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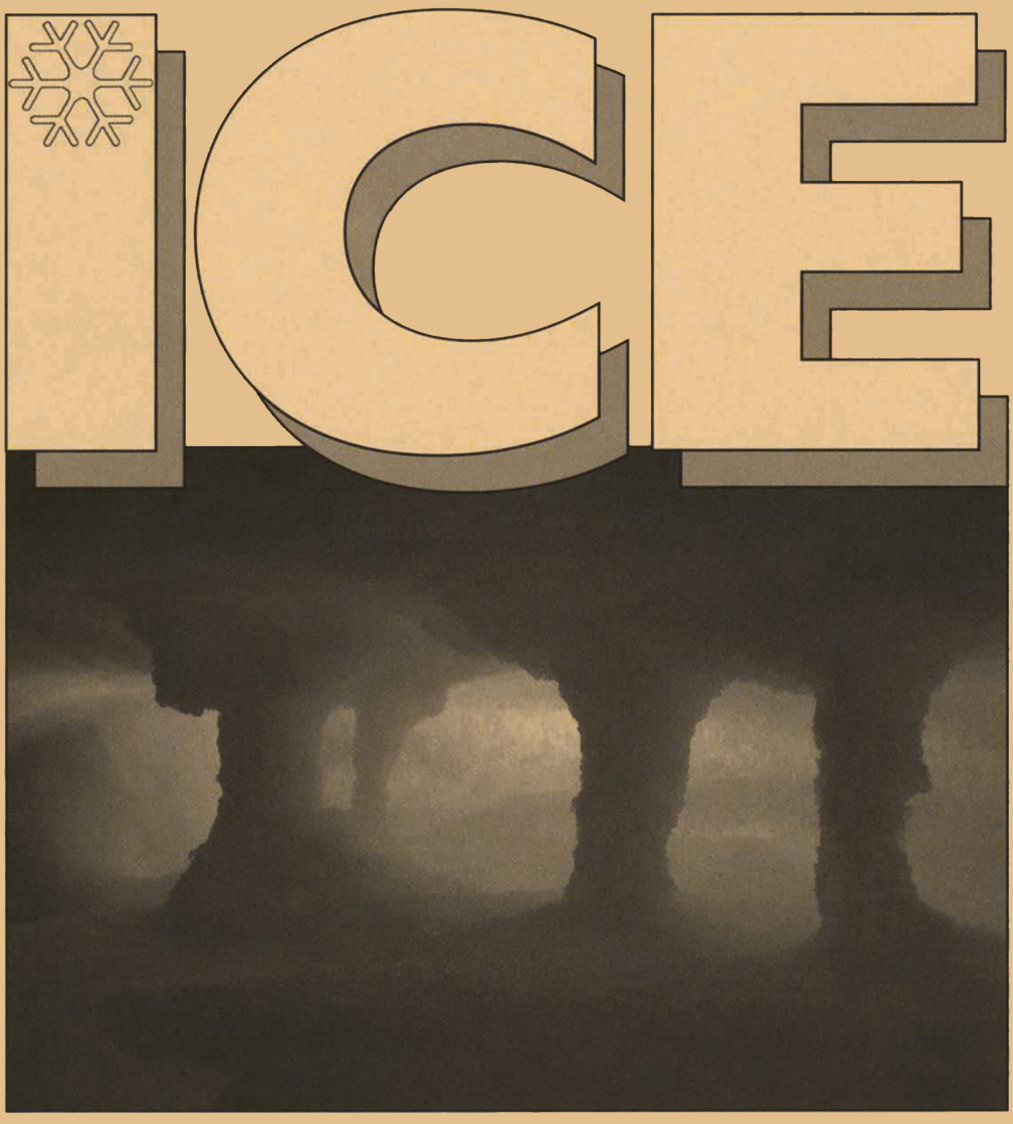
ICE



NEWS BULLETIN OF THE INTERNATIONAL GLACIOLOGICAL SOCIETY

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Ice

News Bulletin of the International Glaciological Society

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Contents

2 **From the Editor**
4 **Recent work**
4 Australia
4 Ice cores
4 Laboratory ice mechanics
5 Glaciers and ice sheets
8 Sea ice and glacimarine processes
10 Large-scale processes
11 Glacial geology
11 Abbreviations
12 **International Glaciological Society**
12 Journal of Glaciology
13 Notes from the production team
13 Books received
14 **News**
14 85th birthday symposium – Gunnar Østrem
16 Obituaries
16 Albert Lincoln Washburn, 1911–2007
18 Ed LaChapelle, 1926–2007
19 Marcel De Quervain, 1916–2007
20 **Recent meetings of other organizations**
Report on the Alpine Glaciology Meeting 2007
21 **Future meetings of other organizations**
Workshop on mass balance measurements and modelling
22 **Glaciological diary**
25 **New members**

Cover picture: A network of flow fingers excavated in the percolation zone of Devon Ice Cap, Nunavut, Canada, during ongoing studies of mass balance spatial variability and internal accumulation (Photograph by Jan Sekerka)

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

Welcome to the first issue of *ICE* for 2007. As usual we are a bit behind but we are now actively working towards rectifying that.

There have been some serious developments this year concerning the *Annals of Glaciology*. As you know, the *Annals* enjoyed the same status as the *Journal of Glaciology*: both were listed on the Web of Science (WoS) or, more precisely, on the Science Citation Index extended.

Last February I discovered, purely by chance, that Thomson Scientific, a private company, had decided to deselect the *Annals* from WoS and enter it exclusively in ISI Proceedings from 2007 forwards. There had been no prior consultation and this came very much as a surprise to us all. As some of you are aware, we wrote to Thomson expressing our concern about their decision and received the reply that since the *Annals* consisted of papers that had been presented at a symposium it should be deselected from the WoS. '*The distinction is not based on the quality of the papers or on the presence of peer review*' (a quote from the Thomson reply).

At present, it can still be said that the *Annals* are ISI-listed, as they are listed in the Index to Scientific & Technical Proceedings® (ISTP®) and Index to Scientific & Technical Proceedings (ISTP/ISI Proceedings).

Our Vice President Eric Wolff summed up the situation very well:

'On the plus side:
As far as I can see the bibliographic details in the ISI Proceedings are the same as in WoS, but with additional information about the conference. There is still an abstract, all the authors, etc. It will still be true to say that a paper in Annals *is 'ISI-listed' It will still, as far as I can tell, be possible to navigate to the paper from another paper that has cited it (i.e. if you find a paper in WoS that cites an* Annals *paper, a single click will take you to the* Annals *information)*

On the minus side:
It will no longer be possible to do a forward search from an Annals *paper, i.e. find out what papers have subsequently referenced an* Annals *paper. If someone does a WoS search for papers on "ice cores" or papers by "Hulbe",* Annals *papers will not come up. They would have to do a second search in Proceedings, or a 'cross-product search', which most people will not do as their normal method. There will not be an 'impact factor' for* Annals.

The third issue may be important for some institutes and it would be useful to find out how serious this is. The second issue makes us a little less visible, and the first one makes Annals *papers somewhat less useful as a route into a new topic, which I would be annoyed by.'*

The most serious problem is that we will lose our impact factor. I have consulted with other learned publishers through the Association of Learned and Professional Society Publishers (ALPSP) and we are not alone. The association has set up a meeting which I will attend, with a senior Thomson person. I will be pressing very hard to have the impact factor reinstated.

We will also be looking at other options to promote the *Annals*. The publications committee and Council have been very much involved in this debate and will decide how to proceed. There are other indexing systems where the *Annals* is listed (e.g. H factor, Scopus, Journal Ranking and Eigenfactor). We should perhaps turn our attention to getting researchers and research bodies to recognise alternate citations as a valid alternative to ISI. There are also other scientific search engines that authors should use, e.g. Google Scholar.

It is not beneficial for the science community for any single private company to have a monopoly on how scientists' work is evaluated, as they clearly have no appreciation of the difference between high-quality, edited, peer-reviewed papers and symposium papers published verbatim; and unfortunately do not seem concerned with fostering rigorous scientific research.

We must break the stranglehold that ISI Thomson has on the scientific community.

Magnús Már Magnússson
Secretary General

Recent work

Australia

ICE CORES

Concentration and isotopic measurements of radiatively important gases in the southern atmosphere
David Etheridge (CMAR)
Gases released by human activity (greenhouse and ozone-depleting gases) are responsible for global change. They are long-lived and well mixed in the atmosphere. The Antarctic regions, remote from industrial and land plant activity, are ideally located to measure global changes in the gases. The CSIRO sampling network represents the most comprehensive, long-running Southern Hemisphere program. With continuing innovation in measurement and interpretive models, it is ideally positioned to detect possible climate-induced regional changes in carbon uptake, as well as monitor global changes. It also provides essential background information to the new challenge of monitoring integrated emissions from the Australian continent.

East Antarctic and circum-Antarctic climate history in Queen Mary Land: an Australian contribution to ITASE
Ian Goodwin (UNew), Mark Curran,
Tas van Ommen (AGAD & ACE)
The climate variability of the Southern Ocean sector of the circum-Antarctic and East Antarctic is investigated using ice core studies. The project will produce a 200–300 year history of atmospheric circulation in the Australian and Southern Ocean sector of the circum-Antarctic, associated with the Antarctic Circumpolar Wave, the El Nino Southern Oscillation and the Southern Annular Mode of climate variability. Proxy rainfall records for south-west Western Australia will be developed from the ice-core data, and extend the instrumental rainfall data by 100–200 years. The project will form a component of the International Trans Antarctic Scientific Expedition (ITASE).

The timing of the last re-advance of the Law Dome Ice Margin, East Antarctica
Ian Goodwin (UNew)
The objectives of this study are to constrain the age of the most recent glacial re-advance of the Law Dome ice margin, near Casey, East Antarctica and to establish the dynamical response time of the Law Dome to increasing snow accumulation rates during the late Holocene.

