UK IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

Newsletter

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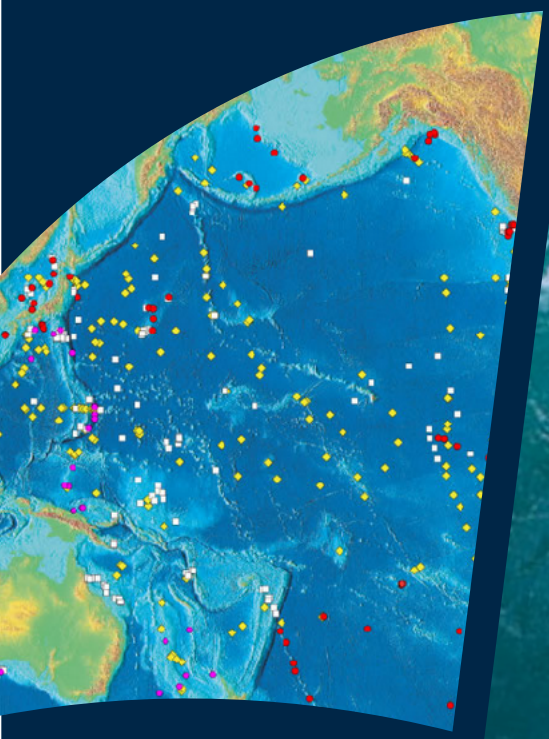
October



Contents

Opportunities & Events	2
Recent Publications	3
Expedition 390C sets sail	4-5
Featured Scientist: Erwan Le Ber	6-10
Useful contact details	11

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Opportunities & Events

October 2020

Opportunities

Join the science team for Expedition 396: Norwegian Continental Margin Magmatism
Scheduled for 6 August – 6 October 2021
Deadline for applications is 11 October 2020. Find out more

PhD Position at National Oceanography Centre Southampton
Explosive submarine eruption processes: pumice raft formation, dispersion and hazard
Supervisors: Dr Isobel Yeo, Prof. Bob Marsh, Dr Bramley Murton (all NOCS), Dr Iona McIntosh (JAMSTEC). Find out more

Events

The Palaeontological Association's 64th Annual Meeting, 16th to 18th December 2020, Hosted online by the Oxford University Museum of Natural History, UK
Abstract deadline 23:59 BST on Friday 9th October Visit Website

Recent Publications & Media Highlights

October 2020

Recent Publications

Featured paper:

Mahony, S.H., Barnard, N.H., Sparks, S.J., Rougier, J.C., 2020. VOLCORE, a global database of visible tephra layers sampled by ocean drilling. Scientific Data volume 7, Article number: 330.

Read a a blog post, for the journal's 'Behind the Paper' series, describing the story of the paper: https://researchdata.springernature.com/posts/150-million-years-of-large-magnitude-explosive-volcanism

The Scientific Data paper is here: https://www.nature.com/articles/s41597-020-00673-1

The VOLCORE data are here: https://doi.pangaea.de/10.1594/PANGAEA.907331

Cramwinckel, M.J., Woelders, L., Huurdeman, E.P., Peterse, F., Gallagher, S.J., Pross, J., Burgess, C.E., Reichart, G.J., Sluijs, A., Bijl, P.K., 2020. Surface-circulation change in the southwest Pacific Ocean across the Middle Eocene Climatic Optimum: inferences from dinoflagellate cysts and biomarker paleothermometry. Climate of the Past 16, 1667-1689.

