IceSked

Issue 7: December 2006

Newsletter of the Antarctic Research Centre
Victoria University of Wellington

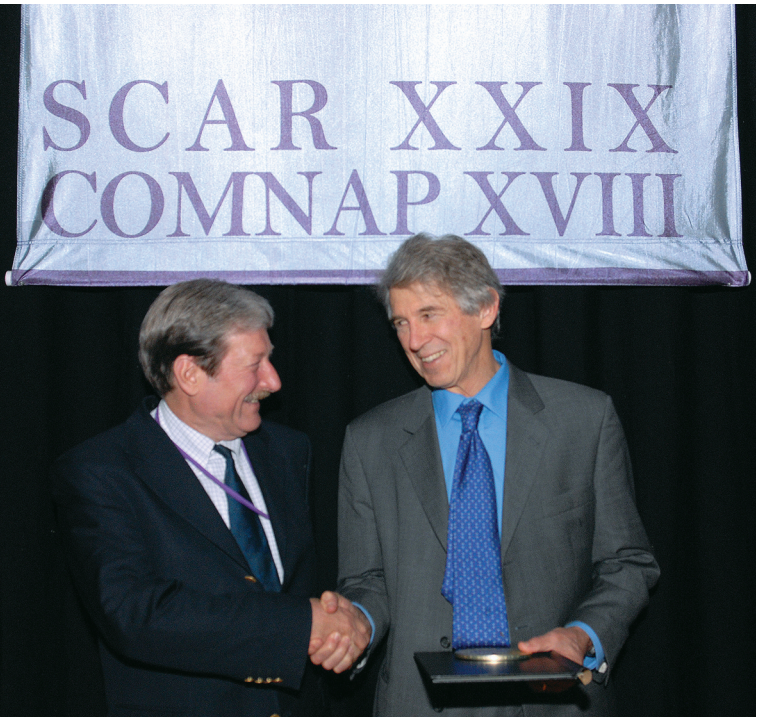
It has been a successful year for funding of Antarctic Ice Core and New Zealand Glaciology research. This issue of IceSked focuses on these exciting developments as well as highlighting some of the field trips undertaken during the year, including a trip to Greenland with a Danish-led expedition and a cruise on the French research vessel "Marion Dufresne".

Inaugural SCAR Medal Awards - Our Director receives President's Medal

At this year's meeting of the Scientific Committee on Antarctic Research (SCAR) in Hobart on the 12th July, three awards were inaugurated. The SCAR service medal was awarded to Dr David Walton, British Antarctic Survey, the SCAR Medal for Outstanding Science to Professor Paul Mayewski, University of Maine, and the SCAR President's Medal for Outstanding Achievement in Antarctic Science to Professor Peter Barrett, Director of our Antarctic Research Centre. The citations and responses for all three awards may be found at www.scar.org/awards/.

Peter was awarded his PhD in 1968, at the Institute of Polar Studies, Ohio State University, for a thesis on the Beacon strata of the Beardmore Glacier area in the central Transantarctic Mountains. During field work there he discovered the first tetrapod remains in Antarctica, a jawbone fragment 6 cm long from a labyrinthodont amphibian, leading to further discoveries that supported the theory of continental drift. His find was published in Science (1968) and reported in Time and Newsweek magazines. While Peter's early work focused on the Beacon Supergroup of the Transantarctic Mountains, today he is universally recognized for his leadership in Antarctic geological drilling. His interest in drilling was sparked by participation, in 1973, in the first deep-sea drilling cruise to the Antarctic, which showed that Antarctic glaciation began more than 20 million years earlier than previously thought. Since then, Peter has been chief scientist on several drilling projects in McMurdo Sound to study the history of the East Antarctic ice sheet, including the CIROS-1 drill hole which showed that 20–30 million years ago the Antarctic ice sheet was warmer and less stable than it is today, and the Cape Roberts Project which showed that the ancient Antarctic ice sheet fluctuated on Milankovitch Cycle frequencies.

