ECORD

European Consortium for Ocean Research Drilling

Newsletter #16

April 2011

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IODP
INTEGRATED OCEAN DRILLING PROGRAM

Mireille Perrin

Message from the Council Chair

The past six months have been extremely productive for the future of IODP. During the last two meetings of IWG+, in December 2010 during the AGU meeting in San Francisco and in January 2011 in Miami, agreements have been found for most points still under discussion and, with the new science plan close to completion, the outline of the new program is now pretty clear. The next step will be to prepare the Memorandum of Understanding (MoU) to be signed by all the partners willing to participate in the new program and an agreement has been reached in particular on the following important points *(see http://www.iodp.org/International-Working-Group-Plus/)*.

To avoid disruption in program management, IODP-MI will continue as the Central Management Office (CMO) through the transition to the new program.

The Science Advisory Structure (SAS) will be simplified. The current three-tier science management system (SSEP, SPC and SASEC) will be replaced by a two-tier system; the **Proposal Evaluation Panel (PEP)** responsible for evaluating the proposals and the **Science Implementation and Policy Committee (SIPCOM)** responsible for approving the annual ship schedule and developing long range operational plans.

The executive body of the new program management structure will be the **Program Governing Board (PGB)**. It will be composed of representatives of the agencies of each country or entity that contributes to financial support of the IODP, with liaisons from PEP and SIPCOM, the Implementing Organizations and the CMO. The PGB will be responsible for the effective delivery of the Program's Implementation Plan within the available resources. SIPCOM, in coordination with the CMO, is to report directly to the PGB.

There will be three major membership categories:

- a **Lead Agency (LA)** provides a contribution of at least USD50M/year, including a core capability platform and at least USD1M/year in commingled funds,
- a **Platform Provider (PP)** provides a contribution of at least USD20M/year, including at least USD6M/year in commingled funds, as well as a long-term commitment to the regular provision of a major platform with significant scientific capability,
- a **Member** provides contributions of at least USD1M/year to the commingled funds.

If the funding structure remains similar to the current situation, each current LAs (NSF and MEXT) will have approximately 1/3 participation level for expeditions and for SAS panels. The remaining 1/3 will go to the other members based on their total contribution to the program. ECORD will have PP membership and will maintain its current level of 8 berths on every expedition.

At the ECORD level, the current member countries have already indicated that in principle they are willing to continue participating. However, the formal decision, through the signature of the ECORD MoU, still needs to be made.

To facilitate the transition to the new phase, ECORD Council has decided to maintain the current EMA (INSU-CNRS) and ESO (British Geological Survey (BGS) in association with Bremen University and the European Petrophysics Consortium) for three years into the new phase. Council is also developing a business plan that will include a broadened scope for ECORD. In the summer of 2011, the ECORD funding agencies will receive the new science plan, the ECORD business plan as well as the ECORD evaluation committee report for consideration. They will be invited to sign an expression of interest by the end of 2011, for an ECORD MoU signature in 2012. But it is also the role of the science community to promote the importance of continued access to scientific ocean drilling for investigating the Earth system.

Mireille Perrin, ECORD Council Chair, from October 1, 2010 to September 30, 2011 - http://www.ecord.org/c/council.php

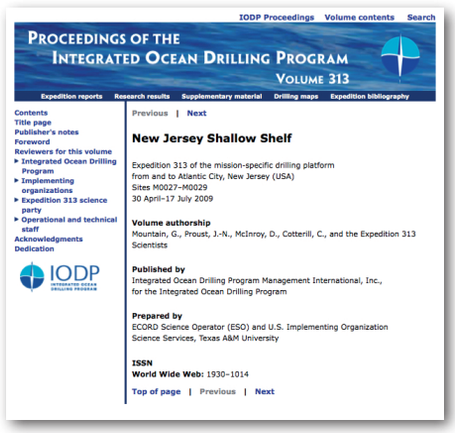
As this newsletter was about to go to print, an 8.9 magnitude earthquake and associated tsunami hit Japan. It is already clear that there has been major loss of life and damage to property and infrastructure, and aftershocks continue to shake Japan. Our colleagues from IODP-MI have informed us that they are all safe in Tokyo. However, the *Chikyu* was in the port of Hachinohe, north of Sendai, preparing for the Shimokita Expedition 337. During the emergency evacuation that followed the tsunami warning, one of the thrusters suffered severe damage and was lost. Fortunately, personnel and visitors aboard, as well as all CDEX/JAMSTEC and support staff ashore, are safe. But the *Chikyu* will need repairs before resuming operations. Therefore, CDEX has officially announced that the current schedule for Expedition 337 is postponed.
All our thoughts are with our Japanese colleagues and friends as well as the whole country in this terrible situation.
It reminds us that we live on a dynamic Earth that has devastating events with tragic consequences such as we have seen in the last few days.


David McInroy

ECORD Science Operator News


Robert Gatliff

The Expedition 313, New Jersey Shallow Shelf, moratorium ended on December 4, 2010, with the publication of the Proceedings of the IODP Volume 313 (doi:10.2204/iodp.proc.313.2010). Results from Expedition 313 were reported at the 2010 AGU Fall Meeting, the Special Session on 'Sea Level, Near-Surface Currents, and the Stratigraphic Record: Recent Results'. Further scientific results are expected in peer-reviewed journals on completion of personal post-expedition research by the Science Party in the coming months. The Science Party will meet on August 15-19, 2011, in Salt Lake City, Utah, for the 2nd Post-Expedition Meeting to present and discuss their scientific findings to date.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PROCEEDINGS OF THE INTEGRATED OCEAN DRILLING PROGRAM
VOLUME 313

Expedition reports | Research results | Supplementary material | Drilling maps | Expedition bibliography

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New Jersey Shallow Shelf

Expedition 313 of the mission-specific drilling platform from and to Atlantic City, New Jersey (USA)
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Expedition 325, Great Barrier Reef Environmental Changes, is currently 10 months into the moratorium period. The 1st Post-Expedition Meeting (editorial) took place at College Station, Texas, from December 7-11, 2010. The Proceedings of the IODP Volume 325 is expected to be published online in July 2011. Some early results are beginning to emerge and have been summarised by Co-chief Scientists Jody Webster and Yusuke Yokoyama, and Staff Scientist Carol Cotterill *(this page)*.

ESO is continuing to follow the ECORD direction to aim to implement at least one mission-specific platform expedition before the end of the program. ESO is currently scoping the two highest ranked proposals currently with the Operations Task Force in parallel: Proposal 548 Chicxulub K-T Impact Crater and Proposal 716 Hawaiian Drowned Reefs. After liaising with IODP's Science Planning Committee and Operations Task Force in March 2011, ESO will formulate an MSP schedule for 2012 and 2013.

The ESO Chair, Robert Gatliff, has been working closely with the ECORD Council and the ECORD Managing Agency (EMA) to formulate a business plan for Europe's involvement in scientific ocean drilling post-2013. This plan is expected to be finalised by the end of April 2011.

David McInroy, ESO Science Manager and Robert Gatliff, ESO Chair - http://www.eso.ecord.org


Carol Cotterill

Unlocking climate and sea-level secrets since the Last Glacial Maximum: Preliminary Results from Expedition 325 to the Great Barrier Reef


Jody Webster


Yusuke Yokoyama

The Great Barrier Reef (GBR) is the largest epicontinental reef system on Earth, extending for 2000 km in a northwest-southeast orientation along the northeast coast of Queensland, Australia. In addition to encompassing numerous reef morphologies, from extensive fringing reefs, patch reefs, ribbon reefs and flood-tide deltaic reefs, the GBR lies in a tectonically stable region far from former ice margins (far-field site). These factors combined gave Expedition 325 the unique opportunity to investigate an unbiased record of reef growth, demise and environmental stress on different reef communities during the last deglaciation.

The offshore phase of IODP Expedition 325 took place from February 11 to April 6, 2010, with the Onshore Science Party (OSP) running from July 2-16, 2010 at the IODP Bremen Core Repository and laboratories in the MARUM building on the campus of Bremen University in Germany.

Coral reefs are excellent sea-level indicators and climate recorders. Scleractinian coral colonies can capture snapshots of oceanographic conditions at the time of their growth, giving an insight into sea-surface temperature, salinity and other parameters such as run-off through analysis of geochemical proxies and the coral skeletons. The reef community composition can give an indication as to position on the reef high wave energy fore-reef or low energy sheltered back reef, and so sea levels at the time of growth, whilst accurate dating by mass spectrometry determines the timing of climate and sea-level changes since the Last Glacial Maximum (LGM).

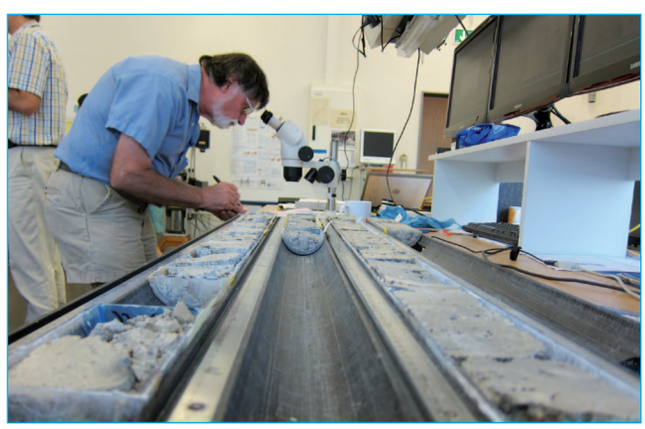
Figure 1: Analysis of the coral species present in each core being conducted by Don Potts during the OSP (A. Gerdes © ECORD/IODP).

The scientific objectives of Expedition 325 were:

1) To establish the course of sea-level rise during the last deglaciation (~20-10 ka) assessing the validity, timing and amplitude of melt water pulse events and testing glacio-hydro-isostatic modelling

2) To reconstruct the nature and magnitude of seasonal-millenial scale climate variability (*e.g.,* sea-surface temperature and salinity) including the identification of specific phenomena such as El Niño-Southern Oscillation (ENSO),

3) To determine the biological and geological response of the GBR to abrupt sea-level and climate change including the identification of reef drowning events, modelling reef building and environmental changes during reef development.

