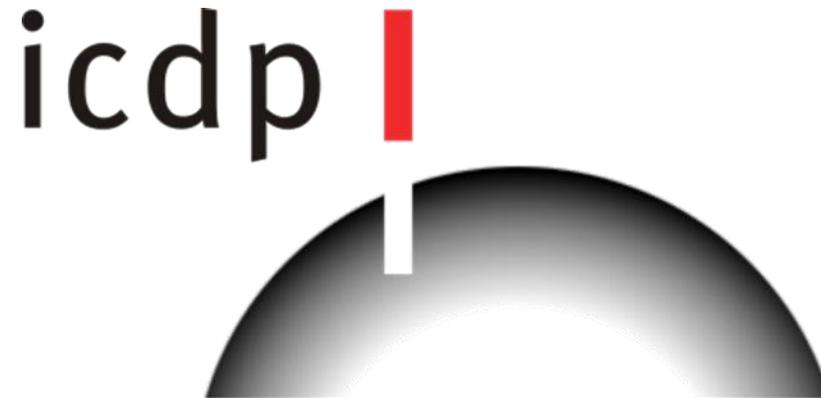


*The International Continental
Scientific Drilling Program:*

*Who we are and what we do for
science and society*



Mission Statement

"Through the unique capacities of scientific drilling to provide exact, fundamental and globally significant knowledge of the composition, structure and processes of the Earth".

What is ICDP?

- An internationally managed and operated Earth science infrastructure which **facilitates** excellent science
- Provides funding and services related to **drilling**
- Addresses fundamental geoscientific problems of global significance and societal relevance – **top down**
- Supports international teams of scientists at carefully selected sites around the world – **bottom up**

Members

Germany
USA
Norway
Sweden
Italy
South Korea
United Kingdom
China
Iceland
Japan
Switzerland
Czech Republic
Netherlands

India
Poland
France
Finland
Israel
New Zealand
Austria
Canada
Belgium (Flanders)

UNESCO



Interest & Negotiations

Australia
Saudi Arabia
Oman
Brazil
Turkey
Denmark

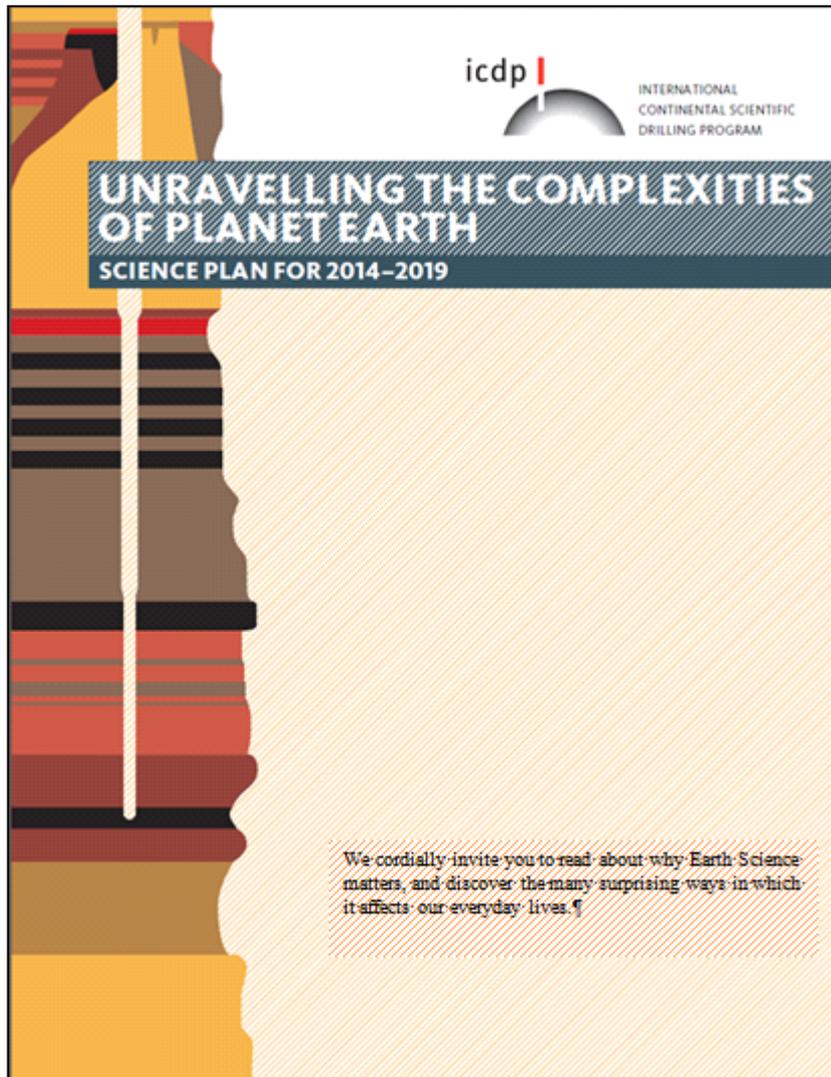
White Paper - The ICDP Science Plan

**“Imaging the Past to Imagine our Future”,
11-14 November, 2013**

164 invited guests from 29 countries



Status White Paper



This plan acts as a roadmap for the international Earth Science community, and at the same time serves as a docking station for national funding initiatives.

Focus: balancing the needs of science and society

- Climate and Ecosystems
- Sustainable Georesources
- Natural Hazards



SOCIETAL CHALLENGES

Motivation

Climate and Ecosystems

Sustainable Georesources

Natural Hazards

PROGRAM

Strategy

Benefits

How ICDP runs

Cooperation in scientific drilling

History

SOCIETAL CHALLENGES

Sustaining economic growth without threatening the environment, supplying an expanding world population with industrial raw materials, energy, and potable water, meeting the challenges posed by global change, safeguarding society from natural disasters, and developing efficient urban infrastructures for transport and housing: **these are the fundamental challenges faced by society in the 21st century.**

The challenges are inextricably linked with the dynamics of planet Earth in its broadest sense; not just the solid Earth surface on which we live, but with the chemical reactions, physical movements and biological interactions taking place below and above that surface. The breadth of time and space is enormous, and degree of complexity immense.