Professor Jorn Thiede, presenting Peter with his award
(Photo: Dan Weavell - courtesy of the Australian Antarctic Division)



Peter has been the New Zealand Representative to the Working Group on Geology in SCAR (1977–2002), a member of the Group of Specialists on Environmental Affairs and Conservation (GOSEAC) (1988–2002), and a member of the Antarctic Off-shore Stratigraphy (ANTOSTRAT) Steering Committee (1990–2000). He was instrumental in establishing the international programme on Antarctic Climate Evolution (ACE), and was Head of the New Zealand Delegation to the Committee for Environmental Protection from its inaugural meeting at the 21st Antarctic Treaty Consultative Meeting (ATCM) in Trømsom in 1998 to ATCM 26 in Madrid in 2003.

Flade Isblink connects with the world

Dorthe Dahl-Jensen at the ice core processing line

Testing the radar set-up on the Nansen sledge

Expedition to Greenland

During June/July '06 Nancy Bertler joined a Danish-led expedition to Greenland. The aim of the Danish/US/Swedish/Finish/Icelandic team was to recover an intermediate depth ice core from Flade Isblink, a small coastal ice cap, north of Station Nord and to test a newly developed drilling liquid, based on coconut extract. The principal investigators, Prof's. Dorthe Dahl-Jensen and Jorgen P. Steffensen, University of Copenhagen, invited Nancy to join the group to gain some practical experience with liquid drilling with the Danish lightweight system, which provided the basis of ice coring equipment throughout the world, including the planned NZ system. The team had a successful season, retrieving a 426 m core of excellent quality. Initial core processing in the field included cutting of isotope samples and electric conductivity measurements. The team worked in two shifts maintaining a friendly competition and enjoyed the evenings indulging in delicious food and discussions ranging from evil washing machines to the importance of Eemian Ice. The threat of global warming was felt particularly strong, when the team witnessed rainfall in June, after having battled with skidoos through extremely wet snow from the drill site back to Station Nord.

Nancy Bertler

VUWAE reunion

An invitation to all members of past VUWAEs

We are planning a reunion to celebrate 50 years of Victoria University of Wellington Antarctic Expeditions and would like you to join us. The date will be Saturday 30th June and Sunday 1st July, 2007, Cotton Building, Victoria University of Wellington. Rooms will be available for displaying memorabilia from the various expeditions and for slideshows by various years. We will organise a dinner for the Saturday evening, and offer lunch and refreshments on both Saturday and Sunday.

Don't forget to e-mail Michelle Dow at Michelle.Dow@vuw.ac.nz or post a reply to her at the Antarctic Research Centre, and let us know whether you are able to attend, and if you have memorabilia you would like to show.

With very best wishes from VUWAE 49 and the current staff and students of the Antarctic Research Centre.

Peter Barrett

A new Ice Core Facility

The joint, GNS Science and VUW, National Ice Core Laboratory is currently being built at GNS Science's Gracefield campus. The construction of the facility is almost complete and will be officially opened in March 2007 and will store up to 2000 m of ice cores at -30°C. The ice will be processed in the freezer at -18°C, and sampled in the warm laboratory using a continuous melter system developed by the University of Maine. The warm laboratory contains two ultra-clean laminar flow cabins, providing class 1 conditions. The samples will be analysed at GNS Science for stable isotopes (oxygen and deuterium), radioactive isotopes (tritium, ^{32}Si, and ^{10}Be), and density measurements using DEXA. At VUW the samples will be analysed for trace elements and major ions by Joel Baker using the newly established ICP-MS laboratory at the School of Geography, Environment and Earth Sciences and for dust mineralogy and flux. NIWA has also contributed to this effort by providing funding for a gas extraction system in addition to their long-standing track record in measuring greenhouse gas concentrations (CO_2, CH_4, NO_2) and isotopic ratios ($\delta^{13}CO_2$, $\delta^{13}CH_4$, ^{18}O).

'Ground Breaking Ceremony' (L-R) Alex Malahoff, Frank Bruhn, Nancy Bertler (Photo: Kate Whitley - courtesy of GNS Science)

Nancy Bertler

Funding approved for Ice Coring System

VUW has recommended for approval $685,000 for the Antarctic Research Centre to build a NZ ice coring system. The drilling equipment will be based on the Danish lightweight drilling system. Alex Pyne and Nancy Bertler will oversee the manufacturing of the drill, which will allow us to recover ice cores to a depth of 700 m. The system will be transportable by small fixed wing aircrafts, such as the Twin Otter, and will be used to recover intermediate length ice cores from coastal Antarctic locations.