Historical atmospheric radio-methane
Andrew Smith (ANSTO), David Etheridge (CMAR), David Lowe (NIWA), Vin Morgan (AGAD & ACE), Katja Riedel (NIWA), Adam Sarbutt (ANSTO), Steven Whiteside (AGAD)
Methane is a significant greenhouse gas, second in importance after carbon dioxide. Methane also plays an important role in establishing the ozone layer, which helps protect the Earth from ultraviolet radiation. Atmospheric methane concentrations prior to 1978 are known from analysing ice-core air. Our aim is to determine the isotopic signature of methane from pre-industrial times in order to determine its origin.

Ice core paleoclimatology
Vin Morgan, Tas van Ommen, Mark Curran, Barbara Smith (AGAD & ACE), Andrew Smith, David Fink (ANSTO), David Etheridge (CMAR), Kevin Rosman, Graham Burton, Paul Vallelonga (UCur), Ian Goodwin (UNew)
Australian ice core paleoclimate study continues with a focus on high-resolution Law Dome records. A new thermally drilled core was recovered in season 2005/06, which provides material covering the last 2–3 centuries for high volume analysis for 14-CH_4, beryllium-10 in particular (a collaboration between ANSTO and AGAD). In addition, new records of trace chemical and water isotope variations will be obtained to extend the modern end of existing records and obtain increased fidelity with 'stacked' records. Calibration of records against meteorological and reanalysis data continues, and will improve our understanding of the climate system.

LABORATORY ICE MECHANICS

Laboratory and model studies of tertiary ice flow under combined stresses and the effect of polycrystalline anisotropy on the flow of polar ice masses
Li Jun (AGAD, now NASA), Bill Budd (ACE),
Jo Jacka (formerly AGAD & ACE), Roland Warner (AGAD & ACE), Adam Treverrow (UTas).
An accurate quantitative description of the relations between the stresses in ice sheets and glaciers and their flow rates is critical to successful modelling of their behaviour. One of the deficiencies of current models of polar ice masses is inadequate consideration of the anisotropic crystal

structure that develops with, and strongly influences, the flow of ice. A series of ice deformation tests under combined shear and compressive stresses has been completed in the AGAD ice mechanics laboratory at the ACE. Results and analysis of these tests, demonstrating the anisotropic character of the flow relations that apply for conditions of steady-state 'tertiary' ice flow under combined stresses, are presently in submission. A recent series of shear deformation tests at ACE, on Antarctic ice from the Law Dome (DSS) ice core explores the connection between enhanced shear flow rates and the anisotropic crystal c-axis fabrics present in the ice core material. The predictions from crystal fabric 'controlled' numerical models of ice rheology will be tested against the experimental deformations once an automated crystal fabric analyzer is available in the AGAD laboratory, to improve the relationships between flow rates and stresses for models of ice sheets and ice shelves.

GLACIERS AND ICE SHEETS

Ice-sheet–atmosphere interaction and surface climatology of interior Antarctica

Ian Allison (AGAD & ACE)

Automatic weather stations are used to provide surface meteorological data from remote regions of the Antarctic ice sheet. A network of more than ten stations is operated. These measure a range of different parameters every hour and relay the data to Australia via a satellite link. Three of the stations, between the coast at 77E and Dome A (the highest point of the East Antarctic ice sheet), are operated in conjunction with the Chinese Antarctic program. The data are used for meteorological forecasting, to support aircraft operations, to provide climatic information, for studies of the surface wind processes over the ice sheet and to support a variety of other research programs such as the interpretation of proxy climate data in ice cores.

Fracturing and deformation along the Amery Ice Shelf

Richard Coleman (UTas), Neal Young (AGAD & ACE), Mark Lackie (UMac), Helen Fricker (UCSD)

In recent years, there has been widespread interest created by the marked retreat of a number of ice shelves on the Antarctic Peninsula (Vaughan & Doake, 1996). More recently there has been the dramatic disintegration of sections of the Larsen Ice Shelf. The collapse of the Larsen 'A' was followed by increases of several-fold in the discharge velocity of glaciers that previously flowed into that section of the shelf. The break-up of sections of the various shelves on the Peninsula has highlighted the importance of understanding how large-scale ice fracture processes occur. There is thus a need to properly incorporate fracture mechanics into models of ice shelf dynamics to adequately address questions of the climate sensitivity of ice shelves. This project proposes to undertake a measurement programme in a margin region of the Amery Ice Shelf near Gillock Island and across the southern section of the grounding zone of the Amery, at the confluence of the Lambert, Mellor and Fisher Glaciers. In total, these three regions of study on the ice shelf will help characterize fracture and deformation processes as the ice shelf goes from grounded to floating, flow around topography and rifting/calving at the ice shelf-ocean boundary. This study will concentrate on investigating the first two of these fracture regions using a combination of GPS measurements, satellite imagery, synthetic aperture radar (SAR) interferometry data, airborne ice radar and, where appropriate, in-situ seismic profiling. These new study regions are transition zones where the floating part of the ice sheet is coupled with the grounded part of the ice shelf in some manner, rather than the calving region at the front of the ice shelf. The grounding zone exists around the entire land perimeter of the ice shelf as well as around individual/isolated grounded points or areas within the ice shelf. The primary objectives of the project are:

- to measure the 3D motion of the ice shelf across fracture zones using GPS
- to estimate the ice shelf thickness and ice draft in the same regions using in-situ seismic and/or ice radar data, in addition to using existing datasets derived from previous radar and satellite altimeter measurements
- to quantify the spatial scales of deformation across the different fracture zones and investigate the stress fields with the aim of formulating numerical models of the fracture processes.

Iceberg calving from active ice-shelf rift systems on the Amery Ice Shelf

Richard Coleman (UTas), Neal Young (AGAD & ACE), Helen Fricker (UCSD)

The main focus of this proposal is to develop an understanding of the mechanics of ice shelf rift initiation and propagation, leading up to an iceberg calving event on one of Antarctica's largest ice shelves, the Amery Ice Shelf (AIS) in East Antarctica, and to determine the effect that the calving event has on the ice shelf dynamics. The specific objectives are:

- to measure simultaneously the propagation and widening of two transverse-to-flow ice shelf rifts that make up the active part of a rift system at the front of the AIS using a combination of satellite and in situ measurements and

to investigate further the apparent relationship between the behaviour of these two rifts

- to study governing stresses controlling the initiation of rifts at the front of the ice shelf and the propagation of the rift system
- to investigate the effect the calving event will have on the stress field in the ice shelf and on the currently inactive rifts (e.g. will calving precipitate propagation of another rift?).

Active ice-shelf rift systems on the Amery Ice Shelf, East Antarctica

Richard Coleman (UTAS), Helen Fricker (UCSD)

This project seeks to understand the fundamental mechanisms and processes involved in rift initiation and calving at the front of large Antarctic ice shelves. Calving is the process responsible for around two-thirds of the mass lost from the Antarctic ice sheet. Understanding the processes involved will help to predict future behaviour of the ice sheet and its impact on sea level and freshwater budgets under different global and regional climate scenarios. The interaction of Antarctica with the changing global climate is one of the core science strategies in Australia's Antarctic science program.

Analysis of East Antarctic drainage basins with altimetric, interferometric, gravity and GPS techniques to determine their state of flux

Richard Coleman (UTAS), Neal Young (AGAD & ACE), Peter Morgan (University of Canberra), Mark Lackie (UMac), Helen Fricker (UCSD)

We propose to reassess the mass balance of Law Dome and the adjacent main plateau by directly determining the spatial distribution of mass changes within the region 66–69°S, 109–115°E. Our approach will combine techniques from geodesy, geophysics and glaciology, and exploit existing field data sets of position and gravity as well as Radio Echo Sounding and seismic profiles that were collected, starting in the 1960s through to the 1980s, combined with re-observation of gravity and position by this project, as well as using the latest satellite gravity, altimeter and synthetic aperture radar (SAR) interferometric data. This approach will allow us to determine changes in ice sheet volume and mass locally on a network of points, rather than assessing the difference between the mass input and mass export terms. Where possible, we aim to determine a time series of mass changes with progressively improved precision and sophistication. The specific objectives are:

- to determine elevation and mass changes over the past few decades using measurements of changes in surface elevation and gravity at stations surveyed from the 1960s to the 1980s and re-measured during 2005–07
- to establish and re-occupy a high precision GPS network to be used in assessing the current state of change, as a reference network for validation of satellite-based studies of elevation and mass change, and as a baseline for future mass balance assessments
- to derive the spatial distribution of mass changes and, where possible, the temporal variability of mass change by combining the results with supplementary datasets to investigate the processes contributing to the observed changes.

Coordinated research into Antarctic calving (CRAC) – Amery Ice Shelf component

Richard Coleman (UTAS), Helen Fricker (UCSD), Paul Tregoning (ANU)

The primary objective of CRAC is to improve our knowledge of the processes involved in rift propagation and tabular iceberg calving from the ice shelves of Antarctica. In this study, we focus on the Amery Ice Shelf (AIS) but the project is integrated and is part of a larger IPY CRAC investigation, teaming up with researchers in the USA and UK where complementary rifting studies will be undertaken on the Ross and Filchner–Ronne ice shelves and how they respond to a changing climate. CRAC particular emphasis will be on studying the calving of tabular icebergs, a process which, for the Amery region, will lead to the calving of a 30 km by 30 km iceberg in the near future. The results of CRAC will contribute to our ability to model the critical role of the Antarctic ice sheet and its ice shelves in global processes, in particular how it might contribute to global sea-level rise.

