IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

UK newsletter 41

2016

NERC SCIENCE OF THE ENVIRONMENT

ECORD European Consortium for Ocean Research Drilling

Recent UK based IODP expedition participants

Expedition 362	Lisa C McNeill, Timothy Henstock, Freya L Mitchison, Kevin T Pickering, Paola Vannucchi
Expedition 363	Tom Dunkley Jones, Paul N Pearson, Christopher R Poole
Expedition 364	Joanna Morgan, Claire Mellet, Charles Cockell, Annemarie E Pickersgil, Auriol Rae
Expedition 367/368	Stephen Bowden
Expedition 369	Richard W Hobbs, Sietske J Batenburg, Kirsty M Edgar, Lauren K O'Connor
Expedition 371	Cherry Newsam
Expedition 381	Lisa McNeill, Gareth Carter, Erwan Le Ber, Richard Collier, Marco Maffione, Christian Marz

Contents

Front cover: Caption here.

Back cover: 2012 UK-IODP Student and Early-Career Scientist Workshop participants. Chicheley Hall. Copyright: UK-IODP

Editor: Kirstin Johnson, British Geological Survey, Environmental Science Centre, Keyworth, NG12 5GG
Graphic design: Debbie Rayner

Foreword

Kirstin Johnson (UK IODP Science Programme Coordinator) , Jess Surma (Programme Manager-NERC), Mike Webb (Programme Executive Officer, NERC), and the UK IODP Programme Advisory Group (see p.24 for membership).

In the last few years (Jan 2014–now) over 50 UK based scientists have successfully applied to be scientific participants in 17 IODP expeditions. These scientists were affiliated with 25 different academic institutes from across the United Kingdom and took part in expeditions exploring sites all over the world. The support the UK IODP provides for these scientists extends to more than just travel and subsidence, and encompasses setting up and co-funding workshops and conferences, such as the UK IODP Annual General Meetings, UK IODP Student workshops and conferences, FORAMS 2018 and the Petrophysics Summer School, 2016 and 2017.

Students and early career researchers are encouraged to make use of additional funding and support (in the form of 'rapid response grants') offered by the UK IODP, in order to further the impact of what is already excellent research that the UK contributes to worldwide environmental science. UK participants in IODP are also eligible for moratorium awards, which improves post-expedition funding, allowing for participating scientists to focus on their research.

We send out regular updates on upcoming expeditions, calls, workshops and conferences to over 600 scientists in the UK. If you would like access to these updates, or have news which you would like circulated around the UK IODP community, please send a short paragraph to the UK IODP Co-ordinator, Kirstin Johnson.

IODP science from UK scientists continues to be published, illustrating the high level of outputs from the programme. Enclosed within this newsletter are examples of this excellent research and the training done UK based scientists.

.

Scientific results from recent expeditions

Expedition 362 – Sunda subduction zone offshore northern Sumatra

6 August–6 October 2017

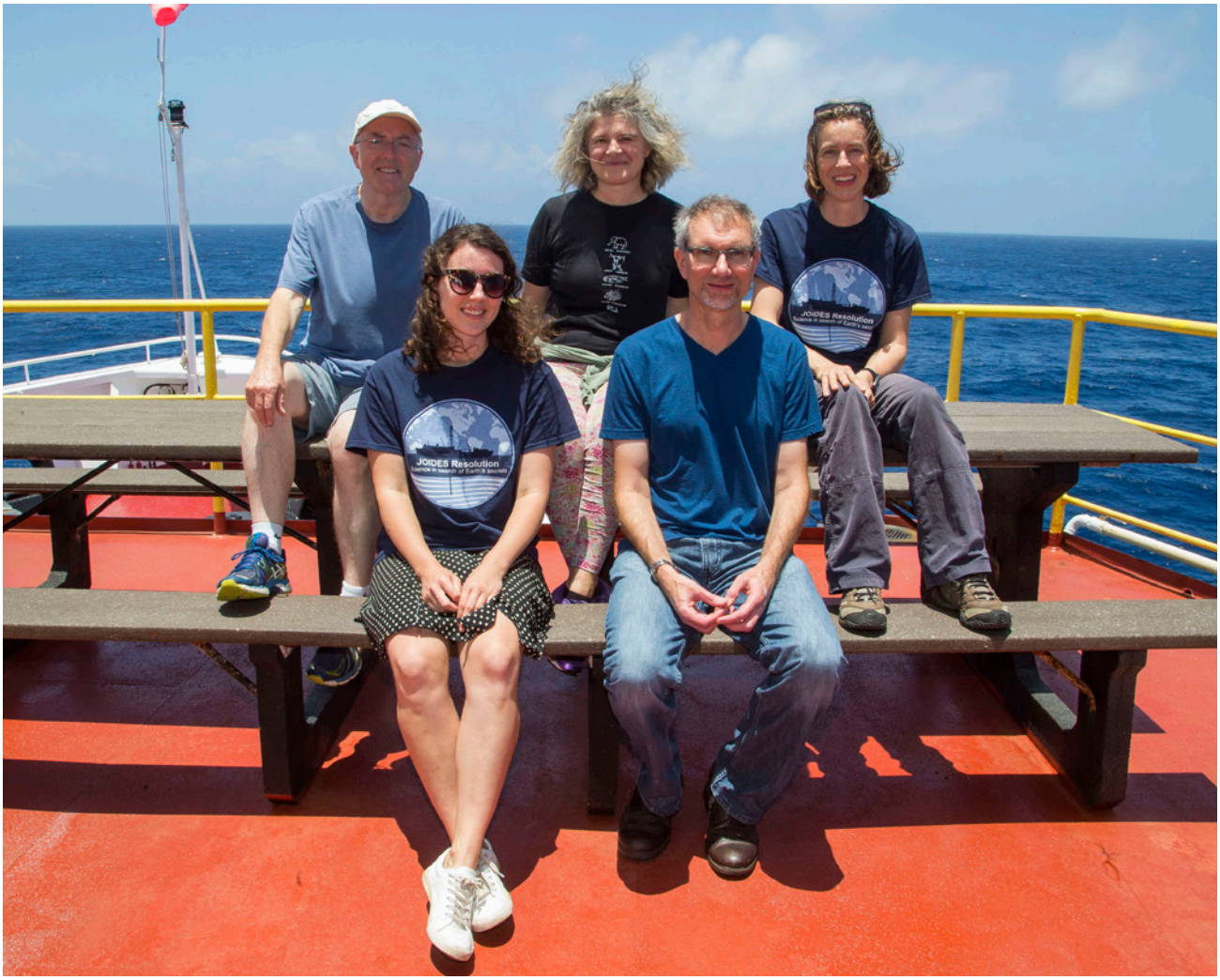
Lisa C McNeill, Timothy Henstock, Freya L Mitchison, Kevin T Pickering, Paola Vannucchi

IODP Expedition 362 was designed to investigate the input section to the Sunda subduction zone offshore northern Sumatra, where a thick pile of sediments is being accreted. This is the area which ruptured in the major Mw=9.1-9.3 earthquake on 26 December 2004, triggering a tsunami that affected coastlines around the Indian Ocean and killed an estimated 250 000 people. The earthquake is now well-documented as having coseismic slip that extended close to the trench, which is hard to reconcile with common views of the mechanical behaviour of materials in the shallow parts of subduction zones. The incoming sediment is covered near the trench by a rapidly accumulating trench wedge, so that the seismogenic zone is 5 km below the seafloor even if it extends to the trench, and within a short distance reaches a depth of 7 km. With the trench seafloor at 4–5 km, this is a depth beyond present or likely near-future drilling capability. However, the sediments forming this critical level within the system can be sampled from the incoming plate. The main objective of Expedition 362 was to sample the input sedimentary section through to oceanic basement to constrain the initial physical, chemical, thermal and mechanical state of the section. Subsidiary (but nevertheless important) objectives were to investigate the development and origins of the Nicobar submarine fan, which the pre-expedition seismic interpretation suggested makes up a significant part of the sediment column.

We drilled at two Sites, U1480 and U1481, and were extremely successful in achieving the Expedition goals despite the challenging depths. These included two of the deepest penetrating non-riser holes achieved during marine scientific drilling. At Site U1480 we cored a complete section from the seafloor to the oceanic basement using a combination of APC, XCB and RCB methods. This involved a total of eight Holes (U1480A-H) and a maximum depth of 1431.6 mbsf, in a water depth of 4150 m. Hole U1480G included the deepest section of drilled-in casing so far achieved (reaching 754 mbsf); a method critical to the success of the Expedition both in terms of increased hole stability and time saved. While logging at Site U1480 was ultimately limited by the hole conditions, we nevertheless achieved good ties between the drilling and site survey seismic reflection data that will allow us to relate results to the subduction zone. Site U1481, close to U1480, was intended to test spatial variation of the sedimentary and basement section, and was to be followed by a third site further to the south. We were able to make a safety and environmental case to EPSP and TAMU to drill down to and start coring at 1150 mbsf at Site U1481 on the grounds of having excellent seismic ties between the two sites, enabling us to contemplate reaching basement a second time. A second long drilled-in casing operation was completed to 734 mbsf, but unfortunately during pulling out there was a major failure of one of the two eddy current brakes on the draw-works. Given the long drilling string required for the hole (over 5.5 km), operations could not continue and brake repairs/replacement were required in Singapore, resulting in a loss of 11 days of Expedition time on site. On our return we continued drilling, reaching a depth of 1500 mbsf at Site U1481. We then completed a logging run to the bottom of the hole (data to 1494 mbsf); the deepest achieved within the Indian Ocean region and an impressive achievement considering the depths, hole materials and conditions involved.

Overall, Expedition 362 was extremely successful, with very strong UK representation in all areas of the science. The initial proposal was driven by Lisa McNeill and colleagues following on from a NERC consortium grant to study the Sumatra subduction zone, and Lisa was also a Co-Chief at sea. Paola Vannucchi was in the Structural Geology team, Kevin Pickering in Sedimentology and Petrology, Freya Mitchison in Palaeontology and Biostratigraphy, and Tim Henstock was the Core-Log-Seismic Integration specialist. We are now well-placed for post-cruise research that will allow the understanding from material collected to be applied to the hazard of earthquakes in subduction zones that involve the accretion of thick sections of sediment, and that may lead to larger earthquakes and tsunami than forecast.

