

International Continental Scientific Drilling Program ICDP

Annual Report 2015

ICDP Project Schedule 2015/2016

Running ICDP Projects

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

ICDP Projects accomplished in 2015

- Lake Towuti Drilling Project (TOWUTI)
- Lake Junín Drilling Project (JUNIN)

Upcoming ICDP Projects

- Probing Reservoir Triggered Earthquakes at Koyna, India (DEEPAK)
- The Basin of Mexico Drilling Program (MEXIDRILL)
- Oman Ophiolite Drilling Project (OMAN)
- Chicxulub Impact Crater (CSDP)
- Iceland Deep Drilling Program (IDDP-2)
- A New Drill Core at Surtsey Volcano (SUSTAIN)
- Lake Challa Drilling Project (DeepCHALLA)

Workshops

ICDP Outreach and Training Activities

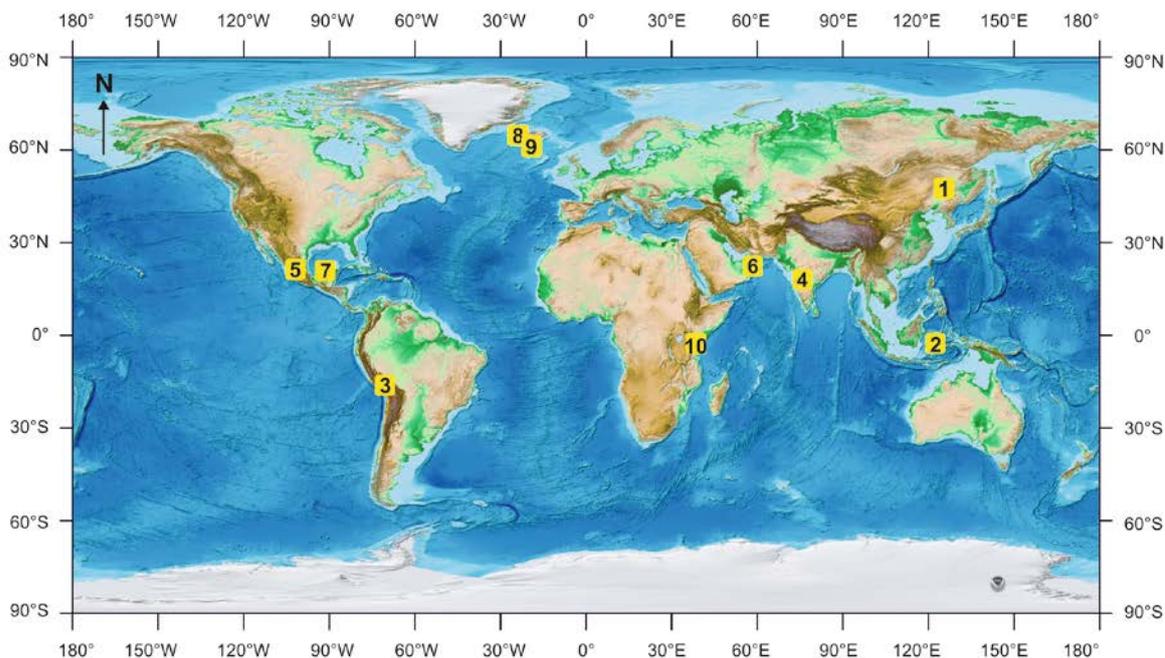
Proposal Submissions 2015

Upcoming ICDP activities

- Anniversary: 20 Years of ICDP

ICDP Profile

ICDP Project Schedule 2015/2016



Currently operating ICDP projects

1	Songliao Basin	Apr. 2014 - Dec. 2016	Songliao Basin, China
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ICDP Operations accomplished in 2015

2	Lake Towuti	May 2015	South Sulawesi, Indonesia
3	Lake Junin	Jul.-Aug.2015	Lake Junin, Peru

ICDP Projects in 2016

4	Koyna	Feb. –Nov. 2016	Maharashtra State, India
5	MexiDrill	Feb. –April 2016	Chalco Basin, Mexico
6	Oman	Sept.-Nov. 2016	Oman
7	Chixulub (jointly with IODP)	Apr.-May 2016	Yucatan, Mexico (offshore)
8	Iceland Deep Drilling Program	July 2016	Reykjanes Peninsula, Iceland
9	SUSTAIN	Aug.-Sep. 2016	Surtsey, Iceland
10	Lake Challa	Nov. 2016	Kenya, Tanzania