To meet these objectives, a succession of fossil reef structures preserved on the shelf edge seaward of the modern barrier reef system were cored from the *Greatship Maya*. A total of 34 holes from four transects, located at three different geographical positions along the GBR shelf, were cored in depths ranging from 42.27-167.14 metres below present-day sea level.

Achieving the above goals will require considerable shore-based analysis and cross-discipline collaboration. Analysis of the IODP minimum and standard measurements on more than 6000 samples taken during the OSP is ongoing *(Figure 1, page 3)*. However, preliminary results suggest that not only will the above scientific objectives be met, but that two additional outcomes can be addressed:

1) New sea-level and paleoclimate information from corals that likely span the LGM (MIS2), pre-LGM (MIS3) and several earlier Pleistocene periods,

2) A high-resolution record of near continuous sedimentation from a fore-reef slope site will compliment the reef development record obtained from the fossil reef structures on the shelf edge.

Whilst offshore, 68 samples of coral were subsampled from core-catcher material from the top, middle and base of each hole for preliminary dating prior to the OSP. This was done under agreement from the full Science Party and Sample Allocation Committee in order to better guide descriptions, collaborative sample requests and the sampling strategy at the OSP. To ensure rapid sample throughput, no sample screening for diagenesis or detrital contamination was performed for either the U-Th or radiocarbon measurements. However, the preliminary age interpretations suggest that Expedition 325 has successfully recovered a complete sequence of material from the LGM interval, through the first half of the deglaciation up to 10 ka *(Figure 2)*. All age interpretations will be further refined in the detailed dating of about 4000 additional samples from across all the holes.

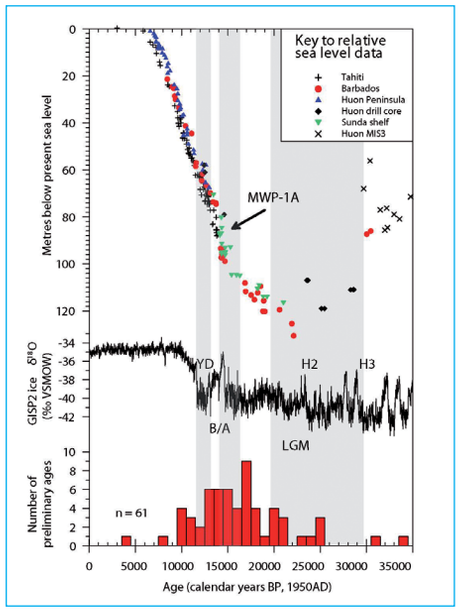

Figure 2: Histogram showing preliminary chronology measurements on core-catcher materials recovered on Expedition 325. The distribution of ages clearly indicates that the recovered fossil coral reef cores span key periods of interest for sea-level change and environmental reconstruction, including the Last Glacial Maximum (LGM) and Heinrich Events 1 and 2 (H2, H3), Bølling-Allerød (B/A) and Younger Dryas (YD). Previously published data on relative sea level from 20 cal ka BP through to present (upper, symbols) along with GISP2 ice $\partial^{18}O$ (a proxy for temperature over Greenland; lower thin black line) are plotted for comparison.

Source of published data: ***Tahiti:*** *Bard et al, 1996; Bard et al, 2010;* ***Huon Peninsula:*** *Chappell and Polach 1991; Edwards, Beck et al. 1993; Yokoyama et al., 2001a,b;* ***Huon drill core:*** *Cutler, Edwards et al. 2003;* ***Sunda shelf:*** *Hanebuth, Stattegger et al. 2000;* ***Barbados:*** *Fairbanks 1989; Bard, Hamelin et al. 1990);* ***GISP2:*** *Stuiver and Grootes 2000.*

In conclusion, the preliminary assessment of cores acquired during Expedition 325 indicates:

1. Shelf-edge features identified on the multibeam bathymetry datasets are definitely fossil coral reef, and therefore constructional features.
2. Nine distinct lithologies have been identified - modern seafloor sediment, coralgal boundstone, coralgal/microbialite boundstone, microbialite boundstone, packstone/grainstone, rudstone, lime sand, lime pebbles and mud.
3. There are series of distinct lithological successions - drowned tops, basal sediments and packstone, that appear to grow on older more complicated Pleistocene sequences - all of which are different spatially and temporally.
4. The upper coralgal-microbialite reef sequence is well developed and thick (up to 20-30m in some holes).
5. *Acropora*-dominated assemblages indicate shallow reef settings with basal section abundant microbialites, giving an excellent sea-level and reef response record.
6. Preliminary age data confirm that the cores acquired span the LGM to post-glacial, with the lower sequence encompassing back to MIS3, with indications of episodic reef growth backstepping up the shelf with rapid drowning events.
7. Benthic foraminifer assemblages, with assessments of abundance and preservation, help provide an indication of water depths (relative sea level) at the time of deposition.
8. For the first time, microbiology samples taken immediately after core recovery will be compared to samples taken from immediately adjacent depths after shipping and storage of the cores at a steady 4°C to assess the impact of shipping and storage of cores on the microbial community.

Detailed analysis is ongoing, with publication of the Expedition Report due in July 2011, and key papers covering sea-level rise, paleoclimate and microbiology expected in the second half of the year. However, the preliminary results give an exciting indication of the importance of this expedition to addressing many of the outstanding questions in the global climate and sea-level histories of the LGM and post-glacial period.

Carol Cotterill, ESO Staff Scientist, Jody Webster and Yusuke Yokoyama, Co-Chief Scientists and Expedition 325 Scientists.

GBREC Expedition 325: http://www.eso.ecord.org/expeditions/325/325.php

Hans Wallrabe-Adams

PANGAEA® a Data Library for IODP

Data management in scientific drilling programs such as the Integrated Ocean Drilling Program (IODP) performs two functions: firstly, the capture of drilling and scientific data during an expedition and secondly, the long-term storage and dissemination of these data. The capture of data for IODP mission-specific platform (MSP) expeditions is separated into two phases. Coring, curation, logging, and basic scientific data need to be collected at the drill site during the offshore phase. Additional data are then captured during the post-drilling phase after the cores have been transported to the Bremen Core Repository (BCR) *(Figure 1)*. This latter phase - the Onshore Science Party - captures detailed measurements, descriptions, images and log data for the split cores. On completion of this second phase, the data are transferred to the long-term information system

PANGAEA® aims at collecting, scrutinising, and disseminating data related to global change in the fields of environmental oceanography, marine geology, paleoceanography and marine biology. PANGAEA® is member of the ICSU World Data System. PANGAEA® is operated as a permanent facility by the Centre for Marine Environmental Sciences at the Bremen University (MARUM) and the Alfred Wegener Institute for Polar and Marine Research (AWI) in Bremerhaven, Germany.

Figure 1: Examination of a core of the Great Barrier Reef Environmental Changes expedition (H.J. Wallrabe-Adams © ECORD/IODP)

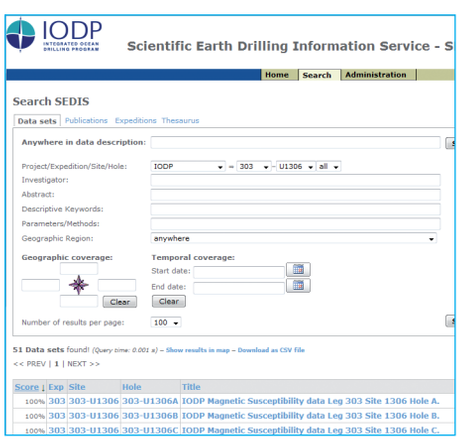

Figure 2: Screen shot of the SEDIS portal component 'Data Search'.

PANGAEA® within the framework of IODP

Within the framework of IODP, PANGAEA® is an active partner in terms of different levels and tasks. During the preparation for the current drilling program, PANGAEA® was a participant in the European JEODI project (Joint European Ocean Drilling Initiative), which defined the European part of IODP. As a result of JEODI, the European Consortium of Research Drilling (ECORD) was established. One component of ECORD - the ECORD Science Operator (ESO) - organises and operates mission-specific platform (MSP) expeditions on behalf of IODP. PANGAEA® is an integral part of ESO and is responsible for the long-term archiving of expedition as well as of post-cruise data. At the end of the moratorium of each expedition all data are made publicly available through PANGAEA's integrated search engine, via a specific MSP Data Portal, and via an IODP-wide portal, the Scientific Earth Drilling Information Service (SEDIS).

Besides being the ESO long-term data archiving facility, PANGAEA® is the lead developer of SEDIS, which provides access to the data of the three Implementing Organizations (IOs): ESO, the United States (IODP-USIO) and Japan (CDEX). SEDIS was planned to be implemented within three phases, the first two of which are already completed. The third phase is now in progress in cooperation with INSTAAR (Inst. of Arctic & Alpine Research, Univ. of Colorado, Boulder). The final SEDIS version will include an advanced data search and download functionality. Visualisation, analysis tools (*e.g.,* GIS, GeoMapApp, CoreWall), and mapping tools (Internet Mapping Service, GoogleTM Earth) will be implemented. Additionally a data submission application is planned.

The current SEDIS portal comprises information about data sets, publications and expeditions supported by a search thesaurus *(Figure 2)*. SEDIS is designed to integrate distributed scientific data via metadata by using international standards for metadata and data exchange and transfer, and uses open-source components. SEDIS is therefore able to easily include other IODP-relevant scientific drilling data from terrestrial or lake drilling if these data sources support the proper exchange standards.

IODP Post-cruise data

Another PANGAEA® project on behalf of IODP-MI was to harvest and archive published post-cruise data produced either on samples derived from expeditions, or on samples requested on archived cores by post-cruise researchers. To date there is no mechanism within IODP to systematically search, collect and archive these data. The project comprises:

- identifying all current and legacy post-cruise publications related to the legacy programs Deep Sea Drilling Program (DSDP), the Ocean Drilling Program (ODP) or IODP from geoscience journals,
- identifying data sets that have not been captured in IODP databases,
- capturing metadata for and data from these publications and
- publishing these data in a publicly available archives accessible to the IODP SEDIS system (*i.e.,* in PANGAEA®).

