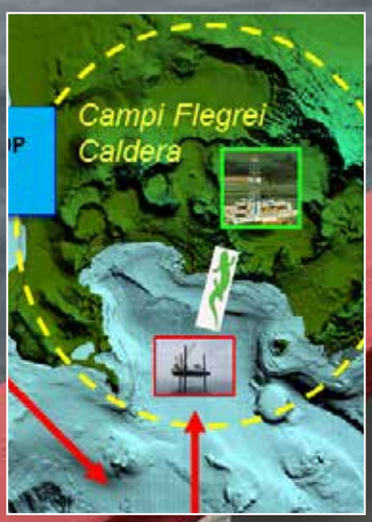
ECORD

EUROPEAN CONSORTIUM FOR
OCEAN RESEARCH DRILLING

ANNUAL REPORT 2017



ECORD
EUROPEAN CONSORTIUM FOR OCEAN RESEARCH DRILLING

IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

From 2003 to 2013, the European Consortium for Ocean Research drilling (ECORD) was part of the Integrated Ocean Drilling Program (IODP-1 2003-2013), which became the International Ocean Discovery Program in October 2013. ECORD coordinated the European contribution to the programme through the mission-specific platform (MSP) concept, which allowed the ocean research community to work in technically challenging conditions where the US drillship *JOIDES Resolution* and the Japanese drilling vessel *Chikyu* are unable to operate. The development of the MSP concept has therefore added a new dimension to ocean drilling.

The ECORD Science Operator (ESO) consortium has successfully managed five MSP expeditions for IODP-1 to the Arctic (2004), Tahiti (2005), New Jersey (2009), the Great Barrier Reef (2010), and the Baltic Sea (2013). ECORD's scientific and operational accomplishments have been prolific and of high quality, and are recognised by our global partners as a crucial contribution to the largest marine geosciences programme in the world.

The International Ocean Discovery Program (IODP-2), which started on 1 October 2013, builds on this legacy and addresses global challenges facing current and future generations with new research approaches, expanded scientific communities and continued development of its unique collaborative model.

In 2017, IODP involves scientists from 23 countries including the USA, Japan, China, South Korea, India, Australia, New Zealand, Brazil and 15 ECORD countries, including Canada.

ECORD funds and implements MSP operations for IODP as an independent platform provider, with the aim to carry out high-profile expeditions and to maintain the implementation of one expedition per year if funding allows for the duration of the 2013-2023 programme. MSPs might include specifically outfitted polar vessels, jack-up rigs, geotechnical vessels, seabed-drilling systems, long-piston coring, anchored barges and others, as determined by scientific priorities and operational efficiency. From 2015 to 2017, ESO has successfully managed three expeditions to the Atlantis Massif, the Chicxulub Impact Crater and the Rift of Corinth.

ECORD makes financial contributions to the US National Science Foundation (NSF) and to the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) for support and access to the *JOIDES Resolution* and the *Chikyu* respectively. Members of ECORD can therefore take part in all IODP expeditions that address research topics such as climate and ocean change, biodiversity, sub-seafloor life, origin of life, natural hazards on human time scales, as well as the internal structure and dynamics of our planet.

Front cover: *from left to right, ECORD Petrophysics Summer School 2017 (photo Sarah Davies); Location of the planned drillsites accross the coastline of the Campi Flegrei area (NW Napoli Bay); Erwan Le Ber (Petrophysics Staff Scientist) and Graham Tulloch (ESO) waiting to deploy a logging tool during Expedition 381 Corinth Active Rift Development (photo ECORD/IODP); cores of Expedition 381 are being prepared for refrigerated storage (photo D. Smith, ECORD/IODP). Background: a rainbow over the Gulf of Corinth seen from Fugro Synergy (photo D Smith, ECORD/IODP).*

Back cover: *The Fugro Synergy drilling in the Gulf of Corinth during Expedition 381 Corinth Active Rift Development (photo J. Everest, ECORD/IODP).*

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http://www.ecord.org

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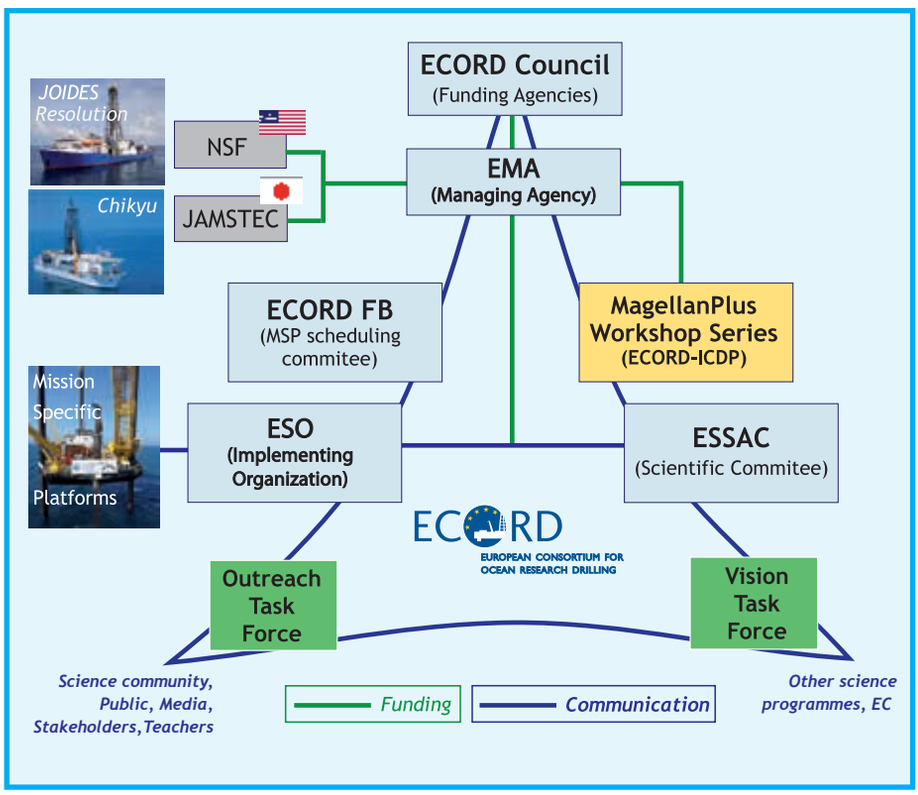
ECORD Annual Report 2017

1 January 2017 - 31 December 2017

Contents

ECORD entities

As defined in the ECORD Memorandum of Understanding, ECORD includes a Managing Agency **(ECORD Managing Agency - EMA)**, an Implementing Organisation **(ECORD Science Operator - ESO)**, three committees **(ECORD Council, ECORD Science Support and Advisory Committee - ESSAC and ECORD Facility Board - EFB)**, two task forces **(ECORD Vision Task Force - E-VTF and ECORD Outreach and Education Task Force - E-OETF)** and a specific workshop programme **(MagellanPlus Workshop Series Programme – MG+)** *(right)*.



The **ECORD Council** is the funding entity for ECORD. It oversees and approves a shared approach to IODP policy with membership from European and associate Funding Organisations.

Chair: Michael Webb (UK; 1 January to 31 December 2017)
Outgoing Vice-Chair: Magnus Friberg (Sweden; 1 January to 30 June 2017)
Incoming Vice-Chair: Guido Lüniger (Germany; 1 July to 31 December 2017)
Council Core Group: Magnus Friberg (Sweden), Eric Humler (France), Guido Lüniger (Germany), Marco Sacchi (Italy) and Michael Webb (UK)
http://www.ecord.org/about-ecord/management-structure/council/

Michael Webb is the Head of Marine Research at the UK's Natural Environment Research Council (NERC). He is responsible for developing and delivering large marine research programmes, and overseeing the programming of NERC's research ships and marine facilities. Before joining NERC in 1999, he did a coastal oceanography PhD at the University of East Anglia, followed by a postdoc at the University of Cambridge. Michael has been a member of ECORD Council since 2009.

The **EMA** is the management entity of ECORD and, on behalf of the ECORD Council, manages the participation of ECORD's members in IODP, represents the link between ECORD and the other IODP members, provides the central services for funds, and oversees the other ECORD entities.

Director: Gilbert Camoin (CEREGE, France)
Assistant Director: Nadine Hallmann (CEREGE, France)
Outreach Coordinator: Patricia Maruéjol (University of Lorraine, France)
Administrator: Patricia Rieu (CEREGE, France)
http://www.ecord.org/about-ecord/management-structure/ema/

Gilbert Camoin, PhD, DSc, is a senior research scientist at the Centre National de la Recherche Scientifique (CNRS) and currently works at the Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (CEREGE) in Aix-en-Provence, France. His research activities are mainly focused on the records of sea-level, environmental and climatic changes by coral reefs and other carbonate systems. He has authored more than 130 peer-reviewed papers and supervised

eleven PhD students and eight post-docs. He was appointed as Director of EMA in January 2012 and served previously as Chair of the ODP/IODP Environment Science Steering Evaluation Panel (2001-2005), Chair of ESSAC (2007-2009), Member of the IODP Science Planning Committee (2007-2010), and Member of the IODP Science Plan Writing Committee (2010-2011).

The **ESO** is a consortium of European scientific institutions formed to undertake mission-specific platform (MSP) expeditions for ECORD on behalf of IODP. It comprises the British Geological Survey (BGS), the MARUM - Center for Marine Environmental Sciences, University of Bremen, and the European Petrophysics Consortium (EPC). Each partner contributes specific expertise to ESO, allowing the consortium to build tailored expeditions to suit the requirements of proposals selected for implementation by the EFB. The BGS coordinates proposal scoping, expedition planning and project management, contracting of drilling services and vessels, operational oversight, and project permitting. MARUM manages the curation services and a scientific facility required by MSPs, provides data management services, and coordinates the implementation of the MSP Onshore Science Parties (OSP), hosted at the IODP Bremen Core Repository and laboratories of the University of Bremen. The EPC involves two European universities: University of Leicester (UK) and University of Montpellier (France). The consortium undertakes petrophysics research and combines borehole geophysics, laboratory experiments and geology through the provision of operational, technical and high-level scientific support for MSP expeditions. The EPC also has links into a larger international logging community that includes personnel at Lamont-Doherty Earth Observatory (USA) and the University of Tokyo (Japan).

Chair: Robert Gatliff (BGS, UK)
Science Manager: David McInroy (BGS, UK)
Operations Manager: Dave Smith (BGS, UK)
Expedition Project Managers: Gareth Carter (BGS, UK), Sophie Green (BGS, UK), Jeremy Everest (BGS, UK)
EPC Managers: Sarah Davies (University of Leicester, UK), Sally Morgan (University of Leicester, UK)
Petrophysics Staff Scientists: Johanna Lofi (University of Montpellier, France), Erwan Le Ber (University of Leicester, UK), Jenny Inwood (University of Leicester, UK)
Curation and Laboratory Manager: Ursula Röhl (MARUM, Germany)
BCR Superintendent: Holger Kuhlmann (MARUM, Germany)
Assistant ESO Curation: Patrizia Geprägs (MARUM, Germany)
Data Managers: Hans-Joachim Wallrabe-Adams (MARUM, Germany), Vera Bender (MARUM, Germany), Mary Mowat (BGS, UK)
Outreach Manager: Carol Cotterill (BGS, UK)
Media Relations: Ulrike Prange (MARUM, Germany)
http://www.ecord.org/about-ecord/management-structure/eso/

Robert Gatliff is the Director for Energy and Marine Geoscience at the British Geological Survey in Edinburgh, UK, and Chair of the ECORD Science Operator. Robert's expertise is based on basin analysis and seismic interpretation of the United Kingdom and he has led geophysics and drilling expeditions on the north-east Atlantic Margin.

David McInroy is Team Leader for Ocean Geoscience at the British Geological Survey in Edinburgh, UK, and is tasked with progressing deep-sea geoscientific research within the BGS Marine Geoscience Directorate. David is a geologist and geophysicist with a research background in the evolution and hydrocarbon prospectivity of the UK's Atlantic Margin, and has participated in geophysical data acquisition cruises on the UK's continental shelf. From 2003-2010, David was Expedition Project Manager for IODP Expeditions 302, 310 and 313, and since 2010 has held the role of ESO Science Manager.

The **ECORD Facility Board (EFB)** is the planning forum for MSP expeditions, including their scheduling, their operational and management oversight, and their long-term planning. This committee is composed of a Science Board, ECORD representatives (ECORD Council Core Group, the Director of EMA, the ESO Chair and Science Manager and the ESSAC Chair) and representatives from the US National Science Foundation (NSF) and the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT).

Chair: Gilles Lericolais (Ifremer, France
Vice-Chair: Gabriele Uenzelmann-Neben* (AWI, Germany)
Members of the Science Board: Gretchen Früh-Green* (ETH Zurich, Switzerland), Stephen Gallagher (University of Melbourne, Australia), Fumio Inagaki (JAMSTEC, Japan), Ellen Thomas* (Yale University, USA)
http://www.ecord.org/about-ecord/management-structure/efb/

** new members in 2017*

Gilles Lericolais is a marine geologist/ geophysicist at Ifremer since 1984. He has been Chief scientist on more than ten scientific cruises in different seas and oceans. He has led and coordinated various science projects such as the FP5 ASSEMBLAGE project and the FP6 HERMES Project dealing with the Black Sea sedimentary systems, the HYPOX FP7 project, EUROMARINE+ and DANCERS. He has been Head of the Laboratory of Sedimentary Environments of Ifremer from 2006 to 2011. GIlles has been in charge of the Ifremer project "Margins and Sedimentary Systems" and of the GOLO programme (Exxon-Mobil, Total, Ifremer). He has authored/co-authored 58 refereed publications. Gilles is Vice-chair of the European Marine Board, member of EurOcean and an alternate member of the Management Board and member of the Executive Committee of the JPI Oceans. He is one of the French representatives of the National board for the IOC of the UNESCO. In 2011, he was appointed as Director of the European and International Affairs of Ifremer. After being Chair of the IODP Site Survey Panel from 2008 to 2013, Gilles has been nominated Chair of the EFB from 2016 to 2018.

The **ESSAC** is the ECORD science committee and is responsible for the scientific planning and coordination of ECORD's contribution to IODP.
Chair: Jan Behrmann (GEOMAR, Germany)
Outgoing-Vice-Chair: Gretchen Früh-Green (ETH Zurich, Switzerland; 1 January to 31 August 2017)
Incoming Vice-Chair: Antony Morris (Plymouth University, UK; 1 September to 1 December 2017)
Science Coordinator: Hanno Kinkel (GEOMAR, Germany)
http://www.ecord.org/about-ecord/management-structure/essac/

Jan Behrmann is a Professor of Marine Geodynamics at GEOMAR Helmholtz Centre of Ocean Research in Kiel, Germany, and President of the German Geological Society - Geological Union. Jan has sailed on five ODP and IODP Expeditions, leading ODP Leg 141 Chile Triple Junction and IODP Expedition 308 Gulf of Mexico Hydrogeology as Co-chief Scientist. He also served on the JOIDES Tectonics Panel, the IODP Science Planning Committee, the IODP Operations Task Force, and on the Science Advisory Group of the International Continental Scientific Drilling Program (ICDP).

The **E-OETF** coordinates ECORD's communication tasks, such as outreach/public information and educational activities related to IODP in ECORD countries. The E-OETF is composed of the EMA Outreach Coordinator (Chair), the ESO Outreach Manager and Media Relations, the ESSAC Chair and Science Coordinator, the EMA Director and Assistant Director.

The **E-VTF** is the ECORD strategic entity in charge of developing a long-term scientific and funding strategy, and monitoring ECORD's progress towards achieving the objectives of the IODP Science Plan. The E-VTF is composed of the ESSAC Chair, the EMA Director and Assistant Director, the ESO Chair and Outreach Manager and the ECORD- ILP Chair.

MG+ is designed to support ECORD scientists in developing new and innovative science proposals to meet the IODP Science Plan challenges. This programme is co-funded by ECORD and the International Continental Scientific Drilling Program (ICDP).

Contact ECORD: http://www.ecord.org/contact-ecord/

ECORD and IODP meetings and conferences

The figure *page 5* summarises the ECORD and IODP meetings that have been held in 2017, as well as two major science conferences (EGU in Vienna, Austria, and AGU in New Orleans, USA) where IODP-related scientific sessions and exhibition booths have been organised.

The **ECORD Council** meets twice a year with a spring meeting (Amsterdam, The Netherlands) involving the Council and the Chairs and Directors of ECORD entities, and a fall meeting organised jointly with ESSAC (Southampton, UK) and attended by representatives of all ECORD entities as well as representatives from our IODP partners (funding agencies, operators and science committees) and collaborating science programmes.

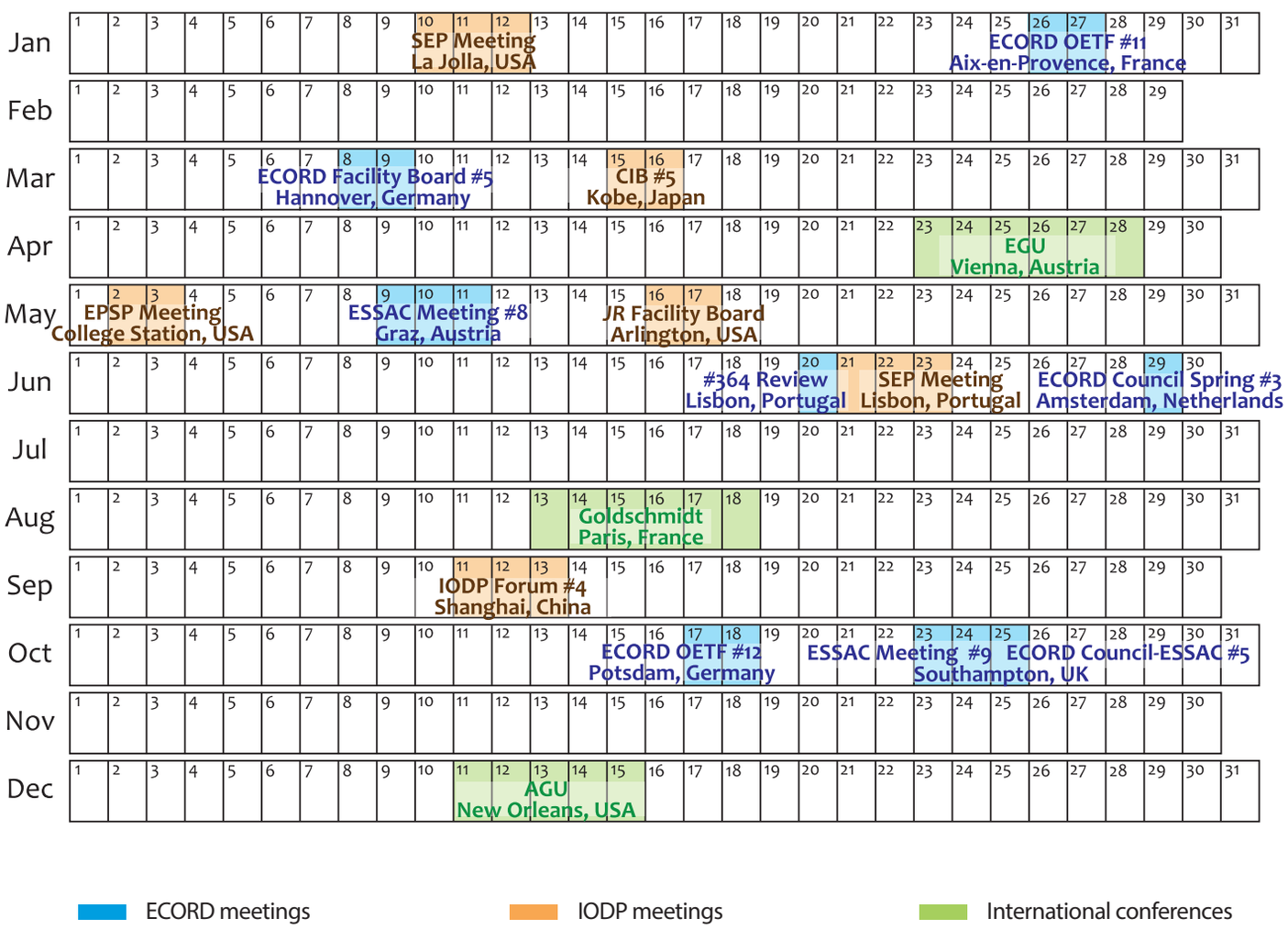
The **ESSAC** meets twice a year with a spring meeting (Graz, Austria) involving the ESSAC Delegates and EMA and ESO representatives. The ESSAC fall meeting (Southampton, UK) was organised jointly with the ECORD Council.

The **E-OETF** meets twice a year with a spring meeting (Aix en Provence, France). Outreach colleagues from the US Science Support Program, CDEX/JAMSTEC (Japan) and ICDP attended the E-OETF fall meeting (Potsdam, Germany) in order to enhance coordination between ECORD, ICDP and IODP partners.

ECORD sends representatives to IODP meetings: the *JOIDES Resolution* Facility Board (JRFB) and the *Chikyu* IODP Board (CIB) meetings, the Science Evaluation Panel (SEP), the Environmental Protection and Safety Panel (EPSP) and the IODP Forum meetings *(see 10. ECORD participation in IODP panels, page 75)*.

Calendar of events: http://www.ecord.org/events-calendar/

Calendar of ECORD / IODP meetings and conferences in 2017



Eclogite - Field excursion of the ESSAC meeting, Graz, Austria, May 2017 (photo H. Kinkel).

1. 2017 highlights

ECORD is a unique European distributed research infrastructure that connects research facilities at multiple sites across Europe. The ECORD research facilities are engaged in the multidisciplinary aspects of the sub-surface scientific research and have a long-standing culture of cooperation on science, technology and education.

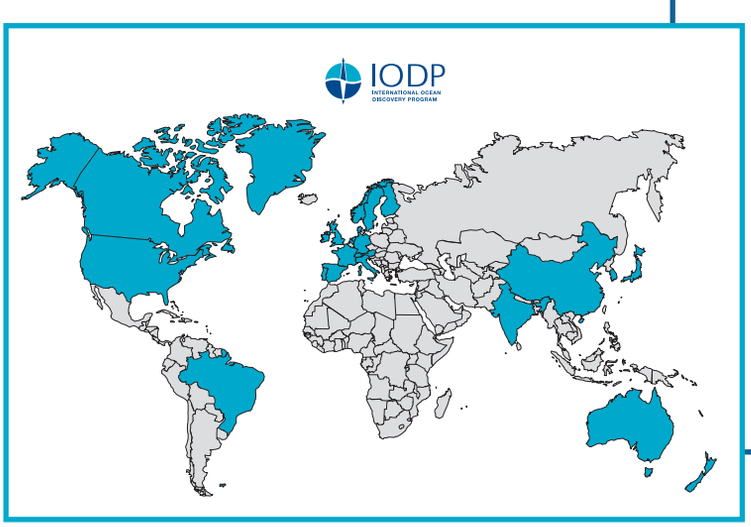
ECORD combines research, education and innovation and offers a unique portfolio of science and educational activities, world-class capabilities, state-of-the-art technology and remarkable knowledge-based resources to the European earth and environmental science community.

In 2017, the ECORD research infrastructure has developed all its capabilities, especially with the successful completion of the offshore phase of the mission-specific platform (MSP) Expedition 381 Corinth Active Rift Development, the organisation of five MagellanPlus workshops and the training of more than 150 students and early-career scientists in ECORD Summer Schools and Training Course. The outstanding intellectual contribution of the ECORD scientists to IODP is reflected by the involvement of 428 scientists in active IODP proposals, the participation of 53 ECORD scientists on six IODP expeditions and the publication of more than 180 papers related to ocean drilling programmes. In parallel, ECORD has ensured all the tasks related to its status of IODP Platform Provider, including the maintenance of sustainable sample and data curation facilities at the Bremen Core Repository and the promotion of ECORD and IODP activities and accomplishments to large audiences.

ECORD has started in 2017 to prepare the second phase (2019-2023) of IODP through its external evaluation and the revision of its Memorandum of Understanding and its partnership with the US National Science Foundation (NSF). Based on the well-established operation of the ECORD infrastructure, its successful implementation, its competitiveness in the international research landscape and maximum return from the investment, ECORD sees its future with confidence, 50 years after the first scientific ocean drilling operations by the *Glomar Challenger* in the Gulf of Mexico (DSDP Leg 1).

ECORD membership and ECORD post-2018 renewal

In 2017, ECORD has entered a three-step process that should lead the current fifteen ECORD member countries *(below)* to commit to the second phase (2019-2023) of IODP before the end of 2018.



Left, IODP member countries, as of December 2017; right, 15 ECORD member countries, as of December 2017 - ***http://www.ecord.org/about-ecord/about-us*** *(maps credit: http://histgeo.ac-aix-marseille.fr).*

The first step of this process consisted in an **evaluation of the ECORD activities** that was conducted from January to June 2017 by an ECORD External Evaluation Committee (EEC) composed of

- Helmut Weissert (Chair, Switzerland),
- Maria Ask (Sweden),
- Adrian Immenhauser (Germany),
- Eystein Jansen (Norway),
- Ralf Littke (Germany),
- Patrick Pinet (France),
- Katherine Richardson (Denmark),
- Johan Robertsson (Switzerland).

The report that was delivered soon after the general meeting that was held on 6-8 June 2017 at the MARUM, Bremen, Germany, covers all aspects of ECORD activities (science, technology, management, education and outreach). The EEC's conclusions especially highlight the ECORD's scientific and operational excellence in the international research landscape during the first phase of IODP (2013-2018), the need to sustain this unique and global research structure, and the need for ECORD to maintain its strengths in being able to finance and implement high-profile MSP expeditions. This evaluation report also includes a series of recommendations concerning various fields (science, education, outreach) that the ECORD Council has considered at its spring meeting that was held on 29 June 2017 in Amsterdam, The Netherlands. Among these recommendations, the ECORD Council has decided that EMA and ESO will be administered by the Centre National de la Recherche Scientifique (CNRS) and the British Geological Survey (BGS) respectively, until the end of IODP - http://www.ecord.org/about-ecord/about-us/

The second step of this process has included a revision of the ECORD MoU managed by EMA and based on an internal reappraisal of ECORD's functioning during the first phase of IODP, as well as recommendations made by the EEC. The different ECORD entities have revised their Terms of Reference and EMA has worked in close collaboration with the ECORD Council to produce the 2019-2023 ECORD MoU that will be distributed to the ECORD Funding Agencies for approval and signature in 2018.

The third step of the ECORD post-2018 renewal consisted of a revision of the MoU between ECORD and the NSF defining the financial and operational agreement regarding ECORD's membership in the *JOIDES Resolution (JR)* Consortium and, in reciprocity, the access of our partner' scientists to MSP expeditions during the second phase of IODP. The discussions between EMA and the NSF led to a formal agreement that was approved by the ECORD Council at its spring 2017 meeting. Overall, there will be no significant change in ECORD scientists' participation to the *JR* expeditions during the second phase of the current programme since the agreed slight reduction in ECORD berths (7 vs. 8 on each expedition) and incorporation of Co-chief Scientists in quota calculations will be compensated by the ten months of *JR* operations that are planned annually until of the end of IODP.

The MoU linking ECORD and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) and concerning the ECORD's participation to the *Chikyu* Program will not be revised as this MoU was signed in 2013 for the whole duration of IODP. The scheduling of an engineering riserless expedition (380 NanTroSEIZE Frontal Thrust LTBMS) and of a riser drilling expedition (358 NanTroSEIZE Riser Hole at C0002) in early 2018 and late 2018-early 2019 respectively, will materialise a continuity in *Chikyu* operations throughout the renewal time window.

In parallel to the implementation of its renewal processes, ECORD has continued to communicate with former ECORD member countries (*e.g.* Belgium, Israel) and other countries

The ECORD External Review Committee and ECORD participants at the June meeting in Bremen (photo Volker Diekamp, MARUM)

(*e.g.* currently Turkey and Greece) to extend the current size of the Consortium.

ECORD budget

Exclusively its 15 member countries currently fund ECORD. In FY17, the total ECORD budget provided by 15 member countries amounted to about 17.6M USD, showing a slight increase of about 30K USD compared to the FY16 budget. Italy increased its annual contribution from 400K to 500K USD; Canada kept a minimum contribution in 2017 whilst identifying new funding sources for the future. The exchange rates between the US dollar and the national currency contributions have been more beneficial than last year to France, Denmark, Spain and Ireland, but affected significantly the UK contribution *(see 9. FY17 and FY18 budgets, pages 69-70)*.

In 2017, the ECORD running costs were very stable, amounting to approximately 15% of the member country contributions, leaving 85% of the ECORD budget for direct operational costs, including the implementation of the MSP Expedition 381 Corinth Active Rift Development and a contribution of 7M USD to the NSF to support *JR* operations.

The ECORD annual budget must be seen as a minimum budget as there are opportunities for IODP member and non-member countries to provide external co-funding and/or in-kind contributions for MSP expeditions (*i.e.* direct operational facilities and services that ESO would normally pay for) in exchange of extra science party positions. ECORD intends to generalise in-kind and external co-funding to implement future MSP expeditions.