Cruising on board the Marion Dufresne

In Jan/Feb of this year VUW/ARC staff and students (Gavin Dunbar, Joe Coyle and Matt Wood) participated in a marine geology cruise on board the French research vessel "Marion Dufresne", in collaboration with a consortium of New Zealand and overseas research institutions. This vessel is unique in its ability to collect long (>20 m) piston cores from the sea floor. The cruise departed Hobart for a 3 day transit across the Tasman Sea to the west coast of the South Island, where 6 cores up to 39.5 m in length were collected from water depths ranging from 886 m to 3220 m. These cores contain a detailed paleoclimate record of both changes in the marine environment over the last ~1 Ma and the adjacent terrestrial environment preserved in pollen and other plant debris washed out to sea.

Cruising on the Marion Dufresne

Twenty-four cores up to 30.3 m long were collected from three sites around the North Island, two from Wanganui Bight and the remainder from Hawke's and Poverty bays. These cores were recovered to improve our understanding of tectonic movements of the NZ continental margin over the last few million years, including the timing of giant submarine landslides and to help quantify patterns and rates of sedimentation on the seismically active continental margin (see MARGINS program web site at www.margins.wustl.edu/).

An important outcome of this cruise is the establishment of joint student projects with NIWA to investigate trace element geochemistry of marine plankton and the environmental record obtained from pollen contained in selected cores.

Gavin Dunbar

Jason Amundsen

S.T. Lee Exchange Fellow - Jason Amundsen

In November and December 2006, we will be joined by Jason Amundsen, an S.T. Lee exchange fellow. Jason, Andrew Mackintosh and Brian Anderson will spend a month surveying ice velocity and thickness of the Tasman Glacier near Aoraki/Mt Cook. The aim is to further our understanding of ice dynamics by developing a validated numerical model of the Tasman Glacier.

Measuring snow accumulation on the upper Franz Josef Glacier in March 2006

Glacier-climate studies in New Zealand

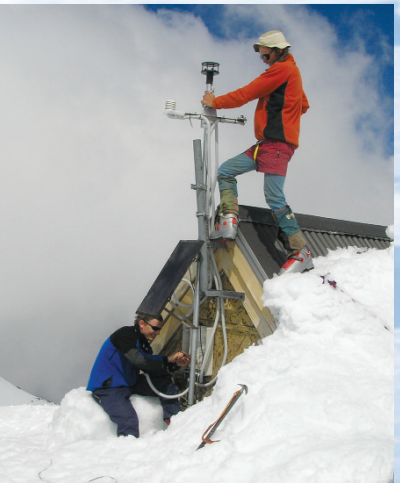
The year started well for our New Zealand glaciology project with the publication of a paper by Brian Anderson and Andrew Mackintosh in the February edition of Geology magazine entitled 'Temperature change is the major driver of late-glacial and Holocene glacier fluctuations in New Zealand'. This is the first of their papers which attempts to reconstruct past climate in New Zealand by using the Quaternary moraine record to constrain numerical models.

Andrew has also had success with research funding, with a Marsden Fast Start award which will provide salary contributions to support Andrew, Brian, and Julian Thomson (a former Royal Society Teaching Fellow). It will also allow Dr Alun Hubbard, a modeller at the University of Edinburgh, UK to visit Wellington for several months in the summer of 2007/8. Andrew was also awarded a grant from the Gary Comer Science and Education Fund (USA). We thank Professor George Denton at the University of Maine for his strong support of our work in this process. The grant will pay for equipment to support field work in the Southern Alps and travel to the University of Chicago to work with Professor Raymond Pierrehumbert, a renowned climate modeller.

Brian has developed a high-resolution energy balance model of the Brewster Glacier in the Southern Alps. Andrew presented the first results of this and related work entitled 'The response of New Zealand glaciers to climatic change' at the International Symposium on Cryospheric Indicators of Global Climate Change in Cambridge, England in August 2006.

Finally, they are about to (re)establish the highest weather station in New Zealand at Dome Shelter (2672 m) on Mt. Ruapehu with Dr. Harry Keys at the Department of Conservation. This forms part of Tom Paulin's M.Sc. project on 'The response of the Whangaehu Glacier to climate change.' Mt. Ruapehu will also be the site of our annual New Zealand Snow and Ice Research Group (SIRG) meeting in February 2007. Please contact Andrew.Mackintosh@vuw.ac.nz for more information.

