

# ICE



**NEWS BULLETIN  
OF THE INTERNATIONAL  
GLACIOLOGICAL  
SOCIETY**





# Ice

## News Bulletin of the International Glaciological Society

Number 158

1st Issue 2012

### Contents

<b>2 From the Editor</b>	18	<i>Annals of Glaciology 54(62)</i>
<b>4 Recent work</b>	18	<i>Annals of Glaciology 54(64)</i>
4 Denmark	19	Books and Merchandise
4 Greenland Climate Research Centre – Glaciology	27	Report from the New Zealand Branch Meeting, Twizel, February 2012
4 Ice sheet–ocean interaction	30	First Circular: International Symposium on Changes in Glaciers and Ice Sheets, Beijing, China, July–August 2013
5 Remote sensing	34	First Circular: International Symposium on Radioglaciology, Lawrence, Kansas, USA, September 2013
7 Ice cores	<b>38 Meetings of other societies</b>	
8 Mass balance and monitoring	38	Northwestern Glaciologists Meeting, Portland, Oregon, USA, October 2011
10 Sea-ice modelling	42	50 years of the NVE’s Glaciology Office, Oslo, Norway, January 2012
11 Climatology and the cryosphere	<b>44 Glaciological diary</b>	
12 Ice sheet hydrology	<b>49 New members</b>	
12 Commercial glaciology		
13 Abbreviations		
<b>14 International Glaciological Society</b>		
14 <i>Journal of Glaciology</i>		
16 Book received		
17 <i>Annals of Glaciology 53(60)</i>		
18 <i>Annals of Glaciology 53(61)</i>		

*Cover picture:* 5 a.m. sunrise through the mountains, Kangerdlugssuaq Fjord, southeast Greenland. Photo by Laurence Dyke, 2nd year PhD student, Swansea University, Wales, UK

Scanning electron micrograph of the ice crystal used in headings by kind permission of William P. Wergin, Agricultural Research Service, US Department of Agriculture

EXCLUSION CLAUSE. *While care is taken to provide accurate accounts and information in this Newsletter, neither the editor nor the International Glaciological Society undertakes any liability for omissions or errors.*

# From the Editor

Dear IGS member

2012 has been a busy year for the IGS. In addition to our *Journal* and *Annals* and our newsletter *ICE*, we have held two symposia. The first one was in Lahti, Finland, at the end of May and beginning of June. The second one was in Fairbanks, Alaska. We are also handling the registration for the SCAR meeting in Portland.

We have had a record number of members this year, to date there are 930 members, the most we have had since 1980. New members are signing up and old members are renewing all the time. This is very encouraging indeed.

The issue I would like to address in this editorial is the stigma that seems to be attached to poster presentations. One thing the IGS prides itself on is the fact that we very rarely have parallel sessions at our conferences. This means that delegates do not have to race between sessions, with the associated disruption, or choose between two talks that they would really like to attend, without any possibility of listening to a replay of the 'missed' talk.

But what this means is that when we have a large number of abstract submissions and a large proportion have requested an oral presentation (which I can understand, as it is much easier to give that than to prepare a good poster), we have to make a choice. The guidelines we follow are for an oral programme that is balanced and fully represents the various topics within the theme of the symposium. The remainder of the abstracts are then allocated a poster slot.

This summer, because of the large number of submissions to our symposia, quite a number of 'oral requests' were transferred to a poster presentation. The vast majority were perfectly happy with that decision, and we introduced an innovation where authors with posters could also submit a short video describing their poster. The videos were then continuously broadcast on a large screen during the sessions and were also made available online. We then had prizes for the most original posters and the best scientific posters. Our authors did not disappoint us. The video submissions were fantastic! We are now planning to make this a regular feature of our symposia and we expect it to become more and more popular.

But there were a few authors who were very disappointed with the verdict. Some even cancelled their participation in the symposium, claiming 'it was too far to travel' for 'only a poster'. One student author said 'my work is too important for just a poster', prompting a member of the scientific steering committee to comment, 'what is his/her advisor teaching him/her?' But it is their loss: where else do you have the opportunity to discuss your work with the leading experts in the field and in the congenial atmosphere that prevails at an IGS symposium? I think an attitude adjustment is in order.

I can remember one of my first IGS symposia, a few decades ago. I was talking to this very friendly man, having the time of my life. Some colleagues referred to him



as John, others as Hans. I later discovered that this was the legendary Röhrlisberger. Later I also met John Glen, Johannes Weertman, John Nye, Almut Iken, Garry Clarke, Barclay Kamb.... the list goes on and on. All absolutely charming and most willing to hold discussions on an equal footing with whoever approached

them. But this is the beauty of being a member of the IGS and attending IGS symposia. You rub shoulders with the great names in glaciology, socialize with your peers, experience cutting-edge science and in general have a great time. What better reasons could there be to join the International Glaciological Society?

**Magnús Már Magnússon**  
Secretary General





# Recent work

## Denmark

### GREENLAND CLIMATE RESEARCH CENTRE – GLACIOLOGY

Greenland Climate Research Centre is concerned with the expected impact of climate change on Arctic marine, limnic and terrestrial environments and on Greenlandic society. For this project DMI is developing a fully-coupled atmosphere–ice-sheet–ocean–sea-ice model system, capable of producing simulations at unprecedentedly high resolutions (1–2km) for areas within the Arctic in general and Greenland in particular. The HYCOM-CICE ocean model is fully coupled with the HIRHAM5 atmospheric model and will run at a 25 km resolution for the whole Arctic. Future simulations driven by the EC-Earth AOGCM are also planned. In addition, glacier surface mass-balance calculations have been incorporated into HIRHAM5 and are used to drive the PISM ice-sheet model on a regional and whole ice-sheet basis. Development of a surface meltwater routing scheme (over glaciers), the incorporation of lakes, fjords and permafrost in the models are ongoing.

**Partners:** NBI/KU (Lead), GEUS, DMI, DTU Space, UAF

**Contact at NBI/KU:** Dorthe Dahl-Jensen (ddj@nbi.ku.dk)

**Contact at GEUS:** Dirk van As (dva@geus.dk)

**Contact at DMI:** Ruth Mottram (rum@dmi.dk)

**Contact at DTU Space:** René Forsberg (rf@space.dtu.dk)

### ICE SHEET–OCEAN INTERACTION

#### SEDIMICE

The SEDIMICE project is focused on climate variability in the Southeast Greenland region (64–68° N). The aim is to reconstruct past fluctuations in marine-terminating outlet glacier dynamics (including iceberg and melt-water production) and the interaction with oceanographic changes. This is done on the basis of sediment cores retrieved from fjords and the shelf and we specifically focus on the instrumental period and try to put it in context with centennial to millennial changes. From cruises conducted in 2009, 2010 and 2011, GEUS has a large repository of marine sediment cores from Sermilik Fjord by Helheim Glacier and the fjords by Ikertivaq and Køge Bugt Glacier complexes as well as from the shelf in the region. The cores are dated by means of  $^{14}\text{C}$ ,  $^{210}\text{Pb}$  and

$^{137}\text{Cs}$  and analysed with regard to ice rafted debris (IRD), foraminifera, diatoms and biomarkers. In this way the interaction between Irminger water, sea surface temperature and iceberg rafting beyond the instrumental time period is evaluated. By combining sediment studies with modern climate studies we aim to extend the knowledge from meteorological time series further back in time. The advantage of palaeoclimate studies is that ‘noise’ is filtered out and the more consistent climate/glacier signal becomes more prominent. This kind of knowledge should provide an important contribution to the ongoing discussion about natural climate variability and the consequences of anthropogenically-driven climate change.

**Duration:** 2009–2013

**Partners:** GEUS (Lead), Danish Natural History Museum, Woods Hole Oceanographic institution, INSTAAR (University of Colorado at Boulder), DMI

**Contact at GEUS:** Camilla S. Andresen (csa@geus.dk)

### Greenland Climate Research Centre–Physical oceanography in Greenland waters under climate change

The waters around Greenland are affected by climate change with implications not only for oceanic physical and biological conditions, but with the potential to feedback to the large-scale thermohaline circulation in the Atlantic and thus the global climate. The aim of this project is to better understand how physical oceanographic conditions in the seas around Greenland will respond under expected climate changes. For this project a coupled ocean–sea-ice model for the Godthaabsfjord has been developed, capable of producing high-resolution simulations (300 m–1 km) of the fjord. The model is coupled with an open ocean model to include the fjord–shelf interaction, including tides and interannual variability of deep water intrusions, and is thus suitable for estimation of heat transport and heat availability for ice melt at the glacier–fjord interface. Other elements of this project are observational studies and physical and biological modelling of Godthaabsfjorden and Young Sound.

**Duration:** 2009–2012

**Partners:** DTU Aqua (Lead), DMI, VitusLab, Greenland Institute of Natural Resources

**Contact at DTU Aqua:** Andre W. Visser (awa@ aqua.dtu.dk)

**Contact at DMI:** Kristine S. Madsen (kma@ dmi. dk)

**Contact at VitusLab:** Jørgen Bendtsen (j b@ vituslab. dk)

## REMOTE SENSING

### **CryoSat Cal/val/CryoVEx**

Airborne radar and laser altimetry for calibration and validation of ESA's CryoSat mission. Surveys of repeated ground tracks along with detailed observations of validation sites are carried out over Greenland Ice Sheet, Arctic sea ice, Austfonna (Svalbard) and Devon (Canada) ice caps.

**Webpage:** [www.esa.int/cryosat](http://www.esa.int/cryosat)

**Duration:** 2003–2014

**Partners:** ESA coordinated with other international partners (e.g. DTU Space, AWI, NPI, Uni. of Oslo, NRCan)

**Project lead:** Malcolm Davidson, ESA, Malcolm. Davidson@esa.int

**Contact at DTU Space:** René Forsberg (rf@space. dtu. dk)

### **Polarview**

Polar View is an earth observation (EO) or satellite remote-sensing program, focused on both the Arctic and the Antarctic. Polar View offers integrated monitoring and forecasting services in the polar regions, as well as mid-latitude areas affected by ice and snow. Polarview utilizes satellite earth observation data from multiple satellite observations, in combination with numerous sophisticated models and automatic tools, to deliver products that accurately illustrate the characteristics of the ice and snow on any given day.

**Webpage:** [polarview.org](http://polarview.org)

**Partners:** see webpage

**Contact at DTU:** Roberto Saldo (rs@space.dtu.dk)

**Contact at DMI:** Leif Toudal Pedersen (ltp@dmi. dk)

### **ESA Ice sheet\_CCI**

The state of the ice sheets is thought to be a major factor determining the pace of sea-level change. The goal of the ice\_sheets\_cci project is to set up a long-term and reliable production of a set of key parameters (surface elevation change, ice velocity, grounding line location and calving front location) from ice sheets, derived from available and future satellite observations.

**Webpage:** [ESA-CCI.org](http://ESA-CCI.org)

**Duration:** 2011–2014

**Partners:** ESA, DTU Space (Lead), S[&]T, ENVEO, UoL, GEUS, NBI/KU, NERSC, DMI

**Contact at DTU Space:** René Forsberg (rf@space. dtu. dk)

**Contact at GEUS:** Signe Bech Andersen (siba@ geus. dk)

**Contact at NBI/KU:** Christine S. Hvidberg (ch@ gfy. ku. dk)

**Contact at DMI:** Ruth Mottram (rumo@dmi.dk)

### **MONARCH-A (EU FP7)**

By adopting an Earth system approach the ultimate goal of the project MONitoring and Assessing Regional Climate change in High latitudes and the Arctic (MONARCH-A) is to generate a dedicated information package tailored to a subset of multidisciplinary Essential Climate Variables (ECVs) and their mutual forcing and feedback mechanisms associated with changes in terrestrial carbon and water fluxes, sea level and ocean circulation and the marine carbon cycle in the high-latitude and Arctic regions.

**Webpage:** [monarch-a.nersc.no](http://monarch-a.nersc.no)

**Duration:** 2010–2013

**Partners:** NERSC (Lead), USFD, UHAM, CNRS, NIERSC, UiB, DTU Space, IFREMER

**Contact at DTU Space:** René Forsberg (rf@space. dtu. dk)

### **IceSAR (POLARIS)**

In collaboration with ESA, DTU Space is developing and testing a P-band radar which can measure the thickness of ice sheets. The P-band imaging SAR designed for forest biomass mapping on the Earth Explorer candidate mission Biomass could also provide unique information on ice sheets in the cryosphere. A number of scientific studies have shown that long-wavelength P-band radar images to map forest biomass, may also be highly useful to monitor ice movement on ice caps.

**Partners:** ESA, DTU Space

**Contact at DTU Space:** Jørgen Dall (jd@space. dtu. dk)

### **ICEGRAV**

Long-range airborne geophysics and ice-penetrating radar measurements in Antarctica. The primary goal of ICEGRAV is to fill-in major gravity data voids in Antarctica, and collect additional data such as lidar, icepenetrating radar (60 and 435 MHz systems) and magnetic data. The ICEGRAV 2010-11 flights covered the Antarctic Peninsula, and continues 2011-13 with measurements in central East Antarctica.

**Duration:** 2010-2013

**Partners:** ESA; NGA, USA; IAA, Argentina; NPI, Norway; University of Texas; British Antarctic Survey

**Contact at DTU:** René Forsberg (rf@space.dtu.dk)

### **Greenland Climate Research Center – Remote Sensing**

Satellite observations in the Arctic is a significant source of information for the conditions in the waters around Greenland. This project focus on satellite observations for documenting and monitoring climate change in Greenland waters. It is linked with: 'The marine Arctic carbon cycle: climate change consequences and ice cover', 'Arctic plankton dynamics - in a changing climate', and 'Oceanography in Greenland waters undergoing climate change'.

**Webpage:** <http://www.natur.gl/en/climate-research-centre/research-projects/satellite-observations/>

**Partners:** DMI and DTU

**Contact at DMI:** Leif Toudal Pedersen (ltp@dm.dk)

### **ESA sea ice CCI**

This is the sea ice component of ESA's climate change initiative. DMI is heading the scientific part of the sea ice concentration where DTU is also a partner, and DTU plays a significant role in the sea ice thickness part as well.

The objectives of the Sea Ice CCI are to twofold: (1) Provide quality-controlled ice concentration data sets for the Arctic and Antarctic from 1979 to present, based on passive microwave data; (2) Provide Arctic sea ice thickness data sets based on radar altimeter data from 1993 to present and with the best possible validation and error characterization.

**Duration:** 2011-2014

**Webpage:** <http://www.esa-cci.org/>

**Partners:** ESA, NERSC (Lead), DMI, DTU Space, Logica, UCAM, UHAM, Ubremen, met.no, FMI etc.

**Contact at DMI:** Leif Toudal Pedersen (ltp@dm.dk)

**Contact at DTU Space:** Henriette Skourup (hsk@space.dtu.dk)

### **ICEMAR**

The overall objective of the ICEMAR project, which started at the end of December 2010, is to establish a pilot down-stream GMES sea ice information service to improve access to existing and new ice information products to aid ships navigating near or within ice-infested waters in the European Arctic (primarily the Greenland and Barents Seas) and the Baltic Sea.

This new service, which is due for delivery in December 2013, shall build on existing ice service elements including GMES services and projects, national/regional institutional and commercial services. The ICEMAR service will be established in an open and expansible way to facilitate the easy inclusion of additional information services as they become available

and coverage of new geographical regions in the future.

**Duration:** 2010–2013

**Webpage:** <http://www.icemar.eu/>

**Partners:** KSAT, BAS, VTT, DMI, met.no, FMI, SMHI, NERSC, SMA, BSH, ITD

**Contact at DMI:** Leif Toudal Pedersen (ltp@dm.dk)

### **Operation IceBridge – information dissemination**

This proposal focuses around Operation IceBridge, a new NASA airborne mission making altimetry, radar, and other geophysical measurements to monitor and to characterize the Earth's cryosphere. Operation IceBridge began operation in 2009 and will continue until the launch of ICESat-2, currently estimated for early 2016. The Earth's cryosphere is in a period of rapid change. Understanding these changes, their causes, and their impacts is critically important to understanding the impacts of global climate change. Data collected by Operation IceBridge will improve our knowledge of the contribution of the world's major ice sheets in Greenland and Antarctica to sea-level rise. It will also make fundamental contributions to understanding changes occurring in the extent and thickness of the Arctic sea ice cap. In Greenland, Operation IceBridge will focus primarily on detailed mapping of the ice sheet to continue monitoring of ice elevation change and collect ancillary data critical to modeling the ice sheet's present and future contributions to sea-level rise. The campaigns will be conducted in March-April of each year, primarily using the NASA P-3 and DC-8, along with smaller aircraft as needed. In conjunction with the Greenland campaign, Operation IceBridge will conduct operations over Arctic sea ice with the NASA P-3 to continue and improve on the freeboard measurements begun by ICESat. The project introduces Greenlandic and Danish students/educational institutions to cutting-edge scientific data—while forging relationships with American researchers. The project will strengthen and increase the capacity for the involved institutions to undertake, and build-upon, related research.

**Duration:** TBD

**Webpage:** [www.nasa.gov/icebridge/](http://www.nasa.gov/icebridge/)

**Partners:** NASA (Lead), GCRC, DTU Space

**Contact at GCRC:** Søren Rysgaard (sory@natur.gl)

**Contact at DTU:** René Forsberg (rf@space.dtu.dk)

### **MyOcean2**

The main objective of the MyOcean2 project is to deliver and operate a rigorous, robust and sustainable Ocean Monitoring and Forecasting system of the GMES Marine Service (OMF/GMS) to users for all marine applications :

maritime safety, marine resources, marine and coastal environment and climate, seasonal and weather forecasting. A ship routing service in ice infested waters is part of the MyOcean2 services, and here DMI and DTU Space participate in developing and delivering relevant products. In the period from April 2012 to September 2014, MyOcean2 will ensure a controlled continuation and extension of the services and systems already implemented in MyOcean, a previous FP7-funded project ( April 2009–March 2012) that has advanced the pre-operational marine service capabilities by conducting the necessary research and development.

**Webpage:** [www.myocean.eu](http://www.myocean.eu)

**Duration:** 2012–2014

**Partners:** See webpage

**Contact at DTU:** Roberto Saldo ([rs@space.dtu.dk](mailto:rs@space.dtu.dk))

**Contact at DMI:** Leif Toudal Pedersen ([ltp@dmu.dk](mailto:ltp@dmu.dk))

### **SMOS-Sea Ice (SMOSIce)**

The aim of the SMOSIce study is to develop, improve and validate algorithms for sea ice thickness retrieval from the 1.4 GHz (L-band, wavelength=20cm) data of the European Space Agency's (ESA) Soil Moisture and Ocean Salinity (SMOS) mission. SMOS payload is the Microwave Imaging Radiometer Using Aperture Synthesis (MIRAS) measuring the brightness temperature at a range of incidence angles and at different polarizations.

**Duration:** 2010–2012

**Webpage:** <https://wiki.zmaw.de/ifm/SMOSIce>

**Partners:** UHH, Ubremen, AWI, FMI, DMI

**Contact at DMI:** Rasmus Tonboe ([rtt@dmu.dk](mailto:rtt@dmu.dk))

### **OSISAF High Latitude Processing Center**

The Ocean and Sea Ice Satellite Application Facility (OSI SAF) of EUMETSAT is an answer to the common requirements of meteorology and oceanography for a comprehensive information on the ocean-atmosphere interface.

One of the objectives of the OSI SAF is to produce, control and distribute operationally in near real-time products containing sea-ice and ocean parameters using available satellite data with the necessary Users Support activities.

**Duration:** 1997–2017+

**Webpage:** <http://www.osi-saf.org/>

**Partners:** EUMETSAT, Meteo France, Ifremer, met.no, DMI, KNMI

**Contact at DMI:** Rasmus Tonboe ([rtt@dmu.dk](mailto:rtt@dmu.dk))

### **Virtuel Galathea 3 (VG3)**

In VG3, experienced high-school and primary school teachers work with Galathea researchers in order to develop teaching material. The Project combines observations from the

Galathea-3 expedition as well as satellite image information for use in education. Through this it is demonstrated that physical sciences and the work with physical sciences subjects are exciting and attentive.

