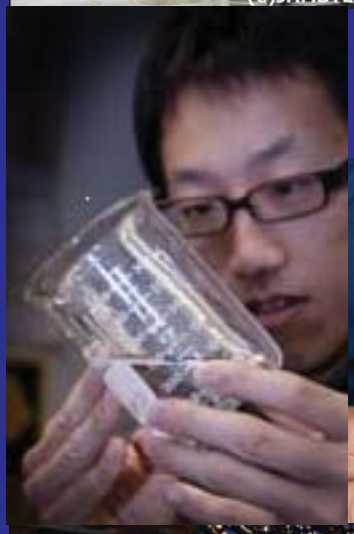
WHO, WHAT, WHERE, WHEN, WHY and HOW...

A Primer to the Integrated Ocean Drilling Program

IODP
INTEGRATED OCEAN DRILLING PROGRAM



PREFACE

The Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP) have revolutionized our view of Earth history and global processes and are widely considered to be models for international cooperation in multidisciplinary research and technological development. The scientific and administrative structures of these programs evolved profoundly during their 35-year existence, and this evolution continued with the start of the Integrated Ocean Drilling Program (IODP) on 1 October 2003. This Primer is intended to give an overview of IODP and how activities in the program are conducted. It is also intended to serve as a guide to participating in any of the many steps involved in scientific ocean drilling planning, execution, data analysis and dissemination. The Primer is a "living" document, to be updated throughout the life of the new program as the framework that supports integrated, multi-platform scientific ocean drilling develops and evolves. Within such a compilation, the amount of detailed information is necessarily limited; interested readers are encouraged to delve deeper into the organization by exploring the website and contact information provided regarding each subject discussed.

IODP – How to get involved

IODP offers numerous avenues for members of the scientific community to become involved with the program. Below are several of the most common avenues. Detailed information can be found in the appropriate section and the associated website links.

- Sailing on an expedition (Section 7.1),
- Submitting a drilling or engineering development proposal (Sections 5.3 and 6.3),
- Serving as a committee member on one of the many IODP Science Advisory Structure Panels or IODP-MI task forces (Section 4.3 and 4.4)
- Serving as an outside reviewer of proposals (Section 5.3).
- Providing/developing third-party tools (Section 6.4)
- Requesting samples for non-IODP funded research and publish results (Section 7.3.1)
- Becoming involved in education and outreach activities (Section 9.2)

WHAT IS IODP?

The Integrated Ocean Drilling Program (IODP) is an international marine research program that explores Earth's history and structure recorded in seafloor sediments and rocks, and monitors subseafloor environments. IODP builds upon the earlier successes of the Deep Sea Drilling Project (DSDP) and Ocean Drilling Program (ODP), which revolutionized our view of Earth history and global processes through ocean basin exploration. IODP greatly expands the reach of these previous programs by using multiple drilling platforms, including riser, riserless, and mission-specific, to achieve its scientific goals. The program's 10-plus-year science program plan, called the Initial Science Plan (ISP), guides scientific investigations and defines program goals constructed around three major scientific themes: (1) The Deep Biosphere and Subseafloor Ocean, (2) Environmental Change, Processes, and Effects, and (3) Solid Earth Cycles and Geodynamics.

The following two sections explain the evolution of IODP along with the complex and ambitious scientific goals that IODP strategically strives to accomplish.

1. History

Scientific ocean drilling represents one of Earth science's longest running and most successful international collaborations. In 1961 when drilling technology was used to successfully recover the first sample of oceanic crust, scientific drilling took root as a new scientific discipline. Over the next 45 years, scientific ocean drilling revolutionized Earth science, as it continues to do today (see Fig. 1).

Fig. 1: History of Scientific Ocean Drilling

1.1. Project Mohole

The vision and reality of deep ocean drilling began in 1961 with Project Mohole. Project Mohole, led by the American Miscellaneous Society with funding from the National Science Foundation, was an ambitious attempt to drill through the Earth's crust into the Mohorovičić discontinuity and to provide an Earth science complement to the high profile Space Race

Project Mohole contracted with Global Marine of Los Angeles for the use of its oil drillship called CUSS I. Consortia of Continental, Union, Superior and Shell Oil Companies (CUSS) had originally developed the drillship in 1956 as a technological test bed for nascent offshore oil industry. While "CUSS I" was one of the first vessels in the world capable of drilling in water depth up to 600 ft, Project Mohole expanded its operational range by virtually inventing what is now known as dynamic positioning (See Fig 2).

Phase One was executed in the spring of 1961. Off the coast of Guadalupe, Mexico, five holes were drilled, the deepest at 183 m (601 ft) below the sea floor in 3,500 m (11,700 ft) of water. This was unprecedented: not in the hole's depth but because of the depth of the ocean and because it was drilled from an untethered platform. Also, the core sample proved quite valuable, showing Miocene age sediments with the lowest 13 m (44 ft) consisting of basalt.

Phase One proved that both the technology and expertise were available to drill into the Earth's mantle. However, Mohole-Phase Two was dissolved in 1966 for budgetary reasons.

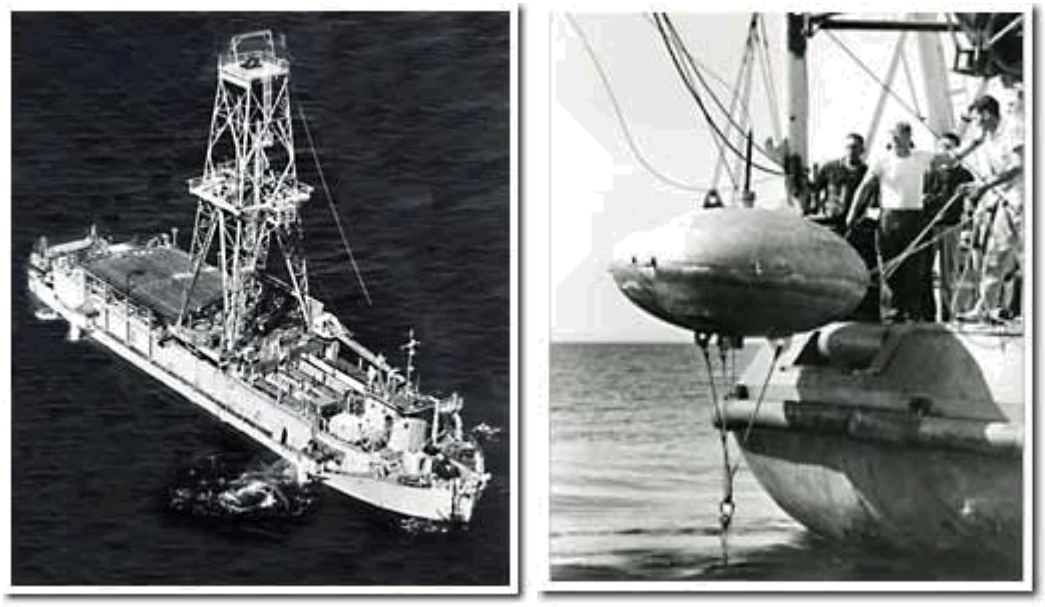


Fig. 2: Project Mohole drillship ship, CUSS I. (Left) Overhead view of CUSS I, the converted Navy Barge used for Project Mohole's deep-sea drilling tests in spring of 1961 (NSF photograph). (Right) CUSS I crew lowering one of the six taut line submerged buoys used for dynamic positioning. The six buoys were lowered into a circular pattern at a depth of about 200 feet. The ship would then use sonar to position itself in the center of the circle (NSF photo.)

1.2. DSDP

Deep Sea Drilling Project (DSDP), based out of Scripps Institution of Oceanography at the University of California, San Diego began June 24, 1966. Starting in August of 1968, The Glomar Challenger (Fig. 3) took DSDP into the Atlantic, Pacific, and Indian oceans as well as the Mediterranean and Red Seas.

From August 11, 1968, to November 11, 1983 an impressive list of drilling accomplishments were achieved from the Challenger. Core samples revealed the existence of salt domes, provided definitive proof for continental drift and seafloor renewal at rift zones confirming Alfred Wegner's theory of continental drift, gave further evidence to support the plate tectonics theory of W. Jason Morgan and Xavier Le Pichon, and enabled many more important discoveries.

With the advent of larger and more advanced drilling ships, the *JOIDES Resolution* replaced the Glomar Challenger in January 1985, to start a new program, called the Ocean Drilling Program (ODP).

Fig. 3: From 1968 to1983, the Glomar Challenger pioneered scientific ocean drilling as the research vessel for the Deep Sea drilling Project, operated by the Scripps Institution of Oceanography, University of California, San Diego.

For more detailed information concerning DSDP please visit:

http://www.iodp.tamu.edu/publicinfo/glomar_challenger.html

1.3. ODP

The Ocean Drilling Program (ODP) was an international cooperative effort to explore and study the composition and structure of the earth's ocean basins. ODP, which began in 1985, directly succeeding DSDP. ODP was a truly international effort with contributions of Australia, Germany, France, Japan, the United Kingdom and the European Science Foundation Consortium for Ocean Drilling (ECOD) consisting of 12 additional European countries. The program used the

drillship *JOIDES Resolution* (Fig. 4) on 110 expeditions to drill about 2000 holes from major geological features located in the ocean basins of the world. The sediments recovered range in age from the last decade all the way back to the Triassic Period, nearly 227 million years ago. ODP advanced scientific discovery deep below the seafloor and provided evidence of 1) fluids circulating through the ridge flanks of the ocean floor, 2) the formation of volcanoes and volcanic plateaus at rates unknown today, 3) natural methane frozen deep within marine sediments as gas hydrate, 4) a vibrant microbial community living deep within oceanic crust, and 5) persistently rhythmic climate history. Drilling discoveries led to further questions and hypotheses, as well as to new disciplines in earth sciences such as the field of pale-oceanography. In 2004, ODP was replaced by the Integrated Ocean Drilling Program (IODP).

Fig. 4: JOIDES Resolution. (Left) JOIDES Resolution was converted in Pascagoula, Mississippi, in the fall of 1984. She was built in Halifax, Nova Scotia in 1978 and had previously sailed the world as a top-class oil-exploration vessel. (Right) The ship can deploy up to 30,000 feet of drill string.

Detailed information on program administration, scientific results, engineering and science operations, samples, data, publications, or outreach materials is located on the ODP legacy website: http://www-odp.tamu.edu/index.html

2. IODP Scientific Goals: The Initial Science Plan

The first program principle developed by the International Working Group charged with formulating IODP states “The IODP is an [integrated, multi-drilling platform] scientific research program with objectives identified in the IODP Science Plan”. Thus the Initial Science Plan (ISP) is the heart of IODP, providing fundamental guidance as to the scientific and technical objectives that are of greatest interest to IODP. Exciting discoveries are certain to lead to new priorities in the future and IODP will be flexible in responding to unique opportunities, but the

Initial Science Plan lays out an essential framework for the design and evaluation of scientific programs that will help to achieve critical goals. IODP studies will lead to a better understanding of the deep biosphere and the sub-seafloor ocean; environmental change, processes, and impacts; and solid earth cycles and geodynamics.

The full title of the Initial Science Plan for IODP is "Earth, Oceans and Life: Scientific Investigations of the earth System Using Multiple Drilling Platforms and New Technologies." The Initial Science Plan grew out of numerous workshops, conferences, and discussions among hundreds of scientists, engineers, and agency representatives. The contents of the Initial Science Plan were formulated mainly during the periods from 1997 to 2001 by an international, multi-disciplinary, scientific community, drawn together by common interests, technical needs, an appreciation for the wonder of scientific discovery, and dedication to the success of the complete enterprise. Some of the objectives discussed in the Initial Science Plan date back to the original Conference on Scientific Ocean Drilling (COSOD, 1982), while others were developed only in the last few years leading to the establishment of IODP. The Conference on Cooperative Ocean Riser Drilling (CONCORD, 1997) and the Conference on Multiple Platform Exploration for the Ocean (COMPLEX, 1999) were particularly important in formulating the scientific objectives for IODP and drafting the Initial Science Plan .

The Initial Science Plan can be downloaded or viewed at: http://www.iodp.org/isp/.

2.1. Initial Science Plan Themes

The Initial Science Plan identifies three broad themes on which scientific ocean drilling efforts will be concentrated beyond the year 2003. The first is the study of the deep biosphere and associated sub-seafloor ocean. The second involves investigating Earth's environmental change, in terms of both its processes and effects. The final theme encompasses a range of inter-related scientific problems pertaining to the cycles and geodynamics of the solid Earth. Within these broad themes, specific areas of concentration are identified for which ocean drilling is either the best, or only, way to solve scientific problems of a fundamental nature. These areas of concentration include studies of: seismogenic zones, gas hydrates, rapid climate change and periods of extreme climates, continental breakup and sedimentary basin formation, large igneous provinces, and the fundamental nature of oceanic crust.

2.2. Implementation Strategy

The integration of multiple drilling platforms, exploratory tools, and diverse strategies in resolving outstanding questions is discussed throughout the Initial Science Plan and is central to the success of IODP.