Operational ICDP Projects

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



DPCSB proposes to conduct scientific drilling in the Cretaceous Songliao Basin, Northeast China to recover a nearly complete Cretaceous terrestrial sedimentary record, as determined from basin-filling history. The borehole SK-II, drilled by the DPCSB project, proposes to obtain about 4500 m cores of Huoshiling to Quantou Formation, 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 excellent high resolution climate records of the terrestrial environment for the whole Cretaceous. Core studies provide unique opportunities for the geosciences community to understand the response of 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 the on-site core repository, equipped with state-of-the-art instrumentation for core analysis.

Engineers of Songliao Basin Drilling Project developed a new drilling tool with 311 mm diameter to drill from 2865 m to 4500 m to retrieve cores of 214 mm diameter without reaming. This tool has been used since April 2015 and runs well with 8.2 m footage per round trip. This is the first time that a 311 mm diameter drilling tool is used for continuous coring in the history of deep drilling. By December 2015, SK-II has drilled 4044 m. Now persistent efforts are made to use double core barrel drilling tools which would extend the footage per round trip to more than twice than before.



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



New record in drilling: 21.33 m core with 214 mm diameter

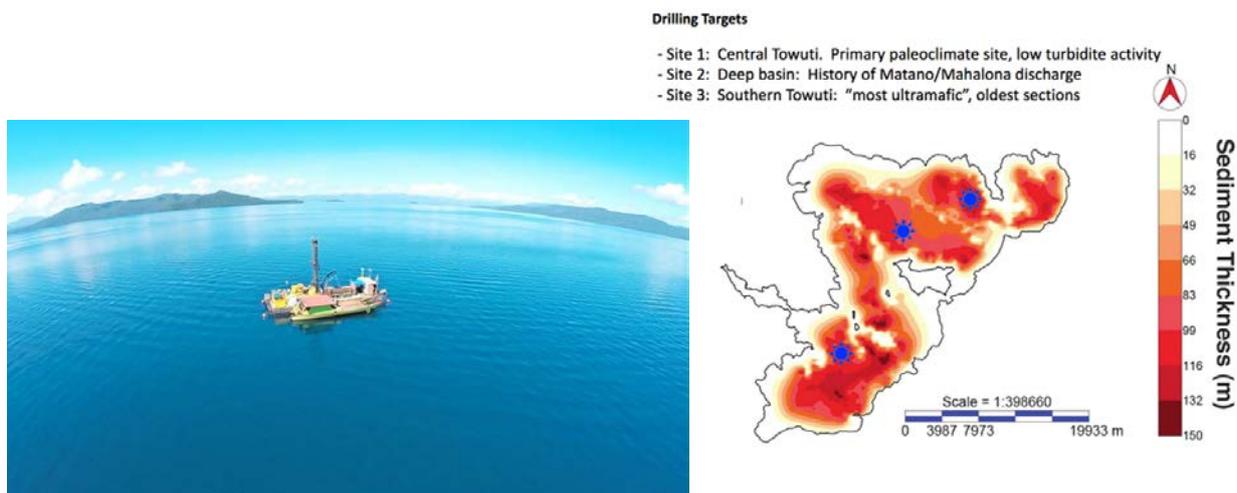
ICDP Operations accomplished in 2015

The Lake Towuti Drilling Project



Lake Towuti in central Indonesia was drilled to obtain valuable new information on understanding the climate, biological, and geomicrobiological evolution of a tropical pacific lake and to reconstruct long-term terrestrial paleoclimate change in a crucially important yet understudied region - the Western Pacific warm pool, heart of the El Niño-Southern Oscillation. Lake Towuti has high rates of floral and faunal endemism and is surrounded by one of the most diverse tropical forests on Earth making it a hotspot of Southeast Asian biodiversity. The ultramafic (ophiolitic) rocks and lateritic soils surrounding Lake Towuti provide ferruginous metal substrates that feed a diverse, exotic microbial community in the lake and its sediments, potentially analogous to the microbial ecosystems that operated in the Archean Oceans and on Mars.

Eleven holes have been drilled at three sites between May and early July 2015 using the Deep Lake Drilling System DLDP. The deepest hole, drilled at Site 3, reached 174 m depth. In total, 1290 m of lacustrine sediments have been drilled and 1009 m core were recovered. The core has been shipped to the US National Lacustrine Core Facility (LacCore) at the University of Minnesota for further analysis and subsampling.



