



SAMCoT News Letter 04/2013 (Aug - Oct 2013)

Administrative reporting

Briefing on Activities:

As a result of an extensive communication campaign linked to the Associated Project OATRC2013, SAMCoT has been featured in different scientific media, among others, The Guardian and the American Polar Society. Links to the different articles are available on the [SAMCoT Webpage](#).



The SAMCoT Technical Workshop, 18th-19th Sep. 2013
Suhm Auditorium, NTNU, Trondheim.

The purpose of the Workshop was to get a status and discuss the way forward, and to reach strategic conclusions with impact on the Cost Time and Resources (CTRs) planning of the different SAMCoT Work Packages (WPs).

The scientific WPs Leaders (A. Marchenko WP1, K.V. Høyland WP2&WP3, Maj Gøril G. Bæverfjord WP6, R. K. Lubbad WP5, S. Løset WP4)/Deputy Leaders (A. Metrikine WP3, J. Finseth WP6, R. Skjetne WP5, J. Amdahl WP4) gave short presentations on status from their WPs. PhDs and post docs were invited as observers and had the opportunity to listen to the opinions from the Industry and Research Partners. The discussions in the Workshop gave valuable feed-back on the activities in the different WPs and how SAMCoT deliverables are disseminated. Opinions and wishes from the Partners were noted and hopefully given priority in the upcoming year.

On September 19th the Research Council of Norway (RCN) paid its annual Site Visit to SAMCoT. The visit was a success and the feedback to the Centre on the work done in the period from Sept.2012 to Sept.2013 was very positive. The minutes of the meeting are available to all SAMCoT Partners [HERE](#)



Participants to the RCN Site Visit to SAMCoT 2013

RCN: E. Normann, L.J. Jenssen, M. Nereng, K. Mayes

SAMCoT: NTNU: S. Løset, M.A. Gutiérrez, K.V. Høyland, R. Lubbad, C.C. Thodesen; UNIS: F.S. Hansen, M. Indreiten; SINTEF: A. Watn; M.G. Bæverfjord; Aalto: J. Tuhkuri; Kværner: H.B. Østlund &

SAMCoT PhDs Candidates and PostDocs

Recruitment:

- ✚ Marnix van der Berg as Research Assistant for WP4
- ✚ PhD position announced in collaboration with AMOS, starting in 2014
- ✚ Post Doc. Aleksey Shestov, from October 2013 for WP1

Achievements:

- SAMCoT Technical Workshop 2013, MoM available for members [HERE](#)
- SAMCoT 3rd EAC Meeting September 19th, MoM available for members [HERE](#)
- SAMCoT GA Meeting September 19th, Protocol available for members [HERE](#)
- RCN Site Visit, the evaluation from the RCN can be found [HERE](#)
- Updated Webpage, SAMCoT in the Media
- E-room project: SAMCoT sharepoint e-room will be upgraded to Sharepoint 2013
- Fulbright Arctic Chair 2013/14, Prof. E. Shulson will be located at NTNU for a period of 7 months, and will actively collaborate with SAMCoT PhDs and Researchers.

Notifications:

✚ 2nd SAMCoT Board meeting 2013:

