IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

ECORD
European Consortium for Ocean Research Drilling

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NEWSLETTER

Front cover: Logo of the 20th Anniversary of ECORD. Bottom circles: logos of IODP expeditions operated by ECORD in consecutive order: Expedition 302, 310, 313, 325, 347, 357, 364, 381, 386.

Design of Expeditions' logos: Jez Everest (302, 310, 313, 325, 357, 381, 386), Alan Stevenson(347), Alan Stevenson and Claire Mellett (364).

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European Consortium for Ocean Research Drilling

ECORD Newsletter #38

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ECORD
European Consortium for
Ocean Research Drilling

Since its creation in 2003, ECORD has developed a unique European distributed research infrastructure that connects research facilities at multiple sites across Europe and Canada.

The ECORD research facilities are engaged in the multidisciplinary aspects of the subsurface scientific research and have a longstanding culture of cooperation on science, technology and education.

IODP
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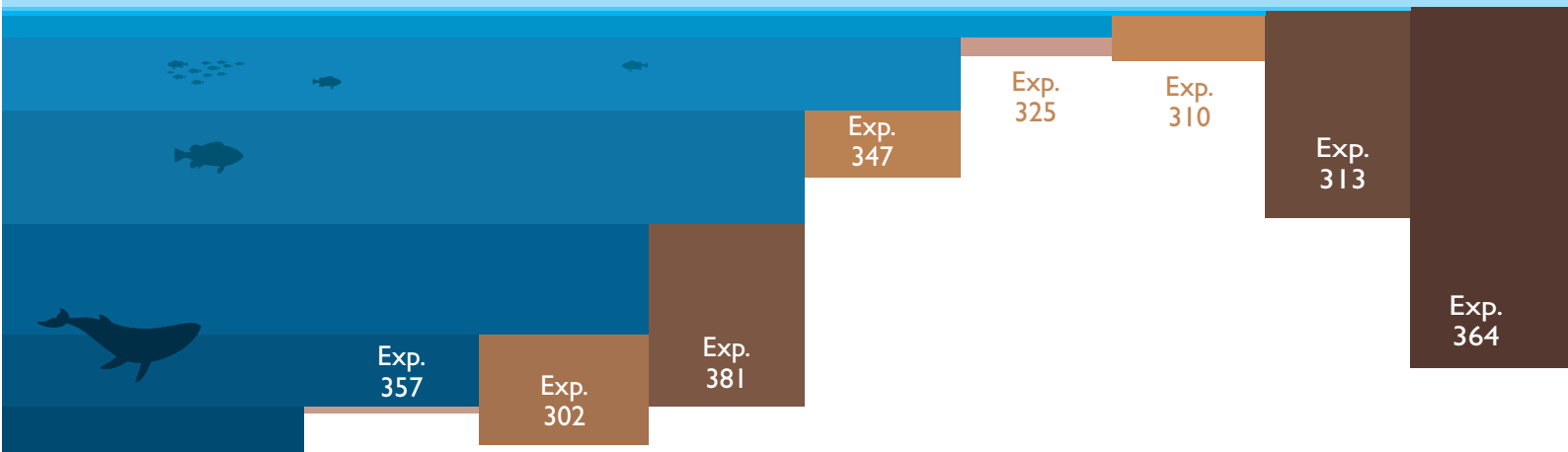


Misson-Specific Platform statistics

9 expeditions

195 holes

3,605 cores

659 expediton days

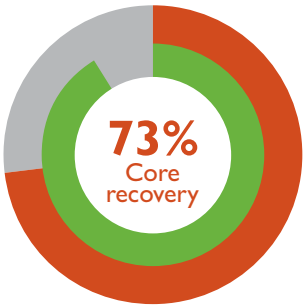
9,357 m cored

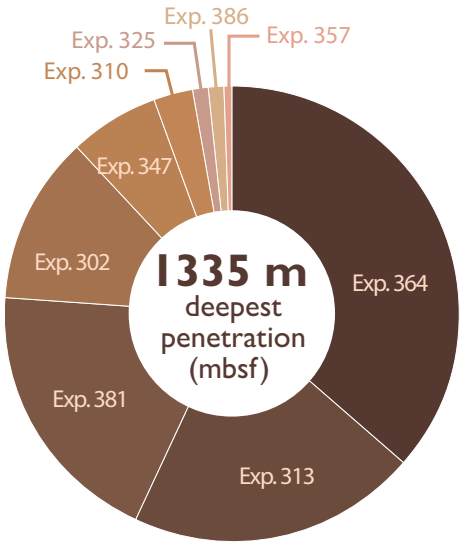
7,503 m recovered

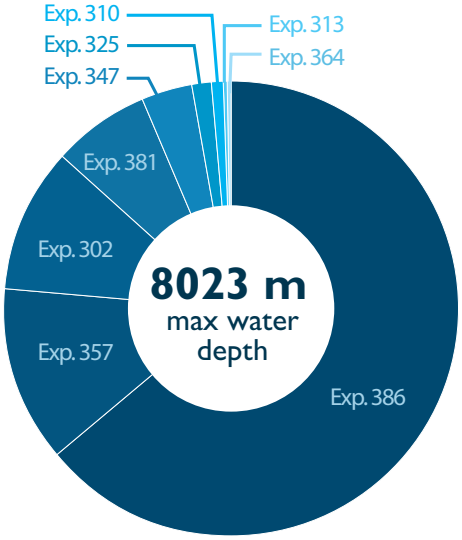
10,241 m drilled

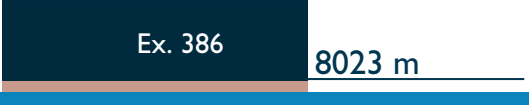
8,023 m deepest water depth

19.8 m shalowest water depth









1 The Joint European Ocean Drilling Initiative (JEODI) and the beginning of ECORD

John Ludden*

Past roles as Associate Director for Earth Science, CNRS and Chief Executive of the BGS, NERC, UK

The concept of having a distinct European identity in the Ocean Drilling Programmeme ODP started in earnest in 2001 when the research funding and operational entities (see below) of Europe banded together. Although European scientists had worked very successfully within ODP there was a consideration that to gain funding across European research agencies and from the European Commission they would need a more united front.

As the same time the fact that ODP with the *JOIDES Resolution* had been unable to drill in certain key regions was being discussed and in particular the need to involve alternative platforms to drill in ice-covered regions, in shallow marginal seas and to drill deep into the crust using riser technology.

This lead to a flurry or activity and numerous meetings with the European partners, who ultimately included Canada, and also the USA and Japan. Thus IODP was created and it included three main partners USA, ECORD and Japan. Agreements on sharing of platforms were established and ECORD and US-IODP along with the *Chikyu* embarked on a very successful 10 year venture in September 2003, which has now been renewed through to 2023 and the longer-term is under discussion.

Creation of JEODI in 2001

To achieve this Europe created JEODI (the Joint European Ocean Drilling Initiative), a research project supported by the European Commission from September 2001 until December 2003 under the 5th Framework Programmeme (FP5) contributing to the implementation of the Key Action 2 "Global Change, Climate and Biodiversity" within the Energy, Environment and Sustainable Development (Contract N° EVR1-CT-2001-20003).

JEODI brought a distinctive European component (partners from 15 member states) to a new era of scientific drilling.

The JEODI Thematic Network emphasised:

- European experience and skill of using and operating "Alternate Platform" drilling technologies to improve the programmeme's shallow-water drilling capabilities,
- Arctic Science, with drilling of the almost wholly unexplored Arctic Ocean,
- Provision of shore based laboratories and other facilities to handle, process, curate and store core derived from these drilling activities,

The birth of the Mission-Specific Platform concept

The JEODI Thematic Network prepared a portfolio of drilling targets and held meetings in Brussels in January 2001 looking into technical requirements for an alternative platform programmeme, and in Lisbon in May 2002 it convened the APLACON - the Alternate Platform Drilling Conference. Thus Europe was able to create a European science plan which was integrated with the international science objectives for oceanic drilling. In particular, this involved the creation of the Mission-Specific Platform concept with aims to undertake deep coring in ice-covered regions, shallow operations in marginal seas, coral atolls etc..

This required then creation of an operational structure in Europe that would manage the ECORD programmeme including the operation of drilling vessels and handling of science and infrastructure in Europe (the core repository the distributed logging facilities and an outreach strategy) along with the creation of and its different management and governance bodies.

JEODI also fostered links with related international scientific programmemes such as ICDP – International Continental Drilling Programmeme, IMAGES, and with scientific programmemes in individual European countries. In particular, research was proposed for drilling related to the fields of climate-change, geological risk,

gas hydrates, deep-offshore resource development, and to ongoing European Community projects such as: DeepBugs, Hydratec, OMARC, Costa, Geomound, DGLab Corinth.

That ECORD has been successful is clearly demonstrated from the richness of its community and outputs; the partners in JEODI listed below are proud to have been part of the process in creating the drilling programmeme. Ultimately we failed to win significant funding from Europe - we were already too organised apparently. Nonetheless, the ECORD results have been part of many European publications, but the European flag has never flown on any IODP or MSP missions - and notably not on ACEX.

Partners in JEODI

John Ludden	JEODI Coordinator	France, CNRS-CRPG
Alister Skinner	Principal contractor	UK, NERC-BGS
Jochen Erbacher	Principal contractor	German, BGR
Nils Holm, Jan Backman	Principal contractor	Sweden, SU
Anders Solheim	Member	Norway, NGI
Naja Mikkelsen	Member	Denmark, GEUS
Kari Strand	Member	Finland, TI
Arny Sveinbjornsdottir	Member	Iceland, SI
Jeroen Kenter	Principal contractor	Netherlands, VUA
Judith McKenzie	Member	Switzerland, ETH-Zürich
Peadar MacArdle	Member	Ireland, DPE-GSI
Menchu Comas	Principal contractor	Spain, CSIC
Enrico Bonatti	Member	Italy, CNR
José Monteiro	Member	Portugal, GRICES

2 ECORD during IODP-1
ECORD: a new European involvement in ocean drilling

Catherine Mével

ECORD Manager, 2003-2011

When my colleague and friend John Ludden, then director for Earth Sciences at INSU-CNRS, talked to me about ECORD and asked whether I was willing to help and become the ECORD manager, I was not sure of the implication and the scope of the task. I had a long history with the drilling programme, but the new phase, the Integrated Ocean Drilling Programme (IODP-1), was planned to be completely different and everything was to be rebuilt. The challenge was really exciting and of course I accepted.

Creation of ECORD: 15 December 2003

Following the preparatory work of JEODI, and after a number of meetings in various capitals of Europe, ECORD was officially created on December 15th, 2003, when the representatives from twelve European countries signed the ECORD Memorandum of Understanding (MoU) in Paris. The objective of ECORD was to be more visible by speaking with only one voice, but also to pool funds and become a ship operator. This MoU created the four bodies which are now familiar entities within the ECORD community: the ECORD Council, the ECORD Managing Agency (EMA), the ECORD Science Operator (ESO) and the ECORD Science Support and Advisory Committee (ESSAC).

ECORD "One country - one vote" principle

It was decided that INSU-CNRS (France) would be the manager of ECORD and collect the funds from the member countries, and that the British Geological Survey (BGS, UK), in cooperation with the Bremen Core Repository and the European Petrophysics Consortium would be responsible for operating Mission-Specific Platforms (MSPs). The MoU also defined the rights and obligations for each member country, depending on their financial contribution. Nonetheless, the principle "one country one vote" was considered essential an applied to decisions within the ECORD council as well as ESSAC.

Beyond the initial signatories (Denmark, Finland, France, Germany, Iceland, Italy, Netherlands, Norway, Portugal, Sweden, Switzerland and United Kingdom), four additional European countries (Austria, Belgium, Ireland and Spain) and Canada joined ECORD progressively to reach 17 in 2007. Finally, Poland joined in 2011.

ECORD joining IODP-1

ECORD had then to negotiate its terms of participation to the new, multiplatform, "Integrated Ocean Drilling Programme". The Lead Agencies, NSF (USA) and MEXT (Japan) would operate a non-riser (*JOIDES Resolution*) and riser (*Chikyu*) drillship respectively, while ECORD would operate the Mission-Specific Platforms.

This ambitious goal provided a major step for the science community, opening access to all ocean environments and to great depths below seafloor.

A new organization had to be set up and discussions were sometimes quite challenging. The new phase was built on the principle of distinguishing the science operation costs (SOCs), and the platform operation costs (POCs). SOCs would come from comingled international funds and be managed by an independent body - IODP MI. POCs would be covered by each platform provider. We had to fight hard to retain enough POCs for MSP operations and having a consortium definitively strengthened the position of European countries who jointly contributed about $22M yearly to the total IODP budget. ECORD was able to negotiate the status of "contributing member" and to obtain a good deal for European scientists in terms of representation in panels and berths on all drilling platforms.

