UNIS | ANNUAL REPORT 2011

THE UNIVERSITY CENTRE IN SVALBARD

MAP OVER SVALBARD

FRONTPAGE
Slush avalanche in Todalen March 2011.
Photo: Markus Eckerstorfer

ON TOP OF THE WORLD
Longyearbyen is literally on top of the world!
Photo: Eva Therese Jenssen

FROM THE DIRECTORS

After eighteen years, the world's northernmost institution for research and higher education is developing into a leading international centre for arctic studies – which has been the long term goal for UNIS. 459 students attended courses in 2011, a hundred more than the year before. The field-based educational concept proves its unique attractiveness and the Norwegian government keeps increasing the state funding, allowing us to expand our course portfolio. Our students come from more than 30 countries and do very well. We have a strong feeling of educating the arctic experts of tomorrow.

The research portfolio keeps growing, and external funding now amounts to more than 30 % of the total income. According to recent statistics UNIS is in the fourth place among Norwegian institutions performing higher education and polar research. The scientific departments of UNIS have achieved quite good marks in the bio- and geoscience evaluations carried out by the Research Council of Norway. UNIS has proved its innovation capacity by spinning off its first company, the UNIS CO2 Lab AS.

Moving into 2012, we see UNIS developing further. Our research departments are part of three proposals for Norwegian centres of excellence, within marine biology and space physics, and one major EU proposal addressing safe subsurface CO2-storage.

As 2011 becomes 2012 there is a change in the leadership. Gunnar Sand leaves after six years at the helm and is being replaced by Ole Arve Misund.

A new director always means fresh ideas and new opportunities. But as UNIS now has a strong scientific foundation and a clear strategy, we have chosen to keep a steady course, not to lose any momentum in the further development of the organization.

At the same time, the mission of UNIS remains the same:

- UNIS offers education and performs research based on Svalbard's location in the High Arctic and the advantages this represents
- UNIS plays a major role in building an international research platform in Svalbard and in representing and securing Norwegian polar interests
- UNIS is a resource for the communities in Svalbard. Our competence is available and we contribute to a stable family society in Longyearbyen
- All UNIS activities satisfy the provisions of the Svalbard Environmental Act. We take pride in leaving behind a minimum of environmental impact

UNIS is a unique institution within the international family of academic institutions. Our vision, Arctic science for global challenges, proves that we see our work in a holistic context. We appreciate the privilege to take part in realizing the potential of this fine institution, and we see it as our responsibility that UNIS mature as a leading center for arctic science and higher education.

Gunnar Sand

Ole Arve Misund

MARCH 2012
Former director Gunnar Sand and present director Ole Arve Misund.
Photo: Eva Therese Jenssen

EXCERPTS FROM THE BOARD OF DIRECTORS REPORT 2011

In 2011 the collaboration between UNIS and the eight universities in mainland Norway was revitalized. The Board of Directors notes that the financial situation is now under control, with strengthened shareholder equity and a good system for managing the company's values. Focus on a quality assurance system for education activities ensures that we live up to NOKUT's requirements. This is accompanied by good research results in several areas.
The Ministry of Education and Research allocated UNIS funds for increased student production. UNIS Co2 Lab AS was established at the end of the year.

The University Centre in Svalbard AS (UNIS) was established as a state-owned limited corporation on November 29, 2002, replacing the original foundation established in 1994 by the universities in Bergen, Oslo and Tromsø and Trondheim. The relationship with the founding institutions is taken care of through representation on the Board of Directors. Relationships with the universities in Stavanger, Ås, Nordland and Agder are secured through the collaboration agreement, but without board representation.

The company's objective is to provide tuition and engage in research based on Svalbard's geographic location in the High Arctic and the special advantages this offers. The educational provision shall act as a supplement to the tuition offered at the universities and form part of the ordinary course of study that culminates in degrees at Bachelor, Master or PhD level. The educational provisions at UNIS shall have an international profile, and all tuition is given in English.

EDUCATION

UNIS offered four fields of study in 2011: Arctic Biology, Arctic Geology, Arctic Geophysics and Arctic Technology. A total of 48 courses were offered, of which 28 were at Master's or PhD level. A total of 459 students from 31 different countries took courses at UNIS and 48 Master's students worked on their theses during the year. In total, UNIS has produced 150.8 student-labour years in 2011.

The proportion of Norwegian students at UNIS in 2011 was 41 % (189 students), of which 70 students were from NTNU (37 %), 55 from UiB (29 %), 25 from UiO (13 %), 24 from UiT (13 %), 9 from UiS (5 %), 5 from UMB (3 %) and 1 from UiN (0.5 %). A total of 12 % of the students came from other Nordic countries, while 12 % were from Germany, 7 % from the United Kingdom and 6 % from Russia.

UNIS is still working to further develop its quality assurance system, which aims to ensure that we live up to the requirements of the National Agency for Quality Assurance in Education (NOKUT). UNIS shall be a safe and recognised interaction partner both for the individual student and for our collaborating universities. The quality assurance system covers all processes of significance for the academic quality.

UNIS offers research and field-based teaching and a learning environment marked by a high level of interaction between studentsand staff in both academic and administrative positions.

The new collaboration agreement between UNIS and the universities in mainland Norway was signed in 2011. A plan of action concerning conditions for academic administration is attached to the agreement, and this plan of action will be clarified and regulated by contract in the course of 2012.

RESEARCH

The research activity at UNIS continues to grow. Examples of central projects from the departments follow below:

During the autumn of 2011, the microbiologists at UNIS established a new sampling station in the Adventfjord in order to follow the marine environment on a short time scale. The station was established by the placement of a sea observatory in September. During the autumn and winter, various measurements were taken, including of bioluminescence, vertical migration of animal plankton and microorganisms.

Parallel with the observatory and associated field studies, our Fulbright Arctic Chair Professor Mark Moline has used an autonomic underwater robot to study the spatial distribution of biological and physical parameters. The collection of samples for analysis of the marine ecosystem started in December, and took place during the Polar Night using various vessels (KV Svalbard and RV Helmer Hanssen).

Important studies surrounding weather forecasting and comprehension of atmospheric boundary layers in Arctic fjords, studies on heat exchanges between warm sea currents, sea ice and cold polar air masses, and studies of transport routes for carbon deposits on snow in Svalbard were among the publications from the Department of Arctic Geophysics' Air-Cryosphere-Sea Interaction Observation Group. These works resulted in the presentation of two doctoral theses at UNIS. The Space Physics group at the department have had a high level of activity at the KHO (Kjell Henriksen Observatory) and the SPEAR (Space Plasma Exploration by Active Radar) in 2011; in December the KHO was used as the ground station during the launch of an ICI-3 rocket from Ny-Ålesund, which had the aim of observing the Northern Lights Svalbard, and SPEAR was involved in the first experiment to modify the lower ionosphere through the project Polar Mesospheric Summer Echos which gathered scientists from Norway and the United Kingdom. The research group has also developed a sought-after Northern Lights forecast, which may easily be downloaded on Android smart phones.

Longyearbyen CO2 Lab was established as a research project in the field of CO2 capture and storage (CCS) at the Department of Arctic Geology in 2007. By 2011 the project had reached a total budget of NOK 43.2 million and it has involved 12 scientific and administrative/technical staff at UNIS. As in the space of the last few years the project has created values in the form of new and detailed knowledge about the underground, six wells and comprehensive experience with equipment for cost-effective drilling and testing of a potential CO2 storage unit, the Board of Directors in 2011 decided to transfer the CO2 project to a new company, UNIS CO2 Lab AS. UNIS retains a 100 % shareholding in this company. The collaboration partners in UNIS CO2 Lab remain the same (7 industry partners, 11 R & D partners in addition to financial support from Research Council of Norway (RCN)/Gassnova research programme CLIMIT). The mandate for the new company takes into consideration that the company may host and manage other externally financed R & D projects. UNIS CO2 Lab AS is the first "spin-off" company in Longyearbyen based on research at UNIS.

