参考資料３

FY04 Program Plan for the Integrated Ocean Drilling Program (IODP)

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Draft version to the Science Planning and Policy Oversight Committee (SPPOC)

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A. Preface

This document represents the Program Plan for the first operational year of the Integrated Ocean Drilling Program (IODP). The Plan contains the scientific rationale for the first series of non-riser vessel (*JOIDES Resolution*) operations, spanning from June 2004 to May 2005, and for the first Mission-Specific Platform (MSP) program in August-September 2004, a multi-vessel expedition to the Lomonosov Ridge in the central Arctic. The Plan also provides details of the ongoing outfitting of the Japanese riser vessel *Chikyu*, and a description of the preparation (e.g., engineering and hazards site surveys) for the inauguration of riser-based scientific operations in FY07.

The first year of IODP represents the culmination of more than 10 years of planning by the international science community as summarized in the IODP Initial Science Plan (www.iodp.org/isp.html), published in 2001. A formal memorandum to co-lead IODP was signed in April 2003 by MEXT (Japan) and NSF (U.S.) (hereafter referred to as the "Agencies"). The European Consortium for Ocean Research Drilling (ECORD) intends to become a participating member of IODP in ~December 2003. ECORD plans to provide MSP capabilities to IODP on a long-term basis. Negotiations continue with other potential IODP partners, including China.

The science presented in this Program Plan is the combined product of two ranking exercises by the IODP Science Advisory Structure (SAS). In August 2002, the five extant MSP programs were ranked by the interim Planning Committee of IODP at the request of the International Working Group (IWG). The top-ranked MSP program, the central Arctic, was then certified by IODP Management International, Inc. (IMI) as being in an "implementation" phase in September 2003. A second (global) ranking of all programs by the Science Planning Committee (SPC) occurred later in September 2003. As described in more detail in the Executive Summary, all science proposed by the international science community, reviewed and ultimately ranked by the SAS for IODP, is being considered in the context of both long-term "project management" and "project scoping."

IMI will implement the tasks and assume the responsibilities of the Central Management Organization (CMO) in IODP through a contractual agreement with the NSF. IMI, incorporated in the U.S. early in 2003, and currently consisting of a membership that is half Japanese and half US, is now in contract negotiation with NSF. The resulting contract should be signed in early 2004 and IMI will then be supported to manage IODP science operation costs on behalf of the international scientific community.

This Plan is the first multi-vessel, multi-operator program in over 35 years of scientific ocean drilling. As such, different modes of expression and levels of detail have inevitably been used by the three Implementing Organizations (IOs, drilling operators) to describe their Science Operation Costs and Platform Operation Costs (SOCs and POCs). This Plan attempts to preserve and present that diversity of expression (see Appendices A-C). We also present a summary budget (see **Table ES-2**) that shows the POCs and SOCs as described in the IODP principles developed and approved by the International Working Group (IWG), and since modified by the

IODP Agencies.

The FY03 Ocean Drilling Program Plan referred to IODP as the "next phase of discovery and expansion of our understanding of Planet Earth." That next phase is now upon us. Let the discovery and expansion of our understanding begin.

Document Structure

The **Executive Summary** contains three sections: the first provides an overview of the IODP, explains its structure, entities and functions, and describes the method by which the Plan was developed. The second section provides a description of the scientific operations and associated activities for the FY04 field programs, along with activities in support of *Chikyu* operations currently scheduled for FY2007. The third section provides summary budget information.

The **Program Plan** contains four sections. The first outlines the organizational framework and entities of IODP, describes the management and operational structure of IODP, and explains how the SAS provides advice and guidance to the program. The second section describes the planning process leading to the development of the FY04-05 operational schedule. The third section is a description of the scientific, operational and fiscal aspects of FY04-05 expeditions. The fourth section summarizes the overall budget for FY04. Detailed budgets from the IOs are presented in the appendices.

Appendix A provides specific activities and detailed budgets for non-riser vessel operations, submitted by the JOI Alliance (JOI, Inc., TAMU, LDEO-Columbia).

Appendix B provides specific activities and detailed budgets for the central Arctic MSP program and advance planning for future MSP projects, submitted by the ECORD Science Operator (BGS, the European Petrophysics Consortium [Universities of Aachen, Leicester, GFZ/ICDP – Potsdam, Montpelier], University of Bremen).

Appendix C provides specific activities and budgets in support of continued outfitting of the riser vessel *Chikyu* and long-range planning in preparation for international science operations by that vessel, submitted by the Center for Deep Earth Exploration (CDEX).

