

Expedition 357 Atlantis Massif Serpentinization and Life is completed



Inside this issue:

ECORD Teachers at Sea

MagellanPlus Workshops: Mantle, Water and Life and Haiti-DRILL

Focusing on IODP science: shipboard paleomagnetism

Scientific drilling in Australasia

Contents

3-4. News from ECORD - G. Camoin and M. Friberg

5-9. ECORD Science Operator

- 5. News from the ECORD Facility Board - G. Lericolais
- 6-9. ESO News - D. McInroy

10-15. ECORD Outreach & Education

- 10. News and Activities - A. Stevenson, J. Gutiérrez Pastor and P. Maruéjol
- 11. ECORD Training Course 2016 - U. Röhl
- 12-13. ECORD Teachers at Sea - M. Darrieu, L. Kavanagh and M. Burgio
- 14-15. Core replicas help teach science - P. Pearson, P. Bridger, S. Lyster and A. Hunt

16-21. ECORD Science Support and Advisory Committee

- 16-19. News - J. Behrmann
- 20-21. Focusing on IODP science: shipboard paleomagnetism on the JR - A. Morris

22-23. Workshops and Conferences

- 22. Calendar of Workshops and Conferences
- 22-23. MagellanPlus Workshop: Mantle, Water and Life - M. Andréani et al
- 23. MagellanPlus Workshop: Haiti-DRILL - N. Ellouz-Zimmermann and M. Pubellier

24. Scientific Drilling in Australasia - N. Exon

25-31. News from ECORD Member Countries

News from Portugal, Israel, France, Netherlands, Finland, Switzerland, Poland, Italy, Ireland, Norway, Canada, Sweden and the United Kingdom.

32. ECORD Contacts

The International Ocean Discovery Program (IODP) is an international research programme dedicated to advancing scientific understanding of the Earth through drilling, coring, and monitoring the sub-seafloor. The European Consortium for Ocean Research Drilling (ECORD) supports the participation of European, Canadian and Israeli scientific communities in IODP and provides funding for the implementation of mission-specific platform expeditions. ECORD is funded by 18 countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Israel, The Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and The United Kingdom.

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For more information, visit www.iodp.org.

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Cover: Offshore operations of Expedition 357 Atlantis Massif Serpentinization and Life onboard RRS James Cook, see page 6 (photo C. Cotterill © ECORD/IODP). Right: photo by Astro-Virginia.edu (see Expedition 364 page 9).





Gilbert Camoin

ECORD membership and renewal

Following negotiations during the last months of 2015, the start of 2016 has seen the return of one ECORD's historical members, Spain, who therefore became the 18th ECORD member country to join the current programme.

Like other IODP partners, ECORD will renew its participation in the second phase of the International Ocean Discovery Program in 2018, the success of which will depend on the commitment of its member countries following an external evaluation of ECORD's achievements and performance. The various criteria that apply include science results measured against the Science Plan, and of pivotal importance will be the success of ECORD's financial model for platform operations. It is anticipated that the success of ECORD's renewal will not only be based on the results of the first five years of the current programme, but also on an ambitious 2019-2023 operational plan for mission-specific platform (MSP) expeditions, as well as the outcomes of the formal renegotiation of MoUs linking ECORD to its partners in Japan, the USA and their Associate Members.

In parallel with the ECORD renewal, the ECORD Council will also define in the coming months renewal procedures for EMA (currently managed by the INSU-CNRS) and ESO (currently managed by the British Geological Survey), which may include the opening of a call for tenders.

MSP expeditions

Despite technically challenging conditions, Expedition 357 Atlantis Massif Serpentinization and Life was successfully completed during October-December 2015 (*ESO pages 6-8*). During the expedition, remotely-controlled seafloor drills, the BGS RockDrill2 and the MARUM MeBo, were used for the first time in IODP. The expedition took place onboard the Natural Environment Research Council's (NERC) research vessel *RRS James Cook*, which was provided as an in-kind contribution by the UK.

The second expedition of the MSP expedition operational plan for 2014-2018,

News from ECORD

which was defined by the ECORD Facility Board in 2014 and 2015, is Expedition 364 Chicxulub K-Pg Impact Crater, which will be carried out in April-May 2016 and is co-funded by ICDP (*ESO page 9*). Expedition 364 will investigate the only known impact structure on Earth that has been directly linked to a mass-extinction event.



Two polar expeditions dedicated to Cenozoic climate changes, Antarctic Cenozoic Paleoclimate, IODP Proposal 813 and Arctic Ocean Paleooceanography IODP Proposal 708, will be implemented in the "ECORD Polar Year" of 2018, which will complete the 2014-2018 operational plan for MSP expeditions (*EFB page 5*)

The **17 active MSP Proposals** that currently reside at the ECORD Facility Board and the Science Evaluation Panel, may partly form the basis of the operational plan that will be defined for the second phase of the current programme. The proposals include a wide range of science themes (climate and sea-level change, geohazards, hydrogeology, deep biosphere, CO₂ storage), and various oceans and seas (Atlantic, Pacific, Arctic and Southern oceans, and the Mediterranean and Japan seas) in diverse environments and drilling conditions, as well as a variety of potential



Magnus Friberg

drilling/coring systems. These proposals demonstrate the significant success and flexibility of the MSP concept, as well as its valuable contribution to IODP. In the future, ECORD intends to generalise in-kind and external co-funding from any IODP member or non-member country to implement MSP expeditions.

JOIDES Resolution and Chikyu expeditions

43 ECORD scientists, including four Co-chief Scientists, were invited to participate in expeditions implemented by the *JOIDES Resolution (JR)* in 2015: four expeditions focused on monsoon history and mechanisms (354 Bengal Fan, 355 Arabian Sea Monsoon-CPP, 356 Indonesian Throughflow, and 359 Maldives Monsoon and Sea Level), and a fifth expedition was dedicated to investigating the structure of the lower crust and the origin of the Moho (360 SW Indian Ridge Lower Crust and Moho). A considerable number of ECORD students and early-career scientists had the opportunity to participate in *JR* expeditions, representing half of the ECORD participants in 2015.

The outstanding intellectual contribution of ECORD's science community to IODP is especially reflected by its active participation in the submission of IODP drilling proposals. Eleven new proposals were submitted in 2015, which, even though is the lowest number since 2011 during the Integrated Ocean Drilling Program, and is much lower than the 36 proposals that were submitted in 2014, has a larger number of unique ECORD proponents (492 out of 1,258 - 39%, including 35 Lead Proponents) than the USA, followed by Japan, ANZIC and other member countries. It is important to note that ECORD's scientists' participation in IODP proposals continues to grow (37% in 2014 and 39% in 2015). With the planned *JOIDES Resolution* drilling operations in the Atlantic Ocean, Mediterranean, Caribbean, and Gulf of Mexico for a few years from 2019 onwards, the number of proposals focused on these regions is expected to increase significantly in the coming years, and the ECORD

science community will certainly play a significant role.

In 2015, ECORD organised five workshops in the frame of the MagellanPlus Workshop Series Programme, providing strong support to scientists developing innovative drilling proposals that concern diverse scientific topics and the three IODP platforms.

Collaboration with other science programmes

Since October 2013, ECORD has played a pivotal role in the development of more active collaboration with other science programmes dealing with sub-seafloor coring (IMPRESS) and continental scientific drilling (ICDP). The newly defined **Amphibious Drilling Proposals (ADPs)**, which require both drilling on land and at-sea to fully complete their scientific objectives, exemplify the closer collaboration between ICDP and IODP, and especially the role of ECORD given that most ADPs will likely involve MSP operations. Procedures for the joint evaluation of ADPs were approved by all relevant IODP and ICDP entities during 2015. The ADP implementation policies were recently defined by a working group that included two representatives from each programme (D. McInroy and G. Camoin from ECORD/IODP, and Uli Harms and C. Koeberl from ICDP). These will be submitted for approval by the IODP Facility Boards, and the ICDP

Executive Committee and Assembly of Governors. ECORD specifically supports the submission of such proposals by allocating an annual budget to assist in the organisation of ADPs workshops within the **MagellanPlus Workshop Series Programme**. The emergence of this new category of proposals is demonstrated by the submission of the first proposal combining land and shallow-water drilling on a Ligurian landslide (796-Full, Lead Proponent: A. Kopf), and the organisation of the Haiti-DRILL MagellanPlus Workshop to develop an ADP investigating the initial thermo-mechanical conditions of the Haitian fault system (*report page 23*).

Educational activities

ECORD's multiple science and educational activities aimed at scientists, students, and early-career scientists, have proved their popularity and their efficiency. **49 lectures in 13 countries** across Europe plus Canada, Israel and Turkey, have been given by the five ECORD Distinguished Lecturers in 2015. A total of **143 students and early-career scientists** have participated in the ECORD Summer Schools and Research Grants, 26 of whom received a Scholarship to attend one of the summer schools.

In addition to the two regular ECORD Summer Schools that are held every year in Urbino and Bremen, an ECORD Training Course has been added to the wide array

of ECORD's educational activities since 2015. This new initiative is tailored to provide a "Virtual Ship Experience" for scientists from academia and industry at the MARUM Center for Marine and Environmental Sciences (*report page 11*). ECORD will also organise its first Summer School on Petrophysics in June and July in Leicester (UK).

In 2015, major efforts were aimed at engaging teachers to help convey the exciting science of ECORD and IODP to school students. **Four teachers** from ECORD member countries sailed as Education/Outreach Officers (*reports pages 12-13*) on three *JOIDES Resolution* expeditions, and the first official ECORD School of Rock was held in Loulé, Portugal in July 2015. The latter is a new initiative that aims to educate teachers about scientific ocean drilling through interaction with expedition scientists and education officers, and to create a network of teachers across the ECORD countries.

ECORD's recent achievements in all domains (science, technology, collaboration, education and outreach) are highlighted in the recent ECORD Annual Report for 2015.

Gilbert Camoin, Director of the ECORD Managing Agency - camoin@cerege.fr - and Magnus Friberg, Chair of the ECORD Council - magnus.friberg@vr.se

Lucas Lourens awarded medal at EGU 2016

The **2016 Jean Baptiste Lamarck Medal** is awarded to Lucas Lourens in recognition of his outstanding contributions to cyclostratigraphy and astronomical tuning of the geologic timescale, and their application to studying Earth's climate history. Lucas Lourens has been an active member of the international ocean drilling community, serving as a representative of the Netherlands. He has participated in international research drilling expeditions to the Walvis Ridge (ODP Leg 208 - http://www.odplegacy.org/science_results/leg_summaries/Leg208/) and Gulf of Cadiz (IODP Expedition 339 <http://iodp.tamu.edu/>



[scienceops/expeditions/mediterranean_outflow.html](http://www.iodp.tamu.edu/scienceops/expeditions/mediterranean_outflow.html)). His research directed at the greenhouse world of 55 million years ago has taken a central role in his

outreach activities, such as the grand battle between universities in the context of the Nationale Academische Jaarprijs 2006–2007. During his 20-year career, he has directed the research of 20 doctoral students. Together, with his co-authors, he has produced approximately 100 papers published in international journals that have been cited more than 5,700 times, making him one of the most frequently cited stratigraphers actively conducting research today.

From the medal's citation - <http://www.egu.eu/awards-medals/jean-baptiste-lamarck/2016/lucas-lourens/>

EGU 2016 Medal Lecture: Tue 19 April, 11:00-12:00, room L6



Gilles Lericolais

News from the ECORD Facility Board

Since 1st January 2016, the ECORD Facility Board (EFB) has welcomed new members. The Science Board of the EFB now has six members instead of the previous five, with three from ECORD countries (including the EFB Chair), one from IODP-*JOIDES Resolution* (USA), one from IODP-*JOIDES Resolution* (associated members) and one member from IODP-*Chikyu* (Japan). Three new members, Stephen Gallagher (University of Melbourne, Australia), Fumio Inagaki (JAMSTEC, Japan) and Gilles Lericolais (Ifremer, France) have joined the EFB, replacing Antonio Cattaneo (Ifremer, France) and Marta Torres (Oregon State University, USA). Karsten Gohl (AWI, Germany), the former Chair of the EFB, has guided the first steps of the new ECORD Facility Board since its launch in 2013. Gilles Lericolais has taken Karsten's place as Chair and Dominique Weis (University of British Columbia, Canada) is now Vice-Chair of the EFB.

The EFB would like to thank Karsten Gohl for his service and commitment to ECORD-IODP. Karsten's enthusiasm, communication and organisational skills have been a significant factor in the successful launch of the EFB's activities, such as the advancement of numerous proposals to the expedition implementation phase. Karsten's term as Chair has made a major contribution to the ECORD's visibility in the scientific drilling community. The EFB would also like to thank Marta Torres and Antonio Cattaneo for bringing their scientific skills to the Science Board, an important factor

that contributed to the high level of the reviews carried out for MSP proposals.

The excellent work of the EFB (2013-2015) has culminated in the success of Expedition 357 Atlantis Massif Serpentinization and Life. Co-chief Scientists Gretchen Früh-Green and Beth Orcutt have indicated that the scientific objectives should be met and have emphasised the operational success of the expedition despite some of the difficulties (*report pages 6 to 8*). Expedition 357 was the first to use seafloor drills in the very challenging drilling environments/lithologies that successive ocean drilling programmes had previously found to be difficult.

