

International Continental Scientific Drilling Program ICDP

Current status as of January 2018

ICDP Project Schedule 2017/2018

ICDP Projects accomplished in 2017

- Drilling the Cretaceous Basin in Songliao, China (CCSD-SK)
- Iceland Deep Drilling Program (IDDP-2)
- Probing Reservoir Triggered Earthquakes at Koyna, India (DEEPAK)
- A New Drill Core at Surtsey Volcano (SUSTAIN)

Currently operating ICDP Projects

- Oman Ophiolite Drilling Project (OMAN)
- Drilling into Seismogenic Zones of M2.0 – M5.5 earthquakes in deep South African gold mines (DSEIS)

Upcoming ICDP Projects

- Drilling the Eger Rift
- Drilling Overdeepened Alpine Valleys (DOVE)
- Jurassic Earth System and Timescale (JET)

Workshops

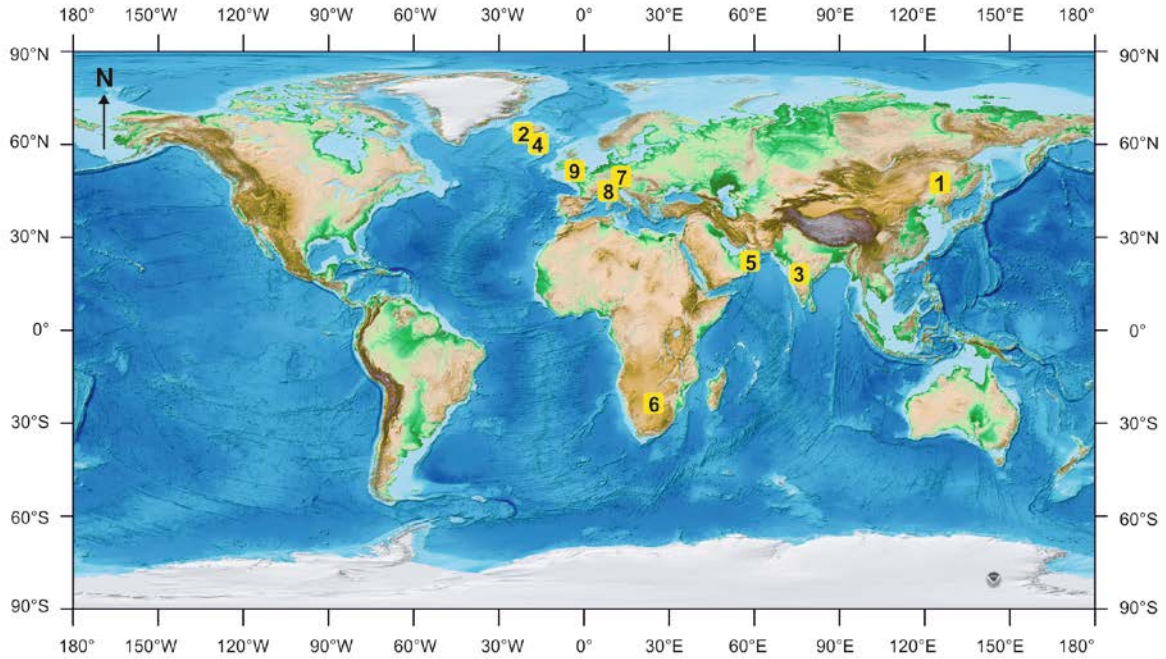
ICDP Outreach and Training Activities

Proposal Submissions 2017

Roadmap for Operational Support in the International Continental Scientific Drilling Program: Plan for 2017–2022

ICDP Profile

ICDP Project Schedule 2017/2018



ICDP Operations accomplished 2017

1	Songliao Basin	Apr. 2014 – Dec. 2017	Songliao Basin, China
2	Iceland Deep Drilling Program	Aug. 2016-Jan. 2017	Reykjanes Peninsula, Iceland
3	Koyna	Dec. 2016-June 2017	Maharashtra State, India
4	SUSTAIN	July-Sep. 2017	Surtsey, Iceland

Currently operating ICDP projects

5	Oman	Dec. 2016-May 2018	Oman
6	DSEIS	June 2017-March 2018	Orkney, South Africa

ICDP Projects scheduled for 2018

7	Eger Rift	Aug. 2018-Feb. 2019	Czech Republic
8	DOVE	Sept. 2018-May 2019	Alpine Valleys
9	JET	Nov. 2018-March 2019	Mochras, Wales (UK)

ICDP Projects accomplished in 2017

Drilling the Cretaceous Basin in Songliao, China (DPCSB, CCSD-SK)