B. Executive Summary

1. IODP – Organizational Framework & Program Plan

The Integrated Ocean Drilling Program (IODP) is an international partnership of scientists and research institutions organized to explore Earth's history and structure as recorded in the ocean basins. IODP will provide sediment and rock samples (cores), shipboard (i.e., platform-based) and shore-based facilities to study these samples, downhole geophysical and geochemical measurements (logging/petrophysics), and opportunities for special experiments (i.e., seafloor and sub-seafloor observatories) to determine *in situ* conditions beneath the seafloor. IODP studies will lead to a better understanding of plate tectonic processes, Earth's crustal structure and composition, environmental conditions and life in ancient oceans, and climate change.

IODP is sponsored by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. National Science Foundation (NSF). The European Consortium for Ocean Research Drilling (ECORD) intends to join IODP in ~December 2003. The Agencies (NSF and MEXT) are currently in discussion with other potential IODP members, including China. The IODP Council, representing all IODP members, provides a forum for consultation among the NSF, MEXT and other IODP member funding agencies.

Scientific advice for IODP is provided by the Science Advisory Structure (SAS), an international organization of advisory committees and panels (see **Figure ES-1**). The scientific basis and justification for IODP is documented in the Initial Science Plan (ISP) for 2003-2013, published in 2001 (www.iodp.org/isp.html). The ISP, commissioned by the IODP Planning Subcommittee (IPSC), represents the result of ~10 years of planning by the international scientific community. Three major community-planning exercises occurred *en route* to the ISP. The first, CONCORD ("Conference on Cooperative Ocean Riser Drilling"), took place in 1997 in Tokyo and developed a set of science priorities for riser-based drilling. The second, COMPLEX ("Conference on Multiple Platform Exploration"), took place in 1999 in Vancouver and developed science objectives for non-riser drilling. In conjunction with this planning, the international community recognized that some ISP science could be addressed only by using specialized platforms (e.g., ice-strengthened drillships, jack-ups) that could be acquired as needed. This initiative became the "mission-specific platform" (MSP) capability in IODP. The third workshop, APLACON ("Alternate Drilling Platforms: Europe as the Third Leg of IODP") examined both the science to be studied using MSPs and MSP capabilities. APLACON was held in 2001 in Brussels. The documents derived from all of these planning efforts may be accessed at www.isas-office.jp.