Conforming with IODP's reporting and review procedures, the EFB is responsible for coordinating the review meetings for MSP expeditions, which are held about six months after the expedition Onshore Science Party. The review meeting for Expedition 357 will therefore take place on 24-25 October 2016 in Bremen, Germany, back to back with the ESSAC-Council meeting to be held on 26-27 October.

The next MSP expedition is Expedition 364 Chicxulub K-Pg Impact Crater for which ESO has recently contracted a drilling rig capable of reaching 1,500 mbsf (*report page 9*).

Even though the (Proposal 813) East Antarctic Paleoclimate expedition is not scheduled until February-March 2018, discussions have already started to try

and bring the expedition forward to a more favourable window during January-February 2018. An ECORD review of the technology to be used for this expedition will be conducted in due course, after which further information will be made available.

To date, the EFB has so far scheduled a total of three MSP expeditions until 2018 (*table below*). With proposals 581 (Coralgal Banks), 637 (New England Shelf Hydrogeology) and 716 (Hawaiian Drowned Reefs), there are currently three proposals in the EFB holding bin.

During the last SEP meeting in January 2016, the 730-Full2 proposal (Sabine Bank Sea Level) was reviewed. The SEP's decision, which endorsed external reviews, was to forward the proposal to the EFB with an excellent rating. The main objective of the proposal is to recover a variety of late Quaternary fossils for dating, and to develop sub-annually resolved climate reconstructions from pre-Holocene corals. This offers a rare opportunity to obtain pre-LGM coral climate records. Two areas for sampling are proposed, one in shallow water (14-110 m), and the other in deeper water (750-1,400 m) with penetration at 150 m for all sites.

The next EFB meeting will be held on 15-16 June 2016 in Brussels, Belgium.

Gilles Lericolais, Chair of the ECORD Facility Board - gilles.lericolais@ifremer.fr

Long-term scheduling strategy of the EFB for MSP expeditions

2016	2017	2018	2019	2020	2021	2022	2023
Exp 364 Chicxulub jack up MC	none (or LC?)	# 813 Antarctic RD2 LC-MC # 708 Arctic drillship HC	tbd LC	tbd LC seabed drill	tbd MC	tbd LC seabed drill	tbd HC

LC = low-cost (<8MUSD), MC = mid-cost (8-15MUSD), HC = high-cost (>15MUSD) - RD2: RockDrill2 (seabed drilling system)



David McInroy

ECORD Science Operator News

In the previous ECORD Newsletter (#25 - November 2015), we reported on our planning for the next two exciting IODP mission-specific platform (MSP) expeditions: Expedition 357 Atlantis Massif Serpentinization and Life and Expedition 364 Chicxulub K-Pg Impact Crater.

In December 2015, ESO completed the offshore phase of its sixth MSP expedition ([pages 6-8](#)). Expedition 357 involved the first use in IODP of remotely-controlled robotic seafloor drills, the BGS RockDrill2 (RD2) and the MARUM Meeresboden-Bohrgerät (MeBo). The expedition was the culmination of three years of IODP-specific technical development and planning, of which, the final phase in 2015 concentrated on the manufacture and modification of new components to improve the capabilities of seafloor drills to meet the expedition's science requirements.

In parallel to the preparation and implementation of Expedition 357, planning activities for future MSP expeditions continued. Expedition 364 ([page 9](#)) is scheduled for April-May 2016 (offshore phase) and September-October 2016 (Onshore Science Party). The expedition aims to recover core samples from the Chicxulub crater's buried peak ring to study the mechanisms of large impact crater formation on Earth and other planets, and the effects on the Earth's environment and ecology.

Additionally, preliminary planning started for an early-2018 expedition based on IODP Proposal 813 Antarctic Cenozoic Paleoclimate, which will use seafloor drilling technology to recover sediments expected to contain records of Antarctica's climate and ice history. Finally, ESO has continued to scope and plan an expedition based on IODP Proposal 708 Central Arctic Paleooceanography, scheduled for later in 2018 in what could be an interesting "Polar Year" for ECORD ([page 5](#)).

IODP Expedition 357 Atlantis Massif Serpentinization and Life

Co-chief Scientists: Gretchen Früh-Green (ECORD, Switzerland) and Beth Orcutt (USA).

Offshore Phase - 26 October - 11 December 2015

The offshore phase of IODP Expedition 357 successfully took place from 26 October to 11 December 2015, sailing to and from Southampton, UK. The vessel was the UK research vessel *RRS James Cook*, provided by the UK's Natural Environment Research Council (NERC) as an in-kind contribution.

The expedition mobilised in Southampton from 18 October, when the ESO team made use of the internal laboratories of the *RRS James Cook* to set up the ESO equipment, mainly provided by MARUM, for core and sample curation, core description, microbiology, and geochemistry for the IODP-MSP core workflow, and IT infrastructure including the latest ExpeditionDIS database created by the developer smartcube. EPC provided two multi-sensor core logger systems for the expedition, including the standard system and a fast-track magnetic susceptibility system. The fast-track facilitated the rapid acquisition of physical properties data from all cores, including whole round samples taken for microbiological analysis.

The engineering teams from the BGS and MARUM worked with the operators of the *RRS James Cook* to install the two seafloor drills that were used for this expedition: the BGS RD2 and the MARUM MeBo ([below](#)). The successful mobilisation of the two seafloor drills on the working deck was the result of several months of careful planning and adaptation work which allowed the two drills to be carried on the expedition, each one acting as a back-up for the other.



Left, deployment of the MeBo over the stern of the *RRS James Cook* (photo Y. Morono © ECORD/IODP); right, recovery of the RD2 over the side of the *RRS James Cook* (photo D. Smith © ECORD/IODP).



Left, Matt Schrenk prepares microbiology samples (photo Y. Morono © ECORD/IODP); right, Gretchen Früh-Green describes cores through the liner (photo C. Cotterill © ECORD/IODP).

Prior to sailing, a successful expedition media event was organised in London by the ESO Outreach team. The media event was held on 22 October at the Foreign Press Association in London, and resulted in several media reports in printed media, online, and on radio, including the BBC.

After a 10 day-transit following departure from Southampton on 26 October, the expedition spent **27 days at 9 sites** on the Atlantis Massif, near the Mid-Atlantic Ridge in the North Atlantic Ocean at roughly 30°10'N and 42°10'W, before a 10-day return transit.

The expedition recovered 57 m of high-quality cores from actively serpentinizing lower crustal and shallow mantle sequences from the detachment fault zone of the Atlantis Massif, with an average recovery of 53%. Two boreholes to 16.5 mbsf, with a record average recovery of over 70%, were drilled north of the Lost City hydrothermal vent field, a new achievement in scientific ocean drilling. The recovered cores were highly heterogeneous, ranging from moderately to highly altered and deformed serpentinized peridotites, with varying compositions and occurrences of talc-amphibole schist zones. Less abundant lithologies included lithified basalt breccias, rodingites, and metagabbros with cataclastic to (ultra)mylonitic deformation fabrics. The cores were not split at sea, however Science Party microbiologists were able to take samples under clean conditions for culturing and later analysis, geochemists acquired and analysed water samples for ephemeral properties, and all participants have indicated that some interesting early results are emerging.

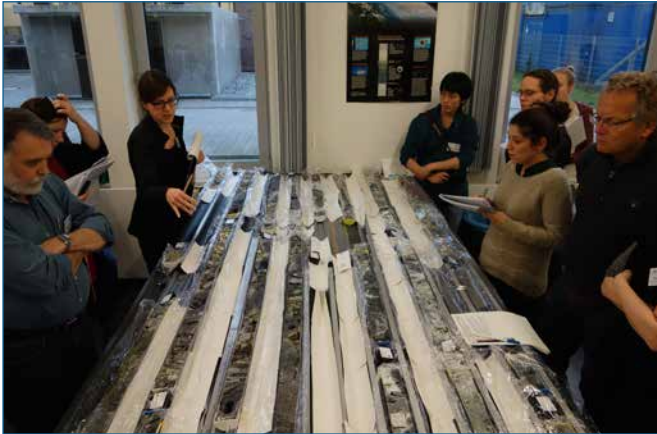
The RD2 and MeBo seafloor drills (page 6) are evolving systems that are under constant development by

technical teams at the BGS and MARUM. To meet the scientific demands of IODP expeditions, new capabilities were identified at previous ECORD technical panel and proponent meetings, in particular downhole logging tools and the ability to plug and instrument boreholes. IODP Expedition 357 served as a catalyst for new seafloor drill developments, and throughout 2015 ESO worked with technical partners at MARUM, BGS and external companies to achieve new advancements in seafloor drill-rig technology, specifically:

- dual induction resistivity logging tools;
- magnetic susceptibility logging tools;
- seafloor drill string plugs for post-expedition fluid sampling by ROV;
- borehole packer system (expanding packer);
- tracer delivery system;
- water sampling system;
- sensor package - CTD/DO/CH₄/pH/Redox.



Expedition 357: First CTD cast at site M0068 with water sampling on recovery (photos C. Cotterill © ECORD/IODP).



Expedition 357 Science Party in discussion at the sampling table after the cores are split (photo D Weis © ECORD/IODP).

The rock drills, logging tools and other developments were tested at BGS Edinburgh, offshore West Scotland and at MARUM in Bremen, and then successfully applied during the expedition. During the expedition, and for the first time in any IODP or non-IODP project, two borehole plug systems were successfully installed by a seafloor drill. Consisting of a valved drill string plug and swellable packer, these borehole plugs will allow future sampling of formation fluids by ROVs, which will facilitate better understanding of the geochemical and microbiological processes in these actively serpentinizing systems. Science Party members have already organised a research cruise to return to the drill sites and sample hydrothermal fluids in the plugged boreholes. The new drill-mounted sensor packages designed for the expedition were highly successful and consistently delivered real-time chemical information, allowing *in-situ* confirmation of ephemeral events such as gas release while drilling. Newly added water sampling apparatus allowed bottom water to be sampled immediately pre- and post-drilling, to augment water samples taken by CTD casts prior to drill landing ([page 7](#)). The new drill-mounted tracer delivery system (pump system) successfully delivered a geochemical tracer during drilling for contamination tracer testing, which will help assess the validity of the microbiology results.

After arriving back in Southampton, the cores, sealed and stored in temperature-controlled containers, were shipped to the IODP Bremen Core Repository. Due to the nature of MSP expeditions in which there are space and time restrictions offshore, the cores are not split at sea therefore the main part of the scientific analysis has to be conducted onshore.

Onshore Science Party 20 January - 5 February 2016

The Expedition 357 Onshore Science Party (OSP) took place from 20 January to 5 February 2016 at the BCR, which is located at the MARUM - Center of Marine Environmental Sciences building on the campus of Bremen University. The Expedition Pre-OSP began on December 15 and continued in January 2016, when EPC undertook natural gamma ray measurements on the whole-round core, MARUM/EPC acquired high-resolution linescan images (360°) of the full core in the liner, and thin sections were made of initial samples taken offshore.

During the evening before the start of the OSP, the Science Party (*below*) was welcomed at an icebreaker party in their hotel. The first day at the BCR was devoted to science meetings, presentations of offshore results, review of core processing and post-cruise science (including sample requests), and familiarisation of the BCR facilities. In contrast to standard IODP sampling parties, the OSP is a 3- to 4-week experience during which the cores are split and all the data for the IODP minimum and standard measurements are acquired.

About 65 participants (scientists and ESO personnel) worked in two shifts to process the cores. The OSP participants used the different labs at MARUM, some of which were devoted to office space and specific laboratories (*e.g.* report writing, microscopy, and physical properties measurements on discrete samples). The main BCR labs were used for core description of the freshly split cores, supported by the use of the CoreWall visualisation system, digital imaging, color-reflectance measurements, split-core logging, petrophysical analyses, and detailed core sampling (*above left*). Further analytical laboratories were available at the MARUM (geochemistry, physical properties) and the Department of Geosciences (paleomagnetism, palynology) of the University of Bremen.

Soon after returning home from the OSP, the scientists received their samples for personal post-expedition research. This post-expedition phase of research is just starting, and is expected to yield new insights into serpentinite-hosted hydrothermal activity, and how microbial communities evolve with its variation.

IODP Expedition 357 was a technically challenging expedition, and work is still required to further develop the capabilities of seafloor drills. Despite the challenges, technical advancements were made that have provided cores from lithologies not previously encountered in scientific drilling, and new data that will enable the Science Party to undertake many different and innovative studies.



Expedition 357 Science Party (V. Diekamp © ECORD/IODP).

IODP Expedition 364 Chicxulub K-Pg Impact Crater

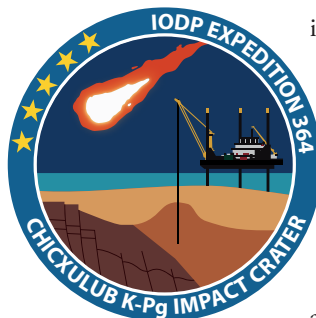
Co-chief Scientists: Joanna Morgan (ECORD, UK) and Sean Gulick (USA)

Good progress was made throughout 2015 towards implementing Expedition 364, and the drilling platform is due to be on site in April 2016. A major activity was the tendering for drilling and platform services, involving a formal bidding exercise that started with a Notice of Interest in the public procurement database of the European Union. Over several months, potential bidders were assessed and negotiations were held with the preferred bidder, culminating with the signing of a drilling contract with DOSECC (Drilling, Observation and Sampling of the Earth's Continental Crust), the company used for the highly successful Expedition 313 New Jersey Shallow Shelf in 2009.

