

ECORD School of Rock 2015 in Portugal



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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 17 countries: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Israel, The Netherlands, Norway, Poland, Portugal, Sweden, Switzerland and The United Kingdom.

IODP is supported by the US National Science Foundation (NSF); Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT); the European Consortium for Ocean Research Drilling (ECORD); the Australia-New Zealand IODP Consortium (ANZIC); India's Ministry of Earth Sciences; China's Ministry of Science and Technology; the Korea Institute of Geoscience and Mineral Resources (KIGAM); and Brazil's Ministry of Education (CAPES).

For more information, visit www.iodp.org.

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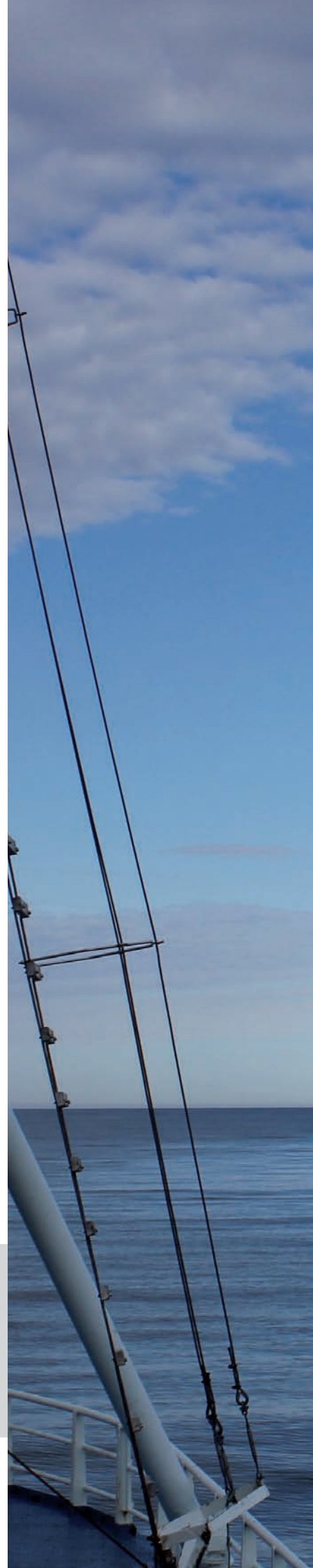
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Cover: ECORD School of Rock 2015 in Portugal, see page 9 (photo Ana Sousa). Right: photo by Katrine Husum (see page 28).





Gilbert Camoin

An Overview of ECORD



Michel Diamant

ECORD membership and mid-term renewal

In early 2016, ECORD will welcome back one of its former members, Spain, who became the 18th ECORD member country - http://www.ecord.org/pdf/ECORD-Headlines_7.pdf. ECORD hopes to further increase its membership soon as contacts with Russia and Turkey have been active in recent months. Russian and Turkish representatives attended the joint meeting of the ECORD Council and ESSAC in Naples, Italy on 28 to 29 October 2015. In addition, an ECORD delegation including three Distinguished Lecturers presented ECORD and science talks during an ECORD-IODP day organised on 15 October 2015 in the frame of the 2nd Coastal and Marine Geology Symposium, in Istanbul, Turkey.

Like other IODP partners, ECORD will soon start to elaborate its plans for mid-term renewal, which will take place in 2018 for most of our member countries (12 out of the current 17 members). These plans will include a review of the consortium, most likely occurring in 2017, and a mix of criteria for a successful renewal involving both significant science results measured against the Science Plan, and success of our financial model for platform operations. Special attention will be given to the ECORD member countries expecting a decision regarding further financial commitment earlier than 2018.

The conclusions of the report "Sea Change" Decadal Survey of Ocean Sciences report released early in 2015 - <http://www.nap.edu/catalog/21655/sea-change-2015-2025-decadal-survey-of-ocean-sciences> - will have major implications for the US *JOIDES Resolution* mid-term renewal plans. The NSF has accepted the recommendations of the report, which were centred on restoring a healthier balance between research and infrastructure funding within the Division of Ocean Sciences, including a 10% reduction in *JOIDES Resolution* (JR) infrastructure costs, the use of part of Complementary Project Proposal (CPP) expeditions income, and an increase in partner contributions to maintain current quotas of partner shipboard participants

for post-renewal JR operations. Formal renegotiation of the MoUs between JR partners, including ECORD, will be required in early 2018, with preliminary negotiations beginning even sooner.

Mission-specific platform (MSP) expeditions

Within the next few months, ECORD will operate two successive IODP expeditions with mission-specific platforms (MSPs). Expedition 357 Atlantis Massif Serpentinization and Life (*pages 6-7*), which will be implemented from October to December 2015, aims to better understand the role of serpentinization in driving hydrothermal systems, in sustaining microbial communities, and in the sequestration of carbon in ultramafic rock. Expedition 364 Chicxulub Impact Crater, planned for April-May 2016, 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 Paleocyanography - IODP Proposal #708 will be implemented in 2018. In addition to the probable scheduling of a low-cost expedition in 2017 this will complete the 2015-2018 operational plan for MSP expeditions that were defined by the ECORD Facility Board (EFB) (*page 5*). The planned MSP expeditions demonstrate ECORD's commitment to deliver an average of one MSP expedition a year for IODP

The scheduled MSP expeditions and the active MSP proposals in the IODP evaluation and operational structures (EFB, Science Evaluation Panel (SEP)) address diverse science topics (*e.g.* geomicrobiology, tectono-magmatic processes, effects of large impacts on Earth's environment, paleocyanography, climate and ice histories) and imply the use of rapidly evolving MSP technology with the use of a variety of innovative drilling systems (seafloor drill technology, jack-up rigs, geotechnical vessels) and the development of associated logging capability for those drills. The evolution

of the MSP concept has been conducted in a new funding environment including "in-kind contributions" (*e.g.* icebreakers, support vessels) that can be proposed by any IODP member or non-member country - <http://www.ecord.org/about/aboutecord.html> - and additional cash contributions to help reduce direct ECORD funding of the MSP operational costs. Expedition 357 Atlantis Massif Serpentinization and Life is the first IODP expedition to utilise seabed drills (the British Geological Survey's (BGS) Seafloor Rockdrill2 (RD2) and the University of Bremen MARUM's MeBo system), which will be deployed from the UK Natural Environment Research Council (NERC) research vessel *RRS James Cook* provided as an in-kind contribution.

ECORD partnership

Thirty-nine ECORD scientists, including four Co-chief Scientists, were invited to sail on IODP expeditions implemented by the *JOIDES Resolution* (Exp 354 Bengal Fan, Exp 356 Indonesian Throughflow, Exp 359 Maldives Monsoon and Exp 360 Indian Ridge Moho - <http://www.iodp.org/expeditions> in addition to the very high number of ECORD proponents involved in active proposals (537, including 40 Lead Proponents, out of 1,352 unique proponents), this reflects the outstanding intellectual contribution of the ECORD science community to IODP.

From 2016 through 2018, the *JOIDES Resolution* will follow a path from the SW Pacific Ocean, through the Southern Ocean, and into the Atlantic Ocean, Mediterranean, Caribbean, and Gulf of Mexico where the ship should operate for a few years from 2019 onwards. Ten months of JR operations per year are expected in 2018 and 2019.

At the last meeting held on 12 March 2015 in Stockholm, Sweden, the ECORD Council reiterated its strong support for the *Chikyu* programme but also expressed concerns about the delay in the implementation of *Chikyu* IODP expeditions. An engineering expedition, with a limited scientific party, is scheduled in 2016 (*table page 14*)

and the implementation of the riserless expedition Nankai Trough Temperature Limit in January-March 2017 is subject to the availability of funds that are not yet secured. ECORD has therefore decided to suspend its membership contribution of the *Chikyū* programme for at least two years (2015-2016), with the firm intention to continue its membership as soon as the situation changes.

ECORD-ICDP collaboration

The newly defined Amphibious Drilling Proposals (ADPs), which require both land and sea drilling to fully complete scientific objectives that cross the shoreline, shape the stronger and closer collaboration between ICDP and IODP, but especially

through ECORD given that most ADPs will likely involve MSP operations. The procedures for the joint evaluation of ADPs have been approved by the IODP Science Evaluation Panel, all three IODP Facility Boards, and the ICDP Executive Committee and Assembly of Governors. The final step will be to define and formalise ADP's implementation policies by a working group including two representatives from each programme (D. McInroy and G. Camoin for ECORD/IODP, and Uli Harms and C. Koeberl for ICDP).

To initiate the writing and submission of such proposals, a specific annual budget has been assigned to ADPs by ECORD and

ICDP for the organisation of workshops in the frame of the MagellanPlus Workshop Series Programme.

Finally as they approach the end of their term in office, we would like to warmly thank, on behalf of ECORD, some key ECORD scientists for their dedication and great work over the past years: Gretchen Früh-Green as Chair of ESSAC, Dick Kroon as Co-Chair of SEP, and Karsten Gohl as Chair of the ECORD Facility Board.

Gilbert Camoin, Director of the ECORD Managing Agency - camoin@cerege.fr - and Michel Diament, Chair of the ECORD Council - diament@ipgp.fr

A tribute to Yves Lancelot

Yves Lancelot passed away at the age of 77 on 7 September 2015. We lose a dedicated supporter of ocean drilling for more than 40 years, a famous paleoceanographer, an enthusiastic sailor and a friend.

Yves started his scientific career at Lamont in the early 1970s where his first exciting seafloor coring experiences took place on the legendary *R/V Vema* with "Doc" Ewing. This clearly guided his future orientation, as he often remembered the systematic coring imposed by Doc every day onboard the *Vema*. He then started to exercise his incredible leadership during these pioneering days of ocean drilling as Scientific Director of DSDP at Scripps.

When he moved back to France in the 1980s, Yves actively promoted ocean drilling in the French community. As Chair of ODP France he encouraged many young scientists to be involved in the ocean drilling programme. The seismic data he collected convinced him that the "Old Pacific crust" was within the reach of the *JOIDES Resolution*. Indeed, ODP Leg 129, with Yves and Roger Larson as Co-chief Scientists, drilled through the Pacific Jurassic oceanic crust, a landmark in scientific ocean drilling history. In parallel, he also understood the power of long piston cores to address recent climate fluctuations, and was instrumental

in supporting the use of the *R/V Marion Dufresne* by the IMAGES community.



Yves was also visionary regarding the role that Europe should play in scientific ocean drilling by bringing access to new platforms. In the early nineties, he introduced the concept of a light drillship, the *NEREIS* operated by Europe, which could be used for shallow drilling and on-station experiments, and therefore complemented the *JOIDES Resolution's* capabilities. This was the first vision of a multiple platform programme with Europe as a single partner and operator, and a first step towards the creation of ECORD at the turn of the century. However, it was probably too early and minds were not prepared yet for this step forward.

Yves also played an important role in the French community, as advisor for oceanography for CNRS. As Director of the Laboratoire de Géologie du Quaternaire in Marseille, he actively contributed to the creation of the CEREGE in Aix-en-Provence in 1995. He finally joined the "Centre Océanologique de Marseille" and led more than twenty scientific expeditions on French and US vessels and authored a stunning number of scientific publications. He supervised many PhD students, some of whom are now recognised scientists.

Yves loved the oceans and was interested in the "big picture". He had incredible energy and enthusiasm for communication. All of us who were fortunate enough to work with him were carried away by his charm and charisma. Yves retired some years ago after which he dedicated his time to writing books and conveying his passion to the general public. His last published work, "*The sea explained to our grand children*", testifies his constant will to transmit his knowledge and excitement to new generations. But 10 years ago he was also able to accomplish his dream, a solo crossing of the Atlantic with his sailboat.

Our warm thoughts go to his sons, grandchildren and particularly to his wife, Edith Vincent, with whom he shared his passion for the ocean and our planet as a whole.

Catherine Mével, Gilbert Camoin and Philippe Pézard



Karsten Gobl

News from the ECORD Facility Board

After scheduling proposals #758 Atlantis Massif for 2015, #548 Chicxulub Impact Crater for 2016 and #813 East Antarctic Paleoclimate for 2018 at the ECORD Facility Board (EFB) meetings in 2013 and 2014, this year's EFB meeting held on 25-26 March in Aix-en-Provence, France, was dominated by discussions on scheduling an Arctic expedition in 2018. The proposal #708 Arctic Paleoceanography (ACEX-2) had been discussed in 2014, but the proponents were asked to submit an Addendum with the presentation and discussion of more site-survey data, which they collected in the Arctic in summer 2014. The EFB decided that the proposal to drill 1 to 2 sites on the southern Lomonosov Ridge can be scheduled for Arctic summer 2018, provided that the expedition's costs are limited to 15 million USD. This requires full in-kind contributions for icebreaker support. Shortly after the EFB meeting a workshop was organised by ESO during which the proponents and operators discussed various options for drilling and logistics.

With this latest decision, the EFB has so far scheduled a total of four MSP expeditions until 2018. 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 (*map, right*), and more proposals are expected to be forwarded from the SEP before the next EFB meeting.