ACTIVE FAULTS AND EARTHQUAKES



Fundamental open questions:

- How do earthquakes nucleate?
- How do they propagate?
- Why do they stop?
- What controls the levels of ground motion during earthquakes?
- What controls the frequency & size of earthquakes?
- How does fault permeability & fluid pressure vary during earthquakes?
- How does stress magnitude and orientation vary during the earthquake cycle?

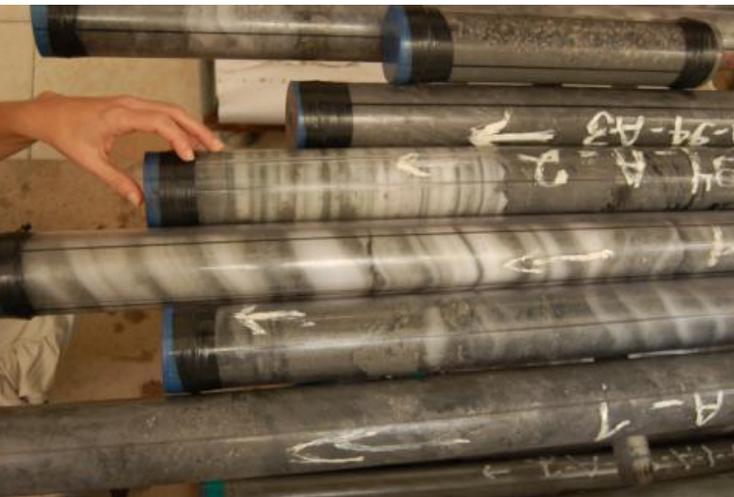
Questions addressed and partially answered:

- Why are major plate-boundary faults like the San Andreas weak?
- How do stress orientations and magnitudes vary across the fault zone?
- What are the width and structure (geologic and thermal) of the principal slip surface(s) at depth?
- What are the mineralogies, deformation mechanisms and frictional properties of the fault rocks?
- How is energy partitioned within the fault zone between seismic radiation, frictional heating, comminution and other processes?

Future Scientific Drilling Targets:

- Induced earthquakes
- Role of fluids
- Borehole observatories
- Experiments on core and models
- In situ experiments
- Capture the complete earthquake cycle

GLOBAL CYCLES EFFECTING CLIMATE AND ENVIRONMENTAL CHANGE



Fundamental Open Questions

- How did Earth's climate system behave during warmer/high-CO₂ worlds?
- How did Earth's climate system behave during glacial cycling in cold worlds, and during icehouse-greenhouse transitions?
- What are fundamental processes, feedbacks forcing climate transitions, decadal to million-year and beyond?
- How fast did permafrost and gas hydrate stability react on changing climate and vice versa?
- What were biotic responses to major environmental changes (e.g., climatic, super-eruptions, impacts), at timescales from decadal to million-year and beyond?
- How did oxygenation of the atmosphere evolve?
- What are the key processes characterizing Earth's Critical Zone?

Future Scientific Targets:

- Lacustrine records, including additional Quaternary records
- Drilling to access Earth's deep-time climate and biotic record
- Drilling to access Earth's earliest paleoenvironmental and paleobiological records (eg oxygenation etc).
- Drilling to access the Critical Zone
- Permafrost and gas hydrates

HEAT AND MASS TRANSFER



Achievements

- Crustal and mantle heat flow and radiogenic heat production inside Earth
- High temperature magmatic and hydrothermal systems (IDDP)
- Active volcanic systems (Unzen, Campi Flegrei, HOTSPOT, Hawaii)

Fundamental Open Questions and future Scientific Targets:

- Studying heat and mass transfer in active volcanic and magmatic environments
- Developing and applying technologies for drilling into very high temperatures
- Properties of super-critical fluid systems
- Heat and mass transfer in low-enthalpy environments
- Determination of undisturbed crustal heat flow values in normal stabilized crust
- Distribution and concentrations of heat producing elements in the crust and mantle
- Understanding heat and mass transfer in genesis of mineral deposits
- Heat and mass transport properties of rocks as functions of temperature and pressure
- Drilling deeper than before (new super-deep holes)

THE UBIQUITOUS HIDDEN BIOSPHERE



Fundamental Open Questions

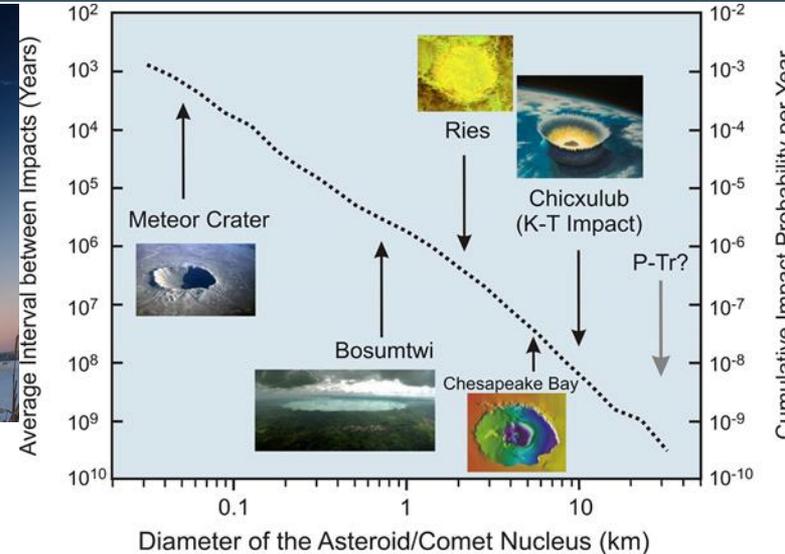
- What is the extent and diversity of deep microbial life and what are the factors limiting it?
- What are the types of metabolism/carbon/energy sources and the rates of subsurface activity?
- How is deep microbial life adapted to subsurface conditions?
- How do subsurface microbial communities affect resources?
- How does the deep biosphere interact with the geosphere and atmosphere?
- Can we use the subsurface biosphere as a model for life on early Earth or other planets?

