

SCIENTIFIC
OCEAN
DRILLING



ANNUAL REPORT

**Australian and New Zealand
IODP Consortium**

2023

EXPLORE

EDUCATE



ENGAGE

ANZIC Office

Research School of Earth Sciences
 Australian National University
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 ANZIC_IODP

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iodp.org.au

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 Front page: Erika Tanaka & IODP
 Back page: Simon George
 Above: Sandra Herrmann IODP,
 JRSO, Joe Cresswell

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ANZIC Chair's Overview

2023 has been a year of consolidation on the national front and an evolving international operating environment for ANZIC.

Our fully staffed national office hosted by the Australian National University has brought stability and leadership to our community which has enabled it to operate effectively both in terms of supporting our community and in undertaking extensive and necessary engagement with the international ocean drilling community.

Our consortium between the Australian and New Zealand marine research community continues to be strong and very effective.

It was very pleasing during the year to successfully obtain NCRIS funding for ANZIC which places our financial future on a more secure basis. This outcome was the result of several years of work by the ANZIC office. The funding will be managed through AuScope Pty Ltd, which has had a long-standing role in managing research infrastructure funds on behalf of the geoscience community. ANZIC will retain its independent oversight functions including the Governing Council and ANZIC office. An enormous thank you to all those who worked to achieve this very important outcome for Australian researchers who wish to be

involved in future scientific drilling. In addition, we have taken important steps towards obtaining membership of the International Continental Drilling Program (ICDP) and now have Australian representation on the governing bodies of the program. I fully expect that during 2024 we will be able to develop a clear research program for continental drilling that will attract international attention and participation.

One of the other challenges that has emerged over 2023 is the question of the shape of future ocean drilling global consortium. While it remains very clear that there is a strong desire to continue to address the very significant research questions that can only be answered by obtaining samples from the seafloor, there remain questions around the nature of future partnerships that will be necessary to undertake that sampling. At the time of writing the future of the *JOIDES Resolution*, which is an ageing vessel, is still being examined by the United States National Science Foundation. In addition, the Earth science communities of Europe and Japan are looking to the future and planning their involvement in ocean drilling. In addition, China has built a new research drilling vessel, *Meng Xiang*, that may be available to the international community.



Fortunately, Australian and New Zealand representatives have been welcomed as participants at various planning meetings ably lead by our Director and a range of community members. Consequently, we can provide our perspective and input into what is an evolving international operating environment.

This Annual Report documents many other highlights and achievements of our very active, dynamic, and diverse community.

Given we now have some stability in our leadership and funding I am very confident about the future of research drilling for

Australian and New Zealand researchers. I know that this access to a sampling capability via drilling will enable our researchers to be important players in tackling the many questions that remain about the development and evolution of our planet.

Dr Chris Pigram AM FTSE
Chair, ANZIC Governing Council

ANZIC Director's Report

ANZIC's post-COVID momentum continued to pick up through 2023. We supported several ANZIC researchers on five scientific drilling expeditions of the International Ocean Discovery Program (IODP), and there were many opportunities for engagement within the ANZIC community.

The biggest news of 2023 was the October announcement of ANZIC's successful bid for funding under the Australian Government's National Collaborative Research Infrastructure Strategy (NCRIS). This gives the A in ANZIC (Australia) funding clarity through to June 2027 and will help New Zealand make the case to their Ministry of Business Innovation and Employment (MBIE) to extend support beyond mid-2026.

Our NCRIS success was facilitated through AuScope, Australia's provider of research infrastructure to the national geoscience community. As a new member of the AuScope family, ANZIC adds access to international subsurface sampling infrastructure to an already broad scope of capabilities supported by AuScope.

Whilst many years of grants from the Australian Research Council's Linkage Infrastructure Equipment and Facilities scheme have served ANZIC well, the switch to NCRIS is a long-awaited change that is the culmination of efforts initiated by my predecessor Prof Leanne Armand and supported by AuScope CEO, Dr Tim Rawling.

With the new NCRIS funds secured, we

commenced discussions on Australian membership of the International Continental Scientific Drilling Program (ICDP). News of Australia joining New Zealand as ICDP members was well received at the conference held in Germany in June to mark 25(+2) years of ICDP.

As a relative newcomer to scientific drilling, the ANZIC Roadshow in February and March (see page 48) was well timed for me as an opportunity to meet and engage in person with our community. The value of this engagement was reflected in an up-tick of interest in joining our Science Committee and the taking up the various opportunities that we offer (e.g. ANZIC IODP Legacy Analytical Funding and our 2024 Marine Geoscience Masterclass – for which over 100 applications were received!).

Our Future DEEP (Future Drilling to Explore Earth's Past) workshop held in Hobart in April (see page 50) maintained the momentum and identified science priorities that provide guidance to our international partners as planning for the future continues.

In October, ANZIC hosted the IODP Forum in Wollongong (page 55), an annual international meeting to discuss the scientific progress of IODP. Beyond the excitement of visiting the Permo-Triassic boundary, a time of major geological upheaval, Forum participants discussed issues ranging from increasing awareness of IODP within the United Nations Decade of Ocean Sciences, to documenting IODP achievements over the last decade.



ANZIC's activities were expertly supported by the ANZIC Office team. We benefited immensely from Sarah Kachovich's vision and apparently unending energy, and from Kelly Kenney's ability to make things happen. After many achievements in a relatively short time, our Communications Officer, Jen Waters, decided to take up new opportunities. I am confident to say that Janelle Kennard, who took up the role in August, is already captivated by the world of scientific drilling!

Looking to the future, the workhorse of scientific ocean drilling for 45 years, the *JOIDES Resolution*, is sadly set to retire following Expedition 403 to the Fram Strait in July and August 2024. The community has argued hard to make the case to extend operations of 'the JR', but current circumstances make an extension unlikely.

Fortunately, endings bring new beginnings and our international partners continue to engage with us in planning for the future.

The European Consortium for Ocean Research Drilling (ECORD) and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC,

operators of Chikyu) are well advanced in plans for transitioning to the International Ocean Drilling Programme (IODP³).

Meanwhile, China launched their new scientific drilling vessel *Meng Xiang* ('Dream') at the end of 2023 and, despite the imminent retirement of the JR, the United States National Science Foundation will continue to direct substantial funding towards future scientific ocean drilling.

Through all this activity, I feel well settled into the ANZIC Director role and have enjoyed everything that comes with supporting the ANZIC community in maintaining its reputation as a valued partner on the international stage. I look forward to new opportunities and new achievements in 2024 as we build on 15 years of the ANZIC partnership.

A handwritten signature in black ink, appearing to read 'Dr Ron Hackney'. The signature is fluid and cursive, written on a white background.

Dr Ron Hackney
ANZIC Director

GeoDiscoveryNZ Report

2023 was an important year for GeoDiscoveryNZ, as we reflect on 15 years of Aotearoa New Zealand involvement in ANZIC. This milestone marks our continued commitment to transforming scientific drilling into action for people and the planet. Our international partnerships have played a key role in understanding of the Earth's climate system and natural hazards. We are actively facilitating proposal development and promoting leadership in bringing scientific drilling expeditions to our region.

Over the past 12 months we have been busy on several fronts, including support for expedition and workshop participation, proposal development, and grant awards. Additionally, we played a key role in developing a roadmap for ANZIC at the Future DEEP (Drilling to Explore Earth's Past) workshop.

Dr Georgia Grant (GNS) sailed on Expedition 400 NW Greenland Glaciated Margin (see page 26). We supported Georgia's attendance onboard the *JOIDES Resolution* and shared regular updates from Greenland on GNS Science social media. Georgia participated in several ship-to-shore educational events, including classroom connections with University of Otago, Te Herenga Waka- Victoria University of Wellington (VUW), and Dargaville school students, plus sessions with staff at GNS Science and the Antarctic Research Centre. Georgia is the first recipient of GeoDiscoveryNZ Post Cruise funding towards studying Greenland and Antarctic icesheet contributions to sea-level rise.

In November, the Sensitivity of the West Antarctic Ice Sheet to 2°C warming (SWAIS-2C) ICDP team deployed to Antarctica for its first drilling season, under the co-leadership of Richard Levy (GNS and VUW). Antarctica NZ delivered all equipment to the drill site at the Kamb Ice Stream. The first short cores were collected in late-December, before operations were halted due to technical challenges. Importantly, drillers, engineers, and scientists have gained significant hands-on field experience with a new custom-designed drilling system developed at the Antarctic Research Centre. A second expedition is planned for 2024/25 returning to the Kamb Ice Stream site.

We have been able to progress results and finalise publications from earlier expeditions to our region. Expedition 374: *Ross Sea West Antarctic Ice Sheet History* held a post-cruise meeting in Italy, co-led by Prof Rob McKay (VUW). That meeting coincided with other forums focused on the value of paleoclimate records from the Antarctic margin and Southern Ocean with the aim of identifying new drilling targets that could be obtained using IODP and ICDP style drilling operations. Dr Christina Riesselman (University of Otago) attended the post-cruise meeting for Expedition 383: *Dynamics of Pacific Antarctic Circumpolar Current*, in the USA.

We participated in a EUROFLEETS+ funded voyage of RV *Tangaroa* (Variation in Subduction Inputs along the Hikurangi Subduction Margin), during March and April, to acquire the second tranche of seismic reflection data in support of Hikurangi margin drilling proposals. We also participated in the USA National Science

Foundation RV *Thomas G. Thompson* voyage (March to April), which deployed a remotely operated vessel to download CORK observatory data. CORKs were installed in two drillholes in 2018, offshore Gisborne during IODP Expedition 375.

Our dedication to building local expertise and collaboration was further strengthened through support of two international ICDP Workshops in 2023. In January, Cécile Massiot (GNS) organised 40 scientists from 13 countries to attend the *Connections Among Life, Geo-Dynamics and Eruptions in a Rifting Arc (CALDERA)* Project Workshop in Tauranga. CALDERA aims to obtain drill cores, downhole measurements, and monitoring data from the Okataina Volcanic Centre to understand past eruptions and inform future volcano-tectonic hazards in rifted calderas. In late-August, Prof Chris Moy (University of Otago), led the ICDP workshop *Fiordland Assessment of Climate, Environment and Tectonics (FACET)* in Dunedin. The workshop aimed to develop priorities for long coring in Fiordland. In November, additional multi-channel seismic data were collected from three fjords, along with a suite of new piston cores intended to provide vital site survey information that will be incorporated into a full drilling proposal submission in 2024.

GeoDiscoveryNZ Legacy Analytical Funding (AILAF) supported projects across a range of disciplines and material recovered by past drilling at Brothers Volcano, Kermadec Arc, Wilkes Land,



Antarctica and in the Southern Ocean.

We have been able to support the next generation of students to attend the upcoming January 2024 ANZIC Masterclass in Queensland.

The Masterclass is a Geo-Education course centred around scientific drilling, specifically targeting high-achieving under-graduate students. Tertiary students from the three New Zealand member Universities were selected to participate and this year we selected one additional student from Waikato University, a non-member University, to generate more national interest and extend the talent pool.

GeoDiscoveryNZ was present at the Geosciences Society of New Zealand annual conference in December 2023, held at Victoria University, Wellington. The focus of our booth and key note presentation, given by Dr Ron Hackney, was on future opportunities for Australia and New Zealand in international scientific drilling.

We are grateful for the continued support from GNS Science and the Aotearoa New Zealand Earth science community. The sustained engagement is instrumental in our mission. We look forward to partnering with you on building a more resilient future.

A handwritten signature in black ink that reads "S. Henrys".

Dr Stuart Henrys
New Zealand Lead Representative and
GeoDiscoveryNZ Chair

About ANZIC

ANZIC is the Australian & New Zealand International Ocean Discovery Program (IODP) Consortium, part of an international marine research collaboration exploring the Earth under the sea.

ANZIC enables Australian and New Zealand scientists to participate in IODP, which undertakes scientific ocean drilling throughout the world ocean to obtain continuous cores of rocks and sediments to address scientific problems of global interest: deep life, planetary dynamics, climate and geohazards.

ANZIC Membership

ANZIC is a strategic collaboration between 19 of Australia's and New Zealand's leading universities and scientific organisations.

Our thriving and passionate community is highly engaged, working in unison to advance marine geoscience in our region and beyond.

ANZIC Members

Funders:

- Australian Government
- Australian Research Council
- MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
- HIKINA WHAKATUTUKI

Members:

- THE UNIVERSITY OF WESTERN AUSTRALIA
- Curtin University
- THE UNIVERSITY OF QUEENSLAND AUSTRALIA
- QUT Queensland University of Technology
- MACQUARIE University SYDNEY AUSTRALIA
- THE UNIVERSITY OF SYDNEY
- Australian Government Geoscience Australia
- UNSW SYDNEY
- Australian National University
- UNIVERSITY OF WOLLONGONG AUSTRALIA
- UNIVERSITY OF AUCKLAND Waipapa Taumata Rau NEW ZEALAND
- NIWA Ta hōroa Nukurangi
- TE HERENGA WAKA WELLINGTON VICTORIA UNIVERSITY OF WELLINGTON
- GNS SCIENCE
- University of Otago OTAKOU WHAKAHIHU WAKA
- THE UNIVERSITY OF ADELAIDE
- THE UNIVERSITY OF MELBOURNE
- MONASH University
- UNIVERSITY OF TASMANIA

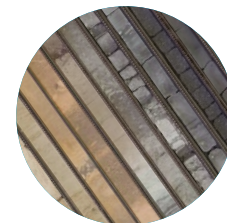
What We Do



Connect scientists with ocean drilling infrastructure

Participating in international expeditions of large, specialised coring vessels provides unique research opportunities to Australian and New Zealand scientists. We fund travel, berth costs, and up to \$40,000 for post-cruise analytical work.