Since the beginning of this project (2007) about 35 journals have been processed with more than 1300 DSDP/ODP/IODP publications. In approximately 700 publications more than 3000 data sets were found in tables/appendices/supplements and were made available in a machine readable form through PANGAEA® and SEDIS.

Hans-Joachim Wallrabe-Adams, PANGAEA® *and ESO Data Manager - hwallrabe@pangaea.de*

PANGAEA®: http://www.pangaea.de


Albert Gerdes


Alan Stevenson

ECORD Outreach and Education Activities


Patricia Maruéjol


Jenny Lezius

News from the Outreach team

The ECORD Outreach team has been busy supporting IODP activities at the AGU 2010 Fall meeting, producing new ECORD publications and video, opening education calls and distributing the ECORD Calendar for 2011!

The team met in Paris on February 14-15, 2010, to plan and organise the ECORD outreach activities that will take place during the spring and summer of 2011.

AGU 2010, San Francisco, USA

Together with their Japanese colleagues ECORD staff were engaged in manning the IODP booth at AGU 2010 in San Francisco. The booth *(photo)* was set up opposite the Consortium for Ocean Leadership booth and both stands were well-located in the exhibition hall to present a good focal point of recent marine research. During the first two days the IODP booth had a constant and intense flow of visitors, interested both in the program and the brochures and newsletters on display. More than 130 new subscriptions for the journal *Scientific Drilling* were registered. The booth included a large monitor to present, amongst others, videos from the INVEST conference and from *Chikyu* expeditions. On the final day of the conference, a science writer from Nature magazine visited the booth to talk with Benoît Ildefonse, Heiko Pälike, and American program scientists.

More than 350 scientists, science managers etc. participated in the Townhall Meeting, which took place in the Hilton Hotel on December 14 and was moderated by Kiyoshi Suyehiro, IODP-MI President and CEO. Eight talks were given and well received. The following dinner reception took place in a relaxed atmosphere that helped to promote long and lively conversations.

Upcoming Events *(see table page 13)*.

Several booths will be organised at international conferences in the course of spring and summer 2011. ECORD will co-ordinate the joint IODP-ICDP activities at EGU 2011 from April 3 to 8 in Vienna, Austria. To distribute the most recent information of the two research programs, there will be an exhibition booth and a Townhall meeting held on Tuesday April 5, in connection with the joint IODP-ICDP scientific session *(see News from ESSAC, page 9)*. Two media conferences are scheduled to inform the press about the future of the Integrated Ocean Drilling Program and the results of the Great Barrier Reef Environmental Changes (GBREC) Expedition, also on April 5.

During the summer, ECORD will also have the opportunity to present IODP at two international conferences: at the Goldschmidt Conference 2011, which will gather geochemists from all over the world in Prague, from August 15 to 19, and at the 3P Arctic Conference where industry geoscientists working in the Arctic region will meet in Halifax, Canada, from August 31 to September 2.

We will also help IODP-MI, and CDEX and IODP-USIO to co-ordinate IODP booths at the Offshore Technology Conference in Houston, JPGU in Chiba-City, Tokyo and AOGS in Tapei, Taiwan by providing them with ECORD publications and information.

ECORD Materials and Resources

A new brochure entitled "Scientific Drilling in the Arctic Ocean" was set up by Dayton Dove (UK IODP) to stimulate industry interests in scientific drilling in the Arctic and to introduce ECORD's experience in this area. This document will be distributed at the 3P Arctic Conference *(see page 13)*.

The ECORD folder was updated with revised New Jersey - Exp. 313 and GBREC - Exp. 325 flyers. Electronic copies of these documents are available at *http://www.ecord.org/pub/brochure.html*.

Since last summer, ECORD teachers and scientists have made extensive use of the five IODP core replicas *(see pages 7 and 13)*.

A new video presenting mission-specific platform expeditions as part of IODP has been produced in time for EGU 2010. The video features all four MSP expeditions to date, and also includes interviews with ECORD and ESO staff, as well as some of the Co-chief scientists. The aim is to explain the role of MSP expeditions in the program and the benefit they bring to the program science by providing access to areas of the ocean that can not be reached by the *JOIDES Resolution* and *Chikyu*.

ECORD Education

ECORD has opened a call to host an ECORD Summer School for students and young scientists in summer 2012. Thematic topics of the Summer School should cover the research areas of the Initial Science Plan of IODP:

- The deep biosphere and the subseafloor ocean,
- Environmental changes, processes and effects,
- Solid earth cycles and geodynamics.

The deadline is May 6, 2011. Further information is available at *http://www.essac.ecord.org/flyer/ESSAC_Call_host_SummerSchool2012.pdf*.

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IODP core replicas help to teach science

During the last six months, the IODP core replicas were loaned to several schools in Europe to support teaching geology to a wide range of students. These included elementary/middle grades in Aveiro, Portugal, the high school in Valbonne, France, and the ECORD Summer School in Urbino, Italy.

Ciencia Viva - Fabrica, Aveiro, Portugal

The Ciencia Viva centre, known as "Fabrica", works in collaboration with the Geoscience Department and the CESAM associated laboratory of the University of Aveiro to promote an outreach programme on marine geology for school classes. On October 13 and 14, 2010, about 300 students (10 to 16 year old) from the Aveiro area visited the centre and learnt of the devastating impact of a meteorite that hit the Earth 65 Ma ago.

Antje Voelker, ESSAC Delegate

Ocean Exploration for the classroom

Teaching geosciences in French high school grades (15 to 18 year old) represents 30% of the natural sciences curriculum. Many practical activities are therefore devoted to topics that require the most concrete supporting materials possible. Replicas of drilling cores from expeditions of the *JOIDES Resolution* drillship therefore help to complete the collections of geological tools used by the teachers. Ten classes - involving about 300 students - at the Lycée International de Valbonne Sophia Antipolis have recently had the opportunity to study such cores replicas.

The Cretaceous-Tertiary (K/T) boundary crisis is an obvious example to study in high school programmes as the associated biological crises are a landmark in the history of the Earth.

Initially, the students explore the geological features of the Cretaceous-Tertiary, such as the visible outcrops on continental areas (*e.g.,* outcrops at Bidart in the Basque Country or Caravaca in Spain). They then have to establish the evidence for the relatively sudden event around 65 Ma as marked by indicators such as the evolution of carbonates, the $^{13}C/^{12}C$ ratio or the unexpected presence of iridium in sediments. These elements allow hypotheses to be formulated that will require further investigation.

Final grade students examine the K/T core replica during classroom activities at the Lycée International de Valbonne (photo Alex Bianchi)

At this stage, the students have the opportunity to look at a core replica that includes evidence of the K/T event, a core collected during the oceanographic expedition ODP Leg 171B. The students have to locate the expedition on ODP/IODP maps, understand how the cores were collected from the seafloor (based on a video taken on the *JOIDES Resolution*), and then have to draw a correctly oriented diagram showing the different sections of the core. Once these various items of information have been gathered, the students then related the core to the hypothesis of a meteorite impact. This stage includes the comparison of fossils present before and after the impact zone (microscopic examination of microfossils such as *Globotruncana/Globigerina*). An experimental protocol to evaluate the carbonate content in the core was established (looking for samples of mud more-or-less rich in carbonates). We then enquired about the specific nature of glassy spherules found in the layer of sedimentary material (evidence of glass from the impact/drops of old molten rock). Evidence of a 65 Ma old impact were then confirmed by the core. If we also consider the large areas of the continents and oceans where this evidence is found, we can also conclude that this was a major event (resulting in the extinction of a major part of the biosphere). We eventually located the probable area of impact in the Yucatan Peninsula.

The students have also studied the oceanic lithosphere in high school. Again, as well as the seismology data (seismic velocity), and images from diving submersibles (pillow lavas), our knowledge of the ocean crust can be greatly facilitated by the examination of a drill core.

Using the seismology tools, students identified a major discontinuity (Moho) between the lower crust and the upper mantle. We also discovered from some oceanographic missions (images/videos of the *Nautile* diving expeditions) that the seafloor pillow lavas were covered with unconsolidated sediments. These observations can be added to using data from the VEMA mission, in which researchers have collected rock samples of basalt, gabbro and peridotite. The students were able to examine the relationship between the basalts and gabbros, and close study of the core replica (including the basalt-gabbro transition) allowed us to get a better understanding of crustal rocks with evidence of a vein complex, and the sequence of rocks in the oceanic crust.

Finally the students identified rock samples using a polarising microscope. They described the texture, from hemicrystalline to holocrystalline, while considering how the igneous rock was emplaced, and identify the main mineral species (to study the link between the mineralogy and between rocks of the crust and upper mantle). Understanding the nature of the seafloor is made much easier by studying the IODP core replicas.

Jean-Luc Bérenguer, Science Teacher at Lycée International de Valbonne, Sophia-Antipolis, France

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Catherine Mével

From the ECORD Managing Agency Director

The end of the current phase of scientific ocean drilling is now approaching. What will be completed during these last thirty months will be more or less settled this summer. We already know that, after two more expeditions in the Eastern Pacific, to initiate the Costa Rica Seismogenic Project (CRISP) and to deepen the hole into the ocean crust at the "SuperFast" site, the *JOIDES Resolution* will enter the Atlantic next fall for six months. She will then return to the North Eastern Pacific and move north to the Alaska margin. It is planned that she will cross the Pacific to end her voyage in the Indian Ocean. On the way, she will have implemented a number of ECORD-led projects and addressed new science topics such as microbiology at the Mid-Atlantic ridge, geohazards associated with landslides on volcano flanks in the Lesser Antilles and relations between climate and tectonics on the Alaskan margin and (to be confirmed) the Bengal Fan.

The *Chikyu* is about to start drilling into the Shimokita Coal Bed, off Japan. This will be the first implementation of a Complementary Project Proposal (CPP), *i.e.,* a project co-funded by other funding sources, in this case MEXT (Japan). In these days of tight funding, this new scheme might become more frequent in the next phase to allow more projects to be implemented. After that, the *Chikyu* will be contracted to industry for six months. This will result in a delay in the continuation of the NanTroSEIZE project until 2012, but will bring in new money and secure funds for scientific drilling within IODP. The plan is to reach the seismogenic zone in 2013.

