

# **OTC Arctic Technology Conference 2015**

**Copenhagen, Denmark  
23-25 March 2015**

**Volume 1 of 2**

**ISBN: 978-1-5108-0391-6**

**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© (2015) by the Offshore Technology Conference  
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact the Offshore Technology Conference  
at the address below.

Offshore Technology Conference  
222 Palisades Creek Drive  
Richardson, Texas 75080-2040

Phone: (972) 952-9494  
Fax: (972) 952-9435

[service@otcnet.org](mailto:service@otcnet.org)

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

## VOLUME 1

<b>ACVs in the Arctic.....</b>	1
<i>Andrews, Darren; Cox, Malcolm</i>	
<b>Advanced Baltic Icebreaker for Finnish Transport Agency .....</b>	8
<i>Kajosaari, Markku</i>	
<b>Analysis of a Large Ice Shear Wall: Implications for Pack Ice Driving Forces .....</b>	13
<i>Timco, G. W.; Barker, A.</i>	
<b>Arctic Development of the Canadian Beaufort Sea, Geohazards and Export Route Options.....</b>	27
<i>Nash, Ian</i>	
<b>Arctic Exploration Activity at a Glance – The Upcoming Activity and the Players .....</b>	45
<i>Norström, Jan G.; Wold, Erik</i>	
<b>Arctic Oil Spill Prevention and Response: Working Collaboratively to Improve and Extend Safe Practice .....</b>	59
<i>Winkler, Mitchell; Jahre-Nilsen, Catherine; Blaauw, Robert; Dyve-Jones, Richard</i>	
<b>Autonomous Underwater Vehicle Operations in the Arctic.....</b>	67
<i>McMillan, John</i>	
<b>Breakthrough in Arctic Shipping .....</b>	73
<i>Hgänninen, S.; Heideman, T.</i>	
<b>Canadian Arctic Oil Shale Resources: A Re-assessment of Potential Ordovician to Carboniferous Oil Shale Deposits .....</b>	83
<i>Goodarzi, Fariborz; Ardakani, Omid Haeri; Pedersen, Per-Kent; Sanei, Hamed</i>	
<b>Challenges of Ice Model Tests on Moored DP Assisted Structures .....</b>	98
<i>Schröder, Christian; Jorde, Jørgen</i>	
<b>Charting a Collaborative Course for Arctic Offshore Oil and Gas Exploration.....</b>	109
<i>Fenton, Jocelyn A.</i>	
<b>A Combined Effort to Deliver Arctic E&amp;P Operations in an HSE Responsible Manner.....</b>	119
<i>Petrone, A.; Scataglini, L.; Buffagni, M.; Aiello, G.; Cianfanelli, M.; Di Muzio, D.; Borello, L.; Sordini, E.; Faraoni, G.; Salvador, C.; Giusto, M.; Catalano, R.; Cherubin, P.; Antico, L.; Bonuccelli, M.; Bandini, R.</i>	
<b>Conical Structures in Ice: Ride-Up, Radius and Results.....</b>	132
<i>Barker, Anne; Sudom, Denise; Sayed, Mohamed</i>	
<b>Converting Science Into Decision Making Support .....</b>	145
<i>Grønnevet, Martin; Barnett, McLean; Semenov, Alexander</i>	
<b>Co-variability of North Atlantic Oscillation and Maximum Sea Ice Extent in the Baltic Sea in CMIP5 Climate Models .....</b>	153
<i>Seitola, Teija; Ukkonen, Peter; Karpechko, Alexey; Ruosteenaja, Kimmo; Gregow, Hilppa</i>	
<b>A Crustal Structure Model of the Beaufort-Mackenzie Margin, Southern Canada Basin.....</b>	163
<i>Oakey, G. N.; Saltus, R. W.; Shimeld, J. W.</i>	
<b>A Deep Water, Under-Ice AUV: Extended Continental Shelf Mapping in the Arctic .....</b>	177
<i>Mosher, D. C.; Verhoef, J.; Travaglini, P.; Pederson, R.</i>	
<b>Deepwater Arctic Subsea Separation &amp; Storage Systems .....</b>	186
<i>Eie, Rolf</i>	
<b>Design and Development of a Greenland Ice and Metocean Geoportal.....</b>	193
<i>Ross, E.; Loos, E.; Fissel, D. B.; Lapidakis, Y.; Zhang, O.</i>	
<b>Design Concept for Steel GBS with Crude Storage in Arctic and Cold Regions.....</b>	206
<i>Bandi, Deepti; Paulin, Mike; Georgiou, Andreas; Dontula, Nagavaishnavi</i>	
<b>Designing New Arctic Ships to Incorporate Cloud Computing for Improved Information Systems and Vessel Management .....</b>	216
<i>McGillivray, Philip A.; Stecca, Michele; Maresca, Massimo; Baglietto, Pierpaolo</i>	
<b>Detection of Oil Under Ice Utilizing Active Acoustic Multibeam Sonars.....</b>	225
<i>Eriksen, Peter Koldgaard; Pociwadowski, Paweł</i>	
<b>Development of Icebreaking Ships with Ice Model Tests .....</b>	236
<i>Wilkman, Göran</i>	
<b>The Distribution of Massive Ice Features by Ice Types from Multi-Year Upward Looking Sonar Ice Draft Measurements.....</b>	258
<i>Fissel, David B.; Ross, Ed; Sadowy, Dawn; Wyatt, Glenda J.</i>	
<b>Emergency Towing Operations in Arctic Waters .....</b>	271
<i>Berg, Tor Einar; Selvik, Ørjan</i>	

