it is intimately connected with the problem of the advance estimation of the berg count off Newfoundland ... A recent formula providing such an estimate at the end of March is based primarily on the December-March pressure gradient between Labrador (Belle Isle) and southernmost Greenland (Ivigtut) ... The significant measure of the unresolved discrepancy between the computed and actual deviations [of berg estimates] is probably due to no provision in the formula for direct information on (1) speed, direction and temperature of the Labrador Current, (2) the iceberg population to the north from which the berg concentration off Newfoundland is recruited and (3) wastage of the bergs also by warm rains and winds. To remedy the lack of information about the Labrador Current, a regular program of observations of the volume and temperature of the current was begun some years ago by the U.S. Coast Guard. ... To obtain adequate information on the iceberg population north of Newfoundland, censuses over a number of years in succession would probably be needed before their value in estimating in advance the severity of the iceberg season off Newfoundland could properly be assessed. In addition to counting the number of icebergs in different sectors of Baffin Bay and Davis Strait, and deducing their movements from the presence of certain concentrations a year or two later, closer information about their actual drift once they break off the glaciers and leave the fjords is desirable. ... (Au)

**922**

**Recent climatic changes in the eastern North American subarctic** / Schell, I.I. Corkum, D.A. Sabbagh, E.N.

(Alaska Science Conference, 24th, "Climate of the Arctic", Fairbanks, AK, 1973. - Fairbanks, Alaska : University of Alaska, 1975, p. 76-81, maps)
References.
*ASTIS document number 176494.*
NFSMO

An analysis of the iceberg count, mainly April-June months, off Newfoundland during the period 1921-1970 showed a sharp decrease in the number of bergs crossing 48 degrees N, from an average of 435 bergs per year in the 1921-50 period (470, 419, 418 respectively in the first, second, and third decades) to 240 in the 1951-60 and to 150 in the 1961-70 decades. The decrease was associated with a decrease in the strength of the December-February northwesterly winds along the Labrador and Newfoundland coasts ... and also a decrease in the winds farther north, causing fewer bergs to drift southward with the Labrador Current. ... (Au)

**923**

**Stability and mutual compensation of relationships with the iceberg severity off Newfoundland** / Schell, I.I.

(Transactions - American Geophysical Union, v. 33, no. 1, Feb. 1952, p. 27-31)
Bibliography.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179680.*
ACU

"Previous studies of different authors show that a relationship exists between the air pressure gradient, Labrador-south Greenland and the iceberg severity off Newfoundland. The author gives a physical interpretation and makes a stability test of this relationship. Other relationships are examined. A formula, based on data prior to 1927 and considering four factors, is derived with r=0.80. This formula is tested for the period 1927-1951. A good agreement is found, especially for years with a small number of icebergs." (AB)

## SCHMIDT, W.F.

**See:** 405.

## SCHOENTHALER, L.

**924**

**Grand Banks ice scour catalogue** / Schoenthaler, L.

[S.l. : s.n., 1985].
[3] leaves ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166553.*

On behalf of the Hibernia joint venture participants, (Chevron, Gulf Canada, Petro-Canada, Columbia Gas and Mobil (operator)) Mobil has compiled a Grand Banks ice scour catalogue using information from wellsite surveys, pipeline surveys, Bedford Institute regional reconnaissance survey data and C-CORE survey data. This presentation will briefly describe the ice scour catalogue. ... Objectives of our cataloguing efforts were: (1) Determine the areas where surveys exist (2) Catalogue scours to be used as base for statistical calculations. Over the last six years Mobil has conducted many wellsite surveys on the Grand Banks, in and around the Hibernia field. The wellsite surveys are conducted over relatively small areas around prospective drillsites, and consist of survey lines laid out in a grid pattern with spacing between 250 and 1000 metres. As a result, large quantities of bathymetric, sub-bottom profiler and sidescan data have been gathered. This data, used as the starting point for establishing our computer based ice scour catalogue, was augmented with pipeline surveys, and regional survey data. (Au)

**925**

**Mobil Oil ice scour model studies** / Schoenthaler, L.

[S.l. : s.n., 1985].
[5] leaves : ill. ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 163597.*

... [This paper describes] some of the work that Mobil has been doing in the last several years with regard to iceberg scour modelling. ... [The] ultimate objective is to develop, verify and define an analytical model capable of fully describing iceberg motion. ...[The first feature required was] the facility to input the shape of the iceberg, as a simple or complex form. The second key

feature was that the iceberg motion should be modelled in the free floating mode as well as in the scouring mode. The last requirement for the model was that the environmental conditions and the soil resistance functions should be capable of being defined by the user. ... (Au)

## SCHOLANDER, P.F.

926
**Bubble pressure in Greenland icebergs** / Scholander, P.F. Nutt, D.C.
(Journal of glaciology, v. 3, no. 28, Oct. 1960, p. 671-678, ill.)
References.
*ASTIS document number 177636.*
ACU, NFSMO

A simple technique for measuring the pressure in individual bubbles of gas in glaciers is described. By this technique, bubble pressures in twenty-six west Greenland icebergs were measured. The bubbles were for the most part tabular in shape and oriented parallel, lending a fibrous and sometimes stratified appearance to the ice. Various suggestions are offered for the formation of these bubbles. Most bubbles had a pressure of 4-5 atmospheres, and pressures as high as 20 atmospheres were recorded. In closely adjacent bubbles differences of 2-5 atmospheres were often measured, which indicated diffusion tightness and lack of plasticity in the ice. When the ice surface melts, the bubbles expand at the cost of water extrusion. The various factors contributing to the maintenance of vertical walls characteristic of tabular bergs are discussed. (Au)

927
**Composition of gas bubbles in Greenland icebergs** / Scholander, P.F. Hemmingsen, E.A. Coachman, L.K. Nutt, D.C.
(Journal of glaciology, v. 3, no. 29, 1961, p. 813-822, ill., maps)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180505.*
ACU

Reports investigation of the volume and composition of gases enclosed in glaciers ranging from Thule south to Brede Fjord. The gas composition deviated appreciably from that of air, and varied within each piece of ice. Undisturbed ancient atmospheric air was not encountered in the Greenland samples. Gas bubbles analyzed from crack fills in icebergs had a high oxygen concentration, sometimes almost matching that of air-equilibrated ice-cold water, from which they originated. Bubbles in blue ice, also analyzed, revealed frequently an elevated oxygen concentration. (AB)

928
**Gases in icebergs** / Scholander, P.F. Kanwisher, J.W. Nutt, D.C.
(Science, v.123, no.3186, Jan. 20, 1956, p. 104-105)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180009.*
ACU

Contains results of studies on pieces of icebergs taken on board the research vessel Blue Dolphin along the Labrador coast during 1954. Most bergs in this area are of Greenland origin. A piece of ice was melted in mercury. The gas phase and the dissolved gases in the melt water were analyzed separately and the results were totaled. Thirty pieces taken from six different bergs were analyzed; the oxygen content in all of the bergs is close to that of the atmosphere, 20.9 percent. Bubbles in the icebergs were found to be under 2-6 atm. pressure. The combined accuracy of the various measurements is estimated to about ± 0.2 percent by volume for the total oxygen and nitrogen. The pressure estimates are probably valid to within ± 25 percent. (AB)

929
**Micro gasometric determination of dissolved oxygen and nitrogen** / Scholander, P.F. Van Dam, L. Claff, C.L. Kanwisher, J.W.
(Biological bulletin, v.109, no. 2, Oct. 1955, p. 328-334, ill.)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179892.*
ACU

Contains description of apparatus and method for determination of oxygen (and nitrogen) in one cu. cm. of water. It is claimed to be superior to the Winkler method for certain purposes, and has been used successfully in determination of gases in icebergs. This work was developed in part on the Blue Dolphin Labrador Expedition in 1954. (AB)

930
**Radio-carbon age and oxygen-18 content of Greenland icebergs** / Scholander, P.F. Dansgaard, W. Nutt, D.C. De Vries, H. Coachman, L.K. Hemmingsen, E.A.
26 p. : ill., map.
Copenhagen : [Comittee for Scientific Research in Greenland], 1962.
(Meddelelser om Gronland, bd.165, nr. 1, 1962, ill., maps)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180343.*
ACU

Contains further results of the Arctic Institute Greenland Expedition of 1958 (No. 60592). One radiocarbon dating was obtained from CO2 in the gas enclosures in the melting of 6-16 tons of ice from 11 West Greenland icebergs. Melt water was also sampled for O-18 determinations. Age of the ice ranged from recent to over 3000 yrs., the oldest ice having the least O-18, i.e. having been formed at the lowest temperatures. Most samples originated fairly near the coast; overall rate of movement, calculated from age and distance, ranged 110-270 m/yr., figures in agreement with other estimates. Simultaneous C14 and O-18 determinations may yield valuable flow information, especially if applied to single drainage systems. Operations were carried out aboard the Norwegian sealer Rundoy; C14 and the O-18 determinations were made at the Univ. of Groningen and the Univ. of Copenhagen, respectively. (AB)

**See also:** 796, 798.

## SCHRODER, H.

**See:** 974.

## SCHULTZ, G.

931
**Icebergs and their voyages** / Schultz, G.
New York : William Morrow and Company, 1975.
95 p. : ill., maps ; 25 cm.
ISBN 0-688-22047-9.
*ASTIS document number 178349.*

Today icebergs are still sovereigns of the sea. ... Here a geographer, known for her writings about cold regions, tells of their role in the

past and speculates on what it could be in the future. The book begins by describing the origin of icebergs – how they calve from glaciers, plunging straight down into the water, or break off from thick ice shelves. Then it discusses the sources of icebergs throughout the world, their routes of travel, and what happens to them along the way. Further chapters report on present attempts to control and use icebergs and outline the plan to tow them to warm, water-short coastal regions, where they can serve as fresh-water reservoirs. ... (Au)

## SCHULTZ, R.H.

**See:** 935.

## SCHWERDTFEGER, P.

**932**

**Iceberg oscillations and ocean waves** / Schwerdtfeger, P.

(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 63-65, figures)

Reference.

*ASTIS document number 61085.*

ACU, NFSMO

The frequencies of both linear and angular oscillations in a vertical plane of a floating iceberg are shown to converge as the horizontal dimensions become relatively larger. ... (Au)

**933**

**On icebergs and their uses : a report to the Australian Academy of Science** / Schwerdtfeger, P.

(Cold regions science and technology, v. 1, no. 1, June 1979, p. 59-79, ill., figures, maps, tables)

References.

*ASTIS document number 24740.*

ACU, NFSMO

Various properties of icebergs have been reviewed in the light of water requirements, both existing and potential, in sub-tropical lands. ... Some aspects of iceberg dynamics and thermodynamics have been discussed and the concept of icebergs being valuable sources (or rather sinks) of energy in addition to their being reservoirs of fresh water has been put forward. ... [The paper includes aspects of iceberg towing and mooring operations.] (Au)

## SCOBIE, R.W.

**934**

**International Ice Patrol operations 1972 – Why so many icebergs?** / Scobie, R.W.

(Symposium on Environmental Conditions in the Newfoundland Grand Bank Area in 1972 and their Effects on Fishery Trends. Special publication – International Commission for the Northwest Atlantic Fisheries, no. 10, 1975, p. 79-93, ill.)

References.

*ASTIS document number 163120.*

NFSMO

The paper discusses the environmental conditions present for 1972, and relates the data to the 1972 high iceberg count. (NFSMO)

**935**

**Oceanography of the Grand Banks region of Newfoundland March 1971-December 1972** / Scobie, R.W. Schultz, R.H.

Washington, D.C. : U.S. Coast Guard, 1976.

viii, 306 p. : ill. ; 28 cm.

(Oceanographic report – United States. Coast Guard, no. CG 373- 70)

Appendices.

References.

*ASTIS document number 170720.*

ACU, NFSMO

Results of oceanographic surveys off the Grand Banks of Newfoundland from April through June 1972 in support of International Ice Patrol and twelve occupations of Standard Sections A1-A4 are discussed. Analysis includes vertical temperature and salinity profiles for each section as well as dynamic-topographic charts for each Ice Patrol survey. Normal dynamic topography charts of the Grand Banks region are updated. Results are similar to those obtained by Soule (1964). Finally there is a discussion of the oceanographic and meteorological conditions which caused more icebergs to drift south of 48 N in 1972 than in any previous year in Ice Patrol history. These conditions include iceberg supply, wind, currents, wave/sea ice, sea temperatures, air temperatures, and precipitation. It is concluded that the single most important factor effecting these conditions is the location and intensity of the Icelandic low. (Au)

**See also:** 502, 761, 870, 1085.

## SCORESBY, W.

**936**

**An account of the arctic regions, with a history and description of the northern whale-fishery, Jun.** / Scoresby, W.

Edinburgh, Scotland : Printed for A. Constable & Co., 1820.

2 v. (xx, 551, 82 p.; viii, 574 p.), 15 plates (4 folded) : ill., 4 maps (3 folded).

Appendices: v. 1. Meteorological tables (daily, Apr. or May-July, 1807-1818, with remarks and analyses). Chronological list of voyages, 861-1819. Table of latitudes and longitudes in Spitzbergen and Jan Mayen, derived chiefly from original surveys. Catalog of plants found in Spitsbergen. State of wind and weather, Aug.-May, 1633-34, on Jan Mayen. v. 2. Acts of Parliament regarding whaling; dimensions of whaling ships; apparatus, crews, signals, weight and measure of oil, and variation of compass.

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 179159.*

Nineteenth century classic on whaling, geography and natural history of northern waters. Contains in v. 1, chap. 1. Remarks on the existence of a sea-communication between the Atlantic and Pacific Ocean; with an account of the progress of discovery. Chap. 2. Descriptive account of some of the polar countries. Spitsbergen and adjacent islands including Hope Island, and Jan Mayen. Chap. 3. Hydrographical survey of Greenland Sea. Chap. 4. Account of the Greenland or polar ice. Kinds of ice, formation, icebergs, seasonal changes, including Davis Strait, properties, movement, drift, and effects of ice on atmosphere and sea. Chap. 5. Observations on the atmospherology; particularly relating to Spitsbergen and the adjacent Greenland Sea. Chap. 6. Sketch of the zoology: whales, seals, polar bears, reindeer, birds, Amphibia, fishes, Crustacea and later forms. Vol. 2, chap. 1. Chronological history of the northern whale fisheries. Chap. 2. Comparative view of the origin, progress, and present state of the whale-fisheries of different European nations. Chap. 3. Situation of the early whale-

fishery. Chap. 4. Account of the modern whale-fishery as conducted at Spitsbergen, Chap. 5. Account of the Davis' Strait whale-fishery; and a comparison with that of Greenland, with statements of expenses and profits of a fishing ship. Chap. 6. Method of extracting oil and preparing whalebone. Chap. 7. Narrative of proceedings on board of the ship Esk, during a whale-fishing voyage to the coast of Spitsbergen, 1816. (AB)

## SCOTT POLAR RESEARCH INSTITUTE

937
**Iceberg research** / Scott Polar Research Institute.
Wadhams, P. [Editor]. Josberger, E.G. [Editor].
Vol. 1, no. 1 (May 1982)-
Cambridge : Scott Polar Research Institute, 1982-
v. : ill. ; 30 cm.
Irregular: 3 to 4 issues per year.
References.
*ASTIS document number 157643.*
ACU, NFSMO

... To create a forum for these disparate investigations and for the exchange of ideas among the widely scattered groups of people involved in iceberg research, we have started ICEBERG RESEARCH with initial funding from Office of Naval Research. It is meant to be an informal newletter, and we welcome contributions from anyone interested in icebergs. The contributions may consist of:... reports on work done. ... abstracts of paper to appear. ... highlighting of problem areas ... discussion of issues raised in previous articles. ... digests of data sources on icebergs. ... discussions of peripheral issues ... announcements or summaries of meetings. ... We hope that in this way the body of iceberg researchers may become a closer community and that the active interchange of ideas and results may promote a more rapid advance in iceberg science and technology. ... (Au)

## SEACONSULT MARINE RESEARCH LTD.

938
**A study of predictive iceberg drift in Labrador waters** / Seaconsult Marine Research Ltd. Hodgins, D.O. Helbig, J.A. Petro-Canada [Sponsor].
[Vancouver, B.C. : Seaconsult Marine Research Ltd., 1982].
Unpublished report.
*Document not seen by ASTIS.*
*ASTIS document number 183750.*

## SEBASTIANI, G.

See: 342.

## SECHER, A.

939
**Mod med isfjelde. Fra min grondlandske skitsebog [Encounters with icebergs. From my Greenland sketchbook]** / Secher, A.
(Gronland, v. 9, Sept. 1967, p. 297-307, ill.)
Text in Danish.
*ASTIS document number 183776.*
ACU

The author describes, by prose and illustration, icebergs encountered in the Davis Strait. (ASTIS)

## SELING, T.V.

940
**Sensitive microwave radiometer detects small icebergs** / Seling, T.V. Nance, D.K.
(Electronics, v. 34, no. 19, May 12, 1961, p. 72-75, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180351.*

Describes U.S. Coast Guard experiences in developing a method better suited than radar for detecting icebergs from aircraft. The difference in apparent temperature between ice and the sea (about 100 C) was utilized in designing the comparison radiometer. Equipment and test results are described showing that bergs (in particular growlers) which may not be visible to radar, make good targets for a radiometer. (AB)

## SELMER, F.

See: 621.

## SEN, D.

See: 174.

## SHARPLES, B.M.

941
**Operational risks in a harsh environment – the human element** / Sharples, B.M. Jack, R.L. Miller, B.L.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 303-309, ill.)
*ASTIS document number 178012.*
NFSMO

This paper contends that the causes of offshore accidents are mainly under human control. A hostile environment need not necessarily increase the total level of risk. Patterns of risk and their orders of magnitude are shown. ... A giant iceberg drifting in 25 m (80 foot) high waves in front of 40 m/sec (80 knot) winds towards a producing oilfield is a nightmare concept. Although the consequences could be disastrous, the risk (defined as probability x consequence) is very small. The probability of those environmental conditions occurring without protection, or correct disconnection procedures being activated in time, are almost negligible. This is because the problems have been recognised, and suitable operational procedures and protection can be provided. It is more likely that a major accident would result from a chain of apparently minor causes or incidents which combine to form a hazardous situation. In these cases the first links in the chain may not be noticed as being significant until too late. The most serious of these factors is likely to be human error. ... (Au)

## SHEA, D.

942
**Marine Traffic Analysis Project Cape Norman, Strait of Belle Isle : project number MOB 82-2, project report** / Shea, D.
St. John's, Nfld. : Vessel Traffic Services, Canadian Coast Guard, 1983.
3 v. (about 620 leaves) : ill., maps ; 28 cm.
Appendices.

*ASTIS document number 167177.*
NFSMO

The need for site specific information is inherent with any waterway assessment. ... The Strait of Belle Isle is an important access for domestic and foreign vessels to and from Canadian ports. Though a traffic separation scheme has been in existence for many years very little is known about vessel movements in the Strait. The Cape Norman site afforded an excellent view of a critical area of vessel movement in the Strait of Belle Isle [and the opportunity to] ... collect data on ... icebergs, and weather. ... The data was collected using the Mobile VTS Unit [in the summer of 1982.] ... Upon completion of data collection, ... an analysis of the data was performed. ... (Au)

## SHIL'NIKOV, V.I.

**943**
**Accuracy of iceberg height measurements** / Shil'nikov, V.I.
(Soviet antarctic expedition information bulletin, v. 6, 1966-67, p. 579-581, ill.)
Reference.
*ASTIS document number 176605.*
NFSMO

The paper gives a number of formulae for measuring the height of variously shaped icebergs. (NFSMO)

## SHIRASAWA, K.

**944**
**The drift of a number of idealized model icebergs** / Shirasawa, K. Riggs, N.P. Muggeridge, D.B.
(Cold regions science and technology, v. 10, no. 3, Nov. 1984, p. 19-30, ill.)
References.
*ASTIS document number 150584.*
ACU, NFSMO

Dimensionless solutions for the equations of motion are introduced as an aid to understanding the movement of spherical and cubical semi-immersed objects during deceleration. Laboratory experiments show that such objects initially move under the action of a drag force that is proportional to the speed of the object, then enter a transition to a final stage where the drag force is proportional to the square of the speed of the object. Frictional and form drag coefficients are obtained by postulating that the product of the initial speed and the time constant for any one object is a constant. The approach and analysis presented in this study should provide insight regarding the probable behaviour of an iceberg under the action of various environmental forces. (Au)

**945**
**An experimental study to investigate the drift of a number of idealized iceberg models** / Shirasawa, K. Riggs, N.P. Muggeridge, D.B.
[St. John's, Nfld. : Memorial University of Newfoundland, Faculty of Engineering and Applied Science], 1983.
i, 62 leaves, ill. ; 28 cm.
References.
*ASTIS document number 161683.*
NFSMO

The non-dimensionalized solutions for the equations of motion are introduced as an aid to understanding the movement of spherical and cubical semi-immersed objects during deceleration. Laboratory experiments show that the objects initially move under the action of a drag force that is proportional to the speed of the object, then enter a transition stage to a final stage where the drag force is proportional to the square of the speed of the object. Frictional drag and form drag coefficients are obtained by postulating the relationship that the product of the initial speed and the time constant for any one object is a constant. The approach and analysis presented in this study should provide insight regarding the probable behaviour of an iceberg under the action of various environmental forces. (Au)

## SHUBOW, L.

**946**
**Iceberg dead ahead!** / Shubow, L.
Boston : Bruce Humphries, 1959.
203 p. : ill.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180122.*

Narrative of four months' service "some years ago" as a crew member of the U.S. Coast Guard cutters Tampa and Modoc in the North Atlantic International Ice Patrol. (AB)

## SHUCHMAN, R.A.

**See:** 388, 389, 624, 672.

## SHULENBERGER, E.

**947**
**Water-column studies near a melting arctic iceberg** / Shulenberger, E.
San Diego, Calif. : Natural History Museum [publisher] ; Springfield, Va. : NTIS [distributor], 1981.
(NTIS AD-A108 304)
References.
*ASTIS document number 177881.*
ACU

Glacial icebergs contain large amounts of nitrate, an important phytoplankton nutrient. Low density iceberg meltwater, in rising, mixes with euphotic zone water nearby, wherein NO3 is in low concentration. Rising meltwater may also entrain nutrient-rich deeper waters and raise them to sunlit depths. Sixteen vertical profiles of nutrients (PO4, NO3, SiO2), chlorophyll-a, and physical parameters were taken near a Greenland iceberg at approximately 50 N, 50 W in May-June 1980. Chlorophyll profiles show very pronounced maxima at or just below the maximum rate of change of water density vs. depth; profile forms are heterogeneous (no "typical" form is evident). No enhancement of chlorophyll concentration was found re distance from or direction to the iceberg. Effects of mixing on NO3 concentrations are marginally detectable, but no 'wake' or 'downward' effects were observed. The iceberg does not appear to grossly perturb water column plant biology nearby, but measures of rates of productivity might show otherwise, particularly near larger (e.g. Antarctic) icebergs. (Au)

## SHVEDE, E.E.

**948**
**Aisbergi severozapadnoi Atlantiki [Icebergs in the northwest Atlantic]** / Shvede, E.E.
(Okenaologiia, v. 6, no. 4, 1966, p. 608-614, ill., map)
References.
English summary.
Text in Russian.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180564.*

Describes the icebergs in Baffin Bay, Davis Strait and adjacent areas, their size, number and forms. Attention is directed to the determination ratio of height above sea level to the submerged part.

