

International Continental Scientific Drilling Program ICDP

Current status as of January 2017

ICDP Project Schedule 2016/2017

Running ICDP Projects

- Drilling the Cretaceous Basin in Songliao, China (CCSD-SK)
- Iceland Deep Drilling Program (IDDP-2)
- Probing Reservoir Triggered Earthquakes at Koyna, India (DEEPAK)
- Oman Ophiolite Drilling Project (OMAN)

ICDP Projects accomplished in 2016

- The Basin of Mexico Drilling Program (MEXIDRILL)
- Chicxulub Impact Crater (CSDP)
- Lake Challa Drilling Project (DeepCHALLA)

Upcoming ICDP Projects

- A New Drill Core at Surtsey Volcano (SUSTAIN)
- Drilling Overdeepened Alpine Valleys (DOVE)
- Jurassic Earth system and Timescale (JET)

Workshops

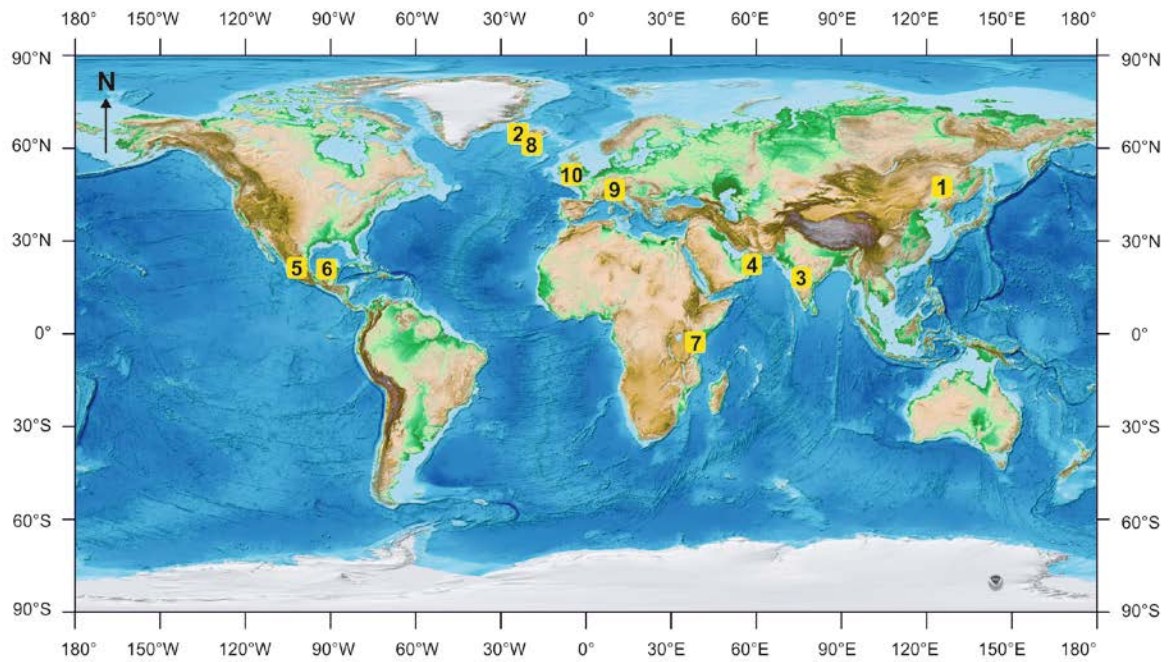
ICDP Outreach and Training Activities

Proposal Submissions 2016

Upcoming ICDP activities

ICDP Profile

ICDP Project Schedule 2016/2017



Currently operating ICDP projects

1	Songliao Basin	Apr. 2014 - June 2017	Songliao Basin, China
2	Iceland Deep Drilling Program	Aug. 2016-Jan. 2017	Reykjanes Peninsula, Iceland
3	Koyuna	Dec. 2016-March 2017	Maharashtra State, India
4	Oman	Dec. 2016-May 2017	Oman

ICDP Operations accomplished 2016

5	MexiDrill	Mar. –Apr. 2016	Chalco Basin, Mexico
6	Chicxulub (jointly with IODP)	Apr.-May 2016	Yucatan, Mexico (offshore)
7	Lake Challa	Nov. 2016	Kenya, Tanzania