The EFB further developed its long-term scheduling strategy (*table below*), taking into account the large range of expedition costs, which largely depend on the type of drilling platform required, and for budget limits on average annual expedition costs. By projecting budget constraints until the end of the current IODP phase in 2023, the EFB expects that one more high-cost expedition, one medium-cost expedition and about 3-4 low-cost expeditions can be scheduled at future meetings. Provisional reservations have been made for the seabed drilling systems MeBo70/200 and RockDrill2 to accommodate any proposal demands. The operation of these systems, as well as long-piston coring, can be conducted in the low-cost category provided that research vessels are contributed in-kind.

At the beginning of 2016, the EFB Science Board will increase its

membership from 5 to 6 members with 3 members from ECORD countries (including the Chair), 1 member from IODP-JR (USA), 1 member from IODP-JR (associated countries) and 1 member from IODP-Chikyu (Japan). Antonio Cattaneo (France) and Marta Torres (USA) will rotate off, and I sincerely thank both of them for their work and engagement in this fantastic team of Science Board members. Gilles Lericolais (France), Stephen Gallagher (Australia) and Fumio Inagaki (Japan) will become new members. Gilles Lericolais will become the new EFB Chair, supported by Dominique Weis as Vice-Chair. The next EFB meeting will be held on 15-16 June 2016 in Brussels, Belgium.

*Karsten Gobl, Chair of the ECORD Facility Board - karsten.gobl@awi.de
<http://www.ecord.org/ecord-fb.html>*



○ MSP proposals in the EFB holding bin
● Scheduled MSP proposals

2015	2016	2017	2018	2019	2020	2021	2022	2023
# 758 Atlantis M. MeBo & RD2 LC	# 548 Chicxulub jack up MC	none (LC?)	# 813 Antarctic RD2 LC-MC # 708 Arctic drillship HC	LC	LC	MC	LC	HC

LC = low-cost (<8MUSD), MC = mid-cost (8-15MUSD), HC = high-cost (>15MUSD) - MeBo and RockDrill2 (RD2) are seabed drilling systems.



David McInroy



Sarah Davies

ECORD Science Operator News



Ursula Röhl



Dave Smith

IODP Expedition 357 Atlantis Massif Serpentinization and Life

Co-chief Scientists: Gretchen Früh-Green (ETH Zurich, Switzerland) and Beth Orcutt (Bigelow Laboratory for Ocean Sciences, USA)

Throughout summer 2015, the ESO team have been working on the final plans for Expedition 357 Atlantis Massif Serpentinization and Life. As reported in Newsletter #23, this is the first IODP Expedition to use seafloor drills instead of traditional vessel-mounted rigs, and an engineering development programme (Newsletter #24) has been underway to develop new scientific capabilities for seafloor drills.

As part of the development programme, an 11-day wet-test of the Rockdrill2 (RD2) system was co-funded by ECORD, industry and the British Geological Survey (BGS), and conducted offshore Oban, Scotland in August (*below left*). Due to delays in the delivery of some new components, the wet-test was



Launch of the RD2 seafloor drill, offshore Oban, Scotland, during the recent trials.

limited to the coring systems, the new dual induction resistivity tool and the existing optical-acoustic-gamma tool. All other developments have since been tested as far as possible onshore at the workshops of BGS Marine Operations (RD2) and the Center for Marine Environmental Sciences (MARUM), University of Bremen (MeBo). The RD2 was tested in challenging hard-rock lithologies, and recovered short sections of hard dolomite from the Islay and Ballachulish Limestones, in addition to a high quality Quaternary sediment core taken at 40 mbsf. A number of engineering issues affected the coring results and prevented the logging tools from being run, with many issues identified and addressed during the test. The engineering results will serve to inform the drilling on the Atlantis Massif for Expedition 357, and many improvements have been made to the RD2 in terms of

bit selection, the drive motor and handling practices. The logging tools have been tested as part of the onshore testing programme. The final stages of planning took place in the weeks leading up to the departure of expedition from Southampton, UK, on 26 October, which involved finalising the offshore microbiology sampling plan.

The mobilisation of the RD2 and MeBo seafloor drills on the expedition platform, the *RRS James Cook*, started on 16 October (*below right*). The *RRS James Cook* is being provided by the UK's Natural Environment Research Council as an in-kind contribution, with extra UK Science Party places awarded on that basis.

On 22 October, a media briefing was held at the London Foreign Press Association which was followed by media visits to the *RRS James Cook* on the 23rd (*page 7*). Media interest has been good, with a science story already published by BBC News in the UK.



RRS James Cook bearing an IODP banner during mobilisation at Southampton, UK.

The schedule for Expedition 357 is as follows:

- 26 October: expedition sets sail for coring sites, approximately 8-day transit.
- 3 November: arrive at coring sites, begin 30 days of scientific drilling and logging.
- 3 December: start ~8-day transit back to Southampton, UK.
- 11 December: arrive back at Southampton to start demobilisation.

The expedition's Onshore Science Party, where the cores will be split and the entire Science Party will convene to conduct the remaining initial scientific analyses, will start on 20 January 2016 at MARUM, University of Bremen, and last for a maximum of 3 weeks.



Expedition Project Manager, Carol Cotterill led a tour of the vessel during the media briefing in Southampton (photo A. Gerdes © ECORD/IODP).

Daily and weekly reports of Expedition 357 are posted online at: <http://www.eso.ecord.org/expeditions/357/357.php>

IODP Expedition 364 Chicxulub Impact Crater

ESO is currently in the final stages of contract negotiation with a preferred drilling contractor for the drilling services and platform for Expedition 364 Chicxulub Impact Crater. The agreed coring plan should allow the desired TD of 1,500 mbsf to be reached within budget. The Call for Scientists was conducted over the summer, and the Science Party have been selected - <http://www.eso.ecord.org/expeditions/364/364.php>.

A Science Workshop was organised by the Co-chiefs and Mexican colleagues in Merida, Mexico, on 30 and 31 March 2015, and was attended by ESO staff. The primary aim of the workshop was

to conduct synergistic planning for the expedition, 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. An application for permission to conduct scientific research by foreigners in Mexican territory has been submitted to the British Embassy Mexico City to be passed to the Mexican Ministry of Foreign Affairs, and an accompanying Environmental Impact Assessment has been produced for the Mexican Under Secretary of Management of the Environment.

Future MSP expeditions

Work continues on the planning for two polar MSP expeditions in 2018: IODP Proposal #813 Antarctic Cenozoic Paleoenvironment, recommended to be scheduled in early 2018, and IODP Proposal #708 Central Arctic Paleoceanography (ACEX2), recommended to be scheduled in late 2018 ([page 5](#)). These two expeditions will create a busy 'polar year' for ESO in 2018, and planning is underway with both proponent groups. The Co-chief Scientists for the expedition based on IODP Proposal #813 Antarctic Cenozoic Paleoenvironment are Dr Trevor Williams from Texas A&M University, USA, and Dr Carlota Escutia, from the University of Granada, Spain. Planning news for these two polar MSP expeditions will feature in future ECORD Newsletters.

David McInroy, ESO Science Manager, Sarah Davies, EPC Manager, Ursula Röhl, ESO Curation and Laboratory Manager and Dave Smith, ESO Operations Manager

Contact ESO: <http://www.ecord.org/contact.html#eso>
<http://www.eso.ecord.org>

Expedition 357: an MSP of Firsts

Did you know?

- Expedition 357 is the first MSP Expedition of the new IODP.
- Expedition 357 is the first IODP Expedition to have a majority female Science Party.
- Expedition 357 is the first IODP Expedition to use seafloor-drill technology.
- Expedition 357 is the first IODP Expedition to use a platform In-Kind Contribution from a member country: the *RRS James Cook*.



(photo Carol Cotterill © ECORD/IODP)



Albert Gerdes



Alan Stevenson

ECORD Outreach & Education News and Activities



Patricia Maruéjol



Julia Gutiérrez Pastor

Since April 2015, the ECORD Outreach & Education Task Force (ECORD OETF) have organised outreach activities at EGU 2015 in collaboration with ICDP, produced and distributed ECORD/IODP resources, and distributed information to the MagellanPlus Workshops. The team met in Potsdam, Germany, on 6-7 October - the meeting was hosted by Thomas Wiersberg at ICDP-GFZ - to coordinate programme's outreach and education activities for the rest of 2015 and early 2016. To enhance further collaboration, IODP and ICDP outreach colleagues are invited to take part in each Fall meeting of the ECORD OETF. This year we welcomed Carl Brenner, Director of the US Science Support Program (USSSP) and Sharon Katz-Cooper, USSSP Education and Outreach Manager (*page 25*), Tamano Omata, CDEX/JAMSTEC Outreach Manager and Nobu Eguchi, CDEX Manager for Science Operations, and Melanie Leng from the ICDP Executive Committee.

- **EGU 2015** - <http://www.ecord.org/pil/booths.html> - 12-17 April 2015, Vienna (Austria). Joint ECORD/IODP-ICDP exhibition booth and townhall meeting. Core-scanner demonstrations, a 3D-video by ICDP and the J-FAST core replica displayed for the first time in Europe attracted a lot of visitors to the booth.
 - Information material was provided to MagellanPlus Workshops (*pages 23 and 24*).
 - ECORD/IODP material (*e.g.* core replicas) and support was provided to national events organised for various audiences, scientists, teachers and the general public. Many science festivals and weeks organised during this Fall have especially highlighted IODP science to the public, such as
 - Natural hazards (K-Pg and J-FAST) at the Bradford Science Festival, UK, and European Researchers' Night in Metz, France
 - Geodynamics (Superfast Oceanic Crust) at the Science Week in Paris, France
 - Past climate events (PETM and Tahiti) at the "Train du Climat" in Nancy (France), and science festival in Granada (Spain).
- Core replicas have also been used during the 12th USSP in Urbino and to support teaching at University College, London.
- Media activities were organised on 22 and 23 October prior to the start of Expedition 357 Atlantis Massif Serpentinization and Life to communicate the goals of the expedition to the public - <http://www.ecord.org/p/msp.html> and *page 6*.

Upcoming events and activities

The ECORD OETF will continue to promote both the IODP and ICDP programmes under the umbrella of "Scientific Drilling" at science conferences and support national IODP educational initiatives. "A need for a new IODP umbrella" was presented by ECORD members of the TF at the IODP Forum meeting in July in Canberra, Australia. Discussions will continue

throughout the rest of the year with our partners to provide suitable materials and new initiatives. ECORD and ICDP will organise a joint exhibition booth (#313) at AGU 2015 from 14 to 18 December and will take part in the Town Hall meeting with IODP and ICDP on Tuesday 15 December. 2016 will be a busy year with joint events organised at two science conferences, EGU 2016 (17-22 April) in Vienna Austria, and IGC 2016 (27 August to 4 September) in Cape Town, South Africa (*pages 16 & 21*).

Education

Diane Hanano (IODP-Canada Science Coordinator), who sailed as Education Officer onboard the *JOIDES Resolution*, reports in this issue (*page 10*) about her participation in Expedition 354 Bengal Fan. A successful ECORD School of Rock (SOR) was organised in Loulé, Portugal by Helder Pereira last July (*page 9*). Plans are underway to support the 3rd ECORD SOR organised in the UK or in Germany in 2016.

ECORD Outreach team: Albert Gerdes and Alan Stevenson, ESO, Julia Gutiérrez-Pastor, ESSAC and Patricia Maruéjol, EMA - <http://www.ecord.org/pil/contacts.html>

The **Superfast Ocean Crust core replica** was displayed during the Fête de la Science in Paris in October 2015, as part of an exhibition organised by the trainees of

in Paris, where they had prepared three interactive exhibits on geodynamics, hydrothermalism and ocean drilling. Having learnt about the different ways



scientists study the seafloor and the ocean crust below it, including the use of satellites, submarines and drilling, the pupils investigated the core replica and discovered rocks from the ocean crust both in hand samples and under the microscope.

the Marie Skłodowska-Curie Initial Training Network ABYSS (abyss-itn.eu). Pupils from three different schools visited the Institut de Physique du Globe (IPGP)

Kristina Dunkel (ABYSS - FP7/2007-2013/ under REA Grant Agreement n°608001.)

ECORD School of Rock 2015

"Investigar e estudar a Terra sob o fundo do mar"

Teaching educators about scientific ocean drilling

Giving continuity to the success of the first ECORD School of Rock (SOR), held in France in 2014, this year's event took place in Portugal from 8 to 10 July. The workshop was held at the recently refurbished Loulé Secondary School (ESL) and was attended by 35 teachers from all over the country (*below*). Its main goal was to educate participants about the International Ocean Discovery Program (IODP), scientific ocean drilling and Earth Science through the interaction with expedition scientists and former "Teachers at Sea". To achieve that objective, the three-day long workshop included presentations, given by scientists, and practical hands-on sessions, developed and tested by scientists and educators who sailed onboard the *JOIDES Resolution*. The detailed workshop programme is available at <http://ecord-sor2015.blogspot.pt/?view=snapshot>.

During the first two days the workshop participants learned about the scientific ocean drilling history and the achievements of expeditions that had Portuguese researchers as members of science parties. The afternoon sessions comprised practical inquiry-based learning activities using IODP data and samples in the lab/classroom (*cover*). At the end of the second day there was still time to make a video conference connection with a group of teachers that were also learning about IODP, in a SOR-like workshop at the Gulf Coast Repository at Texas A&M University.

