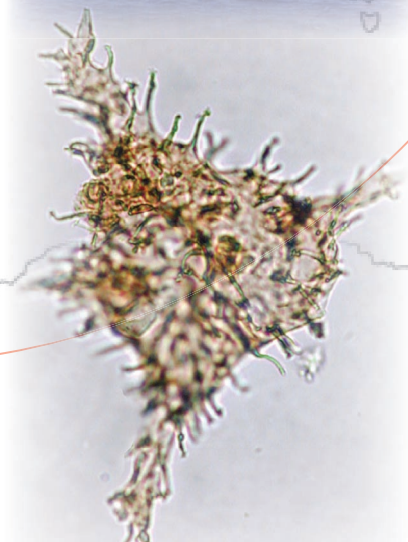
ECORD

European Consortium for
Ocean Research Drilling

Leading and Coordinating Ocean Drilling Science in Europe



April 2008

ECORD European Consortium for Ocean Research Drilling

SIXTH FRAMEWORK PROGRAMME

IODP INTEGRATED OCEAN DRILLING PROGRAM

CONTENTS

At the start of the European Commission funded project "ECORD-Net", one of the main objectives was to develop the structure and mechanisms for coordinating and funding ocean drilling research in Europe. Today, the European Consortium for Ocean Research Drilling (ECORD) has become an important partner in the Integrated Ocean Drilling Program (IODP). The joint European activities and programmes launched by ECORD have created new opportunities for European and Canadian scientists to participate in ocean drilling expeditions.

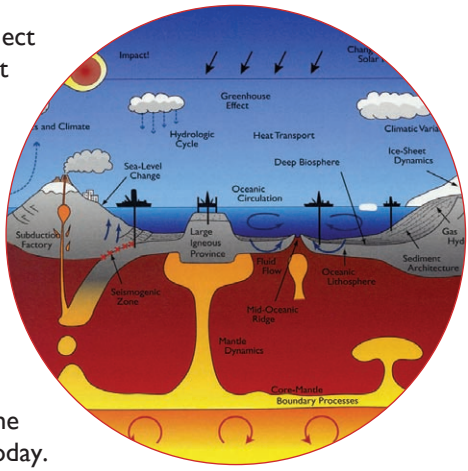
This brochure provides an overview of how ECORD reaches out to the science community through ESSAC, the ECORD scientific committee. ESSAC plays a key role in coordinating the science programming within IODP. It is responsible for:

- *the scientific planning and coordination of Europe's contribution to and participation in IODP,*
- *the optimal scientific staffing, i.e. the nomination of European and Canadian scientists for IODP expeditions on different research vessels and platforms,*
- *the nomination of representatives in IODP science panels and committees,*
- *guidance in proposal preparation and funding strategies,*
- *the promotion of ocean drilling science to a wider audience.*

Cover: (top) Drillship Vidar Viking on site, Arctic Coring Expedition (M. Jakobsson© ECORD/IODP), (middle) Tahiti barrier reef off Papeete, French Polynesia, Tahiti Sea-Level Expedition (© ECORD/IODP), (bottom) Tropical phytoplankton of the Cenozoic sediments of the Arctic Coring Expedition (A. Sluijs© ECORD/IODP).

ECORD in the Integrated Ocean Drilling Program (IODP)

IODP is an international 10-year project (2003-2013) exploring ocean realms that have never been cored before. The scientific objectives of the program are to understand the global earth system and its societal impacts by studying records of past climate changes, biodiversity in sub sea-floor systems, establishing sea-floor laboratories for the study of natural hazards in submarine systems and discovering new energy resources. The results of this scientific ocean drilling program help to resolve the problems our society is facing today.