Figure 1.
UK participants. Front row: Freya Mitchison (Paleontologist, Cardiff University, UK) and Timothy Henstock (Core-Log-Seismic Integration/Geophysics Specialist, National Oceanography Centre, University of Southampton, UK). Back row: Kevin Pickering (Sedimentologist, University College London, UK), Paola Vannucchi (Structural Geologist, Royal Holloway University of London, UK), and Lisa McNeill (Co-Chief Scientist, National Oceanography Centre, University of Southampton, UK). (Credit: Tim Fulton, IODP JRSO) [Photo ID: exp362_173]



Expedition 363 – Western Pacific Warm Pool

6 October – 8 December 2016

Tom Dunkley Jones, Paul N Pearson, Christopher R Poole

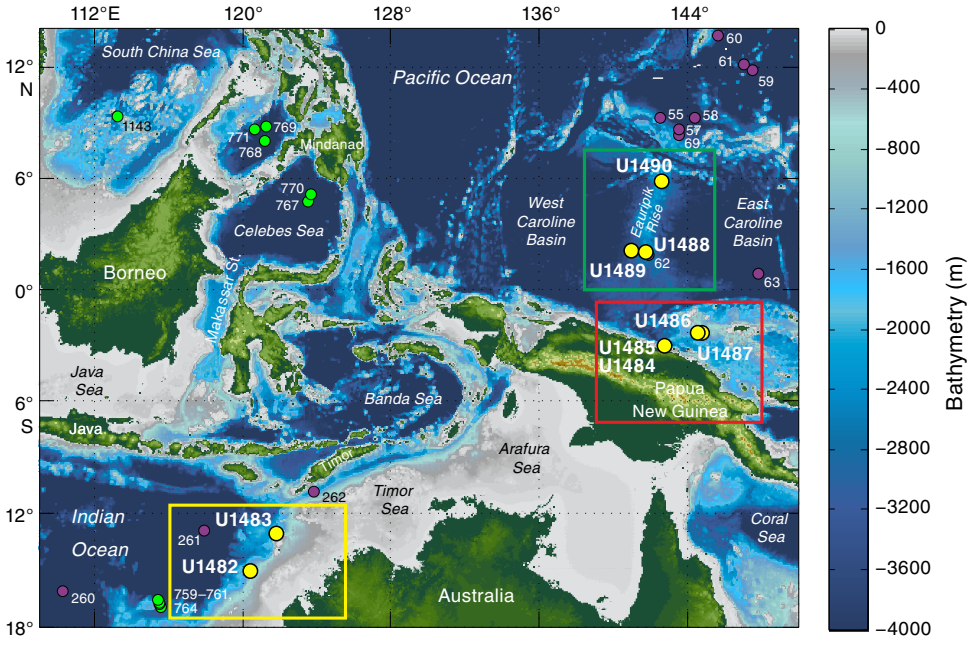
The West Pacific Warm Pool (WPWP), the oceanic region to the east of Indonesia, is the warmest sector of the wider Indo-Pacific Warm Pool (IPWP) with mean annual sea surface temperatures (SSTs) typically >29°C. The region is influential in ENSO dynamics and those of the Asian-Australian monsoon, with warm water fuelling atmospheric convection and heavy rainfall. The western equatorial Pacific is also a crossroads of thermocline and intermediate waters originating at the high latitudes of both hemispheres. With its complex network of passages and basins, the Indonesian continent that borders the western edge of the WPWP exerts a strongest control on the oceanic communication between the Pacific and Indian Oceans, in the form of the Indonesian Throughflow (ITF). Studies of climate variability in the WPWP have relied primarily on the low sedimentation–rate (~2–3 cm/ky during the Pleistocene) Ocean Drilling Program (ODP) Hole 806B from the Ontong Java Plateau (OJP), which serves as a warm end-member to monitor broad-scale zonal and meridional gradients through the Neogene. Higher resolution sites were previously unavailable from this region, preventing direct comparison with suborbital variability known from high-latitude sites; the newly cored sites of IODP Expedition 363 (Exp. 363) fill this gap.

Expedition 363 started from the Loyang Offshore Supply Base, Singapore, with the JOIDES Resolution leaving port on the morning of 11 October 2016, for a 1514 nmi transit to site U1482 just off the NW Australian Shelf. This was the start of a record-breaking expedition that crisscrossed the West Pacific Warm Pool (WPWP), crossed the equator four times, operated in both the Indian and Pacific Oceans, and recovered the most core of any IODP Expedition (6956 m) to date. The science objectives of Exp. 363 required a combination of sites with rapidly accumulating sediment at marginal locations and more typical open-ocean sites in order to trace the evolution of the West Pacific Warm Pool (WPWP) across a range of temporal resolutions. UK participants were all to be found in the micropalaeontology lab, with Chris Poole (UCL), Paul Pearson (Cardiff University) and Tom Dunkley Jones (University of Birmingham) contributing their expertise in planktonic foraminiferal and calcareous nannofossil biostratigraphy. In total, nine sties were cored with two off northwestern Australia and seven in the West Pacific Warm Pool (WPWP) (Figure 1). Drill sites were chosen to provide broad spatial coverage at a range of water depths, in order to intersect key water masses, including the North Pacific Intermediate Water (NPIW), Antarctic Intermediate Water (AAIW), and Upper Circumpolar Deepwater (UCDW). These sediment cores will be used to document the regional expression (e.g., temperature, precipitation, and productivity) and driving mechanisms of climate variability in the WPWP on millennial, orbital and geological timescales.

In summary, Exp. 363 operated in three sectors of the WPWP:

1. Eastern equatorial Indian Ocean, seaward of the NW Australian slope; two sites (U1482 and U1483) recovered upper Miocene to recent sediments, located to target the southwestern edge of the WPWP and the exit of the ITF to the Indian Ocean;

Figure 1.
Location map for IODP Expedition 363 Sites.



2. High sedimentation rate sites in the central sector of the WPWP; these included two sties on the northern margin of Papua New Guinea (Sites U1484 and U1485) less than 8 miles from the coast, with super-high sedimentation rates spanning the last ~450 000 years, and two sites in the Manus Basin providing longer records of the upper Pliocene to recent (Sites U1486 and U1487);

3. Pelagic sites in the northern sector of the WPWP; located on the northern and southern ends of the Eauripik Rise, three sites (Sites U1488, U1489 and U1490) recovered low-sedimentation sequences spanning the late Oligocene/early Miocene to recent.

Future research will focus on the following research themes:

1. *Millennial climate variability in the WPWP (Sites U1484-7)*: in low-latitude and tropical regions, millennial-scale variability is mainly expressed as changes in precipitation. Paleoprecipitation records suggest a southward shift in the ITCZ position apparently synchronous with North Atlantic cold events including the Younger Dryas, Heinrich Event 1, and marine isotope Stage (MIS) 3 stadials. These results are consistent with models that suggest climate conditions at high latitudes influence the position of the ITCZ, with a fast transmission of climate signals through the atmosphere in response to North Atlantic climate change. However, other studies suggest that orbital insolation changes affect tropical dynamics, possibly related to monsoon and ENSO response to changes in the mean climate state of the equatorial Pacific Ocean. As a major source of heat and moisture, the WPWP may have played an important role in millennial-scale variability through changes in its spatial extent and/or its SST. Obtaining long records from the WPWP with comparable resolution to the Greenland ice cores, Chinese speleothems, and high-resolution sediment cores from other regions will provide insight into the mechanisms driving centennial- to millennial-scale climate variability.

2. *Reconstructing orbital-scale climate variability through the Neogene (U1482-2 and U1486-90)*: Due to the distance between the tropical Pacific and polar ice sheets, the dominant driver of changing glacial–interglacial tropical Pacific sea surface temperatures (SSTs) is thought to be atmospheric pCO_2, with some minor contribution from local insolation forcing. Proxy records of precipitation from the western equatorial Pacific, however, are dominated by precessional forcing, suggesting that interhemispheric changes in insolation exert the strongest control on equatorial Pacific hydroclimates, associated with the migration of the ITCZ. Investigating the interconnection between these forcing mechanisms, and their evolution under different background climate states, is one of the overarching goals of this expedition.

Figure 2.
Two specimens of the planktonic foraminifer Globigerinoidesella fistulosa. (Credit: Bill Crawford, IODP JRSO) [Photo ID: exp363_108]

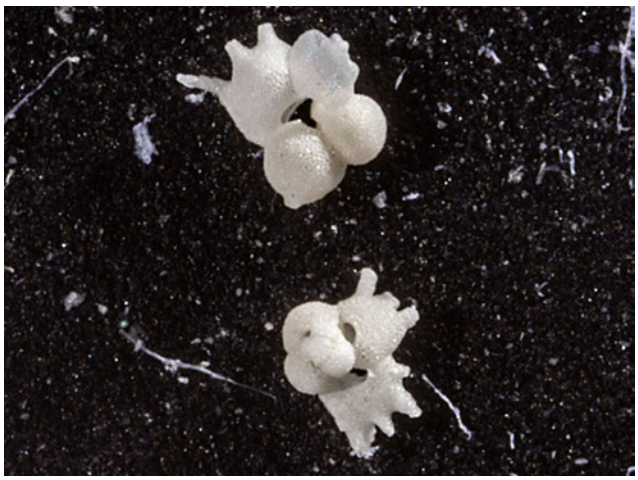
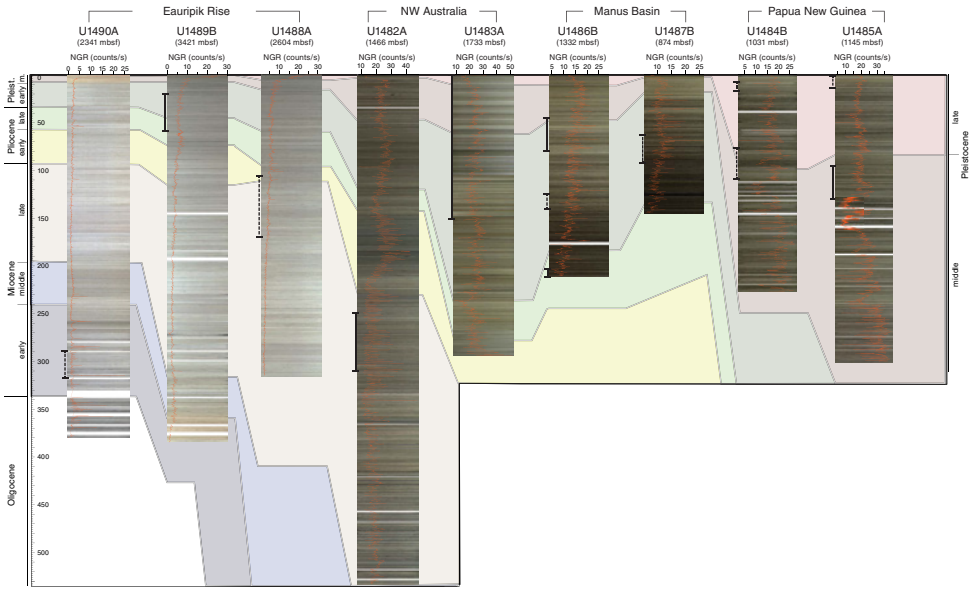


Figure 3.
Line scan images and NGR composites for all of Expedition 363 Sites.



3. *Long-term climate evolution of the WPWP (U1482, U1488-90)*: On million-year timescales, the relationships between different equilibrium states of the tropical Pacific and changes in the Equator-to-pole temperature gradient have likely affected ocean circulation from the middle Miocene through the Late Pleistocene. Specifically, long-term Cenozoic cooling was interrupted by periods of relative global warmth during the Middle Miocene Climate Optimum (MMCO; ~17–15 Ma) and the early Pliocene warm period (4.5–3 Ma). The early Pliocene warm period is of particular interest, as studies suggest that this period was characterized by a reduced Pacific zonal temperature gradient due to substantial warming of eastern equatorial Pacific. However, the spatial extent and magnitude of SST change in the WPWP and their implications for tropical precipitation are debated, and new records from this expedition should contribute to this discussion.

4. *Reconstructing changes in the ITF through the Neogene (U1482, U1488-90)*: on longer timescales, the strongest controls on the properties and strength of the ITF are likely sea level changes leading to the exposure and flooding of the Sunda shelf and tectonic closure of the Indonesian seaways. Reconstructing the thermocline structure at sites located in the heart of the WPWP and off northwest Australia, near the exit of the ITF into the Indian Ocean, will offer the opportunity to study changes in ITF transport in response to tectonic and climate changes through the late Neogene to present.