The activities of the third day of the ECORD SOR 2015 included presentations by "Teachers at Sea" from France, Germany, Japan, UK (*top right*) and the US, during which they shared not only their experiences onboard the *JOIDES Resolution*, but also educational resources (such as websites, eBooks, lesson plans and posters) available to engage their students and fellow teachers with IODP science. One of the highlights of the day was a virtual visit to the IODP Bremen Core Repository (MARUM,

University of Bremen, Germany), through a video conference connection, that allowed us to see some core sections that represent exciting events in Earth history.



From left to right, Helder Pereira, Susan Gebbels (UK), Markus Fingerle (Germany), Jean-Luc Bérenguer (France) and Norihito Kawamura (Japan).

The ECORD SOR 2015 participants went back home with a vast amount of information and a new appreciation for how world-class, cutting edge science is conducted. In the future they can use what they learned to enhance the teaching of science in their schools, to share ideas with other teachers, and encourage their students to explore a wide variety of opportunities in the world of scientific exploration.

Hélder Pereira, Education Officer/Teacher at Sea during IODP Exp 339, Biology and Geology teacher at Loulé Secondary School, Portugal - hpereira@es-loule.edu.pt



Ocean Outreach

Educational highlights from Expedition 354 Bengal Fan

What is our most important role as scientists? Some would say it is to make discoveries that increase our understanding of the world, while others might say it is to inform policy and bring about positive change. Personally, I think that one of our most meaningful responsibilities is to teach and inspire the next generation of scientists.

With that in mind, I boarded the *JOIDES Resolution* in Singapore at the end of January 2015. I had the amazing opportunity to sail as an Education Officer for IODP Expedition 354 Bengal Fan. As the Scientific Coordinator for IODP-Canada, I've been in charge of communications and outreach for the Canadian scientific drilling community since 2010, and now here was my chance to reach audiences around the globe.

We set off through the Straight of Malacca to the Bay of Bengal in the Indian Ocean, where we remained for the full two months. Our main objective was to drill a transect of sites across the middle of a massive accumulation of sediments called the Bengal submarine fan. The age and composition of these sediments can provide powerful clues about the collision of India with Asia, the resulting uplift and erosion of the Himalayas, and the development of the Asian monsoon.

While the scientists were busy in their labs, the Education Team (made up of myself and US videographer Lisa Strong, *above*) had the challenging task of conveying the incredible science and technology to students, researchers and the general public through social media, blogs, videos, and live ship-to-shore broadcasts. Using these various platforms, we taught people about ocean drilling, plate tectonics, sedimentation, carbon burial and the connections between mountain formation and climate.

Our daily posts on Facebook, Twitter and Instagram as well as our blogs, particularly the guest blogs for AGU's GeoSpace, the Canadian Federation of Earth Sciences and Munsell Color, had a huge impact and fulfilled one of my goals to reach new audiences and increase exposure to IODP. Lisa produced

engaging videos including "Source to Sink", "Turbidite Transport", "A Day in the Life of a *JR* Scientist" and even two music videos. We also collaborated on a video series project answering frequently asked questions.

The live broadcasts were the highlight of my day. Over the course of an hour, we took students on a tour of the ship, including the "catwalk" (*below*) and core labs, followed by question and answer with a scientist. In total, we held 60 broadcasts with over 3,200 students at schools, science fairs and museums in 17 different countries (almost half in Europe and Canada). Most of the broadcasts were for students in grades 9-12 (~50%) and college/university (25%), which fulfilled

another of my goals to reach students at more advanced levels.

One of my favourite groups were the nine-year-olds from France who joined us for three broadcasts, each time prepared with new, thoughtful questions. We held four broadcasts with schools in Nepal, which was a significant technical achievement and a unique chance to connect with students in the Himalayas - the source of the sediments we

were studying. Our broadcast with the "Unterirdisch" Geo-Show, part of the annual IODP/ICDP science meeting in Germany, was attended by over 500 students and hailed as the "special highlight" by a local newspaper.

I've been home for six months now, and this once-in-a-lifetime adventure is starting to feel like a dream. Did I actually witness those spectacular sunrises and that giant manta ray? Did we really recover over 1,700 metres of core from below the seafloor? Not a day went by when there wasn't something interesting to learn. I got to interact with a group of kind, funny, intelligent people who quickly became my friends. But I think the best part is knowing that I made a difference and helped launch a new crop of sedimentologists, chemists, paleontologists and engineers.

Diane Hanano, Education Officer during Expedition 354 and CCOD Scientific Coordinator
coordinator@mail.iodpcanada.ca



(Photo Tim Fulton, IODP JRSO)

Reports of ECORD Summer Schools 2015

12th Urbino Summer School in Paleoclimatology 14-31 July 2015, Urbino, Italy

This year's Urbino Summer School in Paleoclimatology (USSP) gathered the leading experts in paleoclimatology and paleoceanography for the 12th time. The town of Urbino (*page 12*), a UNESCO World Heritage Site situated in the beautiful Marche region (Italy), is a perfect place for learning during the day and developing new ideas and partying in the night! Surrounded by beautiful buildings, interesting narrow streets, nice pubs and great people, I had an unforgettable time at USSP.

I heard about the USSP from a friend that works with me, who is a former USSP student. Since I work on terrestrial sediments, he said it can be a great opportunity for me to gain a better insight into the other parts of paleoclimatology, so I applied to go. Thanks to an ECORD scholarship I was able to do so.

From the first day I was delighted with the opportunity to attend the lectures from the leading experts in many fields of paleoclimatology, I used the opportunity to talk to them and to meet over 60 students that share my passion for past climate changes. The summer school lasted for 18 days and we intensively studied of a broad range of topics. First we were introduced to multiple climate and geochemical

proxies, orbital forcing, the basics of climate modeling, then we were guided through key studies of specific climate periods and transitions, and finally discussed future climate changes. We also participated in a one-day field trip where we saw the PETM and K-Pg boundary in Gubbio (*below*) in the morning. In the afternoon we were separated into several groups and collected data to be analysed during the next day. We also had an opportunity to present our posters, and besides presenting our work we were able to learn about research topics from other USSP students.

The special day at the USSP was the Cioppino conference. We were introduced to the ongoing research from some of our lecturers, presented in half-hour talks. After these brilliant talks, we had a memorable evening with fantastic Italian food, great wine and a lot of chatter.

Before the USSP I was not sure what to expect from this summer school. I thought that I possessed good knowledge, and since the summer school lasts for more than two weeks I was afraid I would be disappointed. However, from the first day I realised that this would be an eye-opening two and a half weeks. Amazing lecturers, who I knew only from their names on research papers, were in

front of us giving their comprehensive, exciting and mostly mind-blowing lectures. All of them were keen to answer all of our questions. Throughout the 18 days we gained an overall understanding of climate changes from the past, interpretation of the data and many new ideas. We had an opportunity to understand the connection between all fields of paleoclimatology and to realise where our place is in this. A priceless experience was not only meeting the scientists, but also spending time with many students from different parts of the world. We exchanged many experiences, and besides meeting our future colleagues, we gained friendships that I am sure will last for many years. With a lot of information, new ideas, great friendships and also a lack of sleep, we were happy to be a part of the USSP family, with only the bad feeling that we will never be together again in Urbino, although we are hoping that some of us will have one more drink in the Bosom bar in the future! My time at the USSP was one of the best times of my life from both a scientific and personal side. Although I am not sure how much it changed me, I am sure it was one of the important milestones in my career.

*ECORD Scholarship Awardee 2015:
Igor Obreht, RWTH Aachen University,
Germany*



12th Urbino Summer School in Paleoclimatology (*continued*)

From 15 July to 1 August, 71 students from all over the world came together in the small town of Urbino, Italy to attend the 12th Urbino Summer School in Paleoclimatology (USSP). After several long hours spent travelling, at times asking ourselves why anyone would choose such a small, relatively remote town for a summer school, we finally arrived and the reason instantly became clear. Urbino, a World Heritage Site set in the spectacular hills of the Marche region (*below*), has retained most of its beautiful old town with the university and accommodation situated right in the centre!

The scientific backgrounds of the students were as diverse as their nationalities, but all of us had at least one thing in common; an eager interest in how the Earth's system and climate has evolved through the past. It was great to engage with a wider scientific community of young researchers all interested in the same area. The USSP illustrated the breadth of paleoclimatology, not only the students, but also the faculty, an amazing group of scientists researching at the forefront of our field, which was as varied as it possibly could be.

After an icebreaker party on the first evening, lectures began the next day. The first week was spent learning about basic

paleoclimatological approaches, including biostratigraphy, the construction of age models, climate modelling and sessions on biotic and geochemical proxies. After a one-day field trip to the PETM and the K-Pg boundary, sessions became more analytical with orbital analyses of data collected in the field, providing some hands-on experience with "astrochron"



and climate modelling in general. Towards the end of the summer school we travelled through Cainozoic time learning about the newest insights into key geological intervals, from the PETM to the Holocene. It was not only the lectures that proved invaluable, but also the interaction with both faculty and other students during poster sessions and breaks. This opportunity was more than helpful, enabling us to discuss our research, exchange ideas, seek opinions on our research questions and data interpretation and foster future collaboration possibilities. Even though it

could be a little intimidating to approach some of the world-leading scientists in our field, they encouraged discussion and were always happy to help.

We were fortunate enough to attend the USSP with the help of an ECORD scholarship and would recommend attending the summer school to

anyone interested in paleoclimatology. It is a fantastic opportunity to advance your knowledge of fundamental paleoclimatological principles and increase your understanding of how proxy data interpretation and climate modelling interact. Best of all, it is a chance to meet like-minded people at the same stage of their research careers. The last day in Urbino felt

a bit like the last day of summer camp when you have to say goodbye to all your new friends and go back to reality, but everyone went home bursting with new ideas and enthusiasm about their research! We are very grateful to all those who made the USSP such a fulfilling and unforgettable experience. This year's USSP shirts are green and pink, so watch out for us at the next Conference! ☺

*ECORD Scholarship Awardees 2015:
Henrieka Detlef and Amy Sparkes,
Cardiff University, UK*

<http://www.urbinossip.it>

Ocean crust processes: magma, faults, fluxes, and life

31 August - 11 September 2015, Bremen, Germany

On the afternoon of Sunday 30 August, thirty-three young PhD students from eleven different countries in Europe and America arrived in Bremen. We came together to learn about the numerous processes occurring in the ocean crust and about the ways they can be investigated in the ECORD Summer School 2015, which took place at the MARUM - Center for Marine Environmental Sciences and the IODP Bremen Core Repository at the University of Bremen in Germany. The school combined lectures with practical and laboratory exercises on state-of-the-art IODP-style shipboard methodologies. By the "virtual ship experience" at MARUM, we gained insights into how the samples and measurements we encounter in publications or use for our own research are actually acquired. Moreover, we had the opportunity of presenting our own research projects to exchange our most recent findings and ideas regarding oceanic crust processes.

The lectures addressed "ocean crust processes", the general topic of the summer school, from various disciplines. Topics ranged from the upper mantle to the seafloor, from geochemistry and petrology to seismic and paleomagnetism, and from the formation to the alteration of the ocean crust. We learned that "heat is key" when it comes to estimating hydrothermal fluid fluxes, that oceanic core complexes are not necessarily magma-starved, that deep hydrothermal circulation can result in "hydrous" magmatism, that the appropriate model for crustal accretion at fast-spreading ridges is probably somewhere between the classical "gabbro glacier" and "sheeted sills" end members, that paleomagnetism is not only for sedimentologists, and much, much more. Additionally, we got to know about IODP itself; its world of



photo Voelker Diekamp/MARUM

acronyms, its organisational structure, application processes, current plans and future projects that gave us a much clearer idea of how we may get involved in future IODP expeditions.

We visited the reefer and labs of the Bremen Core Repository, and several of the fascinating "favorite toys" of the MARUM group, such as the seabed drill rigs MeBo, MeBo2, ROV's and AUVs. We experienced many aspects of a core workflow during an IODP expedition: the fun of recognising interesting structures and shiny minerals in a core (*above*) or a thin section, the way in which the most complex cores can be structured, described and classified, and the measurement of physical properties. Course room exercises allowed us to follow the process further from data acquisition through processing to interpretation.

We leave Bremen not only with plenty of new knowledge and inspiration for future projects, but also with fresh ideas

regarding our current research that we presented. Coffee breaks, lunch times and the outdoor group programmes gave us the opportunity to discuss the challenges of our current projects with a number of new colleagues and potential collaborators.

A recurrent thought during the course, which seemed to be shared by all lecturers, is that there is much to be explored, sampled, measured, and understood by the "next generation" of marine geoscientists. Finally, the two weeks of summer school have certainly done their part to prepare us to face the scientific challenges of our future.