In 2023, ANZIC-sponsored expeditioners participated in six expeditions, from Antarctica to Greenland (see pages 20-32).



Fund & support studies of previously collected ocean drilling samples & data

Further analysis of legacy samples reveals answers to critical scientific questions and rapidly delivers research results in a wide variety of fields.

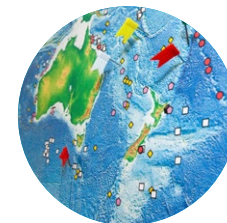
In 2023, we enabled 20 groundbreaking projects by awarding over \$350,000 across Australia and New Zealand (see pages 16-19).



Equip the next generation of scientists

Matching exceptional students and early career scientists to specialist international training opportunities ensures they have the skills to fully participate in future international scientific drilling programs.

In 2023, we funded 5 students to attend IODP Summer Schools internationally (see pages 40-43).



Advocate drilling proposals focused on our region

To align future international scientific drilling projects with the needs of Australian and New Zealand scientists and policy makers, ANZIC actively supports researchers to develop, submit and progress IODP proposals (see pages 14-15).



Nurture international scientific relations and synergies

We organise and attend global events (see pages 46-55) and represent our region on key collaborative boards (see pages 58 and 59).

Expanding our understanding of Earth

In 2023, ANZIC-affiliated researchers continued to expand the frontiers of our knowledge of Earth's dynamic history, processes, structure and future, with 76 significant papers published using IODP science.

EXPLORE

Beneath the seafloor lie records of 200 million years of Earth's climatic, biological, chemical and geological history – just waiting to be explored!

Scientific ocean drilling programs give scientists access to these records via sub-seafloor data and samples of sediment, rock, fluids and living organisms.

Using these, we can transform our understanding about Earth's dynamic history, processes and structure, and help predict the future.

ANZIC enables scientists in Australia and New Zealand to explore these records by funding and supporting:

- development of proposals for drilling new sites of regional interest
- participation in international scientific drilling expeditions
- post-cruise research and collaboration
- research projects using previously collected (legacy) samples and data.

Photo credits: Marley Parker, ECORD,
Patty Strandring, IODP.



IODP Drilling Proposals

Scientists at ANZIC member institutes in Australia and New Zealand continue to lead and contribute to the development of new IODP drilling proposals. Their significant expertise continues to be at the forefront of ambitious drilling project proposals which benefit our region.

There are currently 92 IODP proposals actively being developed and pursued. They cover a broad range of projects across the IODP Science Plan themes and aim to unravel geological mysteries, understand hazards, study climate change and explore our biosphere.

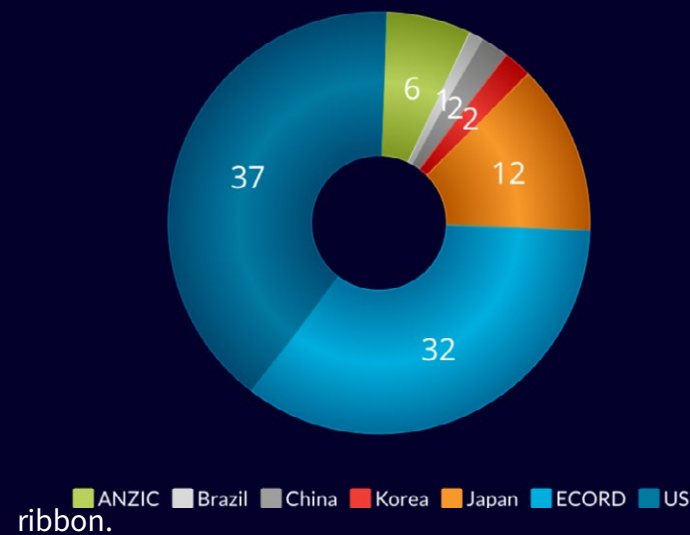
ANZIC's strong contribution is noteworthy. Of the 92 proposals, six are led by ANZIC proponents. Of the total proponents across all projects (1168), 71 are from ANZIC-affiliated institutions. ANZIC scientists are *lead* proponents on the following proposals:

Proposal 751: Prof Robert McKay – Victoria University of Wellington. Ocean-ice sheet interactions and West Antarctic Ice Sheet vulnerability: clues from the Neogene and Quaternary record of the outer Ross Sea continental margin.

Proposal 781B: Dr Laura Wallace – GNS Science. Unlocking the secrets of slow slip by drilling at the northern Hikurangi subduction margin, New Zealand: Riser drilling to intersect the plate interface.

Proposal 871: Dr Ron Hackney – Australian National University. First deep stratigraphic record for the Cretaceous eastern Gondwana margin: Tectonics, paleoclimate and deep life on the Lord Howe Rise high-latitude continental

Affiliation of Lead Proponent
ACTIVE IODP PROPOSALS



Proposal 993: Dr Fabio Caratori Tontini – GNS Science. From arc splitting to oceanic spreading: testing models of back-arc basin formation.

Proposal 998: Prof Robert McKay – Victoria University of Wellington. Tracing Antarctic Cryosphere Origins to Climate And Tectonics (TACOCAT).

Proposal 1002: Dr Taryn Noble – University of Tasmania. Totten Glacier Climate Vulnerability under varying Neogene climate conditions: Lessons for East Antarctic Ice Sheet climate sensitivity.



Sunset over the port side of RV *Tangaroa* during TAN2305

Supporting an IODP drilling pre-proposal: collecting new data

For 10 days in March and April, the Research Vessel *Tangaroa* (TAN2305) successfully collected around 1400 km of seismic reflection data across a broad region of the Hikurangi margin. The main objective of the international voyage was to provide site-survey data for IODP drilling proposal 959.

The Hikurangi margin - off Aotearoa New Zealand's North Island - is the largest source of earthquake and tsunami hazard and shares many similarities with the source region of devastating magnitude 8-9 earthquakes that have struck the Japan (2011) and Sumatra (2004). However, the potential for such hazards remains poorly known and diagnosing the slip behaviour of the subduction zone plate boundary fault is a critical gap. Legacy seismic reflection data primarily images the shallow accretionary wedge, and only a few profiles cross

the deformation front, capture the incoming sedimentary section, and image the key reflector that is the locus of the plate interface fault. The Variation In Subduction Inputs along the Hikurangi subduction margin (VISIT) project seeks to address this gap. Importantly, an IODP drilling proposal (Pre-Proposal 959) has been submitted to target the frontal plate interface fault and recover material hosting the range of slip behaviour observed at Hikurangi.

TAN2305 was funded by EUROFLEETS+, an alliance of European marine research infrastructure.

ANZIC IODP Legacy Analytical Funding (AILAF)

Every year ANZIC provides legacy grants to scientists in a range of fields for analytical research using the vast library of cores, samples and data already collected by scientific ocean drilling. Our grants continue to facilitate the rapid production of high-quality research outputs and publications.

Our 2023 funding round received an excellent response, with 25 applications for a total of \$450,475 requested funding. Applications were received from 21 Australian and four New Zealand teams, representing 11 of our consortium member institutions. Around a third of these were led by women while half were led by early-mid career applicants. Ultimately, 20 applications were funded, to the value of \$350,269.

Successful funding recipients and projects for 2023:

Dr Linda Armbrecht, University of Tasmania.

Characterising radiolarian assemblage change through time: a paleo-genomics approach (IODP Exp. 382)

Dr Catherine Beltran, University of Otago.

Comparison of organic sea surface thermometers in the Southern Hemisphere.

Dr William Defliese, University of Queensland.

Halogens in coral as paleoenvironmental proxies.

Dr Grace Duke, Victoria University of

Wellington. Extension of stable isotope records at Site U1361 on Wilkes Land continental rise, East Antarctica.

Dr Colin Firth, Macquarie University.

What really killed the Dinosaurs? A Southern Hemisphere perspective using novel geochemical proxies.

Prof Simon George, Macquarie University.

Organic matter inputs, depositional environment, and thermal maturity of Paleogene sedimentary rocks in the deep-water South China Sea.

Dr Jacqueline Halpin, University of Tasmania.

Past ice sheet change in western Wilkes Land, East Antarctica.

Dr Martin Jutzeler, University of Tasmania.

Volcanic Record from West Antarctica, Amundsen Sea, IODP 379.

Dr Sarah Kachovich, Australian National University. ANZIC Mini IODP Cores Education Project.

Dr Uwe Kirscher, Curtin University. Enhanced dust influx into the oceans related to hyper-arid periods in Arabia in the Pliocene.



ANZIC Director, Ron Hackeny and ANZIC Manager, Sarah Kachovich, with historic core samples at the Gulf Coast Repository in Texas.

Dr Stefan Loehr, University of Adelaide.

75 Myr record of seawater metal isotope composition from authigenic clays.

Dr Samuel Marx University of Wollongong.

A central Pacific sediment record of Australian dust export. This project is spotlighted on pages 18-19.

Dr Indrani Mukherjee, University of New South Wales. Modern oceans tell an ancient story.

Dr Christian Ohneiser, University of Otago.

Is the stability of Antarctic Bottom Water production really under threat?

Dr Shane Rooyakkers, GNS Science.

Magmatic volatiles, metals, and the magmatic-hydrothermal connection at Brothers Volcano.

Dr Jonathan Tyler, University of Adelaide.

Interglacial temperature change in the

Mediterranean region through the last 630 thousand years.

Sharmaine Verhaert, University of Adelaide.

Unravelling the tectonic and metamorphic framework of subglacial East Antarctica using detrital garnet Lu-Hf geochronology.

Dr Bryant Ware, Curtin University. Towards greater IODP digital discoverability via AusGeochem: A proof of concept.

Prof Joanne Whittaker, University of

Tasmania. South Tasman Rise subsidence and its role in the onset of the Antarctic Circumpolar Current.

Dr Thomas Williams University of Tasmania.

Identifying Signals of Antarctic Ice Mass Loss during Past Warming.

AILAF Project spotlight

Tracking the travels of dust

Dr Sam Marx
University of Wollongong

We all know dust can travel on the wind... and get into everything – usually in small amounts. For researchers like Dr Sam Marx, at the University of Wollongong, that makes studying dust tricky, because it can be hard to detect amongst other geological processes.

Yet, tracking dust – how much is blown, from where, and where it travels to – is important for understanding Earth systems and modelling climate change.

“Dust is an important component of Earth systems and both drives and responds to climate change,” said Dr Marx. “Dust changes atmospheric heat absorption and seeds cloud formation. It's also an important source of key nutrients for remote ocean environments, fertilising phytoplankton growth which draws CO₂ into the oceans.”

Yet dust transport is poorly constrained in current global climate models – a situation Dr Marx is keen to redress.

Ocean cores could hold the key
Australia's iconic red dust is recognisable in deep ocean cores. Deposited in the central Pacific after an 8000km journey from Australian deserts, the dust is strikingly clear in material retrieved by IODP Expedition 329 as fine-grained, red-coloured

sediment often referred to as ‘Pacific Red clay.’

For Dr Marx, the ocean cores offer a crucial and unique opportunity which he is planning to exploit using funds from ANZIC's 2023 AILAF Grants.

“The cores contain a pure dust signal – relatively free from other sediments – that is very difficult to obtain in any other way. It's like having had dust-capture equipment stationed thousands of kilometres from Australia for millions of years.” Dr Marx explained.

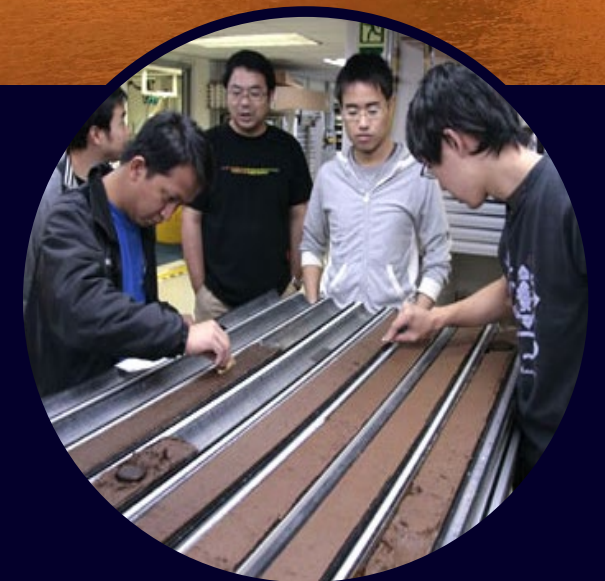
“This is an outstanding opportunity to increase our understanding of dust contributions and dust chemistry.”

By analysing the sedimented dust and comparing it to the well-characterised geochemical properties of source materials, Dr Marx, along with collaborator Balz Kamber at QUT in Brisbane, plans to precisely map the Australian and New Zealand dust sources. Then the geochemical changes which occur during its long flight can be closely examined.

“We're looking to construct detailed geochemical signatures of the aeolian (wind-blown) material, and how that signature changes with the distance travelled. We'll analyse the core samples – at

Dust storm reaches the harbour in Sydney.
Photo credit: Gordon Wrigley on Flickr

Left: Expedition 329 cores containing pacific red clay.
Photo credit: Carlos Alvarez Zarikian, IODP USIO/TAMU



various distances from the dust source in Australia – for major and trace elements, mineralogy and several isotopes.”