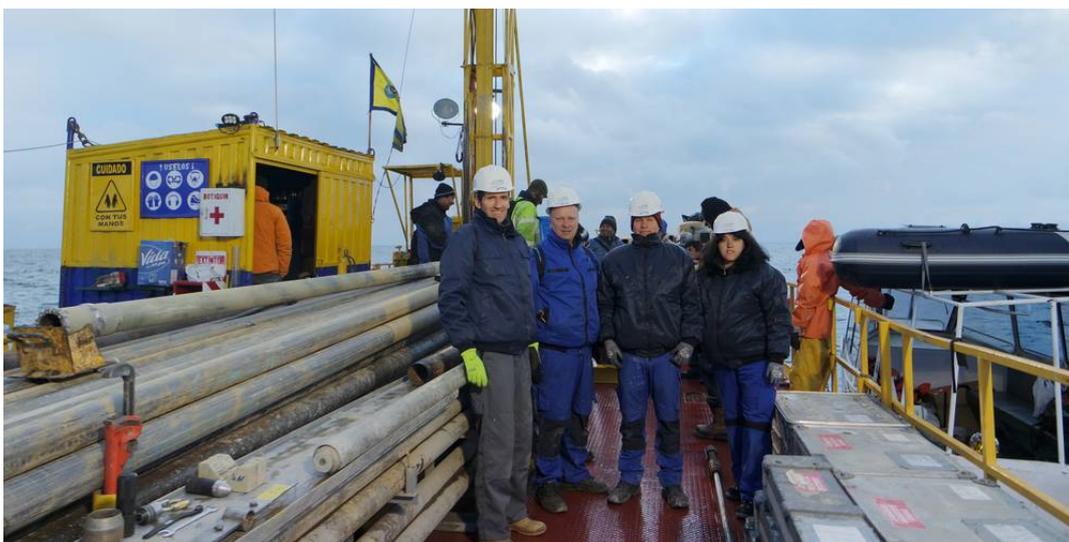
Deep Lake Drilling System DLDP in operation on Lake Towuti. Photo: www.facebook.com/towutidrilling

The Lake Junín Drilling Project (JUNIN)



Lake Junín, located at 4000 m above sea level in the inner-tropics of the Southern Hemisphere, is a prime target for drilling because it contains a thick (>125 m) sediment package deposited at a high rate (0.2 to 1.0 mm yr⁻¹). Lake Junín is one of the few lakes in the tropical Andes that predates the maximum extent of glaciation and is in a geomorphic position to record the waxing and waning of glaciers in

nearby cordillera. Lake Junín drilling delivered critical scientific insights by drilling coupled with analysis by a select international team of scientists. Eleven holes have been drilled on three sites between July and August 2015. 590,1 m have been drilled in total, with a core length of 524,9 m (core recovery=89%). In situ measurements of the petrophysical properties of the lacustrine sediments of the Lake Junín, including spectrum gamma ray, magnetic susceptibility, borehole geometry (dipmeter), temperature, and P-wave velocity were performed by the ICDP Operational Support logging team. The core is stored at the US National Lacustrine Core Facility (LacCore) at the University of Minnesota for further research.



The ICDP downhole logging team after successful logging operations at Lake Junín. Photo by Doug Schnurrenberger.

ICDP Operations in 2016

Deep Drilling at Koyna, India (DEEPAK)

The Koyna Dam located close to the west coast of India is the most outstanding example of Reservoir Triggered Seismicity RTS, where such mankind-induced events have been occurring in a restricted area of 20x30 km² since the impoundment of Shivajisagar Lake in 1962. These 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 Archean granite and gneiss, overlain by Deccan Traps which have been erupted some 65 Ma ago.

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. Two pilot boreholes are proposed to be drilled in 2016 to a depth of 3 km at the Koyna seismic cluster and in the Warna seismic cluster region. The pilot boreholes will provide critical parameters for planning the drilling of the main boreholes, such as in-situ stress regime, pore fluid pressure, fluid/gas properties and hydrological parameters of basement rocks, and geothermal regime.