ECORD Scholarship Awardees 2015 :

Kristina Grete Dunkel, University of Oslo, Norway; Jakub Ciazela, Adam Miciewicz University, Poland; Joseph Offei Thompson, Ifremer, France; Sofia Escario Perez, Geosciences Montpellier, France and Minasadat Seyedali, University of Victoria, Canada



Gretchen Früh-Green

ECORD Science Support & Advisory Committee

News



Julia Gutiérrez Pastor

As the end of 2015 approaches, the ESSAC Office is finishing its term at the ETH Zurich and will soon move to GEOMAR in Kiel, Germany. The year has kept us busy with continued efforts with education and outreach activities and staffing of expedition participants and panel members.

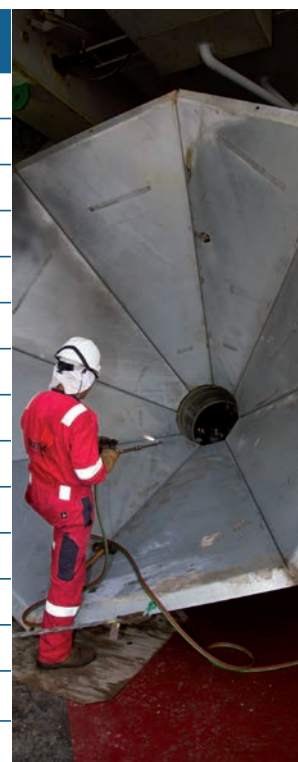
To date three **IODP expeditions** on the *JOIDES Resolution (JR)* have been completed in 2015 and two expeditions - the *JR Expedition 359 Maldives Monsoon* and the offshore phase of *MSP Expedition 357 Atlantis Massif Serpentinization and Life* - are currently underway. Staffing is also complete for Expedition 360 Southwest Indian Ridge Moho, which will start at the end of November 2015. A total of 59 scientists from ECORD member countries will participate in IODP expeditions in 2015, which includes five ECORD Co-chief Scientists, three participants from special calls and three as a result of in-kind contributions for Exp 357. The selection of ECORD scientists to participate in two further expeditions in 2016 has been completed: Exp 361 South African Climates and Exp 362 Sumatra Seismogenic Zone, each of which will include Co-chief Scientists from the UK. In addition, the nomination and selection process for Expeditions 363 Western Pacific Warm Pool and 366 Mariana Convergent

Margin is in progress. Applicants for IODP expeditions have benefited from information provided by on-line, interactive "webinars", which are an initiative originally organised by the Consortium for Ocean Leadership and have become an integral part of the application process for all IODP expeditions.

Since the last newsletter, we have completed the application and staffing processes for the next MSP Expedition 364 Chicxulub Impact Crater, which will be operated by ESO and will be implemented in the spring of 2016, with Joanna Morgan (UK) and Sean Gulick (USA) as Co-chief Scientists. The expedition will include 13 ECORD scientists (from France, Germany, UK, Austria, Belgium, Canada and the Netherlands), four of which will participate in the offshore phase. A call for applications was also issued to participate in Expedition 365 NanTroSEIZE Shallow Megasplay LTBMS onboard the *Chikyu* in the spring of 2016. In addition, ESSAC has issued a call for applications to sail on Expeditions 367 and 368 (CPPs) to drill the South China Sea Rifted Margin in 2017, and the deadline is 15 January 2016. We are pleased to be able to provide students and early-career scientists the opportunity to participate in recent and future expeditions, which make up approximately 50% of the ECORD

IODP Expedition Drilling Schedule

Expedition	Exp #	Drillship	Dates	Co-chief Scientists
Maldives Monsoon	359	JR	30 Sept - 30 Nov 2015	C. Betzler - G. Eberli
Atlantis Massif	357	MSP	24 Oct - 11 Dec 2015 (offshore)	G. Früh-Green - B. Orcutt
SW Indian Ridge Moho	360	JR	30 Nov 2015 - 30 Jan 2016	H. Dick - C. MacLeod
South African Climates	361	JR	30 Jan - 31 March 2016	I. Hall - S. Hemming
Chicxulub Impact Crater	364	MSP	April-May 2016 (offshore)	J. Morgan - S. Gulick
NanTroSEIZE Shallow Megasplay LTBMS	365	Chikyu	26 March - 27 April 2016	A. Kopf - D. Saffer
Sumatra Seismogenic Zone	362	JR	31 July - 30 Sept 2016	L. McNeill - B. Dugan
Western Pacific Warm Pool	363	JR	30 Sept - 30 Nov 2016	Y. Rosenthal - A. Holbourn
Mariana Convergent Margin	366	JR	30 Nov 2016 - Jan 2017	P. Fryer - G. Wheat
S China Sea Rifted Margin A	367	JR	Feb - March 2017	Z. Sun - J. Stock
S China Sea Rifted Margin B	368	JR	April - March 2017	Z. Jian - K. McIntosh
Australia Cretaceous Climate-Tectonics	369	JR	Sept - Nov 2017	tbd
Hikurangi Subduction Margin	tbd	JR	tbd	tbd
Antarctic Cenozoic Paleoclimate	tbd	MSP	Early 2018	tbd
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. A re-entry cone onboard the *JOIDES Resolution* during Expedition 354 Bengal Fan (Tim Fulton IODP/JRSO).

participants in 2015. More information about the scientific objectives and dates of all expeditions can be found on the IODP website at <http://www.iodp.org/expeditions> (table page 14).



First core piece on deck of Expedition 357 Atlantis Massif Serpentinization & Life (photo D. Smith © ECORD/IODP).

In the **IODP advisory panels**, ECORD has 8 members in the science sub-group and 5 members in the site-survey sub-group of the Science Evaluation Panel (SEP), which is responsible for evaluation of all IODP proposals. ESSAC has recently issued a call to replace out-going members in both subgroups; newly-selected members are listed in the table [page 17](#). In September of this year, Dick Kroon ended his term as Co-chair of SEP. ESSAC would like to sincerely thank Dick for the many years of dedication and leadership in promoting new science in IODP. We will miss his enthusiasm and humour and wish him all the best for his future endeavours. In addition, Paul Wilson (University of Southampton) was recently selected as a member of the *JR* Facility Board and will replace Heiko Pälke who has rotated off the panel.

The **ECORD Distinguished Lecturer Programme (DLP)** continues to be a great success with five lectures that cover the major themes defined in the IODP Science Plan:

- Christian France-Lanord (CNRS, Nancy, France), "Himalaya: from mountains to drilling in the Bengal fan",
- Gabriele Uenzelmann-Neben (Alfred-Wegener-Institut, Bremerhaven, Germany), "Reconstructing palaeo-circulation: Reading sediment drifts with the aid of IODP information",
- Jens Kallmeyer (GFZ, Potsdam, Germany), "What controls abundance and activity of microbial life in subsurface sediments? New insights from scientific drilling",
- Antony Morris (Plymouth University, UK), "What can magnetism tell us about oceanic tectonics? New insights from scientific drilling", and
- Paola Vannucchi (Royal Holloway University of London, UK), "Understanding megathrust earthquakes through ocean drilling".

To date more than 40 DLP lectures have been scheduled or are planned, with the DLP lecturers visiting 13 ECORD countries.

The schedule and more information is available under <http://www.essac.ecord.org/index.php?mod=education&page=dlp>.

ESSAC continues to support initiatives to train the next generation of ocean drilling scientists through the **ECORD Summer Schools** and **ECORD Research Grants**. In 2015, young scientists had the opportunity to participate in three Summer Schools sponsored by ECORD and related to marine science research and ocean drilling:

- The International School on Foraminifera (ISF), Urbino, 3-22 June 2015 - <http://www.isf.tmsoc.org>;
- The Urbino Summer School in Paleoclimatology (USSP) on Past Global Change Reconstruction and Modelling Techniques, University of Urbino, Italy, 15 July to 1 August 2015 - <http://www.urbinosp.it>;
- The ECORD Bremen Summer School 2015 on Ocean crust processes: magma, faults, fluxes and life, MARUM, University of Bremen, Germany, 31 August to 11 September 2015 - http://www.marum.delen/ECORD_Summer_School_2015.html

As in past years, ESSAC provided **ECORD Scholarships** to students to attend the summer schools. ESSAC received 33 applications and awarded 10 scholarships to participate in the Urbino Summer School (USSP) ([pages 11-12](#)). We also received 23 applications and awarded 16 scholarships for the ECORD Bremen Summer School ([page 13](#)). In addition to the successful ECORD Training Course "Virtual Drillship", we anticipate having three summer schools in 2016, which will include a new ECORD Summer School in Petrophysics. ESSAC will be issuing a new call for scholarships for these towards the end of the year.

The ESSAC office received 13 applications from 6 ECORD countries for ECORD Research Grants to support outstanding young scientists in IODP-related research ([report page 19](#)). These short-term, merit-based awards contribute to travel and lab expenses and are particularly intended to support studies that promote new collaborations and/or the acquisition of new scientific expertise. Eight young researchers were chosen to receive awards. The recipients in 2015 and reports of previously awarded grants are posted on the ESSAC webpage - <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 is able to offer the unique opportunity for educators and outreach specialists of ECORD countries to sail as Education/Outreach Officers onboard the *JOIDES Resolution*. Following a call for applications in July, we are pleased to see that Michelle Darrieu (France/Belgium) is participating on Expedition 359 Maldives Monsoon and Marion Burgio (France) and Lucas Kavanagh (Canada) were selected for Expedition 360 SW Indian Ridge Moho. We are looking forward to hearing about their experiences.

Further ESSAC-related activities include the EGU 2015 General Assembly Meeting (12-17 April 2015), where a session entitled "Achievements and perspectives in scientific ocean and continental drilling" (co-organised SSP3.3/BG10/CL5/GMPV) was organised as part of the new Programme Sub-group SSP3.3



ECORD Bremen Summer School 2015 (photo Volker Diekamp, MARUM).

- Ocean and continental drilling. As has now become tradition at the EGU meetings, more information about ECORD, IODP and ICDP and possibilities to get involved were available at the IODP-ECORD-ICDP Scientific Drilling booth in the exhibit hall and at the IODP-ICDP Townhall Meeting. The ESSAC Office will also participate in the ECORD-ICDP booth at the upcoming AGU Fall Meeting in San Francisco (14-18 December 2015).

This is the last contribution of the ESSAC News from Zurich - it is time to say "Auf Wiedersehen und vielen Dank" to all who have supported us over the past two years. It has been a pleasure to serve as ESSAC Chair and run the ESSAC Office. We would particularly like to thank the ESSAC delegates and 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; all of which contribute importantly to 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, in the name of all ESSAC delegates, wish her all the best for the future.

Best wishes and good luck to Jan Behrmann who will take over as new ESSAC Chair running the ESSAC Office at GEOMAR, Helmholtz Centre for Ocean Research Kiel in January 2016.

*Gretchen Früh-Green, ESSAC Chair, and Julia Gutiérrez-Pastor, ESSAC Science Coordinator - essac.office@erdw.ethz.ch
<http://www.essac.ecord.org>*

Submit your abstract at upcoming IODP sessions



Scientific Drilling in the Indian Ocean: Initial Results from monsoon expeditions of IODP
<http://meetingorganizer.copernicus.org/EGU2016/session/21135>

Achievements and perspectives in scientific ocean and continental drilling
<http://meetingorganizer.copernicus.org/EGU2016/session/20762>

Deadline: 13 January 2016



Achievements and perspectives in scientific ocean drilling
<http://www.35igc.org/Themes/29/Marine-Geosciences-and-Oceanography>

Deadline: 31 January 2016

ECORD Representatives in IODP advisory panels

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Science sub-group			Werner Piller	Austria	werner.piller@uni-graz.at
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Marguerite Godard	France	marguerite.godard@um2.fr	Site-survey sub-group		
Marc-André Gutscher	France	gutscher@univ-brest.f	Michael Riedel	Germany	mriedel@geomar.de
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Jens Kallmeyer	Germany	kallm@gfz-potsdam.de	Johanna Lofi*	France	johanna.lofi@gm.univ-montp2.fr
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* Temporal replacement of Serge Berné			G. Unzelmann-Neben**	Germany	gabriele.uenzelmann-neben@awi.de
** Until January 2016					
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Philippe Lapointe	France	philippe.lapointe@total.com	Dieter Strack	Germany	ddhstrack@aol.com

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

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The United Kingdom	Antony Morris amorris@plymouth.ac.uk	Bridget Wade b.wade@ucl.ac.uk

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

* On January 2016, Jan Behrmann will be the ESSAC Chair and will replace Rüdiger Stein as ESSAC Delegate for Germany.