DATE: Wednesday 20th November

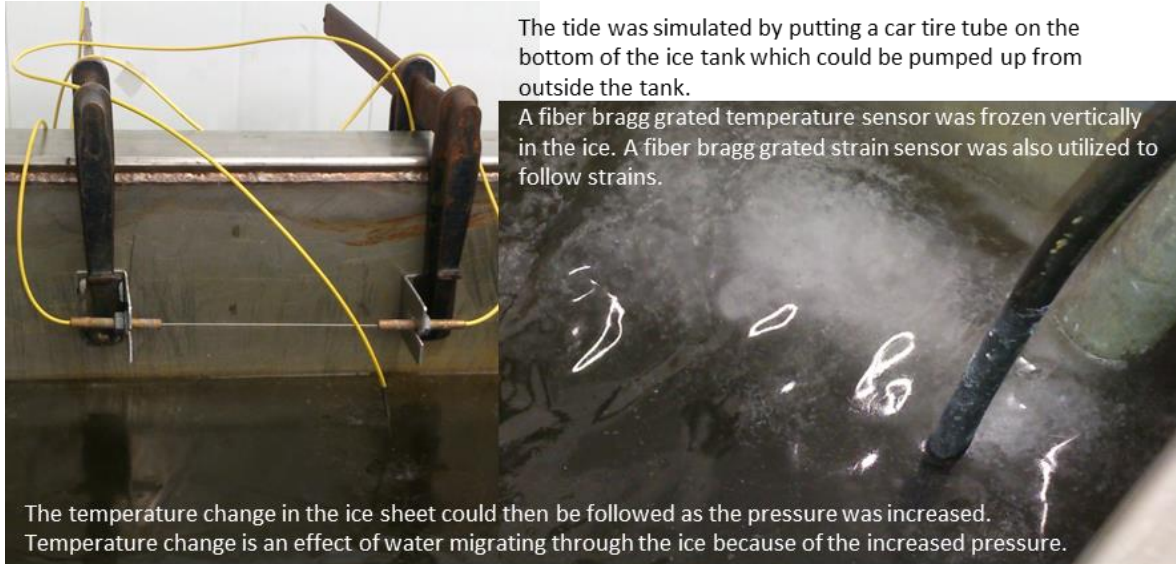
PLACE: At HSVA Hamburg

Work Package 1: Data Collection and Process Modelling

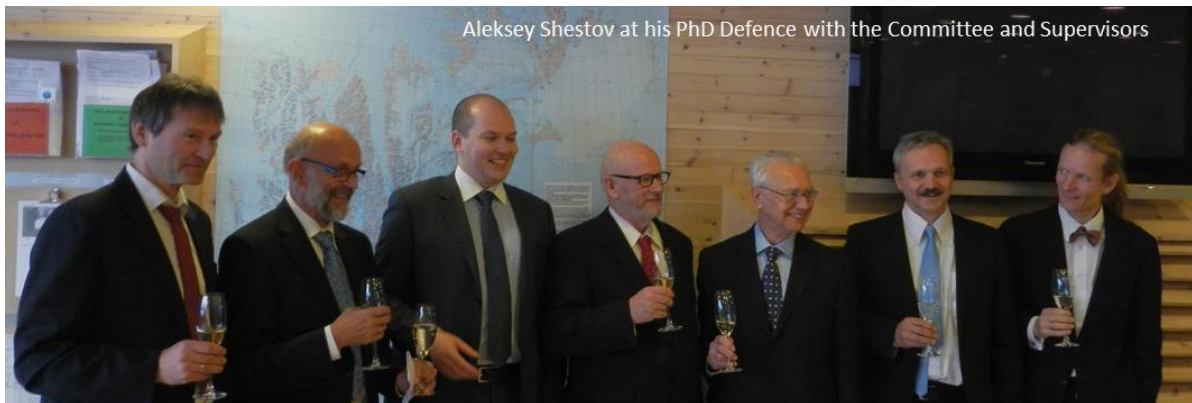
Briefing on Activities:

PhD candidate D. Wrangborg is currently working on a paper on coastal sea ice stresses measured in Barryneset Svea in relation to the ice motion during the tidal cycle.

In addition and on a different topic Wrangborg performed experiments at the UNIS cold laboratory between the 4th and 16th of September. The experiments simulated the tidal influences inside cofferdams covered by ice (as it is in Kapp Amsterdam Svea).



Aleksey Shestov defended his PhD Research successfully on October 3rd on the topic The Role of the Thermodynamic Consolidation of Ice Ridge Keels in the Seabed Gouging Process. The thermodynamic consolidation of ice ridge keels in water at varying freezing points is a significant research topic in his thesis.



Aleksey Marchenko and Anatoly Sinitsyn presented two papers at the SPE Arctic and Extreme Environments Technical Conference and Exhibition in Moscow. A. Marchenko was a member of the conference programme committee. At a round table organized at the conference under the topic 'Education in Oil and Gas Technology', A. Marchenko gave a presentation on different students activities at the Arctic Technology Department at UNIS.

In addition A. Marchenko presented results of the modelling of iceberg drift and rotation at the Institute for Risk & Disaster Reduction seminar at UCL, London. Also results of the study of under ice turbulence in the Barents and Greenland Seas were presented at the General Assembly International Association for the Physical Sciences of the Oceans (IAPSO) in Gothenburg, Sweden.

Achievements:

Journal papers:

Marchenko, A.V., Morozov, E.G. (2013). Asymmetric tide in Lake Vallunden (Spitsbergen), *Nonlinear Processes Geophysics*. 20, 1-10, doi: 10.5194/npg-20-1-2013

Conference papers:

Proc. SPE Arctic and Extreme Environments Conference & Exhibition, Moscow, Russia, 15–17 Oct`13:

- Fomin, Y., Zhmur, V., Marchenko, A., Onishchenko, D. (2013). Heat Flow and Filtration of Seawater in the Coastal Zone of the Arctic Shelf. SPE 166940
- Synitsyn, A., Guegan, E., Kokin, O., Vergun, A., Udalov., Ogorodov, S.A. (2013). Investigations of Coastal Erosion Processes in Varandey area, Barents Sea. SPE 166932



Researcher Nataly Marchenko presented a paper at the RAO/CIS conference in St. Petersburg.