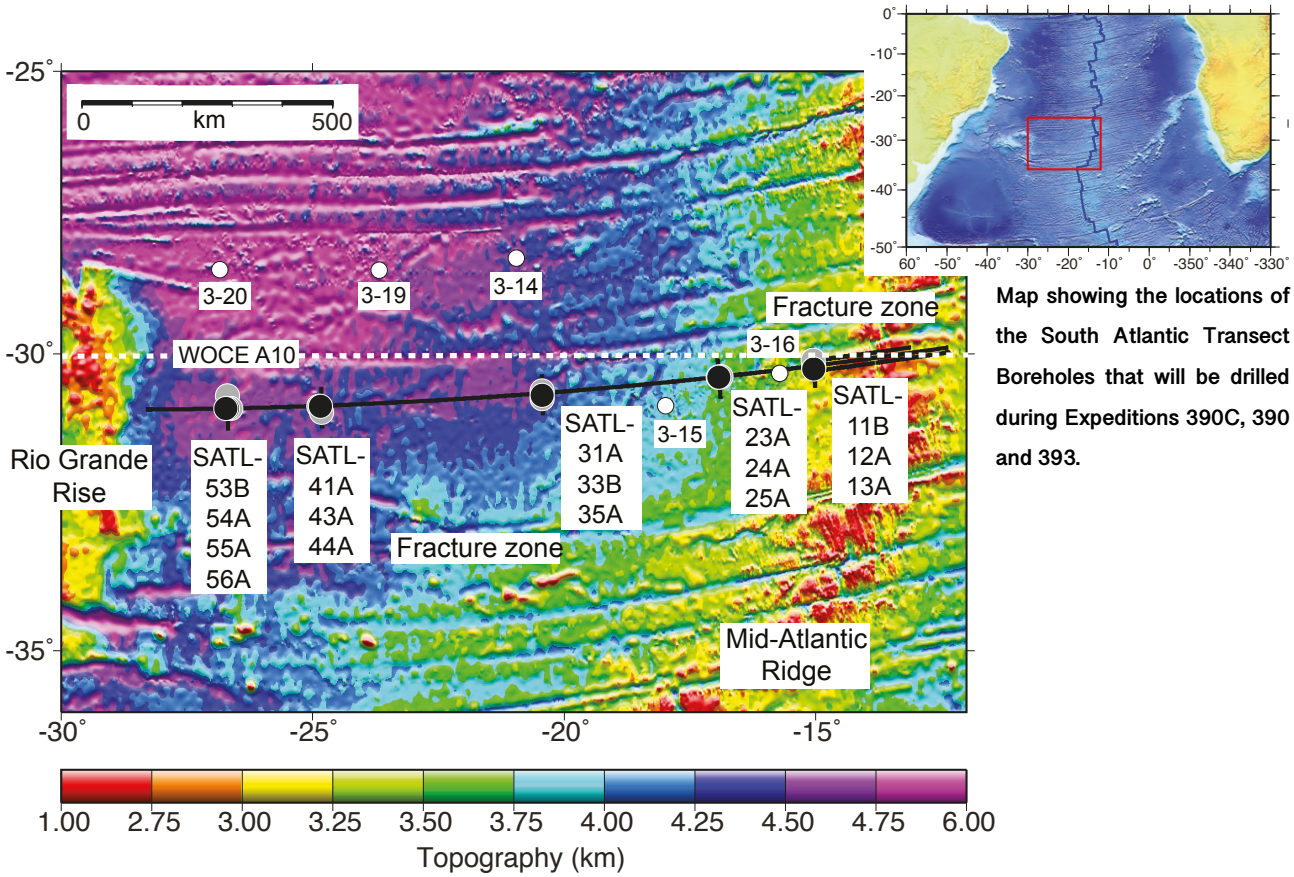
de Castro, S., Hernandez-Molina, F.J., Rodriguez-Tovar, F.J., Llave, E., Ng, Z.L., Nishida, N., Mena, A., 2020. Contourites and bottom current reworked sands: Bed facies model and implications. Marine Geology 428, 28.

Savage, D., Wilson, J., Benbow, S., Sasamoto, H., Oda, C., Walker, C., Kawama, D., Tachi, Y., 2020. Using natural systems evidence to test models of transformation of montmorillonite. Appl. Clay Sci. 195, 11.