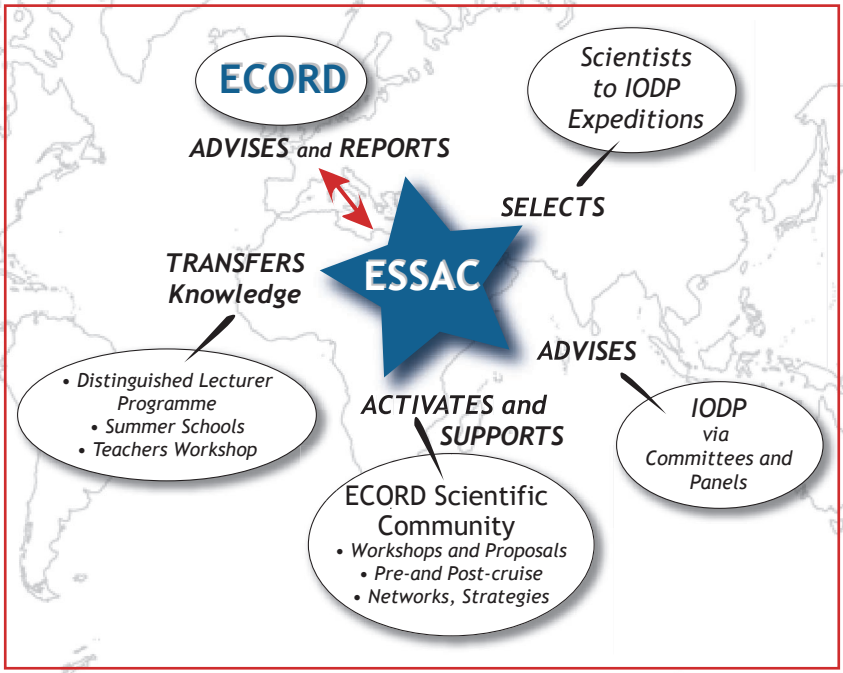
ECORD in IODP - a worldwide scientific partnership

Since its establishment in 2003, the European Consortium for Ocean Research Drilling (ECORD) has worked in close collaboration with the United States and Japan as well as with China, Korea and the newly joined Australian/New Zealand Consortium. IODP operates worldwide and offers access to a range of drilling platforms that can operate in most oceanic environments and allow the scientific objectives of the Initial Science Plan to be addressed. Within the IODP structure, ECORD is responsible for operating the ***mission-specific platform (MSP)*** operations capable of drilling in challenging environments unsuitable for either the riserless drilling vessel *JOIDES Resolution* provided by the United States or the Japanese riser-drilling vessel, the *Chikyu*. ECORD comprises 17 member nations acting as a single entity.

(top) Earth system components, processes and phenomena from space to atmosphere, ice, ocean, crust, mantle and core (figure reprinted from Earth, Oceans and Life, IWGSO, May 2001, courtesy of A. Taira, University of Tokyo), (bottom) IODP drillships (from left to right) MSPs of the Arctic Coring Expedition (M. Jakobsson© ECORD/IODP), JOIDES Resolution (© IODP-USIO) and Chikyu (© JAMSTEC/IODP).

ESSAC - *the Scientific Committee of ECORD*

ESSAC is the ECORD Science Support and Advisory Committee.
ESSAC provides scientific advice to ECORD and coordinates all ECORD's scientific activities in the Integrated Ocean Drilling Program.
ESSAC consists of a national delegate and an alternate from each participating country (i.e. 16 European Countries plus Canada, *see list on page16*) with equal voting rights (one country - one vote). The ESSAC office resides with the chair of the committee who is supported by a scientific coordinator. The office rotates every two years. The current office is located in Aix en Provence, France. Previously, ESSAC was located in Cardiff, United Kingdom (2005-2007) and in Amsterdam, The Netherlands (2003-2005).
ESSAC activities are funded by ECORD.

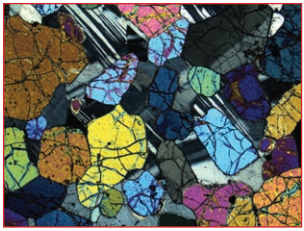


ESSAC tasks and interactions with ECORD and other stakeholders.