Computer simulations of the dynamics and time-evolution of ice-shelves and ice-streams

John Court (UTas), John Hunter (UTas & ACE), Roland Warner (AGAD & ACE)

This project uses a depth-integrated ice-shelf/ice-stream model to investigate the influence of various flow parameters and domain geometries on the growth and decay of ice-shelves. Particular studies include basal melt/freeze and response to climate change, and the influence of rifts on ice dynamics. The role of the grounding zone between ice-stream and ice-shelf flow is also being studied, with the aim of predicting grounding-line response to changes in flow parameters and to changes in melt patterns under the ice-shelf.

Investigating the use of Heard Island as a climatic indicator of the southern Indian Ocean

Shavawn Donoghue (UTas), Kelvin Michael (UTas & ACE), Ian Allison, Rob Massom, Mark Curran (AGAD & ACE)

Heard Island is located in one of the more isolated regions of the southern Indian Ocean.

Changes in the positions of Heard Island's glaciers, and by inference, changes in the region's climate, have been recorded only intermittently since the establishment of the first Australian base in 1947. A combination of glaciochemical analysis (oxygen isotope and trace chemistry), mass balance surveys and modelling is used to investigate the changes that have occurred on the islands glaciers, in particular Brown Glacier. These changes are compared to those observed on other sub-Antarctic islands in combination with regional meteorological records to examine the possibility of using Heard Island's glaciers as a climatic indicator for this region of the southern Indian Ocean.

Numerical study of the circulation and melt/freeze under ice shelves
Ben Galton-Fenzi (UTas), John Hunter (UTas & ACE), Richard Coleman (UTas), John Church (CMAR & ACE)
Of primary interest is the way in which the melting and freezing depends on the ocean temperature, which is increasing (and will continue to increase) with global warming. During the past few years there has been a large programme of data collection on and under the Amery Ice Shelf (the latter using hot water drilling techniques) and in the adjacent area of Prydz Bay. These and future observations will form the basis of numerical modelling of this ocean system. The model used for the Amery studies is Regional Ocean Modeling System (ROMS). ROMS and also OzPOM (based on the well-known Princeton Ocean Model) are also contributors to the Ice Shelf–Ocean Model Intercomparison Project (ISOMIP), which is an international comparison of existing ice shelf cavity models. There is also an interest in modelling the cavities under other ice shelves. Each specific application of the model would indicate the sensitivity of that particular ice shelf to a warming ocean.

Long-range acoustic observation of the Antarctic ice rifting and calving events using the CTBT hydroacoustic listening station off Cape Leeuwin
Alexander Gavrilov (UCur)
Disintegration and melting of ice shelves surrounding Antarctica is one of the major indicators of global climate change. This project uses remote acoustic observations from the existing Comprehensive Nuclear-Test-Ban Treaty hydroacoustic listening stations. This is a new approach to the problem of creating an efficient and cost-effective system to monitor rifting and calving of the Antarctic ice shelves.

Looking back to see the future: change in the Lambert Glacier and the East Antarctic Ice Sheet
Kurt Lambeck, Paul Tregoning (ANU), Richard Coleman (UTas), David Fink (ANSTO)
We are developing a comprehensive understanding of the Lambert Glacier of East Antarctica, from the time of the last maximum glaciation to the present, through an integrated and interdisciplinary study combining new field evidence (ice retreat history, geodetic measurements of crustal rebound, satellite measurements of present ice heights and changes therein) with other geological and glaciological data and numerical geophysical modelling advances.

Antarctica – past, present, and future: exploring the dynamic interactions of ice sheet and ice shelves within the global climate system through computer modelling
Roland Warner (AGAD & ACE)
The balance between ice accumulation and loss for Antarctica is being investigated using computer simulations to predict changes in sea level and input of fresh water to the Southern Ocean. The physics of ice flow and transitions between ice sheet, ice streams and ice shelf flow will be treated in detail. Coupled models will also examine interaction between floating ice shelves and the ocean circulating beneath, since this contact provides an important path for climatic warming to influence the loss of ice.

Antarctica's subglacial waters -is frazil ice a vital factor?
Roland Warner (AGAD & ACE), Michael Williams (NIWA)
The formation, transport and deposition of frazil ice platelets in supercooled water is researched for application to ocean cavities beneath ice shelves, with the aim of explaining marine ice deposits beneath the Amery ice shelf, and observations of frazil ice beneath winter fast ice.

Structure and dynamics of the Dalk Glacier and comparison to other outlet glaciers in Prydz Bay and Mawson Coast
Chris Wilson (UMelb)
The Dalk Glacier, located in the vicinity of the Larsemann Hills, is one of the outlet glaciers that contributes to the drainage of the East Antarctic ice sheet. An investigation will be undertaken to identify and monitor zones of fast-flowing ice and relate these to the development of crevasse fields. These observations will be related to the dynamics of the Sørsdal glacier (Vestfold Hills) and the outlet glaciers in the Framnes Mountains.

Glacier dynamics and mass discharge from the Antarctic ice sheet, 45–160°E

Neal Young (AGAD & ACE), Richard Coleman (UTAS), Glenn Hyland (AGAD & ACE)

Ice streams and ice shelves are components of the Antarctic continental ice cover that are likely to respond earliest to changes in the environment. This project investigates a selection of ice-stream–ice-shelf systems in East Antarctica, their interaction with the ocean and adjoining ice sheet, and the mass budget of drainage basins in that sector. Measurements are made using satellite remote sensing of ice velocity and strain rates, surface topography, ice thickness and, under the floating sections, basal melt/freeze rates, providing observations from a broad area and complementing direct observations from field surveys.

SEA ICE AND GLACIMARINE PROCESSES

Ice shelf–ocean interaction in the cavity beneath the Amery Ice Shelf

Ian Allison, Mike Craven (AGAD & ACE)

Most snow falling on Antarctica drains via ice streams and floating ice shelves to the sea where it lost by iceberg calving or as basal melt. Ocean interaction with the shelves is important because it influences the Antarctic mass budget and modifies the characteristics and circulation of the ocean. This project is directly measuring ocean characteristics, circulation and melt/freezing rates through holes melted through the Amery Ice Shelf into the underlying ocean cavity. The project is linked with others investigating the ice shelf flow and mass budget, and the ocean circulation north of the shelf.

The drift of Antarctic sea ice

Ian Allison, Petra Heil (AGAD & ACE)

Drifting buoys, some with sensors to measure meteorological and oceanographic variables, are deployed on to ice floes to drift with the Antarctic pack ice, either from ships of opportunity or as part of a dedicated scientific voyage. GPS position data and measurements from the sensors are relayed via a satellite link. The buoys thus provide near real-time meteorological data for operational weather forecasting from a region of very sparse data. They also provide data on sea-ice motion, which may be used to validate ice-motion products from satellite-based instruments. Because of the relatively high spatial resolution and the high temporal sampling ratio, buoy-derived information provides detail on the way that ice drift and deformation modify the ice concentration, extent and thickness.

Variability of the coastal Antarctic climate derived from fast-ice observations

Petra Heil, Ian Allison (AGAD & ACE)

Measurements of the date of formation, rate of growth and other physical properties of the land-fast sea-ice off Mawson and Davis, East Antarctica, have been carried out intermittently since the mid to late 1950s. This project now formalizes these measurements by an observational sampling strategy and subsequent processing of fast-ice data at Davis and Mawson stations. Weekly data on fast-ice and snow thicknesses from the ongoing long-term time-series together with meteorological data will be used to analyse ice–atmosphere interactions. Interannual changes will be investigated for climate effects. In addition, sampling at various sites in each region will provide information on the influence of oceanic forcing on the fast-ice growth.

Studying high-frequency Arctic and Antarctic sea-ice dynamics using drifting buoy data

Petra Heil, Ian Allison (AGAD & ACE)

In-situ observations of sea-ice drift from the Arctic and Antarctic together with auxiliary remotely sensed data will be used to determine the contribution of sub-daily motion on the overall drift. Because of the cyclical characteristic of sub-daily motion it induces repeated opening and closing of the ice pack, which has been shown to increase the net ice-growth rate. The net ice growth and the overall sea-ice volume are crucial parameters in understanding the ocean–ice–atmosphere system, especially in the light of climate change. The role of this high-frequency motion in modifying sea-ice thickness and volume will be derived.

Implementation of a sea-ice model for application in the Antarctic

Petra Heil (AGAD & ACE), Nathan Bindoff (TPAC, UTas, CMAR & ACE)

In this project a sea-ice model for application in Southern Ocean climate and forecasting studies is being modified to rectify identified deficiencies (e.g. unaccounted short-term dynamics; non-suitable ice rheology). In situ ice-deformation and ice-stress data will be used to derive parameterizations suitable for the Southern Ocean pack.

Mapping UV radiation in the East Antarctic sea ice zone

Jane Higgins (UTas), Kelvin Michael (UTas & ACE), Rob Massom (AGAD & ACE)

Stratospheric ozone concentrations over Antarctica have declined to as little as 26% of pre-hole values during austral spring and depletion persists over summer. Depletion of stratospheric ozone increases incident short wavelength, high energy, biologically damaging, UVB (280–320 nm)

that reaches the Earth's surface. The ratios of UVB to both UVA (320–400 nm) and PAR (400–750 nm) also increase. This enhancement of UVB coincides with the period of greatest biological production in Antarctic waters and the evidence that UVB radiation can damage plankton is overwhelming. These organisms form the base of the Antarctic food web and are principal determinants of carbon dynamics in marine planktonic systems The aim of this project is to create satellite-derived maps of levels of UVB radiation in the East Antarctic Sea Ice Zone (55–70° S, 60–170° E) and from those maps to derive estimates of the potential damage to the marine biota of the region. Satellite data from various sources will be used to model UVB radiation at the surface. Field radiation measurements will allow the model to be extended to the upper layers of the ice-covered waters and at the base of the sea ice itself. The final component of the modelling is to interpret the levels of UV radiation in the various water and sea ice environments in terms of biologically effective doses.