Future Science Targets

- Deep hardrock microbiology
- Shallow sediments and groundwater geochemistry
- Metalliferous sediments
- Microbiology and geochemistry of serpentinizing rocks and high-pH environments
- Life in geothermal environments
- Biodegradation of hydrocarbons is a topic of major ecological and economical importance
- Mud volcanoes as windows to the deep biosphere



CATAclysmic Events



Fundamental open questions

- Obtain ground truth for confirmation of origin of structures
- Understand the different phases of the cratering process
- Document the final modification of the crater by margin collapse
- Understand the formation, emplacement and magmatic evolution of melt-sheets
- Complement numerical modeling
- Link ejecta and source crater to document the transport, dispersal and deposition
Constrain the energy transfer from the cratering process to the global Earth system
Utilization of impact structures for paleo-climatic/environmental investigations, and to understand the formation associated resources

Future Science Targets

- Sudbury
- Chicxulub

Achievements

- Chicxulub
- Bosumtwi
- Chesapeake Bay
- El'gygytgyn

The International Continental Scientific Drilling Program (ICDP) Call for Proposals

The International Continental Scientific Drilling Program, ICDP coordinates and supports multinational endeavours in continental scientific drilling. The program focuses on challenging themes of global geoscientific and socio-economic relevance, including, but not limited to, active faulting, earthquake processes, heat and mass transport, global cycles, environmental change, and the hidden biosphere.

With this announcement, the ICDP invites Earth scientists to submit project proposals in which drilling is required to achieve critical research goals. This call is open to investigators from ICDP member countries (Austria, Belgium, Canada, China, Czech Republic, Finland, France, Germany, Iceland, India, Israel, Italy, Japan, New Zealand, Norway, Poland, South Africa, South Korea, Sweden, Switzerland, The Netherlands, United Kingdom, United States of America) as well as from countries considering membership in the ICDP. Please note that ICDP provides operational support and allocates co-funding for drilling-related costs only; research grants for the project should be sought from other funding agencies. This concept of commingled funding and international cost sharing, in addition to an exchange of technological capabilities and know-how, has proven very successful over the years.

PROPOSAL PREPARATION

The submission of proposals to the ICDP is normally handled in a 2-step procedure. The first step is the submission of a *pre-proposal* in which a request to hold an ICDP-funded workshop is submitted. The proposal should outline the main objectives, the scientific importance of the planned project, details of the proposed drill site, the expertise of the group of proponents and envisaged international collaboration. The workshop serves to bring together a competitive international research team which can develop a *full drilling proposal*. Principal Investigators should note that they are responsible for planning and running pre-site surveys needed to facilitate the choice of an appropriate drill site. Following a successful pre-proposal and workshop a full proposal can be submitted in a second step.

PROPOSAL EVALUATION

All proposals are evaluated by the Science Advisory Group (SAG) of the ICDP, which makes recommendations to the Executive Committee (EC) based on scientific quality and priority. The EC then reviews technical and financial issues in order to ensure that projects are feasible within the constraints of ICDP's annual and long-range plans. The EC informs the Principal Investigator(s) of the outcome of the

ICDP aims to foster joint projects with the International Ocean Discovery Program, IODP. We therefore cordially invite project proposals in which coordinated drilling on land and at sea is required or land-sea transect drilling series are planned ("amphibious projects"). Joint project proposal submission will be accepted by both programs and jointly evaluated.

Uli Harms, GFZ German Research Centre for Geosciences, Telegrafenberg, D-14473 Potsdam, Germany, phone +49-331-288-1085, fax: +49-331-288-1088, E-mail: u.harms@icdp-online.org

Detailed information on the scope of the ICDP, the submission of proposals, proposal format, and the process for development of a successful proposal is available on the ICDP home page at: <http://www.icdp-online.org/proposals>.

Who can submit?

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.

Types of Proposal

ICDP accepts three types of proposals:

Preliminary Proposal: Project ideas can be submitted to ICDP to get a preliminary evaluation by ICDP and hints how to further develop it.

Workshop Proposal: Serve to acquire funding for a workshop to assemble an international team and prepare a full proposal.

Full Proposal: Mature full proposals are submitted to ICDP for funding of drilling operations and related action

In addition, ICDP panels may request proponents to submit an **Addendum Proposal**.