The Department of Arctic Technology is involved in the Centres for Research-based Innovation (SFI) project "Sustainable Development of Arctic Marine and Coastal Technology". UNIS is responsible for WP 1 of the project. The aim of this sub-project is to undertake data collection and analysis, as well as contributing to the five other sub-projects in collaboration with NTNU and SINTEF. The main focus of the research is the physical and mechanical characteristics of the sea ice and icebergs, as well as surveys of the erosion processes in the Arctic coastal areas. This involves instrumentation and modelling of ice/icebergs and permafrost. The project involves the development and testing of new instruments for field and laboratory studies of the Arctic environment.

During 2011 UNIS scientists have published 73 articles in international refereed journals, of which 16 were at the highest level.

DISSEMINATION

Focus on dissemination continued in 2011. Around 150 Norwegian and international media reports have been logged. Part of this was based on self-produced articles about research projects that reached beyond Norway's borders thanks to our collaboration with Forskning.no, Alpha Galileo and the newly established Science Nordic. In September, a TV crew from the German ARD visited and produced a documentary about three of our German students.

UNIS is popular among the delegations which visit Longyearbyen and 2011 was no exception. Nearly 100 groups from within Norway and abroad visited UNIS. The Svalbard Seminars were extremely well attended. Svalbardkurset and Studietur Nord were run during the summer of 2011 and received good feedback.

Our website was updated regularly and in early 2011 UNIS established its own Facebook page as a link in dissemination via social media: **www.facebook.com/UNIS.Svalbard**. The website and social media will be prioritized in 2012, in addition to the production of news articles for Forskning.no and other dissemination channels. The Board of Directors is extremely satisfied with the dissemination activities.

SOCIAL RESPONSIBILITY

UNIS shall be a resource for the local communities in Svalbard. This applies to the staff, students and the knowledge we possess. The staff shall live and work in Longyearbyen and contribute to the development of both the institution and the community. All shall engage themselves in the community's social and cultural life rather than starting their own clubs or societies. The relationship with the Russians in Barentsburg is being developed through regular contact, increased scientific collaboration and due to the fact that the number of Russian students and staff is increasing. Through the establishment of UNIS Co2 Lab AS, UNIS is contributing to the public debate by participating actively in the discussion about the power supply in Longyearbyen and cooperating closely with the Longyearbyen Local Council on this matter. The annual account shows that in 2011 a total of 55 % of goods and services were purchased locally in Longyearbyen.

STAFF

As of December 31, 2011, the scientific staff at UNIS comprised eight professors, 12 associate professors, five post docs, 13 research fellows, four project positions and 28 with adjunct professor/associate professor attachments. The technical and administrative staff comprised 10.8 and 15.7 labour years respectively. Women accounted for 63 % of the technical and administrative positions, 28 % of the scientific positions and 47 % of the students. Four of the eight members of the Board of Directors were women. The Board of Directors is not aware of discrimination of any form taking place at UNIS.

The following positions are externally funded: one professor (Statkraft), five post docs (four funded by RCN and one by Mabit), four PhD (one funded by the EU and three by RCN) and three adjunct professorships (one each by NGU, NERSC and ARS/NAROM). One associate professorship is part-financed by the Norwegian Polar Institute. The Board of Directors would like to thank these institutions for their contribution to UNIS.

HEALTH, SAFETY AND ENVIRONMENT

Absence due to illness at UNIS in 2011 was 1.4 percent. The institution is certified as an IA enterprise. During 2011 there were no reports of staff members being injured or serious occupational accident or injuries. UNIS is unaware of contamination of the wider environment to any significant degree as a result of the institution's operations. UNIS is working continually to limit the environmental impact of its activities.

ECONOMIC DEVELOPMENT

Funds for operation and investment at UNIS are appropriated in the budget of the Ministry of Education and Research. In 2011 appropriations to UNIS from the Ministry totalled NOK 97,217,000, of which NOK 71.8 million constituted base funding, NOK 3.3 million was for investments in equipment and NOK 22.1 million rent for the science centre and KHO. Income over and above the appropriations from the Ministry of NOK 48.3 million comprises NOK 37.9 million from external project income for research and NOK 10.4 million in income from consultancy services and rentals. UNIS has also experienced an increase in external funding for research from 8 % of its gross income in 2001 to 33 % in 2011. The Board of Directors is extremely satisfied with the increase in external income.

The annual accounts for 2011 show an operating surplus of NOK 2,602,440. The company's total assets as of 31.12.11 were NOK 83,107,465, comprising NOK 42,004,750 of institutional buildings and NOK 14,434,521 of shareholder equity and other equity.

A salary of NOK 929,517 was paid to the Managing Director in 2011. The Chairperson of the Board of Directors received a fee of NOK 55,000, the Deputy Chairperson NOK 33,000 and the other members of the Board of Directors each received a fee of NOK 22,000. The accounts were audited by PricewaterhouseCoopers A/S.

INFRASTRUCTURE AND HOUSING

At year-end 2011, UNIS owned a total of 50 apartments. In addition, UNIS rents a new building, UNIS Guest House, for guest lecturers and guest researchers. The new complex was completed in September 2011 and comprises a total of 52 small studio apartments. UNIS has contracted rental for all the units for a period of 10 years. Since September, research fellows have also lived at the guest house. Due to local rules for commercial buildings, UNIS may not use these apartments for research fellows who shall stay for a period of more than three months consecutively. Cooperation has now been reached with Leonard Nilsen Spitsbergen AS regarding the rental of smaller apartments for the research fellows.

At year-end 2011, UNIS' combined housing loans total NOK 31 million. Interest and instalments on the loan as well as inventory for the apartments must be financed from the operational budget.

The Student Welfare Organisation in Tromsø (SiTø) offers a total of 142 studio apartments to students. It is decisive for UNIS that the students have satisfactory living conditions, and the Board of Directors emphasises continuing the good co-operation with SiTø. At the start of 2012, SiTø has received funding for 40 new studio apartments for students, which will contribute to more easily being able to realise the goal of increased student numbers at UNIS. UNIS is in continual contact with and co-operates with SiTø in order to contribute tothe new studio apartments for students being able to be realised as quickly as possible.

SHAREHOLDER EQUITY AND FINANCIAL RISK

The housing loan has been reduced by NOK 2.4 million in the course of the year. Since 2008, UNIS has repaid NOK 10 million of the loan. In addition to a small increase in the shareholder equity, NOK 1.2 million has been set aside for renovation projects and equipment in 2012. However, strengthening of the shareholder equity is still necessary in order to strengthen the solidarity in the company.

Of the liquidity reserves at year-end of NOK 20.5 million, a total of NOK 19 million comprises advance payments to UNIS belonging to external projects. The low liquidity reserves is attributed to the fact that UNID has pre-paid expenses of NOK 8.2 million for 2012 and that the debtors' applicable externally-financed projects of NOK 10 million is not received until mid-January 2012.

The working capital (current assets minus short-term debt) has gone from minus NOK 1.2 million in 2009 to a positive figure of NOK 4.6 million in 2011.

INTERNAL FINANCIAL CONTROL

UNIS has established simple and good systems for financial follow-ups and reporting. In the light of proposals for appropriation frameworks from the Ministry in October, preparations are being made for a thorough budgeting process for all departments linked to this activity. Detailed budgets are prepared for each individual course.

RISK AND INTERNAL CONTROL IN RELATION TO FIELDWORK, EXCURSIONS AND LABORATORY ACTIVITIES

Unique access to the natural environment in a High Arctic area is UNIS' greatest advantage. Travel and fieldwork in the Arctic wilderness makes major demands on the knowledge, skills and attitudes of those carrying out the work.

Safety in relation to the health and lives of the participants as well as considerations to the vulnerable natural environment are factors that must have the highest priority in the planning and implementation of activities in the field. Safety instructions and HSE internal control routines ensure that the participants in fieldwork are thoroughly prepared for the work that shall be carried out. Comprehensive safety training and quality assurance of the activity are implemented before the field party may depart. The field parties are followed up continually in order to safeguard quality and safety during the fieldwork. Laboratory work is subject to the same quality assurance.

UNIS' internal regulations are based on the formulation of objectives from the Svalbard Environmental Protection Act, which states that in the event of conflict between the activity and the environment priority must be given to environmental considerations. In a period of strong growth at the institution, it is particularly important that we manage to keep pace with the development as seen from an HSE perspective.