Winter foraging locations of Southern Ocean predators in relation to stochastic variation in sea ice extent

Mark Hindell (UTas), Phil Trathan (BAS)

Antarctic marine communities are likely to be among the first anywhere to show changes due to climate change. A top national priority for Australia is to understand how Antarctic communities will be affected if climate change does occur. As predators reflect changes occurring lower in the food chain, these are an important group to study. This study will be the first to specifically link ice extent with the habitat use of predators and quantify how this varies over time. Some work already indicates that there have been community level changes in some predators in the Antarctic due to changes in ice extent, so developing tools to predict the nature and magnitude of these changes are needed.

Distribution, size and dissolution of Antarctic icebergs

Jo Jacka (formerly AGAD & ACE)

This project involves observations, from every ANARE voyage, of icebergs in the Southern Ocean, and with every voyage south it adds data to an international data collection that is co-ordinated in Norway. The data are also added to the web at http://www.antcrc.utas.edu.au/~jacka/climate.html From these observations, statistical calculations have been carried out to estimate the melt rate of the icebergs. The iceberg melt rate in the warmer waters north of the Antarctic Continent may indicate what the melt rates of the continental ice might be, given a warmer climate than currently exists.

Factors affecting DMS in the seasonal ice zone

Graham Jones (USC)

Dimethylsulphide (DMS) is produced by phytoplankton in the ocean leading to sulphur particles in the atmosphere around which water vapour condenses to form clouds. These sulphur-produced clouds reflect solar radiation, keeping temperatures stable. Phytoplankton in sea ice produce significant quantities of DMS. Methane sulphonic acid (MSA),an oxidation product of DMS, has been decreasing in Antarctic sea ice, suggesting that the sea ice extent has been decreasing since the 1950s. Consequently there is a need to assess the major processes responsible for the emission of DMS from the ocean surrounding Antarctica and attempt to assess its effect on the Antarctic climate.

Remote sensing validation experiment

Rob Massom, Ian Allison, Tony Worby (AGAD & ACE), Victoria Lytle (CliC)

The Earth's climate system is profoundly affected by interactions between sea ice, ocean and atmosphere at high southern latitudes. In order to better model and understand these complex interactions, improved data are required on large-scale sea-ice thickness, motion, type and concentration, as well as surface albedo, temperature and snow cover thickness. With its ability to monitor vast regions in a timely, repetitive and cost-effective manner, satellite remote sensing is a key tool in global climate and climate-change research. A number of important new satellite sensors have recently been launched and this project undertook validation studies of key satellite-derived Antarctic sea-ice geophysical products. A ship-based study in the sea ice zone around 120° E was carried out in September–October 2003 to:

- provide a detailed validation of important satellite data in the sea-ice zone in austral spring (when uncertainties in algorithm performance are largest)
- develop electromagnetic induction techniques for measurement of Antarctic sea ice thickness
- provide biogeochemical analyses on snow and sea ice samples to
  a) determine the concentration, speciation and bio-availability of iron, and
  b) better understand processes associated with sea ice biota as they govern emissions of marine gases of climatic significance.

The new satellite data together with in situ data are being used to improve our understanding of air–sea-ice interaction processes in the region in spring, with an overall view to developing a better understanding of the rapid and large-scale seasonal meltback of the ice cover.

Antarctic sea ice thickness distribution from ship observations collected between 1980 and 2004

Tony Worby (AGAD & ACE)

Ship observations, collected over the period 1980–2004, are being used to determine the regional and seasonal variability of the Antarctic sea-ice thickness distribution. The thickness of Antarctic sea ice is not well understood and cannot be determined from remote sensing, yet it plays an integral role in the climate system and is climatically sensitive. This project aims to establish a baseline of sea-ice thickness using data compiled from many different countries, which is required by scientists across many disciplines.

Investigation into sea-ice deformation and floe-size distribution during austral summer

Tony Worby, Petra Heil, Rob Massom (AGAD & ACE), Victoria Lytle (CliC)

This proposal is part of Ice Station Polarstern (ISPOL), a multi-disciplinary study led by the Alfred Wegener Institute (AWI), Germany. The main goal of the ISPOL project is to improve our understanding on the role of the early summer atmosphere–ice–ocean interactions in the western Weddell Sea in global processes. It involved a 30+ day drift station in the western Weddell Sea in support of interdisciplinary research, including oceanographers, glaciologists, biologists, and meteorologists. Our work focussed on the design, deployment and coordination of a meso-scale deformation array (in collaboration with investigators from overseas institutions) and the collection of aerial digital imagery for the analysis of floe-size distribution. This field work provides an extension of the Remote Sensing Validation Experiment (V1 2003/04), with the aims:

- to determine the relative importance of surface, bottom and lateral melt on the total melt of the pack ice
- to investigate changes in the floe-size distribution
- to derive the dominant processes determining meso-scale sea-ice deformation in this region of the Southern Ocean.

Investigation of sea-ice physical processes in East Antarctica during early spring

Tony Worby, Rob Massom, Petra Heil (AGAD & ACE), Jan Lieser (ACE), Ian Allison (AGAD & ACE)

This research will contribute to a large multi-disciplinary study of the physics and biology of the Antarctic sea ice zone in early Spring 2007, undertaken onboard the research vessel *Aurora Australis*. The physical characteristics of the sea ice will be directly measured using satellite-tracked drifting buoys, ice core analysis and drilled measurements, with detailed measurements of snow cover thickness and properties. Aircraft-based instrumentation will be used to expand our survey area beyond the ship's track and to provide access to the sea ice for remote sampling. The data collected will provide valuable ground-truthing for existing and future satellite missions and improve our understanding of the role of sea ice in the climate system. The objectives of this research are:

- to quantify the spatial variability in sea ice and snow cover properties over scales of metres to hundreds of kilometres in the region of 110–130° E, in order to improve the accuracy of sea ice thickness estimates from satellite altimetry and polarimetric synthetic aperture radar (SAR) data.
- to determine the drift characteristics and internal stress of sea ice in the region 110–130° E.
- to investigate the relationships between the physical sea-ice environment and the structure of Southern Ocean ecosystems.

LARGE-SCALE PROCESSES

Interactions between small scale cyclones and sea ice and their role in the Southern Ocean climate system

Amanda Lynch (UMon), John Cassano, James Maslanik (UCol), Annette Rinke, Joerg Bareiss, Klaus Dethloff (AWI)

The Southern Ocean cyclone belt has a strong influence on Australian weather and climate. This project will allow improvements in the understanding of intense small scale cyclones in the region. Importantly, the research will highlight key sensitivities in the coupling between these atmospheric circulations and the underlying sea ice. Further, the compilation of an updated Southern Ocean cyclone climatology will provide a basis for evaluating future changes in cyclone distribution and frequency of occurrence in the Antarctic region.

The variability of the Southern Annular Mode and associations with high latitude weather and climate

Ian Simmonds (UMelb)

The project explores the extent and manner in which the Southern Annular Mode influences, and is influenced by, climate variability in Antarctic and sub-Antarctic regions. It will reveal the degree to which current trends in these features can be seen to be related.

Antarctic associations with Australian and South American cold outbreaks: Present and future
Ian Simmonds (UMelb)
'Cold outbreaks' are severe meteorological events which have significant impacts on many aspects economic and social life in midlatitude communities. This project will lead to a better scientific understanding of these events, and particularly will quantify the role played by the Antarctic topography and sea ice. The research will reveal how their frequency and intensity have changed over recent decades, and how these might be expected to change under global warming.

GLACIAL GEOLOGY

Glacial isostatic rebound in East Antarctica
Paul Tregoning (ANU), Derek Fabel (UGl), and Herb McQueen (ANU)
Measuring present-day glacial isostatic rebound in Antarctica will provide new observations to help constrain ice models that seek to quantify the effect on present-day sea-level rise of changes in the Antarctic Ice Sheet since the Last Glacial Maximum. Using GPS, we will measure present-day uplift at several sites in the Lambert Glacier region.

ABBREVIATIONS

ACE: Antarctic Climate and Ecosystems Cooperative Research Centre
AGAD: Australian Government Antarctic Division
ANSTO: Australian Nuclear Science and Technology Organisation
ANU: Australian National University
AWI: Alfred Wegener Institute for Polar and Marine Research, Germany
BAS: British Antarctic Survey, U.K.
CliC: WCRP/SCAR CliC International Project Office
CMAR: CSIRO Division of Marine and Atmospheric Research
NIWA: National Institute of Water & Atmospheric Research, New Zealand
TPAC: Tasmanian Partnership for Advanced Computing
UCSD: Scripps Institute of Oceanography, UCSD, USA
UCol: University of Colorado, USA
UCur: Curtin University
UGl: Glasgow University
UMac: Macquarie University
UMelb: University of Melbourne
UMon: Monash University
UNew: University of Newcastle
USC: Southern Cross University
UTas: University of Tasmania

Petra Heil
IGS Australian Correspondent

International Glaciological Society

JOURNAL OF GLACIOLOGY

Papers accepted for publication between 1 April 2007 and 30 June 2007. The papers are listed in alphabetical order by first author. Some of these papers have already been published.