**Duration:** 2007–2015

**Webpage:** <http://virtuelgalathea3.dk/>

**Partners:** DTU, GRAS, ESA, DMI, AU, STV and others (see web page)

**Contact at DMI:** Jacob L. Høyer ([jlh@dmu.dk](mailto:jlh@dmu.dk))

### *ICE CORES*

#### **The North Greenland Eemian Ice Drilling – NEEM**

The North Greenland Eemian Ice Drilling (NEEM) is an international ice core research project aimed at retrieving an ice core from North-West Greenland (camp position 77.45°N 51.06°W) reaching back through the previous interglacial, the Eemian. Numerous projects on reconstructing past climate and ice sheet conditions are based on NEEM data. An overview of the Danish projects can be found at <http://www.iceandclimate.nbi.ku.dk/research/>

**Webpage:** [neem.dk](http://neem.dk)

**Duration:** 2007–2012

**Partners:** 14 Nations (<http://neem.dk/partners/>) led by Centre for Ice and Climate, Niels Bohr Institute, Univ. of Copenhagen

**Contact at NBI/KU:** Dorthe Dahl-Jensen ([ddj@gfy.ku.dk](mailto:ddj@gfy.ku.dk))

#### **Past4Future**

A collaborative EU FP7 project combining multi-disciplinary paleoclimate records to analyse, model and reconstruct abrupt climate changes during the previous interglacial period. The 23 partners use paleoenvironmental data and simulations of past climates to advance our Earth system understanding, with the ultimate objective to improve our ability to project potential future changes. Past4Future research focusses at the present and last interglacial periods in order to address these key questions: What is the risk of abrupt changes during interglacial periods? Can we understand the greenhouse gas records of the interglacial periods? What is the risk of rapid collapse of the ice sheets? Did ocean circulation change significantly during the interglacial periods?

**Webpage:** [www.past4future.eu](http://www.past4future.eu)

**Partners:** 23 partners (see webpage)

**Project Lead:** Dorthe Dahl-Jensen, Centre for Ice and Climate, Niels Bohr Institute, Univ. of Copenhagen

**Contact at NBI/KU:** Dorthe Dahl-Jensen ([ddj@nbi.ku.dk](mailto:ddj@nbi.ku.dk))



## **INTRAMIF**

Marie Curie Training network. With INTRAMIF, we bring together experts from atmospheric and climate research, hydrology, oceanography and molecular physics and provide training in these areas for 13 talented Early Stage Researchers (ESR). The ESR projects from the different disciplines are connected by the common theme of Mass independent oxygen isotope fractionation. Danish contributions by Centre for Ice and Climate, Niels Bohr Institute, Univ. of Copenhagen.

**Duration:** 2009–2014

**Contact at NBI/KU:** Thomas Blunier (blunier@nbi.ku.dk)

## **INTIMATE — INTEgrating Ice core, MARine, and TERrestrial records**

COST EU Network managed from Centre for Ice and Climate, Niels Bohr Institute, Univ. of Copenhagen

The objective of INTIMATE is to reconstruct past abrupt and extreme climate changes over the period 60,000 to 8000 years ago, by facilitating INTEgration of Ice core, MARine, and TERrestrial palaeoclimate records and using the combined data in climate models to better understand the mechanisms and impact of change, thereby reducing the uncertainty of future prediction. INTIMATE provides research training to junior scientists and hosts workshops and conferences to facilitate the integration of data and promote the project goals.

**Webpage:** [cost-es0907.geoenvi.org](http://cost-es0907.geoenvi.org)

**Duration:** 2010–2014

**Contact at NBI/KU:** Sune Olander Rasmussen (olander@nbi.ku.dk)

## *MASS BALANCE AND MONITORING*

### **PROMICE – Programme for Monitoring of the Greenland Ice Sheet**

The main task of this monitoring effort is to quantify the annual mass loss from the Greenland Ice Sheet, with an explanation as to its cause. A secondary aim of the programme is to utilize the data collected to gain insight in the mass balance processes and how they connect to the surrounding climate and environment. PROMICE maintains a geographically distributed network of approx. 20 automatic weather stations on the ice sheet margin, carries out repeated airborne surveys of ice sheet elevation and ice depth and works extensively with radar and optical satellite data for ice velocity derivation and ice marginal change. Additionally, PROMICE contributes to the Global Land Ice Measurements from Space (GLIMS) through the establishment of a comprehensive glacier inventory. PROMICE maintains an open access database. The programme demonstrates

the Danish responsibility and will to monitor the development of the Greenland ice sheet in a changing climate.

**Website:** [promice.dk](http://promice.dk)

**Duration:** 2007 onwards

**Collaborators:** GEUS (Lead), ASIAQ, DTU Space  
**Contact at GEUS:** Andreas P. Ahlstrøm (apa@geus.dk)

### **Ice2sea**

An EU FP7 project, ice2sea aims to improve projections of the contribution of ice to future sea-level rise. GEUS participates in ice2sea on several levels: GEUS leads work package 3 (Foundation and validation data) with an overall aim of providing the basic observational data for building and validating the glaciological models applied in ice2sea. Additionally, GEUS participates in work package 2.2 (Basal lubrication by surface melt) where the aim is to obtain a new continuous velocity data set for selected major outlet glaciers from the Greenland ice sheet in order to resolve the annual velocity cycle. GEUS also participates in work package 2.3 (Tidewater glacier calving and ice-ocean interaction) where we will refine estimates of current calving flux and set up a calving model for selected outlet glaciers of the Greenland ice sheet. DMI has provided climate and SMB forcing for the Greenland ice sheet at a resolution of ~27km with the RCM HIRHAM5 and is now running the PISM ice sheet model to make projections of ice sheet change over the 21st century according to different emissions scenarios. NBI/KU leads work package 3.1 with the aim to quantify past and recent accumulation on the Greenland Ice Sheet from a large number of shallow ice cores, both existing and drilled as part of ice2sea. The relationship between accumulation and temperature is investigated and data is delivered to the modelling community. DTU Space participates in work package 3.2, combining GRACE and ICESat results to investigate the relationship between mass loss as observed from gravity change (including an improved GIA correction) and elevation change. Results are further compared to mass balance derived from surface mass balance/ice-calving estimates in an effort to reconcile estimates of current mass loss from the Greenland Ice Sheet from different methods.

**Website:** [www.ice2sea.eu](http://www.ice2sea.eu)

**Period:** 2009–2013

**Partners:** NERC-BAS (Lead), AWI, CSC, DMI, DTU Space, GEUS, NBI, UU, HI, CNRS, MOHC, UiO, ULB, UNIURB, UoB, UoL, VUB, ULG, UZH, US, CECS, ENEA, NPI, IGF-PAS

**Contact at GEUS:** Andreas Peter Ahlstrøm (apa@geus.dk)

**Contact at DMI:** Ruth Mottram (rum@dmu.dk)

**Contact at NBI/KU:** Dorthe Dahl-Jensen, dj@nbi.ku.dk

**Contact at DTU Space:** René Forsberg (rf@dtu.space.dk)

### **Stability and Variations of Land Ice (SVALI)**

The Nordic Centre of Excellence SVALI will study basic cryospheric processes using remote sensing, airborne and in-situ measurements, and carry out advanced Earth System Modelling with focus on land ice in the Arctic/North-Atlantic area. The ultimate goal is to answer these key questions: How fast is land ice volume in the Arctic and North-Atlantic area changing, and why? Will these processes continue to accelerate? What are the consequences for sea-level and ocean circulation? What are the implications for society? GEUS will be involved in observing the present state of the cryosphere, process studies and head the outreach activity of the centre. The DMI Regional Climate Model HIRHAM5 is being upgraded (by improving snow pack, retention and refreezing and albedo parameterizations) to produce high resolution (5.5km) climate simulations to drive ice sheet models including PISM for the Greenland ice sheet. Future scenarios from the EC-Earth coupled Atmosphere-Ocean GCM EC-Earth using the RCP scenarios to 2100 will also be downscaled with HIRHAM5 for Svalbard, Iceland and Greenland. Surface mass balance and other climate fields for ice sheet modelling are output as standard.

**Website:** <http://ncoe-svali.org>

**Duration:** 2010–2015

**Partners:** UiO (Project Lead), NPI, CSC, NBI/KU, DMI, DTU Space, Uppsala University, Norwegian University of Life Sciences, UNIS, Finnish Meteorological Institute, Icelandic Meteorological Office, University of Iceland, Arctic Centre – University of Lapland, Climate Research Centre Greenland, NVE, SU

**Contact at NBI:** Aslak Grinsted (ag@glaciology.net)

**Contact at GEUS:** Signe Bech Andersen (siba@geus.dk)

**Contact at DMI:** Shuting Yang (shuting@dm.dk)

### **RINK – Response of the inland ice-sheet to natural climate changes**

The RINK (Response of Indlandsisen til Naturlige Klimaændringer) project will investigate how the ice margin reacted to earlier periods of warming, the interrelationship between sea-ice and sea-level changes and not at least how its effected human adaptation and migration. Even though the interior of the Greenland Ice Sheet contains the largest mass it is local climatic and topographical conditions that control the discharge of ice – and therefore the intensity of response to climatic

change. RINK pursue a better understanding of the ice marginal dynamic i.e. how and how fast the ice sheet retreated and thinned over timescales of 100–200 years and even up to 1000–3000 years. Raised coastal landforms will indicate if open water or permanent sea-ice prevailed along the coasts, thus enable a new understanding of the sustainability of palaeoeskimos that once lived in Greenland's most inhospitable regions. Finally, by applying 3D-visualization we propose to illustrate the evolution of the ice free land and the ice marginal zone through time, and to enhance the public understanding of the complex geological processes behind the changes of the Greenland Ice sheet during the last 10,000 years.

**Duration:** 2008–2012

**Partners:** Danish Natural History Museum (Lead), Greenland National Museum and Archives, Lund University, GEUS, Bjerknes Centre for Climate Research, NBI/KU, University of London, Geological Survey of Norway

**Contact at SNM:** Kurt Kjær (kurtk@snm.ku.dk)

### **GNET**

Led by Ohio State University's division of Geodetic Science, G-NET is a network of 46 continuous GPS stations spread across Greenland. This network will map the steady vertical velocity field associated with postglacial rebound and improve our understanding of ice mass changes in Greenland, allowing scientists to quickly detect and analyze any abrupt changes in the rate of ice loss in this region.

At selected GNET sites, absolute gravity measurements are conducted in a ~3 year cycle in order to establish time series of gravity change. These data together with the GPS data will provide a unique basis for in-depth studies of cryosphere changes in Greenland and help improve the GIA modelling.

**Duration:** 2007 onwards

**Partners:** Ohio State Uni (lead), Uni. of Luxembourg, UNAVCO, DTU Space

**Contact at DTU:** Bo Madsen (bm@space.dtu.dk)

### **Ice Sheet Mass Balance Intercomparison Exercise (IMBIE)**

The Ice sheet Mass Balance Inter-comparison Exercise (IMBIE) has been established by ESA and NASA as a framework to deliver improved estimates of ice sheet mass balance. The project aims to resolve the apparent disagreement between geodetic estimates of ice sheet mass balance through a coordinated exercise within which estimates are developed from altimetry, gravimetry and mass flux techniques using a common spatial and temporal reference frame and a common appreciation of the contributions due to external signals (e.g. fluctuations in surface



mass accumulation and post glacial rebound). The project brings together a handful of research groups that have been instrumental in developing independent estimates of ice sheet mass balance.

**Webpage:** [homepages.see.leeds.ac.uk/~earkhb/](http://homepages.see.leeds.ac.uk/~earkhb/)

**Duration:** 2011–2012

**Partners:** ESA, NASA and approx. 10 US and European University groups

**Project Leads:** Andrew Shepherd, UL (A.Shepherd@leeds.ac.uk) and Eric Ivins, JPL (Erik.R.Ivins@jpl.nasa.gov).

### **GlacioBasis monitoring programme at the A.P. Olsen Ice Cap**

GlacioBasis is a sub-programme under the Greenland Ecological Monitoring Programme. GlacioBasis monitors glacier mass balance through quantitative field observations from the A.P. Olsen Ice Cap (Northeast Greenland) and from the outlet glacier discharging into the Zackenberg River drainage basin. Three automatic weather stations collect data for surface energy balance and melt modelling from different elevations in the ablation zone. GlacioBasis maintains a network of 15 ablation stakes, and carries out repeated differential GPS surveys and ground penetrating radar surveys of snow depth, calibrating accumulation with density profiles from snow pits. Satellite remote sensing based on optical, thermal infrared, and laser altimetry products from a suite of different satellites and instruments is used to monitor the changes of the ice surface and its physical properties, and to detect the recurrent glacier outburst floods from a glacier dammed lake into the Zackenberg River.

**Website:** [www.zackenberg.dk/Monitoring/GlacioBasis](http://www.zackenberg.dk/Monitoring/GlacioBasis)

**Duration:** 2008 onwards

**Partners:** GEUS (Lead), National Environment Research Institute (NERI)

**Contact at GEUS:** Michele Citterio (mcit@geus.dk)

### **IVEL – Monitoring the outlet glaciers of the Greenland Ice Sheet**

This project aims to quantify the seasonal velocity variation of a number of key outlet glaciers from the Greenland Ice Sheet. This will improve the overall calculation of iceberg calving and bottom melting from the Greenland Ice Sheet, that is the part of the mass loss not due to surface melting. This is accomplished by a combination of photogrammetry from EIS camera systems and GPS's deployed on the tongues of the outlet glaciers.

**Duration:** 2010–2011

**Collaborators:** GEUS (Lead), BPRI/OSU, Arizona University, Extreme Ice Survey (EIS)

**Contact at GEUS:** Andreas P. Ahlstrøm (apa@geus.dk)

### **Mittivakkat Glacier and Sediment Transport Studies, Sermilik Station**

Stereophotos were taken of this glacier in 1933 by K. Milthers. The glacier was since then investigated in 1958, during the international geophysical year (IGY). Mass-balance using a stake network has been carried out since 1994, including both summer and winter balance. Sediment transport is monitored at the outlet from the glacier in order to monitor glacial erosion and proglacial landscape evolution. The glacier is included in the Sermilik Station Arctic Landscape Studies.

**Duration:** 1933, 1958, 1972, 1981 and 1994 and onwards

**Partners:** KU/IGG, AU, GEUS, Danish Natural History Museum

**Contact at KU/IGG:** Morten Pejrup (mp@geo.ku.dk)

**Contact at AAU:** Niels Tvis Knudsen (ntk@geo.au.dk)

**Contact at GEUS:** Robert S. Fausto (rsf@geus.dk)

### *SEA-ICE MODELLING*

#### **North Atlantic–Arctic coupling in a changing climate: impacts on ocean circulation, carbon cycling and sea-ice (NAACOS)**

Arctic sea ice is melting rapidly. Remote sensing has shown that Arctic sea ice thinned dramatically between 2004 and 2008, with thin seasonal ice replacing thick multi-year ice – changes that global circulation models failed to predict.

Local thermodynamic processes and exchange with the atmosphere influence sea ice surface characteristics and hence its albedo, having a significant impact on the sea-ice heat and the distribution of the solar radiation absorbed in the ice-ocean system. These interfacial processes are crucial to our understanding of sea-ice feedbacks and for the correct simulation of the sea ice extent. We will combine preliminary insights gained from the projects DAMOCLES and GreenARC with heat and mass balance measurements from sea ice of different characteristics, which will be gathered by ice mass balance buoys and automatic cameras. Based on this, we will develop improved parameterizations of surface albedo, which will be implemented and tested in the EC-Earth coupled climate model.

**Duration:** 2011–2014

**Webpage:** [www.nacoos.dk](http://www.nacoos.dk)

**Partners:** DTU Aqua, University of Copenhagen, DHI, DMI, Faroee Marine Research Institute, Scottish Marine Institute

**Contact at DMI:** Steffen M. Olsen (smo@dmu.dk)

## HYCOM/CICE

Run at approximately 10x10 km resolution, the HYCOM/CICE coupled ocean–sea-ice model covers Greenland as well as the Arctic and North Atlantic Ocean for numerical ocean and sea-ice prediction purposes. The HYCOM/CICE model is used for statistics on and forecasts of sea ice thickness, concentration and transports as well as ocean currents, temperature and salinity.

**Duration:** Ongoing from 2006

**Partners:** DMI

**Contact at DMI:** Kristine S. Madsen (kma@dmı.dk)

## CLIMATOLOGY AND THE CRYOSPHERE

### DEFROST

DEFROST aims to understand the impact of changes in the cryosphere on ecosystem–geosphere processes, specifically on arctic terrestrial and shallow sub-sea permafrost interactions with climate; to improve data on energy exchange, carbon cycling and GHG emissions from terrestrial and near-coastal cryospheric environments and to improve climate model capabilities for simulating the feedback processes associated with observed changes in permafrost, snow and ice. DMI is modelling the larger scale impacts on atmosphere and climate with improved parameterization of permafrost, snow and ice related processes (both terrestrial and marine) incorporated into the RCM HIRHAM5 and the numerical weather prediction model HARMONIE. Regional downscaling scenarios forced with GCMs will be accomplished with HARMONIE and HIRHAM5.

**Duration:** 2010–2014

**Partners:** DMI, Lund University (Lead)

**Contact at DMI:** Martin Stendel (mas@dmı.dk)

### COMBINE

COMBINE aims to improve Earth system models by incorporating additional processes and representing more Earth system parameters. At DMI the EC–Earth global climate model is being coupled to the PISM Parallel Ice sheet Model for Greenland and Antarctica. To establish a physically sound coupling, the EC–Earth surface scheme is adapted to the land ice surface with an improved snow albedo parameterization and a separate calculation of the snow thermal flux over ice-covered land surfaces. The fully-coupled system is used to investigate the evolution of the ice sheets under different forcings (pre-industrial, 4xCO<sub>2</sub>), including feedback mechanisms and the impacts on the climate system.

**Duration:** 2009–2013

**Partners:** Marco Georgietta (Max Planck Institute for Meteorology, Project Lead)

**Contact at DMI:** Shuting Yang (shuting@dmı.dk)

## CRIOS – Calving Rates and Impact On Sea level

CRIOS aims to develop and improve new and existing glacier models (PISM, ELMER) to incorporate calving and basal hydrology parameterizations that can better predict iceberg loss and the feedbacks on ice dynamics from models. A combination of field work, remote sensing and modelling will be used in this project to produce both development and validation datasets for modelling efforts. DMI is providing the climate forcing fields for the ice models from high-resolution 5.5km runs over Svalbard and Greenland and will incorporate outputs from the CRIOS project into the PISM ice sheet model.

**Duration:** 2012–2015

**Partners:** Doug Benn (UNIS, Project Lead), University of Edinburgh, University of Swansea, University of Aberystwyth and IMAU, University of Utrecht

**Contact at DMI:** Ruth Mottram (rum@dmı.dk)

### Superimp

The project aims to implement the semi-analytical solutions to quantify superimposed ice formation on glaciers in the HIRHAM5 RCM. Data from fieldwork carried out at Tellbreen in Svalbard is being used to develop the parameterization in the model. Future fieldwork is planned to validate the output.

**Partners:** UNIS (Lead), DMI

**Contact at DMI:** Ruth Mottram (rum@dmı.dk)

### DMI–HIRLAM SMB

Run at approximately 5x5 km<sup>2</sup> resolution, the HIRLAM model covers Greenland as well as Svalbard, Iceland and extensive parts of the Arctic and North Atlantic Ocean for numerical weather prediction purposes. Output from the HIRLAM K05 numerical weather prediction model is now being used to estimate the surface mass balance in real time for the Greenland ice sheet. Currently in testing phase, in collaboration with the GEUS–PROMICE project for validation and eventually assimilation purposes, the SMB output will be made live and open access via a web interface.

**Duration:** Ongoing from 1985

**Partners:** DMI (in collaboration with HIRLAM meteorological institutes across Europe), GEUS

**Contact at DMI:** Kristian P. Nielsen (kpn@dmı.dk)

### HIRLAM B

Development of the HARMONIE GLA non-hydrostatic numerical weather prediction model at approximately 2x2 km<sup>2</sup> resolution with application of SW Greenland, in collaboration with both GC-NET and PROMICE for data assimilation purposes, to improve ice sheet weather and climate monitoring in Greenland.

