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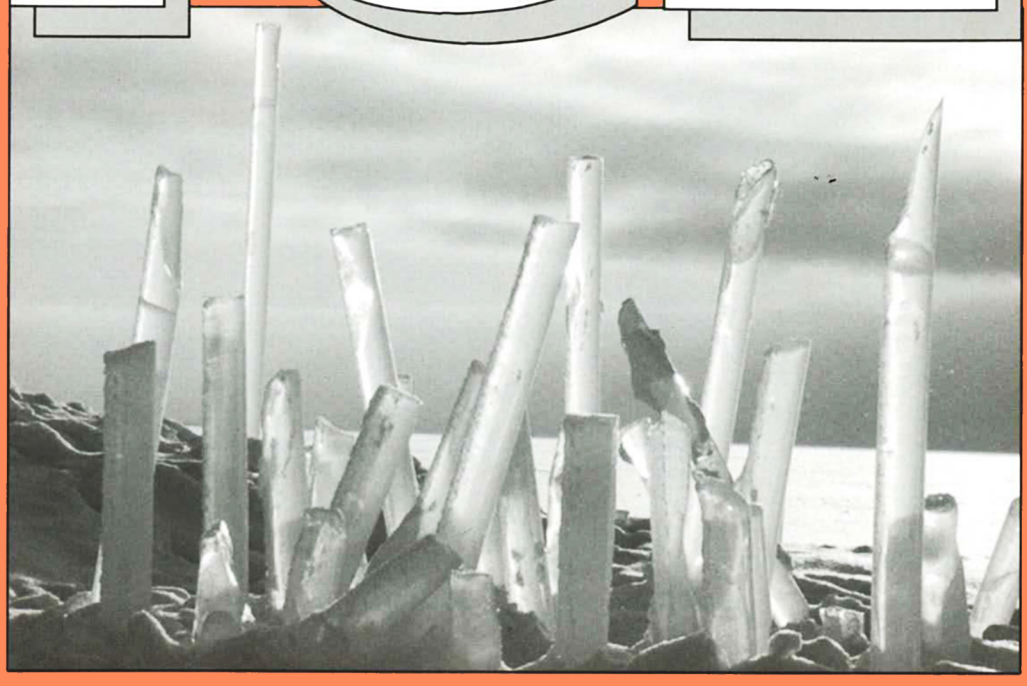

NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

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Ice

News Bulletin of the International Glaciological Society

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Cover picture: Hoar-frosted ice cores stand like an icy, miniature Stonehenge at Summit Camp, Central Greenland, by Brian Bencivengo

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

From the Editor

Dear IGS member

Once again we bring you a 'behind schedule' issue of *ICE*. But we are forever hopeful that we will be able to catch up. The next issue should be out before the end of the year and it will be a double issue as we have quite a lot of material ready.

Talking about a 'lot of material', 2008 looks like it will be another record year for submissions to the *Journal*. Throughout most of the year we have been 4–6 weeks ahead of last year's record submissions of 147. The average for 1993–2006 is 107.

This increase in submissions has prompted Council to consider increasing the number of issues published to possibly six issues per year. Council has already decided to publish five issues in 2008; the fifth issue is a complimentary issue to you and our subscribers. Not only would the extra issues cope with the increased number of papers submitted but also, and just as importantly, speed up the publication of accepted papers. At the time of writing, we are publishing issue 187 on the web. Accepted papers are however being designated to issue 189. Normally 187 would have been the last issue of 2008 and 189 would have been the second issue of 2009, normally published in April–May.

As you can see, authors of accepted papers are waiting for their designated issue. With an extra issue, 188, in 2008, 189 should be published in January–February 2009, 3–5 months earlier than if we had only had four issues in 2008. Should we increase permanently the number of issues, it will most probably involve a slight increase in membership fees beyond the normal 'inflationary' increase. But that opens up the whole issue of the pricing structure of the *Journal*, membership fees, page charges, online vs hard copy subscriptions, pay per view, etc. If you have an opinion on which direction the IGS should take, please contact one of the Council members.

Now that we have production procedures running smoothly, we have started attacking the next great issue, membership.

Over the last 7–8 years we have seen a steady decrease in paid-up membership. The reason is not necessarily that members decide to leave the IGS but primarily the inefficiency of the IGS office in processing and maintaining your membership. We have not sent out reminders nor have we collected your membership fee when you have entrusted us with your payment details. We have now hired a 'membership team' in an effort to rectify this.

They have been going through our old database to try and see whose membership is up to date and whose is not. They are now contacting you to explain the situation. Most often you are amazed to discover that your membership is some 2–4 years behind, sometimes more. But you have responded positively and the number of paid-up members is increasing. If we consider those who have been members at some point during the years 2006–2008, we have quite a respectable number.

But it is clear that we must take drastic action to ensure that this situation does not arise again. We are a long-established professional society and we must appear to be one.

We are looking into a new membership management system in which the web will

play a pivotal role. We want members and prospective members to be able to go onto the IGS website, pay their membership, update their details, purchase books and back issues and book and pay for IGS symposia. We want to be able to send you remainders well in advance and remind you again when you forget to renew (as invariably happened to me before I moved to Cambridge). We want to allow you to pay your page charges online and we want the information to be automatically transferred to our accounting system rather than having to enter the same information three times. We want our invoicing to be prompt and in synch with your research grants. Sometimes we have sent out page charge invoices long after the relevant grant has expired. All this and more we are hoping to implement soon.

We were able to turn the publications around by completely reorganizing the production process. Similarly, we are planning to turn the membership and subscription around by completely reorganizing the IGS back office.

Watch this space!

Magnús Már Magnússson
Secretary General

Recent work

Belgium

GLACIERS

Alaska

F. Pattyn, C. Delcourt (ULB-Glaciol), M. Nolan (UAF, USA)

This project focuses on the dynamic behaviour of McCall Glacier in Arctic Alaska and relies on numerical glacier modelling and Radio-Echo Sounding (RES). Model experiments were carried out with a higher-order numerical ice-flow model, and results were validated with measurements of annual ice velocities and compared with previous estimates of ice flow dynamics. During the 2003, 2005 and 2006 summer campaigns, detailed RES measurements were carried out with a 5 MHz (central frequency) ice penetrating radar. The Basal Reflection Power (BRP) beneath the central flow line abruptly increases at one location area followed by a slow decrease down-glacier. The model experiments show that basal sliding (<50%) is necessary to match the observed annual mean surface velocities in the area that is characterized by high BRP values. However, when taking thermomechanical effects into account, a temperate basal ice layer is apparent in the ablation area which locally softens the ice and can explain to a certain extent the anomalous flow field. The model results confirm that the present temperature field is a remnant of a larger glacier geometry that was near steady state before the onset of enhanced surface thinning in the 1970s. Recent modelling work focuses on the historical and future response of McCall Glacier to changes in climate in support to a comprehensive contribution of Arctic glaciers to 21st century sea-level rise.

Switzerland

P. Huybrechts (VUB)

A glaciological field programme is in operation since 2001 to measure mass balance, ice thickness, and surface velocity on the Vadret da Morteratsch in the Bernina massif in the Engadine (southeast Switzerland). This large valley glacier has a detailed record of front variations dating back to the end of the Little Ice Age and may already have lost up to 40% of its ice volume since 1860. Mass balance and velocity measurements were performed at about 20 locations in the ablation zone and are supplemented with shallow ice core and pit measurements up to an elevation of 3750 m. Ice thickness was measured with two radar systems in around 250 individual locations and along several km of continuous transects. These data are being used in a coupled three-dimensional glacier/mass balance model to better understand the past glacier behaviour and to be able to predict its future behaviour in a warming climate. The mass balance model considers the surface energy fluxes, time-dependent albedo as well as the shading effect of the surrounding mountains. It is driven by meteorological records from surrounding synoptic stations. The ice flow model considers both longitudinal and transverse stress gradients in the force balance in addition to the usual terms of the shallow-ice approximation.

International collaborators: AWI (D), UU (NL)

Bolivia

F. Pattyn, C. Olmos (ULB-Glaciol), E. Ramirez (UMSA, La Paz, Bolivia)

The research objective of this study is to manage the hydrological resources of the cities La Paz and El Alto in Bolivia by numerical modeling of the glaciers that feed into the hydrological system and to study their response to 21st century climate change.

ICE SHEETS AND ICE SHELVES

ISMIP: Ice Sheet Model Intercomparison Project

P. Huybrechts (VUB)

The aim of ISMIP (Ice Sheet Model Intercomparison Project) is to test the current generation of ice flow codes with a new set of intercomparison exercises. The activity is sponsored by CliC (Climate and Cryosphere – a core project of the World Climate Research Programme co-sponsored by the Scientific Committee on Antarctic Research). It is a follow-up to the EISMINT phases I and II, which activity inspired much of the ice-sheet model development during the nineties in laboratories worldwide. New model setups are now available for higher-order flow models (HOM), Heinrich-type of ice-sheet instabilities (HEINO), polar ice sheet models (POLICE), and marine ice sheet models (MISMIP). Website: http://homepages.vub.ac.be/~phuybrec/ismip.html.

ISMIP-HOM: Ice Sheet Model Intercomparison Project on Higher-Order Models

F. Pattyn (ULB-Glaciol)

Higher-order models are models that incorporate further mechanical effects, principally longitudinal stress gradients, or that solve the full system of

equations of the linear Stokes problem. These models are validated in a series of six benchmark experiments of which one has an analytical solution under simplifying assumptions. Five of the tests are diagnostic and one experiment is prognostic or time dependent, for both 2-D and 3-D geometries. The results show a good convergence of the different models even for high aspect ratios. A clear distinction can be made between higher-order models and those that solve the full system of equations. The latter show a significantly better agreement with each other as well as with analytical solutions, which demonstrates that they are hardly influenced by the used numerics.

MISMIP: Marine Ice Sheet Model Intercomparison Project

C. Schoof (UBC, Canada), R. Hindmarsh (BAS, UK), F. Pattyn (ULB-Glaciol)

The last few years have seen a great deal of effort invested by various research groups in developing numerical marine ice sheet models that are intended to represent accurately the motion of an ice sheet grounding line, and this effort has seen a variety of models emerge. It is at present unclear to what extent these models agree with one another, or indeed, how well they are able to model real marine ice sheets. The purpose of the proposed experiments is to address the former question: how well do our models agree with one another? In addition, the purpose of the experiments is also to assess how well the numerical schemes used solve the partial differential equations on which they are based. Not all the models used in marine ice sheet simulations deal with the same equations, but many of them share basic characteristics. Basically, the following questions are addressed to: (i) do marine ice sheets have one or more distinct equilibrium shapes, or do they not exhibit 'neutral equilibrium'? (ii) do stable steady states have to have their grounding lines in a region of downward-sloping bed? (iii) how do equilibria depend on bed geometry and the physics of sliding at the bed, ice viscosity and gravitational forces as well accumulation rates? (iv) Is hysteresis under changes in forcings and internal physical properties possible when the bed is overdeepened? (v) To what extent is high grid resolution, especially near the grounding line, necessary to obtain reliable results? Is this particularly important when modelling transients?

Three-dimensional modelling studies of the Antarctic ice sheet

P. Huybrechts (VUB), F. Pattyn (ULB)

An existing 3-D whole ice sheet model covering the entire Antarctic ice sheet is being developed further to better deal with the basal boundary condition and the coupling with an ice shelf across the grounding line. This model consists of components describing the ice flow, the solid Earth response, and the mass-balance at the ice–atmosphere and ice–ocean interfaces. Grounded ice flow occurs through internal deformation and sliding over the bed. The grounded ice domain is coupled to a dynamic ice-shelf model. The flow is thermomechanically coupled through the simultaneous solution of the temperature and velocity equations. The model freely generates the ice-sheet geometry in dependence of changes in environmental boundary conditions (surface temperature, accumulation rate, and sea-level stand). Standard resolution is 20 km in the horizontal and 31 layers in the vertical. We are nesting a higher-order ice flow code at very high resolution in a number of key locations such as grounding lines and outlet glaciers and ice streams to better deal with the dynamics at these specific places. We also implement an improved basal sliding law which accounts for the amount of basal water. Movement of the water is calculated from a flux relationship and an equation for water movement based on the hydraulic pressure gradient. The nested model will specifically focus on the dynamics of the last glacial-interglacial transition which commenced about 15 000 years ago. This research contributes to the ASPI (Antarctic Subglacial Processes and Interactions: role of transition zones in ice sheet stability) project of the Belgian Federal Office of Science Policy.

Numerical modelling of the decaying northern hemisphere ice sheets

P. Huybrechts (VUB)

A three-dimensional thermomechanical ice-sheet model of the northern hemisphere ice sheets (North America, Greenland, and Eurasia) has been interactively coupled to LOVECLIM, the Belgian Community Earth System Model of intermediate complexity. The interactions between decaying northern hemisphere ice sheets and the atmosphere and ocean are investigated both during the last termination as during MIS3 variations (Dansgaard-Oeschger oscillations). The interest is in the details of the sequence of events which follow initial melting of the ice sheets, their effect on the high-latitude hydrological balance and the thermohaline circulation, and ultimately on atmospheric conditions feeding back on the ice-sheet's surface mass balance. Crucial in this study are the spatio-temporal patterns of variable freshwater discharges and time varying meltwater routing. The latter is obtained from a novel ice-sheet runoff and hydrological routing scheme to quantify the amount of meltwater, the location of drainage pathways, and the possible storage in proglacial lakes. This research contributes to the EU FP7 Marie Curie Research Training Network NICE (Network for Ice and Climate Evolution).