Seadragon studies and other American data are examined. The results are close to M.V. Lomonosov's theoretical calculations that the ratio is up to 1:5. More measurements are needed however for final conclusions. (AB)

949
**Icebergs of the northwest Atlantic** / Shvede, E.E.
(Oceanology, v. 6, no. 4, 1966, p. 499-504, ill., map)
References.
*ASTIS document number 162833.*
NFSMO, ACU

The article briefly reviews the source of icebergs found in the North Atlantic. Their size, shape and direction of drift are also reviewed. A study of icebergs by submarine has determined their underwater shape. From the data, ratio of draft to height of the berg has been determined. (NFSMO)

## SIMMS, A.

950
**Iceberg groundings east coast Canada 1973 - 1981** / Simms, A.
(C-CORE news, v. 8, no. 3, Nov. 1983, [front cover], map)
*ASTIS document number 171280.*
ACU, NFSMO

The map represents the percentage of observed iceberg groundings for 12 or more hours. This preliminary data was compiled from a selected set of wellsite observations recorded during regular drilling season (June - October) 1973 - 1981. ... Average iceberg flux for these areas is approximately 250 - 300 icebergs annually. (Au)

**See also:** 1111, 1113, 1114, 1115.

## SIMPSON, D.M.

**See:** 885.

## SINITSYN, V.L.

**See:** 210.

## SISSALA, J.E.

951
**Nimbus satellite data for polar ice survey** / Sissala, J.E. Sabatini, R.R. Ackermann, H.J.
(Polar record, v. 16, no.102, Sept. 1972, p. 367-373)
References.
*ASTIS document number 170780.*
ACU, NFSMO

Repetitive surveillance by polar-orbiting meteorological satellites can monitor the distribution, variability, and behaviour of sea ice in both Arctic and Antarctic regions. This article reviews some of the applications of Nimbus satellite data to the polar regions. ... (Au)

## SIVERTSON, W.E.

**See:** 358.

## SKOU, N.

**See:** 471.

## SLESSERS, M.

**See:** 201, 628.

## SMIRNOV, S.A.

**See:** 210.

## SMITH, D.A.

952
**Above the Arctic Circle** / Smith, D.A.
(American scholar, v. 39, no. 3, 1970, p. 434-444, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180610.*
ACU

Describes US Coast Guard cutter Southwind and its activites during the 1969 International Ice Patrol Glacier and Oceanographic Survey off West Greenland between Upernavik and Kap York. College and Coast Guard trainees were included in the personnel. The nature of ice and glacier movement, appearance of Gade Glacier, etc are noted. The survey included determination of distances in relation to newly established triangulation control points, also water depths, chemistry and temperatures. Resurvey is planned after a 3-yr interval. (AB)

## SMITH, E.H.

953
**Arctic ice, with especial reference to its distribution to the North Atlantic Ocean** / Smith, E.H.
Washington, D.C. : U.S.G.P.O., 1931.
x, 221 p. : ill.
(The Marion Expedition to Davis Strait and Baffin Bay, 1928. Scientific results. Bulletin - United States. Coast Guard, no. 19, 1931)
Bibliography.
Based on observations made during the cruise of the Marion, forth and back between Newfoundland, Labrador, West Greenland (Disko Bay) and Baffin Island, July-Sept. 1928.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179507.*
NFSMO

Contains a lists of ice terms, descriptions of the physical properties and classification of sea ice with detailed treatment of fast ice, polar cap ice and pack ice (West Spitsbergen, East Greenland and eastern North American packs) and notes on the annual variation of limits of pack ice. Land ice: Glaciation in arctic Eurasia, Canadian Arctic Islands, Ellesmere and Baffin Islands, and (in detail) all of Greenland, with notes on the rate of productivity of West Greenland glaciers, manner of calving, form and size, structure, color, density, and disintergration and melting of icebergs. Remarks on visibility and mirage. Current and wind control of drift of icebergs. Distribution and drift of bergs in Baffin Bay - Davis Strait, and on the Grand Banks of Newfoundland. Methods of protection against bergs and seasonal character of ice in the North Atlantic. Effect of northern ice on temperature and circulation of the waters. (AB)

954
**Ice observation in the Greenland sector, 1940** / Smith, E.H.
(International ice observation and ice patrol service, 1940. – Bulletin – United States. Coast Guard, no. 30, 1941, p. 11-26, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179515.*
NFSMO

Account of the cruise of the U.S. Coast Guard cutter Northland, Sept. 5-23, 1940, in the waters of Davis Strait, Baffin Bay, and especially the Umanak Fiord region of West Greenland. The first of three projected trips to study and survey the glacier fronts, icebergs, and waters of Davis Strait as an aid to the ice patrol service. Description of the birth of icebergs in the Disko Bay-Umanak Fiord regions, their numbers, distribution, and movements northward around Melville Bay, past Cape York and southward along the west side of Baffin Bay-Davis Strait to the North Atlantic. (AB)

955
**The International Ice Patrol** / Smith, E.H.
(The meteorological magazine, v. 60, no.718, Nov. 1925, p. 229-236, maps)
*ASTIS document number 172545.*
ACU, NFSMO

... Floating land ice, or icebergs, as they are commonly termed, because of their size and form, constitute a far greater menace to navigation than does sea ice. The iceberg season may be said to cover the period March 15th to July 15th. The compiled drifts of icebergs, from a record kept by the Patrol, 1913-1925, indicate a tendency towards uniformity, both as to velocity and direction. The most dangerous bergs, that is those which reach low latitudes, generally follow a course which lies more or less parallel to the trend of the continental slope until they arrive at the gateway to the Atlantic – The Tail of the Grand Banks .... In this critical region of the North Atlantic, where two mighty currents meet, the drift of the icebergs cannot be foretold, but we observe that the majority of the bergs set south-westward until caught in the northern edge of the Gulf Stream, along which they are borne, to the east and the northeast. Continually lashed by the surrounding warm water, they disintegrate rapidly, and within a week's time no longer constitute a menace to navigation. The Patrol makes every effort to keep in touch with all such icebergs ... (Au)

956
**The Marion Expedition to Davis Strait and Baffin Bay under direction of the United States Coast Guard, 1928. Scientific results : Part 3 : Arctic ice, with especial reference to its distribution to the North Atlantic Ocean** / Smith, E.H.
Washington, D.C. : G.P.O., 1931.
221 leaves : ill., maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 19)
Bibliography: p. 205-216.
*ASTIS document number 181889.*
NFSM

The Marion Expedition provided an opportunity to observe the general drift and fate of icebergs in the western North Atlantic, floating land ice which calves off west Greenland; and to observe floating sea ice in the form of fast ice, polar cap ice and pack ice. The ocean currents and winds which control and influence the drift of icebergs are discussed. Finally, the effect of northern ice on temperature and circulation of the waters of the North Atlantic is reviewed. (ASTIS)

957
**Oceanography for the ice patrol** / Smith, E.H.
(Transactions – American Geophysical Union, v. 7, 1926, p. 106-112)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179523.*
ACU

History of the patrol and review of its activities, with a description of the oceanographic work needed and planned. (AB)

958
**Recent movements of North Atlantic ice and a proposed Coast Guard expedition to the west Greenland glaciers** / Smith, E.H.
(Transactions – American Geophysical Union, v. 21, 1940, p. 668-671, ill., maps)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179531.*
ACU

Remarks on the drift of the Sedov, 1937-40, and its findings (in brief) concerning drift, depth and ice discharge of the Arctic Basin, and on the warming of the Arctic as it affects icebergs in North Atlantic sea lanes. (AB)

959
**Some meteorological aspects of the Ice Patrol work in the North Atlantic** / Smith, E.H.
(Monthly weather review, v. 50, no. 12, Dec. 1922, p. 629-631)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179540.*

The work of the International Ice Patrol since 1913; factors involved in gaining knowledge of ice conditions in waters off Greenland and Labrador. (AB)

960
**U.S. Coast Guard cutter Northland's ice and oceanographic observation cruise, Baffin Bay and Davis Strait, autumn of 1940** / Smith, E.H.
(Transactions – American Geophysical Union, v. 22, 1941, p. 788-792)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179558.*

Information, with text maps, on approximate number and distribution of icebergs observed during the eighteen-day cruise, and a proposal for future glacier station observers to count number of bergs discharged. (AB)

## SMITH, F.

**See:** 388, 389.

## SMITH, R.A.

961
**Iceberg cleaving and fracture mechanics – a preliminary survey** / Smith, R.A.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 176-190, ill.)
Appendix.
References.
*ASTIS document number 161829.*

ACU, NFSMO

An important phase in a project to utilise icebergs as a freshwater source is the separation of the 'berg into smaller pieces to promote faster melting and easier transport. Any scheme involving cleavage should produce the greatest savings of energy. This paper introduces, in a simple way, the subject of fracture mechanics, which enables estimates to be made of the forces required for various cleaving methods. It is shown that the huge forces required to cleave an iceberg arise not from the strength of the ice itself, but from compressive stresses due to the ice weight. A technique involving wedging with water pressure is shown to be promising in so far as it should be possible to extend a crack at least to the water line in this way. However, formidable engineering problems remain to be investigated before claims could be made that a solution to the problem has been found. (Au)

## SMITH, S.D.

**962**

**CSS Dawson : Iceberg dynamics, Grand Banks, April 22 - May 6, 1985** / Smith, S.D.

Dartmouth, N.S. : Bedford Institute of Oceanography, 1985.
ii, 26 p. : ill. ; 28 cm.
(Cruise report - Bedford Institute of Oceanography, 85-008)
References.
*ASTIS document number 178187.*
NFSMO

[The purpose of the cruise was to] ... Obtain data for development and testing of a computer model of iceberg drift, including drift track, winds, CTD and current profiles, and iceberg size and shape. ... (Au)

**963**

**The influence of winds, currents and towing forces on the drift of icebergs** / Smith, S.D. Banke, E.G.

(Cold regions science and technology, v. 6, no. 3, Feb. 1983, p. 241-255, figures, tables)
References.
*ASTIS document number 116653.*
ACU, NFSMO

A hindcast model simulates the movement of icebergs under the influence of winds, currents, and Coriolis force. Air and water drag coefficients are optimized to give the best fit to the tracks of five icebergs observed near drilling rigs off the coast of Labrador, while in one case observed winds and currents do not appear to be closely related to the drift track. Winds and currents appear to be of comparable importance. The effect of towing is predicted, and is compared in one case with the track of an iceberg under tow. The time required for even the largest icebergs to approach an equilibrium drift velocity after a step change in winds and currents is shown to be only a few hours, and smaller icebergs closely approach equilibrium drift in less than an hour. (Au)

**964**

**A numerical model of iceberg drift** / Smith, S.D. Banke, E.G.

(POAC 81 : the Sixth International Conference on Port and Ocean Engineering under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings. - Quebec City, Quebec : Universite Laval, 1981, v. 2, p.1001-1012, ill.)
References.
*ASTIS document number 163872.*
NFSMO, ACU

The movement of icebergs under the influence of winds and currents has been hindcast using a simple numerical model. Air and water drag coefficients have been adjusted to give a best fit to the observed drift in five of seven cases investigated, while in two other cases the observed winds and currents cannot explain the observed track. (Au)

**965**

**Observation and modelling of iceberg drift off Newfoundland** / Smith, S.D.

(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. - [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 25)
Abstract only.
*ASTIS document number 182222.*
ACU

A dynamic model has been developed to calculate wind and water drag, Coriolis force, and pressure gradient forces on icebergs and by double integration of the acceleration to compute the drift track. Water drag is applied in 10 m segments to allow for variation of the current with depth. Air and water drag coefficients are adjusted for each iceberg to optimize the fit of the modelled track to the observed track. Drift tracks of 10 icebergs in Newfoundland waters have been studied during 3 cruises of CSS Dawson. Radar ranges and bearings, along with LORAN C fixes of ship position, located the iceberg under study at 10 minute intervals for periods of 1 to 3 days. The mass and the cross-sectional areas in water in 10 m layers and in air were estimated from sonar profiles and photographs. Currents were measured continuously using a doppler acoustic profiler, and a bow mast was installed for minimal error from air flow distortion by the ship. Data are being compiled at 10 minute intervals and with currents averaged over 10 m depth intervals. Several modelled drift tracks are discussed. (Au)

**See also:** 149, 151, 152.

## SMITH, W.J.

**966**

**International Ice Patrol** / Smith, W.J.

(Oceanology international offshore technology, v. 3, no. 4, June 15, 1968, p. 37, ill.)
*ASTIS document number 176656.*
NFSMO

The article briefly describes the mission of the International Ice Patrol in the North Atlantic Ocean. The patrol service consists of three functions: determining the position of the icebergs, forecasting the movement of the bergs and disseminating the ice warnings to the public. (NFSMO)

**967**

**The International Ice Patrol** / Smith, W.J.

(Sperryscope, v. 17, no. 5, 1966, p. 1-4, ill.)
*ASTIS document number 177652.*

The cold war against icebergs, waged annually in the North Atlantic by the International Ice Patrol under the direction of the U.S. Coast Guard, ended for the past year on April 29. In these times of international tension, the Patrol is a noteworthy example of effective international collaboration for the preservation of life and property. (Au)

**968**

**International Ice Patrol** / Smith, W.J.

(Oceanology, v. 3, no. 4, 1968, p. 37, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180629.*
ACU

Defines the functions of this service and notes the problems in finding and accurately locating the bergs and the oceanographic

features of the patrol area and predicting the iceberg drift and deterioration. Shortcomings in use of microwave radiometers and radar for the search and effects of strong currents are noted. (AB)

## SNC-LAVALIN NEWFOUNDLAND LIMITED

**See:** 883.

## SNELGROVE, T.

**969**
**Where's that iceberg from?** / Snelgrove, T.
(C-CORE news, v. 9, no. 2, July 1984, p. 4)
*ASTIS document number 172294.*
ACU, NFSMO

... Icebergs impinging on the Grand Banks south of 48 N have two principal sources. The west coast of Greenland is assumed to produce the largest and most numerous icebergs entering Newfoundland waters (Kollmeyer, 1980). A general geological overview of the western coastline of Greenland shows a predominance of igneous and metamorphic rocks. Limestones are found on the north coast of the continent. The second possible source of icebergs is Ellesmere Island in the Canadian Arctic. Kane Basin and Jones Sound, which border the eastern and southern coasts of the Island, are both possible sources of icebergs; both are regions which contain carbonates and sandstones. The eastern region of the Island contains abundant granitic gneisses and volcanics. A detailed investigation of the geology of the eastern Canadian Arctic and the west coast of Greenland coupled with the locations of calving glaciers is required to determine the provenance of the samples collected. Of the fifteen or so icebergs on which Deborah Diemand carried out experiments last year, about one-third contained debris material. This information used in conjunction with other techniques such as calving frequencies, iceberg mass and iceberg drift observations could assist in locating the major provenance of icebergs off the coasts of Newfoundland and Labrador for a given year. (Au)

## SNELLEN, J.B.

**See:** 291.

## SNYDER, H.L.

**970**
**Engineering research in a cold ocean environment** / Snyder, H.L. Grenville, D.M.
St. John's Nfld. : Memorial University of Newfoundland, 1981.
ii, 8p. ; 29cm.
(C-CORE publication, no. 81- 15)
Paper presented at the Canadian Research Management Association Annual Meeting, Halifax, Nova Scotia, October 19, 1981.
*ASTIS document number 86924.*
ACU, NFSMO

The safe and economic development of offshore and Arctic resources require year-round operational capabilities. Engineering research on the behaviour of and the forces imposed by icebergs, and by solid and pack ice regimes involves costly, time-consuming programs. This paper considers some concepts for organization, management and implementation, the goal being effective technology transfer to design engineers of research results. (Au)

## SOBEY, E.

**971**
**Ocean ice** / Sobey, E.
(Sea frontiers, v. 25, no. 2, Mar.-Apr. 1979, p. 105-114, col. ill.)
*ASTIS document number 27685.*
ACU

Describes the formation of sea ice and the calving of glaciers to become icebergs. Discusses the differences between Arctic and Antarctic sea ice, and the effects of climate and salt on sea ice. (ASTIS)

## SODHI, D.S.

**972**
**Motion of icebergs due to changes in water currents** / Sodhi, D.S. Dempster, R.T.
(Ocean 75 record : Ocean 75 is the combined meeting of 1975 IEEE Conference on Engineering in the Ocean Environment and Eleventh Annual Meeting of the Marine Technology Society. – [S.l. : s.n., 1975], p. 348-350, ill.)
References.
*ASTIS document number 163791.*
NFSMO

It was observed during previous field studies ... that icebergs respond mainly to currents of the water body in which they float. Equations of motion for iceberg drift are derived by assuming that the water drag force is proportional to square of relative velocity of water with respect to the iceberg. Exact solutions are presented for two cases – rotary tidal current and sudden change of translatory current velocity. (Au)

**973**
**Prediction of an iceberg drift trajectory during a storm** / Sodhi, D.S. EL-Tahan, M.S.S.
(Proceedings of the Conference on Use of Icebergs : Scientific and Practical Feasibility, Cambridge, U.K., 1-3 April, 1980. Annals of glaciology, v. 1, 1980, p. 77-82, figures, table)
References.
*ASTIS document number 61115.*
ACU, NFSMO

A numerical model is presented for predicting iceberg drift trajectories from known or derived information regarding iceberg characteristics and the environmental forces affecting the motion of an iceberg. The validity of such a model is studied by comparing predicted and observed trajectories of icebergs near Saglek, Labrador, during a storm on 21-22 August 1972. ... In order to appreciate the effect of wind and current forces on the drift of the iceberg, several trajectories are plotted in which various environmental forces are excluded. From this study, it is evident that a good prediction of an iceberg drift trajectory is only possible if rather detailed information is available on the current and wind field. (Au)

## SONDERGAARD PEDERSEN, F.

**See:** 471.

## SORENSEN, T.

974
**Long period wave phenomena in Jakobshavn Harbour Bay, Greenland** / Sorensen, T. Schroder, H.
(Proceedings : the First International Conference on Port and Ocean Engineering under Arctic Conditions / Edited by S.S. Wetteland and P. Bruun. – Trondheim, Norway : Technical University of Norway, 1971, v. 2, p.1312-1324, ill., maps)
References.
*ASTIS document number 177024.*
ACU

Long period waves caused by the calving of ice off Greenland glaciers into Jakobshavn Harbour Bay were examined using model tests. The model tests were performed in order to determine the extent of the resonance problems and to make recommendations for the layout of a pier. (NFSMO)

## SOULE, F.M.

975
**Arctic ice drift and the Humboldt Current [discussion]** / Soule, F.M.
(Science, v.112, no.2898, July 1950, p. 61-62)
Discussion of ASTIS document 179655, A prediction regarding the Humboldt Current / L.R. Bone, in Science, v. 110, no. 2867, 1949, p. 642-644.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179698.*
ACU

Author takes exception to the article of L. R. Boone, A prediction regarding the Humboldt Current, q.v., insofar as the ice seasons of 1922 and 1938, cited as unusually heavy for the Newfoundland Banks region, were not the only such seasons. He also criticizes Boone's assumption that an unusually high number of icebergs calved from their arctic parent glaciers is reflected by a high berg count in latitudes south of 48 N, as apparently assumed by Boone. (AB)

976
**Discussion of some of the effects of winds on ice distribution on the vicinity of the Grand Banks and the Labrador shelf** / Soule, F.M. Challender, E.R.
(Bulletin – United States. Coast Guard, no. 33, 1949, p. 59-61, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179566.*

Results of analysis of direction of wind drift, average gradients of barometric pressure and resultant direction of the wind, Nov. 1946 to June 1947, which effected the destruction of the major part of the icebergs in the Labrador-Newfoundland sector, summer 1947. (AB)

977
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1941** / Soule, F.M. Barnes, C.A.
Washington, D.C. : U.S. Coast Guard, 1950.
62 p., [13] folded leaves of plates : ill., maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 31)
*ASTIS document number 181072.*
ACU, NFSMO

Herewith is presented the report of the International Service of Ice Observation and Ice Patrol in the North Atlantic Ocean for the season of 1941. ... The ice season was one of the lightest on record and it was not necessary to inaugurate a continuous surface vessel patrol. It is estimated that only two bergs drifted south of the 48th parallel during 1941. (Au)

978
**The normal dynamic topography of the Labrador Current and its environs in the vicinity of the Grand Banks of Newfoundland during the iceberg season** / Soule, F.M. United States. Coast Guard [Sponsor].
Woods Hole, Mass. : Woods Hole Oceanographic Institution [publisher] ; [Ottawa] : CISTI [distributor], [1964].
1 microfiche : ill. ; 11 x 15 cm.
(Reference series – Woods Hole Oceanographic Institution, no. 64- 36)
*ASTIS document number 153079.*
NFSMO

There exists for the waters over the northeastern, eastern and southern slopes of the Grand Banks and the contiguous area seaward, a series of surface and subsurface observations of temperature and salinity which is unique for oceanic areas of comparable extent. These are the data collected by the International Ice Patrol from 1913 to the present and published in a series of annual reports as United States. Coast Guard Bulletins. During the second decade of the Ice Patrol's operations the observations became more systematic and attempts were made to examine the Labrador Current by means of vertical cross-sections of temperature and salinity. This developmental period coincided with instrumental development which included the improvement of the Wenner salinity bridge through its first three models. [This report presents data on surface and subsurface data collection during the iceberg season since 1934.] Beginning with the 1934 season Helland-Hansen and Hansen's method of approximating the dynamic height of the sea surface at a shallow-water station has been used, replacing Jacobsen and Jensen's method .... It is largely in consideration of the foregoing that the series of data used in the construction of the normal charts presented here begins with the 1934 ice patrol season. ... Both the 1931 and 1933 iceberg seasons were light and few subsurface data were collected. The series continues through the season of 1941 whereupon it is interrupted during world War II. The series resumes with the season of 1948 and continues through the season of 1961. ... (Au)

**See also:** 154, 233, 236, 237, 238, 242, 243, 244, 245, 261, 263, 287, 288, 353, 354.

## SOULIS, E.D.

979
**Modelling of drift of nearby icebergs using wind and current measurements at a fixed station** / Soulis, E.D.
(Canada's continental margins and offshore petroleum exploration. – Calgary, Alta. : Canadian Society of Petroleum Geologists, 1975, p. 879-889, ill., maps)
References.
*ASTIS document number 163732.*
NFSMO

During the summer of 1972 a major oceanographic investigation was conducted in the Labrador Sea by the Faculty of Engineering and Applied Science of Memorial University, Newfoundland. Wind velocity measurements taken at sea and on shore, current velocity measurements from a fixed array of current meters, and iceberg trajectory measurements recorded from a shore base radar, are analysed. A statistical study shows that an average of 80% of an iceberg's displacement can be modelled from wind and current measurements. The average response of icebergs to wind and transitory current effects is presented. (Au)

## SOWDEN, W.J.

See: 240.

## SPAULDING, M.L.

See: 1055.

## SPERRY RAND CORPORATION. SPERRY MICROWAVE ELECTRONICS DIVISION

**980**

**AN/AAR-33 airborne radiometer system : final report** / Sperry Rand Corporation. Sperry Microwave Electronics Division. United States. Coast Guard [Sponsor].
Washington, D.C. : Coast Guard [publisher] ; Springfield, Va. : NTIS [distributor], 1967.
3 microfiches : ill. ; 11 x 15 cm.
(NTIS AD-674-780)
References.
*ASTIS document number 177911.*
ACU

An airborne, microwave radiometric search set for the detection of icebergs was developed and flight tested. In this report, basic specifications are reviewed, radiometric theory and practice are discussed, design details and development problems are reviewed, radiometric specifications, characteristics, installation and operation are described, and the service approval tests are summarized. The particularly vexing problem with radome aerodynamic characteristics and the solution of the problem are discussed in some detail. Samples of radiometric data over icebergs, ships, sea ice, and over land are given. (Au)

## SPRING, W.

See: 615.

## SQUIRE, V.A.

See: 461, 616, 618, 620.

## SRIVASTAVA, S.K.

See: 1073.

## STACEY, R.A.

See: 143.

## STACY, R.A.

**981**

**Iceberg/seabed interactions** / Stacy, R.A.
(Resource development, v. 13, no. 1, Spring 1981, p. 5-7, ill.)
*ASTIS document number 171808.*
ACU, NFSMO

... An iceberg in motion possesses a tremendous amount of kinetic energy which must be dissipated or converted to potential energy to bring the berg to rest. Scouring is a process that includes both the dissipation and conversion of energy; dissipation by horizontal plowing and conversion to potential energy through the rotation and lifting of the berg as it plows the soil. In order to understand the nature of iceberg scour, it is necessary to have information on the character of the seafloor and the physical, dynamic and hydro-dynamic properties of the berg. ... (Au)

**982**

**The nature of iceberg/seabed interaction** / Stacy, R.A.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 207-210)
*ASTIS document number 149047.*
NFSMO

The iceberg/seabed interaction is described. To understand the nature of iceberg scour, information on the character of the seafloor and the physical, dynamic and hydro-dynamic properties of the berg is required. (NFSMO)

## STANDER, E.

See: 291.

## STAPLETON, G.

See: 809.