These signatures can then be used as a key to identify the often long-distance source of other dust deposits. This will give researchers a clearer understanding of global dust transport.

“If we can construct these signatures,” he said, “we start to open a bigger world of possibilities of reconstructing dust movement across the landscape and globe over time.”

Winning an AILAF Grant

For Dr Marx, IODP offered a new world of data.

IODP has meticulously maintained and curated a repository of sub-seafloor cores amounting to approximately 500km - a treasure trove of valuable samples. ANZIC's legacy project grants encourage fresh perspectives from a wide pool

of researchers to tap into the latent potential of this vast repository and promote greater cross-disciplinary collaboration.

“When I first started searching, it was easy to get lost in the core repository database!” laughed Dr Marx.

“Although if you are from a member institution it is possible to get access to samples, it's the AILAF Grant from ANZIC that makes the work possible in this case, with the \$20,000 providing for detailed geochemical analysis of the samples.”

“The more accurately we can geochemically characterise these samples, the better we can constrain dust fingerprints, and the AILAF funding is critical to that.”

Expeditions

By participating in international scientific drilling expeditions, Australian and New Zealand scientists gain unparalleled opportunities to advance their research as part of an integrated science party, retrieving and analysing critical core samples from some of the world's most challenging environments. ANZIC selects scientists with critical expertise and pertinent research focus to ensure the success of each expedition, and maximise the return on investment for our region.

ANZIC Expeditioners

In 2023, ANZIC-sponsored scientists participated in six expeditions:

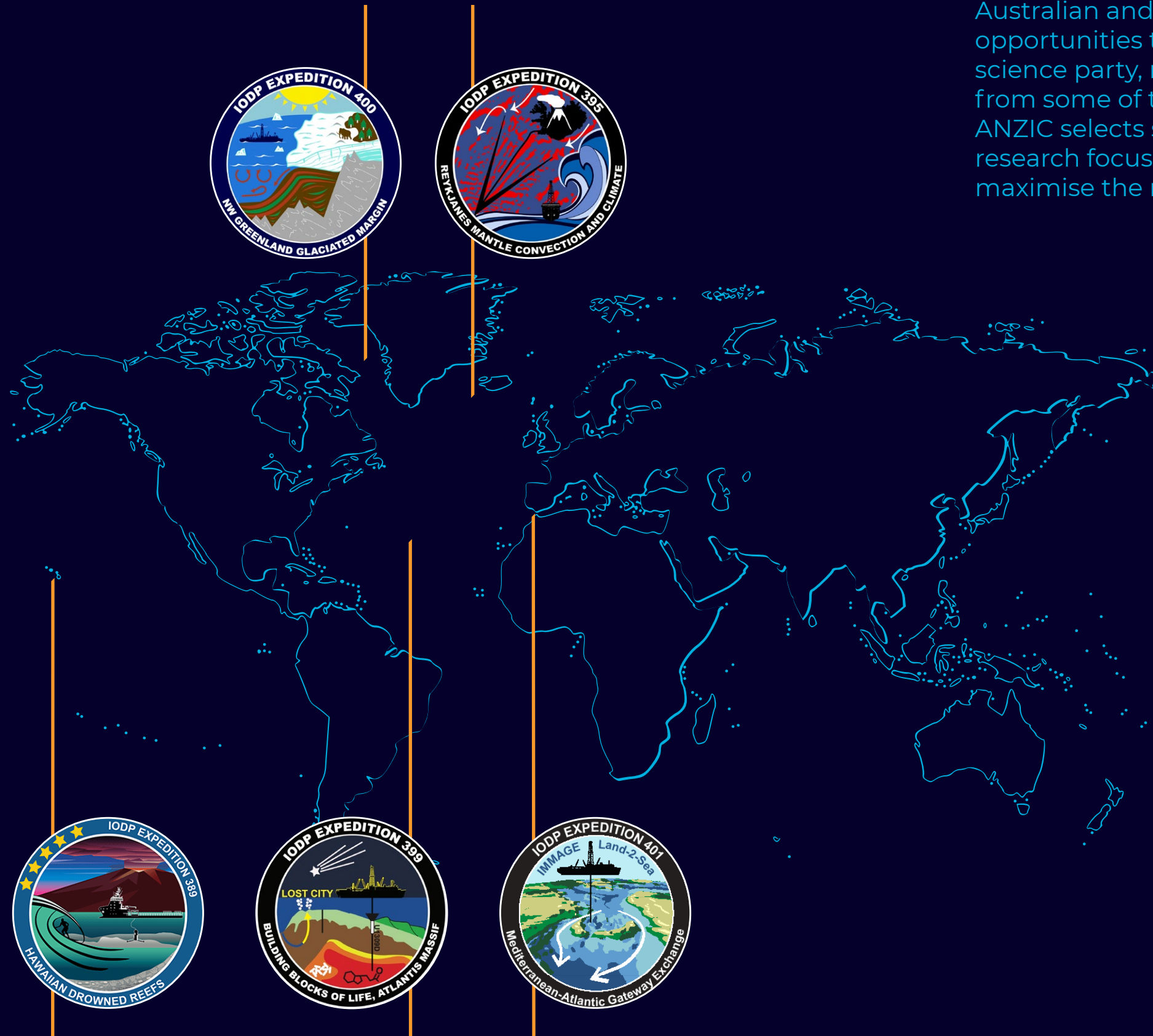
- IODP Expedition 395: Reykjanes Mantle Convection and Climate
- IODP Expedition 399: Building Blocks of Life, Atlantis Massif
- IODP Expedition 400: NW Greenland Glaciated Margin
- IODP Expedition 389: Hawaiian Drowned Reefs
- IODP Expedition 401: Mediterranean-Atlantic Gateway Exchange
- ICDP (International Continental Scientific Drilling) SWAIS2C project: Sensitivity of the West Antarctic Ice Sheet to 2°C.

Expedition highlights

These expeditions recovered more than 17,700 metres of core, which were processed through shipboard laboratories and made available for research investigation.

The year saw two new records for scientific drilling: penetrating 1268 metres below the sea floor to probe deeper than ever into the building blocks of life; and collecting sediment samples close to the centre of the West Antarctic Ice Sheet.

Read the expedition reports on the following pages to learn more.



IODP Expedition 395

Reykjanes Mantle Convection and Climate

Dr Katharina Hochmuth
University of Tasmania

Expedition 395 had, like many expeditions in the last years a long history of cancellations, postponements and many, many video calls before we were finally boarding the *JOIDES Resolution* in Ponta Delgada (Portugal) in June.

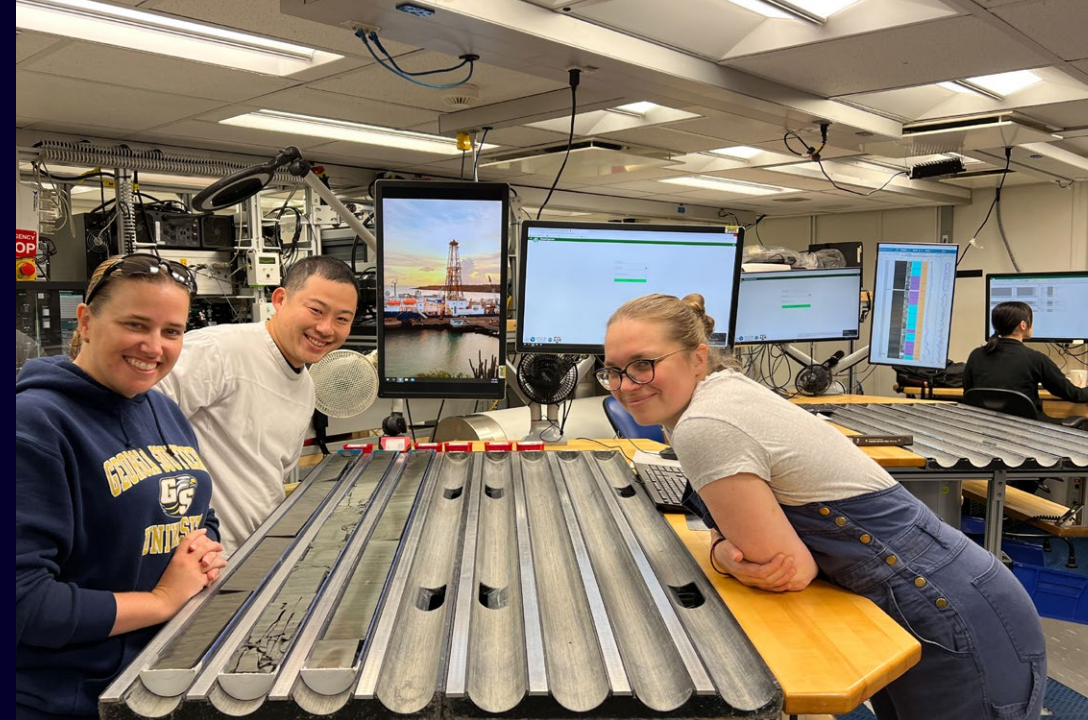
The expedition aimed to investigate the influence of the Iceland Plume on the seafloor spreading south of Iceland, where so-called V-shaped basement ridges have formed. The sediments above the basaltic basement will give us new and exciting insights into the circulation of the North Atlantic, especially the water exchange with the Arctic Ocean across the Greenland-Iceland-Scotland oceanic gateway. Unlike 'our' Tasmanian ocean gateway in the Southern Ocean, this gateway might open and close in concert with the activity of the Iceland plume changing global ocean circulation patterns in 'the geologic blink of an eye'.

After leaving the Azores, we made our way North to collect drill cores as well as downhole logs at four sites of our initial six target sites. During Expedition 395C in 2021, most of our sites had already been visited (finalising operations at two), but without a science party on board. The collected sites represent a transect across the North Atlantic from the westernmost site on the Eirik Drift, 200km offshore the Greenland coast,

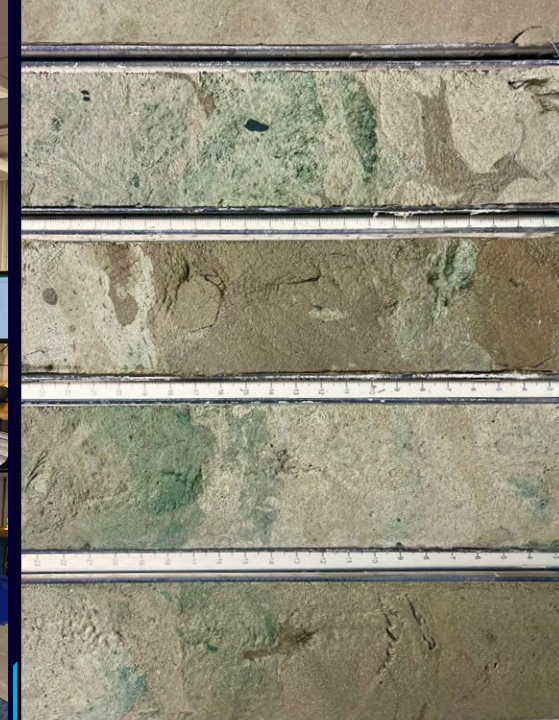
across the Mid-Atlantic Ridge 500km south of Iceland to the Gardar Drift in the East. To tackle our combined paleoceanographic and deep Earth questions, we drilled sedimentary successions as well as oceanic crust of various ages, which is a new approach in this region. In total Expeditions 395 and 395C collected over 6km of core and had a recovery rate of 84%, which is exceptional considering that we drilled into oceanic basement at five of the sites - an historically low-recovery environment.

I joined the scientific team for downhole logging and physical properties analysis. This position somewhat bookends the scientific work on most of the drillsites. As the physical properties specialist, I had the pleasure to always be the first one of the science team to handle and look at the core after the wonderful technical team had received it from the drill team. But I was also closing out the scientific program with the downhole logging after the coring was terminated.

