IceSked

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Newsletter of the Antarctic Research Centre
Victoria University of Wellington

This issue of IceSked focuses on the recent field season in Antarctica. We had a large number of students and staff working in Antarctica this summer, many of them doing preparatory work for the first ANDRILL drilling season next summer. However, we also had two graduate students working with Warren Dickinson to develop new chemical techniques for dating events in the Dry Valleys. Both have received awards from the ARC Development Fund to support their research, which you can read more about in this newsletter.

ANDRILL Science Activities in Preparation for Drilling

This Antarctic field season involved two field events aimed at providing site survey data and preparatory science for the ANDRILL McMurdo Ice Shelf (MIS) Project, scheduled to be drilled later this year. Both projects were supported by a Marsden grant. Between mid-October and mid-December 2005 a large team of 15 led by Tim Naish continued multi channel seismic reflection surveying of the sediments beneath the McMurdo Ice Shelf. The key aim was to define more regionally the three-dimensional geometry and structure of the 1 km-thick stratigraphic succession to be drilled later in the year. The data quality was exceptional this season, and an exciting outcome will be an improved ability to link the target MIS sedimentary succession with the evolution of both the McMurdo Volcanic Province and the Victoria Land Basin. Dhiresh Hansaraj, who is being co-supervised by Stuart Henrys at GNS Science will undertake an MSc project on the seismic reflection data and will eventually make correlations with the drill hole data (see more inside).

Gavin Dunbar deploying the underwater camera at the Hot Water Drill site

In late January Tim returned to Antarctica with Lionel Carter, Gavin Dunbar and Rob McKay to recover short sub-seafloor sediment cores, make oceanographic measurements and high-resolution seismic measurements through a hot-water hole drilled in the McMurdo Ice Shelf as part of the ANDRILL equipment testing programme being carried out by Alex Pyne's team. This latest phase of sub-ice shelf sampling is building towards a regional sedimentary study of the behaviour of the McMurdo Ice Shelf during and following the Last Glacial Maximum (20,000 years ago). The sedimentary models being developed will aid interpretation of the longer ANDRILL core. As part of his PhD project on the Pleistocene glacial and sedimentary history of the McMurdo Ice Shelf, Rob McKay will also analyse cores from west and north of Ross Island recovered by previous marine surveys (see more inside). Rob, Tim and Gavin will travel to the Antarctic core storage facility at Florida State University in early May to sample these cores.

Tim Naish

Dhiresh Hansaraj with Stuart Henrys working on data processing in the back of a Hagglunds

Dhiresh Hansaraj pulling out cable

K001 Camp on the sea ice during the seismic survey

ANDRILL Seismic Survey

Dhiresh Hansaraj has recently completed his undergraduate degree majoring in geology and has now started an MSc project, mapping Pliocene-Pleistocene seismic sequences in the Victoria Land Basin, Antarctica. His MSc study is part of a Marsden-Funded project with GNS Science and the Antarctic Research Centre. The overall project contributes to the ANtarctic Geological DRILLing Programme (ANDRILL) which commences in the austral summer of this year.

Dhiresh's fieldwork this summer involved seismic acquisition along three lines (MIS3, MIS4 and MIS5) on the McMurdo Ice Shelf (MIS). The K001S event, of which he was a part, included students from the University of Otago, as well as GNS Science staff and associates from abroad. Upon arrival at Scott Base, Dhiresh and the rest of K001S met with the drilling team who had been setting up the lines, that is, drilling the holes and preparing the explosives, since early October. The fieldwork consisted of laying out seismic cables along the length of the lines (6km, 7km and 10km respectively), connecting them to geophones buried into the ice shelf, and detonating and recording the shots; each of which was made up of 3.2kg of explosive primers.

Almost 300 shots were detonated during the fieldwork yielding 23km worth of seismic data, which Dhiresh is currently processing for his project, and which will be contributed towards ANDRILL.

Being the largest event at Scott Base during the season, coupled with a run of particularly good weather, K001S was able to complete the seismic acquisition well within the allocated time...four days ahead of schedule in fact. Unfortunately, being the largest event also meant it was the most resource hungry and thus, for Scott Base's sake, needed to be shipped out as soon as the event was completed. Nevertheless, Dhiresh had a rewarding and amazing field season, collected high quality data, and can now use it to produce a sub-surface stratigraphic image of part of the McMurdo Ice Shelf which can later be correlated to the drill hole and used to determine past ice shelf responses to climate forcing.

Dhiresh Hansaraj

Sedimentation beneath the McMurdo Ice Shelf

Rob McKay, a Victoria University MSc graduate, rejoined the Antarctic Research Centre in June 2005 to begin his PhD investigating the late Quaternary history of the McMurdo Ice Shelf. In February 2006, Rob was part of the K001H science team (alongside Tim Naish, Lionel Carter and Gavin Dunbar) that studied sedimentation and oceanographic conditions beneath the McMurdo Ice Shelf, in preparation for deep drilling in 2006/7 as part of the ANDRILL project.