5. *Assessing the density structure of the western equatorial Pacific during the LGM (U1484-87)*: The spatial pattern of temperature and salinity in the ocean can be used to infer deep-ocean circulation. It would be ideal to use the same approach to reconstruct ocean circulation in the past, but we are currently limited by the availability of proxies with sufficient accuracy. Specifically, benthic foraminiferal $\delta^{18}O$ records cannot unequivocally be interpreted in terms of changes in ice volume, temperature, and salinity. For the LGM we can resolve this by reconstructing the chlorinity, as a measure of salinity, and δ18O of seawater from interstitial water profiles of deep-ocean sediment.

From a UK perspective, Paul Pearson is working on the long-term evolution of the thermocline, nutricline, biological pump and atmospheric CO_2 conditions; Chris Poole is focusing on key late Pliocene planktonic foraminiferal extinction events; and Tom Dunkley Jones is working on the late Neogene coccolithophore diversity records and geochemistry. As well as Chris, Paul and Tom, participants with a strong UK connection included Anna Joy Drury (PhD Imperial College), Rob Hatfield (PhD Lancaster), co-chief Anne Holbourn and education and outreach officer Katie Halder (now based in Australia).

Reference

Rosenthal, Y, Holbourn, A, Kulhanek, D K, and the Expedition 363 Scientists, in press. Expedition 363 Preliminary Report: Western Pacific Warm Pool. International Ocean Discovery Program. http://dx.doi.org/10.14379/iodp.pr.363.2017

Expedition 364 – Drilling the Peak Ring of the Chicxulub Impact Structure (T-Limit of the Deep Biosphere off Muroto

5 April – 31 May 2016

Joanna Morgan, Claire Mellet, Charles Cockell, Annemarie E Pickersgil, Auriol Rae

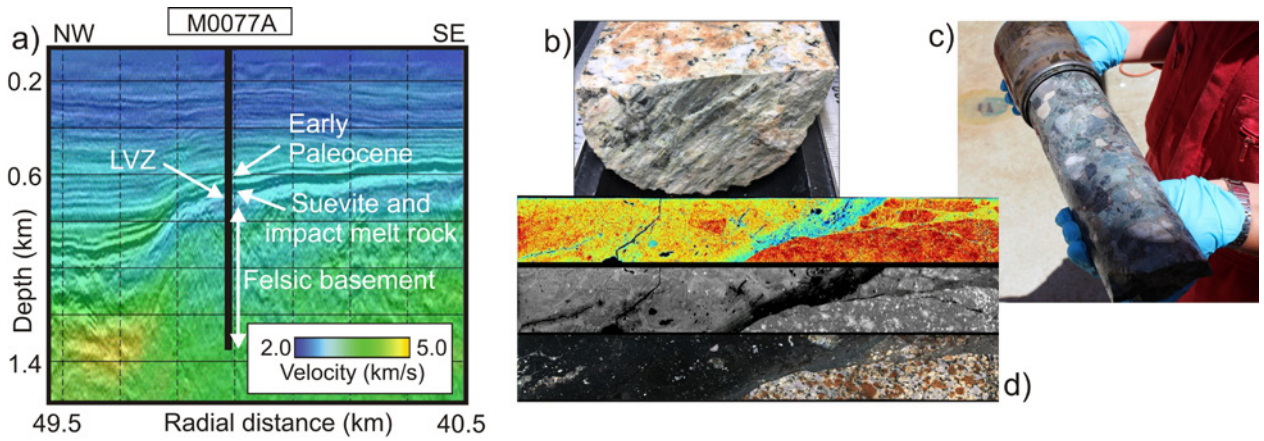
The Chicxulub structure on the Yucatan peninsula, Mexico, was the site of an asteroid impact that devastated the Earth's biosphere 65.5 million years ago. This impact is often referred to as the dinosaur killer, as it is widely thought to be the principal driver of the K-Pg mass extinction. Drilling revealed that the ring of peaks (peak ring) that is observed in the impact basin today, is formed from uplifted rocks that moved a few 10s km during crater formation [1].

Understanding how the Chicxulub crater formed opens a window on how giant impacts alter Earth's climate and how crater-dominated surfaces on planets and moons in our solar system are formed.

The peak ring within the Chicxulub impact structure was drilled in April to May 2016 to investigate: (1) the na-ture and formational mechanism of peak rings and test between two contrasting models [1–3], (2) how rocks are weakened during large impacts, (3) the nature and extent of postimpact hydrothermal circulation, (4) the deep bio-sphere and habitability of the peak ring, and (5) the recovery of life in a potentially, sterile zone. A single hole, M0077A (Figure 1a), was drilled at ~21° 27', 89° 57' [1], using a jack-up platform, the L/B Myrtle, contracted from Montco Offshore. An Atlas Copco mining rig was cantilevered from the bow of the platform, and drilling services were provided by DOSECC between granitic basement and impact melt rock.

(Drilling, Observation and Sampling of the Earths Continental Crust). The downhole logging program was managed by the European Petrophysics Consortium (EPC), and the University of Alberta, Canada, and the University of Texas at Austin, USA, were contracted to carry out the VSP (vertical seismic profile) measurements. Open-hole drilling occurred from the seabed to ~500 m depth, and core was recovered between 505.70 and 1334.73 mbsf (meters below sea floor). Wireline logging and VSP data were acquired in three phases: between ~0–503 m, 506–699 m, and 700–1334 m depth. Logging tools recorded: spectral and total natural gamma ray, sonic velocity, acoustic and optical borehole images, electrical resistivity, induction conductivity, mag-netic susceptibility, caliper, borehole fluid parameters and seismic travel time versus depth from the VSP. Petro-physical properties were measured at surface using a Multi-Sensor Core Logger (MSCL), and included gamma den-sity, electrical resistivity, magnetic susceptibility, and natural gamma ray. The core was sent to Weatherford Inter-national Limited in Houston, Texas, for CT scanning, and these data were processed by Enthought, Inc., and made available to scientists at the Onshore Science party (OSP). The core was then sent to the Bremen Core Repository (MARUM, University of Bremen), Germany, for the OSP which took place between September and October 2016.

Figure 1.
a) Drill Site M0077A located on a depth-converted seismic reflection profile ChicxR3. Colour is seismic velocity obtained using full-waveform inversion. b) Granitic basement with impact-induced shear faults (slickensides) c) suevite (melt-rich lithic impact breccia). d) Corewall images showing a line scan (bottom) and CT scans of a contact.



References

[1] Morgan J V, et al. (2016) Science, 354, 878–882.

[2] Baker D M H, et al. (2016) Icarus, 273, 146–163.

[3] Kring D A, et al. (2016) Nat. Comm., 10.1038/ncomms13161

[4] Gulick S P S, et al. (2008) Nat. Ge-osci., 1, 131–135.

[5] Morgan J V, et al. (2011) JGR, 116, doi: 10.1029 2011JB008210.

Acknowledgments

The Chicxulub drilling expedition was funded by IODP as Expedition 364 with co-funding from the ICDP. The European Consortium for Ocean Drilling implemented Expedition 364, with contributions and logistical support from the Yucatán state government and Universidad Nacional Autónoma de México (UNAM).

Expedition 364 Scientists

Elise Chenot, Gail Christeson, Philippe Claeys, Charles Cockell, Marco J L Coolen, Ludovic Ferrière, Catalina Gebhardt, Kazuhisa Goto, Sean Gulick, Heather Jones, David A Kring, Johanna Lofi, Christopher Lowery, Claire Mellett, Joanna Morgan, Rubén Ocampo-Torres, Ligia Perez-Cruz, Annemarie Pickersgill, Michael Poelchau, Auriol Rae, Cornelia Rasmussen, Mario Rebolledo-Vieyra, Ulrich Riller, Honami Sato, Jan Smit, Sonia Tikoo, Naotaka Tomioka, Jaime Urru-tia-Fucugauchi, Michael Whalen, Axel Wittmann, Long Xiao, Kosei Yamaguchi, William Zylberman.

Expedition 367/368 – South China Sea

9 April – 11 June 2017

Stephen Bowden

The aim of Expedition 367/368's was to test models and possible mechanisms of crustal break-up for the South China Sea. One the greatest achievements of scientific ocean drilling has been to elucidate the processes responsible for the opening of oceans and the formation of oceanic crust; for example the Iberian Margin of the Atlantic. Aside from being fundamental science this is extremely useful for resource provision and is necessary for hazard warning and mitigation. These kinds of expeditions attract the attention of geophysicists and tectonic specialists with models and interpretations that they want to test. Testing occurs within the close confines of the JR's meeting room and core description area; places where previous generations also tested their ideas and at times each other. However, Expedition 367/368 also received interest from sedimentologists and climatologists. Previous expeditions to the region have used sedimentary records to develop models of the Asian Monsoon and its effect on climate. Thus there exists a generation of PhD students and postdocs eager to return to an area on which they have worked hard but never visited.

The expedition sailed from Hong Kong to Shanghai. Embarking was a strange experience in several ways. Foremost was the peculiarity of meeting the other half of the expedition. Expedition 368 was the second part of 367/368. Expedition 367 got to go first, got a prime number and got to drill deep holes to basement. The 368 scientists had a cross-over meeting with our 367 geochemical counterparts. I found this nice but challenging; it was nice to meet our colleagues, but it was challenging to see how hard they had worked and it reminded me what was yet to come. It was also good to see the JR prepare for an expedition. I had never seen this before on the Chikyu (the hard work was done before I arrived), yet this time I got to witness firsthand what is involved, and watch the loading of my third party instrument.

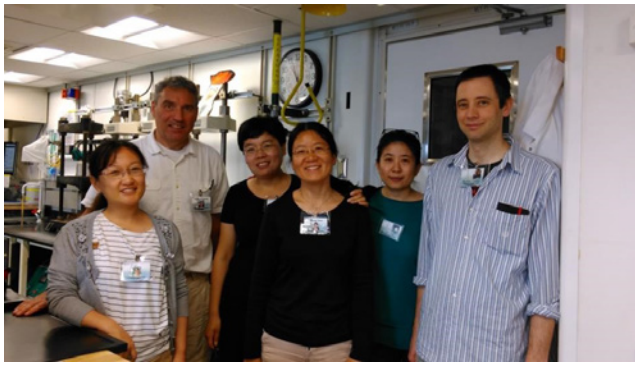
Expedition 368 had two primary sites a number of other contingency sites, and even added another during the expedition. In combination with expedition 367, 368 promised a 4 hole transect running from shallow water to deep water (two sites during 367 and two more during 368) in young emerging porto-ocean. During Expedition 368 it became clear that things were ahead of schedule and a further 3 sites were explored. The first additional site was located in the centre of the South China Sea, but drilling at this site ceased after the entry-cone was placed on the seafloor. Further sites were then explored targeting basement highs located in deep water and required the kind of drilling that only the IODP program provides.

As expeditions go, I have experienced single target and multiple target projects before. I feel both have varying kinds of intensity.

Figure 1.
Portside view at Hong Kong. Bottom: Portside view at Shanghai.

Figure 2.
Petrophysicist Enqing Huang and Co-Chief Hans Christian Larsen will the ramp to lower more rapidly whilst contemplating deepwater and crustal rupturing-processes.