My main personal research interests is related to our paleoceanographic objectives. By using the information downhole logs and cores provided I aim to groundtruth paleo-seafloor reconstructions, which are needed, for example, by the modelling community to provide more accurate ocean and climate models of the past. This approach centres



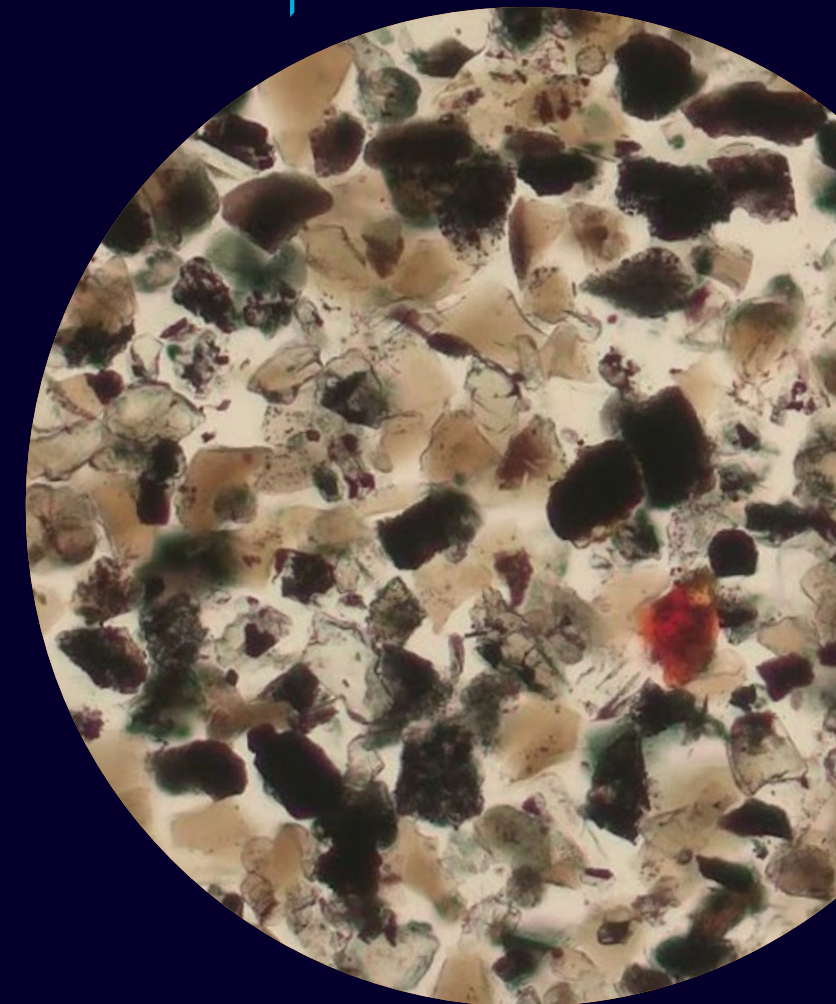
Sarah Friedman, Takuma Suzuki and Katharina Hochmuth (right) at the core description table.
Photo credit: Jennifer Field, IODP



Some cores from the expedition, and below, core samples under the microscope.
Photo credit: Katharina Hochmuth

not only on how the seafloor looked in the past, but also what sedimentation mechanisms contributed to the many hundreds of meters of sediment piled up at some of our sites.

By far the most exciting lucky draw of cores come at the end of the expedition while we were coring 30 Ma old sediments and oceanic crust. We recovered cores in what felt like all the colours of the rainbow, or - better said - all the colour Munsel ever imagined. So even the most glacial-interglacial-loving scientists had to admit that hard rock coring just produces the prettiest of cores!



IODP Expedition 399

Building Blocks of Life, Atlantis Massif

Prof Gordon Southam
University of Queensland

The Atlantis Massif oceanic core complex at 30°N; Mid-Atlantic Ridge; is renowned for the Lost City Hydrothermal Field (LCHF), venting alkaline fluids rich in hydrogen and methane at temperatures ranging from 40-90°C. IODP Expedition 399: *Building Blocks of Life, Atlantis Massif* sought to explore the ‘plumbing network’ that feeds the LCHF.

The Earth’s mantle composition, evolution and influence on early Earth’s lithosphere, hydrosphere, atmosphere, and biosphere has been primarily inferred via surface sampling and indirect methods. In Expedition 399, we recovered a 1268 m deep section of serpentinized abyssal mantle peridotite, interleaved with thin gabbroic intrusions. Further, extensive hydrothermal fluid-rock interaction were recorded across the full depth of the core, which was overprinted by oxidation in the upper 200 m, with alteration patterns that are consistent with vent fluid composition in the nearby LCHF, a model site for studying the links between serpentinization processes and life, which could potentially occur on other planetary bodies.

Working alongside a team of microbiologists, organic and inorganic geochemists, petrologists, structural geologists and geophysical modellers,

representing eight countries, was a wonderful experience. There were new friendships, new collaborations beyond the current project, and of course the new samples of upper mantle that we collected and will share in support of our science.

Expedition 399 has found acclaim beyond the science community as well. It was featured in a Washington Post article by Carolyn Johnson: [In a geologic triumph, scientists drill a window into Earth’s mantle](#) and – as a real measure of recognition – a [series of Sherman’s Lagoon comics](#) from June 26 to July 5, 2023.

Our formal shifts ran 12 hours a day, seven days a week (mine went from 1300 to 0100), though we typically worked beyond our shifts because we didn’t want to miss anything exciting (FOMO!) and to contribute to our day jobs.

The expedition was incredibly successful, drilling a new, record-breaking hole located approximately 800 m north of the LCHF. Hole U1601C was drilled 1268 m into this peridotite-dominated system, well beyond the previous 201 m record. The entire scientific party were thrilled to see every section of these exceptional cores, and for the microbiologists, a glimpse into the deep, serpentinite-hosted seafloor biosphere.

“The expedition was incredibly successful, drilling a new, record-breaking hole 1268 m into this peridotite-dominated system, well beyond the previous 201 m record. The entire scientific party were thrilled to see every section of these exceptional cores.”

– Prof Gordon Southam

I had anticipated collecting up to 150 samples, but finished with 752 samples of peridotite, gabbro and water for materials analyses, including mineral carbonation, and life in extreme environments studies. Hole 1309D has proven to be particularly exciting, producing a low temperature dissimilatory sulfate reducing bacterial enrichment.

Group highlights linked with deep life exploration include:

- Recovery of the most complete record of mantle ever collected by ocean drilling.
- Detection of highly elevated concentrations of molecular hydrogen in borehole fluids, recording active serpentinization.
- Documentation of changing hydrothermal alteration of mantle rocks with depth, providing the opportunity to reconstruct the serpentinization process, including the formation of molecular hydrogen and abiotic synthesis of organic compounds.
- The drilling success provided an unprecedented opportunity for the microbiology group on the ship to preserve uncontaminated rock samples for on-ship and future on-shore analyses.

What an adventure! My thanks to the ANZIC community for their generous support.



Gordon (left) with Johannes Lissenberg, taking samples of a core for analyses during Expedition 399.
Photo Credit: Erick Bravo, IODP JR50

IODP Expedition 400 NW Greenland Glaciated Margin

Dr Georgia Grant
GNS Science

I boarded the *JOIDES Resolution* in Reykjavik, Iceland, in August, travelling as a sedimentologist on Expedition 400 to Northwest Greenland, Melville Bay.

Expedition 400 targets a sequence of sediments deposited on the Greenland continental shelf to recover the first proximal record of the northern Greenland Ice Sheet history throughout the Cenozoic (last 66 million years). From early inception of the Greenland Ice Sheet during the Oligocene/Miocene (~30-5 Ma) to the extent of deglaciation during the Pleistocene (last 2.5 Myr), the expedition set out to investigate the ice sheet configuration under various climate conditions with a goal of understanding oceanic, atmospheric, orbital and tectonic drivers.

My own research seeks to constrain the relative contributions of the Antarctic and Greenland ice sheets to global sea level during warmer climates when atmospheric CO₂ was higher than pre-industrial values (~280 ppm).

The outstanding question remains - how much does the Greenland Ice Sheet contribute and does it respond in-phase with the Antarctic Ice Sheets?

This is important for three reasons. Firstly the

amount that each ice sheet contributes tells us how sensitive they are to warming – should we expect a complete retreat of the Greenland Ice Sheet or will a small ice cap remain? Secondly, the phase relationship will tell us the fundamental response of ice sheets to changes in incoming solar radiation and indicate a pattern of future sea-level rise. Thirdly, the pattern of global sea-level rise depends on where the ice melts from.

Meltwater from Antarctica will raise sea level more in the Northern Hemisphere, due to the loss in gravitational attraction by the ice sheet to regionally proximal sea level and further distribution from Earth's rotation. Equally, meltwater sourced from Greenland will raise sea-level more in the Southern Hemisphere around New Zealand and Australia.

Determining where, when and how much ice sheet retreat occurred in the past will provide important constraints for our future.

Having recently returned from the sampling party in Bremen, Germany, the value of participation in an IODP expedition, and the IODP programme is evident.

It is clear to see how much Australia and New

Icebergs and sunsets featured on Expedition 400.
Right: Georgia on deck on a sunny day.
Photo credits: Zenon Mateo, Erick Bravo, IODP JRSO



Zealand and our scientists have benefitted from our membership. These international collaborations are long lasting and as such have provided a platform for our science and scientists on the global stage.

I'm deeply grateful to have experienced the wealth of expertise on and off the ship required to run an expedition for the benefit of generations to come.

Since returning from Expedition 400, Georgia has been awarded a \$360,000 Marsden Fast Grant for Early Career Researchers (managed by Royal Society of New Zealand) to pursue this line of research. She was also selected as the 2023 New Zealand candidate for the UNESCO- L'Oreal For Women In Science Fellowship that will help to support international collaborative research on the Expedition 400 results.

“It is clear how much Australia and New Zealand and our scientists have benefitted from IODP membership. These international collaborations are long lasting and as such have provided a platform for our science and scientists on the global stage.”

– Dr Georgia Grant

IODP Expedition 389

Hawaiian Drowned Reefs

Prof Jody Webster
University of Sydney

Expedition 389 was operated by ECORD (European Consortium for Ocean Research Drilling) on a Mission-Specific Platform. It targeted fossil coral reefs surrounding Hawai'i – reefs that were drowned by past sea-level rises and subsidence of the crust as the archipelago formed.

The very rapid subsidence in this region created a unique set of conditions that can provide an expanded, high-resolution record in which we can examine very rapid changes in the past – events such as rapid deglaciation and ice sheet collapse.

Corals store past environmental conditions in their skeletons. So there's a unique archive of sea-level, climate change and reef response preserved in these fossil reefs. Using them to look back in Earth's history will provide valuable insight into the mechanisms that cause climate change.

During the offshore phase of the expedition – from August to October – a total of 425 metres of core was recovered from below the seabed at water depths from 130 to 1240 metres.

The expedition built on previous IODP missions to Tahiti (Expedition 310) and the Great Barrier Reef (Expedition 325).

The expedition was an incredible adventure – filled with many ups and downs.

"Overall we collected a truly spectacular sequence of fossil reef material (~ 340 m) that spans important intervals over the past 500,000 years."

It will enable us to decipher, in unprecedented detail, how sea level, paleoclimate and the reef ecosystem has changed over the past 500,000 years, particularly during periods of rapid global change. We will be able to focus in on several of the crucial, but poorly understood, glacial terminations.

We are also delighted to have recovered many samples of annually banded fossil corals that will be used to obtain, for the first time, detailed records of monthly changes in oceanographic conditions from past periods that were different than today.

The idea is to use this data to inform predictions of future Pacific-wide climate change.

The recovered fossil reef cores also illuminate how the health and growth of these coral reef systems were impacted by rapid changes in sea level and climate over a range of different times scales.



A view of Hawai'i's Mauna Kea from the deck.

Left: Jody inspecting a core.

Below: Luzie Schnieders and Jody Webster with a core which captured the initiation of reef growth on basement. Photo credits: Marisa Rydzy, ECORD, IODP, Hannah Grant, Marley Parker, ECORD IODP



As climate change puts the world's reef systems under pressure, the results are more important than ever. We can look at how reefs recovered from past disturbances. How they died and reassembled, if the same ecological communities came back.

After being CT scanned in the UK, the cores will be shipped to Germany for the Onshore Science Party in February 2024 at the IODP Bremen Core Repository. The entire Expedition 389 Science Party – including ANZIC supported on-shore participant, Prof Helen McGregor (University of Wollongong) – will gather to carefully split, hyperspectrally scan and describe the cores in detail. Other standard IODP measurements will be made, and samples taken for postcruise research which will be carried out in labs around the world.



IODP Expedition 401 Mediterranean–Atlantic Gateway Exchange

Prof Simon George
Macquarie University

I was privileged to sail on Expedition 401, for eight weeks from early December. The expedition was the third last one on the stalwart drilling ship, the *JOIDES Resolution*.

We completed seven holes at four sites and were extraordinarily lucky with the weather, given this was mid-winter in the Atlantic. We drilled two new sites off the Iberian Peninsula, U1609 and U1610, and re-occupied the deeper water Site U1385 in order to extend the previous drilling that was only to base Pliocene deeper into the Miocene, and in particular to recover the Messinian. We finished the drilling campaign in the Mediterranean with two sister holes in the Alboran Sea (U1611), off the south of Spain.

This IODP expedition is part of the Land-to-Sea project IMAGE: Investigating Miocene Mediterranean-Atlantic Gateway Exchange. It also involves future International Continental Drilling Program (ICDP) onshore drilling in Spain and Morocco. We are investigating what happened before, during and after the Mediterranean Messinian Salinity Crisis (MSC), which occurred from 6.0 to 5.3 Ma during the last part of the Miocene.

The MSC occurred when the Mediterranean became isolated from the Atlantic, resulting in a 'salt giant', with 1.5 km of halite deposited across the Mediterranean sea floor, taking about ~5-10%

of the ocean's salt, and forming plenty of gypsum deposits. Eventually the Strait of Gibraltar opened, the ocean rushed in, and saline Mediterranean Outflow Water (MOW) started influencing the world's climate, notably making Greenland warmer and Antarctica cooler, shifting the inter-tropical conversion zone, and influencing monsoon and storm tracks.

We are interested in tracing what happened to the MOW over time, and three of our drill sites were located in the Atlantic Ocean to recover the sediments that recorded that history (some amazing sediments termed contourites!). Our fourth drill site, in the Alboran Sea, was situated on a possible palaeo-connection between the Mediterranean and the Atlantic, the Betic Corridor, that ran through southern Spain and which will also be targeted by ICDP drilling in Phase 2 of IMAGE. However, the results from Site U1611 suggest there was deep water isolated basin here during the Messinian, with anoxic bottom waters, a quite surprising and important finding.

In Morocco the Rifian Corridor will be the last part of the IMAGE ICDP drilling, which will investigate that palaeo-connection.