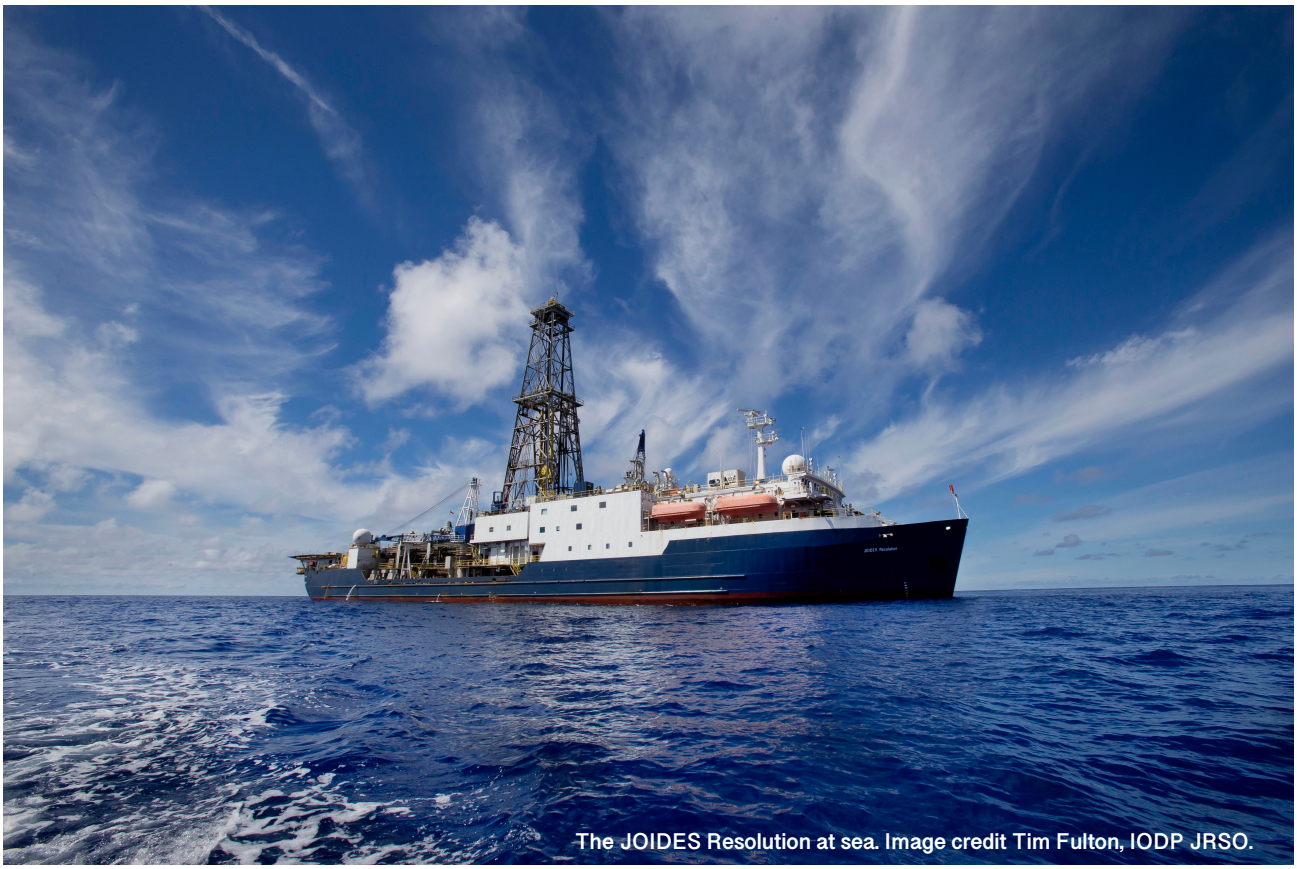
Seyler, C.E., Kirkpatrick, J.D., Savage, H.M., Hirose, T., Faulkner, D.R., 2020. Rupture to the trench? Frictional properties and fracture energy of incoming sediments at the Cascadia subduction zone. Earth and Planetary Science Letters 546, 12.

Expedition 390C sets sail

The JOIDES Resolution is currently sailing through the English Channel and heading to the South Atlantic, where she will begin drilling 'The South Atlantic Transect' (SAT)– a multidisciplinary scientific ocean drilling project led by UK-IODP scientists Dr Roz Coggon and Professor Damon Teagle (both of University of Southampton). The SAT project will recover complete sedimentary sections and the upper ~250 m of the underlying oceanic crust along a slow/intermediate spreading rate Mid-Atlantic Ridge crustal flow line at ~31°S. The sediments along this transect were originally spot-cored more than 50 years ago, during Deep Sea Drilling Project Leg 3, to help verify the theories of seafloor spreading and plate tectonics. Given dramatic advances in drilling technology and analytical capabilities since Leg 3, many high-priority scientific objectives will be addressed by revisiting the transect. The SAT expeditions will target six primary sites on 7, 15, 31, 49, and 61 Ma ocean crust, which will fill critical gaps in our sampling



Map showing the locations of the South Atlantic Transect Boreholes that will be drilled during Expeditions 390C, 390 and 393.