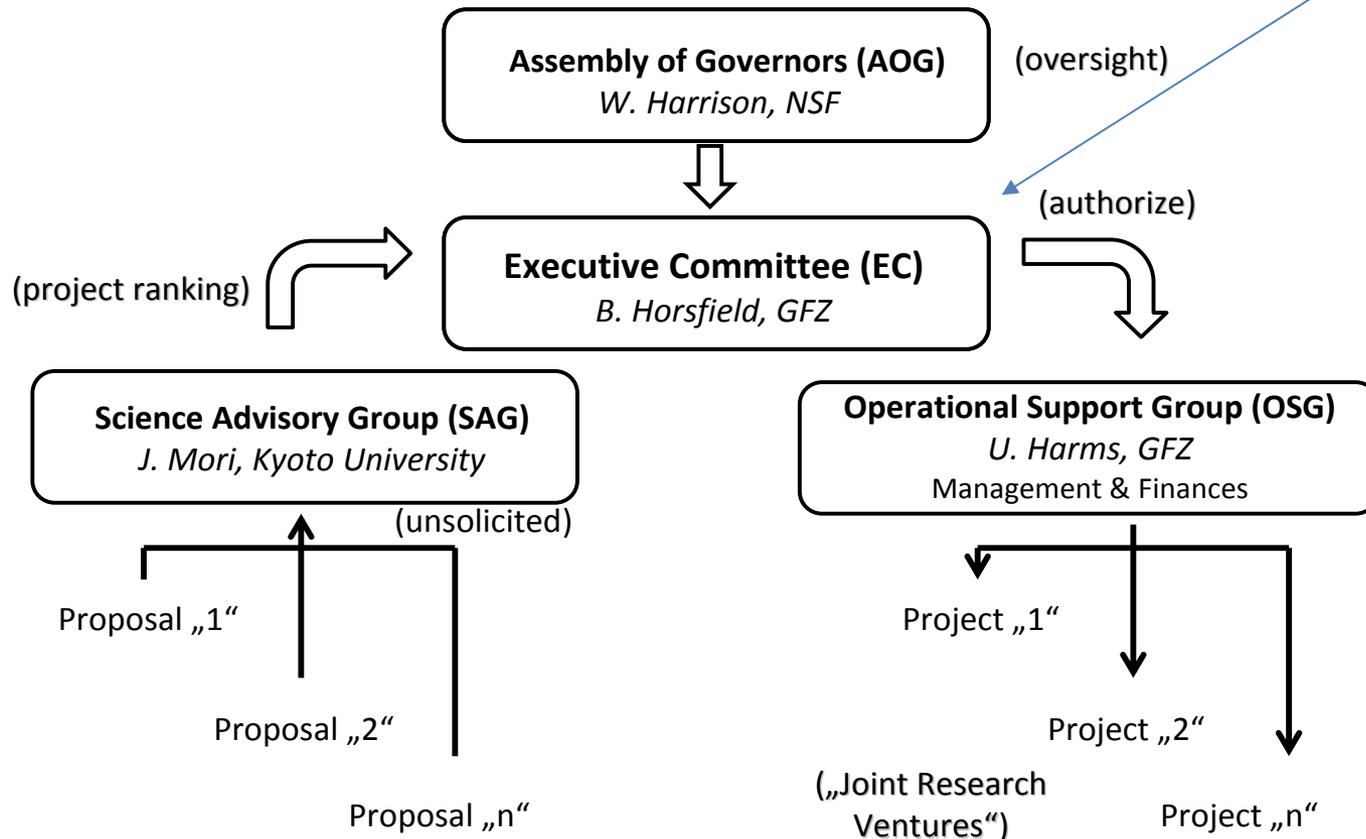
SELECTION CRITERIA

- **Global Criterion**
 - Problem of Global Significance
 - “World-Class” Geological Site
- **International Criterion**
 - Broad International Collaboration
 - Best Possible Science Team
 - Pooling of Resources and Technology
- **Societal-Needs Criterion**
 - Relevance of Problem to Society
 - Collaboration with Industry
- **Need-for-Drilling Criterion**
 - Proof of Necessity for Drilling
- **Depth-to-Cost Criterion**
 - Balancing of Costs and Drilling Design
- **Active-Processes Criterion**
 - active rather than ancient systems

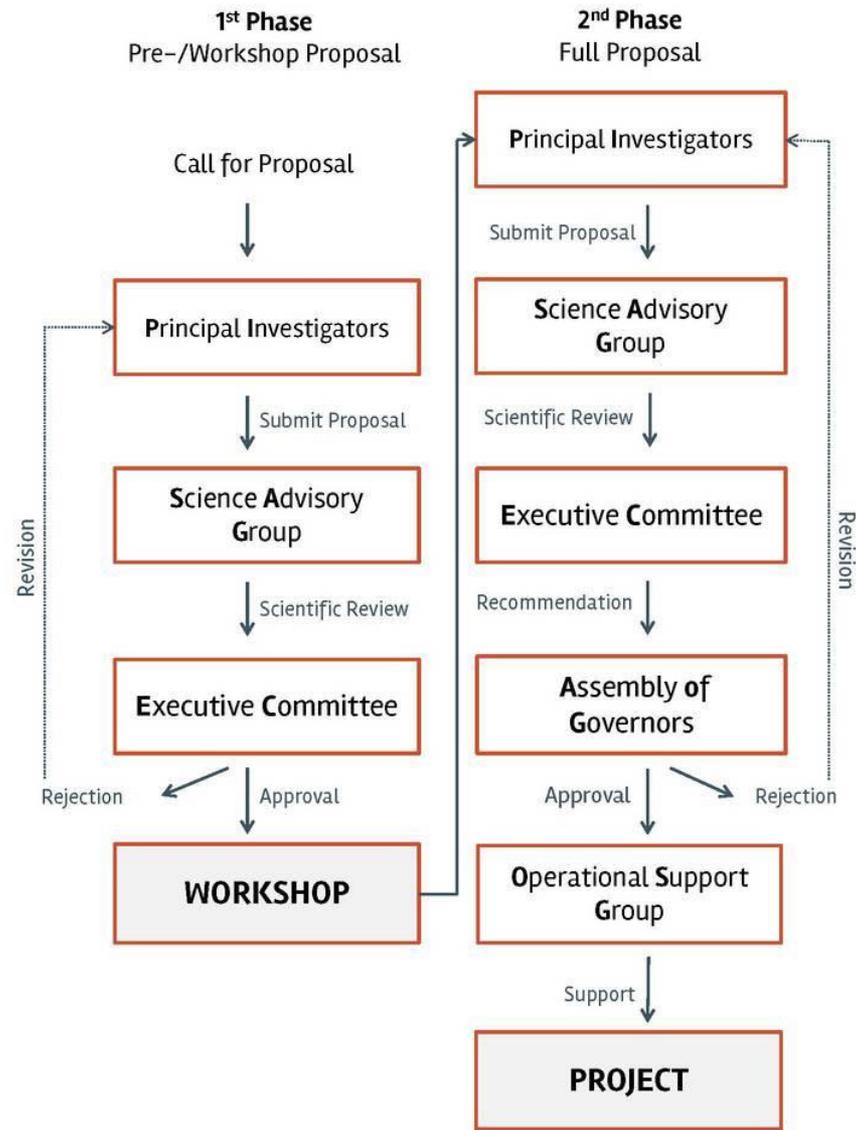
Organization

- Lean and mean.
- Business structure is efficient
- Procedures simple to implement