Over the whole of Expedition 401 we recovered 2.6 km of core, at an amazing 82% recovery. We have used full and half length Advanced Piston Corer drilling for the unconsolidated sediments, a little



Simon George discusses a core section half on the description table with Co-Chief Scientists Rachel Flecker and Emmanuelle Ducassou.
Photo Credit: Erin Winick Anthony & IODP



Extended Core Barrel drilling, and Rotary Core Barrel drilling using a new type of bit that gave fantastic recovery for consolidated rocks.

I worked the day shift (midday to midnight) as part of the sedimentology team, which meant I had the chance to closely examine and describe the sediments on the core table. I also contributed to smear slide examination of the unconsolidated sediments, and thin section work on the few lithified rocks that we recovered.

As well as the science, I took plenty of photos. One highlight was the visit of a Minke Whale, much to the delight of the day shift. With Kellan, one of the Outreach officers on board, we hosted two live ship-to-shore broadcasts for the National Youth Science Forum, in Canberra and Brisbane. It was great to engage with these young scientists, who had plenty of questions for me in the Q&A after the virtual tour around the ship and labs.

There was a hint of sadness on the ship, as the *JOIDES Resolution* is in its last year of IODP operations. There were many fun moments though, notably the Christmas and New Year celebrations, and our fun with shrinking decorated polystyrene cups that took a trip to the sea bed attached to the underwater camera. Many thanks to the excellent support from the ANZIC office in Canberra for my participation in this expedition.

SWAIS2C

Sensitivity of the West Antarctic Ice Sheet to 2°C

ANZIC-supported scientists are part of an international team on the ICDP (International Continental Scientific Drilling Program) SWAIS2C project, drilling under the Ross Ice Shelf to better understand the sensitivity of the West Antarctic Ice Sheet to our warming climate.

The West Antarctic Ice Sheet holds enough ice to raise global sea level by 4.3 metres if completely melted and the unknown response of the ice sheet to future warming remains a significant challenge for modelling future sea level rise. The SWAIS2C project will use geological records to reveal how sensitive the Ice Sheet was to past warming events and to understand past and current drivers and thresholds in the dynamics of the ice sheet. This will support better projections of ice sheet response and sea-level changes up to 2°C of warming.

SWAIS2C is a global collaborative effort, involving over 120 individuals from 35 international research organisations.

ANZIC is proud to have secured an Australian contribution to funding for the project, enabled by AuScope's Opportunity Fund, and to support three off-ice participants: Dr Linda Armbricht (University of Tasmania), Dr Agathe Lisé-Pronovost (University of Melbourne) and Dr Rebecca Parker (University of New South Wales).

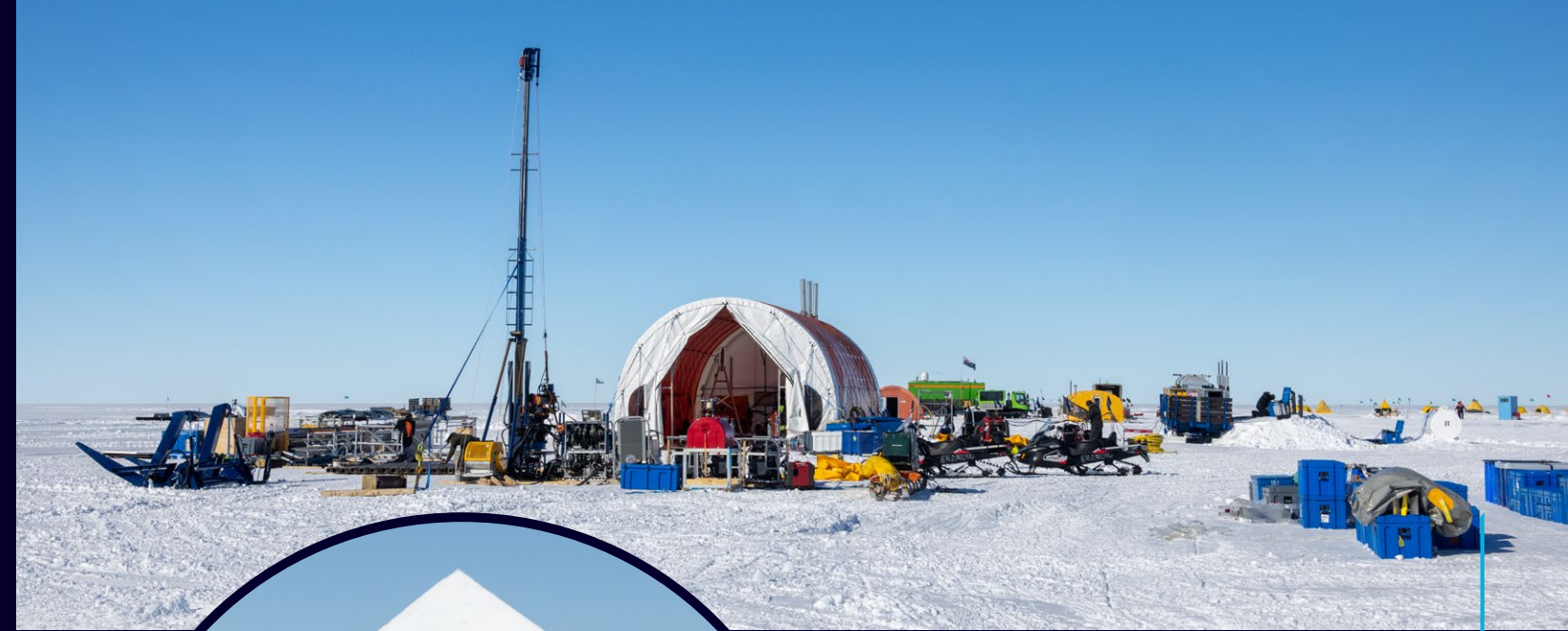
The on-ice adventure began in November, with a team of 26 travelling to the Siple Coast for the summer drilling expedition.

After making the 1200 km traverse from the Scott Base, the on-ice team set up camp near the drill site at the Kamb Ice Stream on the margin of the Ross Ice Shelf. Drilling to retrieve sediment cores deep into an Antarctic seafloor had not previously been attempted so far from a base and so close to the centre of the West Antarctic Ice Sheet.

A custom-designed hot water drilling system (the AIDD – Antarctic Intermediate Depth Drill) was used to melt through nearly 580 metres of ice, breaking through the base of the ice shelf into the 55 m-deep ocean cavity lying between the ice and the ancient layers of mud and rock below. While technical challenges meant the AIDD operation was halted, the team were then able to recover a 1.92 m core – a record for the Siple Coast – as well as nine shorter cores by hammer coring.

“We’re at the frontier, drilling through an ice shelf into the seafloor, to acquire sediment samples that no one has previously been able to obtain. It’s cutting-edge science and incredibly challenging work,” said Richard Levy, SWAIS2C Co-Chief Scientist, from GNS Science Te Pū Ao and Te Herenga Waka—Victoria University of Wellington.

“The sequence of rocks in the sediment should



The drilling tent on the West Antarctic Ice Sheet. Left: The coring team and the precious core. Photo credit: Anthony Powell

“The West Antarctic Ice Sheet is currently losing mass at an unprecedented rate. It is one of the most vulnerable components in the Earth system to increasing warming. But we fundamentally do not know when and how fast it will disintegrate and raise global sea level by several metres,” says Tina van de Flierdt, SWAIS2C Co-Chief Scientist, from Imperial College London.

Having tested the equipment in the field, the team now know the modifications needed to improve the chance for success when they return next summer. SWAIS2C field campaigns are planned for the next three years.

“We are thrilled with what we’ve achieved, it’s a massive step towards our ultimate goal to recover the sediment we need to answer the big questions that are crucial for humanity as we adapt and plan for sea-level rise,” says van de Flierdt.

tell us how the West Antarctic Ice Sheet behaved when it was a bit warmer than today – if we find marine algae it’s likely the ice sheet retreated. This information will allow us to build a much better picture of how Antarctic ice will respond to future warming, which parts will melt first, and which parts will remain.”

“These samples offer a huge increase in the amount of material we have to help us understand the present-day environment beneath the ice shelf, and the history those sediments represent,” says Dr Levy.

Post-cruise progress

Listening in on the Hikurangi subduction zone after IODP Expedition 375

In March and April, the Research Vessel *Thomas G Thompson* visited Aotearoa New Zealand from the USA with Remotely Operated Vessel (ROV) *Jason* on board to find out what two downhole observatories in the northern Hikurangi Margin have been up to for the past five years.

The Hikurangi Margin is an active fault off the east coast of the North Island of New Zealand and is potentially the largest source of earthquake and tsunami hazard in New Zealand.

The two long-term, sub-seafloor 'CORK' observatories were installed in 2018 by *JOIDES Resolution* into the bore holes created during IODP Expedition 375. The observatories – one named Te Matakite, meaning to see into the future – have been continuously recording data ever since.

The primary objective of the *RV Thomas G Thompson* voyage was to collect pressure, temperature, and geochemistry data stored within the CORKs and re-deploy new sensors into the downhole observatories.

It is extremely difficult to retrieve data and deploy new instruments at sites that are located multiple

kilometres underwater. Thankfully, the Woods Hole Oceanographic Institute (WHOI) ROV *Jason* crew are experts at accessing remote underwater sites with the ROV.

The science crew, with representatives from GNS Science, University of Washington, University of Texas and Cornell University, worked with the ROV *Jason* crew to retrieve the data and sensors from the CORK observatories. New pressure and temperature sensors were then prepared for redeployment, which will allow the CORK observatories to continue recording for at least another five years.

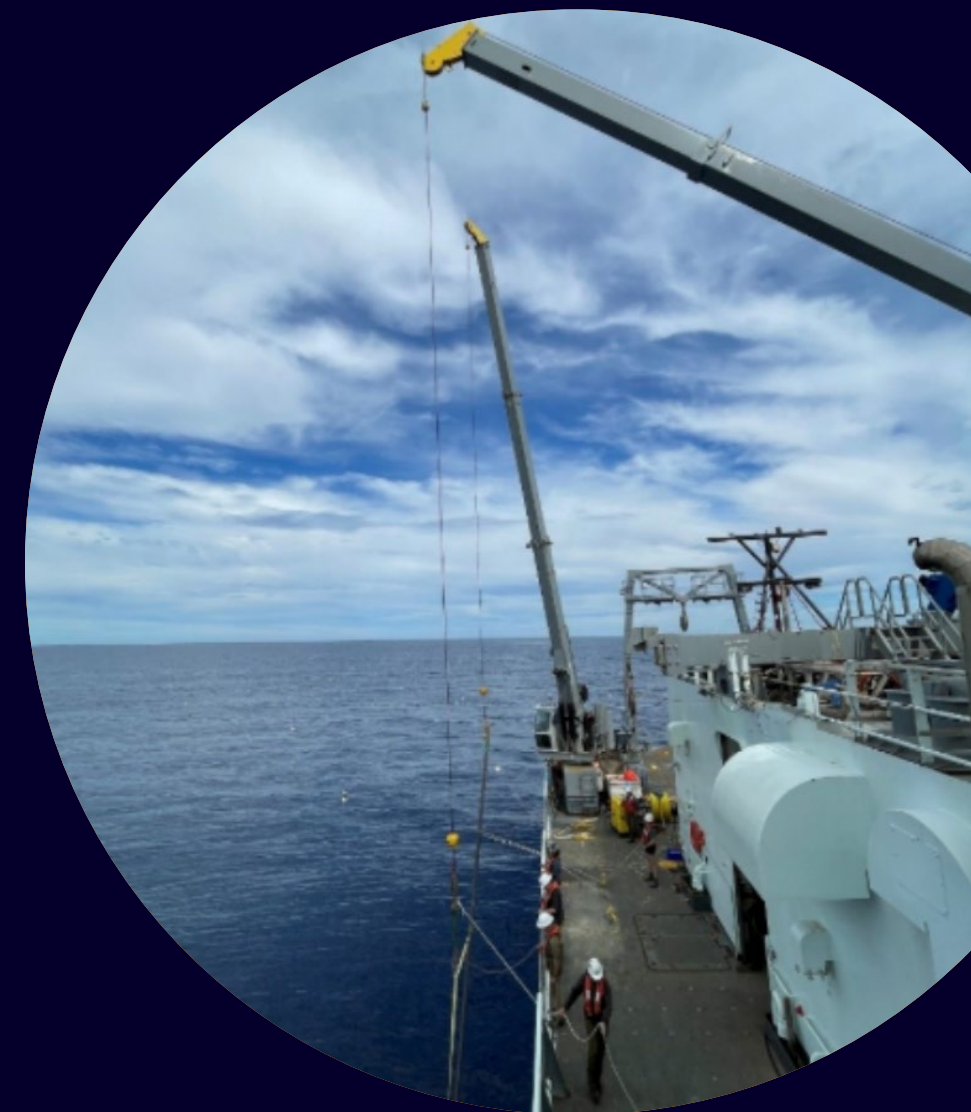
The temperature and pressure sensors were strung onto a long cable (over 100 meters) and lowered from the deck of the *RV Thomas G Thompson* all the way to the observatory on the seafloor – an extremely complex operation requiring careful handling by the crew on deck, as well as several of the vessel's cranes.

The voyage successfully recovered pressure and temperature data that will be used to further study fault slip behaviour and subduction zone processes.



Above: The view inside the ROV *Jason* control van during data download at one of the CORK observatories.

Right: Lowering the replacement instrument package over the side of *RV Thomas G Thompson*.



Post-cruise meetings

In the years following expeditions, ANZIC continues to support expeditioners to collaborate on the outcomes of the voyage and analyse the precious samples and data collected.

