IceSked

Issue 13: December 2009

Newsletter of the Antarctic Research Centre
Victoria University of Wellington

The Antarctic Research Centre is delighted with the $250,000 donation by the Morgan Family Charitable Foundation to support Antarctic climate research. In this issue, we also report on our success in the latest round of Marsden Funding and highlight a number of national and international workshops ARC staff and students have participated in.

A Word From the Director

It's hard to believe six months has passed by since the last IceSked. Our team continues to grow with the appointment of new staff and students. Gigi Woods, sedimentology technician in the School of Geography, Environment and Earth Sciences joined us in July in a part-time capacity adding expert support to our marine geology group. In September, we also welcomed Melissa Bowen, as a Senior Research Fellow in Physical Oceanography. Nancy Bertler, Darcy Mandeno, Cliff Atkins and MSc student Holly Winton head to Antarctica this season, and Rob McKay will sail on the IODP Wilkes Margin expedition in early January. Merry Christmas to you all and we look forward to an exciting 2010.

Tim Naish

Climate Change Research Receives a Significant Boost

The Antarctic Research Centre greatly appreciates the donation of $250,000 from the Morgan Family Charitable Foundation. Economist, adventurer and philanthropist, Gareth Morgan sought advice from ARC's Peter Barrett, David Lowe, and Lionel Carter for his book 'Poles Apart' which explores the science around climate change (see www.polesapart.com for the evidence behind the book and for the advisors' story). The sole stipulation for the donation was "Antarctic climate research", reflecting Gareth's appreciation of the value of this work for today's world.

The donation has been used in part for a research fellowship on ice sheets and sea level to appoint Dr Dan Zwartz (VUWAE 34 followed by a PhD at The Australian National University on modelling the influence of the Antarctic ice sheet on past sea level). Dan, who takes up the appointment in February next year, will undertake research to improve understanding of the contribution of the Antarctic ice sheet to sea level rise in recent glacial cycles, and the effect it could have in the southwest Pacific region in the future. Dan also has experience in communicating climate science, an important aspect of ARC activities. The donation is also providing support for Melissa Bowen's research into the dynamical behaviour of the Southern Ocean (see her article in this issue), a significant influence on Antarctic ice sheet behaviour.

The donation was made to the ARC through the Victoria University Foundation, and is to be spread over two years.

Peter Barrett

Jo and Gareth Morgan with Mt Erebus, Antarctica in the background

RV Joides Resolution docked in Wellington Harbour, 18 November, 2009 (Photo: Margaret Lowe, GNS Science)

Marsden Fund Award for Antarctic Ocean Drilling Expedition

A three-year Marsden Fund grant was awarded to the VUW team of Tim Naish, Rob McKay, Lionel Carter, and Joel Baker for a project titled "*How does Antarctica ride the Milankovitch cycle?*" In simple terms, the team is interested in how the cycles in Earth's orbit (the Milankovitch cycles), that drove repeated oscillations of the great Northern Hemisphere ice sheets, influence fluctuations in the size of Antarctica's ice sheets. The project will support Rob's participation as a member of the shipboard sedimentology team on the Integrated Ocean Drilling Program's expedition to drill marine sediments on the continental margin off Wilkes Land between January and March next year. It is hoped that the cores will provide a 40 million year history of one of the most vulnerable sectors of Antarctica's sleeping giant - the East Antarctic Ice Sheet (EAIS). While the smaller more vulnerable West Antarctic Ice Sheet has been the focus of considerable concern as global temperatures continue to rise, the thresholds for deglaciation of EAIS are poorly understood. Our team, and the Wilkes Margin expedition members will work with climate and ice sheet modellers to gain an improved understanding of the factors that influence EAIS behaviour during past warmer climates. We look forward to the port call of the drill ship, the RV *Joides Resolution* between the 4-6 January 2010 in Wellington, and we hope Rob will get his sea-legs by then. *Tim Naish*

Visit by Prof. Dorthe Dahl-Jensen and the Ice Core Symposium

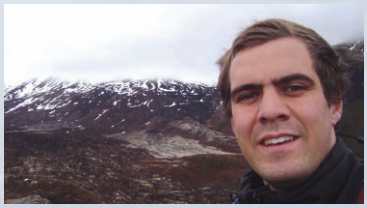
This year's Ice Core Symposium was held on 8 October at GNS Science's National Isotope Centre. The symposium was well attended by scientists and policymakers from across New Zealand, and several ARC staff and students presented during the one-day event. The keynote speaker was Prof. Dorthe Dahl-Jensen, Chief Scientist of the multinational Greenland Ice Coring Project (NEEM project) and Director of the Centre for Ice and Climate, University of Copenhagen. Dorthe also gave a number of stimulating and well attended public talks during her stay, including a presentation at the National Museum Te Papa. Dorthe and her team are an important collaborator of the NZ-led Roosevelt Island Ice Core Project. This project is supported by the International Partnerships in Ice Core Sciences and seeks to improve our understanding of the stability of the Ross Ice Shelf, Antarctica in a warming world.

