

21st International Conference on Port and Ocean Engineering under Arctic Conditions 2011

(POAC 2011)

**Montreal, Quebec, Canada
10-14 July 2011**

Volume 1 of 2

**ISBN: 978-1-61839-225-1
ISSN: 0376-6756**

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2011) by Port and Ocean Engineering under Arctic Conditions (POAC 2011)
All rights reserved.

Printed by Curran Associates, Inc. (2011)

For permission requests, please contact Port and Ocean Engineering under Arctic Conditions (POAC 2011)
at the address below.

Port and Ocean Engineering under Arctic Conditions (POAC 2011)
National Research Council of Canada
1200 Montreal Road, Bldg. M-32
Ottawa, Ontario
Canada K1A 0R6

Phone: (613) 993-7695
Fax: (613) 952-7679

ivana.kubat@nrc-cnrc.gc.ca

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com



POAC '11

Montréal, Canada

Themes

* indicates presenting author

Keynote Lecture 1

MANAGEMENT OF OIL AND GAS ACTIVITIES IN CANADA'S NORTH AND ASSOCIATED RESEARCH

G. Carr*

Keynote Lecture 2

YEAR ROUND ARCTIC OPERATIONS

T. Keane*

Keynote Lecture 3

ISO 19906 - AN INTERNATIONAL STANDARD FOR ARCTIC OFFSHORE STRUCTURES

W. Spring* R.F. McKenna G.A.N. Thomas D. Blanchet

Keynote Lecture 4

POLES APART - A TALE OF TWO EARLY 20TH CENTURY EXPEDITIONS TO THE ENDS OF THE EARTH

P. Noble*

Keynote Lecture 5

ARCTIC OFFSHORE FIELD DEVELOPMENTS IN DEEPER EURASIAN WATERS

S. Loiset*

T01 - Ice Properties

2010 ARCTIC VOYAGE OF THE ICEBREAKING RESEARCH VESSEL ARAON AND THE MATERIAL PROPERTIES OF ARCTIC SEA ICE

K. Choi* Y.-J. Park D.-H. Kim J.-H. Nam

EXPERIMENTAL INVESTIGATION OF FRICTION COEFFICIENT OF LABORATORY ICE

L. Fransson* A. Patil H. Andren

FIRST-YEAR SEA ICE CONDITIONS FOR OPERATIONS IN THE CANADIAN ARCTIC

R. Frederking* A. Collins I. Kubat

SHEAR FAULTING AND THE ICE-STRUCTURE INTERACTION PROBLEM

N. Golding* E.M. Schulson C.E. Renshaw

ANALYSIS OF THE PROBLEM OF SATURATION OF ICE WITH AIR BUBBLES

V. Goncharov* N. Klementieva J. Qin

VISCOELASTICITY, DAMAGE AND ICE BEHAVIOUR IN COMPRESSION

I.J. Jorjaan* R.S. Taylor

OIL ENTRAINMENT AND MIGRATION IN LABORATORY-GROWN SALTWATER ICE

J. Karlsson C. Petrich* H. Eicken

DEVELOPMENT OF ICE FAILURE/YIELD CRITERION FOR ACCIDENTAL LIMIT STATE DESIGN

E. Kim* J. Amdahl S. Løset

EXPERIMENTAL STUDY ON THE POROSITY EFFECT ON THE UNIAXIAL COMPRESSIVE STRENGTH OF BOHAI SEA ICE

Z. Li* L. Zhang P. Lu G. Li M. Leppäranta

FIELD STUDIES OF SEA WATER AND ICE PROPERTIES IN SVALBARD FJORDS

A. Marchenko* A. Shestov E. Karulin E. Morozov M. Karulina P. Bogorodsky S. Muzylev D. Onishchenko Makshtas, A.

FLATJACK CALIBRATION FOR IN-SITU TESTING

M.T. Pennington* J.P. Dempsey

MODELLED BULK SALINITY OF GROWING FIRST-YEAR SEA ICE AND IMPLICATIONS FOR ICE PROPERTIES IN SPRING

C. Petrich* P. Langhorne H. Eicken

OBSERVING THE SNOW AND ICE PROPERTIES OVER THE LABRADOR SHELF WITH HELICOPTER-BORNE GROUND-PENETRATING RADAR, LASER AND ELECTROMAGNETIC SENSORS