Figure 3.
The 367 and 368 Geochemistry teams meet; Li Li, Michael J. Dorais, Yanping Li, Yifeng Chen, Lian Tian and me.



Multiple sites provide you a rhythm to work within whereas single-site expeditions set up an 'all or nothing' situation at the end. This time I was in the laboratory, and since the number of geochemists was few we got to do a bit of everything as we

covered for each other during busy times such as peak-squeezing for interstitial water analysis or when the organic geochemist slept. This felt very productive and stopped the 'groundhog-day' feeling sometimes caused by two months of labwork.

The UK's involvement in 368 was via organic geochemistry. I'll be honest with the reader and admit that when I first saw the prospectus I did wonder why any organic geochemist would want to go and analyse small amounts of methane for a couple of months, in what can be relatively stormy waters. Yet I saw an opportunity. A strength of the IODP program is that it supports many science disciplines from geophysics through to microbiology. Even organic geochemistry. Expedition 368 provided me and the UK a chance to test analytical technologies with applications ranging from environmental monitoring through to oil condition monitoring in heavy machinery.

Figure 4.
Hong Kong's busy harbor and exciting skyline frame the gangway as it is lifted.
(Credit: William Crawford, IODP JRSO) [Photo ID: exp367_007]

During the expedition I used the technology to detect trace concentrations of weathered heavy petroleum residues in ancient sediments. A current question facing organic geochemists is how much petroleum is normal, ie how much is there before humankind started spreading it everywhere? The format and structure of IODP provided a unique opportunity for this to be tested by measuring trace amounts of weathered-petroleum residues in marine sediments over time. This is a good thing to do, yet not so good it justifies an expedition on its own. But good enough that it's a worthy use of the time it takes to incubate samples for methane head space analysis (or the aggregate of that time repeated every other 12 hour period for two months). We'll see what three of my scientific-peers think. But for me and an enterprising student of mine who has started his own business based on the technology, the IODP program provided a chance to do some useful science and test technologies in a normally hard to access environment.

The sampling party is yet to happen, but I would consider the data I acquired very valuable and hopefully worthy of the effort and time many other people invest making the IODP program happen.

Figure 5.
Using my third party instrument in the laboratory.

Figure 6.
Brittany Martinez (Curatorial Specialist, IODP JRSO), Beth Novak (Research Associate, Paleomagnetism Laboratory, IODP JRSO), Lisa Crowder (Assistant Laboratory Officer, IODP JRSO), and Hans-Christian Larsen (Co-Chief Scientist, Denmark) with a hard rock core.
(Credit: Tim Fulton, IODP JRSO) [Photo ID: exp368_214]

Expedition 369 – Australian Cretaceous climate and tectonics

26 September – 26 November 2017

Richard W Hobbs, Sietske J Batenburg, Kirsty M Edgar, Lauren K O'Connor

IODP Expedition 369 set sail from Hobart, Tasmania with four scientists and one outreach officer from the UK onboard on October 1st. The Australia Cretaceous Climate and Tectonics expedition aims to understand the paleoceanography and tectonics of the Naturaliste Plateau and Mentelle Basin off SW Australia. A series of cores from four different sites are planned in order to investigate the rise and collapse of the Cretaceous hothouse, the controls on Oceanic Anoxic Events (OAEs) during major carbon cycle perturbations, Cretaceous paleoceanography including deep and intermediate water circulation, Cenozoic to recent paleoceanography including influence of the Tasman gateway opening and Indonesian gateway restriction, and the tectonic, volcanic, and depositional history of the region prior to Gondwana breakup, as well as after separation from India and subsequently Antarctica.

The expedition reached its first site on the 7th October in the Great Australian Bight after battling with rough seas leaving Tasmania. Site U1512 has so far been successful with over 400 m already drilled and excitement is high as we near our key target of OAE2. After this site the expedition will continue to three sites off the SW corner of Australia before disembarking in Fremantle on the 26th November.

Figure 1.
From left to right: Dr Kirsty Edgar (Micropalaeontologist), Dr Vivien Cumming (Education & Outreach), Prof Richard Hobbs (Co-Chief Scientist), Lauren O'Connor (Geochemist) and Dr Sietske Batenburg (Stratigraphic Correlator) – UKIODP onboard the Joides Resolution.

Figure 2.
Left: Departing from Hobart, Tasmania. Right: The beautiful sunsets we are enjoying along the way.

Expedition 371 – Tasman frontier subduction initiation and paleogene climate

27 July 2017 – 26 September 2017

Cherry Newsam

A team of 32 scientists are currently sailing on IODP Expedition 371 in the Tasman Sea where they are targeting six drill sites (U1506 to U1511) to understand the tectonic history of Tonga Kermadec subduction initiation and palaeoceanographic events in the South West Pacific Ocean. The international team, from 13 countries and 25 academic institutions, are exploring the new continent of Zealandia and have already drilled sediments from the Lord Howe Rise, the New Caledonia Trough and the Reinga Basin.

The team are specifically addressing three key objectives:

Tonga Kermadec subduction initiation: How and why did subduction initiation occur? The primary objective is to date and quantify deformation (timing, distribution and style) and uplift/subsidence (magnitude and timing) associated with Tonga Kermadec subduction initiation to test and refine geodynamic models and theories.

Early Paleogene anomalous warmth in the South West Pacific region: Did subduction initiation influence climate? The secondary objective is to determine if palaeogeographic changes caused by subduction initiation may have led to anomalous regional warmth in the early Eocene by altering ocean circulation. This will address issues arising from previous work from the South West Pacific where early Eocene temperature proxies have recorded extremely high values which do not correspond to palaeoclimatic model simulations for the region.

Pole-Equator climate teleconnections through the late Cenozoic: The third objective aims to study tropical and polar climatic teleconnections through the Cenozoic to understand when the modern ocean circulation system developed in this region. The accumulation of relatively thick carbonate-rich Neogene bathyal strata in this region will detail the palaeoceanographic history and in particular will provide insight into the Neogene biogenic bloom previously documented in this region.

Figure 1.
IODP Expedition 371 drill sites, U1506 to U1511, in the South West Pacific Ocean (Figure from Sutherland et al., 2016).

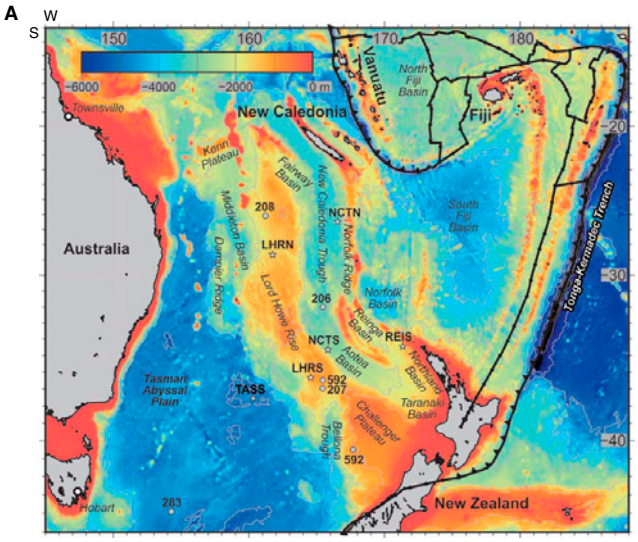


Figure 2.
IODP Expedition 371 Science party (Image credit to Tim Fulton Imaging Specialist).

This eight-week exploratory expedition onboard the JOIDES Resolution collecting core samples of sediments from the South West Pacific will enhance our knowledge of this region, where there has been very little previous ocean drilling (Deep Sea Drilling Project Legs 21, 29 and 90).

The scientific party onboard have already been surprised by a number of discoveries from the cores drilled, retrieving an unexpected volcanic sequence of microcrystalline to fine grained basalt, expanded packages of turbidites and a unit of bioclastic sand containing abundant bryozoans, which all provide an insight into the tectonic development and the oceanographic history of this region. The participants are looking forward to continuing the exploration of this region by analysing the many samples recovered and data generated during this expedition in post cruise research.

Expedition 381 – Corinth active rift development

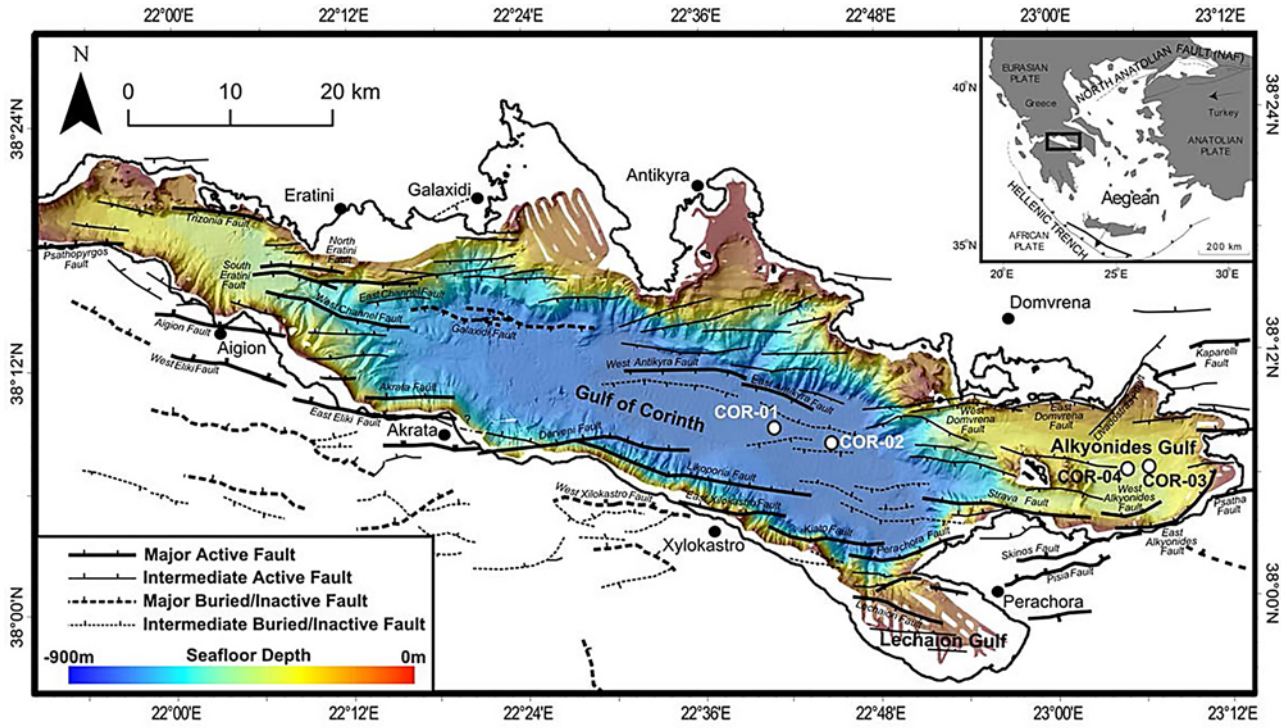
Mid Oct – Mid December 2017

Lisa McNeill, Gareth Carter, Erwan Le Ber, Richard Collier, Marco Maffione, Christian Marz

Continental rifting is fundamental for the formation of ocean basins and hydrocarbon-bearing rifted margins, and active rift zones are dynamic regions of high geohazard potential. However, much of what we know from the fault to plate scale is poorly constrained and is not resolved at any level of spatial or temporal detail over a complete rift system. The active Corinth Rift, Central Greece is in the earliest phase of rifting and a location of high deformation rates, where the syn-rift succession is preserved and accessible, and a dense, seismic database provides high resolution imaging of the fault network and of seismic stratigraphy for the recent rift history but with limited chronology. Expedition 381 will drill, core and log this offshore syn-rift sequence at 3 sites, with depths up to ~750 m below seafloor, with the aim of achieving an unprecedented precision of timing and spatial complexity of rift-fault system development and rift-controlled drainage system evolution in the first 1–2 Myr of rift history. The project will aim to determine at a high temporal and spatial resolution how faults evolve, how strain is distributed, and how the landscape responds within the first few Myrs in a non-volcanic continental rift filling the developing rift basin, as modulated by Quaternary changes in sea level and climate. High horizontal spatial resolution (1–3 km) is provided by a dense grid of seismic profiles offshore that have been recently fully integrated, complemented by extensive outcrops onshore. High temporal resolution (~20–50 kyr) will be provided by seismic stratigraphy tied to new core and log data from three carefully located boreholes to sample the recent syn-rift sequence. The high resolution temporal and environmental data will also provide an important record of Eastern Mediterranean Quaternary climate and paleoenvironment.