ECORD officially joined IODP when, on behalf of the consortium, the Director of CNRS-INSU (France) signed the IODP Memorandum with the Lead Agencies of IODP, NSF (USA) and MEXT (Japan) in Bremen, March 16 2004.

ECORD immediately started seeking for financial support from the European Commission to the MSP operations. Unfortunately, the quest for substantial funding never succeeded. We only obtained an ECORD-Net, glue money to help us set up our organisation, but no money for MSP operations. We

had the same experience with the Aurora Borealis initiative (ERICON project) as well as the Deep Sea and Sub-seafloor Project (DS3F), that aimed at developing a network of infrastructures related to drilling and coring. It is somehow frustrating that the Commission is keen on helping the communities to get organised, but not on actually funding operations or infrastructures. But the council was pleased to accept an in-kind contribution from Sweden for its first MSP project, ACEX, in the form a support research vessel, the Oden. This was the first step for a new funding scheme.

Organising the science community in Europe

The Council rapidly realised the need to help organise the science community in Europe. The ESSAC budget was substantially increased to cover activities such as summer schools and a distinguished lecture programme. Negotiations with the European Science Foundation (ESF) resulted in the launch of two support programmes: the Magellan Workshop Series and EUROMarc (to help access to research vessels for site surveys operations). When these programmes ended, the ECORD council decided to directly fund Magellan together with ICDP.

Operating MSPs - approach to the new concept

Operating MSPs was a totally new concept. ESO rapidly realised that the cost and availability of drilling platforms was dependent on the price of oil. It was also an education for the BGS team to learn to interact with scientists in the "drilling programme" way. As opposed to dedicated ships, ships of opportunity offer limited number of berths and no laboratories. It was immediately obvious that even the basic work of describing the cores could not be completed during the drilling operations. This lead to the invention a new scheme. Only a subset of the science party sailed and secured the collecting of cores. The full science party would meet subsequently at the Bremen core repository (BCR) and benefited greatly from its facilities to achieve the core description and other petrophysical tasks. This organisation with an offshore and an onshore science party, now fully accepted by the science community, was not easy to explain. Convincing scientists to spend several weeks in Bremen and not at sea was not straightforward, despite the advantage of sharing a beer after a long day at work.

ECORD at the end of IODP-1

At the international level, the programme had its ups and downs. The planned refit of the *JOIDES Resolution* lasted much longer that initially envisaged. The JR stopped activities for over three years. The *Chikyu*, officially launched in 2006, turned out to be extremely expensive to operate and did not accomplish what was initially planned. The operator encouraged the community to submit a proposal to drill a deep hole in the Mediterranean, generating excitement in the European science community, but in reality the ship never left Japanese waters and was fully dedicated to implement its first priority, drilling and instrumenting the Nankai seismogenic zone. The MOHO objective seems also still out of reach. And I had a real shock when, to the surprise of all its contributors, NSF decided unilaterally to change the name of the programme to avoid the word drilling. With the new "International Ocean Discovery Programme", I felt I had lost part of my identity.

Looking back at the first phase of ECORD and IODP, it is obvious a lot has been accomplished. Having a consortium helped the European countries to negotiate successfully with the Lead Agencies dozens of European scientists were able to participate and to lead exciting expeditions. They were also largely involved in the international advisory structure and therefore contributed to the science orientations of the programme.

The new access to riser drilling and to MSPs was a major opportunity to scientists, allowing access to new environments. Indeed, the first MSP expedition, ACEX, that drilled the Arctic seafloor beneath the ice to reconstruct past environments, was a major breakthrough. The three expeditions that followed, to Tahiti, New Jersey margin and the Great Barrier Reef, were also successful. But ECORD also contributed to develop more interactions both at the funding agency and at the science community level within Europe. As a convinced European, I can only feel that setting up this Consortium was a major collective achievement, although I don't want to think about my carbon footprint during all these years. And when I reached retirement age at the beginning of 2012 and handed over the management of ECORD to Gilbert Camoin, I was confident ECORD would continue playing its major role in IODP.

Among all the people that contributed to the success of ECORD, John Ludden and Catherine Mével have special thanks to: Soeren Dürr, Chris Franklin, Raymond Schorno (ECORD council), Bob Gatliff, Dan Evans, Dave McInroy, Alan Stevenson, Ursula Röhl, Sarah Davies (ESO), Svetlana Zolotikova, Rosa Bernal Carrera, Mohammed Benchikh, Patricia Maruéjol (EMA), all the successive ESSAC chairs and many others.

3 ECORD during IODP-2
ECORD in the International Ocean Discovery Program

Gilbert Camoin

ECORD Managing Agency Director since 2012

ECORD combines research, education and innovation and offers a unique portfolio of science and educational activities, world-class capabilities, state-of-the-art technology and remarkable knowledge-based resources. This portfolio has been significantly enriched since the start of the International Ocean Discovery Programme to better serve the European and Canadian Earth and environmental science communities.

ECORD at the start of IODP

The architecture and management system of the International Ocean Discovery Programme (IODP) was developed by the International Working Group+, a committee composed of representatives from all Integrated Ocean Drilling Programme funding agencies. This programme has been characterized by a simplified and more flexible funding model and allocated more independence to the platform providers, thus bringing greater opportunities in scientific and technological innovation.

More independence at the consortium level, and in particular in the implementation of Mission Specific Platform expeditions, has required to define a new ECORD structure to face the new challenges and opportunities offered by the new IODP framework. This new structure has allowed ECORD to simultaneously exercise its functions with greater versatility and to ameliorate its partnership opportunities, thus offering an excellent possibility to raise ECORD's profile, visibility and efficiency, and better serve the community in Europe, Canada and associate partners.

ECORD's mutation has been especially materialized by the creation of new entities, which started their activities in 2013. The ECORD Facility Board (EFB) - the MSP expedition scheduling entity – has been the first IODP Facility Board to meet in early March 2013 in Edinburgh, UK. The ECORD Industry Liaison Panel - the ECORD link between academia and industry - has met for the first time in early May 2013 in Geneva, Switzerland. The two task forces, the ECORD Vision Task Force and the Outreach Task Force (EOTF), have been instrumental in the development of ECORD activities during IODP.

ECORD during IODP

Despite a general budget lowering of about $3M since the start of the current programmeme, due to a decrease in member contributions (France and the United Kingdom) and strong fluctuations in exchange rates between the US Dollar and the national currency contributions of five ECORD countries (France, UK, Denmark, Spain and Ireland), ECORD had been able to optimize the resources to dedicate 90% of its budget to the funding of IODP expeditions.

ECORD has implemented five MSP expeditions and has scheduled two others before the end of IODP. To this end, ECORD has developed and formalized the procedures concerning in-kind contributions for MSP expeditions, which can be proposed by any IODP member or non-member country and consisting of a wide array of direct operational facilities and services that the ECORD Science Operator (ESO) would normally pay for.

ECORD's partnership with NSF and JAMSTEC operating the *JOIDES Resolution* (JR) and *Chikyu* has been based on Memoranda of Understanding (MoU). The basis of these MoU included significant co-funding, $8M then $7M annually to the JR and $1M annually to *Chikyu*, that allowed ECORD scientists to participate to expeditions implemented by these facilities, along with berth exchanges to provide access to MSP expeditions for scientists from our partners. The MoU between ECORD and NSF has been signed for five years (2013-2018), while the MoU linking ECORD and JAMSTEC was signed in 2013 for the whole duration of IODP. So far, 35 drilling expeditions have been completed by the JR and seven are planned for 2023 and 2024. Four expeditions have been implemented by *Chikyu* and an additional one is scheduled for 2024.

More than 400 ECORD scientist, including 37 Co-chief Scientists, have sailed on IODP expeditions since the start of the Programme.

At the first meeting of the IODP Forum in 2014, ECORD has initiated the concept of Amphibious Drilling

Proposals (ADP) – now called 'Land-to-Sea Transects' - , which has been instrumental in the development of a closer collaboration between IODP and ICDP through combined drilling operations on land and at sea to fully complete scientific objectives that cross the shoreline.

The International Ocean Discovery Programme will have been executed in two implementation plans (2013-2018 and 2019-2024). ECORD mid-term renewal process has included a three-step process including:

1. an external evaluation by an External Evaluation Committee (EEC) in 2017, which highlighted the ECORD's scientific and operational excellence in the international research landscape during the first phase of IODP (2013-2018) and the need for ECORD to maintain its strengths in being able to finance and implement high-profile MSP expeditions;
2. a revision of the ECORD MoU based on an internal reappraisal of ECORD functioning during the first phase of IODP, as well as recommendations made by the EEC;
3. a revision of the MoU between ECORD and the NSF defining the financial and operational agreement regarding the ECORD's membership in the JR Consortium and, in reciprocity, the access of our partners' scientists to MSP expeditions during the second phase of IODP.

The COVID-19 pandemic that the World has faced in 2020 and 2021 has strongly affected the activities of IODP with the postponement of many expeditions, workshops, conferences and educational activities. However, all IODP and ECORD meetings have been held remotely and then in a hybrid form, thus maintaining the programmeme active during this difficult period. In light of reduced operations and lost opportunities during the COVID-19 pandemic, NSF has decided that unspent funds in U.S. FY2020 and U.S. FY2021 due to reduced operations will be applied to U.S. FY2024 operations. All current IODP partners agreed on the extension of IODP through 2024, which was considered as an 'option' year in Memoranda underlying the JR Consortium to extend the initial term (30 September 2023) of IODP.

Contribution of ECORD to IODP science

ECORD's contribution to IODP science has been remarkable since the start of the International Ocean Discovery Programme. ECORD scientists had a leading role in the submission of drilling proposals that concern all IODP capabilities, with percentages of unique proponents constantly above 37% and up to 40% over the last few years. The leading role of ECORD scientists in the submission of IODP proposals partly relies on the success of the ECORD-ICDP MagellanPlus Workshop Series Programmeme, which provides a substantial support to ECORD scientists to develop innovative drilling proposals concerning diverse scientific topics addressed by the three IODP platforms and/or the ICDP infrastructure. Since 2014, 41 MagellanPlus workshops have been organized (on average 4 workshops per year), involving about 1,500 scientists (23% of early-career scientists on average), and 26 IODP drilling proposals were submitted.

The outstanding intellectual contribution of the ECORD scientists to scientific ocean drilling programmemes is reflected by the Scientific Ocean Drilling Bibliographic Database and Publication Impact Report, which reported in 2022 that 42.9% of total publications are from ECORD scientists.

Training and supporting the next generation of scientists from ECORD members is a major goal for ECORD. The outstanding portfolio of science and educational activities that ECORD has gradually developed over the last years with high demand - an average of 150 per year - from students and early-career scientists. In addition to the ECORD Bremen Summer School and the ECORD Urbino Summer School in Paleoclimatology (USSP) that were created during the previous programmeme, the ECORD Training Course and the ECORD Summer School on 'Downhole Logging for IODP Science' have been developed since 2015 and 2016 respectively.

Promoting activities and accomplishments of IODP to various audiences, including scientists, classrooms and the general public, is a major goal of ECORD through its Outreach Task Force (EOTF). The EOTF constantly updates and creates communication and educational material (core replicas, leaflets, videos, brochures, etc.) that are distributed across the ECORD members for exhibitions and exhibition booths, as well as through the MagellanPlus workshops and ECORD Training Course and Summer Schools. In addition, since 2019, the EOTF has developed exhibition material for temporary exhibitions in museums and aquariums, thus ushering a new communication environment for ECORD.

ECORD-Japan:
The next generation of post-2024 Scientific Ocean Drilling

The end of the International Ocean Discovery Programme is now scheduled on 30 September 2024.

The planning of post-2024 scientific ocean drilling has started in 2019 with several initiatives taken at the national or consortia levels (ECORD, USA, Japan, ANZIC, China) to initiate the momentum that is needed to maintain scientific ocean drilling research in the next decade. As part of these planning efforts, ECORD has organized in 2019 the 'PROCEED' ('Expanding Frontiers of Scientific Ocean Drilling') workshop, which aimed at initiating concepts and defining new goals for future international scientific ocean drilling initiatives, with a special emphasis on new science frontiers and technological developments in a multiple drilling platform approach.

ECORD has started in late 2021 to define and shape its post-2024 plans internally, especially through the instrumental role of the ECORD Vision Task Force and via continuous exchanges between all ECORD entities. ECORD has also exchanged views on the future with all its current partners through our regular channels of communications and via bilateral meetings. A major outcome of these bilateral meetings was the decision by ECORD and Japan to build a combined post-2024 programmeme based on the 2050 Science Framework, which represents a new and innovative approach for conducting science using offshore drilling platforms.