S. Prinsenbergh* I. Peterson S. Holliday L. Lalumiere

[EXPERIMENTS ON THE RELATION BETWEEN FREEZE-BONDS AND ICE RUBBLE STRENGTH PART II: FREEZE-BOND EXPERIMENTS](#) ^{ÁÁÁÁ} H

A.H.V. Repetto-Llamazares K.V. Høyland*

[REVIEW IN EXPERIMENTAL STUDIES OF FREEZE-BONDS](#) ^{ÁÁÁÁ} I

A.H.V. Repetto-Llamazares K.V. Høyland*

[EXPERIMENTS ON THE RELATION BETWEEN FREEZE-BONDS AND ICE RUBBLE STRENGTH PART I: SHEAR BOX EXPERIMENTS](#) ^{ÁÁÁÁ} I

N. Serré* A.H.V. Repetto-Llamazares K.V. Høyland

[FIELD EXPERIMENTS ON ICE-ICE FRICTION](#) ^{ÁÁÁÁ} E

S. Sukhorukov* S. Løset

[THE ROLE OF SPALLING FRACTURE IN SCALE EFFECT IN COMPRESSIVE ICE FAILURE](#) ^{ÁÁÁÁ} F

R.S. Taylor* I.J. Jordaan

[FRICTION MODELING IN ICE CRUSHING SIMULATION](#) ^{ÁÁÁÁ} G

M. Tikkanmäki* L. Makkonen J. Kurkela

[A REVIEW ON THE DEVELOPMENT OF THE METHODS OF ICE AND ICE-SOIL REINFORCEMENT](#) ^{ÁÁÁÁ} H

N.K. Vasiliev* A.A. Ivanov V.V. Sokurov I.N. Shatalina K.N. Vasilyev

T02 - Ice-Structure Interaction

[THREE DIMENSIONLESS INDEPENDENT PARAMETERS TO FULLY DESCRIBE AND ESTIMATE DIMENSIONLESS ICE-INDUCED PRESSURE ON VERTICAL STRUCTURES](#) ^{ÁÁÁÁ} I

A. V. M. Arunachalam*

[CAN WE ENGINEER ICE RUBBLE FOR PROTECTION OF OFFSHORE PLATFORMS IN THE BEAUFORT SEA?](#) ^{ÁÁÁÁ} H

A. Barker* G. Timco P. Spencer

[CALCULATION OF ICE ABRASION FOR THE LIGHTHOUSES INSTALLED IN THE GULF OF BOTHNIA](#) ^{ÁÁÁÁ} H

A.T. Bekker T.E. Uvarova* E.E. Pomnikov

[POTENTIAL FOR OIL AND GAS PROJECTS IN THE NEW OIL AND GAS PROVINCE SHARED BETWEEN RUSSIA AND NORWAY](#) ^{ÁÁÁÁ} G

M. Bulakh* O.T. Gudmestad A.B. Zolotukhin

[PERFORMANCE OF MINIMAL PLATFORMS IN ICE ENVIRONMENTS](#) ^{ÁÁÁÁ} J

A.B. Cammaert* A. Metrikine J.S. Hoving

[PLATFORM SHAPE AND ICE INTERACTION: A REVIEW](#) ^{ÁÁÁÁ} E

K. R. Croasdale*

[OVERVIEW OF THE MOLIKPAQ MULTI-YEAR ICE LOAD ANALYSIS JIP](#) ^{ÁÁÁÁ} F

R. Frederking* K. Hewitt I. Jordaan D. Sudom J. Bruce M. Fuglem R. Taylor

[ESTIMATION OF THE PEAK IMPACT LOAD ON THE MOLIKPAQ BY A MULTI-YEAR FLOE ON MAY 12, 1986 BASED ON FLOE DECELERATION](#) ^{ÁÁÁÁ} G