The JOIDES Resolution at sea. Image credit Tim Fulton, IODP JRSO.

of intact in situ ocean crust with regards to crustal age, spreading rate, and sediment thickness. Using these sections we will investigate: the history of the low-temperature hydrothermal interactions between the aging ocean crust and the evolving South Atlantic Ocean and quantify past hydrothermal contributions to global geochemical cycles; sediment and basement-hosted microbial community variation with increasing substrate age; the paleoceanographic evolution of the South Atlantic Ocean; and the deep-ocean and subtropical gyre responses to changing global climate.

The SAT project comprises two IODP science Expeditions – Exp 390 (Apr – June 2022) and 393 (June-Aug 2022). Although these scientific expeditions had to be rescheduled as a result of the on-going pandemic situation, the SAT project starts on schedule this week with engineering Expedition 390C - thanks to the extraordinary efforts of the JOIDES Resolution Science Operator. The Exp 390C drilling operations will include installation of reentry cones and casing in preparation for Expeditions 390 and 393 and to establish legacy boreholes for future basement hydrothermal and microbiological experiments.

More details on the South Atlantic Transect, and updates on the progress of Exp 390C can be found here: http://iodp.tamu.edu/scienceops/expeditions/south_atlantic_transect.html

Reentry cones like the one pictured here will be deployed at the South Atlantic Transect boreholes during the current engineering Expedition 390C. Image credit William Crawford, IODP JRSO.

Featured Scientist: Dr Erwan Le Ber

Dr Erwan Le Ber is an IODP Research Associate at the University of Leicester. He has a BSc in Biology and Environmental Engineering and a MSc in Geology. In 2010 he moved from France to the UK to study Cryogenian microbial sediments for his PhD at Royal Holloway University. Since 2015 he has been working for the ECORD Science Operator (ESO) as a Petrophysics Staff Scientist.

How did you first learn about IODP?

There are many scientific areas that I find interesting — that is probably reflected in my background and curriculum — and clearly, IODP is a good environment for scientific diversity. Surprisingly, I did not use any IODP data or literature when I was an undergraduate or postgraduate. I knew of the programme, having met a couple of early career scientists who sailed with it, but I did not know the details on how it worked or how to get involved. To be honest, IODP and what it represented sounded beyond my reach. My PhD research was quite remote from IODP science, which generally focuses on much younger formations, but I always was curious to work on boats and exploring the oceans. After my PhD I started looking into several job opportunities, luckily an IODP Research Associate position happened to open at the University of Leicester. After some reading while preparing my application, I was beyond captivated and excited. For this operational role, I suspect that my diverse background and various field experiences helped a lot. I have developed new skills with IODP, mostly in petrophysics and programming, which are new scientific interests to me! My position is mostly operational and for that reason, I am lucky to be involved in ECORD expeditions covering various scientific themes. In that respect, using petrophysics is quite useful because it generates insightful datasets no matter the geological setting.

How are you involved in IODP?

Like my background and interests, my involvement with IODP is quite diverse. I am not involved like most scientists are, participating in one expedition on a specific research theme. I work with the program, to make sure expeditions happen. My main occupation is to work as part of the ECORD Science Operator (ESO). ESO implements ECORD Mission-Specific Platforms (MSP) expeditions. It is a collaboration between teams from the British Geological Survey (BGS), MARUM (University of Bremen) and the European Petrophysics Consortium (EPC, made up of the University of Leicester and the University of Montpellier). EPC, the team I work with, provides petrophysics and downhole logging services for MSP expeditions and I act as what is called a Petrophysics Staff Scientist (PSS). You have to love acronyms if you join the IODP family.