Two primary themes will be addressed by the proposed drilling integrated with the seismic database and onshore data. 1)

Figure 1.
Overview map of the Corinth Rift with primary rift-related faults (both active and currently inactive), multibeam bathymetry of the Gulf, and Expedition 381 drill sites (COR-01, COR-02, COR-04). Fault traces are derived from: Nixon et al., 2016; Bell et al., 2009; Taylor et al., 2011 (offshore); Ford et al., 2007; 2013; Leeder et al., 2012; Skourtsos and Kranis, 2009 (onshore). Inset shows tectonic setting of the Corinth Rift within the Aegean region, Eastern Mediterranean.



Establishment of fault and rift evolutionary history (including fault growth, strain localization and rift propagation) and deformation rates (including definitive fault slip rates for improved hazard assessment). 2) Understanding the response of drainage evolution and sediment supply to rift and fault evolution. Core data will define lithologies, depositional systems and paleoenvironment (including catchment paleo-climate), basin paleobathymetry and relative sea level. Integrated with seismic data, onshore stratigraphy and catchment data, we will investigate the relative roles and feedbacks between tectonics, climate and eustasy in sediment flux and basin evolution. A multidisciplinary approach to core sampling integrated with log and seismic data will generate a Quaternary chronology for the syn-rift stratigraphy down to orbital timescale resolutions and resolve the paleoenvironmental history of the basin in order to address our objectives.

The Expedition will be a Mission Specific Platform due to low bridges accessing the Gulf, using the industry vessel FUGRO Synergy, a DP2 class, multi-purpose geotechnical and drilling vessel. The Expedition is now fully staffed with 9 scientists participating offshore and the full 33-member science party participating in the Onshore Science Party in Bremen in February 2018. ESO (the ECORD Science Operator) will mobilise a number of containerised laboratories for operations and offshore measurements/analysis. Cores will then be split, sampled and described in Bremen following the offshore phase. The Co-Chiefs, Expedition Project Managers, ESO team members and Science Party are now undertaking final preparations in advance of mobilisation for the expedition in Falmouth, UK and then in Corinth, Greece. A full outreach programme is expected with regular updates of the expedition's progress at the ECORD website for the expedition: http://www.ecord.org/expedition381/

Figure 2.
The FUGRO Synergy contracted to conduct Expedition 381.

Expedition PS104 – Ice-sheet dynamics of the Amundsen Sea embayment with *MeBo* shallow drilling

February – March 2017

Rob Larter, Claus-Dieter Hillenbrand, James Smith, Tina van de Flierdt, Patric Simões Pereira, and Steve Bohaty

The stability and mass balance of the West Antarctic Ice Sheet (WAIS) and its implications for future sea-level rise are a major focus of ongoing international research efforts. Notably, ice sheet retreat caused by rapid ocean-driven melting of ice shelves fringing the WAIS has been observed in the Amundsen Sea Embayment (ASE). Marine sedimentary strata in this region could contain a record of environmental change in West Antarctica that extends from the time of continental break-up with New Zealand (~90 Ma) to the present day, including the initial development of the WAIS, as well as various states of WAIS stability and/or collapse. However, no major drilling expedition had visited the ASE before this year.

In February and March 2017, PI Karsten Gohl (Alfred Wegener Institute, Bremerhaven) led Expedition RV *Polarstern* PS104, to tackle this shortcoming. By deploying the MARUM *Meeresboden-Bohrgerät* (MeBo70) drilling system, sediments at 11 holes and from 9 sites were recovered—despite challenges posed by technical problems, weather, and sea ice conditions. The maximum penetration depth was 35.7 mbsf, and recovery rates varied from 7 to 76%. The recovered drillcore sections range in age from Late Cretaceous to Holocene, with the oldest sediments containing Late Cretaceous or early Paleogene pollen, spores and plant fragments that were deposited in a terrestrial environment. The material indicates that there was land above sea level in central West Antarctica at this time, and that it hosted abundant and diverse vegetation. Preliminary biostratigraphic interpretations suggest that glacimarine diamictons recovered in the younger cores are of Oligocene to Miocene age, and thus may record the first advances of the WAIS onto the inner continental shelf. Three sites in inner shelf basins targeted late Quaternary sediments. Constraining the age of the cores recovered at these sites will be difficult due to the lack of microfossils, but preliminary observations suggest that they were all deposited rapidly since the Last Glacial Maximum. These results provide new insight into the Cretaceous–Cenozoic palaeoenvironmental history of the ASE, and will guide planning for future drilling in the region when IODP Expedition 379 targets the ASE in January–March 2019.

UK IODP and the British Antarctic Survey contributed funding to expedition PS104. UK participation in the cruise allowed development of national expertise in the use of the MeBo drilling system as a mission-specific platform for drilling on polar continental shelves. The expedition was the first time a multi-barrelled seabed drilling device such as the MeBo system had been used in Antarctica. An operational report on lessons learned from drilling with MeBo in the Amundsen Sea is currently in press with Geochemistry, Geophysics, Geosystems (Gohl et al., DOI:10.1002/2017GC007081)

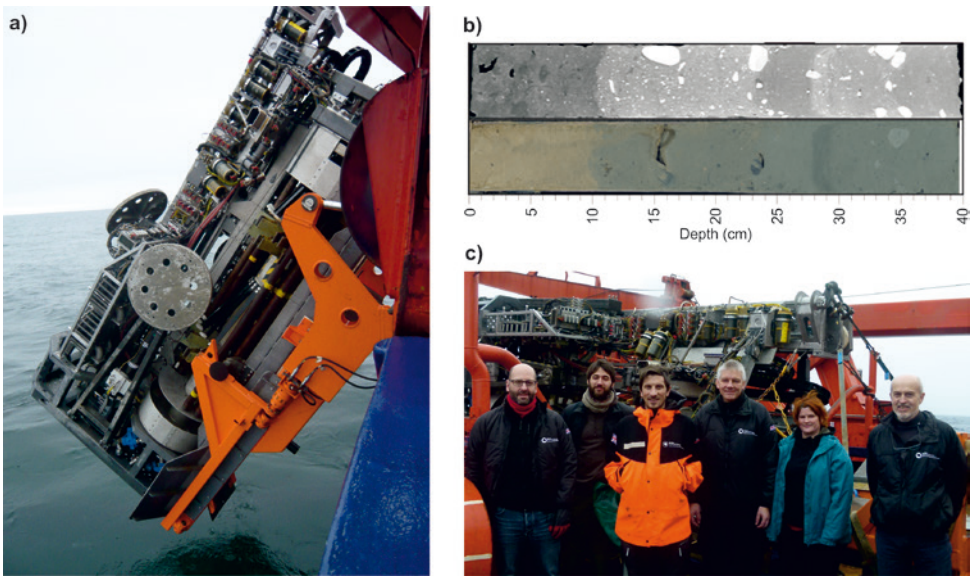


Figure 1.
a) MeBo drilling system being deployed from RV Polarstern.
b) X-ray (upper) and line scan image of part of core section 1R_1 from site BEAR-7a showing terrigenous and diatom-bearing sandy mud overlying diatom-bearing mudstone.
c) UK participants on PS104 (left to right: S Bohaty, P Simões-Pereira, J Smith, C-D Hillenbrand, T van de Flierdt, R Larter). The FUGRO Synergy contracted to conduct Expedition 381.

Scientific workshops

UK IODP support for scientific conferences and workshops

Through direct funding, and/or by providing travel and subsistence funding for participating scientists, UK IODP has recently provided support for the workshops described in this section.

UK IODP is providing funding for the FORAMs 2018 conference as well next year's UK IODP Student Workshop, both of which will be held in June, 2018. UK IODP is also providing funding for the Micropalaeontological Society Annul Conference 2017, to be held on the 15–16th November in London.

Hosting and/or participating in IODP-related meetings is an important factor in maintaining UK scientist's success within the programme. If you would like to attend an IODP conference, or better yet host an event in the UK, please contact the Science Coordinator for further information (ukiodp@bgs.ac.uk).

ECORD summer schools

The UK IODP has funded the participation (€1000) of two UK students in the always excellent ECORD summer schools. ECORD offers these courses and summer schools to further foster the education of young scientists in marine-related sciences and to train a new generation to participate in future ocean drilling expeditions. The most recent of which are listed below.

Currrent-controlled sea floor archives: coral mounds and contourites
Bremen, Germany, **August 21 – September 1, 2017**

14th Urbino symmer school in paleoclimatolgy
Urbino, Italy, **July 12 – July 28, 2017**

Petrophysics summer school
Leicester, UK, **July 2 – July 7 2017**

International Conference in Paleoceanography 2016 Blog

This summer, the twelfth International Conference in Paleoceanography (ICP12) took place in Utrecht, the Netherlands. Held once every three years, ICP12 is one of the biggest international paleoceanography conferences, with leading academics presenting and discussing their research. ICP12 was therefore a great framework for the UK IODP student cohort to discuss recent results and network with a variety of scientists.

The conference was structured with keynote lectures in the morning, and poster sessions and perspective lectures in the afternoon. The session covered a variety of themes, from evolution to paleo-proxies to reconstructing future climate. The keynotes were given by up-and-coming researchers (including Urbino Summer School alumni), whose work is helping to push forward the boundaries in paleoceanography. Each of the speakers at ICP12 provided a fascinating insight into their current research, including new unpublished data. The conference also had a strong focus on the poster sessions, with nearly 700 presentations given by researchers at all stages, from PhD students to professors, including some of the most well-known names in the field.

An obituary for Harry Elderfield, a giant in the field of paleoceanography who passed away earlier this year, was given by Nick McCave from the University of Cambridge. The obituary ended with a demonstration of Elderfield's impact on the field. Those in the audience who were the 'children' and 'grandchildren' of Elderfield, having worked with him directly or being supervised by his former PhD students, were asked to stand, and a significant proportion of the audience did so. Next, all those who worked with the proxies Elderfield developed were asked to stand and virtually everyone stood up and gave Elderfield a standing ovation for his life's work. The main social events during the conference included the conference dinner and the paleomusicology concert. The paleomusicology concert is unique to ICP, and was originally set up by Nick Shackleton at the very first ICP in 1983. This year's concert, featured a variety of performances, from Brahms to the Pixies, and was enjoyed by all.