The specific IODP initial drilling initiatives require IODP to deploy closely linked drilling platform types simultaneously (Fig. 5). A riser-equipped drillship will permit IODP to address deep objectives that require drilling for months to a year or more at a single location. Deep objectives include the "seismogenic zone" experiment, designed to determine the behavior of earthquake-generating faults in subduction zones; the deep crustal and intra-sedimentary biosphere; the three-dimensional structure of oceanic and Large Igneous Province (LIP) crust; and the processes of continental breakup and sedimentary basin formation. A riserless drillship will enable IODP to reach the ocean's greatest depths, while continuing to expand the global sampling coverage and disciplinary breadth characteristic of ODP and DSDP. Mission-specific platforms will permit unprecedented examination of the history of sea-level change in the critical region near the shoreline, the recovery of high-resolution climate records from atolls and reefs in shallow water areas and the exploration of climatically sensitive, ice-covered regions not yet sampled by drilling, such as the Arctic Ocean basin.

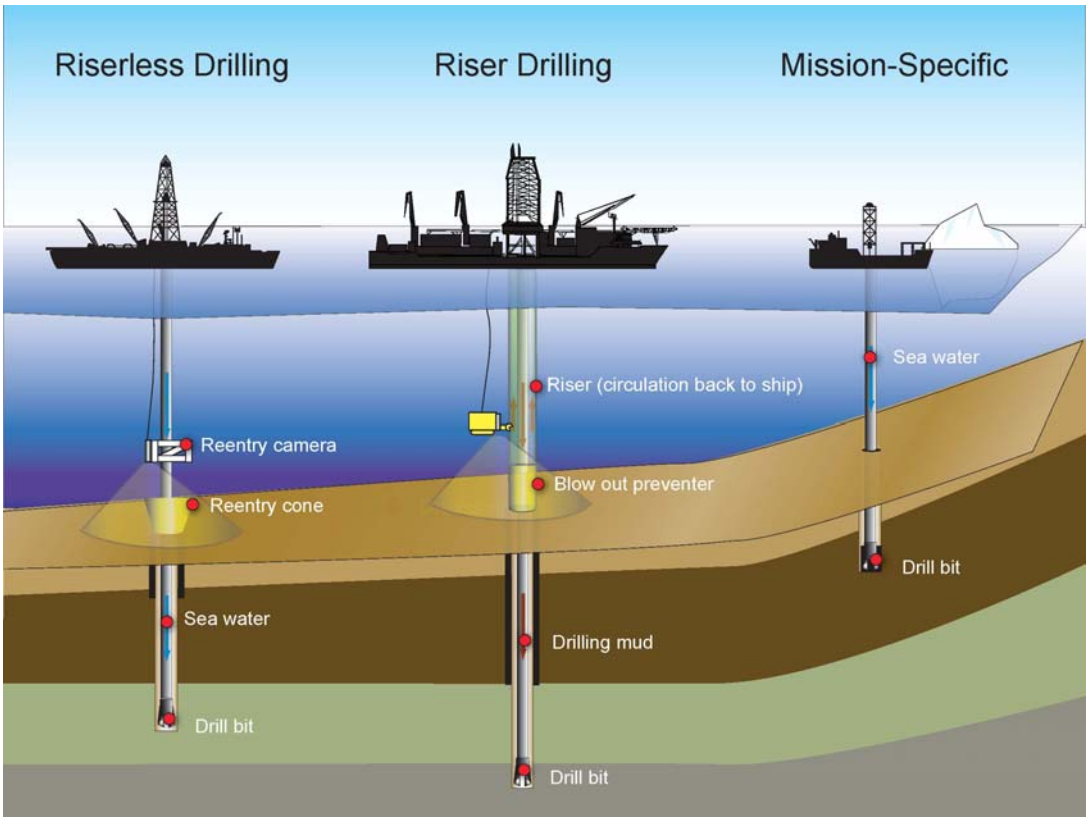


Fig. 5: Graphical depiction IODP's multi-platform approach. The Riser-vessel provides the ability to drill deepest into the earth, the Riser-vessel enables IODP to drill in the deepest water, and the Mission-specific platform allows IODP to complete projects in areas too shallow for the other two drillships. The three platforms enable IODP to conduct scientific ocean drilling in most any condition.

Of fundamental importance to successful drilling from these platforms is the deployment of new or improved drilling, sampling and downhole petrophysical tools, which allow scientists to recover drilled sections more completely, to obtain uncontaminated samples at ambient pressures, to isolate and record data on the physical properties of specific intervals within boreholes and to initiate drilling and recovery of exposed hard rocks. DSDP and ODP have laid a solid technological foundation in most of these areas. Some tools, such as the advanced piston corer (APC) developed for scientific ocean drilling by ODP, require little engineering improvement. Significant improvement of other tools, such as hard rock drilling systems, require that IODP closely interact with scientific users, and call upon the advice and technical expertise of the drilling industries. As IODP drilling progresses into harsher environments, where the challenge of recovering biologically, chemically and physically intact samples continues to increase, improved tools will be critical for achieving the program's scientific goals.

Post-drilling observations and experiments in boreholes, pioneered by ODP, are of great importance in IODP. Sustained time-series recordings by instruments sealed within boreholes are required to investigate active processes such as pore-water flow, thermal and chemical advection and crustal. Boreholes will also be used for perturbation experiments to investigate in situ physical properties of sediments and/or crust, and their associated microbial communities. A global network of geophysical observatories for imaging Earth's deep interior is also planned.

Another important element of our new vision for scientific drilling is the development of closer links between marine geoscientists and their continental drilling and industry colleagues. For example, many fundamental scientific questions to be addressed over the next decade “cross the shoreline.” Attacking these problems will require an integrated approach combining continental studies (e.g., lake and continental crust drilling, field-based mapping, onshore-offshore geophysical transects) and drilling into the seafloor. Close interaction with international scientific programs, such as InterRidge, InterMargins, the International Ocean Network (ION), International Geosphere-Biosphere Program of Past Global Changes (PAGES), International Marine Past Global Change Study (IMAGES), Nansen Arctic Drilling (NAD) and the International Continental Drilling Program (ICDP) will continue to contribute greatly to the quality of IODP science. Ongoing industry-academic dialogue is also defining broad overlap in fundamental research problems that are of interest to both communities. As hydrocarbon exploration rapidly expands into deeper water and the international scientific community gains interest in using deep- water riser technology, opportunities for intellectual and technological collaboration should continue to grow.

HOW DOES IODP WORK?

IODP is a multiplatform, international operation sponsored by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. National Science Foundation (NSF) as Lead Agencies, by the European Consortium for Ocean Research Drilling (ECORD) Managing Agency, the People's Republic of China, and the Interim Asian Consortium; IODP is managed by IODP-Management International; and IODP's drilling platforms are operated by three Implementing Organizations, including the U.S. Implementing Organization, the ECORD Science Operator (ESO), and JAMSTEC's Center for Deep Earth Exploration (CDEX).

Sections 3 and 4 of the Primer will explain how IODP is funded and managed (Fig. 6), below illustrates the general overall functioning of this organization.

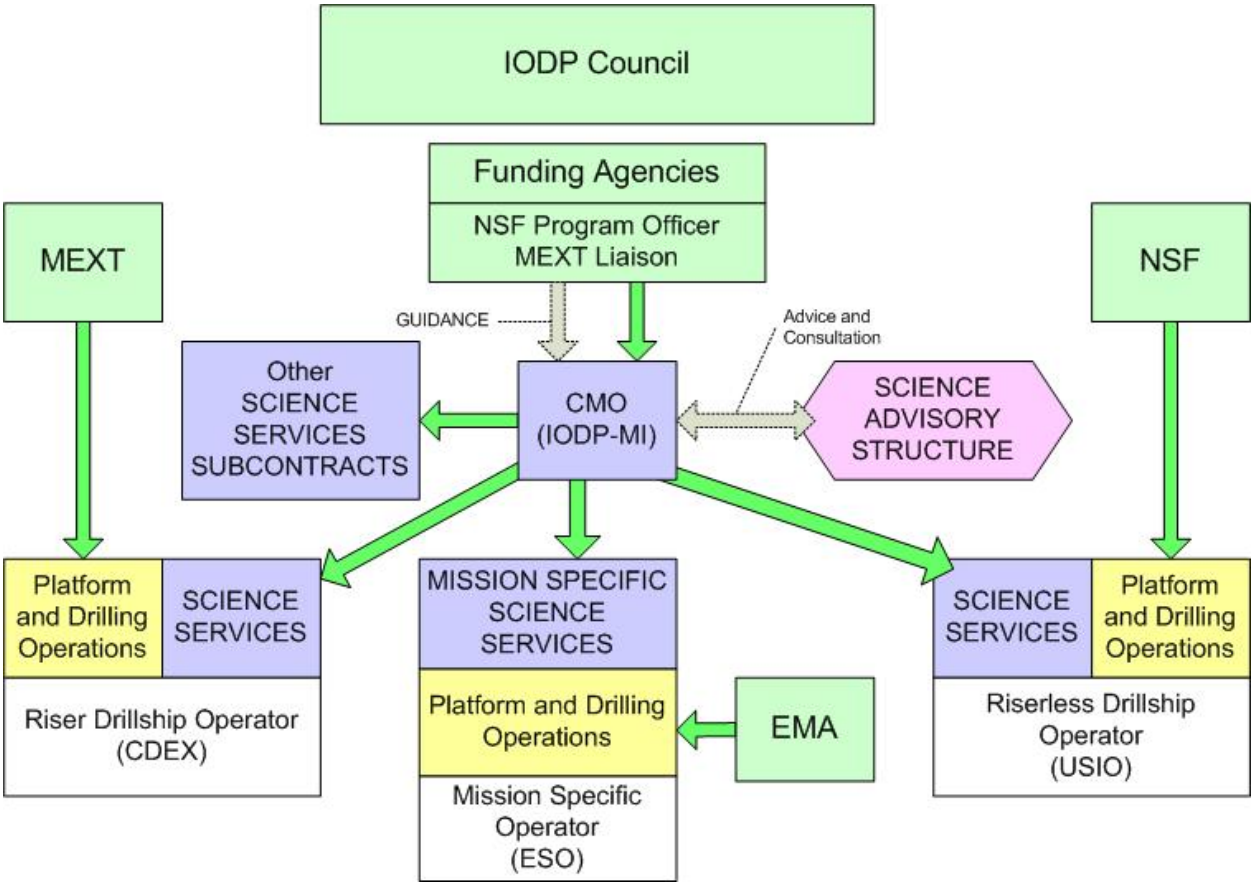


Fig. 6: IODP Organization. Green arrows indicate funding flow. Grey arrows denote guidance and advice.

3. Funding

IODP's initial 10-year life span is supported by five funding entities, including the U.S. National Science Foundation and Japan's Ministry of Education, Culture, Sports, Science, and Technology (the Lead Agencies), the European Consortium for Ocean Research Drilling, the People's Republic of China and the Interim Asian Consortium. Platform Operation Costs are

supplied directly to the Implementing Organizations by the national agencies that support them (See Section 3.3.1). Co- mingled funds from these sources are used for the Science Operation Costs (See Section 3.3.2) of all IODP program activities.

3.1. Lead Agencies

In April 2003, officials from Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. National Science Foundation (NSF) signed a Memorandum of Understanding in which they agreed to form and operate the Integrated Ocean Drilling Program.

IODP is primarily supported by these Lead Agencies. Each Agency has equal membership rights and responsibilities, contribute core capabilities to the IODP, determine total program costs, and contribute equally to the total program costs. The Lead Agencies provide budget guidance to the Central Management Office (IODP Management International) and review and approve the annual IODP Program Plan prior to implementation.

3.2. Members

Membership in the IODP is available to government and/or national agencies that have interest and capability in geoscience research. To become a member, a Memorandum of Understanding (MOU) must be signed by the National Science Foundation of the United States of America, the Ministry of Education, Culture, Sports, Science and Technology of Japan and the appropriate new member agency. The MOU stipulates, among other things, the contribution of the member to the program, the number of scientists that sail on the platforms and number of scientists in SAS Committees and Panels.

IODP members are expected to make appropriate annual payments to the National Science Foundation. The annual payments are then co-mingled and turned over to the Central Management Office for distribution in support of science-operating costs. Annual payment must be at least equal to one full "participation unit". The amount of a participation unit is adjusted annually to meet the demands of specific program objectives (the US Fiscal Year 2007 amount equals $5.6 million). To attain membership of IODP, a minimum annual contribution amount equal to one participation unit is required. A member's expected level of participation in the IODP is proportional to the number of participation units represented by that member's contribution to the IODP.

One participation unit entitles an IODP member to the right to (1) have two of its scientists participate in each drilling cruise; (2) be represented on all planning and advisory panels; (3) have access to all data, samples, scientific and technical results, all engineering plans, data or other information produced under contracts supported as program costs; (4) have access to all data from geophysical and other site surveys performed in support of the program which are used for drilling planning; (5) submit proposals to the Science Advisory Structure for drilling or engineering developments in support of IODP science; and (6) be represented on the IODP Council.

The European Consortium for Ocean Research Drilling (ECORD) Managing Agency is currently a member of IODP (in addition to the Lead Agencies). The consortium was initially established with 12 European countries to maximize the impact of European scientists in IODP. The consortium has since grown representing the collaborative ocean-drilling efforts of 15 European nations, the United Kingdom, and Canada. The European Consortium provides the IODP scientific community with access to mission-specific platforms, in the form of funding and implementation, in addition to the participation unit(s) contributed for science-operating costs.