Proc. of the 11th International Conference and Exhibition for Oil and Gas Resources Development of the Russian Arctic and CIS Continental Shelf RAO/CIS Offshore 2013:

- Marchenko, N., Zhmur, V., Shkhinek, K., Løset, S., Marchenko, A. Safety of Maritime Operation and Sustainable Industrial Development in the Arctic (SMIDA). ISBN 978-5-93808-219-9. pp. 451-456

Proc. Space Technologies Applications for Arctic Region Development Arkhangelsk Sep 17-19 2013

- Guegan, E.B., Sinitsyn, A.O., Ogorodov, S.A., Vergun, A.P. Using of satellite images for the coastal erosion studies in Varandey, Barents Sea.

Abstracts:

Knowledge For The Future, Joint Assembly IAHS-IAPSO-IAPSEI, Gothenburg, Sweden 22-26 July 2013:

- Marchenko, A. (2013). Ice thickness distribution and drift velocities in axially symmetric solutions of sea ice dynamics models with elastic-plastic and viscous-plastic rheology.
- Marchenko, A., Teigen, S.H., Lawrence, J. (2013). Characteristics of ocean currents below drifting ice and around an iceberg in the Greenland Sea.

Field Work:

- Measurements of sea currents, waves and tides in the Ice Fjord and Van Mijen Fjord.
- ADCP AWAC was retrieved from the sea bottom after one year of measurements near the research site at Vestpynten, and data were uploaded and stored. (Work in collaboration with WP6).
- SOI field activities on the Varandey research site (Russian Arctic). Collection of data from thermistor strings after one year of measurements. Several topographic profiles were performed for the monitoring of the coastal erosion in Varandey research site and Vestpynten research sites.
- Measurements of strength and fracture properties of sea ice in fresh ice in the lake in Spitsbergen.

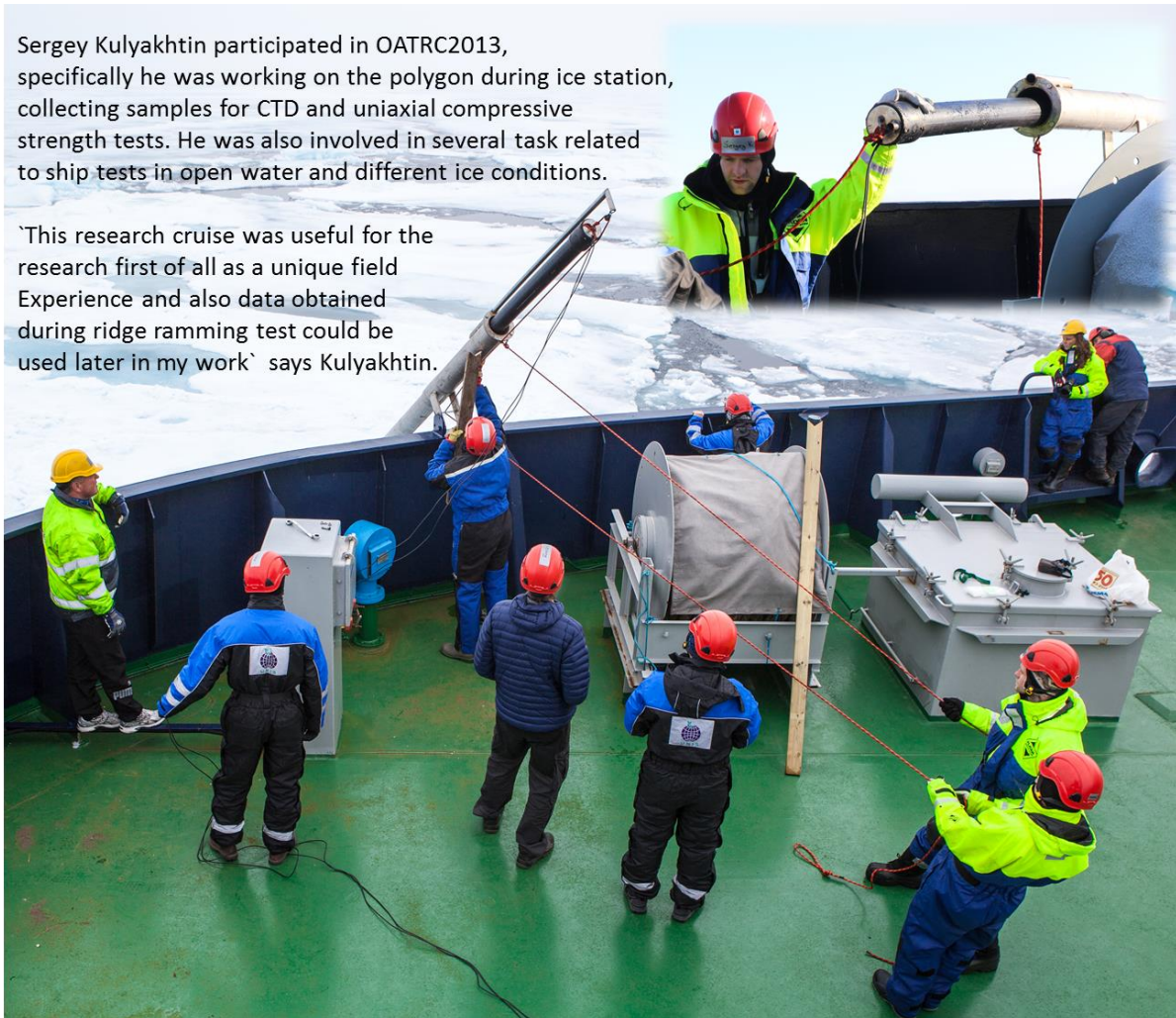
Work Package 2: Material Modelling

Briefing on Activities:

All PhD candidates and the Post-Doc are in good progress. SAMCoT-NTNU PhD candidates, together with the WP Leader and other researchers related to WP2 and/or interested in the topic, meet every second week and discuss for two hours. Each session is dedicated to one of the three candidates' topics (Bekele, Kulyakhtin or Pustogvar).

Sergey Kulyakhtin participated in OATRC2013, specifically he was working on the polygon during ice station, collecting samples for CTD and uniaxial compressive strength tests. He was also involved in several task related to ship tests in open water and different ice conditions.

'This research cruise was useful for the research first of all as a unique field Experience and also data obtained during ridge ramming test could be used later in my work' says Kulyakhtin.



Kulyakhtin currently works on two conference articles. One is related to studying of ice ridge porosity dependence on confining pressure and distribution of block sizes, and the other article is dedicated to modelling of in situ Punch shear tests. Kulyakhtin and Pustogvar are planning further laboratory test of ice rubble in one dimensional compression (oedometer test).

Anna Pustogvar also participated in OATRC2013 mostly addressing the accuracy of ice density measurements.



DL_05

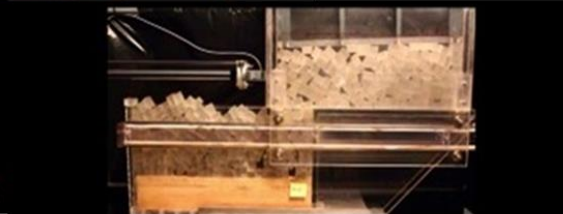
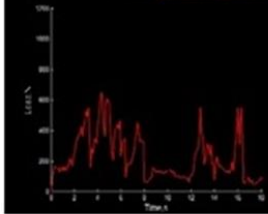


The autumn of 2013 she attends the PhD course Ice mechanics (BA8402) and she work with analysis of the shear box experiments the summer of 2013 to understand the effect of block size shown in this figure.

DS_01

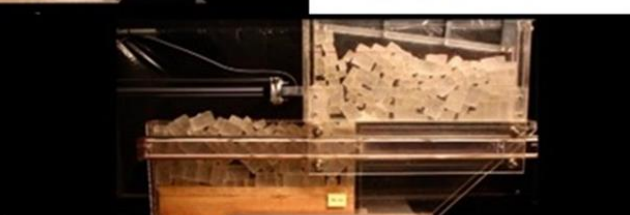
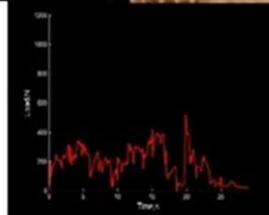
Anna plans further experiments

with the oedometer (together with Kulyakhtin), she also co-supervises a Master student.

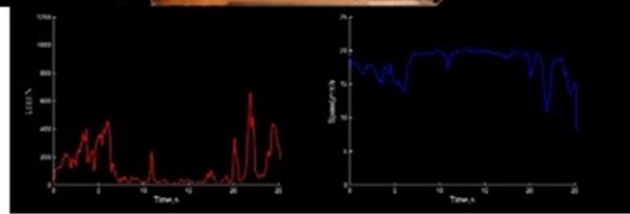


DG_04

Anna currently works on two conference papers, one entitles '2D Direct shear specimen scale effect'.



Laboratory experiments on rubble ice' and another that presents and discusses data from OATRC2013.



Yared Bekele continues his development of the numerical model, he attended the ICSMGE meeting in September 2013. His first aim is to run simulations with a simple thermo-elastic model.

Stanislav Pavlov continues his numerical model based on thermal partial penetration model, he sets up the cold room at UCL for experiments, attended the Arctic Science Conference in Cambridge 17-20 September and the Software and Polar Research Workshop, 16 September also in Cambridge. He prepares for teaching modules and attends the Introduction to teaching module at UCL.

Arttu Polojärvi participated in the DEM conference and presented two papers. He continues his work on FEM-DEM simulations of ice rubble, in particularly the direct shear box experiments at NTNU. He visited NTNU for one week in September.