In August 2017, the new Distributed European Drilling Infrastructure (DEDI) EC H2020 Proposal with Achim Kopf (MARUM, Bremen) as Principal Investigator (PI) was unsuccessful in winning funds. DEDI was proposed to further enhance scientific investigation of the sub-surface through provision of transnational access to cutting edge technologies and proven scientific services to the European earth and environmental scientific communities. DEDI was also designed to foster and improve European collaboration between DEDI partners, research groups and programs, EC-funded infrastructures in the field of Earth and environmental sciences, as well as industry in the development and sharing of new, innovative technologies for specialist sub-surface sampling, measurements, downhole logging and long-term monitoring. Five DEDI partners were directly involved in ECORD through ESO and EMA (BGS - Coordinator, MARUM, University of Leicester, CNRS Montpellier and CEREGE). The proponents will maintain their partnership to be ready to apply for future funding opportunities.

Offshore scientists in Corinth port (Greece) (photo C. Cotterill, ECORD/ IODP).

The ECORD budget showed a positive balance of about 9.6M USD at the end of 2017 and this sum has been carried forward to the ECORD FY18 budget.

Mission-specific platform expeditions

MSP expeditions are an ECORD's landmark since 2004 and ECORD is one of the three IODP Platform Providers since 2013.

From 22 October to 18 December 2017, ESO has successfully implemented the offshore phase of **Expedition 381 Corinth Active Rift Development** *(see 2. Operating and participating in MSP expeditions, pages 20-24)* with Lisa McNeill (ECORD-UK) and Donna Shillington (USA) as Co-chief Scientists and 14 ECORD scientists; four Greek scientists were involved in the Science Party in compensation of the IKC provided by their country and as an incentive for a potential future Greek ECORD membership. Expedition 381 was the third MSP expedition implemented by ECORD for IODP, after Expedition 357 Atlantis Massif Serpentinization and Life (2015) and Expedition 364 Chicxulub K-Pg Impact Crater (2016). The operational review of **Expedition 364 Chicxulub K-Pg Impact Crater** was held on 20 June 2017 in Lisbon, Portugal *(see 3. Anticipating future mission-specific platform expeditions, page 27)*. The operational review committee has congratulated the Co-chief Scientists and all the Science Party Members for this very successful MSP expedition, which was the first IODP expedition to drill the only intact crater peak ring.

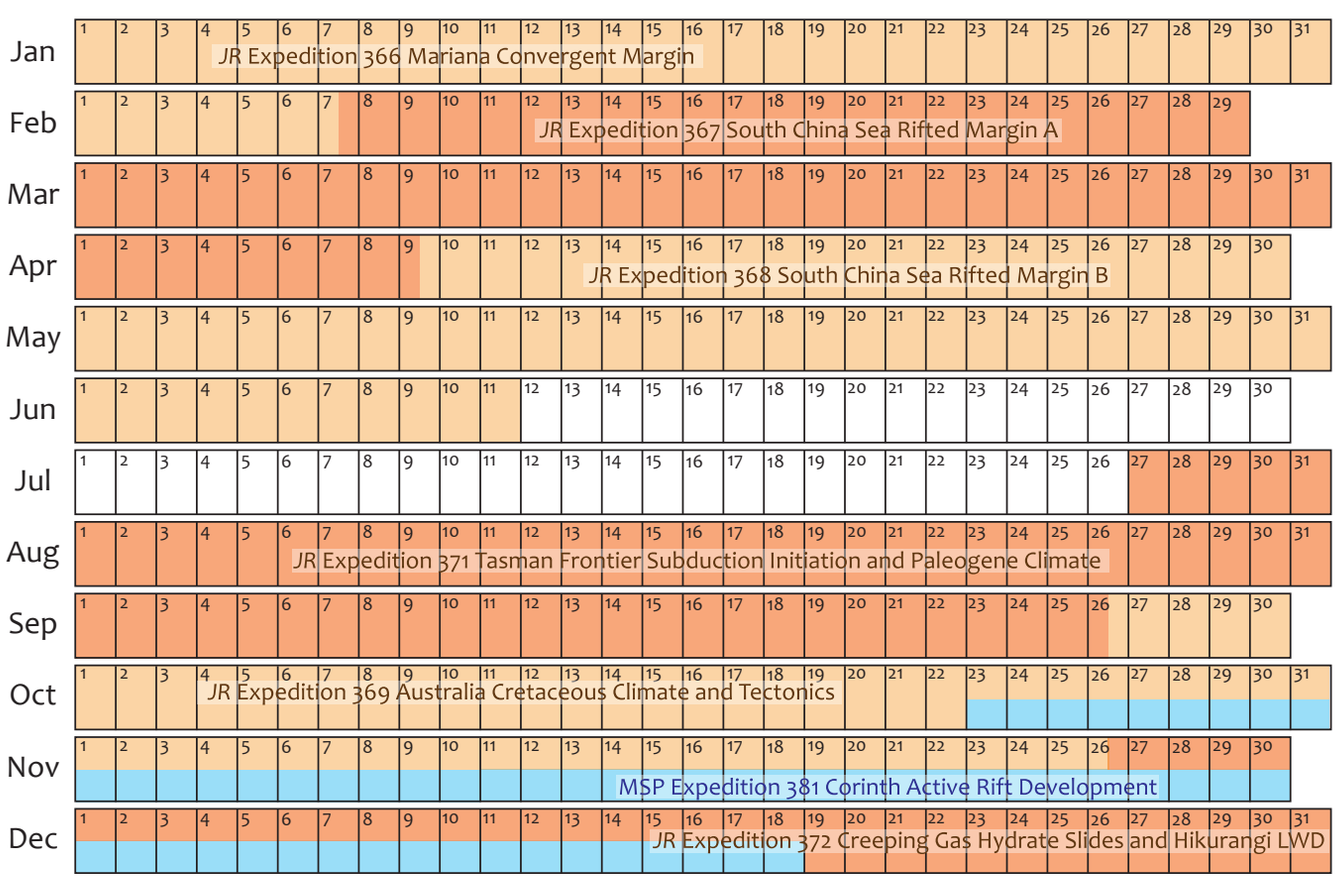
In September 2017, ESO had regrettably announced the cancellation of **Expedition 377 Arctic Ocean Paleoceanography (ArcOP)**, which was scheduled for August to October 2018, as the expected Russian IKC related to additional ice-breaking capability that was essential for the implementation of this expedition has not materialised. With this cancellation and the postponement of Expedition 373 Antarctic Cenozoic Paleoclimate to 2020, the EFB will have to adjust the previously defined long-term MSP scheduling strategy at its next meeting that will be held in Venice, Italy on 6-7 March 2018. Such a long-term scheduling strategy will be largely based on the scientific excellence of drilling/coring proposals, the required drilling technology, and, importantly, the available annual budget for expeditions including opportunities for IKCs. ECORD anticipates that the implementation of future MSP expeditions will require a mix of in-kind and external co-funding, especially for complex and costly multi-platform expeditions, such as Expedition 377. ECORD will actively seek in-kind contributions and also encourage the community to help ECORD in seeking these opportunities.

The JOIDES Resolution returns from Expedition 371 (photo Brian Huber and IODP).

ECORD partnership: *JOIDES Resolution* expeditions

IODP expeditions - http://www.iodp.org/expeditions - provide ECORD scientists with an excellent opportunity to participate in international multidisciplinary ocean drilling projects and to have priority access to unique samples and data. ECORD, as a contributing member of the *JR* consortium, is entitled to an average of **eight scientists**

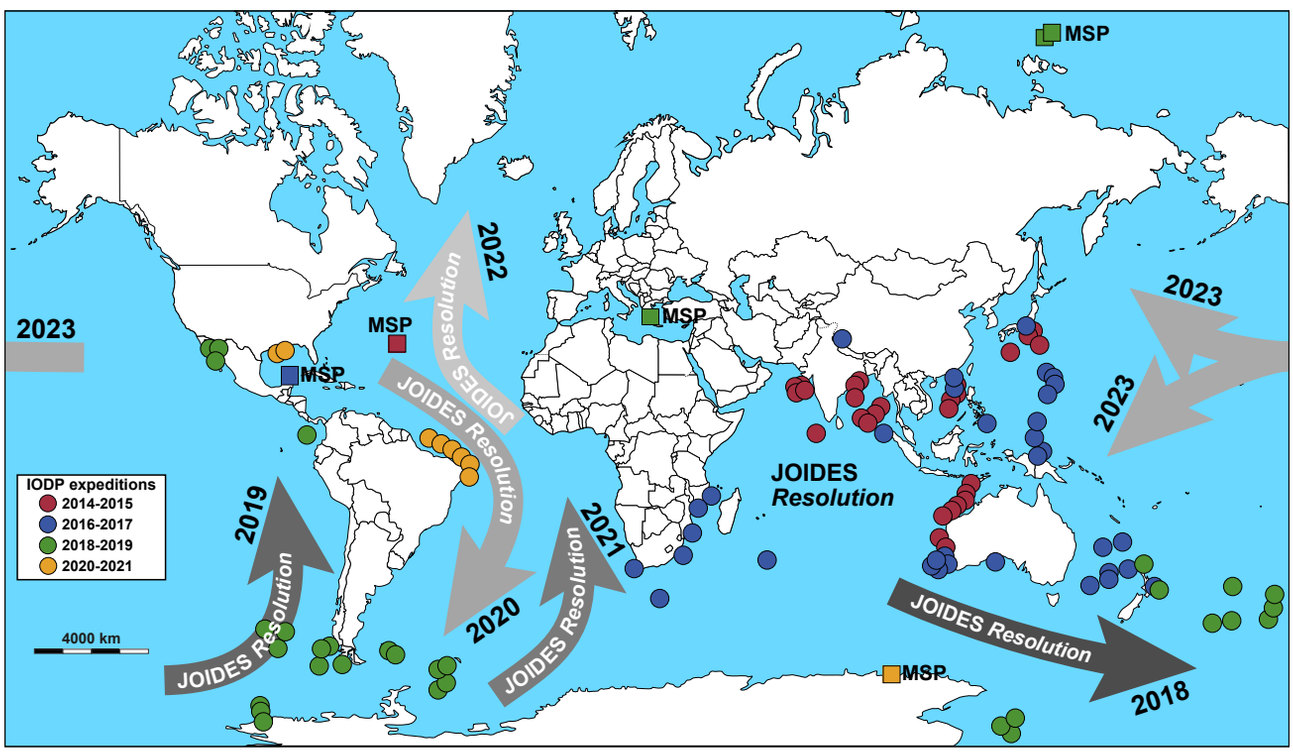
IODP expeditions in 2017



on every JR expedition with the exception of expeditions based on Complementary Project Proposals (CPP), such as the two South China Sea expeditions *(page 10)* for which a reduced contingent of berths is available for scientists from ECORD member countries.

Thirty-nine ECORD scientists, including two Co-chief Scientists and 51% of early-career scientists, were invited to participate in five expeditions that were implemented in 2017 by the *JOIDES Resolution* *(see 4. Participating in 2017 JOIDES Resolution expeditions, pages 33-37)*:

- Expeditions 367 and 368 South China Sea Rifted Margin (7 February - 9 April 2017 and 9 April - 11 June 2017) aimed at understanding the mechanisms of lithosphere extension during continental breakup at a non-volcanic rifted margin;
- Expedition 371 Tasman Frontier Subduction Initiation and Paleogene Climate (27 July - 26 September 2017) to evaluate the potential link between a period of high-amplitude long-wavelength compression and the initiation of the Tonga-Kermadec subduction, or to identify alternative geodynamic processes;
- Expedition 369 Australia Cretaceous Climate and Tectonics (26 September - 26 November 2017) to understand the palaeoceanography and tectonics of the Naturaliste Plateau and Mentelle Basin off SW Australia;
- Expedition 372 Creeping Gas Hydrate Slides and Hikurangi LWD (26 November 2017 - 4 January



Implemented and scheduled IODP expeditions in 2014-2020. Planned JOIDES Resolution ship track for 2020-2023.

2018-2019 IODP JOIDES Resolution expeditions

Expedition	#	Dates	Ports
Ross Sea West Antarctic Ice Sheet History	374	4 Jan. - 8 March 2018	Lyttelton/ Lyttelton
Hikurangi Subduction Margin Observatory	375	8 March - 5 May 2018	Lyttelton/Auckland
Brothers Arc Flux	376	5 May - 5 July 2018	Auckland/ Auckland
South Pacific Paleogene Climate	378	14 Oct. - 14 Dec. 2018	Lyttelton/Papeete
Amundsen Sea West Antarctic Ice Sheet History	379	18 Jan. - 20 March 2019	Punta Arenas/Punta Arenas
Iceberg Alley Paleoceanography / S Falkland Slope Drift	382	20 March-20 May 2019	Punta Arenas/Punta Arenas
Dynamics of Pacific Antarctic Circumpolar Current	383	20 May-20 July 2019	Punta Arenas/Valparaiso
Panama Basin Crustal Architecture (504B) & Eng. Testing	384	20 July-19 Sept.2019	Valparaiso/San Diego
Guaymas Basin Tectonics and Biosphere	385	19 Sept. - 19 Nov. 2019	San Diego/ San Diego

2018), which aimed at investigating the relationship between gas hydrate and underwater landslides and at characterising sediment and fault zone structures and physical properties associated with recurring shallow slow-slip events along the Hikurangi subduction interface.

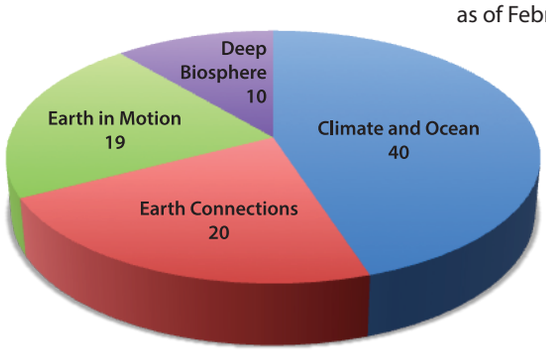
The JR Facility Board (JRFB) has scheduled nine *JR* expeditions in the Pacific and Southern Ocean before the end of 2019 *(page 11)* when the vessel will enter the Gulf of Mexico to implement Expedition 386 Gulf of Mexico Methane Hydrate (21 January - 22 March 2020). The most probable scenario considered by the JRFB involves a ship track in the Atlantic Ocean, the Mediterranean, Caribbean, and the Gulf of Mexico during most of the second phase (2020-2023) of IODP *(page 11)*. The proposal pressure concerning these regions is expected to increase significantly in the coming years and for which the ECORD science community will certainly play a pivotal role.

Anticipating future IODP expeditions

A fairly constant number of new IODP proposals has been submitted in 2017 compared to 2016 (20 vs. 19), especially in October 2017 when fourteen new proposals were submitted, thus demonstrating a strong scientific demand and a sustained involvement of the scientific community in IODP science.

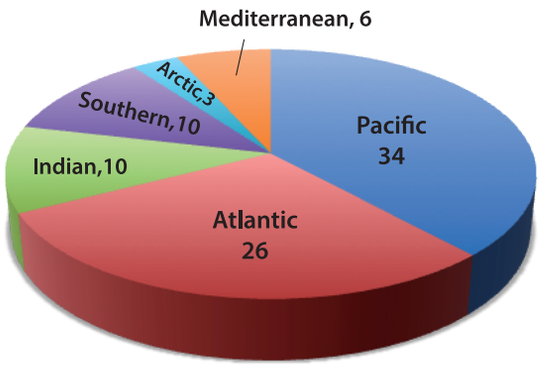
There are currently **89 active IODP proposals** in the archives of the Science Support Office (as of 1 February 2018). Their distribution across the Science Plan themes demonstrates a good proposal pressure in all objectives of the Science Plan *(below)* and rather constant ratios between the themes: 45% of the proposals are in the Climate and Oceans Theme, whilst the other proposals are in the Earth Connections (22.5%), Earth and Motion (21.3%), and Biosphere (11.2%) themes.

as of February 2018



Distribution of active proposals (n = 89) by IODP Science Plan themes.

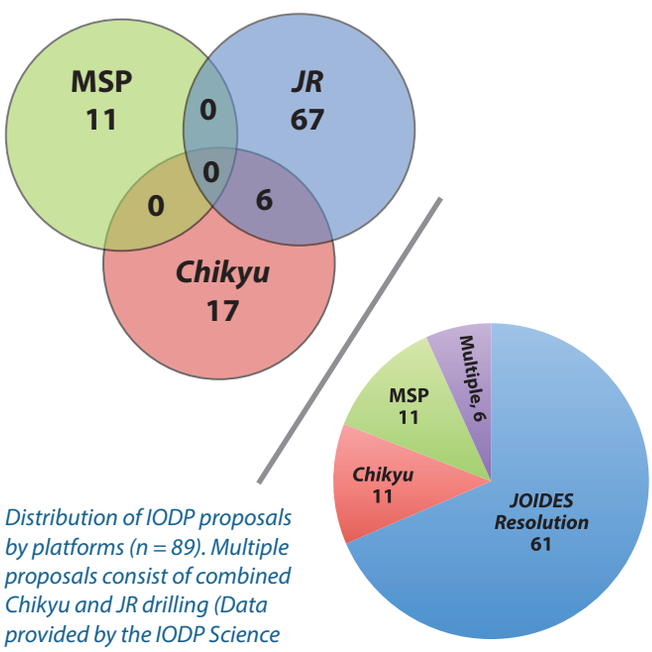
as of February 2018



Distribution of active proposals (n = 89) by target ocean.

Regarding the geographical distribution of active proposals *(above)*, the increasing number of drilling proposals in the Atlantic and the Mediterranean compared to 2016 (26 vs. 23 and 6 vs. 5 respectively) reflects partly the proposal pressure that could be expected from the planned 2019-2023 *JR* ship track *(page 11)*.

The distribution of the 89 active IODP proposals across the various IODP platforms is rather constant compared to 2016 despite a slight decrease in the number of MSP proposals. There are 61 *JR* proposals (68.5%), 11 *Chikyu* proposals (12.4%), 11 MSP proposals (12.4%; *see 3. Anticipating next MSP expeditions, page 29*), and six multiple proposals (6.7%) involving the *JR* and the *Chikyu (below)*. Forty of these proposals are residing at the appropriate Facility Boards ready to be selected for drilling (26 for the JRFB, nine at the *Chikyu* IODP Board and five at the EFB).



Distribution of IODP proposals by platforms (n = 89). Multiple proposals consist of combined Chikyu and JR drilling (Data provided by the IODP Science Support Office as of February 2018).

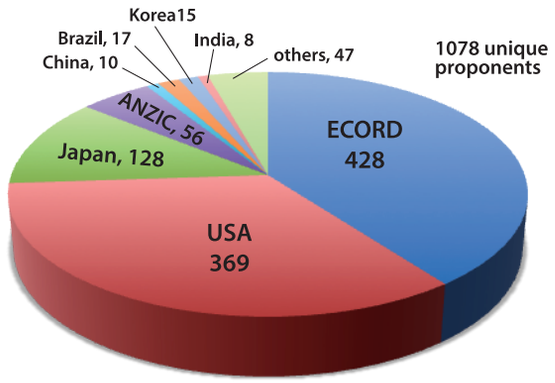
The eleven active MSP proposals that are residing at the EFB and the Science Evaluation Panel (SEP) may form partly the basis of the operational plan that will be defined for the second phase of the current programme *(see 3. Anticipating next MSP expeditions, page 28)*. The objectives of the MSP proposals are quite diverse in terms of science topics (climate and sea-level change, geohazards, hydrogeology, deep biosphere), drilling systems (drill ships, jack-up rigs, seafloor drills, long-piston coring) and geographical areas (Atlantic, Pacific, Arctic and Southern oceans, Mediterranean Sea, Japan Sea), thus demonstrating the great opportunities provided by the MSP concept to IODP. These proposals include an Amphibious Drilling Proposal (796-ADP NADIR: Nice Amphibious Drilling) whose scientific objectives can only be accomplished by combining land and shallow-water drilling, this exemplifies the necessary closer collaboration between ICDP and IODP, especially through ECORD given that most ADPs will likely involve MSP operations.

Four of the six proposals residing at SEP, including a Multi-phase Drilling Proposal (863-MDP ISOLAT Southern Ocean Paleoclimate) involving long piston-coring technology, did not get any action from their proponents since several years and could be deactivated soon. A higher MSP proposal pressure including different science themes and involving various potential drilling/coring systems in diverse environments would be desirable to provide additional scientific, operational and funding opportunities in the near future.

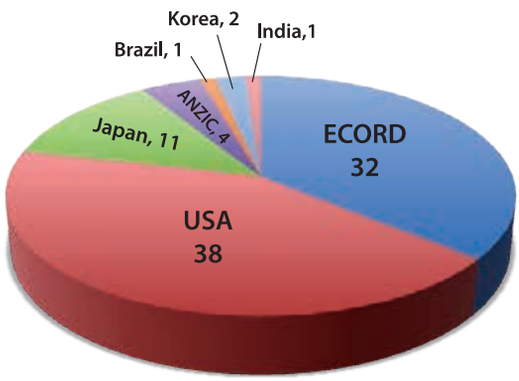
ECORD is providing a huge contribution to the scientific efforts within IODP, as ECORD has a leading role in proposal submission in IODP since 2014 with fairly constant percentage of unique proponents (37 to 40%). Currently, **428 ECORD scientists out of 1078 unique proponents** *(i.e.* 40%), including 32 Lead Proponents, are proponents of active IODP proposals *(above right)*. The wealth of ECORD-led active IODP proposals partly relies on the success of the ECORD-ICDP MagellanPlus Workshop Series Programme *(see 7. Engaging the community, pages 55-57)*, which provides a substantial support to ECORD scientists to develop innovative drilling proposals concerning diverse scientific topics addressed by the three IODP platforms and the ICDP infrastructure.

Valorising IODP science

The outstanding intellectual contribution of the ECORD scientists to IODP is also reflected by the valorisation of cutting-edge results *(see 5. Selected 2017 IODP publications from ECORD scientists, pages 39-49)*. With almost 8000



Distribution of IODP active proposals (n = 89) by proponent's member affiliation.



Distribution of IODP active proposals (n = 89) by Lead Proponent's member affiliation.

serial publications reported in the Scientific Ocean Drilling Bibliographic Database and related to the successive ocean drilling programmes from 1969 through June 2017 (Deep Sea Drilling Project, the Ocean Drilling Program, the Integrated Ocean Drilling Program-IODP-1, and the International Ocean Discovery Program-IODP-2), the ECORD science community demonstrates its leading role in the international geoscience landscape *(table page 14)*.

The programme (Expedition Reports, post-expedition research data reports, and *Scientific Drilling* papers) and non-programme serial publications for all completed IODP-1 and IODP-2 expeditions at the end of June 2017 (Expeditions 301-368, *page 15*) demonstrate that the MSP expeditions, which represent by number less than 10% of all IODP expeditions, have generated a significant proportion of the peer-reviewed scientific publications arising from the programme. Furthermore, the list of the most-cited IODP expedition-related papers as of July 2017 illustrates the high-impact and high-quality science achieved by MSP expeditions *(table page 15)*. However, both figure and table *page 15* do not yet include the high scientific return expected from the most recent MSP

Serial publication authorship by first author, contributing country, contributing authors and total contributions (1969-2017)

Member country or consortia	First authors of serials	Serial contributions by country	Serial contributions by author	Total contributions
Australia-New Zealand Consortium	298	273	330	628
Australia	173	180	205	378
New Zealand	125	93	125	250
Brazil	20	17	18	38
China	363	125	155	518
ECORD	3,967	3,073	3,941	7,908
Austria	13	18	18	31
Belgium	43	43	47	90
Canada	318	224	274	592
Denmark	48	70	74	122
Finland	8	6	6	14
France	595	496	694	1,289
Germany	940	620	814	1,754
Ireland	5	13	15	20
Israel	21	6	6	27
Italy	260	217	277	537
Netherlands	206	217	277	537
Norway	134	112	127	261
Poland	16	4	4	20
Portugal	10	26	29	39
Spain	137	141	177	314
Sweden	100	80	80	180
Switzerland	129	108	117	246
United Kingdom	984	750	1,031	2,015
India	168	33	34	202
Japan	651	537	1,260	1,911
Korea	42	45	50	92
United States	3,823	1,663	3,427	7,250
Total papers	**9,332**			**18,547**

Expeditions 357, 364 and 381, which will further enhance the combined scientific output of MSP expeditions.

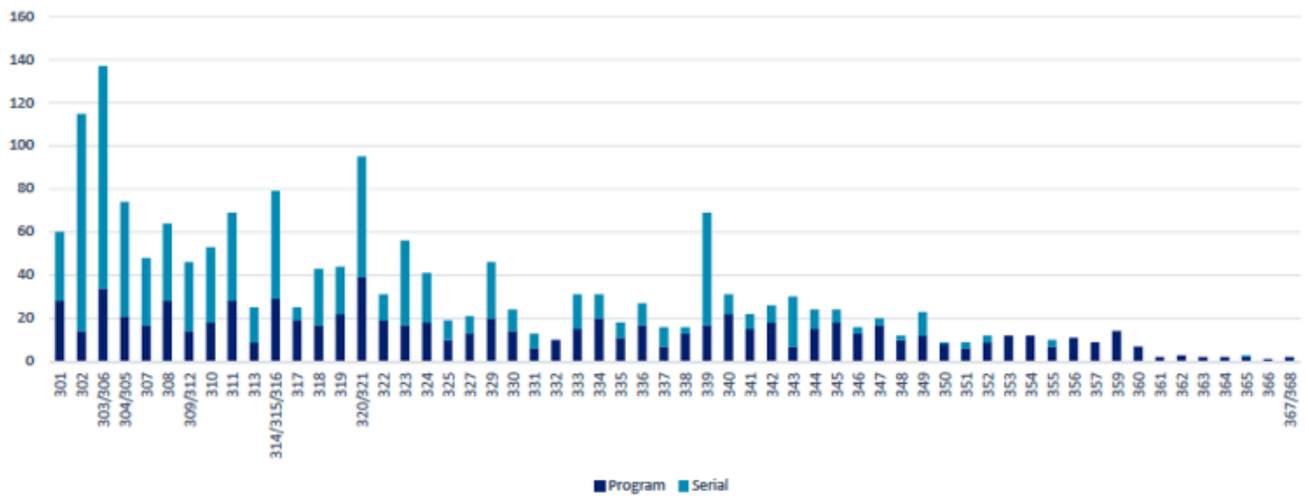
Managing knowledge-based resources

IODP and ECORD implement a sustainable sample and data curation management plan of data conservation and provision to the science community. Hundreds of kilometres of cores, other types of samples (fluids, biota) and data have been acquired and stored in three core repositories (Gulf Coast Repository-GCR, College Station, USA; Kochi Core Center-KCC, Kochi, Japan; Bremen Core Repository-BCR, Bremen, Germany) where they are made accessible to the international community. The BCR currently contains 156,18 km of deep-sea cores from 90 expeditions. All BCR samples (over 1.66 million samples) are entered into a database that is accessible to the general public for post-moratorium samples. In 2017, a total of 32,706 samples were taken at the BCR for 249 requests including 131 requests submitted by ECORD scientists *(see 6. Archiving IODP cores: the Bremen Core Repository, page 51)*. ECORD has developed several databases in order to make available to the science community all the necessary information to the development of drilling proposals and to allow the scientists to get access to the data collected during the drilling expeditions and keep track of ECORD activities in IODP.

Engaging the community

The portfolio of science and educational activities that ECORD has developed over the last years has been very effective in 2017 with high demand from scientists, students, early-career scientists and members from education *(see 7. Engaging the community, pages 57-63)*.

The continuous funding of the **ECORD-ICDP MagellanPlus Workshop Series Programme** expresses the strong



Publication records for Expeditions 301–368 (2003–2017) as of June 2017 - MSP expeditions are Expeditions 302, 310, 313, 325, 347, 357, 364

Top cited IODP expedition–related papers as of July 2017

Expedition	Serials	Times cited
301	https://dx.doi.org/10.1038/nature07174	417
302	https://dx.doi.org/10.1038/nature04668	508
	https://dx.doi.org/10.1038/nature04800	458
	https://dx.doi.org/10.1029/2008GL033520	402
303/306	https://dx.doi.org/10.1016/j.epsl.2005.06.020	276
304/305	https://dx.doi.org/10.1093/petrology/egm021	249
309/312	https//:dx.doi.org/10.1126/science.1126090	153
310	https:dx.doi.org/10.1038/nature10902	261
	https//:dx.doi.org/10.1126/science.1180557x	215
314/315/316	https//:dx.doi.org/10.1126/science.1147195	269
319	https//:dx.doi.org/10.1146/annurev-earth-040610-133408	149
323	https//:dx.doi.org/10.1073/pnas.1203849109	299

Most of them are in the top journals by impact factor. MSP expeditions are Expeditions 302 and 310.

ECORD's support to its scientists to develop innovative drilling proposals concerning diverse scientific topics for any of the three IODP platforms and the ICDP infrastructure - http://www.ecord.org/science/magellanplus/.