<b>Equivalency: Regulatory Flexibility in a Changing World .....</b>	282
<i>Scott, Bill; Osler, Shawn Denstedt Q. C.</i>	
<b>Experimental and Numerical Investigations of a Ship-Shaped, Turret-Moored Floating Structure in Intact and Managed Sea Ice Conditions .....</b>	290
<i>Metrikin, Ivan; Teigen, Sigurd Henrik; Görtner, Arne; Uthaug, Eirik; Strøm Sapelnikov, Dmitry; Ervik, Åse; Fredriksen, Arnt; Lundamo, Trine; Bonnemaire, Basile</i>	
<b>Extending Conventional Pipe-Soil Interaction Models to Include Bundle Effects for Arctic Subsea Pipeline Design .....</b>	300
<i>Georgiou, Andreas E.; Davis, Amy; Eskandari, Farzad; Paulin, Mike</i>	
<b>Field Data for Sea Ice and Iceberg Drift Offshore Newfoundland and Labrador .....</b>	309
<i>Taylor, Rocky; Turnbull, Ian; Slaney, Aaron</i>	
<b>Finding the Source for Hydrocarbon Leakage on the Vestnesa Ridge, NW Svalbard .....</b>	318
<i>Knies, J.; Plaza-Faverola, A.; Bünz, S.; Mienert, J.; Daszinnies, M.; Mattingdal, R.; Chand, S.</i>	
<b>Forecasting Ice and Weather Conditions for Field Operations in Alaska .....</b>	319
<i>Raye, Robert</i>	
<b>Four Oil and Gas Operators Join Forces to Make a Joint Social Baseline Study in Greenland .....</b>	329
<i>Krarup, Hans Christian; Björnsson, Haukur</i>	
<b>Gas Bearing Prospect Identification by Integrated Seismic and Petrophysical Interpretation Using Effective Pore Space Approach .....</b>	336
<i>Nooraiepour, Mohammad; Aali, Masoud; Kovalenko, Kazimir V.</i>	
<b>Gigabytes, Terabytes, a LOT of Bytes? What to Do with Six Years of Chukchi Sea Environmental Studies Data .....</b>	344
<i>Cowee, Christie; Eick, Cindy</i>	
<b>Ice Based Construction of Offshore Arctic Pipelines .....</b>	350
<i>Cowin, T. G.; Lanan, G. A.; Young, C. H.; Maguire, D. H.</i>	
<b>Iceberg Ice Constitutive Modeling and FEA Validation .....</b>	367
<i>Derradj-Aouat, Ahmed; Sarzynski, Melanie; Cordes, Roger</i>	
<b>Iceberg Remote Sensing in Arctic Harsh Conditions .....</b>	380
<i>Kim, Anna N.; Scibilia, Francesco; Bouquet, Grégory</i>	
<b>Icebreaking Trimaran Development Project .....</b>	394
<i>Heikkilä, T.; Mård, A.; Valtonen, V.</i>	
<b>Impact of the Ice Cover onto Seismic Waves' Propagation in Shallow Arctic Water .....</b>	407
<i>Tcheverda, V. A.; Khaidukov, V. G.; Lisitsa, V. V.; Reshetova, G. V.</i>	
<b>Implementation of an On-Site Sea Ice Information System .....</b>	418
<i>Rabenstein, L.; Cochrane, P.; Hendricks, S.; Itkin, M.; Krumpen, T.</i>	
<b>Improved Modeling of Iceberg Ice Constitutive Properties using a Multiscale Approach .....</b>	425
<i>Souza, Flavio; Sarzynski, Melanie; Cordes, Roger</i>	
<b>Improving Ice Pressure Forecasting for Operational Purposes .....</b>	441
<i>Eriksson, Patrick B.; Lensu, Mikko; Haapala, Jari; Lehtiranta, Jonni</i>	
<b>Integration of Seismic and 3D CSEM Data De-risks Play Models in the Hoop Area, Barents Sea .....</b>	449
<i>Gabrielsen, Pål T.; Pedersen, Camilla B.; Fanavoll, Stein; Kjølhamar, Bent E.</i>	
<b>Investigation of the Burial and Exhumation History of East Greenland Based On Apatite-fission Track Analysis, Stratigraphic Landform Analysis and the Geological Record .....</b>	454
<i>Japsen, Peter; Green, Paul F.; Bonow, Johan M.</i>	
<b>Mapping the Surficial Geology of the Arctic Ocean: A Layer for the IBCAO .....</b>	462
<i>Mosher, D. C.; Courtney, R. C.; Jakobsson, M.; Gebhardt, C.; Mayer, L.</i>	
<b>Mobile Technology of Frequency-Resonance Processing and Interpretation of Remote Sensing Data: The Results of Application in Different Region of Barents Sea .....</b>	473
<i>Yakymchuk, N. A.; Levashov, S. P.; Korchagin, I. N.; Bozhezha, D. N.</i>	
<b>Modelling of a Thermal Discharge in an Ice-covered Estuary in Finland .....</b>	488
<i>De Graaff, Reimer; Lindfors, Antti; De Goede, Erik; Rasmus, Kai; Morelissen, Robin</i>	
<b>Monitoring Hazardous Sea Ice Features using Satellite Imagery .....</b>	507
<i>Zakharov, I.; Bobby, P.; Power, D.; Saunders, K.; Warren, S.</i>	