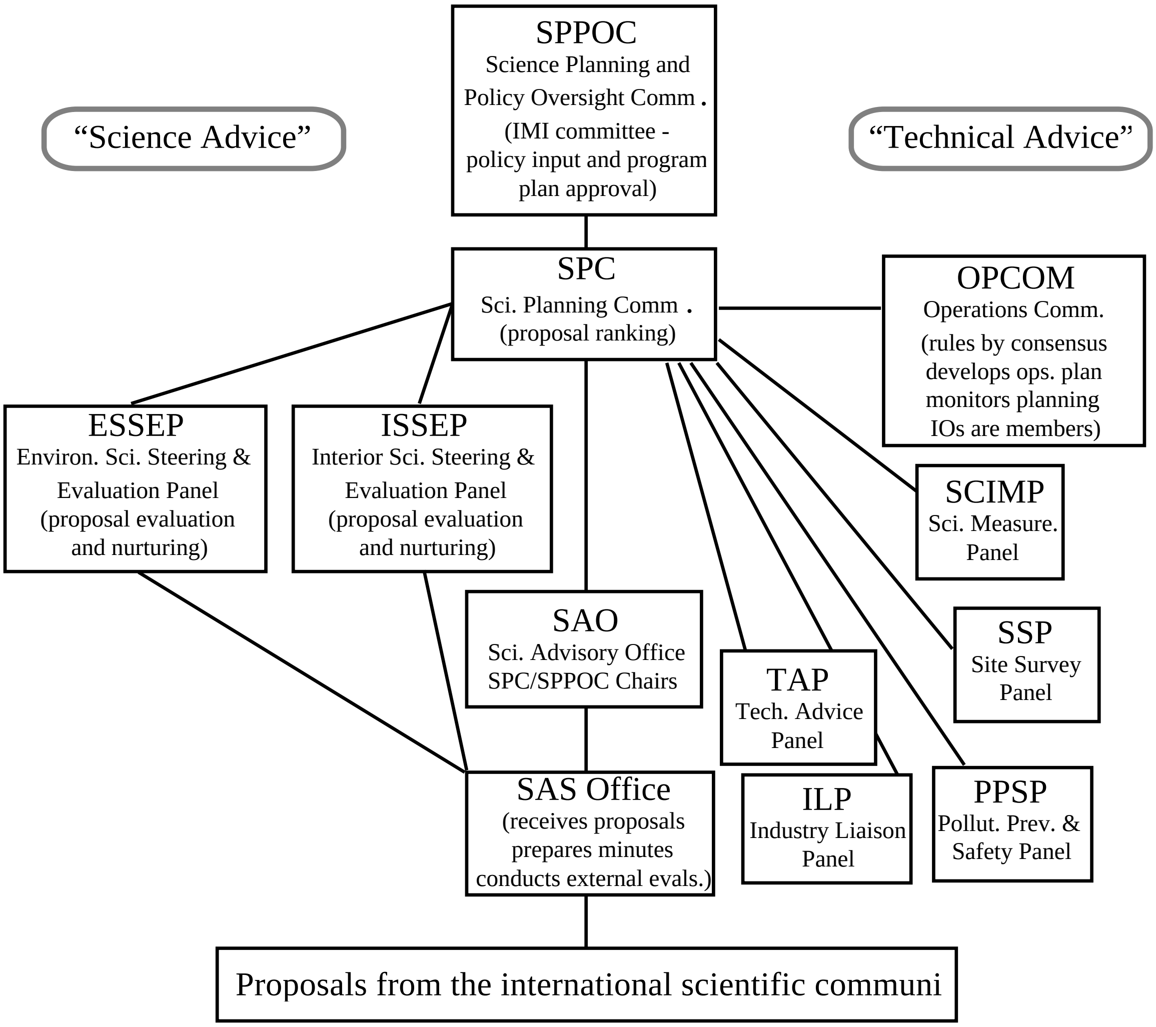


Figure ES-1*: IODP Science Advisory Structure (SAS). Technical and scientific advisory panels liaise as necessary. Technical panels also liaise to OPCOM. Mandates for individual panels can be found at* *http://www.ig.utexas.edu/imi/* *(SPPOC) and* *www.isas-office.jp* *(all other panels).*

Overall management of science operations will be provided by IODP Management International, Inc. (IMI), which is currently negotiating a long-term contract with NSF to undertake the tasks and assume the responsibilities of the Central Management Organization (CMO, **Figure ES-2**). A provisional organizational chart for IMI is presented (**Figure ES-3**). IMI will be tasked with delivering the science prioritized by SAS, in coordination with the Implementing Organizations (IOs).

Develop:

- Annual Program Plan
- Budget plan for Science Operation Cost of the program
- Budget plan for technical/engineering development
- Downhole logging plan and budget
- Annual publication and information service plan, budget, and guidelines for the Program
- Annual plan and budget for education, outreach, and promotion

Execute:

- Contracts with IOs or IODP subcontractors for Science Operation Activities
- Contracts with IOs or IODP subcontractors for technical/engineering development
- Contract (or other agreement) with NSF/MEXT for science operations and management of IODP
- Other contracts/agreements which may be required

Ensure the efficiency of:

- Detailed annual Science Operating Plan
- Detailed annual Platform Operation Plan
- Detailed Science Operation Cost
- Detailed drilling plan prepared by IO and DPG
- Platform Operation Cost of the Program
- Detailed Pre-drilling site survey plan prepared by IO

Secure or Maintain:

- Necessary funding for Science Operation of each platform
- Financial controls for the Science Operation Cost of the Program
- Necessary funding for publication and information services
- Fiscal activities of CMO operations
- Quality control for sample and data archives

Seek or Promote:

- International cooperation to provide timely and useful site survey info for the proposed drill sites
- Advice from the drilling industry on operational/technical solutions
- New members for IODP

Support or Assist:

- Appropriate pre-drilling site survey standard for each platform to meet adequate HSE requirements
- IO to secure drilling permit from the country of jurisdiction
- DPG and IO in creating detailed drilling plans

Conduct:

- Promotion of the Program

Support SAS Activities & Ops:

- SAS Support and Logistics
- Proposal Administration
- Publication and Outreach

Figure ES-2: *CMO tasks and responsibilities, based on recommendations from SAS and Implementing Organizations, and approved by the IWG. These tasks and responsibilities will be the undertaken and assumed by IODP Management International, Inc. (IMI), under long-term contract to NSF.*