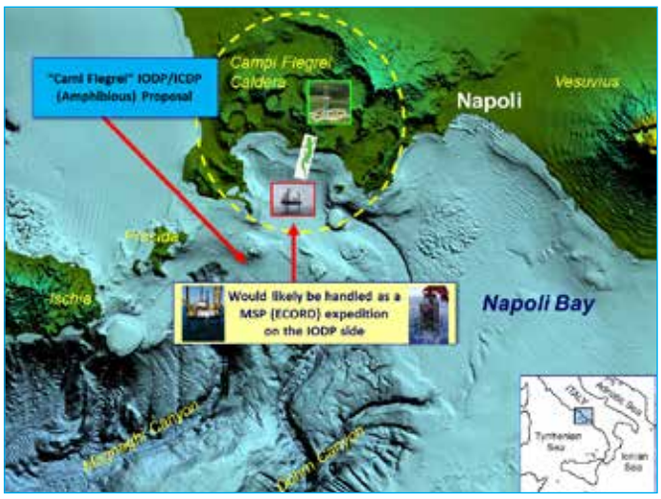
Five workshops have been funded or co-funded by ECORD in 2017 *(see 7. Engaging the community, pages 55-57)*:

- Caldera Drilling - Campi Flegrei (25-28 February 2017, Naples, Italy) *(pages16 and 55)*;
- Tyrrhenian Magmatism & Mantle Exhumation - TIME (5-7 June 2017, Bologna, Italy);
- Australasian Regional Workshop for building new IODP proposals (13-16 June 2017, Sydney, Australia);
- Carbon cycling at the ultra-slow Arctic spreading ridge system' (6-8 September 2017, Bergen, Norway);
- Volcanic, tectonic and hydrothermal processes in an island-arc caldera environment: history, mechanisms, feedbacks and impacts: Initiation of a proposal to drill at the Santorini-Kolumbo marine volcanic system in Greece (21-23 November 2017, Athens, Greece).

The promotion of IODP scientific achievements to a large audience within universities and institutes has been actively conducted by **four ECORD Distinguished Lecturers** *(pages 16 and 62)*:

- Bridget Wade (UK);
- Mark Alexander Lever (Switzerland);
- Gretchen Früh-Green (Switzerland);
- Marianne Conin (France);

who gave **26 lectures in eight ECORD countries in 2017**. http://www.ecord.org/education/dlp/



Location of the planned drillsites across the coastline of the Campi Flegrei area (NW Napoli Bay).

A major goal of ECORD is to train the next generation of scientists from ECORD member countries. The portfolio of educational activities that ECORD has built over the last years and that was already developed in 2016 has been re-conducted in 2017 and included funding or co-funding of three Summer Schools and a Training Course. Like in 2016, more than 150 students and early-career scientists have participated in the ECORD Summer Schools and Research Grants, and fourteen of them received a Scholarship to attend one of these schools.

Three ECORD Summer schools were sponsored by ECORD in 2017: the 14th Urbino Summer School in Paleoclimatology on Past Global Change Reconstruction and Modelling Techniques (13-28 July 2017; Urbino, Italy), the 11th ECORD Bremen Summer School (21 August-16 September 2017; Bremen, Germany) focused on "Current-Controlled Sea-Floor Archives: Coral Mounds and Contourites" and the 2nd ECORD Petrophysics Summer School (27 June -1 July 2017; Leicester, UK) - http://www.ecord.org/education/summer-schools/

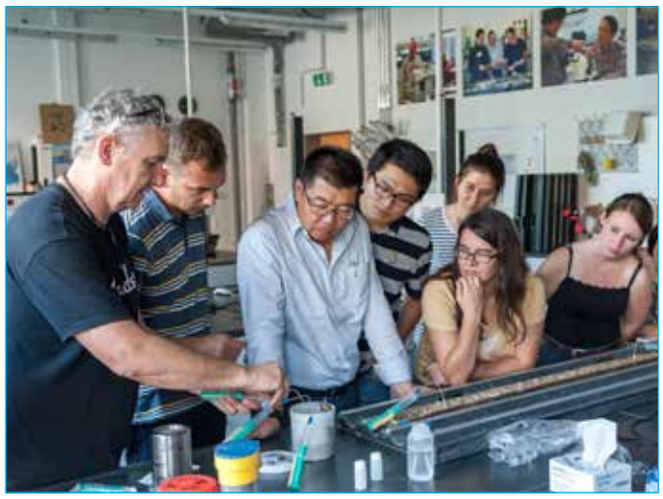
The third **ECORD Training Course** has been held at the IODP Bremen Core Repository at MARUM, Bremen, on 6-10 March 2017. This one-week course aimed at providing a "Virtual Drillship Experience" for scientists from academia and industry through a basic training in IODP expedition and core-flow procedures *(page 17)*. The high number of applications (61) demonstrates a high demand from across both academia and industry - http://www.ecord.org/education/training-course/

ECORD Distinguished Lecturer Programme 2017-2018.

Six ECORD Research Grants - http://www.ecord.org/education/research-grant/ - were awarded to PhD students and early-career scientists to conduct research on core materials and/or data related to successive scientific ocean drilling programmes (DSDP/ODP/IODP).

Since 2015 ECORD has deployed significant efforts towards teachers through the participation of ECORD Outreach/Education Officers in *JOIDES Resolution* IODP expeditions as part of the "Teachers at Sea" programme initiated by Ocean Leadership - http://www.ecord.org/education/teachers-at-sea/ - and the funding of the ECORD School of Rock to support educational activities of teachers interested in IODP science.

In 2017, **three teachers from ECORD countries** sailed onboard the *JOIDES Resolution* and the **third ECORD School of Rock** was held in Brussels, Belgium, from 29 November to 1 December 2017.



ECORD Training Course 2017 (photo Volker Diekamp, MARUM).

ECORD-ICDP exhibition booth at EGU 2017 (photo ECORD/IODP).

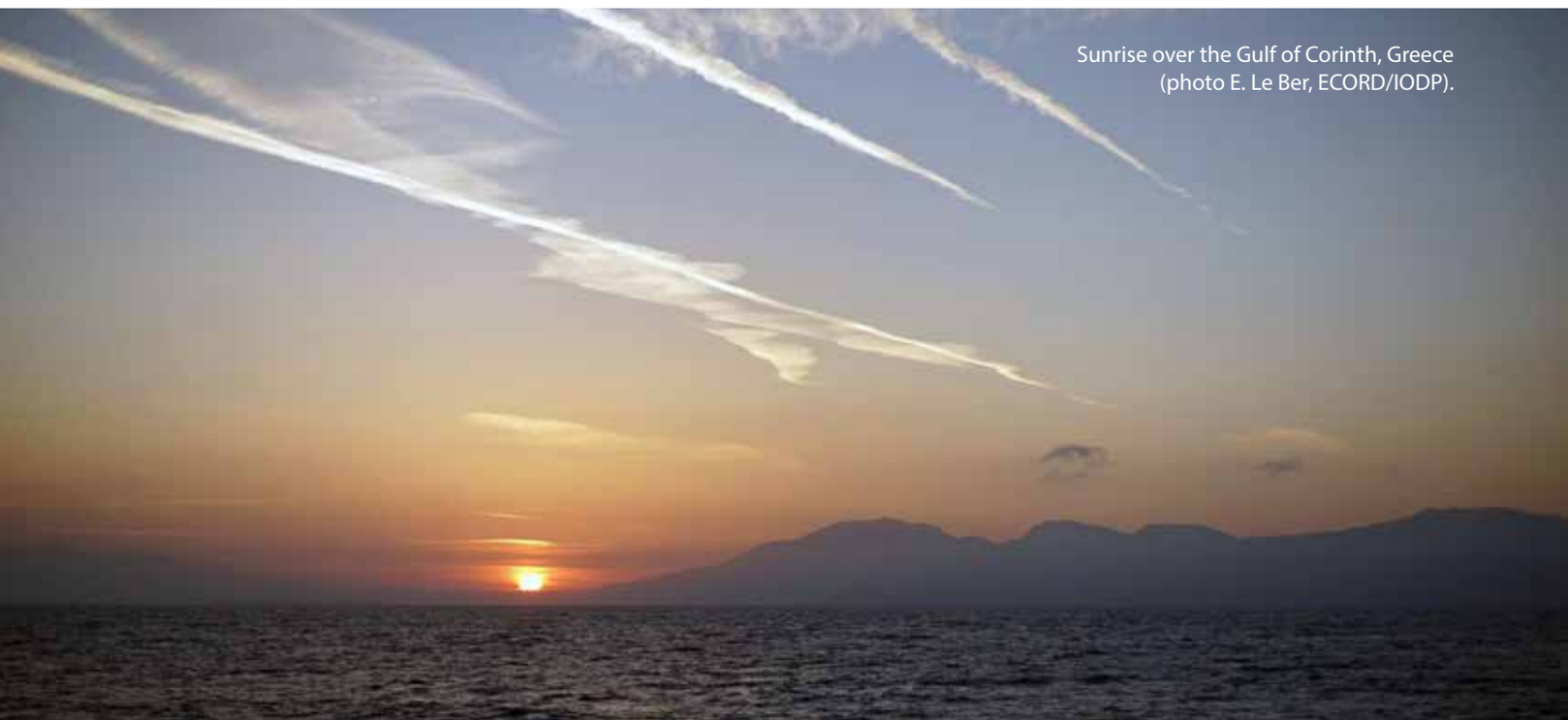
Communicating

Promoting activities and accomplishments of IODP to various audiences, including scientists, classrooms and the general public, is a major goal of ECORD. ECORD constantly update and create communication and educational materials that are distributed across the ECORD member countries *(see 8. Communicating, pages 65-67)*.

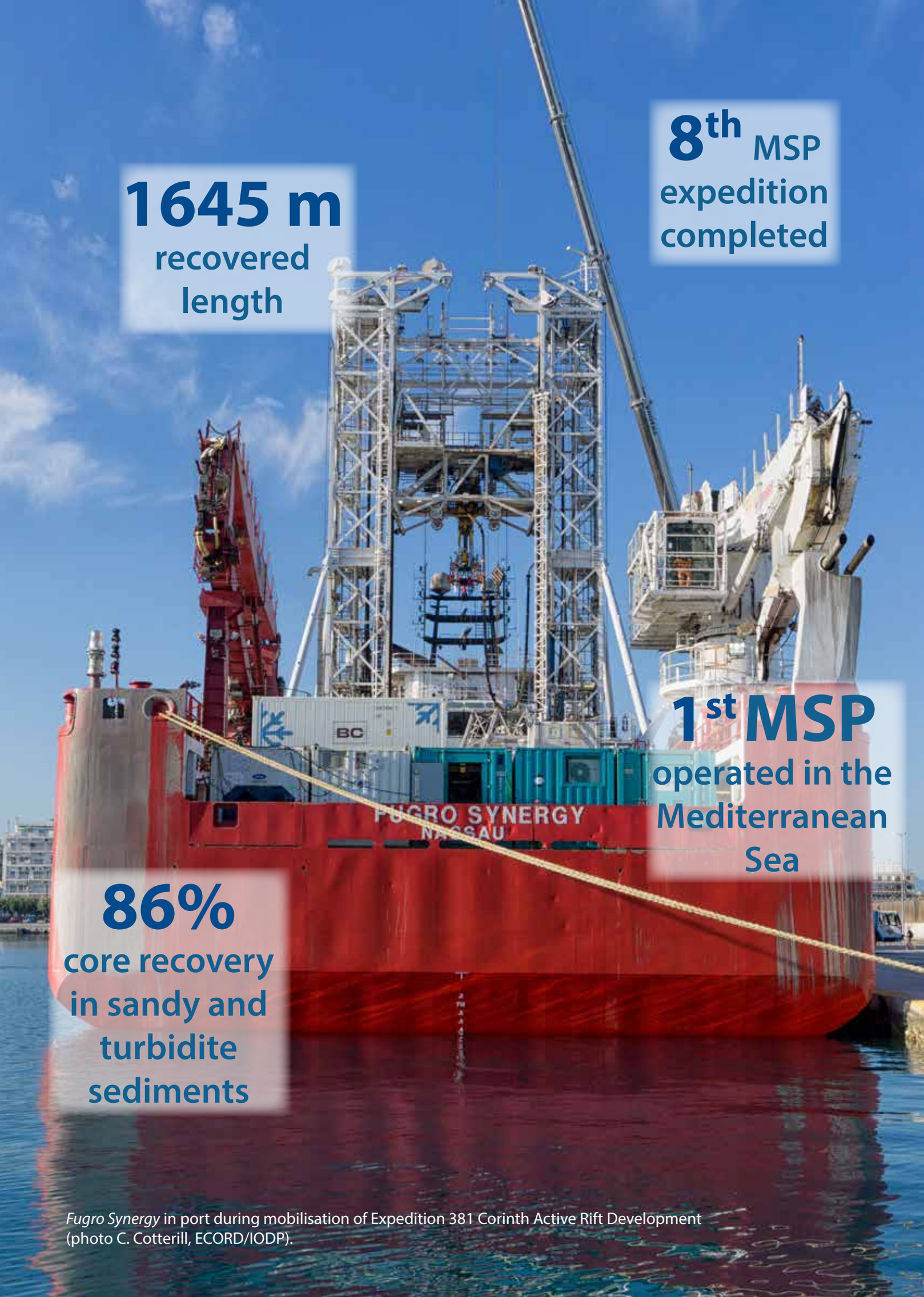
In 2017, the ECORD outreach staff has promoted the IODP and ICDP programmes under the umbrella of Scientific Drilling at major international (EGU *above right*, AGU) and national science conferences with the organisation of joint ECORD-ICDP booths and a Townhall Meeting at the EGU in Vienna, Austria.

The ECORD outreach staff has responded to the very significant media impact of Expedition 364 Chicxulub K-Pg Impact Crater with interest from large and small outlets worldwide (Canada, USA, UK, Japan, the Netherlands, Austria, Spain and Mexico). Hundreds of items have appeared on radio, in print and online, including features by *Science*, *Nature* and the BBC. In parallel, outreach events regarding Expedition 381 Corinth Active Rift Development have been organised before the expedition set sail from the port of Corinth and received global interest.

Related websites:
http://www.ecord.org
http://www.iodp.org



Sunrise over the Gulf of Corinth, Greece (photo E. Le Ber, ECORD/IODP).



Fugro Synergy in port during mobilisation of Expedition 381 Corinth Active Rift Development (photo C. Cotterill, ECORD/IODP).

2. Operating and participating in mission-specific platform expeditions

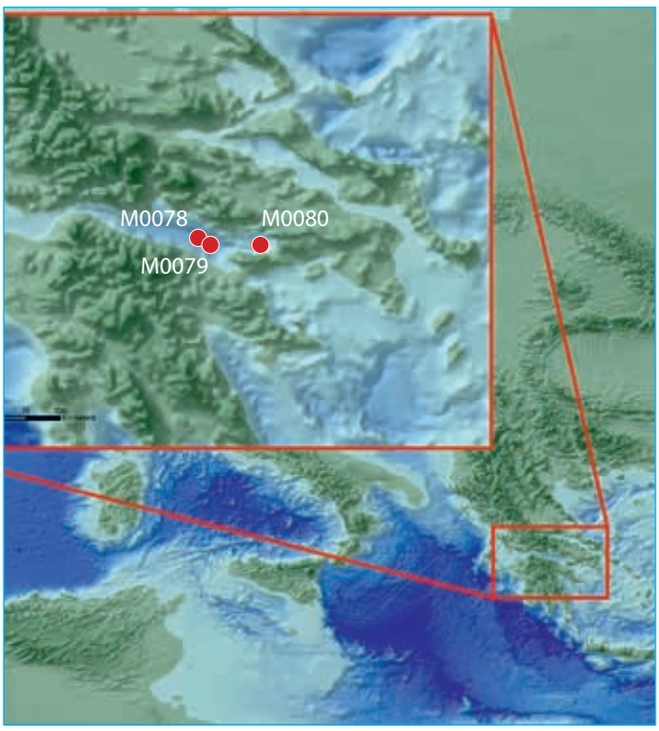
In 2017, the ECORD Science Operator (ESO) implemented the offshore phase of Expedition 381 Corinth Active Rift Development, the **eighth mission-specific platform** (MSP) expedition of IODP. The offshore phase of the expedition was successfully implemented from 22 October to 18 December, when ESO staff, drilling contractors and the Science Party worked to recover and analyse the first deep cores ever taken from beneath the Gulf of Corinth. The material collected will reveal the relationship between rift development and faulting, and how the landscape responded to those forcing factors.

In parallel to the planning and implementation of Expedition 381, scoping and pre-planning of future MSP expeditions continued throughout the year. This included planning work for Expedition 377 Arctic Ocean Paleoceanography (ArcOP), which is currently on hold after the cancellation of the expedition in 2018 *(page 25)*. Scoping of proposals that rely on seabed drilling technology also continued, with all academic and commercial systems, and vessels that could potentially deploy them, under constant review.

ESO support for past MSP expeditions continued throughout the year. In February 2017, the moratorium ended for **Expedition 357 Atlantis Massif Serpentinization and Life**. The IODP Proceedings were published online on 4 February - http://publications.iodp.org/proceedings/357/357title.html - and all shipboard data were made publicly available after export from the ExpeditionDIS and ESO Science Server to PANGAEA - http://iodp.pangaea.de. The Science Party and collaborators of Expedition 357 are continuing their post-expedition research, with papers from this expedition expected to be submitted to peer-reviewed journals by October 2018. ESO staff supported the 2nd Post-Expedition Meeting that was held in Sestri Levante, Italy, 4-7 September 2017, which provided an opportunity for the Expedition Scientists to meet and discuss their latest results and to coordinate their publications in 2018.

In October 2017, the moratorium ended for **Expedition 364 Chicxulub K-Pg Impact Crater** and all shipboard data were made publicly available through the PANGAEA portal, with the IODP Proceedings published online on 30 December - http://publications.iodp.org/proceedings/364/364title.html. The significant media interest in the expedition continues, with interest from large and small outlets worldwide. In 2017, there was significant media interest from Canada, USA, UK, Japan, the Netherlands, Austria, Spain and Mexico. Since the expedition ended, hundreds of items have appeared on radio, in print and online, including features by *Science*, *Nature* and the BBC. Throughout the expedition, ESO facilitated access for production company Barcroft Productions Ltd. for a television documentary, financed by the BBC and PBS Nova. The BBC version aired in the UK on 15 May and the PBS version aired in the USA on 27 December *(see 8. Communicating, page 66)*. While the Science Party continue with their post-expedition research, ESO staff is working with the Co-chief Scientists and

2nd Post-expedition meeting of Expedition 357: Fieldtrip to a quarry showcasing gabbros and serpentinised peridotites (photo S. Green).



Drillsite map of Expedition 381.

Science Party to organise the 2nd Post-Expedition Meeting in Mexico in summer 2018.

IODP Expedition 381 Corinth Active Rift Development

Co-chief Scientists: *Lisa McNeill (ECORD, University of Southampton, UK) and Donna Shillington (Lamont Doherty Earth Observatory, USA)*
Expedition Project Manager: *Gareth Carter*
Petrophysics Staff Scientist: *Erwan Le Ber*
Offshore Operations Manager: *Dave Smith*

• Scientific objectives

Continental rifting is fundamental for the formation of ocean basins, and active rift zones are dynamic regions of high geohazard potential. This project proposes drilling within the active Corinth Rift, Greece where deformation rates are high, the syn-rift succession is preserved and accessible, and a dense, seismic database provides a high-resolution fault network and seismic stratigraphy for the recent rift history.

The Corinth Rift offers access to sedimentary sequences that will enable an unprecedented level of precision of timing and spatial complexity of rift-fault system development and rift-controlled drainage system evolution in the first 1-2 million years of rift history. We propose to resolve at a high temporal and spatial resolution how faults evolve, how strain is (re-) distributed, and how the landscape responds within the first few million years in a non-volcanic continental rift, as modulated by Quaternary changes in sea level and climate.

Expedition 381 provides the opportunity to achieve unprecedented precision of timing and spatial complexity of rift-fault system development and rift-controlled drainage system evolution in the first 1-2 My of rift history. A multidisciplinary approach to core sampling, integrated with log and seismic data, will generate a Quaternary chronology for the syn-rift stratigraphy down to orbital timescale resolutions and resolve the palaeoenvironmental history of the basin in order to address the key objectives:

- **Fault and rift structural evolution in an active continental rift:** To establish the distribution of tectonic strain in time and space and the timescales of fault evolution in a young rift at high resolution (20-50 Kyr and 1-10's of km). What are the controlling parameters on strain localisation? How and when does a "mature" fault network emerge?
- **Surface processes in active rifts:** To determine the evolution of a rift-controlled, closed drainage system in time and space at high temporal resolution (20-50 Kyr) and the relative impact of tectonics and climate on sediment flux.

Three sites were carefully selected to sample the recent syn-rift sequence (IODP Sites M0078 to M0080) *(above left)*. Two primary themes are addressed by drilling at these sites. First, the fault and rift evolution (including fault growth, strain localisation, and rift propagation) and deformation rates will be examined. The spatial scales and relative timing can already be determined using the offshore seismic data, and dating of the new cores will better constrain the timing, provide temporal correlation to the onshore data, and the ability to quantify strain rates. Second, the new expedition data will define lithologies, depositional systems and palaeoenvironment (including catchment palaeoclimate), basin palaeobathymetry, and relative sea level. By integrating this data with seismic data, onshore stratigraphy, and catchment data, the relative roles and feedbacks between tectonics, climate, and eustasy in sediment flux and basin evolution can be investigated.

• Pre-expedition operations

From late 2016 into early 2017, ESO conducted the procurement exercise for a geotechnical vessel and coring

rig for Expedition 381. Following EU contracting rules, responses to a Notice of Interest for drilling services were received at the end of February 2017, followed by a tender assessment exercise, identification of a preferred bidder and contract negotiations. An important milestone was the signing of the drilling contract on 19 May with Fugro Geoservices Ltd., for their flagship *Fugro Synergy*.

The *Fugro Synergy (right)* is a purpose-designed geotechnical drilling and well intervention vessel, with the capacity to perform a wide range of tasks including continuous coring for scientific research.

In contrast to previous MSP expeditions, which have used geotechnical vessels equipped with temporary drilling rigs, Expedition 381 took advantage of the *Fugro Synergy's* permanent drilling rig which has been an integral part of the vessel since it was built in 2009. An additional advantage came in the form of Fugro's Seadevil geotechnical sampling tool. The Seadevil is a hybrid system that combines the power of rig-based drilling with the control and sensitivity of seafloor-based drilling. The Seadevil provided a vertical control system for accurate control of penetration independent of vessel heave, and

Fugro Synergy undergoing final moblisation, Corinth, October 2017 (photo R. Gawthorpe, ECORD/IODP).

provided improved control of the weight applied to the drill bit and very accurate measurement of depth below seafloor. The system performed well until a hydraulic failure forced its early retirement from the expedition. However, the drill string clamp capability was retained without the feed function, and coring could continue without impacting core quality.

Expedition 381 Corinth Active Rift Development: left, working deck of Fugro Synergy. ESO 'Science Area' is situated at the stern of the vessel (blue and white containers) (photo D. Smith, ECORD/IODP).

At nearly 104 m in length, the *Fugro Synergy* had ample deck space for ESO's suite of containerised laboratories and offices, and berth space to accommodate the Science Party and ESO staff *(left)*.

ESO liaised with the Greek Ministry of Foreign Affairs, Greek proponents and the British Embassy in Athens to secure the expedition's coring and Multi-Sensor Core Logger (MSCL, *page 23*) radioactive source permits, which included the submission of an Environmental Impact Assessment to the permitting authorities.

In the months leading up to the expedition ESO maintained, renovated, upgraded and tested its suite of containers, laboratory equipment and IT equipment, and re-stocked consumables. A 10' logging-dedicated container was procured, to provide environmental protection for the logging equipment and engineers (originally motivated by the prospect of high latitude expeditions). Once prepared, the ESO partners organised the logistics of shipping the containers to the mobilisation port in Falmouth, UK, including preparing cargo and freight lists, dangerous goods documentation, and IMO declarations. For ship-to-shore communications, ESO took advantage of the near shore location and installed a new, low cost, high bandwidth 3G mobile communications system.

Expedition 381 cores being prepared for refrigerated storage. The cores will be split at the Onshore Science Party, Bremen, in February 2018 (photo D. Smith, ECORD/IODP).

Expedition 381 coring summary

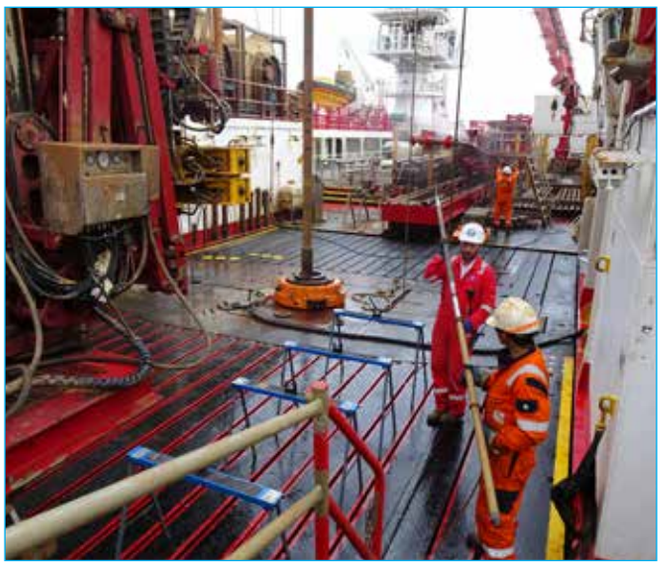
Hole	M0078A	M0078B	M0079A	M0080A	Total
No of cores recovered	176	15	163	146	500
Drilled length (m)	610.43	55.85	704.90	534.10	1905.28
Recovered length (m)	533.99	52.17	610.80	447.83	1644.79
Recovery (%)	87	93	87	84	86
Final depth (mbsf)	610.43	55.85	704.90	534.10	
Proposed hole depth (mbsf)	750.00	N/A	750.00	479.00	

ESO coordinated sample request submissions from the Science Party, which contributed to the planning and development of the offshore core workflow and downhole-logging programme, and was conducted in close cooperation with the Co-chief Scientists and Science Party. This planning was supported by the MARUM Cloud service, a file sharing system recently adopted by ESO, which offers a cost-effective improvement on the previous BSCW (Basic Support for Cooperative Work) system.

- **Offshore operations**

The *Fugro Synergy* was mobilised for the expedition in Falmouth, UK, 4-7 October when the ESO containerised laboratories, offices and equipment were installed on the working deck. Following nine days of transit to the Gulf of Corinth via Malta (for bunkering and for ESO staff to board), final mobilisation took place in Corinth from 16 to 22 October. During this time the offshore members of the Science Party gathered in Corinth to take part in various preparation activities. A media day was held on 19 October, which included a media conference, press release, vessel media visits and interviews with participants *(see 8. Communicating, page 66)*.

The *Fugro Synergy* departed Corinth on 22 October and transited to the first site M0078, with coring commencing early the following day. During the expedition, ESO staff provided operation and drilling contract management, scientific coring oversight, science, database and outreach support, with downhole-logging services being sub-



Petrophysics Staff Scientist Erwan Le Ber being assisted by a Fugro engineer to deploy super-slimline logging tools (photo D. Smith, ECORD/IODP).

ESO Petrophysicist Laurence Phillpot working in the MSCL laboratory (photo D. Smith, ECORD/IODP).

contracted to the University of Montpellier, a European Petrophysics Consortium (EPC) partner.

Coring progress was good for most of the expedition. Slow penetration at depth at the first and second sites led to the decision to terminate these holes before the proposed total depth was reached, conserving time for subsequent holes and allowing the expedition to remain on schedule. Coring at the third site progressed very well, and despite coring 55 m past the proposed total depth (the predicted depth of the basement seismic reflector), basement was not reached. The expedition ended in Corinth on 18 December, after a total of **58 days at sea** and **collecting almost 1645 m of core** *(page 22)*.

Various modes of coring were utilised – Fugro Piston Corer (note this is not the same as the IODP piston corer), Fugro Corer (push and percussive modes), and rotary coring - to maximise the coring rate and efficiency in the highly variable lithologies. When the lithology allowed, coring was briefly paused to take *in-situ* temperature measurements from the formation at the base of the hole.

Preliminary sedimentological analyses identified thinly bedded and laminated mud with thin interbeds of fine sand including organic matter. Lithologies and micropalaeontological assemblages were highly variable, and indicate a range of palaeoenvironments during multiple changes between marine and lacustrine conditions in the Gulf of Corinth. The offshore sedimentologists were able to identify discrete and distinctive sandy turbidite layers through the core liner, which they suspect were deposited during the lowstand isolated mode. The deeper part of the section drilled at Site M0079 shows more complexity and heterogeneity than the equivalent section sampled at Site M0078, which may be a consequence of the expansion and completeness of the section at M0079. At Site M0080, intervals of marine and non-marine deposition were identified, including gravels, pebbly muds/sands, siltstone, and at the base of the hole, coarse conglomerate was recovered. Microfossils were observed in some of the deepest cores, some of which will be able to provide important age constraints on the oldest sediments recovered.

Super-slimline downhole-logging services were contracted from the University of Montpellier *(above left)*. *In-situ* data were acquired, despite some significant technical and geological challenges, from portions of Holes M0079A and M0080A. Datasets acquired include gamma ray, resistivity, magnetic susceptibility and sonic. The logged intervals provide an important dataset, intermediate in scale to the recovered cores and the corresponding seismic data.