## VOLUME 2

<b>Monotower Steel GBS Concept and Design Considerations .....</b>	513
<i>Wu, Chunfa; Ji, Chunqun</i>	
<b>Mud-weight Control During Arctic Drilling Operations .....</b>	522
<i>Torsaeter, Malin; Cerasi, Pierre</i>	

<b>A Multi-Purpose Submarine Concept for Arctic Offshore Operations.....</b>	533
<i>Brandt, Hendrik; Fröhling, Christian; Hollung, Achim; Schiemann, Marc; Voss, Thomas</i>	
<b>Multi-Year Ice Incursions into the Chukchi Sea.....</b>	545
<i>Ward, E. G.; Leidersdorf, Craig; Coogan, Jeffrey; Vaudrey, Kennon</i>	
<b>Navigating the NSR: The Arctic Ice-Breaking LNG Carrier.....</b>	560
<i>Hannon, Frederic; Giboin, Pierre; Kalinin, Andrey</i>	
<b>Numerical Evaluation of Cyclic Frost Heave Growth in Arctic Pipelines and Mitigation Strategies.....</b>	572
<i>Abdalla, Basel A.; Fan, Chengye; McKinnon, Colin; Gaffard, Vincent</i>	
<b>Numerical Research on Usage of Podded Propulsors in Ice Management .....</b>	584
<i>Islam, Mohammed; Jahra, Fatima; Molyneux, David; Hedd, Lee</i>	
<b>Offshore Newfoundland and Labrador Metocean Study .....</b>	607
<i>King, Tony; Wright, Richard; Dровер, Keith; Fleming, Greg; Gillis, Erin</i>	
<b>Oil and Gas Development in The Faroe Islands, Iceland and Greenland: How Local Competence Development Contributes to a Social License to Operate .....</b>	627
<i>Smits, C. C. A.; Justinussen, J. C. S.; Bertelsen, R. G.</i>	
<b>Permafrost Foundations Thermally Stabilized Using Thermosyphons .....</b>	639
<i>Yarmak, Edward</i>	
<b>Permafrost Impact on Gas Fields Development in the Russian Onshore Arctic (Yamal Peninsula).....</b>	651
<i>Yakushev, Vladimir S.</i>	
<b>Post-simulations of Ice Basin Tests of a Moored Structure in Broken Ice - Challenges and Solutions .....</b>	665
<i>Bonnemaire, Basile; Tan, Xiang; Serré, Nicolas; Fredriksen, Arnt; Metrikin, Ivan; Gürtner, Arne</i>	
<b>The Potential Benefits Autonomous Underwater Vehicles Bring to Subsea Inspection in Arctic Regions .....</b>	673
<i>Jamieson, Jim; Hopkins, Dwayne</i>	
<b>Prediction of Arctic Sea Ice for Ship Routing: Forecast Experiment and Ship Cruise .....</b>	680
<i>Dobrynin, Mikhail; Fock, Björn Hendrik; Gierisch, Andrea M. U.; Pohlmann, Thomas; Kaleschke, Lars; Schlünzen, Heinke</i>	