3.2.1. Associate Members

Associate IODP members are those that contribute an amount less than one participation unit and equivalent to at least 1/6 participation unit. Associate IODP members may elect to have scientific participation and representation on Science Advisory Structure service committees, panels, or working groups in proportion to their contributions. However, associate members do not have representation on the Science Advisory Structure Executive Authority or the Science Planning Committee. Participation in drilling operations is prorated based on the fraction of participation unit contributed by an associate member (one full participation unit corresponds to inclusion of two scientists in all drilling operations).

Currently, IODP Associate Members include: The People's Republic of China Ministry of Science and Technology (MOST) and The Interim Asian Consortium, represented by the Korea Institute of Geoscience and Mineral Resources (KIGAM).

For more information on IODP funding agencies, please visit: http://www.iodp.org/funding-agencies/

3.3. IODP Council

An IODP Council, representing all of the partners, provides a forum for exchange of views among member nations and consortia and serves as a consultative body reviewing financial, managerial, and other matters involving the overall support of IODP. The chairperson of the IODP Council rotates among the Lead Agencies.

3.4. Fund Allocation

Total program costs consist of both Platform Operation Costs and Science Operation Costs. The two Lead Agencies (NSF, MEXT) and one full IODP Member (ECORD) are each responsible for funding their nation's/consortia's implementing organization's drilling platform through Platform Operation Costs, while IODP Science Operations Costs, co-mingled from all the international partners membership fees, are used to conduct IODP science.

3.4.1. Platform-Operation costs

The U.S. National Science Foundation (NSF) provides Platform Operation Costs directly to the United States Implementing Organization (USIO), which operates the riserless drillship *JOIDES Resolution*. The Ministry of Education, Culture, Sports, Science and Technology provides Platform Operation Costs for the riser drillship *Chikyu*, operated by the JAMSTEC's Center for Deep Earth Exploration. The European Consortium for Ocean Research Drilling Managing Agency provides Platform Operation Costs for the European Implementing Organization's mission specific platforms.

Platform Operation Costs for the *JOIDES Resolution*, *Chikyu*, and mission-specific platforms support the basic operation of the vessel as a drillship, and include, for example: (1) costs of the drilling and ship's crew, (2) catering services, (3) fuel, vessel supplies and other related consumables, (4) berthage and port call costs, (5) disposal of wastes, (6) crew travel, (7) inspections and insurance, (8) drilling equipment, supplies, and related consumables, (9) engineering or geophysical surveys, and data acquisition and laboratory analyses required for the safety of platform and drilling operations, and (10) administration and management costs of the platform operators.

3.4.2. Science-operation costs

The Ocean Drilling Program office at the U.S. National Science Foundation is also responsible for administering co-mingled funds directed towards the science-operating costs of all IODP operations. These co-mingled funds come from the international partners (Lead Agencies, Contributing Members, and Associate Members) as part of their membership fees used for the conduct of IODP science. The contractual distribution of the co-mingled funds is governed by Annual Program Plans that are approved by the Lead Agencies.

Science Operations Costs include: (1) Technical Services, (2) Computer Capability, (3) Data storage and distribution, (4) Description, archiving, and distribution of data and samples, (5) Deployment of a standard suite of logging tools, (6) Development of new drilling tools and techniques required by IODP research, (7) Program publications (8) Costs of consumables (exclusive of those identified under platform operations costs), (9) Costs required for administration and management, including the Central Management Office and (10) Outreach

4. IODP Operation

An IODP Council, representing all of the partners, provides a forum for exchange of views among member nations and consortia, and reviews accomplishments, status, and plans, including financial, managerial and all other matters regarding the overall support of IODP. The chairperson of the IODP Council rotates among the Lead Agencies.

Day to day IODP operations, however, are provided by three main entities:

The Central Management Office (CMO): IODP-Management International, Inc. (IODP-MI) has received a 10-year contract from the Lead Agencies to run the Central Management Office.

The Implementing Organizations (IOs): the U.S. Implementing Organization (USIO) is responsible for riserless ship operations, JAMSTEC's Center for Deep Earth Exploration (CDEX) is responsible for the riser-equipped vessel, *Chikyu*, and the European Consortium of Ocean Research Drilling Science Operator (ESO) is responsible for mission-specific platforms (MSPs).

The Science Advisory Structure (SAS) - The IODP Science Advisory Structure consists of scientists, engineers, and technologists nominated by IODP program member offices.

4.1. Central Management Office (IODP-MI)

IODP is managed by a nonprofit corporation, IODP-Management International, through a 10-year contract with the National Science Foundation. IODP-MI is responsible for program-wide science planning, oversight of engineering development, publication, education and outreach, site survey data management, and core sample repositories. With advisory assistance from an internationally staffed Science Advisory Structure, IODP-MI translates the scientific priorities of the global ocean-drilling community into annual program plans. An executive committee of the Science Advisory Structure approves each annual program plan before it is funded by the Lead Agencies.

IODP-MI has established two offices: the Washington DC office serves as headquarters and corporate office; the Sapporo office, in Japan, is headed by the IODP-MI Vice President for Science Planning.

For more information on IODP-MI, please visit: http://www.iodp.org/iodp-mi/

4.1.1. Annual Program Plan

It is the responsibility of IODP-MI to develop an Annual Program Plan for IODP in close coordination with the scientific community represented by the Science Advisory Structure and with the Implementing Organizations.

IODP-MI receives drilling proposals from community scientists and the Science Advisory Structure provides advice and recommendations to IODP-MI on the scientific priority of each proposal. IODP-MI then requests annual operational plans and budgets from the IOs that would be required to implement the highest priority science, and works with IOs and the Science Advisory Structure to produce an integrated IODP Annual Program Plan (APP).

IODP-MI submits the program's Annual Program Plan to the Science Advisory Structure Executive Committee and to the IODP-MI Board of Governors for review prior to its consideration by the Lead Agencies. The National Science Foundation has responsibility for contractual approval of the Annual Program Plan, in consultation with Japan's Ministry of Education, Culture, Sports, Science and Technology.

IODP Annual Program Plans can be located at: http://www.iodp.org/app/

4.1.2. IODP-MI Board of Governors (BoG)

A Board of Governors was created to oversee the governance and general management of the affairs, funds, and property of IODP-MI and all its powers. The Board of Governors has the authority to make rules and regulations for IODP-MI's management, create additional offices or special committees, select, employ or remove its agents or employees as necessary, and fill vacancies and change the membership of committees. Additionally, the Board of Governors has the responsibility for the approval and implementation of the annual IODP plan and budget. The Board must approve all grants and contracts; the Board of Governors must receive notification that liability matters are covered beyond the limited liability of IODP-MI in all contractual procedures.

The IODP-MI Board of Governors is made up of appointed persons from IODP member countries and consortia based on financial contribution. Five members from countries or consortia with Lead Agency status are appointed and members of IODP from countries or consortia in IODP without Lead Agency status appoint Governors based on financial contributions (POCs and SOCs) to the IODP according to the following scale, $5M (US) to $9.99M (US) = 1 seat, $10M (US) to $14.99M (US) = 2 seats, $15M (US) to $29.99M (US) = 3 seats, $30M (US) to $44.99M (US) = 4 seats, $45M (US) to $60M (US) = 5 seats. Additionally, the President of IODP-MI serves as a non-voting Governor to the Board.

Information on the IODP-MI Board of Governors, the officers, contact information and meeting minutes are located at: http://www.iodp.org/bog/

4.1.3. IODP-MI Membership

Currently IODP-MI has 31 members, 11 from the United States, 8 from Japan, and 12 from Europe. Membership in IODP-MI is open to nonprofit educational and/or research organizations formed and operated in an IODP Member entity (i.e., country or consortia) that satisfy criteria, as defined by the IODP-MI By-laws and subsequently approved by the IODP-MI Members, as evidencing "a significant dedication to ocean geoscience

research." All members must pay an initial membership fee of US$5000 as well as annual dues not to exceed $5000.

Educational and/or research organizations, government agencies, non-governmental organizations, and for-profit companies ineligible for membership, but having an interest in ocean geoscience research, may become Associate Members. An Associate Member does not have the right to vote upon matters coming before the Membership and cannot serve on the Board of Governors, but can participate in open meetings of the Membership and may serve on other corporate committees, as appropriate. All Associate Members have to pay an initial membership fee of US$2500 plus an annual fee half that of Members.

Other non-profit and educational and/or research institutions with a major commitment to and involvement in ocean geoscience research may be elected as members by the unanimous consent of the voting members. Associate members shall be elected by a majority of the voting members.

An up-to-date list of IODP-MI membership and representative contact information can be found at: http://www.iodp.org/members-and-representatives/.

4.1.4. IODP-MI Task Forces and Project Management Groups

IODP-MI is responsible for overseeing the implementation of a large number of tasks, including operational planning, engineering development, database management, education and outreach, publications, and repository oversight. IODP-MI utilizes task forces to assist in implementation where necessary. The purpose of task forces is to focus the advice obtained from Science Advisory Structure and provide concrete advice on policy, so that IODP-MI can proceed with implementation. All task forces usually will include Science Advisory Structure members, representatives from the Implementing Organizations, and other experts. The members of the task forces are chosen by IODP-MI. Task forces will not be asked to write Request for Proposals. The policy formulations by the task forces, however, will often guide IODP-MI personnel in writing Request for Proposals.

IODP-MI Task Forces are briefly described below. Detailed information, including rosters, meeting minutes, schedules, and agendas are located at: http://www.iodp.org/iodp-mi-task-forces/2/

Management Forum

The Management Forum tackles issues that concern IODP as a whole. It reviews and offers advice to the IODP-MI President on policies, procedures, and current and future activities. The Management Forum, while representing the views of the various separate entities that comprise IODP, is able to express a joint perspective on the program.

The Management Forum includes key personnel from IODP-MI, the Heads of the Implementing Organizations, and the Chairs of the Advisory Committees of the National Program Offices, the Science Planning Committee Chair, and the Science Advisory Structure Executive Committee Chair.

Detailed information regarding Management Forum is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Operations Task Force (OTF)

The IODP-MI Operations Task Force's primary function is to formulate the most logistically, fiscally effective operational plans to meet the objectives set forth in IODP's 10-year science plan, as prioritized by the Science Planning Committee. The scheduling strategy involves: (1) examining science plans for each proposal; (2) determining operational and environmental constraints; (3) developing a matrix that combines the Science Planning Committee science plan with operational and environmental constraints and risk, operational days at sea, and transits; and (4) adding fiscal reality to viable options forwarded to the Science Planning Committee.

Operations Task Force members include the IODP-MI Vice President of Science Operations, IODP-MI Vice President of Science Planning, 1-3 representatives from each Implementing Organization, the Chair of the Science Planning Committee plus 5 additional Science Planning Committee members.

Detailed information regarding the Operations Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Operations Review Task Force (ORTF)

IODP-MI Operations Review Task Force conducts operational reviews of IODP Expeditions. The Task Force review is based upon confidential reports submitted by the Implementing Organization and expedition co-chief scientists. These operational reviews focus on "lessons learned" and "how do we do things better in the future?" Areas of discussion include pre-expedition planning, expedition drilling operations, communications between scientists and operators, roles and responsibilities of scientists and operators, general procedures and policies (e.g., curation, communications), laboratory operations, etc. Each of these operational reviews results in recommendations that are compiled into a short summary report that is posted on the IODP website.

Operations Review Task Force Members include the IODP-MI Vice President of Science Operations (Chair), IODP-MI President, 3-5 representatives from the Implementing Organization under review, 1 representative from each Implementing Organization not under review, the co-chief scientists for the expedition under review, 3 scientists with knowledge about IODP and the expedition under review, and 3 industry representatives.

Detailed information regarding the Operations Review Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Engineering Task Force (ETF)

The Engineering Task Force assists IODP-MI in its effort to bring appropriate technology to the program that is required to meet the science objectives detailed in the IODP Initial Science Plan. In particular, the Engineering Task Force helps IODP-MI establish a long-term engineering vision for the program, evaluate and use advice provided by the IODP Science Advisory Structure to prioritize and implement engineering initiatives, help IODP-MI identify potential vendors and additional engineering experts as required, and help IODP-MI review on-going engineering development projects. Major agenda topics and areas of interest include:

- Determining high-level IODP engineering goals
- Review of Science Advisory Structure advice and prioritization
- Implementation of engineering initiatives
- Evaluate engineering development proposals
- Progress reviews of funded developments
- Review IODP technology road map
- Help IODP-MI determine how best to procure services
- Thematic meetings such as observatory technology, heave compensation, deep drilling and/or coring techniques

The Engineering Task Force is chaired by the IODP-MI Engineering and Operations Manager and includes industry, academic, and government experts on instrument design, drilling techniques, and emerging technologies, as well as one liaison from each Implementing Organization.

Detailed information regarding Engineering Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Curatorial Task Force (CTF)

The Curatorial Task Force (formerly known as the Curatorial Advisory Board) has several main roles including: (1) Acting as an appeals board vested with the authority to make final decisions regarding sample distribution, if and when conflicts or differences of opinion arise among any combination of the sample requester, an IODP Curator at the repository of interest, or the Sample Allocation Committee Reviewing (2) approving requests to sample the permanent archive and (3) approving requests for loans of core material.