The drilling vessel will be the *L/B Myrtle*, sister vessel to the *L/B Kayd* used for Expedition 313. In contrast to Expedition 313, the rig setup and coring plan will allow for a total depth of 1,500 mbsf to be reached. This will be a single-hole expedition, and ESO are planning for multiple pipe size 'step downs' to mitigate the risk of drilling pipes becoming stuck and to increase the chance of reaching the target depth.

ESO has held regular discussions with the logging contractors and Co-chief Scientists regarding logistics and requirements for downhole logging and Vertical Seismic Profiling (VSP) experiments. EPC (Montpellier) will be undertaking the wireline downhole logging and work alongside the University of Alberta who will undertake the VSP experiments with some equipment provided by the University of Texas, Institute of Geophysics. EPC and Bremen have investigated requests for additional pre- and post-onshore science party petrophysical measurements.

In the post-impact sediments, the impact breccias and the peak ring rocks downhole and core petrophysical measurements will be used to ground-truth geophysical models generated from previously-acquired gravity, magnetic, refraction, reflection and MT data. In the post-impact sediments (~70% of which will be drilled without core recovery) downhole data and VSP will be key



in characterising the depositional sequences, identifying seismic reflection horizons, which will then be used to propagate the stratigraphic ages of the reflectors across the impact basin. Association of downhole- and core- petrophysical measurements (acquired with a multi-sensor core logger) will provide a robust dataset to tie cores and seismic, and to test existing hypotheses and models. Data integration is critical for improving the community's understanding of the crater structure away from the drill hole.

In parallel to the technical planning, scientific planning was undertaken by ESO with input from the expedition Co-chief Scientists. During the Call for Scientists in the spring, an information webinar, which was held for potential applicants on 21 April, had 40 attendees, with a total of 66 individual registrants. The Call for Scientists was opened to Mexican scientists to facilitate the project permitting, and as part of negotiations with Mexican institutes to potentially provide an in-kind contribution.

A Science Workshop was organised by the Co-chiefs and Mexican colleagues in Merida, Mexico, on 30-31 March 2015, and was attended by ESO staff. The primary aim of the workshop, which before conduct planning for the expedition, was to encourage Mexican participation in IODP, facilitate the permitting, and initiate public outreach and education within the Yucatán. Additional visits were made by ESO to the British Embassy and to the Secretariat of Environment and Natural Resources (SEMARNAT) in Mexico City as part of the permitting effort.

The offshore phase of Expedition 364 will take place in April and May 2016, and the Onshore Science Party in September and October 2016.

David McInroy, ESO Science Manager - dbm@bgs.ac.uk

Expedition 357 in numbers



- 8 days mobilisation
- 27 days on site (drilling/coring/sampling) + 20 days transit
- 9 sites, 17 holes
- 57,13 m cores (53% recovery)
- water depth: 768 - 1,568 m
- 2 borehole-plug systems installed
- 445 l water column sampling
- 16 days Onshore Science Party
- 1,420 samples taken (onshore and offshore)
- 35 metres of through-pipe total gamma logging
- ~2,400 km² high-resolution multibeam echosounder dataset acquired



Alan Stevenson

ECORD Outreach & Education News and Activities



Patricia Maruéjol



Julia Gutiérrez Pastor

There have been many recent changes within the ECORD Outreach & Education Task Force (E-OETF). With the transfer of the ESSAC Office from Zurich, Switzerland, to Kiel, Germany, Julia Gutiérrez Pastor left her position and is replaced by Hanno Kinkel. Julia had been part of our team since October 2011 and we would like to thank her for her enthusiasm and the efficiency she brought, especially in managing education. We wish her all the best in finding a new position in earth science.

We would also thank Gretchen Früh Green, ESSAC outgoing Chair, for her involvement in education and outreach activities. We are happy to welcome Jan Behrmann, the new ESSAC Chair and Hanno Kinkel ([page 18](#)), who join the Task Force. We also said goodbye to Albert Gerdes, who stepped down as ESO Media Relations Manager at the end of January 2016. Albert has been involved in IODP since the beginning in 2003 and took part in the media activities for all six MSP expeditions during the last 12 years.

Albert also played a lead role in organising the many press conferences that publicised ECORD/IODP science during the EGU Conference in Vienna each year. We will miss Albert's vast experience and knowledge of media relations and science communication in general, as well as his enjoyable company and recommendations for the best place to get a good cup of coffee! We wish him well in the future.

Since November 2015, the E-OETF has organised outreach activities at AGU 2015 in collaboration with ICDP and produced and distributed ECORD/IODP resources. The team met in Bremen, Germany, on 26-27 January 2016 to coordinate the programme's outreach and education activities for 2016. The meeting was hosted by Albert Gerdes at MARUM, University of Bremen.

- **AGU 2015** - <http://www.ecord.org/pi/booths.html> - 14-18 December 2015, San Francisco (USA). A joint ECORD/IODP-ICDP booth was organised ([top](#)). Together with NSF, JAMSTEC and ICDP, ECORD financially supported the IODP-ICDP Town Hall meeting held on 16 December.

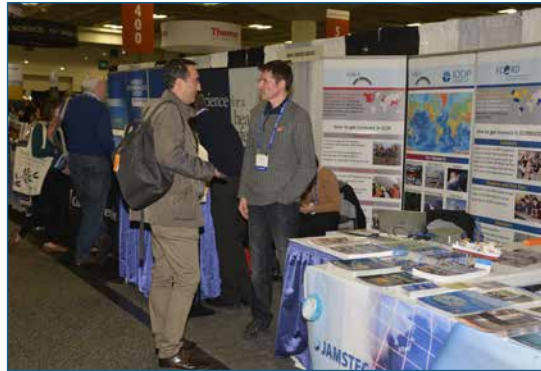
- **ECORD/IODP information materials** were provided to the MagellanPlus Workshop Brazilian Equatorial Margin (BEM II) - <http://bem.rhul.ac.uk/>.

- The **ECORD Annual Report 2015** was delivered in March 2016 ([page 3](#)). Information and outreach materials, logo ([page 9](#)), banner and a leaflet ([above](#)) were also produced for Expedition

364 Chicxulub K-Pg Impact Crater.

- **ODP-IODP core replicas** - <http://www.ecord.org/pi/core-replicas.html> - were provided to support French classes in a middle school in Pau and university of Lorraine in Nancy and for display at a public exhibition on past climate changes (Lunéville, France).

- A **media day** was organised on 1 February 2016 during the Onshore Science Party of Expedition 357 Atlantis Massif Serpentinization and Life to communicate the first results of the expedition to the public.



Upcoming events / activities

- The E-OETF will continue to promote both the IODP and ICDP programmes at science conferences and support national IODP educational initiatives. ECORD and ICDP will organise a joint exhibition booth at:

- EGU - 17-22 April 2016, Vienna Austria, booth #55-56-57-58,

- IGC 2016 - 27 August to 4 September 2016, Cape Town, South Africa, booth # EE10,

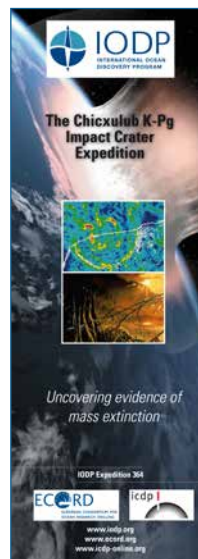
- AGU, 12-16 December 2016, San Francisco, USA, in conjunction with IODP-ICDP sessions or Town Hall meetings ([page 18](#)).

Another important task of the team is the renewal of the ECORD website. At its fall meeting in 2015 in Naples (Italy), the ECORD Council approved our proposal to re-design the three ECORD websites (ECORD, ESO and ESSAC), to improve navigation for our visitors and increase ECORD's visibility. Work is in progress and we hope to relaunch our website by October 2016.

Education

Michelle Darrieu (Lycée Français Jean Monnet, Brussels, Belgium), Lucas Kavanagh (McGill University, Montréal, Canada) and Marion Burgio, (Lycée Louis Barthou, Pau, France), who sailed as Education Officers onboard the *JOIDES Resolution*, report in this issue ([pages 10 and 11](#)) about their participation in Expedition 359 Maldives Monsoon and Sea Level and 360 SW Indian Ridge Lower Crust and Moho respectively. Plans are underway to organise and support the next ECORD School of Rock in 2016.

Alan Stevenson, ESO, Julia Gutiérrez-Pastor, ESSAC and Patricia Maruéjol, EMA



ECORD Training Course 2016: "Virtual Ship Experience" 7 - 11 March 2016, Bremen, Germany

By hosting one of the three IODP core repositories in the world the MARUM - Center for Marine Environmental Sciences, University of Bremen, is also an important hub for the next generation of IODP scientists at an early stage of their career. From 7 to 11 March 2016, the second ECORD Training Course was held at the IODP Bremen Core Repository (BCR) with 30 participants from 14 different countries, including non-ECORD IODP members as well as non-IODP member countries. This five-day course focused on the IODP core-flow and procedures, and was customised to prepare the participants for sailing on an IODP expedition, and to impart them with an appreciation for high standards in all kinds of coring projects. The detailed programme can be seen on http://www.marum.de/en/ECORD_Training_Course_2016.html.



IODP-style lab exercises (*right*) formed the foundation of the course, following the pattern of the unique "Virtual Ship" approach developed for the popular Bremen ECORD Summer School - http://www.marum.de/en/ECORD_Summer_Schools.html. The participants were exceptionally active in taking part in practical exercises and contributing to discussions. They also gained first insights into the multidisciplinary team effort that is a crucial part of the success of the ocean drilling programmes.

Ursula Röhl, ESO Curation and Lab Manager of the IODP Bremen Core Repository, MARUM, University of Bremen
uroehl@marum.de

Scenes from the ECORD Training Course 2016: top right, visual core description in the MARUM laboratories; right, pore-water analysis (V. Diekamp/MARUM).



Group photograph of participants and lecturers of the ECORD Training Course 2016 at the MARUM, University of Bremen (V. Diekamp/MARUM).

ECORD Teachers at Sea

Expedition 359 Maldives Monsoon and Sea Level

In June 2015, I received an email from IODP US in College Station inviting me to apply for an expedition on the *JOIDES Resolution (JR)*, the famous ocean drilling research vessel. I made a first application in 2014 and realise that board the *JR* is a dream for a lot of people! At the beginning of September, I received an invitation to sail on Expedition 359 from 30 September to 30 November. The timeframe was very short before the expedition, but I had no hesitation in accepting as I knew it could be a once in a lifetime experience. I had the support of my headmaster and, thanks to my colleagues, I could be replaced for the time I was on the ship. On 26 September I left Brussels, where I am a Life and Earth Science teacher in the French Lycée Jean Monnet in Brussels (Belgium), to travel to Darwin (Australia), where I landed on 29 September. And that's where the adventure began!

We boarded on 1 October and left Darwin on the 5th for a 13-day transit across the Indian Ocean to the Maldives Islands. Expedition 359 Maldives Monsoon and Sea Level investigated past climate by studying drift deposits and sedimentary carbonate sequences in the Inner Sea of the Maldives and provides records of changing currents related to the evolution of the Indian Monsoon over the past 23 million years.

30 scientists boarded the *JR*, coming from the USA, China, Brazil, India, Korea, Japan, France, Italy, Portugal, Netherlands, UK, Germany, Australia and Israel. We were two Education Officers, Juliet Crowell from Washington DC and myself. With a master's degree in biology and geology, as well as my teaching qualification, I have been teaching life and earth sciences in secondary school trying to connect my students with scientists and research as often as possible. Working onboard the *JR* was an incredible opportunity to make this kind of connection.

During the expedition I videoconferenced (live ship-to-shore broadcasts) 63 high schools abroad and in France (with even if I work in Brussels I am employed by the French government). Each videoconference was an opportunity for the students to visit the ship. With these kind of conferences we contacted around 5,000 students in 22 countries all around the world: French and international high schools in Colombia, Venezuela, Philippines, UK, Germany, Spain, Portugal, Morocco, Italy, Romania, etc.

Juliet, my co-worker, has been in contact with student's group in Canada, Australia and the USA. The scientists were interested in this activity, asking us to meet their own students at the university. It was very exciting for everyone.



Life onboard was regulated by the shifts and the cores, 24 hours a day, 7 days a week. The enthusiasm and the professionalism of everyone, from the drillers to the scientists were amazing.

The expedition ended on 30 November in Colombo, Sri Lanka after eight weeks onboard. When I think about this experience my most enthusiastic and best memories are:

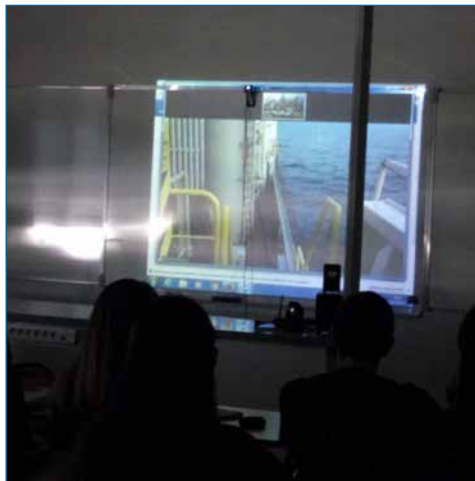
- the first cores from the bottom of the Indian Ocean (even if it was not so deep in the inner sea of the Maldives!);
- the wonderful pictures of coccolithophores from the scanning electron microscope;
- the sunsets that have been such a beautiful and peaceful moment every day.

