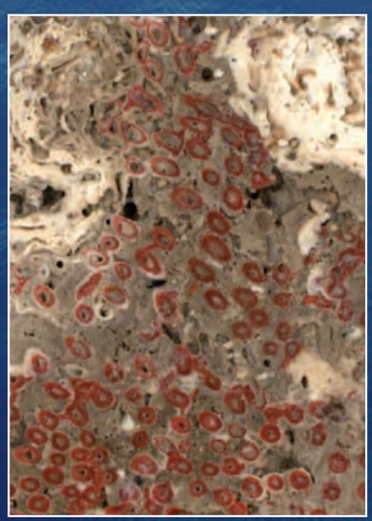
ECORD

European Consortium for
Ocean Research Drilling

# ANNUAL REPORT 2011







ECORD
European Consortium for Ocean Research Drilling

IODP
INTEGRATED OCEAN DRILLING PROGRAM

Since 2003, European and Canadian scientists have participated in the Integrated Ocean Drilling Program (IODP) as part of the European Consortium for Ocean Research Drilling (ECORD). This major international programme now involves scientists from 24 countries including the USA, Japan, China, South Korea, India, Australia and New Zealand. Members of the ECORD consortium are able to take part in international ocean-drilling studies within IODP that address a wide range of fundamental and applied issues that affect everyone. Research topics include global climate change, biodiversity, origin of life, natural hazards involving the study of earthquakes processes, mineral and energy resources along continental margins as well the internal structure and dynamics of our planet.

ECORD also provides an essential role within IODP by contributing a multiple-platform approach that complements the work of the US and Japanese drillships, the *JOIDES Resolution* and *Chikyu*. These mission-specific platform (MSP) operations have allowed the ocean research community to work in key areas such as ice-covered and shallow seas, environments in which the drillships are unable to operate. To date, the ECORD Science Operator (ESO) consortium has successfully managed IODP expeditions to the Arctic, Tahiti, New Jersey and the Great Barrier Reef. The exciting scientific results that have been published, or are emerging from these expeditions, emphasise the benefits of the new MSP dimension that ECORD has brought to scientific ocean drilling.

*Front cover: from left to right, New Jersey Shallow Shelf Expedition (IODP 313); ECORD Summer School 2011; coral core, Great Barrier Reef Environmental Changes Expedition (IODP 325) and ECORD/IODP booth at EGU 2011; background, Great Barrier Reef Environmental Changes Expedition (all photos © ECORD/IODP).*
*Back cover: Drillers and ESO personnel, New Jersey Shallow Shelf Expedition (C. Cotterill © ECORD/IODP).*

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# ECORD Annual Report 2011

October 1, 2010 – September 30, 2011

Prepared by the ECORD Managing Agency,
the ECORD Science Operator and
the ECORD Science Support and Advisory Committee

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*Convoy in ice, Arctic Coring Expedition (IODP 302) (H. Van Der Fecht © ECORD/IODP).*

# 1. FY2011 highlights

Following the **Great Barrier Reef Environmental Changes Expedition** in FY2010, FY2011 was a quiet year for actual MSP operations, but not in terms of activities for all of the ECORD groups. The **ECORD Science Operator** has started scoping several projects that have been highly ranked by the international science advisory structure. ECORD funding will allow one MSP to be implemented before the end of the current phase in FY2013. After the great success of the **ACEX Expedition**, which recovered the first drilled core from the central Arctic seabed under the ice pack, action was taken to prepare for returning to the Arctic to implement exciting new projects arising from the community.

The US drillship ***JOIDES Resolution (JR)*** implemented four expeditions in the Central and Eastern Pacific and, for the first time in IODP, a whole project was devoted to the deep biosphere. The *JR* entered the Atlantic Ocean at the end of the fiscal year where she will remain for most of FY2012, adding more core to the IODP Bremen Core Repository (BCR) collection. The Japanese drillship ***Chikyu*** continued the ambitious and long-term NanTroSEIZE project offshore Japan to better understand the generation of earthquakes in subduction zones. **Forty-five ECORD scientists** were invited to sail on the six expeditions implemented on both vessels. The *Chikyu* programme was unfortunately disrupted by the magnitude 9 Tohoku Earthquake and associated tsunami that damaged the vessel in March. Last August, during the IODP Science Planning Committee meeting, I participated in a visit to the Sendai area organised by our Japanese colleagues and was able to get a better sense of the devastation. This was for me a deeply moving experience and I take this opportunity to express my support and admiration to all Japanese people under these dramatic circumstances. The *Chikyu* will resume operations for IODP in April 2012, starting with the Expedition 343 Japan Trench Fast Drilling Project.

ECORD not only promoted scientific ocean drilling at booths organised at major international conferences, but also by supporting three prominent lecturers who toured universities and institutes across Europe and Canada. Three workshops sponsored by the **ESF-funded Magellan** scheme allowed the community to plan new projects in the Mediterranean Sea and to discuss the potential role of IODP in understanding processes associated with $CO_2$ sequestration in mafic and ultramafic rocks. The Magellan+ Workshop Series is a new programme sponsored by both ECORD and ICDP that will start in 2012 and continue to help scientists from ECORD member countries develop innovative drilling proposals both at sea and on land. Scientific ocean drilling remains highly attractive to young scientists and the **ECORD summer schools** have become very popular with PhD students and early post-doctoral researchers.

With the current phase of IODP and ECORD ending in September 2013, it is now time to prepare for the future. Several major advances towards the new programme took place in FY2011. The **IODP Science Plan for 2013-2023**, elaborated by the international science community, was released in June. The science plan emphasises topics of critical importance to society. The contribution of ocean drilling to investigating climate change and sea-level rise modelling, understanding of ocean acidification processes, long-term monitoring of boreholes to address the triggering of geohazards, and the formation of resources buried under the deep sea, are among key areas for the future. Implementing this science plan will require continued access to the three platforms of IODP. The current IODP funding agencies have already started working on a simplified structure that will give more independence to the platform providers and allow more flexibility.

A very positive evaluation of the outcomes of ECORD within IODP was delivered by an independent committee appointed by the ECORD Council. Maintaining access to scientific ocean drilling is highly recommended, and the specific contribution of mission-specific platforms is clearly acknowledged. However, the need for better integration of scientific ocean drilling with other approaches that investigate the deep seafloor was clearly identified both at the Council level and by the ECORD community. Links with other initiatives such as seafloor observatories or access to research vessels must be strengthened. A high level of technological expertise in sub-seafloor sampling and instrumentation is distributed across institutes and universities in Europe. Working towards the establishment of a **Distributed European Drilling Infrastructure** to better co-ordinate these various entities will be a major goal. At a time when the Ostend Declaration states that "The Seas and Oceans are one of the Grand Challenges for the 21st Century", and as the European Commission and its Member States are preparing for HORIZON 2020, it is important to make the scientific and technological challenges of scientific ocean drilling highly visible.

***Catherine Mével, ECORD Managing Agency Director***

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*ECORD member countries (World map credit: http://histgeo.ac-aix-marseille.fr).*

# 2. About ECORD and IODP

The Earth is a dynamic, continuously changing system. These changes occur at different time scales, from the slow building of the ocean crust and ocean-basin formation, through climate fluctuations to sudden, dramatic events such as earthquakes, slope failures and volcanic eruptions. Because 70% of the Earth's surface is covered by oceans, answers to many questions regarding Earth-system processes are found beneath the seafloor. Archives of past environments and climates are recorded in sediment layers that have slowly accumulated on the seabed; many of the most devastating natural events are triggered underwater. It has recently been documented that a vast portion of the Earth's biosphere exists beneath the ocean floor. The metabolic functions of these organisms are largely unknown.

The only way to access the sub-seafloor environment is by drilling to collect samples, conduct *in-situ* measurements and provide the opportunity for long-term monitoring. Initiated by the US in the late 1960s, scientific ocean drilling has been traditionally implemented under the frame of international programmes. The current phase, the Integrated Ocean Drilling Program (IODP), was established in 2003 and differs from its predecessors by offering access to three types of drilling platform that can operate in most oceanic environments. The IODP Initial Science Plan (ISP) was developed by the scientific community during a series of international workshops. The scientific objectives are to understand the Global Earth System and its societal impacts by studying records of past climate changes, biodiversity in sub-seafloor systems, establishing seafloor laboratories for the study of natural hazards in submarine systems and by discovering new energy resources. IODP is a bottom-up programme. Drilling proposals arising from the community are evaluated by a Science Advisory Structure composed of experts from all IODP member countries.

To become a significant partner in IODP and to play a major role as a platform operator, 16 European countries and Canada *(map, left)* joined IODP as a single consortium, the European Consortium for Ocean Research Drilling (ECORD). Although the European Commission helped to set up the Consortium with support from its ERA-Net Programme that ended in 2008, ECORD is now exclusively funded by its member countries. Through ECORD's membership of IODP, scientists from all ECORD member countries have access to all IODP platforms and participate in the strategic decisions of the programme.

Three types of drilling platforms *(below)* are operated under the framework of IODP. The completely renovated *JOIDES Resolution* is funded and operated by the USA and has a long history of scientific drilling in sediments and the ocean crust in all of the world's oceans. The *Chikyu*, built, funded and operated by Japan, is equipped with a riser system that allows drilling to 6 km beneath the seafloor and in unstable conditions. To reach those depths requires months of drilling and so the *Chikyu's* projects are mostly long term. ECORD has developed the concept of mission-specific platforms (MSPs), drilling platforms that are contracted from the commercial sector and operated on a case-by-case basis



*The three IODP drilling platforms. From left to right, the JOIDES Resolution (Tim Fulton, IODP/TAMU), Chikyu (K. Michibayashi ©IODP/JAMSTEC) and the mission-specific platform L/B Kayd used during the New Jersey Shallow Shelf Expedition (IODP 313) in 2009 (G. Mountain ©ECORD/IODP).*



*Drilling vessel Vidar Viking on site, Arctic Coring Expedition (IODP 302) (M. Jakobsson © ECORD/IODP).*

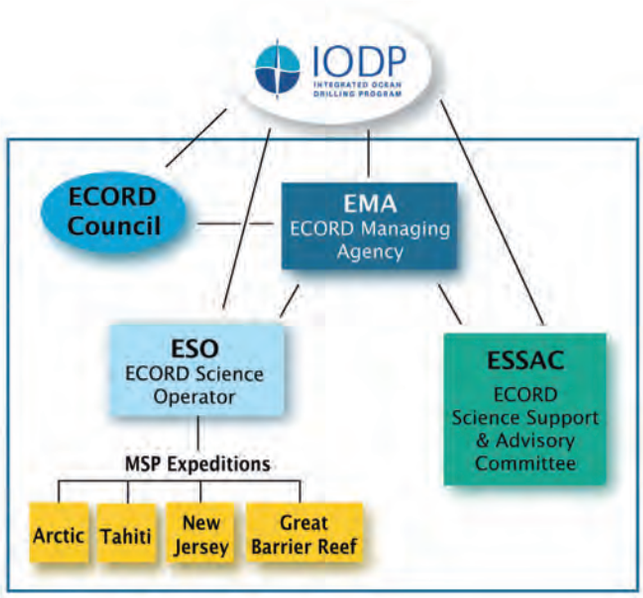
to drill in shallow waters and ice-covered environments that are inaccessible to the US and Japanese drillships *(top left)*.