## STEELE, D.H.

**983**

**Temperature and salinity cycles at the Marine Sciences Research Laboratory Logy Bay, Newfoundland** / Steele, D.H.
St. John's, Nfld. : Marine Sciences Research Laboratory, 1974.
21 leaves : ill., map ; 28 cm.
(Marine Sciences Research Laboratory technical report, no. 12)
(Contribution – Memorial University of Newfoundland. Marine Sciences Research Laboratory, no. 182)
*ASTIS document number 171522.*
ACU, NFSMO

Mean monthly surface temperatures at Logy Bay follow the air temperatures and vary from a maximum of 12 degrees C in September to <0 degrees C in March. They are not greatly affected by the spring drift ice and are most similar to those of the northern Gulf of St. Lawrence and of the mouth of the Bay of Fundy. The salinity remains at about 31 per mille except during the time of the spring melt. [Sea temperature variations] ... are due to the fact that by the end of the winter the water column at shallow depths is essentially isothermal and has a temperature of 0 C or less. As the surface is heated it becomes lighter and results on the colder water. However, it will take little disturbance to bring the underlying cold water to the surface and the temperature will drop precipitously. ... The other factor influencing the surface temperature in the Logy Bay region is the presence of drift ice in spring. Icebergs and field ice are transported south by the Labrador current along the northeast coast of Newfoundland. ... The effect of the ice in the coastal areas is to delay the warning of the surface layer. ... (Au)

## STEENSTRUP, K.J.V.

984
**Bidrag til kjendskab til braeerne og brae-isen i Nord-Gronland [Contribution to the knowledge of glaciers and glacier ice in North Greenland]** / Steenstrup, K.J.V.
(Meddelelser om Gronland, bd.???, hefte 4, 1883, p. 69-112, ill.)
Appendices: Tables of (1) temperature in an iceberg at a depth of 2.5 feet (8 decimeter); (2) melting of ice in sea water; (3) surface temperature, chlorinity (and temperatures) of the coastal waters near glaciers (from Godhaven (Disko) to Umanak).
Summary in French at end of volume.
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179574.*

Results of the authors's expedition to Umanak Fiord, 1878-80, a discussion of measurements and movements of glaciers in the Umanak Fiord region and formation of icebergs. (AB)

985
**Hvorledes dannes de store isfjaelde? [How are the big icebergs formed?]** / Steenstrup, K.J.V.
(Geografisk tidsskrift, bd. 11, 1892, p. 225-231)
Text in Danish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179582.*

Discussion of conflicting theories, (including the author's and Dr. Rink's) on the formation of icebergs off the west coast of Greenland. (AB)

## STELTNER, H.A.R.

**See:** 1123.

## STIRBYS, A.F.

**See:** 642.

## STOLFI, R.

986
**Ice moving in sea water** / Stolfi, R. Fuhs, A.E. Wang, P.C.C. Bourke, R.H. Denner, W.W. Erman, R.J. Clifford, W.F.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 199-219, ill.)
*ASTIS document number 172634.*
ACU, NFSMO

To understand the melting of ice which is moving in sea water, the interdisciplinary team at the Naval Postgraduate School searched for advanced theoretical equations on the subject while simultaneously looking for the results of experimental work. The theoretical work of Dr. Owen Griffin at the Naval Research Laboratory, Washington, D.C., came to the attention of the NPS scientists, and the team asked Dr. Griffin to extend his melt equations, which include consideration of heat, mass, and monentum transfer under conditions of laminar flow, to take account of turbulent flow. Unable to discover significant experimental work on the subject of glacial ice moving in sea water, the team decided to conduct experiments on moving ice in (sea) water (1) to test and verify or modify Dr. Griffin's equations, and (2) to determine the rates of melt, volumetric changes and associated volumetric dimensions. (Au)

**See also:** 293, 430.

## STONE, B.M.

987
**Iceberg draft measurement using a remote control tethered submersible** / Stone, B.M. Jozan, M.M.
(World oil, v.192, no. 5, Apr. 1981, p. 245)
Abstract only.
Paper presented at OTC '81, Houston, Tex., 4-7 May, 1981.
*ASTIS document number 170372.*
ACU, NFSMO

With the start of exploration off Newfoundland and Labrador, a need developed to measure maximum iceberg draft for use in establishing risk to bottom-mounted equipment imposed by drifting icebergs. To undertake these measurements a standard side-scan sonar system, modified for vertical deployment, was introduced to routine offshore drilling operations. The draft, as measured by this system, proved inaccurate and unreliable, primarily due to iceberg subsurface shape and sonar tow fish angle. To provide accurate measurements of maximum draft and reference measurements against which the side-scan sonar could be compared, a unique system utilizing the remotely operated tethered submersible, Scorpio, in combination with real time data processing, was developed and tested. A field program was undertaken to measure iceberg draft using both the side-scan sonar and tethered submersible systems. This paper briefly describes the development of the side-scan sonar system used and, in more detail, the tethered submersible system interfaced with real time data processing and recording. ... During the field program, maximum drafts of 14 icebergs were successfully measured, using both systems. These results are presented and reasons for the discrepancies discussed. Error in measurement from 3 to 36% occurred, thus establishing the limitations of the side-scan sonar technique. (Au)

## STRONG, D.

**See:** 1121, 1124.

## STRUBING, K.

988
**Eisberge im Nordatlantik-60 Jahre International Ice Patrol = Icebergs in the North Atlantic – 60 year International Ice Patrol** / Strubing, K.
(Wetterlotse, v. 26, 1974, p. 141-160)
Text in German.
*Document not seen by ASTIS.*
*ASTIS document number 183440.*

989
**1977 : Nur wenige Eisberge [1977 : Only a few icebergs]** / Strubing, K.
(Umschau Wissenschaft and Technik, v. 78, no. 3, 1978, p. 85-87, ill.)
References.
English summary.

Text in German.
*ASTIS document number 180807.*

The incidence of icebergs in the North Atlantic shows large fluctuations. The heaviest season has occurred in 1972 with 1587 icebergs drifting south of latitude 48 N, whereas in the last three years only a small number was recorded. The quantity of icebergs per season drifting south of 48 N depends on hydrographic and meteorological conditions as well as the iceberg crop. (Au)

## STURM, F.

**See:** 719.

## SUKHOV, B.P.

**990**
**Measurement of iceberg draft** / Sukhov, B.P.
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 265-275, ill.)
References.
*ASTIS document number 161861.*
ACU, NFSMO

The paper reviews the measurements which need to be obtained to calculate iceberg draft, and proposes new methods and techniques to collect the data. (NFSMO)

**991**
**Strait of Belle Isle study : feasibility of providing an electrical power link between Labrador and Newfoundland** / Sukhov, B.P. Crocker, R.W.
(12th Annual Congress, 31 May-2 June 1978, University of Western Ontario. Atmosphere-ocean, v. 16, Annual Congress issue, 1978, p. 35)
Abstract only.
*ASTIS document number 183610.*
NFSMO

The paper summarizes the oceanographic and sea-floor characteristics of the Strait of Belle Isle and their significance for the proposed power link between Labrador and the island of Newfoundland. Particular attention is paid to ice and iceberg conditions in the Strait and the probability of damage to a sea-bottom link from such hazards. Results of the author's preliminary field work (CSS Hudson trip 77-021) in the southern part of the Strait are presented. The short side scan sonar survey indicates that a sea floor cable may be safely laid with careful selection of the route in the area of Forteau Bay, L'Anse-au-Clair and Flowers Cove. Preliminary conclusions and recommendations for future work are given. (Au)

**992**
**Underwater profiling of icebergs using submersibles** / Sukhov, B.P.
(Oceans '78 : the ocean challenge : Fourth annual combined conference sponsored by the Marine Technology Society and the Institute of Electrical and Electronics Engineers, Council of Oceanic Engineering, Washington Section, September 6-8, 1978, Sheraton-Park Hotel, Washington, D.C. – New York : IEEE, 1978, p. 225-230, ill.)
References.
*ASTIS document number 163953.*
NFSMO

A new method is proposed for iceberg draft measurement and profiling using an unmanned, tethered submersible as an underwater platform equipped with a depth meter, an up-looking echo sounder or an up-looking scanning sonar. Block diagrams and instrumentation for measurement and processing of data are presented. Basic measurement equations and accuracy of measurement are analyzed by two methods which give comparable results. (Au)

**See also:** 208.

## SULLIVAN, M.A.

**See:** 860.

## SUPER, A.D.

**993**
**Remote sensing as it applies to the International Ice Patrol** / Super, A.D. Osmer, S.R.
(Proceedings of the Tenth International Symposium on Remote Sensing of Environment, 6-10 October, 1975. – Ann Arbor, Mich. : Center for Remote Sensing Information and Analysis, Environmental Research Institute of Michigan, [1975], v. 2, p.1231-1234)
References.
*ASTIS document number 177253.*
ACU, NFSM

... Since 1913 the U.S. Coast Guard has operated the International Ice Patrol Service, tasked with guarding the southeastern, southern, and southwestern regions of the Grand Banks, locating icebergs, and reporting the danger to mariners. With the aircraft replacing routine ship reconnaissance in 1945, numerous and various attempts have been made to utilize remote sensing techniques in detection and identification of icebergs on the fog-enshrouded Grand Banks. Remote reconnaissance is vital to the Ice Patrol because the Grand Banks, influenced both by the cold Labrador Current and the warm North Atlantic Current, is an area frequented by fog and fishing vessels. This fog, in addition to enshrouding the icebergs from mariners, often renders visual ice reconnaissance flights practically useless for extended durations. Thus, the pressing need for a sensor that has all-weather detection and identification capabilities. This paper will briefly review experiments and evaluations conducted with airborne radiation thermometers (ART), side-looking airborne radars (SLAR), microwave radiometers, and satellite imagery. A brief look will also be taken at what future developments possibly await the Ice Patrol. (Au)

## SUTHERLAND, P.C.

**994**
**On the geological and glacial phenomena of the coasts of Davis Strait and Baffin Bay** / Sutherland, P.C.
(Journal of the Geological Society of London, v. 9, June 1853, p. 296-312)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179590.*

Descriptive notes on the rocks, glaciers, icebergs, currents, and coast-ice, of West Greenland, Canadian Arctic Islands, Davis Strait and Baffin Bay visited by the author on Capt. Penny's voyage, 1850-51. (AB)

## SUTTON, J.

**995**

**Iceberg distributions in the Labrador Sea from SLAR imagery 1978-1980** / Sutton, J. Mudry, D.

(Iceberg research, 1983, no. 5, July, p. 17-20, ill.)

Paper presented at POAC 83, Seventh International Conference on Port and Ocean Engineering under Arctic Conditions, Helsinki, Finland, April 5-9, 1983.

*ASTIS document number 157694.*

ACU, NFSMO

This paper results from work done by Intera Environmental Consultants Ltd. for the Ice Climatology Branch of the Atmospheric Environment Service, on an iceberg data base from SLAR imagery. The imagery analysed consists of 97 flights, over the period from January 1978 to December 1980, along the coast of Newfoundland and Labrador to a maximum of 200 nautical miles offshore. Measurements taken from known points on the imagery, along with image geometry data, were used in a computer program to calculate iceberg locations (latitudes and longitudes) for all the icebergs and iceberg groups identified on each flight. The icebergs were identified from several characteristic radar signatures. ... (Au)

## SWAMIDAS, A.S.J.

**996**

**Bergybit impact forces on a moored semisubmersible** / Swamidas, A.S.J. Reddy, D.V.

(The Seventh International Conference on Port and Ocean Engineering under Arctic Conditions. – Espoo, Finland : Technical Research Centre of Finland, 1983, v. 4, p. 591-619, ill.)

References.

*ASTIS document number 176940.*

NFSMO

The transient responses of and the forces developed on a moored semisubmersible due to collision with a bergybit are presented in this study. Two approaches, one using the total energy of the system, and the other using the conventional structural dynamics method of initial velocity conditions, are presented. Numerical solutions are obtained only for the letter. The local structural response is also considered. Numerical results are presented for impact with two bergybits of mass 5,000 t and 10,000 t. (Au)

**997**

**Iceberg impact forces on gravity platforms** / Swamidas, A.S.J. Arockiasamy, M.

(Proceedings : Third International Specialty Conference Cold Regions Engineering "Northern resource development", April 4, 5 and 6, 1984, Edmonton, Alberta / Edited by D.W. Smith. – Montreal : Canadian Society for Civil Engineering, 1984, v. 1, p. 431-458, ill.)

References.

*ASTIS document number 176923.*

NFSMO

The paper presents an analytical procedure for computing the forces exerted on a gravity platform by the central/noncentral impact of a large iceberg. The mathematical modelling of the impact incorporates a seventh boundary degree-of-freedom (at the impact interface) in the equation of motion of the floating iceberg. Both linear/nonlinear behaviour is modelled for the seventh degree-of-freedom. Numerical results are given for central/noncentral impacts of two sizes of icebergs, one a 5,000,000 t and the other a 12,000,000 t mass iceberg, drifting with velocities of 1.0 and 0.5 m/s. The maximum impact force exerted is about 6.0% of the weight of the iceberg. Noncentral impacts cause larger impact forces. (Au)

**See also:** 140, 377, 738, 851.

## SWITHINBANK, C.W.M.

**998**

**Remote sensing of iceberg thickness** / Swithinbank, C.W.M.

(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 100-107, ill.)

References.

*ASTIS document number 161772.*

ACU, NFSMO

A pulsed radar was mounted in a series of aircraft to measure the thickness of Antarctic tabular icebergs and the ice shelves from which they calve. Echoes displayed on an oscilloscope were continuously recorded on 35 mm film. Good reflections were obtained from the surface and from the ice/water interface except where brine infiltration was extensive. Measured iceberg thicknesses ranged from 30 to 280 meters. Measurements of dielectric absorption may indicate the degree of bottom roughness or the presence of ice frozen from sea water. (Au)

**See also:** 1134.

## SYVITSKI, J.P.M.

**999**

**Seabed investigations of the Canadian East Coast and Arctic using Pisces IV** / Syvitski, J.P.M. Fader, G.B. Josenhans, H.W. MacLean, B. Piper, D.J.W.

(Geoscience Canada, v. 10, no. 2, June 1983, p. 59-68, figures)

References.

*ASTIS document number 120090.*

ACU, NFSMO

Our aim is to provide the reader with information on the Canadian submersible Pisces IV and its effectiveness in reaching a wide range of scientific objectives during a program carried out in the Eastern Canadian offshore in 1981 ... we address a cross-section of objectives [which] include the investigation or characterization of ... iceberg scour processes ... Labrador, Baffin and Grand Banks Shelves ... submarine hydrocarbon seepage (Scott Trough, Baffin Shelf) .... (Au)

## TAGUCHI, Y.

**See:** 593.

## TARRANT, B.

**1000**

**Engineer has answers to transport icebergs** / Tarrant, B.

(Alaska journal of commerce & Pacific Rim reporter, Jan. 1979, p. 1, 7, ill.)

Copy obtained from University of Alaska, Fairbanks/Elmer E. Rasmuson Library.

*ASTIS document number 183628.*

Henk Hesselman wants to move mountains ... mountains of ice, that is. Hesselman, a dutch design engineer currently on extended leave

in Anchorage from a Malaysian company, has designed a working system for moving icebergs, quickly, economically and efficiently. Icebergs, both for Alaska and the rest of the world, have been drawing increasing attention not only for their danger to shipping lanes and drill rigs but also for their potential for an unlimited supply of fresh water. ... (Au)

## TATE, G.L.

**1001**

**The role of liquid oxygen explosive in iceberg utilization and development** / Tate, G.L.

(Desalination : comprising the second volume of the proceedings of the First International Conference on Iceberg Utilization for Fresh Water Production, Weather Modification, and Other Applications, Iowa State University, Ames, Iowa, October 2-6, 1977, v. 29, no. 1-2, Apr.-May 1979, p. 167-172)

References.

*ASTIS document number 162973.*

ACU, NFSMO

Liquid oxygen explosive which is composed of liquid oxygen and carbon releases a large amount of energy on detonation. This energy can be harnessed as a potent tool in the utilization of icebergs. Large ice masses can be shattered and melted by liquid oxygen explosive to provide fresh water for human consumption and for irrigation purposes. This energy can be used as a means of iceberg propulsion through innovative application of this power. This energy can also be utilized to remove and shape an iceberg at its birthplace in the Arctic. (Au)

## TAYLOR, D.J.

**See:** 363.

## TERRY, B.

**See:** 440, 445.

## THANGAM BABU, P.V.

**See:** 860.

## THAYER, N.B.

**See:** 372.

## THOREN, R.V.A.

**1002**

**The application of aerial photo interpretation in the scientific field of ice met at sea** / Thoren, R.V.A.

Stockholm : Research Institute of National Swedish Defense, 1964.

34 p. : ill. ; 28 cm.

FOA 3 report A 603.

Prepared as an invited paper, Commission VII, International Society of Photogrammetry, at the World Congress in Lisbon, September 1964.

Photocopy.

References.

*ASTIS document number 183725.*

OOCCR

This publication includes a synopsis of papers presented at the International Congress in London, 1960, papers presented to the Symposium on Photo Interpretation, Delft, The Netherlands, 1962, and the resolution of the Working Group on Photo Interpretion of Ice (W.G. 6) at the First Symposium on P.I., Delft, 1962. The following sections comprise the major portion of this publication: 1. Viewpoints on surveillance of sea ice conditions; 2. Ice reconnaissance over the North Pole region; 3. Early freeze-up processes; 4. Arctic icebergs; 5. Arctic ice islands; 6. Movements of the ice islands; 7. Ice islands "WH-5"; 8. Tabular icebergs from an ice shelf at Nordostrundingen (North East Cape, Greenland); 9. Siberian "black-ice" and dirty spots on drifting polar pack ice; 10. The application of electronic reconnaissance to photo interpretation of ice; 11. Radar; 12. Subnanosecond radar; 13. Passive microwave radiometry; 14. Low light-level television system; 15. The use of satellites for ice studies; and 16. Recording electronic images without cameras. (ASTIS)

**1003**

**Applications of remote sensing to oceanography & sea ice** / Thoren, R.V.A.

Stockholm : National Defense Research Institute, 1980.

x, 60 p. : ill., map ; 28 cm.

(FOA reports, v. 14, no. 2, 1980)

Prepared as a paper to the 14 Congress of the International Society of Photogrammetry, Hamburg 1980, Commission VII, Working Group VII, 4 "Oceanography and Sea Ice", Federal Republic of Germany, July 13-26.

*ASTIS document number 178721.*

NFSMO

In an introductory chapter (1), designated "Survey of recent development" the author points to the importance of exploring our natural resources in the Arctic and other areas, where the sea is often blocked by floating ice, and the conveyance of the products to southern markets. In any case the best possible position-fixing and a true knowledge of prevailing ice conditions as well as the bathymetry is obligatory, and reliable ice-forecasts desirable. A general view of the introduction of more and more advanced remote sensing techniques is presented .... In chapter 2 the author describes the results of a comprehensive remote sensing experiment on sea ice, performed in the Bay of Bothnia in March 1975. The programmes for the ... all-around scientific arctic expedition in the Swedish icebreaker YMER, in June-September 1980, (chapter 3) include Ice conditions, Ice-Ocean Interaction in the marginal ice zone, Radar Measurements of Backscatter from September Sea Ice, Physical Oceanography, Chemical Oceanography, Atmospheric and Oceanic Research, Glacial extent and climatic variations, Pollution problems as studied in bottom sediments, Sub-marine volcanism and the history of the continental margins, and Marine biology. Since drifting sea ice as well as icebergs may be present also in areas through which heavy transoceanic traffic passes, thereby hazarding the shipping, a careful ice-surveillance by the aid of advanced remote sensing is of great importance. This is illustrated in chapter 4, "Ice in the Grand Banks area". In chapter 5, the author shows that remote sensing makes under-ice navigation possible. ... (Au)

## THORNDIKE, A.S.

**See:** 297.

## TIEN, C.

**1004**

**The effect of melting on forced convection heat transfer** / Tien, C. Yen, Y.-C.

(Journal of applied meteorology, v. 4, no. 4, Aug. 1965, p. 523-527, ill.)

References.
*ASTIS document number 170461.*
ACU

In the study of the melting rate of a solid body surrounded by warm fluid, such as a drifting iceberg in sea water, an accurate prediction of the heat transfer coefficient between the solid and fluid is of the utmost importance since the transfer coefficient is the critical factor which determines the rate of energy exchange. Although there have been numerous investigations on the convective heat transfer between a solid and fluid under various conditions, most of the studies do not take into account the interfacial velocity resulting from melting. As demonstrated in the study of mass transfer (Bird et al., 1960; Stewart, 1950), the interfacial velocity could greatly disturb the final velocity and temperature profiles and significantly influence the values of transfer coefficient. ... The purpose of the present investigation is to study further the effect of melting on convective heat transfer rate. ... (Au)

## TIMMERMANS, W.J.

**1005**
**Design, installation and operation of gathering and transmission pipelines for the Hibernia field /**
Timmermans, W.J.
(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 238-252, ill.)
References.
*ASTIS document number 149489.*
NFSMO

Development of the oil reserve discovered in the Grand Banks area will require a network of gathering lines to bring together production from various locations to a point where the crude oil is loaded into tankers for further transport. This includes flowlines and loading lines. ... Of special concern was the possible damage that grounding icebergs may do to such a system. Several feasible configurations were identified for these lines. It was concluded that the risk of iceberg damage cannot be eliminated, but will be reduced by trenching to the maximum depth presently feasible. Presently available techniques will allow a speedy repair of any such damage, should it occur. RJBA was also requested to investigate the feasibility of laying a transmission line to the Newfoundland shore. Since this line would cross the paths of icebergs along its entire 200 mile length, the risk of damage is high. Therefore, although it is technically possible to install such a line, its successful operation is considered unfeasible. (Au)

## TINHAM, B.

**1006**
**Modular image analyser goes on-line for quality control /**
Tinham, B.
(Control and instrumentation, v. 10, no. 4, Apr. 1978, p. 35, ill.)
*ASTIS document number 172596.*
ACU

... Computer-assisted TV scanning analysis has been used in fields as diverse as the measurement of inhibition zones in microbiology and iceberg size and distribution analysis for geographical research from aerial photographs. ... One of the major advantages of the system is that it can be used to look at features of any size, the only criterion being effectively the type of lens fitted. The device then provides data reduction from each scan to give information including feature size, position, number, distribution and any abnormalities present by comparison with a digital picture stored in memory, of a known good sample. ... (Au)

## TODD, B.J.

**1007**
**Iceberg scouring on Saglek Bank, northern Labrador Shelf /**
Todd, B.J.
Halifax, N.S. : Dalhousie University, 1984.
xvi, 162 p. : ill. ; 28 cm.
Thesis (M.Sc.) – Dalhousie University, Halifax, N.S., 1984.
Bibliography: p. 149-162.
*ASTIS document number 150037.*
NFSMO

High-resolution seismic and sidescan sonar surveys on Saglek Bank indicate extensive areas of iceberg-scoured seabottom. The scour trends and abundance are compared with iceberg trajectories and oceanic current information. Saglek Bank shows heavy scouring (50 to 100% of the seabed shows clearly defined scour marks) on its north-facing bank edge (175 to 250 m water depth) where the iceberg-carrying Labrador Current impinges. The remaining bank edges show moderate to heavy scouring (25 to 75%) while the bank top at water depths less than about 150 m is heavily scoured. The differences in the amount of scouring are interpreted as resulting from variations in iceberg flux, iceberg draft and bathymetry, combined with differing rates of scour obliteration. The orientation of the scours generally parallel the bank edges i.e. northwest-southeast. ... Iceberg scour trends generally reflect the direction of oceanic flow and modern iceberg movements. These movements are primarily controlled by currents which in turn are influenced by the shelf bathymetry. Local direct bathymetric control of iceberg movement has been recognized in shelf areas of low translatory current strength. (Au)

**1008**
**Iceberg scouring on Saglek Bank, northern Labrador Shelf /**
Todd, B.J.
[S.l. : s.n., 1985].
[33] leaves : ill., maps ; 28 cm.
Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.
Indexed from a preliminary draft, July 1985.
Proceedings to be published as an ESRF Report in late 1985.
*ASTIS document number 166537.*

This presentation describes the first use of the Bedford Institute of Oceanography Ice Scour Data Base in a regional geological setting. It reviews the combined efforts of Dr. C.F.M. Lewis, Steve d'Appollonia and the author and supplements similar studies described earlier in this workshop. The papers presented at this workshop so far have indicated that the continental shelves adjacent to the glaciated continents show extensive scouring which is attributable to icebergs. However, most of the published data assumes that scours are aligned with the prominent currents. This assumption, we thought, needed verification. We know that about 85% of the icebergs that reach the Labrador Shelf are calved in the tidewater glaciers of Greenland and flow from the northwest in a southeast direction, along the shelf, under the influence of the Labrador Current. Saglek Bank, which is located on the northern end of the Labrador Shelf was chosen as the study area for a number of reasons. Primarily this area has been the subject of a regional surficial geological study at BIO for several years and significant amounts of geological, iceberg and ocean current data are available. Our objectives were to describe the iceberg scour record and attempt to interpret some of the features that relate the iceberg scours to the known ocean currents. (Au)

## TOTAL EASTCAN EXPLORATION LTD.

**See:** 689, 699, 700, 701, 702, 789, 1125.

## TOTAL PETROLEUM CANADA LTD.

**1009**
**Station keeping, spring 1971 : detection and tracking of icebergs, protection of drilling operations off the south-west coast of Greenland** / Total Petroleum Canada Ltd.
[S.l. : Total Petroleum Canada Ltd., 1971?].
3 microfiches : ill., maps ; 11 x 15 cm.
*ASTIS document number 163996.*
NFSMO

This report describes a series of experiments performed by a ship-based team of engineers off the Southwest coast of Greenland. ... Particular emphasis was placed on the problems of operating in waters where icebergs are present and five reports were produced, dealing with topics such as iceberg distribution, station keeping and the feasibility of towing icebergs. These reports made definite recommendations, but these were based on insufficient practical experience to be directly applicable to drilling operations. The only field work had been a short offshore reconnaissance of Southwest Greenland in the Spring of 1970, and the decision was made that on-site experiments were necessary for further progress. The aim was not to collect data on the particular area in which the trials were carried out, but to test equipment and techniques and to obtain answers to some questions which could not be gained from further study. A large quantity of equipment was taken, some of it having been developed specifically for the experiments. ... the work was directed towards the problem of maintaining a drillship on station in iceberg-infested waters. (Au)

**See also:** 693, 695, 696, 698.

## TRANSPORTATION DEVELOPMENT CENTRE (CANADA)

**See:** 1065, 1066.

## TRETHART, M.E.

**See:** 795.

## TROFIMENKOFF, P.N.

**1010**
**Some iceberg statistics for the Davis Strait** / Trofimenkoff, P.N. Imperial Oil Limited.
[Calgary : Distributed by APOA], 1978.
1 microfiche : ill., map ; 11 x 16 cm.
(APOA project no. 149 : Oilspill and iceberg studies conducted for preparation of an environmental impact statement for Davis Strait. Report, no. 4)
(Eastern Arctic Marine Environmental Studies)
Original publisher: Imperial Oil Limited, Production Dept.
Appendix.
References.
Produced as part of the Eastern Arctic Marine Environmental Studies program.
EAMES order no. ES61.
*ASTIS document number 40843.*
ACU, NFSMO

This report presents some iceberg size and distribution statistics for the Davis Strait area (60 deg.-67 deg. N latitude) obtained from data collected by the International Ice Patrol on northern survey flights. The distribution statistics are used in conjunction with information on iceberg fluxes to obtain an estimate of the mean time between incursions of icebergs within a specified distance from a fixed point in the Davis Strait area. (Au)

## TRYDE, P.

**1011**
**Physics and mechanics of ice** / Tryde, P.
(Die Naturwissenschaften, 67, Jan. 1980, p. 556-559, ill.)
References.
*ASTIS document number 172570.*
ACU

The increased technological activity in the Arctic and Antarctic areas has brought into focus the field of ice mechanics as presented at the symposium. The main subjects were creep and failure of ice, but also engineering problems of ice forces, bearing capacity, icebreakers, icebergs and model ice testing have been covered. ... The discussions at the symposium clearly showed that theoretical and experimental research is an absolute necessity if any of the numerous ice problems shall be solved within a reasonable time. ... The interest in icebergs is increasing as the prospecting of oil moves into the offshore areas of the Arctic (and Antarctic). In order to prepare safety measures in the vicinity of offshore structures it is necessary to know the size and the path of the iceberg. Model ice testing is important because it is a way to make systematic and realistic investigations, where the conditions can be precisely controlled, enabling us, not only to verify the theories, but also to observe the behavior of the ice and thereby making it possible to improve the theories. (Au)

**1012**
**Physics and mechanics of ice, papers** / Tryde, P.
New York : Springer-Verlag, 1980.
xiv, 378p. : ill., figures, tables ; 24cm.
ISBN 3-540-09906-9.
References.
Proceedings of the International Union of Theoretical and Applied Mechanics Symposium held in Copenhagen, Aug. 6-10, 1979.
*ASTIS document number 56537.*
ACU, NFSMO

This volume contains twenty-five papers presented at the symposium covering such topics as stress and strain, fracture mechanics, ice testing methods, the dynamic aspects of ice forces acting on cones and inclined planes, icebergs, and icebreakers. (ASTIS)

## TSINKER, G.P.

**See:** 249.

## TUNNELL, G.A.

**1013**
**Incidence of ice in the approaches to North America during the decade 1946-1955** / Tunnell, G.A.
(Marine observer, v. 31, no.192, 1961, p. 78-84, ill., maps)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180491.*

Reports that a ten-year average of 197 icebergs per year moved south of 48 N compared with a long term average of 400/yr. The southward and eastward movement of pack ice over the Grand Banks was normal, but the eastward extent was greater than normal north of 50 N. The movement of icebergs and the incidence of ice in the Gulf of St Lawrence is controlled by unsteady and highly fluctuating ocean currents, a hazard to shipping and influential in North Atlantic weather patterns. (AB)

## TURNER, J.S.

See: 529, 532.