Achievements:

- Polojärvi, A. and Tuhkuri, J. (2013) Discontinuum modelling in interpretation of punch through tests on partly consolidated sea ice rubble, DEM6 Int. conf in Colorado, USA
- Polojärvi, A. and Tuhkuri, J. (2013) Validating 3D DEM based on laboratory scale punch through tests on artificial sea ice rubble, DEM6 Int. conf in Colorado, USA

Work Package 3: Fixed Structures in Ice

Briefing on Activities:



The PhD students Hayo Hendrikse and Taya Sinitsyna participated in the Oden research expedition in the waters Northeast of Greenland (OATRC2013).

They examined the spatial variation of ice strength by a systematic campaign of uniaxial compression tests.



PhD student Torodd Nord has visited TU-Delft several times, he collaborates with Post –Doc Eliz-Mari Lourens and Professor Andrei Metrikine in developing linear and non-linear models for system identification. It is in general more difficult to measure directly the true ice force in full-scale and smaller scale experiments so that one often needs to back-calculate the forces from measurements of displacements and accelerations.



He has also visited UNIS to teach in Professor Marchenko's course AT-332.

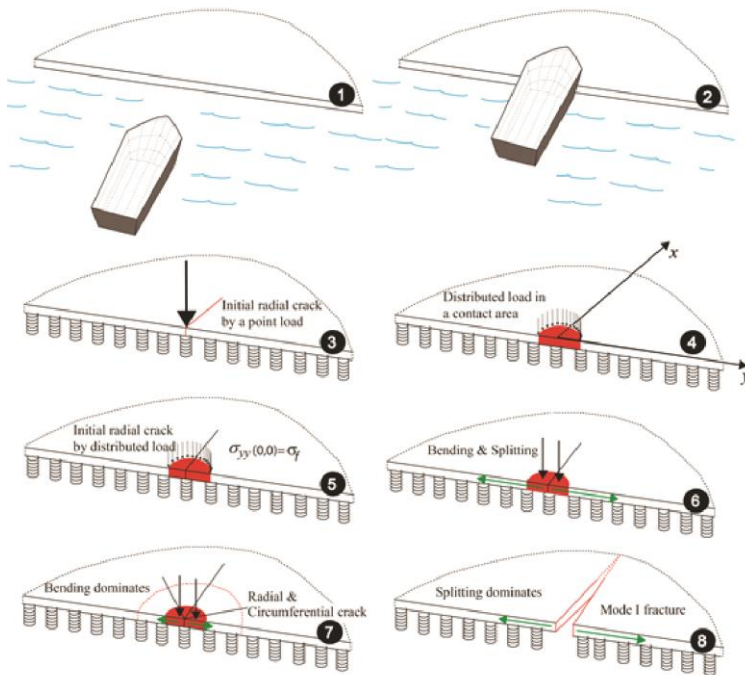
Nord takes care of one week of intensive laboratory work with the UNIS students.

During this week (among many other things) they explored the possibilities of using the UNIS laboratory and their ice tank (FRYSIS) to carry out indentation experiments.

PhD student Hayo Hendrikse is continuing the development of his numerical model and is now visiting NTNU on a regular basis in preparation of some small-scale indentation experiments. The numerical model development has almost reached a stage where experimental validation is necessary to move forward. Besides the preparation of experiments, Hayo is working on two journal publications together with Marnix van den Berg in which a numerical model for prediction of ice induced vibrations of single- and multi-leg structures will be presented. Recently Hayo has participated in the Dutch Engineering Mechanics Graduate School annual symposium presenting his work on ice induced vibrations.

Work Package 4: Floating Structures in Ice

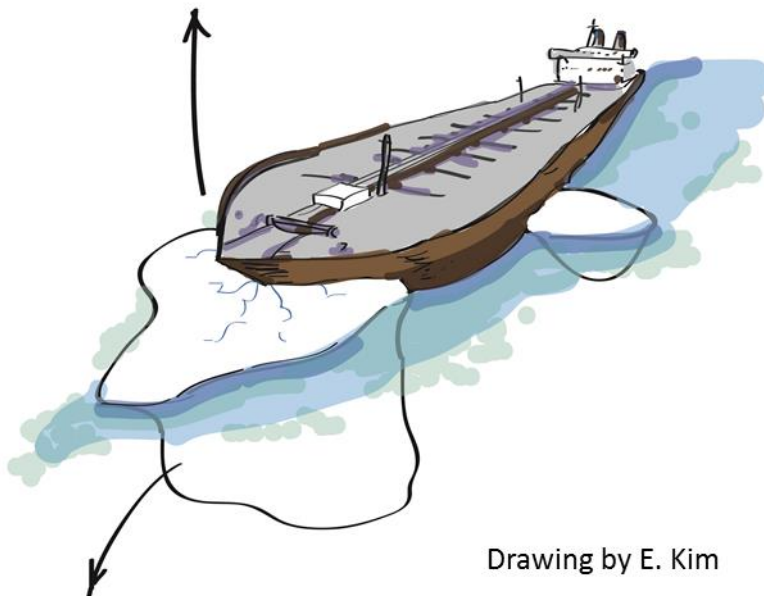
Briefing on Activities:



In the past months PhD candidate Wenjun Lu has been focusing on the theoretical development of global splitting vs. local bending failure of ice interaction with a structure (see left hand fig.)