**Duration:** 2011–2015

**Partners:** DMI (in collaboration with HIRLAM and

ALADIN meteorological institutes across Europe), GEUS, CIRES

**Contact at DMI:** Kristian P. Nielsen (kpn@dm.dk)

### **Greenland–SYNOP**

This project aims to present present-day and historical weather climate data from Greenland in an accessible format. Report <http://www.dmi.dk/dmi/tr11-15.pdf> specifies what data is currently available in the archive and this is being updated constantly as new observations become available. Most observations come from automatic weather stations operated around the coast of Greenland by DMI.

**Duration:** 2009–ongoing

**Contact at DMI:** Ellen Vaarby-Laursen (evl@dm.dk) or Claus Kern-Hansen (ckh@dm.dk)

### *ICE SHEET HYDROLOGY*

#### **GAP – Greenland Analogue Project**

Within sub-project A of GAP detailed investigations of the sub-glacial hydrology in the Kangerlussuaq region of the Greenland Ice Sheet are conducted. GEUS is responsible for determining the spatial and temporal variability in surface meltwater production. For this purpose four automatic weather stations were placed at different elevations; three on ice, one on land. KU/IGG and DTU Artek is responsible for recording the sediment transport from the Greenland Ice Sheet in the Watson River near the outlet into the fjord.

**Website:** <http://www.skb.se>

**Duration:** 2008–2013

**Funding:** Swedish Nuclear Fuel and Waste Management Company (SKB), Posiva Oy, Nuclear Waste Management Organization (NWMO)

**Partners:** Sub-project A: Aberystwyth University, Stockholm University, Uppsala University

**Contact at GEUS:** Dirk van As (dva@geus.dk)

**Contact at KU/IGG:** Andreas Bech Mikkelsen (abm@geo.ku.dk)

**Contact at DTU Artek:** Morten Holtegaard Nielsen (mhn@byg.dtu.dk)

#### **WATERundertheICE**

The extent of the presence of water and distribution of melt water under the Greenland Ice Sheet are poorly known. The effect of the water beneath the ice, however, is well documented: it lubricates the bed and removes the friction between the basal ice and underlying bedrock. The primary objectives of the WATERundertheICE project are to map melt water extent of the Greenland ice

sheet and its impact by tracing internal layers and analyzing bedrock returns from airborne radio echo sounding data, and use mapping results in conjunction with ice sheet and hydrostatic models for the movement of the basal water to predict the ice sheet's response to climate change. We will also study the basal material (dust, DNA and microbiological material) and bedrock properties from the deep ice core sites. This will add a further dimension to the study and provide opportunities to look for life under the ice and constrain the age of the Greenland ice sheet.

**Duration:** 2010–2014

**Partners:** NBI/KU, CreSIS

**Contact at NBI:** Dorthe Dahl-Jensen (ddj@nbi.ku.dk)

#### **Ice, water and sediment**

A recently initiated research project at Aarhus University aims at improving computational methods for modelling subglacial processes related to: (1) melt-water modulated stick-slip, (2) subglacial sediment deformation, and (3) subglacial bedrock erosion. It is widely agreed that these processes influence the overall dynamics of glaciers and ice-sheets significantly. However, implementing such processes in large-scale ice sheet models is challenging, partly because the fundamental physics of the subglacial environment is only poorly understood. For example, the mechanical behavior of water-saturated subglacial sediment is still very much debated. We apply a combination of laboratory experiments, field observations and computational modelling.

**Duration:** 2011–2014

**Partners:** Slawek Tulaczyk (University of California) & Jean Braun (Université Joseph Fourier, Grenoble)

**Contact at AU:** David L. Egholm (david@geo.au.dk)

### *COMMERCIAL GLACIOLOGY*

#### **QasiPower – Glaciological hydropower feasibility study near Qasigiannuit**

The potential for hydropower development of a highly glacierized hydrological catchment in the Qasigiannuit area (West Greenland) is investigated by modelling the surface mass balance and meltwater.

**Duration:** 2010–2011

**Partners:** GEUS (Lead), ASIAQ, DTU Space

**Contact at GEUS:** Michele Citterio (mcit@geus.dk)

*SOME ACRONYMS (NOT A COMPLETE LIST)*

GEUS: Geological Survey of Denmark and Greenland  
DMI: Danish Meteorological Institute  
NBI/KU: Niels Bohr Institute, University of Copenhagen  
DTU Space: Technical University of Denmark, National Space Institute  
AU: Aarhus University  
SNM: Danish Natural History Museum  
KU/IGG: Institute for Geography and Geology, University of Copenhagen  
GCRC: Greenland Climate Research Centre, Greenland Institute of Natural Resources  
ASIAQ: Greenland Survey  
UAF: University of Alaska Fairbanks  
OSU/BPRC: Ohio State University, Byrd Polar Research Center  
CreSIS: Centre for Remote Sensing of the Ice Sheets  
NERC-BAS: British Antarctic Survey  
AWI: Alfred-Wegener-Institut für Polar und Meeresforschung  
CIRES: Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder  
UNIS: The University Centre in Svalbard  
UoL: University of Leeds

**Peter Ahlstrøm**

**Ice2sea Partners**

British Antarctic Survey (NERC-BAS, Project Lead), Alfred-Wegener-Institut für Polar und Meeresforschung (AWI), CSC – Tieteelinen Laskenta Oy (CSC), Danish Meteorological Institute (DMI), DTU Space, Danmarks Tekniske Universitet (DTU), Institute of Earth Sciences, University of Iceland (HI), Universiteit Utrecht (UU), Centre National de la Recherche Scientifique (CNRS), UK Met Office – Hadley Centre (MOHC), University of Oslo (UIO), Université Libre de Bruxelles (ULB), Università degli Studi di Urbino (UNIURB), University of Bristol (UOB), The University of Leeds (UOL), Vrije Universiteit Brussel (VUB), University of Copenhagen, Niels Bohr Institute (UCPH), University of Liège (ULG), University of Zurich (UZH), University of Silesia (US), Centro de Estudios Científicos (CECS), Ente per le Nuove tecnologie, l'Energia e l'Ambiente (ENEA), Norwegian Polar Institute (NPI), Instytut Geofizyki Polskiej Akademii Nauk (IGF-PAS)

**SVALI Partners**

University of Oslo (Project Lead), Norwegian Polar Institute, CSC – IT Center for Science Ltd., University of Copenhagen, Danish Meteorological Institute, Uppsala University, Norwegian University of Life Sciences, University Centre in Svalbard, Finnish Meteorological Institute, Icelandic Meteorological Office, University of Iceland, Arctic Centre – University of Lapland, Climate Research Centre Greenland, Norwegian Water Resources and Energy, University of Stockholm



# International Glaciological Society

## *JOURNAL OF GLACIOLOGY*

Papers accepted for publication between 1 January and 30 June 2012. The papers are listed in alphabetical order by first author. Some of these papers have already been published.

Langfjordjøkelen, a rapidly shrinking glacier in northern Norway

Liss M. Andreassen, Bjarne Kjølmoen, Al Rasmussen, Kjetil Melvold, Øyvind Nordli

An enthalpy formulation for glaciers and ice sheets

Andy Aschwanden, Ed Bueler, Constantine Khroulev, Heinz Blatter

Formation of levees and en-echelon shear planes during snow avalanche runout

Perry Bartelt, James Glover, Thomas Feistl, Yves Bühler, Othmar Buser

Relative contribution of surface mass balance and ice flux changes to the accelerated thinning of the Mer-de-Glace (Alps) over 1979–2008

Etienne Berthier, Christian Vincent

Exploring Antarctic subglacial lakes with scientific probes: a formal probabilistic approach for operational risk management

M.P. Brito, G. Griffiths, M. Mowlem

Seismic activity and surface motion of a steep temperate glacier, a study on Triftgletscher, Switzerland

Pierre Dalban Canassy, Jérôme Faillettaz, Fabian Walter, Matthias Huss

Distributed mass balance modelling on two nearby glaciers of Ortles-Cevedale (Italy) from 2004 to 2009

Luca Carturan, Federico Cazorzi, Giancarlo dalla Fontana

Variability in the mass flux of the Ross Sea ice streams, West Antarctica, over the last millennium

Ginny Catania, Christina Hulbe, Howard Conway, T.A. Scambos, C.F. Raymond

Modelling the delivery of supraglacial meltwater to the ice-bed interface: application to the southwest Devon Ice Cap, Nunavut, Canada

Caroline Clason, Douglas W.F. Mair, David O. Burgess, Peter W. Nienow

Inversion of IceBridge gravity data for continental shelf bathymetry beneath the Larsen ice shelf, Antarctica

James R. Cochran, Robin E. Bell

An improved estimate of microbially mediated carbon fluxes from the Greenland Ice Sheet

J.M. Cook, A.J. Hodson, A.M. Anesio, E. Hanna, M. Yallop, M. Stibal, J. Telling, P. Huybrechts

Potential mechanisms for anisotropy in ice-penetrating radar data

Reinhard Drews, Olaf Eisen, Daniel Steinhage, Ilka Weikusat, Sepp Kipfstuhl, Frank Wilhelms

Ice thickness, areal and volumetric changes of Davies Dome and Whisky Glacier (James Ross Island, Antarctic Peninsula) in 1979–2006

Zbynek Engel, Daniel Nývlt, Kamil Láska

Ice dynamics and sediment movement: Scotland

Andrew Finlayson

Dynamic thinning of Antarctic glaciers from along-track repeat radar altimetry

Thomas Flament, Frédérique Rémy

A physically-based method for estimating supraglacial debris thickness from thermal band remote sensing data

L. A. Foster, B. W. Brock, M.E.J. Cutler, F. Diotri

Radio echo probing of Black Rapids Glacier, Alaska, USA, during onset of melting and spring speed-up

Anthony M. Gades, Charles F. Raymond, Howard B. Conway

Conduit roughness and dye-trace breakthrough curves: why slow velocity and high dispersivity may not reflect flow in distributed systems

J. Gulley, P. Walthard, J. Martin A.F. Banwell, D.I. Benn, G. Catania

The effect of discrete recharge by moulins and heterogeneity in flow-path efficiency at glacier beds on subglacial hydrology

J.D. Gulley, M. Grabiec, J.B. Martin, J. Jania, G. Catania, P. Glowacki



Reconstruction of basal properties in ice sheets using iterative inverse methods  
Marijke Habermann, David Maxwell,  
Martin Truffer

An observationally validated theory of viscous flow dynamics at the ice-shelf calving front  
Richard C.A. Hindmarsh

A method for recording ice ablation using a low-cost ultrasonic rangefinder  
M. Len Keeler, Keith A. Brugger

Measurement of strain components in a glacier  
Arne Keller, Heinz Blatter

Well-posed boundary conditions for limited-domain models of transient ice flow near an ice divide

Michelle R. Koutnik, Edwin D. Waddington

Seasonal variations of  $^{17}\text{O}$ -excess and d-excess in snow precipitation at Vostok station, East Antarctica

A. Landais, A. Ekaykin, E. Barkan, R. Winkler, B. Luz

Impact of model resolution on simulated wind, drifting snow and surface mass balance in Terre Adélie, East Antarctica

Jan T.M. Lenaerts, Michiel R. van den Broeke, Claudio Sarchilli, Cécile Agosta

Vibrations of the Mertz glacier ice tongue, East Antarctica

L. Lescarmontier, B. Legrésy, R. Coleman, F. Perosanz, C. Mayet, L. Testut

Deformation and energy of dry snow slabs prior to fracture propagation

David M. McClung

Widespread rifting and retreat of ice-shelf margins buttressing in the eastern Amundsen Sea Embayment between 1972 and 2011

Joseph A. MacGregor, Ginny A. Catania, Michael S. Markowski, Alan G. Andrews

Mass-balance parameters derived from a synthetic network of mass-balance glaciers  
Horst Machguth, Wilfried Haerberli, Frank Paul

Automatic snow surface roughness estimation using digital photos

Terhikki Manninen, Kati Anttila, Tuure Karjalainen, Panu Lahtinen

Salinity and solid fraction of frazil and grease ice  
Sönke Maus, Sara de la Rosa

New short wave infrared albedo measurements for snow specific surface area retrieval

B. Montpetit, A. Royer, A. Langlois, P. Cliche, A. Roy, N. Champollion, G. Picard, F. Domine, R. Obbard

The response of Petermann Glacier to large calving events and its future stability in the context of atmospheric and oceanic warming  
F.M. Nick, A. Luckman, A. Vieli, C.J. Van Der Veen, D. Van As, R.S.W. Van De Wal, F. Pattyn, A.L. Hubbard, D. Floricioiu

Elevation changes of glaciers revealed by multi-temporal digital elevation models calibrated by GPS survey in the Khumbu region, Nepal Himalayas, 1992–2008

Takayuki Nuimura, Koji Fujita, Satoru Yamaguchi, Rishi R. Sharma

Glacier variations in response to climate change from 1972 to 2007 in the western Lenglongling mountains, Northeastern Tibetan Plateau  
Baotian Pan, Bo Cao, Jie Wang, Guoliang Zhang, Chen Zhang, Zhenbo Hu, Bo Huang

Numerical simulations of cyclic behaviour in the Parallel Ice Sheet Model (PISM)

Ward J.J. van Pelt, Johannes Oerlemans

An inexact Gauss–Newton method for inversion of basal sliding and rheology parameters in a nonlinear Stokes ice sheet model

Noemi Petra, Hongyu Zhu, Georg Stadler, Thomas J.R. Hughes, Omar Ghattas

Can the snowline be used as an indicator of the equilibrium line and mass balance for glaciers in the outer-tropics?

Antoine Rabatel, Ana Bermejo, Edwin Loarte, Alvaro Soruco, Jesus Gomez, Gonzalo Leonardini, Christian Vincent, Jean Emmanuel Sicart

The Propagation Saw Test: slope scale validation and alternative test methods

Cameron Ross, J. Bruce Jamieson

Impact of arithmetic asymmetries on simulated thermodynamical ice-sheet evolution

Fuyuki Saito

Extent of low-accumulation ‘wind glaze’ areas on the East Antarctic Plateau: implications for continental ice mass balance

T.A. Scambos, M. Frezzotti, T. Haran, J. Bohlander, J.T.M. Lenaerts, M.R. Van Den Broeke, K.C. Jezek, D.G. Long, S. Urbini, K. Farness, T. Neumann, M.R. Albert, J.-G. Winther

Large surface velocity fluctuations of Biafo Glacier, central Karakoram, at high spatial and temporal resolution from optical satellite images  
Dirk Scherler, Manfred R. Strecker

Simulations of the Greenland ice sheet 100 years into the future with the full Stokes model Elmer/Ice

Hakime Seddik, Ralf Greve, Thomas Zwinger, Fabien Gillet-Chaulet, Olivier Gagliardini

Coupling ice flow models of varying orders of complexity with the Tiling method

Helene Seroussi, Hachmi Ben Dhia, Mathieu Morlighem, Eric Y. Larour, Eric Rignot, Denis Aubry

Changes in area and geodetic mass balance of small glaciers, Polar Urals, Russia, 1950–2008

Maria Shahgedanova, Gennady Nosenko, Irina Bushueva, Mikhail Ivanov

A wireless subglacial probe for deep ice applications

C.J.P.P. Smeets, W. Boot, A. Hubbard, R. Pettersson, F. Wilhelms, M.R. van den Broeke, R.S.W. van de Wal

Snow density along the route traversed by the Japanese–Swedish Antarctic Expedition 2007/08

Shin Sugiyama, Hiroyuki Enomoto, Shuji Fujita, Kotaro Fukui, Fumio Nakazawa, Per Holmlund, Sylviane Surdyk

Automated remote sensing of sediment plumes for identification of runoff from the Greenland ice sheet

Andrew J. Tedstone, Neil S. Arnold

Integrated electrical resistivity tomography (ERT) and self-potential (SP) techniques for assessing hydrological processes within glacial lake moraine dams

Sarah Thompson, Bernd Kulesa, Adrian Luckman

Detection of a subglacial lake in Glacier de Tête Rousse (Mont Blanc area, France)

Christian Vincent, Marc Desclotres, Stéphane Garambois, Anatoly Legchenko, Hélène Guyard, Adrien Gilbert

Dynamic inland propagation of thinning due to ice loss at the margins of the Greenland ice sheet

Wei Li Wang, Jun Li, H. Jay Zwally

Raman spectroscopy of gaseous inclusions in EDML ice core: first results – microbubbles

Christian Weikusat, Johannes Freitag, Sepp Kipfstuhl

Iceberg signatures and detection in SAR images in two test regions of the Weddell Sea, Antarctica

Christine Wesche, Wolfgang Dierking

Carbonaceous particles reveal that Late Holocene dust causes the dark region in the western ablation zone of the Greenland ice sheet

I.G.M. Wientjes, R.S.W. Van De Wal, M. Schwikowski, A. Zopf, S. Fahrni, L. Wacker

Spatial and temporal variation of ice motion and ice flux from Devon Ice Cap, Nunavut, Canada

Wesley Van Wychen, Luke Copland, Laurence Gray, David O. Burgess, Brad Danielson, Martin J. Sharp

Sr–Nd isotope evidence for modern aeolian dust sources in mountain glaciers of western China

Jianzhong Xu, Guangming Yu, Shichang Kang, Shugui Hou, Quianggong Zhang, Jiawen Ren, Dahe Qin

Volume calculation and analysis of the changes in moraine-dammed lakes in the North Himalayas: a case study of Longbasaba Lake

Xiaojun Yao, Shiyin Liu, Meiping Sun, Junfeng Wei, Wanqin Guo



## Book received

Marshall SJ (2012) *The cryosphere*. (Princeton Primers in Climate.) Princeton University Press, Princeton, NJ. 288 pages. ISBN: 978-0-691-14525-9; 978-0-691-14526-6 (paperback)



## ANNALS OF GLACIOLOGY 53(60)

*The following papers have been selected for publication in Annals of Glaciology 53(60) (thematic issue on Interactions of Ice Sheets and Glaciers with the Ocean), edited by Slawek Tulaczyk*

Stable dynamics in a Greenland tidewater glacier over 26 years despite reported thinning

Suzanne L. Bevan, Tavi Murray,  
Adrian J. Luckman, Edward Hanna,  
Philippe Huybrechts

Response of the Ross Ice Shelf to ocean gravity wave forcing

Peter D. Bromirski, Ralph Stephen

The supply of subglacial meltwater to the grounding line of the Siple Coast, West Antarctica

S.P. Carter, H.A. Fricker

Partitioning effects from ocean and atmosphere on the calving stability of Kangerdlugssuaq Glacier, East Greenland

Poul Christoffersen, Martin E.W. O'Leary,  
Jan van Angelen, Michiel R. van den Broeke

Resolution requirements for grounding line modelling: sensitivity to basal drag and ice shelf buttressing

Rupert M. Gladstone, Antony J. Payne, Stephen L. Cornford

On the influence of outlet glaciers in Greenland bed topography on results from dynamic ice sheet models

Ute C. Herzfeld, James Fastook, Ralf Greve,  
Brian McDonald, Bruce F. Wallin, Phillip A. Chen

Optical-televiever-based identification and characterization of material facies associated with an Antarctic ice-shelf rift

Bryn Hubbard, Jean-Louis Tison, Frank Pattyn,  
Marie Dierckx, Thierry Boereboom, Denis Samyn

The role of Pine Island Glacier ice shelf basal channels in deep water upwelling, polynyas and ocean circulation in Pine Island Bay, Antarctica

Kenneth D. Mankoff, Stanley S. Jacobs,  
Slawek M. Tulaczyk, Sharon E. Stammerjohn

Dynamic instability of marine glacier basins of the Academy of Sciences Ice Cap, Russian High Arctic

Geir Moholdt, Torborg Heid, Toby J. Benham,  
Julian A. Dowdeswell

Rock debris in an Antarctic ice shelf

Keith W. Nicholls, Hugh F.J. Corr,  
Keith Makinson, Carol Pudsey

Glacier acceleration caused by the spreading of warm ocean waters around Greenland

Eric Rignot, Ian Fenty, Dimitris Menemenlis,  
Yun Xu

Glacier Jorge Montt (Chilean Patagonia) dynamics derived from photos obtained by fixed cameras and satellite image feature tracking