- **Onshore expedition activities**

Planning for the four-week Onshore Science Party (OSP) continued through 2017. This included preparation of the wide range of equipment and analytical facilities related to the acquisition of IODP standard measurements, and the associated QA/QC protocols for MSP expeditions *(see 6. Archiving IODP cores: the IODP Bremen Core Repository, pages 51-53)*. Measurements include physical properties including non-destructive core scanning facilities, geochemistry, micropalaeontology, palaeo- and rock-magnetics, sedimentology, petrology, and mineralogy.

The OSP will start on 31 January 2018 at the IODP Bremen Core Repository and the MARUM - Center for Marine Environmental Sciences, with further analytical laboratories accessed through the Department of Geosciences, University of Bremen, Germany. Additionally, ESO prepared a 4-week pre-OSP programme of work to start on 4 January 2018 (staffed by ESO personnel), to acquire thermal conductivity data on whole cores.

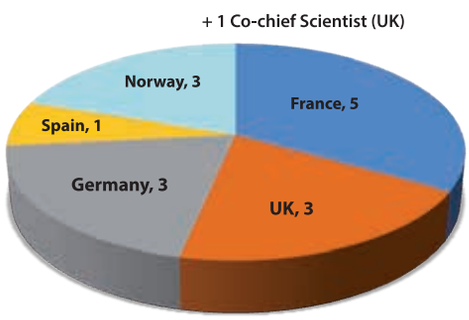
- **Participation**

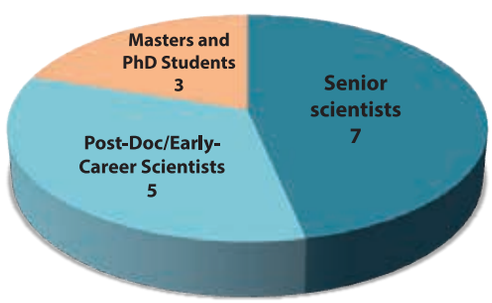
A total of **fourteen ECORD scientists** were invited to participate in Expedition 381, plus one UK Co-chief Scientist *(right)* representing a total of five ECORD countries *(below)*. Students/early-career scientists represented more than half of the scientists *(below)*.

Expedition webpage:
http://www.ecord.org/expedition381/

ECORD participants (Expedition 381)

Co-chief Scientist		
Lisa McNeill	University of Southampton	UK
Scientists		
Richard Collier	University of Leeds	UK
Gino de Gelder	IPG Paris	France
Mail-Linh Doan	University Grenoble Alpes	France
Paula Diz Feirrero	University of Vigo	Spain
Mary Ford	University of Lorraine	France
Robert Gawthorpe	University of Bergen	Norway
Romain Hemelsdaël	University of Montpellier	France
Marco Maffione	University of Birmingham	UK
Casey Nixon	University of Bergen	Norway
Sabire Asli Oflaz	Kiel University	Germany
K. Panagiotopoulos	University of Cologne	Germany
Sofia Pechlivanidou	University of Bergen	Norway
Simone Sauer	Ifremer	France
Joana Seguin	Kiel University	Germany
Teacher at sea		
Martin Böttcher	Rabanus-Maurus Gymnasium	Germany





The offshore team of the Science Party with ESO staff (photo ECORD/IODP).

IODP Expedition 377 Arctic Ocean Paleoceanography (ArcOP)

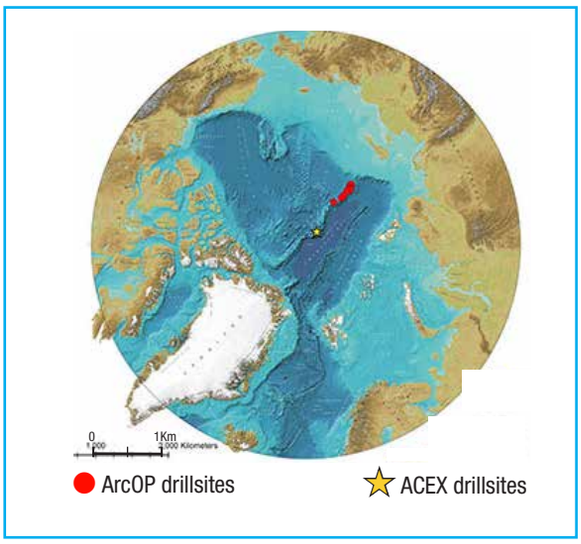
Co-chief Scientists: *Rüdiger Stein (ECORD, Alfred Wegener Institute, Germany) and Kristen St. John (James Madison University, USA)*

During 2017, preparations continued for the ambitious return to the Lomonosov Ridge in the central Arctic Ocean with Expedition 377, which included the running of an open tender exercise for the drilling platform and services. Platform bids were received by ESO on 28 June, and were evaluated in July and August.

The greatest challenge in planning for this expedition was to secure a significant level of In-Kind Contributions (IKCs) from IODP and non-IODP countries. Some contributions were offered, including a support icebreaker from the Alfred Wegener Institute for Polar and Marine Research, Germany, which was greatly appreciated by ECORD and ESO. Despite this generous offer, and the efforts of ESO and ECORD to solicit further contributions from other interested partners, the contributions were insufficient to implement this complex, multi-platform expedition to the central Arctic Ocean within the budget available.

Consequently, in September, ESO regrettably announced the cancellation of Expedition 377, scheduled for August to October 2018, and halted the expedition's staffing exercise that was underway.

ESO has been directed by ECORD to continue planning for Expedition 377 for potential implementation in August to September 2019. The final decision on whether to proceed will be taken by ECORD in spring 2018, and will depend on the level of IKCs secured by that time. Further announcements regarding the future of Expedition 377 and a potential new Call for Scientists will be made via IODP-related channels in due course.



Drillsites of Expedition 377 Arctic Ocean Paleoceanography (ArcOP) and Expedition 302 Arctic Coring (ACEX).

Expedition webpage:
http://www.ecord.org/expedition381/

Related website:
http://www.ecord.org/about-ecord/management-structure/eso/

"Main street" onboard *Fugro Synergy* (photo ECORD/ESO).

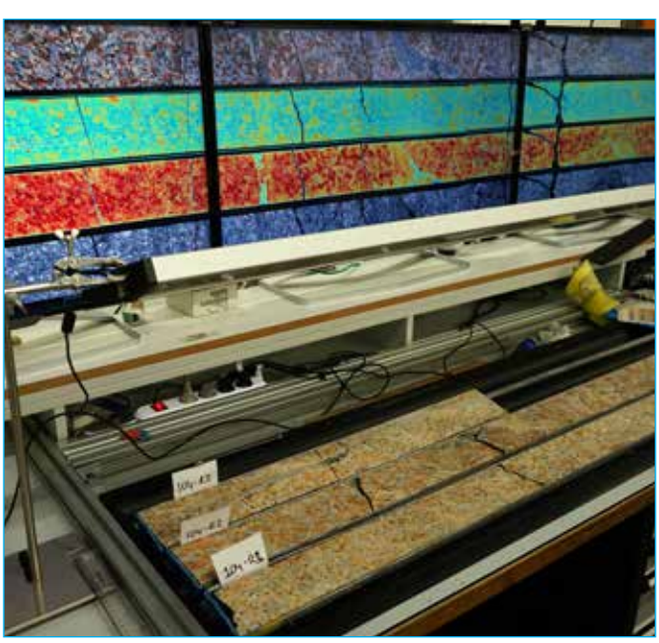
Onboard *Fugro Synergy* during Expedition 381 Corinth Active Rift Development (photo S. Sauer, ECORD/IODP).

3. Anticipating future mission-specific platform expeditions

Operational review of completed expeditions

On 20 June 2017, the ECORD Facility Board (EFB) has organised the operational review of the Expedition 364 Chicxulub K-Pg Impact Crater (5 April - 31 May 2016 - offshore and 21 September - 15 October 2016 - Onshore Science Party) in Lisbon, Portugal. In addition to three EFB Science Board members, Gabriele Uenzelmann-Neben, Fumio Inagaki and Gilles Lericolais (Chair), the Operational Review Committee included two external reviewers, Agnes Kontny (Karlsruhe Institute of Technology, Germany) and Ken Miller (Rutgers University, USA). The committee congratulated the Co-chief Scientists and all Science Party Members for this very successful MSP expedition, which was the first IODP drilling expedition targeting an impact crater. The panel acknowledged the recovery of high quality cores down to nearly 1.3 km below the ocean floor and the successful acquisition of wireline-logging data and CT-scan images. The high quality core material and logging data have already and will contribute significantly to answer the main targets of the project. The first scientific outcome has been published in *Science* (Morgan et al, 2016) and the scientific community can expect further high-ranked publications from this expedition. The Operational Review Committee proposed nine recommendations to improve next equivalent expeditions, even if each MSP expedition is unique.

Liftboat Myrtle, Expedition 364 Chicxulub K-Pg Impact Crater (photo L. Perez-Cruz, ECORD/IODP).



Core imagery and real cores of Expedition 364 Chicxulub K-Pg Impact Crater (photo E. Le Ber, ECORD/IODP).

Drilling operations onboard L/B Myrtle during Expedition 364 Chicxulub K-Pg Impact Crater (photo C. Lowery, ECORD/IODP).

Long-term scheduling strategy (2013-2023) for MSP expeditions

2013-14	2015	2016	2017	2018	2019	2020	2021	2022	2023
347 Baltic *Drillship Greatship Maya*	**357 Atlantis** *RRS James Cook & Seabed drills (MeBo & RD2)*	**364 Chicxulub** *Liftboat Myrtle*	**381 Corinth** *Drillship Fugro Synergy*	no expedition	TBD	**373 Antarctic** *Seabed drill (RD2)*	TBD	TBD *Seabed drill? (MeBo)*	TBD

The next operational review will assess Expedition 381 Corinth Rift Development (23 October -18 December 2017 - offshore and Onshore Science Party scheduled to start on 31 January 2018) *(see 2. Operating and participating in mission-specific platform expeditions, pages 20-24)*, at the edge of the ECORD Council-ESSAC Fall meeting that will be held in The Hague, the Netherlands, on 7-8 November 2018.

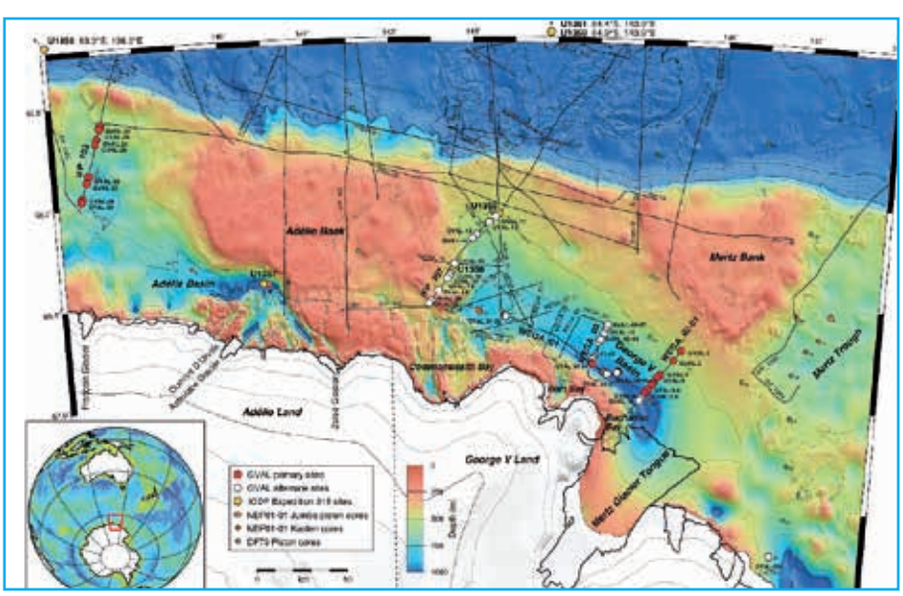
Scheduled expeditions

The 2017 EFB meeting was held on 8-9 March in Hannover at BGR, the German Federal Institute for Geosciences and Natural Resources, and was focused on designing a MSP long-term scheduling strategy (*i.e.* until the end of the current IODP phase in 2023), accounting for the large spread of expedition costs.

Expedition 373 Antarctic Cenozoic Paleoclimate, which was initially scheduled in early 2018, is now provisionally postponed to December 2020-January 2021.

The EFB has scheduled Expedition 377 Arctic Ocean Paleoceanography (ArcOP) for the Arctic summer 2018 based on the provision by Russia of a full In-Kind Contribution (IKC) for icebreaker support. Unfortunately, the expected Russian IKC related to additional ice-breaking capability that was essential for the implementation of this expedition has not materialised. As a consequence, this expedition that was scheduled for August-October 2018 has been cancelled by ESO *(see 2. Operating and participating in mission-specific platform expeditions, page 25)*. A potential re-scheduling of Expedition 377 will be considered in the near future as part of the MSP 2019-2023 operational plan *(table above)*.

With the postponement of two MSP expeditions, which were initially scheduled in 2017 and 2018 (*i.e.* expeditions 377 and 373), the EFB will have to adjust its long-term scheduling strategy at its next meeting that will be held in Venice, Italy, on 6-7 March 2018. The EFB will reconsider the MSP long-term scheduling strategy (*i.e.* until the end of the current IODP phase in 2023), accounting for the large spread of expedition costs, which will largely depend on the scientific excellence of drilling/coring proposals, the required drilling technology, and, importantly, the available annual budget for expeditions including opportunities for IKCs.



Proposal 813 Antarctic Cenozoic Paleoclimate (Williams et al.): Transects of primary and alternate sites along existing seismic lines with a total of 18 primary and 29 alternate sites up to 80 m penetration (353-1407 m WD).

Provisional reservations for 2020 and 2022 have been made for the seabed drilling systems MeBo70/200 and RD2 to accommodate any proposal demands. The operations of these systems, as well as long-piston coring, can be conducted in the low-cost category provided that the research vessels are contributed in-kind.

- **Expedition 373 Antarctic Cenozoic Paleoclimate**

Co-chief Scientists: *Trevor Williams (USA) and Carlota Escutia (ECORD, Spain)*

• Scientific objectives

The aim of this expedition, based on Proposal 813, is to drill the shallowly-buried strata along the George V and Adélie Land shelf of East Antarctica *(page 28)* to obtain a record of Antarctica's climate and ice history from the Eocene (greenhouse) to the Neogene (icehouse).

• Operations

The provisional postponement of Expedition 373 to January 2021 has been provisionally agreed by the Antarctic Support Contract (ASC) at the National Science Foundation (NSF) regarding the utilisation of a seabed drill on the research icebreaker *N. B. Palmer*. The seabed drill to be used for the expedition will be determined nearer the time, following further (non-IODP) projects being undertaken by both the BGS RD2 and MARUM MeBo teams.

Expedition web page:
http://www.ecord.org/expedition373/

MSP proposals at the ECORD Facility Board and at the Science Evaluation Panel

The number of active MSP proposals in the IODP system is lower than in 2016 and includes eleven proposals (vs. thirteen in 2016) concerning various science topics and geographical areas that reside both at the EFB and at the Science Evaluation Panel (SEP). A higher MSP proposal pressure including different science themes and involving various potential drilling/coring systems in diverse environments would be desirable to provide additional scientific, operational and funding opportunities in the near future.

Five MSP proposals currently reside at the EFB *(table below and page 30)*, including the two expeditions that were postponed:

- 708 Arctic Ocean Paleoceanography (Expedition 377);
- 813 Antarctic Ocean Paleoclimate (Expedition 373);

and **three proposals are currently in the EFB 'waiting room'**:

- 637 New England Shelf Hydrogeology;
- 716 Hawaiian Drowned Reefs;
- 730 Sabine Bank Sea Level.

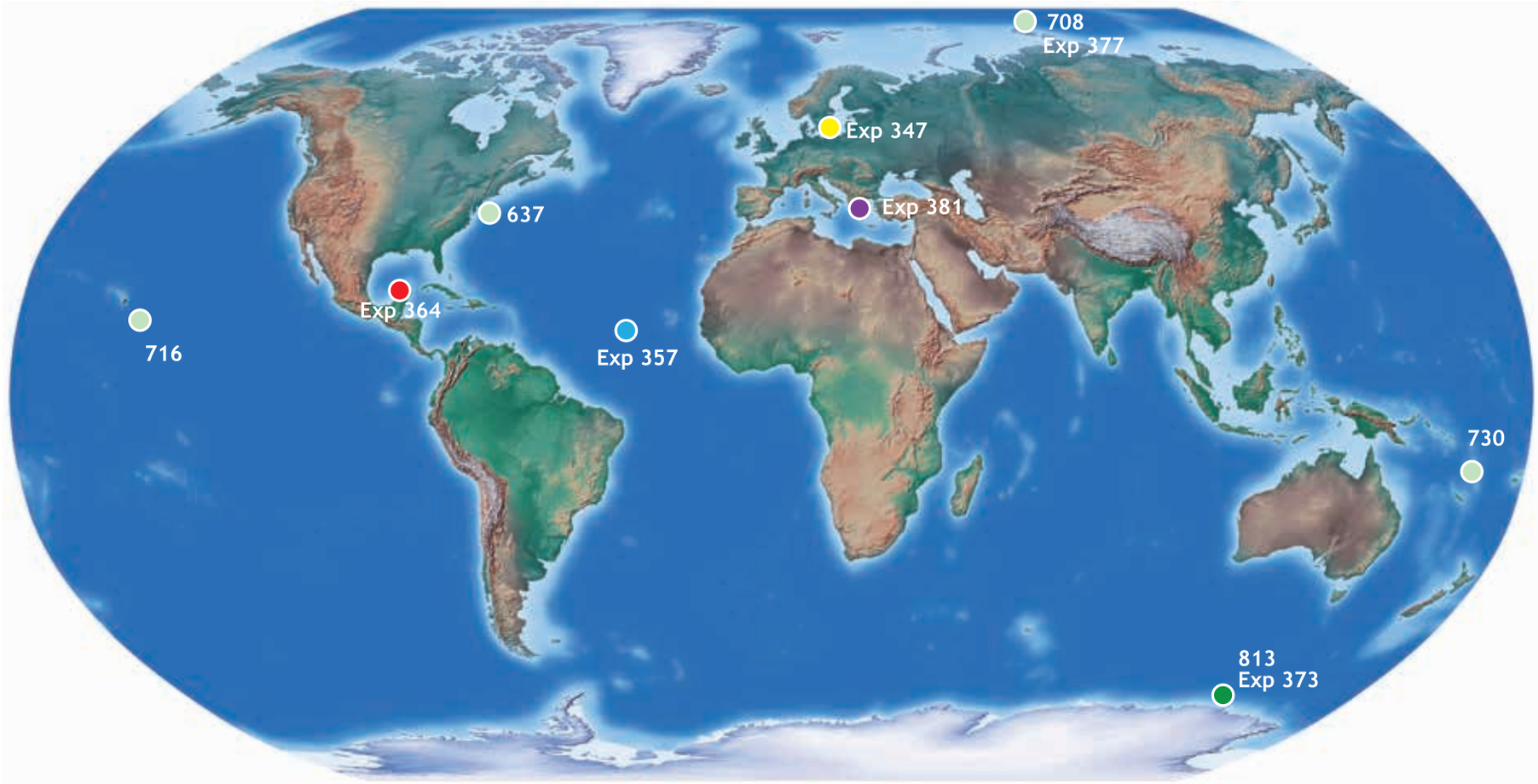
At its 2017 meeting, the EFB has noted that, following its recommendations, a workshop sponsored by IODP (US Science Support Program - USSSP) and ICDP, focusing on the New England Shelf Hydrogeology Proposal has been held on 22-23 May 2017 in Woods Hole, (USA). The overall objectives of the workshop were to develop a new

Mission-specific platform proposals

Proposal #	Short title	Lead Proponent	Ocean/Sea	Drill Platform
at EFB				
637-Full2	New England Shelf Hydrogeology	Person (USA)	Atlantic	Liftboat/jack-up rig
708-Full	Central Arctic Paleoceanography	Stein (ECORD)	Arctic	Drillship
716-Full2	Hawaiian Drowned Reefs	Webster (ANZIC)	Pacific	Geotech. rig/MeBo200
730-Full2	Sabine Bank Sea Level	Taylor (USA)	Pacific	MeBo200
813-Full	Antarctic Cenozoic Paleoclimate	Williams (USA)	Southern Ocean	RD2
at SEP				
796-ADP	NADIR: Nice Amphibious Drilling	Kopf (ECORD)	Mediterranean	Geotech. rig / MeBo
812-Pre	Ross Sea Glacial History	Wilson (USA)	Southern Ocean	Seafloor drill
863-MDP	ISOLAT Southern Ocean Paleoclimate	Peterson (USA)	Southern Ocean	Long-piston coring
866-Pre	Japan Trench Paleoseismology	Strasser (ECORD)	Pacific	Long-piston coring
915 Pre	N Atlantic Fjord Sediment Archives	Giraudeau (ECORD)	Atlantic	Long-piston coring (or JR?)
931Pre	East Antarctic Ice Sheet Evolution	Shevenell (USA)	Southern Ocean	MSP *tbd* (or *JR*?)

*JR: JOIDES Resolution, CPP: Complementary Project Proposal, ADP: Amphibious Drilling Proposal, *** MDP: Multi-phase Drilling Project, RD2: RockDrill2*

Mission-specific platform expeditions and proposals at the EFB



operational plan for Proposal 637-Full2 in order to answer the constraints identified by the EFB, and to establish the value of an onshore component of the project. The workshop included input and participation from 32 researchers from academia, government, industry, IODP (ESO), and ICDP (CDSCO) and lead to the outcome of an addendum, which will be reviewed by the EFB at its 2018 meeting.

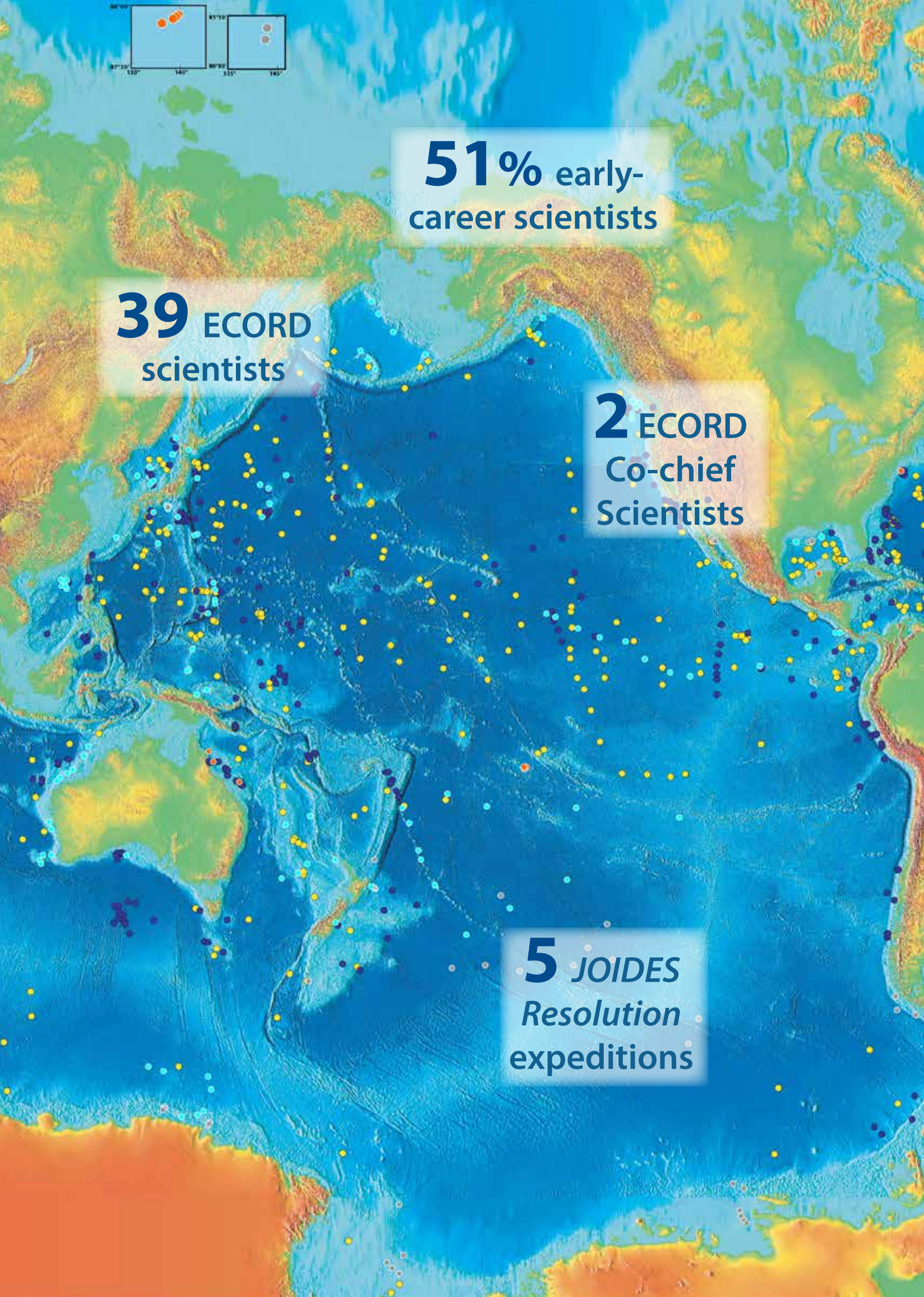
At its 2017 meeting, the EFB has decided to keep the two proposals focusing on sea level (716-Full2 Hawaiian Drowned Reefs, Lead Proponent: J. Webster, and 730-Full2 Sabine Bank Sea-Level, Lead Proponent: Taylor) in the EFB 'waiting room' and to consider the scheduling of one or both of these proposals before the end of the current IODP.

Six MSP proposals are with the SEP and include an Amphibious Drilling Proposal (796 ADP Nice Amphibious Drilling Ligurian Landslide; Lead Proponent: A. Kopf) and three proposals based on long piston-coring technology: a Multi-phase Drilling Proposal (863 MDP ISOLAT S-Ocean Paleoclimate; Lead Proponent: L. Peterson), the 866-Full2 Japan Trench Paleoseismology (Lead Proponent: M. Strasser) and the 915-Pre N Atlantic Fjord Sediment Archives (Lead Proponent: J. Giraudeau). The most recently submitted MSP proposal is the 931-Pre East Antarctic Ice Sheet Evolution (Lead Proponent: A. Shevenell) and the relevant drilling technology will be defined at a later stage.

Three pre-proposals did not record any progress since several years (797 Pre Alaska Beaufort Margin - Lead Proponent: C. Ruppel; 806 Pre Beaufort Gas Hydrate - Lead Proponent: C. Paull; 812 Pre Ross Sea Glacial History - Lead Proponent: D. Wilson) and two of them (797-Pre and 806-Pre) have been recently deactivated.

Related websites:
http://www.ecord.org/about-ecord/management-structure/efb/
http://www.iodp.org/active-proposals
http://www.iodp.org/facility-boards#SEP

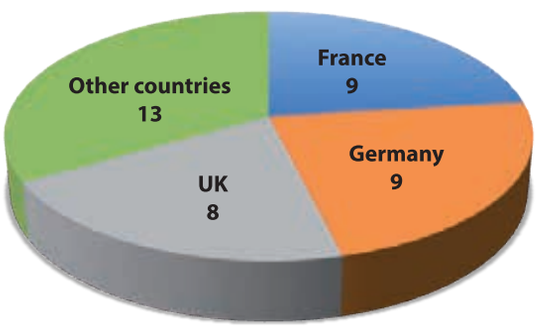
Core deck onboard *Fugro Synergy*, Expedition 381 Corinth Active Rift Development (photo ECORD/IODP).


51% early-career scientists
39 ECORD scientists
2 ECORD Co-chief Scientists
5 JOIDES Resolution expeditions

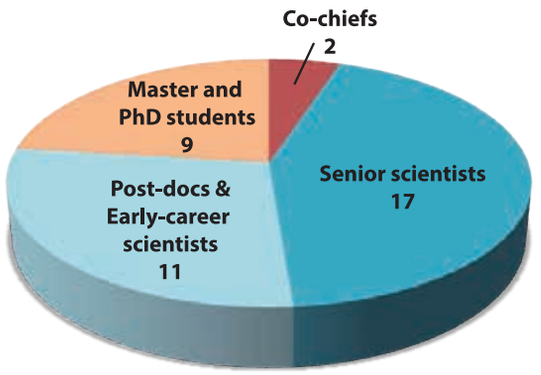
4. Participating in 2017 *JOIDES Resolution* expeditions

Five expeditions including two expeditions based on a Complementary Project Proposal (CPP) were implemented by the *JOIDES Resolution (JR)* in 2017. A total of **39 ECORD scientists from ten ECORD member countries** *(below)* were invited to participate and sailed, including two Co-chief Scientists, one from UK and one from Denmark. Four of the 39 scientists participated following Special Calls.