THE UNIS BOARD OF DIRECTORS 2012:
From left: Geir Anton Johansen (UiB); Marius Berge Eide (student representative); Johanna E. Sollid (UiT); Viva Mørk Kvello (Longyearbyen Lokalstyre); Ole Jørgen Lønne and Elise Strømseng (staff representatives); Ole Arve Misund (director); Berit Kjeldstad (chair – NTNU); and Johannes Pippidis Lorentzen (student observer).
Photo: UNIS

UNIS is working in a determined manner to ensure that the particular safety aspects associated with lab and field activities shall be governing for all activities.

THE PATH FORWARD

At the start of 2012 UNIS was well on the way to restoring a healthy financial position. Expenses are now under control and the institution is operating in line with the budget. The level of debt is significantly reduced and the shareholder equity ratio is approaching 20 %. The Ministry gives the company credit for implementing a turnaround and has increased the target figure for student production by 75 % from 2009 to 2011, from 120 to 200 student-labour years. The student places are well financed and take into account the additional costs associated with field-based activities in Svalbard.

The collaboration with the universities will be of high priority in the future. UNIS has invited parties to participate in a process concerning a plan of action which includes the potential for collaboration in new areas, in light of both UNIS' growth and political/financial trends in the High North. Four new universities, which were not included in the original agreement which dates from 1994, have now signed the collaboration agreement.

The Board of Directors has high expectations for this process and believes it will be a win-win situation for all the parties. From the Board of Directors' perspective, UNIS has taken new steps towards achieving its overall goal of being a leading international centre for Arctic studies. The Board of Directors would like to thank all staff at UNIS for their good contributions in 2011!

BERGEN 22. MARS 2012

Berit Kjeldstad
Jarle Nygard
Geir Anton Johansen
Johanna E. Sollid
Viva Mørk Kvello
Marius Berge Eide
Ole Jørgen Lønne
Elise Strømseng
Ole Arve Misund

QUALITY ASSURANCE SYSTEM FOR EDUCATION

BY ELISE STRØMSENG, DEPARTMENT OF ACADEMIC AFFAIRS

The UNIS Quality Assurance System for the Educational Activities was implemented in 2010 and provides a description of our strategic and systematic efforts involving the quality of education.

In 2011 UNIS signed a formal cooperation agreement with the Norwegian universities to further strengthen cooperation and to ensure that UNIS courses complement the education provided by the mainland universities. The agreement describes matters related to the quality assurance system for education that UNIS and the Norwegian universities will improve and formally agree upon by the end of 2012. The agreement also underlines that UNIS should aim at having a balanced ratio of Norwegian and international students.

QUALITY ASSURANCE SYSTEM STRUCTURE

UNIS will provide challenging and excellent research-based education according to our strategic goals. The educational setting shall be under continuous development based on input and evaluations from the scientific staff, students, management and administration/ logistic staff.

PARTICIPANTS AND AREAS OF RESPONSIBILITY

The Ministry of Education and Research governs and manages the quality of education. The responsibility for UNIS efforts is placed at all levels in the UNIS organization. This is thoroughly described in the UNIS quality assurance document.

CHANGES IN 2011:

Since the establishment of UNIS, the educational cooperation with the Norwegian universities and parts of the UNIS quality assurance system have been ensured by four scientific committees. After the new cooperation agreement of 2011, the science committees have been terminated. The new system which will replace the science committees and their mandate is under development in cooperation with the Norwegian universities. The new system should be completed by the end of 2012 and implemented from 2013.

QUALITY IN COURSE PLANS AND DEVELOPMENT

The effort to improve UNIS courses is a continual process. Internal evaluations of all courses are now being conducted electronically by students (from autumn 2011) and course responsible (from spring 2012).

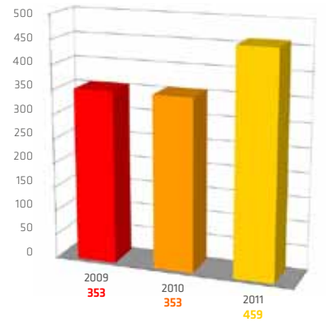
LEARNING ENVIRONMENT SURVEYS

Learning environment related conditions are included in the systematic student evaluations. They include the students' physical learning environment and aim to detect shortcomings concerning all the facilities the students use in an academic context, as well as the services they receive from the UNIS support functions. An annual student survey (arranged by the students themselves) also includes learning environment topics and is important in order to assess the overall quality of UNIS.

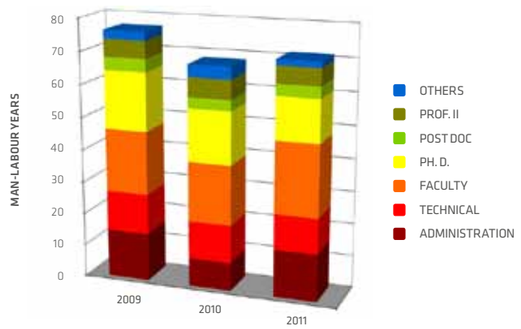
The Department of Academic Affairs prepares annual statistics based on the evaluation of courses. The results of these evaluations and the student survey are used in an overall analysis of UNIS educational quality. Key data is presented to the UNIS Research and Educational Committee and an educational quality report will be presented to the UNIS Board annually. Considered measures of the report should be in accordance with UNIS' strategic goals for education and NOKUT's accreditation requirements.

STATISTICS

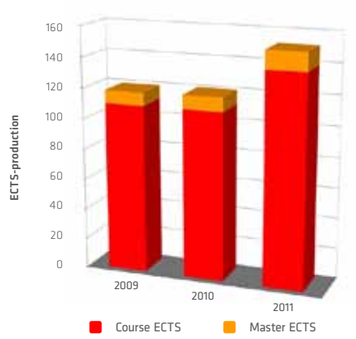
NUMBER OF STUDENTS COMPLETING UNIS COURSES 2009-2011



WORK FORCE IN MAN-LABOUR YEARS ACCORDING TO CATEGORY AT UNIS 2009-2011

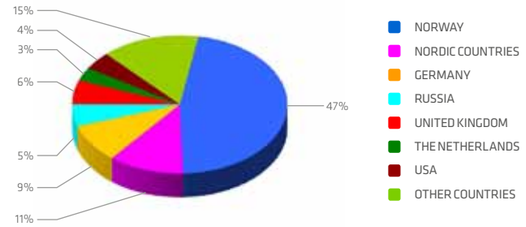


PRODUCTION IN STUDENT-LABOUR YEARS (1 YEAR = 60 ECTS CREDITS)

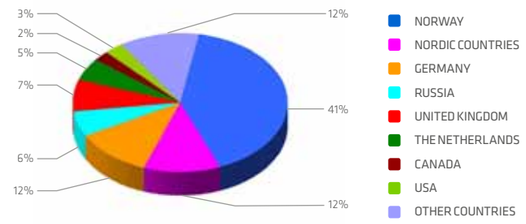


Note: In accordance with mainland universities practice, UNIS now registers ECTS by 1) course production and 2) master students attendance at UNIS

UNIS STUDENTS' NATIONALITY 2010



UNIS STUDENTS' NATIONALITY 2011



RESULTATREGNSKAP 2011

	2011	2010
Driftstilskudd fra KD	97 217 000	89 553 000
Avsatt til investeringstilskudd	- 4 520 209	-4 918 555
Årets driftstilskudd fra KD	92 696 791	84 634 445
Eksterne prosjektinntekter	37 885 264	38 263 946
Øvrige inntekter	10 375 556	12 831 960
Brutto driftsinntekter	140 957 611	135 730 351
Direkte prosjektkostnader	32 903 730	33 568 937
Netto driftsinntekter	108 053 881	102 161 414
Lønn og sosiale kostnader	45 654 157	40 932 615
Felt- og toktkostnader	9 893 389	8 961 680
Kostnader lokaler	29 545 485	26 616 869
Øvrige driftskostnader	17 956 679	19 541 921
Avskrivninger	2 401 731	2 384 961
Sum driftskostnader	105 451 441	98 438 046
Driftsresultat	2 602 440	3 723 368
FINANSINNTEKTER OG FINANSKOSTNADER:		
Finansinntekter	1 124 600	648 839
Finanskostnader	1 726 656	1 707 544
Netto finanskostnader	602 056	1 058 705
Årsts overskudd	2 000 384	2 664 663
DISPONERINGER		
Til annen egenkapital	2 000 383,78	