<b>Preventing Thaw Settlement of Oil Pipelines Buried In Permafrost .....</b>	686
<i>Ali, Muhammad A.</i>	
<b>Probabilistic Modelling of Marine Icing: an Estimation Method for Spray Water .....</b>	688
<i>Aalbers, Albert B.; Poen, Gerard J.</i>	
<b>Probabilistic Seismic Hazard Analysis of an LNG Storage Facility in Warm Permafrost .....</b>	707
<i>Thornley, John D.</i>	
<b>Projected Regulatory Governance for Offshore Hydrocarbon Development in the the Kara Sea .....</b>	716
<i>Skinner, Jon A.</i>	
<b>Real-time Arctic Pipeline Integrity and Leak Monitoring .....</b>	723
<i>Thodi, P.; Paulin, M.; Degeer, D.; Squires, M.</i>	
<b>The Remote Coast: Baseline Mapping in Preparation for Arctic Coastal Disasters.....</b>	739
<i>Mitchell, Todd</i>	
<b>Remote Health Care: A Game Changer for the Arctic.....</b>	745
<i>Berg, J.; Toner, S.; Stilz, R.; Klein, S.; Williams, H.; Pearson, J.; Fraser, A.; Norman, N.</i>	
<b>Remote-Controlled Cement-Pump Unit: A Step Change in Pressure Pumping.....</b>	757
<i>Gupta, Nadish; Ray, John Allen</i>	
<b>Research to Improve Oil Spill Response in the Arctic - A Joint Industry Programme .....</b>	765
<i>Mullin, Joseph V.</i>	
<b>Review and Outlook on Arctic Offshore Facilities &amp; Technologies.....</b>	777
<i>Huaiyin, Li; Xuebo, Dang; Kai, Zhu</i>	
<b>SAMCoT: Leveraging Cross Sector Collaboration to Drive Sustainable Energy Developments in the Arctic .....</b>	801
<i>Kuiper, Guido; Løset, Steinung</i>	
<b>The Seasonal Cycle of Sea Ice Thickness on the North East Greenland Shelf.....</b>	812
<i>Hansen, E.; Gerland, S.; Spreen, G.; Hoyland, K.</i>	
<b>Ship Trial for Testing of an Ice Route Optimization System .....</b>	823
<i>Reimer, Nils</i>	
<b>A Simple Model for Glory Hole Dredge Spoil Dispersion Assessment.....</b>	842
<i>Haneberg, William C.; Bruce, Brittany; Kelly, Joshua T.; Davis, Laurence</i>	
<b>Simulation of Physical Ice Management Operations Including Trajectory, Power and Manoeuvrability Estimation .....</b>	852
<i>Hisette, Q.; Reimer, N.</i>	
<b>Simulations of the StationKeeping of Drillships Under Changing Direction of Ice Movement .....</b>	871
<i>Sayed, Mohamed; Kubat, Ivana; Watson, David; Wright, Brian; Gash, Robert; Millan, Jim</i>	