Incorporation of cryospheric components in the LOVECLIM climate model

P. Huybrechts (VUB)

Three-dimensional thermomechanical polar ice sheet models have been interactively coupled with the Belgian Community Earth System Model of intermediate complexity LOVECLIM. The Greenland and Antarctic ice-sheet components have a 10-km horizontal resolution and 31 layers in the vertical. They calculate ice volume changes and provide freshwater and surface elevation feedbacks with the ocean and the atmosphere. The models include modules that compute the ice flow, the solid Earth's response and the mass balances at the ice-atmosphere and ice-ocean interfaces. To close the sea level contribution from the continental cryosphere, a global glacier melt algorithm from Raper and Braithwaite is employed to obtain the contribution from mountain glaciers and small ice caps in off-line mode. With the coupled model, we explore in a systematic way the range of possibilities for future climate evolution by performing a large ensemble of experiments in which key model parameters are varied within a reasonable range. This allows to estimate probability density functions of important climate characteristics such as the climate sensitivity, the spatial distribution of the temperature and precipitation changes in response to an increase in greenhouse gas concentrations, the response of ice sheets and glaciers, and the evolution of eustatic sea level. The focus is on ice and climate evolution during the third millennium. Model validation within the chosen range of model parameters is performed over the whole Holocene and over the last 1500 years in particular. This research contributes to the ASTER (Assessment of modelling uncertainties in long-term climate and sea level change) project of the Belgian Federal Office of Science Policy.

Antarctic subglacial lakes

F. Pattyn, R. Souchez (ULB-Glaciol)

The influence of subglacial lakes on the dynamics of the ice sheet is investigated through numerical model analysis. We simulated the ice flow across subglacial Lake Vostok, East Antarctica, which showed that pronounced surface flattening and ice-flow turning across the lake is due to its presence and its dynamics as 'imbedded' ice shelf. Model experiments point to a local ice speedup in the northern part of the lake, which can be associated with the onset of an enhanced ice-flow feature, more precisely the onset of the Totten Glacier catchment. Ongoing research focuses on linking the ice dynamic part with water circulation models.

Recent observations have shown that subglacial lakes are prone to drain rapidly, hence challenging the idea of being closed subglacial environments. For instance, changes in subglacial potential gradients may lead to subglacial lake outbursts, hence discharging excess water through a subglacial drainage system underneath the ice sheet. Such process can eventually lead to an ice flow speedup. We developed a full Stokes numerical ice sheet model that takes into account the ice flow over subglacial water bodies in hydrostatic equilibrium with the overlying ice. Sensitivity experiments were carried out for small perturbations in ice flow and basal melt rate as a function of ice thickness, general surface slope, ice viscosity and lake size, so as to investigate their influence on the subglacial potential gradient and the impact on subglacial lake drainage. Experiments clearly demonstrate that small changes in surface slope are sufficient to start and sustain episodic subglacial drainage events. Therefore, lake drainage can be regarded as a common feature of the subglacial hydrological system and may influence to a large extent the present and future behaviour of large ice sheets.

Antarctic Subglacial Processes and Interactions (ASPI)

F. Pattyn, J.-L. Tison, D. Samyn (ULB-Glaciol), P. Huybrechts (VUB)

ASPI (Antarctic Subglacial Processes and Interactions) aims (i) to understand the interactions between the ice sheet and the subglacial environment and the processes that control the Antarctic ice sheet, and (ii) to quantitatively determine the stability of the ice sheet in a changing climate and the impact of climatic variations on the coastal ice sheet. A key factor is the transition zone near grounding lines, i.e. the interface between the ice sheet and an ice shelf. These transition zones are probably among the least understood elements of ice sheets, although they determine to a large extent the processes and dynamics of lateral expansion and retreat of ice sheets as well as the stability of marine ice sheets. We developed higher-order ice sheet models including grounding line migration (see MISMIP) that are incorporated into a large-scale thermomechanical ice sheet model of the Antarctic ice sheet. Sensitivity studies with ice stream and shelf models are carried out to investigate the role of marine ice inclusions in the stability of grounding lines based on rheological characteristics determined from laboratory deformation experiments. Present-day numerical ice sheet models are thus refined this way to improve the predictability in terms of future sea-level rise.

Marine ice and 'ice-mélange' properties

D. Samyn, J.-P. Remy, J.-L. Tison, F. Pattyn, (ULB-Glaciol)

It is now acknowledged that Antarctic ice sheet stability is largely controlled by dynamics of transition zones such as ice shelves. These zones are e.g. acting as confining walls for grounded ice flowing towards the ocean. Though marine ice is an important by-product of ice-shelf/ocean interactions, its origin and dynamics are poorly known. Our project on 'Marine ice and *ice-mélange* properties' is embedded into ASPI and aims at integrating realistic mechanical data of marine ice and *ice-mélange* into ice flow models by investigating the rheology, crystallography and geochemistry of marine ice cores retrieved from various ice shelves in Antarctica. Preliminary results at Nansen Ice Shelf, Terra Nova Bay, indicate that the marine ice flow and rheology is not in agreement with stress fields commonly considered in ice shelves, as revealed by highly contrasted fabric patterns observed in the cores. Our work suggests at this stage that topographical settings (margins and pinning points) play an as important role as the grounding line activity on the dynamics of small ice shelves. Numerical modeling is under way to help us balancing this issue.

Basal ice from deep ice cores

J.-L. Tison, D. Samyn, R. Souchez, R. Lorrain (ULB-Glaciol)

This ongoing research program is a long term endeavour, leaning on the expertise initially developed with basal ice from Swiss valley glaciers and extended to ice sheet deep ice cores such as the Dye-3 or the GRIP ice cores, where clear basal ice layers (i.e. ice loaded with debris particles) were displayed. These studies provide original information on initial and boundary conditions of ice sheets, with important implications for ice sheet inception, ice sheet dynamics, subglacial hydrology and the validity of paleoclimatic signals in older ice, close to the ice-bedrock interface. With the advent of new deep ice cores such as the EPICA Dome C (EDC) and EPICA Dronning Maud Land (EDML), partly driven by the quest of yet older ice, basal interface temperature conditions are generally close to/at the pressure melting point, limiting occurrences of debris-rich frozen basal ice layers. When sampled above subglacial lakes, such as Lake Vostok, the basal ice layers, although depleted of large amount of particles, clearly differ from the meteoric ice layers above, since they result from the refreezing of subglacial lake water. Lots can then be learned on the subglacial conditions from the properties of this lake ice. The situation is less clear at the EPICA Dome C as indicated by our current multi-parametric analyses on what is more often referred to as 'Deep ice' rather than 'Basal ice', because of its ambiguous properties. From the low resolution record available today, several variable seem to indicate that the ice is of 'glacial' origin and has kept its paleoclimatic signature in the lower 60 meters of the core. Some records are however still an enigma: discrepancy between the δD_{ice} and the oceanic record, noticeable reduction of the δD_{ice} amplitude for an uncommon length of the record, flat $\delta^{18}O_{atm}$ curve despite large changes of astronomical forcing a.s.o. These, together with the presence of some dispersed dirt inclusions, suggest flow disturbance mixing. Further arguments are now being looked at, with the help of new high-resolution measurements. The EPICA Dronning Maud Land ice core shows similar thermal conditions close to the bedrock, with a few meter of air-depleted basal ice suggesting refreezing processes. Basal conditions at EDML are currently deciphered from the properties of both the ice itself and of the refrozen water that has invaded the drill hole on termination of the drilling. High supersaturation gas contents were detected (as compared to surface solubility values and to the available total gas content trapped as bubbles within the meteoric ice), potentially linked with the local overburden pressure, therefore calling for gas enrichment processes of the subglacial waters. Our laboratory is also looking at basal sequences from smaller ice caps, such as the Berkner Island ice rise or the Severnaya Zemlya Ice cap.

International collaborators: LGGE (F), LSCE (F), NBI (Dk), AWI (D), BAS (UK)

Biogeochemistry of basal ice environments

J.-L. Tison, D. Samyn, R. Souchez, R. Lorrain (ULB-Glaciol)

This relatively recent development on the biogeochemistry of basal ice from various environments has evolved from the specific gas properties of these ice layers, showing record concentration levels in CO_2 and CH_4 (up to three orders of magnitude higher than atmospheric values) and sometimes extremely low O_2 levels. Gas isotopes ($\delta^{18}O_{atm}$ and $\delta^{13}C_{CH4}$) are also very specific, indicating a predominant impact of microbial processes at the ice-bedrock interface. Basal ice sites from a large variety of environments and locations are presently revisited with the perspective of understanding better both the microbial metabolism and biodiversity (DNA studies) of these peculiar extreme environments that could also be seen as proxies of life forms on icy extra-terrestrial astronomical objects.

International collaborators: LGGE (F), NBI and BI (Dk), BAS (UK), MSU (USA)

Textures/fabrics and deformation–recrystallization processes in deep basal ice layers

D. Samyn (ULB-Glaciol), A. Svensson (NBI, DK)

Ice Physical properties at the base of glaciers and ice sheets are hardly known. Among the various processes that drive basal ice dynamics, the thermal regime and ice fabrics are the main players. Debris characteristics also hold a key role. In an attempt to formalize basal ice processes at subfreezing temperature and to assess the potential role played by debris during recrystallization, crystallographic and structural analyses are conducted in basal ice from various types and locations. This approach has revealed a clear influence of debris arrangement on grain boundary and nucleation kinetics at the rheological interfaces of the basal zone. It has also been shown that strain is localized at these interfaces during basal ice genesis. This has important implications for the knowledge of recrystallization dynamics at the bottom of deep polar ice sheets, which is the focus of ongoing research.

DRY VALLEYS

Basal ice in the Dry Valleys, Antarctica

D. Samyn, R. Lorrain (ULB-Glaciol),
S. Fitzsimons (UOtago, NZ)

The purpose of this research project is to refine our understanding of the behaviour of cold-based glaciers by building depositional and tectonical models based on glaciodynamic processes. Building such models requires establishing functional relationships between geological products and glaciological processes across margin areas. Our main research approach is the study of the dynamics and composition of basal ice retrieved either from tunnels dug at glacier margins or from ice cores sampled at the contact with neighbouring lakes.

Although recent studies demonstrate that cold-based glaciers can erode and deform frozen sediments, we do not yet understand how this deformation occurs, how deformation results in debris entrainment, or how changes in the properties of the resulting basal ice alter the glacier behaviour. These three interrogations drive our research programme.

Buried ice in the Dry Valleys, Antarctica

D. Samyn, R. Lorrain, J.-L. Tison (ULB-Glaciol),
D. Marchant (UBoston, USA)

One partially unresolved question is the age and origin of buried ice found at numerous locations throughout the Dry Valleys, especially in Beacon Valley, Antarctica. Different forms of deposits have been identified so far, some of which being rich in debris and highly deformed. Such buried ice deposits represent a new and potentially far-reaching archive of atmosphere and climate on Earth, which might help documenting the fundamental problem of (pre-) Quaternary global climate change and Antarctic Ice Sheet evolution. Collaborative work has focused on buried ice from Beacon Valley and tributaries and is currently dealing at Glaciol-ULB with the analysis of buried ice from 4 sampling sites in the accumulation and ablation areas of Mullins Rock Glacier. We are investigating the retrieved ice cores for their chemistry, atmospheric gases and O-H stable isotopes, which will help us to identify the origin and formation of the buried ice. We are also determining the structural properties (crystallography, stratigraphy, sedimentology, …) of Mullins buried ice to constrain the processes of formation and deformation of the ice.

Lake ice–basal ice interactions in the Dry Valleys

D. Samyn, R. Lorrain (ULB-Glaciol), S. Mager,
S. Fitzsimons (UOtago, NZ)

It has been demonstrated by members of the research team that perennially frozen lakes in the McMurdo Dry Valleys do contribute to the formation of the basal ice of cold based glaciers descending from the valley slopes and reaching the valley bed where they are at least partially damming these lakes. Investigation of such processes has been performed by examining the solute chemistry, gas content and isotopic composition of ice and water from various lakes and neighbouring glaciers. Liquid water from the lake and/or from other sources plays a role in the build-up and the behaviour of the basal ice layer of the surrounding glacier.

The ice is sampled by coring from the lake surface and also by sampling the walls of tunnels dug from the glacier flank or terminus. Measurements of ice velocity and deformation in the tunnels show complex patterns of strain near the bed that are not well described by Glen's law. Sliding happens at –17°C or even lower, strain is concentrated in weak ice facies and thin shear zones. This study is now extended to situations where Valley glaciers are terminating into proglacial lakes like, for instance, in the case of the Victoria Upper Glacier entering into Victoria Upper Lake, situated in the far east of Victoria Valley. The cores retrieved from the lake show different types of ice. Some of them are sediment rich and often contain algae similar to those observable on the borders of several other glaciers from the Dry Valleys.

SEA ICE

Sea ice physics and biogeochemistry

J.-L. Tison, F. Brabant, G. Carnat (ULB-Glaciol), C. Lancelot, S. Becquevort, V. Schoemann, I. Dumont, F. Masson (ULB-ESA), L. Chou (ULB-LOCGE), J. de Jong (ULB-DSTE), B. Delille, A. Borges, N.-X. Geilfus (ULg-COU), M. Vancoppenolle (UCL-ASTR)

The aims of this research program is to measure and understand better the physical and biogeochemical processes associated to the formation and decay of sea ice, the contribution of which is presently not included in global biogeochemical models, because they are generally poorly known. Peculiar attention is drawn to carbon dioxide (CO_2) and dimethyl sulphide (DMS), both climatically significant gases being actively involved in the metabolic processes of microbial communities in sea ice (sympagic). The project also focuses on the iron cycle (origin, disponibility and transformations) in sea ice, since it has now been clearly demonstrated, at least in Antarctica, that this element is potentially playing a crucial role in controlling phytoplankton productivity and, thereby, the 'carbon pump' of the Southern Ocean.

The geographical domain includes both the Arctic and the Antarctic, for which the controlling mechanisms of the Carbon cycle, the relative balance of marine vs anthropogenic sulphur sources and the availability of iron are likely to be extremely contrasted. The methodology is highly interdisciplinary, combining field process studies, laboratory experimental work and modelling.

In the recent years, four main Antarctic field programs (CAMP HASKELL 1999-2003, ARISE 2003, ISPOL 2004-2005 and SIMBA 2007) have been devoted to data collection from process studies for multi-parametric ice-brine-snow-water measurements (ice textures, bulk salinity, temperature, stable isotopes, total gas content, gas composition (O_2, N_2, CO_2, CH_4, Ar, DMS), ice-air CO_2 fluxes, microbial parameters (chla, biomass, viability, speciation), nutrients (incl. iron)). Iron availability and microcosms experiments were also performed 'in situ'. Two Arctic campaigns are currently running/planned in the framework of IPY (CFL 2007-2008 and Point Barrow 2008-2009).