The Curatorial Task Force is chaired by the IODP-MI Vice President of Science Planning. Members also include the IODP-MI Vice President of Science Operations and three members of the scientific community. The latter serve overlapping four-year terms and are nominated by the Scientific Technology Panel.

Detailed information regarding the Curatorial Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Data Management Task Force (DMTF)

The primary task of the Data Management Task Force is to oversee the development a user-friendly data portal to access and display data generated by the program. The Task Force is also charged with issuing Request for Proposals related to the data portal, associated search engines or visualization tools, and existing or emerging technologies relevant to the program.

The Data Management Task Force is chaired by the IODP-MI Data Manager and is populated by the IODP-MI Publications Manager, Implementing Organization liaisons, and community specialists within the field of digital library technology, Geographic Information Systems (GIS) and geo-referenced data, Web services, data

visualization and cyber-infra structure. The Data Management Task Force is composed of external experts in the following fields:

- Central Web Portal for distributed databases
- Metadata standard for geographic scientific data (ISO 19115)
- Data integration, mining and access in a distributed environment
- GIS, data visualization, mapping and web services
- Scientific data exchange format and standard
- IODP data users

Detailed information regarding Data Management Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2/

Quality Assurance/Quality Control Task Force (QA/QC)

The Quality Assurance/Quality Control (QA/QC) Taskforce established the framework for QA/QC procedures for measurements made on all IODP platforms and shore-based facilities and monitors the success of the implemented QA/QC framework. The Task Force was concluded; QA/QC procedures established can be found in the Meeting Reports.

Outreach Task Force

This Task Force has its roots in planning workshops that took place in February and May of 2004 with a group of advisors convened by the IODP-MI President to construct a fundamental framework of duties and responsibilities to be carried out in an integrated IODP Outreach program. The Task Force has since evolved into a group with two-fold responsibilities: (1) devising and implementing creative education and outreach strategies meant to raise IODP visibility while heightening understanding of scientific ocean drilling; and (2) providing effective counsel to the IODP community in relation to program policies and practices that impact outreach efforts.

The Outreach Task Force is chaired by the IODP-MI Director of Communications. Members include outreach specialists from each of the Implementing Organizations, and scientists representative of each national program office.

Detailed information regarding Education and Outreach Task Force is located at: http://www.iodp.org/iodp-mi-task-forces/2

Project Scoping Groups / Project Management Teams

Project Scoping Groups (PSGs) are used to assess the state of readiness of drilling plans, tool and engineering development, engineering site surveys, etc. The Operations Task Force determines the level of scoping needed for any proposal residing with the Task Force for scheduling and designates a formal Project Scoping Group, if required. Each scoping group will have either the IODP-MI Vice President of Science Operations or the IODP-MI Engineering & Operations Manager as head. This group also will include one or two designated “Chief Project Scientists” and several project proponents to provide the scientific leadership necessary to plan aspects of the project. This Project Scoping Group also has formal liaisons from the Implementing Organizations and Science Advisory Structure and utilizes outside expertise (e.g.,

engineers) as needed. The Project Scoping Group regularly reports to the Operations Task Force on the state of readiness of the Complex Drilling Project.

If, after initial scoping, the project is placed on the IODP operational schedule by the Operations Task Force, the Project Scoping Group will then become a formal Project Management Team (PMT), which plans and coordinates the project through its multi-year operations. Each Project Management Team will have a “core membership” of either the Vice President of Science Operations or the Engineering and Operations Manager as the chair, one or two designated “Chief Project Scientists”, proposal proponents, Implementing Organization representatives (engineers, staff scientists), Science Advisory Structure representatives, Education and Outreach representation and outside engineers (as required). The Project Management Team reports to the Operations Task Force on planning and implementation issues addressed by the team.

Workshops

Workshops focused on Initial Science Plan initiatives are part of a long-range planning effort instigated by the Board of Governors. The workshops are intended to engage both the IODP and non-IODP community in addressing long term planning issues and programmatic needs of the Initial Science Plan that are not being adequately addressed at present as well as expanding upon the set-forth IODP mission.

For more information on past workshops, upcoming workshops, applying to attend workshop or submitting a white paper for a particular workshop, please visit http://www.iodp.org/workshops/

4.2. Implementing Organizations (IOs)

IODP has three Implementing Organizations (IOs), which manage all ships and platform operation for the program.

4.2.1. Japanese Agency for Marine-Earth Science and Technology (JAMSTEC)

The Japan Agency for Marine-Earth Science and Technology (JAMSTEC) Center for Deep Earth Exploration (CDEX) manages platform operations for the riser vessel *Chikyu.*

The Center for Deep Earth Exploration's mission is to contribute to the accomplishment of IODP scientific goals through safe, effective, and efficient operation of the Deep Sea Drilling Vessel *Chikyu.*

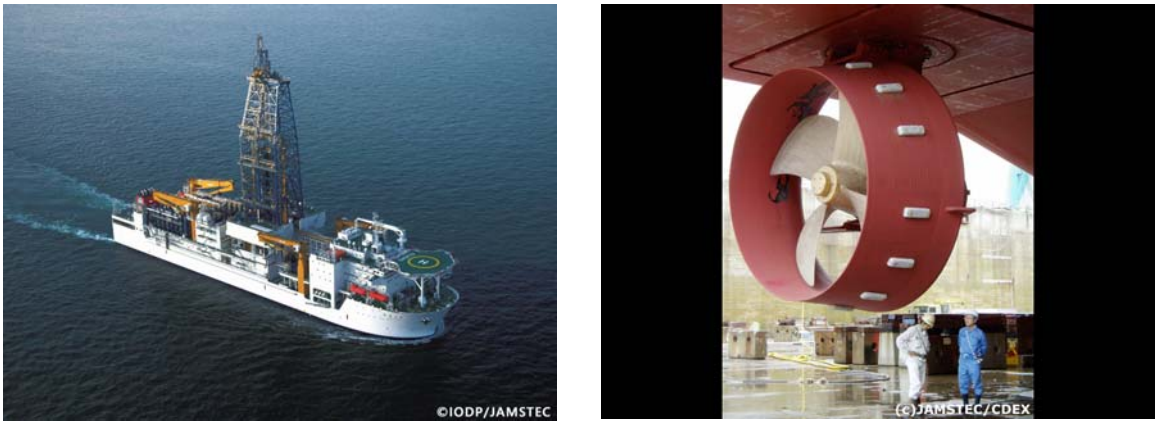


Fig. 7: DV Chikyu Left - D/V Chikyu sailing in Tokyo Bay. Right - The 360 degrees thrusters keep the D/V Chikyu in position.

Deep Sea Drilling Vessel *Chikyu* is the first riser-equipped scientific drilling vessel built for science at the planning stage. It is capable of drilling up to 7,000m below sea floor. The ship will initially be able to conduct riser drilling in water depths up to 2500 m. Plans to increase this capability to 4000 m are underway. The riser system includes an outer casing that surrounds the drill pipe to provide return circulation of drilling fluid to maintain pressure balance within the borehole.

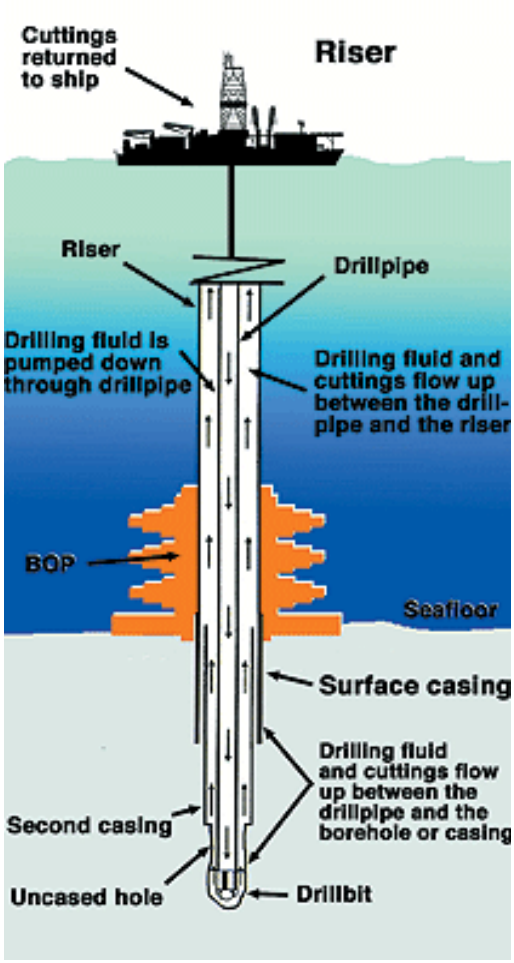


Figure 8. Riser Technology

For detailed information on DV *Chikyu*, please visit:
http://www.jamstec.go.jp/Chikyu/eng/index.html

4.2.2. European Consortium for Ocean Drilling Research (ECORD) Science Operator (ESO)

Mission Platforms are required to investigate high-priority regions such as the Arctic Ocean, and to drill in shallow water (< 20 m) environments that contain detailed records of climate and sea-level change – these other platforms are labeled mission-specific platforms (MSPs) and are implemented by the European Consortium for Ocean Research Drilling (ECORD) Science Operator, a consortium consisting of the British Geological Survey, the University of Bremen, and the European Petrophysical Consortium.

The British Geological Survey (BGS) acts as the consortium co-coordinator responsible for overall ESO management. BGS provides the Science Manager, who acts as the main contact with both the ECORD Management Agency (EMA) and ECORD Council, the Operations Manager, Data Manager and Education and Outreach Manager for the consortium, as well as the Staff Scientist and Administrative Support for each MSP.

The University of Bremen provides the ESO Laboratory and the Curation Manager; the latter being responsible for analytical facilities during offshore MSP operations and the onshore science party. The Bremen Core Repository (BCR) is the ESO facility for core curation and management. The University is also involved in data management tasks provided by WDC-MARE/PANGAEA (IODP-MSP data portal), and provides the Public Relations Manager for ESO. GFZ Potsdam additionally supports ESO by contributing the Drilling Information System (DIS) for offshore data acquisition.

The European Petrophysical Consortium carries out all logging and petrophysical activities for ESO. This consortium comprises the University of Leicester (coordinator), U.K, the Université de Montpellier, France and RWTH Aachen, Germany.

Fig. 9: (Left) Vidar Viking on Expedition 302: ACEX Arctic Coring Expedition; (Right) DP Hunter on Expedition 310: Tahiti Sea Level.

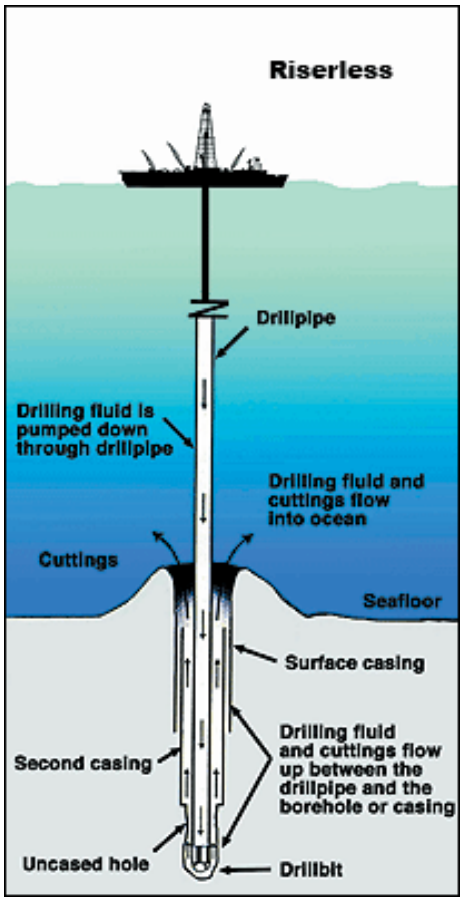
For more information on ESO or Mission-Specific Operations, please visit: http://www.eso.ecord.org/index.html

4.2.3. U.S. Implementing Organization (USIO/COL)

The Consortium for Ocean Leadership (COL) and its partners, Texas A&M University and Lamont-Doherty Earth Observatory of Columbia University, form the U.S. Implementing Organization (USIO), which manages the riserless vessel *JOIDES Resolution*.

The USIO Science Services, Texas A&M University, is responsible for providing a full array of science services, ranging from vessel and drilling operations to ship- and shore-based science laboratories, core repositories, and publication. United States Implementing Organization Science Services, Lamont Doherty Earth Observatory, is responsible for logging-related shipboard and shore-based science services and for leading an international logging consortium to participate in scientific ocean drilling operations.

Fig. 10: (Below left) JOIDES Resolution during initial drilling phase of IODP; (Below right) Riserless drilling technology



The Riserless drilling technology, shown in Fig. 10 (right) uses seawater as the primary drilling fluid, which is pumped down through the drillpipe. The seawater cleans and cools the drill bit and lifts cuttings out of the hole, piling them in a cone around the hole.

IODP-USIO completed IODP Expeditions 301, 303-309, and 311-312 with the riserless drillship *JOIDES Resolution*, the same vessel used during the two decades of ODP. Subsequent to these initial IODP operations, The *JOIDES Resolution* underwent an extensive refit to significantly upgrade its drilling, laboratory, habitability and safety capabilities.

