

IceSked

Issue 42 - July 2024

Newsletter of Te Puna Pātiotio—Antarctic Research Centre
Te Herenga Waka—Victoria University of Wellington

A word from our Director

In this issue, we take a trip to the tropics, Antarctica, and regional NZ in between. A perverse aspect of the melting of our polar ice caps is that some of the most vulnerable and affected are small tropical island nations, or coastal communities in Aotearoa. Our world-leading team of sea level rise experts have been out on the road working in partnership with these communities to understand the impacts of our rising seas. In colder regions, we profile our field expeditions from this year, to better understand the processes that governed past rapid ice sheet melt events, as well as the impacts of climate warming on the marine environment.

Rob McKay

Our Changing Coast Programme in Samoa

Tim Naish

Our Changing Coast (OCC) Programme researchers from Victoria University of Wellington (VUW) and GNS Science attended the 4th Pacific Ocean Climate Change (POCC4) Conference in Apia, Samoa, from 20-24th of May. Jointly hosted by VUW, the South Pacific Regional Environmental Programme (SPREP) and the National University of Samoa, around 100 climate and ocean change researchers and stakeholders attended from across the blue Pacific. This was the first time the conference has been held outside New Zealand.

The objectives of the conference were:

- 1) to raise awareness of the challenges faced by Pacific nations due to climate change;
- 2) to facilitate knowledge sharing and collaboration among experts, policymakers, researchers, and community leaders; and
- 3) to promote sustainable solutions and innovations for mitigating and adapting to climate change in the Pacific region.

Tim Naish gave a keynote address and Richard Levy, Shannon Bengtson and Ian Hamling gave talks on the uncertain contribution of Antarctic ice melt for future sea-level rise, hazard and risk assessment for Tuvalu, and the role of vertical land motions in sea-level projections respectively.

OCC and SPREP's Pacific Climate Change Centre ran a workshop on "Coastal Adaptation & Addressing the Impacts from Sea-Level Rise", aimed at strengthening coastal resilience in the Pacific through sharing of sea level science, tools to guide adaptation, and solutions that mitigate sea-level rise impacts and risk.



Example of coastal strengthening, Upolo Island, Samoa. Photo by Dao Polsiri.

The conference and workshop were very successful, and good contacts were made for future collaborations. It was vital to see first-hand how the Pacific is being impacted by climate change, and the importance of local community and environmental context when thinking about solutions. Pacific Islanders are resilient and adaptable people who understand what it means to be on the frontline of climate change.

While their communities have well-tested emergency response strategies, their losses and damages are increasing, and in some cases, there will be complete loss requiring relocation of communities. We were reminded just why the impacts of climate change on the blue Pacific require global warming to be kept below 1.5°C above industrial levels.

Antarctica field season 2023-24

SWAIS2C Update

Richard Levy

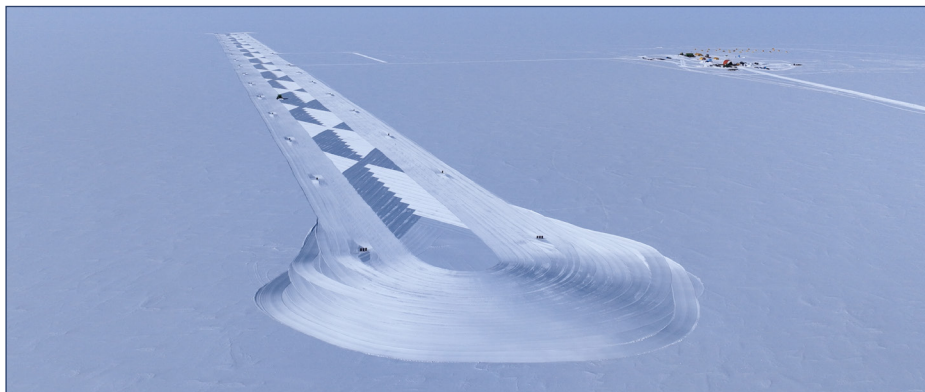
The first SWAIS2C field season at the KIS-3 drill site on the Ross Ice Shelf, Nov 2023 - Jan 2024, involved significant achievements and challenges. We aimed to drill through the ~580-meter-thick ice shelf into sediments beneath the sea floor near the West Antarctic Ice Sheet's grounding zone, 800 km from Scott Base. This season demonstrated the complexities of large-scale, complex scientific endeavours in Antarctica, which often face unexpected obstacles.

An international team of 27 scientists, drillers, mechanics, logisticians, and camp staff transported equipment 1,200 km from Scott Base to the KIS-3 site, set up camp, built a stunning skiway, melted a hole through the ice shelf, collected short sediment cores, obtained oceanographic data, and deployed a GPS system and ice surface radar.