Each country member is represented here



PROJECT SELECTION PROCEDURE

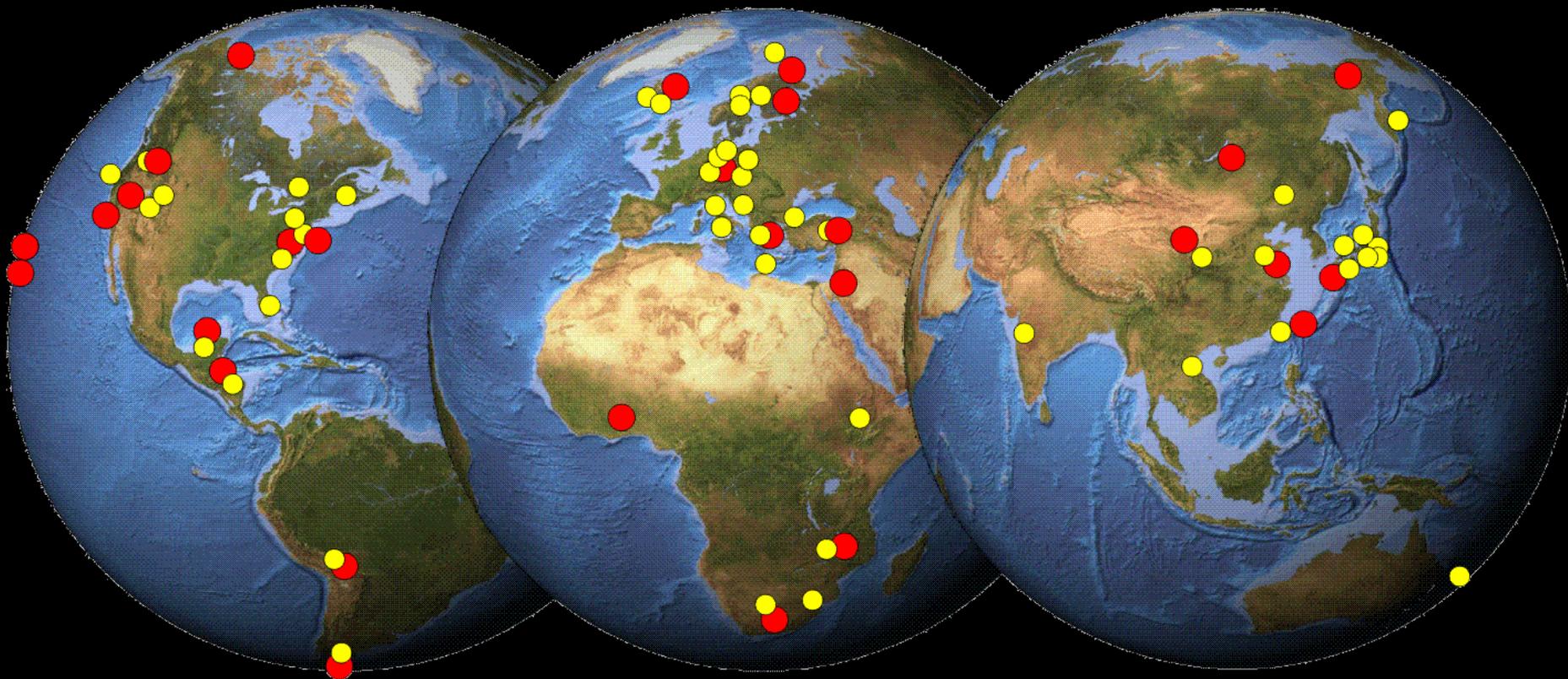


ICDP Workshops

Constitute an essential element in the preparation of a full proposal, as they encourage PIs

- to invite leading experts in the respective field from all over the world
- to deepen and broaden the project, define scientific objectives
- to form an international science team
- to prepare a detailed science, operations, and budget plan for a full proposal

THE STORY SO FAR



74 Workshops and 38 Projects

FUNDAMENTALLY DIFFERENT TO ODP

- The ICDP support is based on the „comingled funding“ principle
- Each ICDP drilling project is independently organized in the form of a Joint Research Venture (JRV)
- Drilling on land involves a much greater diversity of targets and drilling depths, which in turn require application of a much broader spectrum of drilling techniques

Comingled Funding Principle



ICDP co-financed Drilling Projects

Annual budget from membership dues – \$US3.5M

<u>Projects (22)</u>	<u>Total Funds</u>	<u>ICDP funds</u>	<u>ICDP %</u>
<i>examples:</i>			
Mallik	16,500,000 USD	1,300,000 USD	8%
SAFOD	14,951,000 USD	1,720,000 USD	12%
Unzen	12,200,000 USD	2,500,000 USD	13%
Chelungpu	2,370,597 USD	150,000 USD	6%
Bosumtwi	1,760,000 USD	1,235,000 USD	70%
FAR DEEP	970,000 USD	550,000 USD	51%
Lake Potrok Aike (~)	2,300,000 USD	1,300,000 USD	57%
Lake El'gygytgyn(~)	9,900,000 USD	2,200,000 USD	22%
<i>++other projects++</i>			
Total	100,800,000 USD	20,700,000 USD	21%

Project Funding through ICDP

Two Ways of Funding:

1. Leg = Financial Support
2. Leg = Operational Support
through the ICDP
Operational Support Group
at GFZ Potsdam, Germany

ICDP does not fund...



OPERATIONAL SUPPORT GROUP

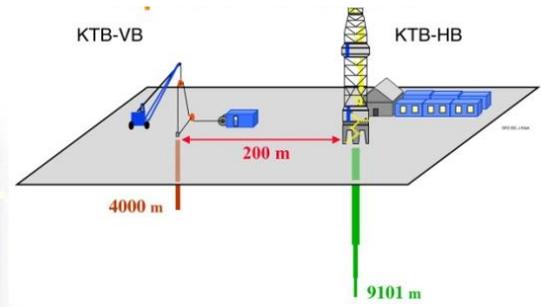
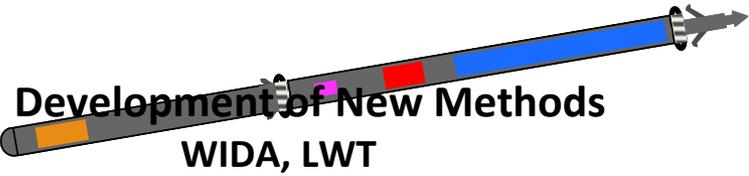
- assists PIs in developing Full Proposals
- supports PIs in planning & design of Drilling Projects
- assists PIs in scientific and engineering drill site operations and management
- provides drilling equipment, downhole tools and field laboratory facilities
- offers a robust data management system
- conducts ICDP Training Courses
- helps organizing ICDP Workshops