Ongoing modelling work develops a new sea ice biogeochemical model (SIMCO), the parametrization of which will rely on the findings of the field campaigns and experimental work. The coupling of this new model with its equivalent (already operational) for the upper surface of the Southern Ocean (SWAMCO) should provide us with an original data set on CO_2 and DMS exchanges between the Ocean, the sea ice and the atmosphere.

International Collaborators: ACE-CRC (Australia), AWI (D), UBangor (UK), UTSA (USA), DRI (USA), UGron (NL), EAS (Can), UOtago (NZ), CEOS (Can).

Sea ice modeling and study of climate variability in the polar regions

Th. Fichefet, H. Goosse, S. Bouillon, E. Crespin, A. de Montety, C. König, W. Lefebvre, O. Lietaer, M. Vancoppenolle (UCL-ASTR)

Important improvements have recently been made to LIM, the Louvain-la-Neuve sea ice model: (1) inclusion of an explicit representation of the sea ice salinity processes and age, (2) incorporation of a subgrid-scale ice thickness distribution and (3) implementation of an elastic-viscous-plastic rheology on a C-grid. Data assimilation techniques are presently used to calibrate it. Furthermore, a finite element version of this model is being developed. LIM, coupled to the French global ocean general circulation model NEMO and driven by atmospheric reanalysis data, is currently utilized to investigate the interannual variability and changes of the Arctic and Antarctic sea ice covers over the last decades. Studies of past (Holocene) and future sea ice changes are also conducted with LIM included in Earth system models of various levels of complexity.

PERMAFROST

Gas properties of ice wedges

T. Boereboom, J.-L. Tison (ULB-Glaciol)

Permafrost areas are currently affected by climate change, and increasing soil melting in the summer alters the carbon cycle in these regions. This work focuses on the study of ice wedges characteristics and their sensitivity to melting. Ice-wedges studies are known, among others, for paleoclimatic and paleoenvironmental reconstructions, but only a few recent studies have focused on their gas properties (total gas content and gas composition in N_2, O_2, CO_2, CH_4, Ar…). Our work focuses on multiparametric analyses of ice wedges and is part of a larger research project entitled: 'Process studies of permafrost dynamics in the Laptev Sea' which is related to the paleoenvironmental history of Cape Mamontovy Klyk (P.I.: H. Meyer). Stable isotope composition, gravimetric ice content and hydrochemical measurements have already been discussed and there is still some debate on the respective age of some ice wedges in the area. Ice crystallography and gas composition are used as means to shed more light not only on the build-up processes of ice wedges but also on how they potentially contribute to fluxes of climatically significant gases (especially CH_4) to the atmosphere.

International Collaborators: AWI (D).

Methane mass-balance and fluxes from permafrost lake ice

T. Boereboom, J.-L. Tison (ULB-Glaciol)

Methane emanations from lakes and mires in permafrost environments represent a potentially important contribution to the increase of greenhouse gases in the atmosphere. Increased soil melting in these regions activates the anaerobic decomposition in wet environments. Several studies have focused on summer fluxes from lake sites, but there is little information related to the gases enclosed in the lake ice during the winter and released into the atmosphere during the springtime. The aim of this project is to study the gas composition (O_2, N_2, CO_2, CH_4, Ar) and the total gas content of winter permafrost lake ice. Various sampling techniques are currently evaluated in order to address the wide range of bubble sizes generally observed in permafrost lake ice. Field work will be located at the Stordalen Mire site, in Northern Sweden.

International collaborators: ULund and UStock (S)

CRYOSPHERE IN GLOBAL CLIMATE MODEL

Assessment of modelling uncertainties in long-term climate and sea level change projections (ASTER)

Th. Fichefet (UCL-ASTR), P. Huybrechts (VUB), A. Mouchet (ULg)

It is crucial for policymakers to take into account the full range of potential future climate and sea level changes. Nevertheless, they are usually faced with different scenarios without a clear understanding of the reasons for discrepancies among them and without knowing if surprises are possible or very unlikely. We therefore propose to assess in a clear and objective way the range of climate and sea level change projections over the next few millennia associated with both model and forcing uncertainties using LOVECLIM, a global three-dimensional Earth system model of intermediate complexity recently upgraded with two new components: a three-dimensional thermomechanical model of the ice sheets that were present in the Northern Hemisphere during the early Holocene and a model of diagenetic processes in deep-sea sediments.

Some key parameters of LOVECLIM will be varied in order to construct about 30 model versions leading to very different climate, sea level and atmospheric CO_2 concentration responses to changes in forcing. For each version, a long control simulation and idealized perturbation experiments will be conducted in order to get precise information on the model behaviour. This will allow, in particular, understanding why the different model versions respond differently to forcing changes. These ~30 model versions will then be utilized to carry out transient simulations over the whole Holocene (i.e., the last 10 000 years), the period around 8.2 kyr before present (BP), which was characterized by an abrupt climate change, and the last millennium. The results of all these simulations will be thoroughly compared with the available observational and proxy data to check if the different model versions are able to reproduce the independently reconstructed variability and changes. The versions that successfully pass this test will be employed to perform simulations of the long-term (millennial scale) evolution of climate and sea level in response to various future CO_2 emission scenarios.

The major outcome of ASTER will thus be a full range of possible long-term scenarios of climate and sea level changes, and an assessment of their likelihood. A particular attention will be paid to the possibility of abrupt or irreversible climate changes involving the North Atlantic meridional overturning circulation, the Greenland and/or Antarctic ice sheets and the carbon cycle.

ABBREVIATIONS

ACE:	Antarctic Climate and Ecosystems
ARISE:	Antarctic Remote Sensing Ice Experiment
ASPI:	Antarctic Subglacial Processes and Interactions
ASTER:	Assessment of modelling uncertainties in long term climate and sea level change
ASTR:	Institut d'Astronomie Georges Lemaître
AWI:	Alfred Wegener Institute für Polar und Meeresforschung
BAS:	British Antarctic Survey
BI:	Biological Institute
CEOS:	Centre for Earth Observation Science-University of Winnipeg
CLiC:	Climate and the Cryosphere
COU:	Chemical Oceanography Unit
CRC:	Cooperative Research Center
DRI:	Desert Research Institute
DSTE:	Département des Sciences de la Terre et de l'Environnement
EAS:	Earth and Atmospheric Sciences-University of Alberta
EISMINT:	European Ice Sheet Modelling Initiative
EPICA:	European Project for Ice Coring in Antarctica
ESA:	Ecologie des Systèmes Aquatiques
Glaciol:	Laboratoire de Glaciologie
GRIP:	Greenland Ice Core Project

HEINO:	Heinrich Event intercomparison
HOM:	Higher Order Models
ISMIP:	Ice Sheet Model Intercomparison Project
ISPOL:	Ice Station Polarstern
LGGE:	Laboratoire de Glaciologie et Géophysique de l'Environnement
LOCGE:	Laboratoire d'Océanographie Chimique et de géochimie des Eaux
LOVECLIM:	Belgian Community Earth System Model of intermediate complexity
LSCE	Laboratoire des Sciences du Climat et de l'Environnement
MISMIP:	Marine Ice Sheet Model Intercomparison project
MSU:	Montana State University
NBI:	Niels Bohr Institute
NICE:	Network for Ice and Climate Evolution
POLICE:	Polar Ice Sheet Models
SIMBA:	Sea Ice Mass Balance of Antarctica
UAF:	University of Alaska, Fairbanks
UBangor	University of Bangor
UBC:	University of British Columbia
UBoston:	University of Boston
UCL	:Université Catholique de Louvain
UGron:	University of Groningen
ULB:	Université Libre de Bruxelles
ULg:	Université de Liège
ULund:	Lund University
UMSA:	Universidad Mayor de San Andrés
UOtago:	University of Otago
UStock:	University of Stockholm
UTSA:	University of Texas San Antonio
UU	Universiteit Utrecht
VUB:	Vrije Universiteit Brussel

International Glaciological Society

JOURNAL OF GLACIOLOGY

Papers accepted for publication between 1 February 2008 and 31 August 2008. The papers are listed in alphabetical order by first author. Some of these papers have already been published.

Nerilie J. Abram, Mark A.J. Curran, Robert Mulvaney and Tessa Vance
The preservation of methanesulphonic acid in frozen ice-core samples

G. Aðalgeirsdóttir, T. Murray, A. Smith, M. King, K. Makinson, K. Nicholls, A. Behar
Tidal influence on Rutford Ice Stream, West Antarctica: observations of surface flow and basal processes from closely-spaced GPS and passive seismic stations

Jinho Ahn, Melissa Headly, Martin Wahlen, Edward J. Brook, Paul A. Mayewski, Kendrick C. Taylor
CO_2 diffusion in polar ice: observations from naturally formed CO_2 spikes in the Siple Dome ice core, Antarctica

Anthony A. Arendt, Scott B. Luthcke, Christopher F. Larsen, Waleed Abdalati, William B. Krabill, Matthew J. Beedle
Validation of High-Resolution GRACE mascon estimates of glacier mass changes in the St. Elias Mountains, Alaska, USA using aircraft laser altimetry

N.E. Barrand, T. Murray, T.D. James, S.L. Barr, J.P. Mills
Optimising glacier DEMs for volume change assessment using laser scanning derived ground control points

L. M. Berliner, K. Jezek, N. Cressie, Y. Kim, C. Q. Lam, C. J. van der Veen
Modeling dynamic controls on ice streams: a Bayesian statistical approach

Philippe Berthet-Rambaud, Ali Limam, Djebar Baroudi, Emmanuel Thibert, Jean-Michel Taillandier
Characterisation of avalanche loading on impacted structures: a new approach based on inverse analysis

Tobias Bolch, Manfred Buchroithner, Tino Pieczonka and André Kunert
Planimetric and volumetric glacier changes in the Khumbu Himal, Nepal, since 1962 using Corona, Landsat TM and ASTER data

Roger J. Braithwaite
Temperature and precipitation climate at the equilibrium-line altitude of glaciers expressed by the degree-day factor for melting snow

Ian Campbell, Robert Jacobel, Brian Welch, Rickard Pettersson
The evolution of surface flow stripes and stratigraphic folds within Kamb Ice Stream: why don't they match?

Jorge Carrasco, Roberto Osorio, Gino Casassa
Secular trend of the equilibrium-line altitude in the western side of the southern Andes, derived from radiosonde and surface observations

Ginny A. Catania, Thomas A. Neumann, Stephen F. Price
Characterizing englacial drainage in the ablation zone of the Greenland ice sheet

William Colgan, James Davis, Martin Sharp
Is the high-elevation region of Devon Ice Cap thickening?

Steven M. Conger, David M. McClung
Instruments and Methods: Comparison of density cutters for snow profile observations

J.A. Dowdeswell, J. Evans, R. Mugford, G. Griffiths, S. McPhail, N. Millard, P. Stevenson, M.A. Brandon, C. Banks, K.J. Heywood, M.R. Price, P.A. Dodd, A. Jenkins, K.W. Nicholls, D. Hayes, E.P. Abrahamsen, P. Tyler, B. Bett, D. Jones, P. Wadhams, J.P. Wilkinson, K. Stansfield, S. Ackley
Instruments and Methods: Autonomous underwater vehicles (AUVs) and investigations of the ice-ocean interface: deploying the Autosub AUV in Antarctic and Arctic waters

Olaf Eisen
Inference of velocity pattern from isochronous layers in firn, using an inverse method

Jérome Faillettaz, Antoine Pralong, Martin Funk, Nicholas Deichmann
Evidence of log-periodic oscillations and increasing icequake activity during the breaking-off of large ice masses

Sergio H. Faria
The symmetry group of the CAFFE model

Robert S. Fausto, Andreas P. Ahlstrøm,
Dirk van As, Carl E. Bøggild, Sigfus J. Johnsen
A new present day temperature parameterization for Greenland

Koji Fujita, Ryohei Suzuki, Takayuki Nuimura, Akiko Sakai
Performance of ASTER and SRTM DEMs, and their potential for assessing glacial lakes in the Lunana region, Bhutan Himalaya

Kotaro Fukui, Toshio Sone, Jorge A. Strelin,
Cesar A. Torielli, Junko Mori, Yoshiyuki Fujii
Dynamics and GPR stratigraphy of a polar rock glacier on James Ross Island, Antarctic Peninsula

B. K. Galton-Fenzi, C. Maraldi, R. Coleman,
J. Hunter
The cavity under the Amery Ice Shelf, East Antarctica

F. Elif Genceli, Shinichirou Horikawa,
Yoshinori Iizuka, Toshimitsu Sakurai,
Takeo Hondoh, Toshiyuki Kawamura,
Geert-Jan Witkampa
Meridianiite detected in ice

Nicholas R. Golledge, Alun Hubbard,
David E. Sugden
Mass balance, flow, and subglacial processes of a modelled Younger Dryas ice cap in Scotland

J.D. Gulley, D.I. Benn, D. Müller, A. Luckman
A cut-and-closure origin for englacial conduits in uncrevassed regions of polythermal glaciers

Robert L. Hawley, Elizabeth M. Morris,
Joseph R. McConnell
Instruments and Methods: Rapid techniques for determining annual accumulation applied at Summit, Greenland

Robert L. Hawley, Ola Brandt, Elizabeth M.
Morris, Jack Kohler, Andrew P. Shepherd,
Duncan J. Wingham
Techniques for measuring high-resolution firn density profiles: a case study from Kongsvegen, Svalbard

Felix Hebeler, Ross S. Purves,
Stewart S.R. Jamieson
The impact of parametric uncertainty and DEM error in ice sheet modelling

Ian M. Howat, Ian Joughin, Mark Fahnestock,
Benjamin E. Smith, Theodore Scambos
Synchronous retreat and acceleration of southeast Greenland outlet glaciers 2000–2006: ice dynamics and coupling to climate

Bryn Hubbard, Samuel Clemmens
Recent high-resolution surface velocities and elevation change at a high-altitude, debris-covered glacier: Chacraraju, Peru