Major change in the organization of international scientific ocean drilling activities

While ECORD and Japan have been advocates for the continuation of a single international programme post-2024, NSF has announced its intention to develop an independent US-led programme. After decades of unified international programmes, from DSDP to the current IODP, this calls for a major change in the organization of international scientific ocean drilling activities.

In response, ECORD and Japan have started in 2022 to build a post-2024 programme committed to the 'philosophy' of the successive scientific ocean drilling programmes and recognizing the necessity to adopt an innovative approach tailored to the post-2024 international landscape.

Prominent role of MSP expeditions post-2024

To this end, ECORD and Japan will implement jointly Mission-Specific Platform (MSP) expeditions, inclusive of the D/V *Chikyu*, that will play a prominent role in achieving the goals of the 2050 Science Framework. The MSP concept that has been initiated by ECORD since 2004 and developed during the current programmeme involves operational and funding flexibility, variable operational times compared to the standard two-month expedition, as well as tailored programmematic procedures concerning proposals and science parties. ECORD and Japan intend to further develop the MSP concept by diversifying drilling and coring technologies, including riserless drilling, giant piston coring and even riser drilling, and applying them to all geological environments, as determined by scientific priorities, operational efficiency and better value for funding.

ECORD and Japan anticipate that the new programme, open to the international scientific communities, will begin immediately after the conclusion of the current IODP.

Developing the architecture of the ECORD-Japan programmeme

International governmental and non-governmental entities are invited to participate as Associate Members for non-platform providers providing cash or in-kind contributions, including temporary (e.g., project-based) membership, or as Partners for regular platform providers. ECORD and Japan have invited potential future scientific ocean drilling programmemes to share overarching resources, such as proposal and data management (the main responsibility of the current Science Support Office – SSO) and the proposal review process (the remit of the current Science Evaluation vPanel – SEP - and Environmental Protection and Safety Panel - EPSP) under the auspices of an 'Alliance'.

ECORD and Japan intend to foster active collaboration with other programmes and initiatives with similar scientific objectives, and implement joint expeditions, regardless of the technology and/or the drilling/coring needs. It is anticipated that drilling expeditions operated on an MSP mode, especially in shallow-environments, will be of pivotal importance to implement Land-to-Sea Transects (L2S) with the International Scientific Continental Drilling Programme (ICDP).

In parallel, a foundational principle of the successive international scientific ocean drilling programmes – continuity of core and data legacies – will be maintained by developing post-2024 initiatives.

There are still many challenges to tackle and many issues to be solved to delineate the final architecture of the ECORD-Japan programmeme and of a potential 'Alliance' of collaborative programmemes. However, based on the well-established operation of the ECORD and JAMSTEC infrastructures, their successful implementation, their competitiveness in the international research landscape and maximum return from investment, a bright future is promised to ECORD and Japan in their intentions to play a prominent role in post-2024 scientific ocean drilling.

Many people have contributed to the success of ECORD in the International Ocean Discovery Programme.

I express my gratitude to all ECORD representatives and scientists who participated to this success and who helped in shaping a new ECORD in a new IODP. My heartfelt thoughts go out to Dirk Kroon. Our IODP partners have also participated to the success of IODP and ECORD over the last decade. I have special thoughts for Tom Janecek and Jamie Allan (NSF), Nobu Eguchi and Shin'ichi Kuramoto (JAMSTEC) and, of course, to many of our international collaborators. Finally, I would like to warmly thank John Ludden and Catherine Mével for your instrumental role in the creation of ECORD and for giving me the opportunity to live a unique experience.

4 Celebrating 20 years of Mission-Specific Platform Expeditions

David McInroy
Science Manager at ECORD Science Operator

Mission-Specific Platforms (MSPs) have been important members of the IODP family for two decades, operating alongside their impressive siblings *JOIDES Resolution* and *Chikyu*.

Over this time, MSPs have capitalised on alternative platforms and methods, enabled niche expeditions, and provided the scientific community access to drilling targets otherwise out of reach.

To go where no scientific drilling project has gone before

At a basic level, this was the reason MSPs were introduced into the Integrated Ocean Drilling Programme in 2003, building on the capability of the wildly successful *JOIDES Resolution* and the Ocean Drilling Programme. Since then, the ECORD Science Operator (ESO), has implemented nine MSP expeditions in 6 different oceans and seas with two more in planning before the end of 2024.

MSP statistics reflect the diversity of platforms used; water depths range from less than 20 m to over 8 km, and the deepest MSP borehole is over 1,300 m below seafloor (mbsf) although many are less than 40 mbsf. MSPs have recovered over 7.5 km of core from 195 boreholes in formations ranging from fossil corals in some of the most environmentally sensitive regions on Earth, to highly-deformed, biosphere-hosting altered ultramafics from the middle of an ocean.

Expedition 302: Arctic Coring Expedition (ACEX), 2004

Expedition 302: Arctic Coring Expedition (2004) cored in the ice-covered central Arctic Ocean and was the first challenge for the newly constructed ECORD and ESO. Supported by the Swedish Polar Research Secretariat, ESO assembled a small fleet composed of two icebreakers and a 'drillship' – an ice-rated supply vessel (*Vidar Viking*) with a temporary coring rig installed over a specially created moonpool. With the inclusion of an expert team and a determined Science Party, the expedition successfully cored to 428 mbsf in moving ice above the Lomonosov Ridge, in water depths up to 1,288 m within 145 miles of the North Pole.

The expedition produced the first long record of Cenozoic sediments from the central Arctic Ocean, which has provided fundamental new insights about the Arctic's Cenozoic paleoenvironmental and climatic evolution. To date, Expedition 302 remains the most prolific producer of peer-reviewed publications of all IODP expeditions, with 190 papers and counting. Equally as important, the expedition demonstrated the technical feasibility of scientific ocean drilling in ice-covered regions.

IODP Expedition 310: Tahiti Sea Level, 2005

After the Arctic success, MSPs turned to other long-standing challenges for scientific ocean drilling: improving recovery in carbonate reefs and operating in very shallow water. IODP Expedition 310: Tahiti Sea Level (2005) provided the backdrop to address both these challenges.

The MSP concept allows ESO to procure drilling platforms from the commercial market on a case-by-case basis, offering the flexibility to deviate from standard scientific coring methods. The *DP Hunter* was contracted for Expedition 310, which was equipped with high-class dynamic positioning essential to hold station with as little as 23 m of drill pipe between the vessel and the seabed.

Like Expedition 302 in the Arctic, a geotechnical rig was temporarily installed on the *DP Hunter*. In fact, the very same rig was used but, crucially, in a different mode. The rig provided heave compensation and the means to lower conductor pipe and a seabed template to guide the coring string. A smaller mining-style coring rig was 'piggy-backed' onto the larger geotechnical rig, allowing the use of thinner, lighter drill pipe and narrower coring tools. This lighter system provided more control over the

drilling parameters and greater responsiveness to the varying reef lithologies and macroporosities downhole. The system achieved a total core recovery of 58%, which was a huge improvement in recovery compared to previous IODP drilling in similar lithologies (<10%). Taking macroporosity into account, core recovery may have been greater than 90%.

Other technical achievements during this expedition were the first use of super-slimline logging tools including acoustic and optical imaging tools, and the use of a down-pipe camera to survey drill sites for live corals before landing the template.

Expedition 310 demonstrated that IODP could successfully drill in very shallow water, tackle lithologies that were previously regarded as problematic, and work responsibly in environmentally sensitive areas. The experience gained on Expedition 310 was vital in efforts to secure permission to core on the Great Barrier Reef using the *Greatship Maya* for Expedition 325 in 2010. These two sister expeditions have produced new data on the paleoceanographic evolution of the tropics as recorded in coral reefs located in tectonically inactive areas.

Expedition 313: New Jersey Shallow Shelf, 2009

With mining-style coring methods successfully demonstrated by Expedition 310, Expedition 313: New Jersey Shallow Shelf (2009) provided a new opportunity to deploy land-based methods in an offshore environment. The hope was that better recovery could be achieved in unconsolidated and loose shelf deposits in which previous scientific drilling had mixed results.

With deeper penetrations required (up to 750 mbsf), the Tahiti technical set-up could not be duplicated for Expedition 313. Due to their thinness, only short lengths of mining drill pipe can handle the stresses and strains of heave compensation, so the only option was to select a fixed, standing platform. Consequently, liftboats entered IODP for the first time and with great effect. Working in only 32 m water depth, the L/B *Kayd* provided a stable platform to deploy a mining drill string from a land-based rig. The benefits of using the lighter coring system on a stable platform quickly became apparent: total recovery was 80%, a notable improvement from previous coring in similar lithologies (61%).

Cores from Expedition 313 have allowed the accurate reconstruction of global sea-level changes during the period 14-24 million years ago, and the associated impact on the development of sedimentary shelf sequences.

Expedition 364: Chicxulub Impact Crater, 2016

Later in 2016, a similar technical setup was deployed for Expedition 364: Chicxulub Impact Crater, using the sister liftboat L/B *Myrtle* in the shallowest water MSP expedition ever – only 19.8 m. In this expedition the coring method performed spectacularly, achieving an incredible 100% core recovery down to 1335 mbsf, with a slightly larger core diameter of 83 mm compared to standard IODP core of about 63 mm. The success of the drilling produced a near continuous lithological record of the Chicxulub Impact Crater, including the Cenozoic post-impact infill, tsunami deposits, breccia, and basement rocks of the main target: the peak ring.

Expedition 347: Baltic Sea Paleoenvironment, 2013

MSPs have found their niche in various aspects of IODP expeditions. Often it is the vessel type or coring technology that sets them apart, but MSPs have also been required for more mundane reasons such as being able to pass under low bridges. Two MSP expeditions, Expedition 347: Baltic Sea Paleoenvironment (2013) and Expedition 381: Corinth Active Rift Development (2017), operated in enclosed seas or river mouths with sites located beyond low bridges. Typical geotechnical rigs are shorter than the towering derricks of the *JOIDES Resolution* or *Chikyu* and the two vessels used, *Greatship Manisha* and *Fugro Synergy* respectively, provided the means to deploy scientific coring in these previously unreachable areas. Expedition 347 was the first MSP to have a strong microbiological element, supported by a new, dedicated, and clean ESO microbiology laboratory container. Additionally, to collect undisturbed samples from, and just below, the seabed, small-scale gravity coring was carried out in parallel to the main coring and incorporated into the IODP core and data management workflows. As well as contributing to a high core recovery of 91%, the success of the parallel coring activity sowed the seeds for introducing alternative coring methods into future MSP expeditions.

Expedition 347 has provided a deeper understanding of the paleoenvironmental evolution of the Baltic Sea Basin through the last glacial cycle, and how the highly variable environment affected the microbial communities and biogeochemical processes in the deep glacial and interglacial deposits.

Expedition 381: Corinth Active Rift Development , 2017

Expedition 381 meanwhile tackled a different topic, and produced the longest and highest resolution record of sediment flux and paleoenvironmental changes when a young rift connects to the global ocean. The results from the expedition show 10s–100s of kiloyear cyclic variations in basin paleoenvironment as eustatic sea level fluctuated with respect to sills bounding the semi-isolated Gulf of Corinth.

Expedition 357: Atlantis Massif Serpentinization and Life , 2015

The most ambitious use of alternative coring methods in IODP was in 2015, on Expedition 357: Atlantis Massif Serpentinization and Life. Two seafloor drills (SFDs) were selected, the British Geological Survey Rockdrill 2 and the MARUM MeBo70, deployed from the UK research vessel RRS James Cook. The SFDs were selected to improve recovery in altered and highly variable shallow oceanic basement rocks, another notoriously problematic lithology in scientific ocean drilling.

SFDs have two key characteristics which may improve recovery in certain lithologies: they deploy lighter coring tools akin to mining-style coring, and they operate in the absence of heave. While total recovery and penetration on Expedition 357 were lower than anticipated, core quality was high and recovery averaged 53% with two of the deepest boreholes recovering 72% and 75% in water depths up to 1,500 m. Such recovery in shallow mantle sequences was unprecedented in the history of ocean drilling.

Furthermore, the SFDs were used as vehicles to carry additional sampling and analysis equipment to the borehole, either specifically designed or modified for the expedition. These included downhole memory logging tools, a borehole plug system to seal boreholes for future fluid sampling, on-board water sampling apparatus, a tracer delivery system, and an on-board sensor package to deliver real-time dissolved oxygen, dissolved methane, pH, oxidation-reduction potential, temperature, and conductivity data during coring. These data enabled in-situ confirmation of ephemeral events such as gas release during coring. This development was the first time such fluid monitoring had been conducted during drilling in an IODP expedition.