M.K. Fuglem I.J. Jordaan J. Bruce*

[AN INSIDE LOOK AT ICE-CRUSHING INDUCED VIBRATION AND LOCK-IN](#) ^{ÁÁÁÁ} H

R.E. Gagnon*

[CRITERION OF ICE INDUCED SELF EXCITED VIBRATION](#) ^{ÁÁÁÁ} J

F. Guo* Q. Yue

[INTRODUCTION OF ICE LOADS IN OVERALL SIMULATION OF OFFSHORE WIND TURBINES](#) ^{ÁÁÁÁ} J

J. Heinonen* S. Hetmanczyk M. Strobel

[ICE INDUCED VIBRATIONS OF FLEXIBLE OFFSHORE STRUCTURES: THE EFFECT OF LOAD RANDOMNESS, HIGH ICE VELOCITIES AND HIGHER STRUCTURAL MODES](#) ^{ÁÁÁÁ} G

H. Hendrikse* G.L. Kuiper A.V. Metrikine

[ICE LOADS ON THE MOLIKPAQ AT AMAULIGAK I-65 BASED ON GEOTECHNICAL ANALYSES AND RESPONSES](#) ^{ÁÁÁÁ} G

K.J. Hewitt*

[ICE LOAD MEASUREMENT ON MOLIKPAQ: METHODOLOGY AND ACCURACY](#) ^{ÁÁÁÁ} J

M. Jefferies* B. Rogers M. Hardy B. Wright

[RE-EVALUATION OF ICE LOADS AND PRESSURES ON THE MOLIKPAQ STRUCTURE](#) ^{ÁÁÁÁ} E

I. Jordaan* J. Bruce K.J. Hewitt R. Frederking

[PRODUCTION SHIP RESISTANCE TO ICEBERG IMPACT STUDY](#) ^{ÁÁÁÁ} F

S.L. Karlinskiy* V.A. Chernetzov

[THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF LEVEL ICE INTERACTION WITH FOUR-LEGGED STRUCTURES](#) ^{ÁÁÁÁ} G