## UNITED STATES. ADVANCED MEASUREMENT SYSTEMS BRANCH. APPLIED SCIENCES DIVISION

**1014**

**Iceberg classification using Side Looking Airborne Radar** / United States. Advanced Measurement Systems Branch. Applied Sciences Division. Farmer, L.D. United States. Coast Guard. Office of Research and Development [Sponsor].
Washington, D.C. : U.S. Coast Guard, Office of Research and Development [publisher] ; Ottawa : CISTI [distributor], 1972.
1 microfiche : ill. ; 11 x 15 cm.
*ASTIS document number 161721.*
NFSMO

The Coast Guard has been experimenting with a Side Looking Airborne Radar for use in radar target classification by the International Ice Patrol. This report, which was prepared for the International Ice Patrol the classification clues and techniques that appear valid at this time for classifying targets as either ice or other than ice. In addition, the report contains information on mensuration, mission planning and radar malfunctions to enhance its value as a training aid. (Au)

## UNITED STATES. COAST GUARD

**1015**

**Announcement of 1986 International Ice Patrol service** / United States. Coast Guard.
Groton, Conn. : International Ice Patrol, 1986.
5 leaves ; 28 cm.
*ASTIS document number 184268.*
ACU, NFSMO

In March or April of 1986, depending upon iceberg conditions, the International Ice Patrol will commence its annual service of guarding the southeastern, southern and southwestern limits of the regions of icebergs in the vicinity of the Grand Banks of Newfoundland. Reports of ice in this area will originate from passing ships and aircraft and from flights by International Ice Patrol (IIP) aircraft. IIP will broadcast two message bulletins each day and a daily radiofacsimile chart containing ice information to inform ships of the extent of the estimated limits of all known ice. ... (Au)

**1016**

**Discussion of iceberg and environmental conditions** / United States. Coast Guard.
(Report of the International Ice Patrol Services in the North Atlantic Ocean, 1983 season. Bulletin – United States. Coast Guard, no. 69, 1984, p. 37-45, maps)
*ASTIS document number 160881.*
ACU, NFSMO

There are a number of factors which affect the number of icebergs that will reach the Grand Banks during a particular ice season. These include the number of bergs that calve from glaciers each year, the ocean currents carrying these bergs south along the Labrador and Newfoundland coasts, the winds which help to move these bergs, the sea ice which tends to retard the movement of bergs and protect those trapped within its limits, and the environmental conditions which affect the melt rates of the bergs (air and sea surface temperature, storm activity, etc.). Each of these factors has some effect on the extent of the iceberg season off Newfoundland. The 1983 Ice Patrol season was the third heaviest season on record with an estimated 1352 icebergs drifting south of 48 N. This was considerably more than the 1900-1983 annual average of 381, though less than the maximum number of 1587, recorded during the 1972 season. Each year thousands of icebergs calve from the glaciers on Greenland's west coast, providing a more than ample supply of bergs in Baffin Bay. The fluctuation in this number of bergs is generally considered to be a minor factor in the number of bergs reaching the Grand Banks because the winds must be favorable to drift the icebergs south and the sea ice must be present to protect them during their long journey. ... The air temperatures ... have been compared with the heavy sea ice conditions experienced during the 1983 Ice Patrol season. Other environmental factors (winds and atmospheric pressures) are discussd in this section in an attempt to explain the large number of icebergs this season. The Oceanographic Conditions section (Appendix B) examines some of the features of the Labrador and North Atlantic currents that the Ice Patrol observed during the 1983 season. (Au)

**1017**

**Iceberg casualties** / United States. Coast Guard.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1973. Bulletin – United States. Coast Guard, no. 59, 1974, p. A-1-A-5)
Appendix A.
*ASTIS document number 166855.*
ACU, NFSMO

[In an] ... extensive literature search for other iceberg related casualties, letters, newspaper accounts and the files of Lloyds have been reviewed. These results are tabulated on ... 19 incidents in the hundred years before, [and] 37 incidents in the 61 years after, the TITANIC .... (Au)

**1018**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1927** / United States. Coast Guard.
Washington, D.C. : U.S. Coast Guard, 1927.
119 p. : ill., maps ; 24 cm.
(Bulletin – United States. Coast Guard, no. 16)
*ASTIS document number 181064.*
ACU, NFSMO

... The duties and scientific work carried on by the ice patrol were, in general, similar to the practice of the previous season. The primary object of the patrol was to locate by scouting, and radio information, the icebergs and ice fields nearest to, and menacing, the North Atlantic lane routes, and to determine the southerly, easterly, and westerly limits of the ice and to keep in touch with it as it moved southward. Radio broadcasts were sent out four times daily giving the whereabouts of this ice and particularly that which was in the immediate vicinity of the North Atlantic lane routes, and ice information was furnished by radio at any time to any ship with which the patrol vessel could communicate. In order that an intelligent service of the highest order be rendered to shipping, an oceanographic program was carried out to afford the vessel on patrol with a practical, up-to-date current map of the critical, infested ice area under surveillance, and scientific studies and observations made bearing upon ice conditions and ice movements. The oceanographic and scientific work being supportive, and secondary in importance, was so arranged that it would not hamper the ice patrol in its primary function of ice scouting. ... (Au)

**1019**

**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1951** / United States. Coast Guard.
Washington, D.C. : U.S.G.P.O., 1952.

85 p. : ill.
(Bulletin – United States. Coast Guard, no. 37)
(Contribution – Woods Hole Oceanographic Institution, no. 601)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179779.*
ACU, NFSMO

Contains section by S. Pisicchio (p. 1-16) reporting on the 1951 season (Feb. 14-May 24), one of shortest on record. Four cruises by the oceanographic vessel Evergreen (the two ice patrol vessels were not needed) and 27 ice observation flights by two aircraft were made. Communications, monthly ice conditions, and weather are discussed. Charts showing ice conditions and surface isotherms, Feb. 1- May 13, and detailed chronological tables of ice reports are given. Only 139 bergs were sighted on flights as far north as 60 N; none drifted south of 46 N. The second section, Physical oceanography of the Grand Banks region and the Labrador Sea in 1951, by F.M. Soule, P.S. Branson, and R.P. Dinsmore (p. 17-85) deals with oceanographic investigations from the Evergreen, Apr. 2-Aug. 1, during which 307 stations were occupied, 24 of them section across the Labrador Sea. Discussion includes: circulation in the Grand Banks and southern Labrador Sea; comparison of temperature-salinity relationships in the Grand Banks region with conditions in other years: relationship between the northern boundary of the North Atlantic Current and the strength of the Labrador Current; volume transport, mean temperature, and salinity distribution within the Labrador and West Greenland Currents in the section from South Wolf Island, Labrador, to Cape Farewell, Greenland; thermal characteristics of this section (increase in temperature of the intermediate water of the Labrador Sea in 1951 over 1950 is noted); continuing deficiency of the Irminger Current in 1951. Tables of oceanographic data (depth, temperature, and salinity) collected at each station are given (p. 54-85). ... (AB)

**1020**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1952** / United States. Coast Guard.
Washington, D.C. : U.S.G.P.O., 1952.
100 p. : ill., charts (6 folded).
(Bulletin – United States. Coast Guard, no. 38)
(Contribution – Woods Hole Oceanographic Institution, no. 637)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179787.*

Contains section by P.S. Branson (p. 1-30) reporting on the 1952 season (Feb. 13-June 16). Three cruises by the oceanographic vessel Evergreen (the two ice patrol vessels were not needed) and 39 ice observation flights by two aircraft were made. Communications and monthly ice conditions are discussed. Charts showing ice conditions and surface isotherms, Feb. 1-June 15, and detailed chronological tables of ice reports are given. During 1952 only 14 bergs were estimated to have drifted south of 48 N, none past 47 N. The second section, Physical oceanography of the Grand Banks region and the Labrador Sea in 1952, by F.M. Soule, (p. 31-100), deals with oceanographic investigations from the Evergreen, Mar. 31-July 27, during which 381 stations were occupied, 24 of them a section across the Labrador Sea. In addition to the usual temperature and salinity measurements, 984 samples were taken for determination of total phosphorous concentration. Discussion includes: circulation in the Grand Banks and southern Labrador Sea; major recurvature of the Labrador Current northward, north of lat. of Flemish Cap; deficiency of the Labrador Current in 1952; comparison of temperature-salinity relationships in the Grand Banks region with conditions in other years; relationship between the northern boundary of the North Atlantic Current and the strength of the Labrador Current; volume transport, mean temperature, and salinity distribution within the Labrador and West Greenland Currents in the section from south Wolf Island, Labrador, to Cape Farewell, Greenland; and continuing deficiency of the Irminger Current in 1952. Data on phosphorus will be published in the next year's report. Tables of oceanographic data (depth, temperature, and salinity) collected at each station are given (p. 55-100). ... (AB)

**1021**
**International ice observation and ice patrol service in the North Atlantic Ocean, season of 1969** / United States. Coast Guard.
Washington, D.C. : U.S. Coast Guard, 1970.
41 p., [3] folded leaves of plates : ill. ; 26 cm.
(Bulletin – United States. Coast Guard, no. 55)
*ASTIS document number 180823.*
ACU, NFSMO

... This Bulletin presents information on Ice Patrol organization and operations as well as on communications, ice conditions, and climatology. ... Preseason aerial ice reconnaissance of Baffin Bay in late September and early October of 1968 indicated the possibility of a heavy ice season on the Grand Banks in the spring of 1969. Figure 1 shows the distribution of approximately 10,000 icebergs observed during the reconnaissance. ... In general the movement of icebergs during the season appeared to follow the normal paths. The number of icebergs drifting south of 48 N. was less than normal. Fifty-seven icebergs drifted south of 48 N. in 1969 versus a 24-year average (1946-1969) of 222 icebergs. The southernmost extent of icebergs this year, 43 50 N., was about the same as the 1945-1965 average of 43 36 N. The southern most extent of sea ice to about 48 30 N., 50 30 W. (Au)

**1022**
**International Ice Patrol** / United States. Coast Guard.
Washington, D.C. : Coast Guard, Public Information Division, 194?.
26 p. : ill., maps.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179701.*

Contains brief popular account (undated but probably prepared about 1948) of the history and work of the International Ice Patrol in the North Atlantic. It was inaugurated following the International Conferernce on the Safety of Life at Sea, London, Nov. 1913, the work being carried out by arrangement of the contracting governments, by the U.S. Coast Guard since 1914, excepting 1917, 1918 when no patrols were undertaken, and 1942-45 when international service was suspended. The contractual arrangements are summarized. The ocean currents and icebergs of the Newfoundland-Labrador-Greenland waters are briefly characterized and diagrammed. Nine photographs illustrate ice conditions and patrol vessel. (AB)

**1023**
**International Ice Patrol** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard. Public Information Division, 1956.
20 p. : ill.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180050.*

Reviews floating ice dangers in the North Atlantic and role of I.I.P.: its air and surface operations, communications system, etc., founding and organization. Summary information is given with illus., diagrams, etc. on ocean currents, ice, and icebergs in the I.I.P. area. (AB)

**1024**
**Long term trends in the iceberg threat in the Northwest Atlantic** / United States. Coast Guard.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1971. Bulletin – United States. Coast Guard, no. 57, 1972, p. 15-24, maps)
References.

*ASTIS document number 166839.*
ACU, NFSMO

Analysis of records on icebergs drifting past Newfoundland since 1880 reveals that the seasonal count of icebergs has fallen by 55% in the last three decades. An analysis of available environmental data for the same period shows that the decrease is associated with a decrease in the strength of winter northwesterly winds off southern Labrador and with an increase in winter air temperatures at Torbay, Newfoundland. (Au)

**1025**
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1970** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1971.
172 p. : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 56)
References.
*ASTIS document number 166944.*
ACU, NFSMO

During the period 1 September 1969 to 31 August 1970, a total of 78 ice observation flights were made. Preseason flights made in September, December, January, February, and March accounted for 18 flights, and 60 flights made during the season accounted for the remainder. The purpose of the preseason flights was to study iceberg distribution patterns in Baffin Bay and the Labrador Sea, and to evaluate the iceberg potential of the developing ice season. The purpose of the flights during the season was to guard the southeastern, southern, and southwestern limits of icebergs, to evaluate the short term iceberg potential of the waters immediately north of the Grand Banks, and occasionally to study the iceberg distribution along the Labrador coast. ... (Au)

**1026**
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1971** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1972.
26 p. : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 57)
*ASTIS document number 166952.*
ACU, NFSMO

The 1971 Ice Season officially commenced at 0000 GMT, 10 March, when the first Ice Bulletin was issued, and continued until the final Bulletin was issued at 1200 GMT, 29 June 1971. ... The U.S. Coast Guard Cutter EVERGREEN, ... conducted oceanographic cruises for the Ice Patrol during April and May. The U.S. Coast Guard Cutter ROCKAWAY, joined EVERGREEN during the May survey to conduct a multi-ship survey of the Labrador Current and the surrounding oceanic area. For the twelfth consecutive year, it was unnecessary to use a surface patrol cutter. During the 1971 Season an estimated 62 icebergs drifted south of 48 N, a relatively light season. It is also estimated that another 11 icebergs drifted south of 48 N during July 1971 only to deteriorate before reaching 47 N. (Au)

**1027**
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1972** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1973.
1 v. (various pagings) : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 58)
*ASTIS document number 166960.*
ACU

During past years, Coast Guard (International Ice Patrol) ships and/or aircraft have patrolled the shipping lanes off Newfoundland within the area of 40 N-52 N, 39 W-57 W, detecting icebergs and warning mariners of these hazards. In the 1972 Ice Patrol season, a total of 1587 icebergs drifted south of 48 N. (NFSMO)

**1028**
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1973** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1974.
1 v. (various pagings) : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 59)
Appendices.
*ASTIS document number 166979.*
ACU, NFSMO

... A single pre-season flight was made in mid-January 1973. ... The 1973 Ice Season officially commenced at 0000 GMT, 24 January, when the first Ice Bulletin was issued, and continued until the final Bulletin was issued at 0000 GMT, 31 July 1973. ... The U.S. Coast Guard Cutter EVERGREEN, ... conducted oceanographic cruises for the Ice Patrol during 3 – 26 April, 8 – 29 May and 13 June – 14 July. Approximately 13 days of the final cruise were devoted to a special survey that provided field data and verification to the Labrador Current model developed by Commander Ronald C. KOLLMEYER, U.S. Coast Guard. This may become a useful input to the iceberg drift program. For the second consecutive year a surface patrol was required. ... On 10 July, with icebergs no longer a threat below 44 N, the surface patrol was terminated. During the 1973 Season an estimated 847 icebergs drifted south of 48 N, a heavy season that was equal in length to last years record of 189 days. (Au)

**1029**
**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1974** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1975.
iii, 62 p. : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 60)
Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1974.
Appendices.
References.
*ASTIS document number 166987.*
ACU, NFSMO

... Preseason flights were made in January, February and March, 1974. The Aerial Ice Reconnaissance Detachment was deployed to St. John's, Newfoundland on March 25 and returned to the United States on July 30, 1974. Several reconnaissance flights of opportunity were conducted in August in conjunction with other missions to determine final melt of bergs and season termination. This was the first time Ice Patrol utilized St. John's for its base of operations almost exclusively. ... The 1974 Ice Season officially commenced at 0000 GMT, March 21, when the first Ice Bulletin was issued, and continued until the final Bulletin was issued at 1200 GMT, August 13, 1974. ... The U.S. Coast Guard Cutter EVERGREEN, ... conducted oceanographic and research cruises for th Ice Patrol from April 4 to May 9, and from June 4 to July 9. During these cruises, EVERGREEN occupied oceanographic stations along select Ice Patrol standard sections, made iceberg tagging and drift observations, took anchored current meter stations and evaluated expendable surface current probes. Approximately two days of the second cruise were devoted to iceberg reconnaissance for the southernmost bergs while enroute to her home port. With the iceberg concentrations south of 46 N relatively sparce, a Surface Patrol was not required this year. During the 1974 Season an estimated 1386 icebergs drifted south of 48 N, the second heaviest season in Ice Patrol history. (Au)

1030

**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1975** / United States. Coast Guard.

Washington, D.C. : United States. Coast Guard, 1976.

v, 77 p. : maps ; 28 cm.

(Bulletin – United States. Coast Guard, no. 61)

Appendices.

References.

*ASTIS document number 167002.*

ACU, NFSMO

... Preseason Ice Patrol northern reconnaissance missions were made in January and February, 1975 to assess the potential for season severity and locate the southern most icebergs. For the second consecutive year, Ice Patrol utilized St. John's, Newfoundland for its base of operations. ... The 1975 Ice Season officially commenced at 0000 GMT, June 24, 1975. ... The U.S. Coast Guard Cutter, EVERGREEN, ... conducted oceanographic and research cruises for the Ice Patrol from April 2 to 29 and May 20 to July 10, 1975. During these cruises EVERGREEN obtained oceanographic data along Ice Patrol standard sections to provide operational ocean current information, conducted iceberg drift studies, and deployed oceanographic current meters. The U.S. Coast Guard Cutter SHERMAN, ... deployed from June 7 to 25, 1975 and joined EVERGREEN for research studies of iceberg drift and deterioration. The Ice Reconnaissance Detachment participated in this phase by locating suitable icebergs for the studies and, on one occasion, dropped ice penetrometers into an iceberg to evaluate this method of affixing an instrument package or beacon to an iceberg. During this second cruise EVERGREEN also conducted two intensive oceanographic surveys to provide data for a Labrador Current model under development. A surface patrol was not required this season. During the 1975 Season an estimated 101 icebergs drifted south of 48 N. (Au)

1031

**Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1976** / United States. Coast Guard.

Washington, D.C. : United States. Coast Guard, 1977.

v, 82 p. : maps ; 28 cm.

(Bulletin – United States. Coast Guard, no. 62)

Appendices.

*ASTIS document number 166286.*

ACU, NFSMO

... There were two preseason reconnaissance missions conducted during the periods 22 January to 1 February and 25 February to 10 March 1976. ... The 1976 Ice Season officially commenced at 0000 GMT on 18 March, when the first Ice Bulletin was issued at 0000 GMT 22 July 1976. ... The U.S. Coast Guard Cutter EVERGREEN, ... conducted oceanographic cruises for the Ice Patrol from 23 March to 25 April and 18 May to 01 July. Additionally, the U.S. Coast Guard Cutter SHERMAN, ... conducted a special Ice Patrol oceanographic cruise slightly east to the Grand Banks from 08 June-01 July 1976. All these cruises provided vital ocean current and temperature data used as inputs to the computerized iceberg drift program and iceberg deterioration predictions. Ice Patrol oceanographic activities are discussed further in the Oceanographic Conditions section of this report. For the third consecutive year no surface patrol was required to patrol the southern limits of icebergs. During the 1976 Season an estimated 151 icebergs drifted south of 48 North latitude, a light season that had a total duration of 126 days. (Au)

1032

**Report of the international ice patrol services in the North Atlantic Ocean. Bulletin – United States. Coast Guard** / United States. Coast Guard.

No. 1 (1914)- .

Washington, D.C. : United States. Coast Guard, 1914- .

v. : figures, tables ; 28 cm.

Annual.

Continuation of R.C.S. bulletin, no. 1-2, 1913 (U.S. Revenue cutter service). Title of no. 3 changed to: International ice observation and ice patrol service in the North Atlantic Ocean, 1914.

Publication suspended 1942-45; ice conditions for these years in report for 1946.

Title from bulletin no. 46, 1961: Report of the international ice patrol service in the North Atlantic Ocean.

Title from bulletin no. 60, 1975: Report of the international ice patrol services in the North Atlantic Ocean.

*ASTIS document number 144479.*

ACU, NFSMO

This is a series of annual reports on the International Ice Patrol Service in the North Atlantic. It contains information on ice conditions and Ice Patrol operations for a one year period. Activities in which the Ice Patrol engages are ice reconnaissance and oceanographic support. (ASTIS)

1033

**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1977** / United States. Coast Guard.

Washington, D.C. : United States. Coast Guard, 1978.

1 v. (various pagings) : maps ; 28 cm.

(Bulletin – United States. Coast Guard, no. 63)

Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1977.

Appendices.

References.

*ASTIS document number 166235.*

ACU, NFSMO

... Preseason Ice Patrol flights were made in January and late February-early March 1977. The Aerial Ice Reconnaissance Detachment was deployed to St. John's, Newfoundland, on 15 March 1977. ... [and] returned to the United States on 22 June 1977, after completion of a Post Season flight on 21 June 1977. The 1977 Ice Season officially commenced at 0000 GMT, 13 March 1977, when the first Ice Bulletin was broadcast by International Ice Patrol Radio Station Boston/NIK .... The USCGC EVERGREEN ... conducted oceanographic cruises for the Ice Patrol from 1 April to 1 May and 23 May to 28 June 1977. During the 1977 season, an estimated 22 icebergs drifted south of 48 N. During the period 1 September 1976 to 31 August 1977, a total of 72 ice observation flights were flown; 13 preseason, 58 seasonal, and 1 post season. The objective of the preseason survey was to study the iceberg distribution patterns in the Labrador Sea and to evaluate the iceberg potential of the developing ice season. The season flight objectives were to locate the southwestern, southern, and southeastern limits of icebergs, to evaluate the short-term iceberg potential of the waters immediately north of the Grand Banks, and occasionally to determine the iceberg distributions along the Labrador coast. One post season flight was made to conduct a final census of the icebergs south of 50 N. ... (Au)

1034

**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1978** / United States. Coast Guard.

Washington, D.C. : U.S. Coast Guard, 1979.

v, 39 p. : maps ; 28 cm.

(Bulletin – United States. Coast Guard, no. 64)

Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1978.

Appendices.