Expedition 374

Ross Sea West Antarctic Ice Sheet History

In September, over 40 scientists, including Co-Chief Scientist Prof Rob McKay (Victoria University of Wellington), met in Trieste, Italy, to discuss the results of IODP Expedition 374 that sailed to the Ross Sea in Antarctica during 2018.

Although post-cruise scientific meetings are usually run within two years of the expedition, this meeting was long delayed by the pandemic. However, in many ways this delay made the meeting more productive as most scientists had extensive datasets to discuss and compare.

Scientists reflected on the successful papers already published from the expedition, but more importantly on the wealth of unpublished data. Plans were coordinated for many more high impact results regarding the history of the West Antarctic Ice Sheet and Ross Sea over the past 18 million years – including ultra-high resolution records of Antarctic Bottom Water change and ice sheet retreat events.

The workshop immediately followed the Scientific Committee for Antarctic Research (SCAR) INStabilities' and Thresholds in ANTArctica (INSTANT) conference, which seeks to understand

how interactions between the ocean, atmosphere and cryosphere have influenced ice-sheets in the past, and what Antarctica's future might look like – aims that were closely aligned with IODP Expedition 374.

A field excursion after the workshop visited the Alps of Friuli-Venezia Giulia where we hiked over a vegetation covered rock glacier – a large contrast to those currently in Antarctica.

Expedition 378

South Pacific Paleogene Climate

Prof Simon George (funded by ANZIC) and Dr Lian Jiang attended the IODP Expedition 378 post-cruise meeting in July. The main meeting was in Salamanca, Spain, followed by a fieldtrip on the Basque Coast Geopark. The meeting was organised by Blanca Ausín, the shipboard organic geochemist and our collaborator on post-cruise analyses we are working on (the expedition sailed in 2020).

There were 11 formal oral presentations, 14 posters, and of course lots of discussion. We presented two talks and two posters. There were breakout groups for discussion of specific topics, and opportunity to plan future publications. During the fieldtrip we visited



Centre: At Basque Coast Geopark
Right: Marie Tharp's map cabinets
Photo credits: Simon George, Christina Riesselman

the world-famous Zumaia Section, where we were able to walk through near-vertical early Paleocene and later Cretaceous strata, including seeing two golden spikes very close together. The precessional cyclicity in the limestones and marls is spectacular, as is the very well preserved K-Pg boundary section and the PETM. Seeing this section helped us understand some of the Paleocene sediments we drilled during Expedition 378.

Expedition 383

Dynamics of Pacific Antarctic Circumpolar Current

Dr Christina Riesselman (supported by ANZIC) and Meghan Duffy attended the IODP Expedition 383 post-cruise meeting in May, along with 35 other shipboard and shore-based participants from the 2019 expedition. Over three days of science talks, collaboration and discussions, they worked towards finalising publications and defining additional research required to meet the expedition's science objectives.

Christina Riesselman presented preliminary results of integrated chronostratigraphy for the Southern Ocean since the late Miocene which was possible because of the unusually complete recovery achieved on Expedition 383.

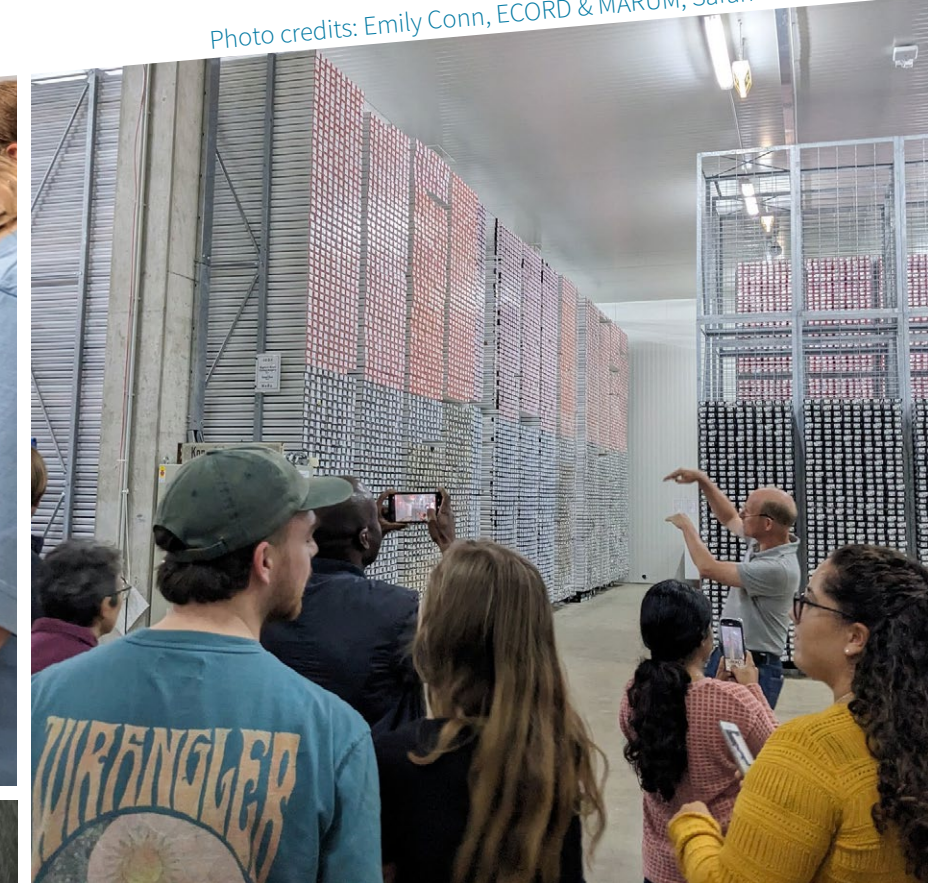
Meghan Duffy (PhD candidate) presented her reconstruction of Southern Ocean paleo-environments over the past 1.4 million years. Honours student, Matt Illing (supervised by shipboard scientist Chris Moy and Lorna Strachan) provided a poster focused on using sedimentology and geochemistry to understand changes in the Chilean margin over the last 160,000 years.

The meeting was hosted by Expedition Co-Chief Dr Gisela Winckler (Columbia University) at the Lamont-Doherty Earth Observatory in Palisades, USA. A group walk overlooking the Hudson River was a highlight. We also visited with former University of Otago PhD student Kirsty Tinto at the Lamont-Doherty laboratories where we were privileged to see Marie Tharp's map cabinets – a thrilling brush with her pioneering sea-floor mapping.

EDUCATE

Every year ANZIC gives students and ECRs at Australian and New Zealand member institutions access to specialist training opportunities, ensuring that researchers have the skills necessary to fully participate in scientific drilling now and into the future.

Photo credits: Emily Conn, ECORD & MARUM, Sarah Kachovich.



IODP Summer Schools

ANZIC works closely with IODP offices around the world to ensure international training opportunities are available to Australian and New Zealand students and ECRs. We fund the participation and travel of students selected to attend.

ECORD Summer School From Greenhouse to Icehouse

ANZIC sponsored two students to participate:
Emily Conn & Joe Cresswell

Travelling to Germany and taking part in the 2023 ECORD Summer School was truly an eye-opening and fulfilling experience. Not only was it amazing to hear from experts and peers regarding their research, skills, and all things IODP, but it was also a privilege to learn it in Bremen, the location of both MARUM (Center for Marine Environmental Sciences) and the IODP Bremen Core Repository (BCR), where all ECORD cores are housed and sampled from IODP missions.

The school's theme was *From Greenhouse to Icehouse - The Cenozoic Arctic Ocean and (global) climate history*, hosted at MARUM in Bremen University. The organisers are high-achieving experts in their fields: Dr Ursula Röhl is the Head of the BCR, Dr Rüdiger Stein is the Professor for the Paleoclimatology of the Arctic at MARUM,

and Professor Dr Dierk Hebbeln is the Graduate Dean of the Bremen International Graduate School for Marine Sciences. All have extensive IODP and at-sea experience, and it was an honour to learn from them, as well as the other experts that lectured on their expertise.

Personally, the highlights of the school were the 'shipboard simulation' activities, where we learned the procedures for analysing cores from the seafloor. This included core logging and smear slide analysis that the sedimentology team completes when new cores come on deck, interpreting downhole logging data to conclude rock structures in situ, and physical property measurements such as water content. I also enjoyed the sessions where our peers presented on their research. This was a great opportunity to practice personal presentation skills, and also



The Summer and the School - Emily and others enjoying icecreams (right) after Joe and classmates examine cores (left).

"As the next generation of scientists on the seafloor, involvement in these opportunities means we know the possibilities, the challenges, and have the skills to make a difference."

hear what's being discovered by fellow students and ECRs.

I felt incredibly lucky to have this opportunity to meet outstanding people and learn new things. Thank you foremost to the organisers at MARUM for a fantastic and practical schedule, and of course to ANZIC, for your continuous support and advocacy for students and ECRs to be involved in IODP. As the next generation of scientists on the seafloor, involvement in these opportunities means we know the possibilities, the challenges, and have the skills to make a difference.

Emily Conn
University of Tasmania

I am very grateful for the funding I received from ANZIC to attend the recent ECORD summer school in Bremen. I was able to learn from and engage with multiple specialists of Cenozoic climate and IODP operations and met many amazing early career scientists. I now have a far broader range of knowledge concerning the various avenues of Cenozoic climate research and the critical gaps which remain.

The course program included a visit to the Bremen core repository and seeing the 'MeBo' up close, as well as connecting live to the chief scientists aboard two ongoing IODP expeditions. The practical 'virtual ship' and IODP proposal writing sessions put me in a great position to apply for future research expeditions and perhaps proposals! I'd fully encourage other early career scientists to attend summer schools such as this if they get the chance!

Joe Cresswell
University of Tasmania

ECORD Summer School

Downhole Logging

ANZIC sponsored three students to participate: Luca Magri, Light Han & Lucinda Duxbury

I still remember the immense joy I felt upon receiving the news that my application for ANZIC sponsorship had been approved so I could participate in the ECORD-IODP: Downhole Logging Summer School.

Our schedule was tightly packed. We learnt the history and operations of IODP, and about downhole logging and its applications, from renowned experts in the field of Petrophysics. Additionally, we underwent training on Techlog, a commercial software by Schlumberger. Two sessions left a deep impression: the poster session and the teamwork project.

During the poster session each of us shared our recent research work, fostering collective exchange. We also talked to IODP members and experts who listened carefully to our explanation and rated our posters. In my poster, I summarised my recent work on geothermal anomalies' data collection and outlined my plan for next steps. I received valuable feedback from team members and absorbed new knowledge from others' posters. What I gained was like attending an international academic conference.

For the teamwork project, I was teamed with other young scientists from American and British universities and assigned an IODP Mission-Specific Platform expedition to analyse. We were tasked with designing our desired work based on the insights into IODP and knowledge

of downhole logging we acquired during the summer school. It was enjoyable and we all performed exceptionally well during the presentation, securing the award of the best logging project.

Consequently, I returned with knowledge, connections, and an invaluable experience. I strongly recommend active participation in future Summer Schools.

Light (Yangguang) Han
University of Wollongong

The course brought together an international group of like-minded individuals. When we weren't being treated to an insider's view of Leicester's scientific treasures (a night at the museum, a tour of the British Geological Survey's core library facilities, the excavation site of King Richard III, a former carpark) – we were hard at work learning Petrophysics 101.

Petrophysics, simply put, is the study of rock properties and their interaction with fluids (gases, liquid hydrocarbons and aqueous solutions). Unsurprisingly, this field was largely born out of the oil and gas industry, but is slowly being co-opted for palaeoclimate research and IODP objectives. For someone with a background in genetics and palaeontology, I felt like I was jumping in the deep end.

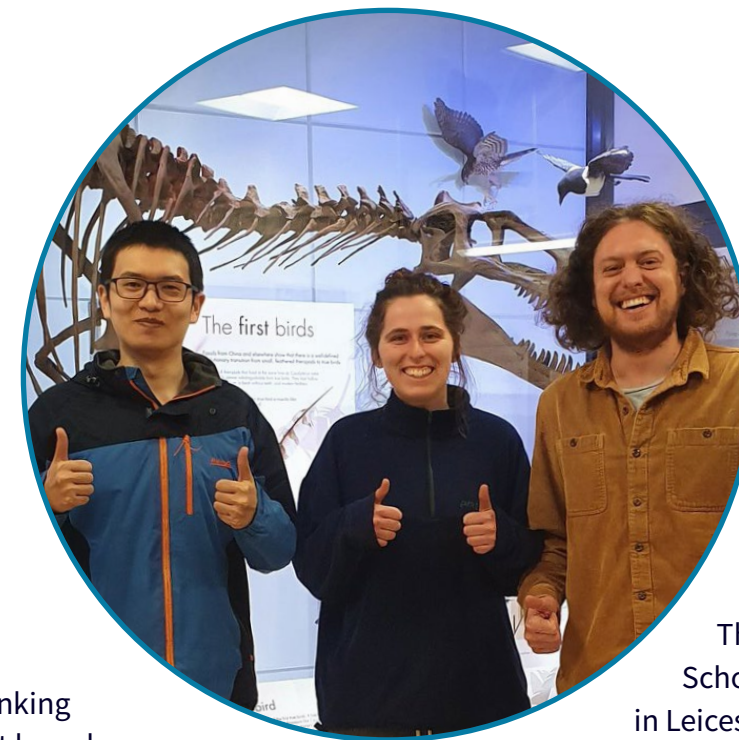
Luckily, very sound floatation devices were in ample supply owing to the expert explanations from the tutors, and I felt like I was in with a chance to get my head around a whole new world in just a week. Petrophysics in the kitchen had us experimenting with dunking various different biscuit brands in warm beverages make sure we really understood porosity and permeability.