ESSAC *SELECTS* Expedition Participants

ECORD pools funds from its 17 member nations to pay a single, joint contribution to IODP, thus opening access to IODP expeditions to all ECORD scientists. ESSAC invites European and Canadian scientists to participate in IODP expeditions via an open call for applications. ESSAC then evaluates and ranks the applications and assists the drilling platform operators in composing the final expedition science party. So far, 12 co-chief scientists and 116 ECORD scientists have participated in 15 IODP expeditions since June 2004.

Major IODP Science Impacts



- *Expedition 301 established a network of instrumented holes on the Juan de Fuca plate. Future cruises will conduct cross-hole experiments in oceanic crust to determine subsurface fluid flow and pathways*
- *Expeditions 304-305 drilled over 1,400 m into the oceanic lower crust exposed at an oceanic core complex of the Mid-Atlantic Ridge, expanding our knowledge on how the oceanic crust is generated at slow spreading ridges (right)*
- *Expedition 307 addressed the role of biological activity in the formation of carbonate mounds on continental margins (Porcupine Seabight, off Ireland)*
- *Expedition 311 challenged our concepts on gas-hydrate formation by drilling the Cascadia margin, off Canada*

Scientific Spotlight - Artic Coring Expedition (ACEX) (Expedition 302)

In 2004, for the first time ever, the ECORD-led mission-specific platform ACEX expedition was able to drill the sea floor beneath the ice pack of the Arctic Ocean. The 496m of cored sediments provided a record of the paleoenvironmental history of the Arctic during the last 56 million years and documented the transition from a 'greenhouse' world to the 'icehouse' world. Arctic temperatures reached subtropical levels during the Paleocene Eocene Thermal maximum (55 million years ago). The massive occurrence of the fern Azolla indicate a freshwater episode ~49 million years ago. The new data also documented that the Arctic ice developed much earlier than previously believed. The first pebbles carried by icebergs appear by 45 million years ago, at approximately the same time as in the Antarctic, and become widespread by 14 million years ago.

(top) IODP Expeditions 314 and 315 science parties aboard the Chikyu (© JAMSTEC/IODP), (bottom) Photomicrograph of a thin section of an olivine-rich troctolite (gabbroic rock) from 1,193.2 m below sea level, showing fresh olivine and plagioclase (© Integrated Ocean Drilling Program).

ESSAC *ADVISES IODP*

Drilling proposals arising from the scientific community are the essence of the program. The intellectual contribution of ECORD scientists is of primary importance in IODP: they lead 40% of the proposals currently being evaluated or scheduled for drilling. ESSAC influences the decision-making at all stages of the science planning process in IODP by appointing scientific experts from the ECORD community to the committees of the IODP Science Advisory Structure (SAS). Many of the ESSAC delegates are themselves current or recent SAS panel members.

Major IODP Science Impacts

:: *Expeditions 303 and 306 recovered high-resolution records of the last million years in the North Atlantic. These archives indicate that the major northern hemisphere ice sheets were unstable during glacial periods*

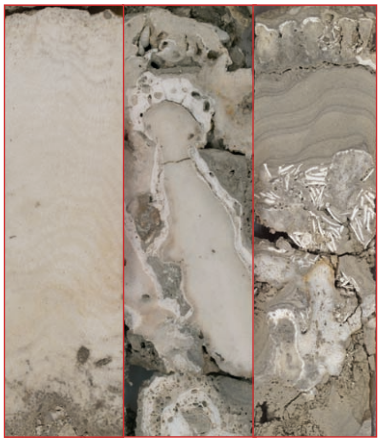
:: *Expedition 308 conducted experiments in the Gulf of Mexico that document the mechanisms controlling slope failure in over-pressured sediments*

:: *Expeditions 309 and 312 penetrated into the plutonic rocks generated in an axial magma chamber at an ultrafast spreading ridge, providing the first continuous section of upper oceanic crust, and leading the way towards achieving full-crustal penetration to the Moho*

Scientific Spotlight - Tahiti Sea-Level Expedition (Expedition 310)