Utilizing new technology in remote Antarctic locations is crucial for advancing research in hard-to-reach areas like the sea floor beneath the Ross Ice Shelf. The new Antarctic Intermediate Depth Sediment Drilling (AIDD) system was deployed on Christmas Eve, with 80 meters of drill string and a sea riser made of Glass Reinforced Epoxy (GRE). Technical issues arose as the drill rig could not maintain a grip on the GRE, leading to the decision to retrieve the drill string and postpone drilling operations. Traditional steel is planned to replace GRE in the next season.

Despite this setback, we were thrilled to retrieve an almost two-meter-long sediment core using a hammer coring system – a record for the region – which will provide an extended record of recent ice sheet and ice shelf retreat. We have many sediment samples with microbiological content which will reveal more about the communities living in the extreme environment below the ice shelf cavity. And we now know that the sediments below the seafloor at KIS-3 are relatively soft and that we can use our hydraulic piston corer with confidence – a big step forward as we sort important details for our drilling campaign.

The team is preparing to return to KIS-3 in November 2024. Addressing the AIDD system's technical issues and leveraging the hands-on field experience gained will be pivotal for the next season's success. We can't wait to return for the 2024/25 season!



K861: first Antarctica experience for ARC postgraduate students

Lottie Stevenson and Aylin de Campo

ARC PhD student Aylin de Campo and MSc student Lottie Stevenson joined an international team of scientists, led by Jamey Stutz, on a mission to study the past behaviour of the Byrd Glacier in Antarctica. This glacier, draining ice through the Transantarctic Mountains into the Ross Ice Shelf, is crucial for understanding sea-level rise and ice sheet stability. The expedition aimed to analyze the glacier's past thinning by collecting glacially-smoothed pebbles from mountain outcrops, which back in New Zealand would be dated using surface exposure techniques.

Following field training at Scott Base, they flew to the camp location on Mt Tadpole, right at the Byrd Glacier and next to Mt Tuatara. Their work involved hiking steep slopes collecting lightly coloured, rounded, glacially-smoothed rocks that seemed out of place on the dark, sharply-angled bedrock surface. Bad weather reduced their fieldwork from three weeks to five days, but the team was still able to collect a significant number of rock samples for dating.



Aylin de Campo collects GPS data on Mt. Tadpole during the K861 field campaign. Photo by Lottie Stevenson.

Meanwhile, research trips by helicopter to remote locations provided stunning views of the immense Byrd Glacier and surrounding peaks. This exceptional landscape has left a profound mark on the two students, and the expedition team hope to leave an equally positive mark there too. During fieldwork, the team crossed the unnamed glacier flowing between Mt Tadpole and Mt Tuatara and will now attempt to name this Gecko Glacier, to continue the locale theme.

Left: Rob Teasdale's runway grooming, KIS-3 Drill site. Photo by Ant Powell.

Tohu o te taiao ki te Tiri o Te Moana: Environmental indicators of Antarctica

Holly Winton and Ayla Hoeta

Holly Winton, Neil Brough and Ayla Hoeta (Waikato Tainui) spent eight weeks in Antarctica during the 2023/24 summer, integrating Western ice core science (ice core drilling and atmospheric monitoring) with Maatauranga Maaori (Maaori knowledge) to study environmental changes in the Ross Sea Marine Protected Area.

Fieldwork included ice core drilling and atmospheric monitoring – this being the western science component. Tiny atmospheric aerosols trapped in ice cores provide insights into climate patterns and environmental changes in Antarctica. The team drilled a 20m ice core near the Priestley Glacier in Victoria Land to develop a 200-year history of phytoplankton biomass and composition in the Ross Sea Marine Protected Area using novel biomarkers.

Using a kaupapa Maaori approach, the researchers also collected observations of the environment to build knowledge about the Maramataka (Maaori lunar and environmental calendar) at Scott Base, including tohu (environmental indicators) and tohu o te rangi (observations in the sky). These are the first observations of tohu in Antarctica using the Kaupapa Maaori framework of Hautu Waka and kaitirotiro. The researchers hope their mahi will help spark an interest in Antarctic science in Te Tiri o te Moana among rangatahi (young people) and strengthen collaboration between Maaori researchers and tangata Tiriti.



Ayla Hoeta and Holly Winton flying the Tino Rangatiratanga flag in the spirit of bringing Maatauranga Maaori to Antarctica. Photo by Julian Malcolm.