Geophysical Borehole Measurements

Logging Sondes

standard

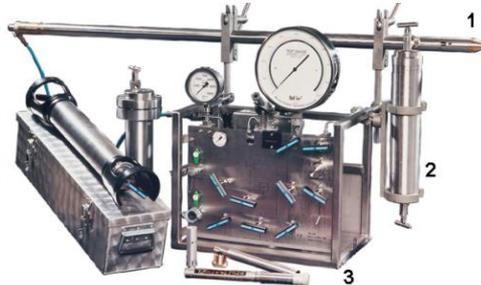
slimhole



Geophone-Chain



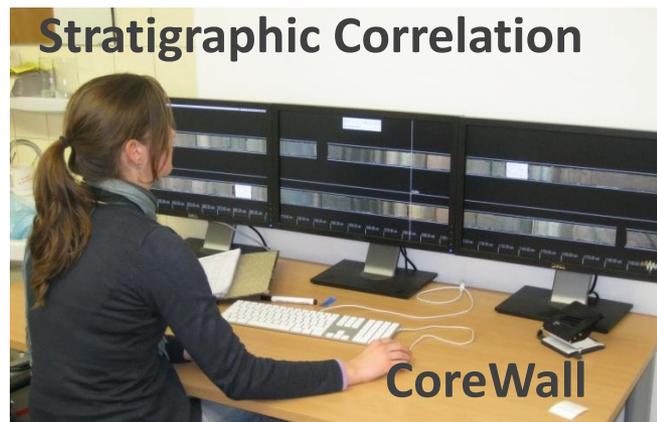
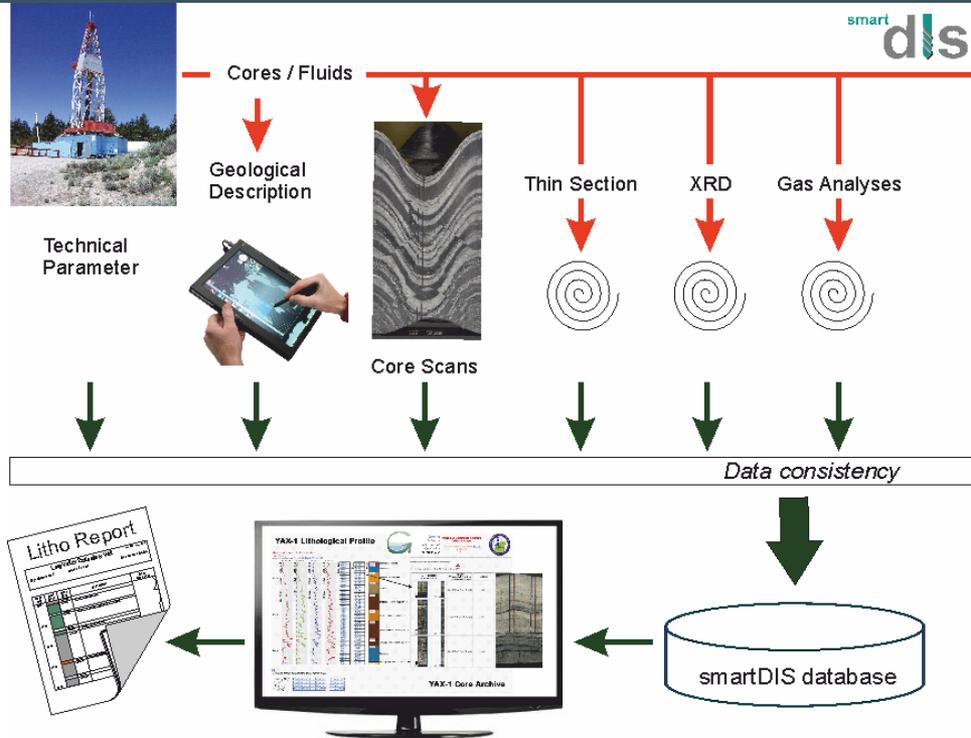
Fluid Sampler



Logging Winches



Data Management



ICDP Information Management Numbers

>18.900 data files
in >550 directories
>7.2 Gbytes
4789 known users,
2800 are registered and distributed in 60
groups
all ICDP proposals

ICDP Training

Call for application each year

2014: at LacCore with focus on soft sediments

2015: at the Franz Josef Glacier, New Zealand,
focus on Fault Zone Drilling plus a visit at
the Alpine Fault Drill site

Look for the call early next year



Nothing happens overnight.....

	1. Year	2. Year	3. Year	4. Year	5. Year			
TOWUTI	2011 WS Proposal	2012 WS	2013 Full P	2013 Add P	2014 Preparation/Funding	2015 Drilling		
IDRAs	2010 WS Proposal	2011 WS	2012 Full P	2012 Add P	2013 Funding/Preparation	2014 Drilling		
Junin	2010 WS Proposal	2011 WS	2012 Full P	2012 Add P	2013 Funding/Preparation			
COSC	2009 WS Proposal	2009 WS				2012 Full P	2012 Add P	
DFDP	2008 WS Proposal	2009 WS			2011 Full P	2011 Add P	2012 Funding/Preparation	
HSPDP	2007 WS Proposal	2008 WS			2010 FP		2011 Full P	
CPCP	2008 WS Proposal	2009 WS	2010 Full P	2010 Funding/Preparation				
COREF	2006 WS Proposal	2007 WS			2009 FP		2010 FP	
GONAF	2006 WS Proposal	2007 WS			2009 FP		2010 FP	2010 Add
Ohrid	2007 WS Proposal	2008 WS	2008 WS	2009 Full P	2009 Preparation/Funding			
Songliao	2007 WS Pro	2007 WS	2008 Full P	2009 Add	2009 Preparation/Funding			

Joint Activities

AGU Fall Meeting 2014

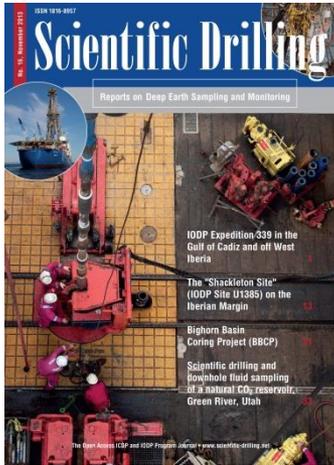
ICDP-IODP Townhall meeting „**Scientific Drilling**“, December 16, 2014 at the Hilton Hotel

With focus on open discussions instead of the usual lectures – an EXPERIMENT!
- generally 100-200 attendees



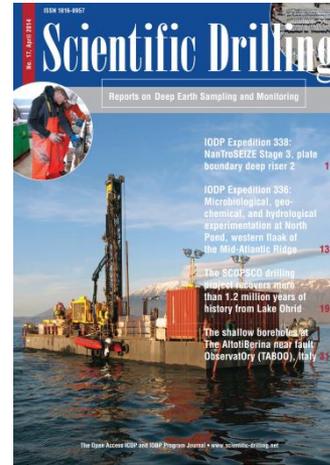
Scientific Drilling Journal

SD No. 16 (Nov. 2013)