ICDP Projects scheduled for 2017

8	SUSTAIN	July-Sep. 2017	Surtsey, Iceland
9	DOVE	Sept. 2017-May 2018	Alpine Valleys
10	JET	Nov. 2017-March 2018	Mochras, Wales (UK)

Operational ICDP Projects

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

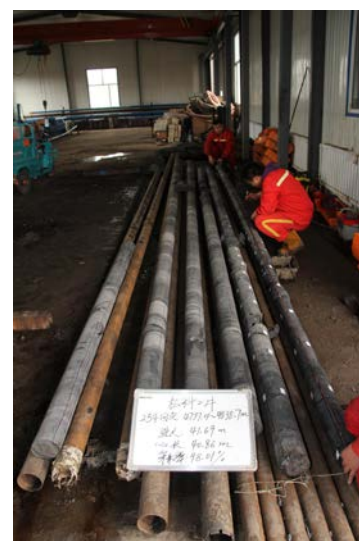


DPCSB conducts scientific drilling in the Cretaceous Songliao Basin, Northeast China to recover a unprecedented extended Cretaceous terrestrial sedimentary record. The borehole SK-II of the DPCSB project will obtain about 4500 m cores of the Huoshiling to Quantou (early Cretaceous) Formations, to be combined with core from the existing boreholes SK-I(n) and SK-I(s) to form the first nearly complete Cretaceous terrestrial sedimentary record in the world. This will provide 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.

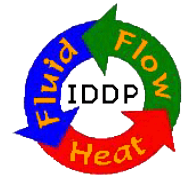
Engineers of Songliao Basin Drilling Project developed a new coring tool with 311 mm outer diameter to retrieve cores of 214 mm diameter without reaming. This instrument has been deployed since April 2015 from 2865 to 4500 m depth and produced so far up to 41.7 m long single cores. It is the first time that a 311 mm diameter drilling tool is used for continuous coring in the history of deep drilling. By December 2016, SK-II has reached 5800 m depth. Currently development efforts are underway to utilize a twin core barrel to double the footage per coring trip.



Crust-I, the new Chinese drill rig with 10 km depth capacity



*New world record in drilling:
41.7 m core with 214 mm
diameter in one run*



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, high temperature and pressure, 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. However, 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 to 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 will last 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. Meanwhile (December 31st) the hole reached a depth of 4626 m and nine coring runs have been performed producing four drill cores for research. Currently, high-temperature geophysical downhole logging is ongoing.



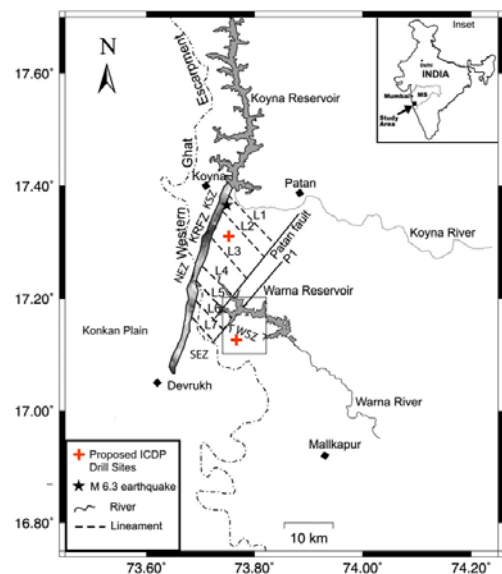
IDDP-2 drill rig near Reykjanes, Iceland



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 some 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. The first out of two pilot borehole drillings started on December 20, 2016 and reached 288 m depth by December 31, 2016. It will provide critical parameters for planning the drilling of the planned up to 7 km deep main borehole, such as in-situ stress regime, pore fluid pressure, fluid/gas properties and hydrological parameters of basement rocks, and geothermal regime.