For additional information on the *JOIDES Resolution*, please visit: http://www.oceanleadership.org/sodv , or go to http://www.iodp-usio.org/ for any information regarding the USIO.

4.3. Science Advisory Structure

IODP science planning is provided by the Science Advisory Structure (SAS), which involves many scientists and engineers on several standing committees and panels. All IODP science is motivated by community input in the form of unsolicited proposals that are nurtured and prioritized by the IODP Science Advisory Structure. Eight committees and panels currently make up the Science Advisory Structure, with each one serving a very specific purpose in the management and implementation of incoming drilling proposals and overall IODP operations.

Information on the committees and panels including panel members, contact information, meeting agendas and meeting minutes, is located at:

http://www.iodp.org/committees-and-panels/.

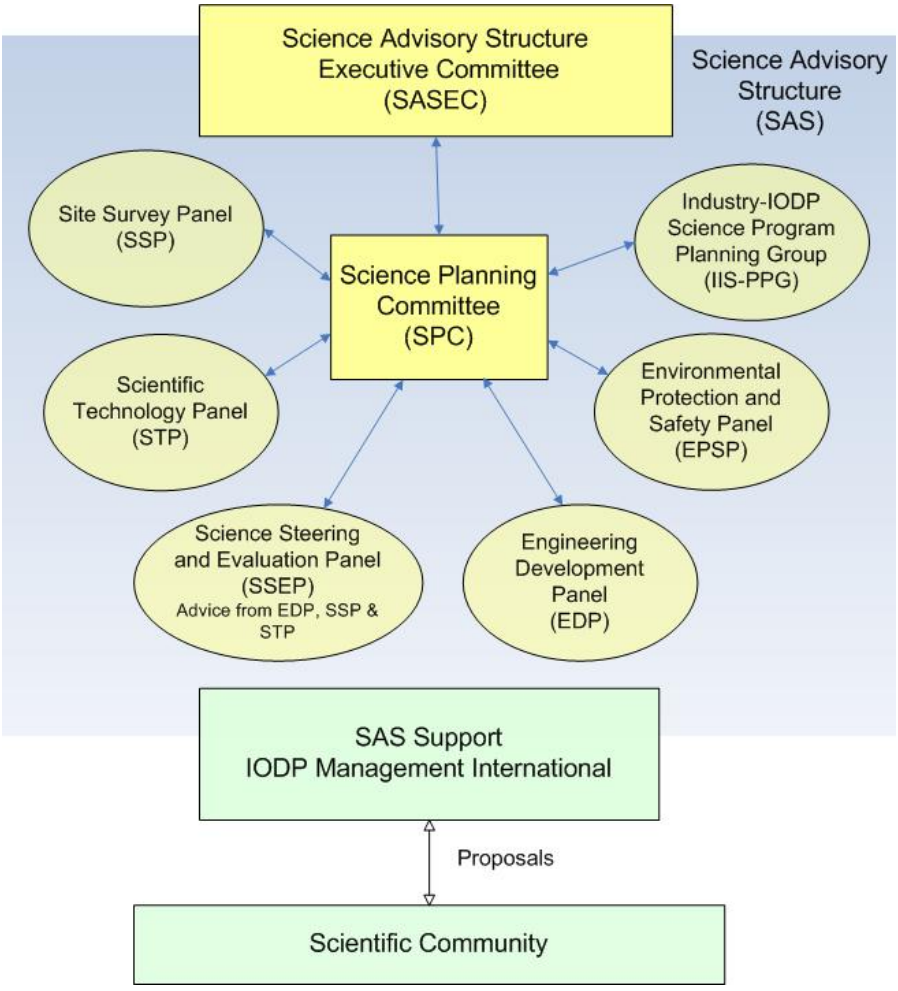


Fig. 11: IODP Science Advisory Structure organization.

4.3.1. Scientific Advisory Structure Executive Committee

The Science Advisory Structure Executive Committee (SASEC), committee of IODP-MI Board of Governors, is considered the Executive Authority of the Science Advisory Structure and is composed of representatives from scientific/academic institutions in

IODP member countries. The Science Advisory Structure Executive Committee provides scientific oversight and long term planning to the program.

The prime responsibilities of Science Advisory Structure Executive Committee are to:

- Formulate scientific and policy recommendations for the Council and reports to the Council,
- Work with the Central Management Organization of IODP to develop an annual program plan for scientific ocean drilling based on the recommendations of the Science Advisory Structure,
- Evaluate and assess IODP accomplishments with regard to established ISP goals and objectives, working with the Science Advisory Structure,
- Promote support for IODP where appropriate (including expansion of membership), and ensures liaison with other scientific programs.

Detailed information on SASEC is located at http://www.iodp.org/sasec/2/

4.3.2. Science Planning Committee

The Science Planning Committee (SPC) focuses on the detailed expedition planning activities that are necessary to achieve the aims and objectives of IODP as expressed in the Initial Science Plan. In this capacity, the Science Planning Committee prioritizes, or ranks, scientific and technological objectives to optimize the scientific returns from multi-platform drilling, sampling, and related experiments. These rankings are based in part on input and advice from the other Science Advisory Structure panels.

Detailed information regarding SPC is located at: http://www.iodp.org/spc/

4.3.3. Science Steering and Evaluation Panel

The Science Steering and Evaluation Panel (SSEP) reports to the Science Planning Committee. The panel interacts with proposal proponents to nurture submitted drilling proposals to maturity, and send mature proposals for external review before forwarding them to the Science Planning Committee. Within the context of the IODP Initial Science Plan, important thematic (and initiative) areas of investigation addressed by proposals that are considered by these panels include: (1) the deep biosphere and subseafloor ocean (deep biosphere; gas hydrates); (2) environmental changes, processes and effects (extreme climates; rapid climate change); (3) solid earth cycles and geodynamics (continental breakup and sedimentary basin formation; (4) large igneous provinces (LIPs); (5) 21st century Mohole; (6) seismogenic zone; and (7) additional themes (and initiatives) that may arise from future scientific planning and assessment.

Detailed information regarding SSEP is located at: http://www.iodp.org/ssep/

4.3.4. Engineering Development Panel

The Engineering Development Panel (EDP) reports to the Science Planning Committee and also may communicate directly with IODP-Management International (IODP-MI). The panel provides advice on matters related to the technological needs and engineering developments necessary to meet the scientific objectives of active IODP proposals and the IODP Initial Science Plan.

Detailed information regarding the EDP is located at: http://www.iodp.org/edp/

4.3.5. Environmental Protection and Safety Panel

The Environmental Protection and Safety Panel (EPSP) reports to the Science Planning Committee. The panel provides independent advice to the Science Planning Committee, IODP Management International (IODP-MI), and the Implementing Organizations with regard to safety and environmental issues associated with general and specific geologic circumstances of proposed drill sites. The Environmental Protection and Safety Panel also provides advice on appropriate drilling technologies for avoidance of drilling hazards and protecting the environment.

Detailed information regarding EPSP is located at: http://www.iodp.org/epsp/

4.3.6. Site Survey Panel

The Site Survey Panel (SSP) reports to the Science Planning Committee. The panel advises drilling proponents, the Science Steering and Evaluation Panel, and the Science Planning Committee on the degree of completeness of the drill site characterization data package, and on whether the scientific objectives of each drill site can be effectively achieved on the basis of the proposal and data package.

Detailed information regarding SSP is located at: http://www.iodp.org/ssp/

4.3.7. Scientific Technology Panel

The Scientific Technology Panel (STP) reports to the Science Planning Committee, and may communicate directly with IODP Management International (IODP-MI). The panel contributes information and advice with regard to the handling of IODP data and information, methods and techniques of IODP measurements (including factors that impact measurements, such as sample handling, curation, etc.), laboratory design, portable laboratory needs, downhole measurements and experiments, and observatories.

Detailed information regarding STP is located at http://www.iodp.org/stp/

4.3.8. Industry-IODP Science Program Planning Group

The Industry-IODP Science Program Planning Group (IIS PPG) reports to the Science Planning Committee. The Industry-IODP Science Program Planning Group identifies subjects of cooperative scientific research between the IODP and selected industries, and promotes development of IODP drilling proposals to address these objectives within the context of the IODP Initial Science Plan. Industrial sectors of interest may include oil and gas and related services, mining, biotechnology, and research and development organizations in these fields.

Detailed information regarding the IIS-PPG is located at: http://www.iodp.org/iis-ppg/

4.4. Program Member Offices

Each IODP partner has a representative Program Member Office (PMO) that supports the involvement of member country/consortia scientists in IODP. PMOs nominate member country/consortia scientists for expeditions and for service on IODP science panels and committees. Information on IODP Program Member Offices is located at: http://www.iodp.org/program-member-offices/.

4.4.1. European Science Support Advisory Committee

For more information about ESSAC, please visit: http://www.essac.ecord.org/

4.4.2. Japan Drilling Earth Science Consortium (J-DESC)

For more information on J-DESC, please visit: http://www.aesto.or.jp/j-desc/english/index_e.html

4.4.3. Korea Integrated Ocean Drilling Program (K-IODP)

For more information on K-IODP, please visit: http://www.kodp.re.kr/

4.4.4. Ministry of Science and Technology of the People's Republic of China

For more information on MOST please visit: http://www.most.gov.cn/eng/

4.4.5. U.S. Science Support Program (USSSP)

Additional information about the USSSP is available at: http://www.usssp-iodp.org/

IODP SCIENCE – How to get involved

IODP offers numerous avenues for members of the scientific community to become involved with the program including (but not limited to):

- Sailing on an expedition,
- Submitting a drilling or engineering development proposal,
- Serving as a committee member on one of the many IODP Science Advisory Structure Panels or IODP-MI task forces,
- Serving as an outside reviewer of proposals,
- Providing/developing third-party tools,
- Requesting samples for non-IODP funded research and publish results,
- Becoming involved in education and outreach activities

5. SCIENCE PLANNING

Science planning in IODP is an ongoing process, occurring at all levels of the Science Advisory Structure and IODP management. In the short term, the Science Advisory Structure and IODP-MI formulate science plans via the IODP Annual Program Plan. In the longer term, the Science Advisory Structure and IODP-M produce planning documents based on deliberations of detailed planning groups and program planning groups, the outcomes of community-wide conferences and workshops, program evaluations, and other science planning activities. From time to time, IODP will summarize long-term goals and objectives in a published IODP Science Plan, such as the current IODP Science Plan, entitled "Earth, Oceans, and Life."

5.1. SAS Activities

The Science Advisory Structure evaluates the readiness of scientific drilling proposals in achieving the goals discussed in the Initial Science Plan. The Science Planning Committee, with the aid of the Operations Task Force, selects submitted proposals to be incorporated into

annual, multi-platform drilling plans that address the long-term goals of IODP. These plans are formalized by IODP-MI, which then presents them to the Science Advisory Structure Executive Committee and ultimately to the IODP Council for review and approval. Costs and logistical considerations, as well as the list of highly ranked drilling proposals are provided by the Science Advisory Structure, figure into the development of the Annual Program Plan.

In tandem with science planning, the Science Advisory Structure also evaluates the needs and plans for technological advancement and engineering innovations that are required to meet the long-term scientific objectives of the Initial Science Plan. All such planning, along with the budgetary impact of executing these plans, must be conducted well in advance; lead time is necessary for engineering and logging developments, and for the establishment and operation of long-term observatories. In these tasks, the Science Advisory Structure works with IODP-MI and the Implementing Organizations to merge scientific priorities with program capabilities.

5.2. Proposal Development

The proposal process provides tremendous opportunities for individuals and groups, including other science programs in liaison with IODP, to explore the frontiers of Earth Science and related disciplines through ocean drilling. The success of IODP rests with the quality of the science proposed and carried out by the community-at-large. Through proposals, individual scientists and groups of scientists have the opportunity to respond to IODP's scientific priorities, as expressed in the Initial Science Plan, and to recommend appropriate targets for drilling. Scheduling a drilling activity is a major investment of time and funds. Hence, proposals need to be well developed before the Science Planning Committee can consider them. The nurturing, development, and evaluation of proposals are the prime responsibility of the Science Steering and Evaluation Panel. Full development of a drilling proposal can take several years.

Another important aspect of developing a drilling proposal is the collection of the requisite survey information (geophysical, geological, and hydrographic) for both regional and site-specific characterization. The completion of necessary surveys, and the submission of supporting survey data to IODP, is in part the responsibility of the proponents (for regional data), and in part the responsibility of IODP (for site-specific information related to safety). All of this coordination requires long-term planning and careful attention to timing, reviewer and panel recommendations and requests.

In developing and revising a scientific ocean-drilling proposal, proponents may, with the permission of the Science Planning Committee Chair, seek technical and safety-related advice from the Science and Technology Panel and the Environmental, Pollution and Safety Panel. They may also wish to seek help from the Industry Liaison Panel for identifying suitable co-proponents in industry or for identifying industry data collected within the proposed study area.

5.3. Drilling Proposals

Figure 12 (below) illustrates how a proposal moves through the Science Advisory Structure planning process to reach the stage of actual scheduling. The initiation of the proposal process begins with one of two primary steps:

Submission of a "Preliminary Proposal" that will be evaluated and nurtured (if appropriate) through panels within the Science Advisory Structure; and

Subsequent submission of a "Full Proposal" that is developed while taking into account the advice from the appropriate Panels.