Expedition 357 recovered high quality cores from actively serpentinising lower crustal and shallow mantle sequences of the detachment fault zone of the Atlantis Massif, considerably improving knowledge about the extent and activity of the biosphere, and the role of serpentinisation in driving hydrothermal systems that sustain microbiological communities.

Expedition 386: Japan Trench Paleoseismology , 2021

vThe latest MSP expedition (2021-2022) continued the philosophy of using alternative but appropriate coring methods, by utilising giant piston coring (GPC) for the first time in IODP. This expedition was the first joint operator expedition between ESO and the Institute for Marine-Earth Exploration and Engineering (MarE3) within the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). The operators utilised the JAMSTEC research vessel *Kaimei* to conduct GPC operations, and the drilling vessel *Chikyu* as the location of the Onshore Science Party and Personal Sampling Party.

Using the GPC system on the *Kaimei*, 833 m of core was collected from 58 boreholes in ultra-deep hadal environments along the axis of the Japan Trench in around 8 km water depth, with an average recovery of 88%. This expedition proved that GPC can provide an IODP-scale expedition, and provide the significant volume of core material required by the Science Party to meet a diverse range of research objectives.

The overarching goal of Expedition 386 is to find and analyse records of past great earthquakes in the trench-fill basins of the Japan Trench. The Science Party will identify the sedimentologic, physical, chemical, and biogeochemical proxies of event deposits in the cores, recognise and date past giant earthquakes, and separate them from smaller earthquakes and other driving mechanisms. The spatial and temporal distribution and variability of such event deposits will be explored, and ultimately a long-term earthquake record for giant earthquakes will be developed.

Expedition 386 was not only a technical success, but also a collaborative success for the operators. The operators worked together across time-zones to overcome the challenges presented by the Covid-19 pandemic, including working out how to implement a hybrid Onshore Science Party for the first time. The collaborative success of Expedition 386 adds to the confidence of the new ECORD-Japan ocean drilling partnership.

ECORD is extremely proud of MSP achievements over the last 20 years, and now looks forward to developing the MSP concept further and building a new set of achievements with its partners in the next decade.

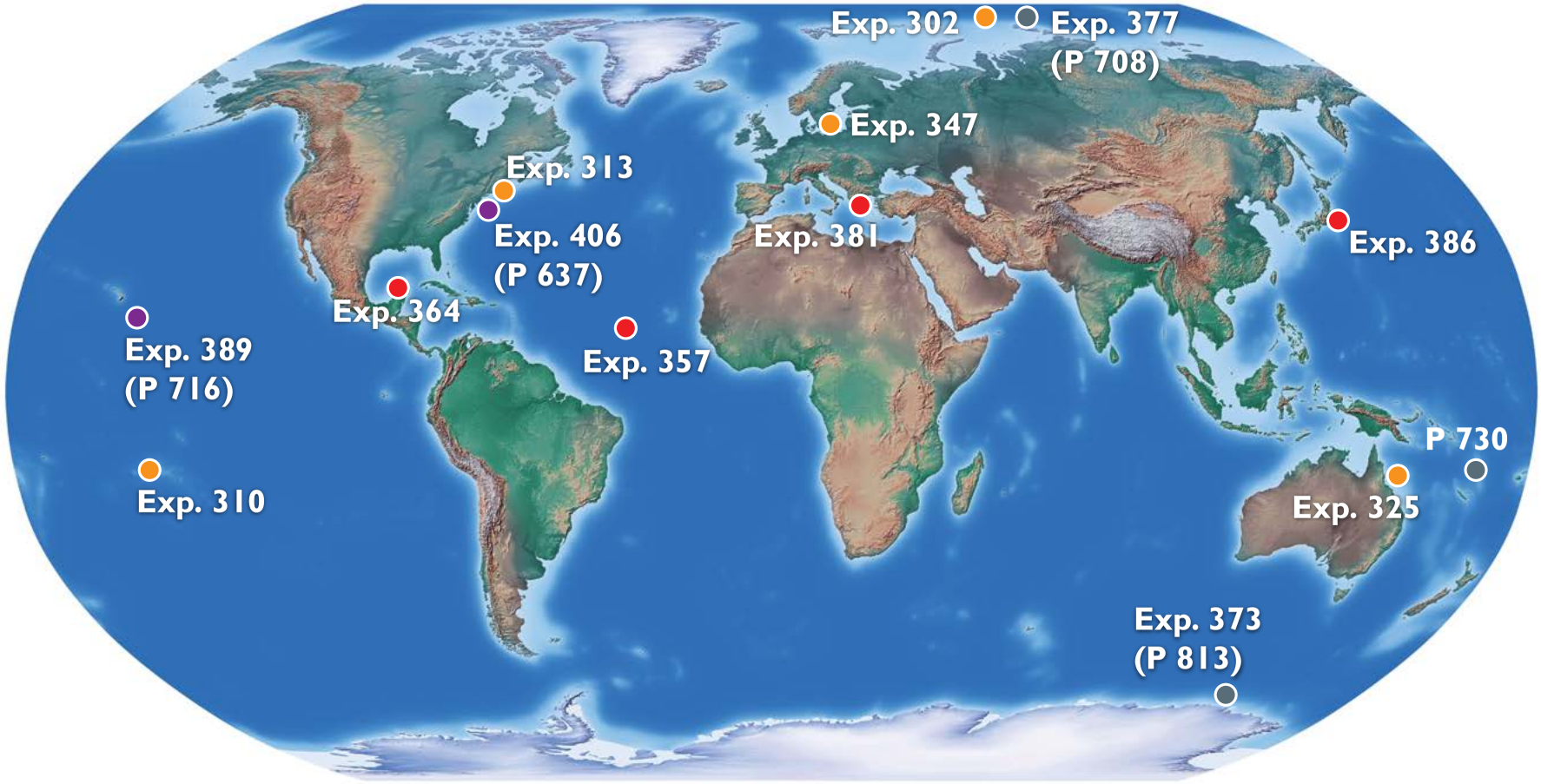
Related websites

https://www.ecord.org/expeditions

http://www.iodp.org/active-proposals

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

Mission-Specific Platform expeditions



5 Offshore and Onshore: Grown with the challenges

Ursula Röhl

ESO Curation and Laboratory Manager since 2003

Time flies - 20 years of ECORD are now behind us. It has been very exciting two decades with extraordinary expeditions, many of them into areas previously untouched by scientific ocean drilling in the framework of one of the international programmes.

We started with a particularly challenging project and implemented Expedition 302: Arctic Ocean Expedition (ACEX) as the first Mission-Specific Platform (MSP) expedition. The incredible results and scientific insights are internationally recognized, who does not know about ACEX? For this first expedition we started small – space on the drilling vessel was logistically restricted – and provided one mobile laboratory from Bremen. The core curation and pore water extraction as well as the analysis of some ephemeral properties took place in this laboratory container. During further expeditions, we gradually increased the mobile laboratories inventory: since Expedition 313: New Jersey Shallow Margin, a separate geochemistry container was added, and during Expedition 347: Baltic Sea Paleoenvironment, a brand new microbiology container was used for the first time. Together with the core logging container from the European Petrophysics Consortium (EPC) and containers provided by the British Geological Survey (BGS), our mobile lab suite provided great services on numerous expeditions by now including to shallow water areas, on drilling platforms and various drilling ships for continental margin or reef sequences, at sites that cannot be logistically reached by the large research drilling ships, for example in the Gulf of Corinth or Baltic Sea. The mobile labs have always been overhauled after and specifically set up before each expedition, with equipment beeing updated or replaced when required. A series of up to several weeks long Onshore Science Parties with splitting, describing, analyzing, and sampling the cores in Bremen supplemented the science services of the Bremen Core Repository (BCR) at MARUM, University of Bremen.

Early in the century I was already involved in the Joint European Ocean Drilling Initiative (JEODI), a research project supported by the European Commission from September 2001 until December 2003 under the 5th Framework Programme (FP5) contributing to the implementation of the Key Action 2 "Global Change, Climate and Biodiversity" within the Energy, Environment and Sustainable Development, and iESO before I became the ESO Curation and Laboratory Manager when ECORD and the ECORD Science Operator (ESO) had started in 2003.

The past two decades have been very successful, hard work, challenging at times and have yielded very interesting scientific as well as methodological and logistical new findings. The energy, enthusiasm and commitment of the ECORD representatives and teams working at sea, in mobile or onshore labs, in the repository, in committees, and at conferences has always been a lot of fun and I wouldn't want to miss all these experiences!

Cores in the reefer of the Bremen Core Repository, MARUM, Germany. Credit: N. Hallmann, ECORD/IODP.

6 ECORD and ICDP: A story of a successful cooperation

Thomas Wiersberg, Uli Harms
ICDP Operational Support Group

The science plans of IODP and the International Continental Scientific Drilling Programme (ICDP) share many scientific themes, such as geohazards, geodynamics, environmental and climate change, the deep biosphere and the evolution of life. Both science programmes utilize research drilling to find answers to burning questions of global and societal relevance related to these themes. This results in a wide range of opportunities for cooperation between both programmes, which have been used with great success in the past.

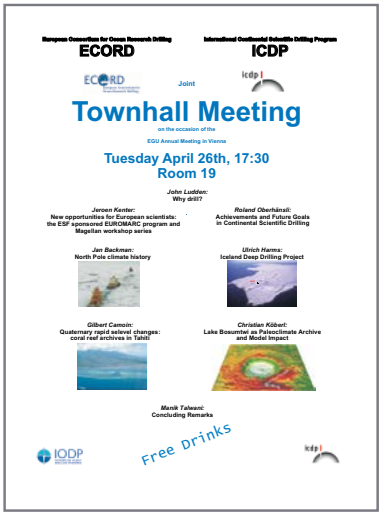
At operational level, the drilling project into Chicxulub Crater offshore Yucatan, Mexico, jointly funded by IODP and ICDP and implemented by ECORD within the framework of IODP Expedition 364 Chicxulub: K-Pg Impact Crater has proven to be highly successful. The Chicxulub impact is the only known terrestrial impact structure to be directly associated with a global mass extinction event. The great success of IODP Expedition 364 as well as the preceding Expedition 313: New Jersey Shallow Shelf triggered a discussion on how project proposals combining marine and continental drilling can be evaluated and supported in a more straightforward way in the future. The discussion resulted in the L2S (Land-to-Sea) initiative: L2S project proposals, i.e., scientific drilling ideas which require both, marine and continental drilling components, are jointly reviewed and, if appropriate, approved by both programmes as part of this new initiative of IODP and ICDP. The first project to be carried out under the L2S initiative is the IODP Expedition 401: Mediterranean-Atlantic Gateway Exchange, with several boreholes to be drilled offshore Portugal and in the Mediterranean Sea from December 2023 to February 2024 in combination with ICDP's IMMAGE project with corresponding boreholes in Spain and Morocco.

Another example of successful joint effort between IODP/ECORD and ICDP is the Magellan initiative, which was initiated in 2006 as Magellan Workshop Series Programme and continued under the MagellanPlus Workshop Series Programme since 2012. This programme, co-funded by ECORD and ICDP, is designed to support scientists in developing new and innovative science proposals to meet future challenges in Earth, life and environmental sciences which critically require deep scientific drilling. For this purpose, MagellanPlus funds workshops and/or scientists that are expected to foster high-quality and innovative scientific drilling proposals for submission to IODP or ICDP. By now, the Magellan initiative results in 66 workshops and summer schools.

Outreach to the scientific drilling community is yet another field of successful joint collaboration between ECORD and ICDP.

Since 2005, the EGU General Assembly has served as the platform to enlighten the scientific drilling community by a joint booth, a joint Town Hall meeting, and since 2013 also a joint scientific session 'Achievements and perspectives in scientific ocean and continental drilling'.

icdp
INTERNATIONAL CONTINENTAL SCIENTIFIC DRILLING PROGRAM



The ICDP-IODP journal SCIENTIFIC DRILLING, which has been jointly issued for eighteen years, published meanwhile 31 volumes, one special issue, includes 317 articles embracing scientific-, workshop-, as well as progress reports, and technical developments.

ICDP congratulates ECORD on its 20th anniversary and looks forward to more years of joint successful cooperation.

Ship board on a lift boat *Myrtle* during IODP Expedition 364. Credit: P. Cruz, ECORD/IODP.

Joint ECORD/IODP-ICDP booth at EGU 2019. Credit: M. Bednarz, ECORD/IODP.