M.M. Karulina* K.N. Shkhinek G.A.N. Thomas

[STRESS CONCENTRATION IN FLOATING ICE WITH A SLOTTED-SHAPED OPENING](#) ^{ÁÁÁÁ} F

F. Keshmiri*

[NUMERICAL INVESTIGATION OF EFFECT OF CHANNEL CONDITION AGAINST SHIP RESISTANCE IN BRASH ICE CHANNELS](#) ^{ÁÁÁÁ} G

A. Konno* O. Saitoh Y. Watanabe

[INTEGRATED NUMERICAL ANALYSIS OF ICEBERG COLLISIONS WITH SHIP SIDES](#) ^{ÁÁÁÁ} G

Z. Liu* J. Amdahl S. Løset

[ICE CRUSHING PRESSURE DISTRIBUTION AGAINST A COMPLIANT STIFFENED PANEL](#) ^{ÁÁÁÁ} H

M. Määtänen* P. Marjavaara S. Saarinen

[CHARACTERISTICS OF ICE DRIFT IN THE WESTERN BARENTS SEA RECONSTRUCTED BY THE DATA OF ICE TRACKERS](#) ^{ÁÁÁÁ} I

DEPLOYED ON DRIFTING ICE AND ICEBERGS IN 2008-2010

A. Marchenko* B. Kvamstad K. Fjørtoft K. Hoyland D. Brazhnikov

SPATIAL-TEMPORAL VARIABILITY OF STATIC ICE FORCES ÁÁÁ €€

B. Morse* E. Stander A. Coté A. Tarras R. Santerre Y. Prat

ICE INDUCED VIBRATION - IMPLEMENTATION OF MÄÄTTÄNEN MODEL AND DEVELOPMENT OF DESIGN SUPPLEMENTS ÁÁÁÁ F€

H. Nandan A.H. Younan* L. Deng

PHENOMENA BEHIND PEAK LOADS ON INCLINED STRUCTURE DURING A SIMULATED ICE PILE-UP PROCESS ÁÁÁÁÁ G€

J. Paavilainen* J. Tuhkuri A. Polojärvi

DEVELOPMENT OF A NUMERICAL SIMULATION FOR ROTATING AND SLIDING OF THE ICE FLOES ALONG A SHIP HULL ÁÁÁÁÁ HE

J. Sawamura* T. Tachibana

NUMERICAL INVESTIGATION OF THE ICE FORCE DISTRIBUTION AROUND THE SHIP HULL IN LEVEL ICE ÁÁÁÁÁ I €

J. Sawamura* R. Kikuzawa T. Tachibana M. Kunigita

THE STUDY OF RELATIONSHIP BETWEEN ICE GEOMETRIC CHARACTERISTICS AND THEIR EFFECT ON ICE LOAD ÁÁÁÁÁ Í €

N. Shrestha* T. G. Brown D. C. Mayne

THE EFFECT OF LOW PASS FILTERS IN THE MOLIKPAQ DATA ACQUISITION SYSTEM ON 'PHASE LOCK' INTERACTION SIGNALS ÁÁÁÁÁ Î €

P. Spencer T. Morrison* M. Jefferies

NUMERICAL SIMULATION OF SHIPS OPERATING IN LEVEL ICE ÁÁÁÁÁ Ï €

B. Su* K. Riska T. Moan

PRESSURE-AREA IN COMPRESSIVE ICE FAILURE ÁÁÁÁÁ Ì G

R.S. Taylor* I.J. Jordaan

STRUCTURAL RESPONSE TO WIND AT THE CONFEDERATION BRIDGE - PIERS 31 AND 32 ÁÁÁÁÁ JG

J. S. Tibbo* N. Shrestha T. Brown

DETAILED PRESSURE DISTRIBUTION ANALYSIS OF A CONFEDERATION BRIDGE PIER ÁÁÁÁÁ K€

D. Tripathi* D.C. Mayne T.G. Brown

RELIABILITY ANALYSIS OF ICE LOADS ON ARCTIC OFFSHORE STRUCTURES ÁÁÁÁÁ FH