To co-ordinate ECORD's scientific participation in IODP, and to operate mission-specific platforms, the consortium is made up of four entities *(top right)*:

**1.** The **ECORD Council** is the executive authority composed of representatives from all ECORD funding agencies. As specified in the ECORD Memorandum of Understanding, the Council has established three management bodies with specific responsibilities:

**2.** The **ECORD Managing Agency (EMA)** is the contact point with all ECORD and IODP entities and is administered by the INSU-CNRS in France. EMA pools funding from the member countries and subcontracts the ECORD Science Operator (ESO), the operational arm of ECORD. EMA is also in charge of ECORD outreach and public relations;

**3.** The **ECORD Science Support and Advisory Committee (ESSAC)** is the scientific committee of ECORD. ESSAC makes decisions on science strategy, nominates ECORD scientists to participate in IODP expeditions, panels and committees, and promotes participation in scientific ocean drilling in its member countries. The host organisation for the ESSAC Office changes every two years. In FY2011 the office was located at the Alfred Wegener Institute, Bremerhaven, Germany but will move to the University of Granada, Spain, on October 1, 2011;




*The four entities of ECORD.*

**4.** The **ECORD Science Operator (ESO)** is the Implementing Organization for mission-specific platform expeditions within IODP. ESO is a consortium of European scientific institutions managed by the British Geological Survey (BGS), who are also responsible for drilling operations. MARUM, University of Bremen is responsible for core curation and analytical facilities and hosts the IODP Bremen Core Repository (BCR). The European Petrophysics Consortium (EPC) is responsible for the acquisition and scientific interpretation of core and borehole petrophysical measurements and is composed of the University of Leicester (UK), Geosciences Montpellier (France) and the RWTH Aachen (Germany).

The ECORD structure has been in place for seven years and is now well established and proven to be very efficient. Nevertheless, with effect from October 1, 2010, ECORD Council made a slight change to the role of the ECORD Council Chair by extending its mandate to one year instead of six months to improve continuity. It is also expected that the Chair will be able to rely on the ECORD Executive in which the three major funding contributors, France, Germany and the UK, are permanently represented. During FY2011, ECORD Council was chaired by Mireille Perrin (France) and will be succeeded by Anne de Vernal (Canada) on October 1, 2011 for the duration of FY2012.

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

# 3. Operating mission-specific platforms

Since the success of the Great Barrier Reef Environmental Changes Expedition (IODP 325) in 2010, ESO has been scoping and planning future mission-specific platform (MSP) expeditions and has continued to work on past expeditions. The next and final MSP expedition of the current programme will be IODP Expedition 347, Baltic Sea Paleoenvironment. Subject to drilling contract and permits, ESO expects to implement the expedition in the spring/summer of 2013. The interest in access to MSPs continues to grow within the scientific community. The success of the MSP concept is shown by the fact that, as of July 2011, there are 10 active proposals in the system and more are being prepared.

## Expedition 313, New Jersey Shallow Shelf

The moratorium period that follows each IODP expedition ended on December 4, 2010, with the publication of the *Proceedings of the IODP Volume 313* (doi:10.2204/iodp.proc.313.2010). Early results from the expedition were publicised by various presentations and posters at the 2010 AGU Fall Meeting in San Francisco, including contributions to a Special Session on 'Sea Level, Near-Surface Currents, and the Stratigraphic Record: Recent Results'.

The 2nd Post-expedition Meeting took place from August 15-18, 2011 at the University of Utah, Salt Lake City, USA, locally hosted by Dr David Dinter of the University's Geology & Geophysics Department. The Science Party gathered to discuss their results to date and to co-ordinate their publication approach. The group also participated in a field trip to the classic outcrops of the Blackhawk Wave-Dominated Coastal System (Book Cliffs) and the Ferron Sandstone Deltaic System, led by Bryan Bracken from Chevron Energy Technology *(below)*.

The Science Party expect to publish a series of collaborative peer-reviewed papers by August 2012 and have received approval from *Geosphere* to proceed with submitting Expedition 313-related papers for a special electronic publication under the theme "Results of IODP Expedition 313: The history and impact of sea-level change offshore New Jersey".

## Expedition 325, Great Barrier Reef Environmental Changes

The expedition's moratorium period ended on July 16, 2011 when the *Proceedings of the IODP Volume 325* were published (doi:10.2204/iodp.proc.325.2011). Like the New Jersey expedition, early results were presented at the 2010 AGU Fall Meeting, including contributions to same Special Session.

The Expedition 325 Operational Review Task Force (ORTF) took place at the Edinburgh offices of the British Geological Survey (BGS) on July 18-19, 2011. According to the standard procedures for all IODP expeditions, the



*(photo M. N. Proust)*



*Coral core emerging out of the barrel, Great Barrier Reef Environmental Changes Expedition (C. Cotterill © ECORD/IODP).*

offshore and onshore operations were reviewed by the Co-chief Scientists, ESO and IODP representatives, and external reviewers. The review panel concluded that the expedition had been a success, and believe that the data acquired will produce a wealth of scientific knowledge for years to come. The review panel identified some areas in which ESO's operational performance could be improved, and ESO will work to address these recommendations in future expeditions. All reports by the Operations Review Task Force concerning MSP Expeditions can be found on IODP-MI's website at http://www.iodp.org/ortf/.

The Expedition 325 2nd Post-expedition Meeting will take place from July 3-7, 2012 at Heron Island, Queensland, Australia. A special session has been co-organised with scientists associated with Expedition 310 (Tahiti) for the 12th International Coral Reef Symposium (July 9-13, Cairns, Australia).



*Fossil red coral (Tubipora) recovered during the Great Barrier Environmental Changes Expedition (M. Mowat © ECORD/IODP).*

## Scoping future MSP expeditions

The budget available to ECORD will allow ESO to implement one more expedition before the end of the programme. There are currently six MSP proposals that have been highly evaluated by the Science Advisory Structure and forwarded to the IODP Operations Task Force (OTF) for possible implementation. Some of these proposals still lack site-survey data or require technology that is not yet available. On the recommendation of the IODP Science Planning Committee at their March 2011 meeting, ESO has started to scope the four most mature proposals, and has set up a "Project Management Team" for each. The aim of the teams is to constrain the operational requirements to fulfil the science objectives and then identify the most suitable platform. The status of the four projects is summarised below.

### *Baltic Sea Paleoenvironment*

At its August 2011 meeting, the Science Planning Committee decided to give priority to the Baltic Sea proposal, now designated IODP Expedition 347 Baltic Sea Paleoenvironment. ESO staff held a Project Management Team Meeting with proponents (and now Co-chief Scientists) Thomas Andrén and Bo Barker Jørgensen on June 28, 2011 at BGS, Edinburgh. ESO is continuing to scope potential drilling methodologies and platforms for this proposal, and has been working with the proponents to accommodate the requirements of the proposed science programme. ESO aims to issue a notice of interest in the OJEU for a platform and coring services for the Baltic Sea expedition at the end of February 2012 with the aim of implementing the project in 2013.



*A view of the Kalmar Strait between mainland Sweden and the island of Öland in the southern Baltic Sea. The small island on the horizon is Blå Jungfrun (Blue Virgin Island), which in previous times was thought to be a place where witches gathered at Easter. (photo T. Andrén).*

### *Chicxulub K-T Impact Crater*

ESO staff held a Project Management Team Meeting with proponents (and now Co-chief Scientists), Joanna Morgan and Sean Gulick, on October 12, 2010 at BGS, Edinburgh. A letter of project approval, co-signed by the IODP-MI President, the EMA Director and ESO Chair, has been submitted to the directors of the Mexican National Council on Science and Technology (CONACYT), and the Mexican Ministry of Environmental and Natural Resources (SEMARNAT). Following submission of this letter, ESO have been asked to formally proceed with permit applications for the hazard site survey and the drilling operation and are continuing to solicit potential contractors to carry out the work. Formal tendering and permitting procedures will start once the funding levels are confirmed, which is likely to be after the end of the current IODP phase.

### *Atlantis Massif Seafloor Processes*

A Project Management Team Meeting with proponents Gretchen Früh-Green and Christopher MacLeod was held on June 29, 2011 at BGS, Edinburgh. The meeting was particularly valuable regarding the proposal's requirement to use a seabed drill, specifically the fresh and altered lithologies likely to be encountered, site selection for the safe positioning of the drill, sampling for the high-priority microbiology programme and to consider the downhole and *in-situ* measurements that might be achievable with a seabed drill.

ESO operations staff are continuing to evaluate all available seabed drill options for this and future proposals, including the evolving BGS and MeBo (MARUM) seabed drills, and are working with the proponents to identify new developments in seabed drill sampling technology to meet this proposal's objectives.

The implementation of this project using a seabed drill from a research vessel is likely to be considerably cheaper than standard MSP expeditions that require ESO to contract a drilling platform from the commercial sector. As the proposal presents a potentially low-cost option, the funding for this project may be available in the near future.

### *Hawaii Drowned Reefs*

ESO has been investigating operational scenarios for implementing the Hawaii Drowned Reefs proposal, which currently includes options to use a geotechnical drillship, a seabed drill, or a mixture of both technologies. A Project Management Team Meeting with proponents Jody Webster and David Clague is planned in November 2011.

## Preparing for Arctic drilling

The Arctic Coring Expedition (ACEX) implemented by ESO in 2004 was a major technological and scientific breakthrough. For the first time, drill cores were recovered from the central Arctic seabed (Lomonosov Ridge) under the pack ice, which documented environmental changes during the last 56 M




*Active IODP proposals in the Arctic area. **680**: The Bering Strait, global climate change and land bridge paleoecology; **708**: A paleoceanographic transect accros the Central Arctic Ocean: towards a continuous Cainozoic record from a greenhouse to an icehouse world; **750**: Chukchi Shelf to Slope transect: linking Beringian and Arctic Ocean history; **753**: Late Quaternary paleoceanography and glacial dynamics in the Beaufort Sea; **756**: Morris Jessup Rise: drilling the Arctic Ocean exit gateway.*

years. This success demonstrated the feasibility of drilling in high latitudes and ice-covered areas and opened the way for submission of new Arctic drilling proposals. Indeed, the geodynamics and paleoenvironment of the Arctic Ocean are still largely unknown, and the Arctic is one of the key scientific targets identified in the IODP Science Plan for 2013-2023. Five proposals are currently in the proposal evaluation process *(top left)* and more are expected to be submitted.

Drilling operations in the Arctic are very expensive because they require additional icebreakers to scout and break drifting ice around the drilling vessel. At the initiative of ECORD's Industrial Liaison Panel, the possibility of collaborating with industry is now being explored. To help promote the achievements and goals of the science community in the Arctic, a brochure on ***Scientific Drilling in the Arctic Ocean*** *(top right)* was published mid-2011 - http://www.ecord.org/pub/Arctic-brochure.pdf.

As part this initiative, representatives of ESO, EMA and ESSAC attended two industry conferences:




- AAPG Polar Petroleum Potential (3P) Arctic Exhibition and Conference, Halifax, Canada, August 30 - September 2, 2011 *(see page 28)*. ECORD organised an IODP-MI-sponsored booth to promote IODP to industry. A session dedicated to scientific drilling in the Arctic allowed the operational and scientific successes of ACEX to be presented, as well as drilling proposals submitted to IODP. Representatives from industry were also invited to identify areas where there is a need for more geodynamic information in the Arctic basins. The conference demonstrated the clear overlap between the science community and industry interests;
- David McInroy (ESO Science Manager) gave a talk on "The First Deep Coring in the Central Arctic Ocean: The Drilling of the Lomonosov Ridge by the IODP" at the Finding Petroleum: Exploring the Arctic Conference, Geological Society of London, October 2011.

## Data management

ESO's data management team, through the IODP Data Management Coordination Group, has continued to work with IODP-MI and the US and Japanese Implementing Organizations regarding standard terminology and dictionaries for use in IODP, exchange of data, the Scientific Earth Drilling Information Service (SEDIS), the Sample Material Curation System (SMCS) and its successor the Sample and Data Request Management system (SDRM).