BALANSE 31.12.2011

	2011	2010
EIENDELER		
ANLEGGSMIDLER:		
Bygninger	42 004 750	44 406 481
Andeler Svalbardhallen	1	1
Sum anleggsmidler	42 004 751	
AKSJER:		
Aksjer i UNIS CO2 Lab AS	100 000	0
Sum aksjer	100 000	0
OMLØPSMIDLER		
Varebeholdning	270 389	607 992
Debitorer	11 959 742	3 040 094
Andre kortsiktige fordringer	8 256 775	1 667 440
Betalingsmidler	20 515 808	21 918 192
Sum omløpsmidler	41 002 714	27 233 718
SUM EIENDELER	83 107 465	71 640 200
GJELD OG EGENKAPITAL		
Innskutt egenkapital	2 054 025	2 054 025
Opptjent egenkapital	12 380 496	10 380 112
Sum egenkapital	14 434 521	12 434 137
AVSETNINGER:		
Utsatt inntektsføring	1 240 000	1 700 000
Sum avsetning med forpliktelser	1 240 000	1 700 000
LANGSIKTIG GJELD:		
Boliglån SparebankEN	31 058 782	33 460 513
Sum langsiktig gjeld	31 058 782	33 460 513
KORTSIKTIG GJELD:		
Leverandørgjeld	13 404 797	5 201 350
Skyldige off.trekk og avgifter	3 899 926	3 786 140
Annen kortsiktig gjeld	19 069 439	15 058 060
Sum kortsiktig gjeld	36 374 162	24 045 550
SUM GJELD OG EGENKAPITAL	83 107 465	71 640 200

JANUARY 2011

View from Longyear glacier towards Longyearbyen.

Photo: Jan Otto Larsen

AUGUST 2011
AB-201 students hop ashore on the north side of the Magdalenefjorden.
Photo: Steve Coulson

ARCTIC BIOLOGY

BY TOVE M. GABRIELSEN

The department conducts research in arctic biology and ecology and provides a full one-year curriculum of undergraduate studies and eight PhD/Master's level courses. The department pursues the strategy to have two research groups, one in marine arctic ecology and one in terrestrial arctic ecology.

TERRESTRIAL ECOLOGY RESEARCH GROUP

By the end of the year, the terrestrial research group consisted of two associate professors, one postdoc and one PhD fellow. Two PhD fellows defended their theses in the fall of 2011.

In March the Research Council of Norway (RCN) funded workshop "The terrestrial and freshwater invertebrate fauna of Svalbard" was held at UNIS. 25 invertebrate ecologists from 11 countries attended this workshop. Outcomes included the establishment of an informal network administered from UNIS and a multi-author manuscript in preparation describing the invertebrate fauna of Svalbard, Novaja Zemlya and Franz Josef Land.
Collaboration with Russian colleagues has enabled access to Russian literature concerning the Russian archipelagoes often not available to western researchers.

During 2011 the RCN funded project AVIFauna (Avian Vectors of Invertebrate Faunas) undertook its first field campaign with two weeks in Ny-Ålesund and three in Barentsburg. Collaborators included researchers from Russia, Poland, the Netherlands and Norway. Samples were also collected from the vicinity of Longyearbyen. Nests and birds were successfully sampled for the invertebrates and two manuscripts are in preparation. Two further field seasons in 2012 and 2013 are planned.

Collaboration with Polish taxonomists has enabled the revision of the gamasid mite inventory for Svalbard based on fresh material collected from throughout Svalbard. Identified specimens are now deposited at UNIS and in Poznan. This revised inventory replaces previous checklists which included many synonyms and likely errors in identification. Ongoing work will revise other taxa with the aim of producing a baseline for future studies.

The Norklima project REINKLIM led from NTNU was funded in 2011. Fieldwork will commence in 2012. The project aims to investigate the role on climate, and climate change, in influencing reindeer populations. The outreach project webpage SPIDER (**www.svalbardinsects.net**) was developed with new photographs and explanatory text added.

A textbook project was initiated in 2011 with the running title "Arctic terrestrial biology: from Svalbard to the circumpolar Arctic". This book edited by the terrestrial biologists at UNIS and Geir Wing Gabrielsen (NPI) will provide the terrestrial students at UNIS with a similar text to the previously successful text "Ecosystem Barents Sea". Given the lack of such an Arctic focused text book it is likely that this book will become popular beyond UNIS.

In cooperation with UiO, the investigations of fungi and mycorrhizal interactions were developed further in 2011. Do for instance plant species living next to each other also share root-symbionts? A new master student did her field work this summer, collecting root-samples for high throughput sequencing to identify fungi and bacteria associated with plant roots. Three ectomycorrhizal plant species were investigated and are currently being analyzed. More traditional fungi collections of fruit bodies and morphological investigations were also done, within the popular science project "Svalbards sopper: Hvem, hva, hvor?" supported by the Svalbard Environmental Protection Fund, and several new species have been identified. The poster about fungi in Svalbard was printed in Russian and English versions, and distributed for free to the residents in Longyearbyen, and a book written for a non-scientific audience is under development. A new PhD fellow, Sunil Mundra, started in November, and he will also work with plant-fungi interactions.

APRIL 2011
AB-203 and AB-204 students on fieldwork in Billefjorden.
Photo: Steve Coulsen

Several ongoing projects were continued in 2011, such as the Norwegian-Russian cooperation project focusing on taxonomy, regional phylogeography and landscape genetics within the grass genus *Puccinellia*, with three new master projects. The cooperation with Jelte Rozema and the University of Amsterdam was also continued and two master students did field work on his research plots this summer, looking at the effect of artificial warming, and the growth response of *Empetrum nigrum*.

The PhD project of Lorna Little, "The Polar Palette", which focus on the effect of flower color in polar regions, in cooperation with the Otago University, New Zealand, had its last field season in 2011. This project got support from Svalbard Environmental Fund to also investigate whether coal dust affected the plants, as a layer of coal dust do affect flower color. No clear connection between dust and color was detected. However, it seems like coal dust reduce plant height. We have also finished a monitoring project of flowers using time-laps cameras this summer. The result is available on the UNIS YouTube account.

HATEG (High Arctic Terrestrial Ecology Group at the Fram Centre) was initiated in 2011, with a workshop in Tromsø called "Svalbards terrestrial ecosystem - climate impacts and trophic interactions". The workshop resulted in economic support from the Fram Centre to start up a pilot study investigating herbivore interactions related to climate change was performed in Svalbard in 2011. The Fram Centre funded a follow-up workshop in 2012 called "Svalbard terrestrial 2012".

MARINE ECOLOGICAL RESEARCH GROUP

By the end of the year the marine ecology research group consisted of one professor, two associate professors, two postdoc and two PhD fellows. Two PhD fellows defended their theses during 2011.

Researchers from the biological department have over the last 15-20 years worked in a very high number of fjords and locations all around Svalbard. A spatial comparison between regions has been a key issue, with focus on areas under different physical and climatic regimes. However, as more research efforts have lately been aimed towards seasonal dynamics and understanding of processes occurring also through the long and dark polar night, the marine research group has made an effort to focus their research more in selected regions. Based upon both the different physical factors and the fact that UNIS has been operating ocean observatories in three fjord systems during the last 10 years, significant research efforts have now been allocated in order to develop fjord laboratories in Billefjorden and Rijpfjorden. Together with current international and local research infrastructure in Kongsfjorden and Isfjorden, these fjords are considered as model systems in which researchers can study biological processes throughout the year as well as providing contrasting climatic regimes ranging from a more high arctic situation in Rijpfjorden to a strongly boreal influenced location in Kongsfjorden.
During the winter of 2011, the biological department carried out several field campaigns in Billefjorden. In early April, a field party of 25 undergraduate students and 15 graduate students and teachers established a field camp in Pyramiden, and carried out research from the ice in Billefjorden. Management issues in the old Russian settlement of Pyramiden were also explored, and a new ocean observatory was deployed through the ice. In mid-May a new group of 20 students and scientists re-established the field site on the sea ice in Billefjorden. After the sea ice break-up in June, pelagic sampling was continued in the summer and early fall utilizing the UNIS research vessel "Viking Explorer". Topical studies of succession of phytoplankton and ice algae as well as zooplankton communities were carried out, both for teaching and research purposes.