Jeremy N. Bassis, Helen A. Fricker, Richard Coleman, Yehuda Bock, James Behrens, Dennis Darnell, Marianne Okal, Jean-Bernard Minster
Seismicity and deformation associated with ice shelf rift propagation

Bjarni Bessason, Gísli Eiríksson, Ódinn Thórarinsson, Andrés Thórarinsson, Sigurður Einarsson
Automatic detection of avalanches and debris flows by seismic methods

Ed Bueler, Jed Brown, Craig Lingle
Exact solutions to the thermomechanically coupled shallow ice approximation: effective tools for verification

Anthony J. Gow, Debra Meese
Physical properties, crystalline textures and *c*-axis fabrics of the Simple Dome ice core, Antarctica

Ilka Hamann, Christian Weikusat, Nobuhiko Azuma, Sepp Kipfstuhl
Evolution of ice crystal microstructures during creep experiments

N.R. Iverson, T.S. Hooyer, U.H. Fischer, D. Cohen, P.L. Moore, M. Jackson, G. Lappegard, J. Kohler
Soft-bed experiments beneath Engabreen, Norway: regelation infiltration, basal slip and bed deformation

Edward C. King, John Woodward, Andy M. Smith
Seismic and radar observations of subglacial bedforms beneath the onset zone of Rutford Ice Stream, Antarctica

Marc Luetscher, David Bolius, Margit Schwikowski, Ulrich Schotterrer, Peter L. Smart
Comparison of techniques for dating of subsurface ice from Monlesi ice cave, Switzerland

Kenichi Matsuoka, Throstur Thorsteinsson, Helgi Björnsson, Edwin D. Waddington
Anisotropic radio-wave scattering from englacial water regimes, Mýrdalsjökull, Iceland

Juan Pablo Milana
A model for the Horcones Inferior glacier surge, Aconcagua region, Argentina

L.W. Morland
The influence of third invariant dependence in the viscous relation for the response of ice on the reduced model for ice-sheet flow.

L.W. Morland
The general viscous relation for the response of ice and its implications in the reduced model for ice-sheet flow

Veijo Allan Pohjola, Harro A.J. Meijer, Annette Sjoberg
Controlled experiments on the diffusion rate of stable isotopes of water in artificial firn

Anna Sinisalo, Aslak Grinsted, John C. Moore, Harro A.J. Meijer, Tõnu Martma, Roderik S.W. van de Wal
Inferences from stable water isotopes on the Holocene evolution of Scharffenbergbotnen blue ice area, East Antarctica

Björn Sjögren, Ola Brandt, Chris Nuth, Elisabeth Isaksson, Veijo Pohjola, Jack Kohler, Roderik S.W. van de Wal
Instruments and Methods: Determination of firn density in ice cores using image analysis

P.S. Sunil, C.D. Reddy, M. Ponraj, A. Dhar
Determination of the velocity field and strain zonation of Schirmacher Glacier (central Dronning Maud Land, Antarctica) using Global Positioning System

Patrick Wagnon, Rajesh Kumar, Yves Arnaud, Anurag Linda, Parmanand Sharma, Christian Vincent, Jose Pottakal, Etienne Berthier, Alaqppan Ramanathan, Syed Iqbal Hasnain, Pierre Chevallie
Four years of mass balance on Chhota Shigri Glacier (Himachal Pradesh, India), a new benchmark glacier in the Western Himalaya

Christine Wesche, Olaf Eisen, Hans Oerter, Daniel Schulte, Daniel Steinhage
Surface topography and ice flow in the vicinity of the EDML deep-drilling site

Satoru Yamaguchi, Renji Naruse, Takayuki Shiraiwa
Climate reconstruction since the Little Ice Age by modelling Koryto Glacier in Kamchatka Peninsula, Russia

Yang Jianping, Ding Yongjian, Liu Shiyin, Liu Jun Feng
Variations of snow cover in the source regions of the Yangtze and Yellow Rivers in China between 1960 and 1999

Notes from the production team

Hello TeX authors out there!
We welcome final papers in TeX, and we are now able to carry out the whole production process in TeX – we have an experienced TeX editor and we are able to typeset in TeX ourselves in-house, rather than using our usual 3B2 typesetting system. We hope this will enable us to process TeX papers more quickly, without the risk of minor glitches that can occur when converting from one program into another.

Correction of papers
In a few papers recently, there have been major changes, even with new figures, at page proof stage. Please do not rewrite your papers at page proof stage unless absolutely necessary! This takes a lot of time and effort in-house and can slow up publication times. Strictly speaking, we ask authors to pay extra for substantial alterations made at this stage, although we always try to accommodate newly discovered data.

Christine Butler
Production Manager

Books received

J. Eamer, H. Main, N. Webster, L. Nygaard and E. Osmond-Jones, eds. 2007. *Global Outlook for Ice and Snow,* United Nations Environment Programme. Nairobi. 235 pp. Several photographs, maps, tables and graphs. (ISBN-13: 978-92-807-2799-9, (softcover), US$ 40.00).

M. C. Serreze and R.G. Barry. 2005. *The Arctic Climate System,* Cambridge University Press, Cambridge etc. (*Atmospheric and space science series*). 385 pp. + xvii. 159 line diagrams, 5 halftones and 8 colour plates, 172 figures. (ISBN-10: 0-521-81418-9, hardback; ISBN-13: 978-0521-81418-8, hardback).

V.M. Kotlyakov, ed. 2006. *Glaciation in the North and Central Eurasia at present time.* Institute of Geography of the Russian Academy of Science – Moscow: Nauka. 488 pp. Several photographs, maps, tables and graphs. (ISBN 5-02-035344-2, hardback). In Russian with extensive English abstracts.

News

85th birthday symposium for Gunnar Østrem 22 March 2007, Oslo, Norway

Gunnar Østrem, honorary member of the IGS, celebrated his 85th birthday on 25 March 2007. In honour of his birthday, the Norwegian Water Resources and Energy directorate (NVE) arranged a Glacier Symposium. The half-day symposium took place on 22 March, which was also World Water Day, at NVE in Oslo, Norway. Twelve speakers from Norway and Sweden were invited to give talks concerning glaciers or climate. Gunnar himself started the proceedings with a dazzling presentation of his work establishing mass balance measurements in Canada in the 1960s. For 40 minutes the audience was enchanted by his narration and Gunnar's excellent way of conveying his Canadian experiences. The other presentations were also of high quality. In real Østrem style, ice cream and sweets were served during the coffee break.

The symposium attracted an audience of about 50 people, among them IGS Secretary General Magnús Már Magnússon. The programme, list of participants and images from the symposium are available at http://www.nve.no/bre (direct link: http://www.nve.no/modules/module_109/publisher_view_product.asp?iEntityId=10399)

After the symposium there was a enjoyable reception at NVE for specially invited guests. Many people gave short speeches relating past experiences doing fieldwork with Gunnar, and how his work had influenced them. Everybody emphasized Gunnar's outstanding enthusiasm for his work and his ability in encouraging colleagues.

Gunnar Østrem is a very enthusiastic and active person. Even though he has been retired for 15 years he is still full of the joy of life and is always looking to the future. In particular, he has a great enthusiasm for glaciology. He still takes part in professional conferences and symposia and only last year participated in both the IGS conference in Cambridge and the North West Glaciologists' Meeting in Fairbanks, Alaska, where he even gave a talk. After the meeting an excursion to Gulkana glacier had been arranged. Not only did Gunnar come along, he also walked all the way to the glacier!

Gunnar was employed at NVE for 30 years. In 1962 he established the Glacier Division, whose main task was to initialize a network of mass balance measurements in Norway for the planning of water power plants. Gunnar made an important contribution to developing methods for mass balance measurements. Because of his experience he was later invited to Canada to be responsible for establishing a Canadian network of mass balance investigations and has written a manual for mass balance measurements. Østrem was appointed professor in physical geography at the University of Stockholm, and has been visiting professor at Carleton University in Ottawa. Østrem's scientific production is considerable. He is author or co-author of about 80 scientific articles or publications – eight of them after his

Figure 1 Gunnar presented his work in Canada to the symposium. Photos: Hallgeir Elvehøy

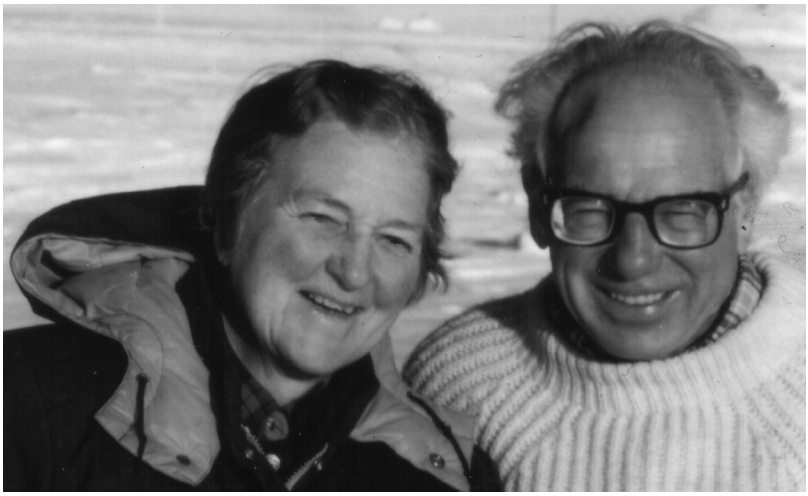
Figure 2 Reception at NVE after the symposium. Photos: Hallgeir Elvehøy

retirement – and the last one was published in 2006. Gunnar Østrem has been awarded the Norwegian honour the King's Order of Merit in gold for his achievements. He has also received a Danish and a Swedish mark of honour. He is an honorary member of the IGS.

Nils Haakensen

Obituaries

Albert Lincoln Washburn, 1911–2007



Very sadly, Link Washburn passed away on 30 January 2007 in Seattle; he was 95. He contributed immensely to the fields of periglacial geomorphology and permafrost research through his studies, his publications, his leadership, and his personal qualities.