Andrew Mackintosh



Andrew Mackintosh and Brian Anderson installing a weather station on Dome Shelter, Mt. Ruapehu in November 2005

OTHER ACTIVITIES

Professor Martin Siegert

S. T. Lee Lecture in Antarctic Studies

This year's S. T. Lee Lecture "The Exploration of Antarctic Subglacial Lakes: Science, Logistics and Politics" was presented by Martin Siegert, recently appointed Professor of GeoSciences, University of Edinburgh, and was attended by over 80 people. Martin has led research into ice sheet modelling and the exploration of subglacial lakes through remote sensing for over a decade. He gave us a clear account of their origins as well as recent insights into newly discovered draining systems connecting lakes beneath the to East Antarctic Ice Sheet. He also touched on the implications of this discovery. Martin gave another talk to the School of Geography, Environment and Earth Sciences on what can be discovered of past ice sheet behaviour through ice-sounding images from aircraft, and discussed plans for future work that include the drilling of a small lake beneath 3000 m of ice behind the Ellsworth Mountains in West Antarctica.

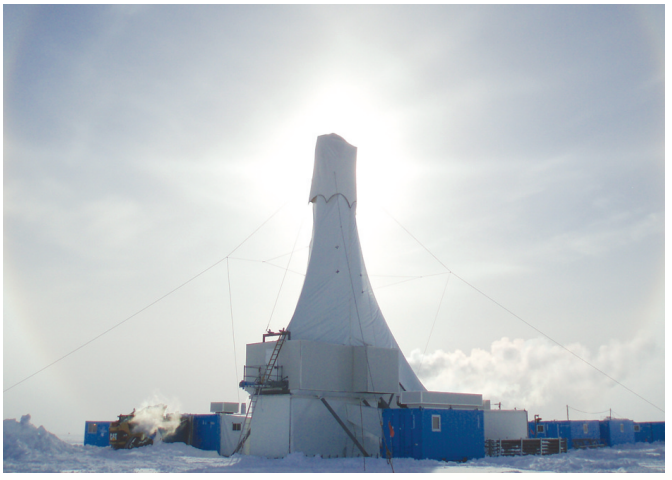
Annual New Zealand Antarctic Conference

In July this year, the Antarctic Research Centre hosted the Annual Antarctic Conference in conjunction with Antarctica New Zealand. This conference is a forum for all events supported by Antarctica New Zealand to share the work they have done in recent seasons with others in the Antarctic community.

The two and a half day conference included presentations from two keynote speakers; John Gleister, CEO, Ministry of Fisheries on "Antarctica: the great integrator - developing an Ecosystem approach", and Paul Callaghan, MacDiarmid Institute director on "The NZ Antarctic Sea Ice programme in McMurdo Sound - overview and applications of Nuclear Magnetic Resonance". Other presentations featured a science communication expert, various science, education, media and scholarship events, dedicated poster sessions, a session by the Antarctica New Zealand management team culminating in a question and answer panel, as well as two half-day pre-conference workshops on the Latitudinal Gradient Project (LGP) and ANDRILL. Social events included a mid-winter celebration and student scholarship awards at Government House on the evening of July 4th and a conference dinner on July 5th.

ANDRILL drilling has begun!

In the first week of November the sea riser (outer steel tube running from the rig floor into the sea floor) was successfully lowered through 900 m of water, drilled to 17 m below the sea floor (bsf) and cemented in. By November 28th, the project was hitting top-gear with the drill bit over 500 m bsf, and over 97% core recovery. The stratigraphy of the drill core is spectacular in terms of the range of rock types and potential implications for the behaviour of the Ross Ice Shelf and West Antarctic Ice Sheet during the last 2 million years. Initial interpretations of the core show numerous oscillations between grounding line and sub-glacial sediments and open water biogenic mudstone. The skill and patience of the operations team, led by Alex Pyne, has enabled a number of technical problems to be solved and we look forward to reading about continued success of the drilling in weekly reports filed by the co-chief scientists, Tim Naish and Ross Powell (MSc VUW, 1975, PhD OSU 1985 and now Professor of Geology at Northern Illinois University, USA). Weekly reports can be found at www.andrill.org.



ANDRILL going up

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