The field campaign and seasonal studies in Billefjorden 2011 enabled a test of field campaigns similar to what will be carried out in both Billefjorden and Rijpfjorden over the next 2-3 years as part of the three large new research projects that were all financed at the end of 2011; "Cleopatra II" (a follow-up of a UNIS-led IPY project), "MicroFun" (a new project on the diversity and function of both terrestrial and marine microbial eukaryotes financed by ConocoPhilips) and "Circa" (a new project from the RCN). All these three projects will form the basis of the research focus in the marine research group during the coming years.

The fall of 2011 saw the beginning of a field campaign more close to home, in Adventfjorden. In September, a mooring was deployed in the mouth of Adventfjorden, and the field campaign started with a joint effort between UNIS scientists and our visiting Fulbright Arctic Chair Fellow Professor Mark Moline from California Polytechnic State University focusing on the importance of bioluminescence and the utility of an autonomous underwater vehicle (AUV) in arctic marine waters. Precious samples of microbial eukaryotes and zooplankton from the Adventfjorden sampling site were obtained from the polar night period in December with the help of the coast guard vessel "KV Svalbard", and sampling in Adventfjorden continued into 2012.

In the BioPAMM project ("Bioprospecting in Arctic marine metatranscriptomes") we use the novel techniques of metatranscriptomics and high throughput sequencing to chart the bioactivities of marine eukaryotic microbes. The project is in cooperation with UiO and Arcticzymes, and employs one post doc.

We are currently building up an extensive mRNA database which will be used to examine the ecological function of the microbes, and to bioprospect for novel commercially interesting bioactivities. These activities will continue in the next few years in the MicroFun project.

GRADUATES 2011

PHD DEGREE:

ÁVILA JIMÉNEZ; MARÍA LUISA:
High Arctic Invertebrate Biogeography. Patterns and colonization processes since the Last Glacial Maximum

MÜLLER, EIKE:
Plants on the run: can high arctic species survive climate change?

NYGÅRD, HENRIK:
Scavenging amphipods in the high Arctic. Studies on benthic and sympagic amphipods of the genera *Onisimus* and *Anonyx*

TANDBERG, ANNE HELENE SOLBERG:
Studies on the amphipod genus *Metopa* (Stenothoidae). Taxonomy, Ecology, Phylogeny

MASTER DEGREE:

BJØRDALSBAKKE, LISE KRISTIN:
Population structure, parasitism and prey preference in *Sclerocrangon boreas* and *S. ferox*, Svalbard

NORLI; MARIT:
Time-series of phytoplankton photosynthesis and dynamics using Phyto-PAM and an Autonomous Underwater Vehicle

PILSKOG, HANNE EIK:
The invertebrate fauna of Svalbard bird nests: ecology and as facilitating colonization of an Arctic archipelago

REGELIN, BEKE:
Purple sandpipers (*Calidris maritime*) feeding in the Arctic estuary: tidal cycle and seasonal dynamics in abundance

AUGUST 2011
AB-202 students and professor Jørgen Berge (far right) examine a capelin catch onboard R/V Helmer Hansen.
Photo: Geir Johnsen

ARCTIC GEOLOGY

BY RIKO NOORMETS

2011 was an active year of research and teaching within the department's core fields: Structural and basin geology, glaciology, marine geology, sedimentology, Quaternary geology, and permafrost and periglacial geomorphology. Two new adjunct professors: Andrew Hodson in glacial geomorphology and Martin Jakobsson in marine geology joined the department in 2011 bringing the total number to seven full-time and eight adjunct staff members. Two new courses were introduced bringing the total number of courses taught in 2011 to 14. In addition to the research and teaching, the department hosted the 5th Arctic Paleoclimate and its Extremes (APEX) conference and field trip with over 60 climate scientists at UNIS. In March, Professor Jakobsson was awarded 2011 International Arctic Science Committee (IASC) Medal.

Several of the department's staff responded to the ConocoPhillips Arctic Research Program 2012-2016 call. At the time of writing this report, three out of 10 projects that were accepted for funding are led by the staff of the department: Doug Benn ("CRIOS – Centre for Research into Ice-Ocean Systems"), Anne Hormes ("Past Ice sheet configuration on Svalbard for better constraints of the Neogene tectonic uplift"), and Riko Noormets and Snorre Olaussen ("Northern Barents Sea hydrocarbon seeps and the geochemistry of the potential source rocks").

The department successfully participated in three national evaluations initiated by the Research Council of Norway - in the Earth Sciences research, in Polar research and in Climate research.

GLACIOLOGY

Doug Benn continued his explorations of glacial drainage systems (ice caves) with master student Kathrin Naegeli. Newly discovered cave sites allowed access to the glacier beds, where there are excellent exposures of subglacial ice. Comparison of this ice with that found beneath recently surged glaciers such as Tunabreen, have provided new insights into glacier dynamic processes during and following the Little Ice Age. Detailed work on this topic was carried out by external UNIS PhD students Harold Lovell and Ed Fleming, including sedimentological, structural and isotopic analysis.

In April, Doug took a step back in time and worked on 650 million year old glacial deposits in NE Svalbard as part of the UK Natural Environment Research Council funded project GAINS (Glacial Activity in Neoproterozoic Svalbard). These rocks were deposited during one of the great "Snowball Earth" glaciations, when Svalbard was located in the tropics. Data collected during this trip and a second trip in July show that the Earth system was more complex and dynamic at that time than previously thought, with alternating glacial and ice-free periods similar to those of more recent geological periods.

QUATERNARY GEOLOGY

Anne Hormes focused on the reconstruction of the terrestrial part of the Svalbard-Barents Sea Ice sheet in central Spitsbergen with fieldwork in Atomfjella together with PhD student Endre Før Gjermundsen and Bachelor student Maximilian Janson. The results of four years of cosmogenic nuclide dating in NW Spitsbergen, Atomfjella and Nordaustlandet were presented on several workshops and conferences by Endre and Anne: APEX 5th International Conference and Workshop in Longyearbyen, XVIII INQUA Congress in Bern, Switzerland, and AGU Fall meeting in San Francisco.

The NSINK International Training network finished in October with a workshop in Obergurgl, Austria. External PhD student Trine Holm presented her results about physicochemical changes in the Kongressvatn lake throughout the last decades in a first publication in Aquatic Sciences and on the INQUA and EGU conferences. She is going to defend her thesis in 2012.

AUGUST 2011
AG-210 students on excursion in Billefjorden.
Photo: Endre Før Gjermundsen

Anne Hormes investigated also the Holocene history of geohazards in cultural heritage sites. Jeannette Kvalvågnes finished her Master's thesis on safety measures for Gruve 1A under the superversion of Jomar Finseth (SINTEF), Jan Otto Larsen (UNIS Arctic Technology department), Anders Schomacker (NTNU), and Anne. In collaboration with SINTEF, Master student Evangeline Sessford performed georadar and differential GPS measurements at Fredheim. She has another field season in Skansbukta and Fredheim in 2012 in order to investigate the Holocene development of geohazards on these sites.

BASIN STUDIES AND SEDIMENTOLOGY

Alvar Braathen and Snorre Olaussen' s focus this year were on further developing major projects such as the UNIS CO2 lab and the "Geological Input to Carbon Storage" together with colleagues from UNIS and other research groups. Both projects address the understanding of fluid flow in unconventional, fractured reservoirs and cap rock successions. As part of Alvar's Fulbright Arctic Chair sabbatical year in 2010-11, he, postdoc Kei Ogata and PhD student Kim Senger undertook field studies in Utah (USA) on world-class examples of leaking fractured reservoir-cap rock systems, together with Professor James Evans and students from Utah State University. The data is currently compared with similar datasets gathered by Kei and Kim from drill cores and outcrops on Svalbard. Further, detailed studies on permeability of reservoir sandstones by Fulbright grantee Cara Magnabusco add to the overall aim of the combined research; to further refine the reservoir model under development for the UNIS CO2 lab reservoir.