Uncertainty remains regarding the implementation of the last mission-specific platform expedition. There are still a number of excellent proposals on the table and, following the last ranking of SPC in March 2011, the ECORD Science Operator will work with the Operations Task Force to evaluate the best option.

To be ready to implement the first expeditions in FY14, the International Working Group Plus (IWG+) has decided to start setting up the new Science Advisory Structure (SAS) in the fall of 2011. The new SAS structure *(see Message from the Chair, page 2)* is about to be finalised and the panels will be appointed progressively, while the current SAS is being phased out. At the end of the current program, given the available ship time, it is inevitable that a number of excellent proposals will not have been implemented. Not all of them are at the same stage of scientific maturity and technical feasibility. At its March meeting, based on the advice of the SSEP, SPC will decide which proposals should be forwarded to the new SAS. All proponents will be individually informed as to the status of their proposal. But most importantly, the first call for proposals for the new program will be launched later this spring, with a deadline on **October 1, 2011**. It is now the task of the community to demonstrate its need for ocean drilling and its creativity by submitting exciting proposals in line with the new science plan.

Catherine Mével, ECORD Managing Agency Director
http://www.ecord.org/ema.html

Continued from page 6

ECORD Summer Schools 2011

The 2011 ECORD Summer School on "Subseafloor Fluid Flow and Gas Hydrates" will be held from September 12-23, 2011 at the Center for Marine Environmental Sciences (MARUM), University of Bremen, Germany. The focus is on scientific lectures (including some topic-related lab exercises) and discussions. "The Virtual Ship" exercise will introduce the participants to life as a shipboard scientist, describing shipboard scientific methods and work flow during a drilling cruise investigating fluid flow and gas hydrates. The deadline for registration is April 15, 2011. Further information is available at *http://www.glomar.uni-bremen.de/ECORD_Summer_School.html.*

The Urbino Summer School in Paleoclimatology will be held from July 13 until August 2, 2011. The focus is on past climate dynamics with special emphasis on the analysis of long-term carbon cycling and its implications in the understanding of present and future climates. The deadline for early-registration was March 15, 2011. Further information is available at *http://www.urbinossp.it/.*

ECORD Scholarships 2011

A call for ECORD Scholarships to attend an ECORD Summer School 2011 was open until March 25, 2011, and posted at *http://www.essac.ecord.org/flyer/Scholarships_flyer_2011.pdf.*
In 2010, 15 young scientists were selected from 47 applicants from 12 ECORD and non-ECORD countries to receive an ECORD Scholarship.

ECORD Research Grants 2011

A call for ECORD Research Grants 2011 was open until March 25, 2011 and posted at *http://www.essac.ecord.org/index.php?mod=education&page=grants*
In 2010, five outstanding graduate students received an ECORD Research Grant to conduct research related to the Integrated Ocean Drilling Program.

ECORD Outreach team: Patricia Maruéjol, EMA, Alan Stevenson and Albert Gerdes, ESO and Jenny Lezius, ESSAC
http://www.ecord.org/pi/promo.html

Rüdiger Stein

News from ECORD Science Support & Advisory Committee

Jenny Lezius

During the last months, we have issued calls for two **expeditions** with *Chikyu*: Expedition **337** (Shimokita Coal-Bed Biosphere) and Expedition **338** (NanTroSEIZE Stage 3, Plate Boundary Deep Riser -2), and calls for three **expeditions** with *JOIDES Resolution*: Expedition **339** (Mediterranean Outflow), Expedition **340** (Lesser Antilles Volcanism and Landslides) and Expedition **341** (Alaska Tectonics, Climate and Sedimentation). ESSAC has completed the selection of ECORD scientists for expeditions 337 and 339, and the staffing is still in process. The *Chikyu* operation schedule has been changed due to non-IODP work for *Chikyu* in 2011; thus CDEX officially announced the postponement of IODP Expedition 338 until summer 2012. Calls for applications to sail on expeditions 340 and 341 are open until May 1, 2011. More information about the scientific objectives, precise dates, and official notification of all these expeditions can be found in the table below and on the IODP web site at *http://www.iodp.org/expeditions/*.

The 2010/2012 series of the **ECORD Distinguished Lecturer Programme** started with the lecturers **Kai-Uwe Hinrichs** (MARUM, University of Bremen, Germany, "Benthic archaea - the unseen majority with importance to the global carbon cycle revealed by IODP drilling"), **Dominique Weis** (PCIGR, University of British Columbia, Canada, "What do we know about mantle plumes and what more can we learn by IODP drilling?"), and **Helmut Weissert** (ETH Zurich, Switzerland, "Carbon cycle, oceans and climate in the Cretaceous: lessons from Ocean Drilling (DSDP to IODP) and from records on continents"). ECORD still invites colleagues, university or non-profit organisations in ALL European countries (and Canada) to apply via electronical mail to essac.office@awi.de **to host a lecture**. Applications from non-traditional IODP and ECORD audiences within the European Community are especially welcome.

In 2011, two **Summer Schools** are funded by ECORD:
• ECORD Summer School on Subseafloor Fluid Flow and Gas Hydrates, from September 12 to 23, Bremen, Germany
• The Urbino Summer School in Paleoclimatology, from July 13 to August 2, Urbino, Italy *(see page 8)*.

ECORD provides scholarships to allow young scientists to attend one of these two ECORD Summer Schools 2011. The call for **ECORD Scholarships** was open until March 25, 2011. A call to host an **ECORD Summer School 2012** is open until May 3, 2011 *(see page 8)*.

ECORD sponsors merit-based awards for outstanding graduate students to conduct research related to the Integrated Ocean Drilling Program. The call for **ECORD Research Grants** was open until March 25, 2011 *(see page 8)*.

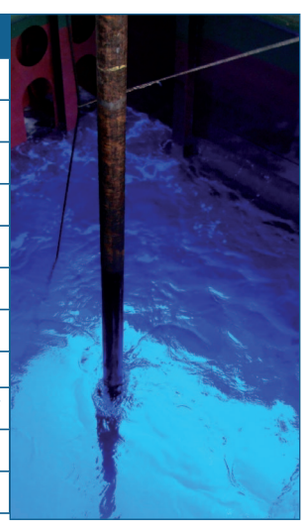
During the EGU 2011 conference in Vienna, ECORD and ICDP will organise a special Interdivision Session dealing with major achievements and perspectives in ocean and continental drilling. Details of the session (oral presentations and posters) including deadlines are available on *http://meetingorganizer.copernicus.org/EGU2011/session/6436*.

All links and further information are provided on our website at *http://www.essac.ecord.org/*.

Concerning the ECORD contribution to IODP expeditions and their outcome, some **statistics** were put together by the ESSAC Office based on input from the national IODP offices and ESSAC delegates. Since the beginning of IODP until the end of 2011/beginning of 2012, *i.e.,* starting with IODP Expedition 301 (Juan de Fuca Hydrogeology) and ending with

IODP Expedition Drilling Schedule

Expedition	Exp #	Drillship	Dates	Co-chief Scientists
Louisville Seamount Trail	330	*JR*	Dec 13, 2010 - Feb 12, 2011	A. Koppers - T. Yamazaki
Deep Hot Biosphere	331	*Chikyu*	Sept 1 - Oct 3, 2010	K. Takai - M. Mottl
NanTroSEIZE-2 Riserless Observatory	332	*Chikyu*	Oct 25 - Dec 12, 2010	A. Kopf - E. Araki
NanTroSEIZE-2 Subduction Inputs 2 & Heat Flow	333	*Chikyu*	Dec 13, 2010 - Jan 10, 2011	T. Kanamatsu - P. Henry
Costa Rica Seismogenesis Project (CRISP)	334	*JR*	March 15 - April 13, 2011	P. Vannucchi - K. Ujiie
Superfast Spreading Rate Crust IV	334	*JR*	April 13 - June 3, 2011	D. Teagle - B. Ildefonse
Mid-Atlantic Ridge Microbiology	336	*JR*	Sept 16 - Nov 17, 2011	K. Edwards - W. Bach
Shimokita Coal-Bed Biosphere	337	*Chikyu*	*Postponed*	K. U. Hinrichs - F. Inagaki
Mediterranean Outflow	339	*JR*	Nov 19, 2011 - Jan 17, 2012	F. Hernandez-Molina - D. Stow
Lesser Antilles Volcanism and Landslides	340	*JR*	Jan 17 - March 18, 2012	A. Le Friant - O. Ishizuka
Alaska Tectonics Climate and Sedimentation	341	*JR*	July 15 - Sept 14, 2012	tba



JR: JOIDES Resolution. Sailing dates may change slightly. From http://www.iodp.org/expeditions. ECORD Co-chief scientists are marked in blue.
The drillstring in the moonpool of the Greatship Maya, GBREC Expedition 325 (photo D. Smith © ECORD/IODP).