Understanding the history and effect of sea-level fluctuations and climate changes is a primary objective of marine science. The Tahiti Sea-Level Expedition aimed to investigate these effects for a critical period of global climate change by studying cores from the coral reefs of the tropical island of Tahiti. The timing and course of past global sea-level changes may help to understand present and future sea-level rise due to global greenhouse conditions. Since the climax of the last ice age about 23,000 years ago, global sea-level has risen by about 120 metres, mainly due to melting of large inland ice sheets and thermal expansion of the global ocean water masses attributed to rising temperatures. Because corals have strict ecological requirements and are extremely sensitive to environmental changes, fossil reefs are accurate and sensitive recorders of past sea-level and climatic change.

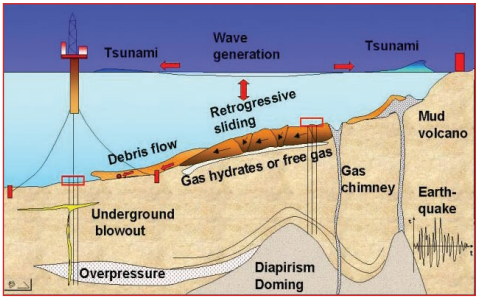
The Tahiti Sea-Level Expedition to the reef terraces around Tahiti, French Polynesia, was the second mission-specific platform project organised and carried out by ECORD.



Close-up photographs of coralgal-microbialite frameworks cored during the Tahiti Sea-Level Expedition (© ECORD/IODP).

ESSAC *ACTIVATES the Scientific Community*

In order to stimulate IODP proposal submission by European scientists, ECORD initiated the Magellan Workshop Series. This 'bottom-up' 5 year programme is funded by 12 ECORD member organisations and run by the European Science Foundation (ESF) in coordination with ESSAC. Workshops are selected twice per year, after an open call for proposals. ESSAC delegates provide strategic guidance through their representation in the Magellan Steering Committee. In addition, the Magellan programme funds individual scientists to participate in international workshops.



ESF-Magellan Workshops

The workshops' scientific topics cover the full spectrum of marine research such as paleoclimatic and impact topics, volcanism and geo-hazards, natural resources or deep-biosphere subjects. Each workshop bring together scientists from various research fields to discuss and to refine future or actual IODP European scientific proposals and to create new collaboration. Seven workshops have been funded so far:

:: ***Southern African Climates, Agulhas Warm Water Transport and Retroflection and Interocean Water Exchanges*** *- 19-21 September 2007, Kiel, Germany*

:: ***Marine Impacts and Environmental Consequences*** *- 10-13 September 2007, Oslo, Norway*

:: ***Exploring Escarpment Mud Mound Systems and Mud Volcanoes with New European Strategies for Sustainable Mid-Depth Coring*** *- 26-29 April 2007, Murten, Switzerland*

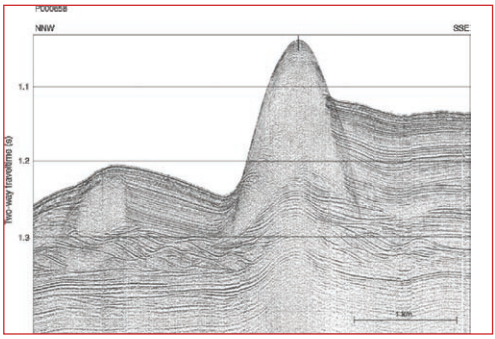
:: ***Drilling through an Active Caldera, Offshore Campi Flegrei, Eastern Tyrrhenian Margin*** *- 13-15 November 2006, Naples, Italy*

:: ***Scientific Ocean Drilling behind the Assessment of Geo-Hazards from Submarine Slides*** *- 25-27 October 2006, Barcelona, Spain*

:: ***Capturing a Salt Giant*** *- 13-15 October 2006, Hamburg, Germany*

:: ***Deep Biosphere*** *- 26-29 January 2006, Kartause Ittingen, Warth, Switzerland*

Drilling strategy to address offshore geo-hazards presented at the Magellan workshop "Scientific Ocean Drilling behind the Assessment of Geo-Hazards from Submarine Slides" (T. Kvalstad, Norwegian Geotechnical Institute - NGI).