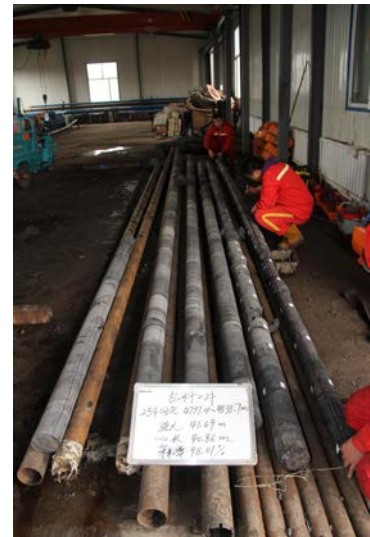


DPCSB conducted scientific drilling in the Cretaceous Songliao Basin, Northeast China to recover an unprecedented extended Cretaceous terrestrial sedimentary record. The borehole SK-II of the DPCSB project obtained about 4500 m cores of the Huoshiling to Quantou (early Cretaceous) Formations, which are combined with the cores from the boreholes SK-I(n) and SK-I(s) to form the first nearly complete Cretaceous terrestrial sedimentary record in the world at one location. This provides an excellent high-resolution terrestrial climate and environmental record for the Cretaceous. Core studies provide unique opportunities for the geosciences community to understand the response of the terrestrial environment to geological events related to the carbon cycle and greenhouse climate change during Cretaceous, which would be of help to inform our understanding of modern global warming. Spud in of SK-II was on April 13, 2014 using the new Chinese rig “Crust-I” with 10 km depth capacity. On-site facilities include an engineering center and an on-site core repository equipped with state-of-the-art instrumentation for core analysis. All retrieved core is being split in three shares for an archive third, and two sampling shares, one reserved for internal Chinese investigations and the other for the international community.

The engineers of this project developed a new coring tool with 311 mm outer diameter to retrieve cores of 214 mm diameter without reaming. This instrument has been deployed since April 2015 from 2865 to 4500 m depth and produced up to 41.7 m long single cores. It is the first time that a 311 mm diameter drilling tool is used for continuous coring in the history of deep drilling. By December 2017, SK-II has reached 6326 m depth and thus is the deepest hole ever drilled under ICDP auspices.

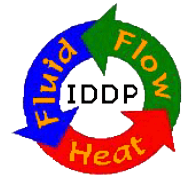


Crust-I, the new Chinese drill rig with 10 km depth capacity. Photo source: Qingtian Lu



New world record in drilling: 41.7 m core with 214 mm diameter in one run. Photo source: Qingtian Lu

Iceland Deep Drilling Project (IDDP-2)



The Iceland Deep Drilling Project (IDDP) is a long-term program by an industry-science-government consortium aimed at investigating very high temperature, supercritical geothermal systems as a way of improving the economics of geothermal energy production. A feasibility study indicated that a well tapping naturally occurring supercritical fluids would produce a power output an order of magnitude greater than that from a 300 °C geothermal well. However reaching a supercritical geothermal reservoir requires drilling to depths of 4 to 5 km, with temperatures in the range of 450-600 °C. In 2009 the well IDDP-1 was drilled to test this concept at Krafla in NE Iceland, planned to reach 4.5 km depth. Drilling had to be terminated at only 2.1 km depth when 900 °C rhyolitic magma was encountered. The borehole was completed as a subcritical well producing steam from the contact zone of the intrusion but casing and cementation were too unstable to maintain the well open for a power production.

IDDP-2 well drilling for supercritical fluids from at least 4.5 km depth started in August 2016 on the Reykjanes Peninsula in SW Iceland on the landward extension of the Mid-Atlantic Ridge and lasted until January 2017. The hydrothermal fluid in the Reykjanes geothermal field is modified seawater, thus this deep well will be the first opportunity worldwide to sample the root zone of a magma-hydrothermal system similar to those that are the sources of the black smokers on the planet-encircling mid-ocean ridges. The hole reached a depth of 4626 m and nine coring runs have been performed producing four drill cores for research. High-temperature geophysical downhole logging confirmed the presence of supercritical fluids with bottom hole temperature of 427 °C and fluid pressure of 34 MPa.