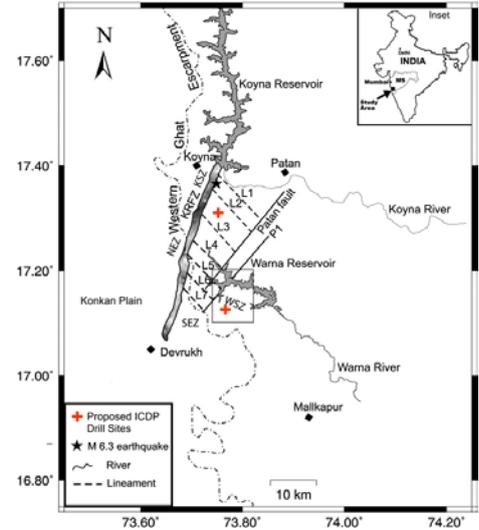
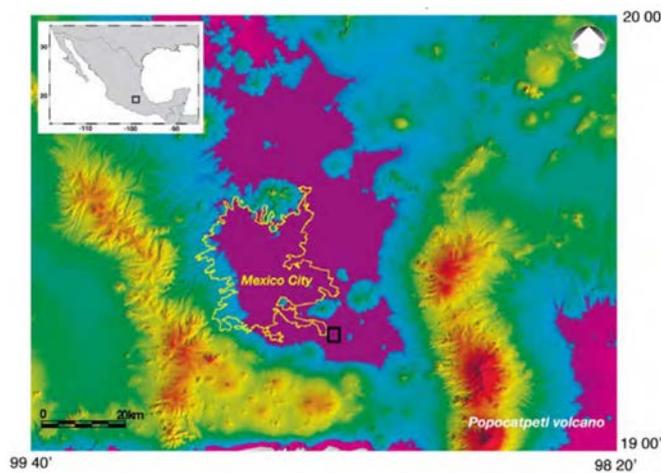


Photo of the Koyna Reservoir (left) and map of the target area of the ICDP Project “Probing Reservoir Triggered Earthquakes at Koyna, India through Scientific Deep Drilling: Pilot Hole Phase”.

The Basin of Mexico Drilling Program (MEXIDRILL)

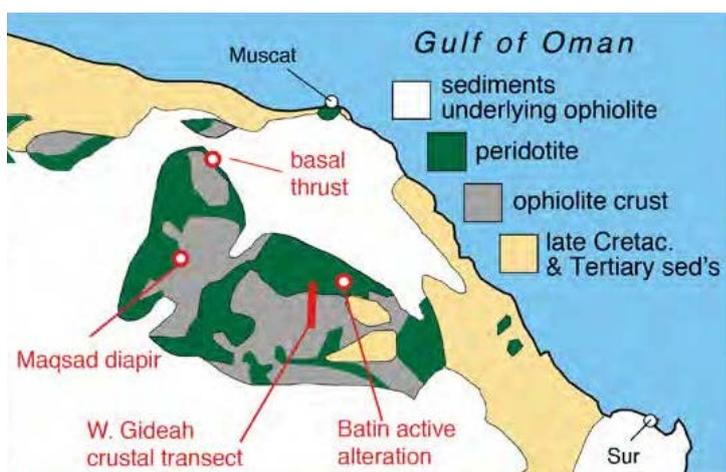
The primary scientific objective of the MEXIDRILL project is to obtain a continuous, high resolution record of past climate and biota in the continental neotropics since the mid-Pleistocene. The targeted location, the Chalco Basin within the Basin of Mexico, contains up to 350 m of lacustrine sediments, 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 expected core record will be among 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, the work we propose will provide a foundation for the development of a range of further scientific activities, including hydrogeology, volcanic history, seismic risks, and deep biosphere processes. Drilling is scheduled for Feb. –April 2016.



Elevation map of the Basin of Mexico, showing the proposed location of coring at Paleolake Chalco, the administrative boundaries of Mexico City, and the Popocatepetl Volcano. Elevations range from 2400 to 5400m.

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.