Guidelines for each of these proposal types are outlined . Details regarding the proposal submission process, both guidelines and best practices, are available at http://www.iodp.org/drilling-proposals/.

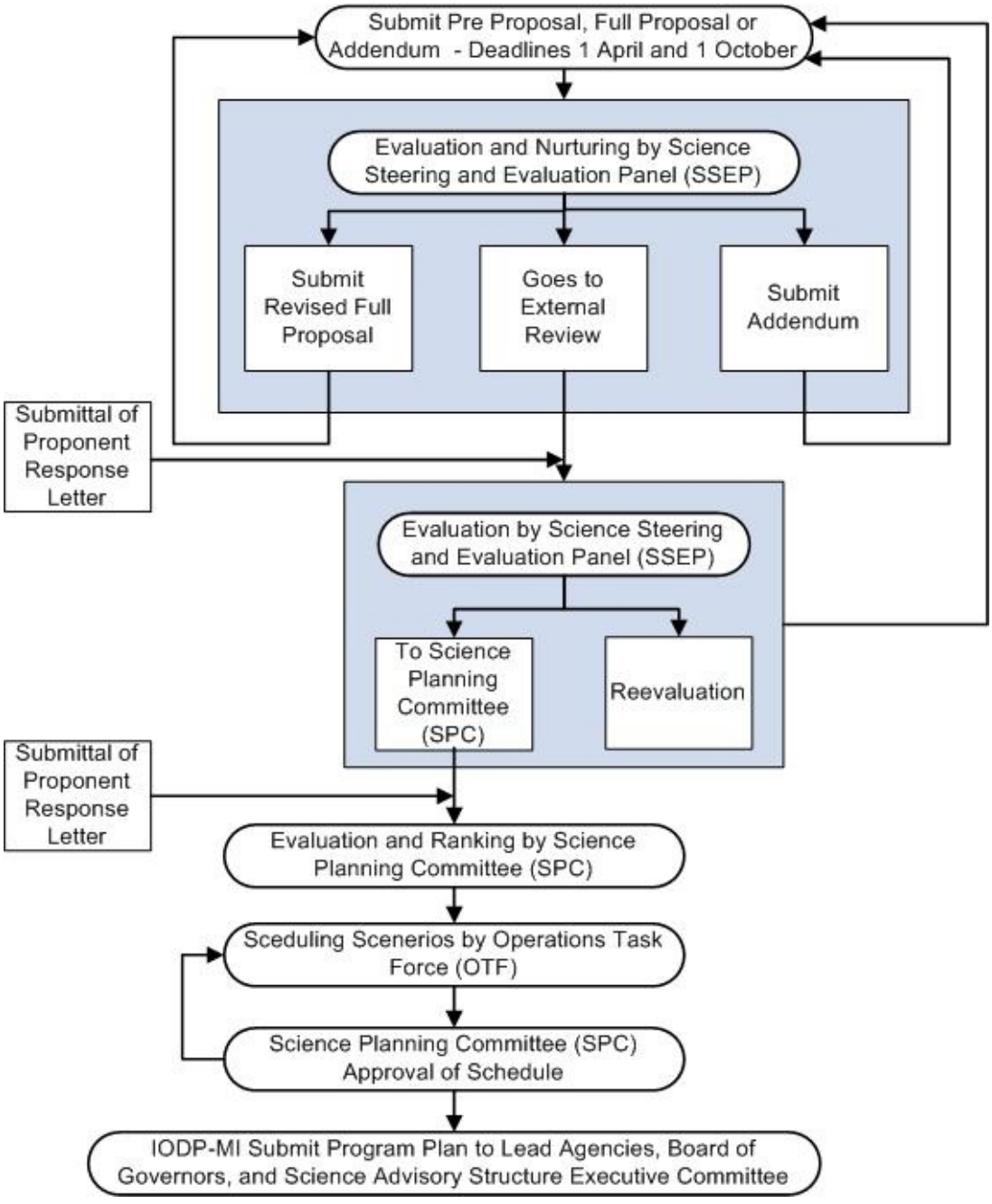


Fig. 12: Proposal submission, evaluation and scheduling process

5.3.1. Schedule for Submission of IODP Proposals

Proposals for scientific ocean drilling may be submitted to the Science Coordinators in the IODP-MI Sapporo Office at any time. However, in order to be considered in the annual cycle of Science Advisory Structure panel meetings, there are two deadlines each year for submission of IODP proposals: 1 April (for the Spring Science Steering and Evaluation Panel meeting) and 1 October (for the Fall Steering and Evaluation Panel meeting). All proposals must be submitted in electronic form through the IODP web site (http://www.iodp.org) and must follow the length and format limitations described in the proposal guidelines. The IODP-MI will deactivate a proposal or ancillary project letter following the absence of any formal activity for a three-year period or as otherwise recommended by the Science Advisory Structure.

A short outline about the three main types of drilling proposals (i.e., Preliminary, Full, and Mission) and the SAS review process is presented below. Detailed information can be found at: http://www.iodp.org/drilling-proposals/

5.3.2. Preliminary Proposals

New ideas for scientific ocean drilling are generally submitted initially as Preliminary Proposals. This allows the Science Advisory Structure to evaluate the proposed scientific and technical goals and provide guidance to proponents as to how a competitive full proposal may be prepared. Proponents may be individual scientists or groups of scientists, including national or international scientific groups or programs that are independent of IODP. In each case, the individuals who are submitting the Full Proposal must be named, and a single contact proponent must be clearly identified.

In exceptional cases (such as a narrow window of opportunity to test an exciting, fundamental scientific idea), a new project can bypass the Preliminary Proposal stage and be submitted initially as a Full Proposal. Proponents are encouraged to begin with a Preliminary Proposal so as to evaluate the level of interest from the Science Advisory Structure and target their program accordingly before expending the considerably greater effort necessary to craft a Full Proposal. In addition to the greater overall length and level of detail of Full Proposals compared to Preliminary Proposals, there are considerable data requirements for Full Proposals. Bypassing the Preliminary Proposal stage may not help to move their proposal forward within IODP quickly, and could even result in a net loss of time if the initial submission is not well received by the reviewers and Science Advisory Structure and a new preliminary proposal is required.

Shortly after each proposal deadline, all new and revised preliminary proposals go to the Science Steering and Evaluation Panel for review. The Science Steering and Evaluation Panel assesses each preliminary proposal in terms of its relevance to the IODP Initial Science Plan, the suitability of the study area and study sites for addressing the proposed scientific objectives, and whether the achievement of those objectives would likely result in any fundamental scientific advances. The Science Steering and Evaluation Panel also determines whether a given preliminary proposal provides a satisfactory basis for developing a complex drilling project.

Written reviews from the Science Steering and Evaluation Panel will be returned to the contact proponent with recommendations on how to proceed with proposal development.

5.3.3. Full Proposals

Proponents who have previously submitted a preliminary proposal may submit a full proposal if advised to do so by the Science Steering and Evaluation Panel. In some cases, an individual scientist or group of scientists with a new idea for scientific ocean drilling may submit a full proposal without first submitting a preliminary proposal, provided that it meets all of the relevant requirements.

A well-prepared full proposal should:

- State the scientific objectives and explain how those objectives relate to, or advance beyond, the IODP Initial Science Plan,
- Justify the need for drilling to accomplish the scientific objectives,
- Present a well-defined strategy for addressing the scientific objectives through drilling, logging, or other down-hole measurements,
- Provide detailed estimates of the time required for drilling, logging, or other downhole measurements,
- Describe the available site-survey data and any plans for acquiring additional data, and discuss how the drilling targets relate to those data,
- Describe any special logistical requirements, non-standard measurements technology, or potential natural hazards,
- Discuss the expected scientific outcome of drilling and any subsequent work required to complete the overall project.

Full Proposals are reviewed by the Science Steering and Evaluation Panel with respect to the fundamental scientific advances that the proposed drilling might make; its relevance to the Initial Science Plan; and the appropriateness of both geographic location and proposed operations for addressing the proposed scientific objectives of the proposal. The Science Steering and Evaluation Panel will determine whether the Full Proposal meets criteria necessary for solicitation of external reviews. These criteria are:

1. The proposal addresses one or more scientific problems that are identified as a high priority in the IODP Initial Science Plan (or moves IODP beyond the Initial Science Plan into new, exciting fields of study);
2. There is clear indication that IODP assets and facilities provide the best means to achieve the scientific objectives to be addressed;
3. There is a well-defined operational strategy, the success of which can be assessed on the basis of the data presented in the proposal.

If these criteria are met, the Science Steering and Evaluation Panel will recommend to the IODP-MI Science Coordinators that external comments be acquired. If it is determined that the three criteria are not met adequately, the Panel will advise the proponents (through the Science Coordinators) as to revisions necessary for further consideration.

Proponents will receive the external reviews of their proposal from the Science Coordinators and may then submit a brief response letter before the next proposal deadline. The steering panels will also receive the external reviews, together with the response letter, and will then write a final panel review assessing the priority of the proposal with respect to the IODP Initial Science Plan. Full proposals that have

undergone external review will automatically go forward to the Science Planning Committee for ranking and potential implementation.

5.3.4. Evaluation and Ranking by Science Planning Committee

For each Science Steering and Evaluation Panel externally reviewed proposal, a package is assembled and forwarded to the Science Planning Committee members that contains:

- The Science Steering and Evaluation Panel review of the proposal;
- The external comments received from anonymous evaluators;
- The proponents' response to the external comments;
- An assessment by the Science Steering and Evaluation Panel as to the priority of the drilling program in the context of the overall achievement of the IODP Initial Science Plan (or how the proposal addresses an exceptional scientific opportunity).

At its annual spring meeting, the Science Planning Committee takes all this information into consideration and conducts a global ranking of the proposals in terms of their scientific priority. The Science Planning Committee acts under strict conflict-of-interest guidelines, and the ranking procedure is also clearly enunciated. A subset of ranked proposals is selected and forwarded to the Operations Task Force for possible scheduling as drilling legs. Those that do not get selected are advised as to whether (i) the Science Planning Committee wishes to keep the proposal active for consideration at a later time (e.g., perhaps when more data are available, pending results from an already scheduled drilling expedition or scheduled geophysical survey), (ii) the Science Planning Committee wishes to see a revision, in which case the proposal is reconsidered by the Science Steering and Evaluation Panels and sent out again for external comment, or (iii) the Science Planning Committee will not consider it further.

5.3.5. Scheduling by the Operations Task Force

The Operations Task Force meets following the Science Planning Committee, with the main goal devising a multi-platform science schedule for the next operating time window (typically the next unscheduled year of operations, but the planning window may vary in length depending on the nature of programs to be scheduled). Issues that are considered in planning a final schedule include the Science Planning Committee ranking, site-survey readiness, potential safety and pollution considerations, technological requirements and readiness (including, but not limited to: core recovery, enhancements to the standard set of logging tools, use of re-entry cones, and casing), availability of the appropriate platform(s), operational considerations (weather, ice cover, currents, and transit times between potential drilling sites), research clearance issues, heave restrictions in shallow water, and budgetary considerations. Operations Task Force then forwards its proposed schedule to the Science Planning Committee for final approval.

Proponents of proposals scheduled by the Operations Task Force are notified in writing. Proponents of proposals sent forward by the Science Planning Committee to the Operations Task Force, but not scheduled for drilling in the particular fiscal year of interest, receive an explanation of the decision and recommendations for future action.

The scheduling of a proposal is not the end of the planning process. Shortly after the schedule is finalized, the Environmental, Pollution and Safety Panel will review the proposal. This requires the compilation of a data package to be submitted to

Environmental, Pollution and Safety Panel for a safety review. Depending on the nature of proposed operations, more than one Environmental, Pollution and Safety Panel review may be required.

6. TECHNOLOGY PLANNING

IODP is committed to dramatically improving the technological capabilities of the scientific ocean drilling program. Through the use of state-of-the-art drilling vessels, through the vision and aptitude of top scientists and engineers worldwide and through the encouragement of the IODP community, IODP has the ability to continue improving upon the tools necessary to further our understanding of earth and its complex systems.

6.1. Current Drilling Technology

IODP's goal is to be able to drill and continuously core at almost any location in the world's oceans. To achieve this goal, the international community has consistently emphasized the use of multiple drilling platforms, including a riser (well-control) vessel, a non-riser vessel, and mission-specific vessels. In response to this requirement, Japan, through its Marine Science and Technology Center (JAMSTEC), has built a riser vessel so that IODP can meet its deep objectives, and also drill targets in potentially overpressured subseafloor environments such as seismogenic zones. The US National Science Foundation has supplied funds to significantly upgrade the *JOIDES Resolution* to enable IODP to drill in a wide range of water depths and lithologies where a riser is not needed. Mission-specific drilling platforms will be mobilized in environments not suitable for either of IODP's two primary vessels, such as the polar regions or shallow waters.

An interactive map of the IODP drilling vessels is located at http://www.iodp.org/key-technologies. The map contains links to the drilling technologies being used on each of the three ships.

6.2. Technology Road Map

The IODP Engineering Development Panel created a technology roadmap at its June 2006 meeting in Germany. This first version of the roadmap, which is used by IODP-MI and SAS to prioritize funding of IODP engineering proposals, consists of over 80 possible engineering developments broken down into three sub-groups:

(1) Sampling, Logging and Coring,

Near-term engineering focus on improving systems fundamental to IODP (e.g., refinements to core barrels, downhole/formation measurements, etc.)