Andrés Rivera, Javier Corripio, Claudio Bravo,  
Sebastián Cisternas

Sensitivity experiments for the Antarctic ice sheet with varied sub-ice-shelf melting rates

Tatsuru Sato, Ralf Greve

Surface mass balance and stable oxygen isotope ratios from shallow firn cores on Fimbulisen, East Antarctica

Elisabeth Schlosser, Helgard Anschütz,  
Elisabeth Isaksson, Tõnu Martma, D. Divine,  
Ole Anders Nost

Sensitivity of the ice shelf ocean system to the sub-ice shelf cavity shape measured by NASA IceBridge in Pine Island Glacier, West Antarctica

Michael Schodlok, Dimitris Menemenlis,  
Eric Rignot, Michael Studinger

Submarine melting of Greenland's glaciers by Atlantic waters

Fiamma Straneo, David Sutherland,  
David Holland, Carl Victor Gladish,  
Gordon S. Hamilton, Helen Johnson, Eric Rignot,  
Yun Xu, Michele N. Koppes

Ice flow sensitivity to boundary processes: a coupled model study in the Subglacial Lake Vostok area

Malte Thoma, Klaus Grosfeld, Christoph Mayer,  
Frank Pattyn

Oceanic mechanical forcing of the dynamics of a marine-terminating Greenland glacier by ice mélange removal and ocean tides

Jacob Walter, Jason E. Box, Slawek Tulaczyk,  
Emily Brodsky, Ian M. Howat, Yushin Ahn,  
Abel Brown

Numerical experiments on subaqueous melting of Greenland tidewater glaciers in response to ocean warming and enhanced subglacial runoff

Yun Xu, Eric Rignot, Dimitris Menemenlis,  
Michele Koppes

More papers for *Annals* 53(60) will be published in the next issue

## **ANNALS OF GLACIOLOGY 53(61)**

*The following papers have been selected for publication in Annals of Glaciology 53(61) (thematic issue on Physics, Chemistry and Mechanics of Snow), edited by Barbara Turnbull*

Snow cover contamination in urban territories  
(Lefortovo District, Moscow)  
I.V Galitskaya, N.A Romyantseva

Satoru Yamaguchi, Kunio Watanabe,  
Takafumi Katsushima, Atsushi Sato,  
Toshiro Kumakura

Change in snow strength caused by rain  
Yoichi Ito, Hiroki Matsushita,  
Hiroyuki Hirashima, Yasuhiko Ito, Tomoyuki  
Noro

More papers for *Annals* 53(61) will be published  
in the next issue

## **ANNALS OF GLACIOLOGY 54(62)**

*The following paper has been selected for publication in Annals of Glaciology 54(62) (thematic issue on Seasonal Snow and Ice), edited by Matti Leppäranta*

Estimating glacier snow accumulation from  
backward calculation of melt and snow line  
tracking  
John Hulth, Cecilie Rolstad Denby

More papers for *Annals* 54(62) will be published  
in the next issue

## **ANNALS OF GLACIOLOGY 54(64)**

*The following paper has been selected for publication in Annals of Glaciology 53(64) (thematic issue on The Geophysics of the Cryosphere and Glacial Products: properties, processes and technical advances), edited by Bernd Kulessa*

An automated approach to the location of  
icequakes using seismic waveform amplitudes  
Glenn Jones, Bernd Kulessa, Samuel Huckerby  
Doyle, Christine F Dow, Alun Hubbard

More papers for *Annals* 54(64) will be published  
in the next issue



# International Glaciological Society

## *Books and merchandise*



July 2012

## Books



### ***Field Guide to Snow Crystals***

Edward R. LaChapelle

Anyone who has ever scooped up a handful of snow and looked closely at the individual crystals of which it is composed will want to own this book, the first field guide designed to explain to snow rangers, serious students, skiers, mountaineers and nature lovers what can actually be seen with the naked eye or a small hand lens.

The book begins with a clear description of the types of snow crystal, how they are formed, and how they change after they have been developed. A section on snow crystal observation and photography

deals with techniques and equipment for use both in the field and in the cold laboratory. Of greatest interest is the series of almost 50 photographs of great beauty and clarity, taken by the author and described and discussed in detail, including a number that illustrate the metamorphism of crystals under various conditions of duration, pressure and temperature.

Edward R. LaChapelle was Professor Emeritus of Geophysics and Atmospheric Sciences at the University of Washington and worked on avalanche research for the US Forest Service for almost two decades. His recognition that the very large natural variation in snow crystal forms played an important role in avalanche formation led indirectly to the original edition of *Field Guide to Snow Crystals*. He is also co-author of *The ABCs of Avalanche Safety*, co-author with Austin Post of *Glacier Ice*, and author of the original USDA *Snow Avalanche Handbook*. He began his snow career at the Swiss Federal Institute for Snow and Avalanche Research, and as a US Forest service snow ranger, he developed many of the techniques of avalanche forecasting and control in use today.

First published 1969 by University of Washington Press, Seattle, WA, USA

This edition published August 1992

102 pp, 146 × 202 mm, Paper, ISBN: 0 946417 13 X

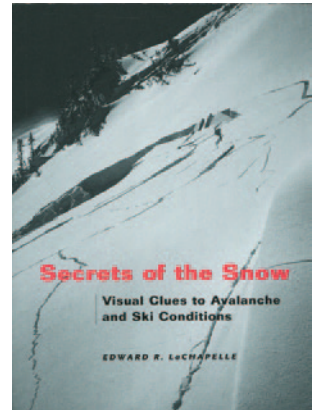
£10.00

***Secrets of the Snow: Visual Clues to Avalanche and Ski Conditions***

Edward R. LaChapelle

The surface of fallen snow – its contours and texture – can tell the interested observer much about the forces that shaped it and about its stability and what it is likely to do. Will it be good for skiing or for packing as a snowball? Will it slide? Is it dangerous?

*Secrets of the Snow* is an overview of the easily visible aspects of snow in the alpine mountain landscape, serving as a companion volume to the author's *Field Guide to Snow Crystals*, which examines snow at the microscopic level. Describing visual snow features and textures arising from climate, wind-drift, layering, solar radiation, and melting, *Secrets of the Snow* explains how snow may be 'read' for information on avalanche formation and suitability for winter sports. Closely linked photographs and text illustrate the shapes, forms, and textures found at the surface of winter snow covers; describe their origins in wind and weather conditions; and guide the reader in interpreting these features to predict snow. *Secrets of the Snow* is essential for winter sports enthusiasts, mountaineers and avalanche-safety specialists.



Published with the University of Washington Press. World rights except in Canada.

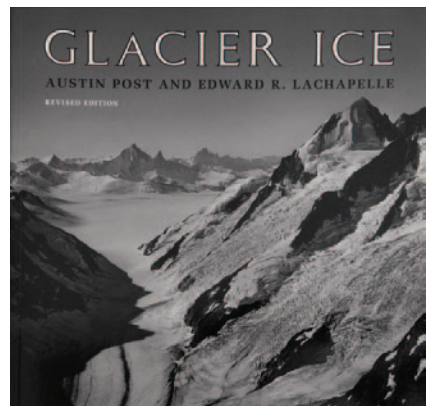
112 pp, 71 illus., bibliog., glossary, index, 6" x 8", Paper, ISBN 0-295-98151-2

£10.00

***Glacier Ice***

Austin Post and Edward R. LaChapelle

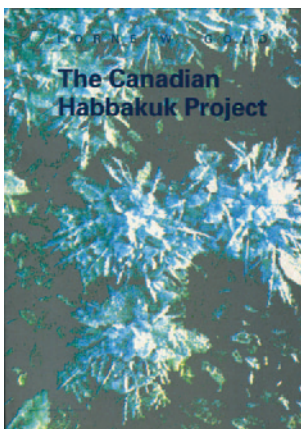
This was the International Glaciological Society's first co-publication venture with the University of Washington Press. First published in 1971, *Glacier Ice* has now been republished in a revised and reformatted edition.



145 pp., 9.75" x 10", Paper, ISBN 0-295-97910-0

£17.00





### ***The Canadian Habbakuk Project***

Lorne W. Gold

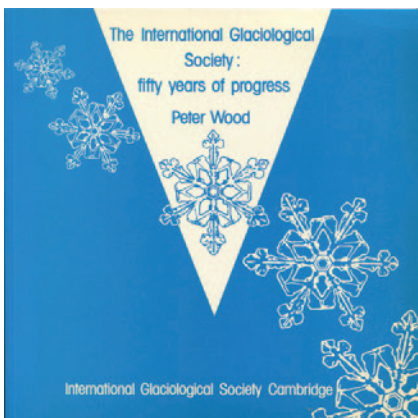
An unusual and little-publicised project of World War II was an investigation into the possibility of building ships of ice. The idea, promoted by Lord Mountbatten, Chief of Combined Operations at the time, was conceived by Dr Pyke, one of his scientific advisors. The scheme was a bold one: to construct huge unsinkable aircraft carriers in such numbers that the words 'shortage of shipping' would lose their meaning. The project was undertaken by the National Research Council of Canada.

The Canadian Habbakuk Project is the account of that scheme. Dr Gold has drawn together archive material from British and Canadian sources, much of which was originally classified as TOP SECRET, and written a lively account of the project, well supported with appendices providing the research background.

Published by the International Glaciological Society 1992

323 pp, 250 × 175 cm, Paper, ISBN 0 946417 16 4

£33.00



### ***The International Glaciological Society: Fifty Years of Progress***

Peter Wood

The history of the Society up to 1986 – published to commemorate our 50th Anniversary.

£11.50

## ***The Heat Budget of Arctic Ice in the Winter***

Aleksandr P. Makshtas

Arctic and Antarctic Research Institute, St Petersburg,  
Russia

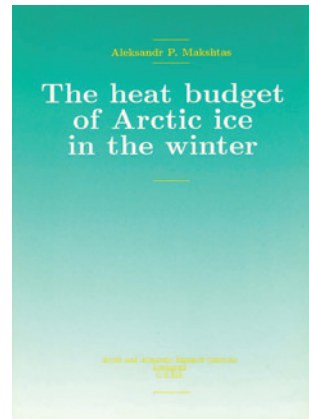
Russian version (ed. Yu. V. Nikolayev) published by  
Gidrometeoizdat, Leningrad, 1984

English translation ed. Edgar L. Andreas  
US Army Cold Regions Research and Engineering  
Laboratory, Hanover, NH, USA

Published by the International Glaciological Society 1991

80 pp, 165 x 235 mm, Paper, 0 946417 12 1

£15.00



## **The International Glaciological Society Porcelain Dish**



This 114mm diameter dish was specially commissioned by the Society and was made by the Royal Worcester Porcelain Company, established 1751.

The ice-crystal design is reproduced from micro-photographs and shows variations on the basic hexagonal shape of crystals formed under differing weather conditions.



£12.00



## Clothing

### The Official International Glaciological Society Tie

---



The tie is made of high-quality silk and the snow crystals are woven into the fabric.

£18.00

### The International Glaciological Society Beanie Hat



This is a high-quality beanie suitable for extensive field use. The shell is knitted in soft-feel acrylic with a Thinsulate® insulation lining.

£15.00

## The International Glaciological Society Fleece Jacket

A rugged, super-heavyweight fleece for general outdoor use, with zipped pockets and an adjustable drawstring at the lower edge.



£27.00

### The International Glaciological Society

Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER, UK

Tel: +44 (1223) 355 974

Fax: +44 (1223) 354 931

E-mail: [sales@igsoc.org](mailto:sales@igsoc.org)

Web: <http://www.igsoc.org>

# Order form

Please send by mail, fax or e-mail attachment to the IGS at the address overleaf

<b>Quantity</b>		<b>Price</b>	<b>Total</b>
<input type="checkbox"/>	<i>Field Guide to Snow Crystals</i>	10.00	£_____
<input type="checkbox"/>	<i>Secrets of the Snow</i>	10.00	£_____
<input type="checkbox"/>	<i>Glacier Ice*</i>	17.00	£_____
<input type="checkbox"/>	<i>The Canadian Habbakuk Project*</i>	33.00	£_____
<input type="checkbox"/>	<i>The IGS: Fifty Years of Progress</i>	11.50	£_____
<input type="checkbox"/>	<i>The Heat Budget of Arctic Ice in the Winter</i>	15.00	£_____
<input type="checkbox"/>	The IGS Dish	12.00	£_____
<input type="checkbox"/>	The IGS Tie	20.40	£_____
<input type="checkbox"/>	The IGS Beanie Hat	15.00	£_____
<input type="checkbox"/>	The IGS Fleece Jacket	30.00	£_____

*Total value of goods ordered* £\_\_\_\_\_

<b>Postage</b>	<b>UK</b>	<b>EU</b>	<b>RoW</b>
Book	£2.00	£4.00	£4.50
Book*	£5.30	£7.00	£7.50
Dish /Tie /Beanie	£2.00	£3.25	£5.00
Fleece	£4.00	£5.00	£5.50

*Total cost of postage* £\_\_\_\_\_

**Grand Total** £\_\_\_\_\_

I enclose a cheque for £\_\_\_\_\_ payable to International Glaciological Society

Payment by MasterCard, VISA or American Express

Card number

Expiration   /   CVV (last 3 numbers on signature strip)

Name of card holder as shown on card: \_\_\_\_\_

Signature: \_\_\_\_\_



## REPORT FROM THE NEW ZEALAND BRANCH MEETING

**Snow & Ice Research Group (New Zealand) Annual Workshop**  
Twizel, New Zealand, 13–15 February 2012

As the bus topped the forested saddle of Burkes Pass, the driver said, 'This is the MacKenzie Basin, the only place in New Zealand named after a criminal.' The criminal, I found, was the most notorious sheep rustler in the history of New Zealand. In the 1850s, James MacKenzie herded this beautiful intermontane basin with sheep he rustled from elsewhere on New Zealand's South Island. 'It wasn't me,' he was said to have explained at his criminal trial, 'it was me dog that did it.'

As my bus drove on, the landscape turned from the forested foothills and lush pastures of the Canterbury district, to the dry but colorful open landscape where the world's most spectacular evidence of climate change is embodied by moraines and striking turquoise lakes, below the mists and gleaming peaks of the Southern Alps. After passing Lakes Taupo and Pukaki, the bus entered the small town of Twizel, the venue for the 2012 Annual Workshop of the Snow & Ice Research Group (NZ), which serves as a branch of the IGS. As Aoraki, the cloud maker (Mt Cook) shrugged the clouds from its shoulders to reveal the spectacular alpine front rising from roughly 700 meters to 3754 m, I alighted from the bus and realized that my original reluctance to travel so far to attend the last of many IGS branch meetings during the first year of my watch as POTIGS (president of the IGS), was easily cast aside.

The 3-day meeting was sited at the Lake Ruataniwha Rowing Centre-Twizel, an athletic complex devoted to the Olympic sport of rowing.



Sebastian Vivero and Clare Webster enjoy the annual workshop of the SIRG.



Huw Horgan, of Victoria University in Wellington, gives a cheerful presentation on his current research.

This year's SIRG workshop was generously sponsored by Antarctica New Zealand, Meridian Energy (the premier 'green energy' producer of New Zealand, and responsible for the impressive hydroelectric network that occupies the MacKenzie Basin, and that depends intimately on the snows of the southern alps that drain through the basin), NIWA, New Zealand's water and atmospheric research institute, Gateway Antarctica of the University of Canterbury, Glacier Explorers (a private glacier tour company that supplied the SIRG's excursion), the Sir Edmund Hillary Alpine Centre of the Aoraki/Mt Cook National Park, and the IGS (through a generous donation from a member, a happy hour reception was provided one of the evenings).

As with the previous branch meetings of the IGS I attended, the SIRG strongly featured younger members of the research community, including students (both under- and postgraduate) as well as the usual senior members of New Zealand's outstanding glaciological community. There were six oral sessions covering the following topics: surface mass balance of the New Zealand alpine glacier system (Ruzika Dadic, Jono Conway, Clare Webster, Heather Purdie and Alice Doughty), hydrology and mass balance of permafrost (including a signature lecture by New Zealand's great glaciologist, Trevor Chinn, entitled



Inka Koch and Stefan Vogel discuss glaciology on the lawn in front of the lecture venue.



Trevor Chinn, one of New Zealand's best glaciological resources.

'unhinged at the snowline...'. Wilfried Hagg, traveling all the way from Munich, Germany, to share his research on the impact of glacier mass balance in the Amu Darya catchment of Tajikistan, David Alexander, Kolja Schaller, Katrin Sattler, Gregor Macara, Ricahrd Jones and Shaun Eaves). Antarctic snow and ice research (Rory Hart, Bob Moonan, Ben Thompson, Alex Gough, Daniel Price, Ken Hughes, Stephan Vogel, traveling from Australia, Huw Horgan, Oliver Marsh, winner of the best student presentation award for the SIRG2012, Inka Koch and myself), New Zealand Glacier Dynamics (Robert Dykes, Todd Redpath, Brian Anderson, whose hairstyle, it was explained, resulted from being too close to a flash of combustion created by lighting a match to a campfire wood pile soaked in gasoline, Andrew MacKintosh, one of the founders of the SIRG and the local NZ correspondent for the IGS, and Laura Kherl), and the meeting wrapped up with

a session on remote sensing (with Ekki Scheffler, Sebastian Vivero, Tim Kerr and Pascal Sirguey).

A highlight of the first day was the evening plenary lecture by Jennifer Purdie, a scientist with Meridian Energy ([www.meridianenergy.co.nz](http://www.meridianenergy.co.nz)), a co-sponsor of the meeting. Jennifer provided a fascinating look at the science and technology of New Zealand's premier hydroelectric generation scheme focused around the lakes and rivers that drain the Southern Alps immediately to the west of the basin. One of the major technological issues of supplying so much 'glacier-friendly energy' to New Zealand consumers is the fact that the total volume of the various lakes (with moraine dammed lakes Tekapo, Pukaki and Ohau being the largest) is only roughly 10% of the annual runoff of the rivers that feed the lakes. This means that the engineers who determine the rates at which the lakes drain through the hydroelectric turbines must pay close attention to snowmelt runoff forecasts to keep the lake levels from exceeding low- and high-stand limits determined by environmental concerns.



The SIRG afternoon excursion hikes along the rolling terrain of the moraine surrounding Lake Pukaki.

By far the highlight of the workshop was the afternoon excursion to the Lake Pukaki Otiran (glacial maximum) Moraines, the Aoraki visitor center and the spectacular boat trip on a proglacial lake to view the calving face of the Tasman Glacier and recently calved icebergs. Although rain (renowned for depositing >12 meters of water equivalent along the axis of the Southern Alps) threatened constantly, the group carried on without complaint to examine the moraine and outwash landscape at the lower end of Lake Pukaki. There, Alice Gough, a recent PhD graduate of Victoria University in Wellington, led a discussion of the





Andrew MacKintosh looks on approvingly as the excursion stops for a discussion of geochronometry.

latest geochronometric methods. After a pleasant, relatively rain-free hike to a classic kettle hole, Doug MacAyeal and Trevor Chinn engaged in a spirited debate about a nearly perfect circular feature at the base of the kettle. Doug claimed that this circle was a true manifestation of a 'numerical grid point' whereas Trevor suggested that it was simply a 'moa circle' (Trevor explained that the now-extinct giant moa were relatively lazy birds, and liked to stand in one spot, slowly rotating around the spot eating the vegetation, hence the circular path of denudation.)

Following the moraines of Pukaki and a brief stop at the interpretive center of Aoraki/Mt Cook National Park, the excursion proceeded to the signature experience made possible by the



The SIRG 2012 participants prepare to embark on Lake Tasman to view the calving face and icebergs. Three small icebergs in the far end of the lake are back-dropped by the terminal moraine of the Holocene stand of the Tasman Glacier.