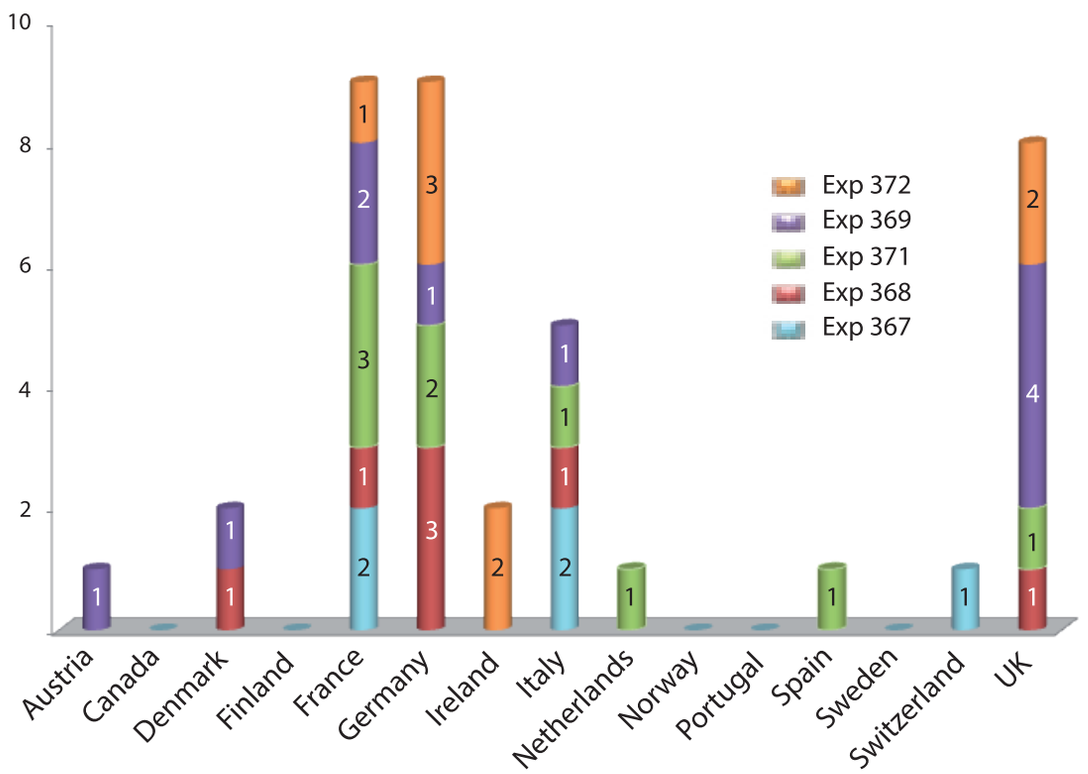
Nine PhD and Master students and eleven Post-docs or early-career scientists had the opportunity to participate in *JR* expeditions, representing 51% of the ECORD participants in 2017 *(below)*. Two thirds of the ECORD scientists came from France, Germany and the UK, and 13 berths were allocated to scientists coming from other ECORD member countries.



Distribution of ECORD participants based on country affiliations (Expeditions 367 to 372, n = 39, including 2 Co-chief Scientists).



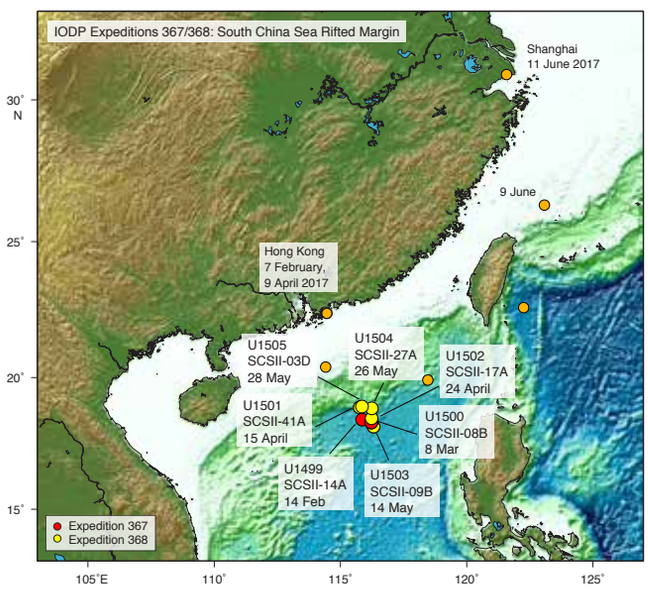
Distribution of ECORD participants based on career stage (n = 39, including 2 Co-chief Scientists).



Distribution of participants based on country affiliations (Expeditions 367 to 372), including 2 Co-chief Scientists and 4 Special Calls.

Expedition 367/368 South China Sea Rifted Margin (7 February-9 April / 9 April-11 June 2017)

The two South China Sea (SCS) Rifted Margin Expeditions (based on IODP Proposals 878-CPP and 878-Add) aimed to understand the mechanisms of lithosphere extension during continental breakup at a non-volcanic rifted margin. The SCS margin shows similarities to the hyper-extended Iberia-Newfoundland margins, possibly including exhumed and serpentinized mantle within the Continent-Ocean-Transition (COT). However, modeling studies suggest that there can be mechanisms of plate weakening other than serpentinization of sub-continental lithospheric mantle. Two competing models for plate rupture (in the absence of excessively hot asthenospheric mantle) result in widely different predictions for development of the SCS margin.



To discriminate between these models, **seven sites (U1499 to U1505)** were drilled across a 150-200 km wide zone of highly extended seaward-thinning crust with a well-imaged COT zone. Coring and logging deep/basal sediments and the underlying basement was the primary objective.

The proposed drillsites aimed at determining the nature of crust within the COT and to constrain **(1)** post-breakup crustal subsidence, **(2)** how soon after breakup igneous crust started to form, **(3)** timing of rifting, and **(4)** rate of extension. The science objectives could be effectively addressed at these drillsites because of the existing constraints on SCS formation and stratigraphy that include previous industry drilling, ODP Leg 184 and IODP Expedition 349 drilling. The study took advantage of the relatively young (Palaeogene) rifting age of the margin and the absence of excessively thick post-rift sediment cover.

ECORD scientists on Expedition 367: from left to right, Alessia Cicconi, Jacopo Boaga, Claudia Lupi, Anne Briais, Michael Nirrengarten and Anders McCarthy (photo William Crawford, IODP JRSO).

ECORD participants (Expedition 367)

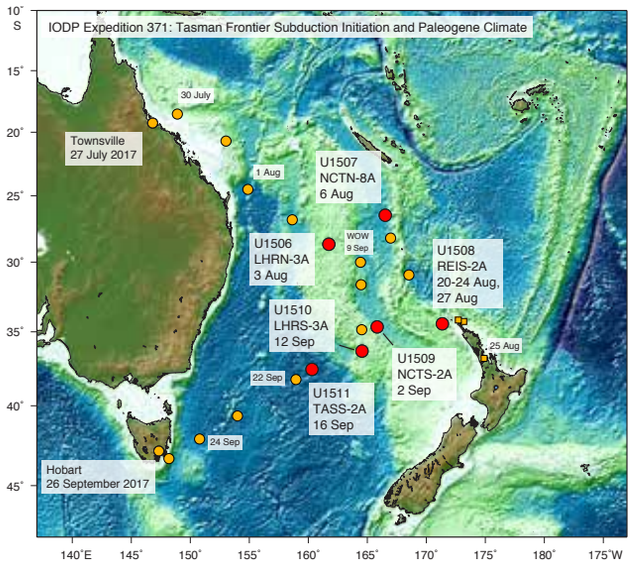
Scientists		
Anne Briais	Observatoire Midi Pyrénées	France
Jacopo Boaga	University of Padua	Italy
Claudia Lupi	University of Pavia	Italy
Anders McCarthy	University of Lausanne	Switzerland
Michael Nirrengarten	IPG - Strasbourg	France
Education/Outreach Officer		
Alessia Cicconi	University of Camerino	Italy

Expedition 368: Hans-Christian Larsen, David Peate (University of Iowa, USA), Liyan Tian (Chinese Academy of Sciences, China) and Carlos Alvarez Zarikian (IODP JRSO) identify components in the latest core (photo Tim Fulton, IODP JRSO).

ECORD participants (Expedition 368)

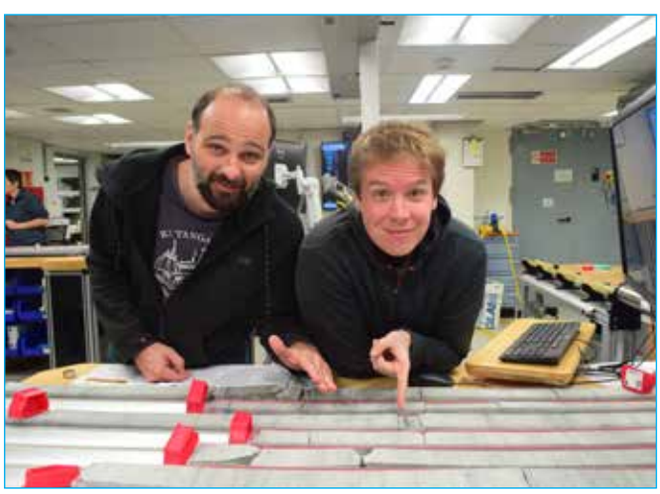
Co-chief Scientist		
Hans Christian Larsen		Denmark
Scientists		
Steve Bowden	University of Aberdeen	UK
Robert Kurzawski	GEOMAR Kiel	Germany
Geoffroy Mohn	University of Cergy-Pontoise	France
Sara Satolli	University of Chieti-Pescara	Italy
Julie Schindlbeck	GEOMAR Kiel	Germany
Froukje Van der Zwaan	Kiel University	Germany

http://iodp.tamu.edu/scienceops/expeditions/south_china_sea_II.html



Expedition 371 Tasman Frontier Subduction Initiation and Paleogene Climate (27 July-26 September 2017)

The Tasman Frontier expedition (based on IODP Proposals 832 Full2 and 832 Add) investigated the Eocene Tonga-Kermadec (TK) subduction initiation (SI). Objective was to evaluate whether a period of high-amplitude long-wavelength compression led to initiation of TK subduction, or determine if alternative geodynamic processes were involved. Core and log data from **six sites (U1506 to 1511)** in the Norfolk Ridge, New Caledonia Trough, Lord Howe Rise and Tasman abyssal plain provide constraints on seismic stratigraphic interpretations and the timing and length scale of deformation and uplift associated with the largest known global SI event and change in plate motion. The Paleogene and Neogene sediments also constrain palaeoceanographic changes caused by SI as well as tropical and polar climatic teleconnections and the transition from greenhouse to icehouse climate states in a region with large meridional variations in surface water properties in a strategic "Southern Ocean Gateway" setting.



ECORD participants Julien Collot and Samuel Etienne at the core description table during Expedition 371 (photo Stephen Pekar & IODP).

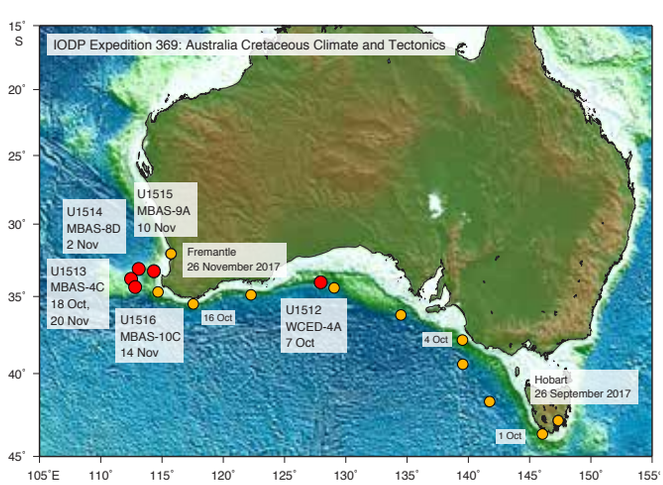
ECORD participants (Expedition 371)

Scientists		
Claudia Agnini	University of Padua	Italy
Laia Alegret	University of Zaragoza	Spain
Aurélien Bordenave	Geol. Survey of New Caledonia	France
Julien Collot	Geol. Survey of New Caledonia	France
Margot Cramwinkel	Utrecht University	Netherlands
Edoardo Dallanave	University of Munich	Germany
Samuel Etienne	Geol. Survey of New Caledonia	France
Cherry Newsam	University College London	UK
Thomas Westerhold	MARUM Bremen	Germany

http://iodp.tamu.edu/scienceops/expeditions/tasman_frontier_subduction_climate.html

Expedition 369 Australia Cretaceous Climate and Tectonics (26 September-26 November 2017)

The Australia Cretaceous Climate and Tectonics Expedition (based on IODP Proposal 760 Full and 897 APL) aimed to understand the palaeoceanography and tectonics of the Naturaliste Plateau (NP) and Mentelle Basin (MB) off SW Australia. Core and log data from **five sites (U1512 to U1516)** in water depths between 850 and 3900 m investigated **(1)** the rise and collapse of the Cretaceous hothouse, **(2)** the controls on oceanic anoxic events during major Carbon cycle perturbations, **(3)** Cretaceous palaeoceanography including deep and intermediate water circulation, **(4)** Cenozoic to recent palaeoceanography including influence of the Tasman gateway opening and Indonesian gateway restriction, and **(5)** the tectonic, volcanic, and depositional history of the NP and MB prior to Gondwana breakup, as well as after separation from India and subsequently Antarctica.



Education/Outreach Officers of Expedition 369: left, Charissa Ruth (USA) and right, Vivien Cumming (ECORD) work on a live broadcast to schools around the globe (photo Cristiane Delfina and IODP).

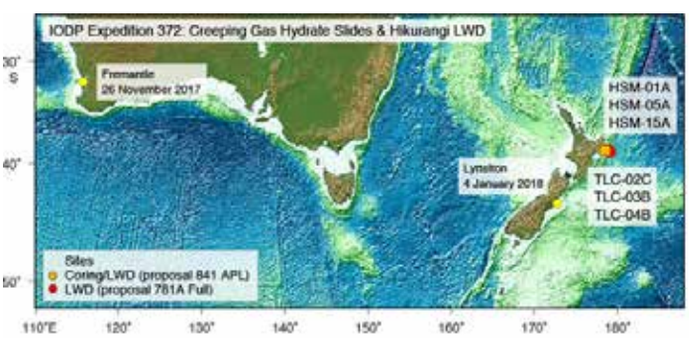
ECORD participants (Expedition 369)

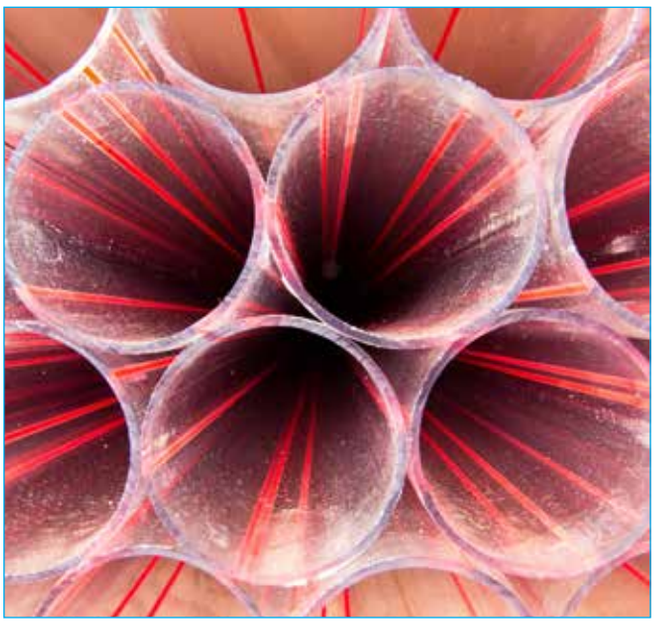
Co-chief Scientist		
Richard Hobbs	University of Durham	UK
Scientists		
Trine Arp	University of Copenhagen	Denmark
Sietske Batenburg	University of Oxford	UK
Hans-Jürgen Brumsack	Oldenburg University	Germany
Kirsty Edgar	University of Birmingham	UK
Matthieu Martinez	University of Rennes	France
Lauren O'Conner	University of Oxford	UK
Maria Petrizzo	University of Milan	Italy
Laurent Riquier	UPMC Paris	France
Erik Wolfgring	University of Vienna	Austria
Education/Outreach Officer		
Vivien Cumming		UK

http://iodp.tamu.edu/scienceops/expeditions/australia_climate_tectonics.html

Expedition 372 Creeping Gas Hydrate Slides and Hikurangi LWD (26 November 2017 - 4 January 2018)

Expedition 372 had two primary objectives **(1)** to investigate the relationship between gas hydrate and underwater landslides (IODP proposals 841-APL2 & 841-Add), and **(2)** to characterise sediment and fault zone structures and physical properties associated with recurring shallow slow slip events along the Hikurangi subduction interface (IODP proposals 781A-Full & 781A-Add2).





Expedition 372: core liners (photo Tim Fulton, IODP/JRSO)..

Sub-marine slides are thought to occur as catastrophic events, and as such pose a significant geohazard potentially causing tsunamis and damaging seafloor installations. Dissociation of gas hydrate has been proposed as a driver of seafloor destabilisation, but there is evidence that gas hydrate itself may lead to seafloor weakening through creeping seafloor deformationThe hypothesis that interstitial gas hydrate, like ice, may exhibit viscous behavior leading to slow deformation as observed in terrestrial rock glaciers has been tested. Alternatively, permeability reduction from gas hydrates may lead to overpressure, hydrofracturing, and seafloor weakening. To elucidate how gas hydrates promote creeping behaviour, logging-while-drilling (LWD) data were collected at all **four sites (U1517 to U1520)** as well as APC cores, pressurised cores, and penetrometer data at one of the LWD sites. Shallow slow-slip events (along the Hikurangi margin)

ECORD participants (Expedition 372)

Scientists		
Sylvain Bourlange	University of Lorraine	France
Morgane Brunet	MARUM Bremen	Germany
Judith Elger	GEMAR Kiel	Germany
Davide Gamboa	BGS	UK
Aggeliki Georgiopoulou	University College Dublin	Ireland
Katja Heeschen	GFZ Potsdam	Germany
David McNamara	National University of Ireland, Galway	Ireland
Matteo Paganoni	University of Oxford	UK

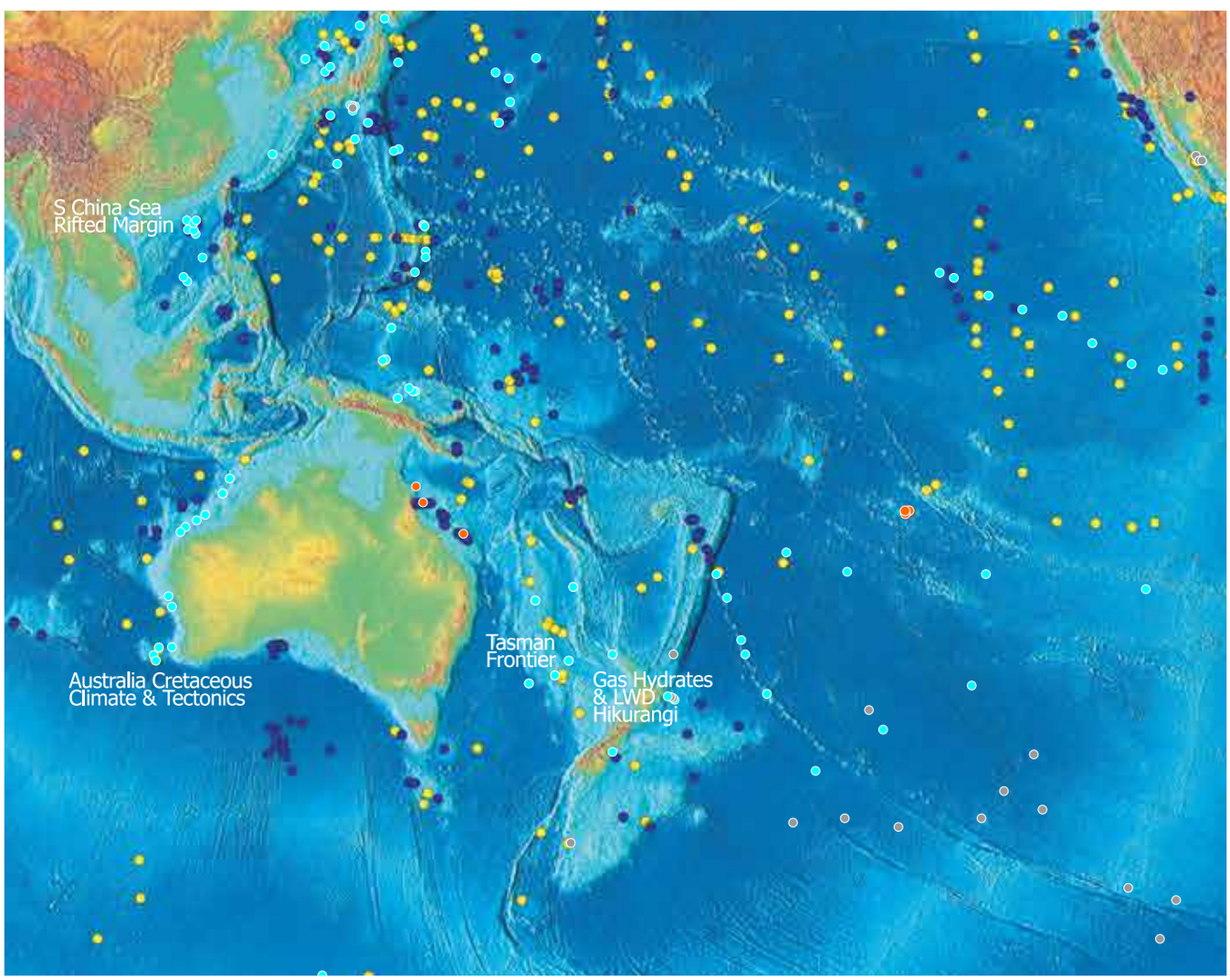
provide the opportunity to investigate the physical processes and *in-situ* conditions that govern the spectrum of fault slip modes through a combination of LWD, coring, and continuous monitoring. On Expedition 372, LWD data were acquired at a series of sites that will be cored and instrumented during the subsequent Expedition 375 Hikurangi Subduction Margin.

http://iodp.tamu.edu/scienceops/expeditions/hikurangi_gas_hydrate_slides.html

Related website:
http://iodp.tamu.edu/scienceops/expeditions.html

Expedition 367: The JOIDES Resolution at Site U1502 (photo Tim Fulton, IODP JRSO).

JOIDES Resolution **expeditions in 2017**



Scientists at the core description table during the Onshore Science Party of Expedition 364 Chicxulub K-Pg Impact Crater (photo Volker Diekamp, MARUM.

5. Selected 2017 IODP publications from ECORD scientists

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2. Avery RS, Xuan C, Kemp AES, Bull JM, Cotterill CJ, Fielding JJ, Pearce RB, Croudace IW (2017). A new Holocene record of geomagnetic secular variation from Windermere, UK. Earth Planet. Sci. Lett. doi:10.1016/j.epsl.2017.08.025

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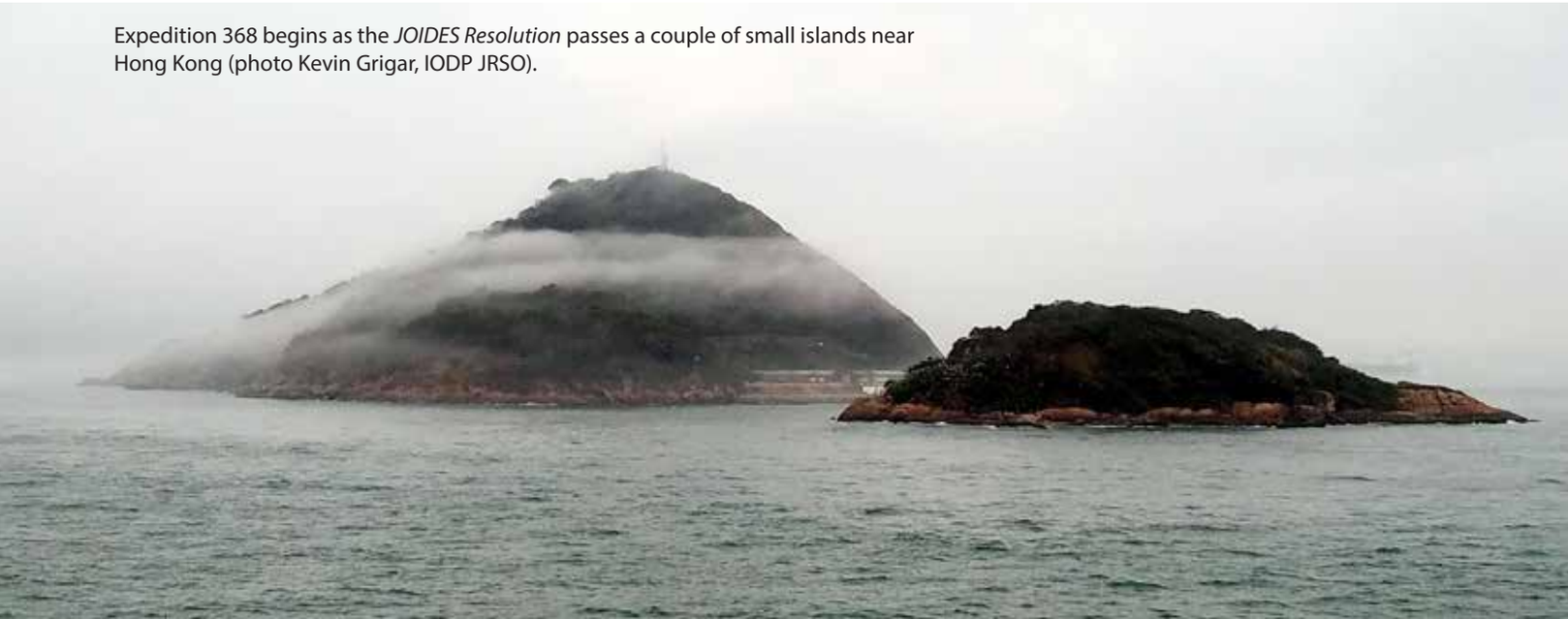
Expedition 368 begins as the *JOIDES Resolution* passes a couple of small islands near Hong Kong (photo Kevin Grigar, IODP JRSO).



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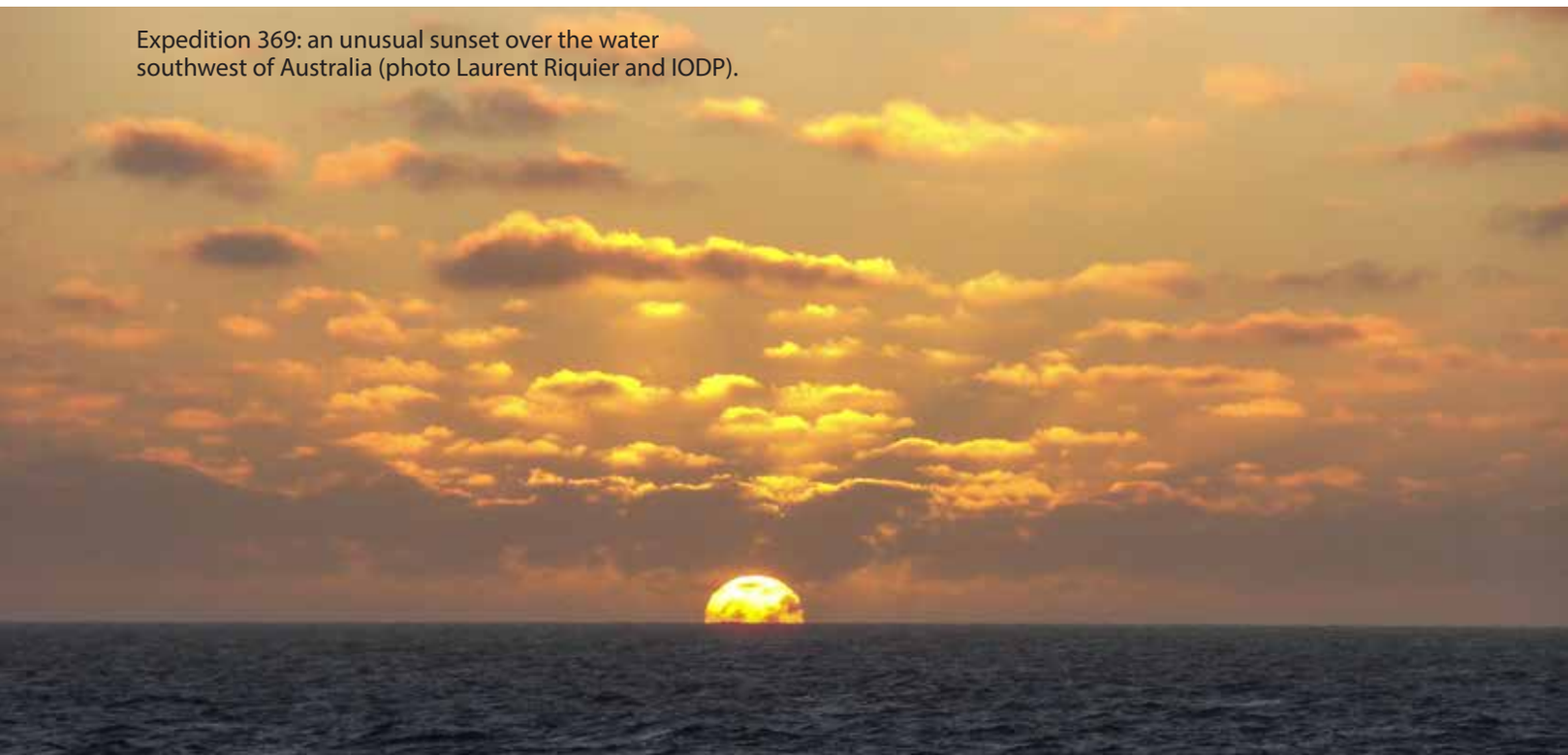
Expedition 369: an unusual sunset over the water southwest of Australia (photo Laurent Riquier and IODP).