(2) Drilling Vessel/Infrastructure,

Near-term engineering focus on understanding factors that control core quantity and quality (e.g., rig instrumentation, heave compensation, drilling dynamics, etc).

(3) Borehole Infrastructure.

Near-term engineering focus on standardizing equipment and procedures

The Technology Roadmap will be continually updated and revised as appropriate by EDP. The technology roadmap can be found at: http://www.iodp.org/eng-dev.

6.3. Engineering Development Proposal Process

IODP-MI has created a process to receive, review, and fund proposals for engineering development that will greatly enhance the ability of IODP to achieve the scientific objectives defined in the IODP Initial Science Plan. This process was developed in consultation with the IODP Science Advisory Structure and Implementing Organizations and endorsed by the IODP Lead Agencies. IODP-MI will review and consider all engineering development proposals submitted; however, proposals addressing the technical problems/issues related to the IODP Technology Roadmap will have a greater probability of achieving funding success than those proposals not aligned with the roadmap.

6.3.1. Funding for Engineering Development Proposals

IODP Science Operation Costs will fund the successful engineering development proposals submitted to IODP-MI. Projects funded by Science Operation Costs funds will follow the submission, review and implementation procedures described herein and must be part of a Lead Agency approved Annual Program Plan. Engineering development projects not funded by IODP Science Operation Costs funds are not subject to the IODP-MI review process. However, these "third-party" developments or deployments are subject to the IODP Third Party Tool guidelines (http://www.iodp.org/eng-third-parties).

6.3.2. Engineering Proposal Types

Two main types of engineering proposals will be utilized by IODP-MI:

Unsolicited Proposals

Unsolicited proposals will likely comprise the majority of proposals entering the system. Proponents of unsolicited proposals will most likely have a higher rate of success if they address at least one of the needs identified in the IODP Technology Roadmap. However, these proposals may also identify a development need not envisioned in the IODP Technology Roadmap.

Following the receipt of a proposal, IODP-MI will nurture the proposal by working with the proponent/s to strengthen the submitted material and in some cases suggesting a significant change in scope of work. For example, a feasibility study could be recommended by IODP-MI to explore the viability of a proposed technology.

Solicited Proposals

Some proposals may be solicited directly by IODP-MI through a Request for Proposal (RFP) process if the pool of unsolicited proposals does not meet the needs of the Program. A solicitation request for a specific technology will be presented by IODPMI to the Science Advisory Structure Panels for their consideration. If the solicitation plan is endorsed, IODP-MI will execute an RFP process ending with the completion of a source selection plan.

6.3.3. Submission and Review Process

Details of the systematic process of proposal submission, nurturing, review and prioritization by IODP-MI and the Science Advisory can be found at http://www.iodp.org/eng.

6.4. Third Party Tools

A third party tool, which is defined as a tool or instrument developed with funds or resources outside the realm of the IODP, must adhere to the development and deployment guidelines established by the IODP Science Advisory Structure prior to deployment on any IODP expedition. The IODP Science Advisory Structure , in conjunction with IODP-MI and the Implementing Organizations, has created a policy to provide consistent oversight of third party development activity and to provide guidance to all proponents with technology or developments new to the IODP. This document expands upon the Third Party Tool policy by providing additional contextual and timing elements to assist proponents, Implementing Organizations, and the Science Advisory Structure in executing this policy.

The policy, implementation guide and a list of third-party tools used in the past, used currently, and under development are located at: http://www.iodp.org/eng-third-parties.

7. EXPEDITION INFORMATION

7.1. Expedition Planning

Once a proposal has been approved by the Science Advisory Structure and scheduled by the Operations Task Force, expedition planning quickly begins.

7.1.1. Staffing

Approximately 18 months prior to the scheduled expedition, a first call for staffing is announced on the IODP website and also in:

- IODP E-news (http://www.iodp.org/community-newsletters/), a bi-monthly newsletter
- Eos (http://www.agu.org/pubs/eos.html), the weekly American Geophysical Union newsletter that publishes material of interest to Earth and space scientists.
- Newsletters published and distributed by the Program Member Offices (http://www.iodp.org/community-newsletters/.)

The announcements provide specific instructions for community scientists on how to apply to their respective Program Member Offices. After Program Member Offices receive and process expedition-staffing applications, they then provide their nominations to the Implementing Organizations. Although each member country/consortia is entitled to their full representation according to the IODP Memorandum of Understanding, there is no “banking’ of unused berths. Berth space can be “traded” between member countries/consortia subject to approval by IODP-MI.

The IOs then work with the PMO and Co-chief scientists to select applicants to fill the various positions on each expedition. Once expedition rosters are agreed upon, the IO sends official invitations directly to each scientist.

Staffing requires a two-step process. Initial invitations are sent to key science participants. Key individuals are those considered to provide critical expertise to delivery of the expedition science. Remaining invitations are sent after responses are received from the initial invitations. Sending invitations in two different groupings provides the opportunity to tune the science party based on the results of the initial invitations. This allows for greater flexibility and for maximizing the expedition science.

Special staffing needs may also be identified during pre-cruise meetings and a subsequent call for applicants with specific skill sets might follow.

The IODP policy and procedures on staffing can be downloaded from: http://www.iodp.org/program-policies/.

Interested applicants should apply through their country's PMO, which has the appropriate application forms and instructions. For more information visit: http://www.iodp.org/apply-to-sail/

7.1.2. Project Management Team Meetings

Multi-year, multi-stage expeditions may require a Project Scoping Group and a Project Management Team to plan and coordinate the project through several years of operations. The Project Scoping Group is assembled as soon as the Science Advisory Structure approves the project. If the Operations Task Force schedules the project, the Project Scoping Group becomes a Project Management Team.

Meetings are held as frequently as needed to plan and coordinate multiple expeditions of the project. After general project scoping is completed, the Project Management Team focuses on the details of expedition planning such as site-by-site operational scoping, drilling strategies, coring and downhole measurement plans, and contingency plans. In addition, they predict possible challenges and hazards, specify critical data sets, determine data requirements, identify site clearance strategies, develop funding scenarios, finalize staffing plans, nominate individuals for specialty science and technology positions, develop plans for long-term observatories, coordinate third-party tool development, and draft a scientific prospectus, etc.

Information about the Project Scoping Groups and Project Management Teams as well as past agendas and reports is located at: http://www.iodp.org/project-scoping-groups/

7.1.3. Pre-Cruise Meetings

Pre-Cruise Meetings are held between appropriate implementing organization staff and the co-chief scientists as needed to finalize the operational plans and schedule and to assure cruise logistics are identified and managed. One of the main goals of the pre-cruise meeting is to finalize the Scientific Prospectus, which requires finalizing the schedule, the scientific objectives, drilling strategy, drill site descriptions, logging and downhole measurement plan, sampling strategy, operations schedule, identification of any expedition-specific sampling needs, and any other component of expedition operations that necessitate a formal plan or description. The published Scientific Prospectus and any other important pre-cruise information for each expedition can be found at: http://www.iodp.org/expeditions/2/.

7.2. Expedition Activity

7.2.1. Expedition operations

The offshore phase of the expedition follows the operational plan presented in the scientific prospectus as closely as possible with regular daily, weekly and site reports submitted by the operator.

Expedition Daily Reports are submitted to appropriate IO and lead agency personnel, and to IODP-MI. The daily reports provide a daily log of location, activity, timeline, transit

information, weather, operating parameters, upcoming operational plans and any other pertinent information specific to an expedition.

Expedition Weekly (or Site) Reports provide more details of actual scientific findings. The reports include a summary of operations, preliminary science results, technical support activity and HSE activity.

7.2.2. Scientist Job Descriptions

Participants are invited to serve in particular jobs that need to be completed to ensure scientific success of the cruise. The optimal mix of expertise is determined by the expedition objectives and by the Co-chief Scientists, the Staff Scientist, and the Supervisor of Science Support.

Below are many of the scientific specialties that are required for each expedition

Core Description

Core describers may have expertise in a wide variety of fields including sedimentology, petrography, petrology, or structural geology. Core description can involve the following tasks:

- Macroscopic visual description of split cores are entered in a core description database that generates standard reports (sediments), or are collected in more detailed core section graphic templates (igneous rocks);
- Microscopic observations from smear slides and/or thin sections, entered in spreadsheet databases and, in some cases, added to the macroscopic description forms;
- Description and measurement of deformational structures;
- Acquisition of data with split-core tracks, including digital images, diffuse color reflectance, and magnetic susceptibility. In some cases, this may also be done by individuals in the physical properties position;
- Preliminary interpretation of depositional, diagenetic, or deformational processes;
- Selection of samples, in consultation with other scientists, for shipboard carbonate, XRD, or chemical (ICP) analysis.
- Analysis of XRD and/or ICP data, if the appropriate expertise exists, this may also be done by one of the inorganic geochemists.

Stratigraphic Correlation

The stratigraphic correlator position is essential on cruises where complete stratigraphic sections are a primary expedition objective. Complete stratigraphic sections are achieved by coring multiple holes at a site. Completion of a meters composite depth (mcd) depth scale in near-real time guides coring operations and ensures complete recovery of the sediment section. A spliced section typically is created and used for sampling. For maximum efficiency, two correlators are needed to cover 24 hours and to guarantee feedback within hours or minutes. Correlation is achieved using workstations and a customized software. The job typically includes operation of the multi-sensor track

(MST) because the primary data sets used are magnetic susceptibility, natural gamma radiation, and gamma-ray attenuation density from whole-core logging. Other data may be needed to improve correlation such as color reflectance logs, macroscopic descriptions from split cores, or even biostratigraphic information.

Biostratigraphy

Micropaleontologists provide age data and a biostratigraphic age model for each site. This work mainly is done using core-catcher samples as soon as possible after a core is recovered. Additional samples may be examined to provide as complete a biostratigraphic characterization of the cored section, or of critical intervals, if possible within the time available. Full assemblage analysis is not required on the ship; rather, identification of useful microfossil datums for constructing age-depth plots and sedimentation/accumulation rate curves is the primary emphasis. Paleoenvironmental or bathymetric data, principally from benthic foraminifers, may also be important on certain cruises.

Magnetostratigraphy

Paleomagnetists conduct paleomagnetic measurements and reduction of data to intensities and direction of magnetization. Paleomagnetists also provide absolute orientation data for orientation of deformational structures measured in the core, if appropriate. Some additional rock magnetic properties can be acquired on the ship, which is particularly useful if the magnetic properties are (partly) ephemeral (post-recovery dissolution, reduction, or oxidation of magnetic minerals).

Physical Properties

Scientists assigned to this job usually determine the following properties:

- Moisture content and grain density on core samples
- P-wave velocity on split cores and/or core samples
- Thermal conductivity on full cores or split cores, if appropriate
- Acquisition, analysis, and presentation of downhole temperature measurements;
- Vane shear strength on split cores if warranted by the cruise objectives.

In addition, they oversee and document the overall physical properties measurement program in consultation with other scientists, including the full-core and split-core logging systems. They also ensure that calibrations and control measurements are carried out according to protocol to ensure data quality control.

Geochemistry

The primary responsibility of organic geochemists is to monitor cores for hydrocarbon content. They advise the Operations Manager and scientific party when hydrocarbon levels in cores may constitute a potential safety or pollution hazard. They also provide data concerning organic matter characterization, elemental composition of organic matter, and carbonate carbon content.

Inorganic geochemists conduct chemical analyses on interstitial water, and/or solid sediment, or rock samples.

Downhole Logging

This position includes the following:

- Work closely with the IO logging scientist in designing, implementing, and interpreting the logging program;
- Interact with core physical properties specialists;
- Assist the Schlumberger field engineer with data acquisition if required;
- Participate in integration of core-log-seismic data.

This position sometimes may include the geophysical responsibilities described below. Details about borehole logging can be found at iodp.ldeo.columbia.edu/TOOLS_LABS/.

Geophysics

This position is responsible for the following geophysical tasks:

- Acquisition, analysis, and presentation of downhole temperature measurements and seismic data
- Acquisition and presentation (site surveys);
- Construction of synthetic seismic profiles;
- Vertical or offset seismic profiling
- May participate in acquisition, analysis, and presentation of downhole temperature measurements (see "Physical Properties" above).

Microbiology

Major responsibilities of the shipboard microbiologist include the following:

- Conduct onsite contamination tests by adding highly sensitive tracers (perfluorocarbons and/or fluorescent microspheres) to the drilling fluid or core barrel to evaluate extent of contamination of cores by the drilling process;
- Conduct sampling for shipboard and shorebased microbiological analyses;
- Analyze thin sections of sediments or rocks for preliminary interpretations on contamination and bacterial activity;
- Start cultures and incubation of samples using different media;
- May participate in the chemical analysis of interstitial waters.

7.3. Post Expedition Activity

7.3.1. Post Expedition Sampling

When feasible, scientists are permitted to collect samples during an expedition. However, in many cases (e.g. MSP operations, high-recovery expeditions, minimal transit time to port) members of the scientific party may need to complete sample requests during a post-expedition sampling party at the appropriate core repository.