The NZ glaciological community is a 'winning bunch' and so takes the winner's podium at the Lake Ruataniwha Rowing Centre for the group photograph of the SIRG 2012 workshop.

generous support of the Glacier Explorers tour company of the local area. After a hike across the Holocene aged terminal moraine of the Tasman Glacier, serving as the natural dam to hold the 6 km long (and growing) proglacial lake into which the Tasman Glacier currently calves, the party donned life jackets and boarded small boats to travel up the lake toward the calving face. Although wet and very chilly, the participants enjoyed a unique up-close view of icebergs, and the various types of ice that are on display due to the constant overturning and break-up of the icebergs. Trevor Chinn pointed out the visible distortions of bedding in the face of the Tasman Glacier that were caused by upstream confluence of the Tasman with its several tributaries. He also pointed out an interesting deposit of dead ice that was left perched atop a sub-lake-level bedrock high, and discussed the sediment dynamics of the newly formed proglacial lake which was now depriving the braided river system downstream of the coarser sediments. After warming up from the boat trip with a brisk walk across the terminal moraine back to the vans, the excursion proceeded to its final stop at the Glentanner Restaurant, for an IGS-sponsored happy hour (featuring South Island's wonderful wines and beers) and a meal. The talks on the morning of the third day were attended by a number of scientists associated with the Australasian Quaternary Association (AQUA, <http://www.aqua.org.au>), which was meeting in nearby Tekapo. The SIRG 2012 annual workshop was organized by Wolfgang Rack, Heather Purdie, Oliver Marsh and Daniel Price of the University of Canterbury, Christchurch, New Zealand.

### Doug MacAyeal



INTERNATIONAL GLACIOLOGICAL SOCIETY

International Symposium on  
**Changes in Glaciers and Ice Sheets:**  
observations, modelling and environmental interactions



Beijing, China  
28 July–2 August 2013

*Co-sponsored by:*

- ❄ Institute of Tibetan Plateau Research,  
Chinese Academy of Sciences (ITP, CAS)
- ❄ Cold and Arid Regions Environment and Engineering Research  
Institute, Chinese Academy of Sciences  
(CAREERI, CAS)
- ❄ Chinese Academy of Sciences (CAS)
- ❄ National Natural Science Foundation of China (NSFC)
- ❄ Third Pole Environment (TPE)

FIRST CIRCULAR

February 2012

<http://www.igsoc.org/symposia/>

<http://www.localsite.cn/>



The International Glaciological Society will hold an International Symposium on 'Changes in Glaciers and Ice Sheets: observations, modelling and environmental interactions' in 2013. The symposium will be held in Beijing, People's Republic of China, from 28 July to 2 August 2013

#### THEME

Glaciers and ice sheets are important components that control sea level change. In response to a warming climate, Greenland and West Antarctic ice sheets have significantly lost mass during the last decade, and mountain glaciers worldwide have rapidly declined. Changes in mountain glaciers have direct impacts on human activities, especially in mid-latitude regions, where high-altitude snow and ice contribute to the hydrological controls of human activity. Therefore, the symposium specifically includes topics pertinent to the Earth's 'Third Pole'. To improve our understanding of the dynamics of cryospheric change, interactions with the climate and impact on the living environment of mountainous regions, it aims to provide a general discussion of changes in these components of the global cryosphere with broader aspects from recent in situ observations, remote sensing measurements and modelling efforts.

#### TOPICS

Meeting participants are encouraged to present on a wide variety of topics. These include:

1. *Assessment of the current state of ice sheets and glaciers*, and their trajectories of change, determined by remote sensing, including airborne and satellite
2. *Remote sensing methodologies and techniques* for providing critical information on glacier and ice sheet profiles, thickness, melt patterns, flow fields, snow layer characteristics and other parameters relevant to the changing cryosphere
3. *Ground-based field studies* of glacier and ice sheet change, including in-situ observations of mass and dynamic changes of mountain glaciers, ice caps, ice sheets and ice shelves, glacier inventories and firn layers, permafrost, snow cover, and observation method
4. *Ice-core records* of past change that is relevant to understanding the current changing states of ice sheets and glaciers both in polar and non-polar environments; special emphasis will be placed on ice-core records from Asia
5. *Subglacial and proglacial sediment-landform* records relevant to understanding present rates of ice sheet and glacier change
6. *Glacier and ice sheet mass balance*, including glacier meteorology, surface energy exchange, snow accumulation processes, mass-balance indices and the relation between glacier mass balances and atmospheric indices. Verification and assessment from in situ observations and remote sensing techniques. Challenges related to scaling assumptions
7. *Assessment of changing ice in the 'Third Pole'*, impacts and drivers. Including glacier monsoon meteorology, dust impact on snow and ice albedo, proglacial lake dynamics, debris-cover effects and human impacts, commonalities between Asian and South American glacier systems
8. *Modelling the processes of glacier and ice-sheet change*, including the thermal and mechanical processes that govern how ice-sheets and glaciers respond to changing environmental conditions. Partitioning of climatic and dynamic mass-balance components, key unknowns, critical observations and limitations to progress
9. *Projection and prediction* of changing glaciers and ice sheets, response to climate change, ice-atmosphere-ocean iterations. Challenges of downscaling methods. Model intercomparison. Sea-level rise experiments specifically designed to inform policy makers, including the AR6 of the IPCC
10. *Glacio-hydrological processes* that have a bearing on accelerating current rates of ice-sheet and glacier change, including the impact of meltwater and subglacial processes in glacier

changes, supraglacial water effects, ice-shelf stability in response to surface meltwater ponding, surface lakes on Greenland, moulin dynamics

11. *Hazards and societal impacts* relating to changing glaciers and ice sheets, including the contribution of glacier wastage on sea-level rise, water resources in different climate, glacier engineering, glacier hazards, glacier outburst floods, ocean circulation, terrestrial and marine bio-geochemical cycles and ecosystems, as well as isostatic changes
12. *General glaciology*: all topics relevant to glaciological science are welcome at the symposium (subject to time and space availability); however, presenters wishing to publish papers on topics not related to those listed above will be invited to submit their manuscripts to the *Journal of Glaciology* rather than to the specifically themed *Annals of Glaciology*.

Additional topics may be added on the basis of requests and abstract submissions. Questions and ideas can be referred to the co-Chief Editors/ co-Chairs of the Scientific Committee.

#### PROGRAMME

The symposium will consist of a mixture of oral and poster sessions, with a large amount of free time to allow participants to exchange scientific information in an informal setting. Wednesday afternoon will be reserved for a symposium activity or excursion. A symposium banquet will be held on Thursday evening. A post-symposium tour to the Tibetan Plateau and glaciers is currently being contemplated by the organizing committee and will be announced later.

#### ABSTRACT AND PAPER PUBLICATION

Participants wishing to present a paper at the symposium are required to submit an abstract. A digest of submitted abstracts will be provided to all participants at the symposium. The Council of the International Glaciological Society has decided to publish a thematic issue of the *Annals of Glaciology* on topics consistent with the Symposium themes. Participants and non-participants alike are encouraged to submit manuscripts for this volume.

#### SYMPOSIUM ORGANIZATION

Magnús Már Magnússon (International Glaciological Society)

#### SCIENCE STEERING AND EDITORIAL COMMITTEE

Douglas MacAyeal (University of Chicago, USA) and Weili Wang (NASA, USA),  
Co-Chief Editors. Scientific editors for the special themed issue of *Annals of Glaciology* will be chosen in the near future.

#### LOCAL ORGANIZING COMMITTEE

Qin Dahe (Co-Chair), Yao Tandong (Co-Chair), Weili Wang, Ren Jiawen, Ding Yongjian,  
Wang Ninglian, Tian Lide, Xu Baiqing, Kang Shichang, Wu Guangjian

#### FURTHER INFORMATION

If you wish to attend the symposium please log on to the IGS website at <http://www.igsoc.org/symposia/2013/china/preregistration/> and register your details and interest in attending the symposium.

Although we strongly encourage prospective attendees to register online it can also be done by filling in and returning the form on the back page of this circular as soon as possible.

The Second Circular will give further information about accommodation, the general scientific programme, additional activities, preparation of abstracts and final papers. Copies will be sent to those who pre-register or return the attached reply form. Members of the International Glaciological Society will automatically receive one. Information will be updated on the conference website, <http://www.igsoc.org/symposia/2013/china/> and the local website when this is set up (a link will be introduced on the IGS site).

**INTERNATIONAL SYMPOSIUM ON CHANGES IN GLACIERS AND  
ICE SHEETS: OBSERVATIONS, MODELLING AND ENVIRONMENTAL  
INTERACTIONS**

Beijing, China  
28 July–2 August 2013

Family name: \_\_\_\_\_

Given name(s): \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

I hope to participate in the Symposium in July/August 2013

I expect to submit an abstract

My abstract will be most closely related to the following topic(s):

\_\_\_\_\_

\_\_\_\_\_

PLEASE RETURN AS SOON AS POSSIBLE TO:

Secretary General, International Glaciological Society  
Scott Polar Research Institute  
Lensfield Road  
Cambridge, CB2 1ER, UK

Tel: +44 (0)1223 355 974

Fax: +44 (0)1223 354 931

E-mail: [igsoc@igsoc.org](mailto:igsoc@igsoc.org)

Web: <http://www.igsoc.org>



INTERNATIONAL GLACIOLOGICAL SOCIETY

International Symposium on  
Radioglaciology



Lawrence, Kansas, USA  
9–13 September 2013

*Co-sponsored by:*

- ❄️ Center for Remote Sensing of Ice Sheets (CReSIS)
- ❄️ US National Science Foundation (NSF)
- ❄️ University of Kansas (KU)
- ❄️ KU School of Engineering

FIRST CIRCULAR

May 2012

<http://www.igsoc.org/symposia/>

<http://www.cresis.ku.edu>

The International Glaciological Society (IGS) will hold an International Symposium on Radioglaciology in 2013. The symposium will be hosted by the Center for Remote Sensing of Ice Sheets (CReSIS). It will be held at the University of Kansas, Lawrence, KS, USA, from 9–13 September 2013.

#### THEME

This symposium will take a comprehensive look at the latest technological innovations in radars and signal processing techniques for investigating ice-sheets, glaciers and their geophysical settings, with emphasis on polar and other logistically challenging settings. Recent advances in radio frequency, microwave, and digital technologies have enabled the development of innovative radars that are used to sound and image glacial ice in new ways. This has allowed researchers to produce 3-D images of the ice-bed interface even when that surface is covered by more than 3 km of ice. Radars have been developed that can successfully sound most challenging areas such as fast-flowing glaciers and ice-sheet margins. In addition, ultra-wideband radars are being used for fine-resolution mapping of near-surface internal layers in polar firn, for strain rate measurements, ice melt, and other innovative applications. The symposium will cover recent measurements and signal processing advances that are leading to new discoveries. It will also examine the observational needs of the next-generation ice sheet models, and how radioglaciology can support modeling requirements. The overarching purpose of this meeting is to discuss the latest technical improvements in radars and signal-processing techniques for polar research, to present recent measurements, and to report on analyses and interpretations of recent observations. Additionally, the meeting will provide an opportunity to discuss observational requirements for radars that will most benefit and support development and validation of next-generation ice-sheet models.

#### TOPICS

Meeting participants are encouraged to present on a wide variety of topics tied to radioglaciology. These include

1. Radars and signal processing techniques for sounding and imaging of polar ice-sheets.
2. Ultra-wideband radar technology and innovative polar research applications.
3. Recent observations and results over the Greenland and Antarctic ice sheets.
4. Enhancements of radar measurements needed for improving next-generation ice-sheet models.
5. Refining algorithms for basal condition assessment.
6. Addressing the gap in radar capabilities for surface-based observations using radar/seismic intercomparisons.
7. Remote sensing techniques for smaller ice masses and ice masses in logistically challenging areas outside the poles.

Additional topics may be added on the basis of request and abstract submissions. Questions and ideas can be referred to members of the science steering committee.



## PROGRAM

The symposium will consist of a mixture of oral and poster sessions, with free time planned to allow participants to exchange scientific information in an informal setting. An excursion to the Kansas Flint Hills, a prairie nature preserve in eastern Kansas, is planned. A symposium banquet will also be held.

## ABSTRACT AND PAPER PUBLICATION

Participants wishing to present a paper at the symposium are required to submit an abstract. A digest of submitted abstracts will be provided to all participants at the symposium. The Council of the International Glaciological Society has decided to publish a thematic issue of the *Annals of Glaciology* on topics consistent with the Symposium themes. Participants and non-participants alike are encouraged to submit manuscripts for this volume.

## SYMPOSIUM ORGANIZATION

Magnús Már Magnússon (International Glaciological Society)

## SCIENCE STEERING AND EDITORIAL COMMITTEE

Prasad Gogineni (University of Kansas, USA), Chair of the Scientific Committee; David Braaten (University of Kansas, USA), Chief Editor; scientific editors Sridhar Anandakrishnan (Penn State University, USA), Dorthe Dahl-Jensen (University of Copenhagen, Denmark), Hugh Corr (British Antarctic Survey, UK).

## LOCAL ORGANIZING COMMITTEE

Sivaprasad Gogineni (Chair), Carl Leuschen, John Paden, Leigh Stearns, Cornelis van der Veen, Stephen Yan.

## SYMPOSIUM REGISTRATION AND ABSTRACT SUBMISSION

If you wish to attend the symposium please log on to the IGS website at <http://www.igsoc.org/symposia/2013/kansas/preregistration/> and register your details and interest in attending the symposium.

Although we strongly encourage prospective attenders to register online it can also be done by filling in and returning the form on the back page of this circular as soon as possible.

The Second Circular will provide further information on accommodation, the general scientific program, additional activities, preparation of abstracts, final papers and the deadlines for submission. Registration confirmation, followed by copies of the Second Circular, will be sent to those who pre-register or submit abstract topic information online. Members of the International Glaciological Society automatically receive this information. Information will be updated on the conference website, <http://www.igsoc.org/symposia/2013/kansas/> and the local website <https://www.cresis.ku.edu/meetings/conferences/> (a link will be introduced on the IGS site).

If you have any questions about registration or submitting an abstract, please contact the IGS directly.

# INTERNATIONAL SYMPOSIUM ON RADIOGLACIOLOGY

Lawrence, Kansas, USA  
9–13 September 2013

Family name: \_\_\_\_\_

Given name(s): \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_

I hope to participate in the Symposium in September 2013

I expect to submit an abstract

My abstract will be most closely related to the following topic(s):

\_\_\_\_\_

\_\_\_\_\_

PLEASE RETURN AS SOON AS POSSIBLE TO:

Secretary General, International Glaciological Society  
Scott Polar Research Institute  
Lensfield Road  
Cambridge, CB2 1ER, UK

Tel: +44 (0)1223 355 974

Fax: +44 (0)1223 354 931

E-mail: [igsoc@igsoc.org](mailto:igsoc@igsoc.org)

Web: <http://www.igsoc.org>

# ❄ Meetings of other societies

## Northwestern Glaciologists Meeting, Portland, Oregon, USA, 14–15 October 2011

It happens every Fall, as the leaves begin to turn or the snow flurries begin to fall (depending on your latitude). All of the glaciologists of the Northwestern United States feel it, the mysterious pull, that curious desire to gather with their fellows and exchange the bits and pieces of knowledge that are so vital to their existence. Each year they choose a different locale, by a strange algorithm known only to themselves.

This year, 14 October found them trickling by threes and fours into a conference hall on the campus of Portland State University, where Andrew Fountain of PSU awaited them in a small conference room with a large coffee urn – the latter an especially welcome sight for the glaciologists who had driven in just that morning. Coffee and pastries in hand, badges haphazardly dangling, everyone took their seats surprisingly close to the official start time. The Meeting of the Northwest Glaciologists had begun.

Although the organizers at PSU attempted to defy a long-established tradition of ad hoc schedule creation by printing up a schedule before the meeting began, it didn't take long for it to be marked up with enough arrows and pencilled-in talks to satisfy the most chaos-loving of attendees. Magnús Már Magnússon kicked off the meeting with announcements of interest to members of the International Glaciological Society, including the Society's efforts to embrace the exciting-yet-bewildering world of social media. A Twitter account, a Facebook page, and a proposed IGSOB blog promise to improve the society's connectedness and perhaps even its potential for outreach beyond the perimeters of glaciology country. Magnús encouraged Society members to bring their students and colleagues into the fold, both for the benefit of the Society itself and to support an independent journal in defiance of academic behemoths who endeavor to establish a monopoly.

Alpine glaciers, climate, and the interactions between took up the rest of the morning session. The convivial atmosphere of the session was capped off with an en masse visit to Portland's famous Food Carts, just a few blocks off campus, offering everything from American burgers to Malaysian laksa.

The afternoon session covered more alpine glaciers, and their cousins the tidewater glaciers



The venue – Portland State University.

and ice shelves. As the afternoon session wore on, with report after report of glaciers rapidly wasting away, session moderator Ed 'The Hammer' Waddington inquired somewhat wistfully whether anyone was planning to discuss glaciers not in retreat. Soon, however, we were all distracted somewhat from the problem of melting ice by the pounding bass beat that began to filter down from the ceiling. Kat Huybers soldiered gamely on with her talk as one of the organizers hurried upstairs to request that the noise be moderated. The sounds of music and running feet continued to add a chaotic counterpoint to the talks throughout the afternoon. Andrew Fountain, undeterred by distractions, finished off the session by reassuring Ed that at least a few glaciers, in the Dry Valleys, were not yet in retreat.

A certain amount of the usual milling around ensued until the beginning of the icebreaker at gracious host Andrew Fountain's house, a short if slightly confusing drive away. Andrew, with Magnús's help, had laid out a quantity of pizza and beer sufficient to sate even hungry and thirsty glaciologists. Kegs of local brew continued flowing long into the night, despite the taxing mental effort expended that day and early schedule for the next.

Saturday dawned bright and far too early. (Fortunately, few attendees needed to take the time to shave; as one speaker noted on Friday, 'I have never been in a room with so much facial hair'.) The short but wide-ranging initial session,



Magnús kicked off the meeting.

labeled 'Remote Sensing/Snow/Ice Cap/Dry Valleys' on the schedule, suited the audience's barely-wakened morning attention span.

Portland obliged the gathering with another uniquely local lunch opportunity, this time a sprawling farmer's market conveniently located immediately outside the conference building. The plethora of artisan breads, locally-grown produce, vegan tamales and other Portlandish delights dazzled the attendees.

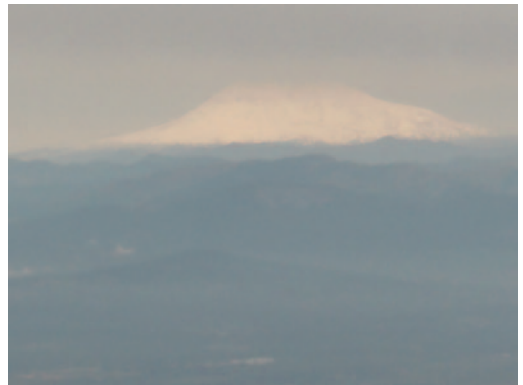
Saturday afternoon started off with Magnús again, pitching the stylish and infinitely useful IGS tie, before segueing into news of various community models. Steve Price discussed CISM, the Community Ice Sheet Model, and its ongoing upgrades, especially for speed and parallelization. He noted that although the release of version 2.0 had been imminent for the last eight or ten months, it was now extremely imminent and would surely be out very soon. Version 2.1, including large-scale parallelization ability, would follow.

Marijke Habermann and Andy Aschwanden reported on PISM, the Parallel Ice Sheet Model, and efforts to use it for inverse modeling. Marijke discussed a library of inverse problems (SIPLE, the Simple Inverse Problems Library) now available online, and some ideas for using PISM with inverse methods.

Ed Waddington started his talk by pointing out that the Russian icebreaker Vladimir Ignatyuk, engaged by NSF to help resupply McMurdo station for the 2011 2012 season, was not as exotic as the name might first suggest in fact, it was built in our own backyard, the Victoria Yard in Victoria, BC. Ed went on to discuss the continuing development of a community firm model, including the various sub-models being developed at the University of Washington (gas diffusion and thermomechanical modeling)



We all enjoyed shopping at the local market.



Mount Hood – an ever-present Oregon landmark.



There was plenty of time for socializing.

and the ICEICS (International Collaboration and Education in Ice Core Science) plan to release a preliminary model in Fall of 2012.

**Regina Carns**





Andrew Fountain was a generous host.

### NWG – a poem

The men and women toil away  
 Wreathed in Pacific mist  
 Until the day the clarion call  
 Goes out on Cryolist  
 'Come one, come all,' the email says  
 Exuding warmth and cheer  
 'Hooray!' say glaciologists,  
 'NWG is here!'