Gavin Dunbar, Tim Naish, Lionel Carter and Rob McKay looking at results from the 3.5kHz echosounder at the McMurdo Ice Shelf site.

Fieldwork was carried out over a four-day period following the completion of the test Hot Water Drill (HWD) hole made by Alex Pyne's team using new ANDRILL equipment. A total of eight sediment cores of the seafloor were collected, along with sub-ice shelf measurements of the water column, and low-energy 3.5kHz seismic profiles of the seafloor sediments. In addition, photographs of the seafloor were also taken.

This work follows on from a previous survey undertaken in 2003, when two HWD access holes were made through the McMurdo Ice Shelf. Rob's studies will contribute to a broader understanding of the relationship between ice shelf dynamics and sedimentation in the McMurdo Sound region. Ultimately, this information will be used to interpret changes in the extent of the ice shelf over the past 2.4 million years, and therefore its sensitivity to climate change, based on expected sediment recovery from the ANDRILL core.

Rob McKay

Rob McKay, Gavin Dunbar, Lionel Carter and Tim Naish at the memorial cross on Observation Hill.

Permafrost and granites in the Dry Valleys

Martin Schiller and Gretchen Williams accompanied Warren Dickinson in Antarctica for the 2005-2006 field season. It was the first time in the Antarctic for both Martin and Gretchen, and they were lucky to get an (almost) full tour of the Dry Valleys. After experiencing the Scott Base way of life (and a trip to Cape Evans), Victoria Valley was the first stop, where the two were introduced to the joys of drilling relict and modern ice for Warren's ongoing research. Next up was the central Wright Valley and the Meserve Glacier camp, providing a spectacular alpine retreat. This was the site for much of Martin's work which took up the majority of their time here, though the team still managed to make an excursion to Prospect Mesa near Bull Pass.

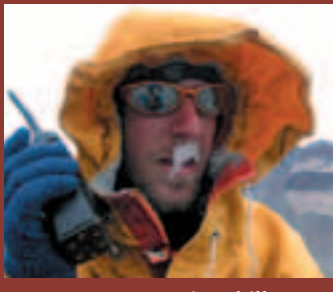
On the journey to Beacon Valley the team was joined by a fourth member, Ron Sletten, a colleague of Warren's from the University of Washington. Ron's past experience in the Beacon Valley was appreciated and stimulated healthy discussions. A few minor snowstorms did little to deter the fervent workers whose time in the Beacon Valley was well utilised. Kennar Valley, the final frontier, was a spectacular finale to a great field season, offering views of the Polar Plateau, Mts Erebus and Lister. From here it was back to Scott Base to enjoy that well deserved shower and fresh food! Warren, Martin and Ron returned to New Zealand after playing the Scott Base waiting game, while Gretchen returned to the field as an assistant on the Lower Wright Glacier, just making it home for that Christmas pudding!

Martin Schiller & Gretchen Williams

Gretchen Williams

First Awards from the Endowed Development Fund

We are pleased to announce that Martin Schiller and Gretchen Williams have received the first awards from the Endowed Development Fund, funding which will help them develop their research. Gretchen and Martin, together with the Antarctic Research Centre, are grateful to all the supporters of the Endowed Development Fund, in particular our corporate sponsors, Antarctica New Zealand, Austral Pacific, and Webster Drilling and Exploration.



Martin Schiller

Martin Schiller came from Göttingen, Germany to study towards his MSc in geology at Victoria University in the beginning of 2005. With a background in geochemistry his MSc project involves testing and applying the established atmospheric 10Be dating method to the unique environment of the Dry Valleys. The majority of field work for this was completed in Wright and Beacon Valleys, where soil profile samples were taken. Martin's grant will support the analysis of samples for Beryllium with an accelerator mass spectrometer (AMS) at GNS Science. Salt analysis of the samples is to be undertaken at the University of Washington, Seattle on an ion coupled plasma optical emission spectrometer (ICP-OES) and ion chromatograph (IC).

Gretchen Williams completed her undergraduate studies here at Victoria earlier this year and is currently working towards her Honours degree in geology. Her project aims to establish the source of granitic clasts from glacial tills in the Beacon Valley. The absence of granite bedrock in the vicinity of the Beacon Valley has been a puzzling feature in the reconstruction of the regions glacial history. Gretchen mapped the granite distribution within the Beacon Valley tills and sampled the different petrologic types. Lead isotope analysis will be used to fingerprint the granite clasts in order to constrain the provenance. Gretchen's grant will support her travel to Copenhagen in June with Joel Baker to perform the analysis on an inductively coupled plasma mass spectrometer (ICP-MS) at the Danish Lithosphere Centre.