At the OATRC2013 expedition he collected valuable full-scale data of the ice splitting process.

In addition, he is at the final revision stage with two submitted papers (i.e., Journal of OMAE and Journal of CRST), and completed a short computational mechanic course in Prague “Modelling of Localized Inelastic Deformation”.



Drawing by E. Kim

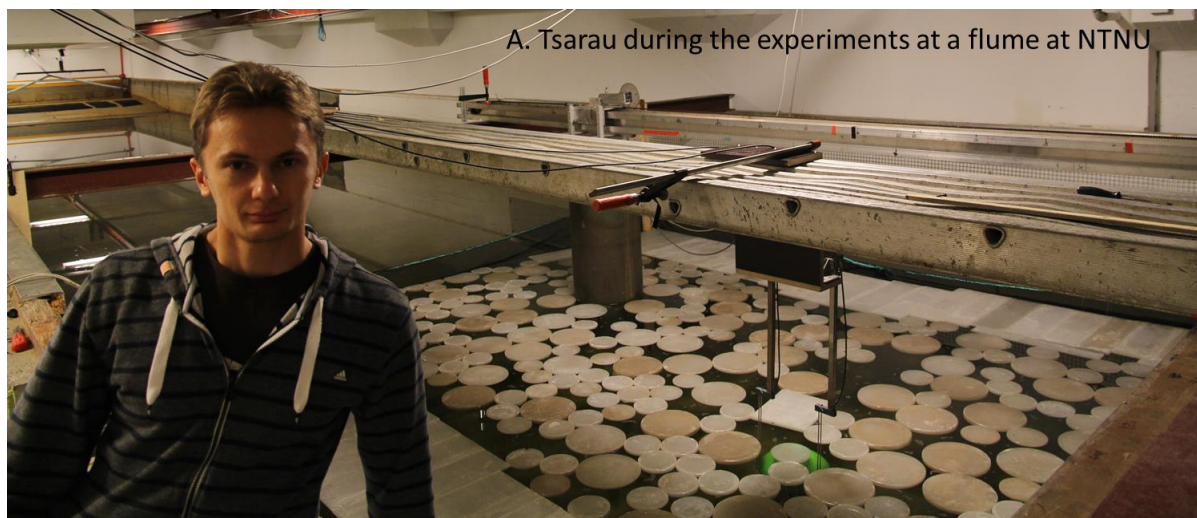
PhD candidate Ekaterina Kim is at the final stage of her PhD. Currently she is finalizing her doctoral thesis with the title “Study of Coupled Behaviour of an Ice-mass and a Ship-structure during an Accidental Collision”.

In addition she is writing a paper on “Experimental investigations of the energy absorption capacity of ice during crushing at small scale. Is the specific energy scale independent?”

In close collaboration with Kim, PhD Candidate Martin Storheim is working in the design of a drop test rig for further tests of deformation and energy dissipation in all interacting bodies.

PhD candidate Chris Keijdener, located at TUDelft, is analyzing a floater where he has replaced the mooring system with prescribed motions. In this way the energy transferred from the ice to the vessel can be calculated for a certain frequency of the vessel. We may then choose a safe frequency to operate the vessel at and hopefully avoid high energy peaks and thus avoid large motions.

PhD candidate Andrei Tsarau also participated at the OATRC2013 expedition making measurements of hydrodynamics effects on the ice transport in the wake of the icebreaker.



In the past weeks, he has performed a set of physical model tests carried out in a flume at NTNU. The purpose of these tests is to assess experimentally the hydrodynamic interaction between broken ice pieces and a floating structure. The experiments are also intended to provide data for the validation of the numerical model developed by Tsarau. The setup used in the lab consists of a towed cylinder that represents a floater and a fully submerged sphere (ice mass) mounted on a three-axial load cell resting on a stiff leg which is fixed to the bottom of the flume. Apart the forces, this setup allowed measuring and recording the cylinder's position and acceleration as well as water elevation above the sphere. To study the free surface effect, there were also several trials performed in a restricted area with artificial ice cover represented by paraffin floes.

Last but not least, PhD candidate Sergiy Sukhorukov has delivered his doctoral thesis which can be downloaded from the e-room. His defence will take place on the 13th November 2013 at NTNU.