All in all, the week was a great introduction to the interdisciplinary world of IODP. Our poster session was a spectacular window into the breadth of research possibilities within the community. I learnt about labs that make lava, how the Mediterranean sea dried out millions of years ago, and how layers of tephra are being used to constrain chronologies in marine Antarctic sediments. And we all learnt how to augment our research with the power of physical properties data.

I'm excited to have been invited to sail as a microbiologist and geochemist on IODP Expedition 403 next year. So I was in awe of the wealth of experience in the room – a smorgasbord of brains to pick for advice.

Throughout the workshop, my brain was bubbling away, thinking about how physical properties data would be used to achieve the research objectives of Expedition 403 – and how I could integrate it into my own research questions.

Overall, the summer school was an enriching



environment where I could connect with new ideas and new people – fostering collaborations and friendships that I'm sure will carry me forward in my career.

Lucinda Duxbury
University of Tasmania

The ECORD Summer School (Downhole Logging) in Leicester was a success. The combination of theoretical lectures, practical hours, software learning and visits to external organisations was very informative and enjoyable. I appreciated the consistency between the content of the theoretical lectures and what learnt in the practical sessions. As a participant of the upcoming Expedition 402, I feel privileged to have had the chance to be trained by inspiring experts in the field on data analysis techniques that I might be using during the voyage. Furthermore, it was a pleasure to be able to experiment directly with Techlog. Considering that the software is owned and used by Schlumberger, it was not only fantastic to see how the IODP dataset can be adapted for analysis, but also to gain experience on how people in industry conduct their work.

I am extremely grateful to ANZIC and ECORD. Everything was very well organised – from travel arrangements to the activities of the Summer School itself. The opportunity to spend time networking and knowing my peers, between sessions and after work, has been significantly important for my professional and personal development.

Luca Magri
University of Tasmania

ANZIC Outreach

To make sure great minds continue to focus on Scientific Drilling, ANZIC highlights the wonders of IODP science to a broad audience.

National Science Week (Australia)

The ANZIC office team celebrated Australia's National Science Week by sharing the wonders of Ocean Drilling!

ANZIC Program Manager, Sarah Kachovich, as one of Science & Technology Australia's SuperStars of STEM, was invited to the Launch of National Science Week at Australia's Parliament House. She and ANZIC Administrator, Kelly Kenney, had a great time sharing the joy of micropaleontology and introducing politicians, their advisors and scientists from a range of disciplines to some microscopic friends from the deep ocean!



To top off the week, Sarah shared her discoveries and experiences aboard the *JOIDES Resolution* on local (Canberra) ABC Radio.

Core on Tour!

Prof Myra Keep took the ANZIC Office's dramatic 'day the dinosaurs died' replica core on an outreach adventure, inspiring undergraduate and primary school students alike. The core replica formed the basis for an entire week on 'Geology of Oceans' for 1st year geology students at the University of Western Australia, and was the centre piece of several outreach efforts with school groups from primary to senior secondary age. It was a fabulous teaching tool!

Student visits

During the year, the ANZIC Office team hosted groups from the University of Tokyo, Australia's National Youth Science Forum and the Earth and Environmental Science Olympiad, taking them on a journey through cores and the delights of scientific drilling.

Expedition 392 as Haiku

A book of poetry is a stunning outcome from IODP Expedition 392 (Agulhas Plateau Cretaceous Climate). This remarkable book,



published in December, takes readers on a journey deep under our oceans – and through time.

3.9.2 Haiku combines poignant poetry and stunning illustrations to describe 68 sediment cores that span more than 70 million years though the entirety of hole 1580a from the expedition.

The poetry strings together the voices of dozens of scientists who lived and worked together for eight weeks aboard the *JOIDES Resolution* in 2022, studying the interplay between changes in global climate, ocean depth and ocean circulation on the Agulhas Plateau south of South Africa.

Science Meets Parliament

It was fantastic to have our Science Committee Chair, Agathe Lisé-Pronovost, and Program Manager, Sarah Kachovich, represent ANZIC at Science Meets Parliament in Australia in March. This event, organised by Science and Technology Australia, gave Agathe and Sarah the opportunity to speak directly with parliamentarians and



highlight the important contributions that scientific drilling makes to our understanding of our planet and its future.

Talking to Policymakers

The ANZIC Office also had the chance to meet with Federal Member for Fremantle (Western Australia), Josh Wilson, in March. ANZIC Director, Ron Hackney, and Program Manager, Sarah Kachovich, chatted at Parliament House about the national importance of active engagement with international scientific drilling program to allow evidence-based decision making that is built on a sound understanding of our Earth's history and dynamics. We appreciated Josh's engagement and efforts to push for a sustainable future for Australia.

ENGAGE

We are proud to host and foster a variety of means for scientists to deepen their engagement with the ANZIC community and International Scientific Drilling science.



Photo credits: Kelly Kenney and Sarah Kachovich

Australian ANZIC Roadshow!

Throughout February and March, ANZIC Director, Ron Hackney, and Program Manager, Sarah Kachovich, hit the road to spend some time at our member institutions around Australia. The Roadshow was a great way to highlight the diverse opportunities that ANZIC provides to its member organisations, and share IODP's wide horizons and broad range of science.

We provided each of our 14 Australian member institutions with posters and flyers to advertise our arrival, then over six action-packed weeks, visited each, engaging with over 380 people! It was an incredible tour, with so many great connections being made and strengthened through seminars, workshops, meetings and discussions.

We had a great time running an interactive workshop 'Exploring planetary processes with IODP science', where we took people on a journey through time to reveal the two hundred million years of Earth's climatic, biological, chemical and geological history that is locked in sediment, rock and fluid beneath the world ocean.

We also had the chance to hear about our community's involvement in, and ideas for, scientific drilling. We were lucky enough to tour an impressive array of high-tech analytical facilities, talk to climate modellers keen to join expeditions, watch simulations of sedimentation from seismic data, and marvel at living microbes ready to be fossilised in the lab.



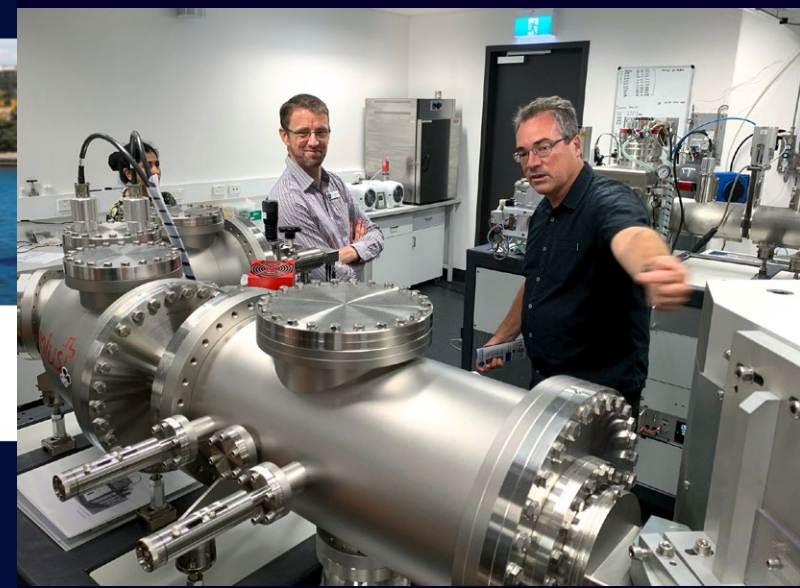
ANZIC Roadshow: Australia Tour

Future opportunities for Australia in international scientific drilling

Australian tour: February & March 2023
New Zealand tour: ETA June 2023



Dr Ron Hackney & Dr Sarah Kachovich
Australian National University



Future DEEP Workshop

Future Drilling to Explore Earth's Past

In May, ANZIC ran a workshop on Future Drilling to Explore Earth's Past (Future DEEP) – an Australasian and Southern Ocean regional planning event, aimed at supporting scientists in developing proposals for the next generation of scientific drilling. It was great to spend two days focused on the needs and interests of the Australian and New Zealand scientific communities.

The hybrid event brought together 134 attendees from 14 different countries, providing the perfect opportunity for the community to celebrate and promote scientific drilling achievements and ideas, and to gather ideas to support broader collaborations with programs in the future.

The workshop also engaged students and Early Career Researchers and provided an update on

the status of ANZIC and international scientific drilling capabilities and opportunities. ANZIC offered travel subsidies for several Early Career Researchers to facilitate their involvement.

Once at the workshop, breakout sessions covered topics including geohazards, legacy assets projects, paleoclimate (especially in Antarctica and around the Southern Ocean), coastal zones, ICDP, and acquiring new site survey data in support of drilling proposals. A number of exciting and vital research questions and ideas were workshopped and developed.

There was quite a buzz with the community together in person for the first time in years, the energy of the large number of students and early career researchers present, and the exciting ideas for scientific drilling discussed.



Right: Future DEEP participants.
Below: DEEP discussions.

FUTURE D.E.E.P.

WORKSHOP



3-4 APRIL 2023

ANZIC is grateful to the amazing organisation of Sarah Kachovich, Kelly Kenney, Agathe Lisé-Pronovost and our Science Committee for making the event such a success.



Future DEEP Workshop

Science priorities

The science priorities and research opportunities that emerged from the workshop have been brilliantly synthesised and detailed in the [Future DEEP Final report](#), written by Dr Sarah Kachovich, Dr Agathe Lisé-Pronovost and the ANZIC Science Committee. The report provides an Australian and New Zealand perspective on the future science that can be supported by scientific drilling on the continents and throughout the world ocean. It identifies science priorities from the Workshop which ANZIC is committed to furthering over the coming years:



Antarctica and the Southern Ocean coordination

Strengthening international partnerships in scientific research and infrastructure, especially by increasing ANZIC's engagement with, and support for, multi-program efforts in Antarctica and the Southern Ocean.



Ground-truthing future climate change

Utilising sedimentary records that preserve evidence of past climate to quantify and reduce uncertainties in future climate and sea level projections, and to improve understanding of key physical processes. Both Australia and New Zealand have invested in infrastructure capability to support this mission, including ocean going research vessels *RV Investigator*, *RSV Nuyina* and *RV Tangaroa*.



Geohazards

Progressing understanding of geohazards, in particular those associated with subduction zone earthquakes. Emerging concerns around submarine slides as a risk to populations and infrastructure also warrant more attention. Australia and New Zealand are developing pools of seafloor instruments to improve environmental and natural hazard monitoring.



Deep biosphere

Advancing geomicrobiology – a discipline with significant societal relevance and the potential for generating paradigm shifts in understanding the habitability of life on Earth and the utility of living organisms in tracking Earth processes and planetary evolution.



Coastal zone

Focusing on coastal zones which host significant ecosystems, freshened groundwater in sub-seafloor aquifers of unknown extent, and are the source of unquantified risks to communities and critical infrastructure. Australia and New Zealand are committed to delivering nationally coordinated capabilities in coastal zone observation, modelling and prediction. Research efforts in the coastal zone will benefit from the Land-to-Sea initiative that aims to strengthen links between IODP and ICDP, an initiative that has potential to support the new NCRIS funded CoastRI program.



Legacy Assets Projects

Implementing Legacy Assets Projects (LEAPs) to add value to existing scientific ocean drilling assets, be they cores, samples, data, drill holes that remain open, or installed borehole observatories. ANZIC recognises the importance of LEAPs and supports initiatives to invest in national core repositories to augment this new initiative.



Engagement with First Nations Peoples in Australia and Aotearoa New Zealand

Acknowledging and supporting the need for cross-cultural thinking towards a new paradigm in geoscience practice and impact globally.



Kickstarting Australian ICDP membership

Co-ordinating the Australian research community and generating ideas in readiness for Australian ICDP membership. Supporting projects already initiated in New Zealand.

Workshop: NZ Marine Geophysics Future

A two-day workshop discussed the present state and future of marine geophysics research in Aotearoa New Zealand.

Over 30 researchers and representatives from GNS Science, NIWA, Victoria University Wellington, University of Tasmania, Auckland University of Technology, CSIRO, New Zealand Parliamentary Commissioner for the Environment, and Toitū Te Whenua Land Information New Zealand met in Wellington in August to discuss the current state and future projects in the field of marine geophysics.

A key focus of the workshop was to discuss how we can increase collaboration across disciplines, and across regions, and expand our research networks to maximise the value and impact of our science. Dr Stuart Henrys took the opportunity to present on the new IODP initiative of LEgacy Asset Projects (LEAPs).

The meeting also shared perspectives on how to better support effective marine earth science data management and accessibility. The participants also focused on the key ocean science challenges and how we can increase opportunities for students in seagoing expeditions.

A recurring message during the two days was the importance of supporting ocean literacy for the public and decision makers. Specifically, how the outcomes and impact of marine scientific research can be better communicated and influence policy makers.

Workshop participants share their perspectives on how to better support effective marine earth science data management.



ANZIC proudly hosted this year's IODP Forum over three days in October. We welcomed our international partners to sunny Wollongong for a wonderful chance to come together and exchange ideas and views on the scientific progress of IODP, and its future.