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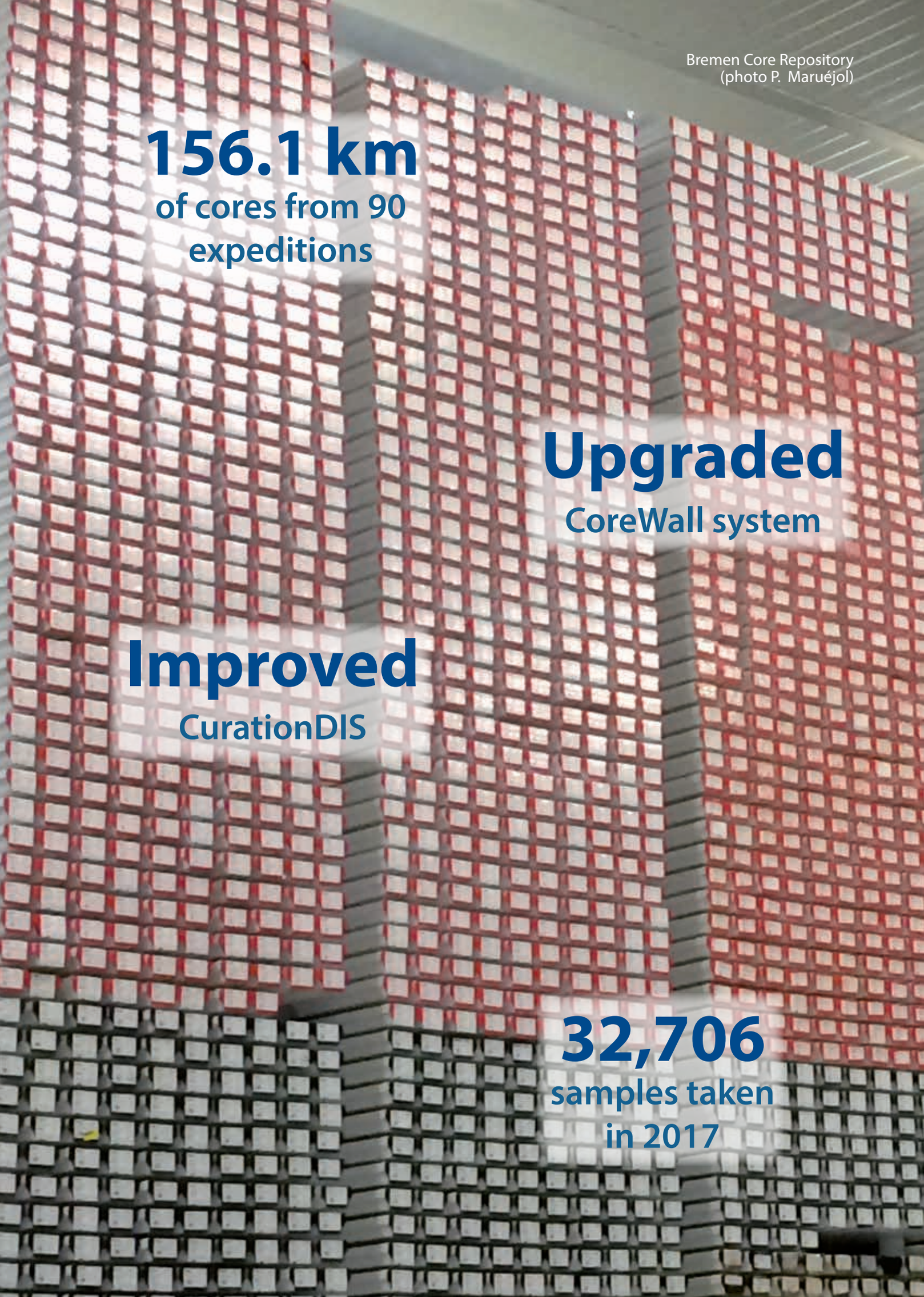
Wildlife in the Gulf of Corinth (D. Smith, ECORD/IODP).



Bremen Core Repository
(photo P. Maruéjol)

156.1 km
of cores from 90 expeditions

Upgraded
CoreWall system

Improved
CurationDIS

32,706
samples taken in 2017

6. Archiving IODP cores: the IODP Bremen Core Repository

The Bremen Core Repository (BCR) at the MARUM, University of Bremen, Germany, is one of the three IODP core repositories. The other two are the Gulf Cost Repository (GCR) located at Texas A&M University in College Station (USA) and the Kochi Core Center (KCC) in Kochi (Japan). In accord with IODP convention and practice, the BCR hosts all the cores recovered since the beginning of scientific ocean drilling from the Atlantic and Arctic Oceans as well as the Mediterranean, Baltic and Black Seas. The BCR is also responsible for organising and hosting the Onshore Science Parties of mission-specific platform (MSP) expeditions and providing mobile laboratories for these expeditions.

Bremen Core Repository and sample statistics	
Expeditions	**Length of cores (km)**
90	156,18
Bremen Core Repository FY17	
Sample requests (from ECORD countries)	**Sample taken**
249 (131)	32,706

Samples and requests at BCR

The BCR presently (January 2018) contains **156,18 km** of deep-sea cores from **90 expeditions**. A total of **32,706 samples** were taken at the BCR for **249 requests** (of which 131 were submitted by ECORD-country scientists) in 2017 *(table above right)*.

A series of improvements in CurationDIS have been accomplished and a new version (6.3) is now in operation at the BCR and working smoothly. The new tool for generating and registering IGSNs has been applied to all samples taken for IODP Expedition 364. The server migration from old separate DIS file servers to MARUM servers within Green-IT Housing Center of the University of Bremen was achieved successfully. This migration included the set-up of two new virtual network-attached-storage (NAS) server systems and respective transfer of database back-ends of the CurationDIS and ExpeditionDIS.

All BCR samples (over 1.66 million samples/more than 6816 sample requests/over 4484 individual scientists, including samples taken earlier at the GCR for legacy cores that are now at BCR) are entered into a database, the BCR DIS Internet Interface, that is accessible to the general public for post-moratorium samples (web interface for curatorial data - http://dis.iodp.pangaea.de/BCRDIS/).

The BCR also temporarily stored cores from the other IODP repositories and made them available for non-destructive measurements campaigns: for example, about 3500 metres of core from Expedition 363 Western Pacific Warm Pool shipped in March 2017 from the Gulf Coast Repository (final archived at Kochi Core Center) were at the BCR. The XRF-core scanning at the surfaces of these archive half-core sections at MARUM and the University of Kiel was completed within five months, after which these cores were returned.

MSP expeditions at BCR

CoreWall-Corelyzer initially used during MSP Onshore Science Parties (OSP) has been continuously undergoing improvements. The CoreWall system was significantly upgraded. A new computer has been installed to increase performance. We are continuing to explore new ways to integrate Corelyzer into our daily normal operations, including education and outreach. Use of the new 'IODP Sample and Data Request' (SaDR) system by the general science community has continued to function well. It is being used for all requests for samples from all DSDP and ODP Legs as well as all IODP expeditions.

The Scientific Earth Drilling Information Service – SEDIS http://sedis.iodp.org/ - is continued in the new IODP and being maintained.

As part of the ECORD Science Operator (ESO), BCR preparations for Expedition 381 Corinth Active Rift Development, including for core curation and core flow/ laboratory options *(right and below)*, were intensified and finalised this year. BCR staff members sailed on this expedition, attended the mobilisation operations in Falmouth, UK, and in Malta, and accompanied the container shipping from Corinth, Greece. In addition, BCR staff members have attended an ESO meeting in Edinburgh, UK, in February, pre-expedition meetings in March (Expedition 381) and in August, (Expedition 377 Arctic Ocean Paleoceanography), and ECORD Outreach & Education Task Force meetings *(see 8. Communicating, page 65)*.

Patrizia Gepräz, assistant curator, in the curation container during Expedition 381 (photo R. Gawthorpe, ECORD/IODP).

The BCR Manager attended the ECORD Facility Board (EFB) meeting in Hannover in March 2017, hosted and participated in the ECORD Evaluation Committee Meeting in June, attended the Operational Review meeting of Expedition 364 Chicxulub K-Pg Impact Crater Meeting in Lisbon during the same month *(page 27)*, and the ECORD Council - ESSAC meeting in Southampton, UK in October 2017.

Luzie Schnieders collects pore-water samples from sedimentary cores during the offshore phase of Expedition 381(photo E. Le Ber, ECORD/IODP).

Visitors at BCR

The location of the BCR on the University of Bremen campus has proven to be very convenient for many visitors, ranging from walk-in scientific visitors, the general public to school classes, including Skype conferences to the Geo show "Unterirdisch" in Braunschweig *(page 53)*. In addition a ship-to-shore live event to the *JOIDES Resolution* was organised during the ECORD Summer School 2017 *(page 53)*, and student groups from other universities in Germany and Europe and official delegations visited the University of Bremen.

Ship-to-shore video with the JOIDES Resolution (Exp 371) during the ECORD Summer School 2017: Thomas Westerhold gave an onboard lab tour (photo Ulrike Prange, MARUM).

Last preparations for the life broadcast for the kids geo show "Unterirdisch" at the occasion of the joint IODP/ICDP colloquium in Braunschweig (photo Volker Diekamp, MARUM).

In 2017, amongst others, the BCR was visited by a delegation from the Marine Technology Society, Japan, two Ministers of the German Federal Parliament, the General Consul of Chile in Hamburg Mr. Erwin Varas and the Honorary Consul of Chile in Bremen Mr. Reinhard Rudolf Ketter, the DFG Commission for Future Targets in Geosciences, Parliamentary State Secretary to the Federal Minister of Education and Research Stefan Müller, a delegation from the University of Malta hosted by Honorary Consul of Malta, Dr Thomas Stöcker including Prof. Alfred Vella (Rector) of the university of Malta and Dr Silvio De Bono (President of the Board of Governors), Malta College of Arts, Science and Technology, the ECORD External Evaluation Committee, the German Council for Scientific Information Infrastructures, a group of 16 international science journalists held a workshop a MARUM on invitation of the German Academic Exchange Service (DAAD) and Professor Jean-Pierre Bourguignon, President of the European Research Council (ERC).

Equally important for informing and educating the general public of our goals and scientific and technical achievements are the frequent visits by representatives of the television, radio and print media. For example, a Science Media film team has filmed at the BCR *(photos below)* for the video "IODP: Open Data for Global Research" - https://www.youtube.com/watch?v=bkng1fm0FeA&feature=youtu.be.

In 2017, the BCR provided core material for numerous course studies run by various instructors. These were usually visits to the BCR by classes. These courses included core description and visual illustration of geoscientific concepts. The BCR is also an ideal place to train students, with the opportunity to work on real cores and have access to laboratory facilities. The 11th ECORD Summer School 2017, presenting a different IODP theme each year that relates to the IODP science plans, was dedicated to the topic of "Current-Controlled Sea Floor Archives: Coral Mounds and Contourites" *(see 7. Engaging the community, pages 58-60)*. The third ECORD Training Course was held in March 2017.

Related website:
https://www.marum.de/en/Research/IODP-Bremen-Core-Repository.html

Scenes at the BCR reefer and lab during the filming for the video "IODP: Open Data for Global Research" (photos courtesy Dan Brinkhuis/ ScienceMedia)

5 MagellanPlus workshops on all IODP themes

6 research grants distributed to young scientists

155 students & early-career scientists trained in 2017

26 IODP-related lectures given in 8 countries

3rd ECORD School of Rock

Supply ship during Expedition 381 Corinth Active Rift Development (photo P. Robert, ECORD/IODP).

7. Engaging the community

Development of future drilling proposals: the MagellanPlus Workshop Series Programme

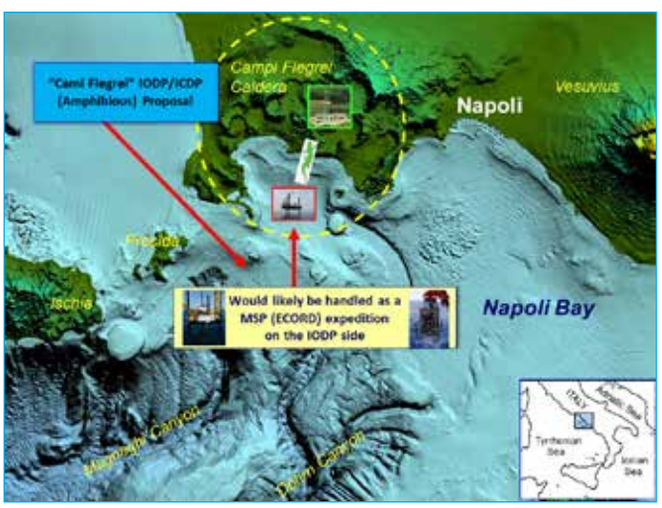
The ECORD/ICDP MagellanPlus Workshop Series Programme is designed to support European and Canadian scientists to develop new and innovative science proposals that follow the major themes of the IODP and ICDP Science Plans. For this purpose this programme funds workshops and/or travel grants that are expected to lead to or foster high-quality and innovative scientific drilling proposals for submission to IODP and ICDP. One call for workshops was issued for the organisation of workshops in 2017 and three new IODP-related proposals were received.

From a **total budget of 70 K€, five MagellanPlus workshops** were funded in 2017:

- **Caldera Drilling - Campi Flegrei, 25-28 February 2017, Naples, Italy**

Conveners: Volkhard Spiess (University of Bremen), Marco Sacchi (IAMC Naples), Giuseppe De Natale (INGV Naples), Lena Steinmann (University of Bremen)

During this workshop, **35 participants from four ECORD countries** gathered to discuss the key scientific issues for a coordinated IODP-ICDP proposal dedicated to the drilling of the Campi Flegrei Caldera. The workshop built upon previous research and networking activities conducted by the proponents *(below)* that included **(1)** coordinated ICDP Workshop and ESF Magellan Workshop held on 13-15 November 2006 in Naples, **(2)** submission and approval of a ICDP full proposal (Campi Flegrei Deep Drilling Project) in 2006-2008, **(3)** submission of IODP pre-proposal 671 in 2006-2007 with indication of re-submission on the basis of an implemented site survey package, **(4)** realisation of two pilot holes (namely 500 m and 200 m deep) as a preliminary phase to the ICDP deep drilling, **(5)** acquisition of new offshore site-survey data (multiscale reflection seismics, multibeam bathymetry and gravity core data) between 2008 and 2016.



- **Tyrrhenian Magmatism & Mantle Exhumation (TIME), 5-7 June 2017, Bologna, Italy**

Convener: Nevio Zitellini (ISMAR Bologna)

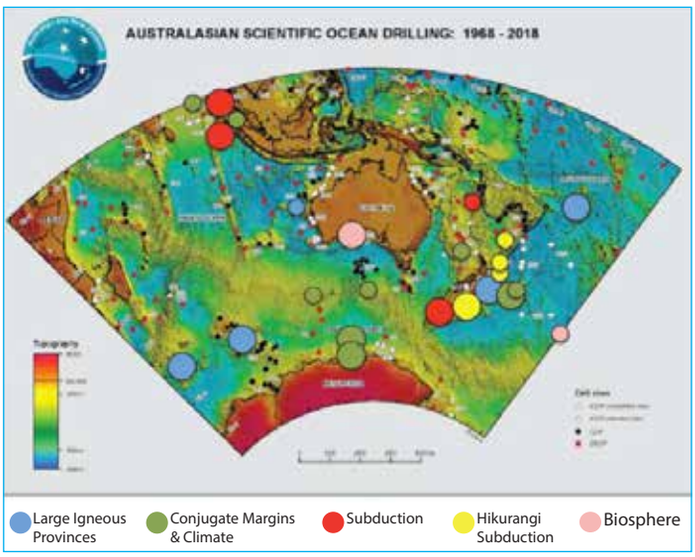
The Institute of Marine Science (ISMAR) of the National Council of the Italian Research (CNR) of Bologna held this workshop, which gathered **36 scientists from seven countries** *(below)*. The workshop was the follow up of the Science Evaluation Panel (SEP) recommendation to the pre-proposal 889 TIME, which was submitted to IODP in March 2016 to study the process of continental lithospheric rifting and formation of the continent-ocean transition (COT), including magmatism and mantle exhumation in the Tyrrhenian basin.

Participants of the TIME MagellanPlus workshop

- **Australasian Regional Workshop for building new IODP proposals, 13-16 June 2017, Sydney, Australia**

Conveners: Neville Exon (Australian National University), Karsten Gohl (Alfred Wegener Institute), Michael Gurnis (California Institute of Technology), Stuart Henrys (GNS Science, Wellington), Fumio Inagaki (JAMSTEC), Rob McKay (Victoria University, Wellington), Dietmar Mueller (University of Sydney, Conference Host), Dhananjai Pandey (NCAOR), Amelia Shevenell (University of South Florida), and Jessica Whiteside (University of Southampton)

The goal of the Australasian workshop was to trigger development of new IODP proposals and re-invigorate existing, compelling proposals. It was an opportunity to



Location map of potentials proposals discussed in the Australasian regional workshop

Participants of the workshop examine the Ægir 6000 ROV during a guided tour of the Norwegian Ocean Observation Laboratory facility at the University of Bergen.

entrain a new generation of early-career scientists to work collaboratively to plan a new phase of scientific ocean drilling in the Australasian region. **Fourteen ECORD scientists from five countries** attended the workshop during which **24 proposals** were discussed *(above)*. The workshop covered all possible IODP platforms, not just the *JOIDES Resolution*, which needs good regional proposals to have it return to this region in 2022, a date that is pencilled into the ship's long-term schedule. Mission-specific platforms (MSP) are suitable for working in shallow-water areas and on the Antarctic continental shelf. There is considerable optimism that IODP Proposal 871, for the use of the *Chikyu* to drill deep into the Cretaceous on the Lord Howe Rise, will come to fruition in 2020 and provide strong encouragement for those hoping to use the *Chikyu* elsewhere in the Australasian region.

- **Carbon cycling at the ultra-slow Arctic spreading ridge system, 6-8 September 2017, Bergen (Norway)**

Conveners: Steffen Leth Jørgensen, Desiree Roerdink and Eoghan Reeves (UiB, KGJ DeepSeaResearch), Tamara Baumberger (NOAA)

The aim of the workshop was to lay the cornerstones for a future full IODP drill proposal to the southern Knipovich ridge (SKR) by framing scientific objectives, select drillsites and expose potential risks related to deep drilling of the North Atlantic Spreading Ridge System. In order to achieve this, the workshop brought together **18 scientists from five countries**, and from multiple disciplines, ranging from geophysics to petrology to biogeochemistry and microbiology, many of which had extensive knowledge and experience in planning and leading previous IODP drilling expeditions *(above right)*.

- **Volcanic, tectonic and hydrothermal processes in an island-arc caldera environment: history, mechanisms, feedbacks and impacts: Initiation of a proposal to drill at the Santorini-Kolumbo marine volcanic system in Greece, 21-23 November 2017, Athens (Greece).**

Convenors: Tim Druitt (Université Clermont Auvergne), Paraskevi Nomikou (University of Athens), Christian Hübscher (University of Hamburg), Dimitrios Papanikoloau (University of Athens)

This workshop assembled a core-working group to initiate a proposal for drilling at Santorini-Kolumbo marine volcanic field in Greece. **Thirty scientists** attended the workshop among which are **eight early-career scientists** and **18 ECORD scientists from five countries**. Santorini is one of the most explosive arc calderas in the world, the iconic Late Bronze Age (LBA) eruption being the most recent of many Plinian eruptions over 350 Ky. Well dated deep-sea ash layers from many of these eruptions form excellent time-stratigraphic markers in marine sediments. The post-LBA Kameni Volcano inside Santorini caldera has been constructed over the last 3600 years, with the last eruption in 1950. Bradyseismic unrest in 2011-2012 inside the caldera has been attributed to shallow injection of magma, reminding us of the risk of future eruptions at this major tourist destination. The Kolumbo underwater volcano, 7 km NE of Santorini, has a 1.5 km diameter crater and formed during up to five eruptions, the latest in 1650. It has an active hydrothermal field, with polymetallic sulphide and sulphate chimneys discharging CO_2-rich fluids. Drilling on and around the volcanic system would lead to better understand **(1)** the eruptive histories of these hazardous volcanoes, **(2)** the dynamics and products of sub-marine explosive activity, **(3)** caldera formation in a subduction setting, **(4)** environmental impacts of the LBA

Santorino-Kolumbo MagellanPlus workshop: Field excursion to the Soussaki volcanic field, west of Athens

eruption, **(5)** links and feedbacks between tectonics and volcanism, **(6)** shallow hydrothermal systems and massive sulphide deposits, and **(7)** microbial ecosystems at arc calderas. The initiative will build on large existing datasets, including a detailed knowledge of the eruptive history of Santorini and its deep-sea ash layers, multiple sub-seafloor seismic reflection profiles obtained in several campaigns since 2006, high-resolution swath bathymetry, submarine sampling by ROVs of volcanic products, hydrothermal deposits and bacterial mounds, and a high-resolution, active seismic tomography experiment carried out at Santorini-Kolumbo in 2015.

A more complete overview of MagellanPlus workshops, reports and summaries can be found at **http://www.ecord.org/science/magellanplus/**.

For the organisation of the regular MagellanPlus workshops it is anticipated that the number of proposals and requested travel grants will not significantly increase. This would imply that the current budget of 70 K€ would suffice for FY18. However, since IODP is heading towards a new phase post 2023 and ECORD should play a pivotal role in the next programme it is anticipated that one or two workshops on theme(s), such as Science Frontiers and New Technological Developments, will be proposed in preparation for an IODP-broad conference to be held in 2019. In addition, initiatives have been deployed to organise a special workshop for early-career scientists from ECORD countries to provide hands-on experience in IODP proposal writing and planning. The MagellanPlus Programme is an ideal platform to support both initiatives and in October 2017, the ECORD Council decided to increase the MagellanPlus FY18 budget by 30 K€ to a total of 100 K€.

Related website: http://www.ecord.org/science/magellanplus/

Training young scientists

A major goal of ECORD is to train the next generation of scientists from member countries and promote IODP-motivated science. The ECORD Summer Schools, initiated in 2007, are well established and are attended annually by many Masters and PhD students as well as postdoctoral research fellows from ECORD member countries and beyond. Three ECORD Summer Schools and one ECORD Training Course were sponsored by ECORD in 2017.

- **2nd ECORD Petrophysics Summer School, Leicester, UK, 27 June - 1 July 2017**

The European Petrophysics Consortium (EPC) organised the Petrophysics Summer School in Leicester (UK) for the second time in 2017, following the success of this event in the previous year.

The 2nd ECORD Summer School in Petrophysics focused on the application of downhole logging and core physical properties data to scientific questions, with case studies from various IODP expeditions. The workshop consisted of lectures, discussion groups, and practical exercises on the different elements and data types used in petrophysical analysis. A total of 16 lecturers and tutors from five different countries provided the programme, with a broad mix from academia, IODP operators and industry. Basic training in industry-standard software packages, including Schlumberger's Techlog, formed a core part of the summer school. Sessions fell into one of three categories:

- those that explained and described the principle behind petrophysical measurements;
- those that demonstrated the methods by which petrophysical measurements are acquired;
- those that revealed the ways in which petrophysical data may be used in the pursuit of scientific objectives through integration and interpretation.

Excursions to Reeves Wireline Technologies *(page 58)* and to the Core Store at the National Geoscience Data Centre of the British Geological Survey *(page 62)* centred on downhole-logging activities, including the development, testing, calibration and deployment of downhole-logging tools. In addition, practical exercises included demonstrations of physical property data acquisition, by way of multi-sensor core loggers. Integration of core physical properties data and their use to calibrate *in-situ* measurements also formed a key component of the

workshop. Poster sessions of the attendee's own research were used to discuss their future aims and create a network.

Related website: https://www2.le.ac.uk/departments/geology/research/gbrg/projects/iodp/summerschool17

- **14th Urbino Summer School in Paleoclimatology on Past Global Change Reconstruction and Modelling Techniques (USSP), Urbino, Italy, 13 - 28 July 2017**

The Urbino Summer School in Paleoclimatology (USSP) is organised annually by an international consortium of scientists and is hosted by the Faculty of Sciences and Technology at the University of Urbino. The summer school is open to students from ECORD member countries, the USA and other countries and is designed to provide training in many different areas of palaeoclimatology, including biogeochemical cycling and palaeoceanography, continental systems, and aspects of deep time climate modeling. The course consisted of a student-centred programme of **(1)** integrated topical lectures by 25 internationally recognised scientists, **(2)** student-centred data-rich exercises, investigations, and presentations on field data and modeling results, **(3)** parallel sessions providing groups of participants with a more focused coverage of selected topics within palaeoclimatology, **(4)** a regional field excursion to classic Cretaceous and Cenozoic sections, and **(5)** intensive discussions of specific palaeoclimate topics in small student working groups facilitated by dedicated instructors. The summer school brought together 66 students from 9 ECORD member countries (Canada, Finland, France, Germany, Italy, the Netherlands, Sweden, Switzerland and the UK) and six non-ECORD member countries (Australia, Israel, New Zealand, Poland, Singapore and the US).

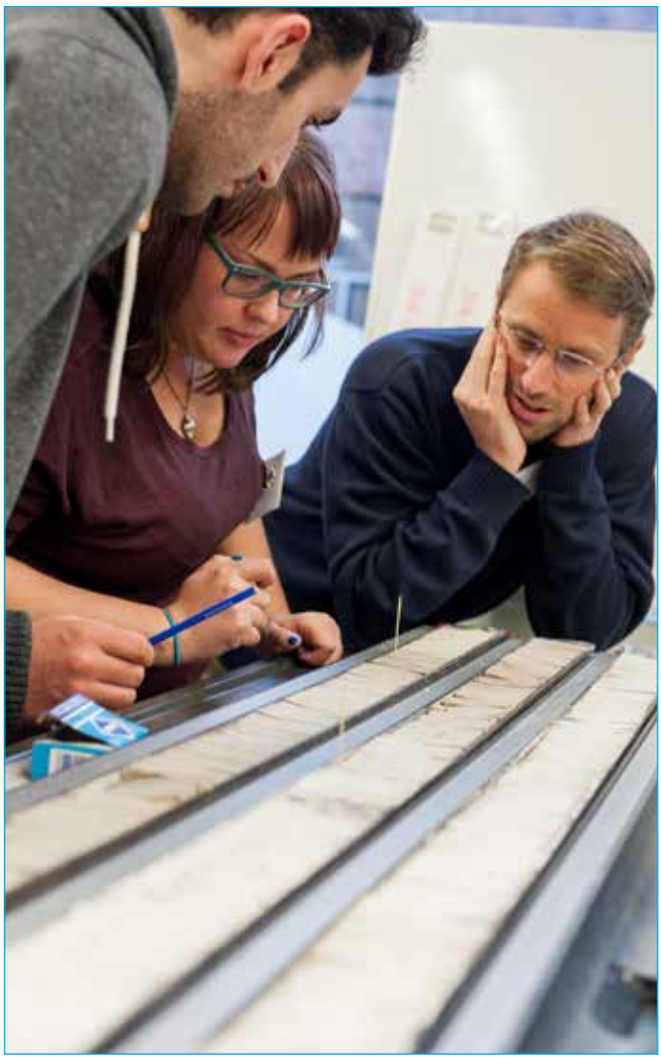
Related website: http://www.urbinossp.it/

- **11th ECORD Bremen Summer School on "Current Controlled Seafloor Archives: Coral Mounds and Contourites", Bremen Germany, 21 August - 1 September 2017**

The ECORD Bremen Summer School on "Current Controlled Seafloor Archives: Coral Mounds and Contourites" made up of the facilities at MARUM and its International Graduate School for Marine Sciences GLOMAR, as well as the Bremen Core Repository (BCR), who jointly offer the unique training possibility used for this summer school by providing laboratory and seminar facilities.

The topic of this year focused on the striking commonality between contourite drifts and cold-water coral mounds in terms of their dependence on a dynamic bottom current regimes and on sediment supply to generate impressive sedimentary archives. Their capacity to form distinct positive seafloor structures means that both systems are characterised by enhanced sediment deposition. Consequently, these sedimentary features can serve as

ECORD Petrophysics Summer School 2017 at Weatherford (photo Sarah Davies).