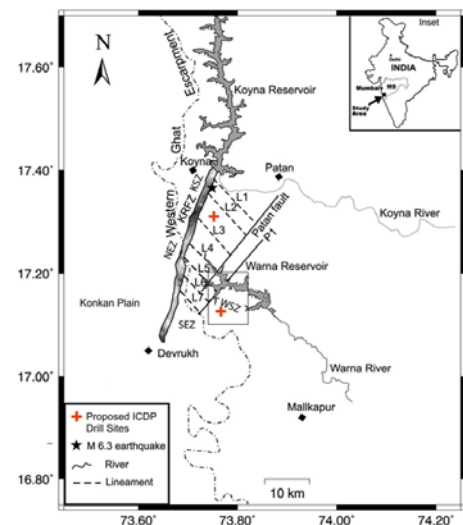
IDDP-2 drill rig near Reykjanes, Iceland. Photo source: Thomas Wiersberg



Deep Drilling at Koyna, India (DEEPAK)

The Koyna Dam area located close to the west coast of India atop the rainy Western Ghats is the most outstanding example of Reservoir Triggered Seismicity (RTS), where mankind-induced events occur in an area of 20x30 km² since the impoundment of Shivajisagar Lake in 1962. Seismic events include the largest triggered earthquake of M≈6.3 on Dec 10, 1967, 22 earthquakes of M>5, about 200 earthquakes of M≈4, and several thousand smaller earthquakes since 1962. The earthquake frequency increases every year following the monsoon rains in the months of June and July; almost every year one or more M≈4 earthquakes occur. There is no other source of seismic activity within 50 km of the Koyna Dam. The Koyna-Warna basement rock consists of Precambrian granitoids and gneisses, overlain by Deccan Traps erupted during the latest Cretaceous.

Nine observation boreholes spanning a depth range of 906 – 1522 m have been drilled in the Koyna-Warna region between 2012 and 2014 to retrieve detailed information on geology, physical properties of rocks, and heat flow prior to deep drilling. Spud-in of the Koyna Fault Drilling (KFD) pilot borehole KFD-1 was on 23 December 2016; the well was completed on 11 June 2017 at a final depth of 3014 m. The hole has been investigated by geophysical downhole logging. Drill cores have been obtained from seven intervals between 1679 and 2911 m and hydrofrac experiments have been conducted at nine depths between 1600 m and 2400 m. An international post-operational workshop was held in Pune from October 13-16, 2017 to summarize the achievements from KFD-1 so far and discuss the next steps.



Koyna site (left) and map of the target area of the ICDP Project “Probing Reservoir Triggered Earthquakes at Koyna, India through Scientific Deep Drilling: Pilot Hole Phase”. The recently drilled hole is northbound. Photo source: Thomas Wiersberg

Surtsey Underwater volcanic System for Thermophiles, Alteration processes and INnovative concretes (SUSTAIN, Iceland)



The SUSTAIN project retrieved core from the isolated oceanic island and UNESCO World Heritage site that is a uniquely well-documented natural laboratory for investigating processes of rift zone volcanism, hydrothermal alteration and biological colonization of basaltic tephra, and development of industrial resources using palagonitic tuff as a prototype for sustainable, high-performance concretes.

The drilling operation began on 24 July, 2017 with the arrival of the advance crew on Surtsey. The Coast Guard boat and helicopter mobilization was on 28-30 July. During the entire run time of the project extensive precautions were taken to avoid contamination of the borehole from nonlocal biological input. The drilling operation ended with the final demobilization with Coast Guard boat and helicopter on 10 September. Two vertical holes, ≈ 150 and ≈ 192 m deep, and one deviated hole (length ≈ 354 m angled, 290 m true vertical depth) have been drilled. The first core was obtained on 10 August 2017. The hole intersects the well-cemented tuff of Surtsey's hydrothermal system, and runs into the deeper deposits of the volcano below 160 m depth. Nearly 100% of consolidated tuff all the way down to 180 m was recovered, which was the final depth of the first hole drilled in 1979. After drilling, the 192 m hole was cased with anodized aluminum casing, a "Surtsey Subsurface Observatory" was installed in one hole for long-term monitoring and in-situ experiments to explore pore water chemistry, microbiota-water-rock interactions and seawater compositional modifications over time. The deviated hole reached at 343 m the feeder dike of Surtur (eastern crater). The final meter of core was a lapilli tuff, indicating the hole traversed the dike.

SUSTAIN was the first project to sample microbial colonization of tephra, together with its pore water, through a neo-volcanic island from the surface to the seafloor. The unique and distinguishing feature of this drilling program was to apply and comprise uniquely volcanologic, geochemical, mineralogical, microbiological and geoarchaeological perspectives to create a new diagenetic and biogenetic paradigm for pyroclastic rock concretes with cation-exchange properties, and also studying long term societal benefits for human and earth ecology.