Improvements have been made to ESO's central expedition database, the Drilling Information System (DIS) *(see BCR*

*page 13)*. For example, the online public query procedure for the sample database - http://134.102.249.79/BCRDIS/ - was improved by the addition of a shortcut route to filter for samples based on a request number. This is the most common query submitted by investigators who have received samples, and represents a great step forward in improving the user-friendliness of the online system.

**Related websites:**
**http://www.eso.ecord.org**
**http://www.sedis.iodp.org**

## Selected publications arising from MSP expeditions in 2011

Abbey, E. A., Webster, J.M., Braga, J.C., Sugihara, K., Wallace, C., Iryu, Y., Potts, D., Done, T., Camoin, G. and Seard C. (2011). Variation in postglacial coralgal assemblages and their paleoenvironmental significance: IODP Expedition 310, Tahiti Sea Level. Global and Planetary Change, 76(1-2): 1-15. doi: 10.1016/j.gloplacha.2010.11.005

Barke, J., Abels, H.A., Sangiorgi, F., Greenwood, D.R., Sweet, A.R., Donders, T., Reichart, G.-J., Lotter, A.F. and Brinkhuis, H. (2011). Orbitally forced *Azolla* blooms and middle Eocene Arctic hydrology: clues from palynology. Geology, 39(5): 427-430. doi:10.1130/G31640.1

Camoin, G. and Seard, C. (2011). Genesis of microbialites as contemporaneous framework components of deglacial coral reefs, Tahiti (IODP 310) - Comment. Facies. doi:10.1007/s10347-011-0264-2

Hathorne, E. C., Felis, T., James, R. H. and Thomas, A.L. (2011). Laser ablation ICP-MS screening of corals for diagenetically affected areas applied to Tahiti corals from the last deglaciation. Geochimica et Cosmochimica Acta, 75: 1490-1506. doi:10.1016/j.gca.2010.12.011

März, C., Vogt, C., Schnetger, B., and Brumsack, H.J. (2011). Variable Eocene-Miocene sedimentation processes and bottom water redox conditions in the Central Arctic Ocean (IODP Expedition 302). Earth Planet. Sci. Lett., 310(3–4): 526-537. doi:10.1016/ j.epsl.2011.08.025

Seard, C., Camoin, G., Yokohama, Y., Matzuzaki, H., Durand, N., Bard, E., Sepulcre, S. and Deschamps, P. (2011). Microbialite development patterns in the last deglacial reefs from Tahiti (French Polynesia; IODP Expedition #310): implications on reef framework architecture. Marine Geology, 279: 63-86. doi:10.1016/j.margeo.2010.10.013

Suto, I., Watanabe, M. and Jordan, R.W. (2011). Taxonomy of the fossil marine diatom resting spore genus Odontotropis. Diatom Res., 26(3): 255-272. doi:10.1080/026



*Arctic Coring Expedition (IODP 302) (M. Jakobsson © ECORD/IODP).*

# 4. Downhole measurements and petrophysics

The European Petrophysics Consortium (EPC) involves three European universities, Leicester (UK), Montpellier (France) and RWTH Aachen (Germany). The EPC central office is located at the University of Leicester and is responsible for the management of the consortium. EPC links into an international logging consortium and its combined petrophysical expertise is available to all scientists involved in IODP. The EPC team provides high-level scientific and technical support to the IODP and ECORD across the range of highly variable environments drilled by the non-riser and mission-specific platforms. For ECORD MSP Expeditions, EPC is responsible for the acquisition of downhole logging data and core petrophysics measurements, data interpretation and the development of associated research programmes. EPC works with staff from the IODP Bremen Core Repository (BCR) to ensure that QA/QC (quality assurance/quality control) procedures are followed during the acquisition of data in MSP operations as required by IODP-MI. Collaboration between EPC and the BCR during the onshore phase of expeditions has been proven to be a successful model for efficient use of petrophysics analytical equipment, staff expertise and data generation.

## Preparations for future expeditions

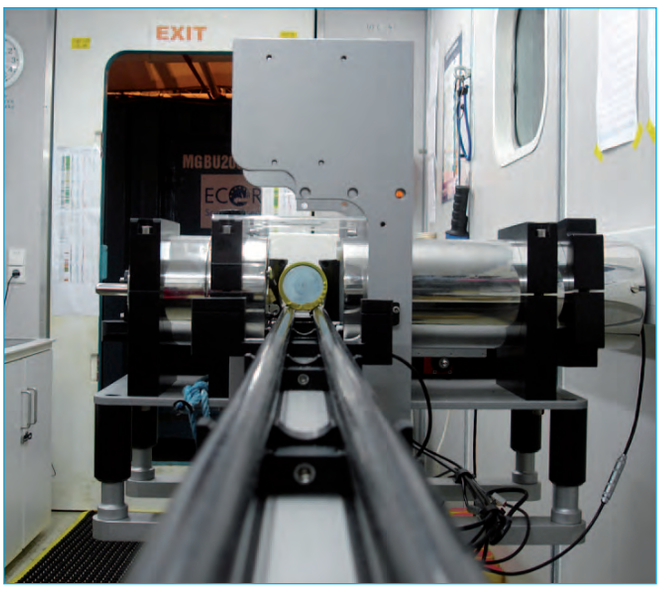
A trial scanning of seabed rockdrill cores on the Geotek Multisensor Core Logger (MSCL) was conducted by the EPC during a BGS cruise on the *R/V James Cook* (JC59, April - May 2011). The petrophysics container *(top right)*, currently housed at the BGS Marine Operations and Engineering site near Edinburgh, was restocked and checked prior to mobilisation for the JC59 survey. Members of the Montpellier group were then trained in the operation of the MSCL in early 2011.

## Professional development

EPC members completed a variety of external professional courses, from project management to dedicated software training (*e.g.* LINUX, MATLAB, Interactive Petrophysics) to update and develop the EPC skills base. A number of petrophysics seminars have been held in-house and EPC members from Leicester regularly attend the London Petrophysical Society Workshops and seminars covering topics such as saturation and under-pressured wells.

## Contributing to *JOIDES Resolution* expeditions

In addition to being a member of ESO, EPC is also part of an international consortium for logging that has been functioning since 1992. The consortium is led by the Borehole Research Group at Lamont-Doherty Earth Observatory (US) and also involves the University of Tokyo (Japan). These institutions provide shipboard logging operations and skilled Logging Staff Scientists on each IODP drilling platform, sharing their experience and expertise across IODP. EPC has a special arrangement with the US Implementing Organization to contribute to logging activities associated with *JOIDES Resolution* expeditions. In 2010-11, the EPC provided the Logging Staff Scientist on Expedition 330 Louisville Seamount Trail Expedition (December 13, 2010 - February 12, 2011, *see page 18*) and Expedition 336 Mid-Atlantic Ridge Microbiology (September 1- November 17, 2011). Expedition 336 involved the deployment of a newly developed logging tool, the DEBI-t (Deep Exploration Biosphere Investigative tool) alongside the standard logging tools *(below)*.




*The MSCL in the Petrophysics container.*



*Louise Anderson, (right), EPC, working alongside personnel from Schlumberger and the Jet Propulsion Lab to deploy the DEBI-t during Expedition 336 (IODP/TAMU).*

**Related website:**
**http://www.gm.univ-montp2.fr/EPC/**

# 5. IODP Bremen Core Repository

The IODP Bremen Core Repository (BCR) at the University of Bremen, Germany, is one of three IODP core repositories, along with the Gulf Coast Repository (GCR) located at the Texas A&M University in College Station (USA) and the Kochi Core Center (KCC) in Japan. According to IODP regulations, the BCR hosts all cores recovered since the beginning of scientific ocean drilling from the Atlantic and Arctic Oceans as well as the Mediterranean and Black Seas. The BCR also organises and hosts the Onshore Science Parties (OSP) of mission-specific platform expeditions, as well as the offshore curation and analysis during all expeditions operated by ESO.

The BCR currently (February 2012) holds more than 146 km of deep-sea cores from 85 expeditions. During FY2011, a total of 18,968 samples were taken as a result of 181 requests, 120 of which were submitted by ECORD scientists. The relatively new procedure of sampling all BCR cores using the Drilling Information System (DIS) database and Curation DIS has proven to be an efficient tool for this purpose *(see ESO, page 10)*. All samples (1,221,022 samples/4,381 sample requests/2,467 individual scientists, including samples taken earlier from legacy cores now stored at the BCR) are entered into a publicly accessible database that gives access to all post-moratorium samples (web interface for curatorial data: http://134.102.249.79/BCRDIS/).

The CoreWall-Corelyzer initially used during MSP Onshore Science Parties has been continuously undergoing improvements. The CoreWall hardware is permanently installed in the BCR laboratory and new ways of integrating the Corelyzer into the BCR's day-to-day operations continue to be explored, including education and outreach. Visitors to the BCR are always impressed by the sharp, high-resolution pictures of the cores and the facility to view the sediments from top to bottom in any borehole, as well as being able to examine close-up images of the cores.

As all cores collected in the western Pacific are permanently stored at the Kochi Core Center, the cores from Great Barrier Reef Environmental Changes Expedition (IODP 325) were shipped at the end of the moratorium year (August-September 2011) *(below)* and were safely received on October 21, 2011.

The BCR staff, in cooperation with the other core repositories, contributed to the evaluation of the new IODP Sample and Data Request Management (SDRM) system for sample request submission by scientists. After assessing the latest test version, a list of suggestions for improvements were provided and compiled with those of the other repositories to deliver a user-friendly and efficient system for submitting sample requests.

ESO continues to implement QA/QC (quality assurance/quality control) procedures during MSP expeditions to conform with IODP-MI standard practices. The various elements of this work, encompassing overall policies and procedures for QA/QC, are either in progress or already completed (*e.g.* for geochemistry data in the database of past MSP expeditions). ESO is currently investigating their potential implementation during MSP expeditions and are also scoping similar procedures for analytical equipment and instrumentation.






*Shrink-wrapping of core sections and boxed cores from IODP Expedition 325 in preparation for transport to the Kochi Core Center (KCC).*

The online tutorials for both the offshore phase of MSP expeditions and the Onshore Science Party are constantly being improved .

The maintenance and upgrade of the laboratory containers and equipment used offshore, plus the analytical instruments used during the OSPs, is an ongoing activity at the BCR.

The BCR's location in the same building as the MARUM - Center for Marine Environmental Sciences, University of Bremen, and its proximity to the university's Department of Geosciences, has led to frequent requests for tours of the BCR facility by visiting scientists. In the past year the repository has also provided core material for a number of course studies for a wide range of purposes. These included instruction on core description and the visual illustration of geoscientific concepts. These activities are seen as an important vehicle for publicising the work of IODP, especially to the next generation of geoscientists. During the year the BCR was visited by several school groups, but in special cases selected cores were sent to schools within Germany, where they were examined and discussed in their scientific context. Equally important for informing and educating the public of ECORD and IODP's scientific and technical achievements are the frequent events attended by representatives of the television, radio and print media.

Other visitors to the BCR in 2011 included Dr Ulrich Harms, (Executive Secretary, International Continental Scientific Drilling Program - ICDP), Dr Asahiko Taira (Executive Director, Japan Agency for Marine-Earth Science and Technology, JAMSTEC) and Nobu Eguchi (Expedition Project Manager, JAMSTEC), as well as members of the Senate Commission for Geoscience Research at the German Research Foundation (DFG) and a delegation of 20 representatives from Brazil.

Scientists participating in the ICDP Lake Van (Turkey) Expedition held their science party at the BCR from January 20 to February 11, 2011. The Lake Van cores were split, described and sampled using procedures similar to those of the MSP expedition science parties, therefore helping to standardise the practices and strengthen the cooperation between ECORD and ICDP.

During the evaluation of ECORD in 2011, the Evaluation Committee visited the MARUM, University of Bremen including BCR to review the facilities (March 4, 2011) and to see the reefer and mobile lab containers that ESO deploy offshore during MSP expeditions *(below),* and to see the sampling and analytical laboratories (in an Onshore Science Party "style").