Bryn Hubbard, Sam Roberson, Denis Samyn,
Derek Merton-Lyn
Digital optical televiewing of ice boreholes

Matthias Huss, Reto Stöckli,
Giovanni Kappenberger, Heinz Blatter
Temporal and spatial changes of Laika Glacier, Canadian Arctic, since 1959 inferred from satellite remote sensing and mass-balance modelling

D. Iliescu, I. Baker
Effects of impurities and their redistribution during recrystallization of ice crystals

Guillaume Jouvet, Marco Picasso,
Jacques Rappaz, Heinz Blatter
A new algorithm to simulate the dynamics of a glacier: theory and applications

P. Lacroix , B. Legresy, K. Langley, S.E. Hamran,
J. Kohler, S. Roques, F. Remy, M. Dechambre
Instruments and Methods: In situ measurements of snow surface roughness using a laser profiler

Michael Lau, Stephen J. Jones, Ryan Phillips
Effects of sample size, centrifugal acceleration and brine inclusions on elastic modulus of sea ice

Martina Luetschg, Michael Lehning,
Wilfried Haeberli
A sensitivity study of factors influencing warm/thin permafrost in the Alps

Scott B. Luthcke, Anthony A. Arendt,
David D. Rowlands, John J. McCarthy,
Christopher F. Larsen
Recent glacier mass changes in the Gulf of Alaska region from GRACE mascon solutions

David Maxwell, Martin Truffer, Sergei Avdonin,
Martin Stuefer
An iterative scheme for determining glacier velocities and stresses

Kenneth C. McGwire, Richard B. Alley,
John R. Banta, Geoffrey M. Hargreaves,
Joseph R. McConnell , Kendrick C. Taylor
Instruments and Methods: Dating annual layers of a shallow Antarctic ice core with an optical scanner

Reginald R. Muskett, Craig S. Lingle,
Jeanne M. Sauber , Austin S. Post,
Wendell V. Tangborn, Bernard T. Rabus
Surging, accelerating surface lowering and volume reduction of the Malaspina Glacier System, Alaska, USA and Yukon, Canada, from 1972 to 2006

Daniel Pringle, Guy Dubuis, Hajo Eicken
Instruments and Methods: Impedance measurements of the complex dielectric permittivity of sea ice at 50 MHz: pore microstructure and potential for salinity monitoring

Adina E. Racoviteanu, Yves Arnaud, Mark W. Williams, Julio Ordoñez
Decadal changes in glacier parameters in the Cordillera Blanca, Peru derived from remote sensing

Valentina Radic, Regine Hock, Johannes Oerlemans
Analysis of scaling methods in deriving future volume evolutions of valley glaciers

J. Brent Ritchie, Craig S. Lingle, Roman J. Motyka, Martin Truffer
Seasonal fluctuations in the advance of a tidewater glacier and potential causes: Hubbard Glacier, Alaska, USA

Andrés Rivera, Javier G. Corripio, Ben Brock, Jorge Clavero, Jens Wendt
Instruments and Methods: Monitoring ice capped active Volcán Villarrica in southern Chile by means of terrestrial photography combined with automatic weather stations and GPS

Katrin Röhl
Characteristics and evolution of supraglacial ponds on debris-covered Tasman Glacier, New Zealand

Franco Salerno, Elisa Buraschi, Gabriele Bruccoleri, Gianni Tartari, Claudio Smiraglia
Surface area variations of Sagarmatha National Park (Nepal) glaciers in the second half of the 20th Century by comparison of historical maps

P. Santibañez , S. Kohshima, R. Scheihing, J. Jaramillo, T. Shiraiwa, S. Matoba, D. Kanda, P. Labarca, G. Casassa
Glacier mass balance interpreted from biological analysis of firn cores in the Chilean lake district

T. Scambos, R. Ross, R. Bauer, Y. Yermolin, P. Skvarca, D. Long, J. Bohlander, T. Haran
Calving and ice shelf break-up processes investigated by proxy: Antarctic tabular iceberg evolution during northward drift

Erik Schiefer, Brian Menounos, Roger Wheate
A inventory and morphometric analysis of British Columbia glaciers, Canada

Jürg Schweizer, Achim Heilig, Sascha Bellaire, Charles Fierz
Variations in snow cover properties at the snowpack depth, the slope and the basin scale

Hakime Seddik, Ralf Greve, Luca Placidi, Ilka Hamann, Olivier Gagliardini
Application of a continuum-mechanical model for the flow of anisotropic polar ice to the EDML core, Antarctica

Min Song, Ian Baker, David M. Cole
The effect of particles on creep rate and microstructures of granular ice

Ondrej Soucek, Zdenek Martinec
Iterative improvement of the shallow ice approximation

E. Thibert, R. Blanc, C. Vincent, N. Eckert
Glaciological and volumetric mass-balance measurements: error analysis over 51 years for Glacier de Sarennes, French Alps

Jason F. Thomason, Neal R. Iverson
Deformation of the Batestown Till of the Lake Michigan Lobe

Michael S. Town, Edwin D. Waddington, Von P. Walden, Stephen G. Warren
Temperatures, heating rates and vapor pressures in near-surface snow at the South Pole

Scott W. Tyler, Susan A. Burak, James P. McNamara, Aurele Lamontagne, John S. Selker, Jeff Dozier
Spatially distributed temperatures at the base of two mountain snowpacks measured with fiber optic sensors

Jeffrey A. VanLooy, Richard R. Forster
Glacial changes of five southwest British Columbia icefields, Canada, mid-1980s to 1999

Fabian Walter, Nicholas Deichmann, Martin Funk
Basal icequakes during changing subglacial water pressures beneath Gornergletscher, Switzerland

Alexander V. Wilchinsky
Linear stability analysis of ice sheets interacting with oceans

Scott Williamson, Martin Sharp, Julian Dowdeswell, Toby Benham
Iceberg calving rates from northern Ellesmere Island ice caps, Canadian Arctic, 1999–2003

ANNALS OF GLACIOLOGY, VOLUME 47

The following selected papers from the 6th International Workshop on Ice Drilling Technology, held at the National Conservation Training Center, Shepherdstown, West Virginia, USA, 17–23 September 2006, have been accepted for publication in Annals of Glaciology *Vol. 47, edited by Frank Wilhelms and Joan J Fitzpatrick*

L Augustin, H Motoyama, F Wilhelms, S Johnsen, S Bo Hansen, P Talalay, N Vasiliev
Drilling comparison in 'warm ice' and drill design comparison

L. Augustin, S. Panichi and F. Frascati
EPICA Dome C 2 drilling operations: performances, difficulties, results

Nobuhiko Azuma
Heat generated by cutting ice

Charles Bentley, Bruce R. Koci
Drilling to the beds of the Greenland and Antarctic ice sheets: a review

J. Green, B. Koci, J. Kyne
KOCI drill for drilling in ice, sand and rock: drill requirements, design, performance, difficulties

Sigfús J. Johnsen, Steffen Bo Hansen, Simon G. Sheldon, Dorthe Dahl-Jensen, Jørgen P. Steffensen, Laurent Augustin, Paul Journé, Olivier Alemany, Henry Rufli, Jakob Schwander, Nobuhiko Azuma, Hideaki Motoyama, Trevor Popp, Pavel Talalay, Thorstein Thorsteinsson, Frank Wilhelms, Viktor Zagorodnov
The Hans Tausen drill: design, performance, further developments and some lessons learned

Jay A. Johnson, William P. Mason, Alexander J. Shturmakov, Scott T. Haman, Paul J. Sendelbach, Nicolai B. Mortensen, Laurent J. Augustin, Kristina R. Dahnert
A new 122 mm electromechanical drill for deep ice sheet coring (DISC) part 5: experience during Greenland field test

Jay Kine, Joe McConnell
The 'PrairieDog': a double-barrel coring drill for 'hand' augering

Jay Kyne, Joe McConnell
The 'SideWinder' for powering a hand-coring auger in drilling and lifting

M. Mangir Murshed, Sérgio H. Faria, Werner F. Kuhs, Sepp Kipfstuhl, Frank Wilhelm
The role of hydrochlorofluorocarbon densifiers in the formation of clathrate hydrates in deep boreholes and subglacial environments

William P. Mason, Alexander J. Shturmakov, Jay A. Johnson, Scott Haman
A new 122 mm electromechanical drill for deep ice-sheet coring (DISC): 2. Mechanical design

Nicolai B. Mortensen, Paul J. Sendelbach, Alexander J. Shturmakov
A new 122 mm electromechanical drill for Deep Ice Sheet Coring: Part 3 – control, electrical and electronics design

Robert Mulvaney, Olivier Alemany, Philippe Possenti
The Berkner Island Ice Core Drilling Project

Alexander J. Shturmakov, Donald A. Lebar, William P. Mason, Charles R. Bentley
A new 122 mm electromechanical drill for deep ice-sheet coring (DISC): 1. Design concepts

Alexander J. Shturmakov, Paul J. Sendelbach
A new 122mm electromechanical drill for deep ice sheet coring: Part 4 – drill cable

P.G. Talalay, Roger LeB. Hooke
Closure of deep boreholes in ice sheets: a discussion

P.G. Talalay
Dimethyl siloxane oils as an alternative borehold fluid

N.I. Vasiliev, P.G. Talalay, N.E. Bobin, V.K. Chistyakov, V.M. Zubkov, A.V. Krasilev, A.N. Dmitriev, S.V. Yankilevich, V.Ya Lipenkov
Deep drilling at Vostok station, Antarctica: history and recent events

More papers for *Annals* 47 will be listed in the next issue of ICE

ANNALS OF GLACIOLOGY, VOLUME 49

The following papers from the International Symposium on Snow Science, held at the Russian Academy of Sciences, Moscow, Russia, 3–7 September 2007, have been accepted for publication in Annals of Glaciology *Vol. 49, edited by Martin Schneebeli and Jerome B. Johnson*

Tao Che, Xin LI, Rui Jin, Richard Armstrong, Tingjun Zhang
Snow depth derived from passive microwave remote sensing data in China

Chen Yaning, Xu Changchun, Chen Yapeng
Snow cover response to climate change in the mountainous region of the Tarim River basin over the past four decades

François-Xavier Cierco, Mohamed Naaim & Florence Naaim-Bouvet
Experimental study of particle concentration fluctuations in a turbulent steady flow

Eleri Evans, Richard Essery, Richard Lucas
Changing snowcover and the net mass balance of Storglaciären, Northern Sweden.

J. Freitag, S. Kipfstuhl, S. H. Faria
3D X-ray micro tomography and 2D microstructure mapping of polar firn – a comprehensive picture by two complementary methods?

Dieter Issler, Alessia Errera, Stefano Priano, Hansueli Gubler, Bernardo Teufen, Bernhard Krummenacher
Inferences on flow mechanisms from snow avalanche deposits

Dieter Issler, Peter Gauer
Exploring the signifcance of the fuidised flow regime for avalanche hazard mapping

Shichang Kang, Jie Huang, Yanwei Xu
Changing in ionic concentrations and $\delta^{18}O$ in the snowpack of Zhadang Glacier on Mt. Nyainqentanglha, Southern TibetanPlateau

Huilin Li, Zhongqin Li, Feiteng Wang, Wenbin Wang, Lin Wang
Depositional characteristics of NH_4^+ on Urumqi Glacier No. 1, eastern Tianshan, China

Li Zhongqin, Wenbin Wang, Feiteng Wang, Huilin Li
Characteristics of ionic concentration and$\delta^{18}O$ and their variability in dry season and wet season snow on Urumqi Glacier No. 1 in eastern Tianshan, China

R.Mott, F. Faure, G. Koboltschnig, M. Lehning, H. Löwe, G. Michlmayr, A. Prokop, W. Schöner
Simulation of seasonal snow cover development and seasonal snow cover distribution for glaciated sites (Sonnblick, Austrian Alps) with the ALPINE3D model

A. Pozdnoukhov, R.S. Purves, M. Kanevski
Applying Machine Learning Methods to Avalanche Forecasting

Andrey N. Salamatin, Vladimir Ya. Lipenkov
Simple relations for the close-off depth and age in dry-snow densification

Yuri Seliverstov, Tatiana Glazovskaya, Alexander Shnyparkov, Yana Vilchek, Ksenia Sergeeva
Estimation of influence of snow avalanches on activity of the person

K.E. Sinclair, S.J. Marshall
Postdepositional Modification of Stable Water Isotopes in Winter Snowpacks in the Canadian Rocky Mountains

Dan Singh, Amreek Singh, Ashwagosha Ganju
Site specific analog weather forecast system for Northwest Himalaya in India

Konosuke Sugiura, Tetsuo Ohata
Large-scale characteristics of the distribution of blowing-snow sublimation

Vladimir N. Golubev, Marina N. Petrushina, Denis M. Frolov
Winter regime of temperature and precipitation as a factor of snow cover distribution and its stratigraphy

Wang Feiteng, Li Zhongqin, Li Huilin, Wang Wenbin, Wang Lin
Development of depth hoar and its effect on stable oxygen isotopic content in snow-firn stratigraphy on Urumqi Glacier No. 1, Eastern Tianshan, China

E. Zege, I. Katsev, A. Malinka, A. Prikhach
New algorithm to retrieve the effective snow grain size and pollution amount from satellite data

Shiqiao Zhou, Shichang Kang, Zhiyuan Cong
Microscale spatial variability of snowpack: Isotopic and chemical heterogeneity of a firn pack at Mt Qomolangma (Everest)

Annals 49 is now complete

ANNALS OF GLACIOLOGY, VOLUME 50

The following selected papers from the International Workshop on Mass Balance Measurements and Modelling, held at Skeikampen, Norway, 26–28 March 2008, have been accepted for publication in Annals of Glaciology *Vol. 50, edited by Jon Ove Hagen and Joan J Fitzpatrick*

Anthony A. Arendt, Scott B. Luthcke, Regine Hock
Glacier changes in Alaska: can mass balance models explain GRACE mascon trends?