But most of all, the best thing was to learn something about science every day, whether about paleontology or about magnetism or sediments. It was huge! The experience was outstanding for learning, but also for thinking about how to apply this learning to teaching. For example all the data about past climate - several kilometres of cores

sampled from the seafloor - could help us understand the present climate change.

Three months after the end of the expedition, I often feel I am still aboard the *JOIDES Resolution*! I keep in touch with Sébastien Haffen, French scientist of Expedition 359, and I look forward to working with Marion Burgio, Education Officer on Expedition 360 (*page 13*), to share useful experiences for our students.

Michelle Darrieu, Education Officer, Lycée Français Jean Monnet, Brussels, Belgium
<http://joidesresolution.org/blog/365>



Live broadcast brings IODP into the classroom.

Expedition 360 SW Indian Ridge Lower Crust and Moho

Starting a Hole to the Mantle: Education and Outreach Onboard IODP Expedition 360

There are few goals in Earth science that have stood unfulfilled longer than that of drilling to the Moho, the seismic discontinuity long assumed to be the crust mantle boundary. This began as Project Mohole in the 1960s and was most recently continued in the form of IODP

Expedition 360 to Atlantis Bank on the Southwest Indian Ridge, aboard the *JOIDES Resolution (JR)*. This site was specifically chosen to investigate the nature of the lower crust at an ultra-slow spreading ridge, where large detachment faults split the upper and lower crust, allowing us to drill directly into gabbros exposed on the seafloor. Expedition 360 took place during December 2015 and January 2016; spoiler alert, we did not reach the Moho! This leg was only to start the hole that will hopefully one day be continued by

another expedition on the *JR* and perhaps be completed by the *Chikyu*; however, this is all dependant on the current setup and stability of the hole, as well as the scientific results of this initial leg.

As part of the four-member education and outreach team, my job was to communicate the goals and progress of the expedition in understandable terms to the general public. This turned out to be especially pertinent for Expedition 360 due to strong media interest that resulted in articles from top-tier media outlets including the BBC, Nature, Smithsonian, Science Friday, and the Boston Globe. Facilitation of interviews, clarification of concepts, and fact-checking were essential services provided to the many interested journalists. I say essential as a number of articles were written by journalists who did not contact the team onboard the ship and the errors were considerable. This fed a high degree of public concern over this expedition, stemming from misconceptions regarding the safety of drilling towards the mantle.

We were at no risk of triggering a volcano, earthquake, or deflating the Earth, and the education and outreach team did our best to inform and correct these misconceptions through blogs, social media, video broadcasts, and an "Ask Me Anything"

session on reddit. In addition, I produced a regular podcast from onboard the ship, "A Hole in the Bottom of the Sea" <http://joidesresolution.org/node/4349>, and a number of short videos, one of which quickly gained popularity, becoming by far the most viewed (over 15,000 times) on the *JR*'s YouTube channel.

In the end, we drilled 789 m, short of our initial goal of 1,300 m, but still the deepest single-leg hard rock hole and the 5th deepest hard rock hole ever drilled! The expedition ended with a final set back, bolts sheared off the drill pipe and a metal ring fell into the hole during the last days at the drill site. We were unable to fish this piece out before we had to depart for Mauritius, but on 9 March, we got word that the *JR* Facility Board has approved to ship's return to Atlantis Bank this summer during its planned transit from South Africa to Sri Lanka to clean out the bottom of the hole and cement the fault zone that gave us so much trouble.

This will ensure the hole is in the best possible condition to be continued in the future. Perhaps it could even one day be the first to reach all the way through the crust to our planet's mantle!

Lucas Kavanagh, McGill University, Montréal, Canada
<http://joidesresolution.org/blog/367>

How to build an International team spirit: 30 PhD people, 60 days on a boat for the best and... only the best!

"Somewhere over the ocean,
You will find...
Hundreds of crazy people,
Floating on the *JR*..."

This expedition began with a long long transit from Colombo, to the Atlantis Bank and we had time to think about our place in the project Mohole. What an extraordinary adventure to come with a far, far objective, the mantle ... not for us, not in this leg, but in our minds, as a quest!!!

We spent all of the expedition describing crustal olivine-gabbro and explaining to the students all over the world that SloMo project is about ... reaching the Moho ! But the educators have

Continued on page 31



The Education and Outreach Officers. From left, Jiansong Zhang (Xinhua News Agency Shanghai Branch, China), Lucas Kavanagh (Canada), Alejandra Martinez (USA), and Marion Burgio (France) (Bill Crawford, IODP JRSO).

Core replicas help teach science

ODP replica core a hit exhibit at the COP21 climate conference in Paris

Paul Pearson*

In December last year, world leaders and delegations from over 190 countries along with many representatives from intergovernmental organisations, non-governmental organisations and civilian society, met in Paris to forge a deal on greenhouse gas emissions. A hit exhibit amid this hustle and bustle was a tangible example of extreme climate change past - a replica core of the Paleocene Eocene Thermal Maximum (PETM) at Ocean Drilling Programme (ODP) Site 1262 from Walvis Ridge in the South Atlantic.



The exhibit event was staged by a consortium of European and US institutes and programmes (photo Plymouth Marine Laboratory).

The core records a period of dramatic global warming and ocean acidification 56 million years ago caused when large volumes of carbon were added to the ocean - atmosphere system as CO₂, methane, or both. The tropical ocean warmed to 40°C, with extinctions on the seafloor and many plankton species finding refuge in the polar oceans. The dramatic colour shift seen in the core (*above*) is the result of almost total dissolution of calcium carbonate on the seafloor during the peak of the event leaving a residue of reddish clay behind. Similar evidence has been found in all the ocean basins.

Professor Paul Pearson of Cardiff University brought along the core to emphasise the reality of extreme climate change. Speaking at a special event on the changing ocean and its impact on society, he said "We are already emitting CO₂ over ten times faster than occurred in the PETM. If we are to avoid unleashing climate change just as extreme and much more rapid than this, then global carbon emissions must be brought under control".

related to ocean acidification, warming, deoxygenation and sea-level rise.

The core formed part of a UNFCCC COP21 exhibit staged by a consortium of ocean science institutes and programmes, including Plymouth Marine Laboratory, l'Institut Universitaire Européen de la Mer, and l'Ecole Doctorale des Sciences de la Mer both based at the Université de Bretagne Occidentale, the UK Ocean Acidification Programme, BIOACID, l'Université Pierre et Marie Curie in Paris, Scripps Institute of Oceanography and the cluster of Excellence LabexMER. Student volunteers worked tirelessly throughout the summit to explain how ocean health will become increasingly stressed by at least three interacting factors of ocean warming, acidification and deoxygenation.

Site 1262 was drilled during ODP Leg 208. The core replica was made by Paula Weiss (former IODP-ODP Curator) and given to ECORD by the Integrated Ocean Drilling Programme-MI. It is available to borrow via <http://www.ecord.org/pi/core-replicas.html>

The event "Changing Ocean and its impact on Society" was organised by Plymouth Marine Laboratory and took place in the EU pavilion (*left*). It provided an integrated and updated perspective by ocean experts on the climate related changes, risks and projections for both natural and human ocean systems including a review of key reports and sources of information on science and policy

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The Paleocene-Eocene Thermal Maximum: Investigating the connection between ocean drilling and climate science

Paul Bridger, Sinéad Lyster and Abigail Hunt*

The discipline of palaeoceanography provides an insight into past climates and their applications to modern science. Oceans are the predominant control on climate and their associated climate archives provide the best records of palaeotemperature. Furthermore, oceans provide the most extensive records, with marine sediments documenting climatic changes up to 200 Ma. They document a much greater time span in comparison to other climate archives, such as lake sediments (<1 Ma), ice cores (<800 Ka), and tree rings (<10 Ka). Ocean drilling allows us to access these superior records.

As geoscience undergraduates at University College London, we have had the opportunity to study Cenozoic marine sediments and observe what is arguably the most studied climatic event in geological history. We were assigned a replica of an ocean floor sediment core; this core was retrieved on ODP Leg 208, Site 1262 in the South Atlantic Ocean. The core represents the Paleocene-Eocene Thermal Maximum, which occurred ~55 Ma, as well as the climatic conditions prior to, and succeeding, this event.

The Paleocene-Eocene Thermal Maximum, or the PETM, was a short climate interval whereby global temperatures greatly increased at both equatorial and polar latitudes (Zachos *et al.*, 2001; Zachos *et al.*, 2003). This climate event was a result of the rapid release of ~2000 billion metric tons of carbon into the atmosphere (Zachos *et al.*, 2005), causing widespread warming. This carbon was likely released in the form of methane, and is attributed to the melting of methane hydrates stored in the ocean floor (Thomas *et al.*, 2002; Zachos *et al.*, 2005).

As part of the assignment, we observed a clay-rich horizon within the core

- as inferred from the presence of very fine-grained red sediments (right). This horizon reflects the warming-induced ocean acidification that led to increased carbonate dissolution, therefore raising the carbonate compensation depth (CCD). The absence of calcareous nannofossils at this horizon is in accordance with a raised CCD. Underlying the PETM horizon, a carbonate-rich nannofossil ooze is visible. This same lithology is repeated above the horizon, therefore demonstrating a return to previous conditions following the climate interval. Being able to make observations from primary data, such as this core, allowed us to develop our interpretative skills. To us as students, practicing these skills is more beneficial than studying articles whereby climate proxy data has already been graphically depicted and interpreted.

This exercise demonstrated the vast opportunities that ocean drilling offers to palaeoceanography. The emergence of ocean drilling and associated technologies has greatly advanced scientific research, permitting access to an ever-expanding climate archive and allowing scientists to go further into deep geologic time. As a result of ocean drilling, the Cenozoic is the most thoroughly studied period of geological history, with observed climate



Undergraduate students at University College London studying a replica of an ocean floor sediment core in order to develop past climate interpretation skills (photo Prof. Bridget Wade, University College London).

trends facilitating understanding and interpretation of modern-day climatic patterns.

For further reading:

- Sluijs *et al.* (2007) In: (eds. Williams *et al.*) *Deep-Time Perspectives on Climate Change: Marrying the Signal from Computer Models and Biological Proxies*, The Micropalaeontological Society, Special Publications. The Geological Society, London. 323-349.
- Zachos *et al.* (2001) *Science*, 292, 686-693
- Zachos *et al.* (2003) *Science*, 302, 1551-1554.
- Zachos *et al.* (2004) *Proc. Ocean Drilling Program, Initial Reports*, vol. 208, Ocean Drilling Program, College Station, Texas.
- Zachos *et al.* (2005). *Science*, 308, 1611-1615

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Jan Behrmann

ECORD Science Support & Advisory Committee News

At the end of March 2016, the ESSAC Office will finish its term at the ETH Zurich and will move to GEOMAR at Kiel, Germany. Hanno Kinkel is the new Science Coordinator ([page 18](#)). The past months have kept us very busy with continued efforts regarding education and outreach activities, and staffing of expedition participants and panel members.

Six IODP expeditions using the *JOIDES Resolution* were completed in 2015 and the first three months of 2016. Within ECORD's mission-specific platform (MSP) programme, IODP Expedition 357 Atlantis Massif Serpentinization and Life successfully finished its offshore and onshore phases in December 2015 and February 2016, respectively ([pages 6-8](#)). In 2015, a total of **59 scientists, including five Co-chief Scientists** from ECORD member countries participated in IODP expeditions. Three participants responded to special calls, and three took part as a result of in-kind contributions for Expedition 357.

The selection of ECORD scientists to participate in further expeditions by the *JOIDES Resolution*, the *Chikyu* and MSPs during 2016 ([table below](#)) has been completed. IODP Expedition 361 South African Climates has just ended on 31 March, with a total of nine scientists from ECORD countries onboard, including a Co-chief Scientist from the UK. The *Chikyu* is conducting IODP Expedition 365 NanTroSEIZE Shallow Megasplay LTBMS between 26 March and 27 April

2016, with a small group of scientists headed by Achim Kopf (Germany) and Demian Saffer (USA) as Co-chief Scientists. The MSP Expedition 364 Chicxulub K-Pg Impact Crater will be operated by ESO and implemented in the spring of 2016, with Joanna Morgan (UK) and Sean Gulick (USA) as Co-chief Scientists ([page 9](#)). The expedition includes 14 ECORD scientists (from France, Germany, UK, Austria, Belgium, Canada and the Netherlands), four of whom will participate in the offshore phase. Staffing for IODP Expedition 362 Sumatra Seismogenic Zone has been completed. Nine scientists from ECORD countries will sail, including a Co-chief Scientist from the UK. Nominations and the selection process for IODP Expeditions 363 Western Pacific Warm Pool, 366 Mariana Convergent Margin and 367/368 South China Sea are in progress. Applicants for these expeditions have greatly benefited from information provided by online, interactive "webinars", an initiative originally organised by the Consortium for Ocean Leadership. These have become an integral part of the application process for all IODP expeditions.

We are pleased to be able to provide many students and early-career researchers with the opportunity to participate in IODP expeditions. Young scientists continue to make up approximately 50% of the ECORD participants. More information about the scientific objectives and dates of all expeditions can be found in the [table below](#) and on the IODP website at <http://www.iodp.org/expeditions>.