- 4 x Science Reports
- 2 x Progress Reports/
Technical developments
- 4 x Workshop Reports

SD No. 17 (April 2014)



- 2 x Science Reports
- 3 x Progress Reports/
Technical developments
- 3 x Workshop Reports

SD No. 18 (publication in November 2014)

Current submission status:

- 2 x Workshop White paper
- 2 x Workshop Report
- 1 x Technical Developments





- pool expertise , foster exchange among scientists
- information platform
 - Know-how
 - funding possibilities
 - technical and logistical advice
- assistance in planning and conducting projects and site surveys
- assistance in the preparation of proposals
- support development of new instrumentation and technologies
- develop industrial cooperation, evaluate commercial bids
- outreach, education, training



Central core repository for continental cores



➔ to assure high-quality long-term curation of valuable core material



Site I

at the **BGR (Berlin Spandau)** for hard rocks

facilities:

- core repository, capacity 34 km
- working space for preparation
- labs for analysis (MSCL, XRF-Scanner)
- office space for guest scientists, seminar rooms



Site II

at the

Bremen Core Repository for lake sediments

facilities:

- MARUM I, capacity 200 km
- MARUM II, capacity about 70 km
- deep freeze at - 80 °C
- separate freezer at - 20 °C
- working space for preparation
- labs for analysis (MSCL, XRF, CT-Scanner)
- office space, seminar rooms



Overarching Data Information System (DIS)

Complex Sample Curation Software



cores/ samples get a persistent
IGSN

Science Reports

Scientific Drilling Into the San Andreas Fault Zone —An Overview of SAFOD's First Five Years



by Mark Zoback, Stephen Hickman, William Ellsworth,
and the SAFOD Science Team

doi:10.2204/iodp.sd.11.02.2011

Abstract

The San Andreas Fault Observatory at Depth (SAFOD) was drilled to study the physical and chemical processes

Detailed planning of a research experiment focused on drilling, sampling, and downhole measurements directly within the San Andreas Fault Zone began with an international workshop held in Asilomar, California in December



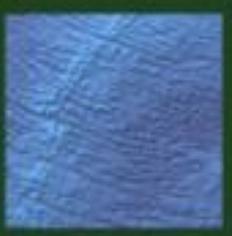
Welcome to the



GESEP
Drilling
Information
System V.: 1.0

German
 Scientific
 Earth Probing
 Consortium
GESEP e.V.

a tool to establish and manage an information system for drill sites and core repositories.



Overarching Data Information System

Web Portal

- ➔ Open access with improved availability and quality of geoscientific data
- ➔ A project independent, central data base with primary data and meta data as well as associated samples and publications

The Virtual Core Repository

ACCESS

REPOSITORIES

PROJECTS

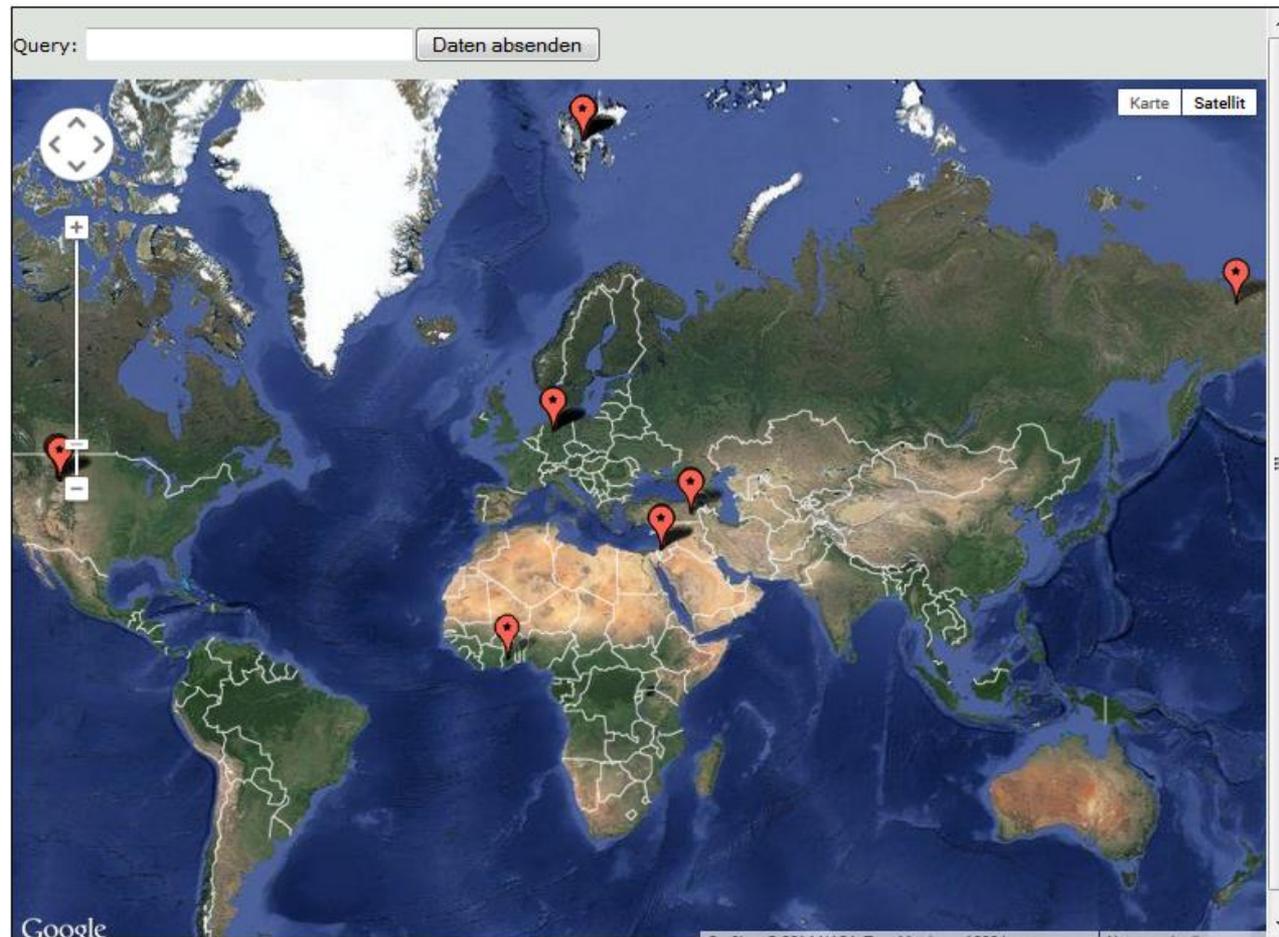
GESEP

Portal

This site is currently under construction.