On Friday afternoon the conference closed with 'The Great Debate', during which a panel and the audience discussed the idea that the current trend towards more of a focus on resolving social issues arising from climate change may be a threat to the fundamental research in paleoceanography. To illustrate this, the debate started by highlighting the number of times the word 'paleoceanography' appeared in the most recent IPCC report, and with this the impact our field has on policy makers—which turns out to be zero! What followed was a lively and spirited debate with delegates offering arguments to support the whole spectrum of opinions on this issue.

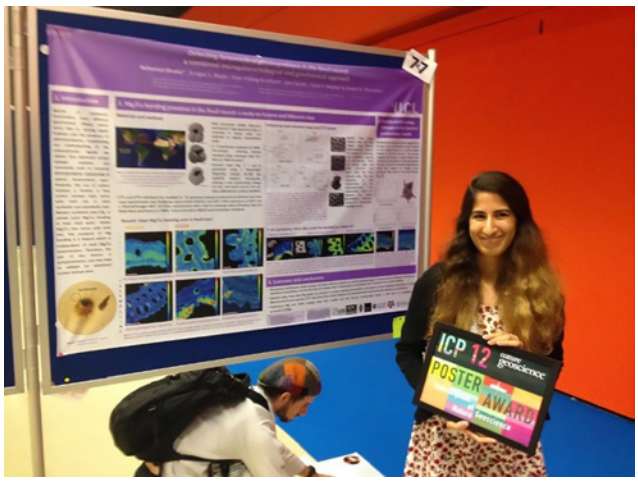
Although paleoceanographers believe the past is the key to the future and that ocean records are integral to unlocking the past, policymakers mainly use the present to try to understand the future. One of the main conclusions from the debate was that the field needs to progress further, and that scientists and policymakers need to work together more—whether this be through interdisciplinary collaboration, outreach work, or other avenues—to help the general public understand of the importance of paleoceanography to predict future climatic changes.

Twelve poster prizes were also awarded, and included four PhD students from the UK-IODP community: Amy Sparkes (Cardiff), Jenny Roberts (Cambridge), Nicholas Evans (Cambridge) and Rehemat Bhatia (UCL).

Overall, ICP12 was really well organised and an excellent experience full of fascinating insights. We would like to thank the organising committee for their work and support, and hope to be part of the next ICP in Sydney, Australia, in 2019.

If you'd like to see a little bit more about what went on during ICP12, check out the ICP12 facebook page and the daily catch-up videos!

Figure 1.
Rehemat after winning one of the best poster prizes. Her poster included results utilising samples from Site U1338 (IODP 320/321) and Bass River (ODP 174AX).



Petrophysics summer school 2017

1–7 July, 2015

The petrophysics summer school was organized with the aim of providing a learning environment where industry and academic experts can come together to give training on the practice of petrophysics and its applications across the hydrocarbon industry and the International Ocean Discovery Program (IODP)

Day 0: **Saturday afternoon, King Richard III Hall**. We were all treated to a warm ice breaker reception at the King Richard visitor's center. This was a wonderful opportunity to meet and discuss with all the 30 participants from 17 different countries while helping ourselves to some appealing refreshments. We met with our instructors, including experts from industry and academia and had the chance to view the historical exhibition of King Richard III.

Day 1: **University of Leicester, Geology Department**. Our day began at 9am with a welcome address by Summer School organiser, Sally Morgan (University of Leicester). This was followed immediately by a presentation introducing us to the International Ocean Discovery Program (IODP) by Angela Slagle (Lamont-Doherty Earth Observatory). This presentation was a real eye opener into activities run by IODP. We were also introduced to logging tools and riser drilling with different presentation sessions.

After lunch, we displayed and presented posters on our personal research. Later on, we all gave an elevator pitch on what we had been working on. We had numerous coffee breaks with a wide selection of drinks, sweets, Japanese snacks etc.–we could not have asked for more.

Day 2: **University of Leicester, Geology Department**. We were introduced to the fundamentals of Petrophysics. This was a classroom session with class work examples. After lunch, we were introduced to core physical properties. We rounded off the day with a lecture on estimating in-place hydrocarbon volumes.

Day 3: **Field trip**. We all took a bus ride to Weatherford East Leake where we had the opportunity to view logging tools and see how they are designed, produced and calibrated. We were broken into teams and given tours of the workshops and laboratories across their site. After this, we took a short bus trip to the British Geological Survey core repository in Keyworth. Here we were taught how to integrate downhole well data with core descriptions. The day was rounded off with a night out in the city to celebrate American Independence Day.

Day 4: **University of Leicester, Geology Department**. Today was dedicated mostly to learning how to use Techlog, which is Schlumberger's petrophysics software. Industry experts and researchers from IODP took us through this. Activities included well log interpretation and synthetic seismogram generation.

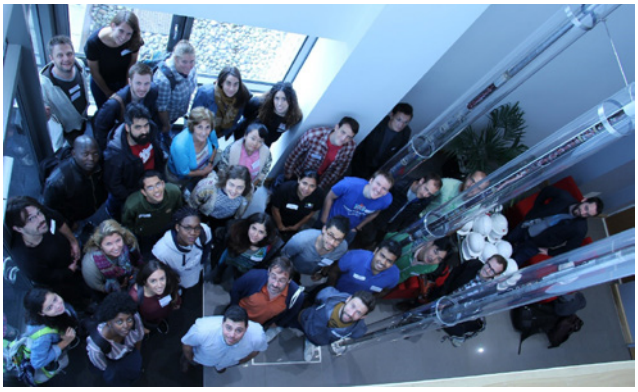
Day 5: **University of Leicester, Geology Department**. We continued with Techlog training also working on a data set from IODP Expedition 346: Asian Monsoon. The day was wrapped up with a visit to the New Walk Museum in Leicester followed by curry night at Kayal restaurant also in the city.

Day 6: **University of Leicester, Geology Department**. We went through an IODP case study and an industry case study using Techlog and were given a free session on Techlog so that we could play around with what we had learnt throughout the programme. This was followed by farewells.

The 2017 Petrophysics summer school was a wonderful opportunity to meet and network with students, post docs, senior scientists and industry experts from all over the world. It was an opportunity to discuss our research interests while learning about petrophysics. I will really miss socialising in the multicultural city of Leicester.

Peace Aaron, Durham University peaceaaron@yahoo.com

Figure 1.
Petrophysics Summer School 2017 at Weatherford, East Leake (photo Sarah Davies, University of Leicester).



Wombat in the Greenhouse: Sampling rare regional records of Mesozoic Environmental Change

Science Lead: Jessica Whiteside
Data Lead: TBD
Other possible proponents/interested parties: Tim Bralower, Junichiro Kuroda, Mike Coffin, Dietmar Müller, Irina Borissova, Fumio Inagaki, Simon C. George, Neville Exon, Yasu Yamada, Yair Rosenthal, Ulrich Wortmann. Trevor Williams, Eun Young Lee, David de Vleeschouwer, Maija Raudsepp, Yuki Morono

Increasing ocean acidification, deoxygenation, and extinction are among the measurable consequences of current and 21st century projected trends in atmospheric CO_2 concentrations and climate change. Several mass extinction events in Earth's past occurred during global greenhouse (hothouse) climates, and these may serve as partial analogues from which we can infer the ecological consequences of anticipated future global climate scenarios. The warmest such interval in the last 300 million years—the early Mesozoic Era (252 to 66 million years ago, Triassic through Cretaceous)—witnessed pivotal biotic, climatic, and tectonic events against a backdrop that included generally elevated CO_2, conjoined and splitting continents, and nascent modern ecosystems. This time interval is punctuated by a number of sudden environmental changes, including possible transient icehouse intervals, the Carnian Pluvial Event, Large Igneous Province (LIP) emplacements, and at least two bolide impacts. This was also a period of large-scale continental dispersion, as the supercontinent Pangaea was slowly breaking apart to form the major plates we observe today.

Drilling of continuous marine sedimentary archives that document Earth's climate and tectonic history in Mesozoic time is a scientific and societal priority. Extensive early Mesozoic marine records from this region are rare, and when present they are difficult to precisely correlate with classic Tethyan and northern Panthalassan sections. This is primarily because the marine biozonation for this southern hemisphere region differs strikingly from the Laurasian index fossils used to define the GSSP chronostratigraphic boundaries. Thus, integrating a precise and accurate global picture of environmental and biotic changes during the early Mesozoic is impossible now.

We propose to drill Mesozoic sedimentary sequences on the northeastern side of the submerged Wombat Plateau, which is part of the northernmost continental margin of Australia. Here, previous work at four drill sites (759–761, 764) by ODP Leg 122 scientists reveals a thick succession of Late Triassic (Carnian–Rhaetian: ~236–201.6 million years ago) deltaic and shallow marine sediments unconformably overlain by Late Cretaceous (Cenomanian-Maastrichtian: 100.5–66 million years ago) pelagic sediments, including records of Oceanic Anoxic Event 2 across the Cenomanian-Turonian boundary (where black shale total organic carbon values rise to >25%) and the Cretaceous-Paleogene boundary. Though this previous drilling established a basic understanding of the sequence, core recovery was quite poor (≤30%), and existing cores are in poor condition, precluding the possibility of developing a well-preserved continuous record from them.

New core from the Wombat Plateau will provide a better understanding of the early Mesozoic in the region. These Triassic sediments were deposited at 20–30°S paleolatitude, which is particularly important because lower-latitude sediments from the Southern Hemisphere are rare. The magnetostratigraphic record recovered from this core will allow a precise correlation to Northern Hemisphere sections independent of biostratigraphy. At the same time, the biostratigraphic record for the core will allow correlation and integration of other South Pacific sections, and provide key southern hemisphere data for Late Triassic climate events (e.g., late Norian-Rhaetian increase in pCO_2, Carnian Pluvial Event, Manicouagan and Rochechuart impacts, and far-field effects of the Central Atlantic Magmatic Province). The regional versus global effect of these events is in debate, and thus a high-resolution southern record is critical for their understanding. Additionally, timing and environmental changes surrounding the Norian-Rhaetian boundary are poorly understood globally, and this drill site has high potential to recover a nearly complete shallow-marine record of this transition. Finally, the Late Cretaceous sediments that cap the Triassic sequence are an important deep-water record of the dynamic environmental changes during this time, just before the end-Cretaceous mass extinction event. Moreover, long sedimentary records from old rifted margins provide important information for reconstructing the pre-conditions and onset of rifting, continental breakup, and the formation of young ocean basins (and the many associated environmental changes), and the limits and evolutionary nature of the deep biosphere.

2016 UK IODP General Conference

15 November, 2017

Kirstin Johnson (UK-IODP Science Coordinator; BGS)

In November last year, we held our UK IODP meeting at the Royal Geographical Society. There was excellent attendance with around 80 attendees from over 30 different academic institutes. Keynote speakers were Lisa McNeill, Chris MacLeod, Ian Hall and Joanna Morgan, with topics covered such as 'Earth in Motion' and 'Oceans and Climate'. There were nine additional lecture presentations and 26 poster presentations given by UK IODP scientists.