*ASTIS document number 166227.*
ACU, NFSMO

... Preseason Ice Patrol flights were made in January and February, 1978. The Aerial Reconnaissance Detachment was deployed to St. John's, Newfoundland, on 20 March 1978. The Aerial Reconnaissance Detachment was deployed to St. John's, Newfoundland, on 2 March 1978. The detachment returned to the United States on 20 July 1978. The 1978 Ice Season officially commenced at 0000 GMT, 21 March 1978 .... The USCGC EVERGREEN, ... conducted oceanographic cruises for the Ice Patrol from 31 March through 22 April, 1 June through 26 June and 11 August through 2 September, 1978. During the 1978 season, an estimated 75 icebergs drifted south of 48 N. ... During the period 1 September 1977 to 31 August 1978, a total of 94 ice observation flights were flown; 12 preseasonal and 82 seasonal. The objective of the preseason survey was to study the iceberg distribution patterns in the Labrador Sea and to evaluate the iceberg potential of the developing season. The season flight objectives were to locate the southwestern, southern and southeastern limits of icebergs, to evaluate the short-term iceberg potential of the waters immediately north of the Grand Banks, and occasionally to determine the iceberg distribution along the Labrador coast. ... (Au)

**1035**
**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1979** / United States. Coast Guard.
Washington, D.C. : U.S. Coast Guard, 1980.
1 v. (various pagings) : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 65)
Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1979.
Appendices.
*ASTIS document number 166219.*
ACU, NFSMO

... Preseason reconnaissance flights in January and February 1979 determined the early season iceberg distributions. Based on these flights the season commenced 6 March 1979. From that date until 21 July 1979, an Aerial Ice Reconnaissance Detachment operated from St. John's, Newfoundland averaging a patrol every other day over the Grand Banks. The season officially closed on 22 July 1979. During the 1979 season, an estimated 152 icebergs drifted south of 48 N. ... During the 1979 Ice Patrol Season (considered from 1 September 1978 through 31 August 1979) there were 145 aircraft sorties flown in support of International Ice Patrol. These included preseason surveys, ice observation flights and logistic flights. Preseason flights determine iceberg concentrations north of 48 N which are necessary to estimate the time when icebergs will threaten the North Atlantic Shipping Lanes in the vicinity of the Grand Banks. During the active season, ice observation flights map the southwestern, southern and southeastern limits of icebergs. ... (Au)

**1036**
**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1980** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1981.
v, 68 p. : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 66)
Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1980.
Appendices.
*ASTIS document number 166197.*
ACU

During past years, Coast Guard (International Ice Patrol) ships and/or aircraft have patrolled the shipping lanes off Newfoundland within the area of 40 N-52 N, 39 W-57 W, detecting icebergs and warning mariners of these hazards. In the 1980 Ice Patrol season, a total of 23 icebergs drifted south of 48 N. (NFSMO)

**1037**
**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1981** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1982.
1 v. (various pagings) : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 67)
Cover title: Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1981.
Appendices.
*ASTIS document number 166162.*
NFSMO

During past years, Coast Guard (International Ice Patrol) ships and/or aircraft have patrolled the shipping lanes off Newfoundland within the area of 40 N-52 N, 39 W-57 W, detecting icebergs and warning mariners of these hazards. In the 1981 Ice Patrol season, a total of 63 icebergs drifted south of 48 N. (NFSMO)

**1038**
**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1982** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1983.
1 v. (various pagings) : maps ; 28 cm.
(Bulletin – United States. Coast Guard, no. 68)
Cover title: Report of the International Ice Patrol in the North Atlantic, 1982 season.
Appendices.
*ASTIS document number 166111.*
ACU, NFSMO

... A pre-season deployment was made from 1-3 March 1982 to determine the early season iceberg distribution. Based on this trip, the regular deployments began on 10 March with the 1982 season officially opening on 13 March. From that date until 27 August 1982, an aerial Ice Reconnaissance Detachment (ECERECDET) operated from Gander, Newfoundland, averaging one patrol every two days over the Grand Banks. The season officially closed on 1 September 1982. No U.S. Coast Guard cutters were deployed to provide Ice Patrol oceanographic support or to act as surface patrol vessels this year. During the 1982 season, an estimated 188 icebergs drifted south of 48 degrees North. ... During the 1982 Ice Patrol Fiscal year (considered from 1 September 1981 through 30 September 1982), 118 aircraft sorties were flown in support of the International Ice Patrol. These included pre-season flights, ice observation and logistics flights during the season, and post-season flights. Pre-season flights determined iceberg concentrations north of 48 N which were necessary to estimate the time when icebergs would threaten the North Atlantic shipping lanes in the vicinity of the Grand Banks of Newfoundland. During the active season, ice observation flights located the southwestern, southern, and southeastern limits of icebergs. ... (Au)

**1039**
**Report of the International Ice Patrol Services in the North Atlantic Ocean, season of 1983** / United States. Coast Guard.
Washington, D.C. : United States. Coast Guard, 1984.
1 v. (various pagings) : ill. ; 28 cm.
(Bulletin – United States. Coast Guard, no. 69)
Cover title: Report of the International Ice Patrol in the North Atlantic, 1983 season.
Appendices.
References.
*ASTIS document number 166081.*

ACU, NFSMO

... Two pre-season deployments were made from 26-29 January 1983 and 10-14 February 1983 to determine the early season iceberg distribution. Based on these trips, regular deployments started on 18 February with the 1983 season officially opening on 22 February. From that date until 27 August 1983, an aerial Ice Reconnaissance Detachment (ICERECDET) operated from Gander, Newfoundland, one week out of two during the season. The season officially closed on 26 August 1983. No U.S. Coast Guard cutters were deployed to act as surface patrol vessels this year. The USCGC NORTHWIND was deployed to provide oceanographic support to Ice Patrol from 21-27 March 1983. During the 1983 season, an estimated 1352 icebergs drifted south of 48 N latitude. ... During the 1983 Ice Patrol season ... 117 aircraft sorties were flown in support of the International Ice Patrol. These included pre-season flights, ice observation and logitics flights during the season, and post-season flights. Pre-season flights determined iceberg concentrations north of 48 N, necessary to estimate the time when icebergs would threaten the North Atlantic shipping lanes in the vicinity of the Grand Banks of Newfoundland. During the active season, ice observation flights located the southwestern, southern and southeastern limits of icebergs. (Au)

**See also:** 978, 980, 1040, 1041.

## UNITED STATES. COAST GUARD. OFFICE OF RESEARCH AND DEVELOPMENT

**See:** 879, 1014, 1055.

## UNITED STATES. COAST GUARD. RESEARCH AND DEVELOPMENT CENTER

**1040**

**Elements of an iceberg deterioration model** / United States. Coast Guard. Research and Development Center.
Robe, R.Q. United States. Coast Guard [Sponsor].
Groton, Conn. : U.S. Coast Guard, Research and Development Center [publisher] ; Springfield, Va. : NTIS [distributor], 1983.
1 microfiche : ill. ; 11 x 15 cm.
(Report – United States. Coast Guard, CG-D-18-83)
(NTIS AD-A133 223)
References.
*ASTIS document number 173975.*
NFSMO

A model of iceberg deterioration using loss of mass has been developed which is based upon gross iceberg characteristics and environmental factors. The significant iceberg characteristics have been determined to be waterline length, height above water, and class (drydock, pinnacle, tabular, or domed). The environmental factors used are water temperature, wind speed, and wave height and period. The reduction of mass has been assumed to be the result of forced convective melting of the underwater portion, wave erosion at the water line, and calving of ice undercut by the waves. This model is designed to be in a form simple enough so that the deterioration can be easily computed. (Au)

**1041**

**Iceberg drift near Greenland – 1980 to 1982** / United States. Coast Guard. Research and Development Center.
Robe, R.Q. United States. Coast Guard [Sponsor].
Groton, Conn. : U.S. Coast Guard, Research and Development Center [publisher] ; Springfield, Va. : NTIS [distributor], 1982.
1 microfiche : ill., maps ; 11 x 15 cm.
(Report – United States. Coast Guard, CG-D-36-82)
(NTIS AD-A-121-586)
References.
*ASTIS document number 174009.*
NFSMO

In 1980 six satellite-tracked buoys were deployed on icebergs along the Coast of Greenland. One of these icebergs was in the Denmark Straits east of Greenland while the remaining five were in Baffin Bay. The icebergs were tracked using System ARGOS. The drift speeds near Greenland rarely exceeded 0.20 m/s with speeds less than 0.10 m/s being most common. The speed of the one iceberg that drifted to the North American side of Baffin Bay was higher (up to 0.65 m/s) after reaching the western side of Baffin Bay. The data supports a conclusion that icebergs reaching the western side of Baffin Bay come from glaciers north of 74-30N. The icebergs tracked were grounded for 63% of the time tracked. (Au)

## UNITED STATES. CONGRESS. HOUSE. COMMITTEE ON MERCHANT MARINE AND FISHERIES

**1042**

**North Atlantic International Ice Patrol. Hearings before the Committee on Merchant Marine and Fisheries, House of Representatives, Seventy-fourth Congress, second session, on S. 4648, an act to promote safety at sea in the neighborhood of ice and derelicts, and for other purposes** / United States. Congress. House. Committee on Merchant Marine and Fisheries.
Washington : U.S.G.P.O., 1936.
ii, 9 p.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179710.*

The bill provided for congressional ratification of the renewal of an agreement reached in London, 1929, by The International Convention of Safety of Life at Sea, whereby thirteen other countries agreed to share operating expenses with the United States, the latter carrying out the patrol; an agreement first reached in 1914. (AB)

## UNITED STATES. HYDROGRAPHIC OFFICE

**1043**

**American practical navigator, an epitome of navigation and nautical astronomy, originally by Nathaniel Bowditch** / United States. Hydrographic Office.
Washington, D.C. : G.P.O., 1943.
391, 387 p. : ill.
(United States. Hydrographic Office, no. 9, 1943)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179604.*

Includes chap 23 (p. 298-307) on ice movement in the North Atlantic Ocean, noting season of ice on the Grand Banks, origin of icebergs, ice-bearing currents, drift and iceberg characteristics, field ice, ice disappearance, and signs of proximity of ice. (AB)

**1044**

**Arctic ice and its drift into the North Atlantic Ocean** / United States. Hydrographic Office.
12th ed.
Washington, D.C. : G.P.O., 1953.
1 sheet (folded) : charts.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179795.*

This Supplement to the Pilot Chart of the North Atlantic Ocean contains brief discussion of "formation of the International Ice Patrol, managed by the U.S. and ... formation and course of the West Greenland and Labrador currents and the Gulf Stream. Defines different types of field ice – storis, west ice and winter ice – and berg ice, and reviews at length the seasonal distribution of these types of ice in East Greenland, West Greenland, Southwest Greenland, Frobisher Bay, Hudson Strait, Hudson Bay, Labrador, Newfoundland, Gulf of St. Lawrence and Grand Banks. Visual and instrumental methods for detecting field and berg ice are included [and] ... suggestions ... for any ship that must sail into the ice are listed. Charts show distribution of different types of ice, principal iceberg glaciers which discharge into Baffin Bay, drift of icebergs from their source into Baffin Bay and drift tracks of icebergs, 1900-1940." (AB)

**1045**

**Arctic ice and its drift into the North Atlantic Ocean** / United States. Hydrographic Office.
14th ed.
Washington, D.C. : Hydrographic Office, 1955.
1 sheet (folded) : ill., charts.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179922.*

Latest edition of Arctic Bibliography, No. 37920, with information, similarly, on currents, types of ice, distribution and drift. (AB)

**1046**

**Arctic ice and its drift into the North Atlantic Ocean** / United States. Hydrographic Office.
15th ed.
Washington, D.C. : G.P.O., 1956.
1 sheet (folded) : ill., charts.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180025.*

This supplement to the Pilot Charts of the North Atlantic Ocean contains brief discussion of "formation of the International Ice Patrol, managed by the U.S. and ... formation and course of the West Greenland and Labrador currents and the Gulf Stream. Defines different types of field ice – storis, west ice and winter ice – and berg ice, and reviews at length the seasonal distribution of these types of ice in East Greenland, West Greenland, Southwest Greenland, Frobisher Bay, Hudson Strait, Hudson Bay, Labrador, Newfoundland, Gulf of St. Lawrence and Grand Banks. Visual and Instrumental methods for detecting field and berg ice are included [and] ... suggestions ... for any ship that must sail into the ice are listed. Charts show distribution of different types of ice, principal iceberg glaciers which discharge into Baffin Bay, drift of icebergs from their source into Baffin Bay and drift tracks of icebergs ...." (AB)

**1047**

**Long-range ice outlook eastern Arctic, 1959** / United States. Hydrographic Office.
Washington, D.C. : Hydrographic Office, 1959.
24 p. : maps.
(Miscellaneous publication – Unites States. Hydrographic Office, no. 15869- 18)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180130.*

Presents the first estimate of expected sea ice conditions mid-May to mid-September, for the 1959 Eastern Arctic sealift, based on aerial reconnaissance Mar. 24-28, 1959, oceanographic and climatic data winter 1958-59, and climatic outlook for 1959. Probable ice conditions in the Labrador Sea, Davis Strait, Baffin Bay, and along the East Greenland coast, are shown on monthly charts: also dates of opening and freeze-up. Conditions are expected to be better than in 1958 along the West Greenland coast from Disko Bugt to Thule, worse than in 1958 along the Labrador Coast, and variable along the East Greenland coast. A gereral brief on icebergs is included. (AB)

**1048**

**Sea ice and its drift into the North Atlantic Ocean; edition no. 17** / United States. Hydrographic Office.
Washington, D.C. : Hydrographic Office, 1960.
1 sheet (folded) : ill., maps ; 30 x 42 1/2 in.
(Supplement to pilot chart of the North Atlantic Ocean United States. Hydrographic Office, Apr. 1960)
References.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180220.*

Outlines, with illus., maps, graphs, table, main factors causing the annual concentration of icebergs off Newfoundland. Ice conditions along the east, west, and southwest Greenland coasts, in Frobisher Bay, Hudson Bay and Strait, Baffin Bay-Davis Strait, Labrador Sea, and the Gulf of St. Lawrence are outlined; berg distribution, movement southward in the West Greenland and Labrador Currents, melting in warm Gulf Stream water are described. Methods of berg or field ice detection are suggested, and procedures for navigating in pack ice are recommended. Nearly all western North Atlantic bergs originate from 20 Greenland glaciers, which are shown (maps) together with their bergs' routes southward. Publications and services of the International Ice patrol, the U.S. Coast Guard, and the U.S. Hydrographic Office are noted. (AB)

## UNITED STATES. JOINT PUBLICATIONS RESEARCH SERVICE

**See:** 235.

## UNITED STATES. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

**See:** 846, 1049, 1053, 1054.

## UNITED STATES. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. ICEX SCIENCE AND APPLICATIONS WORKING GROUP

**See:** 845.

## UNITED STATES. NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER

**1049**

**Possible methods for distinguishing icebergs from ships by aerial remote sensing** / United States. National Aeronautics and Space Administration. Lewis Research Center. Howes, W.L. United States. National Aeronautics and Space Administration [Sponsor].
[Cleveland, Ohio : Lewis Research Center] [publisher] ; Springfield, Va. : NTIS [distributor], 1979.
1 microfiche : ill. ; 11 x 15 cm.
(NASA technical memorandum, 79310)
References.
*ASTIS document number 161730.*
NFSMO

Methods are discussed for distinguishing icebergs from ships utilizing airborne radar and microwave radiometry. Side-looking radar is appropriate for targets off the flight path whereas radiometry may be appropriate for targets along the flight path. The radar methods are classified according to whether the target is resolved. Since targets of interest may be near or below the resolution threshold, methods which do not require target resolution are preferred. Among these methods, polarization techniques appear most feasible. Specifically, these include identification using the relatively greater depolarization by natural targets (icebergs) relative to that by man-made targets (ships), and identification by means of doubly-reserved circular polarization produced by reflecting surfaces intersecting at right angles. (Au)

## UNITED STATES. NAVAL OCEANOGRAPHIC OFFICE

**See:** 1133.

## UNITED STATES. NAVAL OCEANOGRAPHY COMMAND

**See:** 1050.

## UNITED STATES. NAVAL POLAR OCEANOGRAPHY CENTER

**1050**

**Ice observation handbook 1984** / United States. Naval Polar Oceanography Center. United States. Naval Oceanography Command [Sponsor].

New ed.

[Washington, D.C. : Naval Polar Oceanography Center, 1984].

1 v. (various pagings) : ill. ; 28 cm.

Cover title.

Appendices.

*ASTIS document number 163988.*

ACU

... The Ice Observation Handbook, a compendium of aerial, ship, and shore codes and terminology, has been designed primarily for use by the ice observer in the field and by those activities routinely making use of sea ice products. Complete explanations of all NAVPOLAROCEANCEN ice codes, as well as, a complete explanation of the World Meteorological Organization (WMO) ice codes, abbreviations, and glossary of the ice thickness matrix are contained for reference. ... Reliable observations provide input into the analysis and forecasting that supports operations in the Arctic and Antarctic. The information contained in this handbook should clarify communications between the observer/forecaster, and the field user by standardizing reporting procedures and eliminating confusion regarding current codes and terminology. ... (Au)

## UNITED STATES. OFFICE OF NAVAL RESEARCH

**See:** 388.

## UNITED STATES. OFFICE OF NAVAL RESEARCH. AIR PROGRAMS

**See:** 451.

## UNITED STATES. WEATHER BUREAU

**1051**

**Severe ice in North Atlantic** / United States. Weather Bureau.

(Mariners weather log, v. 1, no. 3, May 1957, p. 48)

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180068.*

Reports of mariners indicate unusually severe ice in the Newfoundland area in early 1957. The sinking of a 134-ft. vessel after striking an iceberg on Feb. 4 about 35 mi. east of Cape Breton Island is reportedly the first vessel sunk by iceberg collison since the Titanic (in 1912). By mid-March, the ice pattern was two months ahead of schedule. (AB)

## UNIVERSITE LAVAL

**1052**

**POAC 81 : the Sixth International Conference on Port and Ocean Engineering Under Arctic Conditions, Quebec, Canada, July 27-31, 1981, proceedings** / Universite Laval. Quebec (Province). Ministere de l'Environnement.

Quebec City, Que. : Universite Laval, 1981.

3 v. : ill., figures, tables ; 21 cm.

Text in English and French.

English abstracts provided for French papers.

*ASTIS document number 113182.*

ACU, NFSMO

... in these conferences, the transfer of new knowledge is direct and results of research can be put to immediate use. ... In the previous "POAC" conferences, a major orientation was given to problems in the North Sea, then in full exploration bloom. However, the present conference is mainly directed towards the Canadian and American Arctic waters. Thus the papers are heavily weighed on ice questions, which is the major new aspect of development in these regions. The preeminence of ice in this conference is so large that the word ice or its equivalent appears in the title of 95 papers out of 120. Consequently, several sessions had to be organized on ice action on the subjects of "Ice Mechanics", "Sea Ice Conditions" and "Marine Structures". Except for those on "Meteorology and Oceanography" and "Wave Mechanics" all other sessions deal mostly with ice. They are: "Navigation in Cold Regions", "Remote Surveillance and Instrumentation", "Marine Foundation and Scour", "Oil Spills", "Sea Ice Drift", "Interaction between Ice and Shore", "Icebergs" and "Ice Control Measures". ... (Au)

## UNIVERSITY OF KANSAS. SPACE TECHNOLOGY CENTER

**1053**

**Radar systems for a polar mission : final report** / University of Kansas. Space Technology Center. Moore, R.K. Claassen, J.P. Erickson, R. Fong, R.K.T. Komen, M. McCauley, J. McMillan, S. Parashar, S.K. United States. National Aeronautics and Space Administration [Sponsor].

[Hampton, Va. : National Aeronautics and Space Administration] [publisher] ; Sprinfield, Va. : NTIS [distributor], 1977.

1 microfiche : ill. ; 11 x 15 cm.

(RSL technical report – University of Kansas. Remote Sensing Laboratory, 291- 2)

(NTIS N78-10344)

References.

*ASTIS document number 174084.*

NFSMO

Use of radar is indicated for observation of phenomena in the polar regions, particularly during the dark months. This report reviews the status of radar observation of sea ice (quasi-operational from aircraft), glaciers (little known), and icebergs (feasible but little research, and problems in discriminating icebergs from ships). Techniques for satellite observation are presented, with emphasis on use of a scanning synthetic-aperature radar (SCANSAR) of modest resolution to achieve the wide swathwidth required for frequently repeated coverage. Methods for processing SCANSAR data onboard the satellite were investigated, and some 5 methods appear feasible at the present time, although more research is needed. Use of CCD and SAW devices appears particularly promising in the achievement of low-power-consumption processors, but the rapid advancement of the digital art means that sampled-data analog processors using CCD and MOS devises must continually be compared with their digital competitors to determine which is best at the time a design decision must be made. (Au)

## UNIVERSITY OF KANSAS. SPACE TECHNOLOGY CENTER. RAYMOND NICHOLS HALL. REMOTE SENSING LABORATORY

**1054**

**State of the art – radar measurement of icebergs** / University of Kansas. Space Technology Center. Raymond Nichols Hall. Remote Sensing Laboratory. Parashar, S.K. United States. National Aeronautics and Space Administration [Sponsor].

Lawrence, Kan. : University of Kansas Space Technology Center, Raymond Nichols Hall, Remote Sensing Laboratory, 1976.

i, 8 leaves ; 28 cm.

(Technical memorandum – University of Kansas. Space Technology Center. Raymond Nichols Hall, 291-2)

References.

*ASTIS document number 163236.*

NFSMO

Radar can be useful for sensing icebergs, and in fact radar may be the most useful sensor because of its wide coverage under adverse weather conditions. Although several experiments have been conducted in the use of radar for this purpose, these have been performed on a somewhat qualitative basis and with equipment that happened to be available. Consequently, it can be stated that X-band and K-band radars operating at modest angles of incidence are useful for iceberg discrimination and that horizontal polarization with resolutions between 20 and 100 meters could be used successfully. Research is needed, however, to ascertain the best frequency or frequencies, the best incidence angles, and the best resolutions for detecting icebergs and discriminating them both from ships and from water and sea-ice backgrounds. (Au)

## UNIVERSITY OF RHODE ISLAND. DEPT. OF MECHANICAL ENGINEERING

**See:** 1055.

## UNIVERSITY OF RHODE ISLAND. DEPT. OF OCEAN ENGINEERING

**1055**

**Theoretical estimates of the various mechanisms involved in iceberg deterioration in the open ocean environment** / University of Rhode Island. Dept. of Ocean Engineering. University of Rhode Island. Dept. of Mechanical Engineering. White, F.M. Spaulding, M.L. Gominho, L. United States. Coast Guard. Office of Research and Development [Sponsor].

Washington, D.C. : U.S. Coast Guard, Office of Research and Development, 1980.

iv, 126 p. : figures, tables ; 28 cm.

(Final report – United States. Coast Guard. Research and Development Center, CGR/DC- 7/80)

([Report] – United States. Coast Guard, USCG-D-62-80)

(NTIS AD-A-091 557)

Also available on microfiche.

References.

*ASTIS document number 85219.*

ACU, NFSMO

Theoretical estimates are developed for a variety of mechanisms for the deterioration of icebergs in the open ocean environment. ... Formulas are given for computing the static stability of an iceberg from observations of the exposed shape. Simple theoretical estimates are made for the response of an iceberg to a sudden change in wind or water current and the speed at which a berg is driven by the wind. ... Solar insolation and buoyant meltwater convection are shown to be minor contributions to deterioration, with melt rates of 2-20 cm/day at best. ... The most important mechanism is wave erosion, with waterline melt rates estimated as high as 150 cm/day/deg. C. Digital computer finite difference results for the fracture of an overhanging ice slab plus wave erosion theory lead to a theoretical estimate for the calving time of an iceberg subjected to a wave environment. (Au)

## URALOV, N.S.

**See:** 201, 202.

## URICK, R.J.

**1056**

**The noise of melting icebergs** / Urick, R.J.

(Journal of the Acoustical Society of America, v. 50, no. 1, 1971, p. 337-340, ill.)