IODP Expedition Drilling Schedule

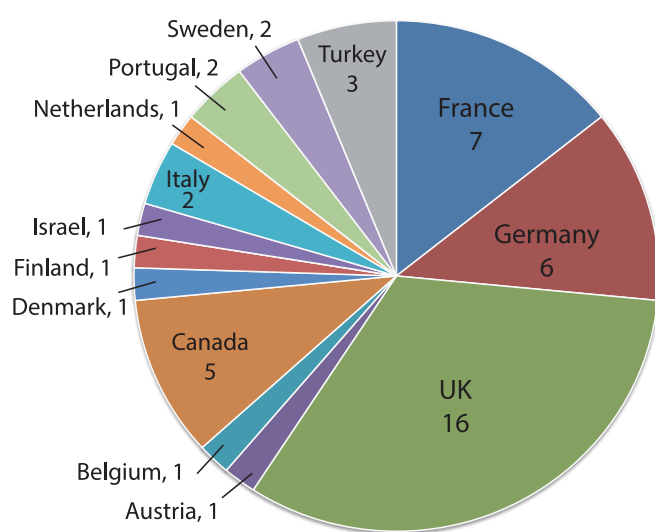
Expedition	Exp #	Drillship	Dates	Co-chief Scientists
South African Climates (SAFARI)	361	JR	30 Jan - 31 March 2016	I. Hall - S. Hemming
NanTroSEIZE Shallow Megasplay LTBMS	365	Chikyu	26 March - 27 April 2016	A. Kopf - D. Saffer
Chicxulub K-Pg Impact Crater	364	MSP	5 April - 31 May 2016 (offshore)	J. Morgan - S. Gulick
Sumatra Seismogenic Zone	362	JR	6 Aug - 6 Oct 2016	L. McNeill - B. Dugan
Western Pacific Warm Pool	363	JR	6 Oct - 8 Dec 2016	Y. Rosenthal - A. Holbourn
Mariana Convergent Margin	366	JR	8 Dec 2016 - 7 Feb 2017	P. Fryer - G. Wheat
S China Sea Rifted Margin A	367	JR	7 Feb - 9 April 2017	Z. Sun - J. Stock
S China Sea Rifted Margin B	368	JR	9 April - 9 June 2017	Z. Jian - K. McIntosh
Australia Cretaceous Climate-Tectonics	369	JR	4 Oct - 4 Dec 2017	tbd
Hikurangi Subduction Margin	tbd	JR	tbd	tbd
Antarctic Cenozoic Paleoclimate	tbd	MSP	Jan - Feb 2018	C. Escutia - T. Williams
Arctic Ocean Paleoceanography	tbd	MSP	Mid-late 2018	tbd



LTBMS: JR: *JOIDES Resolution*, MSP: *mission-specific platform* - <http://www.iodp.org/expeditions>. ECORD Co-chief Scientists are marked in blue. Launching the MeBo onboard the RRS James Cook during Expedition 357 Atlantis Massif Serpentinization and Life (Y. Morono © ECORD/IODP).

On the **IODP Advisory Panels**, ECORD has eight members in the science sub-group and five members in the site sub-group of the Science Evaluation Panel (SEP), which is responsible for the evaluation of all IODP proposals (*table page 19*).

The 2015 **ECORD Distinguished Lecturer Programme (DLP)** has successfully continued into the first half of 2016, with five lecturers covering the major themes defined in the IODP Science Plan. To date, 49 DLP lectures have been scheduled or are planned, with the DLP lecturers visiting 13 ECORD countries (*below*). Further information is available at <http://www.essac.ecord.org/index.php?mod=education&page=dlp>. A new call for the 2016/2017 DLPs lecturers will be circulated soon.



Distribution of the ECORD Distinguished Lecturers in 2015 and 2016 (n = 49).

ESSAC continues to support initiatives to train the next generation of ocean-drilling scientists through the **ECORD Summer Schools**. In 2016, young scientists will have the opportunity to participate in three Summer Schools sponsored by ECORD and related to marine science research and ocean drilling:

- The Urbino Summer School in Paleoclimatology (USSP) on Past Global Change Reconstruction and Modelling Techniques, University of Urbino, Italy, 13 to 29 July 2016 - <http://www.urbinosp.it>;
- The ECORD Bremen Summer School 2016 on Submarine Geohazards: Mapping, Monitoring, and Modelling, MARUM, University of Bremen, Germany, 5- 16 September 2016 - http://www.marum.de/en/ECORD_Summer_School_2014.html;
- The ECORD Summer School on Petrophysics, Leicester, UK, 26 June to 1 July 2016 - <http://www2.le.ac.uk/departments/geology/research/gbrg/projects/iodp/summerschool16>.

As in previous years, ESSAC will award **ECORD Scholarships** to young scientists to attend the USSP, Bremen and Petrophysics summer schools. Applications were received by 15 March 2016.



Expedition 361 Southern African Climates: from left to right, Andreas Koutsodendris (Sedimentologist, University of Heidelberg, Germany), Masako Yamane (Sedimentologist, JAMSTEC, Japan), and Thibaut Caley (Sedimentologist, University of Bordeaux, France) at the description table (photo Tim Fulton, IODP JRSO).

In addition, a new call to host **ECORD-sponsored summer schools in 2017** will be released soon. The results of these calls will be announced following the next ESSAC Council meeting at the end of May on <http://www.essac.ecord.org/index.php?mod=education&page=summer-school>

The ESSAC office issued a call for applications for the **ECORD Research Grants** to support outstanding young scientists in IODP-related research, with a deadline of 15 February 2016. These short-term, merit-based awards contribute to travel and laboratory expenses, and are particularly intended to support studies that promote new collaborations and/or the acquisition of new scientific expertise. Young researchers will receive the awards, and applications are now being evaluated by ESSAC - <http://www.essac.ecord.org/index.php?mod=education&page=grants>.

As part of the Teachers at Sea programme, an initiative of the Consortium for Ocean Leadership, ESSAC offers the unique opportunity for educators and outreach specialists from ECORD countries to sail as **Education/Outreach Officers** onboard the *JOIDES Resolution*. A call for applications to sail in the following five *JR* Expeditions was issued in January: Expedition 362 Sumatra Seismogenic Zone: (6 August - 6 October 2016), Expedition 363 Western Pacific Warm Pool (6 October - 8 December 2016), Expedition 366 Mariana Convergent Margin (8 December 2016 - 7 February 2017), Expedition 367 South China Sea Rifted Margin A (7 February - 9 April 2017) and Expedition 368 South China Sea Rifted Margin B (9 April - 9 June 2017). The deadline to apply was 10 March 2016 and the applications are now being evaluated - <http://joidesresolution.org/node/453>.

Further ESSAC-related activities include the EGU 2016 General Assembly Meeting in Vienna, Austria (17 - 22 April 2016), where a session entitled "Achievements and Perspectives in Scientific Ocean and Continental Drilling (Session SSP1.3)" has been organised (*page 18*). As has now become a regular event at



ESSAC Science Coordinators, left, Hanno Kinkel and right, Julia Gutiérrez Pastor met in Zurich, Switzerland, before the ESSAC Office is transferred to Kiel, Germany.

the EGU meetings, more information about ECORD, IODP and ICDP, and possibilities to get involved in the programmes, are available at the joint ECORD-IODP-ICDP booth in the

exhibit hall, and at the IODP-ICDP Town Hall Meeting. On the occasion of the 35th International Geological Congress (27 August - 4 September 2016; Cape Town, South Africa), there will be an IODP Symposium in the Marine Geosciences and Oceanography theme, entitled "Achievements and Perspectives in Scientific Ocean Drilling" (*below*).

I sincerely thank Gretchen Früh-Green for the past two years that she has served as ESSAC Chair. Gretchen will continue to serve as ESSAC Vice-chair in 2016. We particularly thank the ESSAC Delegates and their Alternates for their active involvement in the numerous ranking and selection processes related to expeditions, panel membership, and education and outreach activities. We also appreciate the cooperation and support of EMA, ESO, the ECORD Council and the other IODP bodies; this is instrumental for the success of ESSAC as a science advisory body of ECORD. Last but not least, as ESSAC Chair, I would like to sincerely thank Julia Gutiérrez-Pastor for her continuous dedication, guidance and hard work as Science Coordinator for ESSAC over the past four years and, on behalf of all ESSAC Delegates, wish her all the best for the future.

Jan Behrmann, ESSAC Chair - essac@geomar.de

IODP sessions at 2016 science conferences



EGU 2016, Vienna - ICDP-IODP Town Hall Meeting
Tue 19 April, 19:00-20:00, Room G2
<http://meetingorganizer.copernicus.org/EGU2016/session/22119>



EGU 2016, Vienna - Achievements and Perspectives in Scientific Ocean and Continental Drilling (SSP1.3)
Thu 21 April, 8:30 - 12:00, Room M2 & Hall D Posters until 19:00

<http://meetingorganizer.copernicus.org/EGU2016/session/20762>



AESC 2016, Adelaide, Australia
Scientific Results of the International Ocean Discovery Program (IODP) as the Australasian program intensifies

<http://aesc2016.gsa.org.au/themes/>



Goldschmidt 2016, Yokohama, Japan
Session 05e - Hard-Rock Drilling: Oceanic Lithosphere to Continental Crust Formation

<http://goldschmidt.info/2016/program/programViewThemes>



IGC 2016, Cape Town, South Africa
Achievements and perspectives in scientific ocean drilling

<http://www.35igc.org/Themes/29/Marine-Geosciences-and-Oceanography>

Oceanography

Preliminary programme will be posted on 1 July.

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<http://www.iodp.org/facility-boards#SEP> - <http://www.iodp.org/facility-boards#EPSP>

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<http://www.essac.ecord.org/index.php?mod=about>



Focusing on IODP Science

Shipboard Paleomagnetism on the *JOIDES Resolution*

Antony Morris*

IODP expeditions offer unparalleled opportunities for international, multidisciplinary collaborations to address major research questions, and participation can be a transformative experience for any Earth scientist. Paleomagnetism is a core discipline in all scientific ocean drilling expeditions, and shipboard paleomagnetists provide invaluable contributions to expedition outcomes while benefitting from the excellent laboratory facilities and technical support available on the *JOIDES Resolution (JR)*.

The *JR* Paleomagnetic Laboratory is organised in two halves in the heart of the research facilities on the Core Deck, between the core description tables and the microscopy suite. One half of the lab is occupied by a 2G Superconducting Rock Magnetometer (SRM; *Figure 1*), designed for pass-through measurement of half-core sections and incorporating in-line alternating field (AF) demagnetization coils capable of maximum peak fields of 80 mT. This is used for routine measurement of the natural remanent magnetization of archive section halves and subsequent AF demagnetization to remove secondary magnetizations. This instrument allows the polarity of magnetization of core samples to be determined and intervals for detailed sampling to be identified.

The second half of the laboratory houses equipment for the analysis of discrete samples (minicores or cubes; *Figure 2*) cut from working section halves. It is equipped with an AGICO JR-6A fluxgate spinner magnetometer, providing the most accurate remanence measurements possible in the shipboard environment (Expedition 335 Scientists, 2012), a DTech AF demagnetizer unit and an ASC Scientific Thermal Demagnetizer. In combination, this instrumentation allows shipboard paleomagnetists to acquire demagnetization data with a quality approaching that achievable in

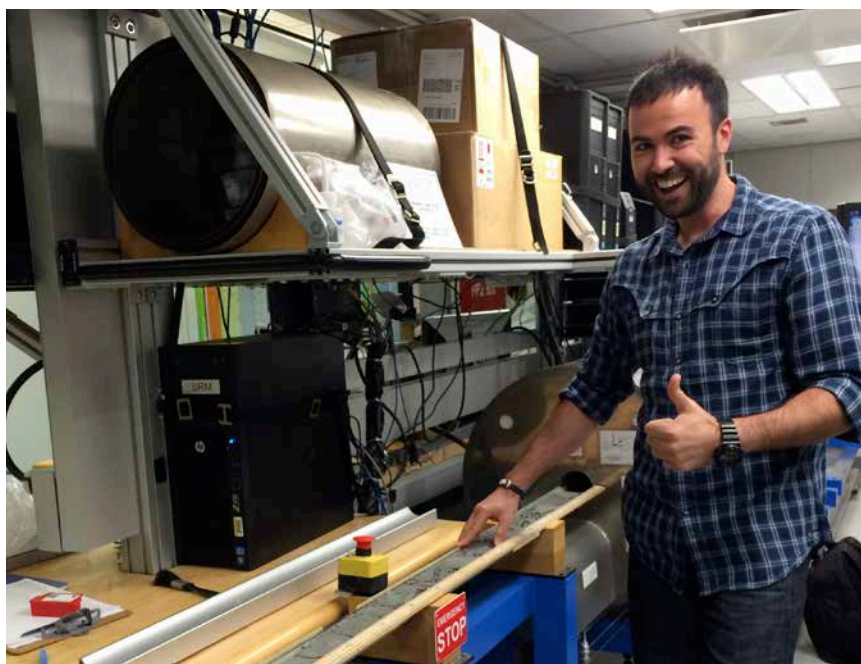


Figure 1: Marco Maffione (Utrecht University) operating the SRM on the JOIDES Resolution during IODP Expedition 351 Izu-Bonin-Mariana: Arc Origins (Antony Morris & IODP).

laboratories onshore (*Figure 3*). The lab is also equipped with an AGICO KLY4S Kappabridge, allowing measurement of the anisotropy of magnetic susceptibility of discrete samples. In addition, the multisensor track systems operated by the Physical Properties team provide whole-round and point susceptibility data measured on core sections. Finally, basic rock magnetic and anisotropy of remanence experiments can be conducted, using a pulse magnetizer and the DTech unit to impart isothermal and anhysteretic remanences, respectively.