ANDRILL Hot Water Drill Testing

A crew lead by Alex Pyne, and including Tamsin Falconer successfully tested the Hot Water Drilling System (HWD) on the McMurdo Ice Shelf near the McMurdo Ice Shelf (MIS) drill site this summer. Despite delays in getting the equipment set up (due to the late arrival of the cargo ship American Tern at McMurdo), the HWD successfully drilled through 97 metres of ice shelf in three days, and the equipment performed very efficiently.

The purpose of the HWD part of the drilling system is to make a hole through the ice shelf, approximately 600mm in diameter, and to keep it open for the entire drill season (at least three months). This stops the sea riser becoming frozen into the ice shelf and subsequently being broken or pulled out of the sea floor by tide and lateral movement of the ice shelf. The HWD system will also make a 'well' in the ice shelf to provide water supply for the systems at the drill site (the drill fluids system and the HWD itself).

The ANDRILL operations team was also involved in the ship offload of other major ANDRILL gear such as the drilling rig and platform, and more than 20 containers. Once the gear had arrived at Scott Base, part of the team was dedicated to assembly, organisation and winterisation of the equipment so that it will be ready to deploy for the drill season later this year. Staff at both Scott Base and McMurdo assisted the team in moving containers and the drill platform, and in getting the gear ready.

Tamsin Falconer

Alex Pyne with the Hot Water Drill

OTHER ACTIVITIES

S. T. Lee Lecture in Antarctic Studies

This year's S. T. Lee Lecture will be held at Victoria University on Thursday 20th July. The presenter will be Prof Martin Siegert speaking on The Exploration of Subglacial Lakes in Antarctica. Prof Siegert, from the Bristol Glaciological Centre at the University of Bristol, UK, recently co-authored an article in *Nature* on connections between subglacial lakes in Antarctica. We will be sending out invitations to the lecture closer to the date, and full information will be available on our website.

Climate Change Conference

Over the last three decades the Antarctic Research Centre has focussed increasingly (but not exclusively) on understanding the history and behaviour of the Antarctic ice sheet in the geological past. We have not only made a lot of progress through offshore drilling, but have also built up extensive network of fellow scientists interested in climate history and behaviour.

This knowledge and network contributed directly to last month's two-day conference on Climate Change and Governance (www.vuw.ac.nz/ips), organised by Victoria University of Wellington's Institute of Policy Studies, and the School of Earth Sciences to find a way forward.

Day 1 focussed on science, starting with a geological perspective (we now risk shifting climate back to the high CO_2 greenhouse world of more than 34 million years ago) and moving through the direct influence of CO_2 and its effect on climate, weather, oceans and ice. Day 2 reviewed policy options with commentaries on human wants versus need, aspirations versus reality, the role of local versus central government, mitigation versus adaptation, and the need for urgency. This was stressed both by Lord Oxburgh, ex-chair of Shell, in his keynote address, and by Tony Blair in his mid-morning video appearance with John Campbell of TV3.

The conference took place at a time when global warming events and concerns are being more widely reported than ever before in scientific journals, the press and popular magazines. Special issues of *Science* and *Time* magazine appeared in the week of the conference. Media reporting of the conference (business pages included) was encouraging in the focus on what practical steps a small society like ours can take to both mitigate and adapt to the effects of change. Follow-on activities have included lectures organised in the main centres by the Royal Society of New Zealand, discussions with government agencies on how New Zealand might follow Sweden's lead in seeking to reduce its dependence on fossil fuels, and a plan by the Wellington Regional Chamber of Commerce for a conference on 'Climate Change and Business' for around September.

ARC Director Peter Barrett was a member of the Conference Organising Committee and the Programme Committee, both chaired by Jonathan Boston of the Institute of Policy Studies.

A video record of the meeting can be found at www.vuw.ac.nz/sog

Peter Barrett

Joint Antarctic Research Institute

Victoria University of Wellington and GNS-Science formalised their longstanding collaborative relationship with the formation of the Joint Antarctic Research Institute on 14 February. The Joint Antarctic Research Institute combines the expertise of Victoria's Antarctic Research Centre and GNS Science's Antarctic research programme, and brings together under one umbrella about 30 staff from the two institutions with an interest in Antarctic and related earth science research. There will be more detail on our work under the Joint Antarctic Research Institute banner in future issues of IceSked.

Minister of Research Science & Technology, Hon Steve Maharey with Peter Barrett, Vice Chancellor Pat Walsh and GNS Science Chief Executive Alex Malahoff with a polar tent at the launch of the Joint Antarctic Research Institute

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