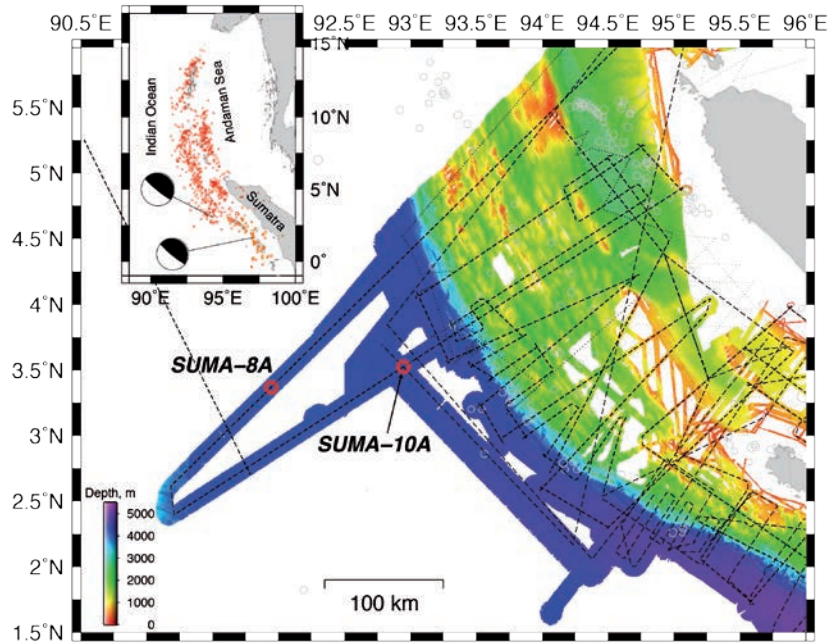
Focusing on IODP Expeditions

IODP Expedition 362: "The Sumatra Subduction Zone - The Role Of Input Materials In Shallow Seismogenic Slip And Forearc Plateau Development"

Lisa McNeill*

IODP Expedition 362 will target the Sunda subduction zone for the first time in scientific ocean drilling history. The 2004 Mw 9.1 earthquake and tsunami that struck North Sumatra and the Andaman-Nicobar Islands ruptured the northern part of this subduction zone, and devastated coastal communities around the Indian Ocean. This earthquake and the Tohoku-Oki Mw 9.0 earthquake in 2011 showed unexpectedly shallow megathrust slip, and neither are well explained by existing models and by relationships observed at margins where seismogenic slip typically occurs farther landward. The input materials of much of the northern Sunda subduction zone are a thick sequence of primarily Himalayan-derived Bengal-Nicobar Fan related sediments - this section is 4-5 km at the trench off North Sumatra. The sedimentary sequence shows strong evidence for induration and dewatering and the deepest sediments where the plate boundary fault begins to form have probably reached the temperatures required for sediment-strengthening diagenetic reactions prior to accretion. In addition, the subduction forearc structure and morphology here is unusual (the prism forms a wide plateau) and this is likely to be linked to internal and basal forearc properties. The correspondence between the 2004 rupture location and the overlying prism plateau, and evidence for a strengthened input section suggests the input materials are key to driving the distinctive slip behaviour and long-term forearc structure.

The primary objectives of Expedition 362 are therefore to establish **a)** the initial and evolving properties of the North Sumatran incoming sedimentary section and **b)** the potential effect of these properties on seismogenesis, tsunamigenesis, and forearc development for comparison with global examples. To address these objectives, Expedition 362 will drill, sample and log the input section by drilling at two sites (*map, above right*) to generate a composite section of



Bathymetry of the North Sumatra subduction forearc and the location of the two borehole sites (red circles) on the incoming oceanic Indian plate. Black lines indicate seismic reflection data collected since the 2004 earthquake, grey circles indicate aftershock locations following the 2004 earthquake. Inset shows seismicity associated with the 2004 (red) and 2005 (orange) earthquakes.

the entire input section and to map how properties change on approach to the subduction zone. The primary target will be reaching the oldest sediments overlying basement where the plate boundary fault (or décollement) forms. Samples will be analysed for their lithology, physical properties, deformation, geochemistry and evidence of diagenetic alteration. An important part of the expedition will be taking *in-situ* formation temperature and pore-pressure measurements in each borehole using deployment of specialist downhole tools (the APCT-3, SET, SETP and T2P tools). Sample, log and physical and thermal properties will then be incorporated into post-expedition experimental and numerical modeling studies in order to project how these properties will evolve as the input sediment section thickens, the overburden increases and temperatures increase towards and then within the subduction zone. Thus we will be able to predict properties and slip

behaviour in the outermost subduction zone to compare with behaviour during the 2004 earthquake. The drilling results will also provide information on **a)** the history of Nicobar Fan sedimentation (related to Himalayan-Tibetan collision and uplift and monsoon development) complementing existing and recent IODP drill sites, and **b)** the state of stress of the Indian oceanic plate in the vicinity of the April 2012 earthquake sequence: exceptionally strong intraplate earthquakes including the largest strike-slip event ever recorded.

Expedition 362 is scheduled for August and September 2016 - http://iodp.tamu.edu/scienceops/expeditions/sumatra_seismogenesis.html

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Report of ECORD Research Grants

Paleoceanographic changes in the Gulf of Cádiz during the late Pliocene

Angela Garcia-Gallardo*

1) Background

The Institute of Earth Sciences of the University of Graz (Austria) is involved in post-cruise research efforts of IODP Expedition 339 towards a better understanding of the environmental significance of Mediterranean Outflow Water (MOW) and its role in global climate (Stow *et al.*, 2013). The research focus lies on the reconstruction of paleoceanographical changes in the NE Atlantic Ocean during the Pliocene caused by the onset of MOW after the opening of the Gibraltar Strait (~5.3 Ma).

Preliminary results from upper Pliocene sediments recovered at IODP Site U1389E (Figure 1) were ambiguous and difficult to interpret with respect to MOW. The methodology relied on micropaleontological and geochemical proxies as tracers of MOW: distinct benthic foraminiferal assemblages provide information on MOW intensity, velocity and bottom water ventilation, while the combination of $\delta^{18}\text{O}$ and Mg/Ca from benthic foraminifera indicates changes in the contribution of warm and highly saline MOW. The combination of these proxies is generally considered a reliable tool for MOW reconstruction (Rogerson *et al.*, 2011). However, their application to the Pliocene sediments of Site U1389E was complicated by preservation, the limited amount of suitable benthic foraminiferal shells, reworking and transport.

In addition, high-resolution records of total organic carbon (TOC), CaCO_3 and S contents were acquired from Site U1389E to address changes in export productivity and bottom water ventilation. Preliminary results revealed distinct cyclic patterns in well recovered intervals potentially related to orbital forcing. However, the

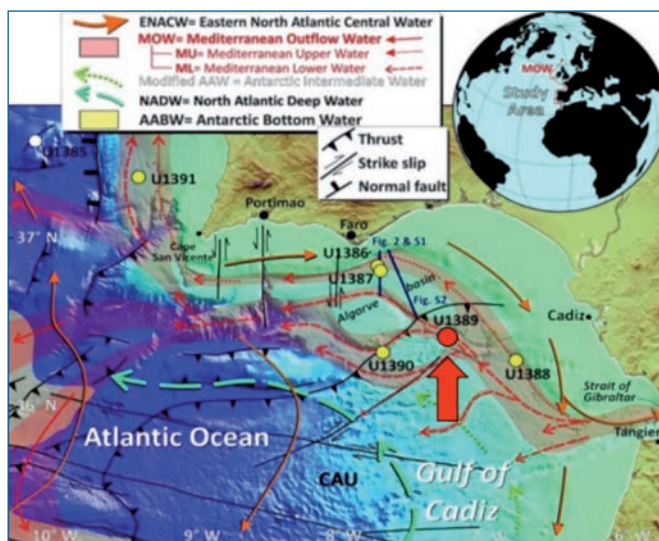


Figure 1. Hydrography of the Gulf of Cádiz and main flow paths of the Mediterranean Outflow Water (MOW). Location of IODP Site U1389E is indicated in red.

interpretation remained difficult as the source of CaCO_3 content of U1389E was not clear.

These difficulties resulted in the consideration of additional proxy records, which could provide reliable data in a time- and cost-efficient manner. Bahr *et al.* (2014) have recently introduced the Zr/Al ratio as a novel proxy for MOW reconstruction in upper Pleistocene sediments of IODP Sites U1387 and U1389. In their study, the authors demonstrate that the Zr/Al ratio follows occurrences of contourites, and therefore serves as a semi-quantitative indicator of bottom current strength (Bahr *et al.*, 2014).

Furthermore, the origin of the carbonate in the sediment (biogenic vs detrital; continental runoff) is reflected in varying distributions of elements such as Sr, Ti and Fe (Hodell *et al.*, 2008; Bahr *et al.*, 2014). Input of biogenic organic matter is reflected in the Br content of the sediment, which in combination with TOC and S records provides information about export productivity and bottom water oxygenation (Bahr *et al.*, 2014).

2) Materials and methods

The studied sediments come from cores of IODP Site U1389E (Figure 1) collected during IODP Expedition 339 in the Gulf of Cádiz, and are stored at the Bremen Core Repository at MARUM. The study focuses on the acquisition of an elemental record (in particular Zr, Al, Sr, Ca, Br, Ba, Fe, K and Ti) from upper Pliocene (~2.6-3.6 Ma) sediments of Site U1389E on cores 41R through 70R (703.6-982.78 mbsf; total recovery: 127.8m) (Figure 1; Stow *et al.*, 2013). XRF Core Scanner

data were collected at MARUM, University of Bremen every 5 cm down-core over a 1.2 cm² area with down-core slit size of 12 mm using generator settings of 10, 30, and 50 kV, and currents of 0.2, 1.0, and 1.0 mA, respectively. A sampling time of 20 seconds directly at the split core surface of the archive half was used with an XRF Core Scanner II (AVAATECH Serial No. 2). The split core surface was covered with a 4 micron thin SPEXCerti Prep Ultralene1 foil to avoid contamination of the XRF measurement unit and desiccation of the sediment. The herein reported data have been acquired by a Canberra X-PIPS Silicon Drift Detector (SDD; Model SXD 15C-150-500) with 150eV X-ray resolution, the Canberra Digital Spectrum Analyzer DAS 1000, and an Oxford Instruments 50W XTF5011 X-Ray tube with rhodium (Rh) target material. Raw data spectra were processed by the analysis of X-ray spectra by Iterative Least square software (WIN AXIL) package from Canberra Eurisys.

3) Results and discussion

Results from XRF scanning on the sediment cores from Site U1389E are consistent with the upper Pleistocene records for the same site in Bahr *et al.*

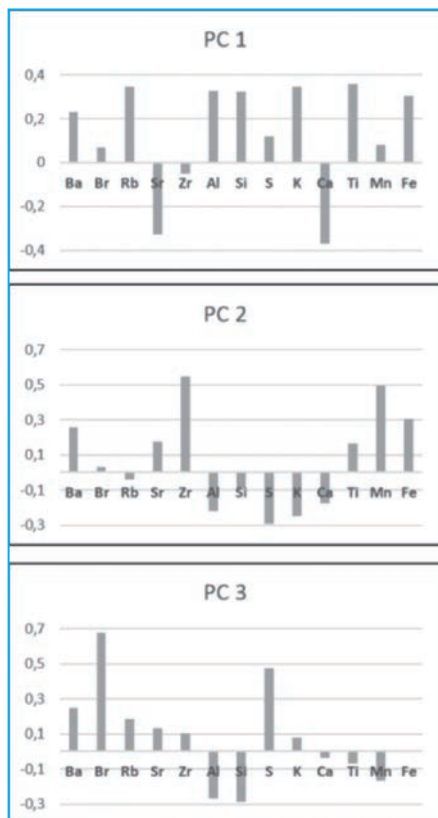


Figure 2. Principal components analysis for the XRF data of U1389E.

(2014). Preliminary principal component analysis (PCA) reveals three principal components (PCs), together explaining 79% of the variance observed in the records (Figures 2 and 3).

PC 1 (49% of variance) is characterised by positive loadings of Al, Si, Fe, Ti and negative loadings of Sr and Ca. This pattern is best explained by variations of detrital siliciclastic sediments (terrestrial input) and biogenic carbonate (productivity).

PC 2 (18% of variance) shows positive loadings for Zr and negative loadings of Al and Si. A comparison to occurrences of contourites observed in the sedimentary record strongly suggests a relation to bottom-current strength (Bahr et al., 2014). This allows this new proxy to be applied for the first time to the Pliocene record of MOW.

Finally, PC 3 (12% of variance) shows strong positive loadings of Br and S, most likely reflecting export productivity and bottom water oxygenation. In well recovered intervals, all three PCs

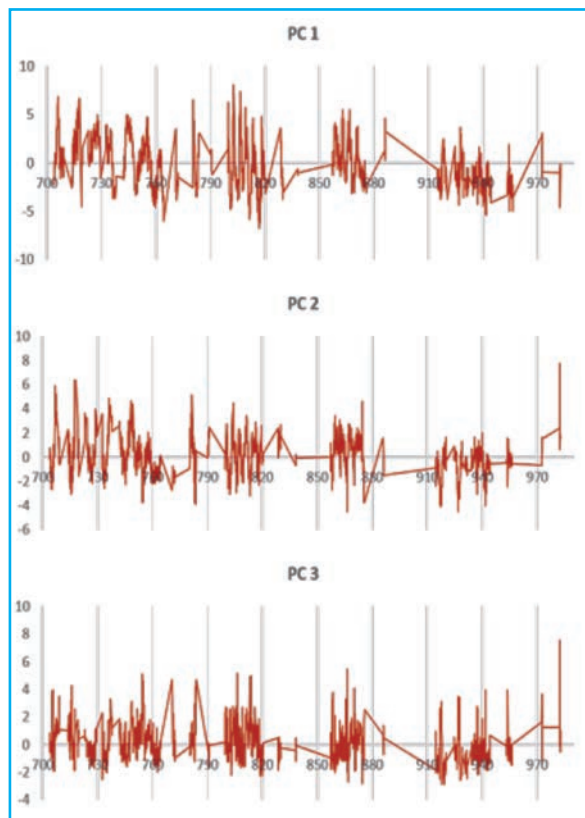


Figure 3. Scores of principal components 1-3 in the U1389E records. X-axis: depth in metres below seafloor.

show distinct cyclic patterns that vary in amplitude and frequency over the studied interval. A long-term increase in the amplitude of the cycles in PC 2 correlates with a general coarsening of the sediments, culminating in sections 41R-47R and indicating a significant strengthening of MOW < 2.7 Ma (Stow et al., 2013). The parallel increase in the length of the cycles in PC 1 and PC 2 supports preliminary results of the ongoing revision of the age model for the interval, which indicate a significant increase in sedimentation rates in sections 41R-47R. The completion of the revised age model in the near future will help to evaluate short-term fluctuations in the XRF records and their potential relation to orbital forcing.