Funding for a new post doc and two new PhD students was secured to strengthen the CO2 Lab studies in 2012. Snorre Olaussen also started two new basin study projects, focusing on the Barents Sea and Northernmost Atlantic, both supported by Lundin Norway AS. One project aims at improving the knowledge of the Upper Paleozoic carbonate system in the Arctic, and includes an adjunct professor position in carbonate geology at UNIS. The research is undertaken in cooperation with Professor Benoit Beauchamp (University of Calgary, Canada). The other basin study addresses Lower Cretaceous clastic wedges in the Northernmost Atlantic, and includes a post doc position at UNIS. In addition, Lundin Norway AS has funded a state-of-the-art computer facility at UNIS, strengthening the department's potential to work on seismic data of the Svalbard region, kindly supplied by the Norwegian Petroleum Directorate.

Maria Jensen was on maternity leave part of 2011 and after returning continued her research on the tidal sedimentology at Braganzavågen.

PERMAFROST AND PERIGLACIAL GEOMORPHOLOGY

The research in 2011 focused on collaboration with international research groups at University of Copenhagen, Denmark; University of Carleton, Ottawa, Canada; University of Alaska, Fairbanks, USA and with the cryosphere research group at University of Oslo, Norway. Hanne Christiansen spent her sabbatical in 2011 at these institutions. The largest research efforts were the participation in the DEFROST "Impacts of a changing cryosphere – depicting ecosystem-climate feedbacks as affected by changes in permafrost, snow and ice distribution" centre, and the PAGE21 "Changing Permafrost in the Arctic and its Global Effects in the 21st Century" EU research project. DEFROST is a Nordic Centre of Excellence, funded by the Nordic Council of Ministers and led by Lund University, Sweden. The PAGE21 is an EU 7th framework research project, coordinated by the Alfred Wegener Institute, Germany, which started in November 2011.

Markus Eckerstorfer continued his PhD study on snow avalanches and their meteorological control. External PhD student Tatsuya Watanabe continued his intensive field study of mudboil dynamics in Adventdalen. Jordan Mertes started in November 2011 as UNIS external PhD student in DEFROST. He studies the ground thermal state of different permafrost landforms in the Nordic area, and is based at University of Copenhagen. UNIS external PhD student Arnauld Heroult established CH4 and CO2 flux measurements from ice-wedges in Adventdalen as part of the Greencycles II research project. His home university is Lund, Sweden. Matthias Siewert and Stefanie Härtel graduated as master students in periglacial geomorphology from UNIS and the universities of Bonn and Leipzig as home universities. Two new Master's students, Wesley Farnsworth and Sara Cohen started studying periglacial geomorphology in autumn 2011 at University of Oslo and UNIS.

Our collaboration with the Portuguese coordinated research project "Earth-Mars analogues of polygonal terrains" (ANAPOLIS), continued studying ice-wedges in Adventdalen in Svalbard with Jose Saraiva as external PhD student at UNIS. Field data was collected and permafrost found in the Nordnes unstable rock slope area as part of the collaboration with the "Rockslide in Troms" intermunicipality geohazard research and monitoring project, for determining the potential influence of permafrost on the unstable rock slope processes.

MARINE GEOLOGY

Riko Noormets' research on the reconstruction of the Svalbard-Barents Sea Sheet was expanded to the northern and eastern Svalbard margins. Together with the PhD student Teena Chauhan and colleagues from the Universities of Cambridge, St. Andrews and Tromsø, this work will provide new insights into the ice sheet dynamics and deglaciation history, as well as postglacial paleoceanography in these, less well known parts of Svalbard. All bathymetric data acquired in these areas have been incorporated in the next release of the International Bathymetric Chart of the Arctic Ocean (IBCAO).

In Isfjorden marine geological investigations focused on the mapping of the distribution and structure of pockmarks in order to understand their origin and link to the geological processes and climate evolution in Svalbard. This work is conducted by PhD student Srikumar Roy and is partly supported by the UNIS CO2 Lab project. Funding for the state-of-the-art marine survey instrumentation used for these studies was obtained from the Research Council of Norway through the FME SUCCESS program. Investigations of the Holocene paleoenvironmental changes using the wind-blown deposits in the marine sediments in Adventfjorden were continued in collaboration with Polish colleagues. In April, together with the colleagues from Poznan and Tromsø, Riko Noormets organized the Svalbard Science Forum sponsored workshop titled "Environmental changes in Svalbard since the last glacial maximum – integrating marine and terrestrial records" that brought together 25 leading glacial-, geo- and climate scientists at the Fram Centre in Tromsø.

GRADUATES 2011

PHD DEGREE:

BÆLUM, KAROLINE:
Geophysical and geological investigations of subsurface reservoirs - case studies of Spitsbergen, Norway

SUND, MONICA:
On the dynamics of surge-type and tidewater glaciers in Svalbard

MASTER DEGREE:

FARRELL, LAURA REBECCA:
Appraisal of the Longyearbyen CO2 Project, a fractured reservoir

HÄRTEL, STEFANIE:
Formation and dynamics of Holocene ice-wedge polygons in Lower Adventdalen, Svalbard

MERTES, JORDAN:
Heat flux modelling on debris covered glaciers

MORK-JANSSON, WICTOR A.:
Avsetningsmiljø og sekvensstratigrafi av Rurikfjellet-formasjonen, Svalbard

SIEWERT, MATTHIAS B.:
Development of talus cones in Longyeardalen, Svalbard

WÆRUM, GARD OLE:
Bruddmønstre i øvre triaslagrekken ved Vindodden på Svalbard: opptreden, geometri og dannelsesmekanismer samt betydning for CO2 lagring

APRIL 2011
The quaternary geology group on fieldwork in Atomfjella, northern Spitsbergen.
Photo: Anne Hormes

ARCTIC GEOPHYSICS

BY FRANK NILSEN

The department has in total seven full time faculty positions, and has established research within oceanography, cryosphere, meteorology, middle and upper polar atmosphere. The department also consists of six adjunct professors, as well as one research assistant (oceanography), one Post Doc (middle polar atmosphere) and three PhD students (upper polar atmosphere, middle polar atmosphere and cryosphere).

Teaching was conducted at both the undergraduate and graduate level, with six courses in each level. An important part of all courses is the fieldwork, which allows the students to actively carry out research in the field. During 2011 the department has carried out several courses with teaching of field method on glacier, in the surface boundary layer over land and sea ice, at the Kjell Henriksen Observatory (KHO) and on two scientific cruises around Svalbard. The data collected are then typically used in course reports, giving the students valuable experience in analyzing and presenting scientific data in a coherent manner.

MIDDLE/UPPER ATMOSPHERE RESEARCH GROUP

The Space Physics Group investigates the middle/upper polar atmosphere using KHO, SPEAR, and EISCAT. All these facilities operated nominally in 2011. There were several additions to the instrumentation at KHO, funded by the Research Council of Norway (RCN). The InfraSpace project covered a major upgrade of the meridian-scanning photometer and the installation of a new mesospheric imager. The design and construction of our new daylight double etalon interferometer is on track. A one meter diameter integrating sphere is installed in the optical laboratory to sensitivity calibrate our instruments.

In collaboration with the Russian Polar Geophysical Institute and RCN we have now completed the design and installation of two NORUSCA II cameras; one camera is installed at KHO, and one in Barentsburg. Both instruments have been fully operational for one auroral season.
In September KHO launched an auroral forecast service for mobile phones. It has gained public interest and forecasts up to 1 hour in time the size and location of the auroral ovals, mapped on to a solar illuminated globe.