Loading ESO containerised labs on-board prior to an expedition

ESO team building while preparing a platform

Petrophysics is the study of the physical properties (e.g. density and resistivity, P-wave velocity) of rocks. These properties can be measured on the cores IODP recovers, and in holes that were drilled or cored. To collect data from the cores, we use a piece of equipment called a Multi-Sensor Core Logger (MSCL). It is an apparatus that pushes cores through a series of sensors. Once a borehole has been completed, or a specific depth reached, it is possible to lower tools into the hole at the end of a steel cable to measure similar physical properties of the rocks in the borehole wall. This is downhole logging and the resulting data is quite powerful because it is both in situ and continuous. A lot more could be said about petrophysics, and if you want to learn about it within an IODP environment, the University of Leicester hosts a Summer School about it!

When a drilling proposal completes the IODP review process and is confirmed to be implemented as an MSP expedition, ESO works together to make it happen. My role as a PSS is to focus on core petrophysics and downhole logging for the expedition, where I act both as an operator with ESO and as a member of the Science Party. To that end, I liaise with the Science Party's Co-Chiefs as well as the rest of ESO to make sure we understand the scientific needs and how they can be best implemented. Everyone in ESO has their own operational expertise, from drilling/coring to the curation of the cores, and we make sure that expeditions run as smoothly as possible for everyone on board.

Inside the containerised MSCL lab

Before sailing, I go with ESO to prepare the platform. All our equipment is in containerised labs (including our MSCL). After this mobilisation period, a part of the Science Party joins us on board and off we go for two months at sea. On board I work closely with the petrophysics and logging teams, help to collect data, process them and eat a lot of chocolate cookies. Because ESO does not have a dedicated drilling platform, further lab work is done after each expedition, traditionally in MARUM, for one month with the full Science Party. We call this work in Bremen the Onshore Science Party. As the PSS, I am in charge of synchronising petrophysics measurements with the wider core flow. Our measurements are acquired by both ESO and members of the Science Party. I then work with the Science Party to produce parts of the upcoming expedition Preliminary Report and Proceedings. At the end of the Onshore Science Party, all scientists go back to their home laboratories and work on their research with data and samples from the expedition.

Beyond expeditions, I am lucky to be involved in some outreach and knowledge transfer. I have been teaching and co-teaching petrophysics at several training courses (e.g. ECORD Summer School, ECORD Virtual Drillship). Back in 2016, the University of Leicester started hosting its own Petrophysics Summer School: a full week focussing on our expertise. Here is a link to the latest edition: [https://www2.le.ac.uk/de-

partments/geology/research/gbrg/projects/iodp/petrophysics-summer-school-2019]. Another part of the outreach I take part in is to attend conferences (e.g. EGU, AGU, GASS) to encourage early career researchers to get involved with the IODP community.

Finally, more recently, I had the opportunity to attend the IODP Science Evaluation Panel (SEP) to give operational advice to the scientific community reviewing IODP drilling proposals. To summarise, after five years with ESO, my involvement with IODP covers early stage IODP processes with SEP; operational planning and implementation of MSP expeditions; participation to expeditions; and various forms of outreach and knowledge transfer.

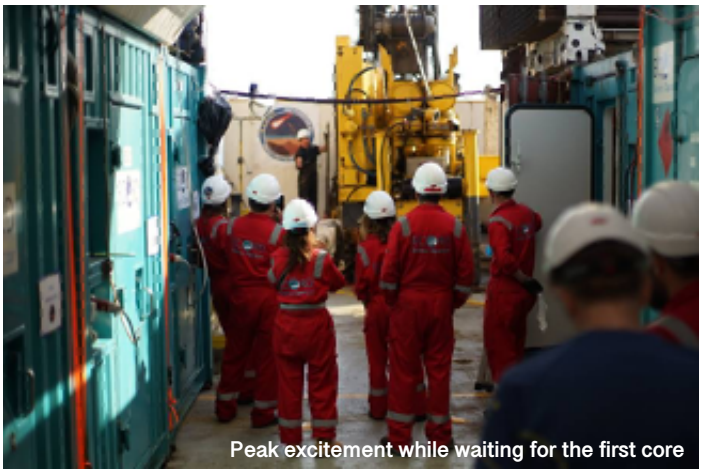
What was your first experience of sailing on an IODP Expedition?