The BCR is also an ideal place to train students, with the opportunity to work on real cores and have access to laboratory facilities ("Virtual Ship"). Since 2007, ECORD has organised annual summer schools on alternating themes of the IODP science plan. In 2011, the Bremen Summer School was dedicated to "Subseafloor Fluid Flow and Gas Hydrates" *(see ECORD Summer Schools, page 23)*.

**Related website:**
**http://www.marum.de/en/IODP_Core_Repository.html**



*Members of the ECORD Evaluation Committee visit the ESO Geochemistry container at the MARUM/BCR.*

# 6. Participating in IODP expeditions

Participating in an IODP expedition presents scientists with an excellent opportunity to have priority access to unique samples and data and to be involved in international teams. As a contributing member of IODP, ECORD is entitled to an average of eight scientists on every IODP expedition. Following an open call for applications, potential participants are nominated by ESSAC. The membership of the science party is finalised during discussions between the Implementing Organization, the two appointed Co-chiefs Scientists and the IODP member countries/consortia. For ECORD, member country rights are proportional to their financial contribution to the consortium ("quotas"). Selection of the science team is therefore not only based on scientific merit but must also fulfil the country quotas.

In FY2011, a total of six expeditions were implemented on both the *JOIDES Resolution* and the *Chikyu*, and 45 ECORD scientists were invited to participate, including five Co-chief Scientists. The *Chikyu* programme was unfortunately disrupted by the Tohoku Earthquake and associated devastating tsunami. While preparing to sail in Hachinohe harbour in March, the *Chikyu* was caught in the tsunami waves. The vessel was pushed against the quay, the hull was damaged and one of the azimuth thrusters was lost such that subsequent IODP expeditions had to be cancelled. This dramatic and devastating event hit the whole country, directly or indirectly, and some consequences are still being felt. Fortunately, the *Chikyu* will resume operations for IODP in April 2012.

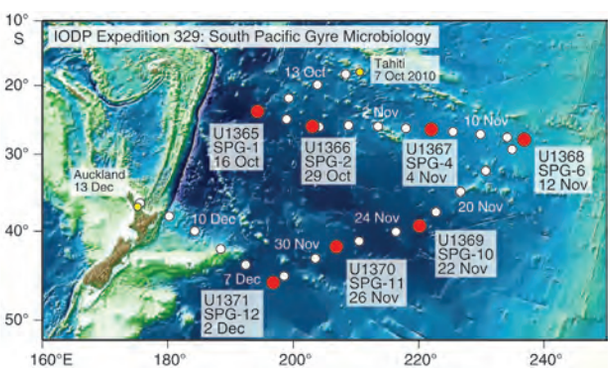


*Laurent Toffin (left) and Bjørn Olav Steinsbu (right) take microbiology samples (photo John Beck, IODP/TAMU).*

## Expedition 329, South Pacific Gyre Sub-seafloor Life, *JOIDES Resolution*, October 9 - December 13, 2010

Expedition 329 was the first IODP expedition to be dedicated to the investigation of the deep biosphere. Its primary goal was to define the physical and chemical limits of sub-seafloor microbial life in tectonic and oceanographic settings not yet explored. A series of holes were drilled along two transects hinged in the centre of the South Pacific Gyre with the aim of:

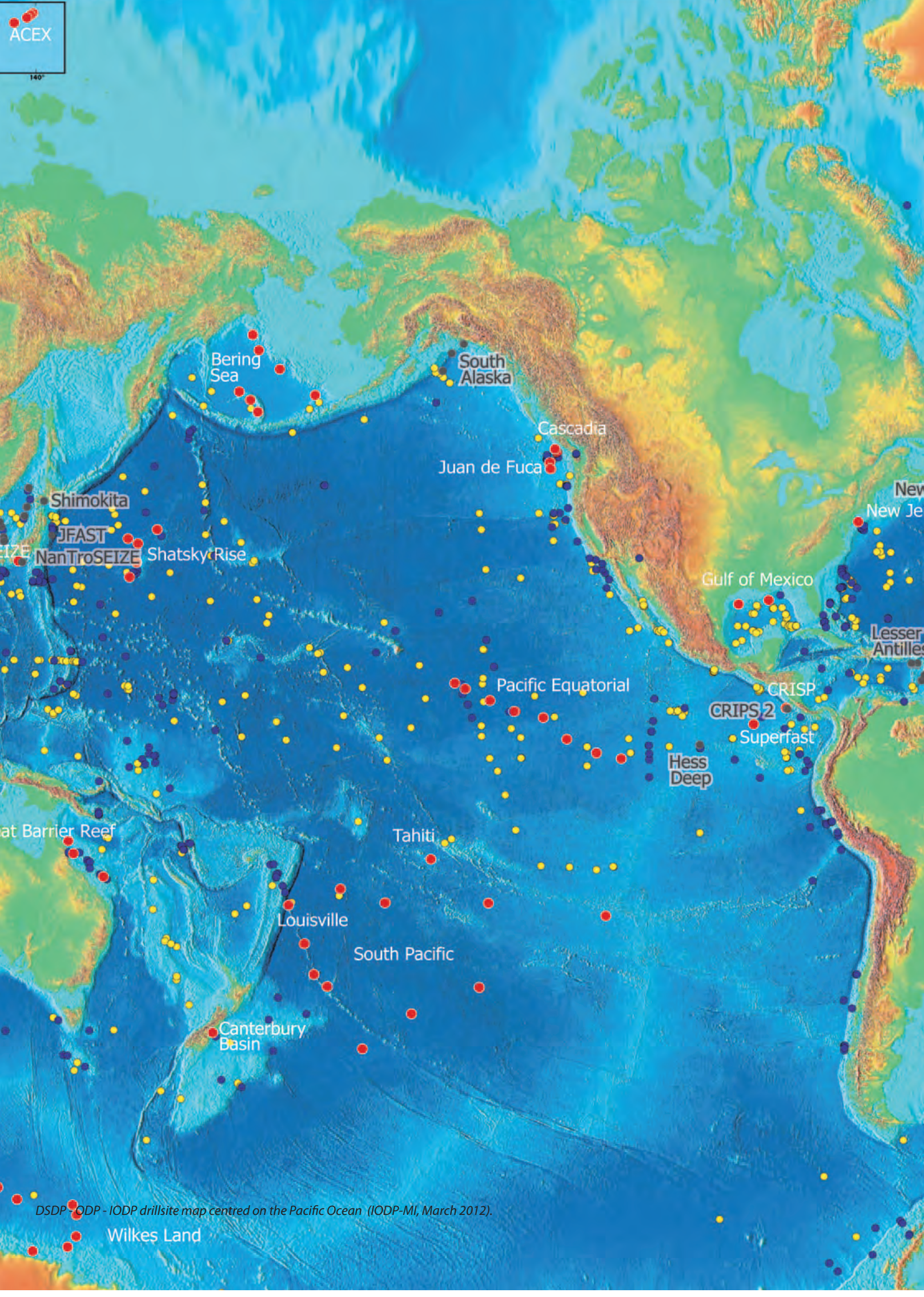
1. documenting the nature of microbial communities and testing the energetic limit to life in the most food-poor deep-sea sediments;
2. testing the influence of crust age and sediment thickness on microbial communities, the availability of electron donors and acceptors, and the hydrologic evolution of crustal basalt.




*Expedition 329 drillsites.*

### ECORD participants (Exp. 329)

| | | |
|---|---|---|
| Nathalie Dubois | Dalhousie University | *Canada* |
| Tim Engelhardt | ICBM-Oldenburg | *Germany* |
| Timothy Ferdelman | MPI-Bremen | *Germany* |
| Britta Gribsholt | Aarhus University | *Denmark* |
| Jens Kallmeyer | University of Potsdam | *Germany* |
| Christopher Smith-Duque | NOC-Southampton | *UK* |
| Bjorn Olav Steinsbu | University of Bergen | *Norway* |
| Michal Szpak | Dublin City University | *Ireland* |
| Laurent Toffin | Ifremer | *France* |

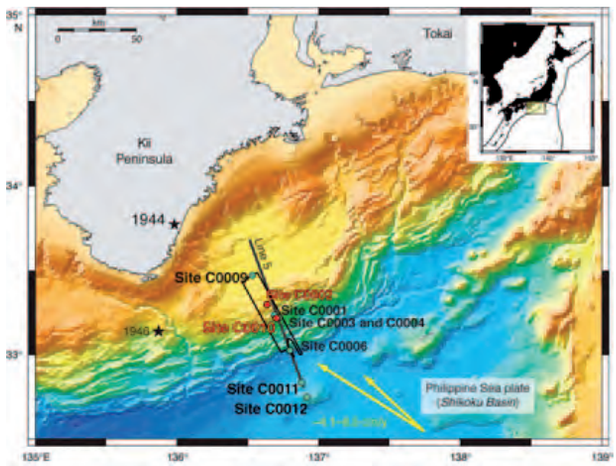



*DSDP - ODP - IODP drillsite map centred on the Pacific Ocean (IODP-MI, March 2012).*

## Expedition 332, NanTroSEIZE Stage 2: Riserless Observatory, *Chikyu*, October 25 - December 12, 2010

NanTroSEIZE (Nankai Trough Seismogenic Zone Experiment) is a complex ocean-drilling project that will be conducted over several years with multiple teams of scientists. The experiment is the first time it has been attempted to drill across the area of a subduction zone where earthquakes and tsunamis are generated, in order to sample and install instruments. The target area is located in the Nankai Trough off Japan. The project is focused on a fault called a splay thrust, which is the continuation of the seismogenic zone upward to the seafloor. Expedition 332 aimed at deploying/recovering borehole observatories to collect pressure and temperature measurements at Sites C0002 and C0010 *(right)*. Due to its particular and mostly technological goal, the expedition has fewer members in its science party.

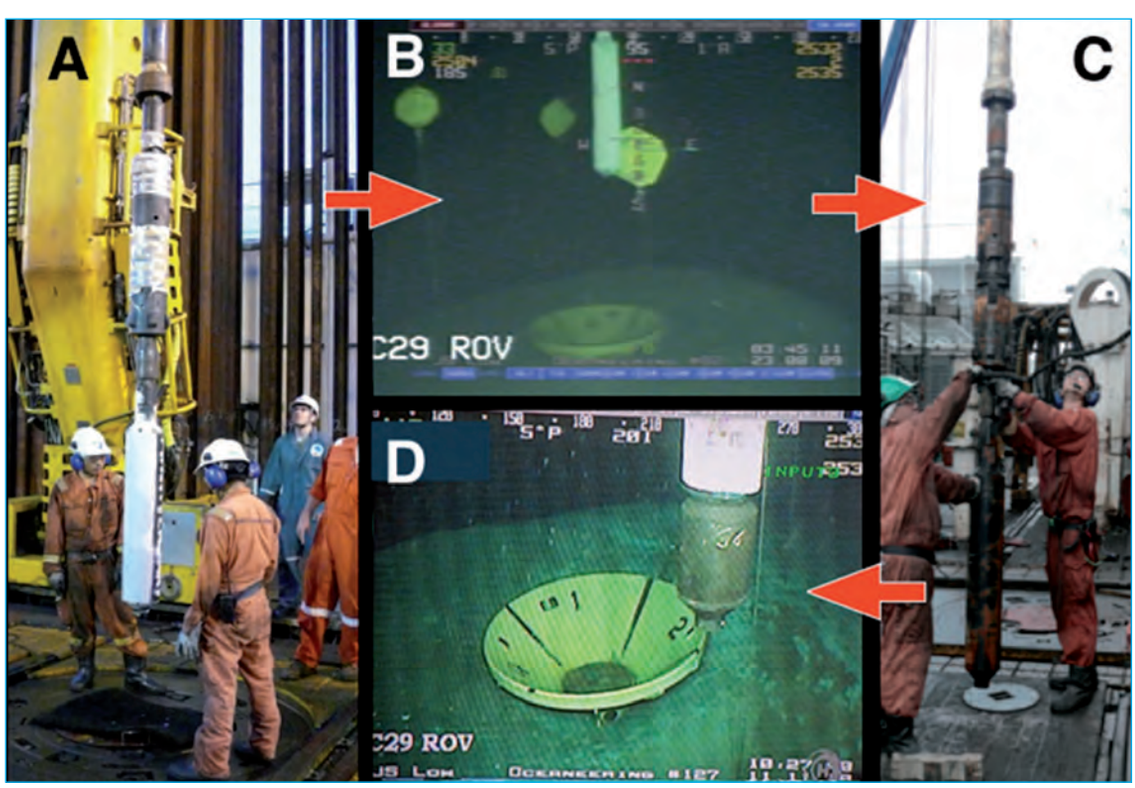
The role of ECORD in this expedition was essential as the "miniCORK" concept used during the project was developed by a group at Bremen University. The SmartPlug, a miniCORK deployed during Expedition 319, was recovered at Site C0010 after 15 months of successful recording. Time-series data recovered from the self-contained instrument include seafloor and formation pressure as well as four independent temperature records from the fault zone and the overlying seafloor reference. The SmartPlug was replaced by a GeniusPlug *(below)*, which is similar in geometry and equally self-contained but with an additonal component that hosts an OsmoSampler for collecting fluids for geochemical analysis and a flow-through osmotic colonisation system for microbiological study.