The new Zr/Al proxy record for MOW will help to improve our understanding of benthic foraminifera as MOW proxies, specifically in comparison to early Pliocene records from U1387C (García-Gallardo, in prep; Schönfeld, 2002a, 2002b) first described the elevated epifauna (benthic taxa inhabiting elevated substrates such as hard rocks, shells, etc.) with greater

settling heights above the sediment surface under the influence of strong bottom currents in the Gulf of Cádiz. With this strategy, these foraminifera optimise food acquisition under strong bottom-currents, and the abundance of these epibenthic foraminifera is closely related to the ambient flow regime in the deep Gulf of Cádiz (Schönfeld, 2002 a,b). However, this potentially powerful proxy has been rarely applied to the sediment record (Schönfeld & Zahn, 2000). At U1389E, specifically *Planulina ariminensis* shows an exceptional correspondence in its abundance to the Zr/Al curve, and supports its reliability as MOW indicator at U1387C (García-Gallardo, in prep).

Preliminary results show that XRF-scanning provides multiple paleoceanographic proxy records that make an important contribution to the ongoing research at Site U1389E and to the overall success of the research objectives of Expedition 339.

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Acknowledgements

I would like to thank the ESSAC Scientific Committee for financial support. Ursula Röhl (MARUM, University of Bremen), Patrick Grunert (Rutgers University) and Gerald Auer (University of Graz) are acknowledged for their help with organising XRF-scanning and the interpretation of the data. This research used data acquired at the XRF Core Scanner Lab at the MARUM - Center for Marine Environmental Sciences, University of Bremen, Germany, and contributes to the research goals of IODP Expedition 339 and FWF-project P25831-N29, funded by the Austrian Science Fund (FWF).

Continued on page 31

Calendar of Workshops and Conferences

<p>2015</p> <p>14 - 18 December AGU Fall Meeting San Francisco, CA, USA meetings.agu.org</p> <p>-----</p> <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 General Assembly 2016 Vienna, Austria egu2016.eu</p>	<p>22 - 26 May JPGU 2016 Chiba, Japan www.jpogu.org/meeting_e2016/</p> <p>1 - 3 June GAC-MAC Whitehorse, YK, Canada whitehorse2016.ca</p> <p>19 - 22 June AAPG 2016 Calgary, AB, Canada ace.aapg.org/2016</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>-----</p> <p>2017</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>15-18 October AAPG London, UK www.aapg.org</p> <p>30 Oct - 2 Nov 3P Arctic Calgary, Canada www.3parctic.com</p> <p>-----</p> <p>2018</p> <p>17-21 June GAC-MAC Vancouver, BC, Canada www.gac.ca/wp</p>
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Reports of Workshops and Conferences

:: STRATI 2015, 19-23 July 2015, Graz, Austria

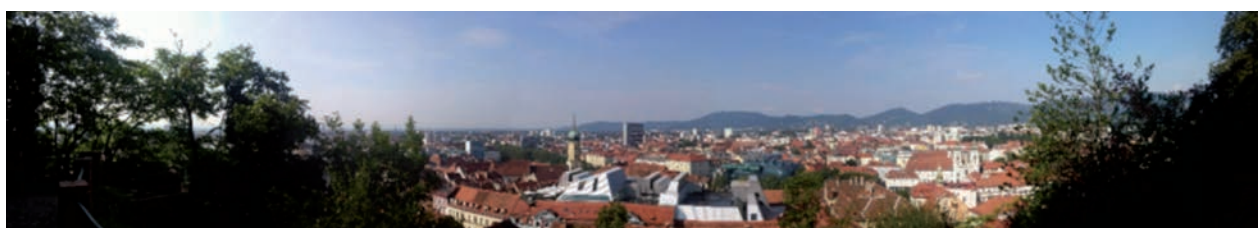
by David J. King¹ and Chris R. Poole¹

The 2nd International Congress on Stratigraphy took place in the beautiful surroundings of Graz, Austria from 19-23 July 2015. The congress covered all aspects of stratigraphy ranging from the Archean to the Holocene, as well as hosting meetings for working groups dedicated to the assignment of Geological Boundary Stratotype Section and Points (GSSP).

A number of presentations aimed to address stages boundaries currently lacking a GSSP, though potential sections must fulfil strict criteria and thus require a robust chronostratigraphic

framework. Historically, GSSPs have been defined at terrestrial geological sections, though finding an appropriate site is often difficult. As such, there is now increasing discussion over the possibility of utilising marine sections, *i.e.* IODP and ODP sites and cores, for GSSPs (such as ODP Leg 154 Sites [Ceara Rise, equatorial Atlantic] for the Langhian Stage, Middle Miocene).

The main advantage of a marine section is that some cores will be able to provide levels of detail unrivalled in terrestrial



sections, with continuous sedimentation, well-resolved biostratigraphy, magnetostratigraphy and astronomical tuning. However, a key criterion for GSSP assignment is that the locality must be easily accessible and be available for sampling. While the latter is possible, the core will eventually become depleted. Nonetheless, this idea remains interesting and viable

for at least the Cainozoic if suitable terrestrial sections cannot be found.

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<http://strati2015.uni-graz.at>

:: Scientific Drilling in the Indian Ocean Crust and Mantle, 13-16 May 2015, Woods Hole Oceanographic Institution, USA

by Henry Dick¹ and Benoit Ildefonse²

The Workshop for Scientific Drilling in the Indian Ocean Crust and Mantle was held May 13-16, 2015 at the Woods Hole Oceanographic Institution, with the participation of 60 scientists from Australia, Canada, China, France, Germany, Great Britain, Italy, Japan, and the United States. The meeting was co-sponsored by IODP China and the United States Scientific Support Program (USSSP, *see page 25*), and the MagellanPlus programme supported travel of five participants from ECORD member countries. The workshop included an extensive overview of the tectonics, geophysics, geochemistry and geology of the region of interest, the SW Indian Ridge. Also presented were papers on current research on mantle geochemistry, petrology, geophysics, geology, and biogeochemistry, as well as crust/ocean interactions at slow spreading mid-ocean ridges.

The SW Indian Ridge spreads at ~14 mm/yr, and represents the best studied ultra-slow end-member for seafloor spreading. In addition to the unique tectonics of amagmatic spreading where the mantle spreads directly to the seafloor, it spans the range of melt production from effectively zero to some of the thickest ocean crust ever measured away from a mantle hotspot. Thus, it is a unique laboratory for the study of magmatic processes and related tectonics of crustal and lithospheric accretion. The SW Indian Ocean floor, exposing ~23% mantle



peridotite, represents a highly reactive substrate for water/rock interaction compared to the dominantly basaltic crust at faster spreading ridges. This has the potential to at least partly explain diversity in the microfauna and differences in the chemistry of the oceans, with significant implications for the Earth global carbon budget. Related microbiology and biogeochemistry objectives were presented at the workshop.

This meeting was an opportunity for exchange between the science party of the coming Expedition 360 at the Atlantis Bank, and the broader community on proposed research and objectives for deep crustal drilling at the SW Indian Ridge. Two other drilling targets were also discussed for nurturing future IODP

proposals: the Dragon Flag hydrothermal area, situated on a detachment fault at 49°40'E, and the smooth seafloor area at 64°30', that represent the magma-starved end-member of ultra-slow spreading ridges. Details of site surveys to be planned after the coming riserless drilling at the Atlantis Bank, and before a potential ultra-deep drilling program, were also discussed and listed, based on recent state-of-the-art seismic experiments in mid-ocean ridge settings that have some similarities with Atlantis Bank, either because of tectonic setting and/or in scientific objectives.

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<http://web.whoi.edu/indian-ocean-drilling/us-china-international-ocean-discovery-program-workshop/>

Reports of MagellanPlus Workshops

:: Investigating Mediterranean-Atlantic Gateway Exchange (IMAGE) - 5-8 May 2015, Rabat (Morocco)

Convenors: R. Flecker, J. Hernandez-Molina, F. Hilgen, F.J. Jimenez-Esejo, J. Lofi, P. Meijer, M. Rogerson, F. Sierro, M. Gutjar and W. Krijgsman.

The MagellanPlus IMAGE workshop held in Rabat Morocco in May 2015 was embedded within an existing RCMNS Interim Colloquium entitled Mediterranean-Atlantic gateways (Neogene to present). The colloquium was originally designed as an opportunity to share with the wider scientific community the results of two independent but complementary research projects: IODP Expedition 339 which recovered a Pliocene-Recent record of Mediterranean Outflow from the Gulf of Cádiz; and the EU-funded Marie Curie Initial Training Network, MEDGATE, which is reconstructing Mediterranean-Atlantic exchange during the Late Miocene when the gateway configuration was different (*right*). However, after the colloquium was scheduled, the research environment shifted, primarily as a result of encouragement from IODP's Science Evaluation Panel to develop specific drilling proposals in the Mediterranean. All four of the scientific themes that are already being developed as Mediterranean drilling proposals include the recovery of its Late Miocene record of extreme salinity change, the Messinian Salinity Crisis. Consequently an understanding of Mediterranean-Atlantic exchange before, during and after the formation of the world's youngest and largest saline giant is required to evaluate its causes and consequences. The MagellanPlus IMAGE workshop was used to drive the meeting beyond merely being an opportunity to share and discuss new results, giving it a clear focus on building on this knowledge to explore the potential benefits of, and problems, with developing a drilling strategy for recovering this critical record of Mediterranean-Atlantic connectivity and exchange.

The meeting comprised a series of four conference-style presentation sessions with associated posters and a half-day fieldtrip to acclaimed local successions at the western end of the Rifian corridor (*above*). In all sessions, and during the fieldtrip,



Map of the pre-Gibraltar Atlantic-Mediterranean gateways 5-10 million years ago.

convenors sought to capture key insights pertinent to the drilling objective. The meeting culminated in the final workshop session in which seismic data from the gateway region was presented, key research questions identified and possible drilling targets were discussed. A two-day post-conference fieldtrip was organised to enable those that wished to visit important, but more inaccessible and less well known successions from axial parts of the Rifian corridor.

As a result of this MagellanPlus IMAGE workshop, the proponents received a clear mandate from the diverse community that attended, to work towards developing new drilling proposals for recovering a complete record of Late Miocene Mediterranean-Atlantic exchange. This is likely to require an amphibious strategy involving both offshore and onshore drilling. There are however two major challenges that need to be overcome before such a proposal is ready for submission, and strategies to address these were discussed and agreed on at the meeting.

1. There are several key pieces of research that need to be undertaken and published in order to give the drilling proposal scientific credibility. Following the meeting, the

proponents met to identify the nature of this research and construct the teams that could undertake the work. This will form a special issue to be published in due course. **2.** More work needs to be done to identify ideal target locations for drilling. Those presenting seismic data agreed to work together with each other and the proponents to refine suitable drilling targets.

A final important component of the success of the workshop was the high profile role given to early-stage researchers from both IODP Expedition 339 and MEDGATE. These researchers were involved in a leadership capacity in all aspects of the meeting. They designed and convened sessions, led the fieldtrips, identified and invited keynote speakers and judged the prizes. We are proud to report that participants were extremely complimentary about the skill with which these individuals acquitted themselves and we look forward to seeing them take an increasing role in the development of this drilling project over the years to come.

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:: Submarine Paleoseismology: Using giant-piston coring within IODP to fill the gap in long-term records of great earthquakes - 16-18 July 2015, Zurich (Switzerland)

Convenors: M. Strasser, A. Cattaneo, K. Ikehara and C. McHugh

Many large earthquakes affect offshore environments. Shaking of the seafloor can trigger landslides or surficial sediment resuspension that evolve downslope into debris flows and turbidity currents, or mud-density flows, respectively. In sub-aquatic environments, the sedimentary record provides high sensitivity and continuity, so extreme-event deposits are better preserved and easier to date than their terrestrial counterparts. The concept of studying sub-aquatic event deposits for paleoseismology is increasingly being applied in various settings. These studies, which are mostly based on conventional 10-m long cores, demonstrate the potential to advance our understanding of earthquake recurrence. However, due mostly to the lack of longer cores, these studies often focus on time periods too short to provide robust input for long-term seismicity evaluation and advanced seismic hazard assessments. With ECORD opening their mission-specific platform (MSP) approach to include giant-piston coring within IODP, a new horizon has opened up for designing and performing objective-driven multi-coring expeditions fully dedicated to the rapidly growing field of submarine paleoseismology. IODP is uniquely positioned to address the complex feedback mechanisms between earthquake shaking and its manifestation in the marine archive, to eventually provide longer records to constrain earthquake recurrence far beyond historical catalogues.