Dorthe Dahl-Jensen giving her presentation at Te Papa, Wellington

Olga Sergienko en route to McMurdo Ice Shelf, Antarctica

NZ's Glacier & Climate Modellers Come Together

On 2 November, VUW hosted the first Glacier & Climate Modelling Workshop in association with JARI. The one-day event brought together New Zealand's glacier and climate modelling community and included talks from researchers from NIWA, Otago, Canterbury and Victoria universities. The aim of the workshop was to discuss recent progress and future research directions in three areas: modelling of Southern Hemisphere paleoclimate; simulating future glacier response and water impacts in New Zealand; and predicting the future response of Antarctic ice sheets. The keynote lecture by Olga Sergienko, Princeton University, concerned this last theme, modelling of the physical processes controlling ice-sheet behaviour in Antarctica.



Rory Mearns in Tongariro National Park

Palynomorphs for Paleoenvironmental Reconstructions

Palynomorphs are microscopic fossils that have a cell wall made from an organic compound that is very chemically stable, allowing for easy preservation. Three sorts of palynomorphs are being used in my study: dinoflagellates; prasinophyte algae; and acritarchs, all are of marine origin. The distribution of these fossils in the core reflects the original distribution of the living forms which in turn is dependent on the environmental conditions (temperature, salinity and water depth) that existed at the time. This allows us to use the fossil data in paleoenvironmental reconstruction.

I am analysing samples from the ANDRILL MIS core at 10 metre intervals, with increased resolution over areas of interest such as major changes in the fossil palynomorph assemblages. Results to date show an interesting mix of in situ and reworked palynomorphs. In situ palynomorph assemblages are the ones we use to estimate paleoenvironment. The reworked forms may indicate changes in glacial history such as changing source areas. I plan to combine my data on reworked forms with the volcanic provenance study already carried out on the core to hopefully determine exactly where the fossils come from. Since many of the reworked palynomorphs in my samples are from organisms that existed during warm Eocene conditions, I hope to be able to pinpoint the source of this material - which has proved elusive. *Rory Mearns*

ARC at Antarctic Climate Evolution Symposium, Grenada

Granada, the centre of Moorish influence in Spain for many centuries and home of the Flamenco, was host to the first Antarctic Climate Evolution (ACE) Symposium from 7-13 September 2009 (see www.acegranada2009.com). ACE was established by SCAR in 2004 as one of its five scientific research programmes, with the aim of integrating geoscience data and ice-climate-ocean modelling to establish past Antarctic climate and ice sheet behaviour and so project future behaviour.

The meeting was organised by ACE co-conveners geophysicist Carlota Escutia Dotti (University of Granada), and paleoclimate modeller Rob DeConto (University of Massachussetts). The 160 attendees from 16 countries included a good representation from the Antarctic paleoclimate community.

ARC was also well represented with two talks on ANDRILL MIS results (Tim Naish on orbital influences on Pliocene ice sheets and Rob McKay on whether Antarctica drove Northern Hemisphere glaciations), a talk by Andrew Mackintosh on the ocean and sea level influence of the last Antarctic ice sheet retreat and one by Peter Barrett on the contribution ACE might have to the 5th Assessment Report of the Intergovernmental Panel on Climate Change now being planned.

The symposium included workshops on Circum-Antarctic Seismic Stratigraphy and Paleobathymetry, led by Stuart Henrys (GNS Science) and Karsten Gohl (Alfred Wegener Institute), and Antarctic Landscape Evolution, led by Peter Barrett (ARC), Jane Francis and Alan Hayward (University of Leeds), Christine Siddoway (University of Colorado) and Karsten Gohl. Both projects aim for an integrated Antarctic paleoenvironmental history over the last 100 million years with significant results expected on a 2-6 year time frame.

After the meeting Tim Naish (ARC), Richard Levy (GNS Science), Laura De Santis (Istituto Nazionale di Oceanografia e di Geofisica Sperimentale) and Frank Rack (University of Nebraska-Lincoln) ran a remarkably well-timed and productive two-day workshop for planning future drilling campaigns for the next 20 years using a range of platforms, including ANDRILL, SHALDRILL and IODP. Presentations included Tamsin Falconer outlining the current plan for drilling on the Ross Ice Shelf east of Ross Island using a newly developed re-entry capability. The outcome of the workshop was a 20 page "white paper" summarising an Antarctic-wide drilling strategy for understanding past Antarctic ice and climate behaviour.

Our accommodation in Granada was in the old town, just across the valley from Alhambra, the Arab palace completed in the 14th Century, with evening meals in the local tapas bars, and informal discussions on the roof of our apartment. All in all a memorable conference and a great foundation for the next few years.