B. Wang R. Basu* A. Jha S. Winterstein

NUMERICAL ASSESSMENT FOR STATIONARY STRUCTURE (KULLUK) IN MOVING BROKEN ICE ÁÁÁÁÁ GH

J. Wang* A. Derradji_Aouat

T03 - Extreme Ice Features

A COMPARATIVE ANALYSIS OF RUBBLE FIELD DATA COLLECTION TECHNIQUES ÁÁÁÁÁ HH

M. Flynn A. Barker*

VALIDATING HELICOPTER-BASED ELECTROMAGNETIC INDUCTION (HEM) MEASUREMENTS OVER THICK MULTI-YEAR ICE ÁÁÁÁÁ Î

M. Johnston* C. Haas

MULTI-YEAR FLOE AND RIDGE STATISTICS FROM SUBMARINE UPWARD LOOKING SONAR DATA FOR THE BEAUFORT SEA ÁÁÁÁÁ Í

B. Marcellus* R. McKenna D. McGonigal R. Pilkington

DANGEROUS ICE CONDITIONS AND ACCIDENTS IN RUSSIAN ARCTIC ÁÁÁÁÁ Î Ì

N. Marchenko*

EXTREME ICE FEATURES DISTRIBUTION IN THE CANADIAN ARCTIC ÁÁÁÁÁ Î Ì

D. McGonigal* D. Hagen L. Guzman

ICE ISLAND OCCURRENCE ON THE CANADIAN EAST COAST ÁÁÁÁÁ Ì Ì

I. Peterson*

MORPHOLOGY AND PHYSICAL PROPERTIES OF OLD SEA ICE IN THE FRAM STRAIT ÁÁÁÁÁ JÌ

A. Shestov*

A REVIEW OF THE MORPHOLOGICAL AND MECHANICAL PROPERTIES OF FIRST-YEAR SEA ICE RIDGES ÁÁÁÁÁ K€

L. Strub-Klein*

ONE SEASON OF A 1ST YEAR SEA ICE RIDGE INVESTIGATION- WINTER 2009 ÁÁÁÁÁ G€

L. Strub-Klein* K.V. Hoyland

ANALYSIS OF FIRST-YEAR AND MULTI-YEAR SEA ICE RIDGE PROPERTIES ÁÁÁÁÁ HG

D. Sudom* G. Timco B. Sand L. Fransson

T04 - Offshore Operations: Logistics and Ice Management

SHIP EMERGENCY RESPONSE IN POLAR WATERS ÁÁÁÁÁ I H

A. Broughton* M. LaRoche M. Pavic D. Prentice D. Upcraft

WHEN CERTAINTY IS FAR FROM CERTAIN ÁÁÁÁÁ Í I

A. Chamberlain*

OPTIMUM LOAD SPACING FOR SAFER TRANSPORTATION ON FLOATING ICE ÁÁÁÁÁ Î G

F. Keshmiri*

ADVANCES IN ICE MANAGEMENT FOR DEEPWATER DRILLING IN THE BEAUFORT SEA ÁÁÁÁÁ Ì G

B. Maddock A.D. Bush T.P. Wojahn T. Kokkinis A.H. Younan J.R. Hawkins*

ICE MANAGEMENT FOR STEERING OF LARGE ICE FLOES ÁÁÁÁÁ Ì Ì

K. Soofi P. Noble C. Yetsko D. Sudom A. Collins M. Sayed*

T05 - Operational Experience: Lessons Learned from the Caspian Sea

[INVESTIGATION OF ICE IN THE EASTERN PART OF THE CASPIAN WITHIN "BACKGROUND ECOLOGICAL INVESTIGATION AT JAMBAI YUJNY-YUJNY ZABURUNJE" PROGRAM](#) ¶¶¶¶ JĪ

E. Ayazbaev P. Buharitsin*

[ICE CONDITIONS IN THE LOWER REACHES OF THE VOLGA AND THE NORTH-CASPIAN SEA DURING THE TEMPERATE WINTER OF 2009/10](#) ¶¶¶¶ €Ī