Drillers Steve Cole, Justin Blouin, AJ Vecchiarelli, Beau Marshall, and Matt Lyon hold the last core of the SUSTAIN drilling operation. Photo source: <https://surtsey50years.utah.edu>

Currently operating ICDP projects

The Oman Ophiolite Drilling Project



The Samail ophiolite in Oman is the world's largest, best-exposed, and most-studied subaerial block of oceanic crust and upper mantle. Observations of mantle peridotites overlying the subduction zone thrust, which carried the ophiolite onto the Arabian continental margin, reveals an unexpected reservoir of carbon, derived from subducted sediments and precipitated as carbonate minerals in the mantle wedge. This could form an important, hitherto unrecognized part of the global carbon cycle. Following ground-breaking work in the 1980's, there has been a recent surge of interest in the Samail ophiolite as the ideal site for studying the weathering of mantle peridotite, which appears to be associated with the subsurface biosphere, thereby fueling microbial catalysis of low temperature alteration reactions. Such studies will contribute to understanding microbial ecosystems in extreme environments and the origin of life on Earth and possibly other planets. Drilling provides key data on the processes of melt extraction from the mantle, igneous accretion of oceanic crust, and hydrothermal modification of that crust. Drilling will also investigate present day alteration processes, their relationship to the deep biosphere, and their potential for accelerating carbon capture and storage via in-situ mineral carbonation and is planned at four sites at the southeast end of the Samail Ophiolite Complex, near to Muscat.



Oman drill site (left) and scientists from the Oman shipboards science party in front of D/V Chikyu (right). Photo sources: OmanDrillProj on Twitter (left), omandrillingproject on Facebook (right)

Phase 1 drilling operations started on December 24, 2016. 12 holes have been drilled with a total length of 3670.0 m and 2319.73 m core were obtained during Phase 1. Phase 1 core description took place from 15th July to 15th September on board the Drilling Vessel Chikyu, while she was docked in Japan. The shipboard science party of 67, including six Omani trainees, performed detailed, IODP-standard logging of 1500m of core from 15th July to 15th September 2017. Oman Phase 2 drilling started in November 2017 and is currently underway.

Drilling Seismologic Zones in Deep South African Gold Mines (DSEIS)



DSEIS drills up to 40 boreholes in South African gold mines into and around seismogenic zones to study the rupture details and scaling of both small (M 2.0) and larger (M 5.5) earthquakes. Several times a year, small mining-induced earthquakes occur only a few tens of meters from active workings in South African gold mines at depths of up to 3.4 km. The source regions of these events will be accessed with short boreholes from the deep mines. The largest event (M 5.5) recorded in a mining region, took place near Orkney, South Africa on 5 August 2014, with the upper edge of the activated fault being several hundred meters below the nearest mine workings (3.0 km depth). Post-drilling measurements and local sensitive monitoring network is elucidating changing rock and fluid properties. In-situ monitoring and sampling enables geomicrobiologists to discuss the relationship between physical properties of active faults and deep biosphere activities.

A first attempt of coring the source area of this earthquake from the MOAB gold mine reached 817 m with excellent core quality. However, the drilling failed to penetrate into the fault zone. A second borehole with a slightly different angle is currently underway. This hole shall enable important near-field seismological observations, as well as a rare opportunity to study the generation of H₂ that may serve as energy source for microbiological activity.

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Near the bottom of the Moab Khotsoeng gold mine in South Africa, scientists aim to drill to the site of a recent earthquake. HIROSHI OGASAWARA

Deep in a South African gold mine, scientists drill for the heart of an earthquake

By Paul Voosen | May 31, 2017, 11:00 AM

A Science article reports on DSEIS drilling (<http://www.sciencemag.org/news/2017/05/deep-south-african-gold-mine-scientists-drill-heart-earthquake>).

ICDP Operations scheduled for 2018

Drilling the Eger Rift

The Bohemian Massif (500-250 Ma), the easternmost part of the Variscan orogenic belt, is one of the largest stable outcrops of pre-Permian rocks in Central and Western Europe. This region has persistent geodynamic activity that is clearly linked to the upper mantle, and offers a globally unique location for studying intra-continental earthquake swarm (ES) seismicity in combination with deep crust and mantle degassing as well as their interaction with the deep biosphere. The main questions regarding seismicity, microbial life and origin, and heat flow are all linked by the common questions of fluid flow, pathways, and composition. The ICDP project 'Drilling the Eger Rift' aims to develop the most modern, comprehensive laboratory at depth worldwide for the study of ES, crustal fluid flow, mantle-derived CO₂ and He degassing, and processes of the deep biosphere. In order to reach a new level of high-frequency, near source, and multi-parameter observation of ES and related phenomena, such a laboratory will comprise of a high-frequency 3D seismic array with a set of four shallow boreholes, combined with modern continuous real-time fluid monitoring at depth (the shallow boreholes) and the study of deep biosphere. From the microbiological viewpoint active fault zones could be seen as Hot Spots of microbial life in the deep subsurface compared to other continental deep biosphere ecosystems due to an intensified substrate support by the CO₂-dominated fluid flow. Therefore active fault zones provide unique conditions for studying microbial life at depths, which can only be done in situ. The regular occurrence of persistent ES with known radiation effects offers the unique possibility to design and tune a borehole-based monitoring network for optimized analysis of the high frequency content of weak swarm-like seismicity, which appears clearly related to fluid-flow in the crust between 5 and 10 km depth. A 108.50 m deep pilot hole was drilled in spring 2016 to study the impact of CO₂-rich mantle-derived fluids on the geo-bio interaction.