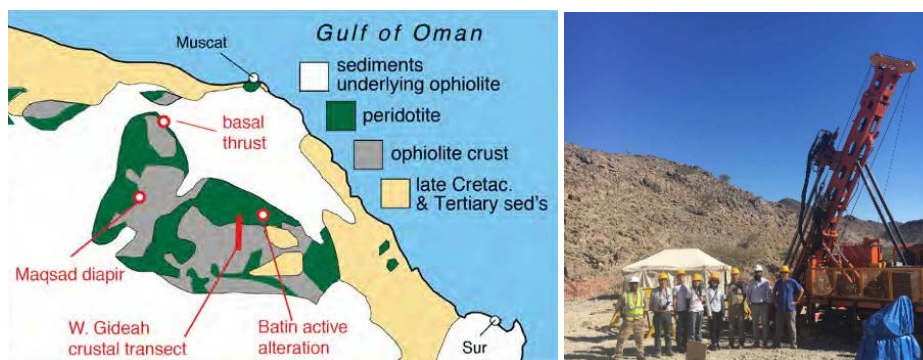
Koyna site (left) and map of the target area of the ICDP Project “Probing Reservoir Triggered Earthquakes at Koyna, India through Scientific Deep Drilling: Pilot Hole Phase”.

The 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 will provide 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.



GT2A drill site and schematic geologic map of the Samail and Wadi Tayin massifs of the Samail ophiolite with the drill site locations

After a long preparatory phase extended by a permitting issues operations started on December 24 at the first of four locations. By December 31, 2016, Hole GT2A advanced down to 149 m with more than 48 excellent drill cores recovered so far. Operations will be continued at a second site until a 10 months break from March 2016 on due to super hot weather conditions.

ICDP Operations accomplished in 2016

The Basin of Mexico Drilling Program (MEXIDRILL)



The primary scientific objective of the MEXIDRILL project is to obtain a continuous, high-resolution record of past climate and biota in the continental Neotropics of the Americas since the mid-Pleistocene. The targeted location, the Chalco Basin within the Basin of Mexico, contains up to 350 m of lacustrine sediments, which have likely recorded at least ~500 to 700 kyr of tropical North American climate history. Its location immediately adjacent to Mexico City gives this climate record particular

societal relevance. The core record is one of the longest records from North America, originating from an area with very little paleoclimate data existing for times prior to the Last Glacial Maximum. In addition to paleoenvironmental studies, the core investigation will elucidate the volcanic history and risk



in the area due to several ash layers and some encountered lava flows and allows for deep biosphere process studies. Another societal key issue of investigations is the hydrogeology of the area with its drastic groundwater level decrease. Drilling was conducted in April 2016 and recovered 1042.3 m of

drill core (92.5% recovery) from four drill holes at one drill site. Core studies are ongoing in the LacCore lacustrine core repository at the University of Minnesota, US.

The Chicxulub Impact Crater (IODP Expedition 364)



Scientific drilling of the Chicxulub Impact crater was a joint IODP-ICDP operation to address several questions related to large impact crater formation on Earth and other planets, and the effects of large impacts on the Earth's environment and ecology. The unique Chicxulub impact crater in Mexico is the only known terrestrial impact structure that has been directly linked to a mass extinction event (the K-Pg mass extinction). Of the three largest impact structures on Earth it is the best-preserved and only terrestrial crater with a global ejecta layer. Additionally, it is the only known terrestrial impact structure with an unequivocal topographic peak ring. "Expedition 364" drilled and cored into the Chicxulub impact structure to recover cores from and above the peak ring. In doing so, the expedition aimed to address several questions, including: 1) what rocks comprise a topographic peak ring and how are peak rings formed; 2) how are rocks weakened during large impacts to allow them to collapse and form relatively wide, flat craters; 3) what caused the environmental changes that led to a mass extinction and what insights arise from biologic recovery in the Paleogene; and 4) what effect does a large impact have on the deep subsurface biosphere, and can impacts generate habitats for chemo-synthetic life?