The UK IODP team would like to thank everyone who attended, especially those who presented their outstanding and innovative work.

Knowledge exchange update 2017

Sally Morgan, UK IODP Knowledge Exchange Fellow

It has been a busy time for UK IODP knowledge exchange, working in collaboration with the wider Programme Advisory Group to build a solid case for UK IODP renewal in 2018. A combination of responding proactively to the 2011 'Wakeham Review' of the programme and introducing new innovative initiatives, will contribute positively to the report that is being compiled.

Impact case studies

A number of impact case studies have now been submitted to the NERC database detailing some of the major research successes and ones-to-watch arising from the UK IODP scientific community. The case study portfolio includes a combination of projects and outputs that have been academia led, but also cases where industry have enhanced the value of IODP data through inclusion in their commercial models and products. There is still an opportunity to have a KEF-supported case study written about your impactful research: please complete the online Impact Capture Survey or email to register your interest.

Travel awards

This discretionary funding is aimed at supporting the UK IODP scientific community in their endeavours to engage with end-users. Individuals are invited to apply to the scheme to support both existing and emerging collaborative ventures with end-users, or to attend conferences that are end-user facing. Early career scientists are particularly encouraged to apply via the website.

Impact & policy training opportunities

In early 2018 there will be an opportunity for members of the UK IODP scientific community to receive professional training in impact, particularly related to public policy. Sessions on offer will include one tailored to early career researchers, with another focused on mid-to senior-level researchers. Places will be limited and participants will be selected via a competitive process — more information to follow soon.

Petrophysics summer school

A UK IODP initiative, the Petrophysics Summer School is about to enter its third year. The first two schools have proved a huge success training a total of 60 participants from around the world, with financial support from UK IODP, ECORD, LPS, AFES and MSG, and a pool of instructors from across industry, academia and IODP. This unique week-long school became CPD-accredited in 2017 providing high-quality training in petrophysics to industry and researchers at any stage in their careers. Information about the next school will be available in early 2018.

Communication

- Meeting representation including: AAPG-ICE 2017; MSG Shackleton Meeting; GASS 2017; UGUK.
- Committees and Panels: Through invitation, UK IODP is now represented on the Geological Society of London's Marine Studies Group and Environment Network. Panellist representation on the recent NERC Innovation Placements Panel. Invited contributer on Alternative Technologies to Well Logging Sources workshop (2018).
- Latest publications: Impact: Linking Science & Policy, August 2017 edition (https://impact.pub/August-2-2017digitaledition/); GEOExPro, vol13 n6 2017 (https://www.geoexpro.com/articles/2017/01/a-time-saving-taxonomic-tool)
- Website: the site is aimed at both end-users and the research community to facilitate access to information about IODP, particularly in relation KE activities including: data access and current opportunities.
- Banners: A series of six pull-up banners are available for use by the UK IODP community to help promote the programme. Further information about the banners and how to access them is available on the website.
- Alumni: A database of all UK IODP alumni has been compiled and is accessible via the website. It includes information on which expedition people have sailed on and in what capacity, as well as information about publications, research awards and careers. The database remains a work in progress. Should you spot any errors or omissions please get in touch.

Pathways to impact

Get in touch for help and advice on writing your PTI statements.

For more information: www.iodp.rocks
If you have any KE questions or ideas email: ukiodp_kef@le.ac.uk
Follow UK IODP KE on Twitter: @Sci_fOD

UK IODP news

Kirstin Johnson (Science Coordinator-BGS), Jessica Surma (Programme Manager-NERC)

Websites

http://www.bgs.ac.uk/iodp/ (Coordinator's website: Programme activities, guidance, and scientific highlights)

http://www.nerc.ac.uk/research/funded/programmes/ukiodp/ (Formal website: programme announcements and information)

International Ocean Discovery Program (IODP) (2013–2023)

The cuurent phase of IODP commenced in October 2013. All implementing organizations have agreed to administer programmes under the governing goals laid out in the new Science Plan 'Iluminated Earth's Past, Present and Future' (http://www.iodp.org/science-plan-for-2013–2023). UK scientists played a central role in developing the Science Plan which is organized around four themes:

1. Climate and Ocean Change: Reading the Past, Informing the Future
2. Biosphere Frontiers: Deep Life, Biodiversity, and Environmental Forcing of Ecosystems
3. Earth Connections: Deep Processes and Their Impact on Earth's Surface Environment
4. Earth in Motion: Processes and Hazards on Human Time Scales

Structure

The European Consortium for Ocean Research Drilling (ECORD) members have of signed the MoU concerning national contributions to ECORD.

Under the present IODP programme, it has been agreed by all the lead funding agencies that there will be a simplified funding model (no 'co-mingled funds'), with lighter management. While maintaining the overarching international umbrella of the programme, platform providers will have greater independence.

ECORD berths

The result of this restructuring is that in comparison with the past 10 year phase, there will be more ECORD (and by extension, UK) berths on JOIDES Resolution (JR) and Mission Specific Platform (MSP) expeditions, and fewer on Chikyu. It is anticipated that there will be up to 400 ECORD berths on JR over the next phase. ECORD is planning to run an average of one MSP per year, with a minimum of 10 ECORD berths per expedition (i.e. ~100 berths over the 10 year programme), it is anticipated that approximately six berths will be available for ECORD scientists on Chikyu per year, (i.e. ~60 over the 10 year programme).

Co-chief scientists will not count against berth quotas in the new programme. All told, it is expected there will be between 500 and 600 ECORD berths over the next 10 year programme, a 25–50% increase on the concluding programme.

UK IODP (2013–2018); Present phase for NERC's directed research programme

Notable elements of the current programme include:

- Moratorium Awards (new) — incorporates participation costs for IODP expeditions (continued) and post-cruise funding (continued) (~£2.5 mil over 5 years)
- Site Survey Grants (continued) (~£2.2 mil)
- Knowledge Exchange Function (new) (~£0.2 mil)

The British Geological Survey will continue to provide the UK IODP Science Coordination function, and NERC will continue to administer the programme (~0.5 mil).

Moratorium awards

These awards combine salary support for expedition participants and funding for post cruise research. Moratorium awards are available to all IODP expedition participants, however available funding for post cruise research will depend on career stage:

- PhD student — £25 000
- Post-doctoral researcher — £50 000
- Tenured scientist — £25 000

Applications for Moratorium Awards will be made through JeS prior to joining expedition. Further detail and guidance is available on the NERC UK IODP webpages and through the UKIODP mailing list.

Site survey grant rounds

A key requirement of the IODP proposal evaluation process is that potential drill sites have adequate site surveys to justify selection of safe drill sites. UK IODP will continue to make

available resources to allow the UK community to acquire such site surveys, since they are essential for UK-lead expedition applications. These grants in the past have been important for establishing UK's leadership in UK IODP.

Science coordination

- Continue to communicate programme news and opportunities to network of over 500 UK scientists who engage in IODP-related research.
- Support UK scientists participating in IODP expeditions as well as those engaged in the IODP Science Advisory Structure (SAS).
- Organise, facilitate, and sponsor science meetings/workshops
- Establish programme research priorities with NERC managers and the Programme Advisory Group.
- Support student opportunities and outreach (e.g. Summer schools, and Teachers at Sea)
- Regularly publish programme literature through newsletters, website, advocacy reports, etc . . .

UK IODP Programme Advisory Group

The chair of the Programme Advisory Group (PAG) is Damon Teagle. The PAG comprises delegates to IODP's Science Advisory Structure (SAS) international panels, and several invited members. A 3+1 rotation policy has been implemented on the PAG, which entails three years commensurate with SAS membership, then one further year on PAG.

ESSAC Office comes to the UK from 1 January 2018

Professor Antony Morris (School of Geography, Earth and Environmental Sciences, University of Plymouth) has been appointed as the next Chair of the European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC).

This means that the ESSAC Office will come to the UK for two years from January 2018, and will be supported by a full-time Science Coordinator, based in Plymouth.

This is the first time ESSAC has been hosted in the UK for more than a decade, and Antony's appointment builds upon his extensive ocean-going experience (having previously sailed on five IODP expeditions). He was also an ECORD Distinguished Lecturer from 2014–2016.

He said: "*I'm delighted to be appointed as the next Chair of ESSAC, and to have the opportunity to host its office here in the UK. Having represented the UK on ESSAC for several years, I have seen the vital role this committee plays within the European Consortium for Ocean Research Drilling and the International Ocean Discovery Program (IODP).*"

ESSAC is responsible for the scientific planning and coordination of ECORD's participation in IODP, and manages the competitive international process that selects the best scientists to sail as part of Science Party on each IODP expedition. ESSAC also implements a programme of outreach events, funds summer schools that provide training research students and early career researchers, and provides support to the science community via grants and scholarships.

Antony added: "*As one of the three largest financial contributors to ECORD, the UK receives a significant quota of science places on IODP expeditions in each phase of the program. One of the primary functions of ESSAC is to ensure that these national quotas are maintained while at the same time identifying the best combination of ECORD scientists to contribute to the success of each expedition. We also strive to offer opportunities to sail to scientists across all career stages, from new PhD students through to senior professors. This complex selection task requires close cooperation between all 15 ESSAC delegates, who work together to ensure the joint success of our national scientific communities within the wider IODP framework.*"

Congratulations are due to **Julie Prytulak** *(Imperial College London)* for the honour of winning the **2017 Houtermans Award**.

The Houtermans award is bestowed annually to a scientist within 12 years from the start of PhD, which must be completed. The award recognizes a single exceptional contribution to geochemistry, published as a single paper or a series of papers on a single topic. It is named in honour of Friedrich Georg Houtermans, a Dutch-Austrian-German physicist. The award is presented annually at the Goldschmidt Conference. The award consists of an engraved medal, an honorarium (1000 Euros) and a certificate.

Julie Prytulak is a Lecturer in the Earth Science and Engineering Department at Imperial College London. Julie is Canadian, with many formative years spent in the wide expanse of the Saskatchewan prairies before she received a BSc honors degree in Geology from Carleton University, Ottawa in 2002. She then moved across the continent and into the USA to complete an MS degree at Washington State University in 2004, working with Jeff Vervoort on the Hf-Nd isotope composition of subducting sediments.