*Expeditions 332 and 333 drillsites.*

### ECORD participants (Exp. 332)

| | | |
|---|---|---|
| Achim Kopf, Co-chief Scientist | University of Bremen | *Germany* |
| Sebastian Hammerschmidt | University of Bremen | *Germany* |




*Cycle of operations at IODP Hole C0010: SmartPlug (white) and bridge plug with rubber seals (still wrapped) on the rigfloor (A), during deployment (B) and after recovery (C). The rusty unit was refurbished, extended by 30 cm to host the Osmo-Sampler and FLOCS chamber, and then re-deployed as a GeniusPlug (D) (© JAMSTEC/IODP).*



*Marion Garçon (inorganic geochemist) preparing samples for XRF analysis (JAMSTEC/IODP).*

## Expedition 333, NanTroSEIZE Stage 2: Subduction Inputs 2 and Heat Flow, *Chikyu*, December 13, 2010 - January 10, 2011

Expedition 333 was also part of the NanTroSEIZE project, and had two major objectives. The first was to drill into a stack of landslide deposits at the foot of the splay thrust to determine their frequency of occurrence, their relationship with episodes of splay thrust motion, and their possible role in tsunami generation (site NTS). The second objective was to continue the characterisation of the material that will be entrained into the subduction zone by coring and heat-flow measurements at Sites C0011 and C0012 *(see map, page 17)*.

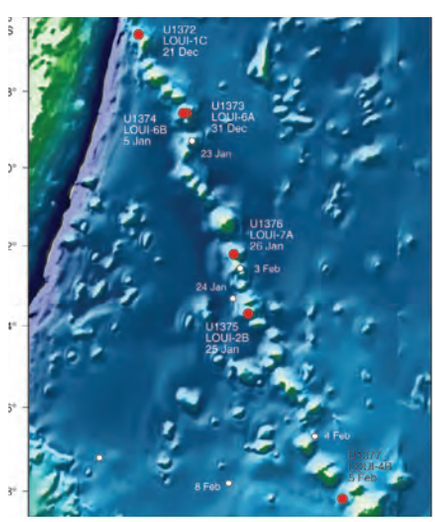
### ECORD participants (Exp. 333)

| | | |
|---|---|---|
| Pierre Henry, Co-chief Scientist | CEREGE | *France* |
| Tiago Alves | University of Cardiff | *UK* |
| Thorsten Bauershachs | Christian Albrechts University | *Germany* |
| Marion Garçon | ISTerre, Grenoble | *France* |
| Jan Sverre Laberg | University of Trömso | *Norway* |
| Boris Marcaillou | University Antilles et Guyane | *France* |
| Michael Strasser | University of Bremen | *Germany* |

## Expedition 330, Louisville Seamount Trail, *JOIDES Resolution*, December 13, 2010 - February 12, 2011

The Louisville Seamount Trail is a 4,300 km long volcanic chain that has been built in the past 80 M years as the Pacific plate moved over a persistent mantle melting anomaly or hotspot. The chain is the South Pacific counterpart of the much better studied Hawaiian-Emperor Seamount Trail. Although independent of plate tectonics, it is now understood that hot spots are not fixed either.

Drilling a series of holes along the hot-spot trail allowed the scientific team to demonstrate that the Hawaiian and Louisville hotspots have moved independently, with a latitudinal motion for Hawaii but a largely longitudinal shift for the Louisville hotspot.




*Expedition 330 drillsites.*

### ECORD participants (Exp. 330)

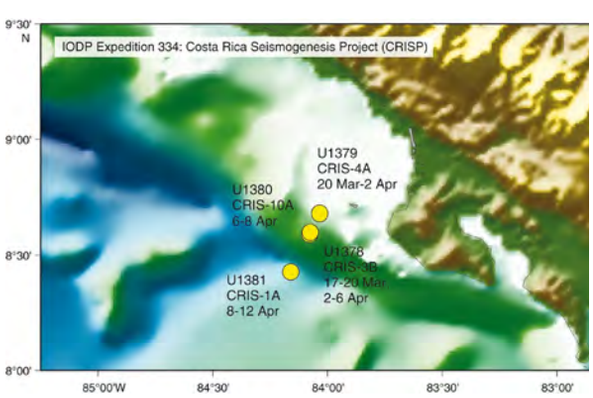
| | | |
|---|---|---|
| Christoph Beier | University Erlangen-Nürnberg | *Germany* |
| Fabien Deschamps | ISTerre, Grenoble | *France* |
| J. Godfrey Fitton | University of Edinburgh | *UK* |
| Cédric Hamelin | IPG-Paris | *France* |
| Lara Kalnins | University of Oxford | *UK* |
| Nicola Pressling | NOC-Southampton | *UK* |
| Svenja Rausch | University of Bremen | *Germany* |
| Rebecca Williams | University of Leicester | *UK* |
| Louise Anderson, Logging Staff Scientist | University of Leicester | *UK* |




*Microphenocrsyt in basalt - looking a bit like the JOIDES Resolution! (IODP)/TAMU).*

## Expedition 334, Costa Rica Seismogenesis Project (CRISP), *JOIDES Resolution*, March 15 - April 13, 2011

With a relatively thin sediment cover, fast convergence rate, abundant seismicity, subduction erosion and change in subducting plate relief along strike, the Costa Rica subduction zone offers excellent opportunities to study the causes of earthquake nucleation and rupture propagation.




*Expedition 334 drillsites.*

The CRISP project complements other deep-fault drilling projects such as the San Andreas Fault Observatory at Depth and the Nankai Trough Seismogenic Zone Experiment, and investigates the first-order seismogenic processes common to most faults and those unique to erosional margins. This long-term project was initiated during Expedition 334 by drilling shallow holes at five sites across the subduction zone, down the slope and into the subducting plate.



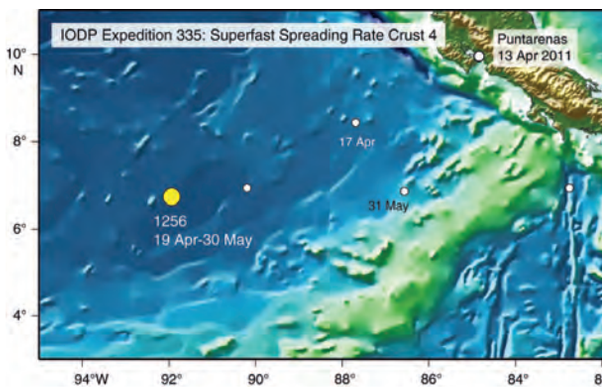
*Marianne Nuzzo (organic geochemist) analyses samples in the chemistry laboratory (photo John Beck, IODP/TAMU).*

### ECORD participants (Exp. 334)

| | | |
|---|---|---|
| Paola Vannuchi, Co-chief Scientist | University of Florence | *Italy* |
| Yvonne Arroyo | GEOMAR | *Germany* |
| Udo Barkahausen | BGR | *Germany* |
| Marianne Conin | CEREGE | *France* |
| Arnauld Heuret | Géosciences-Montpellier | *France* |
| Steffen Kutterholf | GEOMAR | *Germany* |
| Gillian A. McCay | University of Edinburgh | *UK* |
| Marianne Nuzzo | LNEG | *Portugal* |
| Michael Stipp | GEOMAR | *Germany* |

## Expedition 335, Superfast Spreading Rate Crust 4, *JOIDES Resolution*, April 13 - June 3, 2011

The Superfast Spreading Crust project was designed to help understand the formation, architecture and evolution of ocean crust formed at fast spreading rates. As part of this long-standing objective, Expedition 335 was the fourth project dedicated to drilling a basement reference hole that was initiated during ODP Hole 1256D.




*Expedition 335 drillsites.*

During the expedition, the hole was slightly deepened into the dyke/gabbros transition. A remarkable sample suite of granoblastic basalt with minor gabbros was recovered, some of which intrude previously recrystallised dykes, providing a detailed picture of a rarely sampled critical interval of the oceanic crust.



*Lydéric France and Bénédicte Abilly (petrologists) examine basalt lithology from the cuttings (IODP/TAMU).*

### ECORD participants (Exp. 335)

| | | |
|---|---|---|
| Benoît Ildefonse, Co-chief Scientist | Géosciences-Montpellier | *France* |
| Damon Teagle, Co-chief Scientist | NOC-Southampton | *UK* |
| Bénédicte Abily | GET | *France* |
| Lydéric France | CRPG-CNRS | *France* |
| Marguerite Godard | Géosciences-Montpellier | *France* |
| Michelle Harris | NOC-Southampton | *UK* |
| Jürgen Koepcke | University of Hannover | *Germany* |
| Johan Lissenberg | University of Cardiff | *UK* |
| Antony Morris | University of Plymouth | *UK* |



*Sunset at Hole 1256D (William Crawford, IODP/TAMU).*

## Selected 2011 publications with a major ECORD contribution arising from *JOIDES Resolution* and *Chikyu* expeditions


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*Preparing the drill for coring, Louisville Seamount Trail Expedition (Kazuyoshi Moriya & IODP).*

# 7. Engaging the community

One of ECORD's main responsibilities is to promote and facilitate ocean drilling within its member countries. The scientific committee of ECORD, ESSAC, has developed a number of activities that contribute to co-ordination of the science community, the preparation of drilling proposals and the education of future generations.

## ECORD Summer Schools

Training the next generation of scientists in ECORD member countries is a major goal. Initiated in 2007, the ECORD summer schools are now well established and attended by a large number of PhD students and post-doctoral researchers from member countries and beyond. In 2011, two summer schools were sponsored by ECORD.

### *ECORD Summer School on "Subseafloor Fluid Flow and Gas Hydrates", Bremen, September 12-23, 2011*

Held at the IODP Bremen Core Repository (BCR), the summer school brought together 24 PhD students and young post-docs from Europe, Canada and the USA (11 Germany, 3 UK, 2 France, 2 Spain, 2 Canada, 1 Sweden, 1 Romania, 1 Turkey, 1 USA). The ECORD Bremen Summer School takes advantage of the "virtual ship" facilities associated with the core repository. Students worked on real cores stored at the BCR using the laboratory facilities available at MARUM. In 2011, the students also had the great opportunity to gain "real ship experience" by sailing and collecting cores from the western Baltic Sea onboard the *R/V Alkor* *(below)*.