Implementing Organizations

IODP is the first scientific ocean drilling program to have more than one IO (Implementing Organization, i.e., drilling operator). Non-riser drilling capability will be supplied by the JOI Alliance, a partnership of JOI, Inc. (overall management), Texas A&M University (operation of the non-riser drillship, the *JOIDES Resolution* in the first phase of IODP, and associated activities of expedition staffing, logistics, program-specific engineering development and operations, shipboard laboratories, curation and distribution of core samples and data) and

Lamont-Doherty Earth Observatory of Columbia University (geophysical and geochemical logging services, involving acquisition, processing and interpretation of logging measurements). The ECORD Science Operator (ESO) will supply mission-specific platform (MSP) drilling and logging capabilities. The ESO is a consortium led by the British Geological Survey (MSP operations and program-specific engineering development), the European Petrophysics Consortium (logging services) and the University of Bremen (repository services). Riser drilling capability using the vessel *Chikyu* will be supplied by the Center for Deep Earth Exploration (CDEX). These relationships are outlined (**Figure ES-4**).

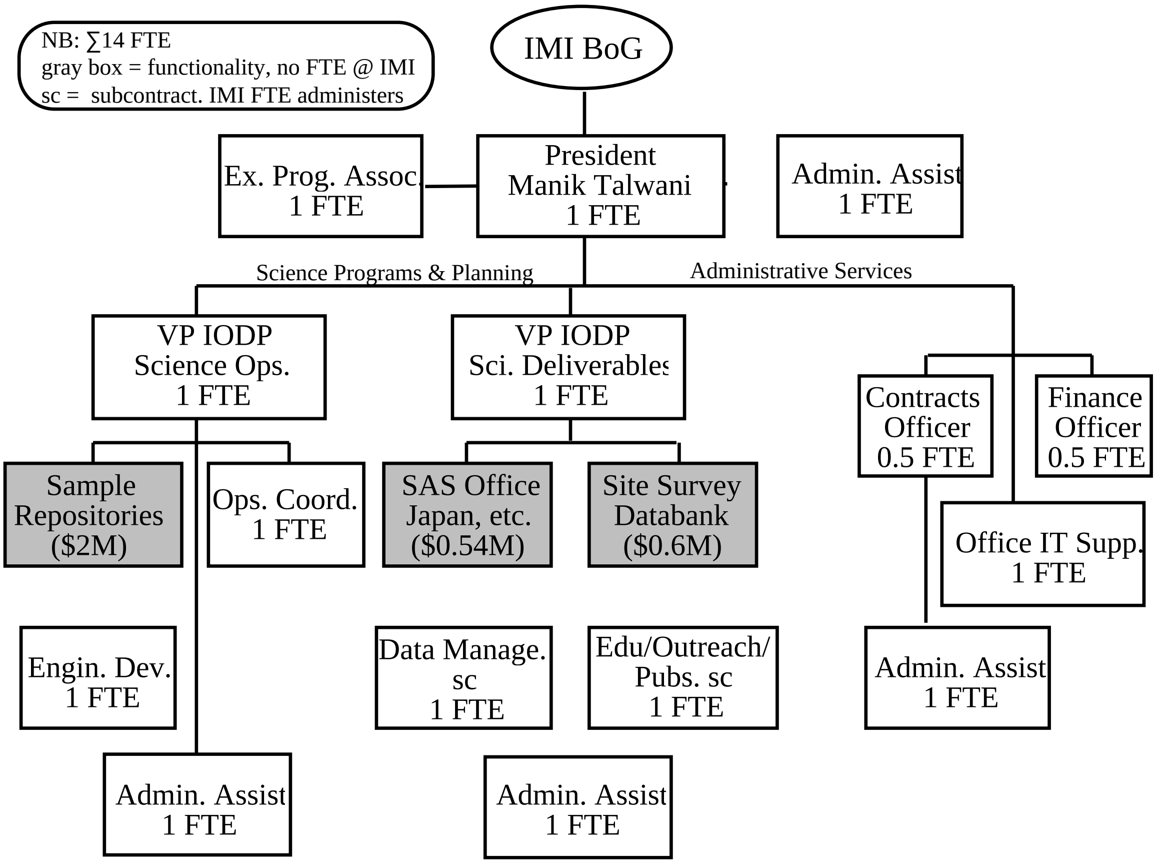


***Figure ES-3**: Prospective organization of IODP Management International, Inc. (IMI). In the diagram, "sc" stands for a subcontract (i.e., IMI administration of a particular task, like data management or publications, actually conducted external to the corporation). FTE means "full-time equivalent". The number of FTEs to be employed by IMI is still under discussion. Amounts in some boxes refer to estimates of resources anticipated for those tasks. Please note that the SAS Office is part of IMI, although it is listed as a subcontract.*