*ASTIS document number 163171.*

NFSMO, ACU

Icebergs seem to have escaped serious attention as sources of underwater sound. The noise of icebergs has been measured by means of sonobuoys dropped by an aircraft at distances between 200 and 10,000 yd. Two isolated icebergs 130 to 150 ft high were measured at a location northeast of Newfoundland. Noise apparently originated by the bergs was found to have a spectrum flat to about 10 kHz, the limit of measurement, with spectrum levels of –37 and –42 dB re 1 dyn/sq cm at 200 yd from the two bergs. Ice sizzle is readily observed with a cube of cloudy ice and a hydrophone in a container of water. It is surmised that this noise is caused by the explosion of tiny air bubbles entrapped in the ice under pressure and released as melting occurs. Alternatively, at deep depths, the process may be one of implosion of the cavities by inrushing water. The level of the noise of icebergs doubtless depends on many factors, such as size, depth, air content, and rate of melting in the surrounding water. (Au)

## VALEUR, H.H.

**1057**
**Isforholdene i de Gronlandske farvande = The ice-conditions in Greenland waters, 1965** / Valeur, H.H.
Kobenhavn : Danske Meteorologiske Institut [publisher] ; Springfield, Va. : NTIS [distributor], 1980.
2 microfiches : maps ; 11 x 15 cm.
(NTIS N82-12533)
ISBN 87-7478-183-9.
Appendix.
*ASTIS document number 177890.*
ACU

The present volume is the ninth of the series "The Ice Conditions in the Greenland Waters" and the present volume is the last to be issued in this form. This publication reports on the extent and presence of sea ice for the year 1965, which has principally been gathered from flight reconnaissances. For each of the coastal stations daily information on the distribution on pack ice, fast ice, nilas, and icebergs is provided, and information on fast ice thickness and the daily number of icebergs reported. (ASTIS)

## VAN ALLEN, W.H.

**1058**
**International Ice Patrol** / Van Allen, W.H.
(Canadian geographical journal, v. 62, no. 3, Mar. 1961, p. 76-87, ill., map)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180360.*
ACU

Describes this ice observation and reporting service undertaken in the Grand Banks area by the U.S. Coast Guard for 16 contributing nations. Its organization after the Titanic sank from an iceberg collision and its history since 1913 are outlined. Its present operations, oceanographic studies (including the effects of ocean currents on iceberg drift), and experiments to demolish icebergs with thermite and carbon black are reviewed. Canadian contributions to the Patrol are noted. (AB)

## VAN DAM, L.

**See:** 929.

## VAN DER LINDEN, W.J.

**1059**
**Hamilton Bank, Labrador margin : origin and evolution of a glaciated shelf** / Van der Linden, W.J. Fillon, R.H. Monahan, D.
Ottawa : Canadian Hydrographic Service and the Geological Survey of Canada, [c1976].
1 portfolio : ill., maps (part. fold.) ; 29cm.
(Paper – Geological Survey of Canada, 75- 40)
(Marine sciences paper, 14)
ISBN 0-660-00482-5.
References.
*ASTIS document number 6572.*
ACU, NFSMO

Hamilton Bank consists of a thick wedge of Mesozoic and Cenozoic sediments that was built out over a block-faulted, subsiding Precambrian crystalline basement. Subsidence was in response to the same forces that caused the opening of the Labrador Sea and the separation of Greenland and North America. The gross final relief was formed through alternating phases of valley erosion and of deposition corresponding to periods of glacio-eustatic lowered and raised sea level. ... Postglacial sediment dynamics has been largely a matter of winnowing and local redeposition of glacial deposits. The bulk of the fine clays that accumulated in the deepest parts of the marginal trough in early postglacial time seems to have been derived from the inner shelf while the Labrador Current was confined to the outer edge of the shelf. In the past 6000 years or so, however, the Labrador Current adopted a course closer to shore, through Cartwright Saddle and the marginal trough. Icebergs calved from the Greenland Icecap are carried southward across Hamilton Bank by the Labrador Current. Where they touch bottom furrows are gouged up to several meters deep and several kilometers long. (Au)

## VAN IEPEREN, M.

**See:** 547.

## VAN OORTINERSSEN, G.

**See:** 830.

## VANDALL, P.E.

**1060**
**Ice and offshore production on the east coast of Canada** / Vandall, P.E.
(Conference on Canadian Offshore Drilling & Downhole Technology (CODD), September 14-16, 1981, Hotel MacDonald, Edmonton, Alberta. – Calgary, Alta. : CODD, 1981, [p. 53-61], figures, map, tables)
References.
*ASTIS document number 132772.*
NFSMO

Significant hydrocarbon discoveries have been made on the Southeast Baffin Island Shelf, Labrador Shelf, the Grand Banks and the Scotian Shelf. In all areas but the Scotian Shelf the development of production concepts and the design of offshore structures will be highly dependent upon a knowledge of pack ice and iceberg conditions. ... (Au)

## VENKATESH, S.

**1061**
**An arctic iceberg deterioration field study and model simulations** / Venkatesh, S. EL-Tahan, M.S.S. Mitten, P.T.
(Annals of glaciology, v. 6, 1985, p. 195-199, ill.)
References.
*ASTIS document number 182753.*
ACU, NFSMO

This paper describes the details of a field study on the deterioration of two icebergs grounded outside St. John's harbour in Newfoundland, Canada. Observational data was collected during the period 10-25 June 1983, and included berg-related, meteorological and oceanographic data. The study indicated the need for a stable observation platform to enable accurate measurements of iceberg profiles. The observed decay of the two icebergs is compared with simulations from a model that predicts mass losses due to insolation, buoyant vertical convection, forced convection in air and water, wave erosion and calving of the resulting overhanging ice slabs. There was good agreement between observations and model simulations with the model underestimating the mass losses by about ten percent. Other salient features noted during the field study are also discussed. (Au)

**1062**

**On the deterioration of a grounded iceberg** / Venkatesh, S.
(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. – [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 29)
Abstract only.
*ASTIS document number 182230.*
ACU

This paper examines the deterioration of an iceberg grounded outside St. John's Harbour in Newfoundland, Canada, in terms of its initial velocity prior to grounding. Theoretical expressions for the lifting of the iceberg and hence its buoyancy loss during grounding are derived as a function of initial iceberg velocity and ocean bottom slope. Wave erosion and calving, among others, are two of the most significant mechanisms for iceberg deterioration. With wave erosion occurring on the seaward side of the grounded iceberg, model simulations are compared with observational data from a field study conducted on the grounded iceberg between June 10-17, 1983. Model simulated time of refloatation of the iceberg agrees with observations, for initial iceberg velocity of 0.3 – 0.5 m/s. Model simulations of the deterioration of the iceberg beyond the point of refloatation are also compared with observations. Allowing for a ten percent error in the observed above-water volume of the iceberg on June 10, the model simulated mass losses are in good agreement with observations. Best results are obtained for the model initialized with data observed on June 14, 1983 the first day for which detailed observational data are available following refloatation of the iceberg. (Au)

**See also:** 375, 376, 379, 383, 385.

## VERDIER, J.

**See:** 627.

## VERLET, J.

**See:** 144.

## VIATEC RESOURCE SYSTEMS INC.

**1063**

**Assessment of marine radars for the detection of ice and icebergs** / Viatec Resource Systems Inc. Ryan, J.P. Harvey, M.J. Kent, A. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF [publisher] ; Calgary : Pallister Resource Mgt. Ltd. [distributor], 1985.
xiii, 127 p. : ill. ; 28 cm.
(Environmental Studies Revolving Funds report, no. 008)
ISBN 0-920783-07-4.
Appendices.
References.
Also available on microfiche.
*ASTIS document number 181625.*
ACU, NFSMO

In the winter of 1984 a comprehensive field program was undertaken to assess the iceberg detection capability of existing marine-type radars. The semi-submersible Sedco 706 drilling platform was selected for the trials. The Sedco 706 has four radar systems on board, two X-band (3 cm) and two S-band (10 cm), all manufactured by Racal-Decca of Britain. ... The data collected has proven useful in identifying the effect of critical environmental conditions, such as ducting and subrefraction, as well as proceding valuable information on sea clutter. The calibration of the radar system has permitted the calculation of iceberg radar cross-sections and a normalized radar cross-section for the ocean in a wide range of sea conditions. Five of the important findings follow. (a) The derrick-mounted S-band radar detected and tracked about four times as many icebergs as the other systems, which was due, in part, to different levels of system performance. (b) On clear cool days when ducting was shown to exist, this S-band radar typically detected medium icebergs in the range from 17 to 20 naut mi (31.5 to 37 km). (c) During foggy weather, calculation for the refractivity in the lower atmosphere almost always indicated subrefractive conditions. The detection ranges for medium icebergs during these conditions were typically less than 17 naut mi (31.5 km) and most frequently around 15 naut mi (27.8 km) for the S-band radar. (d) Comparision of calculated back-scatter coefficients for the sea surface for various sea conditions with published data shows good agreement over certain ranges of grazing angles (normally 0.5 deg. to 1.0 deg.) in the higher sea conditions. Measured values were consistently lower than the published data at other grazing angles. (e) Calculation of iceberg radar cross-sections indicate a general agreement between the collected data and the relationship proposed by Budinger (1960) linking the radar cross-section to the cross-sectional area. (Au)

**1064**

**Enhancement of the radar detectability of icebergs** / Viatec Resource Systems Inc. Ryan, J.P. Environmental Studies Revolving Funds (Canada) [Sponsor].
Ottawa : ESRF [publisher] ; Calgary, Alta. : Pallister Resource Mgt. Ltd. [distributor], 1986.
2 microfiches : ill. ; 11 x 16 cm.
(Environmental Studies Revolving Funds report, no. 022)
ISBN 0-920783-21-X.
Appendices.
References.
Also available in hardcopy.
*ASTIS document number 183873.*
ACU, NFSMO

A study has been undertaken to investigate the use of enhancement techniques to increase the radar detectability of icebergs. These techniques will permit more efficient use of iceberg management tools such as support vessels and aircraft. There are essentially two strategies to achieve enhancement available; namely passive and active. Passive techniques refer to those which increase the icebergs effective echoing area or radar cross-section and include the deployment of reflective material on the iceberg surface as well as a number of reflector configurations based on balloon and kite systems. Active techniques include the use of radar transponders, radio direction finding equipment, radio navigation equipment and satellite tracking systems. The study has demonstrated that passive techniques may be used to increase the probability of detection of icebergs as well as increasing the detection or tracking range. The passive methods considered offer a very inexpensive way of improving iceberg tracking capability. These enhancement techniques will only be effective within the radar horizon (typically 35 km for a derrick top radar). Active methods may be employed for ranges beyond the radar horizon. These techniques can provide from 50 to 500 km tracking ranges depending on the system used. Recommendations from this study include field trials for the identified passive enhancement techniques and an evaluation of the operational requirements for both passive and active methods. (Au)

**1065**

**A preliminary system specification for the ice hazard detecton/collision avoidance system** / Viatec Resource Systems Inc. Harvey, M.J. Transportation Development Centre (Canada) [Sponsor].
Montreal : Transporation Development Centre [publisher], 1982 ; Toronto : Microlog [distributor], 1984.
1 microfiche ; 11 x 15 cm.
(Transport Canada report, no.TP4216E)

(Microlog, microfiche collections, 84- 1782/1)
Appendices.
References.
*ASTIS document number 182281.*
ACU

An investigation conducted during the period of September 1982 to November 1982 to outline the capabilities of various sensors and the requirements of offshore operators is reported. These capabilities and requirements were utilized to produce a preliminary system specification for an integrated ice hazard detection/collision avoidance system (IHD/CAS). This system is to comprise a group of sensors designed to complement each other's performance. They range from long-range high frequency radar, medium range microwave radar to relatively short range, low light level television systems and infrared detection systems. All sensors are to be fully integrated to permit the operator to gain all necessary ice detection information using one system and to enable the collision avoidance system to determine, with a high degree of confidence, the risk posed by ice present in surrounding water. A follow-on project will further elaborate the requirements for IHD/CAS and define to a much greater degree all of the various system specification requirements. (Au)

**1066**
**Specification investigation and data assessment of an ice hazard detection/collision avoidance system** / Viatec Resource Systems Inc. Harvey, M.J.
Transportation Development Centre (Canada) [Sponsor].
Calgary, Alta. : Viatec Resource Systems Inc. [publisher], 1983 ; Toronto : Microlog [distributor], 1985.
2 microfiches : ill. ; 11 x 15 cm.
(Transport Canada report, no.TP4896E)
(Microlog, microfiche collections, 85- 2666)
Appendices.
References.
*ASTIS document number 178241.*
ACU

This project was initiated by the Transportation Development Centre to perform an evaluation of a set of field data collected by Remotec Applications Inc. during 1981. This data consisted primarily of recorded radar returns and supporting documentation for a collection of iceberg targets. The evaluation consisted of selecting the most promising targets which could be digitized and used for further analysis. The selected targets were subjected to some basic manipulations in order to assess the target data quality. The targets selected are considered to be useful for studies that attempt to evaluate radar signal processing techniques. A variety of techniques are proposed such as scan to scan integration. Further development of the system specification for an integrated ice hazard detection/collision avoidance system was undertaken and reported. The area of emphasis centered upon the display requirements. Potential Canadian users and research organizations were consulted to identify development programs underway which could assist in system development. (Au)

## VOEVODIN, V.A.

**1067**
**Dimensions of icebergs in the region of Franz-Josef Land and Spitsbergen** / Voevodin, V.A.
(Problems of the Arctic and the Antarctic, v. 39, 1972, p. 175-178, ill.)
(Problemy Arktiki i Antarktiki, v. 39, 1972, p. 138-140, ill.)
References.
*ASTIS document number 157619.*
ACU, NFSMO

... we attempted to determine the vertical and horizontal parameters of the icebergs and their fragments in Franz-Josef Land and Spitsbergen. The magnitudes of 59 icebergs in Franz-Josef Land and Spitsbergen were determined from the data of aerial photographs taken by the co-workers of the laboratory of instrumental ice survey techniques at the Arctic and Antarctic Institute in April, 1967, 1969 and 1970. The magnitudes of 59 icebergs in Franz-Josef Land and Spitsbergen were determined. From the data of the mean lengths of the iceberg shadows and from the computed altitude of the sun at the time of the survey the elevation of the iceberg was calculated by the formula h=l tan h., where h is the elevation of the iceberg over the ice surface: l is the length of the iceberg's shadow on the ice; h. is the altitude of the sun, degrees. ... (Au)

## VON DRYGALSKI, E.

**1068**
**The temperatures of the iceberg** / von Drygalski, E.
(Iceberg research, 1983, no. 6, Nov., p. 10-12)
Translation from German of "Die Temperaturen des Eisbergs", from Deutscha Sudpolar-Expedition 1901-1903, Bd. 1, Hft. 4, Chapter 11, p. 650-652 (published in 1921 by De Cruyter, Berlin and Leipzig).
*ASTIS document number 157724.*
ACU, NFSMO

This extract taken from the original work of 1901 – 1903 describes the methodology used and the results obtained in the measurement of the surface and internal temperature of an iceberg. Measurements were obtained up to 30 metres into the berg over a num r of months. Deductions are made on the temperatures found in re to air temperatures and ocean water temperatures. (NFSMO)

## VON KLEBELSBERG ZU THUMBERG, R.

**1069**
**Handbuch der Gletscherkunde und Glacial-geologie [Handbook of glaciology and glacial geology]** / Von Klebelsberg zu Thumberg, R.
Wien, Austria : Springer Verlag, 1948.
1028 p. : ill.
Bibliography.
This work is summarized and discussed and additional literature indicated by J. Solch, Neue Handbucher zur Gletscher – und Eiszeitkunde, in Geographisches Gesellschaft in Wien, Mitteilungen 1950, Bd. 92, p. 97-101.
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179671.*

A comprehensive treatise on general, historical and regional glaciology. Vol. 1 (general part) deals with (a) glaciology: types of ice, glacier formation, structure, movements, surface, beds, classification, catastrophes, calving, etc.; (b) glacial geology: glacial deposits, moraines, erosions, changes of sea-levels due to glaciation. Vol. 2 (historical-regional part) deals with the Quaternary and pre-Quaternary glaciation of the various continents and includes the following arctic areas: Greenland, the Canadian Arctic Islands and Alaska during the Quaternary (p. 472-90), and Spitsbergen, Franz Josef Land, Iceland, Jan Mayen, Scandinavia and Finland (p. 570-99), the Urals (p. 653-55), Severnaya Zemlya, Novo-Sibirskiye Ostrova and Siberia (p. 754-60) during the same epoch. Brief references to arctic areas are found in the section on pre-Quaternary glaciation (p. 854-912). (AB)

## VOSS, K.

**1070**
**Coast Guard discovers that Sperry iceberg tracker system** / Voss, K.
(Technology week, v.???, no.???, Jan. 16, 1967, p. 38-39, 41, ill.)
*ASTIS document number 167282.*
NFSMO

[A microwave radiometer installed on USCG aircraft is used for spotting and tracking icebergs. The unit can also be use in plotting of ocean currents.] ... By pinpointing the radiated energy source and magnitude, and recording them in coordination with the aircraft's speed, direction and altitude, technicians can measure such factors as size and shape of an iceberg, its rate of melting, the direction of its migration, speed through the water, and even whether the snow on its surface is new or old. ... Icebergs are "read" by the unit because, to the radiometer, they are hot when compared to the low-emissivity ocean around them. In other words, the iceberg is a richer source of the microwave energy than is the water. A ship will produce still different "signals" for the receiver. (Au)

## WADHAMS, P.

**1071**
**The resource potential of antarctic icebergs** / Wadhams, P.
(Iceberg research, 1985, no. 10, Apr., p. 9-23, ill., maps)
References.
*ASTIS document number 171395.*
ACU, NFSMO

The utilization of icebergs as a fresh water source is not new; but the technology that is required to make this idea a reality is still emerging. This article discusses the elements of an iceberg utilization scheme including iceberg detection and selection, iceberg propulsion, iceberg protection from melt during transit, and the processing or utilization of an iceberg. Physical properties of icebergs or glacier ice, and engineering techniques applicable to iceberg break-up are also discussed. (ASTIS)

**See also:** 461, 617, 806, 937.

## WALSH, J.

**1072**
**Electromagnetic propagation and scatter for mixed paths with multiple and finite discontinuities and application to remote sensing of sea ice with HF radar** / Walsh, J.
St. John's, Newfoundland : C-CORE, 1983.
v, 105 p. : figures ; 28 cm.
(C-CORE publication, no. 83- 16)
(C-CORE publication. Technical report)
Appendix.
References.
*ASTIS document number 130460.*
NFSMO, ACU

A general formulation of the problem of determining the electromagnetic field resulting from a finite electric current source located above a plane surface is presented. ... The technique has also been used successfully in the treatment of rough surface propagation and scatter and layered media propagation. ... Applications of the theory to sense sea ice and icebergs remotely using HF radars are discussed. Several examples of predicted return from iceberg models are given and the magnitude of the return related to ocean clutter. (Au)

**1073**
**A new iceberg detection system : ground wave Doppler radar** / Walsh, J. Dawe, B.J. Srivastava, S.K.
(Electronicom'85 Conference proceedings, Metro Toronto Convention Centre, Toronto, Ontario, Canada, October 7, 8, 9, 1985. – [New York] : Institute of Electrical and Electronics Engineers, 1985, p. 220-222, ill.)
(C-CORE publication, no. 85- 16)
Proceedings paper no. 85094.
References.
*ASTIS document number 177059.*
NFSMO, ACU

A software detection model is developed which predicts the returned Doppler spectrum for an iceberg target using ground wave Doppler radars. The model includes estimates for the backscattered Doppler dependant cross-estimates for the transmission losses over a rough spherical earth and standard estimates for man made and atmospheric noises are included in the model. A comparison between the results predicted by the model and experimentally acquired data has been effected on a target signal to noise power density ratio basis. An HF Doppler radar operating at 25.40 MHz with a narrow beam receive antenna was used for the experiment. The results of the comparison yield a degree of confidence to the model and show these radars to be effective ice hazard remote sensors. (Au)

## WALSH, J.E.

**See:** 908, 1103.

## WALTERSON, J.

**1074**
**Isberg i sikte. Internationella Ispatrullen och dess arbete for sjofartens sakerhet pa Nordatlanten [Iceberg in sight, the International Ice Patrol and its work in the interest of safety at sea on the North Atlantic]** / Walterson, J.
(Jorden runt, v. 33, no. 1, 1961, p. 3-11, ill.)
English abstract.
Text in Swedish.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180513.*

Reviews development of the North Atlantic sea lanes, the hazard of icebergs, loss of the Hans Hedtoft and the Titanic, and the work of the Ice Patrol. Its cost, shared by 16 nations, is near a million dollars annually. The location, charting, and reporting of ice, and recent attempts at demolition are described. Radar reflection of icebergs is only a sixtieth of that of a ship the same size. (AB)

## WANG, P.C.C.

**See:** 430, 986.

## WARD, R.D.C.

**1075**
**A cruise with the International Ice Patrol** / Ward, R.D.C.
(Geographical review, v. 14, no. 1, Jan. 1924, p. 50-61, ill., maps)
Also published (with slight differences of text and illustrations) in U.S. Weather Bureau. Monthly weather review, Feb. 1924, v. 52, p. 71-78.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179620.*

ACU

Brief account of the establishment and work of the patrol; of the drift of icebergs down Davis Strait, in the Labrador Current to the Grand Banks of Newfoundland. (AB)

## WARNER, J.L.

**See:** 296.

## WATKINS, L.

**1076**

**"Berg mobile" battles icebergs** / Watkins, L.

(Marine engineering/log (1979), v. 86, no. 1, 1981, p. 80-83, ill.)

*ASTIS document number 177679.*

Because most of an iceberg's mass is below the surface a hitch at the waterline often results in its turning as force is applied. Two companies have come up with an answer to getting a grip at the center of gravity – a remotely controlled, submersible attachment. Deployed from a surface craft stationed beyond the risk area, Berg Mobile will seek the attachment area, inject a hotwater probe, allow it to freeze, and then permit tugs to do their job. ... The details of later production models have to be worked out. But it will be roughly 1.8 m (6 ft) long, electrically propelled and guided by sonar. Sonar will also be used to map the shape of the berg. Quick release devices enable the power cable and vehicle to detach from the towing cable but the hazardous nature of the operation may limit its use. For this reason, considerable care has been taken to reduce the unit cost. The prototype is expected to cost about $100,000 and subsequent operational models less than $50,000. ... (Au)

## WEATHERINGTON, R.D.

**See:** 451.

## WEDLER, E.

**1077**

**Satellite Ocean-Related Imagery Applications Program** / Wedler, E. Worsfold, R.D.

(Oceans '78 : the ocean challenge : Fourth annual combined conference sponsored by the Marine Technology Society and the Institute of Electrical and Electronics Engineers, Council of Oceanic Engineering, Washington Section, September 6-8, 1978, Sheraton Park Hotel, Washington, D.C. – New York : IEEE, 1978, p. 427-432, ill, map)

(C-CORE publication, no. 78- 7)

*ASTIS document number 176907.*

NFSMO

Sea ice distribution, sea surface temperature contouring, and Iceberg/Ocean Vessel Detection and Identification have been identified as areas of immediate concern to marine activities off the Canadian East Coast. These are areas, also, in which LANDSAT and NOAA data from the Shoe Cove Satellite Receiving Station have been investigated and found both useful and operational with respect to providing data to users. The Satellite Ocean-Related Imagery Applications Program allowed the demonstration of this transfer of satellite technology to ocean interests. (Au)

**1078**

**Shoe Cove satellite data assistance to Canada's cold ocean resource development** / Wedler, E. Battikha, M. Brake, L.

St. John's, Newfoundland : C-CORE, 1978.

1 v. (unpaged) : ill., tables ; 28 cm.

(C-CORE publication, no. 78- 3)

Paper for the 92nd annual EIC Conference, St. John's, Newfoundland, May 24-27, 1978.

References.

*ASTIS document number 9938.*

ACU, NFSMO

... This paper describes and illustrates the satellite data presently received from the newly operating Shoe Cove Satellite Receiving Station (SCSRS) and details potential application areas applicable to the cold ocean resource areas. ... The three application areas discussed in this report are areas of immediate potential benefit to development activities in the cold ocean resource environment – sea surface temperature mapping, sea ice distribution and iceberg/ocean vessel detection. ... (Au)

**See also:** 326, 891, 892, 894, 1121.

## WEEKS, W.F.

**1079**

**The iceberg cometh** / Weeks, W.F. Mellor, M.

(Technology review, v. 81, no. 8, Aug./Sept. 1979, p. 66-75, ill.)

References.

*ASTIS document number 170674.*

ACU, NFSMO

The arcticle discusses the feasibility of towing icebergs from the Antarctic to different world locations. It looks at the technical problems that one could encounter in such an operation, i.e. capabilities of tugboats, type of towing line required, coriolis effect, melting rates, etc. Towing of icebergs for purposes other than water supply is already an accomplished fact. The work done by Memorial University Scientists pioneered this research, however, much more work is required. Here the author briefly describes the nature of the resource, the principal technical problems and some of their proposed solutions, the costs and benefits of the idea, its impacts, and, of course, its future prospects. (ASTIS)

**1080**

**Icebergs as a fresh water source : an appraisal** / Weeks, W.F. Campbell, W.J.

Hanover, N.H. : Cold Regions Research and Engineering Laboratory, 1973.

iii, 29 p. : ill. ; 28 cm.

(Research report – U.S. Army. CRREL, 200)

References.

*ASTIS document number 170380.*

ACU, NFSMO

The thesis of this paper – that icebergs can be towed to locations remote from the polar regions and used there as sources of fresh water – is an intriguing idea which is not new. ... The problem can be divided into four main parts: (a) locating a suitable supply of icebergs, (b) calculating the power requirements necessary to transport the icebergs to a location where fresh water is needed, (c) calculating the amount of ice that will be melted in transit, and (d) estimating the overall economic feasibility of the venture. This paper is a preliminary look at each of these aspects of the problem. (Au)

1081
**Mechanical properties of ice in the arctic seas** / Weeks, W.F. Mellor, M.
(Arctic technology and policy : proceedings of the Second Annual MIT Sea Grant College Program Lecture and Seminar and the Third Annual Robert Bruce Wallace Lecture / Edited by I. Dyer and C. Chryssostomidis. – Washington, D.C. : Hemisphere Pub. Corp. [publisher] ; Toronto, Ont. : McGraw-Hill International [distributor], 1984, p. 235-259. ill.)
References.
*ASTIS document number 156310.*
ACU, NFSMO

The mechanical properties are reviewed for the main types of ice in arctic seas [glacial (icebergs), shelf (ice islands), sea ice] and representative values are given. Each ice type possesses a characteristic range of structures and compositions that differentiate it from other varieties of ice and to a considerable extent, these produce large variations in mechanical properties. Factors affecting mechanical properties (temperature, brine and gas volume, crystal orientation and size, strain rate) are discussed, as are gaps, contradictions, and inadequacies in available data. (Au)

1082
**Pack ice and icebergs : report to POAC 79 on problems of the seasonal sea ice zone : an overview** / Weeks, W.F. Denner, W.W. Paquette, R.G.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 320-337)
References.
*ASTIS document number 56138.*
ACU, NFSMO

This paper is an attempt to summarize the results of the Seasonal Sea Ice Zone (SSIZ) Workshop, held February 26, to March 1, 1979 in Monterey, California. The purpose of the Workshop was to summarize the existing knowledge of the SSIZ, to identify significant problem areas, and discuss approaches to finding solutions. ... (Au)

1083
**Some elements of iceberg technology** / Weeks, W.F. Mellor, M.
Hanover, N. H. : U.S. Army. CRREL, 1978.
v, 31 p. : ill., map, charts ; 27 cm.
(CRREL report, 78- 2)
(Iceberg utilization : proceedings of the First International Conference and Workshops on Iceberg Utilization for Fresh Water Production, Weather Modification and Other Applications held at Iowa State University, Ames, Iowa, USA, October 2-6, 1977 / Edited by A.A. Husseiny. – New York ; Toronto : Pergamon, 1978, p. 45-98, ill.)
Bibliography: p.30-31.
*ASTIS document number 1619.*
ACU, NFSMO

... the paper attempts to make technical information on glaciological and ice engineering aspects of the problem more readily available to the interested planner or engineer. Specific conclusions include: 1) No unprotected iceberg, no matter how long or wide, would be likely to survive the ablation caused by a long trip to low latitudes. 2) Icebergs that have a horizontal dimension exceeding 2km may well be prone to breakup by long wavelength swells. 3) To avoid the dangers associated with an iceberg capsizing, the width of a 200-m-thick iceberg should always be more than 300 m. 4) For towing efficiency the length/width ratio of a towed iceberg should be appreciably greater than unity. 5) For a pilot project, the selected iceberg would have to be quite small, if for no other reason than the practical availability of tug power. (Au)

**See also:** 250, 251.

## WEERTMAN, J.

1084
**Bottom crevasses** / Weertman, J.
(Journal of glaciology, v. 25, no. 91, 1980, p. 185-188)
References.
*ASTIS document number 47856.*
ACU, NFSMO

An approximate calculation is made of the rate at which a bottom crevasse in a cold ice shelf or tabular iceberg can close shut by freezing of water and can creep open through the creep deformation of ice. In all but the thickest ice shelves and icebergs, those with a thickness greater than about 400 m, the freezing process is the more important mechanism if the ice is cold (<-10 deg. C). Consequently in a cold iceberg or ice shelf a bottom crevasse, once formed, will freeze shut. (Au)

## WEIR, C.R.

1085
**Oceanography of the Grand Banks region of Newfoundland March 1974-October 1974** / Weir, C.R. Hayes, R.M. Robe, R.Q. Scobie, R.W.
Washington, D.C. : U.S. Coast Guard, 1978.
vii, 197 p. : ill., figures, tables ; 26 cm.
(Oceanographic report – United States. Coast Guard, no. CG 373- 74)
Contents : Oceanography of the Grand Banks region of Newfoundland, April-July 1974. – Iceberg tagging and drift study, International Ice Patrol cruises, 1974.
Appendix.
References.
*ASTIS document number 66290.*
ACU, NFSMO

Two cruises were conducted to the Grand Banks of Newfoundland during the 1974 International Ice Patrol season. The main purpose of these cruises was to assist Commander, International Ice Patrol in the prediction of iceberg drift. Direct current measurements were made in the Ice Patrol area with both subsurface current meter arrays and shipboard current meter stations. A flow onto the Grand Banks was observed in addition to the southerly flowing Labrador Current. An additional research project was completed involving the tagging of icebergs and the observation of their drift. (Au)

1086
**Operational use of free-drifting, satellite-tracked buoys** / Weir, C.R.
(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1976. Bulletin – United States. Coast Guard, no. 62, 1977, p. 73-76, ill., map)
Appendix D.
References.
*ASTIS document number 166928.*
ACU, NFSMO

The 1976 Ice Patrol season initiated the Coast Guard's use of the Buoy Transmitting Terminal (BBT) buoy system. This system is capable of drifting with the ocean currents and transmitting information via satellite. The information is then relayed to ground

stations where environmental data and buoy position are determined. ... [The report describes the use of the BTT.] (Au)

## WEIR, F.V.

**1087**

**The ability to protect oil/gas pipelines and subsea installations from icebergs in the Hibernia area** / Weir, F.V.

(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 279-290, ill.)