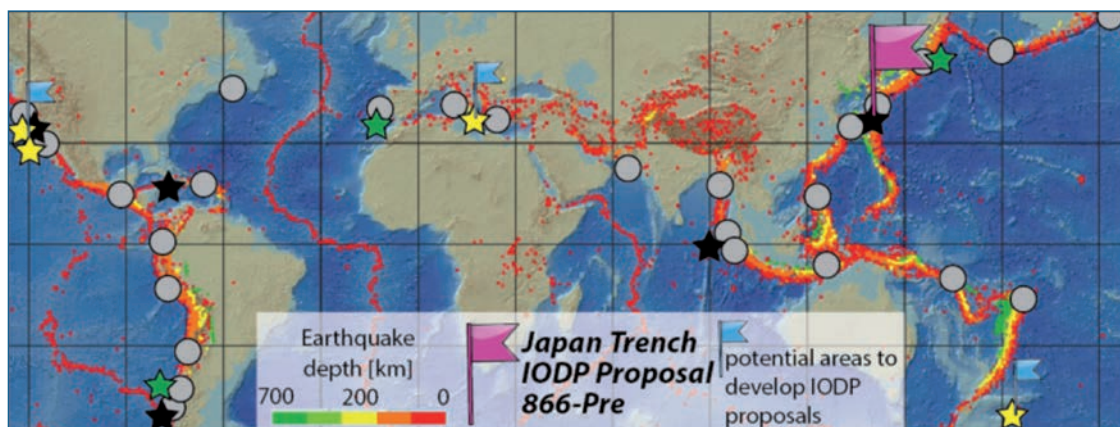
The workshop was held in Zurich from 16-18 July 2015 to discuss and define a strategy of how and where we could best make use of giant-piston coring efforts within IODP to make some major advancements in submarine paleoseismology. 59 participants (24 students/early-career scientists) from 14 countries, and representing a broad spectrum of expertise ranging from marine geology to seismology, attended the workshop. The first day was devoted to overview presentations of major scientific themes and questions. This set the ground for the following group discussion that generically discussed objectives, needs, opportunities and challenges for submarine paleoseismology within IODP.

The second day featured several presentations and posters by participants about their own perspective on the state-of-the-art and future opportunities for submarine paleoseismology, followed by group discussion to identify potential study areas and scientific approaches.

Already before the workshop, we had identified the Japan Trench as an ideal study area and submitted an IODP Pre-Proposal (Proposal #866-Pre, Japan Trench Paleoseismology). Workshop discussion during the first two days revealed endorsement of the Japan Trench as a primary target for understanding causes, consequence and recurrence of submarine earthquakes and tsunamis. The third day was dedicated to develop IODP Proposal #866-Full, based on input from the previous workshop days. The constructive discussions and clearly defined action plan constitute a critical step towards the development of a competitive full proposal, with submission date targeted in 2016. Furthermore, the workshop also identified high potential for the application of submarine paleoseismology within IODP to advance our understanding of long-term earthquake histories in the Mediterranean Sea, and the Hikurangi and Cascadian Margins. Workshop discussion nurtured emerging needs and great opportunities for these regions, and the final day of the workshop also featured a group discussion to define action plans to begin to develop additional IODP submarine paleoseismology proposals.

Additional funding was provided by NSF through the U.S Science Support Program; and contributions by the Swiss National Science Foundation, the Swiss Academy of Science, the Swiss Seismological Service, the International Associations of Sedimentologists and ETH Zürich.

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Compilation of global seismicity, regionally-representative major earthquakes (grey dots), and paleoseismologic data sets, illustrating how little is known about long-term earthquake recurrence: green & yellow stars show arguably complete archives spanning <2 and >5 kyrs, respectively. Black stars show fragmentary and debated records. Full list of references available at https://www.dropbox.com/s/pk0rncys0gotyq/doc77-3_Paleoseis_compilation.pdf?dl=0

The US Science Support Program (USSSP) relocated at Lamont Doherty Earth Observatory

In March of 2015, the Lamont-Doherty Earth Observatory (LDEO) of Columbia University entered into a five-year cooperative agreement with the U.S. National Science Foundation to manage the U.S. Science Support Program (USSSP) associated with IODP. Lamont succeeds the Consortium for Ocean Leadership, which served the U.S. ocean drilling community with distinction for many years in the course of administering this multifaceted programme.

USSSP is responsible for providing financial and managerial support for many components of the U.S. IODP effort, including programme planning and development (through the funding of workshops, for example), expedition participation (via financial support for scientists for expedition-associated salary and travel) and pre-drilling activities, among numerous other programme elements. The new USSSP Office at LDEO will also manage a diverse portfolio of education and outreach activities, including a new collaboration with the American Museum of Natural History in New York City that will feature an annual IODP-themed lecture in the Museum's Hall of Ocean Life, followed by professional development and student workshops focusing on the science and social significance of IODP.

USSSP is advised by the 10-member U.S. Advisory Committee for Scientific Ocean Drilling (USAC), now under the leadership of the new Chair Beth Christensen of Adelphi University. USAC provides advisory assistance to USSSP with workshop and pre-drilling activity reviews, expedition staffing nominations, panel membership selection, graduate student fellowship awards, and other activities. USAC also serves as the primary voice of the U.S. ocean drilling community, providing a means through which researchers can offer input and



From left to right: Maureen Raymo (co-PI), Carl Brenner (PI, Director), James Spencer (Logistics Coordinator), Lori McCaleb (Program Manager), Angela Slagle (Science Program Officer). Not pictured: Dave Goldberg (co-PI), Sharon Cooper (Education/Outreach Officer).

suggestions about future directions of the U.S. IODP effort.

The Principal Investigator and Director of the new USSSP Program at LDEO is Carl Brenner, who previously has served as Manager of the ODP Site Survey Databank and more recently has been a member of Lamont's Borehole Research Group. He is assisted by co-PIs Dave Goldberg and Maureen Raymo, both of whom have long and distinguished histories in IODP and its predecessor programmes. The Science Program Officer is Angela Slagle, previously a Logging Staff Scientist, while Education and Outreach activities are directed by Sharon Cooper, who comes to Lamont from Ocean Leadership.

Through the IODP Forum and other venues, USSSP complements and

collaborates with other IODP Program Member Offices and also manages the nomination process for ECORD members of the *JOIDES Resolution* Facility Board. In addition, it has hosted ECORD educators in its School of Rock programme and provided training for ECORD participants in its Education/Outreach programme on the *JOIDES Resolution*. There is considerable interest among all IODP partners for closer international collaboration on IODP outreach activities in the future, which should increase the public's awareness of IODP's accomplishments and spur the public to further explore the major scientific themes and achievements of IODP.

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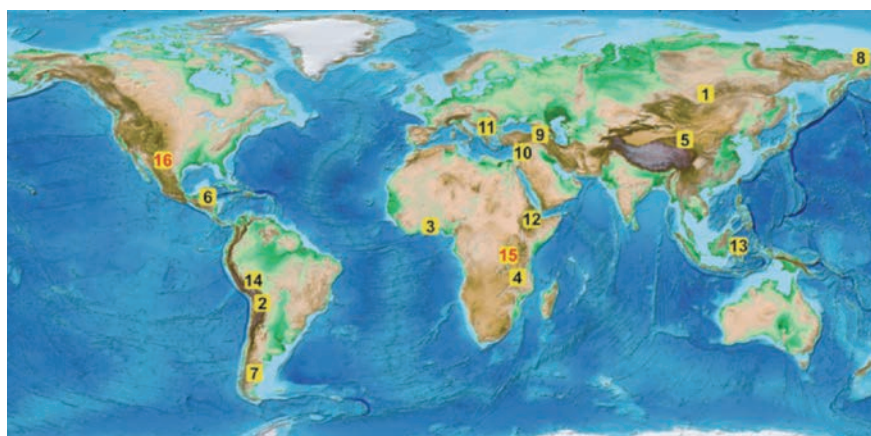


Drilling Lacustrine Sediments

Thomas Wiersberg

The 6th International Limnogeology Congress (ILIC6) was held from 15 to 19 June 2015, in Reno - Tahoe, Nevada (USA), and brought together leading limnologists, geologists, limnologists, paleontologists and geochronologists from academia, and science funding agencies from all around the world. The conference took a multi-disciplinary look at the sedimentary record of lakes, including climate change, contaminant, and limnological research from the present to the Precambrian. ICDP was present with a booth that served as a meeting point for introducing ICDP lake drilling projects and for discussing future lake drilling.

Lacustrine drilling is one key topic among the research themes supported by ICDP as we are facing amplified global warming, a rising sea level, regional climate shifts, and extreme climate events that severely impact the human habitat. We therefore are invited to conduct research that provides an understanding of present and past climate variations on regional and global scales. Lakes are the ideal target for such research, because they are dynamic response systems that integrate environmental, climatic and tectonic forcing into a continuous, high-resolution archive of local and regional change. A prime objective of drilling lacustrine sediments is therefore recovering continuous records of past global climate



- | | | |
|---|--|---|
| 1. Lake Baikal Drilling Project (Russia, 1997-1998) | 7. Potrok Aike Maar Lake Sediment Archive Drilling Project (Argentina, 2008) | 12. Hominin Sites and Paleolakes Drilling Project (Kenya & Ethiopia, 2013-2014) |
| 2. Lake Titicaca Drilling Project (Bolivia, 2001) | 8. Lake El'gygytyn Drilling Project (Russia 2008-2009) | 13. Lake Towuti Drilling Project (Indonesia, 2015/2015) |
| 3. Lake Bosomtwi (Ghana, 2004) | 9. Lake Van Drilling Project (Turkey, 2010) | 14. Lake Junin Drilling Project (Peru, 2015) |
| 4. Lake Malawi Drilling Project (Malawi, 2005) | 10. Dead Sea Deep Drilling Project (Israel, 2010-2011) | 15. Lake Challa Drilling (Kenya-Tanzania, 2016) |
| 5. Lake Qinghai Drilling Project (China, 2005) | 11. Lake Ohrid Drilling Project (Macedonia, 2013-2014) | 16. Lake Chalco Drilling Project (Mexico, 2016) |
| 6. Lake Peten Itza Drilling Project (Guatemala, 2006) | | |

and environmental changes and to compare with those available from oceans or ice cores, having substantially greater temporal and spatial resolution.

ICDP has undertaken fourteen lake sediment coring projects to recover long undisturbed high-resolution archives of climate and environmental development, while drilling is planned in several others (*above*). ICDP provides the Deep Lake Drilling System (DLDS), a barge and

drill rig system to recover sediment and rock cores from lake bottom and shallow water floors. The system consists of a wireline drilling rig capable of recovering core from 1,400 m depth and a modular barge of 24.4 by 7.3 m size. The operator of the DLDS is GTE, the successor of DOSECC Exploration Services. The DLDS has been deployed successfully on Lake Van in Turkey, the Dead Sea in Israel, Lake Ohrid in Macedonia, Lake Towuti in Indonesia and Lake Junin in Peru.

The **2015 ICDP Training Course on Lacustrine Sediment Drilling** was held at Lake Ohrid and Lake Prespa, Macedonia, on 14-19 September. 20 scientists from 15 countries followed lectures and performed practical exercises related to scientific drilling of lacustrine sediments. Practical exercises included interpretation of data from seismic surveys to define the best drilling locations, drill-core opening and handling (*right*). Principal Investigators from successfully completed ICDP lake

drilling projects (SCOPSCO, Towuti) provided valuable insights in planning and execution of lake drilling campaigns. Other lectures covered topics such as downhole logging, pre-site studies, on-site sample handling, storage, and analysis, data management, funding and support by ICDP, and outreach. Other highlights of the training course were visits to the UWITEC barge to see a small piston-coring system in operation and to an airgun boat for seismic surveys, both at Lake Prespa.



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News from ECORD Member Countries

Finland

Finnish participants of IODP Expedition 347 Baltic Sea Paleoenvironment, Outi Hyttinen and Aarno Kotilainen, have continued their work on the expedition material. The results have been disseminated at several meetings: the EGU General Assembly 2015, in Vienna, Austria in April 2015; Japan Geoscience Union Meeting in May 2015; and the 10th Baltic Sea Science Congress, in Riga, Latvia on 15-19 June 2015.



Participants of the Exp 347 Post-Cruise Meeting had lunch at Fjärås Bräcka end moraine during an excursion in southern Sweden. That location is not so far from the IODP Site M0060 recovered during Expedition 347.

Expedition 347 Post-cruise Meeting.