Before IODP drilling can take place, extensive geological and geophysical surveying must be carried out. Such surveys are expensive, and beyond the means of some of the smaller member nations of ECORD. To achieve the maximum benefit from Europe's investment in IODP, and to maintain its international scientific leadership, ECORD and the ESF initiated a joint 3-year EUROCORES programme called EuroMARC (European Collaboration for Implementation of Marine Research on Cores), that would allow European nations to pool their national funds for pre- and post-cruise science, in particular to support site surveys. EuroMARC aims at enhancing the benefit from already established funding groups and research communities such as ECORD and the International Marine Past Global Change Study (IMAGES). Nine ECORD member organisations support this trans-national programme.

Scientific Impact

Of the seven projects ultimately approved by the participating funding agencies, three are closely related to IODP. They will contribute in funding post-cruise science and help generate new drilling proposals:

:: *Mid latitude carbonate systems: complete sequences from cold-water coral carbonate mounds in the northeast Atlantic (CARBONATE) - to quantify biogeochemical processes as mid latitude carbonate sinks (photo above)*

:: *Ultra-slow spreading and hydrogen-based deep biosphere (H2DEEP) - to study geodynamic and hydrothermal processes along one of the most slow-spreading segments of the global ridge system*

:: *The last deglacial sea-level and climatic changes (CHECREEF) - to study reef cores retrieved around Tahiti during IODP Expedition 310, to investigate further the Tahiti reef slopes and perform a site survey cruise on the Great Barrier Reef to generate high-resolution bathymetric and seismic data.*

Example of site survey data necessary to locate drill sites: high-resolution seismic section of Challenger carbonate mound, drilled during IODP Expedition 307 (Henriet et al., 2002).

ESSAC *TRANSFERS Knowledge to the Next Generation of Scientists*

In order to reach out to students and young scientists as well as the science community at large, ECORD initiated a number of activities to promote the accomplishments of the program and to encourage involvement of new communities. ESSAC coordinates these activities, issues the corresponding calls and selects the applicants, and advises on educational concepts. These activities are open to non-ECORD European countries, to raise awareness of ocean drilling.

ECORD Summer Schools

To train the new generation of scientists that will participate in marine science and ocean drilling, ECORD initiated a summer school programme in 2007. Following an open call, ESSAC selects the applying institutions based on pedagogic and scientific merits. In 2007, the first two sponsored summer schools both addressed the same theme of the IODP science plan, "Environmental Change, Processes and Effects", but with a different and complementary approach. In the future, ESSAC will welcome applications addressing other themes.

ECORD Scholarship

ECORD funds twelve scholarships annually to allow outstanding young scientists to attend a summer school. ESSAC selects the best candidates after a call open to both ECORD member countries and non-ECORD European countries.

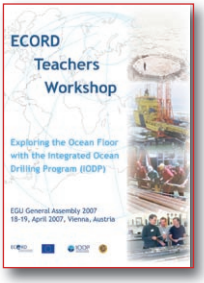
ECORD Distinguished Lecturer Programme

This programme is designed to bring the exciting scientific discoveries of IODP to the geosciences community in Europe and Canada. ESSAC selects three Distinguished Lecturers per year, one in each of the three main thematic areas of IODP. Applications to host a Distinguished Lecturer are accepted from any college, university, or non-profit organisation in ECORD member countries and non-ECORD European countries.

(top) The 2007 USSP (Urbino Summer School in Paleoclimatology) on Past Global Change Reconstruction and Modelling Techniques. This summer school combined lectures, exercises and field experience, (middle) The 2007 ECORD Summer School in Paleoceanography was held in Bremen and centered on the Bremen Core Repository, (bottom) Paul Wilson (National Oceanographic Centre, Southampton), one of the 2007 ECORD Distinguished Lecturers, gives a lecture at GEOTOP, Montréal, Canada.