In addition to engaging in the broader research environment on the *JR*, a typical 12-hour shift for members of the paleomagnetism team involves balancing activities between: (1) running archive section halves continuously through the SRM system, having optimized the number of AF demagnetization steps to give sufficient information to characterize remanences while allowing

measurements to keep up with core flow through the laboratory; (2) performing demagnetization and other experiments on discrete samples while the archive section halves are running; and (3) keeping up with processing of data using appropriate software (bring your own favorite package!). The datasets generated by intensive, 24/7 operation of the Paleomagnetic Laboratory can be exceptionally large. For example, during the recent IODP Expedition 360 SW Indian Ridge Lower Crust and Moho, demagnetization of archive section halves generated more than 14,000 orthogonal vector plots, spaced every 2 cm downhole! Hence, creative thinking may be required to find efficient ways to perform principal component analyses while acquiring yet more data in the laboratory.

The natural magnetization of IODP samples is often affected by spurious components of magnetization acquired during the drilling process. These “drilling-

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induced magnetizations” (Acton *et al.*, 2002) tend to mask the paleomagnetic signal of interest and have to be removed by careful shipboard demagnetization in order to recover geologically significant, original magnetizations. Normally these drilling components are easily identified as they have steep inclinations aligned along the core axis and so can be distinguished from naturally acquired magnetizations that would rarely have this direction (Figure 3).

Another major difference between IODP samples and those collected in the field onshore is a lack of azimuthal orientation. The resulting inclination-only data are invaluable for dating sequences using magnetostratigraphy and for determining paleolatitudes, and on expeditions involving advanced piston coring of sediments it may be possible to recover declinations with reasonable confidence using the “FlexIT” tool (e.g., Arculus *et al.*, 2015). In contrast, quantification of tectonic rotations affecting basement igneous rocks using inclination-only data alone will always be non-unique. This limitation can be overcome, however, by collaborating with shipboard structural geologists and logging scientists to reorient core pieces using oriented images of the borehole wall acquired using the Formation MicroScanner tool (Morris *et al.*, 2009).

Some of the most exciting aspects of working as a shipboard paleomagnetist relate to the unique working environment on the *JR*. Paleomagnetic analyses associated with an IODP expedition typically form only one strand of a much larger, collaborative, multidisciplinary research endeavour aimed at addressing highly significant research questions. The opportunities for daily interaction with world experts and talented early-career researchers in fields such as petrology, geochemistry, sedimentology, paleontology, physical properties and geophysical logging, working together with a common aim, cannot be replicated onshore. This continuous interaction opens up possibilities for new and exciting collaborations that extend well beyond the time at sea.

Then there is the experience of working in one of the world’s most efficient and effective scientific research environments. A typical shipboard party of 30 scientists, each working 12 hours (minimum!) a day for 60 days, generates a combined effort equivalent to 13 years of work for an

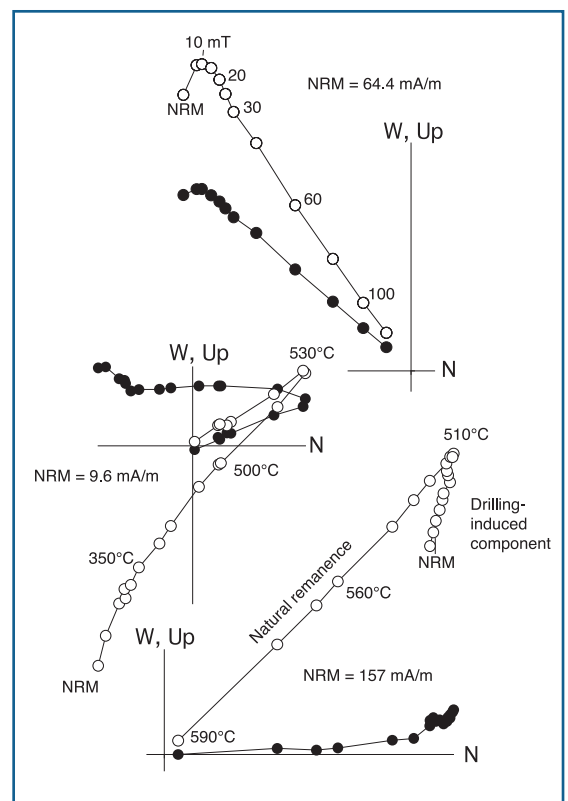


Figure 3: Examples of high-quality shipboard demagnetization data, from gabbros sampled during IODP Expedition 304 Oceanic Core Complex Formation, Atlantis Massif 1.

individual onshore. If the fundamental contributions made by the *JR* technical staff, drillers, ship crew and caterers are included, that figure rises to closer to a lifetime of work effort packed into two months! It is this combination of collaborative and intensive research effort that ensures members of each IODP science party remain linked by their shared experience throughout their careers, resulting in friendships and collaborations that persist for decades post-cruise.

For these reasons, I would encourage other members of the paleomagnetic community to take advantage of the outstanding research opportunities associated with sailing on the *JOIDES Resolution* and also on other IODP platforms, and to offer their expertise to benefit future IODP expeditions. If you want to find out more, a useful overview of shipboard paleomagnetic operations is provided by Richter *et al.* (2007), but please feel free to contact me directly - amorris@plymouth.ac.uk - if you would like to discuss applying to sail in person.



Figure 2: Cubic discrete samples awaiting paleomagnetic analysis, IODP Expedition 360 SW Indian Ridge Lower Crust and Moho (Antony Morris & IODP).

Calendar of Workshops and Conferences

<p>2016</p> <p>30 March - 1 April BEM II MagellanPlus Workshop Ubatuba (SP), Brazil www.ecord.org/magellanplus.html</p> <p>17 - 22 April EGU 2016 Vienna, Austria www.egu2016.eu</p> <p>9 - 11 May Antarctica Ice & Climate MagellanPlus Workshop College Station, TX, USA www.ecord.org/magellanplus.html</p> <p>22 - 26 May JPGU 2016 Chiba, Japan www.jpгу.org/meeting_e2016/</p>	<p>1 - 3 June GAC-MAC Whitehorse, YK, Canada whitehorse2016.ca</p> <p>19 - 21 June BFS + H-ODIN MagellanPlus Workshop London, UK www.ecord.org/magellanplus.html</p> <p>19 - 24 June ICRS 2016 Hawaii, USA sgmeet.com/icrs2016</p> <p>26 June - 1 July Goldschmidt 2016 Yokohama, Japan goldschmidt.info/2016</p> <p>31 July - 5 August AOGS 2016 Beijing, China www.asiaoceania.org</p>	<p>27 Aug - 4 Sept 35th IGC Cape Town, South Africa www.35igc.org/</p> <p>29 Aug - 2 Sept ICP 2016 Utrecht, The Netherlands www.icp12.uu.nl</p> <p>12 - 16 December AGU 2016 San Francisco, USA fallmeeting.agu.org/2016</p> <p>-----</p> <p>2017</p> <p>23 - 28 April EGU 2017 Vienna, Austria www.egu.eu</p> <p>14 - 17 May GAC-MAC Kingston, ON, Canada www.gac.ca/wp</p>	<p>13 - 18 August Goldschmidt 2017 Paris, France goldschmidt.info/2017</p> <p>30 Oct - 2 Nov 3P Arctic Calgary, Canada www.3parctic.com</p> <p>11 - 15 December AGU 2017 New Orleans, USA meetings.agu.org</p> <p>-----</p> <p>2018</p> <p>8 - 13 April EGU 2018 Vienna, Austria www.egu.eu</p> <p>10 - 14 December AGU 2018 Washington, DC, USA meetings.agu.org</p>
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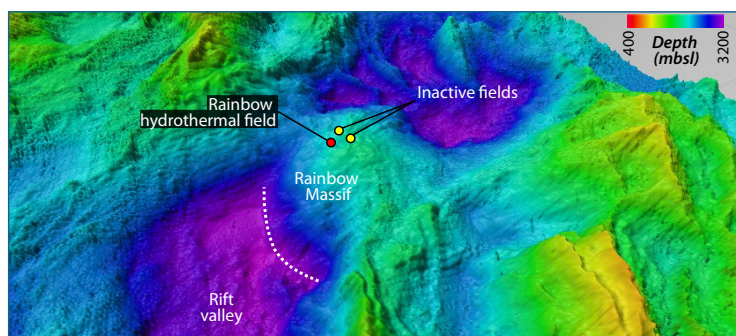
Reports of MagellanPlus Workshops

:: Mantle, Water and Life: the ultramafic-hosted Rainbow hydrothermal field - 10-12 June 2015, Lyon (France)

Convenors: M. Andreani, C. Konn, A. F. Marques, M. Schrenk

Understanding interactions between the mantle, fluids and sub-surface microbial ecosystems is one of the main decadal goals of the new IODP Science Plan, and is a major research theme of the Deep Carbon Observatory (DCO) community.

The Rainbow massif, located at 36°14'N along the mid-Atlantic ridge (MAR) (*right*), is one of the most spectacular expressions of the interplay between magmatic, tectonic, hydrothermal, and biological processes at slow-spreading ridges. It thus provides the opportunity to address these first order questions at a single location, through integrated studies. This massif hosts the Rainbow hydrothermal field, which is rooted in deep-seated rocks (gabbroic and mantle-derived rocks) most probably exhumed along a detachment fault now thought to be inactive. As opposed to the Atlantis Massif (30°N; MAR), which hosts the off-axis, alkaline, low-temperature Lost City field which has been investigated during three IODP expeditions (304 and 305 in 2006 and 357 in 2015, *pages 6-8*), the Rainbow massif hosts a near-axis, acidic, high-temperature hydrothermal site,



venting fluids at 350-365°C and associated with Cu-Zn-(Co) massive sulfide mineralisation. Hence, the Rainbow massif represents a pertinent complementary target for improving our understanding of interactions between seawater-derived fluids and the heterogeneous crust generated at slow-spreading ridges, and the tectonic processes associated with its emplacement.

Addressing the functioning of such systems requires direct observation and sampling of the sub-surface, with an access

to the third (vertical) dimension that can only be achieved by drilling.

To promote and develop a drilling proposal on the Rainbow massif, we organised a 3-day MagellanPlus workshop in Lyon, France, 10-12 June 2015, co-funded by ECORD and the Deep Carbon Observatory. The 26 participants from seven different countries (Italy, France, Germany, Norway, Switzerland, UK, and USA) brought their complementary expertise in geophysics, geology, geochemistry and biology, to establish an up-to-date synthesis of our knowledge on the Rainbow massif and more generally on ultramafic-hosted hydrothermal sites. Discussions identified key questions that remain to be addressed to fully

understand the drivers and geometry, as well as the geochemical and biological consequences of these hydrothermal systems. The Rainbow massif was recognised as an optimal target, given the large amount of work conducted in this area in recent years, which reflects the strong scientific interest of the community. It was recognised drilling is now a necessary step to move forward. Contributions from experienced scientists and specialists in drilling technologies allowed efficient discussions on possible drilling strategies that will be presented in a pre-proposal in 2016.

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:: Drilling the dual active faults system in Haiti. - 26-28 October 2015, Rueil Malmaison (France)

Convenors: N. Ellouz-Zimmermann and M. Pubellier

The Haiti-DRILL MagellanPlus workshop was held in Rueil-Malmaison (France) on 26-28 October 2015, and hosted by IFP-Energies Nouvelles. The workshop brought together 36 experts from various countries in the Caribbean region, the Americas and Europe. The programme, supported by the ECORD/ICDP MagellanPlus Workshop Series, was aimed at setting out a proposal dedicated to drill and document the left-lateral dual N. Caribbean transform boundary in Haiti. The objectives of IODP and ICDP's scientific issues, as well as regional constraints and needs in Haiti, were presented extensively in order to frame the discussions. The active setting of the faults presents a remarkable offshore-onshore continuity; therefore one of the objectives was to agree on the relevance of an Amphibious Drilling Proposal (ADP) with a proper definition of the objectives, site locations, site surveys and scientific interactions. Scientific and technical presentations were aimed at defining the regional/local geological and structural controls, and a synthesis of fluids sampling to refine the target locations.

Seismic studies are numerous offshore, but they are difficult to conduct on land due to high relief and the impossibilities of using dynamite in Haiti. Proposals were then made to use adequate techniques, such as a Weight Drop tool, to obtain better 3D images of the active fault across the selected sites and the Azuei Lake. The best technical ways to conduct seismic surveys in Haiti were discussed, and it was recommended that links were made with projects dedicated to surface fault trace characterization. One of the main objectives of the project is to compare regular surface observations (description, fluid sampling, seismicity indicators and measurements) and their variability at depth in a specific segment close to Port-Au-Prince. It was therefore strongly recommended that the monitoring attempts were defined, as well as the tools proposed for use in the well cross-cutting the EPG Fault.



The Haiti DRILL participants during the working session of the last day.

The combination of the ICDP and the IODP Haiti-DRILL projects was encouraged. Questions were raised concerning the way that the two panels could be matched, and agreement was reached about the location of the IODP and ICDP sites (with one alternate site in the ICDP project).