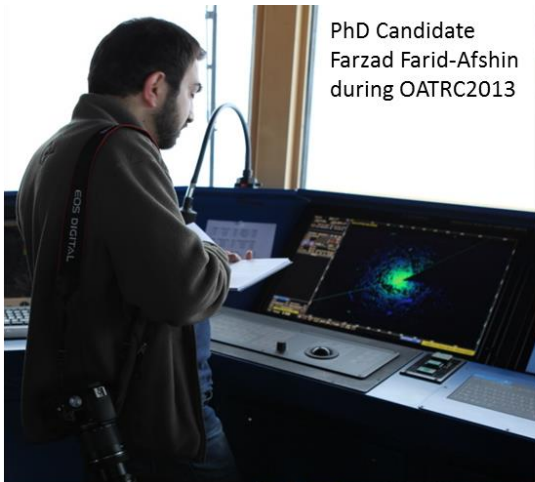
Achievements:

- Sukhorukov, S. (2013): Ice-Ice and Ice-Steel Friction in Field and Laboratory. Doctoral theses at NTNU, 2013:300, 106 p.
- Sukhorukov, S. and S. Løset (2013): Friction of sea ice on sea ice. Cold Regions Science and Technology, 94 (2013), pp. 1-12.
- Sukhorukov, S. and A. Marchenko (2013): Geometrical stick-slip between ice and steel. Cold Regions Science and Technology (accepted).

Work Package 5: Ice Management and Design Philosophy

All PhD candidates (F. Farid-Afshin, R. Yulmetov, M. Kashafutdinov, P. Norgren) are in good progress with their courses and their scientific work.

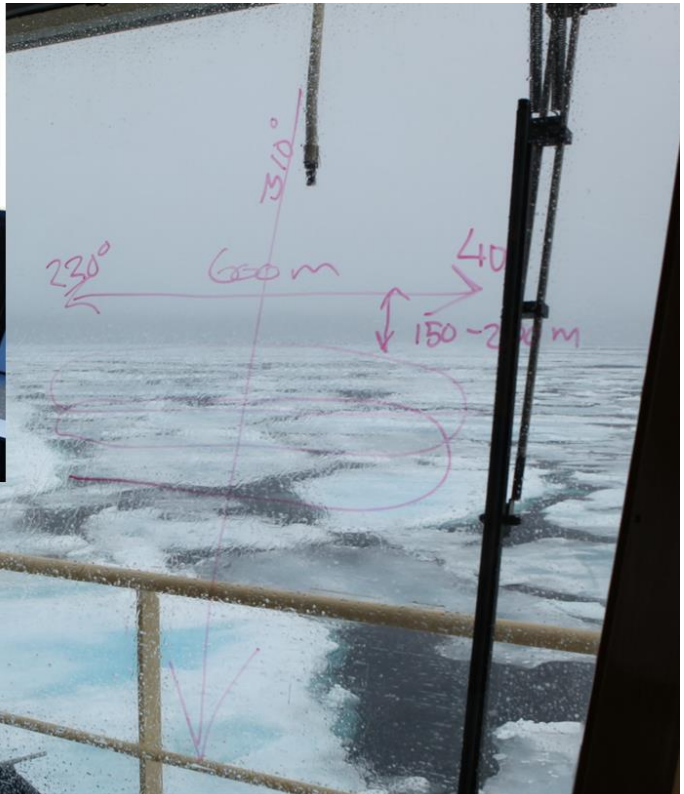
F. Farid-Afshin is studying different methods to quantify the safety of offshore structures protected by Ice Management (IM). He completed a number of courses and made a good progress in reviewing the literature of Probabilistic and Non-Probabilistic Methods of Uncertainty, Reliability and Decision Making. Part of his work will be published in OMAE14 next summer. Three out of the four PhDs in WP5 participated in OATRC2013 and they returned with extremely useful field experience, data and ideas for their further work.



PhD Candidate
Farzad Farid-Afshin
during OATRC2013

Farid-Afshin took part in OATRC2013 where he performed IM trials.

Some results of these trials will be published in IAHR14.



R. Yulmetov is studying the drift and towing of icebergs in pack-ice. He constructed a numerical model where he is now able to simulate the free drift of icebergs in the presence of sea-ice.

R. Yulmetov participated in OATRC2013 where he installed ITDs on a number of icebergs. Some of his findings from the field and the numerical simulations will be published in IAHR14.

M. Kashafutdinov is studying the large scale (Ocean scale) drift of iceberg where the deterioration (melting) of iceberg's mass is an important factor. M. Kashafutdinov developed a numerical model to couple the thermal erosion to the drift equations. Recently, he was also able to include the influence from waves.

P. Norgren is studying the underwater monitoring of sea ice. He is developing guidance algorithms for monitoring of drifting sea-ice. P. Norgren participated in OATRC2013 and gained experience with using ROVs under ice.



P. Norgren during OATRC2013



The main activity in WP5 the past three months was the execution of Oden research expedition in the waters Northeast of Greenland.