His exceptional contributions to science include pioneering discoveries about processes shaping Arctic landscapes that are presented in numerous, carefully crafted articles, monographs and authoritative books that are recognized worldwide. Reflecting on his research, Link said, in one of his rare speeches in 1988, 'To test the forefront of knowledge for even a brief period, particularly when the subject matter concerned the intimate workings of nature, provided both a motivation and challenge that … are deep and real for me….' This was evident in his own meticulous and exhaustive field and laboratory studies of diverse types of processes characteristic of Artic lands, including patterned ground formation, slope movement and ice growth in soils (e.g. Washburn, 1967, 1969). His deep interest in periglacial processes and his untiring, generous effort to properly present the work and ideas of other researchers are clearly visible in his monographs (e.g. Washburn, 1987, 1997) and renowned books that remain the standard references in the field (*Periglacial Processes and Environments*, 1973; *Geocryology – a survey of periglacial processes and environments*, 1979). His last major publication, which examines in detail the genesis and properties of patterned ground on Cornwallis Island in Arctic Canada, appeared in 1997 as he turned 85.

On a more personal side, Link inspired, stimulated, and encouraged researchers worldwide. Together with his wife Tahoe – his field assistant, friend and companion for 71 years – Link aided and guided numerous young researchers. They accomplished this through their exceptionally warm and encouraging personalities, their generosity, as well as their passion for, and deep commitment to Arctic science, landscapes and people. Their exceptional hospitality was renowned worldwide. Wherever they lived, from Montreal to Seattle, the Washburn home 'came to be a natural Mecca for Arctic people going through the city; a sort of unofficial hostelry of infinite hospitality' (Dunbar, 1952). Their love of the far north was also clear from their calendar, which revolved around a northward migration each summer to carry out field research; these sojourns in the Arctic continued well into their eighties. This love pervades Tahoe's own insightful account, *Under Polaris: an Arctic Quest*, of their life among the Inuit from her journals written during their fieldwork on Victoria Island from 1938–41.

Link, as his many friends knew him, was also a visionary. Decades before the emergence of 'earth system science' and the widespread concern about global warming, Link conceived, and launched, the Quaternary Research Center at the University of Washington to promote interdisciplinary

research about the global environment during the Quaternary. This critical period features the evolution of humans and the advent of civilization as well as massive, abrupt changes in climate, sea level, global biota and ice extent that still challenge our understanding and remind us of the challenge of predicting climate and environmental change. Sensing the need for a scientific journal devoted to the field, Link launched *Quaternary Research*, which appeared in 1970. 'He shepherded the journal through its first 5 years, establishing for it a reputation for breadth and excellence, and making it one of the most widely cited earth science publications' (Porter, 2007).

Paraphrasing Porter (2007), Link's passion for snow, ice and the Arctic can be traced to his student days at Dartmouth College. He was a member of a Harvard–Dartmouth expedition to Alaska's Mt Crillon in 1934, a National Geographic expedition to Mt McKinley in 1936, and the Boyd East Greenland Expedition in 1937. He was an ardent member of the downhill ski team and was invited to participate in the 1936 Winter Olympic Games. These varied demanding excursions exposed him to high-latitude glacial environments. Entering Yale for graduate work, Link studied under the supervision of Professor Richard Foster Flint, who later was both a faculty colleague and a close friend. Link's PhD dissertation (1942), based on pioneering field studies in Arctic Canada, was published in 1947. Following war-time service as a cold-weather expert in military intelligence (1942–5), Link was appointed the first executive director of the Arctic Institute of North America, a post he subsequently relinquished to head SIPRE, the US Army's Snow, Ice, and Permafrost Research Establishment, which became the Cold Regions Research and Engineering Laboratory (CRREL) in 1961. He moved from SIPRE to join the faculty of Dartmouth College in 1953; in 1960 he moved to Yale and became Director of Graduate Studies in the Department of Geology. Link joined the University of Washington's Geology faculty in 1967.

Link was recognized and honored nationally and internationally. He was an honorary member of AINA, the International Glaciological Society and the International Union for Quaternary Research. He received the Kirk Bryan Award of the Geological Society of America (1971), the Andre H. Dumont Medal of the Geological Society of Belgium (1975), an Honorary Doctorate from the University of Alaska (1981) and the Vega Medal of the Swedish Academy for Anthropology and Geography (1997). Steve Porter (2007) provides a listing of the many national and international committees and organizations for which Link served as a directing officer, as well as a selected bibliography of A. Lincoln Washburn.

Highlights of Link's career include unfailing scholarship, research, administration, and careful, detailed planning. In addition to his renowned articles and textbooks, the research centers he directed, and the scientific journals he launched, his rich scientific legacy includes the unusually cohesive and amiable permafrost and periglacial community the emergence of which was fostered in part by Link and Tahoe's warmth, generosity and friendship, which reached many members of this worldwide community.

Acknowledgements
I am thankful to Steve Porter and Carl Benson for their thoughtful obituaries, sections of which I have borrowed from liberally, and to Ross Mackay for providing the photograph of Link and Tahoe Washburn.

References

Benson, Carl S. 2007. Albert Lincoln Washburn (1911–2007). *Arctic*, **60**(2).

Dunbar, M.J. 1952. A.L. Washburn. *Arctic*, **5**(1), 3.

Porter, S.C. 2007. In Memoriam: A. Lincoln Washburn (1911–2007). *Quaternary Research*, **67**, 311–312.

Washburn, A.L. 1947. Reconnaissance geology of portions of Victoria Island and adjacent regions, Arctic Canada. *Geological Society of America Memoir*, **22**.

Washburn, A.L. 1967. Instrumental observations of mass-wasting in the Mesters Vig District, Northeast Greenland. *Meddeleser om Grønland*, **176**(4).

Washburn, A.L. 1969. Weathering, frost action, and patterned ground in the Mesters Vig District, Northeast Greenland. *Meddeleser om Grønland*, **176**(4).

Washburn, A.L. 1973. *Periglacial Processes and Environments*. London, Edward Arnold, 320 pp.

Washburn, A.L. 1979. Geocryology – a survey of periglacial processes and environments. London, Edward Arnold, 402 pp.

Washburn, A.L. 1987. Mima mounds – an evaluation of proposed origins, with special reference to the Puget Lowland. *Washington Department of Natural Resources. Division of Geology and Earth Resources. Report of Investigations*, **29**.

Washburn, A.L. 1997. Plugs and plug circles: a basic form of patterned ground. Cornwallis Island Arctic Canada – Origin and implications. *Geological Society of America Memoir,* **190**.

Washburn, T.T. 1999. Under Polaris: an Arctic quest. Seattle: University of Washington Press.

Bernard Hallet

Ed LaChapelle, 1926–2007

Ed LaChapelle was a long time member of the IGS and served as Vice President and Council Member. He graduated in physics at the University of Puget Sound (UPS) in Tacoma, Washington and he also received an Honorary Doctorate from UPS. He began his career in glaciology with a year-long visit to the Swiss Federal Institute for Snow and Avalanche Science during the disastrous year of 1950/1. In 1952, he joined the avalanche research station of the US Forest Service at Alta, Utah. This resulted in the introduction of formal techniques for snow observations and avalanche forecasting and the development of instruments for weather and snow observations. While with the Forest Service, he also wrote the *Avalanche Handbook* (1961) for the US Forest Service, which has been revised by various people for 45 years as the major technical work in the field. In 1969, he became a professor in the Department of Atmospheric Sciences and the Geophysics Program at the University of Washington.

Ed's scientific contributions to glaciology were many and varied, with fundamental work on alpine glaciers and, more notably, snow and avalanche science. His work on glaciers consisted mostly of summer field work for many years on the Blue Glacier on Mt Olympus, Washington. This work included verification of regelation as a mechanism of glacier sliding along with Barclay Kamb. He also published the highly sought after and beautiful book *Glacier Ice* along with Austin Post in 1971.

His contributions to avalanche science and technology included definition of the fundamental principles of avalanche forecasting based on his vast field experience. As a result of his experience in electronics with the US Navy, he pioneered the modern avalanche transceiver while working with John Lawton. These contributions to avalanche safety are used every winter by tens of thousands of people who travel avalanche terrain.

Ed LaChapelle's books on snow and avalanches included: *The ABCs of Avalanche Safety* (three editions since 1961), *Field Guide to Snow Crystals* (first published 1969 (a great bargain at US$2.95!) and still available from the IGS) and *Secrets of the Snow* (2001 co-published by the IGS). The direct 'day to day' impact of Ed's work on people, particularly those who travel in avalanche terrain, probably exceeds that of any glaciologist in history.

On the personal side, Ed was a free spirit and a wonderful colleague and friend. His lectures were like his writing: very clear and a pleasure to experience. His early retirement from the academic world in 1982 is an example of his free-spirited nature. Soon after, he moved to the solitude of McCarthy in the Wrangell Range of central Alaska for the spring and summer months. Ed was a modest person who left it to others to discover his great qualities. He ranks high on the personal accomplishment scale but his driving motivation was to produce products that were useful to people and, in my experience, he was not interested whether he personally was credited or not. His love of snow and ice never wavered: he was on skis up until the last 2 hours of his life and what a life it was!

David McClung
University of British Columbia, Vancouver, BC, Canada

Marcel de Quervain, 1916–2007

Marcel de Quervain died on 12 February 2007 in his home town of Zürich.

He grew up in Zürich and studied at the ETH Zürich, where he finished his studies with a PhD in Natural Sciences. Because his father was director of the Swiss Federal Institute of Meteorology, he came quite early into contact with meteorology and snow and ice. He was 5 years old when his father crossed the inland-ice cap of Greenland with a small team.

Some years later, he got his first job as a young scientist at the Canadian Research Council in Ottawa (1948/9) and there sketched a new snow classification.