*ASTIS document number 149500.*

NFSMO

The paper discusses two pipeline routes from the Hibernia field to Newfoundland and the associated problems. Methods for protecting subsea installations and pipelines were evaluated in light of current technology. (NFSMO)

**1088**

**The comparative environmental risks associated with fixed platforms and floating platforms and with tankers and pipelines** / Weir, F.V.

(Proceedings of the Symposium Production and Transportation Systems for the Hibernia Discovery, St. John's, Newfoundland, Canada, February 16-18, 1981 / Edited by W.E. Russell and D.B. Muggeridge. – St. John's, Nfld. : Petroleum Directorate, Government of Newfoundland and Labrador, 1981, p. 337-355, ill.)

*ASTIS document number 149519.*

NFSMO

The environmental risks associated with fixed or floating production systems are discussed. Mobil Oil Canada is confident that systems which can be moved in the face of iceberg and floe ice occurrence will be environmentally safe. A fixed, in-place gravity platform can be designed. (NFSMO)

**1089**

**Mobil favour mobile systems** / Weir, F.V.

(Resource development, v. 13, no. 1, Spring 1981, p. 6, ill.)

Abridged from paper by F.V. Weir, Mobil Oil Canada Ltd.

*ASTIS document number 171816.*

ACU, NFSMO

... The Grand Banks or Hibernia environment criteria – is very similar to North Sea conditions, with one very important exception. That is the occurrence of icebergs and floe ice. In our view, there are only two ways to combat this ice occurrence. They are to design a platform that can be quickly and completely moved from the area if ice occurs, which is the floating concept, or to design a platform that will remain in the area and withstand the most severe ice occurrence that can occur, which is the gravity or fixed platform concept. ... Additional studies are underway on gravity platforms and ice occurrence and hopefully these will help to determine the viability of the gravity concept, which of course, is still actively being considered as a production scheme for the Hibernia Area. ... Now consider the other concept, that is a floating design that will have the ability to leave the area if icebergs or floe ice are approaching. (Au)

**1090**

**Pipeline hinges on berg protection** / Weir, F.V.

(Resource development, v. 13, no. 1, Spring 1981, p. 8-9, map)

Abridged from a paper by F.V. Weir, Mobil Oil Canada Ltd.

*ASTIS document number 170267.*

ACU

Mobil Oil Canada has looked at two pipeline routes from Hibernia to the Newfoundland coast. One, which we refer to as the 'Northern Route', is from Hibernia to Trepassey Bay, a distance of some 225 miles. ... To protect pipelines from icebergs and iceberg scour, there is really only one obvious solution and that is, of course, to bury the pipeline several feet below the deepest known iceberg scour depth. ... (Au)

## WELSH, J.P.

**1091**

**Iceberg drift from surface currents** / Welsh, J.P. Phillips, S.M.

(Report of the International Ice Patrol Service in the North Atlantic Ocean, season of 1973. Bulletin – United States. Coast Guard, no. 59, 1974, p. B1-B5, ill.)

Appendix B.

References.

*ASTIS document number 163368.*

NFSMO

The operational requirements of the International Ice Patrol (IIP) are to locate icebergs that menance the North Atlantic shipping lanes off the Grand Banks of Newfoundland and to predict their movement. A computerized iceberg drift model has been developed to assist in the performance of these requirements. ... The objective of this iceberg drift study was to determine by field tests the usefulness of an expendable surface current probe for determination of iceberg drift as it applies to IIP needs. This recently developed air-deployable device measures surface current precisely, rapidly, and inexpensively. ... [Due to failure in data recording, full evaluation was not possible.]. (Au)

**See also:** 373, 1119.

## WESSELS, E.

**See:** 426.

## WESSELS, G.J.

**1092**

**Simulating spaceborne SAR imagery of icebergs** / Wessels, G.J. Raney, R.K. Lowry, R.T. Kirby, M.E. Gray, A.L.

(Proceedings of the Ninth Canadian Symposium on Remote Sensing, August 14-17, 1984, St. John's, Newfoundland / Edited by S.M. Till and D. Bajzak. – Ottawa : Canadian Aeronautics and Space Institute, 1984, p. 109-120, ill.)

References.

*ASTIS document number 176818.*

NFSMO

A project to develop simulated spaceborne SAR imagery of icebergs has been undertaken in support of the RADARSAT program. The approach uses high resolution, low noise airborne SAT data, subjecting it to smoothing, noise addition, and speckle multiplication, in order to represent data expected from a satellite SAR for specified parameter values. High resolution airborne SAR-580 data is low pass filtered to simulate the effective resolution response of the spaceborne SAR. This smoothed image is then resampled at a rate comparable to the spaceborne SAR being simulated and represents a "radar reflectivity map" which serves as the input to the SAR simulation routines. The input data can

represent actual (average) radar reflectivity, collected over sites of technical or economic interest. Having obtained a map of average radar reflectivity, the coherent fading of the spaceborne SAR is simulated. This is done by using a random number generator to create the "multiplicative noise" or speckle which represents the coherent fading for the radar and processor combination of interest. The desired degree of incoherent averaging or multi-looking is simulated by a weighted average over the appropriate number of statistically independent output images. In addition to simulating the coherent or multiplicative noise, the system can also simulate varying degrees of additive or thermal noise. Standard quantitative norms are applied (variance to mean squared ratio, etc.) to characterize the result. This paper describes the simulation technique and provides examples of imagery simulating a variety of radar and processing options. The software is known as the RADARSAT SAR Simulation Package (RSSP). (Au)

## WEST, A.

**1093**
**Canadians declare open season on errant icebergs** / West, A.
(Offshore engineer, 1986 [ 2] Feb., p. 24-27, ill. (some col.))
*ASTIS document number 184241.*
ACU, NFSMO

All manner of towing, pushing and splitting systems developed to control the intrusion of icebergs into sensitive oil exploration and development areas were put through their paces off eastern Canada last year – a bumper year for experience and experimentation. (Au)

## WESTERGARD, H.

**See:** 480.

## WETZEL, V.F.

**1094**
**Potential schemes for offshore Labrador year round production** / Wetzel, V.F. Berenger, D.M. Jozan, M.M.
(Twelfth Annual Offshore Technology Conference 1980, proceedings. – Dallas : Offshore Technology Conference, 1980, v. 1, p. 293-305, figures)
(OTC paper, 3711)
References.
*ASTIS document number 116041.*
ACU, NFSMO

... Primarily, the paper will present a summary of environmental conditions [in the Labrador Sea] with their impact on production schemes. The main results of prefeasibility studies undertaken by the Labrador Group will be presented. They lead to : (1) A universal answer to year round production consists of a floating scheme equipped with ice cutting capabilities. ... The addition of ice cutting capability will enable near year round production schedules. The utilization of this same ice cutting principle, when applied to a dynamically positioned semisubmersible drilling vessel, could also enable the exploration and production drilling schedules to be accelerated to a near year round operation instead of the current four month program. (2) A site specific approach could be taken in some areas, such as an artificial island in shallow water, or (3) A conventional pipeline with multi-phase transportation from site to shore with main production facilities on shore. (Au)

## WHILLANS, I.M.

**See:** 297.

## WHITE, F.M.

**1095**
**How and why do icebergs deteriorate?** / White, F.M.
(Maritimes, v. 24, no. 4, Nov. 1980, p. 12-15, figures)
*ASTIS document number 68233.*
NFSMO

A brief presentation on current research of iceberg deterioration processes. (ASTIS)

**See also:** 1055.

## WHITTAKER, S.

**1096**
**Iceberg scouring in Hudson Bay** / Whittaker, S. Chevalier, B. Geerlof, H.
(14th Arctic Workshop : Arctic land-sea interactions, 6-8 November, 1985, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada. – Dartmouth, N.S. : Bedford Institute of Oceanography, 1985, p. 91)
Abstract only.
*ASTIS document number 176338.*
ACU

Iceberg scour marks are present on four site survey locations ... in Hudson Bay. Water depths range from 135 to 185 m. Equipment deployed during the survey produced quality sidescan sonar, echosounder, and sub-bottom profiler data. Grab samples and bottom photographs provided ground truthing of the geophysical interpretation. Surficial sediments are dominated by silty-clay with few gravel and pebble inclusions. Two types of iceberg scour marks identified are "typical" and "corduroy". ... The scour marks present at the sites are believed to be relict iceberg scour marks. Their size, morphology, and water depths rules in favour of scours formed by grounding icebergs. The age of these iceberg scour features is uncertain, but they are assumed to postdate the uppermost accumulation of the Recent mud which they scar. The features are not assumed to be modern iceberg scours since no icebergs have been known to exist in Hudson Bay in modern time. (Au)

## WILKINSON, T.L.

**See:** 812.

## WILLIAMS, P.D.L.

**1097**
**The detection of ice at sea by radar** / Williams, P.D.L.
(The radio and electronic engineer, v. 49, no. 6, June 1979, p. 275-287, ill.)
References.
*ASTIS document number 170801.*
ACU, NFSMO

... The satisfactory detection of icebergs has thus long been regarded as a problem area. But radar, which was originally regarded as the panacea for obstacle detection in bad weather, has had a chequered history of success and failure against floating ice. ... For the larger ice masses, i.e. bergs, the r.c.s. [target echoing area] and height above water will give many miles of detection range on quite a modest radar, but the smaller growlers are regarded as a problem and this paper attempts to quantify expected radar performance for any given set of conditions by drawing on available results allied to a simple model. ... (Au)

## WILSON, L.E.

**1098**

**Method of moving a floating body into a predetermined float path** / Wilson, L.E. [Inventor]. Atlantic Richfield Company [Assignee].

(Official gazette of the United States Patent Office. Patents, v.959, no. 3, 1977, p. 997, ill.)

*ASTIS document number 177512.*

In a method for moving a body in a predetermined float path which is different from said body's natural drift path, said body floating in a liquid, the improvement comprising reducing the density of the liquid in which said body is floating, said reduction in density being generally in the direction of said predetermined float path, thereby providing a path of lesser resistance for travel for said body, said path of lesser resistance being in the general direction of said predetermined float path. (Au)

## WILSON, L.M.

**1099**

**The effect of averaging period of iceberg velocity** / Wilson, L.M.

(16th Annual Congress, 26-28 May, 1982, University of Ottawa. Atmosphere-ocean, v. 20, Annual Congress issue, 1982, p. 37)

Abstract only.

*ASTIS document number 168912.*

ACU, NFSMO

Iceberg and ice floe speeds are necessary components of offshore engineering off Canada's East Coast. These data are often available as daily speeds averaged over 24-hr periods. Instantaneous speed data, averaged over a much shorter time period are required for engineering applications but are seldom available. From a study of iceberg observations it is possible to calculate the effect of averaging period on the apparent iceberg speed. Data are presented for thirty iceberg for which the speeds are calculated for averaging periods of 1, 2, 3, 4, 5, 6, 7, 8, 12 and 24 h. Relative speed ratios for different average periods and their variation are calculated and presented. The relationships among these ratios are investigated and the strongest of these noted. (Au)

## WILSON, M.A.

**See:** 712, 713.

## WINSOR, W.D.

**1100**

**The CODAR and iceberg detection trials** / Winsor, W.D.

(C-CORE news, v. 8, no. 3, Nov. 1983, p. 4-5, ill.)

*ASTIS document number 172448.*

ACU, NFSMO

The HF Radar field program planned for and executed over the eastern approaches to the Strait of Belle Isle combined two experiments in a single field trip. ... The first objective was to measure the radar cross-section of a number of icebergs at HF operating frequency; 25 MHz. The second was to undertake an extended time period surface current mapping survey over a waterway where the net current behaviour is reasonably well understood. ... (Au)

**1101**

**A feasibility study of using HF groundwave radar for sea ice and iceberg detection : evaluation of an HF antenna and data collection of ocean spectra** / Winsor, W.D. Klein, K.

St. John's, Nfld. : Centre for Cold Oceans Resources Engineering, 1983.

vi, 76 p. : ill. ; 28 cm.

(C-CORE publication, no. 83- 10)

(C-CORE publication. Technical report)

Appendices.

References.

*ASTIS document number 163384.*

NFSMO

The report describes a field experiment to test the performance of a 24 element fixed (nonsteered) phased antenna array at HF (25.4 MHz) and to collect a data set of HF backscatter from an ocean radar range. This experiment is a preliminary step to explore the feasibility of using the HF Radar system to detect sea ice and icebergs. (NFSMO)

## WITTMANN, W.I.

**1102**

**Ice conditions in Baffin Bay and the Labrador Sea relevant to proposed cable tracks and cable operation** / Wittmann, W.I.

Washington, D.C. : Hydrographic Office, 1961.

11 leaves : ill., maps.

(Informal oceanographic manuscripts - United States. Hydrographic Office, no. 16-61)

References.

*Document not seen by ASTIS. Citation from AB.*

*ASTIS document number 180378.*

NFSMO

Describes ice conditions relevant to the laying, maintenance, and repair of the proposed Newfoundland-Greenland cable from Deer Lake to Dye 1 - Itivdleq near Sondre Stromfjord, and to Thule. Ice conditions in waters along the track which may break or crush cables are also dealt with. Sea-ice coverage in the area is the main factor in planning ship operations for the proposed cable; unescorted vessels can operate safely and efficiently in pack ice of less than one-tenth coverage. With icebreaker support, maintenance and repair operations may be conducted with concentrations of ice up to five-tenths. Glacial ice, as bergs, bergy bits and growlers, is also a hazard to shipping. Sea ice is not a serious problem in causing cable breaks on this track; bergs and bergy bits are most numerous near Disko Bugt and Umanak Fjord; minimum frequency of icebergs appears to be in the area between Ivigtut and 68 30 N. Height and draft measurements of bergs made by the USS Seadragon in 1960 are summarized; height-drift relationships are graphed from reconnaissance flight data. Icebergs tend to rock, calve fragments, or capsize; thus their height-draft ratios may change frequently. Bathymetric data should be used in coordination with ice information. (AB)

**1103**

**Long-range prediction of iceberg severity in the Labrador Sea** / Wittmann, W.I. Hester, L.H. Dehn, W.S. Walsh, J.E.

(Canadian East Coast Workshop on Sea Ice, January 7-9, 1985 [sic] : agenda and abstracts. - [Halifax, N.S.] : Bedford Institute of Oceanography, 1986, p. 31)

Abstract only.

*ASTIS document number 182249.*

ACU

Statistical models for the long-range prediction of iceberg severity

in the Labrador Sea are developed from observational data for the years 1947-1984. The predictors are the monthly fields of sea level pressure and 700 mb geopotential height over the Northern Hemisphere. The primary statistical tools are gridded correlation patterns, composite grids for mild and severe extremes of iceberg severity, and multiple regression. Statistical significance is established by repeated Monte Carlo simulations of the experimental procedure and by testing on independent data. Statistically significant associations are found between the springtime iceberg severity index and the circulation fields of the antecedent October-March period. At lead times of 3-4 months, median absolute errors in the long-range forecasts of the severity rank are 3-4 in a set of 30 ranked years. The teleconnection patterns exhibited by the predictor fields are synoptically compatible with eastern Canadian ice conditions in both mild and severe extremes of severity. (Au)

**1104**

**Sea ice. Part 2 : Distribution and forecast services, North American Arctic waters** / Wittmann, W.I. Burkhart, M.D.

(Mariners weather log, v. 17, no.???, Nov. 1973, p. 343-355, ill., maps)

*ASTIS document number 177385.*

Some regimes of the navigable sea ice areas in the North American Arctic waters are subjected to total or near total annual growth and decay cycles; examples are the Baffin Bay and the Bering Sea icepacks. This means that much of the sea ice in this hemisphere is predominantly first-year ice and, except where salinities are low or under conditions of extreme pressure, they do not offer serious problems to ships with reinforced hulls or accompanied by icebreakers, during much of the year. On the other hand, several areas contain considerable quantities of multi-year ice, alternately advected into or away from an area; examples of this type are the Chuckchi and Beaufort Seas icepacks north of Alaska, the pack ice drifting southward off East Greenland, and that contained within portions of the Canadian Archipelago. However, in the Archipelago, it is more a matter of sea ice regularly surviving the brief summer melt season – and being "trapped" – rather than one where continuous advective influences play the leading role. [Major North American ice regimes are discussed, providing information on the following areas: ice cover, sea ice formation, pressure ice, icebergs, ice navigation and sea ice observing and forecasting services.] ... (Au)

## WOLFORD, T.C.

**1105**

**Comparison of observed and computed iceberg trajectories** / Wolford, T.C.

(EOS (Washington), v. 53, no. 1, Jan. 1972, p. 397)

Paper presented at the American Geophysical Union Annual Meeting, 53rd, Washington, D.C., April 17-21, 1972.

Abstract only.

*ASTIS document number 163198.*

ACU

... Six detailed theoretical iceberg trajectories have been computed by the International Ice Patrol using actual observed values of wind velocities, current velocities, sail areas, and iceberg masses. The input values were observed during an iceberg drift study in August 1968. The mathematical model used to generate the theoretical iceberg trajectories is based on a non-linear ordinary differential equation which includes Coriolis force, wind force, and water force. It is solved numerically each time a predicted iceberg position is wanted. The numerical solution is obtained from a computer program based upon the one-step Runge-Kutta method whose inputs are hourly values of current and wind velocity. The theoretical and the observed iceberg trajectories were compared for geometrical similarity, equality of displacement, and direction of drift. These trajectories agreed very well when comparing direction of iceberg drift and the geometrical similarity, especially when the current velocity was obtained from drogues closer than one nautical mile to the iceberg. If the current information came from drogues greater than one nautical mile from the iceberg, the total predicted iceberg drift distance began to differ significantly in one of the coordinate directions. (Au)

**1106**

**Sea ice and iceberg conditions, 1970-79** / Wolford, T.C.

(Scientific Council studies, 5, 1982, p. 39-42, maps)

References.

*ASTIS document number 176532.*

NFSMO

The number of icebergs (averaged by decades) drifting south of 48 degrees N in the Northwest Atlantic decreased steadily between 1932-41 and 1962-71. Extraordinarily heavy ice conditions occurred in 1972, 1973 and 1974 when 1,588,846 and 1,387 icebergs were sighted south of 48 degrees N. The previous record was 1,329 icebergs in 1929. After these three heavy ice years, the annual number of icebergs drifting south of 48 degrees N averaged only 123 during 1975-81, the range being from 23 to 300. The record number of icebergs in 1972 has been attributed to favorable oceanographic and meteorological conditions for iceberg drift prior to and during the ice season. (Au)

**1107**

**The United States Coast Guard program on iceberg detection and drifts** / Wolford, T.C.

(Abstracts from "Workshop Seminar on Ice and Related Studies", March, 1969. Marine Sciences Centre manuscript report, no. 13, 1969, p. 47-48)

*ASTIS document number 179906.*

OONL

The International Ice Patrol has been studying the drift and deterioration of icebergs since its inception in 1913. Since 1965, five detailed iceberg trajectories have been determined using fixed buoys and reference markers for periods of 10 to 19 days. Concurrently all relevant environmental parameters that could influence the iceberg's drift and deterioration were measured. In two cases this included both Lagrangian and geostrophic currents. ... An attempt has been made to compute the trajectory of one of the studied icebergs using Newton's second law .... So far there has been extremely poor agreement between the computed and measured trajectories. During the 1967 and 1968 ice seasons the International Ice Patrol conducted experiments with a passive, scanning, X-land radiometer and a multiland side looking radar. ... Thus far only preliminary results have been obtained, but it appears that there are some remaining problems. (Au)

**See also:** 393, 603.

## WONG, M.

**See:** 141.

## WONG, T.T.

**See:** 248, 309.

## WOODS HOLE OCEANOGRAPHIC INSTITUTION

**1108**

**Research in relations between the North Atlantic sea ice and arctic weather : conducted during the period May 15, 1949-August 15, 1949** / Woods Hole Oceanographic Institution.

Woods Hole, Mass. : Woods Hole Oceanographic Institution [publisher] ; Springfiled, Va. : NTIS [distributor], 1949.

1 microfiche ; 11 x 15 cm.

(Reference series – Woods Hole Oceanographic Institution, no. 49- 41)

(NTIS AD-A080 556)

References.

*ASTIS document number 174050.*

NFSMO

The program of Research in relations between North Atlantic ice and Arctic weather was begun by Mr. Irving Schell with separate considerations for the two distinct types of sea ice, icebergs and pack ice or field ice, and the oceanographic and meteorological factors that to a great extent control their movements and distribution. The correlation tests currently being made are based on data of berg counts from 1880 to 1949 ... and pressures etc. from southern Greenland, Iceland, northern Europe and eastern Canada covering, as far as possible, the same seventy years of record. ... Also, data on the temperature, volume and transport of the Labrador Current obtained in recent years by the U.S. Coast Guard ... are being compared with different factors as well as with the berg counts to determine, if possible, a relationship between them. (Au)

**1109**

**Research in relations between the North Atlantic sea ice and arctic weather : conducted during the period November 15, 1949 to February 15, 1950** / Woods Hole Oceanographic Institution.

Woods Hole, Mass. : Woods Hole Oceanographic Institution [publisher] ; Springfiled, Va. : NTIS [distributor], 1950.

1 microfiche ; 11 x 15 cm.

(Reference series – Woods Hole Oceanographic Institution, no. 50- 14)

(NTIS AD-A080 435)

*ASTIS document number 174068.*

NFSMO

... Following the plan outlined in Periodic States Report for the period May 16-Aug 15, 1949, a test of the relationships that figure in the formula derived by Smith (1931) for predicting the severity of the iceberg season south of Newfoundland, was made. ... It appears ... there is marked agreement on the whole between the observed and the computed departures, as shown by the correlation coefficient r = 0.69 (1927-1949). For the eleven cases out of twenty-three in all, when the computed departure ... exceeded ± 1.0, the agreement as to sign held in 10. A more complete account of this investigation together with a general discussion of the problem of iceberg foreshadowing off Newfoundland, is given in the technical report WHOI Reference no. 50-15, "Further on Foreshadowing the Iceberg severity off Newfoundland", submitted March 1950. (Au)

**1110**

**Research in relations between the North Atlantic sea ice and arctic weather : conducted during the period September 15 to November 15, 1949** / Woods Hole Oceanographic Institution.

Woods Hole, Mass. : Woods Hole Oceanographic Institution [publisher] ; Springfiled. Va. : NTIS [distributor], 1949.

1 microfiche ; 11 x 15 cm.

(Reference series – Woods Hole Oceanographic Institution, no. 49- 54)

(NTIS AD-A077 681)

References.