During the eight-week expedition onboard the Liftboat Myrtle, a team of scientists collected 828.9 m of drill core from a 1331.9 m deep borehole at an offshore site about 30 km northwest of Progreso, Mexico, on the Yucatan shelf, Gulf of Mexico, in April-May 2016. The sampling party was held in Sept. 2016 at the IODP core repository at MARUM in Bremen, Germany to study and sample rocks from the best-preserved large impact crater on Earth, and the only one with an intact topographic peak ring - a ring of hills that stand above the otherwise flat crater floor. An initial "Science" paper published immediately after the sampling party confirmed that the peak ring is made up of far-transported granitic basement transported during impact process from the deep crust to surface.

Lake Challa Deep Drilling



In November 2016 DeepCHALLA sampled a sediment record of Lake Challa, a 92-m deep crater lake near Mt. Kilimanjaro in eastern equatorial Africa. Lake Challa's proximity to the Indian Ocean ensures its all-season location east of the Congo Air Boundary, the zone of convection between Atlantic and Indian Ocean moisture sources. Consequently the region is not directly impacted by the climatic effects of changes in tropical Atlantic thermohaline circulation, through which signatures of northern hemisphere glaciation are transferred to low-latitude continents. DeepCHALLA recovered the lacustrine sediment sequence of Lake Challa down to 214.8 meter below the lake floor, with almost certain 100% coverage over the uppermost 121.3 m (ca. 150,000 years ago to the present) and at least 80% coverage in the lower part of the sequence, down to the lowermost distinct seismic reflector displayed in the project logo. This reflector represents a 2-meter thick layer of volcanic sand and silt deposited ca. 250,000 years ago, and overlies silty lacustrine clays deposited during early lake development. As readily observed through the transparent core liners, Lake Challa sediments are finely laminated throughout most of the recovered sequence. Down-hole logging from 187 m depth to surface produced continuous profiles of in-situ sediment composition that confer an absolute depth scale to both the recovered cores and their three-dimensional representation in seismic stratigraphy. Core opening and initial description in the LacCore facility in Minneapolis is scheduled for spring 2017.



ICDP Operations scheduled for 2017

ICDP CORING PROJECT AT SURTSEY, ICELAND: SUSTAIN

The SUSTAIN project: “Surtsey Underwater volcanic System for Thermophiles, Alteration processes and INnovative concretes” will retrieve 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. A 181 m hole cored in 1979 provides a petrological, mineralogical, and thermal framework to understand early eruptive and hydrothermal processes in tephra and feeder dikes and the structure of the volcano above and below sea level. Subsurface microbiota has now been observed in fluids extracted below the 120 °C thermal barrier of microbial life.

The SUSTAIN coring project will be based on two cored holes, designed to protect the sensitive wildlife and vegetative habitats of the Surtsey Natural Reserve. A clean 200-meter-deep vertical hole with anodized aluminum casing will explore pore water chemistry, microbiota-water-rock interactions and seawater compositional modifications over time. After drilling, a "Surtsey Subsurface Observatory" will be installed in this hole for long-term monitoring and in-situ experiments. A 300-meter-long slanted hole with steel casing inclined west towards the eastern volcanic vent axis will intersect dike intrusions, provide additional information on deep stratigraphy and structure, and will be utilized to investigate higher temperature zones of the hydrothermal system. SUSTAIN will be 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. All precautions will be taken to avoid contamination from the surroundings. Investigating cores will further clarify the internal structure and facies architecture of the type and locality of Surtseysan volcanism, and thereby providing a reference for thermal granulation experiments to refine models for explosive magmatic and phreatomagmatic fragmentation and production of airborne ash clouds. The unique and distinguishing feature of this drilling program is 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.

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 unfavourable 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 2017 with ICDP support as a proof of 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 2017/2018 away from the tourist season when the beach is popular in Britain.

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. Over the past years, ICDP supported the conduction of workshops with a broad topical spectrum addressing either future drilling projects or thematic issues.