Drilling Overdeepened Alpine Valleys (DOVE)

The DOVE project is planning to drill a series of drill holes along and across the Alps into overdeepened valleys all the way to bedrock, in order to answer key questions on the timing and extent of past Alpine glaciations, how atmospheric circulation patterns affect the ice build-up along and across the Alps, and how mountain ranges and their foreland shaped by repetitive glaciations. In addition, overdeepened valley fills act as crucial players in natural hazard assessments, as they are influenced by a variety of mass movements and, moreover, they represent areas of high seismic risks related to their unfavorable seismic site effects. Drilling these deposits, paired with geophysical explorations and drill-hole instrumentation, will provide the means to evaluate the potential of the valley fills to serve as drinking water resources and to quantify the mentioned hazards. The drilling strategy is to perform a drilling transect with drill sites in France, Switzerland, Austria, Italy, Germany, and Slovenia.

Two of these sites will be drilled in Switzerland and Germany in 2018 with ICDP support as a proof on concept study to determine if datable material can be recovered and if proxy data for paleo-environmental interpretations can be established.

Jurassic Earth system and Timescale (JET)

The major goal for this ICDP project is to produce a new global standard for the Early Jurassic Epoch, a time of extreme environmental change, by re-drilling a 45-year-old borehole at the Mochras Farm on the coast of Cardigan Bay, Wales, and developing an integrated timescale and stratigraphy for the cored material. Through the Early Jurassic there are well-documented examples of rapid transitions from cold, or even glacial climates, through to super-greenhouse events, the latter characterized worldwide by hugely enhanced organic carbon burial, multiple large-magnitude isotopic anomalies, global sea-level changes, and mass extinctions. These events not only reflect changes in the global climate system but are also thought to have had significant influence on the evolution of Jurassic marine and terrestrial biota. Furthermore, the events may serve as comparators for present-day and future environmental transitions. The new datasets will be applied to understand fundamental questions about the long- and short-term evolution of the Earth System. Drilling of a 2 km deep well will be executed during winter 2018/2019.

Workshops

ICDP funds workshops to support a group of international scientists with an outstanding scientific theme of socio-economic relevance that requires drilling. The workshops serve to form a broad and competent Science Team and to develop full drilling proposals to ICDP and other co-funding agencies or industry. ICDP also supports post-drilling workshops after completion of the operative work and basic core/sample description for e.g. discussing of initial results and execution of a sampling party. Over the past years, ICDP supported the conduction of workshops with a broad topical spectrum addressing either future drilling projects or thematic issues.

Workshops 2017	Date and Venue	Participants	Countries
Scientific Exploration of Induced Seismicity and Stress (SEISMS)	March 28-31, 2017 Lamont-Doherty Earth Observatory, New York, USA	86	10
Drilling the Ivrea-Verbano zone (DIVE)	May 1-5, 2017 Baveno, Italy	47	9
Newberry Deep Drilling Project (NDDP)	September 10-14, 2017 Bend, Oregon, USA	60	10
Archean Shallow-Water Environments: Moodies Group, Barberton Greenstone Belt, South Africa	October 5 - 10, 2017 Barberton, South Africa	60	14
Post-Operational International Workshop on Deep Scientific Drilling at Koyna, India	October 13-16 Pune, India	67	10
Forthcoming Workshops			
Drilling Lake Nam Co, Tibetan Plateau	May 22-24, 2018 Beijing, China	Call was closed on Jan. 15	-
Drilling Investigation of Seismogenic Crust in Oklahoma (DISCO)	May 3-5, 2018 Norman, Oklahoma, USA	Call is open until Feb. 16	-

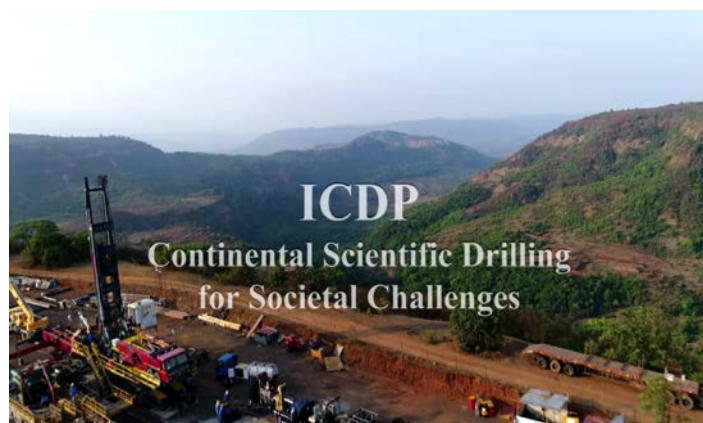
ICDP Outreach and Education Activities

Publications



Issues 22 and 23 of the IODP-ICDP program journal SCIENTIFIC DRILLING were published by Copernicus Publications in May resp. November 2017. SD 22 includes one Science report, one Progress report, two Technical Developments, and two Workshop Reports. SD 23 comprises two science reports, two Technical Developments, and two Workshop Reports.