*ASTIS document number 174041.*

NFSMO

[The following tasks were undertaken under this contract:] 1. Select monthly and seasonal ice data beginning approximately with this century, prepared by the Danish Meteorological Institute and the International Ice Patrol, and which were treated for individual regions in a recent investigation by L. Koch .... 2. ... compute zonal, meridianal, and other significant indices of the large-scale atmospheric circulation contemporary with and preceeding various ice conditions in the several regions investigated. 3. Prepare mean monthly and seasonal series of North Atlantic sea temperatures from data collected by the International Council for the exploration of the Sea and the Hydrographic Offices. 4. Compute mean monthly and seasonal series of water transports in regions that have possible bearings on the ice conditions. 5. Obtain ... estimates of the water-transport in the trade and other North Atlantic areas for which no direct determinations can be had. 6. Develop methods for estimating the extent and mechanism of ice melting and young-ice formation. 7. Investigate possible relations between the critically evaluated dynamic and thermal circulation indices and contemporary and following ice conditions. ... In continuance of the investigations of relations of the weather both with the iceberg severity off Newfoundland and the ice off Iceland, a check was made of the relation indicated by Groissmayr (1939) between the ice off Newfoundland and the preceeding temperatures in the North Atlantic and adjacent areas using the data for the twenty-three year period 1926-1949 following the series of years that figures in his computations. ... (Au)

## WOODWORTH-LYNAS, C.M.T.

**1111**

**Grounding and scouring icebergs on the Labrador Shelf** / Woodworth-Lynas, C.M.T. Simms, A. Rendell, C.M.

[12] leaves, figures, table ; 28 cm.

(C-CORE publication, no. 84- 8)

(Iceberg research, 1984, no. 7, Mar., p. 13-20, ill.)

References.

*ASTIS document number 148202.*

ACU, NFSMO

... Whilst most offshore operators agree that scours and scouring are problems to the safe exploration and development of hydrocarbon resources, very little effort has been directed at determining modern day grounding frequencies in exploration areas. ... Because there is a large gap in our knowledge of modern grounding frequencies, we have analyzed a complete set of iceberg radar observation data from the Labrador and northeast Newfoundland Shelf collected between 1973 and 1981. We have currently analyzed more than 1500 iceberg tracks observed at these wellsites in order to establish criteria for identifying grounded and scouring icebergs. So far we have identified over fifty groundings from eleven areas but we feel that this number is conservative and that several other groundings will be identified as our criteria are refined. We present here, for the first time, some preliminary results of this study from six wellsites on Makkovik Bank. (Au)

**1112**

**Iceberg grounding and scouring** / Woodworth-Lynas, C.M.T.

(C-CORE news, v. 9, no. 1, Mar. 1984, p. 5, ill.)

*ASTIS document number 148229.*

ACU, NFSMO

This article reports on the analysis by the author and by A. Simms and C. Rendell of tracks of over 1,500 icebergs collected from 40 wellsites between 1973 and 1981. The study is concentrated on the Saglek and Makkovik Banks, the best documented areas on the

Labrador Shelf. Results will be published in C-CORE's Technical Report "Iceberg Grounding and Scouring on the Labrador Continental Shelf." (ASTIS)

**1113**

**Iceberg grounding and scouring frequency, Labrador Sea** / Woodworth-Lynas, C.M.T. Simms, A. Rendell, C.M.

(Oceans 84, conference record : industry, government, education ... design for the future. – [New York : Institute of Electrical and Electronics Engineers], 1984, v. 1, p. 259-262, ill.)

(C-CORE publication, no. 84- 16)

References.

*ASTIS document number 150762.*

NFSMO, ACU

Iceberg scouring presents a major problem in the placement of pipelines and other seabed installations at producing wells in the iceberg-rich waters of the eastern Canadian continental shelf. Over fifty grounded and scouring icebergs have been identified from iceberg observations made at twelve exploratory wellsites on the Labrador and northeast Newfoundland shelf areas. From these data sets, icebergs which remained stationary for twelve hours or more, were considered to be grounded. Bergs which moved into shallower water from the grounding sites were interpreted to be scouring. We found that icebergs can scour both up and downslope; one berg scoured over a vertical interval of 45 m. Many scour tracks exceeded lengths of 20 km and some exceeded 50 km. The grounding frequency varied greatly between years and wellsites; the average, however, ranges between 5 groundings per 100 bergs at 59 degrees N and 3.4 per 100 at 56 degrees N. ... (Au)

**1114**

**Iceberg grounding and scouring from Labrador** / Woodworth-Lynas, C.M.T. Simms, A.

[S.l. : s.n., 1985].

[20] leaves : ill., maps ; 28 cm.

Paper presented at: Ice Scour Workshop, Calgary, Alta., 5-6 Feb., 1985.

Indexed from a preliminary draft, July 1985.

Proceedings to be published as an ESRF Report in late 1985.

*ASTIS document number 163520.*

[This paper outlines a study on iceberg groundings using radar data.] Observations of over 2000 icebergs have been used to delineate areas of active grounding and scouring on the Labrador Shelf. ... [The] study shows that many scouring icebergs can move over very large (220 km) distances and may traverse significant (up to 45 m) ranges in bathymetry. ... On Saglek Bank, [it was estimated] ... that approximately 112,000,000 cubic m of seabed material may be reworked each year by scouring icebergs, clearly indicating that although grounding frequencies are low, iceberg scouring is a dynamic and geologically important process capable of generating significant areas of iceberg turbate facies. (Au)

**1115**

**Iceberg grounding and scouring on the Labrador continental shelf** / Woodworth-Lynas, C.M.T. Simms, A. Rendell, C.M.

(Cold regions science and technology, v. 10, no. 2, Feb. 1985, p. 163-186, ill.)

References.

*ASTIS document number 160547.*

ACU, NFSMO

Icebergs drifting in seas of the eastern Canadian Continental Shelf present serious hazards to offshore drilling operations. Damage to offshore structures may be caused by direct collisions with a floating or gravity-based structure. Icebergs whose keels touch and plough through or scour the soft sediments of the seabed may crush and rupture seabed installations such as wellheads, anchoring/mooring systems, pipelines and telecommunication cables. Observations made at exploration wells on the Labrador Shelf from 1973 to 1981 are used to delineate areas of active iceberg scouring and to quantify the incidence of grounding and scouring icebergs. The term grounded is used to describe icebergs whose keels have contacted the seabed and which have thus been halted. Scouring icebergs are those whose keels have contacted the seafloor, but which continue to move forward. Observations of more than 1500 icebergs from twenty-two well sites have been analyzed and criteria for identifying grounded and scouring bergs have been established. Over fifty icebergs have been observed to ground and scour in eleven areas. Over the observation periods, the average grounding frequency for Makkovik and Saglek Banks were 3.3% (data collected in seven years) and 4.3% (data collected in six years), respectively. It appears likely, however, that these frequencies are an underestimate and that many more "possible" grounding and scouring icebergs will eventually be included in the data set. We show that many scouring icebergs can move over large (60 km) distances and are able to traverse significant (up to 45 m) ranges in bathymetry. We suggest that they may accomplish this through increases and decreases in draft by continual gradual rotation about a horizontal axis normal to the movement direction. (Au)

**1116**

**Iceberg scouring frequencies and scour degradation on Canada's eastern shelf areas using sidescan mosaic remapping techniques** / Woodworth-Lynas, C.M.T. Barrie, J.V.

(POAC 85 : the Eighth International Conference on Port and Ocean Engineering under Arctic Conditions, Narssarssuaq, Greenland, September 7-14, 1985, proceedings. – [Copenhagen, Denmark] : Danish Hydraulic Institute, 1985, v. 1, p. 419-442, ill.)

(C-CORE publication, no. 85- 14)

References.

*ASTIS document number 181803.*

ACU, NFSMO

Icebergs are known to ground and scour on the continental shelf bank areas of Atlantic Canada in places where exploration drilling has been or is being carried out. Numerous groundings have been documented from drillsite iceberg radar logs in both the Labrador and Grand Banks shelf regions in the last decade, giving rates of scouring, for example, of 3.3% on Makkovik Bank and 4.3% on Saglek Bank of the Labrador Shelf. Four icebergs in the process of grounding and creating a scour have been fully documented for three differing seabed environments. In two cases return surveys have documented subsequent morphological changes due to degradation processes over a period of up to three years. Sixteen mosaic surveys of iceberg scoured seabed have been made at different bank locations since 1976. Careful analysis of the repeat mosaics should reveal new iceberg scour features and give information on scour degradation rates. (Au)

**1117**

**The relative age of ice scours using cross-cutting relationships** / Woodworth-Lynas, C.M.T.

St. John's, Nfld. : Centre for Cold Ocean Resources Engineering, Memorial University, 1983.

viii, 54 p. : figures, tables ; 28 cm.

(C-CORE publication, no. 83- 3)

(C-CORE publication. Technical report)

ISBN 0-88901-089-7.

References.

*ASTIS document number 115460.*

ACU, NFSMO

Iceberg scour marks are straight or curvilinear troughs on the seabed which have been formed by grounding iceberg keels as they are carried forward by ocean currents. A new method for dating

the relative ages of ice scour utilizes cross-cutting relationships. The method allows delineation of relative age groups and identification of oldest and youngest end member scours from sidescan sonar mosaics. Selective coring of two or more end member scour troughs from a scour population in which undisturbed sediments have accumulated and use of conventional absolute age dating techniques should establish the age of the population from which a scouring rate can be extrapolated. A decrease in scour width with decreasing scour age shows positive correlation and has been used to show a possible net decrease in iceberg size with time. (Au)

**1118**

**The relative age of ice scours using cross-cutting relationships** / Woodworth-Lynas, C.M.T.

(Program with abstracts – Geological Association of Canada (1980), v. 8, 1983, p. A75)

Abstract only.

*ASTIS document number 148725.*

ACU, NFSMO

Iceberg scour marks are ubiquitous on the seabed of the continental shelves of southeastern Baffin Island and Labrador and are made by grounding icebergs which plough linear furrows in the seafloor sediments. When a scouring iceberg traverses a pre-existing scour mark the resulting characteristic cross-cutting relationship that is made can be easily detected from sidescan sonograms. Using the cross-cutting principle a method for defining the relative ages of scour populations from three areas in this shelf region has been developed. The method allows the delineation of oldest and youngest "end member" scours which can be radiometrically dated to define the absolute age of the scour population. A decrease in scour width with decreasing scour age can be shown and this may be used to infer a net decrease in iceberg size since deglaciation. (Au)

**See also:** 160, 163, 179, 291, 298, 566, 819.

## WOOLEVER, G.F.

**1119**

**Utilization of remote sensing techniques for U.S. Coast Guard missions** / Woolever, G.F. Kidd, L.A. Welsh, J.P. McIntosh, J.A. Farmer, L.D.

(Proceedings of the Tenth International Symposium on Remote Sensing of Environment, 6-10 October, 1975. – Ann Arbor, Mich. : Center for Remote Sensing Information and Analysis, Environmental Research Institute of Michigan, [1975], v. 1, p. 3-16, ill.)

References.

*ASTIS document number 173681.*

ACU, NFSM, NFSMO

The U.S. Coast Guard is implementing a variety of remote sensing techniques in the performance of several missions, such as for pollution surveillance, ice classification, iceberg detection and classification, vessel traffic system development, and search and rescue. Recent activities are briefly described, including examples of imagery and forecasts for future applications. (Au)

## WORSFOLD, R.D.

**1120**

**C-CORE remote sensing** / Worsfold, R.D.

(C-CORE news, v. 2, no. 1, Jan. 1977, p. 3-4, ill.)

*ASTIS document number 172340.*

ACU, NFSMO

Our mandate, the cold oceans, involves that area of Canada that extends from Newfoundland to the North Pole. ... One of the best methods for studying it is remote sensing. C-CORE's initial program has focused on hydrocarbon development in deep ice-frequented waters. Sea ice and icebergs have been recognized as a major impediment to development in these areas. Because of environmental factors such as weather, it is necessary to sense the target (sea ice) at many frequencies. C-CORE's interest is to promote multifrequency studies to determine a broad band spectral signature for the many different forms of sea ice and thus to achieve the optimal system of sensors for all-weather, all-time remote sensing of ice-frequented waters. C-CORE's remote sensing studies are concentrating on aerial photography, thermal infrared and active microwave. Studies have been both field and laboratory oriented. Field studies took place at Forteau and Cartwright, Labrador during the 1976 winter field season. Airborne data was also obtained over the Grand Banks south and southeast of St. John's, Newfoundland. ... (Au)

**1121**

**Project SAR '77** / Worsfold, R.D. Strong, D. Wedler, E.

St. John's, Nfld. : Memorial University of Newfoundland, Centre for Cold Ocean Resources Engineering, 1977.

13 p. : figures ; 28 cm.

(C-CORE publication, no. 77- 19)

(POAC 77 : proceedings / Edited by D.B. Muggeridge. – St. John's, Nfld. : Ocean Engineering Information Centre, Memorial University of Newfoundland, 1977, v. 2, p.1051-1063, ill., maps)

Cover title.

References.

Reprint of C-CORE publication, no. 77-19.

*ASTIS document number 133051.*

ACU, NFSMO

A program concerned with the obtaining of simultaneous multifrequency synthetic aperture radar data was carried out by the Centre for Cold Ocean Resources Engineering (C-CORE) during February and March 1977. The program was managed and operated by C-CORE and several government departments will be working with the data in conjunction with C-CORE. A preliminary analysis on imagery obtained of an iceberg and on imagery of the Goose Bay Airport are presented. The main benefit of the project has been the generation of baseline radar imagery on Labrador sea ice that is available for planning future studies and for the development of interpretation methodologies. (Au)

**1122**

**A proposal to investigate the use of a four channel multi-frequency Synthetic Aperture Radar for sea ice and iceberg studies** / Worsfold, R.D.

St. John's, Newfoundland : Centre for Cold Ocean Resources Engineering, Memorial University of Newfoundland, 1976.

1 v. (various pagings) ; 29 cm.

Appendices.

References.

*ASTIS document number 11088.*

ACU, NFSMO

This paper describes the proposal for remote sensing studies of sea ice off the Labrador and Newfoundland coasts. The proposal resulted in the Project SAR '77 programme which made use of the four channel, X and L-band synthetic aperture radar operated by the Environmental Research Institute of Michigan. A description of C-CORE facilities and their other research programs, and a brief biography of Worsfold are included in the appendices. (ASTIS)

1123
**Shorebased radar data for navigation of coastal and restricted ice covered areas with specific examples of Bylot Island, N.W.T., Canada** / Worsfold, R.D. Parashar, S.K. Ramseier, R.O. Steltner, H.A.R.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 83-98, ill., maps, photos.)
References.
*ASTIS document number 56049.*
ACU, NFSMO

A program designed to determine the utility of shorebased radar in aiding navigation in coastal and restricted ice covered areas in the Arctic is described. ... Various data handling requirements and options for the monitoring of coastal and restricted ice covered areas are being examined and assessed. Requirements concerning data utilization for input into prediction models are also being considered. Radar scope data available in photographic, tape, and visual formats are being analyzed. ... The integration and correlation of these forms of data is examined. (Au)

1124
**Thermal infrared measurements and error correction methods, Grand Banks, Newfoundland, April-July 1976** / Worsfold, R.D. Strong, D. Roberts, B. Richter, S.
St. John's Newfoundland : C-CORE, 1977.
iii, 82 p. : figures ; 28 cm.
(C-CORE field report)
Appendices.
References.
Cover title: C-CORE field report February 1977.
*ASTIS document number 130397.*
NFSMO, ACU

During the iceberg season of 1976, airborne radiation thermometer data was collected by the International Ice Patrol. The data was made available to the Centre for Cold Ocean Resources Engineering for Analysis. The purpose of the analysis was to construct near-synoptic thermal contour maps of the Grand Banks region by plotting data from a series of consecutive flights over a short time period. Two such periods were analyzed. Because of atmospheric conditions, errors are introduced into the recorded data. Three error correction methods were identified and two methods were used to correct the raw data. The methods were assessed as to their suitability and conclusions made concerning each. Recommendations are made concerning the direction of further research and the application of the thermal contour maps to iceberg deterioration determinations and possible use in the fishery. (Au)

**See also:** 326, 581, 624, 733, 809, 1077.

## WRIGHT, B.D.

1125
**Ice conditions affecting offshore hydrocarbon production in the Labrador Sea** / Wright, B.D. Berenger, D.M. Total Eastcan Exploration Ltd. Berenger, D.M.
(Proceedings – Workshop on Research in the Labrador Coastal and Offshore Region, Goose Bay, Labrador, September 4-6, 1980 / Newfoundland Institute for Cold Ocean Science. [St. John's, Nfld.] : Memorial University of Newfoundland, 1980, p. 307-319, figures, tables)
(The Labrador Ice Dynamics Experiment : proposed program of study. – St. John's, Nfld. : Newfoundland Institute for Cold Ocean Science, 1981, p. 51-62, ill., maps)
References.
*ASTIS document number 73628.*
ACU, NFSMO

... Here, ice conditions in the Labrador Sea are described and the results of sea ice and iceberg research programs carried out by the Labrador Group since the early 1970's are highlighted. The sea ice studies include field data acquisition on the physical and mechanical properties of first and multi-year ice present in the area along with its movement. The iceberg information, collected in conjunction with the exploratory drilling program, consists of data on the physical properties of icebergs and their motion characteristics. The large variability in ice conditions is shown to be a significant factor affecting the design of offshore hydrocarbon production systems for the Labrador Sea. (Au)

1126
**Satellite applications to the oil and gas industry in the Canadian Arctic** / Wright, B.D. Hnatiuk, J.
[S.l. : s.n.], 1977.
11 p. : ill. ; 28 cm.
Photocopy.
Paper presented at Satellite Applications to Marine Operations Conference, New Orleans, 1977.
*ASTIS document number 178411.*

The hostile environments characterizing the Canadian Arctic's most prospective sedimentary basins, the Beaufort Shelf, the northwestern Sverdrup Basin and the Labrador Shelf are described along with the requirements for the design and operation of offshore exploration and production facilities in these areas. In this discussion, emphasis is given to ice, weather and waves, which are the primary environmental factors governing either facility design or the long range, strategic, and tactical planning necessary for safe and efficient operations. The unique needs for real-time processing and transfer of the large quantities of data required for environmental monitoring are also outlined along with the special requirements for navigation and communication systems in the northern environment. The current application of satellite technology to petroleum activities in the Canadian Arctic is summarized and areas of deficiency identified, including sensor capabilities, spatial and temporal coverage, and resolution. Possible solutions to these deficiencies are discussed in terms of recent and potential developments in satellite technology, and also in relation to the constraints imposed by declining hydrocarbon reserves and the need for timely development of petroleum sources in Canada. [Remote sensing of environmental conditions such as sea ice, icebergs, ice islands, weather and wave conditions are discussed.] (Au)

**See also:** 200, 717.

## WRIGHT, S.

**See:** 117.

## YEN, Y.-C.

**See:** 1004.

## ZAGORODNOV, V.S.

1127
**Gidroakusticheskii metod kontrolia massoobmena na nizhnei poverkhnosti shel'fovykh lednikov i aisbergov = Hydroacoustic method of mass transfer control at the bottom surface of ice shelves and icebergs** / Zagorodnov, V.S.

(Materialy gliatsiologicheskikh issledovanii : kronika obsuzhdeniia, vyp. 43, 1982, p. 93-103)
References.
English summary.
Text in Russian.
*ASTIS document number 170275.*
ACU

... The authors have worked out ultrasonic equipment for observations and control of the melting-freezing processes under ice shelves and icebergs. Acoustic antennas of subglacial installations are able to work under high hydrostatic pressure with the help of long cable (500-800 m) at high frequency and can provide high resolution for the distance and angle of the locality. Two scanning instruments, used for the observations of the Ross Ice Shelf in 1978-1979, are described in the paper. ... (Au)

## ZALESKI-ZAMENHOF

**1128**
**Iceberg resisting offshore structures for the 21st century** / Zaleski-Zamenhof. Doris, C.G.
(Arctic ocean engineering for the 21st century : proceedings of the First Spilhaus Symposium / Edited by B.C. Gerwick. – Washington, D.C. : Marine Technology Society, 1985, p. 195-201, ill.)
References.
*ASTIS document number 170542.*
NFSMO

The paper presents the design philosophy to structural safety in offshore structures with respect to iceberg impact. Also discussed are concrete materials to be used in the proposed Doris structures. (NFSMO)

## ZARDUSKI, E.F.K.

**See:** 214.

## ZENTZYTZKI, ST.M.

**1129**
**Eisberge unter Kontrolle [Icebergs under control]** / Zentzytzki, St.M.
(Orion, Jahrg. 7, nr. 3, Feb. 1952, p. 115-118, ill.)
Text in German.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179930.*

An outline of the activities undertaken by U.S. vessels for the International Ice Patrol commencing in 1912; agreement of 1933 among Atlantic countries on precautionary measures against icebergs: double-bottom ships, numbers of passengers and lifeboats, etc.; effect of radio and aircraft in iceberg spotting and reporting; use of radar and loran on U.S. patrol boats; description of the latter. (AB)

## ZEUSLER, F.A.

**1130**
**Standing iceberg guard in the North Atlantic** / Zeusler, F.A.
(National geographic, v. 50, July 1926, p. 1-28, ill.)
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 179639.*
ACU

A popular account of the founding and activities of the International Ice Patrol, including notes on the Greenland origin, the behavior, size, etc., of icebergs. (AB)

## ZEVENHUIZEN, J.

**See:** 567, 569.

## ZHADRINSKII, S.V.

**See:** 201, 202.

## ZIELINSKI, A.

**1131**
**A towed sonar system for iceberg profiling (TIP)** / Zielinski, A.
[S.l. : s.n., 1980].
Memorandum dated 21 April 1980.
*Document not seen by ASTIS.*
*ASTIS document number 183601.*

**See also:** 667, 792.

## ZORN, R.

**1132**
**Discussion by L.D. Brooks on "Iceberg investigations along the west coast of Greenland" : author's reply** / Zorn, R. Magnor, K.
(POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings. – [Trondheim, Norway : Norwegian Institute of Technology], 1979, v. 3, p. 348)
Discussion of ASTIS document number 172847, Iceberg investigation along the west coast of Greenland / J. Dietrich, et. al. in POAC 79 : the Fifth International Conference on Port and Ocean Engineering under Arctic Conditions, at the Norwegian Institute of Technology, August 13-18, 1979, proceedings, v. 1, p. 221-239.
*ASTIS document number 172871.*
ACU, NFSMO

It should be stated that Fig. 3 only illustrates the amount of iceberg data of 3-hourly iceberg counts within areas of 1 degree lat. x 10 long. from not stationary weatherships thus without count data obtained at the drill rigs. For the last sentence on page 11 "maximum number reflects the mean iceberg density distribution" it should be stated that the screen in Fig. 9 indicates the mean iceberg density and the numbers indicate the maximum number of observed icebergs. All data for 1975 and 1978 are analyzed in details in the report series "Environmental Conditions offshore West Greenland", Vol. I-IV, prepared by DHI for the Greenland Technical Organization. (Au)

**See also:** 351, 679, 683.

## ZUBOV, N.N.

**1133**
**Arctic ice** / Zubov, N.N. United States. Naval Oceanographic Office [Translator]. American Meteorological Society [Translator].
[Springfield, Va. : National Technical Information Service, 1979].
vi, 491 leaves : ill., figures, tables ; 28 cm.
(Technical report – United States. Air Force. Geophysics Laboratory, AFGL-TR-79-034)
Bibliography: p.479-491.
*ASTIS document number 52299.*
ACU, NFSMO

Reference texts devoted entirely to the concepts of arctic ice and arctic oceanography have not previously been available in English. N.N. Zubov's classical reference "Arctic ice", still holds much historical interest and provides general information of considerable value to the beginning investigator. [This text contains information on the following topics : properties of sea water, changes in temperature and salinity of the ocean, the mixing of ocean waters, ice information and ice types in the sea, physical and chemical properties of sea ice, ice accretion, deformation of ice, melting of sea ice, tidal phenomena and ice, sea currents and ice, wind and drift of ice, circulation of water and ice of the Arctic Basin, seasonal and long-term fluctuations of ice.] (Au)

## ZUMBERGE, J.H.

**1134**
**The dynamics of ice shelves** / Zumberge, J.H. Swithinbank, C.W.M.
[S.l. : s.n., 196?].
35 p. ill., map.
References.
Typescript.
*Document not seen by ASTIS. Citation from AB.*
*ASTIS document number 180530.*

Outlines the physical characteristics of ice shelves and discusses their function as geologic agents of erosion, transportation and sedimentation. The calving of tabular icebergs from them is mentioned. Emphasis is on Antarctic examples but reference is made to the shelves of Ellesmere Island, northeast Greenland and Franz Joseph Land. (AB)

## ZWALLY, H.J.

**1135**
**Passive microwave images of the polar regions and research applications** / Zwally, H.J. Gloersen, P.
(Polar record, v. 18, no.116, May 1977, p. 431-450)
References.
*ASTIS document number 170526.*
ACU

Passive microwave images of the polar regions, first produced after the launch of the Nibus-5 Electrically Scanning Microwave Radiometer (ESMR) in December 1972, have become a valuable new source of polar information. ... Two remarkable aspects of satellite-borne microwave radiometers are the complete spatial detail obtained by the scanning sensors and the temporal detail provided by continual coverage. ... The purpose of this paper is to present some examples of the microwave images that have been produced recently, to review the physical basis for the measurement of certain desired parameters, and to discuss the significance of some of the glaciological, oceanographic, and meteorological observations that have been made. ... [This paper contains research results on the following areas: microwave emissivity and brightness temperature; polar microwave images; sea ice and icebergs; ice sheets, ice shelves and ice caps; land snow cover, lakes; and developing applications.] (Au)

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