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

The Chixulub Impact Crater (IODP Expedition 364)

Scientific drilling of the Chixulub Impact crater is a joint IODP-ICDP approach 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 expedition target is the unique Chicxulub impact crater, Mexico, which 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" aims to drill and core into the Chicxulub impact structure to recover cores from and above the peak ring. In doing so, the expedition aims 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? The expedition will drill and core a single 1500 m deep borehole at site about 30km northwest of Progreso, Mexico, on the Yucatan shelf, Gulf of Mexico, in April-May 2016

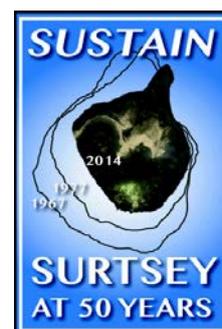
Lake Challa Deep Drilling

DeepCHALLA proposes to exploit the continuous 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. The project's principal objective is to acquire high-resolution and well-dated proxy records of continental climate and ecosystem dynamics near the equator over the past ca.250,000 years, thus encompassing two complete glacial-interglacial cycles and the entire known existence of modern humans (*Homo sapiens*) in East Africa. Documentation of long-term biodiversity patterns and the ecological dynamics of tropical savanna (grassland-woodland) ecosystems in response to changes in atmospheric CO₂, temperature, moisture balance, and fire will help explain/predict the present-day/future prevalence of C3 and C4 plant species in tropical grasslands, and the past/future persistence of biodiversity hotspots in eastern Africa.



ICDP SUSTAIN PROGRAM AT SURTSEY

A New Drill Core at Surtsey Volcano: A Natural Laboratory for Time-Lapse Characterization of Hydrothermal Seawater and Microbial Interactions with Basaltic Tephra Surtsey volcano, an isolated oceanic island and UNESCO World Heritage site, 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 181 m hole drilled in 1979 provides a petrological, mineralogical, and thermal



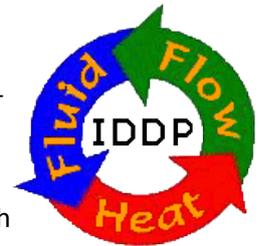
framework to understand early eruptive and hydrothermal processes in tephra and feeder dikes and the structure of the volcano above and below sea level. Subsurface microbiota have now been observed in fluids extracted below the 120 °C thermal barrier of microbial life.

The SUSTAIN drilling program (Surtsey Underwater volcanic System for Thermophiles, Alteration processes and INnovative concretes) 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 would explore pore water chemistry, microbiota-water-rock interactions and seawater compositional modifications over time. After drilling, a "Surtsey Subsurface Observatory" would be installed in this hole for long term monitoring and in-situ experiments. A 300-meter-long angle hole with steel casing inclined west toward the eastern volcanic vent axis would intersect dike intrusions, provide additional information on deep stratigraphy and structure, and investigate higher temperature zones of the hydrothermal system. The SUSTAIN drilling program would be the first 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 would further clarify the internal structure and facies architecture of the type and locality of Surtseyan 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 geochronological 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 through .

Iceland Deep Drilling Project (IDDP-2)

The Iceland Deep Drilling Project (IDDP) is a long term program by an industry-government consortium aimed at investigating very high-temperature, supercritical geothermal systems as a way of improving the economics of energy production. A feasibility study indicated that a well producing 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 a 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 flowed into the borehole. The borehole was completed as a subcritical well producing from the contact zone of the intrusion.

Despite the interesting result of well IDDP-1, the IDDP has not lost sight of the original goal, aiming for reaching supercritical, 450-600°C geothermal fluids by drilling a second 4.5-5 km deep well in 2015 on the Reykjanes Peninsula in SW Iceland the landward extension of the Mid-Atlantic Ridge. The hydrothermal fluid in the Reykjanes geothermal field is modified sea water, so 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. If the IDDP successfully demonstrates producing energy from very hot, magma-hydrothermal systems, this approach could be applied on a global scale, wherever suitable young volcanic rocks occur. This has the



advantage of increasing the power output of existing geothermal fields, and extending their resource base and lifetime without increasing their environmental foot prints.



IDDP-1 Drilling near Krafla, Iceland

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.

Workshops 2015	Date and Venue	Participation	Countries
Trans-Amazon Drilling Project	March 18-20, 2015 Manaus, Brazil	29	7
Coring North Sea Cenozoic	March 18-21, 2015 Utrecht, Netherlands	63	8
Haiti-DRILL (MagellanPlus)	October 26 - 28 , 2015 Rueil-Malmaison, France	unknown	unknown
Drilling into Seismogenic Zones of M2.0-5.5 earthquakes in South African gold mines (DSeis)	October 31-November 3, 2015 Potchefstroom, South Africa	67	7
Forthcoming Workshops	Date and Venue		
Multi-Well Deep Underground Laboratory in the Songliao Basin	July 4-6, 2016 Beijing, PR China	-	-

New ICDP Proposals submitted 2015

ICDP funding is proposal-driven. Scientists from ICDP member countries or countries considering membership have the right to submit unsolicited proposals to the ICDP. Proposals may be assembled by individuals or groups of scientists from single or groups of countries. ICDP accepts proposals of all kinds until **January 15** each year. With 21 proposals received for the January 2015 Deadline, the number of proposals reached a record and set a new benchmark for future proposal submissions.