The Polar Institute of China (PRIC), the University of Electro Communications in Tokyo and the Finnish Institute of Meteorology ave joined KHO with new instruments. 20 groups from 10 nations were present at KHO in 2011. In November we ran the new PhD-level course AGF-351 "Optical methods in auroral physics research" for the first time, and 14 selected students used our facilities for extensive training. In December we were actively involved in the launch of the ICI-3 sounding rocket from Ny-Ålesund. KHO provided ground support to the campaign. The aim of the rocket was to investigate space weather and find out why GPS signals are disrupted in the post noon dayside / ionosphere.

At SPEAR we carried out several campaigns, including one joint campaign with our Russian colleagues at the Arctic and Antarctic Research Institute.

METEOROLOGY RESEARCH GROUP

The meteorology group works mainly with the atmospheric boundary layer and energy exchange processes between different types of surfaces, such as water, snow, ice and tundra.

During 2011, exchange processes between the atmospheric boundary layer and the surface in Arctic fjords were in particular focus with several publications as well as one PhD and one Master student graduating in the subject. Fjords are very challenging environments to work with. Taking meteorological measurements and performing numerical model simulations are difficult due to the complex interactions between the large-scale weather conditions, land, sea, sea ice and surrounding topography consisting of mountains, valleys and glaciers. But, in order to improve weather and climate models in the Arctic, these systems have to be better understood.
Tiina Kilpeläinen successfully defended her PhD thesis in September entitled "The Atmospheric Boundary Layer over Arctic Fjords". In her thesis, she used both measurements and numerical modelling from several Svalbard fjords, including measurements from long-term meteorological campaigns over Isfjorden at Vestpynten outside Longyearbyen. Kilpeläinen demonstrated that processes in the atmospheric boundary layer over fjords vary more, both spatially and temporally, than previously suggested. Hence, fjords present a challenge for numerical weather predictions.

SEPTEMBER 2011
KHO launches an auroral forecast service for mobile phones. To download the app: http://kho.unis.no
Photo: Fred Sigernes

JANUARY 2011
The northern lights (Aurora Borealis) dance above Platå mountain and Bjørndalen.
Photo: Robert Pfau

The long-term measurements at Vestpynten were also used in the Master thesis of Stephan Kral where he shows that the calculations of turbulent fluxes are very dependent on how raw data are treated and that commonly used methods may give erroneous results over an Arctic fjord. Associate Professor Anna Sjöblom was in addition involved in a study over Wahlenbergfjorden, Nordaustlandet, where it was shown that turbulent fluxes are often underestimated over an ice covered fjord. Such errors need to be rectified in order to improve weather and climate models.

CRYOSPHERE RESEARCH GROUP

In the field of snow- and ice processes research on quantification of aerosols impact on surface albedo is carried out. In 2011 a field campaign was carried out on the western margin of the Greenland ice sheet. The mass of aerosols and solar reflectivity was quantified as part of a research project in collaboration with several international research institutions focusing on the impact of glaciers near the coast of Greenland. The Greenland Ice Sheet reacts on the warming that Greenland has been subject to the last 10 years. The melt has increased and the glacier fronts have retreated. The melt has both global and local impact. Globally the increased melt results in sea level rise, change of the ocean currents and the atmospheric circulation over Greenland. Locally the position of the glacier front and the fresh water production is vital for fishery and transport. There are big gaps in our knowledge on the amount of freshwater produced each year and on how and where the water melts. The project will investigate these processes with focus on the Nuuk area. The UNIS contribution to this project is research on the impact of aerosols on glacier ice melt.

In the Nordic Centre of Excellence project "SVALI" involving partners from all Nordic countries, a PhD study has been established in collaboration with University of Uppsala. SVALI is a part of the Top-level Research Initiative, which is a major Nordic collaborative venture for studies of climate, energy and the environment. The SVALI NCoE is within the TRI sub-programme "Interaction between Climate Change and the Cryosphere" (ICCC), which aims to improve our understanding of stability, variations and dynamics of the cryosphere.

2011 also resulted in research for the local society. SNSK requested a report on potential impact of dust from a road over Marthabreen and its consequences for environment and glacier melt. The report has been followed up by involvement in glacier monitoring together with University of Oslo

PHYSICAL OCEANOGRAPHY RESEARCH GROUP

Main focus has been on research projects related to oceanographic- and sea ice data collection in fjord and shelf areas around Svalbard, in the Greenland Sea, Eurasian basin and the Barents Sea ("CRYOSAT Sea Ice", ESA-Prodex, and "Arctic Climate and Environment of the Nordic Seas and the Svalbard - Greenland Area (AWAKE)", Polish-Norwegian Research Fund).

Data collected during the IPY years 2007-2010 have been used to study the dynamic of the West Spitsbergen Current and its effect on the water mass and sea ice distribution in Fram Strait and the Arctic Ocean through two publications. Based on the long time hydrographic monitoring program conducted in selected Arctic fjords in Svalbard by UNIS, new knowledge on shelf-fjord exchange processes in Arctic fjords were presented at conferences and workshops.

Sigurd Henrik Teigen successfully defended his PhD thesis in June entitled "Water mass exchanges in the sea west of Svalbard – A Process study of flow instability and vortex generated heat fluxes in the West Spitsbergen Current". His thesis represents another step towards understanding the dynamical processes that affect the Atlantic Water transformation occurring in the sea west of Svalbard. The stability properties of the West Spitsbergen Current (WSC) were thoroughly examined based on a slowly varying background current profile determined from IPY mooring data. Our findings demonstrate that the processes of offshore isopycnal diffusion of heat and lateral water mass exchange across the Arctic front are intensified by flow instability in the WSC during winter. Quantitative estimates of the amount of cooling being inflicted on the core of the WSC by these processes were also presented.

Juni Vaardal-Lunde successfully defended her Master thesis "Topographically Controlled Flow in the Isfjorden Trough and the West Spitsbergen Shelf". In her thesis, a one layer numerical model were developed that demonstrates how the Atlantic Water (AW) from the WSC is topographically steered onto the West Spitsbergen Shelf (WSS) with a special emphasize on the Isfjorden Trough. Model results show that the WSC connects easier to the Isfjorden Trough than anywhere else on the shelf, letting the trough being exposed to warm and salty AW. The simple one layer barotropic model gives a good approximation of the dynamical processes on the WSS, which plays a significant role in the cooling process of the WSC on its way to the Arctic Ocean.

GRADUATES 2011

PHD DEGREE:

KILPELÄINEN, TIINA:
The Atmospheric Boundary Layer over Arctic Fjords

TEIGEN, SIGURD HENRIK:
Water mass exchanges in the sea west of Svalbard – A Process study of flow instability and vortex generated heat fluxes in the West Spitsbergen Current

MASTER DEGREE:

KRAL, STEPHAN:
Observations on the Atmospheric Boundary Layer in an Arctic Fjord System during summer

VAARDAL-LUNDE, JUNI:
Topographically Controlled Flow in the Isfjorden Trough and the West Spitsbergen Shelf

SEPTEMBER 2011
AGF-214 students and staff onboard R/V Håkon Mosby.
Photo: Ragnheid Skogseth

ARCTIC TECHNOLOGY

BY MARK HERMANSON

The Department of Arctic Technology conducts research in:

- Environmental chemistry related to current and potential pollution problems and impact on the environment;
- Geotechnical engineering related to foundation of infra-structures in frozen ground and the expected effects of climate change;
- The mechanics of ice and its influence on offshore structures related to oil and gas exploitation.

These research activities generate material for courses offered in all three areas given at the Bachelor, Master's and PhD levels, giving students a good opportunity to study both the theoretical and practical aspects of Arctic technology.

ENVIRONMENTAL CHEMISTRY

The Environmental chemistry section in the Arctic Technology department at UNIS was staffed by two full-time researchers during 2011; Associate Professor Mark Hermanson and PhD candidate Pernilla Carlsson.

Dr. Mark Hermanson presented research results at eight conferences and workshops during 201, among them at the Arctic Monitoring & Assessment Program in Copenhagen; the International Workshop about Inventories and Emissions of Dioxins, Furans and Hexachlorobenzene in Mexico City, and at the Society for Environmental Toxicology & Chemistry (SETAC) 32nd Annual North American Conference in Boston.