**Related website:**
**http://www.marum.de/Page10870.html**

### *2011 Urbino Summer School in Paleoclimatology (USSP) - Past Global Change Reconstruction and Modelling techniques, Urbino, July 13 - August 2, 2011*

This summer school is organised every year under the auspices of the University of Urbino to train a group of students from ECORD member countries, USA and beyond. It includes lectures, field trips and exercises organised by instructors drawn from an international pool built up to include the top scientists in their field. In 2011, the summer school brought together 64 students from 21 countries, including 12 ECORD member countries (1 Austria, 4 Netherlands, 14 UK, 2 Belgium, 7 Italy, 1 Switzerland, 1 France, 4 Germany, 1 Finland, 3 Spain, 2 Canada and 1 Norway).

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



*ECORD Summer School on Subseafloor Fluid Flow and Gas Hydrates.*

ECORD also sponsors a ***Scholarship Programme*** that help students to participate in the summer schools. In 2011, 50 applications were received from which 14 scholarships were awarded. Besides the ECORD member countries (4 UK, 2 France, 2 Germany, 1 Netherlands, 1 Belgium, 1 Norway, 1 Spain and 1 Canada), ESSAC also decided to allocate one place to a Brazilian student, to help raise awareness of the drilling programme in the country.

## ECORD Grants

ECORD sponsors merit-based awards for outstanding graduate students to conduct research related to scientific ocean drilling. Research may be directed toward the objectives of upcoming or past DSDP/ODP/IODP expeditions (core material and/or data). The aim of the awards is to encourage young scientists to develop their own project and to become familiarised with ocean drilling. Fourteen applications were received in 2011, and 5 grants were funded (2 UK, 1 Germany, 1 Netherlands and 1 Sweden).

## ECORD Distinguished Lecturer Programme (DLP)

The goal of the DLP is to promote the scientific achievements of ocean drilling to a large audience within universities/ institutes in ECORD member countries. ESSAC selects the three "Distinguished Lecturers" who then tour the globe to present their lectures, each on one of the three main scientific themes addressed by IODP. Any university in ECORD member country may apply to host a lecturer. In 2011, the appointed lecturers were:

- Kai-Uwe Hinrichs (University of Bremen, Germany): "Benthic archea - the unseen majority with importance to the global carbon cycle revealed by IODP drilling";
- Dominique Weis (University of British Columbia, Canada): "What do we know about mantle plumes and what more can be learned by IODP drilling ?";
- Helmut Weissert (ETH Zürich, Switzerland): "Carbon cycle, oceans and climate in the Cretaceous: lessons learned from ocean drilling (DSDP to IODP) and from records on continents".

The lecturers visited 18 universities in Europe, Canada and the US during 2011 and will continue until new lecturers are selected in 2012.

**Related website:**
**http://www.essac.ecord.org/index.php?mod=education**

## Magellan Workshop Series

To help scientists from ECORD member countries develop successful drilling proposals, ECORD has collaborated with the European Science Foundation (ESF) to set up the "Magellan Workshop Series". Since its establishment in 2006, the series has presented scientists with a twice-yearly opportunity to apply to a call for supporting a workshop. Three workshops were sponsored during FY2011.

### *Real-time Amphibic Monitoring and Borehole Observatories (RAMBO), October 14-16, 2010, Bremen, Germany*

*Convenors: Achim Kopf and Pierre Henry*

20 participants from Europe and the USA discussed the needs and technological requirements for long-term monitoring of geohazard processes. The workshop allowed the group to develop observatory strategies for key areas in the Mediterranean Sea, *e.g.* the Marmara sea and the Nice landslide, as well as for Alpine Fault continental drilling.

### *The GOLD (Gulf of Lion Drilling) project, drilling in the Western Mediterranean Sea, October 20-22, 2010, Banyuls, France*

*Convenors: Marina Rabineau, Daniel Aslanian, Karine Alain and Christian Gorini*

Co-sponsored by the ESF Magellan Workshop Series, Institut Carnot and INSU-CNRS, the workshop gathered 60 international participants. The aim was to plan a deep hole in the Gulf of Lion (Western Mediterranean), to address a variety of science topics including environmental changes, and in particular the Messinian crisis that resulted in the deposition of a 1 km thick salt layer, the nature of pre-salt sequences, and margin formation. This area also provides a unique natural laboratory to study the extent and nature of the deep biosphere, above and beneath the impermeable salt layer. Interest from oil companies was demonstrated by the presence of representatives from Total, Melrose, Statoil, Petrobras and Sonatrach.




### *Geological carbon capture and storage in mafic and ultramafic rocks: role of oceanic and continental scientific drilling, January 8-12, Muscat (Sultanate of Oman)*

*Convenors: Marguerite Godard, Damon Teagle, Peter Kelemen (LDEO, USA) and Sobhi Nasir (SQU, Oman)*

Sponsored by IODP-MI, Sultan Qaboos University, the (US) National Science Foundation, the ESF Magellan Workshop Series, UK-IODP, InterRidge and the (US) Consortium for Ocean Leadership, the workshop was attended by 87 participants from 15 countries. Consensus was reached on the need to develop integrated international research networks to favour the development of new geological storage techniques adapted for long-term $CO_2$ storage in



*Magellan Workshop Series: Geological carbon capture and storage in mafic and ultramafic rocks: role of oceanic and continental scientific drilling. Field trip in the Oman Mountains.*

mafic and ultramafic reservoirs. The workshop was followed by two days of field trips to view natural mineral carbonation processes in the Oman Mountains *(above)*.

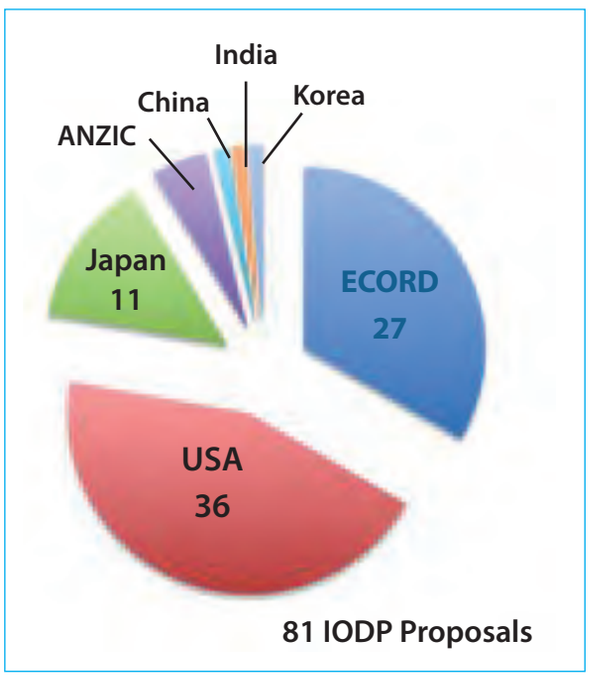
**Related website:**
**http://www.esf.org/magellan**

The Magellan scheme ends in December 2011, allowing one more workshop to be held. There is unfortunately no opportunity for the ESF to continue funding this scheme. However, ECORD Council has recognised the need to maintain such a mechanism to stimulate and nurture the process of developing new and innovative drilling proposals and at its June 2011 meeting decided to allocate funds from its own budget and continue offering the possibility to organise workshops. Starting in 2012, the **Magellan +** scheme will also be supported by the International Scientific Continental Drilling Program (ICDP). Magellan + will consider proposals requiring both oceanic and continental drilling, and will therefore contribute to the development of further links between ECORD and ICDP scientists.

**Related website:**
**http://www.essac.ecord.org/flyer/MagellanPlusCall0712.pdf**

## Proposals submitted by ECORD scientists

The life of IODP depends on the wealth of drilling proposals submitted by the scientific community. The ECORD community has always been very active in developing new ideas and as a result a third of the current proposals are led by ECORD scientists. Moreover, as of July 2011 there were 325 scientists from ECORD member countries involved in active proposals *(below)*, demonstrating that there is an obvious and sustained interest for scientific ocean drilling in ECORD member countries.




*Proposals currently in the IODP system by country/ consortium of the lead proponent (as of July 27, 2011). ANZIC (Australia - New Zealand IODP Consortium) has four. India, China and Korea have one each.*

**Related website:**
**http://www.iodp.org/active-proposals**

# 8. Reaching out

Promoting the activities and accomplishments of the drilling programme to large audiences is a major and constant goal. At the ECORD level, responsibilities for outreach activities are distributed between EMA, ESO and ESSAC. Each office maintains its own website: EMA manages the ECORD website - http://www.ecord.org, which provides access to general information about the structure of ECORD and details about publications and resources; the ESO website - http://www.eso.ecord.org - gives information specifically related to mission-specific platform (MSP) expeditions and the ESSAC website - http://www.essac.ecord.org - describes opportunities to participate in IODP expeditions and events such as the ECORD summer schools and Distinguished Lecturer Programme (DLP) *(see pages 23-24)*.

The ECORD outreach team met twice to co-ordinate the programme's outreach activities, in Paris in February 2011 and in Prague in August 2011. Representatives of the team also met with their IODP Outreach Task Force colleagues from IODP-MI, in Tokyo in September 2011, including the outreach specialists from the US and Japanese Implementing Organizations. The team also contributed to broader IODP objectives by providing input to the Science Plan for 2013-2023, "Illuminating Earth's Past, Present and Future".



*IODP booth at AGU 2010.*



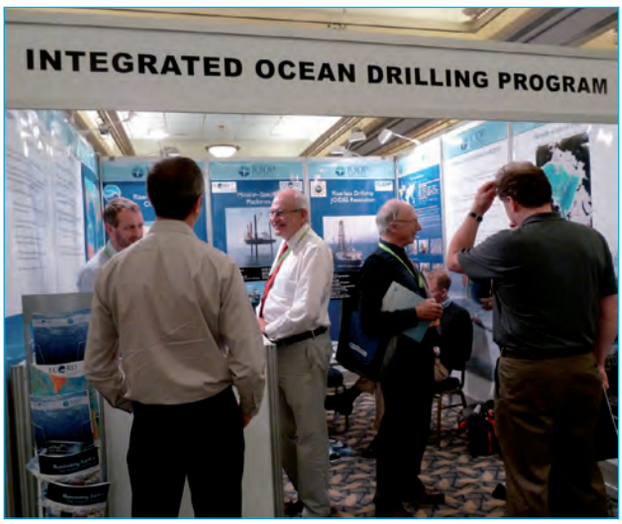

As there were no MSP expeditions between October 2010 and September 2011, ECORD outreach activities were mainly focussed on promoting IODP through participation at selected conferences and the various newsletters and promotional materials.

In late 2010/2011, ECORD outreach staff participated in IODP booths at the EurOcean Conference in Ostend, Belgium in October 2010, the American Geophysical Union (AGU) Fall Meeting in San Francisco, USA in December 2010 *(left)*, the European Geosciences Union (EGU) Conference in Vienna, Austria in April 2011 *(page 27)*, the Goldschmidt Conference in Prague, Czech Republic in August 2011, and the Polar Petroleum Potential (3P Arctic) Conference in Halifax, Canada in late August/September 2011 *(page 28)*. The main event for ECORD is the EGU Conference in Vienna at which IODP sponsors a booth and also supports a Townhall meeting and organises media conferences to promote specific issues or expeditions. In 2011, the EGU booth and Townhall Meeting were joint ventures with the International Scientific Continental Drilling Program (ICDP). The success of these events will lead to similar collaboration in 2012.