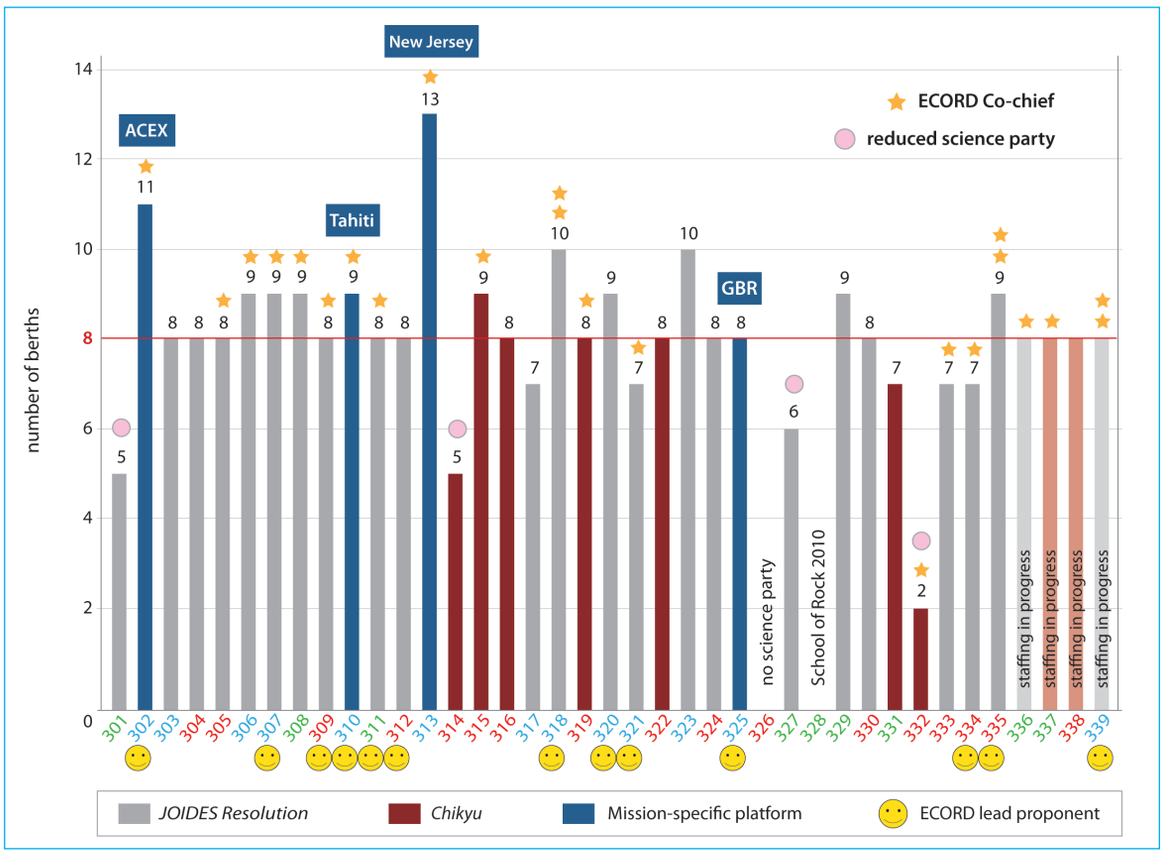


Figure 1: ECORD participation in IODP Expeditions from Expedition 301 in 2004 until Expedition 339 that will take place late 2011 - http://www.iodp.org/expeditions/

IODP Expedition 339 (Mediterranean Outflow), 39 expeditions were carried out or scheduled *(Figure 1)*. The scientific objectives of these expeditions are related to the three main themes of the Initial Science Plan, *i.e.,* Deep Biosphere and Subseafloor Ocean (9 expedition numbers highlighted in green in *Figure 1*), Processes and Effects of Environmental Change (13 expedition numbers, highlighted in light blue in *Figure 1*), and Solid Earth Cycles and Geodynamics (17 expedition numbers, 9 of which were devoted to the NanTroSEIZE Experiment, highlighted in red in *Figure 1*). Thirteen of the 39 expeditions were based on proposals led by ECORD scientists. Following the Memorandum of Understanding signed by NSF, MEXT and EMA/ECORD, eight ECORD scientists may sail onboard a "normal" IODP expedition (there might be exceptions for expeditions with a reduced Science Party), *i.e.,* there is the same number of participants from USA (8), Japan (8), and ECORD countries (8). As obvious from *Figure 1*, there are several IODP expeditions with more than 8 ECORD participants, with the maximum numbers of ECORD participants involved in the MSP expeditions 302 (ACEX) and 313 (New Jersey). In total, 24 (one third) of the 74 Co-chief scientists are from ECORD countries.

Following the expeditions, sample requests have to be submitted to the IODP core repositories and have to be approved to obtain sediment material for post-cruise research. ECORD scientists have also played a leading role in this area. Between 2003 and 2010, more than 1400 sample requests, about 48% of the total number, were sent to the core repositories *(Figure 2a)*. The data

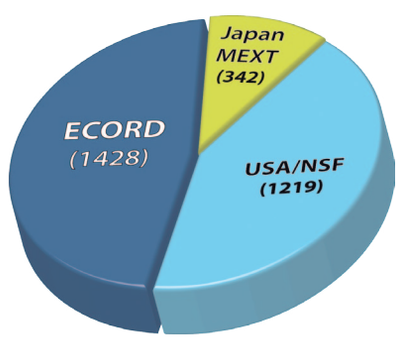


Figure 2a: Proportions of the total sample requests received by the IODP Core Repositories (2003-2010)

obtained through multidisciplinary studies of thousands of samples were published in a remarkable number of more than 3100 publications with about 2650 in international peer-reviewed journals (including about 100 in *Nature* and *Science*) and about 470 IODP proceedings articles *(Figure 2b)*. In summary, ECORD scientists have been and are still strongly involved in the planning and implementation of expeditions as well as in post-cruise research on IODP sediments and publications of IODP data throughout the current phase of IODP.

This is the last ESSAC News contribution we put together for the ECORD Newsletter, and the next ESSAC Meeting to be held on May 11-13, 2011 in Leuven, Belgium, will be the

last organised by the ESSAC Office in Bremerhaven before its rotation to Granada, Spain, in October this year. "Time to say good-bye and thank you very much". Thus, we - Jenny as Science Co-ordinator and myself as ESSAC Chair - would like to take the opportunity to thank all the ESSAC delegates, EMA, ESO, the ECORD Council and the other IODP bodies for their active cooperation during the last 18 months. Furthermore, I myself would like to point out that running the office in Bremerhaven successfully could not have been achieved without the dedication and hard work of our Science Co-ordinator - thanks a lot, Jenny! We hope that the constructive and efficient cooperation between all of us will also continue in the future, *i.e.,* during the two final years of the running phase of IODP.
Best wishes and good luck to Carlota Escutia-Dotti who will take over as the new ESSAC Chair running the office in Granada!

Rüdiger (Rudy) Stein, ESSAC Chair and Jeannette (Jenny) Lezius, ESSAC Science Co-ordinator - essac.office@awi.de

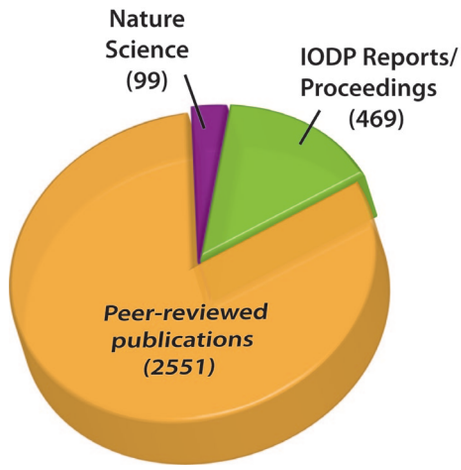


Figure 2b: Distribution of IODP data published by ECORD scientists (2003-2010)

Reports of Magellan Workshop Series

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

Convenors: Achim Kopf - akopf@uni-bremen.de and Pierre Henry - henry@cerege.fr

Many geodynamic processes are associated with seismicity, slope instability or both, and much progress has been made recently to unravel the mechanisms governing them. Historical records show that southern Europe is particularly vulnerable to geohazards, mostly because of its complex tectonic setting in the collision zone between Africa and Eurasia. In prehistoric times, hazards manifested themselves by destruction of world wonders (*e.g.,* Colossus of Rhodes 224BC, Pharos Lighthouse 365AD) or places such as Troy, Armageddon, to name just a few. At present, the Mediterranean Sea comprises approximately 46000 km of coastline with 160 million people living along it (plus an additional 135 million tourists each year, *i.e.,* 30% of the global tourism). Geohazards pose a considerable risk to society in the circum- Mediterranean, and large cities (Istanbul, Athens, Nice, etc.) plus stretches where the economical loss is potentially huge (*e.g.*, French Riviera, etc.). As a consequence, the understanding of episodic and equally highly infrequent nature of natural hazards has to be improved. The only means to shed light on the processes governing earthquakes and landslides are time-series data to identify precursor phenomena to the events. They are particularly critical in the IODP and ICDP context, as is successfully shown in various projects.

The Magellan Workshop sponsored by the European Science Foundation and MARUM Research Centre, Bremen, was entitled "Real-time Amphibic Monitoring & Borehole Observatories (RAMBO)" and was held in Bremen, Germany, on October, 14-16, 2010. The workshop objectives were to explore the following fields of long-term monitoring and observatory approaches:

- Borehole coring, downhole measurements and geophysics as a component of observatory site survey (stress determination, characterisation of the earth beneath stations),
- Shallow borehole monitoring for parameters that cannot be accessed by surface monitoring (*e.g.,* piezometers [currently installed in Nice and Sea of Marmara]),
- Deep boreholes for *in situ* characterisation and monitoring of faults.

To maximise the benefit of such observatory data, an efficient network (including a real-time connection) is critical for using the resulting scientific data in early warning.
A total of 20 dedicated scientists participated at the workshop, from nine European countries and the USA. The expertise of the group spans over a wide scientific spectrum within geosciences. In addition, several of the participants have been (or are) leaders of scientific drilling expeditions, involved in IODP and ICDP proposals, and/or leaders or associates in ongoing EU projects.
About 50-60% of the meeting was devoted to presentations about IODP and ICDP projects, active and future drilling proposals related to the topic of the workshop, and the associated technology required to achieve the goals (stress measurements, observatories, ship status, new site-survey sources). The second half of the meeting was devoted to discussions in the entire group as well as in break-out working groups; in addition, writing groups formed to formulate observatory strategies in areas of marine or continental drilling. Also, one new IODP proposal spun off from these discussions.

The deliverables of the workshop, as stated in the application, are **(1)** a summary of the workshop results (to ESF and ESSAC/ECORD), **(2)** a new proposal to IODP in the Sea of Marmara, and **(3)** several smaller documents that sketch observatory strategies for *e.g.,* Nice Slope Landslide Drilling (IODP 748), Alpine Fault Continental Drilling, etc. The participants refrained from writing an EU proposal within FP7 because the current call for "Real-time earthquake mitigation" seems to focus on research other than drilling (*i.e.,* data acquisition and, foremost, risk assessment).