*P. Buharitsin**

[ICE GOING CAPABILITY OF A SMALL UNCONVENTIONAL VESSEL IN THE KASHAGAN FIELD](#) ¶¶¶¶ FG

L. Cok K.E. Sazonov V.A. Beljashov V.M. Shaposhnikov A.B. Nesterov E. Putorti*

[OFFSHORE PLATFORMS AND DETERMINISTIC ICE ACTIONS: KASHAGAN PHASE 2 DEVELOPMENT: NORTH CASPIAN SEA](#) ¶¶¶¶ GG

K. Croasdale I. Jordaan P. Verlaan*

[SOME OBSERVATIONS OF ICE FEATURES IN THE NORTH CASPIAN SEA](#) ¶¶¶¶ HG

G Crocker A Ritch R Nilsen*

[PROBABILISTIC MODELLING OF THE ICE ENVIRONMENT IN THE NE CASPIAN SEA AND ASSOCIATED STRUCTURAL LOADS](#) ¶¶¶¶ Ī F

I. Jordaan P. Stuckey J. Bruce K. Croasdale P. Verlaan*

[ICE ENCRoACHMENT IN THE NORTH CASPIAN SEA](#) ¶¶¶¶ Ī F

R. McKenna P. Stuckey M. Fuglem G. Crocker D. McGonigal K. Croasdale P. Verlaan A. Abuova*

[MODELLING OF ICE RUBBLE ACCUMULATIONS IN THE NORTH CASPIAN SEA](#) ¶¶¶¶ Ī F

R. McKenna D. McGonigal P. Stuckey G. Crocker R. Marcellus K. Croasdale P. Verlaan A. Abuova*

[THE NORTH CASPIAN SEA ICE CONDITIONS AND HOW KEY ICE DATA IS GATHERED](#) ¶¶¶¶ Ī F

R. Nilsen P. Verlaan*

[ICE ISSUES RELATING TO THE KASHAGAN PHASE 2 DEVELOPMENT: NORTH CASPIAN SEA](#) ¶¶¶¶ Ī F

P. Verlaan K. Croasdale*

T06 - ISO 19906 Arctic Offshore Structures: Scope and Rationale

[DATA FOR CRUSHING FORMULA](#) ¶¶¶¶ JF

*T. Kärnä D. Masterson**

[ISO 19906 ICE CRUSHING LOAD DESIGN EXTENSION FOR NARROW STRUCTURES](#) ¶¶¶¶ €H

M. Määttänen T. Kärnä*

[ICE MANAGEMENT AND OPERATIONAL STRATEGY FOR FLOATERS IN ICE](#) ¶¶¶¶ FG

C. Makrygiannis R. McKenna B. Wright T. Sildnes W. Jolles M. Mørland R. Basu N. Allyn*

[ISO 19906: BEARING CAPACITY OF ICE AND ICE ROADS](#) ¶¶¶¶ GĪ

*D. Masterson S. Løset**

[COMPARISON OF ICE LOAD CALCULATIONS USING ISO 19906, CSA, API AND SNIP](#) ¶¶¶¶ HĪ

D.M. Masterson J.S. Tibbo*

[THE NEW ISO19906 STANDARD AND RELATED ARCTIC ACTIVITIES AT DNV](#) ¶¶¶¶ Ī Ī

P.O. Moslet O.T. Gudmestad T. Sildnes E. Sæbø*

[MOVING ON FROM ISO 19906: WHAT OUGHT TO FOLLOW?](#) ¶¶¶¶ Ī Ī

*A.C. Palmer**

[ISO 19906 - IMPLICATIONS FOR ARCTIC OFFSHORE ESCAPE, EVACUATION AND RESCUE](#) ¶¶¶¶ Ī Ī

J. Poplin F. Bercha C. Brummelkamp D. Dickins S. Knight M. Mansurov M. Moorland D. Onshuus Santos-Pedro, V. A. Simões Ré G. Timco*

[ISO 19906 ANNEX B – DESCRIPTION AND USE](#) ¶¶¶¶ Ī Ī

W. Spring G. Timco Y. Mironov C. Shaw*

T07 - EER for Ice-Covered Waters

[OCCUPANT HABITABILITY WITHIN A TOTALLY ENCLOSED MOTOR PROPELLED SURVIVAL CRAFT](#) ¶¶¶¶ Ī Ī

A. Baker A. Simoes-Re J. Power S. MacKinnon*

[SEASONAL STRATEGIES FOR EVACUATION FROM OFFSHORE STRUCTURES IN THE BEAUFORT SEA](#) ¶¶¶¶ JG

A. Barker G. Timco B. Wright*

[AN OVERVIEW OF RECENT PROJECTS TO STUDY THERMAL PROTECTION IN LIFERAFTS, LIFEBOATS AND IMMERSION SUITS](#) ¶¶¶¶ €GG

L. Mak M.B. DuCharme B. Farnworth E.H. Wissler R. Brown A. Kuczora*

[PERFORMANCE MEASUREMENTS OF THE EFFECT OF SIMULATOR TRAINING ON NOVICE OPERATORS IN SIMULATED ICE CONDITIONS.](#) ¶¶¶¶ €FG

S Power MacDonald S.N. MacKinnon A. Simoes Re J. Power*

[FIELD TRIALS OF A LIFEBOAT IN ICE AND OPEN WATER CONDITIONS](#) ¶¶¶¶ €GH

A. Simões Ré B. Veitch A. Kuczora A. Barker D. Sudom P. Gifford*

[KEY CONSIDERATIONS RELATED TO SUPPORT VESSEL USE FOR PERSONNEL EVACUATION FROM OFFSHORE PLATFORMS IN THE BEAUFORT SEA](#) ¶¶¶¶ €H

B. Wright R. Browne G. Timco A. Barker*

T08 - Moored Structures in Ice-Covered Waters

[NUMERICAL SIMULATIONS OF MOORED STRUCTURES IN ICE: INFLUENCE OF VARYING ICE PARAMETERS](#) 

B. Bonnemaire T. Lundamo N. Serré A. Fredriksen*

[SIMULATION METHODOLOGY FOR ASSESSING SEA ICE DOWNTIME OF FLOATING PLATFORM](#) 

B. Bonnemaire T. Sagerup T. Lundamo A. Fredriksen P. Liferov G. Le Marechal*

[EXPERIENCES AT HSWA WITH MODEL TESTING OF MOORED STRUCTURES IN ICE-COVERED WATERS](#) 

K.-U. Evers P. Jochmann*

[WATER-ICE ACTIONS ON FLOATING PLASTIC JETTY IN SVALBARD](#) 

A. Marchenko K. Bråten*

T09 - Ice Forecasting

[THE INCORPORATION OF AN OCEAN TEMPERATURE PROFILE INTO AN EXISTING ICEBERG DETERIORATION MODEL](#) 