Matthias Huss, Andreas Bauder
Twentieth century climate change inferred from four long term point observations of seasonal mass balance

Roger J. Braithwaite
After six decades of monitoring glacier mass balance we still need data but it should be richer data

Roger J. Braithwaite
Calculation of sensible-heat flux over a melting ice surface using simple climate data and daily measurements of ablation

Kristian Breili, Cecilie Rolstad
Ground based gravimetry for measuring small spatial scale mass changes on glaciers

F. Pellicciotti, M. Carenzo, J. Helbing, S. Rimkus, P. Burlando
On the role of the subsurface heat conduction in glacier energy heat balance modeling

Luca Carturan, Federico Cazorzi, Giancarlo Dalla Fontana
Enhanced estimation of glacier mass balance in unsampled areas by means of topographic data

J. Graham Cogley
Geodetic and direct mass-balance measurements: comparison and joint analysis

Thorben Dunse, Thomas Vikhamar Schuler, Jon Ove Hagen, Trond Eiken, Ola Brandt, Andrea Taurisano, Kjell Arild Hâgda
Recent fluctuations in the extent of the firn area of Austfonna, Svalbard, inferred from GPR

H. Escher-Vetter, M. Kuhn, M. Weber
Four decades of winter mass balance of Vernagtferner and Hintereisferner: Methodology and results

Andrew G. Fountain, Matthew J. Hoffman, Frank Granshaw, Jon Riedel
The Benchmark Glacier Concept – does it work? Lessons from the North Cascade Range, USA

Alex S. Gardner, Martin Sharp
Sensitivity of net mass balance estimates to near-surface temperature lapse rates when employing the degree day method to estimate glacier melt.

C. Genthon G. Krinner H. Castebrunet
Antarctic precipitation and climate change predictions: horizontal resolution and margin vs plateau issues

C. Genthon, O. Magand, G. Krinner, M. Fily
Do climate models underestimate snow accumulation on the Antarctic plateau? A re-evaluation of/from in-situ observations in East Wilkes and Victoria Lands

W.D. Harrison, L.H Cox, R. Hock, R.S March, E.C. Pettit
Implications for the dynamic health of a glacier from comparison of conventional and reference-surface balances

Torborg Haug, Cecilie Rolstad, Hallgeir Elvehøy, Miriam Jackson, Ivar M. Johansen
Geodetic mass balance of the Western Svartisen ice cap in the periods 1968–85 and 1985–2002

Matthias Huss, Andreas Bauder, Martin Funk
Homogenization of long term mass balance time series

A.G. Krusic, M.L. Prentice, J.M. Licciardi
Climatic implications of reconstructed early-mid Pliocene equilibrium-line altitudes in the McMurdo Dry Valleys, Antarctica

Frank Paul, Heidi Escher-Vetter, Horst Machguth
Comparison of mass balances for Vernagtferner obtained from direct measurements and distributed modelling

L. A. Rasmussen
South Cascade Glacier mass balance, 1935–2006

C. Rolstad R. Norland
Ground based interferometric radar for velocity and calving rate measurements of the tidewater glacier Kronebreen, Svalbard

D. Six, P. Wagnon, J.E. Sicart, C. Vincent
Meteorological controls on snow and ice ablation for two very contrasted months on Saint-Sorlin Glacier (France)

A. Soruco, C. Vincent, B. Francou, P. Ribstein, T. Berger, J.E. Sicart, P. Wagnon, Y. Arnaud, V. Favier, Y. Lejeune
Mass balance of Zongo glacier, Bolivia, between 1956 and 2006. Using glaciological, hydrological and geodetic methods.

E. Thibert, C. Vincent
Best possible estimation of mass balance combining glaciological and geodetic methods"

C. Vincent, A. Soruco, D. Six, E. Le Meur
Glacier thickening and decay analysis from fifty years of glaciological observations performed on Argentière glacier (Mont-Blanc area, France)

More papers for Annals 50 will be listed in the next issue of ICE

ANNALS OF GLACIOLOGY, VOLUME 51

The following selected papers from the International Symposium on Radioglaciology and its Application, held in Madrid, Spain, 9–13 June 2008, have been accepted for publication in Annals of Glaciology *Vol. 51, edited by Richard Hindmarsh*

John H. Bradford, Joshua Nichols,
T. Dylan Mikesell
Georadar field methods and reflection tomography for large scale, laterally continuous profiles of electromagnetic wave velocity and water content in glaciers

Kenichi Matsuoka, Anthony Gades,
Howard Conway, Ginny Catania,
Charles F. Raymond
Radar signatures beneath a surface topographic lineation near the outlet of Kamb Ice Stream and Engelhardt Ice Ridge, West Antarctica

Frank Pattyn, Charlotte Delcourt, Denis Samyn,
Bert De Smedt, Matt Nolan
Bed properties and hydrological conditions underneath McCall Glacier, Alaska, USA

More papers for Annals 51 will be listed in the next issue of ICE

REPORT ON THE WORKSHOP ON MASS BALANCE MEASUREMENTS AND MODELLING, SKEIKAMPEN, NORWAY, 25–28 MARCH 2008

Ten years ago, I attended a workshop on methods of mass balance measurements and modelling at Tarfala in northern Sweden. Aside from the usual conference pleasures, we could make excursions to the nearby Storglaciären and wonder at the longest continuous record of mass balance. The 1998 workshop was marked by publication of a very handsome special edition of *Geografiska Annaler* (Volume 81A, No. 4, 1999). It was no wonder, then, that I pricked up my ears when I first heard rumours of another workshop on mass balance measurements and modelling, 10 years after the first one. Tarfala II! The old fox could smell it in the wind! Papers! Discussions! An icebreaker! Coffee breaks! Proceedings! All the things that make life worthwhile for a veteran of uncounted glaciological conferences! The clincher came when I noticed that the workshop was scheduled for the week after my long-planned cross-country ski holiday in Norway. This was definitely a must-attend meeting and I was able to cripple myself the week before and display a most heroic limp at the long-awaited event.

The 2008 workshop was held in Skeikampen close to Lillehammer, the spiritual home of Norwegian winter sports. This fact was marked by near ice-age conditions in Lillehammer, and the narrow road linking Skeikampen to the outside world was almost blocked by snow. Workshop participants could ski in near white-out conditions anytime that they could get away from the conference.

Figure 1: Despite the always-welcome visibility of Alpine glaciologists, the scope of the workshop was wider than ever in terms of geography, gender and mass-balance processes.

Figure 2: Workshop participants enjoying one of the rare moments with bright sunshine.

Although part of a long tradition of meetings sponsored by IGS, the Skeikampen workshop departed from tradition in several interesting ways. The presentations were more geographically diverse so we got glaciers from New Zealand, South America and Asia in addition to the usual diet of Alpine and Scandinavian glaciers with Greenland ice for dessert. We also heard something about sublimation in addition to the usual accumulation and melting. Sadly, under the stresses of global warming, we also heard about glaciers that are now going around without an equilibrium line: this is something that no good glacier should do. There was a lot about modelling but it was so much better integrated with measurements that one distinguished glaciologist even wondered why there were no modellers there. My answer was that we are all modellers now. I noticed more 'badges of convenience' than ever before as glaciologists, especially the younger ones, cross continents in pursuit of their trade. I also had the impression that there were more women around than formerly so the few grand old ladies of glaciology have welcome reinforcements.

Figure 3. After organizing most (or all?) practical aspects of the workshop Liss Andreassen takes time off to chair a scientific session

With so many young people there, I thought they might need some assistance in remembering references and using terminology correctly, so I stationed myself at the front of the auditorium where I could be of most use in the discussions. My old friend Gunnar Østrem joined me and made himself responsible for the correct scaling of drawings, especially plots of mass balance against altitude that allow the grand old men to compute vertical gradients of mass-balance with the *Mark 1 Eyeball* while younger glaciologists prefer geostatistical methods. I think our interventions were generally welcome although there was a minor revolt over the alleged use/abuse of Julian Days a.k.a. Julian Dates.

Figure 4. Gunnar Østrem assists younger colleagues with arcane geometrical concepts

Figure 5. Georg Kaser tries to explain his triumph in adding a new item (IACS) to international alphabet soup although he does not appear to know what to do next

Now, a few months after a very successful workshop, the Internet is running hot with referees' reports and final, final drafts as the editorial team struggle to finish what will become volume number 50 of the thematic journal *Annals of Glaciology*. I think future glaciologists will find much to enjoy when that number comes out although there are still a few things remaining to be done before we can say that we have solved all the great problems of glacier mass balance. Are there any bids yet for holding another workshop in 2018?

Roger J. Braithwaite
School of Environment and Development, University of Manchester, UK

Notes from the production team

Here are some top tips to further help us speed up the processing of LaTeX papers

1. Download the latest v2.00 IGS class file.
2. Do not edit igs.cls or any style files supplied in this distribution. We always use the distributed versions of class and style files, so any changes you make will be overwritten. If you must make changes to the design, put the changes in a new file (e.g. magnusson.sty) and include the file using \usepackage{magnusson}. Ensure that comments are added so that the typesetter can follow what you've changed.
3. Size your artwork to fit either one or two columns (maximum width of 86mm or 178mm respectively). Lettering in figures should, in general, be 1pt smaller than the text. If possible, make it 8.5pt Optima (Arial is a reasonable alternative) at the final size. Remember that artwork can make or break a paper. Spend a little time making the figures look consistent.
4. Add-on style files are fine, but avoid those that clash with the IGS design (e.g. fancyheadings.sty).
5. If you have any queries regarding the design or BiBTeX, email ali@igsoc.org, who will resolve any issues you have before you submit your paper.
6. We are always pleased to have feedback on the class file and guide.

Thanks a lot.

Ali Woollatt
IGS Production

Books received

Dewalle D. R. and A. Rango. 2008. *Principles of Snow Hydrology*. Cambridge: Cambridge University Press, 410 pp. (ISBN: 978-0-521-82362-3, (hardback), GBP £75, USD $150).

Armstrong R. L.and E. Brun. 2008. *Snow and Climate: Physical Processes, Surface Energy*. Cambridge: Cambridge University Press, 222 pp. (ISBN: 978-0-521-85454-2, (hardback), GBP £65, USD $130).

Kotlyakov V.M., editor in chief. 2007. *Glaciation in North Eurasia in the Recent Past and Immediate Future*. Moscow: Institute of Geography of the Russian Academy of Sciences. Nauka. 336pp. (ISBN: 978-5-02-035765-5 (in cloth).

INTERNATIONAL GLACIOLOGICAL SOCIETY

INTERNATIONAL WORKSHOP ON WORLD GLACIER INVENTORY

Lanzhou, China

20–24 September 2008

CO-SPONSORED BY:

Cold and Arid Regions Environmental and Engineering Research Institute
Chinese Academy of Sciences (CAREERI, CAS) [The State Key Laboratory of Cryosphere Sciences, CAREERI, CAS]
World Glacier Monitoring Service (WGMS)
World Glacier Inventory (WGI)
Institute of Tibetan Plateau Research, Chinese Academy of Sciences (ITP, CAS)
Global Land Ice Measurements from Space (GLIMS)
National Natural Science Foundation of China (NSFC)
Chinese Academy of Science

SECOND CIRCULAR

April 2008

Registered Charity

INTERNATIONAL GLACIOLOGICAL SOCIETY
PRESIDENT: A. Ohmura
VICE PRESIDENTS: I Allison, M. Sturm, E. Wolff
IMMEDIATE PAST PRESIDENT: E.M. Morris

WORKSHOP ON WORLD GLACIER INVENTORY
The International Glaciological Society will hold an iInternational workshop on World Glacier Inventory in 2008. The workshop will be held in Lanzhou, People's Republic of China, during 21–24 September (Sunday to Wednesday) in 2008. Registration will take place on Saturday 20 September.

WORKSHOP ORGANIZATION
Magnús Már Magnússon (International Glaciological Society).

SCIENCE STEERING AND EDITORIAL COMMITTEE
Atsuma Ohmura, Simon Ommanney, Roger Braithwaite, Bruce Raup, Wilfried Haeberli, Qin Dahe, Ding Yongjian, Liu Shiyin, Wang Ninglian

LOCAL ARRANGEMENTS COMMITTEE
Qin Dahe (Chair), Yao Tandong, Ding Yongjian, Ren Jiawen, Liu Shiyin, Wang Ninglian, Kang Ersi.

INFORMATION ABOUT THE SYMPOSIUM MAY BE OBTAINED FROM:
International Glaciological Society, Scott Polar Research Institute, Lensfield Rd, Cambridge CB2 1ER, UK. E-mail: igsoc@igsoc.org; Tel: +[44] (0)1223 355 974; Fax: +[44] (0)1223 336 543

Liu Shiyin/Xie Aihong, Donggang West Road 320, Lanzhou, 730000, Gansu Province, China. E-mail: liusy@lzb.ac.cn\zieaih@lzb.ac.cn; Tel: +86-931-4967375; Fax +86-931-4967375/ +86-931-4967338, Fax: +86-931-8271124
IGS Web: http://www.igsoc.org/symposia/
Local website: http://www.casnw.net/workshop/Workshop.html

PARTICIPATION
This circular includes instructions for registration and for arranging accommodation. A registration form (available at the Workshop website) is also included. The registration and accompanying payment are due 15 July 2008. There is a surcharge for late registration. The participant's registration fee includes organization costs, a set of abstracts, coffee breaks and lunch.

REGISTRATION FEES	**£**	**US$**	**€**
Participant (IGS member)	190	375	245
Participant (not IGS member)	215	425	275
Student or retired IGS member	115	225	150
Accompanying person	115	225	150
Late registration surcharge (after 10 June 2008)	50	100	65

Workshop study tours: Please book before 1 July. Bookings will be done by fax to the Local Organizing Committee.

Registration refunds will be made according to date of notification. Cancellations made before 15 July 2008 will receive a full refund. Cancellations between 15 July and 1 September 2008 will receive a 50% refund. After 1 September it will not be possible to make any refund.