ICDP Image Video



The 4:07 minutes long ICDP Image Video is intended to inform the interested public and ICDP stakeholders on how ICDP projects addresses the topics Climate and Ecosystems, Sustainable Georesources and Natural Hazards, and how ICDP operational support and knowledge transfer works. The ICDP Image Video was released on December 11, 2017, and premiered at the ICDP-CSDCO Town Hall Meeting in New Orleans.

<https://www.youtube.com/watch?v=v3-9kSsxkrU>

ICDP Best Practice Brochure (ICDP Primer)



The Operational Support Group has summarized its expertise on preparing and conducting a scientific drilling project in the so-called ICDP Primer. A new edition of this brochure was published in September 2017. This third edition contains two completely new chapters (*Dealing with Media* and *Core Correlation using Corelyzer, Correlator and the DIS*). Other chapters, in particular *Site Selection and Presite Surveys* and *Downhole Logging*, were updated.

ICDP Training Course

The annual ICDP Training Courses on continental scientific drilling was held at the KTB Geocenter in Windischeschenbach from November 5-10. 30 Participants from 14 countries, including Namibia, Brazil, China, Japan, Costa Rica, India, Israel, Czech Republic, UK, USA, Italy, Swiss, Sweden, and Germany, followed lectures and performed practical exercises on project planning and management, drilling engineering, sample handling, storage and curation, on-site studies, downhole logging, data management, outreach, and post-drilling measures.

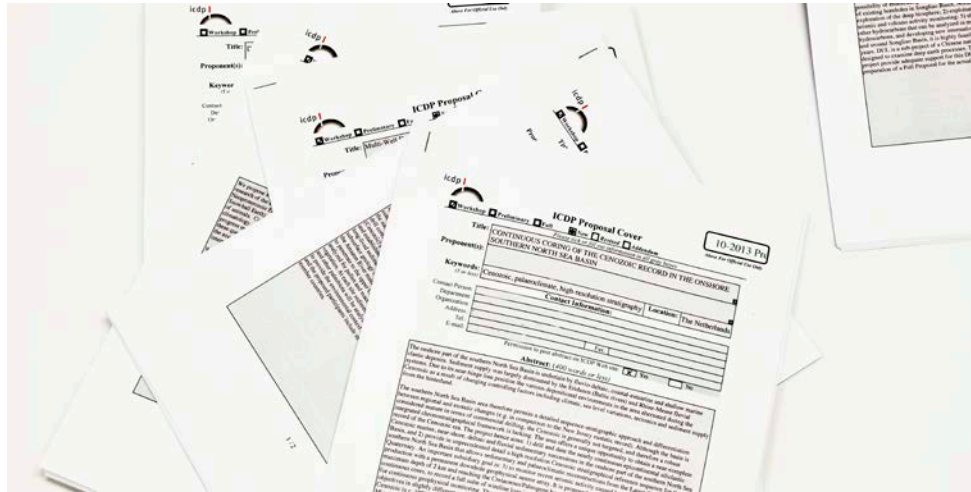


ICDP at Conferences and other outreach activities

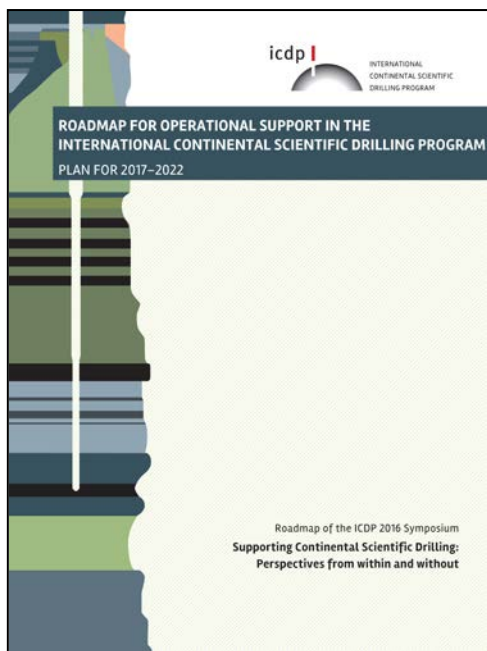
ICDP was presented at the 2017 EGU General Assembly in Vienna with a joint IODP-ICDP booth, Town Hall meeting, and a scientific session. At the 2017 AGU Fall Meeting in New Orleans, a joint Town Hall meeting with CSDCO (Continental Scientific Drilling Coordination Office) was held and a joint IODP-ICDP booth attracted the attention of AGU participants.