Finnish participants joined the IODP Expedition 347 Post-Cruise Meeting held in Södertörn University, Stockholm, from 28 September to 2 October 2015.

Aarno Kotilainen, ESSAC Delegate - aarno.kotilainen@gtk.fi - and Anna Kalliomäki, ECORD Council Delegate - <http://iodpfinland.oulu.fi>

Portugal

IODP Portugal. During the last few months IODP Portugal underwent several changes. Within the Fundação para a Ciência e a Tecnologia (FCT), the supervision of the programme moved from the hands of Olga Dias, the long-term ECORD responsible and Alternate, to the newly established Gabinete Oceano (Ocean Office) overseen by Telmo Carvalho and Ana Amorim. IODP Portugal expresses a big thanks to Olga Dias for her dedication during many years (2001-2015). In addition, the Secretary of State for Science approved the nominations for the ECORD and ESSAC delegates and alternates. Luis Menezes Pinheiro (*right*) from the University of Aveiro, the former ESSAC Alternate, replaces Fernando



Barriga as ECORD Delegate and Telmo Carvalho as coordinator of FCT's Ocean Office becomes the ECORD Alternate. Antje Voelker (IPMA, Lisbon) is renewed as ESSAC Delegate and Cristina Veiga-Pires from the University of

the Algarve is appointed as ESSAC Alternate (*table page 17*).

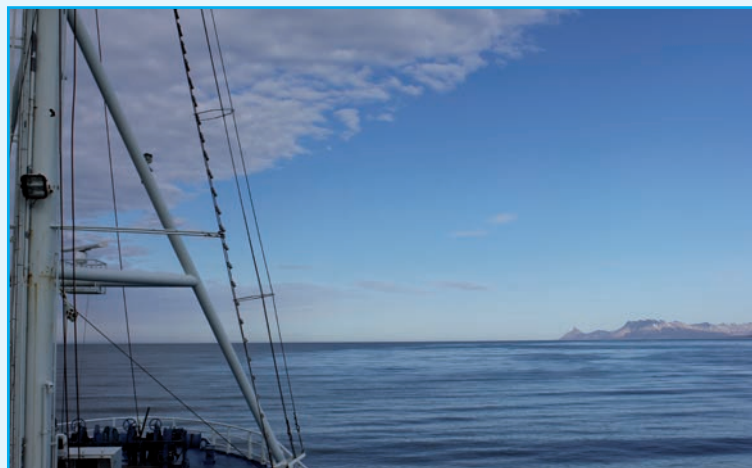
Outreach & Education. In early July, Helder Pereira from the Secondary School in Loulé successfully carried out the ECORD SOR 2015 (*page 9*) with many IODP Portugal scientists contributing to the presentations and exercises. IODP-related science and possibilities will be promoted to the Portuguese scientific community during the IODP Portugal Day on 3 November, organised together with the national Ciência Viva Agency at the Pavilhão de Conhecimento in Lisbon.

Antje Voelker, ESSAC Delegate - antje.voelker@ipma.pt - and Luis Pinheiro, Council Delegate - imp@geo.ua.pt

Norway

The Norwegian IODP community is happy to observe that lately several early-stage scientists from Norwegian research institutions have applied to participate in **IODP expeditions**. The Norwegian ECORD/ESSAC representatives will keep announcing and encouraging Norwegian participation.

*Katrine Husum, ESSAC Alternate
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Switzerland

On September 9, 2015, the 2nd **SwissDrilling Day** was held in Bern (*right*) and was a great success. This joint IODP/ICDP meeting provided a platform for Swiss-based scientists to share their experiences and future plans in ocean and continental drilling. Especially for early-career scientists, the meeting presented an opportunity to develop contacts, as well as to learn how to become an active member of the international scientific drilling community. About 40 participants from all Swiss academic institutions attended the meeting. The programme included oral presentations of ongoing scientific drilling related research, and reports on future drilling projects and perspectives for new drilling proposals. The presentations covered a broad range of topics from paleoclimate and paleoceanography, over biosphere frontiers to earth dynamics and hazards. One highlight of the meeting was the skype live chat with Daniel Ariztegui from the IODP workshop

on the Argentine Passive Volcanic Continental Margin, held at the same time in Buenos Aires. Daniel could provide some first-hand insights into the workshop's objectives and progress. A further highlight for the SwissDrilling community in 2015 is IODP Expedition 357 to the Atlantis Massif (*page 6*), with Gretchen Früh-Green as Co-chief Scientist and Stéphane Rouméjon, ETH Zurich, as a member of the Onshore Science Party.

The **Swiss community** continues to be active in representing ECORD in the advisory committees, with Andrea Moscariello as Chair of the ECORD Industry Liaison Panel, Stefano Benasconi on the MagellanPlus Steering Committee and Gretchen Früh-Green as ESSAC Chair. In July, Michael Strasser hosted a MagellanPlus Workshop on



Submarine Paleoseismology (page 22). This workshop brought together over 60 international scientists to the ETH Zurich to discuss and prepare an IODP proposal for MSP giant piston coring in the Japan Trench. Michi has now moved to the University of Innsbruck - we would like to sincerely thank him again for the years of enthusiasm and dedication to the SwissDrilling community and wish him all the best.

*Mareike Trauerstein, SwissDrilling
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Israel

ECORD Distinguished Lecturer Programme.

We are already in our third year of membership to ECORD and involved in many fronts. In early May 2015, the University of Haifa hosted Prof. Paola Vannucchi from the Royal Holloway University of London, as part of the ECORD Distinguished Lecturer Programme (*right*). Prof. Vannucchi's talk entitled "Understanding Megathrust Earthquakes through Ocean Drilling"

was well attended by a large crowd of students and scholars from all universities in Israel.

IODP Expeditions.

This ECORD Newsletter will be released shortly after Dr. Or Bialik (sedimentologist), who is a member of the Department of Marine Geosciences at the University of Haifa, sailed on Expedition 359 to the Maldives. This is the first time an Israeli scientist is participating in an IODP expedition and we are all excited. There have been



an increased number of applications by scientists based in Israel to use the infrastructure that IODP provides through ECORD and this scientific berth is a welcome result.

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Austria

IODP Expeditions. The Austrian IODP community continues to grow and involvement in IODP activities is constantly increasing. Walter Kurz (University of Graz) sailed on Expedition 352 Izu Bonin Mariana Forearc in summer 2014 as a structural geologist. Recently Gerald Auer (University of Graz) participated in Expedition 356 Indonesian Throughflow as a sedimentologist and micropaleontologist (*right*). For 2016, Ludovic Ferrière (Natural History Museum, Vienna) has been invited to participate in Expedition 364 Chicxulub Impact Crater.

As a result of participation in IODP expeditions three

projects of the Austrian National Science Fund (FWF) are currently active including 1 PostDoc and 4 PhD positions. These projects are dedicated to Expeditions 339 Mediterranean Outflow, 344 Costa Rica Seismogenesis Project, CRISP 2 and 352 Izu Bonin Mariana Forearc.

IODP Austria. Besides Austrian activities in the ECORD Council and ESSAC, Werner Piller (University of Graz) started a three-year term in 2015 as member of the Science sub-group in SEP and continues as a member of the MagellanPlus Steering Committee. In the latter position, Werner attended the workshop "Investigating Mediterranean-Atlantic Gateway Exchange" in Rabat, Morocco (*page 20*)



Gerald Auer onboard the JOIDES Resolution during Expedition 356 (photo Bill Crawford, IODP/JRSO).

as a watchdog. Another important point from an IODP perspective is that Michael Strasser, who was a very active IODP scientist when he was at ETH in Zurich, was appointed as full professor in sedimentary geology at the University of Innsbruck in October 2015 and we are confident that he will continue his IODP

activities and strengthen the Austrian community.

Werner E. Piller, ESSAC Delegate - werner.piller@uni-graz.at, Michael Wagreich, ESSAC Alternate - michael.wagreich@univie.ac.at, and Bernhard Plunger, ECORD Council Delegate - bernhard.plunger@oeaw.ac.at

Canada

Education & Outreach.

IODP-Canada had a successful booth shared with ICDP-Canada at the AGU-GAC-MAC-CGU Joint Assembly in Montréal on 3-7 May 2015 - <http://ja.agu.org/2015>.

IODP-Canada was pleased to provide summer school scholarships to Minasadat Seyedali (University of Victoria), Khalhela Zoeller (University of Ottawa), Anna Phillips and Man-Yin Tsang (University of Toronto). The PhD students attended one of the 2015 ECORD Summer Schools on ocean crust processes ([page 13](#)) in Bremen, Germany, and paleoclimatology in Urbino, Italy, ([right](#)), where they

were "stimulated to be more sceptical about individual evidence but be more creative to fit different evidence together."

IODP Expeditions.

Lucas Kavanagh (MSc graduate of McGill University, now STEM educator with Actua) was invited to sail as an Education Officer on Expedition 360 SW Indian Ridge Lower Crust and Moho (30 November 2015 - 30 January 2016). Dominique Weis (University of British Columbia) will participate as a geochemist during the Onshore Science Party



of Expedition 357 Atlantic Massif Serpentinization and Life (January-February 2016).

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Sweden

Meetings and Conferences. Sweden hosted two major ECORD-related activities after the Swedish Research Council hosted the Spring Council meeting in Stockholm in March. Firstly, the Department of Earth Sciences at Uppsala University hosted the ESSAC meeting on 18-20 May, during which Anthony Morris presented his DLP lecture "What can magnetism tell us about oceanic tectonics? New insights from scientific drilling" to an open audience. The meeting was followed by an excursion, led by Professor Graham Budd, to the impressive late Devonian impact crater that is now Lake Siljan.

The second activity was the 2nd Post-Cruise meeting of Expedition 347 Baltic Sea Paleoenvironment at Södertörn University on 28-29 September. This event was hosted by the Swedish Co-chief Scientist Dr Thomas Andrén and was followed by a Baltic Sea Colloquium on the 30 September, which



(photo Bill Crawford, IODP JRSO).

included a series of public lectures and a poster display about Baltic Sea research. Many of the expedition scientists took part in a regional excursion led by Professor Svante Björck, who took them across many of the impressive relic landforms and

deposits produced by the last glacial cycle.

IODP Expeditions. Nannofossil expert Jorijntje Henderiks sailed on IODP Expedition 356 Indonesian Throughflow and proudly stood at her workstation ([left](#)).

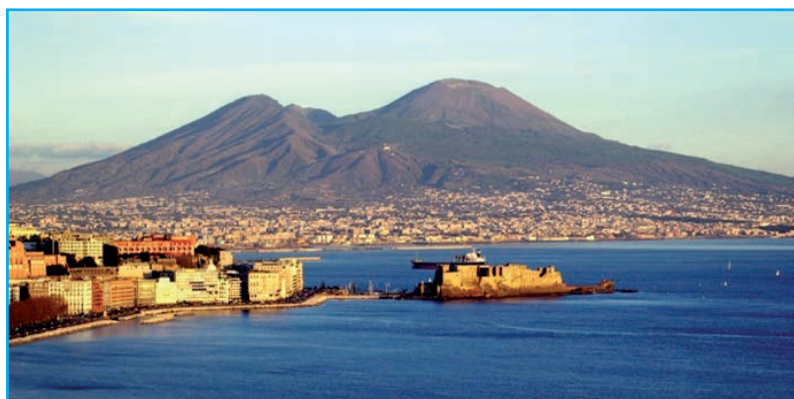
Sweden is planning a joint Arctic expedition with the USA in 2018, which will use the icebreaker *Oden*. Currently we are looking into the possibilities of combining this effort with the ECORD Arctic drilling planned for the same year and hope then to draw on the good experiences from the ECORD Arctic Coring Expedition (ACEX). The final decision will be based on interest from the Swedish research community, the logistic challenges of piggy-backing major expeditions, and how such a contribution will be received by ECORD.

Ian Snowball, ESSAC Delegate - ian.snowball@geo.uu.se and Magnus Friberg, Council Delegate - magnus.friberg@vr.se

Italy

IODP-Italy. After many years of difficulty for the Italian scientific community in finding adequate financial support for national participation in the past IODP programme (2003-2013), the new IODP phase (2013-2023) seems to have started under good auspices for IODP-Italy. Italian participation in ECORD is now fully and stably funded by the Ministry of Education, University and Research, with the administrative support of the National Research Council (CNR).

Since early this year, we have created an IODP national office and have selected Dr. Annalisa Iadanza as the IODP-Italy Science Coordinator. We are currently reorganising the IODP-Italy staff and national committee, addressing financial support to Italian scientists, and



planning a series of new actions, including outreach activities and restyling of the IODP-Italy web site. Thanks to this new initiative several Italian scientists have applied to participate in IODP expeditions, and some applications have been successful.

ECORD Meetings. IODP-Italy has recently hosted the Joint ECORD Council - ESSAC Meeting #3, held in Napoli (26-29 October 2015)

(above). The meeting programme included a field trip to the Southern Apennines led by Paolo Scandone, with an overview of tectonics and regional geology of the Campania - Lucania area and its Mesozoic shallow water carbonate and deep basin (Lagonegro) thrust units.

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The Netherlands



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Canada



Israel



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