THEME
An effort to create an inventory of important features of glaciers on a global scale was launched as part of the International Hydrological Decade (1965–1974), resulting in the World Glacier Inventory (WGI). The main motivation was to obtain information on distribution of surface area and ice volume of glaciers. Initially, the aim was to compile an inventory of all glaciers outside the two ice sheets Greenland and Antarctica. It was also planned to repeat a similar effort after a few decades to to detect changes in glaciers. To date about 37% of the estimated total glacier surface is inventoried in the WGI and made available through the World Glacier Monitoring Service (WGMS) in Zürich, Switzerland, and National Snow and Ice Data Center (NSIDC) in Boulder, USA. It was realized that the original inventory method using aerial photography, topographic maps and planimetry was too time consuming to keep up with the current rapid changes glaciers are experiencing, and many regions still lacked the information necessary for a detailed inventory. In the early 1980s first attempts were made to obtain glacier inventory data from satellite images. With the launch of Landsat 4 in 1982 (since 1984 replaced by Landsat 5) and the availability of 30 m resolution data from the Thematic Mapper (TM) sensor, automated mapping of glacier ice from multispectral bands became possible and related methods have been developed. The Global Land Ice Measurements from Space (GLIMS) initiative, begun in about 1995, is a global effort to apply these methods to build a new glacier inventory that contains, in addition to point locations, also full digital glacier outlines. The GLIMS archive currently contains information on approximately 39% of the estimated number of glaciers, or 27% by surface area. During the 40 years after launching the WGI and 20 years of glacier remote sensing work, both efforts have made substantial progress and contributed tremendously to our knowledge in glaciology and related sciences. Both inventories are, however, incomplete. The original and detailed inventory was completed by only 11 countries and one region, and some completed national inventories are not forwarded entirely to the world data centres. There are ongoing efforts to

map global land ice cover at lower spatial resolution from satellite data, but higher resolution remote sensing-based inventories still leave approximately 70% of glacier area uncovered. There is now a significant overlap between the WGI and GLIMS inventory. This situation offers a chance to calculate glacier change through time, at least in regions where the originally used glacier boundaries are available to guarantee that the same entities are compared. Further, original and satellite-based methods have been successfully applied beyond the regions of the original concept, namely to Greenland and Antarctica, albeit for limited areas. A number of scientific works have been already accomplished by using inventoried data, often to calculate changes in hydrological basin discharge. The full potential of calculating glacier specific volumes from the topographic information stored in the WGI remains to be explored. In particular, the application of new technologies (GIS) combined with satellite-derived terrain models opens promising new perspectives. The combination with GCM provided scenarios on future climate change for improved assessment of global sea-level rise have only started to be discussed among related communities. The missing data in the WGI make the estimation of the global ice volume, a primary goal of the inventory effort, difficult. In the meantime the cryosphere itself is rapidly changing. It is thus of the utmost importance to complete a global inventory as soon as possible. Whether the data from the WGI and the GLIMS inventory could be combined or have to be completed separately, remains to be discussed. The proposed workshop is thus not an occasion to present the inventoried contents. The workshop is intended to review and discuss what has been accomplished on a global scale, and to consider how the WGI and GLIMS data have been and will be applied, and what remains to be done to produce a complete global glacier inventory.

TOPICS

The suggested topics include:

1. Overview of the present status of glacier inventories based on the original (WGI) and simplified (GLIMS) methods.
2. Experiences of completion of national inventories: Ex-Soviet Union, China and Iceland (These are big owners of glaciers who completed the national inventories).
3. GLIMS and GlobGlacier status: Developments in methodology for an automatic inventory; other glaciological remote sensing projects at NASA, ESA and other space agencies.
4. Challenges and results of comparing satellite-based inventories with the original WGI.
5. Present data availability at two main centres, NSIDC in Boulder and WGMS in Zürich.
6. Applications of WGI and GLIMS for glacier ice volume calculation, global sea-level change, hydrological cycle and water resources, energy planning and disaster monitoring; new ideas for other applications.
7. Strategy for completion of the World Glacier Inventory and GLIMS.

SESSIONS AND POSTERS

The official language of the workshop is English. Oral presentations will be held on three full days and one half-day. There will be ample opportunity for poster displays. Poster boards measuring 900 mm wide by 1200 mm high (A0 portrait size) will be supplied for the poster presentations.

ABSTRACTS

1. SUBMISSION OF ABSTRACTS Participants who want to contribute to the Workshop should submit an abstract of their proposed presentation. This abstract must contain sufficient detail for its scientific merit and relevance to the Workshop theme to be judged by the Editorial Board. A website will be available from 1 May 2008 where authors can upload their abstract and all the relevant contact information. The abstract itself should not exceed 400 words. References and illustrations should not be included. Those unable to submit their abstract via the internet can submit electronic files on a CD or diskette to the IGS office where a member of staff will upload them onto the website. **LAST DATE FOR RECEIPT OF ABSTRACTS: 10 JUNE 2008**
2. SELECTION OF ABSTRACTS Each abstract will be assessed on its scientific quality and relevance to the Workshop theme. Authors whose abstracts are accepted will be invited to make either an oral or poster presentation at the Workshop. First or corresponding authors will be advised by 1 July 2008 of the acceptance or otherwise; other authors will not be informed separately. Authors who have not received notification by that date should contact the IGS office in Cambridge in case their abstract was not received. The abstracts will be compiled into a paper or CD format, and may be published on the Internet.
3. DISTRIBUTION OF ABSTRACTS A set of the accepted abstracts will be provided to participants upon registration on 20 September 2008.

THEMATIC PUBLICATION

The Council of the IGS has decided to change the editorial policy of the *Annals of Glaciology*. The *Annals* will be published as a thematic journal whose themes will be chosen by the IGS Council

on a regular basis. Such themes may run parallel to the themes of symposia or may be independent. Thus the Council has decided to publish an *Annals* issue whose theme will be *World Glacier Inventory*. Submissions are open to anyone. All papers should be submitted through the IGS online submission system and will be refereed and edited according to the Society's regular standards before being accepted for publication. Those submitting abstracts to the Workshop will be asked to indicate whether they intend to submit a paper for publication in the *Annals*, so that reviewers may be sought in advance. Papers submitted for consideration in the *Annals* cannot be submitted to another publication as well. The deadline for submitting papers to the *Annals* is 31 August. The page charge policy for publishing in the *Annals of Glaciology* has not been finalized yet but that information will be made available as soon as possible.

EXCURSIONS AND SOCIAL PROGRAM

In honour of Professor Shi Yafeng's 90th birthday there will be a celebration on the morning of 25 September. Professor Shi is an Honorary Member of the International Glaciological Society. The leaders and distinguished guests will give speeches, and then there will be an Award Distribution Ceremony.

On the afternoon of Sep. 25, there will be the symposium of Shi Yafeng's Academic Thought. On the evening, we will visit the Yellow River. On Sep 26 and 27 there will be academic plenary presentations on glaciers and frozen ground.

An ICEBREAKER reception hosted by the State Key Laboratory of Cryosphere Science will be held on September 20 (Saturday evening). BANQUET to be held at the Ningwozhuang Hotel, on Sunday evening, 21 September at a cost of RMB ¥200 per person.

For evening meals, there are several options that are left to the individual participants to explore. Two other buffet dinners will be provided at a price of RMB ¥270 per person. Remember that the banquet is separate. To attend the banquet and have the buffet dinners for the remainder of the week, tick both boxes on the Registration and Accommodation Request Form and make the payment at the Workshop front desk upon arrival. Of course, you can buy as many (or few) buffet tickets as you would like.

POST WORKSHOP STUDY TOURS: Two separate study tours have been arranged. Please indicate which post-workshop study tour you would like to participate in before July 1.

I. Tour to the No. 12 glacier (39°26'N, 96°33'E), a cold glacier in the northwest Qilian Mountains in Gansu Province. The Dunhuang Mogao Grottos, a renowned historic site dating back to 366 AD, is within 100 miles to the west of the glacier – 4 days, RMB ¥1640 per person.

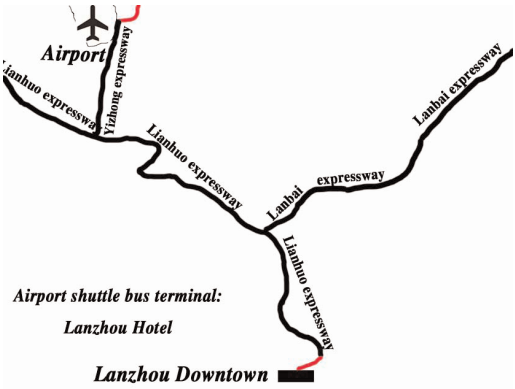
II. Tour to the Hailuogou glacier (29°36'N, 101°54'E), a temperate glacier on the east slope of Mt Minya Konka in western Sichuan Province. A permanent observational station near the glacier has been running for over 20 years. To the north of the Mount, the famous Tibetan town Kangding is located – 6 days, RMB ¥2510 per person.

More details on the study tours can be found at the back of this circular.

VENUE

The workshop will be held at the Ningwozhuang Hotel, Lanzhou, China

Getting to the Workshop venue – Zhongchuan Airport to the city of Lanzhou



Route map from Zhongchuan Airport to Lanzhou downtown

请送我到民航大巴终点站----兰州饭店，谢谢！

Please take me to airport shuttle bus terminal----Lanzhou Hotel. Thank you!

请送我到宁卧庄宾馆，谢谢！

Please take me to Ningwozhuang Hotel. Thank you!

请送我到民航大巴乘车处（兰州饭店西侧民航售票处）

Please take me to airport shuttle bus stop. Thank you!

In case you and your computer cannot read Chinese, we put the above figure for you to print and aid you to get to your destination. After you get off the air plane, you can give it to the driver, and he/she shall take you to the place where you want.

Airport Shuttle Bus
If you take the airport shuttle bus, please get off at the end of the route (named as Lanzhou Hotel). One-way price is at RMB ¥30, and there is the direct shuttle bus before/after every scheduled flight. It takes around 80 minutes to get to the shuttle bus terminal, downtown (Lanzho Hotel).

Taxi
One-way price: about RMB ¥180. – Time: around 1 hour

Sketch map of the hotels and the institute (CAREERI)

ACCOMMODATION INFORMATION
Suite room: two rooms with one bigger bed or two smaller beds Double room: one room with two beds Single room: one room with one bed The price does not include breakfast, since it is the discounted rate.

Ningwozhuang Hotel
Address: Tianshui Road 366, Lanzhou, China Phone: +86-931-8265-888, or +86-931-8416-221 Fax: +86-931-8417-639 – Website: http://travel.mygongshe.com/hotel/hotel-0.ht
Cost: Double room: RMB ¥480 (VIP building) or RMB ¥380 (other buildings) per day per room

Lanzhou Hotel
Address: Donggang Western Road 486, Lanzhou, China Phone: +86-931-8416-321, Fax: +86-931-8418-608. Website: http://www.lanzhouhotel.com
Cost: Suite room: RMB ¥680 or RMB ¥880 per day
Double room: RMB ¥280 per person per day in double occupancy or
RMB ¥480 per day per room for single occupancy
Single room (big bed): RMB ¥280 per person per day

Jincheng Hotel
Address: Tianshui Mid Road 3, Lanzhou, China Phone: +86-931-8416-638, or +86- 0-132-3931-3189 or +86-931-3695-000, Fax: +86-931-8418-438 Website: http://www.gsjcbg.com
Cost: Suite room: RMB ¥448 or RMB ¥468 per day
Double room: RMB ¥272 or RMB ¥298 per day per room – double occupancy
Single room (big bed): same as double room

Note: the current exchange rate between US$/RMB is around 7.01, and EUR/RMB is around 10.9.

VISA
If you need visa for coming to China, please provide high resolution scanned copy of your passport via e-mail (xieaih@lzb.ac.cn) before July 1. If you have problems getting a visa, please contact the Workshop secretariat.

WORKSHOP WEBSITE
Additional information and announcements will be posted on the Workshop website http://www.igsoc.org or http://www.casnw.net/workshop/Workshop.html. If you do not have access to the internet, please ask for information through Workshop secretariat directly (see above).

IMPORTANT DATES

Financial support request	10 June
Submission of abstract	10 June
Pre-registration deadline	15 June
Deadline for full refund	15 July
Deadline for refund	1 September
Notification of abstract acceptance to authors	1 July
Accommodation	1 July
Submission of Passport Copy for people who need VISA	1 July
Submission of post workshop study tours	1 July
Submission of paper	31 August
Preliminary Program on Workshop web site	10 September

POSSIBLE FUNDING
Some very limited financial support for participants from developing countries and countries with economy in transition is being explored. Unfortunately it is restricted to only 10 participants. Please contact the local organizing committee directly via Liu Shiyin\Xie Aihong Donggang West Road 320, Lanzhou, 730000, Gansu Province, China E-mail: liusy@lzb.ac.cn \ xieaih@lzb.ac.cn Phone: +86-931-4967375, Fax: +86-931-4967375/ +86-931-4967338, Fax: +86-931-8271124

INTERNATIONAL GLACIOLOGICAL SOCIETY
INTERNATIONAL WORKSHOP ON WORLD GLACIER INVENTORY
September 20–24 2008, Lanzhou, China

Registration and Accommodation Request Form

Please fill out this registration form and send to igsoc@igsoc.org \ liusy@lzb.ac.cn \ xieaih@lzb.ac.cn by June 10, 2008 (Double click one of the boxes to tick it).

Please make copies of the registration form if you require an invitation for an accompanying person.

Given Name: _____ Surname: _____

Affiliation:_____

Address: _____

_____

Country: _____

Nationality: _____

Visa for coming to China: ☐ Needed ☐ Not needed

E-mail: _____

Phone/Fax: _____

Presentation: ☐ Oral ☐ Poster

Scientific topic:_____

Attend banquet: ☐ Yes ☐ No

Need buffet dinner: ☐ Yes ☐ No

Attend excursion: ☐ Yes ☐ No

Workshop study tours No. 12 glacier ☐ Yes

Hailuogou glacier ☐ Yes

Please specify the dates of check in and out if you want to book a room.

Date of check in: _____ Date of check out: _____

Any other date if any: _____ Number of people: _____

Which hotel and what type of room will you book?

Hotel: _____ Type of room: _____ Cost (per day): _____

Special requests: _____

_____

_____

Abstract Submission Form

Please submit your abstract online through the IGS website. This is STRONGLY recommended. If you have a limited access to the internet you can use the below form. Please complete this form for each presentation, and send it to \ by June 10, 2008. For those who would like to make more than one presentation, please copy this form (Double click one of the boxes to tick it).