♦ The GOLD project - Drilling in the Western Mediterranean Sea, October 19-22,2010, Banyuls, France

Convenors: Marina Rabineau - marina.rabineau@univ-brest.fr, Daniel Aslanian - aslanian@ifremer.fr, Karine Alain - karine.alain@univ-brest.fr and Christian Gorini - christian.gorini@upmc.fr

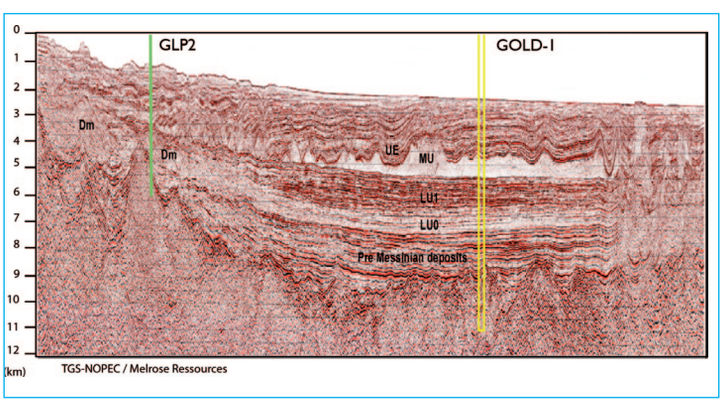
A workshop on the Gulf of Lyon Drilling (GOLD) project sponsored by the European Science Foundation (ESF), EDROME-Ifremer, INSU-CNRS and ActionMarges Consortium (Total-BRGM-Ifremer-IFP-INSU) was held on October 19-22, 2010 in the Observatoire Océanologique de Banyuls-sur-mer, France. Despite a general strike in France, 57 out of the 60 registered scientists from twelve countries, arrived in Banyuls to discuss the opportunity, challenges and scientific outcomes to drill deep holes in the Gulf of Lion. Scientists from five international oil companies were also present.

The GOLD IODP Project aims to recover the complete history of the Gulf of Lion (25-30 Ma) with a specific focus on Global Climate and Sea-Level Changes, Extreme Events, Margin Formation, Natural Resources and the Deep Biosphere using dedicated drilling platforms (MSP, *JOIDES Resolution* and *Chikyu*). It should be emphasised that no academic drilling dealing with pre-5 million years have been conducted in the Mediterranean Sea.

During the course of the three days a series of talks and posters focused on these topics were presented - *http://www.congres.upmc.fr/gold/*. Discussions were held in two sub-groups dealing with different drilling targets, the GOLD-1 project, located at the toe of the continental slope (2400 m water depth), which aims to drill below the thick salt layer using the *Chikyu* and the GOLD-2 project on the shelf (30-120 m water depth) that aims to drill the Pliocene-Pleistocene with a mission-specific platform. During the course of the discussion it appeared that the GOLD-1 project was more mature than the GOLD-2 project. The consensus was therefore to submit two separate and parallel proposals.

The location of the GOLD-1 drilling *(Figure above)* is the only place in the Gulf of Lion where the sedimentary column is fully complete (without major erosion and hiatuses) to enable the very high-resolution record of climate variations over 23 Ma within the 7.7 km of strata. The borehole would reach the substratum in a key area with a thin crust, the precise nature of which is still a problem. The site is also characterised by the presence of evaporites and a 1 km-thick halite-rich layer corresponding to the Messinian salinity crisis, an extreme event representing a unique crisis in Earth history. The drillsite is located sufficiently far from the shelf and slope to be saved from the Messinian outstanding erosional event, and also free from salt faulting and salt diapirs that deform deposits. The site is particularly appropriate to address the questions of dispersal/evolution and of life's tolerance to environmental extremes and habitability since extreme conditions, such as high P and T, salt layers and particular organic matter content all prevail at the GOLD site. A general discussion on the best drilling strategy to reach the overall goals was held on the second day. The possibility to create a public-private consortium was also discussed on the last day. A half-day fieldtrip was organised and conducted by G. Clauzon, J-P. Suc and J-L Rubino in the nearby Roussillon Basin.

Topic discussions enabled us to identify key unanswered questions of global interest to be adressed in the IODP proposal, as reported in the full report posted online *(www.esf.org/magellan)*.



Position of the proposed GOLD drilling on seismic profile, at 2400 m water depth. The objective is to sample 7.7 km of sediments including 1 km of salt (transparent layer MU on profile) plus the crust recording at least 23 Ma of high-resolution earth history.

All participants were willing to go ahead with the project. We also decided to keep the four main scientific themes because the objectives of the GOLD-1 drilling project are diverse but complementary and fully relevant to the science targeted in the new drilling program.

Some key points were decided to organise the future of the project:

1. The final objective is to submit an IODP proposal for the new IODP Program on October 1, 2011,

2. Marina Rabineau (ECORD, France), Junichiro Kuroda (Japan) and André Droxler (USA) were defined as international leaders for the project. A Steering Committee was also defined,

3. We decided to organise a new workshop in Tokyo, focused on the GOLD-1 ultra deep drilling, to better involve the Asian"community. We therefore submitted a proposal to IODP-MI to hold a new workshop in Tokyo in 2011.

Full reports of the Magellan workshops are posted on http://www.esf.org/magellan *(click on 'Science Meetings')*

Workshop and Conference Announcements

- ESF Magellan Workshop Series http://www.esf.org/magellan
  - Arctic Ocean drilling and the site survey challenge - *early November 2011*, Copenhagen, Denmark
- ECORD Distinguished Lecturer Programme
  http://www.essac.ecord.org/index.php?mod=education&page=dlp
- EGU 2011, April 3-8, 2011, Vienna, Austria http://meetings.copernicus.org/egu2011/
- JPGU 2011, May 22-27, 2011, Chiba-City, Japan http://www.jpgu.org/meeting_e/
- AOGS 2011, May 8-12, 2011, Taipei, Taiwan http://www.asiaoceania.org/aogs2011/public.asp?page=home.htm
- Goldschmidt 2011, Aug. 15-19, 2011, Prague, Czech Republic http://www.goldschmidt2011.org/
- 3P Arctic Conference, Aug. 31 - Sept. 2, 2011, Halifax, NS, Canada http://www.3parctic.com/
- CAREX Conference on Life in Extreme Environments, Oct. 18-20, 2011, Dublin, Ireland http://www.carex-eu.org/

Continued from page 7

"Hey, but that is exactly the same as we saw yesterday in the field!" - a note on the IODP core-replica.

We are in the middle of the first week of the ECORD co-sponsored Urbino Summer School in Paleoclimatology (USSP) course 2010. The comment comes from a student sitting in the second row. The power of the message contained in a single object is much stronger than a thousand words… Instructor Mark Leckie of the School of Rock, also engaged in USSP teaching, says "yeah, normally the curators don't let you take cores outside of the Core Repository, but for you they made an exception!". The students stare at the realistic cores as if they were original. Only after a while do they begin to realise that, of course, there is no way that cores containing *e.g.,* the Cretaceous/Paleogene boundary, or the Paleocene/Eocene Thermal Maximum (PETM)

USSP students working on core description (USSP 2010).

can ever leave the repository in somebody's suitcase. Yet, they can get a great, almost realistic impression of what these 'special of special cores' look like, thanks to ECORD.

We are looking at the plastic replica of a core drilled in the early Cenozoic sediments of the Walvis Ridge, Southern Atlantic Ocean, showing the Paleocene/Eocene Thermal Maximum (PETM) (ODP Leg 208, Hole 1262C - Core 5H, Section 4). The similarity with the Paleocene/Eocene succession visited one day before in the surroundings of Gubbio is immediate.

A set of three core replicas graciously provided by ECORD to USSP for core description lab.

The replica suddenly becomes the main object of discussion and an object of extraordinary instructional power. The core replicas provided by ECORD are used, mainly through the first week at USSP, to put into practice the theoretical background of lectures dealing with stratigraphy and sedimentology during the introductory part of the course. They are a formidable example of paleoclimatic sedimentary archive that the student can (well, actually they can't) touch with their hands. Having them at their disposal allows the USSP IODP 'Science Party' activity (the simulation of a mini-IODP cruise) to be completed.

Henk Brinkhuis and Simone Galeotti, Urbino Summer School in Paleoclimatology (USSP) - http://www.urbinossp.it/

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A Letter from Switzerland

Swiss involvement in IODP

Although Switzerland is a land-locked country without major oceanographic research institutions, Swiss scientists have been actively involved in ocean drilling programs since the early days of DSDP. In 1986, the Swiss National Science Foundation (SNSF) began funding Swiss participation in ODP, as a member of ECOD and, since 2003, in IODP, as a member of ECORD. The SNSF financial support has provided Swiss scientists the opportunity to directly participate in shipboard activities, as well as develop marine research programs utilising the material acquired through the international ocean drilling programs.

Gretta Bartoli, right, showing core logger image of laminated sediments to Co-Chief Scientist Christina Ravelo during IODP Exp. 323 Bering Sea Paleoceanography (IODP/TAMU).

Swiss marine research on global scale

Visualising the entire seafloor as a natural laboratory, Swiss scientists have employed the IODP research platforms to tackle a broad range of scientific questions. To date, eight scientists from Switzerland have participated as shipboard participants on seven different IODP expeditions, sailing on all IODP platforms including the *JOIDES Resolution* (Exp. 303, 305, 323, 324), the *Chikyu* (Exp. 316, 319A&B) and the MSP *DP Hunter* (Exp. 310). They have conducted research on the full range of topics as outlined in the Initial Science Plan. Ralf Schiebel (Exp. 303) and Gretta Bartoli (Exp. 323) have been involved in drilling programs to evaluate the processes affecting both extreme and rapid climate change in the North Atlantic and the Bering Sea, respectively. Adélie Delacour (Exp. 305) and Sandra Herrmann (Exp. 324) contributed to the study of processes pertaining to the Earth's interior with the drilling of the Oceanic Core Complex Formation in the Central Atlantic and the Shatsky Rise in the Central Pacific, respectively. Crisogono Vasconcelos (Exp. 310) probed the deep sub-seafloor biosphere during the MSP drilling of the Tahiti drowned coral reefs in the Western Pacific. Finally, France Girault (Exp. 316), Natalia Efimenko (Exp. 319A) and David Buchs (Exp. 319B) were members of the multi-expedition teams onboard the *Chikyu* aiming to study the seismogenic zone as part of the NanTroSEIZE program drilling the Nankai Trough, off Japan. More information on Swiss participation in IODP can be found at our website managed by Federica Tamburini *(http://www.swissiodp.ethz.ch/)*.