The JOI Alliance is under contract to NSF, ESO will operate under the auspices of the European Management Agency (EMA) based in Paris, and CDEX is part of the Japan Marine Science and Technology Center (JAMSTEC). The Site Survey Data Bank prepares safety packages for pre-expedition review of designated sites, and supplies each shipboard scientific party with the geophysical data necessary to conduct scheduled drilling expeditions properly. The Data Bank also assists scientists interested in developing IODP proposals by providing information with respect to scientific problems of interest to the scientific ocean drilling community. In FY2004, resources to operate the Data Bank will be provided by NSF, through the ODP contract with JOI.

IMI

IODP Management International, Inc. (IMI) is a non-stock corporation incorporated in the U.S. IMI is presently negotiating a contract with NSF to provide the services of a Central Management Organization (CMO) for IODP (see **Figure ES-2**). IMI was incorporated in March 2003, and shortly thereafter, an interim planning office was established at The University of Texas at Austin, Institute for Geophysics (UTIG). Paul Stoffa, Director of UTIG, has been serving as interim President of IMI, while James Austin has been serving as interim IODP director. The interim office has accomplished the following tasks: advertising for permanent IMI officers (a President and one Vice President have been hired, see **Figure ES-3**), calling an inaugural meeting of IOs to discuss topics of mutual interest (e.g., databases, tool development, HSE), initiating an international effort to coordinate education and outreach, and liaising as necessary to SAS committee and panel meetings in order to provide continuity between science advice and guidance and program management. A permanent IMI office should be established by ~1 April 2004.