Visual core description during the ECORD Training Course 2017 (photo Volker Diekamp, MARUM).

palaeo-archives of environmental changes with enhanced temporal resolutions. However, their temporal ranges and/or resolutions vary with changing forcing conditions. Thus, combining different signals and mound versus contourite records will be among many promising tasks for future cooperation between contourite and cold-water coral mound researchers.

Related website: **https://www.marum.de/en/education-career/ECORD-training/ECORD-Summer-Schools/ECORD-Summer-School-2017.html**

- **ECORD Training Course 2017 "The Virtual Drillship Experience", Bremen, Germany, 6 - 10 March 2017**

For the third time the ECORD Training Course took advantage of the setting of the IODP BCR at MARUM and provided a "Virtual Drillship Experience" for scientists from academia and industry. This one-week course was focused on basic training in IODP core-flow procedures and preparing participants to sail on an offshore drillship expedition *(pages 17, left and 63)*. IODP-style lab exercises form the basis of the ECORD Training Course and follow the pattern of the unique "Virtual Ship Experience" developed for the Bremen ECORD Summer Schools. MARUM received **61 applications from 20 countries**, which attests to the established success of the training course. A total of **30 participants** from eleven ECORD and non-ECORD countries (Australia, Brazil and USA) attended the course.

Related website: https://www.marum.de/en/education-career/ECORD-training/ECORD-Training-Courses.html

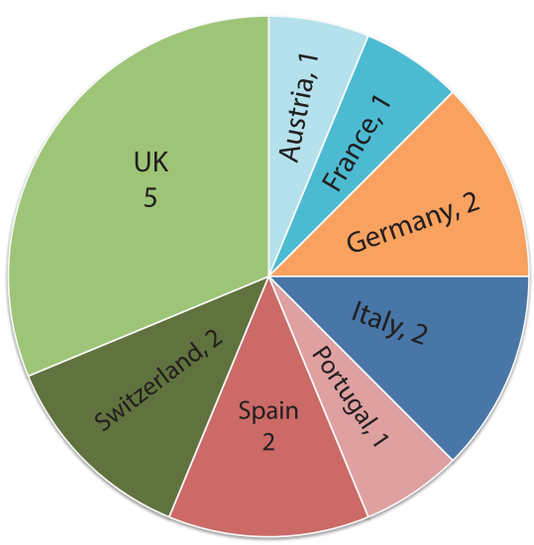
Sponsoring research for young scientists

- **ECORD Scholarships 2017**

ECORD Scholarships provide support to outstanding students to attend the ECORD-sponsored Summer Schools, and a total of **42 applications** were received in 2017.

- The ECORD Petrophysics Summer School (Leicester, UK) received **sixteen applications** for ECORD scholarships from **eight ECORD member countries**, and **five students from four ECORD member countries** were awarded *(below)*. In addition, nine travel awards by USSSP to US-based scientists and two awards by UK-IODP were given to participants for their attendance at the Petrophysics Summer School

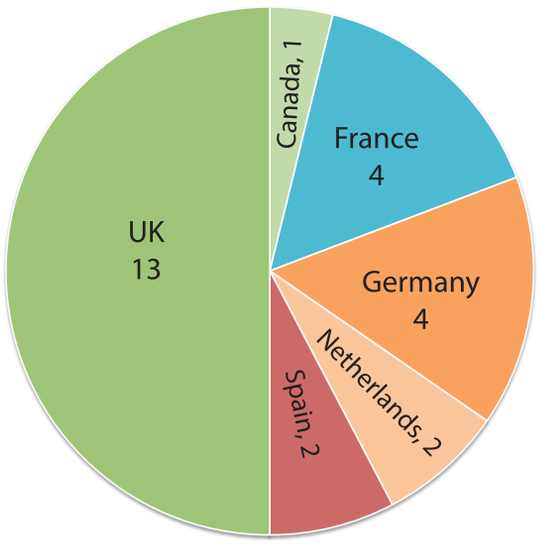
- The Urbino Summer School in Paleoclimatology



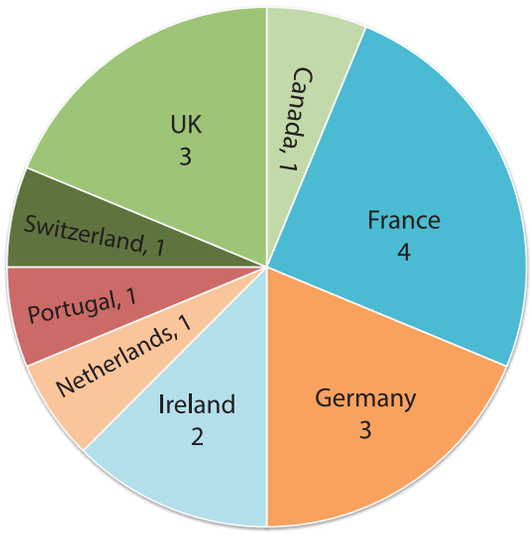
Distribution of ECORD Scholarship applications to the Petrophysics Summer School 2017 (n = 16).

Scholarship awardees - 2nd Petrophysics Summer School

Cristoph Böttner	GEOMAR Kiel	Germany
Emma Gregory	Durham University	UK
Daniel Tentori	University of Rome	Italy
Sandra de Castro Santos	CSIC University of Granada	Spain
Bettina Schramm	GEOMAR Kiel	Germany



Distribution of ECORD Scholarship applications to the Urbino Summer School 2017 (n = 26).



Distribution of applications to the ECORD Research Grants 2017 (n = 16).

Scholarship awardees - 14th Urbino Summer School

Markus Adlof	University of Bristol	UK
Lucia Alonso Azibeiro	University of Salamanca	Spain
Ronald Guthrie	University of Oxford	UK
Gwen Owen Jones	University of Southampton	UK
Ilja Kocken	Utrecht University	Nertherlands
Ruifang Ma	University Paris-Sud	France
Simone Moretti	MPI Chemistry, Mainz	Germany
Emanuela Piga	Cardiff University	UK
Mike Marcell Zwick	University of Glasgow	UK

received a total of **26 applications** for ECORD scholarships from **six ECORD member countries**, and **nine students from four ECORD member countries** were awarded *(above)*.

- No applications were received for ECORD scholarships for the 11th ECORD Bremen Summer School.

http://www.ecord.org/education/scholarship/

- **ECORD Research Grants 2017**

ECORD supports outstanding early-career scientists by sponsoring merit-based awards for research that is directed toward scientific objectives of past or upcoming DSDP / ODP / IODP expeditions (core material and data). The aim is to foster participation of young scientists in ocean drilling research and encourage them to develop their own projects and collaborate with other research groups outside of their home institutions.

Sixteen applications from **eight ECORD member countries** were submitted in 2017 from PhD students and post-doctoral researchers and **six grants were awarded** (2 UK, 1 Germany, 1 Netherlands, 1 Canada and 1 Portugal) *(above right)*.

http://www.ecord.org/education/research-grant/

ECORD Research Grants 2017

Jakub Ciazela	University Hannover	Germany
Margot Cramwinckel	Utrecht University	Netherlands
Lauren O´Connor	University of Oxford	UK
Teresa Rodrigues	IPMA Lisbon	Portugal
Man-Ying Tsang	University of Toronto	Canada
Madeleine Vickers	Plymouth University	UK

Education/Outreach Officers

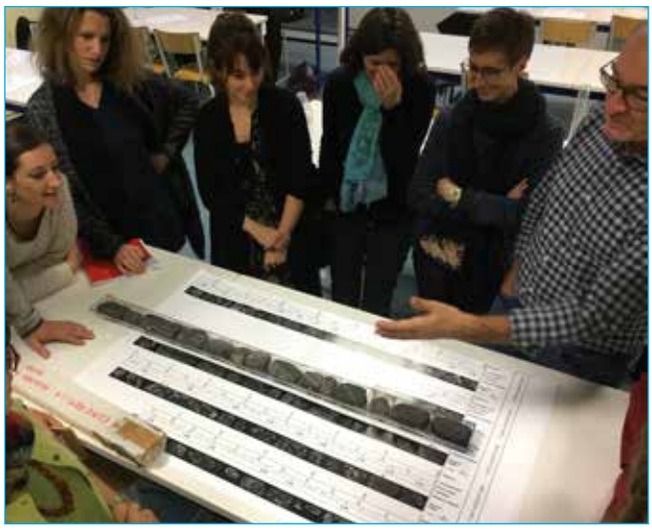
As part of the "Teachers at Sea" programme, initiated by Ocean Leadership and sponsored by the USA, teachers from ECORD countries have the opportunity to participate onboard the *JOIDES Resolution* as Education/Outreach Officers during IODP expeditions - http://joidesresolution.org/onboard-outreach-officer. The primary objectives of this education programme are to:

- Provide educators with opportunities to sail on a ocean-going marine research vessel, working along-side scientists and using state-of-the-art scientific approaches to address problems of global interest and obtain first-hand knowledge of the results of the expeditions,
- Translate scientific results into useful teaching resources, such as classroom curriculum materials,
- Disseminate education resources into classroom settings and motivate other teachers to use IODP science and materials in their curriculum.

Following a call for applications in 2016, ESSAC selected **three teachers** from **eight applicants from three ECORD member countries** to sail on *JOIDES Resolution* expeditions in 2017:

- Martin Böttcher - Teacher (Germany) - Expedition 366 Mariana Convergent Margin & South Chamorro Seamount, posts on ship's log - http://joidesresolution.org/ - and report;

Isabel Sauermilch (left) and Alessia Cicconi conduct a video conference, showing students where the core liner tubes are stored on the core receiving platform, also named the "Cat Walk." (photo William Crawford, IODP JRSO).



Introducing IODP cores with replica and high-definition core photographs to the participants of the ECORD Training Course 2017 (photo Michèle Darrieu).

- Alessia Cicconi - Teacher (Italy) - Expedition 367 South China Rifted Margin A *(above left)* - posts on ship's log,
- Vivien Cumming - Outreach specialist (UK) - Expedition 369 Australia Cretaceous Climate and Tectonics *(pages 35-36)* - posts on ship's log.

Related website: http://www.ecord.org/education/teachers-at-sea/

The **ECORD School of Rock** supports educational activities of teachers interested in IODP science via a workshop with lectures given by scientists and practical hands-on sessions developed and tested by scientists and educators who sailed on IODP drillships. The main part of the funding of every ECORD School of Rock has to be provided by the national educational organisation/ministry of the hosting country. The national IODP offices provide additional funding, and support may also be requested from ECORD.

In 2017, the **third ECORD School of Rock** was held in Brussels and organised by Michèle Darrieu, from 29 November to 1 December 2017 for a group of 20 teachers from French high schools based in London, Brussels, Dublin, Luxembourg, Stockholm, Paris and Quimper *(below)*. The main goal of the workshop was to address French teachers based in North and central European countries on how to develop activities with appropriate IODP resources in the classroom *(above)*. The workshop included lectures given by six ECORD scientists and practical hands-on sessions developed and tested by scientists and ECORD teachers who sailed on IODP expeditions. During the workshop, interviews of ECORD scientists were conducted by students and posted on the web radio of the high school.

Related website: http://www.ecord.org/education/sor/

Participants of the ECORD School of Rock 2017

Promoting IODP science through the ECORD Distinguished Lecturer Programme

The ECORD Distinguished Lecturer Programme (DLP) is designed to bring the scientific achievements of ocean drilling to a broad audience within universities/institutes in ECORD member countries. ESSAC selects "Distinguished Lecturers" who then tour ECORD member countries, and on occasion non-ECORD countries, to present the exciting discoveries related to the four main scientific themes addressed by the IODP Science Plan - http://www.iodp.org/science-plan-for-2013-2023. Any university or institution located in an ECORD member country may apply to host a lecturer.

The programme was renewed in 2017 *(page 16)* following great successes in previous years, with four lecturers selected to cover the major themes defined in the IODP Science Plan:

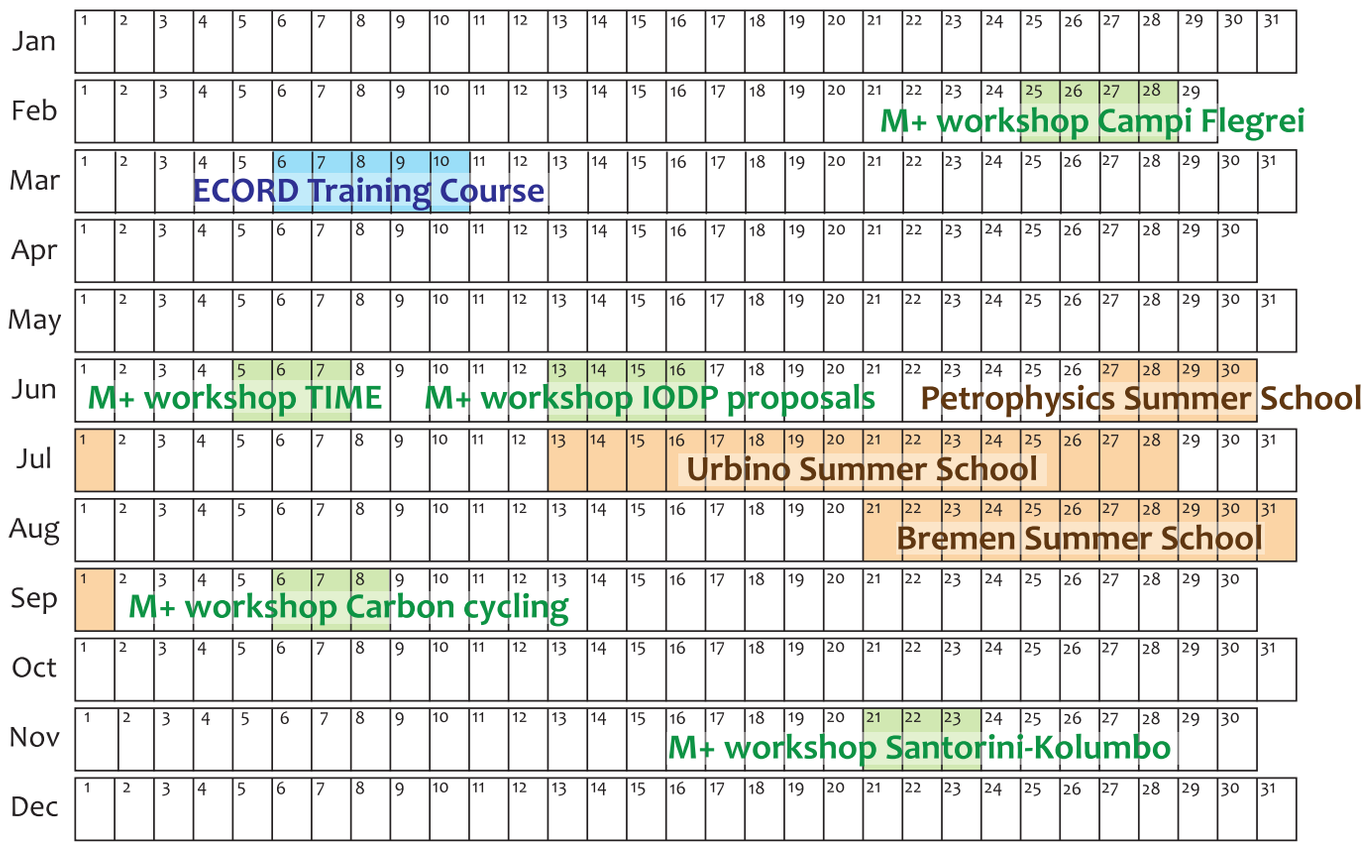
- **Bridget Wade,** University College London: "Biotic response to Cenozoic climate perturbations: new insights from ocean drilling"
- **Mark Alexander Lever**, ETH Zurich: "Controls on microbial population size and community structure in sub-seafloor environments"
- **Gretchen Früh-Green**, ETH Zurich: "Serpentinization and life: Insights through ocean drilling";
- **Marianne Conin**, University of Lorraine, Nancy: "Thrilling advances in the understanding the up-dip limit of subduction zones and the associated risks of tsunami and earthquakes through scientific drillings".

Distribution of the ECORD Distinguished Lecturer in 2017 (n = 23).

Twenty-six DLP lectures were scheduled in 2017 with the DLP lecturers visiting **eight ECORD countries** *(above)*. The schedule and more information is available under **http://www.ecord.org/education/dlp/**.

ECORD Petrophysics Summer School 2017: Prof Sarah Davies and students look at cores at the National Geoscience Data Centre, British Geological Survey (photo E. Le Ber).

ECORD Summer Schools, Training Course and MagellanPlus (M+) workshops in 2017



ECORD Training Course 2017 (photo Volker Diekamp, MARUM).

8 teachers/ outreach specialists involved

2 films related to Expedition 364

10 events showing ODP/ IODP replicas

2 exhibition booths at major science conferences

3 media events related to MSP expeditions

Interviews on the quayside before Expedition 381 set sail from the port of Corinth (photo C. Cotterill, ECORD/IODP)

8. Communicating

Promoting activities and accomplishments of IODP to various audiences is a major goal of ECORD. Within ECORD, responsibilities for outreach and education activities are distributed between EMA (coordination, publications and web), ESO (MSP expeditions and media) and ESSAC (education), and are coordinated by the ECORD Outreach & Education Task Force (E-OETF). The E-OETF met twice during 2017 with outreach colleagues from ICDP and also with colleagues from the US Science Support Program, CDEX/JAMSTEC (Japan) at the fall meeting.

Communicating with scientists

In 2017, the ECORD outreach staff continued to promote both the IODP and ICDP programmes under the umbrella of "Scientific Drilling" at science conferences. In coordination with our colleagues from the USA and Japan, and with the ICDP outreach staff, a joint IODP-ICDP booth was organised at the AGU Fall Meeting 2017 in December in New Orleans (USA). With almost 15,000 participants, the main event for ECORD is the European Geosciences Union (EGU) Conference in Vienna (Austria) in April, at which ECORD and the ICDP jointly sponsored a booth *(page 66)* and organised a Townhall Meeting. ICDP logging scanner demonstrations and videos attracted many visitors to the booth and programme information and subscriptions were accessed via online tools. The success of these joint events will lead to similar collaborations in 2018 at the EGU as well as at the AGU.

The E-OETF also supported ECORD member countries Italy and France with the organisation of exhibition booths at science conferences held in Pisa, Trieste and Toulouse. ECORD information was also widely distributed through the ECORD-ICDP MagellanPlus Workshop Series Programme *(pages 55-57)* and ECORD Training Course and Summer Schools *(pages 57-59)*. The E-OETF sponsored a workshop at the 2017 Goldschmidt Conference to train early-career scientists in science communication.

The **ECORD Newsletter** *(above)* is published twice yearly to coincide with the EGU and AGU conferences (spring and fall of each year). The newsletter provides the main published source of general ECORD information, and includes reports on recent outreach and educational activities. Leaflets explaining the programme objectives and the latest information resulting from the six completed MSP expeditions are included in an ECORD folder *(left)*, which is continuously updated.

Media activities

Media activities were conducted by the ESO outreach staff to provide information on ECORD general activities and on mission-specific platform expeditions, especially in regions where these expeditions are implemented.

Two media conferences focusing on the first results of Expedition 364 Chicxulub K-Pg Impact Crater were held at major US science conferences, the Lunar Planetary Science

Conference (LPSC) in March in Houston, and at the AGU 2017 in New Orleans.

A media day related to Expedition 381 Corinth Active Rift Development was organised on 19 October in Corinth (Greece), before the expedition set sail from the port of Corinth. Following the press conference where the Co-chief Scientists and the Expedition Project Manager presented the expedition to the journalists, more interviews were organised during the tour of the vessel *(right and page 64)*. A media release was issued to communicate the goals of the expedition to journalists and media offices of institution of the Science Party, in total 170 outlets. The event received global interest and was reported in six countries.
http://www.ecord.org/outreach/press-releases/

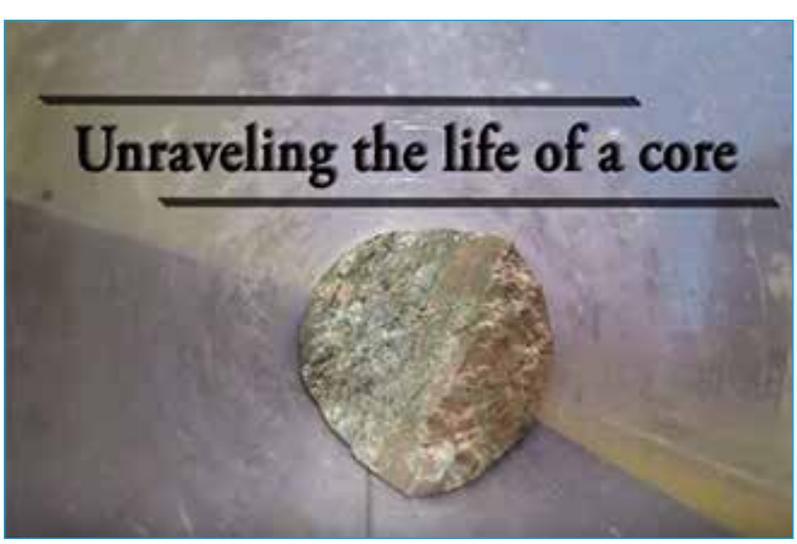
Co-Chief Scientist Lisa McNeill being interviewed by Greek station Skai TV (photo D. Smith, ECORD/IODP).

Communicating with the general public

In preparation for the start of Expedition 381 Corinth Active Rift Development, promotional materials, logo *(page 20)*, leaflet, banner and expedition web page were designed to create the individual identity of the expedition. Several videos were produced during the offshore phase of Expedition 381 and posted on the ECORD YouTube channel. A large number of interviews, GoPro films, video footages were collected to prepare audio-visual materials for the public. New video resources arising from Expedition 364 include a TV documentary produced by Barcroft aired on the BBC, NHK, France Télévision and NOVA and a new video "Unraveling the life of a core" by Lara Jacobi, student at MARUM, University of Bremen *(below)*.
http://www.ecord.org/resources/gallery/ecord-tv/

Participants of the EGU GIFT workshop in the ECORD IODP booth at EGU 2017.

A number of public outreach events organised by ECORD scientists and IODP national offices in France, Italy, Germany, the United Kingdom and Portugal, received a support from ECORD. Replicas of drill cores from ODP/IODP legs and expeditions are valuable tools to introduce ODP/IODP science and to raise awareness about ocean drilling to the public. In 2017, core replicas were provided to support open days in science centres, scientific exhibitions and science festivals in the United Kingdom, France and Germany.
http://www.ecord.org/resources/core-replicas/



ECORD scientists and education/outreach officers who took part in IODP expeditions are vital to bring IODP science to classrooms and the public *(photos page 67)*. In 2017, **eight ECORD teachers and outreach specialists** were involved in IODP expeditions, outreach sessions at conferences and educational workshops *(See 7. Engaging the community, pages 60-62)*. In April, the participants of the EGU/GIFT workshop 2017 were convened to

Adelie Delacour presents IODP during a science festival at University of Saint Etienne, France (photo I. Champion, UJM)

Summer school introducing IODP and marine geology to teenagers organised at the University of Algarve by Cristina Veiga-Pires in July 2017 (photo C. Veiga-Pires).

the ECORD/IODP booth at lunch breaks where they learnt about IODP educational activities and resources *(page 66)*. In late November-early December, Michèle Darrieu, Education Officer on Expedition 359, organised the third ECORD School of Rock at the *Lycée International Français* in Brussels, Belgium, with support from the E-OETF *(page 61)*.

Following the recommendations of the ECORD Evaluation Committee and the decisions of the ECORD Council in June 2017, the E-OETF has started discussions to broaden its outreach activities and resources to the general public.

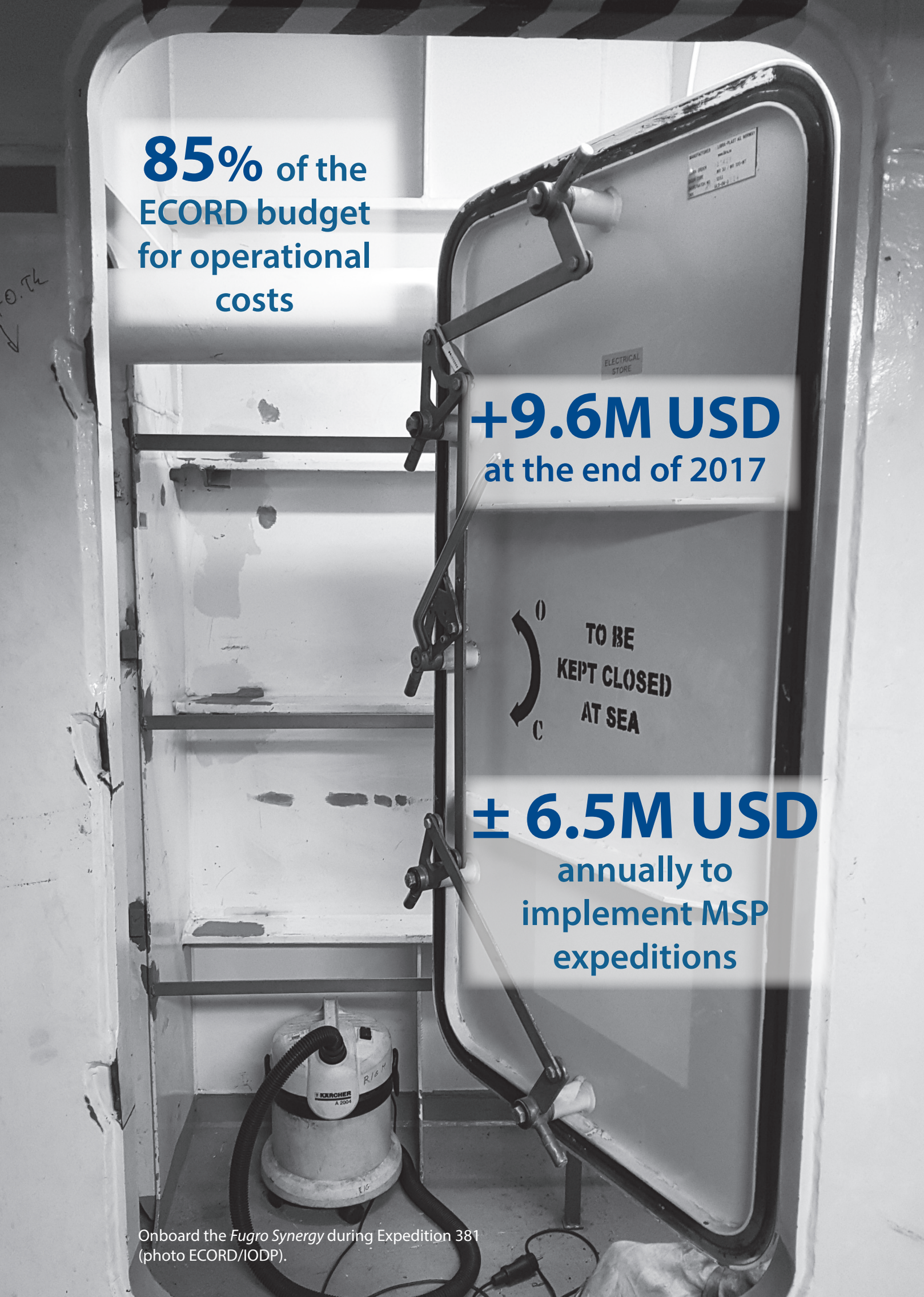
ECORD online

With the ability of the ECORD website *(right)* to distribute online news and the ECORD web app used at conferences, more than 1159 subscribers joined the ECORD mailing list. **Fifty-six online ECORD news** have been distributed to the ECORD mailing list (representing about 1.1/week) and 31 ECORD news have been posted on the ECORD homepage. The ECORD website has an average of 1700 users/month with peaks of 2900 in May and November, and **5900 page views/month** with peaks of 9235 and 7544 in May and in October corresponding to the release of the call for Expedition 377 and the start of Expedition 381. The top six countries using the website are the UK, USA, France, Germany, Italy, and Greece (in February 2017).

Information posted on our social networks (Twitter, Facebook and YouTube) not only helps guiding users to specific ECORD webpages but also encourages return visits to the website. Conveying information to the science community and the wider public is especially useful during major ECORD/IODP events, like MSP expeditions. ECORD continues to share information via ECORD Headlines and by posting news and photographs on its official social media outlets, Twitter - @ECORD_Outreach (1248 followers), Facebook (559 friends) and YouTube EcordEso). Regular promotion of MSP expedition accomplishments are posted on the ESO Twitter - @ESO_Outreach - and ESO Facebook pages. A **blog for Expedition 381** was set up and regularly fed by the outreach team of the expedition - https://esoexp381corinthactiveriftdevelopment.wordpress.com/. Views are directed from ECORD social media and website. Throughout the expedition it received 3577 views on "About" principally from UK, USA, Germany, France and the Netherlands.

Related websites:
http://www.ecord.org/outreach/
http://www.ecord.org/resources/

@ECORD_Outreach ESSAC ECORD YouTube ECORDESO channel



85% of the ECORD budget for operational costs

+9.6M USD at the end of 2017

± 6.5M USD annually to implement MSP expeditions

Onboard the *Fugro Synergy* during Expedition 381 (photo ECORD/IODP).

9. FY17 and FY18 budgets

FY17 ECORD budget

ECORD is currently funded exclusively by 15 member countries.