From all along the Western edge  
 Of this great continent  
 They left their labs and offices  
 And in small bands they went  
 To Portland, fabled Mecca  
 For the fans of bean and brew  
 And home to the iceologists  
 Ensnconced in PSU.



Portland is the micro-brewery capital of North America.

The day dawned drab and drizzly  
 As the guests all trickled in  
 Lining up for badge and coffee,  
 They all waited to begin.  
 Magnus kicked off, exhorting us  
 To join the IGS  
 And tell our friends, and tweet and blog  
 On things of interest.

Presenters spoke of thermal  
 Structure, and drainage subglacial.  
 They talked about erosion  
 And its shape and aspects spatial.  
 An ice core from Mt Waddington,  
 A northwest glacier survey,  
 And why a glacier will not calve  
 When sea ice gets in her way.



Getting the beer on tap.

As noontime passed, a hunger  
 Began subtly to intrude  
 For in nearby carts awaited  
 Cornucopias of food.  
 Several dozen glaciologists  
 Went traipsing out to eat  
 And returned, all pleased and sated  
 As they each re-took a seat.

Magnus urges everybody  
 To acquire a snazzy tie.  
 It's something you can fiddle with  
 As post-noon talks flow by:  
 Extreme subglacial pressure,  
 Melt runoff in Glacier Bay,  
 Yakutat's tongue disintegrates  
 And quickly floats away.



Inverse retreat of grounding lines,  
Laser-based altimetry,  
Some glaciers in the North Cascades  
Seem somewhat prone to flee.  
Mount Daniels has some glaciers  
With mass balance in the black,  
But Midgardgletscher's wasting  
And Three Sisters melting back.

Model glaciers show large variance  
With inputs that are random;  
Shadows tell us elevations  
If we can just understand 'em.  
Dry Valleys observations:  
Mullins glacier, water tracks.  
Surface roughness up in Greenland –  
Get it right and don't be lax.

On glacier after glacier  
The presenters had their say  
With dire news of melting  
And retreating day by day.  
Ed 'The Hammer's plaintive question  
'Is there not one glacier growing?'  
Drew a helpful reassurance  
That a few still kept on flowing.

Tired and brain-full, glaciologists  
Escape into the night.  
But just briefly do they scatter  
Soon all will re-align  
At Andrew's table, pizza-covered,  
Stocked with local beer  
They drink and laugh and while the night  
Away, lingering here.

The next day dawns too early  
But there's lots of talks today!  
A new roster of topics  
And a lot of things to say.  
Soot in China snow is copious,  
Glacial runoff's growing less.  
Your apparent climate signal  
May be just a red-noise mess.

Glaciers melt in the Dry Valleys,  
And it sometimes triggers quakes.  
The WAIS core's being analyzed  
However long it takes.  
Ice streams in West Antarctica  
Occur in curious shapes;  
Refreezing changes temps in firn  
As latent heat escapes.



Annie Donnehey (left) and Fiona Seifert (right) enjoy the farmers' market.

At some point, there's a pause and all  
Emerge into the sun  
And behold: a farmer's market!  
It's a most convenient one.  
Now, fed, we admire the posters:  
Greenland outlet glaciers' speed,  
And Greenland crevasse albedo.  
It's relaxing to just read.

CISM's becoming scaleable  
While PISM gets inverted.  
Firn models are constructed  
With an effort that's concerted.  
Firn sub-models: gas diffusion,  
Crystal growth, and firn compaction.  
More on PISM validation,  
Water conduit reaction.

Gamburtsev sub-glacial mountains,  
Whillans speeds by stealing lakes,  
Measurements test forward models,  
Isotopes show climate breaks.  
Snowball sea glaciers—survivable?  
Frost breaks down cores of rock.  
And suddenly we realize  
That was the final talk.

And off we all will stumble  
As the sun sets o'er the sea  
Meandering home, and pondering  
Next year's NWG.

**Regina Carns**

## 50 years of the NVE's Glaciology Office Oslo, Norway, 12 January 2012



Olav Dybwadskog, Randi Pytte, Wibjørn Karlén and Gunnar Østrem attacking the cake.



Olav Dybwadskog, Liss Andreassen, Bjarne Kjølmoen and Kjetil Melvold at the poster exhibition.

The 50th anniversary of Brekontoret was celebrated on 12 January 2012 at the Norwegian Water Resources and Energy Directorate (NVE) in Oslo. Brekontoret ('the Glaciology Office') was established in 1962 by Professor Gunnar Østrem. Its mission was to collect and analyse data from Norwegian glaciers in order to plan the hydropower development in the Jostedalbreen area as well as to carry out glaciological research in Jotunheimen. The office is now called Section for Glaciers, Ice and Snow and employs 16 professionals.

The Section for Glaciers, Ice and Snow at NVE operates a long-term national glaciological observation programme, which includes mass balance observations at 15 glaciers, front variations at about 40 glaciers and area change for all glaciers on mainland Norway. Measurements and assessments of ice elevation, displacement, thickness and melt, as well as glacier lake outburst floods, are also carried out. Glaciological research is a main pillar of the Section, including operations of the Svartisen Subglacial Laboratory.



Gunnar Østrem cutting the cake.



Rune Engeset and Bjørn Wold giving a presentation.

The laboratory is the only place worldwide where scientists are able to carry out observations and experiments underneath a glacier 200 m thick. The Section is a partner in the top-level research centre SVALI (Stability and Variations of Arctic Land Ice). The glaciological activities at the Section are not restricted to glaciers: It is responsible for developing a Norwegian avalanche-forecasting centre, snow hydrology for flood forecasting and hydropower production, lake-ice warnings, lake-ice mapping and temperature observations in the Norwegian rivers and lakes.

The anniversary was celebrated by more than 50 invited participants with a series of presentations, a poster exhibition and a dinner with joyful speeches and anecdotes from the past 50 years. Presentations were given by Michael Zemp (WGMS), Magnús Magnússon (IGS), Jack Kohler (NPI) and Olav Dybwadskog, as well as Randi Pytte Asvall, Jim Bogen, Morten Johnsrud and Rune Engeset from NVE.

The event was organised by Liss Andreassen, Bjarne Kjøllmoen, Nils Haakensen, Rigmor Haggunn and Gunnar Østrem.

**Rune Engeset**  
**Head of Section for Glaciers, Ice and Snow**



Magnús Magnússon and Jack Kohler comparing ties at the dinner.



# Glaciological diary

\*\* IGS sponsored

\* IGS co-sponsored

2012

9–12 January 2012

## **Nordic Geological Winter Meeting**

Reykjavík, Iceland

Permafrost and Periglacial Processes session.

Conveners: Ivar Berthling [ivar.berthling@svt.ntnu.no] and Bernd Etzelmüller [Bernd.etzelmuller@geo.uio.no]

Website: [http://www.jfi.is/ngw\\_2012](http://www.jfi.is/ngw_2012)

Website: [http://www.jfi.is/ngw\\_2012](http://www.jfi.is/ngw_2012)

10–13 January 2012

## **Workshop on the Dynamics and Mass Budget of Arctic Glaciers/IASC Network on Arctic Glaciology Annual Meeting**

Zieleniec, Poland

Details as PDF: [http://www.igsoc.org:8000/symposia/Flyers\\_etc/PolishMeetingJan2012.pdf](http://www.igsoc.org:8000/symposia/Flyers_etc/PolishMeetingJan2012.pdf)

Contact Krzysztof Migala [krzysztof.migala@uni.wroc.pl]

Contact Krzysztof Migala [krzysztof.migala@uni.wroc.pl]

20 January 2012

## **Symposium: The mountain cryosphere – a holistic view on processes and their interactions**

University Zurich Irchel, Switzerland

Flyer: [http://www.igsoc.org:8000/symposia/www.geo.uzh.ch/microsite/cryodata/cryosphere\\_flyer.pdf](http://www.igsoc.org:8000/symposia/www.geo.uzh.ch/microsite/cryodata/cryosphere_flyer.pdf)

Contact Stephan Gruber [stephan.gruber@geo.uzh.ch]

Contact Stephan Gruber [stephan.gruber@geo.uzh.ch]

30 January–1 February 2012

## **Responding to Arctic Environmental Change: Translating Our Growing Understanding into a Research Agenda for Action**

Kingston, Ontario, Canada

Website: <http://www.queensu.ca/qieep>

2–3 February 2012

## **6th Alpine Glaciology Meeting**

ETH Zürich, Zürich, Switzerland

Website: <http://people.ee.ethz.ch/~glacier/agm2012/>

Contact: Martin Lüthi [luethi@vaw.ethz.ch] or

Martin Funk [funk@vaw.ethz.ch]

6–7 February 2012

## **Trans-Himalayan workshop: Glaciers, Snow Melt and Runoff in the Himalayas**

Kathmandu, Nepal

Website: <http://www.eu-highnoon.org/workshopkathmandu2012>

9–10 February 2012

## **\*The Geophysics of the Cryosphere and Glacial Products: Properties, Processes and Technical Advances: New Advances in Geophysics Meeting 2012**

British Geophysical Association/Royal

Astronomical Society/The Geological Society

Burlington House, London, UK

Website: [http://www.swan.ac.uk/environment\\_society/newscentre/latestevents/bgacryosphericgeophysics.php](http://www.swan.ac.uk/environment_society/newscentre/latestevents/bgacryosphericgeophysics.php)

Website: [http://www.swan.ac.uk/environment\\_society/newscentre/latestevents/bgacryosphericgeophysics.php](http://www.swan.ac.uk/environment_society/newscentre/latestevents/bgacryosphericgeophysics.php)

13–15 February 2012

## **\*Snow and Ice Research Group (SIRG) New Zealand Annual Workshop 2012**

Lake Ruataniwha Rowing Complex, near

Twizel, New Zealand

Website: <http://www.sirg.org.nz/>

15–17 February 2012

## **Land Ice Working Group (LIWG) of the Community Earth System Model (CESM) annual winter meeting**

Boulder, Colorado, USA

Website: <http://mailman.cgd.ucar.edu/mailman/listinfo/ccsm-liwg>

Website: <http://mailman.cgd.ucar.edu/mailman/listinfo/ccsm-liwg>

20–24 February 2012

## **2012 Ocean Sciences Meeting**

Salt Lake City, Utah

Website: <http://www.sgmeet.com/osm2012/>

24–28 February 2012

## **2012 Association of American Geographers Annual Meeting**

New York, USA

Website: <http://www.aag.org/cs/annualmeeting>

1–12 March 2012

## **Short Course in Physical Principles of Hydrology**

Kananaskas Valley, Alberta, Canada

Website: [http://www.cwra.org/Branches/CSHS/Principles\\_of\\_Hydrology\\_ShortCourse\\_2011.aspx](http://www.cwra.org/Branches/CSHS/Principles_of_Hydrology_ShortCourse_2011.aspx)

Website: [http://www.cwra.org/Branches/CSHS/Principles\\_of\\_Hydrology\\_ShortCourse\\_2011.aspx](http://www.cwra.org/Branches/CSHS/Principles_of_Hydrology_ShortCourse_2011.aspx)

5–8 March 2012

## **German Geophysical Society Meeting 2012**

Hamburg, Germany

The conference has three key topics:

Geophysical earth system research, Passive

seismics in applied geophysics, and Natural

Hazards and Geophysics

Website: <http://www.dgg-2012.de/index.php?id=561&L=1>

7–9 March 2012

**42nd Annual International Arctic Workshop  
Winter Park, Colorado, USA**

Website: <http://instaar.colorado.edu/meetings/AW2012/>

12–16 March 2012

**SVALI PhD course/workshop: Applications of radar data from ice sheets to understand ice flow processes**

Center for Ice and Climate, University of Copenhagen, Denmark

Contact: Christine Hvidberg [ch@gfy.ku.dk]

Website: [http://ncoe-svali.org/phd\\_school/courses/workshops\\_etc.html](http://ncoe-svali.org/phd_school/courses/workshops_etc.html)

19–22 March 2012

**SLALOM2012 (Sea-Level and Adjustment of the Land: Observations and Models) Conference**

Athens, Greece

Website: <http://slalom2012.geol.uoa.gr/>

22–23 March 2012

**Midwest Glaciology Meeting**

Penn State University Campus, University Park, PA

Contact Nathan Amador [nsa125@psu.edu]

11 April 2012

**Workshop: Tools & Technologies for Polar Climate Change Research**

Stony Brook University, Stony Brook, New York, USA

Workshop flyer: <http://lynchlab.files.wordpress.com/2012/02/polar-technologies-workshop.pdfhp>

14–18 April 2012

**12th International Circumpolar Remote Sensing Symposium**

Levi, Finland

Website: <http://alaska.usgs.gov/science/geography/CRSS2012/index.php>

18–20 April 2012

**Training Seminar on Snow Remote Sensing**

Istanbul, Turkey

Contact: Aydın Gürol Ertürk [agerturk@dmi.gov.tr]

Website: <http://www.turkwater.com/haberler/kurs.htm>

19–22 April 2012

**Arctic Science Summit Week**

Montréal, Canada

In conjunction with the IPY 2012 From Knowledge to Action conference

Website: <http://www.assw2012.org/>

22–27 April 2012

**IPY From Knowledge to Action Conference  
Montreal, Québec, Canada**

Website: <http://www.ipy2012montreal.ca/index.php>

22–27 April 2012

**European Geosciences Union: General Assembly 2012**

Vienna, Austria

Website: <http://meetings.copernicus.org/egu2012/>

23–26 April 2012

**Interpraevent 2012 – 12th Congress: Protection of Living Spaces from Natural Hazards**

Grenoble, France

Website: <http://www.interpraevent2012.fr/>

26–27 April 2012

**David C. Sego Symposium**

Edmonton, Alberta, Canada

Website: <https://uofa-cee.gobigevent.com/>

2–4 May 2012

**American Polar Society 7th Anniversary Meeting and Symposium**

The Polar Regions in the 21st Century: Globalization, Climate Change and Geopolitics

New York, New York, USA

Website: <https://www.americanpolarsociety.org/>

Contact: Alfred S. McLaren [alfredsmclaren@aol.com]

14–18 May 2012

**12th International Circumpolar Remote Sensing Symposium**

Levi, Finland

Website: <http://alaska.usgs.gov/science/geography/CRSS2012/index.php>

21–22 May 2012

**European Parallel Ice Sheet Modeling (PISM) Workshop**

Hamburg, Germany

Contact Christian Rodehacker [christian.rodehacker@zmaw.de]

Website: <http://mpimet.mpg.de/euro-pism.html>

22–24 May 2012

**18th International Symposium on Polar Sciences: Milestones in Polar Research Collaboration**

Jeju Island, Republic of Korea

Website: <http://symposium.kopri.re.kr/>



28 May–1 June 2012

**\*\*International Symposium on Seasonal Snow and Ice**

Lahti, Finland

Links on website: <http://alaska.usgs.gov/science/geography/CRSS2012/index.php>

Contact: Secretary General, International Glaciological Society

3–8 June 2012

**XV Glaciological Symposium: Past, Present and Future of the Cryosphere**

Arkhangelsk, Russia

Contact: Stanislav Kutuzov [s.kutuzov@gmail.com]

Website: <http://glac2012.igras.ru/>

5–7 June 2012

**69th Annual Meeting of the Eastern Snow Conference (ESC)**

Frost Valley, New York, USA

Website: <http://www.elements2012.ca/>

5–8 June 2012

**Canadian Geophysical Union Annual Meeting**

Banff, Alberta, Canada

Website: <http://www.elements2012.ca/>

10–21 June 2012

**Permafrost Modelling Course**

Department of Geosciences, University of Oslo

Website: <http://www.mn.uio.no/geo/english/research/networks/perma-nordnet/events/courses/permafrost-modelling.html>

11–15 June 2012

**21st IAHR International Symposium on Ice**

Dalian, China

Contact: Pat Langhorne [pat.langhorne@otago.ac.nz]

Website: <http://slcoe.dlut.edu.cn/ice/iahr2012.html>

12–14 June 2012

**26th international Forum for Research into Ice Shelf Processes (FRISP)**

Utö, Stockholms Archipelago, Sweden

Contact: Adrian Jenkins [ajen@bas.ac.uk]

Website: <http://rechenknecht.natgeo.su.se/FRISP2012>

14–16 June 2012

**34th Polar Symposium**

Sosnowiec, Poland

Website: <http://sympozjumpolarne2012.us.edu.pl/>

24–29 June 2012

**Goldschmidt Conference**

Montréal, Québec, Canada

Website: <http://www.vmgoldschmidt.org/2012/index.htm>

25–27 June 2012

**Transantarctic Mountains Camp Workshop**

Indianapolis, Indiana, USA

Website: <http://tamcamp.org/>

25–29 June 2012

**\*\*International Symposium on Glaciers and Ice Sheets in a Warming Climate**

Fairbanks, Alaska, USA

Links on website: <http://glaciers.gi.alaska.edu/events/igs2012>

Contact: Secretary General, International Glaciological Society

25–29 June 2012

**Tenth International Conference on Permafrost**

Tyumen, Russia

Website: <http://www.ticop2012.org/>

2–6 July 2012

**International Training Workshop: Micromorphology of Glacigenic Sediments**

Centre for Micromorphology, Queen Mary,

University of London, London, UK

Details: [http://www.igsoc.org:8000/symposia/Flyers\\_etc/CfM\\_2012.pdf](http://www.igsoc.org:8000/symposia/Flyers_etc/CfM_2012.pdf)

Contact: Simon Carr [s.carr@QMUL.AC.UK]

13–25 July 2012

**SCAR 2012: Antarctic Science and Policy Advice in a Changing World**

Portland, Oregon, USA

Website: <http://scar2012.geol.pdx.edu/>

14 July 2012

**\*ISMAS 2012 Workshop**

Portland, Oregon, USA

Website: <http://www.climate-cryosphere.org/en/events/2012/ISMAS/Home.html>

13–17 August 2012

**Asia Oceania Geosciences Society/American Geophysical Union Joint Assembly**

Resorts World Sentosa, Singapore

Website: <http://www.asiaoceania.org/aogs2012>

26–30 August 2012

**4th International Disaster and Risk Conference**

Davos, Switzerland

Website: <http://www.idrc.info/>

26–30 August 2012

**IGU 32nd International Geographical Congress**

Cologne, Germany

Website: <https://igc2012.org/frontend/index.php>

5–6 September 2012

**\*\*International Glaciology Society British Branch Meeting 2012**

Aberdeen, UK

Contact: Douglas Mair [d.mair@abdn.ac.uk]

11–14 September 2012

**4th International Geologica Belgica Meeting 2012 (GB2012): Moving Plates and Melting Icecaps**

Brussels, Belgium

Website: <http://www.geologicabelgica.be/gb2012>

11–22 September 2012

**Karthus course on Ice Sheets and Glaciers in the Climate System**

Karthus, Italy

Website: <http://www.projects.science.uu.nl/iceclimate/karthus/>

12–14 September 2012

**UK Antarctic Science Conference 2012**

Cambridge, UK

Contact: Nicola Munro [asc2012@bas.ac.uk]

Website: [http://www.antarctica.ac.uk/about\\_bas/events/ukasc2012/index.php](http://www.antarctica.ac.uk/about_bas/events/ukasc2012/index.php)

16–23 September 2012

**5th International Workshop on Ice Caves**

Barzio and Milano, Italy

Website: <http://users.unimi.it/icecaves/IWIC-V/>

20–22 September 2012

**19th Annual West Antarctic Ice Sheet Initiative Workshop**

Eatonville, WA, USA

Website: [http://depts.washington.edu/wais2012/wais\\_operations\\_meeting/users.unimi.it/icecaves/IWIC-V/](http://depts.washington.edu/wais2012/wais_operations_meeting/users.unimi.it/icecaves/IWIC-V/)

24–29 September 2012

**Symposium: 20 years of Progress in Radar Altimetry**

Venice-Lido, Italy

Website: <http://www.altimetry2012.org/>

1–5 October 2012

**\*International Symposium on Ice Core Science**

Giens, France

Website: <http://www.ipics2012.org/>

13–20 October 2012

**Interdisciplinary Climate Change Research Symposium**

Colorado Springs, Colorado, USA

To apply see DISCCRS website: [http://disccrs.org/application\\_instructions](http://disccrs.org/application_instructions)

23–26 October 2012

**Arctic in Rapid Transition (ART) Science Workshop**

Sopot, Poland

Website: <http://tinyurl.com/Sopot2012>

Contact: Christie Wood [chwood@clarku.edu]