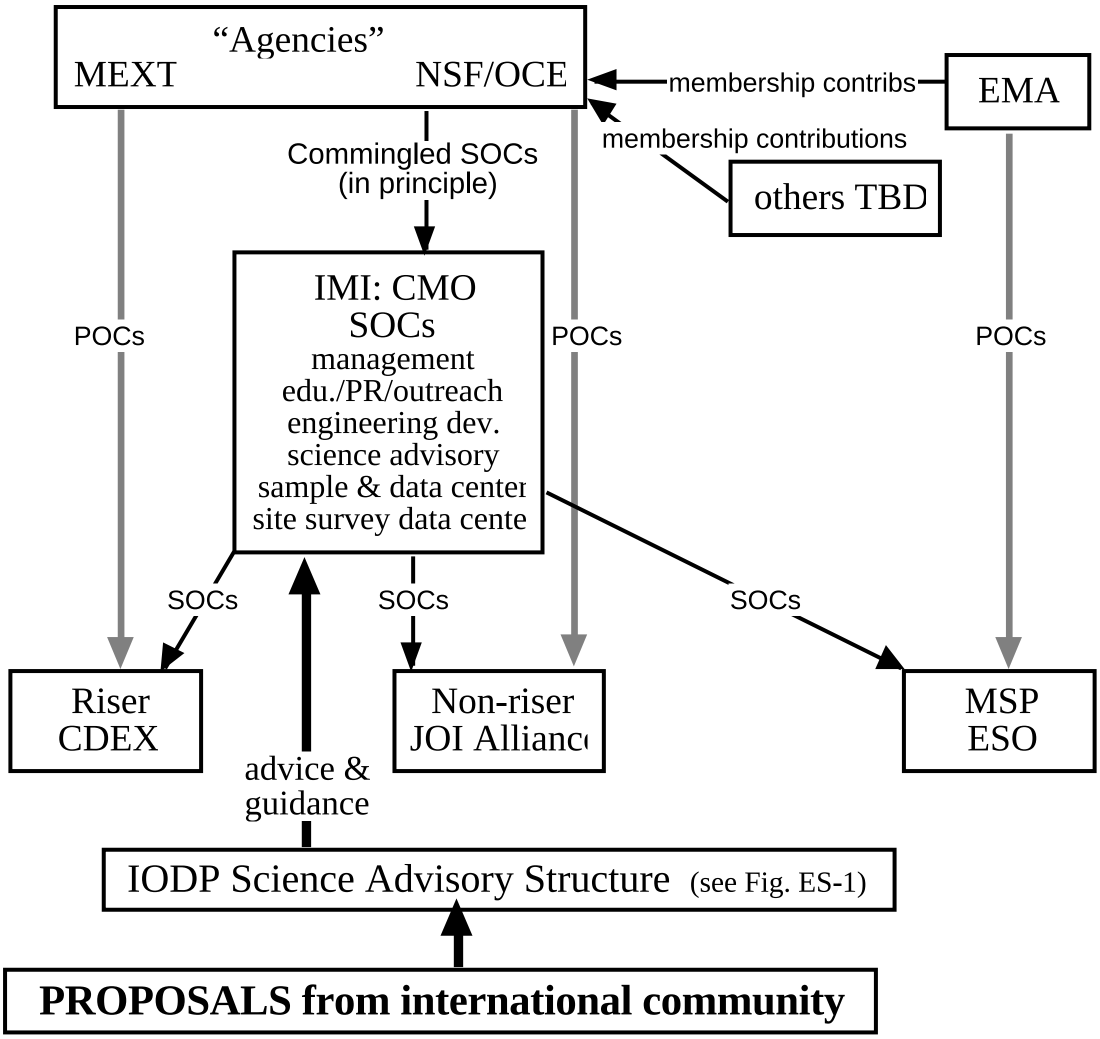


Figure ES-4: *IODP program management structure, when IODP is fully implemented. SOCs represent "Science Operating Costs", while POCs represent "Platform Operating Costs", as defined in IODP principles and since modified by the Agencies. SOCs and POCs are detailed in accompanying budgets, both in the Program Plan and in Appendices A-C. While ESO is the primary provider of MSP capability, additional MSP operators are possible.*

Science Advisory Office

Establishing an IODP Science Advisory Office (SAO) to support the activities of the designated SPPOC and SPC chairs, not to be confused with the Science Advisory Structure (SAS) Office (see **Figure ES-1**), is mandated in the IODP memorandum between MEXT and NSF, which was signed on 22 April, 2003. The SAO is being implemented gradually at the Ocean Research Institute, University of Tokyo, beginning with the appointments of the SPPOC chair (Kensaku Tamaki) and SPC chair (Mike Coffin) in August and September 2003, respectively, and the hiring of a full-time administrative assistant (Yamaguchi) in November 2003. Full implementation of the SAO is anticipated during the second quarter of calendar 2004, when the source of support for the SAO will shift from JAMSTEC and Joint Oceanographic Institutions, Inc. (JOI) to IMI.

Science Advisory Structure (SAS) Office

The SAS Office manages the IODP proposal process, coordinates and supports SAS activities, and facilitates communication among the SAS, IODP management entities and the international scientific drilling community (see **Figure ES-1**). The SAS Office also contributes content to program plans and assists and coordinates the activities of the Science Planning and Policy Oversight Committee (SPPOC), Operations Committee (OPCOM) and other detailed and program planning groups mandated by Science Planning Committee (SPC). The SAS office staff (science coordinators Nobu Eguchi and Jeff Schuffert, and administrative assistant Komamura) maintains close working relationships with the chairs of the SPPOC and the SPC (through the SAO), and the interim IMI office at UTIG (to be replaced by IMI ~1 April 2004). The Advanced Earth Science and Technology Organization (AESTO) organizes and supports the SAS Office, and JAMSTEC currently provides office space, infrastructure and equipment. The source of support for the SAS Office will shift from JOI to IMI in the second quarter of calendar year 2004, when the current office in Tokyo relocates to Hokkaido, Sapporo, and becomes the permanent SAS/IODP Office, part of IMI.

Project Management

A Project Management System (PMS) has been proposed for use in all IODP expeditions by the Project Management System Working Group (PMSWG) mandated by the SPC. The PMS represents a phased approach, with reviews at specified intervals during so-called scoping, implementation and evaluation phases, providing assurance that each IODP expedition makes progress towards its goal(s). PMS makes maximum use of previous scientific ocean drilling practices and allows for flexibility in application, depending on the platform(s) selected for specific expeditions (riser, non-riser and/or MSP) and the complexity of the planned activities. The main objective of the PMS is to provide IODP management and its funding bodies with assurance that acceptable HSE and drilling standards are met at all stages of expedition planning, that value is achieved, and that all aspects related to envisioned operations are considered. PMS is based on standard industry project-management practices. The PMSWG has recommended a test to confirm the extent to which PMS can be implemented in practice in IODP. The PMSWG has further recommended that after a relatively short implementation interval (e.g., 18 months), the performance of the PMS be evaluated and modified as appropriate.