On 1 January 1950 de Quervain took over the direction of the Swiss Federal Institute for Snow and Avalanche Research, Weissfluhjoch/Davos. The catastrophic avalanche winter (1950/1) that followed with 98 people killed in the Swiss Alps probably stressed not only the young director but also his small staff (of 10!). But he rose successfully to the challenge. The avalanche warning system, the basics of avalanche zoning, avalanche protection works and afforestation had to be urgently renewed. At these times not only the technical means but also the financial resources were meagre. The fight for money was one problem but finding and appointing new scientific and technical staff was also difficult and to create adequate workshop capability at short notice was almost impossible in high Alpine terrain (i.e. Weissfluhjoch: 2670 m a.s.l.)!

Marcel de Quervain was not 'only' director of the Insitute (1950–80) but also a researcher. He published about 100 scientific and/or technical papers. The themes were mainly snow classification, the physical behaviour of snow, avalanche zoning and natural hazards (e.g. UNESCO summaries). For many years he also gave a lecture at the ETH Zürich on 'Snow and Avalanches'.

He also was active in many international and national societies; the main ones were the International Glaciological Society, where he was president (1975–8) and an honorary member; in 1982 he also received the Seligman Crystal. In Switzerland he was the president of the Swiss Hydrological Society and a member of the Glacier Commission. Under his guidance the SLF Institute organized several international symposia in Davos (in 1965, 1974 and 1978) on snow/avalanche and ice aspects.

Marcel de Quervain was not only a skilful author, he was an enthusiastic speaker who could explain complicated aspects both to students and to lay audiences.

In his eighties he helped to arrange and publish the results of the Greenland Expeditions of his father Alfred de Quervain, who had died quite young. The book ends with an interesting critical sentence: 'We have all lost the rhythm of our planet and so have made fools of ourselves.'…The midnight sun and the creeping Greenland ice have already given hints to this crew that our planet has his own laws….

Paul Föhn, Davos

Recent meetings (of other organizations)

Report on the Alpine Glaciology Meeting 2007 Zürich, Switzerland, 1–2 March 2007

For the third time the Alpine Glaciology/ Glaciologists Meeting was hosted in Zürich, Switzerland. The 11th Alpine Glaciology Meeting took place on 1–2 March 2007 at VAW, ETH Zürich. The meeting was fun and we would like to express our thanks to all who contributed and attended to the meeting. At least 62 participants, mainly from the Alpine countries Austria, France, Germany, Italy, Slovenia and Switzerland, enjoyed 23 talks and 15 posters. Topics varied from snow and mass balance studies, flow modeling and remote sensing to glacier-dammed lakes and falling ice and rock.

We were honoured to have Magnús Már Magnússon, Secretary General of the IGS, as a special guest, who talked about the impressive speeding up of the *Journal of Glaciology* publishing process.

Enough time was allotted to coffee breaks, poster sessions and an evening dinner event – opportunities nobody missed to talk to many participants.

The next Alpine Glaciology Meeting will be held on 6–7 March 2008 in Chamonix.

Martin Lüthi and Martin Funk

There was plenty of opportunity for chatting to other participants

Future meetings (of other organizations)

Workshop on mass balance measurements and modelling, Skeikampen, Norway, 26–28 March 2008

The focus of the workshop will be on presenting the state of the art of glacier mass-balance methods, assessments and modelling. The workshop will build on the workshop on methods of mass balance and modelling held in Tarfala, Sweden, 1998. Glacier mass balance has attracted considerable interest in the years since the 1998 workshop. As an example, the IPCC have increasingly used mass-balance data for assessments of, for example, sea-level and water-cycle changes in their 2001 and 2007 reports. This increase in interest has resulted in a wealth of published work. The 2008 workshop is thus an attempt to provide the state of the art in scientific understanding of mass balance measurements and modelling.

Hellstugubreen in Jotunheimen. Photo: NVE

Objectives

- Regional and global assessments of glacier volume change
- Expanding mass-balance measurements to unmeasured glaciers
- New measurement techniques
- Homogenization of long-term mass-balance records
- Uncertainty in glacier mass-balance assessments
- Use of weather station data on glaciers for observing and/or modelling mass balance
- Mass-balance modelling

A volume of *Annals of Glaciology* with peer-reviewed papers is planned from the workshop. The deadline for abstracts will be 15 November 2007. Abstract submission will be through the IGS website at http://www.igsoc.org/

Organization

The meeting will be held at Skeikampen, a ski resort north of Lillehammer, Norway. Three full days are planned for oral and poster presentations. Rooms have been reserved at special rates to accommodate the participants. The workshop is sponsored by the Glacier, Snow and Ice section, Norwegian Water Resources and Energy Directorate (NVE), the IUGG Comission on the Cryospheric Sciences (IUGG/CSS) and the International Glaciological Society (IGS).

Further details on the workshop can be found on the website: www.nve.no/mbworkshop

Glaciological diary

** IGS sponsored * IGS co-sponsored

2007

15–16 January
Periglacial and paraglacial processes and environments, past, present and future
Geological Society, London, UK
Joint meeting between the Geological Society of London and the Quaternary Research Association
Organizers: Dr Jasper Knight (j.knight@exeter.ac.uk) and Dr Stephan Harrison (Stephan.Harrison@exeter.ac.uk), University of Exeter, UK

15–17 January
Workshop on the dynamics and mass budget of Arctic glaciers
GLACIODYN (IPY) meeting
IASC Working group on Arctic Glaciology, Pontresina, Switzerland
Convenors: J. Oerlemans (IMAU, Utrecht University and C.H. Reijmer (IMAU, Utrecht University

12–16 February
3rd WGNE Workshop on Systematic Errors in Climate and NWP Models
San Francisco, USA
See: http://www-pcmdi.llnl.gov/wgne2007/

1–2 March
11th Alpine Glaciology Meeting
VAW, ETH Zürich
Zürich, Switzerland
Contact Martin Lüthi at luethi@vaw.ethz.ch

19–26 March
Karst and Cryokarst
25th Speleological School
8th GLACKIPR Symposium
Sosnwiec-Wroclaw, Poland
Contact: Andrzej Tyc at atyc@us.edu.pl or andrzejtyc@wp.pl

15–20 April
European Geosciences Union General Assembly 2007
Vienna, Austria
See: http://meetings.copernicus.org/egu2007/

2–5 May
37th Annual Arctic Workshop
Skaftafell National Park, Iceland
See http://www.earthice.hi.is/page/arctic

21–22 May
Workshop on 'Advanced concept for radar sounder'
Cambridge, UK
Contact: David Blake, British Antarctic Survey (d.blake@bas.ac.uk)
See: http://www.antarctica.ac.uk/Meetings/2007/ACRAS2007/

28 May–1 June
Glacier and ice sheets – processes and modelling
St John's, Newfoundland, Canada
Joint CMOS-CGU-AMS Conference
Conveners: Gwenn Flowers, Simon Fraser University, gflowers@sfu.ca; Sara Boon, University of British Columbia; boon@unbc.ca
See http://www.cmos2007.ca/en/index.htm

4–5 June
Conference on global climate change and sustainability
Tromsø, Norway
See http://www.wed.npolar.no/

15 June
UK Polar Network event
British AntarcticSurvey, Cambridge, UK
Contact: Liz Thomas; e-mail: LITH@bas.ac.uk

17–20 June
Cryogenic resources of polar regions
Salekhard City, Polar Cycle, West Siberia
Vladimir P. Melnikov Academician, Scientific Council on Earth Cryology, Russian Academy of Sciences; Yu. V. Neyolov Governor, Yamal-Nenets Autonomous District; Jerry Brown, President, International Permafrost Association
See: http://www.ikz.ru/permafrost/

27–29 June
ICESat-II Science Workshop
Washington, D.C. Area
Contact: Seelye Martin; office: +1 202-358-0746; cell: +1 206-708-9472; email: seelye.martin-1@nasa.gov

2–13 July
***Union Commission for the Cryospheric Sciences (UCCS) symposium**
24th General Assembly of the International Union of Geodesy and Geophysics, titled Earth Our Changing Planet.
Perugia, Italy.
See http://www.iugg2007perugia.it/

17–19 July
DESDynI Science Workshop
Contact: Diane Wickland or John LaBrecque; email: John.LaBrecque@nasa.gov

26 July–10 August
Field Course on Remote Sensing for Ecosystem Assessment
Kola Peninsula, Russian Arctic
contact: Gareth Rees,Scott Polar Research Institute, University of Cambridge, e-mail: wgr2@cam.ac.uk, or
Olga Tutubalina, Moscow State University, e-mail: olgatut@mail.ru

28 July–3 August
XVII INQUA Congress 2007
Cairns Convention Centre, Cairns, Australia
See http://www.inqua2007.net.au/

2–5 August
Geodiversity of Polar Landforms
IAG/AIG Regional Conference on Geomorphology
Longyearbyen, Spitsbergen, August 2-5,
Contact: Agata Buchwal (kamzik@amu.edu.pl)

6–14 August 2007
33rd International Geological Congress
Oslo, Norway
See http://www.33igc.org/

15–16 August
IODP Topical Symposium: North Atlantic and Arctic Climate Variability
Bremen, Germany
See http://www.iodp.org/topical-symposium

24 August 2007
UK participation in the Greenland ice core drilling project NEEM
Meeting at the British Antarctic Survey, Cambridge
Contact: Regine Röthlisberger, BAS, e-mail: rro@bas.ac.uk

25–26 August 2007
Southern Ocean Physical Oceanography and Cryosphere Linkages project (SOPHOCLES) meeting
Geophysical Institute, University of Bergen, Bergen, Norway
See http://clic.npolar.no/theme/sophocles.php

26–31 August 2007
10th International Symposium on Antarctic Earth Sciences
University of California, Santa Barbara, USA
See http://isaes2007.geol.ucsb.edu/index.html