In FY17[+], the total ECORD budget provided by 15 member countries amounted to about17.5M USD *(below)*. Since 2014, the ECORD budget decrease is of 1.34M USD, mainly due to strong fluctuations in exchange rates between the US dollar and the national currency contributions of five ECORD countries (France, UK, Denmark, Spain and Ireland).

The ECORD budget is seen as a minimum budget due to the opportunity for members to make direct cash and/or in-kind contributions (IKC) that allow them to increase their contributions to ECORD on an *ad-hoc* / expedition by expedition basis.

The contributions to the ECORD budget are unevenly distributed between the member countries, ranging from 5.6M USD to 33K USD *(below)*. Based on their contributions, each ECORD member country receives a participation quota for all IODP expeditions. However, the participation of ECORD member countries to the ECORD educational programme *(page 71)* is standard and not based on levels of financial contribution.

The three major ECORD contributors, Germany (5.6M USD), France (4.595M USD) and UK (3.437M USD), provide 77.5% of the total ECORD budget. The contributions of other member countries range from 33K USD to 1.1M. Italy increased its annual contribution from 400K USD to 500K USD; Canada kept a minimum contribution in 2017 whilst identifying potential new funding sources.

The table *page 70* summarises the ECORD budget for FY17. The expenses are given for comparison.

The ECORD running costs are very stable, amounting to approximately 15% of the member country contributions, leaving **85% of the ECORD budget for direct operational costs**, including the implementation of MSP expeditions (Expedition 381 Corinth Active Rift Development in 2017) and a contribution of 7M USD to the National Science Foundation (NSF) to support the *JOIDES Resolution* operations.

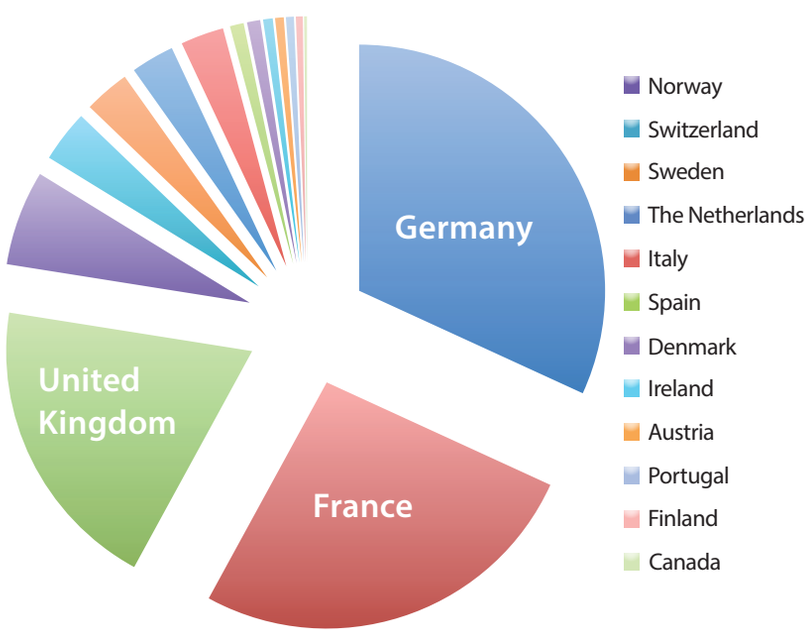
It was agreed with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) that the ECORD 2017 and 2018 annual contributions of 1M USD to support the *Chikyu* operations will be deferred to 2019.

ECORD member country contributions for FY17 (USD).

Austria	100,000
Canada	33,400
Denmark*	152,600
Finland	80,000
France*	4,595,500
Germany	5,600,000
Ireland*	118,750
Italy	500,000
Netherlands	500,000
Norway	1,100,000
Portugal	92,000
Spain*	160,000
Sweden	528,000
Switzerland	600,000
United Kingdom*	3,437,000
TOTAL	**17,597,250**

The amount in USD is based on the exchange rate (when applicable) at the time of the payment by the relevant partner.

***** countries paying their contribution in their own currency



Distribution of ECORD member contributions for FY17.

[+]*Fiscal year covers the period from 1 January - 31 December of the relevant year*

ECORD FY17 budget *(in USD)*		
	FY17 Income	FY17 Expenses
FY16 balance	**10,002,265**	
FY17 contributions	**17,597,250**	
ECORD-NSF MoU		7,000,000
ECORD-JAMSTEC MoU		0*
ESO		9,972,364
EMA		274,400
MagellanPlus		78,400
ECORD Outreach		63,300
ESSAC		276,783
BCR		313,642
TOTAL	**27,599,515**	**17,978,889**
FY17 balance	**9,620,626**	

Exchange rate: 1€ = 1.19 USD
The amounts in USD are subject to exchange rate fluctuations.
* Payment delayed to 2019

ECORD member country contributions for FY18 (in USD).

Austria	100,000
Canada	30,000
Denmark*	152,000
Finland	80,000
France*	4,500,000
Germany	5,600,000
Ireland*	120,000
Italy	500,000
Netherlands	500,000
Norway	1,100,000
Portugal	90,000
Spain*	180,000
Sweden	528,000
Switzerland	600,000
United Kingdom*	3,450,000
TOTAL	**17,530,000**

The amount in USD will be based on exchange rate (when applicable) at the time of the payment by the relevant partner. (1 € = 1.22 USD in this table)

***** countries paying their contribution in their own currency

The ECORD budget shows a positive balance of about 9,6M USD at the end of 2017 and this sum will be carried forward to the ECORD FY18 budget.

FY18 ECORD budget

The expected total contributions for FY18[+] from the 15 ECORD member countries is about 17.53M USD *(table above right)*.

The table *right* summarises the expected ECORD budget for FY18.

Budgets of ECORD Entities

- **ECORD Managing Agency (EMA)**

The table *page 71* summarises the EMA budget for FY17 and FY18*, as approved by the ECORD Council in October 2017.

Most of the expenses remained stable with the exception of a slight increase in salaries (+ 13.9%), a higher budget of 11.8K USD to cover the organisation of the ECORD meetings and an increased budget for the organisation of MagellanPlus workshops. The budget to cover the organisation of the ECORD Evaluation Committee (only in

ECORD FY18 budget *(in USD)*		
	FY18 Income	FY17 Expenses
FY17 balance	**9,620,626**	
FY 18 contributions	**17,530,000**	
ECORD-NSF MoU		7,000,000
ECORD-JAMSTEC MoU		0*
ESO		2,811,526**
EMA		300,560
MagellanPlus		100,000
ECORD Outreach		66,400
ESSAC		294,158
BCR		332,093
TOTAL	**27,150,626**	**10,904,737**
FY18 balance	**16,245,889**	

Exchange rate: 1 € = 1.22 USD
The amounts in USD are subject to exchange rate fluctuations.

* Payment deferred to 2019
** Fixed operational costs + Expedition 381 Onshore Science Party

[+]*Fiscal year covers the period from 1 January - 31 December of the relevant year*

FY17), the Expedition Operational Review Committee (ORC) meetings and the SEP June meeting decreased by about 10K USD. Overall, the EMA FY18 budget anticipates an increase of 12.5% compared to FY17.

EMA budget for FY17 and FY18					
	FY17 *		FY18**		Variance ***
	€	*USD*	€	*USD*	%
Salaries					
Assistant Director	54,000	60,480	68,000	80,300	+25.9
Outreach Coordinator	47,000	52,640	47,000	55,500	0
Total	**101,000**	**113,120**	**115,000**	**135,800**	**+13.9**
Compensation for the Director	**50,000**	**56,000**	**50,000**	**59,000**	**0**
Travel EMA @ CEREGE	**50,000**	**56,000**	**50,000**	**59,000**	**0**
Travel EEC (8) and ORC (2)	**9,000**	**1,0080**	**2,000**	**2,400**	**-77.8**
ECORD Meetings	**5,000**	**5,600**	**10,000**	**11,800**	**+100**
Consumables	**2,500**	**2,800**	**2,500**	**3,000**	**0**
SEP June meetings	**7,500**	**8,400**	**5,000**	**5,900**	**-33.3**
MagellanPlus	**70,000**	**78,400**	**100,000**	**118,000**	**+42.9**
***Scientific Drilling* journal**	**3,700**	**4,140**	**0**	**0**	**-100**
Overheads	**20,000**	**22,400**	**20,000**	**22,400**	**0**
TOTAL	**315,000**	**352,800**	**354,500**	**417,300**	**+12.5**

* 1€ = 1.12 USD (22 September 2015); ** 1€ = 1.18 USD (27 September 2017); *** Based on the budget in €.

- **ECORD Science Support and Advisory Committee (ESSAC)**

The table *below* summarises the ESSAC budget for FY17 and FY18* as approved by the ECORD Council in October 2017.

ESSAC budget for FY18, University of Plymouth, UK					
	FY18		FY17		Variance
	€	USD	€	USD	%
Salaries					
Science Coordinator (Grade 8/43)	68,369	80,578	68,686	81,049	- 0.6
Compensation for the Chair	50,000	59,000	50,000	59,000	0
Total salaries/compensation	**118,369**	**139,578,**	**118,686**	**149,049**	**- 0.34**
Travel					
Chair	15,000	17,700	15,000	17,700	0
Science Coordinator	6,000	7,080	6,000	7,080	0
Meetings					
ESSAC May meeting	2,500	2,950	2,500	2,950	0
ESSAC October meeting	2,500	2,950	2,500	2,905	0
Travel support for invited speakers to ESSAC meetings	3,000	3,540	3,000	3,540	0
Travel support for ESSAC Liaison to SEP meetings	3,000	3,540	3,000	3,540	0
Conference travel support	4,000	4,720	4,000	4,720	0
Education & Outreach					
Support for ECORD Distinguished Lecturer Programme	12,000	14,160	12,000	14,160	**0**
Support for ECORD Summer Schools	30,000	35,400	30,000	35,400	**0**
ECORD Training Course	6,500	7,670	6,500	7,670	**0**
ECORD Summer School Scholarships	15,000	17,700	15,000	17,700	**0**
ECORD Research Grants	18,000	21,240	18,000	21,240	**0**
Teachers at sea (travel support)	7,500	8,850	7,500	8,850	**0**
Total costs excluding salaries	**131,000**	**154,580**	**131,000**	**154,580**	**0**
TOTAL	**249,369**	**294,158**	**249,686**	**294,629**	**- 0,16**

1€ = 1.18 USD, 1£ = 1.12 €, 1£ = 1.32 USD

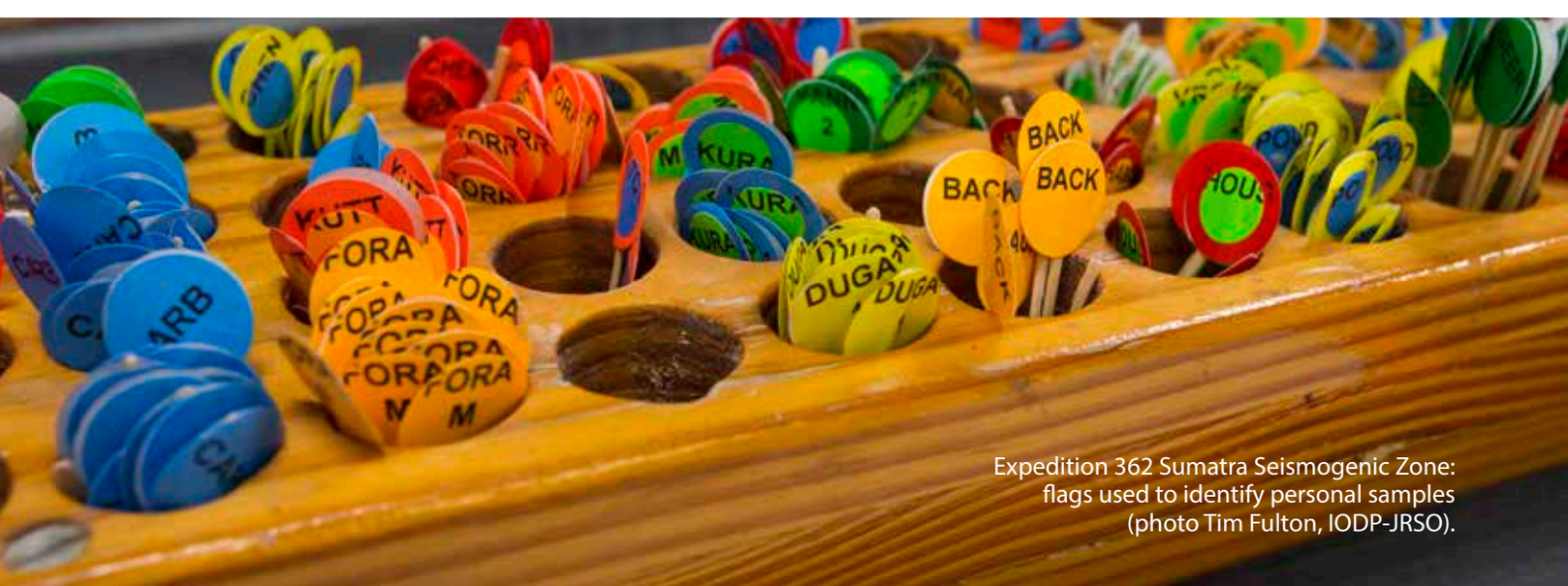
- **ECORD Science Operator (ESO)**

The table *below* summarises the expenditure breakdown of ESO for FY17 in US dollars as approved by the ECORD Council in October 2017.

ESO FY17 expenditure breakdown *(in USD)*

	FY17 Annual Program Plan Budget				FY17 Expenditure				Variance
	BGS	MARUM	EPC	TOTAL	BGS	MARUM	EPC	TOTAL	
Management and administration	**279,632**	**145,951**	**307,233**	**732,816**	**331,059**	**145,951**	**307,233**	**784,243**	**-51,427**
Personnel	214,632	104,951	239,233	558,816	303,462	104,951	239,233	647,646	-88,830
Travel	50,000	26,000	40,000	116,000	21,594	26,000	40,000	87,594	28,406
Supplies	5,000	5,000	9,000	19,000	2,016	5,000	9,000	16,016	2,984
Equipment	5,000	5,000	9,000	19,000	3,809	5,000	9,000	17,809	1,191
Other	5,000	5,000	10,000	20,000	178	5,000	10,000	15,178	4,822
Technical, Engineering and Science Support	**7,917,609**	**364,101**	**865,413**	**9,147,123**	**7,335,320**	**364,101**	**865,413**	**8,564,834**	**582,289**
Personnel	510,085	167,101	276,413	953,599	652,012	167,101	276,413	1,095,526	-141,927
Travel	40,000	40,000	40,000	120,000	68,783	40,000	40,000	148,783	-28,783
Supplies	0	82,000	0	82,000	0	82,000	0	82,000	0
Shipping	20,000	60,000	20,000	100,000	4,750	60,000	20,000	84,750	15,250
Communication	15,000	0	0	15,000	2,007	0	0	2,007	12,993
Contractual services	0	0	25,000	25,000	0	0	25,000	25,000	0
Equipment	5,000	0	4,000	9,000	36,153	0	129,000	165,153	-156,153
Other	7,327,524	15,000	500,000	500,000	6,571,616	15,000	375,000	6,961,616	880,908
Core Curation	**0**	**81,255**	**0**	**81,255**	**0**	**81,255**	**0**	**81,255**	**0**
Personnel	0	68,255	0	68,255	0	68,255	0	68,255	0
Travel	0	6,000	0	6,000	0	6,000	0	6,000	0
Supplies	0	2,000	0	2,000	0	2,000	0	2,000	0
Shipping	0	5,000	0	5,000	0	5,000	0	5,000	0
Data Management	**119,669**	**150,960**	**34,528**	**305,157**	**90,677**	**150,960**	**34,528**	**276,165**	**28,992**
Personnel	10,669	130,460	34,528	167,657	13,898	130,460	34,528	178,886	-3,229
Travel	8,000	8,000	0	16,000	20	8,000	0	8,020	7,980
Supplies	6,000	0	0	6,000	0	0	0	0	6,000
Contractual Services	75,000	0	0	75,000	47,541	0	0	47,541	27,459
Equipment	20,000	12,500	0	32,500	29,218	12,500	0	41,718	-9,218
Publications	**150,000**	**0**	**0**	**150,000**	**149,683**	**0**	**0**	**149,683**	**317**
Contractual Services	150,000	0	0	150,000	149,683	0	0	149,683	317
Outreach	**45,185**	**21,200**	**17,264**	**83,649**	**77,721**	**21,200**	**17,264**	**116,185**	**-32,536**
Personnel	29,185	13,200	17,264	59,649	59,636	13,200	17,264	90,100	-30,451
Travel	8,000	8,000	0	16,000	10,284	8,000	0	18,284	-2,284
Supplies	8,000	0	0	8,000	7,801	0	0	7,801	199
GRAND TOTAL	**8,512,095**	**763,467**	**1,224,438**	**10,500,000**	**7,984,460**	**763,467**	**1,224,438**	**9,972,365**	**527,635**

ESO FY18 budget *(in USD)*				
	BGS	**MARUM**	**EPC**	**TOTAL**
Management and administration	**233,129**	**161,299**	**304,874**	**689,302**
Personnel	153,129	115,299	239,233	513,302
Travel	50,000	26,000	40,000	116,000
Supplies	5,000	5,000	9,000	15,000
Equipment	5,000	5,000	9,000	15,000
Other	10,000	10,000	10,000	30,000
Technical, Engineering and Science Support	**427,383**	**676,723**	**392,978**	**1,497,084**
Salaries and fringes	380,383	242,123	309,978	932,484
Travel	44,000	40,000	36,000	120,000
Supplies	0	356,600	0	356,600
Shipping	0	20,000	20,000	40,000
Communication	0	0	0	0
Contractual services	0	0	25,000	25,000
Equipment	3,000	3,000	2,000	8,000
Other direct costs	0	15,000	0	15,000
Core Curation	**0**	**81,371**	**0**	**81,371**
Personnel	0	68,371	0	68,371
Travel	0	6,000	0	6,000
Supplies	0	2,000	0	2,000
Shipping	0	5,000	0	5,000
Data Management	**121,294**	**97,421**	**41,434**	**260,149**
Personnel	12,294	79,421	41,434	133,149
Travel	8,000	8,000	0	16,000
Supplies	6,000	0	0	6,000
Contractual Services	75,000	0	0	75,000
Equipment	20,000	10,000	0	30,000
Publications	**150,000**	**0**	**0**	**150,000**
Contractual Services	150,000	0	0	150,000
Outreach	**87,781**	**28,575**	**17,264**	**133,620**
Personnel	71,781	20,575	17,264	109,620
Travel	8,000	8,000	0	16,000
Supplies	8,000	0	0	8,000
GRAND TOTAL	**1,009,587**	**1,045,389**	**756,550**	**2,811,526**



Expedition 362 Sumatra Seismogenic Zone: flags used to identify personal samples (photo Tim Fulton, IODP-JRSO).

- **Bremen Core Repository (BCR)**

The table *below* summarises the BCR budget for FY17 and FY18* as approved by the ECORD Council in October 2017.

BCR budget for FY17 and FY18					
	FY17*		FY18**		Variance ***
	€	*USD*	€	*USD*	%
Salaries					
Personnel (1.6 FTE)	**162,277**	**181,750**	**165,025**	**194,730**	**+1.7**
Student workers	**6,500**	**7,280**	**8,200**	**9,676**	**+ 26.2**
Travel	**2,500**	**2,800**	**1,800**	**2,124**	**-28**
Supplies	**3,500**	**3,920**	**2,000**	**2,360**	**-42.9**
Shipping	**11,250**	**12,600**	**11,500**	**13,570**	**-10**
Curation DIS updates	**3,000**	**3,360**	**3,000**	**3,540**	**0**
SEDIS web portal maintenance & service **24/7** (incl. 0.08 FTE)	**11,000**	**12,320**	**9,500**	**11,210**	**-13.6**
Indirect costs	**80,011**	**89,612**	**80.410**	**94.884**	**+0.5**
TOTAL	**280,038**	**313,642**	**281,435**	**332,093**	**+0.5**

** 1€ = 1.12 USD; ** 1€ = 1.18 USD;* *** based on the budget in €.

- **ECORD Outreach & Education Task Force (E-OETF)**

The table *below* summarises the E-OETF budget for FY17 and FY18* as approved by the ECORD Council in October 2017. In 2017, higher expenses related to educational activities (support to ECORD teachers to EGU, School of Rock 2017) were balanced by lower travel expenses to keep the buget stable. The variance between 2017 and 2018 budgets is + 3.2%.

ECORD outreach budget for FY17 and FY18					
	FY17*		FY18**		Variance***
	€	*USD*	€	*USD*	%
Exhibit booths at conferences	**17,162**	**19,221**	**20,000**	**23,600**	**+16.5**
Publications	**10,144**	**11,361**	**11,300**	**13,364**	**+11.4**
Overheads	**3,000**	**3,360**	**3,000**	**3,540**	**0**
Other costs	**12,674**	**14,195**	**7,000**	**8,260**	**-44.8**
Shipping	**4,000**	**4,480**	**4,000**	**4,720**	**0**
Travel	**7,600**	**8,512**	**11,000**	**12,980**	**44.7**
TOTAL	**54,580**	**61,129**	**56,300**	**66,464**	**+3.2**

* 1€ = 1.12 USD (22 September 2015); ** 1€ = 1.18 USD (27 September 2017); *** Based on the budget in €.

J-FAST core replica (photo J. Gutiérrez Pastor).

10. ECORD participation in IODP panels

The **International Ocean Discovery Program (IODP)** is composed of three platform providers (NSF-USA for *JOIDES Resolution*, MEXT/JAMSTEC - Japan for *Chikyu* and ECORD for MSPs), three Facility Boards, two IODP advisory panels, a Science Support Office and the IODP Forum. The ECORD participation in the IODP entities in 2017 is listed below.

The ***JOIDES Resolution* Facility Board - JRFB** is the planning forum for expeditions using the *JOIDES Resolution*.
ECORD Members of the JRFB: Gilbert Camoin (France), Wolfgang Bach (Germany) and Paul Wilson (UK).
http://www.iodp.org/facility-boards#JRFB

The ***Chikyu* IODP Board - CIB** is the planning forum for expeditions using the *Chikyu*.
ECORD Members of the CIB: Gilbert Camoin (France) and Benoit Ildefonse (France).
https://www.jamstec.go.jp/cib/

IODP advisory panel: Science Evaluation Panel (SEP) evaluates the scientific objectives and relevance of proposed expeditions using all IODP platforms.
SEP ECORD Members: Rebecca Bell (UK), Steve Bohaty (UK), Calvin Campbell (Canada), Louis Géli (France), Marguerite Godard (France), Marc-André Gutscher (France), Samuel Jaccard (Switzerland), Jens Kallmeyer (Germany), Andrew McCaig (UK), Kevin Pickering (UK), Werner Piller (Austria), Michele Rebesco (Italy), Michael Riedel (Germany), Heinrich Villinger (Germany).
http://www.iodp.org/facility-boards#SEP

IODP advisory panel: Environmental Protection and Safety Panel (EPSP) evaluates the environmental protection and safety of proposed expeditions using all IODP platforms.
EPSP ECORD Members: Martin Hovland (Norway), Philippe Lapointe (France), David Long (UK), Dieter Strack (Germany).
http://www.iodp.org/facility-boards#EPSP

The **IODP Forum** is the overarching umbrella of the programme and provides advice to IODP Facility Boards on platform provider activity.
ECORD attendees at the 2017 IODP Forum in Shanghai, China: Gilbert Camoin (France), Nadine Hallmann (France), David McInroy (UK), Werner Piller (Austria)
http://www.iodp.org/iodp-forum

IODP drillships: from left to right, the JOIDES Resolution (photo Wiliam Crawford, IODP/TAMU), Fugro Synergy during Expedition 381 Corinth Active Rift Development (photo C. Cotterill, ECORD/IODP) and the Chikyu (© JAMSTEC/IODP).

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List of acronyms

ACEX: Arctic Coring Expedition

ADP: Amphibious Drilling Proposal

AGU: American Geophysical Union

ANZIC: Australia-New Zealand IODP Consortium

APC: Advanced Piston Corer

APL: Ancillary Project Letter

ArcOP: Arctic Ocean Paleoceanography

ASC: Antarctic Support Contract

AWI: Alfred-Wegener-Institute

BBC: British Broadcasting Corporation

BCR: Bremen Core Repository

BGR: Bundesanstalt für Geowissenschaften und Rohstoffe

BGS: British Geological Survey

BSCW: Basic Support for Cooperative Work

CDEX: Center for Deep Earth Exploration

CEREGE: Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement

CIB: *Chikyu* IODP Board

CNR: Consiglio Nazionale delle Ricerche

CNRS: Centre National de la Recherche Scientifique

COT: Continent-Ocean Transition

CPP: Complementary Project Proposal

CT: Computed Tomography

DAAD: Deutscher Akademischer Austauschdienst

DEDI: Distributed European Drilling Infrastructure

DFG: Deutsche Forschungsgemeinschaft

DIS: Drilling Information System

DLP: Distinguished Lecturer Programme

DSDP: Deep Sea Drilling Project

E-EB: ECORD Executive Bureau

E-OETF: ECORD Outreach & Education Task Force

E-VTF: ECORD Vision Task Force

EC: European Commission

ECORD: European Consortium for Ocean Research Drilling

EEC: External Evaluation Committee

EFB: ECORD Facility Board

EGU: European Geosciences Union

EMA: ECORD Managing Agency

EPC: European Petrophysics Consortium

EPSP: Environmental Protection and Safety Panel

ERC: European Research Council

ESO: ECORD Science Operator

ESSAC: ECORD Science Support and Advisory Committee

ETH: Eidgenössische Technische Hochschule

FP: Framework Programme

FY: Fiscal Year

GCR: Gulf Coast Repository

GEOMAR: Helmholtz Centre for Ocean Research Kiel

GLOMAR: Bremen International Graduate School for Marine Sciences

GFZ: Deutsches GeoForschungsZentrum

GIFT: Geosciences Information for Teachers

IAMC: Istituto per l'Ambiente Marino Costiero

ICDP: International Continental Scientific Drilling Program

Ifremer: French Research Institute for Exploitation of the Sea

IGSN: International Geo Sample Number

IKC: In-Kind Contribution

ILP: Industry Liaison Panel

IMO: International Maritime Organisation

INGV: Istituto Nazionale di Geofisica e Vulcanologia

IOC: Intergovernmental Oceanographic Commission

IODP: Integrated Ocean Drilling Program (2003-2013) & International Ocean Discovery Program (2013-2023)

IPG: Institut de Physique du Globe

ISMAR: Istituto di Scienze del Mare

ISOLAT: Integrated Southern Ocean Latitudinal Transects

JAMSTEC: Japan Agency for Marine-Earth Science and Technology

JOIDES: Joint Oceanographic Institutions for Deep Earth Sampling

JPI-Oceans: Joint Programming Initiative Healthy and Productive Seas and Oceans

JR: *JOIDES Resolution*

JRFB: *JOIDES Resolution* Facility Board

JRSO: *JOIDES Resolution* Science Operator

K-Pg: Cretaceous–Paleogene

KCC: Kochi Core Center

KGJ DeepSeaResearch: K.G. Jebsen Centre for Deep Sea Research

L/B: Liftboat

LBA: Late Bronze Age

LPSC: Lunar Planetary Science Conference

LTBMS: Long-Term Borehole Monitoring System

LWD: Logging While Drilling

MARUM: Center for Marine Environmental Sciences, University of Bremen

MB: Mentelle Basin

mbsf: metres below sea floor

MDP: Multi-phase Drilling Project

MeBo: Meeresboden-Bohrgerät

MEXT: Ministry of Education, Culture, Sports, Science and Technology

MoU: Memorandum of Understanding

MSCL: Multi-Sensor Core Logger

MSP: Mission-Specific Platform

NADIR: Nice Amphibious Drilling In-situ Monitoring and Risk Analysis

NanTroSEIZE: Nankai Trough Seismogenic Zone Experiment

NAS: Network Attached Service

NCAOR: National Centre for Antarctic and Ocean Research

NERC: Natural Environment Research Council

NHK: Nippon Hōsō Kyōkai,

NOAA: National Oceanic and Atmospheric Administration

NP: Naturaliste Plateau

NSF: National Science Foundation

ODP: Ocean Drilling Program

ORC: Operational Review Committee

OSP: Onshore Science Party

PBS: Public Broadcasting Service

PI: Principal Investigator

QA/QC: Quality Assurance/Quality Control

RD2: Rockdrill2

ROV: Remotely Operated Vehicle

SaDR: Sample and Data Request

SCS: South China Sea

SEDIS: Scientific Earth Drilling Information Service

SEP: Science Evaluation Panel

SI: Subduction Initiation

SOR: School of Rock

SSE: Shallow Slip Events

UIB: University of Bergen

UNESCO: United Nations Educational, Scientific and Cultural Organization

UPMC: Université Pierre et Marie Curie

USSP: Urbino Summer School in Paleoclimatology

USSSP: U.S. Science Support Program

TIME: Tyrrhenian Magmatism & Mantle Exhumation

TK: Tonga Kermadec

XRF: X-Ray Fluorescence

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http://www.ecord.org