Query:

Karte Satellit



Google

The Virtual Core Repository

ACCESS

REPOSITORIES

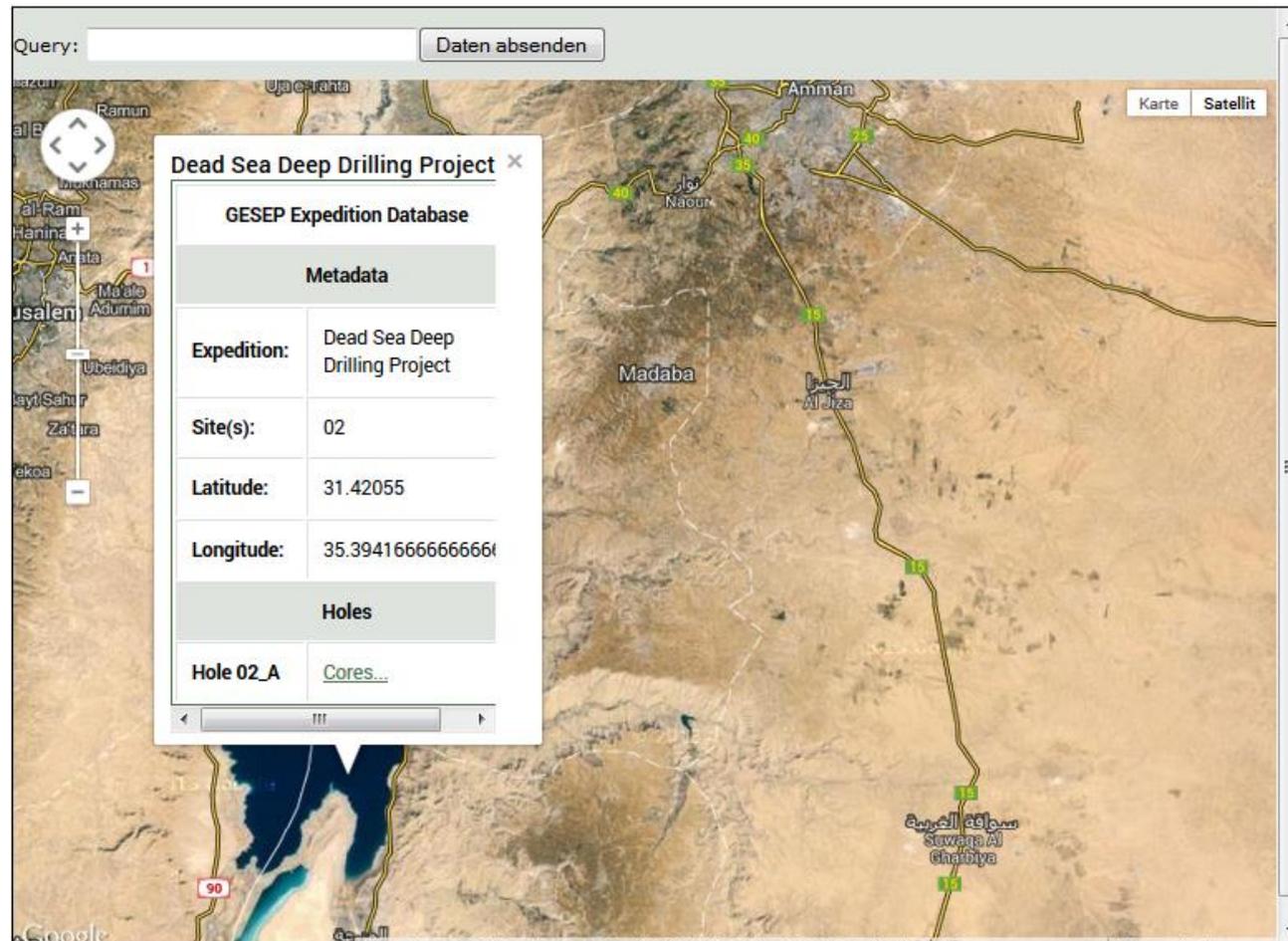
PROJECTS

GESEP

Portal

This site is currently under construction.

Query:



Karte Satellit

Dead Sea Deep Drilling Project

GESEP Expedition Database

Metadata	
Expedition:	Dead Sea Deep Drilling Project
Site(s):	02
Latitude:	31.42055
Longitude:	35.394166666666666
Holes	
Hole 02_A	Cores...

MARUM Core Repository Bremen - DIS View: Core-Details



Go to repository login-page:

[Repository login](#)

Core:

Expedition	Site	Hole	Core	Gear	Type	Top Depth (m)	Drilled Length	Bottom Depth	MCD Offset	Recovery	Recovery(%)	Oriented	Sections	Core Catcher	Curator	IGSN	Comments
DSDDP	02	A	1	RIG	H	11.42	1.48	12.9	0	1.48	100	no	2	yes	MS	MBCR5017RC9H001	soft, liquid salt, with grains of salt

Sections:

Section	Section Length	Curated Length	Top Depth (m)	Bottom Depth (m)	Curator	CC	MCD Top	Box	Slot	Position	IGSN	Comments
1	1.4	1.4	11.42	12.82	MS	no	11.42	1	1	F	MBCR5017RS3B101	
2	0.09	0.09	12.82	12.9	MS	yes	12.82	1	1	F	MBCR5017RS4B101	

Measurements, descriptions and images:

Section	MSCL-Meas.	Spectro-Meas.	XRF-Light	XRF-Medium	XRF-Heavy	Section Desc.	VCD-File	Thin Sections	360° Scan	Slabbed Scan
1	X					X	X			X 
2						X	X			X 

Samples:

Section	Half	Type	Top (cm)	Bottom (cm)	Top Depth (m)	Top MCD (m)	Volume (cc)	Request	IGSN	Sample	Comments
1	W	---	114	114	12.56	12.56	3.2	DSDP0001	MBCR5017RXFI701	9735	a bit silty

Thank you for your attention!