Project Scoping

As part of the PMS, a Project Scoping Working Group (PSWG) has been established by SPC to begin the scoping process for two proposed complex drilling projects (CDPs). To date, the SSEPs consider two Seismogenic Zone proposals, 603-NanTroSEIZE and 537-Costa Rica, to be CDPs. A CDP has one or more clearly articulated, overarching scientific goal(s); achieving the goal(s) requires completing linked scientific and operational components, each of which can be accomplished in a reasonably short time. However, the fundamental goal(s) of a CDP cannot be achieved through completion of a series of independent drilling expeditions, but must instead be part of a planned and coordinated (and perhaps multi-year and multi-platform) activity. The PSWG first met in August 2003. The scoping process includes expedition description, risk analyses and long-term operational planning. Membership has included representatives from proponent groups and IOs, an industry project management advisor, a risk identification specialist and a well engineer.

A project-scoping group under the PMS has also been established for 533-Central Arctic Paleoceanography. This Arctic Scoping Group (ASG) first met in October 2003. Establishment of a project-scoping group for 595-Indus Fan (and Murray Ridge) was also endorsed by the SPC in September 2003; that group may be formed before the end of calendar year 2003.

Coordination of the IODP Program Plan

IODP scientific expeditions are based on proposals submitted by the international science community to the SAS Office (see **Figures ES-1** and **ES-4**). SAS advisory panels review these proposals and then make recommendations to the SPC that ranks proposals, and decides operational matters with the advice and guidance of the OPCOM. After scheduling has been completed, SPC writes a science plan and submits it to IMI. In turn, IMI prepares the Program Plan from the science plan with budgetary input on operations from the IOs (JOI Alliance, ESO and CDEX, see appendices A-C) and from the Agencies. The draft Program Plan is then reviewed by SPPOC, an IMI committee, and finally forwarded by IMI to NSF and MEXT for formal approval.

SOCs and POCs

The costs of IODP are divided into two categories, Platform Operation Costs (POCs) and Science Operation Costs (SOCs). These were originally discussed and agreed upon by the IODP International Working Group. Subsequently, they were codified in the IODP memorandum signed by NSF and MEXT in April 2003, and are excerpted below. Modifications to this categorization may occur through consultation with and concurrence of the Agencies. At the time that this Program Plan was written, IMI had received no further details concerning definitions of POCs and SOCs.

> **<u>Platform Operations Costs</u>** are expected to 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.
>
> **<u>Science Operation Costs</u>** are expected to provide for those activities onboard program platforms necessary to the proper conduct of the scientific research program and those shore-based activities required to properly maintain and distribute samples and data, support seagoing activities, and administer and

manage the program. These costs include, for example: (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); and, (9) costs required for administration and management, including the Central Management Office.

Scientific Highlights of the FY04-05 Science Program

Specific details concerning science operations for FY04 are presented in the Program Plan section (Section C) of this document. Here, we provide a brief summary of these operations.

Planning Phase: At the August 2002 meeting of the interim Planning Committee, the central Arctic MSP program was ranked first of five MSP programs considered ready for ranking at that time. In September 2003, at its first global ranking of available IODP drilling proposals, the SPC conducted a competitive evaluation of 16 externally reviewed proposals sent by the Science Steering and Evaluation Panels (SSEPs, see **Figure ES-1**), and reaffirmed the previous evaluation of the externally reviewed central Arctic proposal, resulting in the selection of four non-riser expeditions and one Arctic MSP expedition that are described in this Program Plan. The scheduled programs (see **Figure ES-5**) all directly address principal themes of *Earth, Oceans, and Life*, the IODP Initial Science Plan (ISP).

- One expedition, Juan de Fuca Ridge Flank Hydrogeology (545-Full3), addresses the deep biosphere and the subseafloor ocean.
- Three expeditions, Central Arctic Paleoceanography (533-Full3), North Atlantic Neogene-Quaternary Climate (572-Full3) and Norwegian Margin Bottom Water (543-Full2), address environmental change, processes and effects.
- One expedition, Atlantis Oceanic Core Complex (512-Full3), addresses solid earth cycles and geodynamics.
- In addition, the Central Arctic Paleoceanography (533-Full3) expedition will drill the central Arctic Ocean for the first time, and represents the first dedicated MSP activity performed under the auspices of international scientific ocean drilling.