Swiss microbiologist Rolf Warthmann, left, with Crisogono Vasconcelos, hard at work on MSP DP Hunter during IODP Exp. 310 Tahiti Sea Level. (©ECORD/IODP).

Ocean drilling promotes young scientists

The careers of young Swiss-based scientists have benefited through direct shipboard participation in IODP expeditions, where they have gained invaluable experience, established important scientific networks and developed new scientific ideas. Four doctoral students (Delacour, Efimenko, Girault and Herrmann) have sailed on various IODP expeditions. Material recovered during drilling has formed a significant part of the doctoral theses of these individuals, but, more importantly, valuable research experience was gained during the doctoral studies. It is noteworthy that many of the Swiss participants in the earlier ODP and now IODP endeavours have graduated from young researcher positions to professorial positions in universities within Switzerland and abroad. These young scientists have all acknowledged the important role ocean drilling played in the advancement of their careers.

Swiss scientific proposal development

Through involvement in networks within the international marine geologic community, Swiss scientists have become active in writing new IODP drilling proposals. Gretchen Früh-Green is the lead proponent on IODP proposal 758-Full2: "Serpentinisation and life: Biogeochemical and tectono-magmatic processes in young mafic/ultramafic seafloor", currently under consideration. This proposal is envisioned as an MSP expedition using a seabed rock drill for the first time in the IODP program. Silvia Spezzaferri has been active in a multi-disciplinary European-wide team developing proposals for Atlantic Mound Drilling on the Morocco Margin. Michael Strasser, a recent recipient of an SNSF professorship for junior researchers, was the lead proponent on IODP Proposal 738-APL Nankai Trough Submarine Landslides History, which was drilled during IODP Exp. 333. The post-cruise science of Exp. 333 is one of the major objectives for Strasser's proposed research to be conducted at the ETH Zürich.

Swiss contribute to science advisory structure

The Swiss ocean drilling community has had representation in the IODP Science Advisory Structure (SAS) beginning with the formulation of the IODP Initial Science Plan, 2003-2013. Swiss scientists have held and continue to hold important panel positions as ECORD delegates within the SAS, allowing them to contribute to the development of the science within IODP. Helmut Weissert served on the Science Steering & Evaluation Panel (SSEP) (2003-2004) and Georges Gorin on the Science & Technology Panel (STP) (2007-2010) while Gretchen Früh-Green continues as a delegate to the Science Planning Committee (SPC) (2008-2011). SAS participation is an excellent way to transfer knowledge back to the Swiss community, as well as introducing an international community to the Swiss science scene through the hosting of SAS meetings. Indeed, deep-sea drilling remains an integral part of the Swiss Earth Science research programme.

Judith A. McKenzie (ESSAC Delegate) and Martina Kern-Lütschg (ECORD Council Delegate)

The SmartPlug and GeniusPlug: A versatile "mini-CORK" observatory for re-use in boreholes

Achim Kopf [1] and Earl Davis[2]

In order to study many natural geological processes in situ, long-term observatories are required. In scientific ocean drilling, such observatories generally require to hydraulically separate the borehole from the overlying ocean water body, and for this purpose, so-called CORKs (Circulation Obviation Retrofit Kits) were invented. The name refers to a standardised tophole assembly with re-entry cone from which casing strings are hung downhole. Those casings stabilise the hole and enable multiple instrument installations.

The majority of the ODP and IODP CORKs focus on sites with hydrological activity, and tap either into oceanic crust or accretionary complexes. The key objectives have included the monitoring of pore pressure and temperature plus the option for fluid sampling for geochemistry. The initial CORKs were deployed in 1991 on ODP Leg 139 on the Juan de Fuca spreading ridge (Davis et al., 1992). Since this initial deployment, CORKS have been deployed on seven additional ODP legs and six IODP expeditions at a sedimented mid-ocean ridge, the flanks of mid-ocean ridges and convergent margins. Among the large number of scientific papers having originated from those observatories and fluid studies, three articles are of particular interest to the general scientific community. One is a compilation of first-order scientific results spanning hydrogeological, physical and geochemical conclusions (Kastner et al., 2006). Another highlights the evolution of CORK design and physical sensors, methods of submersible operation, and an outlook for future work and funding pathways (Becker & Davis, 2005). The third focuses on fluid sampling capabilities and chemical sensors associated with CORK observatories during the past two decades (Wheat et al., 2011) and outlines a number of pitfalls in this field.

Given the complexity and cost of some CORK designs, there has recently been a trend to scale back the scope and focus on simpler instruments with fewer sensors and fewer levels of monitoring. Condensed to a bare minimum, the first-generation "mini-CORK", termed SmartPlug, was designed by ECORD scientists from Germany and Canada to record formation pressures and temperatures at the level of a casing screen that spans a major out-of sequence splay fault branching off the primary subduction thrust in the Nankai subduction zone accretionary prism. The data document ambient conditions, and provide proxies for strain and fluid flow related to tectonic and seismic activity. The 130-cm-long instrument hangs below a casing bridge-plug seal and includes two pressure sensors (resolution 10 ppb full-scale, i.e., ~ 0.7 Pa, equivalent to 0.07 mm of seawater head), one plumbed to the formation intersected by the casing screen below the seal, and the other to the section of the borehole above the seal to record ocean loading signals *(Figure 1)*. Temperature is recorded with a platinum thermometer and by a self-contained miniature temperature logger (MTL), resolving to approximately 0.5 mK. The second-generation "mini-CORK", termed GeniusPlug, consists of a SmartPlug to which an extension containing an osmo-sampler for fluid geochemistry (Jannasch et al., 2004) and a FLOCS (Flow-Through Osmo Colonization System (Orcutt et al., 2010) unit for microbiology are added at the bottom *(Figure 1)*.

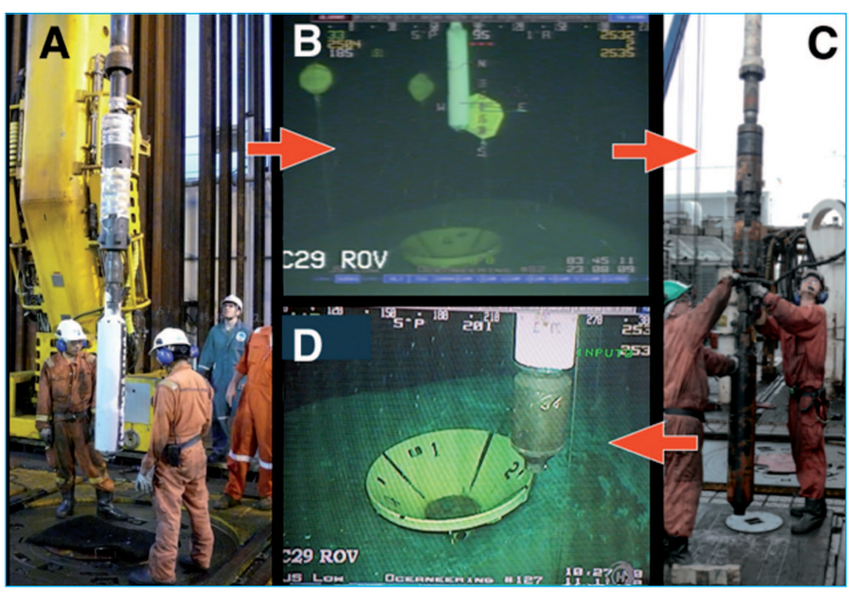

Figure 1: Cycle of operations at IODP hole C0010A: SmartPlug (white) and bridge plug with rubber seals (still wrapped) on the rigfloor (left), during deployment (top), and after recovery (right). The rusty unit got refurbished, extended by 30 cm to host the osmo-sampler and FLOCS chamber, and got deployed as GeniusPlug (bottom) (© JAMSTEC/IODP).

So far, one SmartPlug was deployed during IODP Expedition 319 in the framework of the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) project. The instrument was successfully monitoring P and T conditions in Hole C0010A, where a prominent fault zone cuts the accretionary prism. After 15 months, it was replaced with a GeniusPlug during Expedition 332 in November 2010 (Kopf et al., *in press*). An initial evaluation of the data post-cruise attests well-resolved records of P and T, the first being dominated by ocean tidal loading. The data also attest that the bridge plug effectively sealed the borehole because upon re-entry of the drill string, the upward-looking pressure sensor

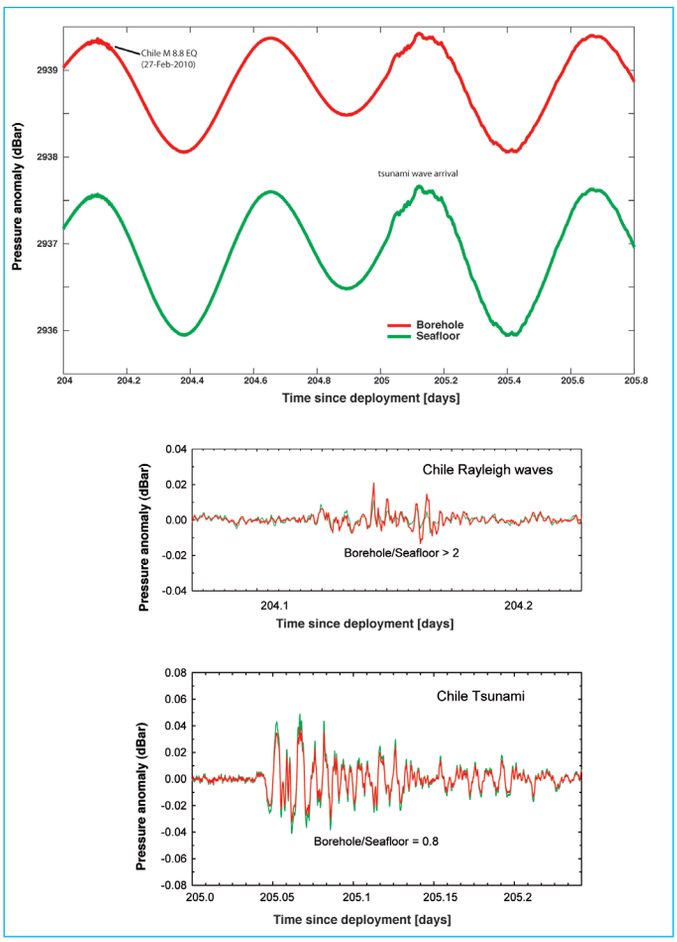

Figure 2: Data example from upward- (green) and downward-looking (red) pressure transducers during the M8.8 earthquake off Chile (25 February 2010). Note stronger dampening of the EQ-signal, but more enhanced signal of the tsunami waves traveling to Japan in the upward-looking sensor.

shows a strong fluctuation owing to displacement of borehole fluid, whereas the downward-looking pressure sensor encounters no such interference. Far-field earthquakes and tsunamis, such as the M8.8 Chile event in February 2010 *(Figure 2)*, are recorded together with smaller deformation events and microseismicity nearby (Kopf et al., *in press*). Detailed post-cruise analysis will reveal more information about both the instrument performance and geological processes governing the data.