Gabriele Uenzelmann-Neben

ECORD Facility Board Chair 2019-2021

I joined the ECORD Facility Board (EFB) in 2017 and became chair of the panel in 2019. ECORD had planned to implement Expedition 377: Arctic Ocean Paleoceanography (ArcOP) in 2018 only to discover that the proposed in-kind contribution of a Russian ice breaker would not materialize. This left ECORD without an expedition implemented in 2018. Our plans to implement either Expedition 373: Antarctic Cenozoic Paleoclimate or Expedition: 389 Hawaii'an Drowned Reefs in 2019 unfortunately were not fruitful either since no contractor could be identified to successfully carry out one or the other expedition. So, these were two difficult years for the EFB; the trust in implementing MSPs in the IODP world vanished. This was a heavy blow. However, we did not give up and started planning for 2020: it was decided to implement Expedition 386: Japan Trench Paleoseismology. Only to be hit hard by the COVID-19 pandemic. All plans had to be put on hold. This was quite a difficult time.

Via an intense and extremely successful collaboration with our Japanese partners from Jamstec and MarE3 as well as the Co-chiefs it became possible to realise the first offshore phase of Expedition 386 in 2021, and then the onshore and personal sampling phases in 2022. This expedition has been a huge success.

Meanwhile we had made plans to implement Expedition 377 ArcOp in 2022 and were well on our way but this time the Russian invasion of Ukraine stopped us short. Again, The EFB had to re-plan and we hopefully will end this IODP phase with the successful drilling of Hawaii'an Drowned Reefs (Expedition 389) followed by Expedition 406: New England Shelf Hydrogeology.

So, the years I have spent as chair of the EFB have been difficult ones, not as I anticipated with successful implementation of one expedition after the other. Zoom meetings have been on my agenda several times per month to discuss options, both with the other members of the EFB as well as with ESO, the ECORD Council, EMA. Before I joined the EFB I have been a member of the Science Evaluation Panel for a number of years, dealing with the scientific objectives and the site survey data. Now however, I had to deal with feasibilities, with possible options due to the budget, with politics as well. This has been the other side of the story. But even though this at times has been difficult I take great satisfaction from the successfully implemented expeditions, from the fact that as a team of different panels we have been able to increase knowledge via scientific ocean drilling.

The EFB itself is a great panel benefitting from the highly qualified members. Discussions amongst the EFB members and with the other panels have always been extremely interesting.

As the present phase of IODP is coming to a close, the planning for the future of scientific ocean drilling has begun. I am very glad that I can be part of the development of this new programmeme to ensure that this great type research continues.

My experience with ECORD:

Carlota Escutia

ESSAC Spain Delegate, ESSAC Chair 2011-2012

I have been involved in scientific ocean drilling programmemes since 1995 as a proponent, member of science parties, Leg Project Manager while working for the Ocean Drilling Programme at Texas A&M, member of advisory panels, Co-chief scientist of Expedition 318, ESSAC Delegate of Spain, and ESSAC Chair in 2011 and 2012. I consider it a privilege to be involved in these programmemes that have allowed so many transformational scientific discoveries and have been a key to developing my own scientific career.

In all my experience with ECORD and IODP, one of the most valuable was working side by side with the many scientists who work tirelessly and generously for the success of the programmemes. This cooperation has become a model for global research. Both, as drilling Leg Project Manager and ESSAC Chair, I was also able to work and experience firsthand how science and diplomacy helps to build links between countries and colleagues with different organizational and cultural backgrounds. Another aspect I have valued is the research collaborations and life-long friendships that resulted from working together towards a common research or diplomatic goal, which creates the possibility for discovery and success. I appreciate how international collaboration through ECORD and IODP Expeditions and their research/educational activities have broadened so many personal and professional horizons for scientists. This has helped researchers overcome challenges such as spatial distance and differences of culture, language, and career stage.

I am confident that ECORD and its partners will be able to continue providing the break-through science, which can only be obtained from deep time geological records of our Earth´s history. This research is critical to better understand our present and future earth history.

Robert Gatliff

ESO Chair 2010 - 2018

In 2003 I was appointed Head of Marine & Petroleum Geology at the British Geological Survey where we had an exciting programmeme of industry research consortia, EU projects and our core science programmeme. But in addition, a huge new project had just begun and the ESO team were preparing for Expedition 377: ACEX. What a time! There was a fantastic group of experienced operations and scientific staff ably led by Alistair Skinner and Dan Evans and the office was alive with detailed planning for the three-ship expedition with a great team of specialists from Canada and Sweden, and our partners from Bremen, Leicester, Montpellier and Luxemburg. What an achievement to get ECORD on the map!

My first big IODP meeting was a review of ACEX in Washington, where I met some of the key figures from IODP, including Manik Talwani. Their support for the "new kids on the block" was most welcome as despite the marvellous results there was no shortage of criticism!

Over the next few years, the ESO team evolved, and I contributed more as Chair of ESO as the ACEX pioneers retired and the next generation developed their expertise. It was really stimulating to be in the global discussions about the best science projects and the most effective technologies we could use - from jack-ups and drill ships to sea floor robotic drills, as well as new laboratory techniques.

ECORD is a great partnership and the close links between the ESO partners, and those between EMA and ESO, and the global links with operators and scientists from around the world all helped build a successful programmeme. It was a privilege to work on a truly global project that contributes so much to the geological sciences.

My experience with ECORD:

Alan Stevenson

ESO Outreach Manager 2005 - 2019

My first ECORD experience, within a few days of being appointed ESO Outreach Manager in October 2005, was to attend a meeting in Hachinohe, Japan organized by IODP-MI Communications Director, Nancy Light, and to meet my outreach colleagues from the US, Japan and Europe. There was a lot to learn about the Programmeme - I still have the manuals explaining the many IODP acronyms! The trip included a tour of the *Chikyu*, which had only recently been delivered to JAMSTEC and was so new that we sat on polythene-wrapped chairs during a meeting in the ship's conference room. The report of that meeting, which I produced for ECORD Newsletter #6, was the first outreach report to feature in the Newsletter.

It's fair to say that I didn't have a lot of outreach experience at that stage; my main job was leading the Marine Geoscience team at the British Geological Survey (BGS), and I had several years' experience co-ordinating EC-funded projects involving the geological surveys of Europe. However I was fortunate to have joined an experienced team led by Patricia Maruejol at EMA and Albert Gerdes, Media Relations Manager at ESO, who had been involved in ECORD from the start, covering the successful outreach for the ACEX and Tahiti expeditions.

The next few years were relatively quiet for ESO outreach as there were no MSP operations between early 2006 and mid-2009. However, the period was an opportunity to develop and add to the means of communicating ECORD science to the public and the science community. The team expanded the website and outreach resources, and ECORD Newsletter content was broadened to include reports from all ECORD entities, as well as interviews with MSP Co-chiefs, and contributions from ECORD scientists involved in any of the IODP expeditions. We produced the first video explaining ECORD's contribution to IODP and the Mission-Specific Platform concept. We also implemented a new 'wallpaper' approach to the ECORD booth at EGU using posters to present the activities of the ECORD science community in all aspects of IODP. I'm proud to say that the approach was influenced by my daughter while at BGS on work experience from school, as I gave her the task of designing an eye-catching style of presentation.

I recall the nervous anticipation before my first MSP expedition in 2009, Expedition 313: New Jersey Shallow Shelf. Would the media take an interest and turn up for the Press Conference? When I arrived in Atlantic City, I was pleased to see an article on the front page of a local newspaper explaining why the Liftboat *Kayd* was in port (with its three 75-m legs it was an unusual and obvious feature on the city skyline). After the press event there was an interview with Co-chief Scientist Greg Mountain on the early-evening NBC News, in which ECORD was specifically mentioned, which prompted Catherine Mevel to treat us to a bottle of champagne! But perhaps the best example of outreach was hearing the commentary on a tourist boat in the harbour, explaining that the *Kayd* was taking part in an IODP expedition to the Atlantic margin!

It's difficult to pick out any particular highlights of my time with ECORD. The outreach team participated in meetings of IODP, ECORD Council and the Facility Board, the Industry Liaison Panel, ESSAC, EMA as well as the operational planning for MSPs. We worked with the MSP Co-chiefs and outreach experts at their universities, who assisted us with local media engagement. We also worked closely with the EMA Directors Catherine Mevel and Gilbert Camoin and their teams, so we were in a possibly unique position in having regular contact with all aspects of ECORD. We also benefitted from the links and co-operation with the outreach team from ICDP, led by Thomas Wiersberg, with whom we shared booths at EGU and other conferences.

I greatly enjoyed my participation in ECORD and the opportunity to work with international scientists researching issues of global importance. Congratulations to ECORD on your 20th Anniversary! I wish you every success in the future.

IODP Expedition 302 — Year: 2004

Arctic Coring Expedition - ACEX

Co-chief Scientists	**Jan Backman** (ECORD - Sweden) **Kate Moran** (ECORD - Canada)
	www.ecord.org/expedition302
Expedition Project Manager	**David McInroy**
Vessels	RV *Vidar Viking* (drilling vessel) IB/RV *Oden* (icebreaker) NS *Sovetski Soyuz* (icebreaker)

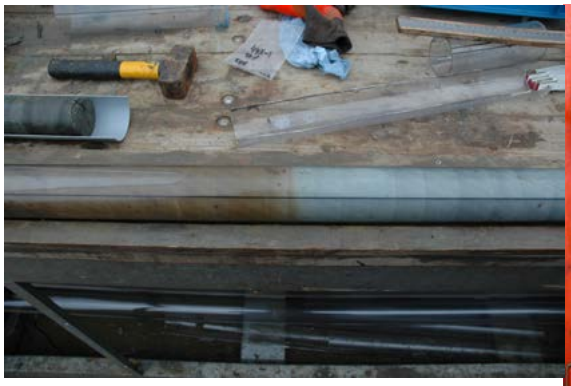
6 boreholes

120 cores

penetration below the seafloor (m)

1288 deepest water depth (m) **428**

- Moving ice
- Three operating vessels, including two ice-breakers
- First long record of sediments from the central Arctic Ocean
- New insights about the Arctic's Cenozoic paleoenvironmental and climatic evolution



Photographs

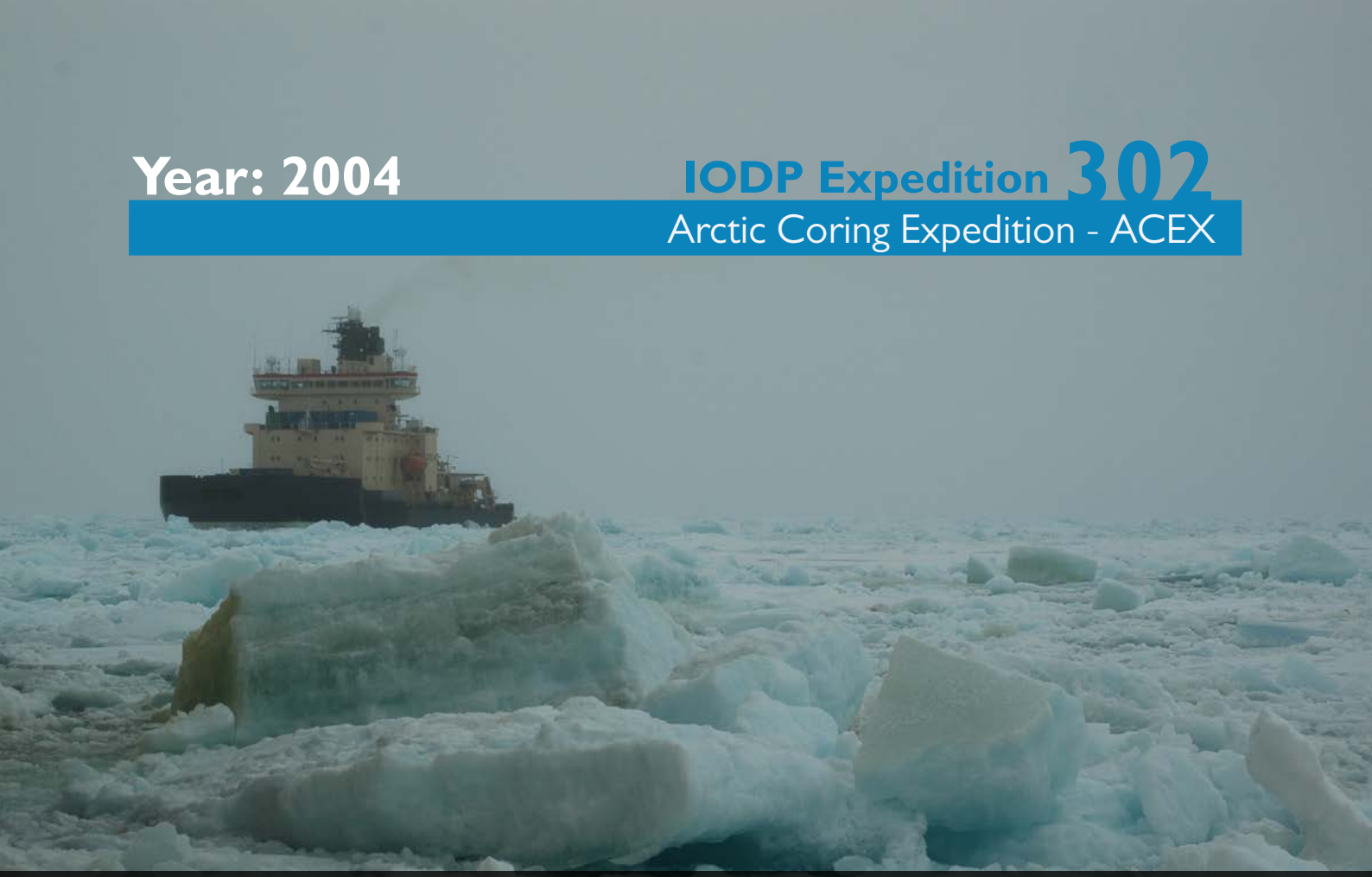
Left: Core section M0002A-44X-1: sharp transition into gray lithologic subunit 1/5. Credit: Jan Backman, ECORD/IODP.