In 2011, Dr. Hermanson got funding from Svalbard's environmental protection fund for the project "Atmospheric PCB Input History at Lomonosovfonna, Svalbard" and funding from The Norway-America Association for "Investigation of organic contaminants in an ice core from Svalbard". Dr. Hermanson had research connections with these institutions during 2011: Environment Canada; Vrije Universiteit Amsterdam, Norwegian Polar Institute and Paul Scherrer Institute, Switzerland.

Pernilla Carlsson finished her fieldwork in 2011. She processed samples in the laboratories and optimized methods for analyses of chiral pesticides. Pernilla received funding from Svalbard's environmental protection fund for an outreach project and has visited pupils in Longyearbyen School to teach them about environmental chemistry, using samples from local reindeers to illustrate contaminants in the food web and show what a chemist does. In addition, Carlsson presented research results at the Arctic Monitoring & Assessment Program conference in Copenhagen.

GEOTECHNICAL ENGINEERING

The Geotechnical engineering section in the Arctic Technology department was staffed by two full-time researchers during 2011: Associate Professor Jan-Otto Larsen and PhD candidate Louis Delmas.

The Department of Arctic Technology is involved in the Centres for Research-based Innovation (SFI) project "Sustainable Development of Arctic Marine and Coastal Technology" (SAMCoT). UNIS is responsible for WP1 of the project, which aim is to undertake data collection and analysis, as well as contributing to the five other sub-projects in collaboration with NTNU and SINTEF.

In 2011 Jan-Otto Larsen was directly involved with the SAMCoT project, including acting as co-leader of work package 1: "Collection and analysis of field data and properties" together with Aleksey Marchenko. He was head of work package 4: "Floating structures in ice". In connection with his leadership in WP4, he gave a presentation to the End Seminar of the project in May 2011.

MARCH 2011
An Arctic Technology student performs sea ice experiments near the Longyearbyen quay.
Photo: Eva Therese Jenssen

Larsen is responsible for two courses at UNIS. In addition, he has accepted responsibility for coordinating eight different courses for highway maintenance crews throughout Norway, one of which he taught himself at Haukeli high mountain highway in March 2011. He was guest lecturer in various courses at NTNU in Trondheim and also worked as a consultant for the mining company on Svalbard, SNSK, regarding avalanche risk at the new Lunckefjell mine.

During 2011 Larsen was also a member of the Engineering Geology Committee of the Transportation Research Board of the National Academies (USA). As a member of this committee, he is responsible for review of submitted papers and consults with other committee members regarding meetings and presentations for the TRB. Jan-Otto Larsen also organized and Avalanche protection seminar at UNIS with participants from NTNU, Norwegian Water Research and Energy Directorate, Norwegian Rail, and Norwegian Public Road Administration.

Louis Delmas spent 2011 writing his thesis, which he is expected to defend in 2012.

ICE MECHANICS

The ice mechanics section had three full-time researchers during 2011: Professor Aleksey Marchenko and PhD candidates Aleksey Shestov and Lucie Strub-Klein.

Aleksey Marchenko is leader of work package 1 in the SAMCoT project entitled "Collection and analysis of field data and properties" (2011-2019). In addition, he participated in the following projects: Aleksey Marchenko participated in the following projects: "Maritime safety management in the High North" (MARSAFENorth); "Influence of thermo-physical properties of sea ice and sea water on the state of Arctic ice cover and energy exchange in Polar Regions" (Russian Foundation for Basic Research); the DYPIC project and finally "Carrying out simulation experiments under natural ice conditions. Elaboration of physical-mathematical models, performance of calculation", contract between JSC Gazprom and Gazprom VNIIGAZ LLC for R&D works "Assessment of ice and lithodynamic impact on offshore gas production and transmission facilities in the Baydaratskaya Bay and the Gulf of Ob in the area of Kharasaveyskoe field taking into account temporal variability".

Marchenko presented research results at four conferences during 2011: The International Conference on Port & Ocean Engineering under Arctic Conditions in Montreal; at the EURODYN 2011 in Leuven, Belgium, at the Arctic Frontiers Conference in Tromsø and at the European Geosciences Union General Assembly in Vienna. Marchenko was co-author of four book chapters in "Proceedings - International Conference on Port and Ocean Engineering under Arctic Conditions 2011".

Aleksey Shestov gave a presentation and contributed to the conference proceeding publication with "Morphology and physical properties of old sea ice in the Fram Strait", Proceedings of the 21th International Conference on Port and Ocean Engineering under Arctic Conditions. Montreal. Canada.

Lucy Strub-Klein worked on her thesis which she will defend in first half of 2012. She also attended the International Conference on Port & Ocean Engineering under Arctic Conditions in Montreal where she gave a presentation and contributed to the conference proceeding publication with: Strub-Klein, L. and Høyland, K.V. 2011, "One season of a 1st year sea ice ridge investigation, Winter 2009"; and Strub-Klein, L. 2011, "A review of the morphological and mechanical properties if first-year sea ice ridges".

GRADUATES 2011

PHD DEGREE:

SINITSYN, ANATOLY:
Construction of pile foundations in plastically frozen soils

MASTER DEGREE:

BLUMER, TORSTEIN:
Avalanche risk assessment for infrastructure in Lunckefjell, Svalbard

HELGELAND, INGJERD:
Gysing av trepelar i permafrost

HUSDAL, EIRIN:
The application of modified total sounding techniques in frozen ground

KVALVÅGNES, JEANETTE:
Vurdering av sikringstiltak ved Gruve 1A, Longyearbyen, Svalbard

APRIL 2011
A student excursion heading for Barentsburg.
Photo: Juni Vaardal-Lunde

APRIL 2011
What to do in your free time?
Go on a scooter trip of course!
Photo: Juni Vaardal-Lunde

STUDENT COUNCIL

BY VINCENT CARRIER, SC LEADER SPRING 2012

The student environment at UNIS is special and unique in many ways. Students from all over the world come to Svalbard to experience the high Arctic. The small community makes everybody know everybody and there is a close bond between students, staff and the local community. This relationship along with the astounding surroundings, the magic light and the unforgettable excursions make students come back year after year.

The Student Council (SC) members are elected in the beginning of each semester. The number of people with specific responsibilities within the SC is:

President (1); Vice-President (1); Board members (4); Treasurer (1); Vice-Treasurer (1); Kitchen Equipment group (3): Student Equipment group (4); Yearbook group (4); Friday Gathering group (4); Movie Night group (2); Lifeguard group (3); Icebreaker Party group (4), and Environmental group (4). One representative from each group is present in the SC meetings.

Social activities are arranged throughout the year, with Friday Gathering every week, movie nights, dinners and so on. The students also have access to two cabins and a multitude of hiking and safety equipment, free of charge. The SC is the main funding source for new outdoor gear, kitchen supplies, material for the annual yearbook and more. The students are able to get involved with the local community on numerous different levels. At Svalbardhallen, the local sports hall, many students participate on sports teams with the locals. In 2011 some students also participated in the biannual sports competition between Longyearbyen and Barentsburg.

The Environmental group students run the community thrift store known as "Bruktikken". Here you can donate your stuff that you don't need anymore, and get additions to your closet or bookshelf by taking something home with you. In 2011 this group also arranged the annual Longyearbyen charity flea market at UNIS. As in the past years, the event has been a great success.

During both the light and dark period students are involved with the organization of the Dark Season Blues festival in October, the Polarjazz festival in February and the Sun Festival in March. In this way they not only aid the community but also have a chance to socialize more with the local people.

The Student Council exists to support the UNIS students and to ensure that the student welfare is maintained. The students have representatives on the UNIS Board (board representative and observer) and in the UNIS leader group. These representatives discuss those topics that affect the students most and topics concerning the student view of UNIS as an institution. Students are also represented in ReCom (UNIS Research and Education Committee). The job of the ReCom student representatives is to assure quality in all courses that UNIS provides. Student surveys are undertaken to get a more clear picture of the opinions about different aspects of the student life and a chance to contribute to the further growth and development of UNIS.

As a student representative you get an inside view of how UNIS is run and get to participate on most levels. Because of the interaction of past student representatives UNIS has become what it is today, from a student point of view.

And it is the reason why close to 100% of the students rate the UNIS experience as AWESOME!

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