The initial deployments have shown that the "mini-CORK" concept may be a feasible, low cost approach to time-series data and, in case of the GeniusPlug, samples. In particular the hardware cost is little when compared to full CORK installations such as those recently accomplished with *JOIDES Resolution* (*e.g.,* Juan de Fuca Ridge-Flank Hydrogeology Exp. 327) or *Chikyu* (*e.g.,* NanTroSEIZE Stage 2 - Riserless Observatory Exp. 332). Two additional "mini-CORK" instruments are available at present, each to be equipped with either the geochemistry/microbiology extension or just to be used to monitor physical parameters. The system is versatile and may be used on mechanical bridge plugs in any future or legacy hole with casing in the upper portion.

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Achim Kopf and Earl Davis for the team working on the mini-CORK observatories: Demian Saffer, Alison Labonte, Robert Meldrum, Heinrich Villinger, Sean Toczko, Sebastian Hammerschmidt, Rachel Lauer, Martin Heesemann, Robert MacDonald, Geoff Wheat, Hans Jannasch, Katrina Edwards, Eiichiro Araki. We acknowledge that the majority of the funding for the SmartPlug and GeniusPlug instruments originated from the German Science Foundation (grant DFG KO2108/8-1 to Kopf). We also thank CDEX for having supported this approach, purchased the retrievable bridge plugs and leased the running tool during IODP NanTroSEIZE expeditions.

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IODP Expedition 310 "Tahiti Sea Level" An open window on last deglaciation events

Gilbert Camoin[1] and Yasufumi Iryu[2]

The IODP Expedition 310 "Tahiti Sea Level" (Camoin et al., 2007a,b), the first IODP Expedition to drill recent reefs, has provided an unparalleled reef record of the last and penultimate deglaciations (more than 600 m of cores with a recovery higher than 90%, Inwood et al., 2008) and brought a wealth of new information in various scientific fields.

The overall objectives of the IODP Expedition 310 Tahiti Sea Level were:

- to constrain the history of postglacial sea-level rise,
- to use coral skeletal chemistry to reconstruct past climate variability in the southern Pacific, and
- to asses the reef response to sea-level and coeval environmental changes.

The reconstruction of the last deglacial sea-level rise and reef development relies mostly on the combination of accurate radiometric U-series and ^{14}C dating results of pristine *in situ* coral samples and the interpretation of coralgal assemblages that can be considered as reliable depth indicators. The reconstruction of climate variability is based on the analysis of subseasonally-resolved proxy records of past sea-surface temperature (SST) and sea-surface salinity (SSS) that are stored in the aragonite skeleton of annually-banded massive corals.

The drilled coral-reef systems around Tahiti are composed of two major chronological and lithological sequences (Camoin et al., 2007a,b), which are attributed to the last deglaciation (Deschamps et al., *in review*, Camoin et al., *in review*) and to older Pleistocene time windows (Thomas et al., 2009, Fujita et al., 2010, Iryu et al., 2010). At all drill sites, the last deglacial reef sequence is mostly composed of reef frameworks comprising three major components, corals, algae and microbialites, whose proportions vary largely throughout the last deglacial reef sequence (Seard et al., 2011, Camoin et al., *in review*, Abbey et al., 2011).

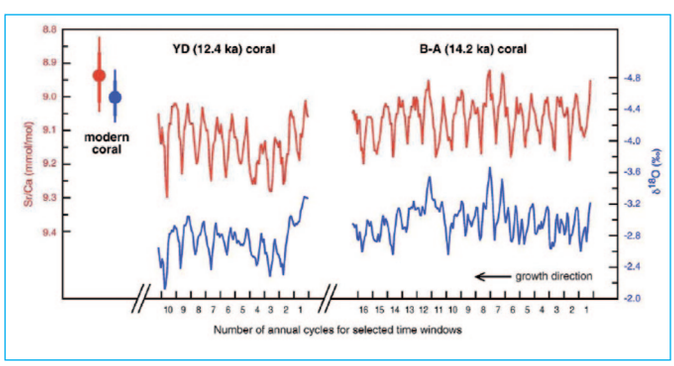
The major results regarding the Tahiti Expedition, covering the three general objectives listed above, have been recently published or are currently in press or in review. This short article summarises the major scientific achievements of the expedition.

Sea-level and reef development

Coral samples recovered from twenty-three cores drilled at fourteen different sites provided eighty reliable and stratigraphically consistent U-Th ages within a 10-16 ka time window (Deschamps et al., *in review*). Tahiti provides therefore an accurate coral-reef record that encompasses the MWP-1A and MWP-1B events reported at 14.08-13.61 and 11.4-11.1 ka respectively in the Barbados record (Peltier and Fairbanks, 2006). The overall reef sequence covering the last 16 kyr at Tahiti is comprised of successive units, which typify the backstepping of shallow-water coralgal assemblages through time: between 16.1 and 10 ka in offshore sites and between 13.8 and 6 ka below the modern barrier reef (Camoin et al., *in review*).

The last deglacial reef sequence is continuous at all drill sites, implying that reefs accreted mostly through aggradational processes and that there was no major break in reef development between 16 and 10 ka (Camoin et al., *in review*). This suggests that environmental conditions in Tahiti were optimal for reef development and that no significant long-term environmental changes occurred during that period. At each individual drill site the last deglacial reef sequence displays a general deepening-upward trend, indicating that reef growth gradually lagged behind sea-level rise.

The oldest period of the last deglacial reef record at Tahiti corresponds to the base of the reef sequence cored on the outer ridge of Tiarei, which indicates a relative sea level (RSL) of 105-115 m at around 16 ka, in good agreement with observations from the Sunda Shelf for the same period (Deschamps et al., *in review*).



Monthly resolved Sr/Ca (red) and ∂^{18}O (blue) records of two fossil Tahiti corals representing time windows at 12.4 ka and 14.2 ka, corresponding to the Younger Dryas (YD) and Bøllering-Allerod (B–A) periods of the Northern Hemisphere, respectively, compared to data derived from modern Tahiti coral Sr/Ca and ∂^{18}O records (From Asami et al., 2009).

The occurrence of an accelerated rise in sea level with an amplitude of 16±2 m between 14.65 and 14.3, corresponding to the MWP-1A, is typified by a major discontinuity in the upper envelope of the data points in the new Tahiti RSL record (Deschamps et al., *in review*), indicating therefore that the MWP-1A occurred at least 500 years earlier than previously proposed based on the Barbados record (Peltier and Fairbanks, 2006). This implies that the MWP-1A coincided with the inception of the Bølling warming period and cannot be considered anymore as a trigger of the Older Dryas cooling event that terminated the Bølling period, as proposed previously (Peltier and Fairbanks, 2006). In agreement with Clark et al.'s predictions (Clark et al., 2002), the sea-level reconstructions during the MWP-1A event at Tahiti seem to preclude a sole Laurentide Ice Sheet contribution to MWP-1A and indicate that a significant, if not the major part of, Antarctic contribution to the last deglaciation occurred during the MWP-1A spell (Deschamps et al., *in review*), as predicted through a Global Isostatic Adjustment (GIA) approach (Bassett et al., 2005).

The occurrence of a second period of accelerated rise in sea level (MWP-1B in Barbados, Fairbanks, 1989, Peltier and Fairbanks, 2006) is not recorded in the Tahiti record, therefore questioning the validity of this event.

Climate variability

Several time windows of the last deglaciation have been investigated to reconstruct the climate variability at a subseasonal resolution. It has been demonstrated that the annual mean SSTs were 2.6 - 3.1°C lower at 12.4ka, the Younger Dryas (YD) cold reversal, and 1.0 - 1.6°C lower at 14.2ka, the Bølling–Allerød warming (B-A), than the present, suggesting that a pronounced cooling occurred in the western to central tropical South Pacific during the YD event (Asami et al. 2009), in clear contrast with foraminiferal magnesium/calcium (Mg/Ca) records from the western and eastern equatorial Pacific (*see discussion* in Asami et al, 2009 and Inoue et al., 2010). A cooling trend from the B-A to YD was also reported by Inoue et al. (2010), who measured Mg/Ca, Ba/Ca, and U/Ca ratios and Cd contents of pristine *Porites* corals with ages from 15 to 9ka and used them as proxies for upwelling and SSTs. Reconstructed SSTs indicate that SSTs were ~2°C lower between 15.3 and 14.3ka and ~4°C lower at 12.6 relative to the present. However, the SST values are clustered and have more stable values between 15.3 and 14.3ka, which contrasts well with cooler and more scattered values between 12.6 and 9.8ka, in agreement with SST reconstructions of ~24.3°C (~3.2°C colder than modern) presented by DeLong et al. (2010) on another 9.5 ka old coral from the Tahiti record. The variation patterns of the four trace elements suggest that upwelling and/or entrainment of subsurface cooler water into mixed layers was enhanced around Tahiti and that the tropical South Pacific was characterised as La Niña-like conditions during this period. The coral records indicate that seasonal cycles in SST were approximately the same in the B-A and YD episodes (Asami et al. 2009) and at 14.7ka and 11ka (Hathorne et al. 2011) and approximately the same or greater at 9.5ka (Delong et al. 2010) compared to the present.

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