27–31 August
Workshop: Glaciers in watershed and global hydrology
Obergurgl, Austria
Sponsored by International Commission on Snow and Ice Hydrology and Commission for the Cryospheric Sciences Contact: Regine Hock; Tomas Johannesson, Reykjavik; Gwenn Flowers, Vancouver; Georg Kaser, Innsbruck

29–31 August
Polar Dynamics: Monitoring, Understanding, and Prediction
Open science conference
Geophysical Institute, University of Bergen. Allegt 70, N-5007 Bergen, Norway
See: http://www.gfi.uib.no/conference2007/info.htm
E–mail: conference2007@gfi.uib.no

31 August–1 September 2007
Workshop on the latest advances of remote sensing tools for monitoring hazardous glaciers
Macugnaga, Italy
See http://www.galahad.eu/ and click on 'Macugnaga Workshop'

3–7 September
****International Symposium on Snow Science, Moscow, Russia**
Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, UK
Web: http://www.igsoc.org/symposia

5–8 September
International Forum for Research into Ice Shelf Processes (FRISP)combined with the West Antarctic Ice Sheet (WAIS) Initiative
Algonkian Regional Park in Sterling, Virginia, USA
Contact: Adrian Jenkins (a.jenkins@bas.ac.uk)

11–14 September
The Annual Remote Sensing and Photogrammetry Society Conference
Special session under the context of Remote Sensing and Photogrammetry in Polar Regions
School of Civil Engineering and Geosciences, Newcastle University
See http://www.ceg.ncl.ac.uk/rspsoc2007/

11–22 September
Ice sheets and glaciers in the climate system
Karthaus, Italy
This summer course is meant for Ph.D. students who work on a glaciology-related climate project.
See: http://www.phys.uu.nl/~wwwimau/education/summer_school/

12–13 September
***IGS British Branch meeting**
University of Edinburgh, Edinburgh, UK
See http://www.geos.ed.ac.uk/research/eeo/events/igsbbm07
Contact: Steven Palmer, Mal KcMillan and Kate Briggs; igsbbm@staffmail.ac.uk

15 September
SEDIBUD Second workshop
Working Group on Sediment Budgets in Cold Environments
Abisko, Sweden
See http://www.geomorph.org/wg/wgsb.html
Contact: Achim Beylich (achim.beylich@NGU.NO) or Scott Lamoureux (lamoureu@post.queensu.ca)

15–17 October 2007
International conference 'Managing Alpine Future'
Congress Innspruck, Austria
See http://www.alpinefuture.com/

16–18 October 2007
Ny-SMAC (Ny-Alesund Science Managers Committee) Seminar, an open meeting
Møller Centre, Cambridge, UK
See http://www.antarctica.ac.uk/nysmac/

22–26 October
2nd Asia CliC Symposium
CAREERI, Chinese Academy of Sciences, Lanzhou, China
See http://www.casnw.net/clic/Asia_clic.html

25–27 October
***IGS Nordic Branch meeting**
Department of Earth Sciences, Uppsala University, Sweden
Contact: Rickard Pettersson; rickard.pettersson@geo.uu.se
See http://www.geo.uu.se/glaciology/NIGS/

26–27 October
Northwest Glaciologists (NwG) meeting,
Portland, Oregon, USA
See
http://www.glaciers.pdx.edu/NwG/default.html

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–17 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

10–13 March
International Symposium on Mitigative Measures against Snow Avalanches
Egilsstadir, Iceland
See:
http://www.orion.is/snow2008/organizer.html

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

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

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

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

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

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/

August/September
Workshop on World Glacier Inventory
Cold & Arid Regions Environmental & Engineering Research Institute
Lanzhou, China
Contact: Professor Shiyin Liu; liusy@lzb.ac.cn

New members

Mr John R. Appleby,
School of People, Environment & Planning, Massey University, Private Bag 11 222, Palmerston North, New Zealand
Tel [64](6) 3569099 x2342; jrappleby@yahoo.co.uk

Mr José Araos
Avenida Bulnes 01890, Punta Arenas-Magallanes 6200000, Chile
Tel [56](61) 217315; Fax [56](61) 217315; jose.araos@gmail.com

Mr Samuel Auclair
144 rue des chênes, F-45160 Olivet, France
Tel [33](2) 38643686; Fax [33](2) 38644738; s.auclair@brgm.fr

Mr Alberto Barud-Zubillaga
University of Texas, 500 W. University, Burges Hall #212, El Paso, TX 79968-0684, USA
Tel [1](915) 7477632; Fax [1](915) 7475145; barud@geo.utep.edu

Thomas W. Beale
11 Buckingham Street, Cambridge, MA 02138-2219, USA
Tel [1](617) 4577112; Fax [1](617) 3543971; tbeale@cambridgeassociates.com

Dr Daniele Bocchiola
Department DIIAR, Section CIMI, Politecnico di Milano, Piazza Leonardo da Vinci 32, I-20133 Milano, Italy
Tel [39](02) 23996223; Fax [39](02) 23996207; daniele.bocchiola@polimi.it

Dr Jean-Bruno Brzoska†
Centre d'Études de la Neige, METEO-FRANCE /CNRM, 1441 Rue de la Piscine, Domaine Universitaire, F-38406 Saint-Martin-d'Hères Cedex, France
Tel [33](4) 76637925; Fax [33](4) 76515346; jean-bruno.brzoska@meteo.fr

Prof Hi-Ryong Byun
Pukyong National University, Dae-Yeon, 608-737 Namku, Busan, Republic of Korea
Tel [8251]6206283; Fax [8251]6216283; hrbyun@pknu.ac.kr

Dr Marco Casazza
Dipartimento di Fisica Generale, Universita di Torino, Via Giuria 1, I-10125 Torino, Italy
Tel [39](011) 6707441; Mobile [39](339) 2450636; casazza@to.infn.it

Ms Ranmali Ira De Silva
10 Wincote Drive, Tettenhall, Wolverhampton WV6 8LR, UK
Tel [44](1902) 751221; ranmali.desilva@spc.ox.ac.uk

Mr Christopher Doughty
Rescan Environmental Services, 6th Floor, 1111 West Hastings Street, Vancouver, British Columbia, V6E 2J3, Canada
Tel [1](604) 6899460; cdoughty@sfu.ca

Mr Thorben Dunse
Department of Geosciences, University of Oslo, PO Box 1047 Blindern, N-0316 Oslo, Norway
Tel [47](2285) 7318; thorben.dunse@geo.uio.no

Dr Wolfgang A. Fellin
Institute of Infrastructure, Unit of Geotechnical and Tunnel Engineering, University of Innsbruck, Technikerstrasse 13, A-6020 Innsbruck, Austria
Tel [43](512) 507-6672; Fax [43](512) 507-2996; wolfgang.fellin@uibk.ac.at

Mr Andrew Ford
School of Conservation Sciences, Bournemouth University, Christchurch House, Talbot Campus, Poole, Dorset, BH12 5BB, UK
Tel [44](1202) 966730; Fax [44](1202) 965255; aford@bournemouth.ac.uk

Dr Olivier Gagliardini
Lab. Glaciologie et Géophys. l'Environ. Domaine Universitaire, 54 rue Molière, B.P. 96, St Martin d'Héres Cedex F-38402, France
Tel [33](4) 76-82-42-76; Fax [33](4) 76-82-42-01; gagliar@lgge.obs.ujf-grenoble.fr

Miss Jennifer A. Hall
66 Coombe Bridge Ave, Stoke Bishop, Bristol, BS9 2LS, UK
Tel [44](7960) 175752; jah06@aber.ac.uk

Mr Dale Hess
481 Washington Highway, Snyder, NY 14226, USA
Tel [1](585) 356-5335; dalehess@buffalo.edu

Dr Tobias Jonas
Swiss Federal Inst. for Snow and Avalanche Research (SLF), Snow Hydrology Research Group, Flüelastrasse 11, CH-7260 Davos, Switzerland
Tel [41](81) 4170259; Fax [41](81) 4170110; jonas@slf.ch

† Sadly Dr Jean-Bruno Brzoska died on 28 July 2007 of heart failure.

Prof Ki Young Kim
192-1 Hyoja-2-dong, Chunchon, 200-701 Kangwon-do, South Korea
Tel [82](33) 2508584; Fax [82](33) 2448580; kykim@kangwon.ac.kr

Dr Jaakko Mäkinen
Finnish Geodetic Institute, Geodeetinrinne 2, FIN-02430 Masala, Finland
Tel [358](9) 29555317; Fax [358](9) 29555200; jaakko.Makinen@fgi.fi

Ms Melissa Park
1404 Toledo Street, Bellingham, WA 98229, USA
Tel [1](360) 2444830; glacier.girl@aazphoto.com

Mrs Tracey Pearman
Willowbank, 80 Lydd Road, Camber Sands, Rye, TN31 7RS, UK
Tel [44](1580) 891432; tracey_barefoot@yahoo.co.uk

Dr Neil Ross
56 Tatling Grove, Walnut Tree, Milton Keynes, MK7 7EQ, UK
Tel [44](7967) 821376; neil.ross@ed.ac.uk

Dr Compton J. Tucker
NASA Goddard Space Flight Center, Code 614, Bldg. 33, Room A106, 8800 Greenbelt Road, Greenbelt, MD 20771, USA
Tel [1](301) 614-5644; Fax [1](301) 614-5666; tucker@usgcrp.govh

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ICE

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All enquiries about the International Glaciological Society should be addressed to:
Secretary General, International Glaciological Society, Scott Polar Research Institute,
Lensfield Road, Cambridge CB2 1ER, UK
Tel: +44 (1223) 355 974 Fax: +44 (1223) 354 931
E-mail: igsoc@igsoc.org
Web: http://www.igsoc.org/