S.E. Bruneau E.G Manning G Crocker*

[THE INFLUENCE OF SOLAR ACTIVITY FLUCTUATIONS ON LONG-TERM CLIMATIC EVENTS IN THE NORTH-CASPIAN REGION FOR THE PERIOD BEFORE 2017](#) 

P. Buharitsin A. Andreev*

[A MODIFIED DISCRETE ELEMENT MODEL FOR SEA ICE DYNAMICS](#) 

S. Ji A. Wang B. Li Y. Liu H. Li*

[A CONCEPTUAL FUZZY LOGIC MODEL TO ESTIMATE SHIP SCALE ICE COMPRESSION HAZARD](#) 

T. Kōuts M. Lilover*

[OBSERVATIONS OF SHIPS IN COMPRESSIVE ICE](#) 

H. Leisti K. Kaups J. Lehtiranta M. Lindfors M. Suominen M. Lensu J. Haapala K. Riska Kouts, T.*

[ARCTIC ICE EXTENT FORECASTING USING THE UKMO GLOSEA4 SEASONAL PREDICTION SYSTEM](#) 

K. A. Peterson A. Arribas A. McLaren H. Hewitt M. Gordon*

[ON A NEW NUMERICAL SCHEME FOR ICE DYNAMICS MODELS](#) 

R.S. Pritchard B. Tremblay*

[EVALUATION OF THE CONCEPTS SEA ICE FORECASTS](#) 

G. Smith C. Beaudoin A. Caya M. Buehner F. Roy F. Davidson J. Wells T. Carrieres Ritchie, H. Y. Lu*

[LONG TERM BALTIC SEA ENSEMBLE FORECASTING](#) 

A. Westerlund B. W. An T. Stipa*

T10 - Remote Sensing in Ice

[HIGH RESOLUTION RADARSAT-2 SAR DATA FOR SEA-ICE CLASSIFICATION IN THE NEIGHBORHOOD OF NUNAVIK'S MARINE INFRASTRUCTURES](#) 

C. Gignac Y. Gauthier J.S. Bédard M. Bernier D. Clausi*

[DAILY GLOBAL SEA ICE MAPS FROM AMSR-E 89 GHZ OBSERVATIONS - A POLAR VIEW SERVICE](#) 

G. Heygster H. Wiebe J. Notholt R. Saldo*

[INTEGRATION OF SEA-ICE MONITORING COMPONENTS TO SUPPORT HIGH LATITUDE OFFSHORE OPERATIONS - TWO CASE STUDIES](#) 

M.C. Hill G.R. Pilkington I. Turnball*

[DIGITAL IMAGE TECHNIQUES OF SEA ICE FILED OBSERVATION IN THE BOHAI SEA](#) 

S. Ji H. Li A. Wang Q. Yue*

[THE POTENTIAL OF SATELLITE EARTH OBSERVATION OF ICE CONDITIONS IN SUPPORTING ISO 19906](#) 

K. Partington N. Fournier M. Winkler*

T11 - Ports in Cold Climates

[FORECAST OF BEARING CAPACITY REDUCTION AT ROADS AND PORTS DURING THAW SEASON](#) 

*A. Berglund T. Edeskär S. Knutsson**

[MICROBIAL INDUCED CORROSION ON A WHARF IN THE CANADIAN ARCTIC](#) 

H. Kullmann M. Graff R. Watson*

[WATER-ICE ACTIONS ON THE COAL QUAY AT KAPP AMSTERDAM IN SVALBARD](#) 

A. Marchenko A. Shestov A. Sigítov S. Løset*

[ICE ACTION ON A GEOBAG EMBANKMENT IN LANDFAST SEA ICE ON SVALBARD, NORWAY](#) 

*E. Østerås J. Finseth K.V. Høyland**

[MARINE INFRASTRUCTURES IN NUNAVIK AND CLIMATE CHANGES](#) 

Y. Ropars A. Guimond J.-P. Savard*

T12 - Innovations in Navigation and Shipping in Ice-covered Waters

[THE INTERIM RESULTS OF THE LONG-TERM ICE LOADS MONITORING ON THE LARGE ARCTIC TANKER](#) 