25–27 October 2012

**International Glaciology Society Nordic Branch Meeting 2012**

Stockholm, Sweden

Contact: Susanne Ingvander [susanne.ingvander@natgeo.su.se]

1–3 November 2012

**XI International Scientific Conference: Integrated Researches of Spitzbergen Nature**

Murmansk, Russia

Website: <http://icc.skics.ac.cn/>

10–12 November 2012

**International Conference on the Cryosphere: Changes, Impacts and Adaptation**

Sanya, China

Website: <http://icc.skics.ac.cn/>

3–7 December 2012

**American Geophysical Union Fall Meeting**

San Francisco, California, USA

Website: <http://fallmeeting.agu.org/2012/>

**2013**

6–8 January 2013

**SEG/AGU Cryosphere Geophysics Workshop**

Boise, Idaho, USA

Website: <http://www.seg.org/events/upcoming-seg-meetings/cryo2013>

Contact: Hans-Peter Marshall [hpmarshall@boisestate.edu]

15 January 2013

**Third International Symposium of Arctic Research (ISAR3)**

Tokyo, Japan

Contact: Japan Consortium for Arctic Environmental Research [jcar-office@nipr.ac.jp]

17–20 January 2013

**World Snow Forum**

Novosibirsk, Russia

Website: <http://www.worldsnowforum.org/>

20–25 January 2013

**Arctic Frontiers: Geopolitics and Marine Production in a Changing Arctic**

Tromsø, Norway

Website: <http://www.arcticfrontiers.com/>

14–15 February 2013

**17th Alpine Glaciology Meeting**

Grenoble, France

24–28 February 2013

**Workshop on the Dynamics and Mass Budget of Arctic Glaciers / IASC Network on Arctic Glaciology Annual Meeting**

Obergurgl, Austria

Contact Carleen Tijm-Reijmer [c.h.tijm-reijmer@uu.nl]

4–5 April 2013

**Conference: Holocene Climate Change**

London, UK

Contact Steve Whalley [steve.whalley@geolsoc.org.uk]

8–13 July 2013

**Joint IACS/IAMAS Conference: Air and ice – interaction processes**

Davos, Switzerland

Contact: Charles Fierz [fierz@slf.ch]

28 July–2 August 2013

**\*\*International Symposium on Changes in Glaciers and Ice Sheets: observations, modelling and environmental interactions**

Beijing, China

Contact: Secretary General, International Glaciological Society

Website: <http://www.igsoc.org:8000/symposia/2013/beijing/>

9–13 September 2013

**\*\*International Symposium on Radioglaciology: advances in radio frequency, microwave and digital technologies**

Lawrence, Kansas, USA

Contact: Secretary General, International Glaciological Society

Website: <http://www.igsoc.org:8000/symposia/2013/kansas/>

**2014**

March–April 2014

**\*\*International Symposium on Sea Ice**

Hobart, Australia

Contact: Secretary General, International Glaciological Society

26–30 May 2014

**\*\*International Symposium on Observations, Modelling and Prediction of the Cryospheric Contribution to Sea Level Change**

Chamonix, France

Contact: Secretary General, International Glaciological Society

25–30 August 2014

**\*\*International Symposium on the Changing Arctic Cryosphere**

Edmonton, Alberta, Canada

Contact: Secretary General, International Glaciological Society

**2015**

August 2015

**\*\*International Symposium on Contemporary Ice-Sheet Dynamics: ocean interaction, meltwater and non-linear effects**

Cambridge, UK

Contact: Secretary General, International Glaciological Society

September 2015

**\*\*International Symposium on High Mountain Glaciology**

China

Contact: Secretary General, International Glaciological Society

**2016**

June 2016

**\*\*International Symposium on the Hydrology of Glaciers and Ice Sheets**

Iceland

Contact: Secretary General, International Glaciological Society

August/September 2016

**\*\*International Symposium on Polar Sea Ice, Polar Climate and Polar Change**

Boulder, Colorado, USA

Contact: Secretary General, International Glaciological Society



# New members

**Dr Erkut Aykutluğ**

Department of Earth System Science, University of California, Irvine  
3200 Croul Hall, Irvine, CA 92697-3100, USA  
Tel (949) 232-5977  
eaykutlu@uci.edu

**Dr Kenji Baba**

Environment and Symbiotic Science, Rakuno Gakuen University  
582 Bunkyo-dai-Midorimachi, Ebetsu Hokkaido 0698501, Japan  
kbaba@rakuno.ac.jp

**Mr Rajeshwar Singh Banshtu**

Department of Civil Engineering, National Institute of Technology  
Hamirpur Himachal Pradesh 177005, India  
Tel +911972254336  
banshtu.rajeshwar@gmail.com

**Miss Alison Banwell**

Scott Polar Research Institute  
Lensfield Rd, Cambridge, CB2 1ER, UK  
afb39@cam.ac.uk

**Mr Andrew Beedlow**

Geology/Geophysics, Geophysical Institute, University of Alaska Fairbanks  
PO Box 742305, Fairbanks, AK 99775-2305, USA  
Tel +1 (541)740-0180  
Andrew.Beedlow@gi.alaska.edu

**Mr James Bendle**

School of G.E.S., University of Glasgow  
Gregory Building, Lilybank Gardens, Glasgow G12 8QQ, UK  
Tel +44 (0)141 330 6864  
James.Bendle@glasgow.ac.uk

**Ms Katrin Bentel**

Department of Mathematical Sciences and Technology, Norwegian University of Life Sciences  
IMT, Postboks 5003, 1432 Ås, Norway  
Tel +47 64965456  
katrin.bentel@umb.no

**Dr Jane R. Blackford**

School of Engineering, University of Edinburgh  
Sanderson Building, King's Buildings, Edinburgh EH9 3JL, UK  
jane.blackford@ed.ac.uk

**Dr Andrew Bliss**

Geophysical Institute, University of Alaska Fairbanks  
903 Koyukuk Drive, Fairbanks, AK 99709, USA  
Tel +1 (510)558-0785  
andybliss@gmail.com

**Dr Christopher P. Borstad**

Applied Low Temperature Physics, Jet Propulsion Laboratory  
4800 Oak Grove Drive, Pasadena, CA 91109, USA  
Tel +1 (626)421-9941  
cborstad@gmail.com

**Ms Clare Boston**

Geography, Queen Mary University of London  
2B Meadow House Drive, Fulwood, Sheffield S10 3NA, UK  
Tel +44 (0)7960137273  
c.boston@qmul.ac.uk

**Mr Tom Bradwell**

British Geological Survey  
Murchison House, West Mains Road, Edinburgh EH9 3LA, UK  
Tel +44 (0)131 667 1000  
tbrad@bgs.ac.uk

**Ms Juliana Braun**

Ludwig-Maximilians-Universität  
Ganghoferstrasse 92b, D-81373 Munich, Germany  
juliana.braun@gmx.net

**Mr Jed Brown**

Mathematics and Computer Science Division, Argonne National Laboratory  
9700 S. Cass, Bldg 240, Argonne, IL 60439, USA  
jedbrown@mcs.anl.gov

**Mr Evan Burgess**

Department of Geography, University of Utah  
260 S. Central Campus Drive, Rm 270, Salt Lake City UT 84112, USA  
Tel 3038196673  
evanburgess@gmail.com

**Mr Patrick Burns**

College of Earth, Ocean, and Atmospheric Sciences, Oregon State University  
2758 NW Coolidge Way, Corvallis, OR 97330, USA  
burnspat@onid.oregonstate.edu

**Mr Adam Campbell**

Department of Earth and Space Sciences,  
University of Washington  
Box 351310, Seattle, WA 98195, USA  
campbead@uw.edu

**Mr Seth Campbell**

Climate Change Institute & Dept of Earth Sci,  
University of Maine  
5790 Bryand Global Science Center, Orono, ME  
04469-5790, USA  
seth.campbell@umit.maine.edu

**Ms Christina Carr**

Earth Sciences, Montana State University  
317 Cody Street, Cheyenne WY 82009, USA  
Tel +1 (406)-381-6039  
christinagcarr@gmail.com

**Ms Joanne R. Carr**

Department of Geography, Durham University  
Science Laboratories, South Road, Durham DH1  
3LE, UK  
j.r.carr@durham.ac.uk

**Dr Tao Che**

Lab. of Remote Sensing and Geospatial Science,  
Cold & Arid Regions Env. & Eng. Res. Institute,  
CAS  
320 Donggang West Road, Lanzhou, Gansu  
730000, P.R.China  
chetao@lzb.ac.cn

**Ms Christine Chen**

Byrd Polar Research Center, The Ohio State  
University  
Scott Hall Room 108, 1090 Carmack Road,  
Columbus, OH 43210, USA  
cchen181@gmail.com

**Mr Shu Chen**

Center for Remote Sensing of Ice Sheets, 2335  
Irving Hill Road, Lawrence, KS 66045, USA  
Tel +1 (785)424-0893  
s708c400@ku.edu

**Miss Winnie Chu**

Earth and Environmental Sciences, Columbia  
University  
107D Oceanography, 61 Route 9W – PO Box  
1000, Palisades, NY 10964-8000, USA  
Tel +1(845) 365-8910  
wchu@ldeo.columbia.edu

**Mr Josh Cleall**

University of Exeter  
Amory Building, Rennes Drive, Exeter, Devon  
EX4 4RJ, UK  
Tel +44 (0)7753203352  
jpfc201@exeter.ac.uk

**Mr Zhiyuan Cong**

ITPCAS  
A4, Datun Rd., Chaoyang District, Beijing  
100101, P.R.China  
zhiyuancong@itpcas.ac.cn

**Ms Juliana Costi**

Geosciences, Federal University of Rio Grande  
do Sul  
9500 Bento Goncalves Ave, Porto Alegre RS  
90540000, Brazil  
Tel +55 5182491657  
ju.costi@gmail.com

**Dr Jill H. Crossman**

School of Geography and Environment,  
University of Oxford  
South Parks Road, Oxford OX1 3QY, UK  
Tel +44 (0)7734 648357  
jill.crossman@ouce.ox.ac.uk

**Ms Niamh Cullen**

Earth sciences, Trinity College Dublin  
College Green, Dublin 24, Ireland  
Tel +353 87 7507595  
cullenni@tcd.ie

**Dr Helen Dahlke**

Physical Geography and Quaternary Geology,  
Stockholm University  
Svante Arrheniusväg 8c, SE-10691 Stockholm,  
Sweden  
helen.dahlke@natgeo.su.se

**Ms Alice M. Doughty**

480 Convene Rd, Sebago, ME 04029, USA  
Tel +1(207) 625 5757  
alice.doughty@gmail.com

**Mr Yoann Drocourt**

Geography, Swansea University  
Singleton Park, Swansea SA2 8PP, UK  
ydrocourt@gmail.com

**Dr Miles Dyck**

Renewable Resources, University of Alberta  
751 General Services Bldg, Edmonton, Alberta  
T6G 2H1, Canada  
Tel +1(780)-492-2886  
miles.dyck@ualberta.ca

**Mr Shaun Eaves**

Victoria University of Wellington  
22 Norwich Street, Wadestown, Wellington  
6012, New Zealand  
shaun.eaves@vuw.ac.nz

**Dr Ben Edwards**

Geology Department, Dickinson College  
PO Box 1773, Carlisle, PA 17013-2896, USA  
edwardsb@dickinson.edu



**Mr Jeremy Ely**

Department of Geography, University of Sheffield  
Winter Street, Sheffield S10 2TN, UK  
gga08je@shef.ac.uk

**Professor Sérgio H. Faria**

IKERBASQUE  
Alameda Urquijo 4, 4º, ES-48008 Bilbao, Spain  
Tel +34 94 401 4690, ext. 11  
sergio.faria@bc3research.org

**Mr Johannes Feldmann**

Potsdam Institute of Climate Impact Research,  
University of Potsdam  
Telegraphenberg A 31, D-14473 Potsdam,  
Germany  
johannes.feldmann@pik-potsdam.de

**Dr Robert Fischer**

NASA GISS  
283 Herrick Ave, Teaneck, NJ 07666, USA  
Tel +1(617) 308-0436  
robert.p.fischer-1@nasa.gov

**Mr Thomas Flament**

LEGOS  
14 avenue Edouard Belin, F-31400 Toulouse,  
France  
Tel +33 561333444  
flament.thomas@gmail.com

**Mr Julian Freed-Brown**

Department of Physics, University of Chicago  
5550 S Dorchester Ave, Apt 502, Chicago, IL  
60637, USA  
Tel +1(847) 422-3062  
jfreedbrown@gmail.com

**Mr Lee Eric Freitag**

Applied Ocean Physics and Engineering, Woods  
Hole Oceanographic Inst.  
266 Woods Hole Rd, Mail Stop 18, Woods Hole,  
MA 02543, USA  
lfreitag@whoi.edu

**Ing. Dr Barbara Frigo**

Dept of Structural & Geotechnical Engineering,  
Politecnico di Torino  
Corso Duca degli Abruzzi 24, IT-10129 Torino,  
Italy  
Tel +393490807899  
barbara.frigo@polito.it

**Mr Takehiro Fukuda**

Institute of Low Temperature Science, Hokkaido  
University  
Kita-19, Nishi-8, Kita-ku, Sapporo Hokkaido  
060-0819, Japan  
Tel +81-11-706-7438  
takefd@lowtem.hokudai.ac.jp

**Mr Gao Jing**

Institute of Tibetan Plateau Research, CAS  
No.A4, Datun Road,, Chaoyang District, Beijing  
100101, P.R.China  
gaojing@itpcas.ac.cn

**Ms Gabrielle Gascon**

Earth and Atmospheric Sciences, University of  
Alberta  
1-26 Earth Sciences Building, Edmonton, Alberta  
T6G 2E3, Canada  
gascon@ualberta.ca

**Miss Morgan Gibson**

12/2 Dalkeith Road, Edinburgh EH16 5BP, UK  
Tel +44 (0)7876664137  
morganjgibson@gmail.com

**Mr Christian Gobel**

Oceanography, Federal University of Rio Grande  
Av. Itália, km 8, Prédio 6 Sala 23A, Rio Grande  
do Sul, 96203-900, Brazil  
goebel85@gmail.com

**Mr Bjorn Grigholm**

Earth Sciences, University of Maine  
138 Sawyer Environmental Research Center,  
Orono, ME 04469, USA  
bjorn.grigholm@maine.edu

**Ms Gail Gutowski**

Geosciences, University of Texas at Austin  
J.J. Pickle Campus, Bldg 196, 10100 Burnet Rd  
(R2200), Austin, TX 78758, USA  
gail.gutowski@utexas.edu

**Mr Wilfried J. Hagg**

Kommission für Glaziologie, Bayerische  
Akademie der Wissenschaften  
Marstallplatz 8, D-80539 Munchen, Germany  
Wilfried.Hagg@lrz.badw-muenchen.de

**Mr Robert Hale**

2550 University Heights, Boulder, CO 80302,  
USA  
robert.hale@colorado.edu

**Dr Torborg Heid**

Department of Geosciences, University of Oslo  
P.O. Box 1047, Blindern, N-0316 Oslo, Norway  
torborgh@geo.uio.no

**Mr Michael Hekkers**

University of Alaska Southeast  
11120 Glacier Hwy, Juneau, AK 99801, USA  
Tel +11 (907) 796-6523  
mlhekkers@uas.alaska.edu

**Mr Sam Herreid**

Glaciology, University of Alaska Fairbanks  
P.O. Box 81101, Fairbanks, AK 99708, USA  
Tel +1 (907) 687-4668  
sjherreid@alaska.edu

**Dr Huw Horgan**

Antarctic Research Centre, Victoria University of Wellington  
PO Box 600, Gate 3, Kelburn Pde, Wellington  
6012, New Zealand  
Tel +64 4 463 6918  
huw.horgan@vuw.ac.nz

**Ms Saffia Hossainzadeh**

Earth and Planetary Sciences, University of California, Santa Cruz  
1156 High St, Earth and Marine Sciences Building, Santa Cruz, CA 95064, USA  
Tel +1 (831) 261 6372  
shossai2@ucsc.edu

**Dr Matthias Huss**

Department of Geosciences, University of Fribourg  
Chemin du Musée 4, CH-1700 Fribourg, Switzerland  
matthias.huss@unifr.ch

**Mr Richard Jones**

Antarctic Research Centre, Victoria University of Wellington  
School of Geography, Environment and Earth Sciences, PO Box 600, Wellington 6012, New Zealand  
richard.s.jones@vuw.ac.nz

**Mrs Inge Juszak**

Zuerichholzstrasse 8, CH-8057 Zürich, Switzerland  
juszak@ifu.baug.ethz.ch

**Dr Leif Karlstrom**

Department of Geophysics, Stanford University  
397 Panama Mall, Stanford, CA 94305, USA  
leifk1@stanford.edu

**Ms Donna Keib**

ICE Design & Consult  
PO Box 211846, Anchorage ,AK 99521, USA  
Tel +1 (907)-280-7844  
donna.keib@icedesignconsult.com

**Mr Christian Kienholz**

Geophysical Institute, University of Alaska  
903 Koyukuk Drive, Fairbanks, AK 99775-7320, USA  
christian.kienholz@gi.alaska.edu

**Mr Jin-Woo Kim**

Satellite Geophysics, Seoul National University  
Gwanakgu Daehakro Seoul National University,  
25-1/420, Seoul 151-749, Republic of Korea  
modone79@gmail.com

**Mr Jonathan Kingslake**

Department of Geography, University of Sheffield  
Sheffield S10 2TN, UK  
jkingslake@gmail.com

**Dr Christophe Kinnard**

Glaciology, CEAZA  
Raúl Bitran s/n, Colina El Pino, Casilla 554, La Serena , Chile  
christophe.kinnard@ceaza.cl

**Miss Teresa Kyrke-Smith**

Department of Earth Sciences, University of Oxford  
South Parks Road, Oxford OX1 3AN, UK  
teresa.kyrke-smith@earth.ox.ac.uk

**Mr Lan Cuo**

Institute of Tibetan Plateau Research, CAS  
No.A4, Datun Rd., Chaoyang District,, Beijing  
100101, P.R.China  
lancuo@itpcas.ac.cn

**Miss Amber Leeson**

School of Earth and Environment  
University of Leeds, Woodhouse Lane, Leeds LS2 9JT, UK  
Tel +44 (0)113 34 39085  
eeaal@leeds.ac.uk

**Mr Pierre-Marie Lefevvre**

Department of Geosciences, University of Oslo  
Sem Sælands vei 1, NO-0371 Oslo, Norway  
p.m.b.e.lefevre@geo.uio.no

**Dr Jan L. Lieser**

ACE CRC, University of Tasmania  
Private Bag 80, Hobart, Tasmania 7001, Australia  
Tel +61362267899  
jan.lieser@gmail.com

**Mr Chuck Lindsay**

National Park Service  
2181 Kachemak Drive, Homer, AK 99603, USA  
Tel +1 (907) 235-7892  
chuck\_lindsay@nps.gov

**Mr Brad Lipovsky**

Geophysics, Stanford University  
397 Panama Mall, Stanford, CA 94305, USA  
Tel +1 (775) 3391627  
lipovsky@stanford.edu

**Mr Liu Jingshi**

Institute of Tibetan Plateau Research, CAS  
A4, Datun Rd., Chaoyang District, Beijing  
100101, P.R.China  
jliu@itpcas.ac.cn

**Dr Liu Lin**

Geophysics, Stanford University  
397 Panama Mall, Stanford University, Stanford,  
CA 94305, USA  
Tel +1(650) 498-5606  
liulin523@gmail.com

**Mr Liu Yongjin**

Institute of Tibetan Plateau Research  
No.18, Shuangqing Rd., Beijing 100085,  
P.R.China  
yqliu@itpcas.ac.cn

**Professor Connie Lovejoy**

Department of Biology, Laval University  
1030 ave de la Medecine, IBIS, Québec G1V  
0A6, Canada  
Tel +1 (418) 656 2007  
connie.lovejoy@bio.ulaval.ca

**Mr Brian McDonald**

University of Colorado at Boulder  
Engineering Center, 425 UCB, Boulder, CO  
80309-0425, USA  
brian.w.mcdonald@colorado.edu