Forthcoming Workshops	Date and Venue	Participation	Countries
Structure and Evolution of Magmatic and Hydrothermal Systems in offshore collapse/resurgent calderas (MagellanPlus)	February 25-28, 2017 Naples, Italy	call is still open	-
Scientific Exploration of Induced Seismicity and Stress (ICDP-SCEC)	March 29-31, 2017 Columbia University, NY, USA	call is still open	-
Deep Continental Drilling into the Moho in the Ivrea-Verbano Zone, in the Italian Alps (ICDP)	May 1-5, 2017 Baveno, Italy	call is still open	-
Freshwater Resources along Continental Shelves (ICDP-IODP)	May 22-23, 2017 Woods Hole, USA	call is still open	-
Workshops 2016			
Multi-Well Deep Underground Laboratory in the Songliao Basin	July 4-6, 2016 Beijing, PR China	81	7
Deep Drilling of Lake Chad	September 21-23, 2016 Aix-en-Provence, France	53	12

ICDP Outreach and Education Activities

Publications



Issue 21 of the IODP-ICDP program journal SCIENTIFIC DRILLING was published by Copernicus Publications in August 2016, including three Science Reports, one Progress Reports and one Workshop Report. Publication of SD 22 is scheduled for January 2017.

ICDP Training Course



The annual ICDP Training Courses on continental scientific drilling was held at the GFZ German Research Centre for Geosciences in Potsdam from October 16-20, in conjunction with the ICDP Operational Support Conference (see below), and the national core repository of the Federal Institute for Geosciences and Natural Resources (BGR) in Berlin Spandau, Germany. 30 Participants from 14 countries, including Brazil, China, Japan, South Korea, India, Israel, Turkey, 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.



Impressions from the 2016 ICDP Training Course at the national core repository of the Federal Institute for Geosciences and Natural Resources

ICDP at Conferences and other outreach activities

ICDP was presented at the 2016 EGU meeting in Vienna, the 35th International Geological Congress (IGC) in Cape Town, South Africa, and the 2016 AGU meeting in San Francisco with joint IODP-ICDP booths (EGU, AGU, IGC), Town Hall meetings (EGU,AGU), and scientific sessions (EGU, IGC). A Union Symposium at the EGU in Vienna in April 2016, jointly organized with the Deep Carbon Observatory and some EGU Divisions, under the title “Deep Geofluids - the bringers of change” addressed the physics, chemistry and biology, including water as agent in natural earthquake initiation, deep fracture fluids isolated in crust, activated degradation of organic matter in the deep biosphere, supercritical water for geothermal energy, metal-transporting hydrothermal fluids, sustainable energy and mineral resources, deep fluids and deep life, CO₂ storage, and hydrofracking.

Event	ICDP Town Hall Meeting	Booth	Scientific Session
EGU 2016 General Assembly	X (with IODP)	X (with ECORD)	X
JPGU	X (with IODP)	X	-
35 th International Geological Congress (IGC), Capetown, South Africa	-	X	X
AGU 2016 Fall Meeting, San Francisco, USA	X (with CSDCO)	X (with IODP)	-



The IODP-ICDP booth at EGU 2016 was well attended

Symposium: 20 Years of ICDP

A two-day symposium “Supporting Continental Scientific Drilling – Perspectives from Within and Without” was held October 20-21 at the German Research Centre for Geosciences with 100 international participants. Leading researchers in the field of Earth and related sciences, stakeholders, media representatives, ICDP panel members and PIs discussed the current status of the OSG, future measures and actions and draw an interim conclusion after the 2013 ICDP Science Conference. A white paper summarizing the recommendations for operational support in ICDP of the symposium that will also serve as proposal for ICDP panel decisions on future support for the Operational Support Group of ICDP at GFZ in Potsdam is currently in preparation.



ICDP Proposal Submission 2016

With nine Full Proposals, nine Workshop Proposals, and one Technical Proposal submitted by January 15, 2016, the number of submitted proposals remained at a high level.

Upcoming ICDP activities

Change in the ICDP Executive Committee

After six successful years as Chairman of the ICDP Executive Committee, Brian Horsfield will handing over his position to Axel Liebscher, Head of Section on Geological Storage at GFZ, with effect from April 2017.

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 to 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 37 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, 2016) 21 members including 21 countries (namely: Germany, USA, Japan, China, Austria, Norway, Czech Republic, Iceland, Finland, Italy, South Korea, Spain, Sweden, Switzerland, New Zealand, France, Israel, 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 carrying 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:

- Prof. Dr. Brian Horsfield (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
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