Many thanks to Prof Simon George and students from Macquarie University for organising a fabulous pre-Forum field trip! We explored fascinating geology around the Sea-Cliff Bridge, examined the Permian-Triassic boundary (a time of major geological upheaval), and took in the geology and views of the Sydney Basin region.

Thanks also to students and staff from the University of Wollongong, who provided a beach-side BBQ to cap off the day!

The University of Wollongong's Innovation Campus provided the perfect venue for the Forum

IODP Forum

itself, and deep discussions between delegates from the US, Canada, UK, Europe, Japan, China, India, New Zealand and Australia. We shared progress, ideas and plans for the future. Several working groups were formed to further progress important issues and directions. Discussion particularly focused on:

- possibilities for post-IODP programs and collaborations
- how to communicate valuable operational lessons learned to post-IODP programs
- the future of the IODP Forum, as the custodian of the IODP Science Plan and an important forum for synergistic collaborations
- communicating IODP's greatest impacts to both the science community and to program funders and policy makers
- opportunities for IODP to engage more closely with the United Nations Decade of Ocean Science for Sustainable Development.

Dr Ulrich Harms from ICDP was also able to attend the Forum, facilitating discussions around cooperation between IODP and ICDP on Land-to-Sea proposals and the need for post-IODP programs to work closely with ICDP to provide a distinct path from proposal to implementation for proponents with investigations that cross the shoreline.

ANZIC Governing Council

The Governing Council is a steering committee for ANZIC, responsible for broad policy and high-level decision making.

ANZIC Science Committee

The Science Committee has oversight of the scientific program of ANZIC, including setting criteria and assessing applications for expeditions, legacy funding and summer schools.



Dr Chris Pigram
Chair



Dr Ron Hackney
Director



Prof Dorit Jacobs
ANU Director/Host



Dr Stuart Henrys
GNS Science



Dr Agathe Lisé-
Pronovost
Chair



Prof Myra Keep
Vice Chair/University
of WA



Dr Linda Ambrecht
University of Tasmania



Dr Sarah Kachovich
Program Manager



Prof Andrew Roberts
ARC LIEF Lead/ANU



Dr Christina Riesselman
University of Otago



Prof Kliti Grice
Curtin University



Assoc Prof Joanne
Wittaker
University of Tasmania



Dr Martin Jutzeler
University of Tasmania



Dr Lorna Strachan
University of
Auckland



Dr Derya Güler
University of
Queensland



Dr Luc Serge-Doucet
Curtin University



Dr Lucy McGee
University of
Auckland



Dr Agathe Lisé-
Pronovost
University of Melbourne



Dr David Robinson
Geoscience Australia



Dr Joanna Parr
CSIRO



Roger Fairclough
Neo Leaf Global/
Independent
Member



Dr Tim Rawling
AuScope/
Independent Member



Dr Katharina
Hochmuth
University of Tasmania



Dr Sara Moron-
Polanco
University of Sydney



Assoc Prof Marco
Coolen
Curtin University



Dr Verity Normington
Geoscience Australia



Dr Samuel Boone
University of
Melbourne

Observers:

Assoc Prof Helen Bostock, Dr Nathan Daczko, Dr Richard Jones, Assoc. Prof Helen McGregor, Prof Robert McKay, Dr Joshu Mountjoy, Dr Luke Nothdurft, Dr Mick O'Leary, Prof Iain Suthers, Dr Lorna Strachan, Dr Jonathon Tyler, Prof Jody Webster.



Dr Alexander Franke
University of Adelaide



Dr Nicky Wright
University of Sydney



Dr Georgia Grant
GNS Science



Dr Suzanne Bull
GNS Science



Dr Rebecca Parker
University of NSW

ANZIC Representation at IODP

IODP evaluates proposals for scientific drilling expeditions based on impact, logistical feasibility, and cost through a system of Facility Boards and Advisory Panels whose membership is drawn from the international scientific community.

Drilling proposals are first evaluated by the Science Evaluation Panel, which is responsible for evaluating the scientific objectives and technical approach of submitted proposals at all stages, and for forwarding ready-to-drill and top-priority proposals to the appropriate Facility Board. The Environmental Protection and Safety Panel provides critical support to the review process.

ANZIC has participation rights on these IODP panels, with ANZIC representatives listed below.

ANZIC representatives also participated in the 2023 IODP Forum.



“Being on the committee makes me feel a part of a national group, helping to promote science that answers big picture questions.”

– Dr Lucy McGee, University of Adelaide
Member of ANZIC Science Committee

ANZIC Representatives

Committee or Panel	Representatives	Institution
Science Evaluation Panel	Science Reps to September 2023: Dr Mark Kendrick Dr Hugo Olierook (alternate) Science Reps from October 2023: Dr Hugo Olierook Assoc Prof Stephen Gallagher (alternate) Prof Chris Elders Site Reps: Dr Jess Hillman Dr Wanda Stratford (alternate)	University of Queensland Curtin University Curtin University University of Melbourne Curtin University GNS Science GNS Science
Environmental Protection and Safety Panel	Dr Simon Holford Prof Myra Keep (alternate)	University of Adelaide University of Western Australia
JR Facility Board	Prof Rob McKay Assoc Prof Ron Hackney	Victoria University of Wellington ANZIC / Australian National University
ECORD Facility Board	Prof Jody Webster Assoc Prof Ron Hackney	University of Sydney ANZIC / Australian National University

IODP Forum attendees

April Forum (Vienna)	Assoc Prof Ron Hackney Dr Tim Rawling Prof Andrew Roberts	ANZIC / Australian National University AuScope Australian National University
September Forum (Wollongong)	Assoc Prof Ron Hackney Dr Sarah Kachovich Dr Chris Pigram Dr Gary Wilson Dr Tim Rawling Dr Stuart Henrys Assoc Prof Helen Bostock Prof Rob McKay Dr Agathe Lisé-Pronovost Ms Kelly Kenney Ms Janelle Kennard	ANZIC / Australian National University ANZIC / Australian National University ANZIC GNS Science AuScope GeoDiscoveryNZ / GNS Science University of Queensland GeoDiscoveryNZ / Victoria University of Wellington ANZIC Science Committee / University of Melbourne (online) ANZIC / Australian National University ANZIC / Australian National University

More opportunities to engage

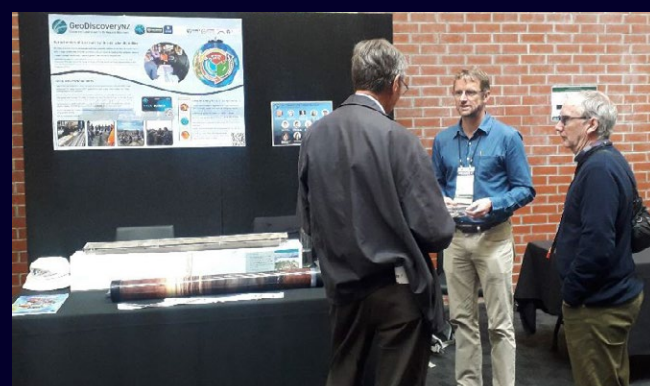
Australian Earth Sciences Convention

ANZIC and AuScope held a joint booth at the Australian Earth Sciences Convention in Perth in June. This was a great chance for Australia's Earth scientists to learn more about ANZIC and IODP, and to explore opportunities for research and collaboration. ANZIC Science Committee Chair, Agathe Lisé-Pronovost and Vice-Chair, Myra Keep, were there to represent ANZIC, along with Program Manager, Sarah Kachovich. There was even a live cross to the *JOIDES Resolution* and the team of scientists on Expedition 395, including ANZIC expeditioner Dr Katharina Hochmuth, as they collected drill samples of lava and sediment from the deep waters south of Iceland.

The booth was one of the most popular spots at the exhibition. The replica core from ODP Leg 171B containing debris from the Chicxulub impact crater at the Cretaceous-Paleogene boundary (the day the dinosaurs died) was – as always – a huge hit with conference attendees and school children alike!

The ANZIC team also convened a session showcasing some of the latest research based on

IODP cores and data which was well attended, included a good number of papers, and created considerable enthusiasm.



Geoscience Society of New Zealand conference

The Geoscience Society of New Zealand Annual Conference 2023 was held in November at Victoria University of Wellington. GeoDiscoveryNZ was a bronze sponsor of the event and maintained a booth throughout, ably assisted by Marianna Terezow, Stuart Henrys (both GNS Science) and Ron Hackney (ANZIC Office). It was an excellent opportunity for networking with many early career researchers and students.



Sarah, Agathe, Myra, and plenty of swag at the AESC booth.

Visitors to the booth were encouraged to share GeoDiscoveryNZ's presence at the conference by posting a photo to social media and tagging ANZIC and GeoDiscoveryNZ, in exchange for some merchandise. Ron also provided a well-attended presentation: 'Future Opportunities for Australia and New Zealand in international scientific drilling'.

SCAR INSTANT Conference and PMO exchange

In September, ANZIC Program Manager, Sarah Kachovich was a sponsored attendee at the SCAR INSTANT Conference in Italy where she

presented the Future DEEP Workshop Report and connected the ANZIC research community with Northern Hemisphere scientists.

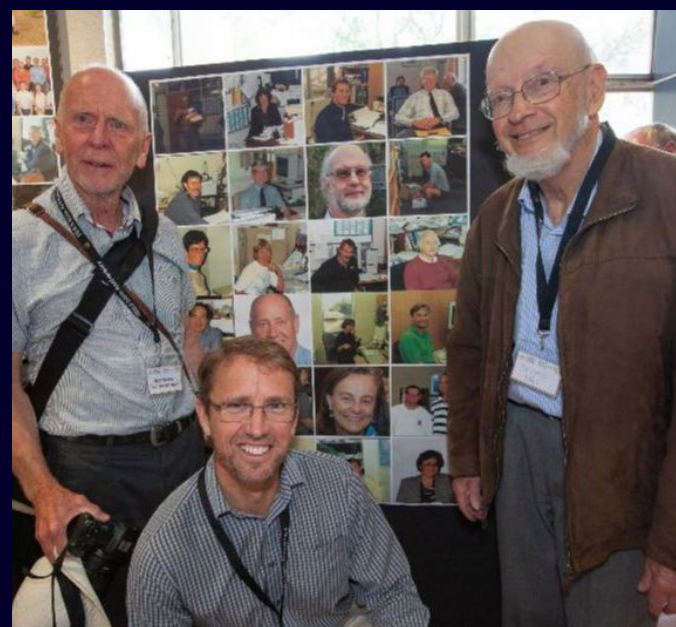
During this trip, Sarah also spent time at the offices of ECORD's Science Support and Advisory Committee (ESSAC) in Trieste and the ECORD Science Operator (ESO) in Edinburgh. This was a great opportunity to share experiences and exchange ideas on program level-procedures. One notable outcome of these visits was a first-time invitation to our IODP partners to send international students to participate in our ANZIC Marine Geoscience Masterclass.

ANU's Research School of Earth Sciences 50th Anniversary

ANZIC's host institute – the Australian National University's Research School of Earth Sciences – celebrated its 50th Birthday in November.

The ANZIC office team joined in with a vibrant display, ANZIC cupcakes, and catching up with former ANZIC Directors Neville Exon and Richard Arculus (pictured below with current Director, Ron Hackney)!

Most excitingly, Prof Maureen Raymo from Lamont-Doherty Earth Observatory in the US, presented the 2023 Jaeger-Hales Lecture – there was standing room only and much discussion! Professor Raymo also spent time with students and ECRs, lending her wisdom and mentorship.



AGU

In December, ANZIC Program Manager, Sarah Kachovich, travelled to the US on an ANU Research School of Earth Science staff development award, to attend the Annual Meeting of the American Geophysical Union (AGU). The specific purpose of this award was for Sarah to undertake AGU Science Advocacy and Policy Making Workshops. This professional development opportunity provided new knowledge that is not only beneficial to Sarah's role with ANZIC, but also to our host school at ANU. From an ANZIC perspective, Sarah's new insights will help build on ANZIC's science diplomacy role and our international collaborations as we navigate the upcoming changes to IODP.

Research Infrastructure Expo

The ANZIC office team got out and shook some hands at the Research Infrastructure Expo at the Australian National University (our host institution) in December.

It was a joy to make connections between IODP and a wide range of other disciplines and capabilities, and to help the replica cores tell their fascinating stories.

Submission to Decadal Survey

GeoDiscoveryNZ and ANZIC made a submission to the US National Academies 2025-2035 Decadal Survey of Ocean Sciences for the National Science Foundation. The Decadal Survey will advise the NSF on forward-looking



Above: IODP town hall meeting at AGU.
Left: Prof Maureen Raymo presents the 2023 Jaeger-Hales Lecture.



approaches to guide investments in research, infrastructure, and workforce development. The committee overseeing the Decadal Survey will develop a research and infrastructure strategy to advance understanding of the ocean's role in the Earth system and the sustainable blue economy. The submission identified a number of priority cross-cutting science themes, including climate change, natural hazard disaster risk reduction, and managing coastal landscapes. We encourage future NSF scientific drilling infrastructure that ensures broad access, meets future global science challenges, and recognises the importance of leveraging broad international partnership investments.

2023 Publications

ANZIC member researchers once again generated significant published works arising from IODP science, with a total of 75 publications for Australia and New Zealand authors in 2023, where 18 were ANZIC first authored papers. Overall, there were 445 publications in IODP science from global scientists in 2023.

The following alphabetical list includes records from the Scientific Ocean Drilling Bibliographic Database, with ANZIC researchers highlighted in bold.

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