It was decided that the project would be complemented by submitting proposals, (1) including ROV and coring in addition to the programme already planned in December 2015 for offshore targets and (2) a combination of coordinated lake-to-land geological, coring and new seismic surveys, with those already underway.

A discussion took place about the best way to integrate scientific objectives onshore and offshore, together with the selection of the drilling platform and tools, followed by suggestions for a scheme to lead the team and the task force requirements.

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Scientific Ocean Drilling in Australasia

Neville Exon*

The Australian and New Zealand IODP Consortium (ANZIC) consists of seventeen universities and four science agencies, and is a small but scientifically important part of the IODP programme. ANZIC is in good financial shape, with Australia obtaining very adequate five year funding from the Australian Research Council and our partners late last year. New Zealand is also continuing its financial input at the existing level. ANZIC's Annual Report for 2015 has just been published on paper, and is available on the ANZIC web site <http://iodp.org.au/event/anzic-annual-report-2015>. We had scientists involved in all the expeditions drilled in 2015, including Expedition 357 Atlantis Massif Serpentinization and Life operated by ECORD. We look forward very much to the high-profile MSP Expedition 364 Chicxulub K-Pg Impact Crater starting in April this year, with Marco Coolen from Curtin University aboard as a microbiologist.

Despite our interest in all IODP expeditions, it is particularly noteworthy that five regional IODP expeditions are scheduled over the next three years, and four more may be scheduled before 2020. At this moment there will be four *JOIDES Resolution* expeditions and one mission-specific platform expedition (*map below*).

The *JOIDES Resolution* successfully carried out Expedition 356 Indonesian Throughflow Current off northwest Australia in late



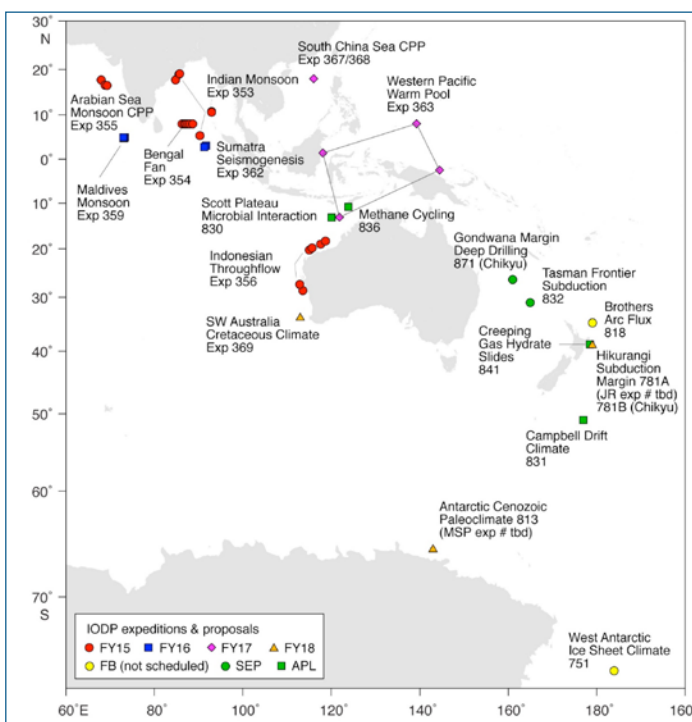
From left: Craig Fulthorpe (Expedition 356 Co-chief Scientist, USA), Stephen Gallagher (Expedition 356 Co-chief Scientist, University of Melbourne, Australia), Brad Clement (Director, IODP JRSO), Federal Assistant Minister of Science Karen Andrews, Federal Local Member Natasha Griggs, and Neville Exon (ANZIC Office, Australian National University, Australia). (Tim Fulton, IODP JRSO)

2015, before heading westward for an extensive Indian Ocean campaign. The two Australian port calls were an opportunity to share cutting edge science with pupils from local schools and scientists from universities and the petroleum industry. In Darwin, we had the pleasure of hosting the Assistant Minister for Science, the Honourable Karen Andrews (*above*), and she expressed great interest in the *JOIDES Resolution* and the IODP science programme.

Five Australians, including Co-chief Scientist Stephen Gallagher (*above*), took part in Expedition 356, which drilled six holes from 28°S to 18°S. It was designed to investigate the last 5 million years of Earth history, including changes in the flow of the huge ocean currents south and west from the Indonesian straits, as sea levels rose and fell, and associated changes in Australia's climate.

The next two *JOIDES Resolution* expeditions in our region will be Expedition 362 Sumatra Seismogenesis Zone and Expedition 363 Western Pacific Warm Pool. Expedition 369 off southwest Australia, dealing with Cretaceous climate and tectonics, is scheduled for late 2017. It will investigate a broad suite of questions including the rise and collapse of the Cretaceous hothouse and the nature of oceanic anoxic events. The *JOIDES Resolution* will go east after that, picking up many of the expeditions and proposals shown on the map.

We look forward very much to future ECORD expeditions and especially the drilling of the Antarctic Cenozoic Paleoclimate Proposal 813 in early 2018. The first new site survey for the *Chikyū* Gondwana Deep Margin Proposal 871-CPP, to drill the Cretaceous sequence on the Lord Howe Rise east of Australia, starts in March this year.



Completed, proposed and approved IODP Expeditions for our region as of January 2016 All these expeditions will or would use the JOIDES Resolution except for proposals 781B, 813 and 871. The map was kindly prepared by Katerina Petronotis of JRSO in February 2016.

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News from ECORD Member Countries

Portugal

On 3 November 2015, the current and former ECORD and ESSAC Delegates organised the **IODP Portugal Day** with support from FCT's Ocean Office and the national Ciência Viva Agency who hosted the event at Pavilhão do Conhecimento in Lisbon. This open event aimed to promote IODP and its various opportunities to scientists, teachers and students and was attended by about 150 people, including students from the Universities of Aveiro and Algarve, respectively, with University of Coimbra scientists joining online. The programme included talks by ECORD Distinguished Lecturers, Gabriele Uenzelmann-Neben and Jens Kallmeyer, a presentation by Fernando Barriga summarising the Portuguese participation in (I)ODP and a poster exhibit highlighting results by Portuguese scientists. The

videoconference to the *JOIDES Resolution* (Exp. 356) was joined by the Ciência Viva school class (*top left*), who as part of their programme on Marine Sciences, learned about laboratory methods in paleoceanography that morning. The day ended with a tribute to José Hipólito Monteiro (*top right*), with speeches by Judy McKenzie and Menchu Comas, and to Armando Trigo de Abreu, who both paved the way for Portugal to join ODP. Three core replicas were exhibited during the day and could also be seen at the



Two generations of IODP: left, the Ciência Viva school class joined the IODP Portugal Day attendees during the videoconference with Exp. 356 and the JOIDES Resolution (photo L. Gaspar); right, José Hipólito Monteiro was honored by IODP Portugal for his endless efforts to make Portugal an ODP member, which became a reality in 1997, and for his long standing commitment to the Portuguese (I)ODP community (photo A. Voelker).

Ciência Viva centre in Lousal until the end of November.

*Antje Voelker, ESSAC Delegate - antje.voelker@ipma.pt
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Israel

We are pleased to say that Dr. Or Bialik from the Dr. Strauss Department of Marine Geosciences at the University of Haifa has recently returned from the Maldives, having participated onboard the *JR* on Expedition 359 Maldives Monsoon and Sea Level (*right*). Or is the first Israeli scientist to participate in an IODP leg and has contributed to the scientific cruise with his expertise as a sedimentologist. We are looking forward to the publications from this cruise, as well as the participation of more Israeli scientists in the IODP through our membership of ECORD.

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From left to right, Or Bialik (University of Haifa), Christian Betzler (Co-chief Scientist, University of Hamburg) and Juan Carlos Laya (Texas A&M University) look Expedition 359 cores onboard the JOIDES Resolution (photo Tim Fulton, IODP/TAMU).

France

The French community was well represented in recent expeditions, including the four and three scientists who participated in **Expeditions 357 and 360** respectively, and two Education Officers during **Expeditions 359 and 360**.

IODP-France will hold its Scientific Days on 29-30 November 2016 at the CNRS headquarters in Paris (*right*). More details will be made available on <http://www.iodp-france.org/pro>. This event will report on the involvement of the French scientific community in IODP, with an overview of recent expeditions and future projects. It will also provide an opportunity for the scientific community to meet the representatives of ECORD and national funding agencies.



The **DREAM Proposal 857B** aims to drill a transect on the Balearic promontory (Western Mediterranean) with the *JOIDES Resolution*. The proposal is led by Johanna Lofi (Géosciences Montpellier) and involves 30 Europeans, including 9 French

researchers. The project will be submitted as a full-proposal in 2017 after site-survey data are acquired by the *R/V OGS Explora* (MEDSALT 2 cruise coordinated by A. Camerlenghi from OGS, Italy).

The **Haiti-DRILL MagellanPlus Workshop** was convened by Nadine Ellouz (IFPEN) on 26-28 October 2015 in Paris (*page 23*) to bring together Haitian, French and international teams working in Haiti. The purpose of the workshop was to discuss the collection of data on the active/inactive faults system through drilling offshore and onshore, and to document the past seismic activity revealed by sedimentary archives from Haitian lakes.

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The Netherlands

IODP-related research and outreach activities have been boosted by the successful implementation of the **Netherlands Earth System Centre (NESSC)**. The NESSC is a virtual research centre comprising experts from the NIOZ Royal Netherlands Institute for Sea Research, Radboud University Nijmegen, Utrecht University, VU University Amsterdam and Wageningen University. Funding is provided by a Gravitation Grant from the Dutch Ministry of Education, Culture and Science, which supports excellent research. It brings together scientists with a background in physics, earth sciences, ecology and mathematics to better understand the processes behind climate change and to improve future climate projections and predictions. The NESSC

has offered more than 40 PhD/Post-doc positions within its first phase and sponsors amongst others, the Urbino Summer School on Paleoclimatology, expeditions and educational programmes.

IODP-NL has also been very successful in having a number of **IODP expedition participants** in 2015/16: Willem Renema (Naturalis) on Exp. 356 Indonesian Throughflow; John Reijmer (VU) on Exp. 359 Maldives Monsoon and Sea Level; Oliver Plümpner (*above*) (UU) on Exp. 360 SW Indian Ridge Lower Crust/Moho; Jeroen J.L. van der Lubbe (VU) on Exp. 361 Southern African Climates and Jan Smit (VU) on the upcoming Expedition Chicxulub K-Pg Impact Crater.



(photo Bill Crawford, IODP JRSO).

The Dutch community also continues to represent ECORD in advisory committees, with Lucas Lourens as Chair of the **MagellanPlus Steering Committee**.

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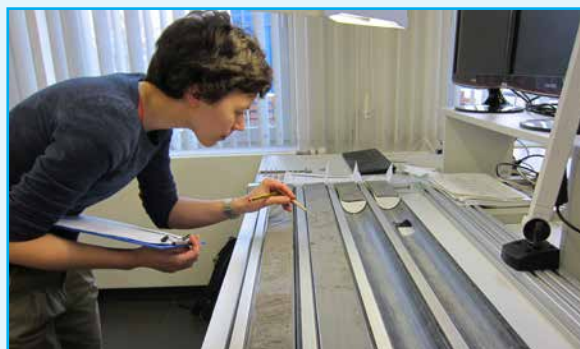
Finland

The new Finnish ESSAC Delegate is **Outi Hyttinen**. She currently works as a post-doctoral researcher at the University of Helsinki, Department of Geosciences and Geography. Her research topics are marine sedimentology and Quaternary paleoceanography. Outi participated in IODP Expedition 347 Baltic Sea Paleoenvironment both off- and onshore.



areas are marine sedimentation, trace fossils, early-diagenetic mineral microanalysis and paleoceanography.

Joonas Virtasalo will start as a new ESSAC Alternate delegate. Joonas is an active member in the Baltic Sea research community, and works as a senior scientist at the Geological Survey of Finland (GTK) Marine Geology Unit. His research focus



Outi Hyttinen during the Onshore Science Party of Expedition 347 Baltic Sea Paleoenvironment (© ECORD/IODP).

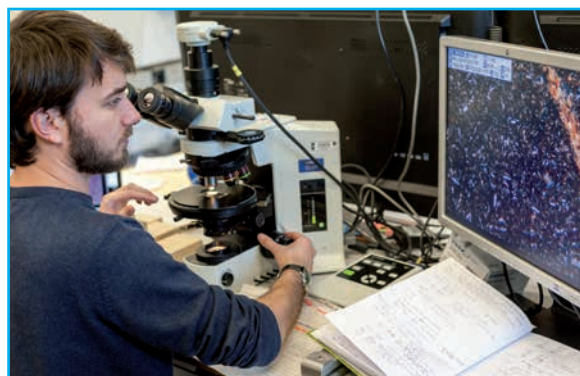
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Switzerland

The **Swiss community** continues to represent ECORD in several advisory committees: Andrea Moscariello (University of Geneva) is Chair of the ECORD Industry Liaison Panel; Stefano Bernasconi (ETH Zurich) is a member of the MagellanPlus Steering Committee; and Samuel Jaccard (University of Bern) has been selected as a new member of the Science Evaluation Panel. Gretchen Früh-Green (ETH Zurich) has recently finished her two-year term as ESSAC Chair and host of the ESSAC Office. Gretchen will act as ESSAC Vice-chair for the next year and will continue as ESSAC Delegate for Switzerland.