Peter Barrett

Melissa Bowen on the Wellington coast

Physical Oceanographer Joins the ARC Team

I joined the ARC in September as a Senior Research Fellow. I received my PhD in physical oceanography in 2000 from the Massachusetts Institute of Technology/Woods Whole Oceanographic Institution Joint Program and, after postdoctoral study at the University of Colorado, have worked at both NIWA, Wellington, and Heriot-Watt University, Edinburgh.

I study processes in the modern ocean using observations and models to explain the nature and cause of ocean variability. In particular, focussing on the last few decades when we have detailed measurements of the ocean from satellites. My work has covered a range of scales from understanding the net effect of tidal flows in estuaries to explaining variability in the South Pacific subtropical gyre and the boundary currents along the Australian and New Zealand coasts.

In the ARC, I'll be working with Lionel Carter on studying processes in the modern ocean that can lead to better predictions of future ocean conditions and inform our understanding of past ocean circulation. I also collaborate with colleagues at NIWA on projects measuring the subtropical inflow and the boundary currents along the New Zealand margins.

Melissa Bowen

Unraveling the Variability of Paleotemperature Estimates

Developing a proxy for ocean temperatures (Mg/Ca) has been the main focus of my life for the past two years. Working with the planktonic foraminifera species *Globigerina bulloides* (less than 0.5 mm in diameter), we looked at samples from marine core top sediments from New Zealand. Foraminifera that grow in warmer waters incorporate more magnesium in their calcite shells compared to those from cooler waters. This follows an exponential relationship that allows the ratio of Mg to Ca to be used as an ocean thermometer. This study used laser ablation inductively coupled plasma mass spectrometry techniques to establish a Mg/Ca-temperature calibration for *G. bulloides* which can be used to accurately reconstruct past ocean temperatures in the southwest Pacific region. One of the most unexpected developments was the identification of a strong correlation between shell weight/length ratios and water temperature which suggests this relatively simple-to-acquire data has the potential to be developed as a new surface ocean thermometer. Joel Baker, Lionel Carter and Gavin Dunbar have been excellent supervisors and I look forward to working with them to develop and apply these new proxies in the future.

Julene Marr

Julene Marr on the mass spectrometer, VUW

Julene submitted her MSc thesis titled "Ecological, oceanographic and temperature controls on the incorporation of trace elements into *Globigerina bulloides* and *Globoconella inflata* in the southwest Pacific Ocean." in August.

OTHER ACTIVITIES

Supporting the Antarctic Research Centre

In 2004 the Antarctic Research Centre launched an Endowed Development Fund Appeal to provide funds for students to undertake research in Antarctica, and for emerging research opportunities. Twenty students have so far been awarded grants from the Fund for field work in Antarctica, conference attendance, and travel for collaborative work at other institutions.

We urge you to consider supporting the Endowed Development Fund, either through a monthly automatic payment, or through a gift in your will, which is a tremendous way to show support while not impacting on your financial needs during your lifetime.

For support options please refer to: http://www.victoria.ac.nz/antarctic/about/ Endowments_Donations/development-fund.aspx All donations are made through the Victoria University Foundation, a registered charity, and are therefore eligible for a charitable gift taxation rebate.

For further information on how you can provide philanthropic support to the Antarctic Research Centre, please contact our Director, Prof. Tim Naish, Email: tim.naish@vuw.ac.nz, or Diana Meads, Fundraising Manager, Victoria University of Wellington Foundation Ph: 0800 VIC GIFT (0800 842 4438), Email: diana.meads@vuw.ac.nz

Recent Achievements

Prof. Tim Naish was awarded a 2009 New Zealand Science and Technology Medal by the Royal Society of New Zealand. The citation reads “For scientific leadership and contributions of fundamental new knowledge on the how the Antarctic ice sheets have influenced global sea-level change and climate, with implications for our warming world.” Tim says he is very pleased to see the success of the ANDRILL McMurdo Ice Shelf Project Science Team recognized. “The award reflects the collective efforts of the team.”

In August, MSc student Julia Bull, completed her thesis titled “Stable isotope, major and trace element chemistry of modern snow from Evans Piedmont Glacier, Antarctica: Insights into potential source regions and relationship of glaciochemistry to atmospheric circulation and vigour”. Julia's currently writing a paper from her thesis before heading to the wilds of Canada, we wish her well.

Lana Cohen, a new PhD student with the ARC, received Antarctica New Zealand's Sir Robin Irvine Scholarship to undertake research on understanding the relationship between short term (decadal and annular) climate cycles in the Antarctic climate system and the longer term warming trend.

Looking Back: Photo from the Archives

Sled Dogs in Antarctica

The use of sled-dogs in Antarctica has been banned since 1993 due to concerns regarding their impact on native wildlife.

(Photo: Colin Brown, VUWAE 19, 1974-75 & 24, 1979-80)

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