Year-round tohu observations continue at Scott Base by wintering staff. Time-lapse footage of the night sky and western scientific data from ice cores, satellites and ground-based instruments will support building a comprehensive picture of environmental changes on lunar, seasonal and centennial timescales in the Ross Sea Marine Protected Area using an integrated kaupapa Maaori and western science approach.

Exploring the depths of Discovery Deep

Liz Keller



The K-863 camp site. Photo by Liz Keller.

During Dec 2023 – Jan 2024, Liz Keller joined a team of four other scientists from Otago University and AWI to conduct a geophysical survey at Discovery Deep. Discovery Deep is on the western edge of the Ross Ice Shelf and is one of the deepest areas of the Ross Ice Shelf ocean cavity, where sediment layers on the seafloor are likely to be the thickest and to contain a high resolution record of past climate. It has been proposed as a future drilling location to collect a deep sediment core to learn more about ice sheet evolution under a

warming climate. The goal of this field campaign was to collect geophysical data to characterise the sedimentary basin underneath the ice shelf and to find the best location to collect a core.

The team spent 3 weeks in the field camping on the ice shelf. Sedimentary and bathymetric data were acquired by recording acoustic signals with a seismic streamer. The streamer consists of an array of geophones (sensors) connected by a cable, which is laid over the surface of the ice. When a loud sound is generated, the geophones record the sound waves as they are reflected from the seafloor, allowing for the calculation of the distance from the surface to the sediments underneath.

Gravity data was also collected as another independent means of inferring the bathymetry underneath the ice shelf. Preliminary data analysis indicates that the locally-acquired bathymetry data does not match the patterns from a previous airborne gravity survey, and the basin is deeper than originally thought (approx. 1600 m at the deepest point observed so far). More observations are still needed to find the best location for drilling.



2024 expedition, Mt Ruapehu. Photo by Rebekah Parsons-King.

Girls* on Ice 2025 expedition

Applications to join our Girls* on Ice Aotearoa NZ expedition are now open, closing August 7. We invite applications from girls* aged 15-16 yrs with a love for science and the great outdoors. The programme will run mid-January 2025, with a week exploring Mt Ruapehu and three days at Te Herenga Waka—Victoria University of Wellington.

"I really enjoyed learning about so many different things in such a vast range of areas and it really confirmed that I want to pursue a career in environmental sciences."

2024 participant from post-expedition survey.

Read more, sign up for news, and apply online at: <https://www.wgtn.ac.nz/antarctic/outreach/girls-on-ice-aotearoa-nz>.

*We welcome cisgender girls and transgender, agender, nonbinary, intersex, and genderqueer youth.

Climate Forum Whanganui 19-21 March 2024

Tim Naish

Supported by Te Au Hururi: Te Au Hou - Our Changing Coast programme at the ARC and hosted by Te Ao Hou Marae in Whanganui, this dynamic event gathered indigenous voices from around the world to address pressing climate challenges they are facing and explore collaborative solutions.

A diverse lineup of speakers, including climate scientists, policymakers, indigenous scholars and leaders from iwi Māori, Yupik Alaska and Aboriginal Australians, community leaders, and youth activists, including Tim Naish and Billy van Uitregt from VUW amongst others, provided insights on climate change

Prof. Nick Golledge elected to Royal Society Te Apārangi

The ARC's Professor Nick Golledge is one of 21 new Ngā Ahurei a Te Apārangi Fellows elected to the Academy of the Royal Society Te Apārangi in 2024. Fellowships recognise researchers, scholars, and innovators throughout Aotearoa New Zealand who have achieved excellence in their various disciplines across science, technology, and the humanities, and have made an impact at the highest international level.

Nick was elected for global leadership in Antarctic ice-sheet modelling. His fundamental discoveries include that ice-sheet melting could produce a positive feedback loop that accelerates its own retreat, and the 2°C temperature-rise threshold for long-term Antarctic ice-sheet stability.



Prof. Nick Golledge with Prof. Geoff Chase, Academy Executive Committee Chair. Photo credit RSNZ


issues and potential pathways for action. A key issue addressed was the impact climate change has had and will continue to have of on values and assets of indigenous communities who are often the most vulnerable. Another focus was how traditional indigenous knowledge, such as mātauranga can be woven with western science to improve understanding and outcomes.

Speakers and participants alike emphasised the need for urgent and ambitious climate action, and echoed the importance of collaboration, innovation, and political will in addressing the climate crisis.

 www.linkedin.com/company/antarctic-research-centre

 www.wgtn.ac.nz/antarctic

 Antarctic-Research@vuw.ac.nz

 +64-4-463 6587



Near Upper Priestley Glacier, Victoria Land. Photo by Holly Winton