A. Iyerusalimskiy J. Choi G. Park Y. Kim H. Yu J. St.John*

[RISK-BASED APPROACH FOR STRUCTURAL DESIGN OF ICE-STRENGTHENED VESSELS NAVIGATING IN THE BALTIC SEA](#) 

J. Kaldasau P. Kujala*

M. Kapfer* T. Hirose J. Bennett

CHARACTERIZATION OF PRESSURED ICE THREAT TO SHIPPING ÁÁÁÁFHÍ

I. Kubat* D. Watson M. Sayed

A SHIP MANOEUVRING IN ICE MODELING SOFTWARE OSIS-IHI ÁÁÁÁFHÍ

M. Lau*

THE ICE FIELD TESTS OF KOREAN ICEBREAKING RESEARCH VESSEL ÁÁÁÁFHÍ

C.-J. Lee* S.-Y. Jeong H.-S. Kim

INVESTIGATIONS OF VARIABILITY FOR SHIP NAVIGATION THROUGH THE NORTHWEST PASSAGE, 1982-2010 ÁÁÁÁFHÍ

T.D. Mudge* D.B. Fissel M. Martínez de Saavedra Álvarez J.R. Marko

ICE HAZARD RADAR ÁÁÁÁFHÍ

B. O'Connell*

SYNTHETIC APERTURE RADAR BASED ICE AND ICEBERG MONITORING IN SUPPORT OF TACTICAL OPERATIONS ÁÁÁÁFHÍ

D. Power* K. Partington N. Walker

POLAR VIEW: INNOVATIVE INFORMATION SERVICES TO SUPPORT NAVIGATION IN ICE-INFESTED WATERS ÁÁÁÁFHÍ

T.M. Puestow* D. Power P. Adlakha

DEVELOPMENT OF PREDICTION METHODS FOR ICE GOING SHIPS BASED ON NEURAL NETWORKS ÁÁÁÁFHÍ

N. Reimer*

ICE RESPONSE MONITORING USING STRUCTURAL MONITORING SYSTEMS ÁÁÁÁFHÍ

G. Sagvolden* K. Pran

THE APPROACH FOR INCLUDING POLAR CLASS VESSELS IN THE CANADIAN ARCTIC SHIPPING REGULATIONS ÁÁÁÁFHÍ

G.W. Timco* A. Collins I. Kubat

T13 - Mechanics of Scour and Pipeline Protection

IMPACT OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF EXTREME SCOURING (GOUGING) EVENTS, CANADIAN BEAUFORT SHELF ÁÁÁÁFHÍ

S. Blasco* E. Carr P. Campbell J. Shearer

AN ENGINEERING ASSESSMENT OF ICE GOUGE STATISTICS AND RECOMMENDED STATISTICAL DISTRIBUTIONS FOR EXTREME ICE GOUGE PARAMETER ESTIMATION ÁÁÁÁFHÍ

J. Caines* M. Paulin S. Kenny

THE FORCES REQUIRED TO PRODUCE SEABED GOUGES ÁÁÁÁFHÍ

A. Fredj G. Comfort* K. Been

ICEBERG SCOUR RISE-UP MODELING ÁÁÁÁFHÍ

P.F. Moore* T. King M. Fuglem G. Sonnichsen

KEEL-SEABED INTERACTION: NUMERICAL MODELLING FOR SANDS ÁÁÁÁFHÍ

R. Phillips* J. Barrett

ADVANCED NUMERICAL SIMULATIONS OF ICE GOUGE EVENTS AND IMPLICATIONS FOR ENGINEERING DESIGN ÁÁÁÁFHÍ

K. Pike S. Kenny* B. Hawlader

LARGE SCALE INDENTER TEST PROGRAM TO MEASURE SUB GOUGE DISPLACEMENTS ÁÁÁÁFHÍ

R.B. Sancio* K. Been J. Lopez

2004 GRAND BANKS ICEBERG SCOUR SURVEY ÁÁÁÁFHÍ

G. Sonnichsen* T. King

ÁÁÁÁFHÍ

ÁÁÁÁFHÍ

ÁÁÁÁFHÍ