After a first lab experience and getting familiar with the programme, my operator role took me to Expedition 364 (Chicxulub Impact Crater). The project was already ready to go ahead when I joined as a PSS in training. I read all the literature about the impact crater as well as the drilling proposal, and could not believe it was happening - we were really going to have the opportunity to drill into and explore a geological feature we knew almost nothing about. ESO met in Mexico with the drilling team to complete the preparation of the platform. We sailed to site and members of the Offshore Science Party joined when everything was ready for drilling. There's no need for me to explain how thrilling it is for any geoscientist to be part of a project that aims to drill the Chicxulub impact crater. Like most expeditions, operations had ups and downs but ultimately the drilling was a tremendous success. I was working in the MSCL lab on the night shift (midnight to noon), and helped my PSS colleague during downhole logging operations. It was enthralling to see all the different datasets building up together as the result of a team effort, and equally fascinating to see the genuine excitement of the Science Party as cores were coming up on deck. After a few weeks, operators and scientists tend to create a very sociable dynamic, which makes of these long experiences an enjoyable and memorable time.

First time seeing the boat used for Expedition 364

How did this first experience affect your career?

This first experience showed me another aspect of research that I truly enjoyed; it is like being backstage and seeing how it all comes together. I still experience the excitement of research but my main mission is to contribute to its success by collecting useful data for the researchers and for the community (IODP is a legacy program, which means that the various datasets collected during all expeditions across the ocean floor are accessible to anyone, and have a similar format). Preparing and working on an offshore scientific expedition comes with many unknowns. The various experiences I had so far are building up skills that allow me to have a good understanding of what is expected and of what is achievable. That is how this first experi-


Peak excitement while waiting for the first core

ence affected my career: I migrated from pure research to approaches that consider both research and operations.

How have you continued to be involved in IODP?

To this day, I still work as part of ESO and therefore IODP. The dynamics between research and operations mentioned above is something I am seeking and is what motivates me. Since I joined in 2015, I have been involved in four IODP expeditions. After expeditions 357 (onshore only) and 364, I sailed on two more expeditions: one other MSP (Corinth Active Rift Development in 2017 in Greece) and one on the Chikyu with our Japanese operator colleagues (Nantroseize: Plate Boundary Deep Riser 4 in 2018-2019 in Japan). And I am hoping to sail on more MSPs in the future.

As explained above, I am also involved in outreach and knowledge transfer. Conferences and summer schools are good environments to encourage young scientists to apply to sail. An IODP offshore experience is unique, and the science produced is crucial to understanding past and future Earth processes in fields that are highly relevant to society, such as climate change and geohazards.

Helicopter shuttle on the Chikyu

"They are real adventures aiming at exploring our planet's history, and it is a privilege to be part of them."

A desk with a view during Expedition 381

What do you find to be the most exciting part of being involved in IODP?

Working in an international environment and being on the move. I enjoy the diversity of my missions and colleagues, the changes in pace from small conferences to busy labwork. But really, what is surely exciting is to go at sea. They are real adventures aiming at exploring our planet's history, and it is a privilege to be part of them.

Do you have any advice for other researchers who are interested in participating in IODP activities?

From my experience, IODP is a supportive and encouraging community. For a first taste for early career researchers, I would definitely recommend attending an IODP training or Summer School. It is similar to an expedition to some extent: about 30 international participants are there for the duration of the event, all with different backgrounds and interests. It is also an opportunity to

meet with tutors who have extensive experience with the program.

With this first experience, if sailing sounds indeed like an exciting adventure, I would simply advise to apply to sail. There are several calls released every year, each one needs a variety of expertise. Even if the geological setting sounds exotic or remote from your area of research, your expertise might be relevant and useful, so you could to be invited to sail. Most expeditions have well-balanced ratios between career levels as well as genders.

Finally, if you know you could get some answers (relevant to IODP's science plan) by drilling somewhere offshore, work with your community to submit a proposal. To optimise the feasibly of your project, do not hesitate to seek advice by contacting operators in the USA, Europe or Japan.

Working at sea comes with some stunning scenery

Useful Contact Details

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