Expedition Moratorium

A moratorium period of one year is granted to members of the expedition science party to conduct drilling project-related research before core samples and data are made available to the general scientific community. During this period, only members of the science party are permitted to receive core samples and/or associated data. The Sample Allocation Committee, comprised of the Expedition Co-Chiefs, Staff Scientist, and Curator, are responsible for approving all moratorium sample requests. The moratorium period may be appropriately adjusted to account for specific issues affecting the scientific objectives of the expedition.

The science party is defined as those scientists selected by IODP to produce initial, openly shared data associated with a particular drilling project within the moratorium period. After the moratorium period ends, samples are given or loaned to persons whose requests have been approved by the IODP Curator in the following three categories:

- Scientists who wish to conduct research on IODP materials and publish the results but who are not necessarily associated with a specific drilling project,
- Curators of museums and collections, and
- Educators.

After the moratorium period expires, project data are also publicly available.

Post Moratorium Sampling

Samples and data are available to research scientists, educators, museums, and outreach institutions amongst others. IODP has a specific sample, data, and obligations policy to:

- Ensure availability of samples and data to Science Party members so they can fulfill the objectives of the drilling project and their responsibilities to IODP;
- Encourage scientific analyses over a wide range of research disciplines by providing samples to the scientific community;
- Preserve core material as an archive for future description and observations, nondestructive analyses, and sampling;
- Disseminate “Expedition Research Results” papers published in the Proceedings of the Integrated Ocean Drilling Program from drilling project-related research; and
- Support education and outreach related to the drilling program by providing core materials to educators, museums, and outreach institutions.

Sample- and Data-Recipient Responsibilities

Receipt of samples and data comes with a specific obligation to conduct research and publish their results. Papers must be published in a peer-reviewed scientific journal or book published in English. In the event that research is discontinued, samples may have to be returned as per instructions from IODP Management International, Inc. Manuscripts for publication must be submitted within 20 months post-moratorium.

Those scientists not meeting the above obligations may be restricted from obtaining future samples and/or data and may not be allowed to participate in future

drilling projects. Obligations incurred during the Ocean Drilling Program (ODP) will be carried forward into IODP.

The Sample, data and obligations policy as well as online sample request forms, online core images, core data, log data and contact information can be found at: http://www.iodp.org/access-data/

7.4. Core Repositories

IODP oversees repositories around the world. Samples are distributed according to ODP and IODP policies.

IODP maintains three international core repositories: The Gulf Coast Repository (GCR) at Texas A&M University in College Station, TX, USA; The Bremen Core Repository (BCR) at the University of Bremen in Bremen, Germany and; the Kochi Core Center (KCC) in Kochi, Japan. Each repository archives cores based on their geographic location.

For more information on the repositories, please visit: http://www.iodp.org/repositories/2/

7.5. Data

7.5.1. Core and Sample data

IODP is developing a web-based information service to facilitate access to all data and information related to scientific ocean drilling, regardless of origin or location of data. This service will be designed to integrate distributed scientific drilling data via metadata. The three main data contributors to information service will be the IODP implementing organizations (IOs) from the United States (USIO), Japan (CDEX) and European Consortium (ESO). More information can be found about this service at: http://sedis.iodp.org/

Until this new information service is available, each of the implementing organizations will maintain its own database to archive the data and to make it easily available to the public. Each database includes paleontological, lithostratigraphic, chemical, physical, sedimentological, and geophysical data for ocean sediments and hard rocks.

USIO – *JOIDES Resolution*

The shipboard collected core data for each USIO expedition is stored at Texas A&M University (TAMU), www.iodp.tamu.edu/database/index.html.

All USIO logging data is processed and stored at Lamont-Doherty Earth Observatory (LDEO), http://brg.ldeo.columbia.edu/logdb/.

ESO – Mission Specific Platforms

The ESO MSP data is located at: http://iodp.wdc-mare.org/.

CDEX – *Chikyu*

All *Chikyu* data is currently located at: http://www.jamstec.go.jp/*Chikyu*/eng/Expedition/data_sample.html

7.5.2. Site Survey Data Bank (SSDB)

The Site Survey Data Bank (SSDB) provides an online resource for IODP proposal proponents, reviewers, and panel members worldwide. On average, IODP maintains more than 100 active proposals, involving nearly 1,000 proponents from more than 40 countries. During the process through which IODP proposals evolve into fully mature scheduled expeditions, different sources of data are submitted to augment an original proposal. These data are maintained by the SSDB in a secure and user-friendly environment.

Conceived by IODP-MI in collaboration with Scripps Institute of Oceanography (SIO) at the University of California, San Diego, and the San Diego Supercomputer Center, the SSDB enables users to monitor their proposal status graphically by proposal number, data type, or date. A geographic Java SSDB viewer allows users to view all proposal data objects displayed over a base map of global topography, crustal age, or other custom maps. Data may be viewed or downloaded under password control.

To find out more about the SSDB, and/or to download or contribute data, please visit: http://ssdb.iodp.org/.

7.6. Expedition Publications

IODP publishes numerous documents, mostly in electronic form. Below is a brief summary of these documents and their locations. Please visit http://www.iodp.org/scientific-publications/ for more details and access to IODP publications.

7.6.1. Proposals

The final version of the expedition proposal is published and made available by IODP. The Science Advisory Structure-approved proposal contains the final information and data describing scientific goals, detailed information on geological setting, drilling justification, drilling and logging/downhole measurement strategies, and site survey data. The site survey data provides general site information such as location, jurisdiction, and water depth, and operation information such as general lithologies, coring plan, logging plan, estimated operational time required, hazards, and expected weather, specific details on available site survey data and data still to be collected, detailed logging plan, and a pollution and safety hazard summary. These data are provided for both planned and contingent sites.

7.6.2. Scientific Prospectuses

The Scientific Prospectus is compiled by the Expedition Co-chief Scientists and finalized during the Pre-Cruise meeting. The document includes all the details describing exactly how the expedition's scientific goals will be met including: a final schedule, the scientific objectives, drilling strategy, drill site descriptions, logging and downhole measurement plan, sampling strategy, operations schedule, identification of any expedition-specific sampling needs, and any other component of expedition operations that necessitate a formal plan or description.

7.6.3. Ship Reports

Daily operational reports are sent from IODP vessels. Relevant portions of these reports can be accessed via the IODP website (http://www.iodp.org)

7.6.4. Preliminary Report

A Preliminary Report is released approximately 2 months following the conclusion of offshore operations. The Preliminary Report reiterates the background and scientific objectives of an expedition and also presents the hypotheses tested, summaries of operations and findings at each site, preliminary scientific conclusions and observations, and a preliminary scientific assessment.

7.6.5. Proceedings

The Proceedings present the scientific and engineering results of IODP drilling projects, each an important component of an international program designed to better understand Earth, its environmental changes and processes, the deep biosphere, and climate change. Expedition Proceedings are published by IODP-MI for IODP under the sponsorship of the U.S. National Science Foundation, Japan's Ministry of Culture, Education, Sports, Science and Technology, and other IODP members. Proceedings are published in two stages: (1) Expedition Initial Reports, and (2) Expedition Scientific Results. The Initial Reports volume contains a detailed summary of the scientific and engineering results from each leg, whereas the Scientific Results volume, published approximately 2 years following the Initial Results volume, contains a series of peer-reviewed papers that describe the results of shore-based studies related to the leg.

Results presented in the Proceedings include information such as:

- Expedition summaries: Scientific and operational objectives, operational strategy, site results, conclusions, references, etc.
- Site Summaries: Site objectives, operations, lithostratigraphy, biostratigraphy, paleomagnetism, composite section, geochemistry, physical properties, references, etc.
- Core Descriptions
- Expedition Research Results: data reports and synthesis reports
- Drilling Location Maps
- Supplemental Material

7.6.6. Publications during Expedition Moratorium

A central goal of IODP publications is to disseminate the results to the scientific community via scholarly journals. To assist a scientific party wishing, during the moratorium period, to publish the key scientific findings from an expedition in a journal that requires a temporary embargo on publication of IODP reports, news releases, and/or publications, IODP has developed a series of procedures and protocols. Please see Section 2.1 of the IODP Sample, Data, and Obligations policy for details (http://www.iodp.org/program-policies/)

7.6.7. Logging Summary

Description of logging operations and detailed analysis of log data is presented for each logged hole. An example can be found at: http://iodp.ldeo.columbia.edu/LOG_SUM/311/index.html

Access to all IODP, ODP, and (many) DSDP publications can be found at: http://www.iodp.org/scientific-publications/

8. Expedition Legacy

Archive and preservation of ocean drilling legacy data is a high priority at IODP. Having complete, well-described, logically organized data sets, from drilling and coring logs to post-expedition publications, for each expedition is vital to the worldwide impact of the program. Efforts are still underway to complete the archives from ODP and efforts are continually underway in IODP to ensure that data capture, archive and organization are a part of every-day operation – Fig. 13, below, exhibits just that. The IODP-MI data management team incorporated all borehole data from DSDP, ODP, and IODP into a single database displayed through Google Earth. Every borehole drilled during any of these three programs can be easily located and related information such as: location, water depth, core recovered and specific core data, can be quickly and effortlessly obtained. Instructions and files for downloading the Google Earth database can be found at: http://www.iodp.org/borehole-map.

Fig. 13: Google Earth map showing drill site locations and core data for DSDP (green), ODP (yellow), and IODP (red) boreholes.

Program legacy data, currently for DSDP and ODP can be found at:

http://www.iodp.org/legacy-data/

9. Outreach

9.1. Publications

9.1.1. Website

Online at www.iodp.org, the IODP web portal interlinks numerous IODP program partners and related research programs. Its search engine networks several dozen programs and institutions with content related to scientific ocean drilling.

9.1.2. Scientific Drilling

Scientific Drilling is the IODP program journal. The journal provides reports on deep Earth sampling and monitoring from ocean drilling and continental drilling scientific research projects.

Scientific Drilling is a semiannual journal published jointly by Integrated Ocean Drilling Program Management International (IODP-MI) with the International Continental Scientific Drilling Program (ICDP). It is designed to enhance communication between IODP and ICDP, and other scientific drilling communities. IODP and ICDP welcome contributions on any aspect of scientific drilling, including borehole instruments, observatories, and monitoring experiments.

To view past issues or subscribe to the mailing list, please visit: http://www.iodp.org/scientific-drilling/4/.

9.1.3. E-News

E-News is a bi-monthly newsletter sent out electronically to keep interested persons informed on IODP expeditions, ships, platforms, and other breaking news. To view past E-News issues or subscribe to the mailing list, please visit: http://www.iodp.org/community-newsletters/ - here you can also find links to the IODP partner newsletters.

9.1.4. News / Media

IODP is committed to keeping the latest happenings in scientific drilling research in the news. The website has a doorway designed specifically for the media with news releases, publications, fact sheets, and other useful tools and information including a direct link for submitting media requests.

To view recent and past news articles, please visit: http://www.iodp.org/news-releases/2/.

For media requests such as an interview with IODP representative, high-resolution images, or an onsite visit to a drilling vessel, please fill out a request form at: http://www.iodp.org/Portal2?iodp_sub_template=Portal2sub.

9.2. Public Interface

9.2.1. IODP Distinguished Lecture Series

The Integrated Ocean Drilling Program (IODP) has launched a new biannual lecture series: IODP DRILLS, the Distinguished Researcher & International Leadership Lecture Series.

IODP DRILLS is a topical scientific lecture series that features prominent, internationally known scientists describing scientific results derived from samples retrieved from beneath the ocean floor. DRILLS will actively engage future generations of scientists in ocean drilling, while highlighting scientific ocean drilling's major accomplishments to the scientific community and beyond.

Information and video of previous lecture series and information regarding future DRILLS lecture series can be found on the DRILLS webpage.

9.2.2. IODP Topical Symposia

IODP-MI, with the assistance of the Science Advisory Structure Executive Committee, supports topical symposia designed to address broader topics of scientific ocean drilling and serve as an outreach outlet to the scientific community.

IODP's first topical symposium, "North Atlantic and Arctic Climate Variability", will be held Aug. 15–16, 2007, at the University of Bremen, in coordination with other events highlighting the International Polar Year/ For more information on the climate symposium, go to http://www.iodp.org/topical-symposium/2/

9.2.3. Town Hall Meetings

Cosponsored by the European Consortium of Ocean Research Drilling and IODP-MI since IODP began operating in 2004, Town Hall Meetings are convened around broad themes, feature presentations on emerging topics from scientists working in the program, and are usually held at American Geophysical Union and the European Geophysical Union.

9.2.4. Conference Outreach

IODP aims to meet scientists, engineers, teachers, and academics at large international, regional, and national professional conferences worldwide. Through special technical sessions and exhibitions, IODP seeks to recruit young, interested, and diverse scientists to participate in scientific ocean drilling.

9.2.5. Educational Initiatives

IODP reaches out to teachers and students with unique programs designed to interest young people and adults in scientific investigations of Earth and the ocean floor. Recent successful programs include "School of Rock," rolled out by the USIO for science teachers (http://www.oceanleadership.org/learning); "Sand for Students" introduced to high school students in Japan (http://www.sand4students.net/en/index.html); and teacher workshops presented by ECORD to academics attending EGU (http://www.ecord.org/edu/education.html).