Right: Seacore drillers marking 1 mile of drill string at 320 mbsf. Credit: Kate Moran, ECORD/IODP.

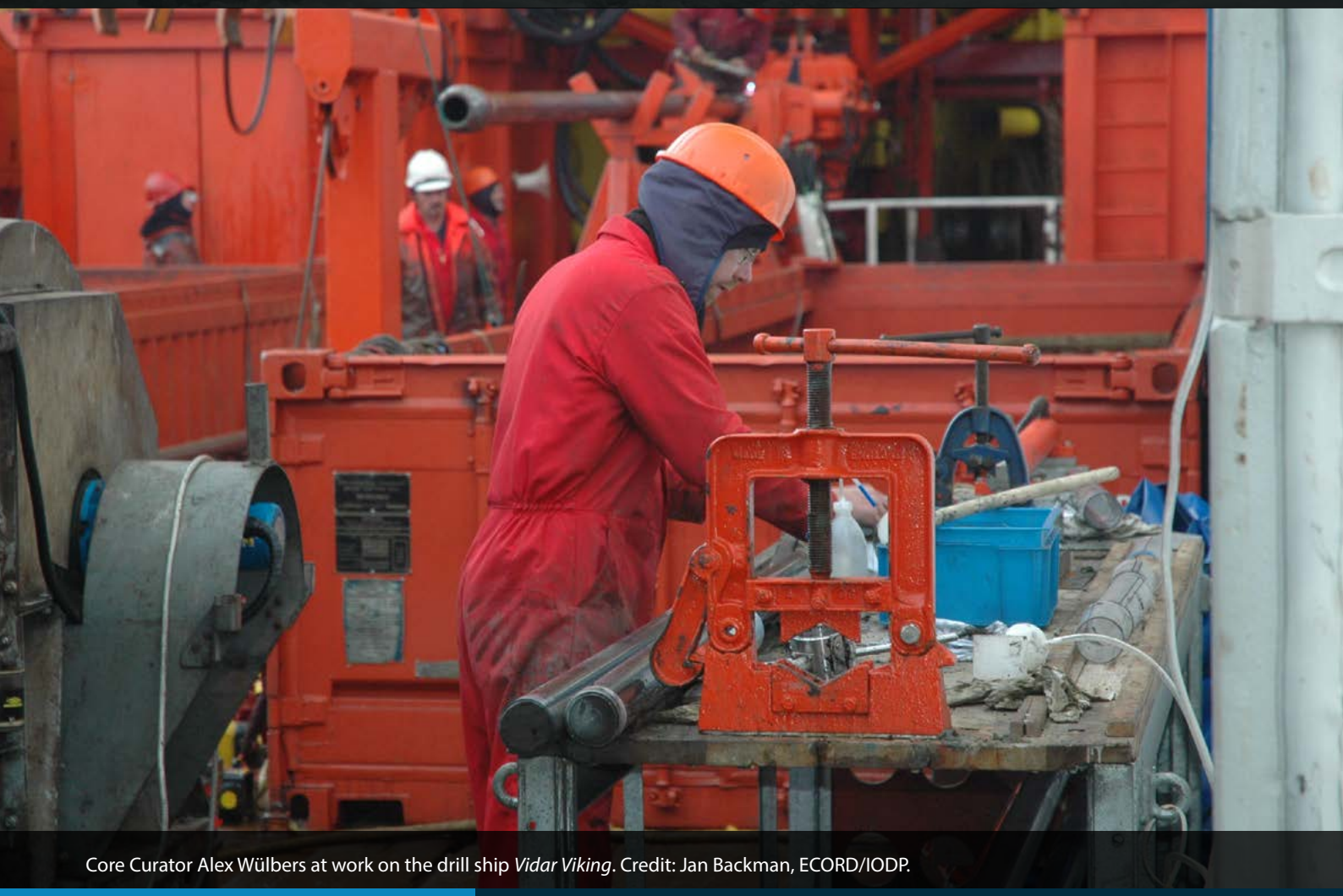
The Arctic Coring Expedition (ACEX, or IODP Expedition 302) provided rare and unique glimpses into Cenozoic Arctic Ocean history based on the 339 m of sediment retrieved from the crest of the Lomonosov Ridge, about 120 km from the North Pole. Logistical challenges of station keeping in m-thick moving sea ice were successfully met during ACEX, proving that drilling and coring are indeed feasible in the central Arctic Ocean using advanced multiship ice management strategies.

Year: 2004

IODP Expedition 302
Arctic Coring Expedition - ACEX



View from drill ship *Vidar Viking*: *Oden* crushing 100+ m ice floes into bergy bits. Credit: Jan Backman, ECORD/IODP.



Core Curator Alex Wülbers at work on the drill ship *Vidar Viking*. Credit: Jan Backman, ECORD/IODP.

IODP Expedition 310 Year: 2005

Tahiti Sea Level

Co-chief Scientists	**Gilbert Camoin** (ECORD - France) **Yasufumi Iryu** (Japan)
	www.ecord.org/expedition310
Expedition Project Manager	**David McInroy**
Vessels	DP *Hunter*

37 boreholes **726** cores

penetration below the seafloor (m)

117 deepest water depth (m) **102**

58% Standard core recovery

92% Effective core recovery

- Shallow-water, environmentally sensitive area
- Most extensive geological research on coral reefs
- Highest recovery in shallow-water carbonates in the history of ocean drilling
- First use of super-slimline logging tools
- Sea-level rise, climate change and reef development during the Last Deglaciation on a volcanic island

I served as one of the co-chief scientists of IODP Expedition 310: Tahiti Sea Level. It was the first expedition targeting coral reef deposits in the history of ocean drilling, beginning with the DSDP. It succeeded in delineating the geohistory of coral reefs in Tahiti for the past 17,00 years. Because I had not expected microbialites to be an essential component of coral reef deposits before the expedition, but I saw them every day during the drilling, which is impressive even now.

Yasufumi Iryu
Expedition 310 Co-chief Scientist

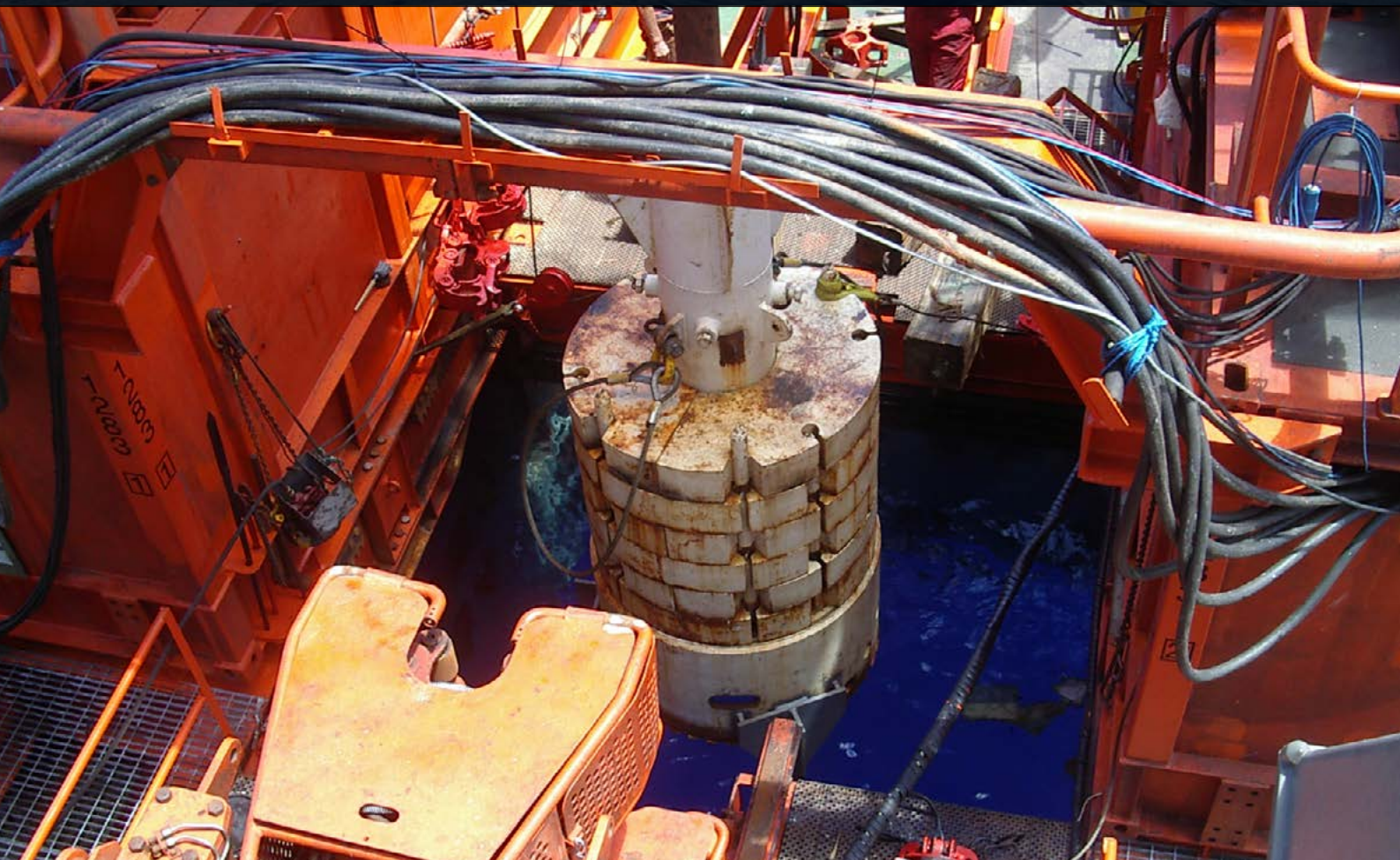
Expedition 310 Co-chief Scientist Gilbert Camoin discussing a freshly drilled core onboard DP *Hunter*. Credit: ECORD/IODP.

Year: 2005

IODP Expedition 310

Tahiti Sea Level

DP *Hunter* offshore Tahiti during IODP Expedition 310. Credit: G. Camoin, ECORD/IODP.



Seabed template to guide the coring string duriing IODP Expedition 310. Credit: G. Camoin, ECORD/IODP.

IODP Expedition 313 — Year: 2009

New Jersey Shallow Shelf

Co-chief Scientists	**Greg Mountain** (USA) **Jean-Noël Proust** (ECORD - France)
	www.ecord.org/expedition313
Expedition Project Manager	**David McInroy**
Vessels	L/B *Kayd* (lift boat)

3 boreholes **612** cores

penetration below the seafloor (m)

35 — **755**

deepest water depth (m)

- Shallow-water drilling
- First use of lift boat in IODP
- Good recovery of unconsolidated and loose shelf deposits
- Ten-million years record (Oligocene-Miocene) of climate and sea-level change on a passive continental margin

Onboard lift boat *Kayd* during IODP Expedition 313. Credit: T. Hayashi, ECORD/IODP.

Year: 2009

IODP Expedition 313
New Jersey Shallow Shelf

Lift boat Kayd during IODP Expedition 313. Credit: C. Cotterill, ECORD/IODP.

Operations during IODP Expedition 313. Credit: H. Otsuka, ECORD/IODP.