☐ Oral presentation ☐ Poster presentation (A0 size) ☐ Either

Scientific topic:_____

Title of presentation: _____

Authors and their affiliations: _____

_____

Abstract (300 words): _____

_____

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The following is the full price of air ticket from Dunhuang to other places. This price may be discounted. The exact time of each flight can only be known after 4 April.

Direction	**Price (RMB ¥)**
Lanzhou to Chengdu	1090
Lanzhou to Dunhuang	1300
Dunhuang to Beijing	1880
Dunhuang to Shanghai	2460
Dunhuang to Yinchuan	890
Dunhuang to Urumchi	710
Dunhuang to Chengdu	1540
Dunhuang to Xi'an	1680

In Chengdu airport, there are many more flights not listed here, please check this yourself on the internet.

Post Workshop Study Tours

Four-day Tour to No. 12 glacier and Dunhuang

Date	Days	Activities	Meals	Accommodation
25 Sep.	1st	Set out for Dunhuang by MU2416 at 22:35		Dunhuang International Hotel (****)
26 Sep.	2nd	Visit Lao-Hu Valley at Subei County by bus. Visit No. 12 glacier. Set out for Anxi after supper (180 km)	B/L/D	Anxi Hotel(***)
27 Sep.	3rd	Visit Dunhuang Mogao Grottos (25 km from hotel). Visit Sha-Zhou Castle (Movie City). Visit Ming-Sha Mountain and Moon-like Lake by camel (self pay for camel using)	B/L/D	Dunhuang International Hotel (****)
28 Sep.	4th	After breakfast, the tour bus takes the traveler to airport and the tour ends	B	

Notes:
- Price: RMB ¥1640 (for more than 10 persons)
- If you need the single room, please pay more RMB ¥410 per person.
- The price doesn't include the air ticket from Lanzhou to Dunhuang and Dunhuang to other places (e.g. Beijing, Lanzhou etc.).

The price includes:
- Ticket for the first gate of scenic place
- Hotel
- Tour bus
- Responsibility insurance
- Emergency insurance of tour
- 3 breakfast, 2 lunch and 2 dinner (8 dishes and 1 soup for lunch and dinner)
- Tour guide

Six-day Tour to Hailuogou glacier and Chengdu

Date	Days	Journey	Activities	Meals	Accommodation
26 Sep.	1st	Lanzhou–Chengdu	Set out for Chengdu by CA4210 10:00/11:20, and visit Wuhouci Temple and Jinli old street	L/D	Jindi Hotel or similar hotel (***)
27 Sep.	2nd	Chengdu–Kangding (7 hs)	Visit Erlang Tunnel	B/L/D	Jinshan Hotel or similar hotel (***)
28 Sep.	3rd	Kangding–Hailuogou (106 km, 2 hs)	Visit Paoma mountain by (up and down) cable car	B/L/D	Changzheng Hotel or similar hotel (****)
29 Sep.	4th	Hailuogou Glacier	Visit Dabing icefall by cable car. Visit the Glacier World of and hot spring in Camp 2 (RMB ¥60 per person)	B/L/D	Ge'ersa Hotel or similar hotel (***)
30 Sep.	5th	Hailuogou–Chengdu (356 km, 7 hs)	Moxi old town, Roman Catholic Church, Chairman Mao Zedong Memorial, Camp 3 of Hailuogou glacier (including travel bus), Luding Bridge, Wenshu Temple, WenShu lane and local opera performance – Face changing (RMB ¥120 per person)	B/L/D	Jindi Hotel or similar hotel (***)
1 Oct..	6th	Chendu	After breakfast, the tour bus takes the travelers to airport and the tour ends	B	

Notes:
- Price: RMB ¥2510 (for more than 10 persons)
- If you need the single room, please pay more RMB ¥450 per person.
- The price doesn't include the air ticket from Lanzhou to Chengdu and Chengdu to otherplaces (e.g. Beijing, Lanzhou etc.).
- You can choose to visit the Panda base on September 6th, and you pay it yourself.

The price includes:
- Ticket for the first gate of scenic place
- Hotel
- Tour bus
- Tour guide
- Responsibility insurance
- Emergency insurance of tour
- 5 breakfast, 5 lunch and 5 dinner (8 dishes and 1 soup for lunch and dinner)

INTERNATIONAL GLACIOLOGICAL SOCIETY

INTERNATIONAL WORKSHOP ON SNOW AND AVALANCHES

Manali, India
6–10 April 2009

CO-SPONSORED BY:

Snow and Avalanche Study Establishment (SASE), Manali India

FIRST CIRCULAR

March 2008

Registered Charity

The International Glaciological Society will hold an International Symposium on Snow and Avalanches in 2009. The symposium will be held in Manali, India 6–10 April in 2009.

THEME

Snow and avalanche science has made fundamental contributions to human safety in mountain regions. It has now evolved into an important branch of glaciology. Initially snow science was aimed at understanding avalanche formation and developing avalanche control measures. These remain important topics. However, now an understanding of how snowy environments throughout the world are affected by global climate change is required. The role of snow in hydrological and ecological earth surface processes is therefore a central theme of the symposium.

TOPICS

The suggested topics include:

1. Snow, including:
   Snow hydrology; Snow ecology, Snow metamorphism, Snow microstructure, Snow and climate change: threat perception; Snow in the Himalayans; Snow, glacier mapping and global climate change
2. Snow avalanches, including:
   Avalanche forecasting; Avalanche dynamics; Avalanche control and engineering
3. Snowpack, including:
   Snowpack properties and process modelling; Snowpack stability and spatial variability
4. Observations and instrumentation, including:
   Observation networks in snowbound regions; Cold region instrumentation and measurement networks; Remote sensing applications of snow; glaciers and mountain hazards, Global connections between cryospheric regions
5. Mountain meteorology

ABSTRACT AND PAPER PUBLICATION

Participants wishing to present a paper at the workshop are required to submit an abstract. A pre-print of submitted abstracts will be provided for all participants at the workshop. Selected papers will be refereed, edited and published by the International Glaciological Society in an ISI listed publication.

ACCOMMODATION

Details will be given in the Second Circular.

SYMPOSIUM ORGANIZATION

Magnús Már Magnússon (International Glaciological Society)

SCIENCE STEERING AND EDITORIAL COMMITTEE

Perry Bartelt and Jürg Schweitzer, Co-Chief Editors

LOCAL ARRANGEMENTS COMMITTEE

R.N. Sarwade (chairman), R. Shankar, P. Mathur, A. Ganju, Amod Kumar, Pramod Satyawali, R.R. Seth, S.S. Lalji, K. Srinivasan, P.S. Negi, R.K. Garg, Snehmani, G.K. Panesar, V.D. Mishra, Arun Choudhary.

SYMPOSIUM STUDY TOURS

The study tour is planned to the Beas Kund glacier (32º24', 77º5'), a temperate glacier on the southern slope of Pir Panjal Range in Manali area of Himachal Pradesh, India. The tour will also visit the Prini hydropower station (192 MW), which is located in the vicinity of the Beas river. The Nala feeding the power station originated from 6000 m having a catchment area of 144.70 km^2.

There are several places of interest in and around Manali, where short visits can be made: (a) Naggar: a historic place famous for an old castle and a Roerich Art Gallery. (b) Tibetan Monasteries: Ancient monasteries depict rich tradition of spiritualism and handicrafts. (c) Ancient temples and local sight seeing: Manali, an epic town in the land of Gods offers picturesque sights and traditional culture. (d) Manikaran hot water spring is an ancient pilgrimage centre where a blend of different faiths can be seen.

FURTHER INFORMATION

If you wish to attend the symposium (also the symposium study tour) please return the attached form as soon as possible. The Second Circular will give further information about accommodation, the general scientific program and guides for workshop study tours, and preparation of abstracts and final papers. Copies of the Second Circular will be sent to those who return the attached reply form. Members of the International Glaciological Society will automatically receive one.

INTERNATIONAL GLACIOLOGICAL SOCIETY
INTERNATIONAL WORKSHOP ON SNOW AND AVALANCHES
Manali, India, 6–10 April 2009

Family Name: _____

First Name(s): _____

Address: _____

_____

_____

_____

Tel: _____ Fax: _____

E-mail: _____

I hope to participate in the Symposium in April 2009 ☐

I expect to submit an abstract ☐

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

_____

_____

_____

I am interested in an accompanying person's programme ☐

I am interested in the workshop study tours ☐

PLEASE RETURN AS SOON AS POSSIBLE TO:
Secretary General, International Glaciological Society,
Scott Polar Research Institute, Lensfield Road, Cambridge, CB2 1ER, UK
Internat.: Tel: +44 (0)1223 355 974 Fax: +44 (0)1223 354 931
E-mail: igsoc@igsoc.org Web: http://www.igsoc.org

News

Obituary: Roy (Fritz) Martindale Koerner 1932–2008

Polar Scientist, explorer and member of the British Trans-Arctic Expedition

Roy (Fritz) Koerner, 75, died on 26 May only three and a half weeks after returning from his last field season to the Canadian High Arctic. He continued his pioneering work of monitoring the ice caps until the very last. Fritz was an outstanding field scientist and looked on everything he undertook with a sense of adventure and fun. His glacier mass balance studies spanning the years 1961–2008 became the standard reference for the Canadian Arctic and helped provide proof of global warming.

Fritz was the team scientist on Wally Herbert's four man British Trans-Arctic Expedition and along with Wally, Allan Gill and Ken Hedges made the epic dog sledge trip from Point Barrow, Alaska to Svalbard. The Duke of Edinburgh was their patron. They left in January 1968 for this 476-day trek. They reached the Pole and over-wintered, supported by airdrops from the RCAF. Fritz's early careful and consistent measurements of ice movement and thickness are quoted still by those who study the sea ice of the Arctic today.

Fritz was a boy during the Second World War and was evacuated from his home in Portsmouth where his father worked in the naval dockyard. He attributed his educational start and subsequent career in science to the opportunities that were opened up after the war by the new Labour government. He used his scholarship well and received his BA from the University of Sheffield in 1954. After a brief foray into teaching he signed up with the FIDS (Falkland Islands Dependencies Survey), precursor to the British Antarctic Survey. He worked for FIDS from 1957 to 1960 as the meteorologist at Hope Bay, Antarctica. He picked up his love of glaciology and dog sledging in these years and met his future friend and colleague Wally Herbert. He came home to Britain to receive the Polar Medal and the naming of an Antarctic mountain after him, 'Koerner Rock'.

Fritz's long affair with the Canadian Arctic started in the period 1961/62 while he was the glaciologist with the Arctic Institute of North America's over-wintering expedition to study the Devon Island Ice Cap. His long and continuous mass balance study started then. His early Devon work led to his PhD from LSE after which he was briefly a research associate with Ohio State University's Institute of Polar Studies. He spent a

field season in East Antarctica at the 'Pole of Inaccessibility' working on measuring snow accumulation and stratigraphy at that remote site. This work earned him a United States Antarctic Service Medal.

Fritz settled in Canada in 1969 with his Polish wife Anna (nee Kowalczyk). They lived near Ottawa, where he took up a job with the 'Polar Continental Shelf Project', a research and logistics arm of the Canadian Government. He and his colleague Stan Patterson began that organization's glaciology group. Fritz eventually took over the group, which became part of the Geological Survey of Canada. He continued his mass balance study of the Devon Ice Cap and added other sites on Meighen Island, Ellesmere Island and Melville Island, thus spanning all the

climate regions of the Queen Elizabeth Islands. His approach to polar science was direct, critical and focused on the essentials, like starting and running the mass balance monitoring project. The group obtained an ice coring drill in the late 1960s and began the systematic coring of the major ice caps in Arctic Canada and, along with his colleagues and students, Fritz defined the climate history of Canada's Arctic and related it to that of Greenland. Fritz focused on the use of summer melt features in the ice cores as an unequivocal means of assessing detailed summer temperatures as far back as 11 000 years ago. He showed that the warmest time since the end of the last Ice Age was between 8000 and 11 000 years ago and that the long cooling trend since then has been dramatically reversed in the last century, during which ice melt rates were shown to have increased dramatically. The recent climate change debate has leaned heavily on his melt layer records from the Arctic, and Fritz was an active participant in the early rounds of the Intergovernmental Panel on Climate Change (IPCC). In the 1980s Fritz and his colleagues were the first to use cores to measure in detail the history of acid pollution in the Arctic. He also gave guidance to the planning of the first systematic airborne laser altimeter measurements of the major glaciers and ice caps of the Canadian Arctic. Fritz's science was highly respected and seminal (over 70 papers and book chapters). His colleagues benefited greatly from his direct but always fair criticism, and his sharp wit; as did numerous graduate students from all over the World who utilised his hard earned data and solicited his comments and advice. Never did he ask for anything in return but an acknowledgment. He was working on a popular book about glaciers and climate when he died, and he continued to monitor mass balance and pollution trends right through his last field season.

Fritz's life and work were ever intertwined; his colleagues were his friends and he took his wife and children with him to the Arctic. In his retirement Fritz devoted more time to education and outreach, travelling many times as a lecturer with 'Students On Ice' tours to both polar regions. He had a natural affinity for young people who found his energy and iconoclastic style compelling. The Inuit youngsters of the High Arctic also responded well to him and he gave annual spring study tours to students of the school in Grise Fiord, taking them up to their local ice cap that he specially instrumented with a weather station. He thought that the Inuit would need to understand and see the changes that were sweeping over them because of climate.

Fritz lost his wife Anna in 1989 but remained close to his children, son Justin and daughters Eva, Davina and Kristina. They were with him when he slipped away. He was a charming and generous man. He was also intensely competitive and athletic; an outstanding distance runner all his life and a good cross-country skier. It was typical of him that he insisted on going on his last field trip even though he knew his strength was fading. His love of the polar regions and science resulted in a large body of what is now invaluable information about how our climate has been changing. He often retorted that the work he started so long ago would probably not pass today's over-planning and outcome-oriented management frameworks. Lucky for us all, his insight and initiative were enough back then. With his passing, many of us in the field sense an era is closing. That said, Fritz's pioneering and long-standing work on monitoring and assessing glacier mass balances in the Canadian Arctic Islands is destined to be continued by his colleagues who will do so armed with all they have learned from him, and his guiding spirit.