**Mr Tom Mallard**

Mallard Design Company  
15860 NE 15th St Apt B4, Bellevue, WA 98008-  
2742, USA  
Tel +1 (928) 542-1656  
mallard@mallard-design.com

**Mr Bryce A. Malton**

5 Brackley Close, Peterborough PE3 6LH, UK  
bmalton@me.com

**Professor Alexey Markov**

Polar Research Center, Jilin University  
No. 6 Ximinzhu Street, Changchun City, Jilin  
Province 130026, P.R.China  
Tel +86-131 59560851  
am100@inbox.ru

**Dr Daniel Martin**

Lawrence Berkeley National Laboratory  
1 Cyclotron Road, Mail Stop 50A-1148,  
Berkeley, CA 94609, USA  
Tel +1 510-495-2852  
dfmartin@lbl.gov

**Dr Guillaume Masse**

UPMC, CNRS  
LOCEAN UMR7159, Université Pierre et Marie  
Curie, 4 place Jussieu, F-75252 Paris, France  
guillaume.masse@upmc.fr

**Miss Brooke Medley**

Earth and Space Sciences, University of  
Washington  
Polar Science Center, APL, Box 355640, 1013  
NE 40th Street, Seattle, WA 98105-6698, USA  
Tel 9144171199  
bmed@u.washington.edu

**Mr Clément Miège**

736 Windsor St, Salt Lake City, UT 84102, USA  
Tel +18016616524  
clement.miege@gmail.com

**Mr Masahiro Minowa**

Hokkaido University  
3-15-510, North8 South1, Higashi-ku, Sapporo,  
Hokkaido 060-0908, Japan  
Tel +81-11-706-7438  
m\_masa@lowtem.hokudai.ac.jp

**Dr Samuel Morin**

CEN, CNRM-GAME  
1441 rue de la piscine, Meteo-France/CEN,  
38400 St Martin d'Hères, France  
morin.samuel@gmail.com

**Ms Ruth I. Mugford**

Scott Polar Research Institute, University of  
Cambridge  
Lensfield Road, Cambridge CB2 1ER, UK  
Tel +44 (0)7870 585881  
r.i.mugford@googlemail.com

**Dr Nathaniel Murphy**

Geophysical Institute, University of Alaska  
Fairbanks  
903 Koyukuk Drive, Fairbanks, AK 99775, USA  
Tel +1 (907) 474-7373  
nmurphy@gi.alaska.edu

**Ms Kathrin Naegeli**

University of Zürich  
Hohlstrasse 201, CH-8004 Zürich, Switzerland  
kathrin.naegeli@geo.uzh.ch

**Dr Martin O'Leary**

AOSS, University of Michigan  
2455 Hayward St, Ann Arbor, MI 48109, USA  
m.e.w.oleary@gmail.com

**Dr Batuhan Osmanoglu**

Glaciology, University of Alaska Fairbanks  
P.O. Box 757320, Fairbanks, AK 99775, USA  
Tel +1 (907) 4747679  
batuhan.osmanoglu@gmail.com

**Mr Jared L. Peters**

Geography, Simon Fraser University  
101-9288 University Cres, Burnaby, British  
Columbia V5A 4X7, Canada  
Tel +1 (778) 846-3734  
jaredpeters4@gmail.com

**Ms Lene Petersen**

Civil, Environment and Geomatic Engineering,  
ETH Zürich  
ETH Hönggerberg, HIL D 21.1, Wolfgang-Pauli  
Strasse 15, CH-8093 Zürich, Switzerland  
petersen@ifu.baug.ethz.ch

**Mr Dhiraj Pradhananga**

Geography and Planning, Univ. of Saskatchewan  
213-1151 Sydney St., Canmore, Alberta T1W  
3G1, Canada  
dhirajpradhananga@yahoo.com

**Mr Chander Prakash**

Civil Engineering Department, National Institute of Technology  
Hamirpur, Himachal Pradesh 177005, India  
chandermanali@gmail.com

**Mr Sam Prodger**

University of Plymouth  
204 North Road West, Plymouth, Devon PL1 5DE, UK  
sam.prodger@postgrad.plymouth.ac.uk

**Ms Enrica Quartini**

Institute for Geophysics, University of Texas at Austin  
3605 Steck Ave, Apt 1027, Austin TX 78759, USA  
enrica@ig.utexas.edu

**Mrs Galina Ragulina**

Hydrological department, Norwegian Water Resources and Energy Directorate  
Middelthunsgate 29, NO-0301 Oslo, Norway  
Tel +47 22 95 95 95  
gara@nve.no

**Mr Philipp Rastner**

Geography, University of Zürich  
Winterthurerstrasse 190, CH-8057 Zürich, Switzerland  
Tel +41 44-635 52 48  
philipp.rastner@geo.uzh.ch

**Assoc. Professor Diandong Ren**

Physics, Curtin University  
GPO Box U1987, Perth, WA 1987, Australia  
Tel +61 892669066  
rendianyun@gmail.com

**Alexander Robel**

Earth & Planetary Sciences, Harvard University  
20 Oxford St, Office 404, Cambridge, MA 02138, USA  
Tel +1 (305) 5190643  
robel@fas.harvard.edu

**Dr Cecilie Rolstad Denby**

Dept of Mathematical Sciences, Norwegian University of Life Sciences  
Postboks 5003, NO-1432 Ås, Norway  
cecilie.rolstad@umb.no

**Dr Ann V. Rowan**

Institute of Geography and Earth Sciences, Aberystwyth University  
Llandinam Building, Penglais, Aberystwyth SY23 3DB, UK  
Tel +44 (0)1970 622 786  
anr34@aber.ac.uk

**Ms Alicia Rutledge**

School of Earth and Space Exploration, Arizona State University  
PO Box 876305, Moeur Building Rm 131, Tempe, AZ 85287-6305, USA  
Tel 480-225-3362  
alicia.rutledge@gmail.com

**Mr Daiki Sakakibara**

Institute of Low Temperature Science, Hokkaido University  
Nishi-8, Kita-19, Kita-ku, Sapporo 060-0819, Japan  
sakakibara@pop.lowtem.hokudai.ac.jp

**Mr Tatsuru Sato**

Graduate School of Environmental Science, Hokkaido University  
Kitaku, Kita 19, Nishi 8, 1-23-10, Sapporo Hokkaido 0600819, Japan  
Tel +81 117067438  
tsato@lowtem.hokudai.ac.jp

**Mr Peter N. Sedwick**

Ocean, Earth & Atmospheric Sciences, Old Dominion University  
4600 Elkhorn Ave., Norfolk VA 23529, USA  
psedwick@odu.edu

**Mr Julien Seguinot**

Stockholm University  
SE-106 91 Stockholm, Sweden  
julien.seguinot@natgeo.su.se

**Dr David Shean**

Polar Science Center, Applied Physics Lab, University of Washington  
1013 NE 40th St, Seattle, WA 98105, USA  
dshean@uw.edu

**Mr Owain Slater**

Geomatics Group  
23 Millmead Road, Oldfield Park, Bath BA2 3JW, UK  
oj.slater@gmail.com

**Mr Lukasz Stachnik**

Geomorphology, Jagiellonian University  
Gronostajowa 7, PL-30-387 Krakow, Poland  
Tel 0048-503821706  
lukasz.stachnik@gmail.com

**Mr Christopher M. Stevens**

Earth and Space Sciences, University of Washington  
1143 NW 60th St., Seattle, WA 98107, USA  
Tel +1 (406) 579-7287  
maximusjstevens@gmail.com

**Mr Craig Stewart**

Scott Polar Research Institute, Cambridge University  
Lensfield Road, Cambridge CB2 1ER, UK  
craig.l.stewart@gmail.com

**Dr Julienne Stroeve**

NSIDC, University of Colorado  
Campus Box 449, Boulder, CO 80309-0449, USA  
stroeve@nsidc.org

**Professor Pavel Talalay**

Polar Research Center, Jilin University  
No. 6 Ximinzhu Street, Changchun City Jilin Province 130026, P.R.China  
Tel +86-158 44084830  
ptalalay@yahoo.com

**Dr Marco Tedesco**

Graduate Center, City University of New York (CUNY)  
160 Convent Avenue, New York, NY 10031, USA  
mtesesco@ccny.cuny.edu

**Mr Daniel Tobler**

Natural Hazards, GEOTEST SA  
Birkenstrasse 15, Zollikofen CH-3052, Switzerland  
daniel.tobler@geotest.ch

**Mr Thomas Trantow**

515 42nd Street, Boulder, CO 80305, USA  
trantow@colorado.edu

**Ms Mihaela Triglav-Cekada**

Department of Photogrammetry and Remote Sensing, Geodetic Institute of Slovenia  
Jamova 2, SI-1000 Ljubljana, Slovenia  
Tel +386 1 200 29 08  
mihaela.triglav@gis.si

**Ms Barbara Truessel**

Geophysical Institute, University of Alaska Fairbanks  
903 Koyukuk Drive, Fairbanks, AK 99775, USA  
btruessel@gi.alaska.edu

**Mr Andrew J. Turner**

Built and Natural Environment, Northumbria University  
44 Wolseley Gardens, Newcastle upon Tyne NE2 1HR, UK  
Tel +44 (0)191 227 4294  
a.j.turner@northumbria.ac.uk

**Ms Carmen P. Vega Riquelme**

Earth Sciences, Uppsala University  
Villavägen 16, SE-75236 Uppsala, Sweden  
carmen.vega@geo.uu.se

**Mr Denis Voytenko**

University of Asouth Florida  
4202 E. Fowler Ave., Tampa 33620, USA  
dvoytenk@mail.usf.edu

**Ms Alexandra L. T. Waechter**

Geography, University of Ottawa  
60 University Pvt., Room 043, Ottawa, Ontario K1N 6N5, Canada  
Tel +1 (613) 562-5800 ext.3913  
awaec036@uottawa.ca

**Professor Wang Lei**

Institute of Tibetan Plateau Research, CAS  
No.A4, Datun Rd, Chaoyang District,, Beijing 100101, P.R.China  
wanglei@itpcas.ac.cn

**Mr Keguang Wang**

Norwegian Meteorological Institute  
Kirkegårdsveien 60, Tromso NO-9293, Norway  
keguangw@met.no

**Mr Robert Way**

Geography, Memorial University of Newfoundland  
PO Box 83, Stn. B, 131 Hamilton River Road, Goose Bay Newfoundland A0P1E0, Canada  
Tel +1 (709)-896-3891  
rway019@gmail.com

**Mr Warren Wilder**

Geophysical Sciences, University of Chicago  
1414 E. 59th St #772, Chicago, IL 60637, USA  
Tel 7135740127  
warrengrantwilder@gmail.com

**Mr James Wilkinson**

Department of Earth Sciences, Oxford University  
South Parks Road, Oxford OX1 3AN, UK  
Tel +44 (0)7540 542561  
james.wilkinson@univ.ox.ac.uk

**Mr David Willis**

Earth Sciences, Monash University  
Wellington Rd, Clayton, Victoria 3135, Australia  
Tel +61 424558666  
david.willis@monash.edu

**Mr Nat Wilson**

Dept of Earth Sciences, Simon Fraser University  
8888 University Drive, Burnaby, British Columbia V5A 1S6, Canada  
Tel 604 354 0841  
njwilson23@gmail.com

**Dr Gabriel Wolken**

Alaska Dept. of Natural Resources, Div. of Geological and Geophysical Surveys  
3354 College Rd., Fairbanks, AK 99709, USA  
Tel +1 (907) 4515018  
gabriel.wolken@alaska.gov



**Mr Michael Wolovick**

Earth and Environmental Science, Columbia University  
P.O. Box 1000, 61 Route 9W, Palisades ,NY 10964, USA  
mwolovic@ldeo.columbia.edu

**Mr Qian Yang**

Department of Geology, University of South Florida  
4202 E. Fowler Ave, SCA 528, Dept.Geology, Tampa, FL 33620, USA  
Tel +1 (305)9891908  
qianyang@mail.usf.edu

**Dr Yang Wei**

Institute of Tibetan Plateau Research, CAS  
No.A4, Datun Rd, Chaoyang District, Chaoyang District, Beijing 100101, P.R.China  
yangww@itpcas.ac.cn

**Miss Ashley York**

Geography, Planning & Red, Northern Arizona University  
923 West University Ave, Apt 334, Flagstaff, AZ 86001, USA  
Tel +1 (775) 233-5187  
ay242@nau.edu

**Dr Duncan A. Young**

Institute for Geophysics, University of Texas at Austin  
J.J. Pickle Research Campus Bldg. 196 (ROC), 10101 Burnet Road, Bldg 196, RM 2200, Austin, TX 78758, USA  
Tel +1 (512) 663-3271  
duncan@ig.utexas.edu

**Ms Joanna Young**

Geophysics, University of Alaska Fairbanks  
Geophysical Institute, 903 Koyukuk Drive, Fairbanks, AK 99775-7320, USA  
Tel +1 (907)-474-7187  
joanna.young@gi.alaska.edu

**Ms Yuliya Zaika**

Faculty of Geography, M.V. Lomonosov Moscow State University  
ul.Zheleznodorozhnaya 10, Kirovsk, Murmansk region 184250, Russia  
Tel +79216056502  
yzaika@inbox.ru

**Mr Rodrigo Zamora**

Glaciology, Centro de Estudios Cientificos  
Av. Prat 514, casilla 1469, Valdivia 0509000, Chile  
Tel +56 63234535  
rzamora@cecs.cl

**Mr Harry Zekollari**

Vrije Universiteit Brussel, Plainlaan 2, B-1050 Brussels, Belgium  
harry.zekollari@vub.ac.be

**Mr Fan Zhang**

Institute of Tibetan Plateau Research, CAS  
No.A4, Datun Rd., Chaoyang District,, Beijing 100101, P.R.China  
zhangfan@itpcas.ac.cn

**Assoc. Professor Huabiao Zhao**

Institute of Tibetan Plateau Research, CAS  
4A Datun Rd., Chaoyang District, Beijing 100101, P.R.China  
zhaohb@itpcas.ac.cn

# International Glaciological Society

Secretary General M.M. Magnússon

	<b>Council Members</b>		<b>Concurrent service on Council, from</b>
President	D.R. MacAyeal	2011–2014	2010
Vice-Presidents	P. Bartelt	2011–2014	2011
	C.L. Hulbe	2009–2012	2006
	F. Navarro	2011–2014	2011
Immediate Past President	E. Brun	2011–2013	2008
Treasurer	I.C. Willis	2009–2012	2006
Elective Members	D. Dahl-Jensen	2010–2013	2010
	G. Flowers	2009–2012	2009
	*S. Fujita	2011–2014	2011
	W.F. Kuhs	2009–2012	2009
	*M. Lappäranta	2010–2013	2010
	*R. Massom	2009–2012	2009
	*J. Oerlemans	2010–2013	2010
	J.A. Richter-Menge	2009–2012	2009
	*C. Ritz	2011–2014	2011
	*M. Schiwkowski	2011–2014	2011
	*Liu Shiyin	2010–2013	2010
	*Xiao Cunde	2011–2014	2011
Co-opted	F. Pattyn	2011	2011
	O. Gagliardini	2011	2011
	R.C. Hindmarsh	2011	2011

\*First term of service on the Council

## IGS Committees

Awards	M. Tranter (Chairman)
Nominations	E. Brun (Chairman)
Publications	C.L. Hulbe (Chairman)

## Correspondents

Australia	P. Heil	Netherlands	J. Oerlemans
Austria	Friedrich Obleitner	New Zealand	A. Mackintosh
Belgium	J.-L. Tison	Norway	J.C. Kohler
Canada	H. Jiskoot	Poland	W. Dobinski
Chile	G. Casassa and Andrés Rivera	Russia	V.N. Mikhaleenko
China	Yao Tandong	Spain	F. Navarro
Denmark	A.P. Ahlström	Sweden	V.A. Pohjola
Finland	M. Leppäranta	Switzerland	F. Paul
France	C. Ritz	UK	B.P. Hubbard
Germany	H. Oerter	USA (Eastern)	D.C. Finnegan
Iceland	P. Þorsteinsson	USA (Western)	H.B. Conway and
Italy	C. Smiraglia		E.D. Waddington
Japan (Hokkaido)	T. Shiraiwa	USA (Alaska)	M.A. Nolan
Japan (Honshu)	K. Nishimura		

## Seligman Crystal

1963 G. Seligman	1986 G. de Q. Robin	2000 S.C. Colbeck
1967 H. Bader	1989 H. Oeschger	2001 G.S. Boulton
1969 J.F. Nye	1989 W.F. Weeks	2001 G.K.C. Clarke
1972 J.W. Glen	1990 C.R. Bentley	2003 K. Hutter
1972 B.L. Hansen	1990 A. Higashi	2005 R.B. Alley
1974 S. Evans	1992 H. Röthlisberger	2007 L.G. Thompson
1976 W. Dansgaard	1993 L. Lliboutry	2009 P.A. Mayewski
1977 W.B. Kamb	1995 A.J. Gow	
1982 M. de Quervain	1996 W.F. Budd	
1983 W.O. Field	1997 S.J. Johnsen	
1983 J. Weertman	1998 C. Lorius	
1985 M.F. Meier	1999 C.F. Raymond	

## Honorary Members

G.K.C. Clarke	J.W. Glen
V.M. Kotlyakov	M.F. Meier
W.S.B. Paterson	C.W.M. Swinbank
G. Østrem	G. Wakahama

## Richardson Medal

1993 H. Richardson	1999 J.A. Heap
1997 D.R. MacAyeal	2003 C.S.L. Ommanney
1998 G.K.C. Clarke	2010 T.H. Jacka

# International Glaciological Society

Scott Polar Research Institute, Lensfield Road  
Cambridge CB2 1ER, UK

## DETAILS OF MEMBERSHIP

Membership is open to all individuals who have a scientific, practical or general interest in any aspect of snow and ice. Payment covers purchase of the *Journal of Glaciology* and *ICE*. Forms for enrolment can be obtained from the Secretary General or filled in on line on <http://www.igsoc.org/membership>. No proposer or seconder is required.

### ANNUAL MEMBERSHIP FEE 2012

	Sterling	US	Euro
Ordinary members	£82/72*	\$131/115*	€94/83*
Supporting members	£261	\$418	€300
Contributing members	£130	\$208	€150
Retired/partner members	£27	\$43	€31
Student members (and juniors under 30 years)	£41/36*	\$66/58*	€47/41*
Institutions, libraries for <i>Journal of Glaciology</i> Volume 58 <sup>†</sup>	£332/290*	\$531/464*	€382/334*
<i>Annals of Glaciology</i> – 53(60, part 1), 53(60, part 2) and 53(61)			
Individual price to members	£33	\$53	€38
Subscription price to members (3 issues)	£78	\$125	€90
Individual price to libraries/institutions <sup>†</sup>	£78	\$125	€90
Subscription price to libraries/institutions (3 issues) <sup>†</sup>	£221/195*	\$354/312*	€254/224

\*Online only access.

<sup>†</sup>Net of VAT.

Note: Payments in currencies other than those listed above should be calculated at the exchange rate in force at the time of payment. Then add sufficient money to cover the bank charges. Any bank transfers from outside the UK into our £ sterling account incur bank charges. The Society needs the full payment, so bank charges should be paid by you. The most economical way is to transfer payments into the respective account, i.e. USD\$ into our \$ account and EURO€ into our € account. Payment may also be made by Access/Eurocard/MasterCard or VISA/Delta.

## ICE

Editor: M.M. Magnússon (Secretary General)

This news bulletin is issued to members of the International Glaciological Society and is published three times a year. Contributions should be sent to your National Correspondent or to the Secretary General, International Glaciological Society, Scott Polar Research Institute, Lensfield Road, Cambridge CB2 1ER, UK.

Annual cost for libraries, etc., and for individuals who are not members of the Society:

Sterling £35.00 US\$56 €40

All enquiries about the International Glaciological Society should be addressed to:  
Secretary General, International Glaciological Society, Scott Polar Research Institute,  
Lensfield Road, Cambridge CB2 1ER, UK

Tel: +44 (1223) 355 974 Fax: +44 (1223) 354 931

E-mail: [igsoc@igsoc.org](mailto:igsoc@igsoc.org)

Web: <http://www.igsoc.org/>