ESSAC *TRANSFERS Knowledge to Teachers*

ESSAC augments the visibility of IODP by transferring the exciting scientific discoveries of the program and the implied societal relevances of these outcomes to a wider audience. Target groups include teachers, students and the general public. As well as representing Europe and Canada as a single entity, ECORD also strongly encourages educational activities in the individual member countries.
Educational activities at a national level have included participation of a Swedish teacher in the Arctic Coring Expedition; visits to school classes in France; a roadshow to German universities; an expedition logbook by a Swiss writer and a travelling photo exhibition at universities in Spain.



ECORD Teachers' Workshop

The first ECORD Teachers' workshop dedicated to high-school teachers was organised in 2007, in association with the GIFT (Geophysical Information for Teachers) symposium at EGU in Vienna, Austria. 70 teachers from 22 countries registered for the workshop which presented current ocean-drilling scientific results and future science plans concerning sea-level change, slope stability, earthquakes, volcanoes and life in extreme environments in addition to presenting the IODP drilling fleet.

ECORD Educational Activities

ECORD takes advantage of portcalls to offer guided tours of the drillships to schools. In Tahiti, students from several Papeete elementary and high schools had the opportunity to visit the DP Hunter and learn about drilling techniques. Many individual initiatives by ECORD scientists have also allowed the excitement of the expeditions to be conveyed by communicating directly from the ship to schools during the drilling operations.

(top) ECORD booklet distributed to the participants of the Teachers' Workshop held at EGU 2007, (bottom right) High-school students from Lycée Paul Gauguin, Papeete in Tahiti, visiting the DP Hunter drillship during its stay in Tahiti (© ECORD/IODP), (bottom far right) Poster compiled by a French elementary school communicating with the scientists on board IODP Expedition 312 (see http://www.iodp-france.org/).

PERSPECTIVES

Since its inception, ECORD has moved quickly into operation and today reaches out to the scientific community through its science committee (ESSAC). Recently, ECORD has mandated ESSAC to become open to, and interact with, a wider scientific community as well as to promote existing knowledge and the importance of scientific marine drilling to new audiences. These ECORD decisions are key elements for keeping pace with future scientific and societal developments.

At the IODP level, new exciting programmes have started. The most ambitious, initiated in 2007, is to better understand the mechanisms of earthquake generation. The NanTroSEIZE project is investigating the Nankai seismogenic zone off Japan, where devastating earthquakes are generated. The aim is to combine drillholes in several key locations and sea-floor and borehole observatories to monitor the behaviour of rocks, sediments and fluids in relation to seismic activity.

In the future, ECORD will target a more trans-disciplinary approach to marine science through initiatives such as the "Deep Sea Frontier", which links ocean drilling with the broader marine geosciences and other fields of research such as biology and ecology, and the development of long-term observatories and monitoring. ECORD is also actively pursuing closer ties with major earth science programmes, such as the International Continental Drilling Program (ICDP). ESSAC will also continue to play a major role in establishing networks and collaborations and supporting these mid-term activities.

The recent external review of ECORD stated that "ECORD and its associated scientists were producing high-quality, international research in ocean science and clearly was representing excellent value for money". The fact that ECORD was thought to be an outstanding example of good international cooperation was made possible in no small measure by the funding via the European Commission's European Research Area Network scheme: the so-called "ECORD-Net". Follow-up support from the European Commission will be essential to help ECORD enhance his role in ocean drilling and develop better links with the other components of the Deep Sea Frontier initiative.

ECORD-Net Members:
Denmark, France (coordinator), Germany, Iceland, The Netherlands, Norway, Portugal, Sweden, Switzerland and United Kingdom.

ECORD Members:
Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Drillship DP Hunter on site, with Tahiti in the background - Tahiti Sea-Level Expedition 310 (© ECORD/IODP).

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