ICDP Proposal Submission 2017

With eight Full Proposals, nine Workshop Proposals, and one Pre-Proposal submitted by January 15, 2017, the number of submitted proposals remained at a high level.



Roadmap for Operational Support in ICDP: Plan for 2017–2022



The Operational Support Group of the ICDP organized the symposium “Supporting Continental Scientific Drilling: Perspectives from within and without” in October 2016. The meeting was dedicated to celebrate the 20th anniversary of ICDP and to plan the future of operational support. The results of the symposium, mainly four key recommendations: i) focus in education and outreach by addressing stakeholders at large, ii) set up additional standard blueprints for managing drilling projects, iii) invest in personnel and software to ensure data logging and data access, and iv) acquire new instrumentation to ensure best possible on-site science, were summarized in the brochure *Roadmap for Operational Support in the International Continental Scientific Drilling Program: Plan for 2017–2022*. It serves as a guideline for all ICDP Stakeholders where to focus and how to invest in operational support in the future.

ICDP Profile

Scientific drilling is an indispensable tool of modern Earth Science research because it provides the only means of obtaining direct information about on-going processes below the surface of the Earth and at depth. Drilling allows determining *in-situ* properties of solid materials and fluids, and permits testing of hypotheses and models derived from surface and remote sensing observations. Drill holes may be used as a natural laboratory for experiments and observatories for long-term monitoring of ongoing active geological, microbiological (etc.) processes. Earth drilling, therefore, plays a critical role in scientific

research directed towards improving our understanding of the workings of our planet and has a key role in solving urgent societal problems.

Multinational efforts in continental scientific drilling have been coordinated by ICDP since 1996. The concept for this program was developed in response to the geosciences community's need for scientific drilling as an essential tool to achieve a better understanding of fundamental Earth processes and structure. The program is based on comingled funding and international cost sharing, joint efforts of international science teams, as well as technology and knowledge sharing. The program concentrates on topics of high international priority, and drilling projects are conducted at locations of global geological significance. The organization is simple and flexible, comprises an independent science review board and executive and oversight committees. Administration assistance and substantial operational support are provided voluntarily by the German Research Centre for Geosciences – GFZ in Potsdam. Funding is provided by a growing number of member countries, usually through corresponding national funding agencies.

ICDP fosters proposals through international workshops that assist researchers in the development of a drilling proposal. To date, 86 of these workshops have been funded and have resulted in a total of 42 ICDP supported, successfully executed, drilling projects. Thematically the activities have focused on paleoclimate investigations, earthquake and volcano research, impact events, geodynamics, and potential energy resources (see below for current and future themes). Many scientific results from these drilling and Earth observation projects have been published in high-ranking scientific journals. Training of on-site scientists in engineering, on-site science and data management technologies are also important components of ICDP's strategy to foster the success of ICDP-related drilling proposals. The journal "Scientific Drilling" (jointly issued with the International Ocean Discovery Program IODP), serves to communicate developments from current projects as well as workshop reports and announcements for future scientific-drilling related activities.

Global Partners

ICDP has currently (as per December 31st, 2017) 21 members including 20 countries (namely: Germany, USA, Japan, China, Austria, Norway, Czech Republic, Iceland, Finland, Italy, South Korea, Spain, Sweden, Switzerland, New Zealand, France, India, the Netherlands, the United Kingdom, and Belgium) and UNESCO as member organization. Expressions of interest in membership and/or negotiations are currently underway with Australia, Brazil, Russia, Turkey, Portugal, Denmark, among others. The German Research Centre for Geosciences - GFZ in Potsdam is the Executive Agency of the ICDP and acts on behalf of the ICDP members.

Support Level

Drilling projects are an integral component of major geoscience research programs, including comprehensive pre-site investigations, accompanying laboratory studies, drilling (directly supported by ICDP), and measurements and tests in the drill hole. Drilling programs are costly and only realizable to a limited extent by any entity acting alone. International cost sharing, optimal utilization of all available resources, incorporation of international leading experts, and application of the existing knowledge combined with selection of optimal drilling locations ("World Geological Sites"), are all essential elements of the international continental scientific drilling program ICDP.