IODP Expedition 325 Year: 2010

Great Barrier Reef Environmental Changes

Co-chief Scientists	**Jody Webster** (ANZIC) **Yusuke Yokoyama** (Japan)
	www.ecord.org/expedition313
Expedition Project Manager	**Carol Cotterill**
Vessels	MPSV *Greatship Maya*

34 boreholes **420** cores

penetration below the seafloor (m)

167 deepest water depth (m) **46**

- Shallow-water, environmentally sensitive area
- Sea-level rise, climate change and reef development during the Last Deglaciation on a continental margin

IODP Expedition 325: Great Barrier Reef Environmental Changes was built on a wonderful foundation of innovation and hard work by numerous mentors and colleagues over many years. I remember as a fresh graduate student visiting France with my then supervisor Peter Davies as he and Gilbert Camoin (Co-chief of Expedition 310: Tahiti Sea Level) discussed exciting new plans to submit an IODP proposal (519) to investigate the drowned coral reefs offshore Tahiti and the Great Barrier Reef (GBR). Tahiti was successfully drilled in 2005, but due to a lack of site survey data the GBR drilling was unable to proceed at the time.

Upon returning to Australia following a post doc in the US, my colleagues and I were able to complete the necessary GBR site survey and Expedition 325 drilling was completed in 2010. Through the incredible hard work of the entire Expedition 325 science team and extended collaborators, we have been able to make some fundamental contributions to our understanding of past sea level changes, climate and environmental variations and coral reef responses over the past 30,000 years. From both a professional and personal standpoint, Expedition 325 has been a truly transformative experience. I have made life-long friends and colleagues, and for that I am deeply grateful to IODP and ECORD.

Jody Webster examining freshly drilled core onboard MPSV *Greatship Maya* during IODP Expedition 325. Credit: D. Potts, ECORD/IODP.

Jody Webster
Yusuke Yokoyama
Expedition 325 Co-chief Scientists

Year: 2010

IODP Expedition 325

Great Barrier Reef Environmental Changes

MPSV *Greatship Maya* during IODP Expedition 325. Credit: D. Smith, ECORD/IODP.

Left: Drilling rig of MPSV *Greatship Maya* during IODP Expedition 325. Credit: C. Cotterill, ECORD/IODP.
Right: Fresh core being examined onboard the ship during IODP Expedition 325. Credit: D. Smith, ECORD/IODP.

IODP Expedition 347 Year: 2013

Baltic Sea Paleoenvironment

Co-chief Scientists	**Tomas Andrén** (ECORD - Sweden) **Bo Barker Jørgensen** (ECORD - Denmark)
	www.ecord.org/expedition347
Expedition Project Managers	**Carol Cotterill** (lead) **Sophie Green**
Vessels	MPSV *Greatship Maya*

35 boreholes **798** cores

penetration below the seafloor (m)

233 **437**

deepest water depth (m)

- High recovery by gravity coring
- First microbiology-focused MSP expedition
- Microbial communities and biogeochemical processes in the deep glacial and interglacial deposits
- 140,000-years evolution of the Baltic Sea Basin through the last glacial cycle

Working on freshly recovered core onboard MPSV *Greatship Maya* during IODP Expedition 347.
Credit: T. Andrén, ECORD/IODP.

Year: 2013

IODP Expedition 347

Baltic Sea Paleoenvironment

MPSV *Greatship Maya* during IODP Expedition 347. Credit: D. McInroy, ECORD/IODP.

Onboard MPSV *Greatship Maya* during IODP Expedition 347. Left: Freshly recovered core. Credit: T. Andrén, ECORD/IODP. Right: Co-chief Bo Barker Jørgensen working on data onboard the ship. Credit: T. Andrén, ECORD/IODP.

IODP Expedition 357 Year: 2015

Atlantis Massif Serpentinization and Life

Co-chief Scientists	**Gretchen Früh-Green** (ECORD - Switzerland) **Beth Orcutt** (USA)
	www.ecord.org/expedition357
Expedition Project Managers	**Sophie Green** **Carol Cotterill** (offshore)
Vessels	*RRS James Cook*, seabed drills RD2 and MeBo

17 boreholes **68** cores

penetration below the seafloor (m)

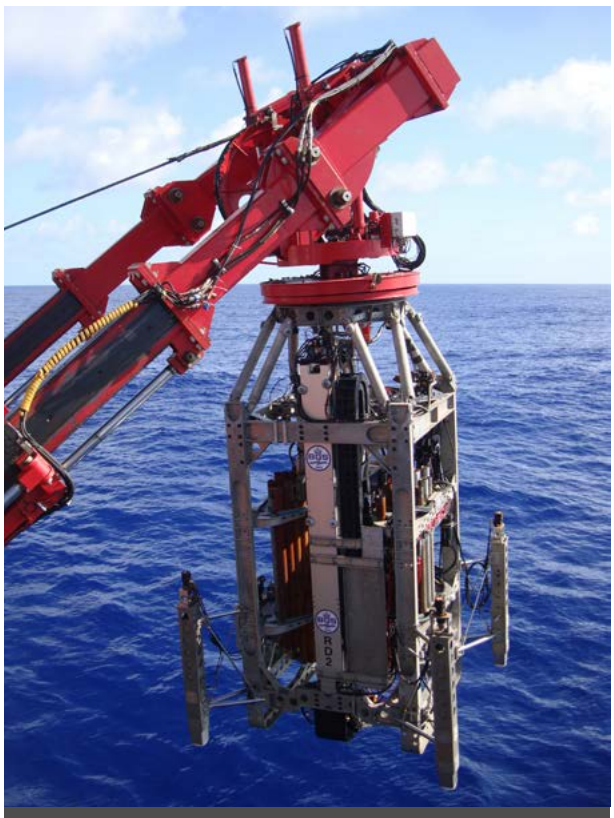
1568 | **16**

deepest water depth (m)

- First use of sea-floor drilling systems
- Development of new logging tools, plugs and sensors for seafloor drills
- Highest recovery in shallow mantle sequences in the history of ocean drilling
- Role of serpentinization in driving hydrothermal systems that sustain microbiological communities in the Atlantic Ocean

One focus of IODP Expedition 357 was to understand the links between serpentinization processes and microbial activity in the shallow subsurface of the Atlantis Massif, an oceanic core complex that hosts the Lost City hydrothermal field. Seabed rock drilling technology was used for the first time to recover ultramafic and mafic rock sequences and fluids along a major detachment fault zone. New technologies developed for the expedition included an in-situ sensor package and water sampling system that documented extensive active serpentinization. Moreover, new technologies enabled collection of pristine samples for microbiological investigation, revealing a low biomass ecosystem that differs from the unique microbial communities observed in the high pH hydrothermal fluids of Lost City.

Gretchen Früh-Green
Beth Orcutt
Expedition 357 Co-chief Scientists



Seabed drills RD2 during IODP Expedition 357.
Credit: D. Smith, ECORD/IODP.

Year: 2015

IODP Expedition 357

Atlantis Massif Serpentinization and Life

Participants of Onshore Science Party on IODP Expedition 357, Bremen, Germany. Credit: V. Diekamp, MARUM, ECORD/IODP.

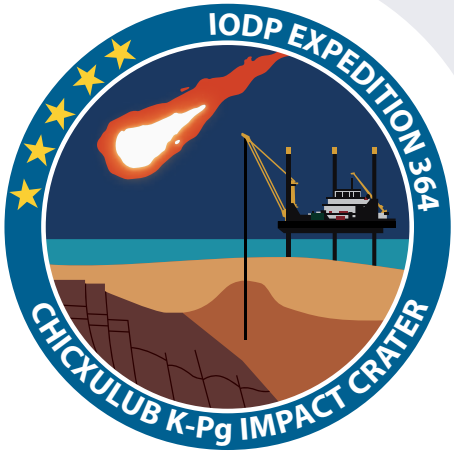
MPSV *Greatship Maya* during IODP Expedition 347.
Credit: D. McInroy, ECORD/IODP.

A core split into halves during Onshore Science Party on IODP Expedition 357, Bremen Core Repository, Germany.
Credit: D. Weis, ECORD/IODP.

Sampling cores from IODP Expedition 357 during Onshore Science Party in Bremen Core Repository, Germany. Credit: T. Andrén, ECORD/IODP.

IODP Expedition 364 Year: 2016

Chicxulub Impact Crater



Co-chief Scientists	**Joanna Morgan** (ECORD - UK) **Sean Gulick** (USA)
	www.ecord.org/expedition364
Expedition Project Managers	**Claire Mellett** (lead) **Sophie Green** **Gareth Carter**
Vessels	*L/B Myrtle* (lift boat)

1 borehole **303** cores

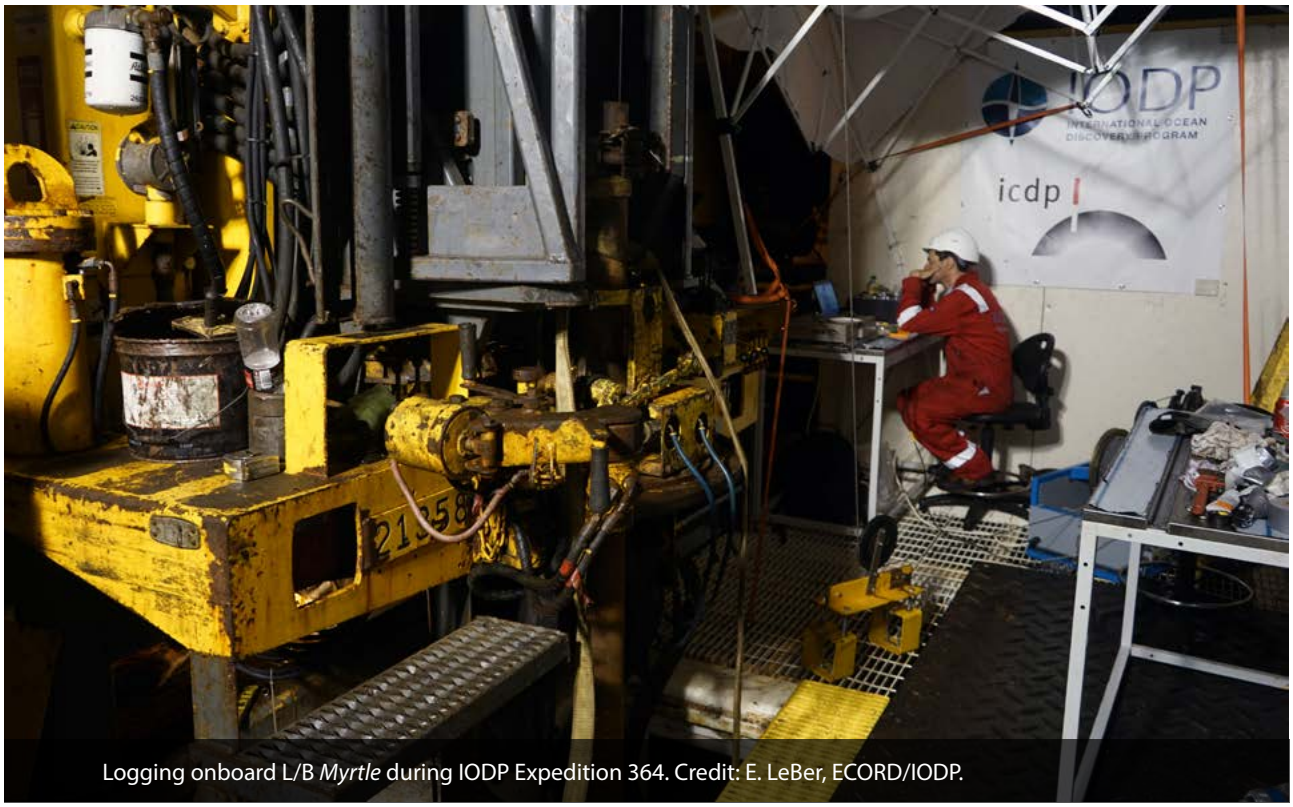
penetration below the seafloor (m)

19.8 | **1335**

deepest water depth (m)

100% Core recovery

- Shallowest water drilling in the history of ocean drilling
- Maximum recovery and deepest MSP penetration using shore-based mining technology
- Collaboration with ICDP
- Mass extinction 65 million years ago and life recovery after an asteroid impact
- Continuous lithological record, including the Cenozoic post-impact infill, tsunami deposits, breccia, and basement rocks



Logging onboard L/B *Myrtle* during IODP Expedition 364. Credit: E. LeBer, ECORD/IODP.

Year: 2016

IODP Expedition 364
Chicxulub Impact Crater

L/B *Myrtle* during IODP Expedition 364. Credit: P. Cruz, ECORD/IODP.

Left: Drilling rig of L/B *Myrtle* at night. Credit: E. Le ber, ECORD/IODP.
Right: Freshly recovered core section onboard L/B *Myrtle*. Credit: D. Smith, ECORD/IODP.