ECORD staff also helped their outreach colleagues in Japan and the USA to co-ordinate booths at the Offshore Technology Conference (OTC) in Houston, USA, the Japan Geoscience Union Meeting in Chiba, Japan and the Asia Oceania Geosciences Society (AOGS) Conference in Taipei,




*ECORD/IODP booth at EGU 2011.*




*IODP booth at 3P Arctic Conference in Halifax, Canada.*

Taiwan. In May 2011, ECORD provided promotional materials when the Canadian offices of IODP and ICDP shared a booth at the Geological and Mineralogical Associations of Canada (GAC-MAC) in Ottawa.

The ECORD Newsletter *(page 26)* 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 ECORD activities in general and includes updates on outreach activities. In addition to this published resource, ECORD also produces and updates leaflets/flyers explaining the programme objectives and with the latest information resulting from the four MSP expeditions carried out so far. The New Jersey Shallow Shelf and Great Barrier Reef Environmental Changes expedition leaflets were updated during 2011.




An important addition to the outreach resources was completed in 2011 with the production of a film that describes ECORD and the MSP concept *(above)*. The film, entitled "ECORD: Exploring the Earth under the sea" was first shown at the EGU Conference in Vienna and is available in a variety of formats on the ECORD website. A long version



*Educators at La Fabrica Centro Ciencia Viva, Aveiro, Portugal, presented IODP core replicas in their classrooms.*

lasting approximately 16 minutes was made (htpp://www.ecord.org/images/ECORD_Video-2011.mp4) complemented by a shorter, 6-minute version.

To support science education, several IODP resources and educational activities have been made available to teachers in ECORD countries. Replicas of drilling cores from ODP/IODP expeditions conducted by the *JOIDES Resolution* were loaned to several schools in Europe, including elementary to middle grades in Aveiro, Portugal *(above)*, high-school grades in Valbonne, France and the ECORD Urbino Summer School. About 700 students had the opportunity to look at a core replica that includes evidence of the K/T event (ODP Leg 171) or studied the sequence of the basalts, vein complex and gabbros in the oceanic crust (IODP Exp. 312) and the paleoclimatic events recorded in marine sediments drilled during ODP Leg 208, IODP Expeditions 302 and 310. 'Ship to shore conferences' organised during IODP Expedition 335 allowed educators and students to be connected to the scientific and technical teams while at sea.

Since 2004, several European teachers have been invited to participate in IODP expeditions as well as in the US School of Rock programme, in particular the Teachers' workshop held onboard the *JOIDES Resolution* in 2011.

**Related website:**
**http://www.ecord.org/pi/promo.html**

# 9. Preparing for the future

The current phase of scientific ocean drilling ends in September 2013. 2012 will be a crucial year in most ECORD and IODP member countries as they decide if they will continue their membership of the programme. It is therefore essential to provide those who will make the decisions with all the information they need about the achievements made during the current phase and the future science goals and organisation for the next phase. Accordingly, a number of actions have been initiated both at the international and ECORD level to help prepare for the future.

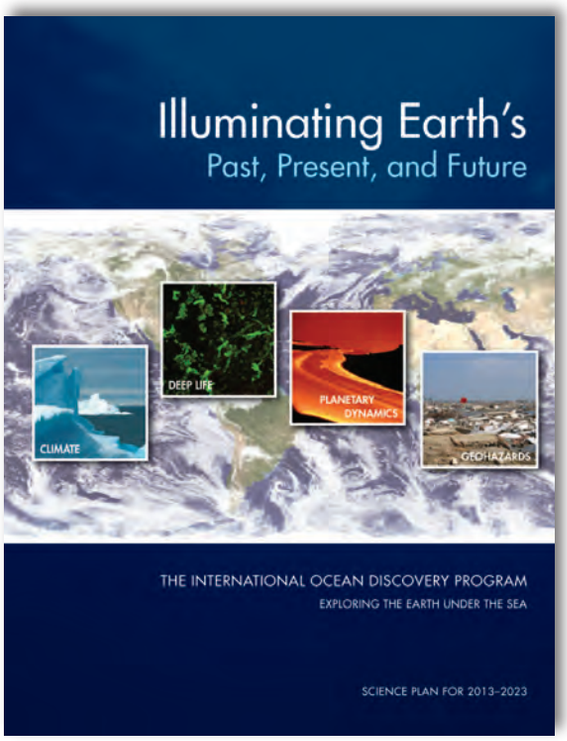
## International level

In 2009, the funding agencies that currently contribute to IODP decided to set up the International Working Group + (IWG+) and start planning the framework for cooperation in the new drilling programme. In 2011 substantial progress was made towards renewal of the programme. Based on the outcomes of the INVEST meeting that brought together ~600 scientists, engineers and decision makers in Bremen in September 2009, the **IODP Science Plan for 2013-2023** was finalised and presented in June 2011 in Amsterdam - http://www.iodp.org/Science-Plan-for-2013-2023/

The new science plan emphasises topics of critical importance to society. These key issues include the contribution of ocean drilling to the investigation of climate change and sea-level rise modelling, the understanding of ocean acidification processes, long-term monitoring of boreholes to address the triggering of geohazards, and the formation of resources buried in the deep sea. To make progress in understanding these science topics requires continued access to all three types of drilling platform provided by IODP.

The current partners of IODP agree that the architecture of the programme should be simplified and streamlined. A new framework that allocates more independence to the platform providers within a maintained international structure has been proposed and will be finalised in 2012. ECORD considers that this new, simplified framework provides an exciting opportunity to introduce more flexibility in the implementation of mission-specific platform operations.

Expanding the membership of IODP has been a long-standing objective with the aim of not only involving new communities, but to benefit from their intellectual contribution. At the end of 2011, IODP has 24 member




countries, including the 17 partners of ECORD. Responsibility for expanding the consortium is led by IODP-MI, who in July 2011 organised a delegation to Brazil that included EMA Director, Catherine Mével. During the visit, representatives from several Ministries in Brasilia as well from the science community in Rio de Janeiro showed a strong interest in joining the programme in the near future.

## ECORD level

Initially composed of 12 members, ECORD has progressively expanded to its current 17 countries. Fruitful contacts have been pursued with potential new partners such as Poland and Israel, which hopefully will result in additional members joining ECORD in the near future.

An independent committee of seven prominent scientists was tasked by the ECORD Council to evaluate the role of ECORD in the scientific achievements of IODP, and to assess the IODP Science Plan for 2013-2023, in particular the need for a strong mission-specific platform programme to address the science objectives. The "ECORD Evaluation Report" was finalised at the end of September - http://www.ecord.org/pub/ECORD_evaluation-report.pdf. The committee's evaluation was very positive, emphasising the need for scientific ocean drilling to understand the Earth system and recognising the unique contribution of mission-specific platforms that have expanded the science goals by allowing IODP to drill in shallow waters and ice-covered areas. The report also stresses the prominent

role of ECORD scientists in submitting successful proposals and in achieving the IODP science objectives *(right)*.

Ocean drilling is a unique tool in providing direct access to sub-seafloor environments. However, it has been recognised that ocean drilling should be integrated with other approaches to investigation of the deep seafloor, which has led the ECORD scientific community to be active participants in the EC-funded project "Deep Sea and Sub-Seafloor Frontier"(DS$^3$F). The DS$^3$F co-ordination action aims at "developing seafloor and sub-seafloor sampling strategies for enhanced understanding of deep-sea and sub-seafloor processes by connecting marine research in life and geosciences, climate and environmental change, with socio-economic issues and policy building" Beyond the scientific goals common to ECORD and the DS$^3$F, which in particular includes climate change, deep-sea resources, the deep biosphere and geohazards, it is important to develop strategies to facilitate access to the sub-seafloor. DS$^3$F and ECORD representatives attended the EurOCEAN Conference held in Ostend, October 12-13, 2010 *(see page 26)* to promote this joint approach to the European Commission and other policy makers.

A workshop held in Grenoble in February 2011 as part of DS$^3$F WP7 activities focused on "technologies for sub-seafloor sampling and instrumentation". The participants from academia and industry recognised the high level of expertise distributed across Europe in areas such as the implementation of scientific ocean drilling (with the ECORD Science Operator experience), seabed drills, long piston coring, *in-situ* pressure sampling, high temperature drilling/tools and borehole observatories. The major outcome of this meeting was to recommend building on existing knowledge and working towards the establishment of a "Distributed European Drilling Infrastructure". This initiative will develop closer collaboration between research and operational groups across Europe, sharing experiences and capabilities and avoiding duplication. It will also help to facilitate the seeking of joint funding for new technological developments. This idea was endorsed by the ECORD Council and presented by Catherine Mével at the ESFRI (European Strategy Forum on Research Infrastructures) meeting in Brest in July 2011, as well as the "Marine Board" plenary session in Madrid in October 2011. Indeed, such a distributed infrastructure would not only greatly facilitate access to the sub-seafloor but also strengthen the technological capabilities and facilitate innovation. The infrastructure would also facilitate relationships with




other existing initiatives such as the OFEG (Offshore Facility Exchange Group) and EUROFLEET for access to research vessels, EMSO (European Multidisciplinary Seafloor Observatory) for long-term monitoring of boreholes, and ICDP (International Continental Scientific Drilling Program) to share knowledge on drilling and coring tools, data management, etc. The next step in 2012 will be to contact potential partners and initiate the network, with the aim of gaining the recognition and support of the European Commission and ESFRI. At a time when the HORIZON 2020 framework is being developed by the European Commission and its Member States, it is essential to ensure that both the scientific and technological goals of ECORD and DS$^3$F are considered.

Representatives at the ECORD Council all endorse that continued access to ocean drilling is essential for the scientific community. However, the Council also recognise that the concept of mission-specific platforms offered by ECORD has not only been critical to opening access to new oceanic environments but also to establishing ECORD as a key player in the Integrated Ocean Drilling Program. A formal decision on their continuation beyond 2013 will be made by the member countries in 2012.

**Related websites:**

http://www.iodp.org/Science-Plan-for-2013-2023/
http://www.ecord.org/pub/ECORD_evaluation-report.pdf
http://www.deep-sea-frontier.eu/

# 10. FY2011 ECORD budget

ECORD is currently funded exclusively by its member countries. In FY2011, the total ECORD budget amounted to USD 21.37 M. The budget is unevenly distributed between the member countries, from USD 5.6 M for the three major contributors to USD 30,000 for the two smallest *(below)*.The ECORD member country quotas are calculated on the basis of these contributions.

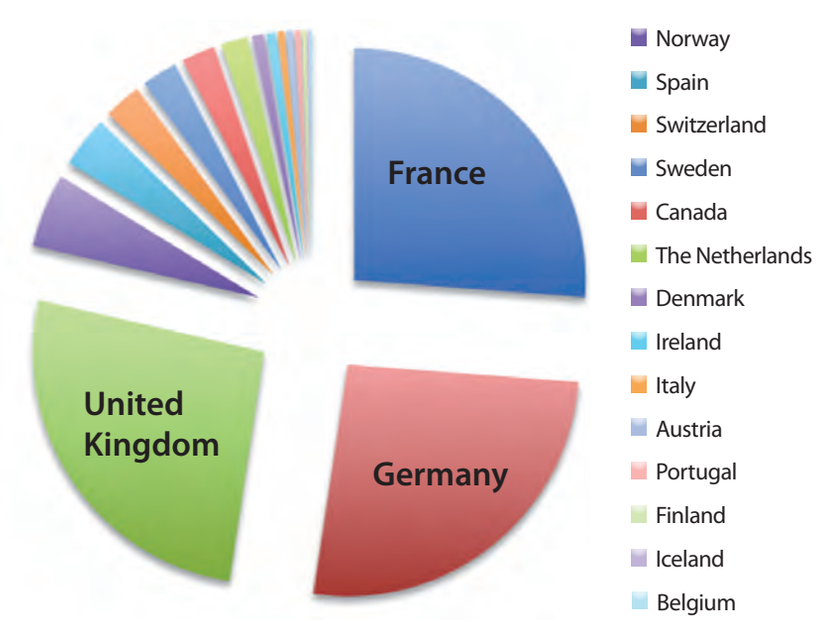
According to the Memorandum signed with the Lead Agencies of IODP, the NSF and MEXT, ECORD makes an annual contribution of USD 16.8 M to the IODP commingled funds to support "Science Operation Costs" (SOCs). These SOCs include support to the Central Management Office (IODP-MI) as well as to platform providers to cover the science support activities (analytical facilities, core curation, data management, etc.). As one of the three platform providers, the ECORD Science Operator therefore receives money from the commingled funds to cover science costs associated with mission-specific platform expeditions. This budget is negotiated between ESO and the Central Management Office and specified in the IODP Annual Program Plan. The remaining ECORD budget is used to support the MSP "Platform Operation Costs" (POCs), as well as the ECORD Managing Agency and the ECORD Science Support and Advisory Committee.