Oden Arctic Technology Research Cruise 2013 (OATRC2013) was an innovative and exciting research programme which ran as a SAMCoT associated project with full funding from Statoil.

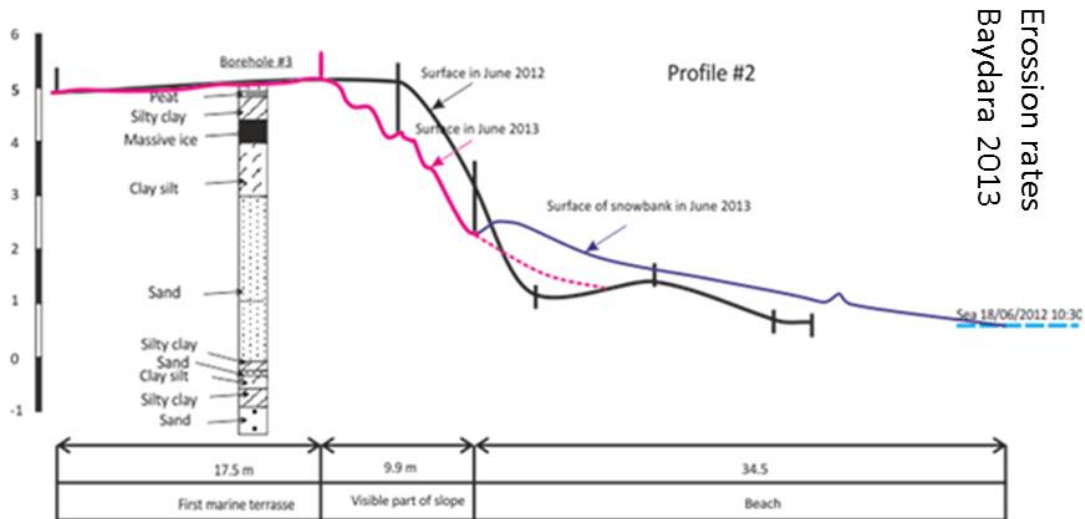
The cruise lasted for 15 days and it allowed 32 participants (mostly SAMCoT PhDs and researchers) to collect valuable full-scale data.



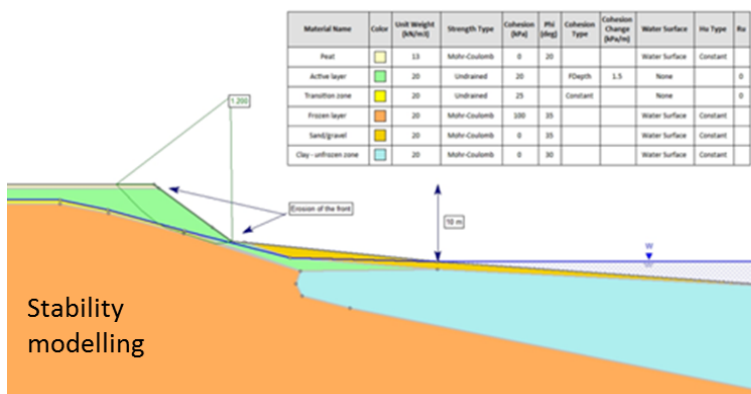
Work Package 6: Coastal Technology

Briefing on Activities:

In the period from August to October the activity of WP6 Coastal Technology included field work, field work reporting, modeling and publishing. A field survey was performed in September in Spitsbergen, observing and measuring erosion rates at sites and mapping the state of existing erosion protection structures. The results from the survey will be presented in reports in the end of the year and publications in 2014.



The results from the summer field studies at Vestpynten and Baydara are also currently being processed and are being up for reporting, including laboratory results of thermal properties and 3D-surface models. In collaboration WP1 the Acoustic Wave and Current (AWAC) profiler has been successfully logging outside our erosion study site at Vestpynten. After a year it has been recovered and the data is currently interpreted at UNIS. Consequently the AWAC has been reemployed at the sedimentation study site at Kapp Amsterdam. Sediments samples were taken during the same survey.



The first erosion modeling seminar was held in October, where the WP mainly worked with modeling of temperature by means of TEMP/W with Input of data from thermistor Strings and other relevant data from sites on Vestpynten and Baydara, including the influence of future ambient temperature due to climate change.

Additional, modeling of the stability of the bluff, dependent of depth of active layer, has been studied, and will be continued in 2014. The WP presented a paper on coastal erosion protections using geosynthetics and local available materials at the Cold Regions Engineering sessions at the Canadian Geotechnical Conference in the end of September and visited the Canadian Hydraulics Centre at the National Research Council in Ottawa.

Achievements:

- Wold, M., Finseth, J., Tangen, H. and Bæverfjord, M.G.(2013): Coastal erosion and erosion protection using geosynthetics in the Arctic, field studies in Svalbard", The 66th Canadian Geotechnical Conference, September 28th -October 2nd, Montreal, Canada