IODP Expedition 381 | Year: 2016

Corinth Active Rift Development

Co-chief Scientists	**Lisa McNeill** (ECORD - UK) **Donna Shillington** (USA)
	www.ecord.org/expedition381
Expedition Project Managers	**Gareth Carter** (lead) **Jeremy Everest**
Vessels	D/V *Fugro Synergy*

4 boreholes **500** cores

penetration below the seafloor (m)

864 deepest water depth (m) **705**

86% Core recovery

- First use of a Seadevil template
- Longest and highest resolution Quaternary record of sediment flux and paleoenvironmental changes in an active rift system
- Geohazards and tectonic processes initiating ocean basins
- Recent climate history of the Eastern Mediterranean Sea

Drilling operations onboard D/V *Fugro Synergy* during IODP Expedition 381. Credit: P. Robert, ECORD/IODP.

Year: 2016

IODP Expedition 381
Corinth Active Rift Development

D/V *Fugro Synergy* during IODP Expedition 381. Credit: J. Everest, ECORD/IODP.

Left: Main street onboard D/V *Fugro Synergy* during IODP Expedition 381. Right: Freshly recovered core section. Credits: J. Everest, ECORD/IODP.

IODP Expedition 386 Year: 2021

Japan Trench Paleoseismology

Co-chief Scientists	**Michi Strasser** (ECORD - Austria) **Ken Ikehara** (Japan)
	www.ecord.org/expedition386
Expedition Project Manager	**Jeremy Everest**
Vessels	R/V *Kaimei* (offshore), D/V *Chikyu* (onshore)

58 boreholes **58** cores

8023 deepest water depth (m)

penetration below the seafloor (m) **1239**

88% Core recovery

- First giant piston coring expedition in the history of ocean drilling programmemes
- Deepest water depth
- First expedition jointly implemented by two IODP operators
- Long history of giant earthquakes off Japan

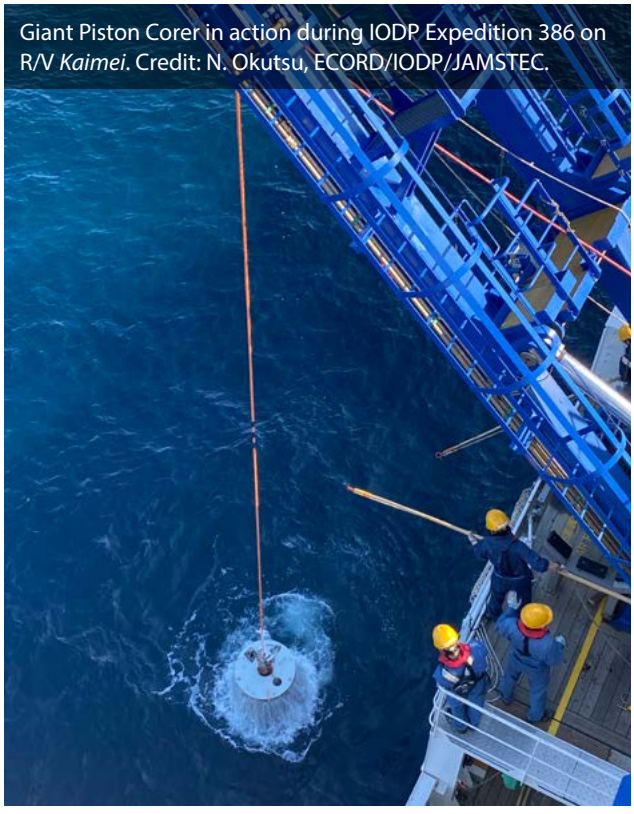
IODP Expedition 386 was…

- **the first** research expedition to perform high-temporal and high spatial resolution investigation and sampling of a hadal oceanic trench, that form the deepest and least explored environments on our plant, but contain excellent sedimentary archives of megathrust ruptures to reconstruct the long-term history of giant subduction zone earthquakes and tsunamis.

- **the first** use of a Giant Piston Coring System for an IODP expedition, with all the technical and methodological modifications in curatorial, logging and core analyses procedures and standard operational procedures that guarantees quality-controlled and quality-assured data and sample availably that will be made openly available to the international science community.

- **the first** collaborative operation between IODP operators, with the European Consortium for Ocean Research Drilling (ECORD) and the Japan Agency of Marine-Earth Science and Technology (JAMSTEC) jointly working together to make the expedition a success;

Michi Strasser
Ken Ikehara
Expedition 386 Co-chief Scientists



Giant Piston Corer in action during IODP Expedition 386 on R/V *Kaimei*. Credit: N. Okutsu, ECORD/IODP/JAMSTEC.

Year: 2021

IODP Expedition 386
Japan Trench Paleoseismology

Freshly recovered cores onboard *Kaimei* during IODP Expedition 386. Credit: N. Okutsu, ECORD/IODP/JAMSTEC.

Top: R/V Kaimei. Bottom: D/V Chikyu.
Credit: JAMSTEC.

Co-chief Scientists onboard *Chikyu* during Personal Sampling Party.
Credits: P. Bellanova, ECORD/IODP/JAMSTEC.

IODP Expedition 389 — Year: 2023

Hawaiian Drowned Reefs

Co-chief Scientists	**Jody Webster** (ANZIC) **Christina Ravelo** USA)
	www.ecord.org/expedition389
Expedition Project Managers	**Hannah Grant** (lead) **Margaret Stewart**
Vessel and drilling system	TBD

- Environmentally sensitive area
- 500,000-year record of sea-level, climate change and reef development

IODP Expedition 406 — Year: 2024

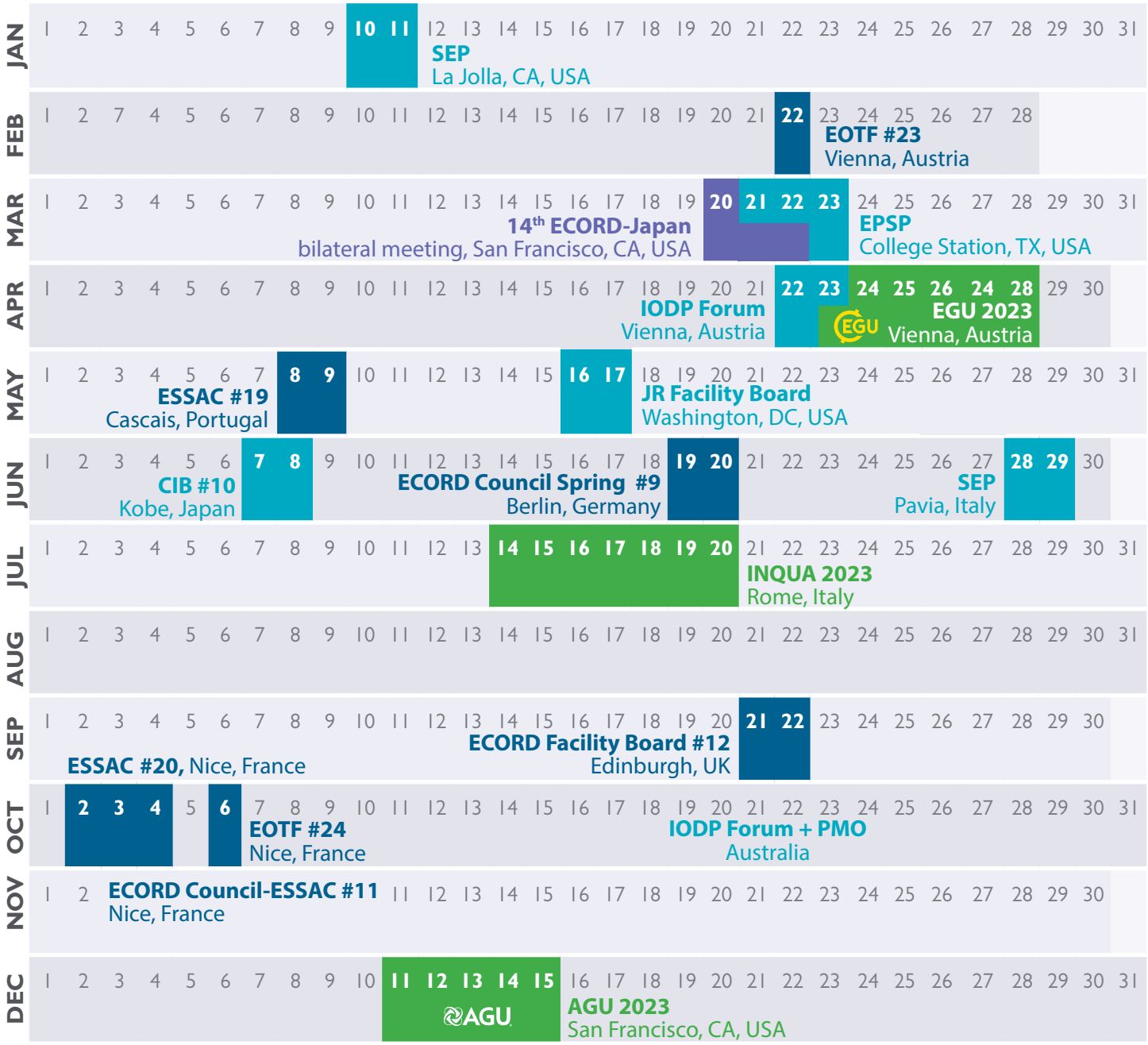
New England Shelf Hydrogeology

Co-chief Scientists	**TBD**
	www.ecord.org/expedition406
Expedition Project Manager	**TBD**
Drilling platform	TBD

- Reconstructing rates, directions and mechanisms of groundwater flow and chemical fluxes in continental shelf environments

View from R/V *Kaimei* during IODP Expedition 386. Credits: N. Okutsu, ECORD/IODP/JAMSTEC.

ECORD / IODP meetings and conferences **2023** calendar



ECORD meetings | IODP meetings | bilateral meetings | International conferences

Figure summarizing the ECORD and IODP meetings that have been held in 2022, as well as the two major conferences (EGU and AGU) where IODP-related scientific sessions and booths have been organised.

Acronyms:
AGU - American Geophysical Union, CIB - *Chikyu* IODP Board, EFB - ECORD Facility Board, EGU - European Geosciences Union, EOTF - ECORD Outreach Task Force, EPSP - Environmental Protection and Safety Panel, INQUA - International Union for Quaternary Research, JRFB - *JOIDES Resolution* Facility Board, SEP - Science Evaluation Panel.

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

ECORD European Consortium for Ocean Research Drilling

IODP International Ocean Discovery Program

IODP expeditions in 2023

- 11 December - 10 February: JR Expedition 398: Hellenic Arc Volcanic Field
- 12 April - 12 June: JR Expedition 399: Building Blocks of Life, Atlantis Massif
- 12 June - 12 August: JR Expedition 395: Reykjanes Mantle Convection and Climate
- 12 August - 12 October: JR Expedition 400: NW Greenland Glaciated Margin
- August-October: MSP Expedition 389: Hawaiian Drowned Reefs

ECORD Summer Schools and Training Course in 2023

- 13-17 March: The Shipboard Simulation Experience, Bremen, Germany
- 6-22 July: 18th ECORD Urbino Summer School in Paleoclimatology, Urbino, Italy
- 22-28 July: 7th ECORD Summer School on Downhole Logging for IODP Science, Leicester, UK
- 4-15 September: 15th ECORD Bremen Summer School on "From Greenhouse to Icehouse - The Cenozoic Arctic Ocean and (global) climate history", Bremen, Germany

MagellanPlus workshops in 2023

- 11-13 January: CenoStore, Belfast, UK
- 1-3 March: MAREXKUS, Rome, Italy
- 3-6 July: MANTLE-L2S, Plymouth, UK

Workshops and colloquia in 2023

- 17, 19 and 26 January: ESSAC and J-DESC Workshop: Future of Scientific Ocean Drilling, virtual
- 21-23 July: ICDP in the Second Quarter of its First Century, Potsdam, Germany
- 29-30 November: IODP France Days, Paris, France

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2023 ECORD Member Countries

Austria	1	Österreichische Akademie der Wissenschaften (ÖAW)
Canada	2	Canadian Consortium for Ocean Drilling (CCOD)
Denmark	3	Danish Agency for Science and Higher Education (DAFSHE)
Finland	4	Suomen Akatemia
France	5	Centre National de la Recherche Scientifique (CNRS)
Germany	6	Deutsche Forschungsgemeinschaft (DFG)
Ireland	7	The Geological Survey of Ireland (GSI)
Italy	8	Consiglio Nazionale delle Ricerche (CNR)
Netherlands	9	Nederlandse Organisatie voor Wetenschappelijk Onderzoek (NWO)
Norway	10	Forskningsrådet
Portugal	11	Fundação para a Ciência e a Tecnologia (FCT)
Spain	12	Ministerio de Economía y Competitividad (MINECO)
Sweden	13	Vetenskapsrådet (VR)
Switzerland	14	Fonds National Suisse de la Recherche Scientifique (FNS)
United Kingdom	15	United Kingdom Research and Innovation (UKRI)

ECORD
European Consortium for Ocean Research Drilling

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