A highlight for the SwissDrilling community in 2015 was the implementation of **IODP Expedition 357 Atlantis Massif Serpentinization and Life**, with Gretchen Früh-Green as Co-chief Scientist and lead proponent on the proposal to use seafloor drills for the first time in the ocean drilling programmes. This MSP expedition (*pages 6-8*) also included Stéphane Rouméjon (*right*) as a metamorphic petrologist from the ETH Zurich as a participant in the Onshore Science Party, which was held in Bremen during January-February 2016.

SwissDrilling.ch had a successful booth at the Swiss Geoscience Meeting on 21 November 2015 in Basel. About 700 geoscientists from all over



Stéphane Rouméjon at the Onshore Science Party of Expedition 357 (photo Voelker Diekamp, MARUM).

Switzerland participated in the conference. Visitors to the booth were given a variety of informational materials and giveaways and could follow video clips from past drilling expeditions on a large screen. Young researchers (MSc and PhD students) in particular visited the booth to obtain information about how to become involved

in scientific drilling, and delegates from organisations and industry showed interest in the Swiss participation in the international scientific drilling programmes.

Gretchen Früh-Green, ESSAC Delegate and Vice-Chair and Mareike Trauerstein, SwissDrilling Coordination Office. <http://www.swissdrilling.ch>

Poland

Jakub Ciazela (Institute of Geology - Adam Mickiewicz University) recently sailed as an Inorganic Geochemist on Expedition 360 SW Indian Ridge Lower Crust and Moho, the Indian Ocean South of Mauritius (11 November 2015 to 30 January 2016). This was the first time a Polish scientist had sailed on the *JOIDES Resolution* and we were all excited. Expedition 360 was the first of two expeditions that would drill into the upper mantle at Atlantis Bank. Almost 800 m massive gabbro have been drilled during this leg. Core recovery ranges from 44% to 96% with poor to excellent drilling conditions. This deepest single-leg basement hole drilled into ocean crust is in overall good condition and will be

reoccupied by Leg 2. Sulfide-rich intervals have been found in the lower part of the hole and they will be the focus of Jakub's interest. In his post-cruise research, he will investigate the cycle of sulfur and chalcophile elements in the lower oceanic crust.

Jakub Ciazela was awarded an ECORD Scholarship to participate in the ECORD Summer School on ocean crust processes in Bremen (31 August - 11 September 2015). He also attended the Workshop "Scientific Drilling in the Indian Ocean Crust and Mantle" held on 13 -16 May 2015



From left to right, Henry Dick (Co-Chief Scientist, USA), Jakub Ciazela (Inorganic Geochemist, Poland), and Juergen Koepke (Metamorphic Petrologist, Germany) (photo Bill Crawford, IODP JRSO).

at the Woods Hole Oceanographic Institution, and his travel was supported by the MagellanPlus programme.

Szymon Uscinowicz, ESSAC Delegate - susc@pgi.gov.pl

Italy

Meetings and Conferences. IODP-Italy attended the first conference of the Italian Marine Geologists (CNR, Rome, 18-19 February 2016). Angelo Camerlenghi (OGS), Lead Proponent of the IODP multi-phase drilling project MDP 857, presented "Uncovering the Mediterranean Salt Giant"; Laura De Santis (OGS) presented the "Drilling Projects of the Antarctic Continental Margin", which include the scheduled seafloor-drill MSP expedition 813 and the IODP Full Proposals 732 and 751; Marco Sacchi and Annalisa Iadanza (IAMC-CNR) presented an update on ECORD and IODP activities. A Skype conference from the *JOIDES Resolution* with the universities of Parma and Milano, was held on 25 January 2016. Luca



Lanci (University of Urbino) has been invited to a MagellanPlus workshop (Ubatuba, 30 March-3 April 2016) dedicated to the nurturing of the Brazilian Equatorial Margin (BEM II) full proposals.

IODP Expeditions. The national office supported Karen Gariboldi (University of Milano) who participated as a micropaleontologist in the Sampling Party of Exp. 353;

Sergio Andò (University of Milano) who joined the Exp. 355 Editorial Meeting, and Luca Lanci (University of Urbino) who sailed on Exp. 359 as a paleomagnetist. In 2016, three Italian petrologists Alessio Sanfilippo and Riccardo Tribuzio (University of Pavia) participated in Expedition 360, while Chiara Boschi (IGG-CNR) took part in the Onshore Science Party of Expedition 357.

Italian IODP representatives.

Since September 2015, Elisabetta Erba (University of Milan) has been a member of the IODP Curatorial Advisory Board. In February 2016, Michele Rebesco (OGS) became a new member of the MagellanPlus Steering Committee.

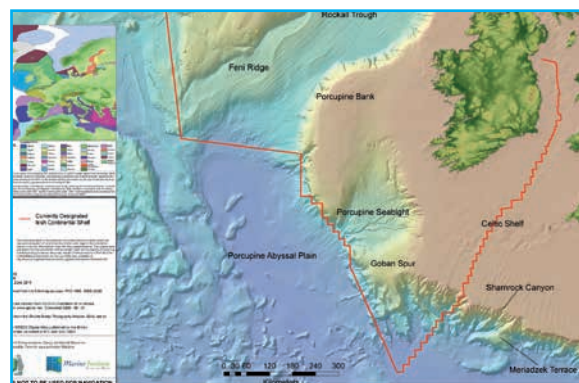
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Ireland

IODP was featured on Irish Newstalk Radio when reporter Sean Moncrieff interviewed Co-chief Scientist Sean Gulick about **Expedition 364 Chicxulub K-Pg Impact Crater**. The potential importance of supporting the link between the meteor impact and dinosaur extinction was discussed, as well as how IODP works and Sean acknowledged the research is supported through ECORD. As Koen Verbruggen (ECORD Ireland) listened to the show he sent a text,

which was read on air, stating that such research is also supported by the Geological Survey of Ireland, which the presenter said was surprising and great!

In 2013, the Irish Petroleum Affairs Division commenced the Regional Seismic Survey Project, which was completed in 2014. The survey was a major **2D regional seismic survey** undertaken by the Irish Government (DCENR) in conjunction with ENI Ireland BV over Ireland's Atlantic frontier basins. The survey acquired 16,800 km of



full-fold 2D regional seismic data and gravity and magnetic data. The new data will aid our understanding of the offshore Irish Atlantic geology, and will be of particular interest to Government, industry

and IODP researchers worldwide.

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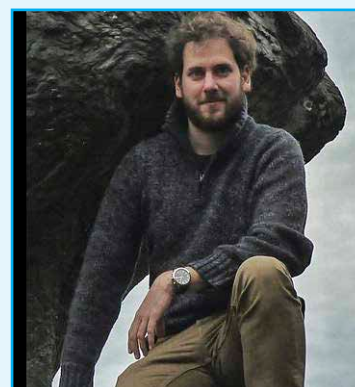
Norway

Last year, the Research Council of Norway (RCN), through its National Financing Initiative for Research Infrastructure (INFRASTRUCTUR), funded a large addition to the national stable isotope laboratory facilities located at the Department of Earth Science at the University of Bergen. The new laboratory is called FARLAB (facility for advanced isotopic research and monitoring of weather, climate, and biogeochemical cycling) allowing new and more advanced research using stable isotopes.

The facilities in FARLAB represent methodology not previously available in Norway and allows

stable isotope analyses in sea-water, rain, water-vapour, marine and freshwater carbonates, stalagmites, deep-sea vents, organic molecules and hydrothermal systems. Some of the new equipment is mobile and will be brought onboard research vessels or planes for direct measurements in the field.

The first new data to be collected for the FARLAB facilities will be conducted by **Dr. Nele Melders** PhD student Niklas Meinicke (*right*), who will sail on Expedition 363 Western Pacific Warm Pool. The timing of the expedition fits perfectly into Niklas' PhD project schedule, as by that time he will be fully up to speed with the clumped isotope method.



FARLAB collaborates with University of Oslo and UiT The Arctic University of Norway and welcomes collaboration with the international IODP participants.

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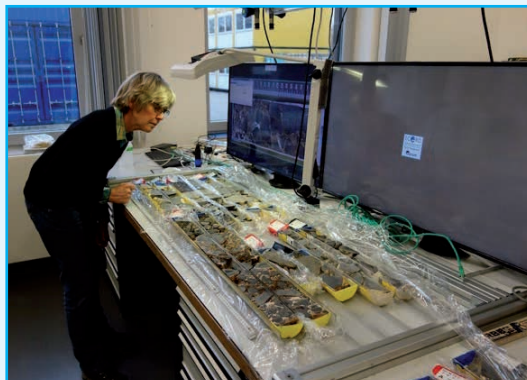
Canada

Education & Outreach.

Lucas Kavanagh sailed as an Education Officer on Expedition 360 SW Indian Ridge Lower Crust and Moho (30 November 2015 - 30 January 2016). Lucas produced 5 podcasts, and, along with the other educators, made a total of 129 webcasts. He also facilitated interviews with over 40 media outlets and conducted an "Ask Me Anything" on Reddit.

IODP Expeditions. Dominique Weis (University of British Columbia) returned from the successful Onshore Science Party at the Bremen Core Repository for Expedition 357 Atlantis Massif

Serpentinization and Life (20 January - 5 February 2016) (*right*). Gordon Osinski (Western University) has been selected to participate in the onshore phase of Expedition 364 Chicxulub K-Pg Impact Crater (starting 21 September 2016).



ECORD/IODP

Committees. David Mosher (Natural Resources Canada) completed his term on the Site Evaluation Subgroup of the Science Evaluation Panel. The IODP-Canada community would like to thank David for his service over the past three years. Dominique Weis,

who recently served as interim Vice-Chair of ESSAC, is now serving as Vice-Chair of the ECORD Facility Board.

Diane Hanano, CCOD Scientific Coordinator

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Sweden

Meetings and Conferences. As an ECORD Distinguished Lecturer, Dr Jens Kallmeyer (GFZ Postdam) presented his lecture "What controls abundance and activity of microbial life in subsurface sediments?" to an enthusiastic audience at the Department of Earth Sciences at Uppsala University on 18 February. Jens also took the opportunity to visit the Department of Geological Sciences at Stockholm University the next day.

IODP Expeditions. Looking ahead, we are delighted that Professor Jan Backman (Stockholm University) has been invited to sail on Exp. 362 Sumatra Seismogenic Zone (6 Aug-6 Oct 2016) as a nannofossil palaeontologist. Dr Abigail Barker plans to attend the 2nd Post-Cruise Meeting of Expedition 350 Izu-Bonin-Mariana Rear Arc in



The Swedish icebreaker Oden, seen from the icebreaker Vidar Viking during Exp. 302 Arctic Coring (ACEX) (photo H. Pålke © ECORD/IODP).

Marrakesh in early May. As reported in the previous newsletter, Sweden is planning a joint Arctic expedition

with the USA in 2018, which will use the icebreaker *Oden* (*left*) and potentially combine this expedition with the ECORD Arctic drilling expedition. The Swedish Research Council and Swedish Polar Research Secretariat have encouraged the Swedish science community to submit research applications that could take advantage of this opportunity.

Membership. The Swedish scientific representatives' mandate in ECORD and ICDP expires at the end of 2016. The Swedish Research Council will engage the community in selecting new representatives for international cooperation in scientific drilling.

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Magnus Friberg, Council Chair
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United Kingdom

The **2015 UK IODP Student workshop and National Conference** was held in Allendale and Newcastle respectively from 22 to 25 September. Both events were a great success and attracted many speakers and significant interest. Students presented their own research and developing expedition proposals.

Following the success of the event, it is planned to hold the student workshop again in 2016. A big thanks goes to Kate Littler and Bridget Wade for giving up their valuable time. Thanks also to the Newcastle team and presenters at both events. And a very big thank you to the students who made the three days so enjoyable.

UK IODP student representatives were identified to help promote the programme within universities.



Students enjoying a Skype call to Expedition 356 Indonesian Throughflow.

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Continued from page 13

to make the students dream about science and I could lead more than 50 videoconferences with the participation of scientists, Benoit Ildefonse, Lyderic France, and also Natsue Abe, Tomo Morishita, Gustavo Viegas, Alessio Sanfilippo, Biswajit Ghosh, Carlotta Ferrando. I was very satisfied to reach some universities in Japan, Europe and USA. A challenge for the next leg will be scheduling events with museums! Earlier selection of the education team will help to plan these events.

The technical challenge and the professionalism of each team on board was amazing but the human experience was maybe the strongest, as we spent two months together on a “tiny” boat. I met a wonderful community of smart scientists AND artists. During Christmas, we heard poetry and music from the Co-chiefs and from the different teams. The whole expedition participants built a team spirit the best way we could imagine and I had a real sense that there can't be good interactions, good

post-cruise cooperation, without these strong relationships that were shown day after day, as we approached the Atlantis Bank.

I quickly found a new point of view to give to the students:

- Who really are the geoscientists?
- What sort of students have they been?
- Why did they choose geoscience?

Now, back at work in my home town, I can verify that it is actually what the students, from 7 to 20 years old, want to know. And I am happy, as a teacher, to be able to share my own experience of the researchers' community. I very much believe that is the best way to create links between education and science.

Marion Burgio, Lycée Louis Barthou, Pau, France
<http://joidesresolution.org/blog/368>

Continued from page 21

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Canada



Israel



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