UK IODP Programme Advisory Group (PAG) membership		
All IODP Science Advisory Structure (SAS) panel members plus chair, and other invited members		
Member	**Science Advisory Structure (SAS) Panel**	**PAG membership end date**
Damon Teagle (Southampton)	*Chair of the PAG*	September 18
Sally Morgan (Leicester)	*Knowledge Exchange Fellow*	October 17
Steve Bohaty (Southampton)	*Science Evaluation Panel*	December 18
David Long (BGS)	*EPSP (Environmental Protection and Safety Panel)*	September 18
Antony Morris (Plymouth)	*ESSAC (ECORD Science Support and*	October 19
Paul Wilson (Southampton)	*JR Facilities Board*	November 19
Andy McCaig (Leeds)	*SEP*	September 20
Rebecca Bell (Imperial)	*Science Evaluation Panel*	January 20
Kate Littler (Exeter)	*ESSAC (alternative)*	August 19
Mike Lovall (Southampton)	*IODP Curatorial Advisory Board*	

UK IODP Moratorium Award recipients

Cruise number	Grant reference	Participant's name	Research Organisation/ University
360	NE/N019199/1	Chris MacLeod	Cardiff
360	NE/N019210/1	Tony Morris	Plymouth
361	NE/P000037/1	Ian Hall	Cardiff
361	NE/P000878/1	Stephen Barker	Cardiff
361	NE/N020286/1	Margit Simon	Cardiff
361	NE/P009573/1	Erin McClymont	Durham
364	NE/P005217/1	Joanna Morgan	Imperial
364	NE/P006736/1	Charles Cockell	Edinburgh
364	NE/P011195/1	Auriol Rae	Imperial
364	NE/P005764/1	Dr Ewan Le Ber	Leicester
362	NE/P012817/1	Lisa McNeil	Southampton
362	NE/P012140/1	Timothy Henstock	Southampton
362	NE/P016618/1	Kevin Pickering	UCL
362	NE/P011268/1	Paola Vannucchi	Royal Holloway
363	NE/P016375/1	Paul Palmer	Cardiff
363	NE/P016456/1	Caroline Lear	Cardiff
363	NE/P016456/1	Caroline Lear	Cardiff
363	NE/P016642/1	Chris Poole	UCL
370	NE/P015190/1	Hayley Manners	Southampton/ Plymouth
370	NE/P015182/1	Stephen Bowden	Aberdeen
366	NE/P020860/1	Baptiste Debret	Cambridge
366	NE/P020909/1	Catriona Menzies	Southampton
363	NE/P01741X/1	Tom Dunkley Jones	Birmingham
363	NE/P017320/1	Ian Hall	Cardiff
362	NE/P021182/1	Freya Mitchison	Cardiff
368	NE/R002576/1	Stephen Bowden	Aberdeen
371	NE/R009295/1	Cherry Newsam	UCL

Grants:

Recent rapid response grants

Rapid response grants have supported small-scale, shore research activities relating to IODP leg objectives. As of 15 March 2014, Rapid Response grants are no longer available to ship-based IODP participants (all 3 platforms) as well as shore-based participants on Mission Specific Platform (MSP) expeditions, as these individuals are eligible for Moratorium Awards.

Rapid Response Grants will be available to shore-based Science Party members of JOIDES *Resolution* and *Chikyu* expeditions, who are not eligible for the Moratorium Awards.

Get involved—mailing list

Would you like to hear more about research opportunities with IODP? From announcements to join IODP expeditions, to meeting announcements, to funding opportunities, the UK IODP Announcements include monthly newsletter. Email the Science Coordinator (ukiodp@bgs.ac.uk) to have your name added to the mailing list. Also see the websites listed at the top of this section.

UK IODP contacts

UK IODP Science Coordinator

Kirstin Johnson
British Geological Survey
The Lyell Centre
Research Avenue South
Edinburgh, EH14 4AP
Tel: 0131 6500 384
ukiodp@bgs.ac.uk

UK IODP Programme Manager

Jessica Surma
Natural Environment Research Council
Polaris House
North Star Avenue
Swindon, SN2 1EU
Tel: 01793 411600
jetc@nerc.ac.uk

Science Programmes Officer

Daniel Knight
Natural Environment Research Council
Polaris House
North Star Avenue
Swindon, SN2 1EU
Tel: 01793 411672
daig@nerc.ac.uk

Programme Director

Dr Mike Webb
Natural Environment Research Council
Polaris House
North Star Avenue
Swindon, SN2 1EU
Tel: 01793 411520
mweb@merc.ac.uk

UK ESSAC Representative

Professor Tony Morris
School of Geography, Earth and Environmental Sciences
Plymouth University
Plymouth, Devon PL4 8AA
Tel: 01752 584766
A.Morris@plymouth.ac.uk

UK IODP Knowledge Exchange Fellow

Dr Sally Morgan
School of Geography, Geology and the Environment
University of Leicester
University Road, Leicester
LE1 7RH
Tel: 0116 252 3933
geology@le.ac.uk

Useful websites

International Ocean Discovery Program (UK)
www.ukiodp.bgs.ac.uk
www.nerc.ac.uk/research/funded/programmes/ukiodp/

ECORD sites

European Consortium for Ocean Research Drilling (ECORD)
www.ecord.org

ECORD Science Support Advisory Committee
www.essac.ecord.org

IODP central sites

IODP Management International Inc.
www.iodp.org

Science Plan for IODP (2013–2013)
http://www.iodp.org/science-plan-for-2013-2023

JAMSTEC
www.jamstec.go.jp/chikyu/eng/index.html

IODP Science Advisory Structure
www.iodp.org/sas

IODP implementing organisations

Centre for Deep Earth Exploration (CDEX)
www.jamstec.go.jp/chikyu/eng/index.html

ECORD Science Operator
www.eso.ecord.org

JOI-Alliance US Implementing Organisation
www.iodp-usio.org

IODP core repositories

Bremen Core Repository (BCR) (Germany); Gulf Coast Core Repository (GCR) (US); Kochi Core Repository (KCC) (Japan). Access through central IODP website:
http://www.iodp.org/repositories

IODP national offices

Canada http://www.iodpcanada.ca/
Finland http://iodpfinland.oulu.fi/
France www.iodp-france.org/
Germany www.iodp.de/
Italy http://www.iodp-italia.cnr.it/index.php/it/
Netherlands www.iodp.nl/
Portugal http://e-geo.ineti.pt/ecord/
Spain http://carpe.usal.es/~iodp/
Sweden https://www.ssdp.se/
Switzerland www.swissiodp.ethz.ch

IODP China http://iodp-china.org/
IODP Korea www.kiodp.re.kr
IODP Australia and New Zealand http://iodp.org.au/
IODP India http://www.ncaor.gov.in/iodps
IODP Brazil https://www.capes.gov.br/bolsas/programas-especiais/iodp/

IODP related sites

Consortium for Ocean Leadership
http://www.oceanleadership.org/; and
http://www.oceanleadership.org/scientific-programs/scientific-ocean-drilling/

European Science Foundation (ESF)
www.esf.org

Japan Drilling Earth Consortium (J-DESC)
www.j-desc.org/

International Continental Scientific Drilling Programme (ICDP)
www.icdp-online.org/contenido/icdp/front_content.php

Lamont Doherty Earth Observatory
www.ldeo.columbia.edu

MEXT Ministry of Education, Culture, Sports, Science and Technology
www.mext.go.jp/english/

National Science Foundation
www.nsf.gov

Natural Environment Research Council
www.nerc.ac.uk

USSSP U.S. Science Support Programme
www.usssp-iodp.org

ODP legacy sites

Joint Oceanographic Institutions for Deep Earth Sampling
www.ifm-geomar.de

ODP Wireline Logging Services
www.ldeo.columbia.edu/BRG/ODP/

Science Operator Texas A&M University (TAMU)
www-odp.tamu.edu/index.html

Acronym list

ACORK	Advanced Circulation Obviation Retrofit Kit
ADP	Amphibious Drilling Project
AGU	American Geophysical Union
ANZIC	Australia-New Zealand IODP Consortium
APL	Ancillary Project Letter
BCR	Bremen Core Repository
BoG	Board of Governors
CAPES	Coordination for the Improvement of Higher Education Personnel (Brazil)
CDEX	Center for Deep Earth Exploration
CDP	Complex Drilling Projects
CEREGE	Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement
CIB	Chikyu IODP Board
CORK	Circulation Obviation Retrofit Kit
CPP	Complementary Project Proposal
DOI or doi	Digital Object Identifier
DSDP	Deep Sea Drilling Project
D/V	Drilling Vessel
ECORD	European Consortium for Ocean Drilling Research
EDP (old)	Engineering Development Panel (SAS)
EFB	ECORD Facility Board
EMA	ECORD Management Agency
EPC	European Petrophysical Consortium
EPSP	Environmental Protection and Safety Panel (SAS)
ESO	ECORD Science Operator
ESSAC	ECORD Science Support and Advisory Committee
ETF (old)	Engineering Task Force
FB	Facility Board (e.g. ECORD and JOIDES Resolution FB's; Chikyu IODP board (CIB)
GCR	Gulf Coast Repository
HSE	Health, Safety and Environment
ICDP	International Continental Scientific Drilling Program
IIS-PPG	Industry-IODP Science Program Planning Group
ILP	Industry Liaison Panel (ECORD)
IO(s)	Implementing Organization(s)
IODP	International Ocean Discovery Program (2013–2023)
IODP	Integrated Ocean Drilling Program (2003–2013)
IODP-MI	Integrated Ocean Drilling Program – Management International
ISP	Initial Science Plan
JAMSTEC	Japan Agency for Marine-Earth Science and Technology
JANUS	USIO Database System
J-CORES	Japanese Database System
J-DESC	Japan Drilling Earth Science Consortium
JOI	Joint Oceanographic Institutions, Inc.
JOIDES	Joint Oceanographic Institutions for Deep Earth Sampling
JR	JOIDES Resolution
JRFB	JOIDES Resolution Facility Board
JRSO	JOIDES Resolution Science Operator
IGC	International Geological Congress
KCC	Kochi Core Center Repository
KIGAM	Korea Institute of Geoscience and Mineral Resources
K-Pg	Cretaceous-Paleogene
LDEO	Lamont-Doherty Earth Observatory
LIMS	Laboratory Information Management System
LTBMS	Long-Term Borehole Monitoring System
LUBR	Leicester University Borehole Group
LWD	Logging while drilling
MDP	Multi-phase Drilling Project
MEXT	Ministry of Education, Culture, Sports, Science, and Technology (Japan)
MOST	Ministry of Science and Technology (People's Rep. of China)
MSP	Mission Specific Platform
Mw	Moment magnitude
NanTroSEIZE	Nankai Trough Seismogenic Zone Experiment
NERC	Natural Environment Research Council (UK)
NJGS	New Jersey Geological Survey
NSF	National Science Foundation (USA)
ODP	Ocean Drilling Program
OTF (old)	Operations Task Force (SAS)
PANGAEA	Publishing Network for Geoscientific & Environmental Data
PDF	Portable Document Format
PEP	Proposal Evaluation Panel (SAS)
PI	Primary Investigator
POC	Platform Operations Costs
POOH	Pull Out Of Hole
RCB	Rotary Core Barrel
SAS	Science Advisory Structure
SASEC (old)	Science Advisory Executive Committee (SAS)
SCIMPI	Simple Cabled Instrument for Measuring Parameters In-situ
SEG-Y	Seismic data (designated Y) file in the Society for Exploration Geophysicists' (SEG) 'standardized' format
SEP	Science Evaluation Panel
SIO	Scripps Institution of Oceanography
SIPCom	Science Implementation and Planning Committee (SAS)
SOC	Science Operating Costs
SCP	Site Characterization Panel (SAS)
SPC (old)	Science Planning Committee (SAS)
SSDB	Site Survey Data Bank
SSEP (old)	Science Steering and Evaluation Panel (SAS)
SSP (old)	Site Survey Panel (SAS)
SSO	Science Support Office
STP (old)	Scientific Technology Panel
TAP (old)	Technology Advice Panel
TP	Technology Panel (SAS)
USAC	United States Advisory Committee for Scientific Ocean Drilling
USIO	United States Implementing Organization
USSAC	United States Science Advisory Committee
USSSP	United States Science Support Program
WDC-MARE	World Data Center—Marine
WOW	Wait On Weather

UK newsletter 41
2016

IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

NERC
SCIENCE OF THE ENVIRONMENT