Written by his friends and colleagues

APECS Survey: what is it like to be an early career polar researcher during this IPY?

The Association of Polar Early Career Scientists (APECS) is currently conducting a survey to better understand current thinking in the early career polar researcher community. The survey is aimed at graduate students, post doctoral researchers, junior faculty and those at an equivalent career level who conduct any kind of research related to the polar regions. The aim of the survey is to inform the larger polar community of how early career researchers view their research and their career prospects. It will also provide a benchmark by which changes in early career research environments can be historically gauged between now and the next International Polar Year (IPY).

The idea for this survey came about at the IPY New Generation of Polar Researchers (NGPR) Symposium, which took place in Colorado Springs in May 2008. Participants of the Symposium expressed an interest in surveying the broader early career polar community to get a better sense of how those at the beginning of their careers feel about their research and work environment. The survey was launched on 15 September 2008 and so far the response has been excellent, with over 150 surveys conducted in the first two days.

The data collected in this survey will form part of an IPY archive and as such will be freely available to all. Results will identify how we can improve the success of one of the most important legacies of IPY: its future generation.

Participation in the survey is completely anonymous and it takes around 5 minutes to complete. The survey is located at: http://arctic-portal.org/apecs/early-career-survey

APECS: The Association of Polar Early Career Scientists (APECS) is an international and interdisciplinary organisation for undergraduate and graduate students, postdoctoral researchers, early faculty members, educators and others with interests in Polar Regions and the wider cryosphere. Our aims are to stimulate interdisciplinary and international research collaborations, and develop effective future leaders in polar research, education and outreach.

Glaciological diary

** IGS sponsored * IGS co-sponsored

2008

7–9 January
International Workshop on Snow, Ice, Glacier and Avalanches
Mumbai, India
See http://www.csre.iitb.ac.in/csreworkshop/index.html
Contact: Dr G.Venkatraman; e-mail: gv@iitb.ac.in

28 January–2 February
Workshop on the dynamics and mass budget of Arctic glaciers
GLACIODYN (IPY) meeting, Obergurgl, Austria
Convenors: J. Oerlemans, email: j.oerlemans@phys.uu.nl; and C.H. Reijmer, email: c.reijmer@phys.uu.nl
See: http://www.phys.uu.nl/~wwwimau/research/ice_climate/iasc_wag/activities.html

5–7 March
The 38th Annual International Arctic Workshop
Institute of Arctic and Alpine Research (INSTAAR), University of Colorado, Boulder, Colorado, USA
Contact email: ArcticWS@colorado.edu
See http://instaar.colorado.edu/meetings/AW2008/

6–7 March
Alpine Glaciological Meeting
Chamonix, France
Contact: Christian Vincent email: vincent@lgge.ujf-grenoble.fr

10–11 March
International Symposium on Mitigative Measures against Snow Avalanches
Egilsstadir, Iceland
See: http://www.orion.is/snow2008/organizer.html

10–11 March
Workshop on the Microstructure and Properties of Firn
Dartmouth College, Hanover, NH, USA
See http://engineering.dartmouth.edu/firn/

18–19 March
IP3 Users Workshop: 'Prediction of Water Resources in Mountain and Northern Canada: What is needed, what can be done'
Canmore, Alberta, Canada
See http://www.usask.ca/ip3/download/canmore2008/canmore_agenda.pdf

26–28 March
Workshop on mass balance measurements and modelling
Skeikampen, Norway.
Convenor: Glacier section at Norwegian Water Resources and Energy Directorate (NVE).
See http://www.nve.no/mbworkshop

27–29 March
GSA Northeastern: Antarctic Climate Evolution
Buffalo, NY, USA
See http://www.geosociety.org/sectdiv/northe/08mtg/techprog.htm

1–4 April
Second International Conference – 'Arctic Palaeoclimate and its Extremes (APEX) – Recent Advances'
Department of Geography, DurhamUniversity, Durham, UK
See http://www.apex.geo.su.se/meetings/apex2008.html
Conference contact: Niamh McElherron; c.mcelherron@durham.ac.uk

13–18 April
European Geosciences Union
General Assembly 2008
Vienna, Austria
See http://meetings.copernicus.org/egu2008/

4–11 May
New Generation of Polar Researchers (NGPR)
Symposium for Early Career Scientists Conducting Polar Research during the IPY
La Foret Conference Center, Colorado Springs, Colorado, USA
See http://www.disccrs.org/ngpr/

5–8 May
Science of Solar System Ices (ScSSI)
A cross-disciplinary workshop
Oxnard, California, USA
See http://www.lpi.usra.edu/meetings/scssi2008/

10–14 May
CGU-CGRG Joint Meeting: 'Canadian Geophysical Sciences: Present and Future'
Banff Park Lodge, Banff, Canada
See http://ucalgary.ca/~cguconf/

25–29 May
42nd Annual Congress of the Canadian Meteorological and Oceanographic Society (CMOS)
Special session on 'Avalanche Science and Forecasting'
Kelowna, BC, Canada
See http://cmos2008.ca/en/

26–30 May
Interpraevent 2008 – 11th International Symposium
Dornbirn Exibition Centre, Dornbirn, Austria
See: http://www.interpraevent2008.at/

28–30 May
Eastern Snow Conference
Fairlee (Lake Morey) Vermont,, USA
See http://www.easternsnow.org/

9–13 June
****International Symposium on Radio-glaciology and its Applications, Madrid, Spain**
Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK
See: http://www.igsoc.org/symposia

15–20 June
The 27th International Conference on Mathematical Geophysics
Longyearbyen, Spitsbergen
See http://www.fys.uio.no/cmg2008/

16–18 June
GLIMS workshop on glacier mapping using remote sensing methods
Boulder, Colorado, USA
See http://glims.org/

24–26 June
Antarctic Peninsula Climate Change (APCC-5): Climate, Ice, Oceans, and Life
University of California, Irvine, California, USA
Contact: Eric Rignot, erignot@uci.edu

29 June–3 July
9th International Conference on Permafrost
Celebrating the 25th Anniversary of the formation of the International Permafrost Association
University of Alaska Fairbanks, Fairbanks, AK, USA
See: http://www.nicop.orgn

3–11 July
XXI Congress of the International Society for Photogrammetry and Remote Sensing

Special Session on Observation and Monitoring of Polar Regions (SS-12)
Beijing, China
See http://www.isprs2008-beijing.org/

6–11 July
Remote Sensing of the Cryosphere
2008 IEEE International Geoscience & Remote Sensing Symposium
Boston, Massachusetts, USA
See http://www.igarss08.org/

7 July
***IPY Early Career Polar Researchers Workshop** 2008
St. Petersburg, Russia
Contact: Liz Thomas (liz.thomas@polarnetwork.org)
See http://www.igarss08.org/

8–11 July
SCAR/IASC 2008 Open Science Conference
St Petersburg, Russia
See: http://www.ipy.org/index.php?/ipy/detail/scar_open_science_conference

13–18 July
Goldschmidt2008 – Session 16d: Biogeochemistry of weathering in glacial environments: local, regional, global and extraterrestrial consequences
Vancouver, Canada
Contact: Martyn Tranter; m.tranter@bristol.ac.uk

6–14 August
International Geological Congress (IGC)
Oslo, Norway
See http://www.33igc.org/coco/

11–14 August
Joint 17th Conference on Applied Climatology and 13th Conference on Mountain Meteorology
Whistler, British Columbia, Canada
See http://www.ametsoc.org/MEET/fainst/200813montmet17AP.html

17–22 August
****International Symposium on Dynamics in Glaciology**
Limerick, Ireland
Contact: Secretary General, International Glaciological Society,
See http://www.igsoc.org/symposia/2008/ireland/

18–25 August
IAVCEI General Assembly
Reykjavík, Iceland
See http://www.jardvis.hi.is/page/I08-intro and http://www.jardvis.hi.is/page/I08-SYM3

1–2 September
William Smith Meeting of the Geological Society 2008
Observations and Causes of Sea-Level Change on Millennial to Decadal Timescales
Burlington House, London
See http://www.geolsoc.org.uk/gsl/events/listings/page3053.html

2–3 September
Observations and causes of sea-level changes over millennial to decadal timescales
The Geological Society, London, UK
See www.geolsoc.org.uk/gsl/events/listings/page3053.html

3–11 September
The XIV Glaciological Symposium on Glaciology from International Geophysical Year to International Polar Year
Irkutsk, Russia
Contact: Yuliya Rayskaya: gs2008@onlinereg.ru
See http://www.onlinereg.ru/site.php?go=61&lang=ENG

8–9 September
***IGS British Branch annual meeting**
School of the Environment & Society, Swansea University, UK
Contact: Timothy D. James; igsbb2008@swansea.ac.uk
See http://www.swansea.ac.uk/geography/Research/igsbb2008/

8–11 September
10th International Symposium on High Mountain Remote Sensing Cartography, (HMRSC-X)
ICIMOD, Kathmandu, Nepal
See http://menris.icimod.net/HMRSC-X/

9–20 September
Karthaus 2008 summer course on 'Glaciers and Ice Sheets in the Climate System'
Karthaus, northern Italy
See http://www.phys.uu.nl/~wwwimau/education/summer_school/

12 September
Sea Ice Group workshop
University of Bangor, Bangor, Wales
See http://www.pol.ac.uk/home/news/seaice/

18–20 September
International Forum for Research into Ice Shelf Processes (FRISP)
A joint meeting with the West Antarctic Ice Sheet (WAIS) Initiative
Losehill Hall, Hope Valley, Derbyshire
Contact: FRISP – Adrian Jenkins; a.jenkins@bas.ac.uk; WAIS – Bob Bindschadler; robert.a.bindschadler@nasa.gov

20–24 September 2008
****International Workshop on World Glacier Inventory**
Cold & Arid Regions Environmental & Engineering Research Institute
Lanzhou, China
Contact: Professor Shiyin Liu; liusy@lzb.ac.cn

23–25 September
Workshop on GAMIT/GLOBK/Track
Boulder, Colorado, USA
See http://www.unavco.org/edu_outreach/uscs/2008/gps.html

21–27 September
International Snow Science Workshop, ISSW
Whistler, Canada
See http://www.issw2008.com/

17–18 October
Nortwest Glaciology Meeting
University of Washington, Seattle, Washington. USA
See http://www.ess.washington.edu/Surface/Glaciology/nwg_08.html

4–6 November
First International Symposium on the Arctic Research (ISAR-1): Drastic Change under the Global Warming
Tokyo, Japan
See http://www.jamstec.go.jp/iorgc/sympo/isar1/index.html

6–8 November
***IGS Nordic Branch annual meeting**
Finnish Institute of Marine Research, Helsinki, Finland
Contact: Olli-Pekka Mattila; olli-pekka.mattila@helsinki.fi
See http://www.geo.physics.helsinki.fi/NIGS-08/

10–13 November
Quaternary Climate: from Pole to Pole EPICA Open Science Conference
Venice, Italy
See http://www.epica2008.eu/

19–22 November,
IMPETUS 2008: Techniques in Polar and Ocean Observation and Monitoring
St. Petersburg, Russia
See http://www.otto-schmidt-laboratory.de/?Events:IMPETUS_2008 or contact Carolyn Wegner; e-mail: impetus2008@ifm-geomar.de

24–28 November
Fourth EGU Alexander von Humboldt International Conference
The Andes: Challenge for Geosciences
Santiago de Chile
Contact: Peter Fabian (EGU); peter.fabian@wzw.tum.de
René Garreaud (Universidad de Chile); rgarreau@dgf.uchile.cl

15–19 December
AGU Fall meeting
San Francisco, California, USA
See http://www.agu.org/meetings/fm08/

2009

16–19 February
IASC – network on arctic glaciology
Biogeoscience Institute, University of Calgary
Barrier Lake Station, Kananaskis Country, Alberta, Canada
See http://bgs.ucalgary.ca/

22–27 March
Association of American Geographers, AAG, 2009 Annual Meeting
Includes: Glacier session, Changing Geographies of Arctic and more that may be of interest to glaciologists.
Las Vegas, USA
See: http://aag.org/annualmeetings/2009/index.htm

6–10 April 2009
****International Symposium on Snow and Avalanches**
Manali, India
Contact: Secretary General, International Glaciological Society
See http://www.igsoc.org/symposia/2009/manali/index.html

7–12 July
7th International Conference on Geomorphology (ANZIAG)
Melbourne, Australia
See http://www.geomorphology2009.com/
Contact: geomorphology2009@tourhosts.com.au

19–29 July 2009 (Cryospheric sessions 20–24 July)
'Our Warming Planet' IAMAS, IAPSO, IACS joint assembly
Montréal, Canada
See http://www.moca-09.org/index.asp
Contact: montreal2009@nrc-cnrc.gc.ca

27–31 July
****International Symposium on Glaciology in the International Polar Year**
Newcastle, UK
Contact: John Woodward; john.woodward@unn.ac.uk
Secretary General, International Glaciological Society

27 September–2 October
International Snow Science Workshop, ISSW
Davos, Switzerland
See http://www.issw.ch

2010

31 May–4 June
****International Symposium on Sea Ice**
Symposium theme: The role of sea ice in the physical and biogeochemical system
Tromsø, Norway
Contact: Secretary General, International Glaciological Society

21–25 June
****International Symposium on Snow, Ice and Humanity in a Changing Climate**
Sapporo, Japan
Contact: Secretary General, International Glaciological Society

13–17 September
****International Symposium on Disappearing Ice**
A celebration of the 50th Anniversary of Byrd Polar Research Center
Byrd Center, Ohio State University, USA
Contact: Secretary General, International Glaciological Society

2011

5–10 June
****International Symposium on Interactions of Ice Sheets and Glaciers with the Ocean**
Scripps Institution of Oceanography, La Jolla, USA
Contact: Secretary General, International Glaciological Society

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International Glaciological Society

Secretary General M.M. Magnússon

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