Proposal Type	Number of received proposals	Funded/encouraged	Funded + Addendum	Rejected/not encouraged
Full Proposal	8	-	5	3
Workshop Proposal	9	2	2	5
Pre-Proposal	1	1	-	-
Technical Proposal	3	2	-	1

ICDP Outreach and Training Activities

Publications



A “Snapshot of Research Findings Enabled by Scientific Drilling”, a special issue published by the International Journal of Earth Sciences, was published in September 2015. 13 papers address the importance of drilling for studying global geodynamic cycles and Earth evolution, with reference to hotspot volcanism, the formation of continental crust, collisional orogenesis, continental rifting, subduction zone processes and ore deposits.

Two issues of the IODP-ICDP program journal SCIENTIFIC DRILLING were published by Copernicus Publications in 2015 (SD 19 in May and SD 20 in December), including three Science Reports, nine Workshop Reports, one Progress Reports and one report on Technical Developments.

ICDP Training Courses

Two ICDP Training Courses were held in 2015. The ICDP Training Course on Lacustrine Sediment Drilling at Lake Ohrid and Lake Prespa, Macedonia (September 14-16), was attended by 20 scientists from 15 countries who followed lectures and performed practical exercises related to scientific drilling of

lacustrine sediments. Practical exercises included interpreting data from seismic surveys to define the best possible drilling locations, drill core opening and core handling. PIs from successfully completed ICDP lake drilling projects (SCOPSCO, Towuti) provided valuable insights in planning and executing lake drilling campaigns. Other lectures covered topics such as downhole logging, pre-site studies, on-site sample handling, storage, and analysis, data management, funding and support by ICDP and outreach. Highlights of the training course were visits of the UWITEC barge anchored at Lake Prespa to learn how to operate a small piston coring system on an airgun boat for seismic surveys..



Impressions from the 2015 ICDP Training Course on Lacustrine Sediment Drilling at Lake Ohrid/Prespa

22 Principal Investigators, project managers and leading scientists of upcoming continental scientific drilling projects meet for the ICDP Training Course on Planning, Management and Execution of Continental Scientific Drilling Projects from October 19-21, 2015, at the GeoZentrum KTB in Windischeschenbach, Germany. This training course touched upon relevant aspects for managing a scientific drilling project, including proposal writing & multi-source fundraising, drilling engineering basics, HSE (Health, Safety, Security and Environment), on-site project management, sample handling & curation, downhole logging planning & execution, and outreach.



ICDP at Conferences (EGU, AGU, ILIC) and other outreach activities

ICDP was present at the 2015 EGU meeting in Vienna, the International Limnogeology Congress (ILIC) in Reno, and the 2015 AGU meeting in San Francisco with ICDP booth (ILIC), joint ECORD-ICDP booths (EGU, AGU), Town Hall meetings (EGU,AGU), and scientific sessions (EGU).

Upcoming ICDP activities

Anniversary: 20 Years of ICDP

Several events throughout the year are planned to celebrate the 20th year of ICDP's existence. 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" addresses 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.

A two-day symposium "Supporting Continental Scientific Drilling – Perspectives from Within and Without" will be held October 1-2 at the German Research Centre for Geosciences (GFZ) to discuss future measures and actions and to draw an interim conclusion after the 2013 ICDP Science Conference.

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, 2015) 23 members including 22 countries (namely: Germany, USA, Japan, China, Canada, Austria, Norway, Poland, Czech Republic, Iceland, Finland, Italy, South Korea, Sweden, Switzerland, New Zealand, France, Israel, India, the Netherlands, the United Kingdom, and Belgium) and UNESCO as member organization. Spain will return to ICDP on January 1, 2016.

Expressions of interest in membership and/or negotiations are currently underway with 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, the scientific manpower and size of the respective country. The full or "Category A" members USA, Germany, and Japan provide \$700,000 and have the right to chair panels, while China, Canada, France and India contribute \$200,000. The smaller European countries contribute according to their ESF share between amounts of \$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 "comingled 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 comingled 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).

Potsdam, 04. 02.2016

Thomas Wiersberg, ICDP OSG

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