To simplify the money flow, it was agreed in 2010 by ECORD, NSF and MEXT that the SOCs allocated to the ECORD Science Operator will be paid directly from the ECORD budget and deducted from the ECORD contribution to the commingled funds.

After paying its contribution to IODP commingled funds, ECORD's remaining budget does not allow the implementation of one MSP expedition every year. Funds must therefore be accumulated over several years and carried forward. The last MSP expedition was conducted in FY2010. In FY2011, the ECORD Science Operator requested a small budget to start preparing for the final expedition of the current phase of IODP to be conducted in FY2013. The FY2011 balance will be carried forward to allow this expedition to happen.

| | |
|---|---|
| Austria | 100,000 |
| Belgium | 30,000 |
| Canada | 500,000 |
| Denmark | 170,000 |
| Finland | 66,380 |
| France | 5,600,000 |
| Germany | 5,600,000 |
| Iceland | 30,000 |
| Ireland | 140,000 |
| Italy | 100,000 |
| The Netherlands | 400,000 |
| Norway | 1,100,000 |
| Portugal | 90,000 |
| Spain* | 762,000 |
| Sweden | 528,000 |
| Switzerland | 560,000 |
| The United Kingdom | 5,600,000 |
| **Total** | **21,376,380** |

** to be received*




*ECORD member country contributions for FY2011 (USD).*

The tables below detail ESO's actual expenditure during the same period. Compared with the allocated funds, there is a positive balance, largely due to money allocated in POCs for a hazard site survey at the Chicxulub site, which has not yet been implemented. The sum carried forward is still held by EMA.

| ECORD FY2011 budget in USD Millions | | |
|---|---|---|
| | income | expenses |
| FY10 carry forward | 2.34 | |
| ECORD member contributions | 21.37 | |
| Contribution to IODP commingled funds | | 14.27 |
| EMA | | 0.34 |
| ESSAC | | 0.22 |
| ESO POCS | | 1.54 |
| ESO SOCS | | 2.52 |
| **Total** | **23.71** | **18.89** |
| **FY2011 balance** | **4.82** | |

| ESO FY2011 overall expenditure, in USD | | | |
|---|---|---|---|
| | FY11 Annual Program Plan budget | FY11 expenditure | FY12 carry forward[1] |
| Science Operation Costs (SOCs) | 2,524,041 | 2,417,108 | 106,933 |
| Platform Operations Costs (POCs) | 1,538,898 | 237,526 | 1,301,372 |
| **Grand Total** | **4,062,939** | **2,654,634** | **1,408,305** |

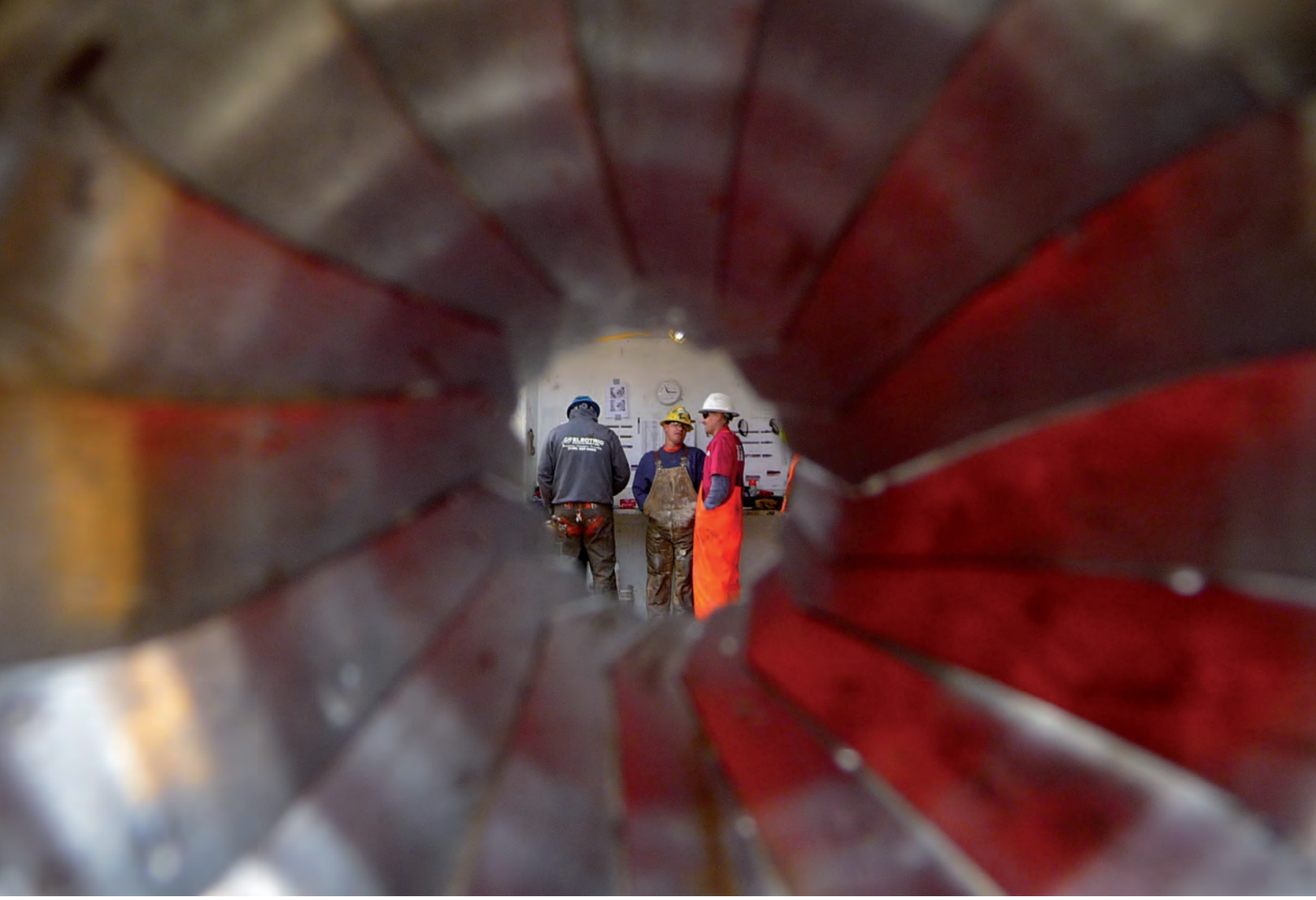
[1] *Carry forward amounts are held at EMA*

| ESO FY2011 SOC expenditure breakdown, in USD | | | |
|---|---|---|---|
| | FY11 budget | FY11 expenditure | Variance |
| Management and administration | 866,514 | 871,743 | -5,229 |
| Technical, Engineering and Science Support | 1,019,931 | 995,544 | 24,387 |
| Core Curation | 78,411 | 78,411 | 0 |
| Data Management | 397,985 | 354,806 | 43,125 |
| Outreach | 161,200 | 116,549 | 44,651 |
| **Grand Total** | **2,524,041** | **2,417,108** | **106,933** |

| ESO FY2011 POC expenditure breakdown, in USD | | | |
|---|---|---|---|
| | FY11 budget | FY11 expenditure | Variance |
| Management and administration | 318,321 | 82,548 | 235,773 |
| Technical, Engineering and Science Support | 1,220,570 | 154,978 | 1,065,599 |
| **Grand Total** | **1,538,898** | **237,526** | **1,301,372** |

# Annex - List of Acronyms

**ACEX**: Arctic Coring Expedition
**AGU:** American Geophysical Union
**ANZIC:** Australia-New Zealand IODP Consortium
**BCR**: Bremen Core Repository
**BGS**: British Geological Survey
**CDEX**: Center for Deep Earth Exploration
**CORK**: Circulation Obviation Retrofit Kit
**CRISP**: Costa Rica Seismogenic Project
**DIS**: Drilling Information System
**DLP:** Distinguished Lecturer Programme
**DSDP**: Deep Sea Drilling Project
**DS$^3$F**: Deep Sea and Sub-Seafloor Frontier
**ECORD**: European Consortium for Ocean Research Drillling
**EGU**: European Geosciences Union
**EMA**: ECORD Managing Agency
**EPC**: European Petrophysics Consortium
**ERA-Net**: European Research Area Network
**ESF:** European Science Foundation
**ESFRI**: European Strategy Forum on Research Infrastructures
**ESO**: ECORD Science Operator
**ESSAC**: ECORD Science Support and Advisory Committee
**FLOCS**: Flow-Through Osmo Colonization System
**GCR**: Gulf Coast Repository
**ICDP**: International Continental Scientific Drilling Program
**IODP**: Integrated Ocean Drilling Program
**IODP-MI**: Integrated Ocean Drilling Program Management International, Inc.
**IWG+**: International Working Group Plus
**JAMSTEC:** Japan Agency for Marine Earth Science and Technology
**JOIDES**: Joint Oceanographic Institutions for Deep Earth Sampling
**JR:** JOIDES Resolution
**KCC**: Kochi Core Center
**MARUM:** Center for Marine Environmental Sciences, University of Bremen
**MEXT**: Ministry of Education, Culture, Sports, Science and Technology
**MoU**: Memorandum of Understanding
**MSCL**: MultiSensor Core Logger
**MSP**: Mission-specific platform
**NanTroSEIZE**: Nankai Trough Seismogenic Zone Experiment
**NSF**: National Science Foundation
**ODP**: Ocean Drilling Program
**ORTF**: Operation Review Task Force
**OSP**: Onshore Science Party
**POCs**: Platform Operation Costs
**SEDIS:** Scientific Earth Drilling Information System
**SOCs**: Science Operation Costs
**TAMU**: Texas A & M University



## ECORD Members

**Austria:** Österreichische Academie der Wissenschaften (ÖAW) and Fonds zur förderung der Wissenschaftlichen Forschung (FWF)
**Belgium:** Fonds Wetenschappelijk Onderzoek - Vlaanderen (FWO)
**Denmark:** Forsknings- og Innovationsstyrelsen
**Canada:** Natural Sciences and Engineering Research Council of Canada (NSERC)
**Finland:** Suomen Akatemia
**France:** Institut National des Sciences de l'Univers - Centre National de la Recherche Scientifique (INSU-CNRS)
**Germany:** Deutsche Forschungsgemeinschaft (DFG)
**Iceland:** Rannsóknamiðstöð Íslands (RANNIS)
**Ireland:** The Geological Survey of Ireland (GSI)
**Italy:** Consiglio Nazionale delle Ricerche (CNR)
**The Netherlands:** Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO)
**Norway:** Forskningsrådet
**Portugal:** Fundação para a Ciência e a Tecnologia (FCT)
**Spain:** Ministerio de Ciencia e Innovación (MICINN)
**Sweden:** Vetenskapsrådet (VR)
**Switzerland:** Fonds National Suisse (FNS)
**The United Kingdom:** Natural Environment Research Council (NERC)

ECORD
European Consortium fo
Ocean Research Drilling

IODP
INTEGRATED OCEAN
DRILLING PROGRAM