<b>Strategy for Fast Tracking Development of Arctic Oil-Gas Offshore Field .....</b>	888
<i>Shandrygin, A. N.; Dubrovsky, D. A.</i>	
<b>Targeted Full-Waveform Inversion of Ground-Penetrating Radar Data for Quantification of Oil Spills under Sea Ice.....</b>	898
<i>Bradford, John H.; Marshall, H. P.; Babcock, Esther; Dickins, David F.</i>	
<b>Technology Adoption of Unmanned Aircraft Systems in Alaska and the Arctic .....</b>	905
<i>Rogers, Marty</i>	
<b>Thermal Characterization of Potential Leaks in Offshore Pipelines.....</b>	910
<i>Siebenaler, Shane; Iyer, Mahesh; Kulkarni, Mohan; Salmatanis, Nikolaos</i>	
<b>Time Domain Analysis of Floe Ice Interactions with Floating Structures .....</b>	920
<i>Lubbad, Raed; Løset, Sveinung</i>	
<b>Tubular Integrity: Analytical Approach and Modeling of Optimum Performance Envelope in Presence of Gas Hydrates.....</b>	931
<i>Anand, Kumar Dinkar; Samuel, Robello</i>	
<b>Unmanned Aircraft Systems for Geotechnical Monitoring of Pipelines in the Arctic .....</b>	948
<i>Cunningham, Keith; Hatfield, Michael; Pericón, Laura Samsó</i>	
<b>Update on a New Ice Simulation Tool using a Multi-Model Program .....</b>	955
<i>Septseault, Cyril; Béal, Pierre-Antoine; Yaouang, Sébastien Le; Dudal, Alexey; Roberts, Brian</i>	
<b>Update on Probabilistic Assessment of Multi-year Sea Ice Loads on Vertical-faced Structures .....</b>	963
<i>Thijssen, Jan; Fuglem, Mark; Muggeridge, Karen; Morrison, Tom; Spencer, Paul</i>	
<b>Using Autonomous Marine Vehicles to Enable Accurate Wellbore Placement in the Arctic.....</b>	977
<i>Poedjono, Benny; Pai, Sudhir; Maus, Stefan; Manoj, Chandrashekaran; Paynter, Ryan</i>	
<b>Virtual Arctic Simulation Environment .....</b>	999
<i>Hamilton, Matthew; Dodd, Stephen</i>	
<b>Winterization of Bow Loading Systems on Shuttle Tankers.....</b>	1015
<i>Nikolaisen, Øyvind; Sunde, Jarle; Gudmestad, Ove Tobias</i>	
<b>Author Index</b>	