ICDP is financed through the annual contributions of its members. The membership fees vary and are based on a number of criteria that include economic factors, scientific impact and manpower and population of the respective country. The members USA and Germany provide \$1,000,000, Japan \$350,000, while China, France, United Kingdom and India contribute about \$200,000. The smaller European countries contribute amounts between \$20,000 and \$70,000 annually. The ICDP funds are used, for the most part, for co-funding of approved ICDP projects and for executing ICDP workshops and training courses. In addition, funds cover expenditures for the maintenance of the ICDP Equipment Pool and the ICDP Drilling Information System (DIS). The annual membership income to support ICDP activities is approximately \$3.5M.

The philosophy of ICDP support for projects is based on the “commingled funding” principle. This means that the ICDP is usually one of several funding partners in a joint drilling project. The financial contribution by ICDP to directly support a drilling project varies between about 5% to about 70% (in rare cases) of the total operational costs. Usually national funding agencies or other sources of support for scientific drilling provide the remainder of the funding for the drilling project.

The program is based on a reliable budget with regular financial contributions by the member institutions, strict expense policies including moderate project funding with no long-term financial commitments and very low program administration costs. This allows for attracting new Earth science communities through opportunities to get workshop and project proposals funded. ICDP’s organization, its financing through commingled funding, and the bottom-up project policy, which is relying on unsolicited proposals and thus driving the program at large, is serving as a model for other programs.

ICDP Organizational Structure and Management

The Assembly of Governors (AOG) provides financial and scientific oversight of the ICDP. It determines the program policies, decides on EC-recommended full proposals and allocates the amount of commingled ICDP funding for each individual drilling project. In addition, the AOG decides on the annual program plan, associated budget and discusses the long-range plans of the ICDP as they are prepared and proposed by the EC.

The Executive Committee (EC) is responsible for the operation and management of the program. It decides on workshop and technical proposals, reviews the operational, technical, managerial and financial feasibility of full proposals, recommends funding of full proposals to the AOG, assembles the scientifically prioritized projects into an annual program plan with an associated annual budget and prepares the long-range program plan that constitutes the ICDP program. The EC is made up of one appointee from each ICDP member country and nominated by the respective funding partners of the program. EC members typically are science managers with expertise in drilling and/or coordination of major research projects. The chair of the EC (Executive Chair) represents the ICDP internationally and has the executive responsibility for carrying out the program. The executive chair plays a key role as the international spokesperson and ambassador for the ICDP. Tireless efforts to attract membership of an increasing number of countries have resulted in a strong growth of the scientific community for drilling.

The Science Advisory Group (SAG) is an independent body of internationally renowned experts in the research fields covered by the program. Its task is to carry out thorough scientific evaluations of all pre-proposals, full proposals and workshop proposals as they are submitted to the ICDP. The SAG also

assigns priority on each proposal based on expected scientific impact, outreach and educational potential. The SAG recommendations are the primary input to the EC as it develops projects for both annual and long-range programs. The SAG has developed the following set of evaluation criteria:

- Quality of Science
- Need for Drilling
- Qualifications of Proponent
- Societal Relevance
- Budget
- Responsiveness to previous recommendations
- Technical Feasibility
- Adequacy of Site Characterization
- Cost Effectiveness
- Project Organization

The Operational Support Group (OSG) plays a major role in supporting the management of the program and in providing expertise and stability to planning and operation of the overall program. The German Research Centre for Geosciences (GFZ) in Potsdam handles the administration of the program, including financial accounting and contractual support. Currently the GFZ finances from its own budget a group of six scientists, engineers and technicians who compose the core of the ICDP Operational Support Group and are based at the GFZ. The OSG serves to support the following functions:

- Providing technical and scientific liaison to SAG and EC
- Developing Joint Research Ventures for each project authorized by the EC
- Managing and supporting the Secretariats for AOG and EC
- Assisting in contracting and permitting
- Supporting scientific and engineering drill-site operations
- Supporting field facility for core and sample description and management
- Providing all data collected during each project through a readily accessible data management system for ICDP projects, the Drilling Information System (DIS)
- Preparing – through ICDP’s DIS - Initial Reports that describe drilling, engineering, sample and core description, and also procedures for each project
- Providing training courses in scientific drilling prior to and during drilling projects
- Organizing outreach activities on major international geoconferences (AGU, EGU, IGC)
- Editing the IODP-ICDP journal ‘Scientific Drilling’
- Developing, purchasing and maintaining an ICDP Equipment Pool comprising scientific-technical instruments and tools for on-site use during ICDP projects
- Providing management support for individual ICDP projects
- Providing and operating ICDP equipment

Management of ICDP activities at the GFZ takes place by the following personnel:

- Dr. Axel Liebscher (EC Chair)
- Dr. Ulrich Harms (Executive Secretary and Head of the ICDP Operational Support Group).

*Credits: Topographic/Bathymetric world map (Page 2) with courtesy from NOAA
All photos by ICDP unless otherwise stated.*