2. IODP science plan summary for FY04

Brief summaries of the scientific objectives of selected IODP FY04 (and provisional FY05) expeditions (see **Table ES-1 and Figure ES-5a.**) are as follows:

Juan de Fuca Ridge Flank Hydrogeology (545-Full3) – Expedition 1/300

This multidisciplinary research program will evaluate the formation-scale hydrogeologic properties (transmission, storage) within oceanic crust; determine how fluid pathways are distributed within an active hydrothermal system; establish links between fluid circulation, alteration, and geomicrobial processes; and determine relations between seismic and hydrologic anisotropy. To accomplish these goals, two existing sub-seafloor observatories penetrating the upper crust will be replaced, and two new holes (600 m and 200 m into the crust) will be drilled, cored, sampled, instrumented and sealed. The first multi-dimensional, cross-hole experiments ever attempted in oceanic crust will be conducted, including hydrologic, microbiological, seismic and tracer components. Following drilling, multi-year tests using this network of sub-seafloor observatories will allow examination of a much larger volume of the crustal aquifer system than has been tested previously. By monitoring, sampling, and testing within multiple depth intervals, the extent to which oceanic crust is connected vertically and horizontally, the influence of these connections on fluid, solute, heat and microbiological processes, and the importance of scaling on hydrologic properties, will all be evaluated. The study area is characterized by: a) thick sediment cover isolating permeable basement, allowing small pressure transients to travel long lateral distances, b) outstanding coverage of seismic, heat flow, coring, geochemical and observatory data, allowing detailed hypotheses to be posed and tested, c) existing ODP drill holes and long-term observatories, providing critical monitoring points for pre- and post-drilling experiments, d) a naturally over-pressured formation that will drive multi-year, cross-hole experiments, and e) a planned, cabled seafloor observatory network that will facilitate long-term experiments, data access and instrument control. This expedition and associated work will elucidate the nature of permeable pathways in the crust, the depth extent of circulation, the importance of permeability anisotropy and the significance of hydrogeologic barriers in the crust. It will demonstrate where viable microbiological communities live and how these communities cycle carbon, alter rocks and are influenced by flow paths. It will also quantify lateral scales over which solute transport occurs, the extent of flow channeling and mixing in the crust, and how these processes relate to rock structure and fabric. Finally, it will determine how to relate seismic velocities and velocity anisotropy to hydrogeologic properties.

Central Arctic Paleoceanography (533-Full3) – Expedition MSP-1

The Lomonosov Ridge in the central Arctic Ocean rifted and separated from the continental shelf of the Kara and Barents Sea during early Paleogene time, and has subsequently subsided to its present water depth. Sediments of biogenic, eolian and ice-rafted origins have accumulated on the ridge crest. Five drill sites on the Lomonosov Ridge crest, all in international waters, are distributed between 81°N and 88°N, in water depths ranging from 800 to 1415 m (see **Figure ES5 b. and c.**). In the primary target area between 87°N and 88°N, the presumed pelagic cap of flat-lying sediment is ~450 m thick, indicating an average sedimentation rate of ~10 m/my throughout Cenozoic time. Sampling of these sediments will provide an unprecedented and unique opportunity to acquire first-order knowledge about the paleoceanographic history of the central Arctic Ocean. Sampling of the underlying bedrock provides a similarly unique opportunity to decipher the tectonic history of the Lomonosov Ridge and the formation of the Eurasian Basin. Scientific objectives are to investigate: a) the long-term (<50 Ma) climate history of the central Arctic Ocean and its role in the transition from one global climate extreme (Paleogene greenhouse, lacking glaciation) to another (Neogene icehouse, exhibiting bipolar glaciation), b) the shorter-term (Neogene) climate history, and connecting that history in the Arctic Ocean to that in the North Atlantic Ocean at sub-millennial scale resolution, c) the composition and origin of the pre-Cenozoic bedrock underlying the sediment drape, and d) the rifting and subsidence history of the Lomonosov Ridge. The widely spaced latitude and partly overlapping goals of the five drill sites will make the overall expedition less vulnerable to local ice conditions. These major goals can be achieved by completing one site (i.e., multiple penetrations to assure recovery of a complete section) to 450 mbsf, the approximate base of the pelagic cap. If ice conditions prohibit success at the first site, a suite of sites from other areas along the Lomonosov Ridge corridor will be drilled as ice conditions permit to achieve the proposed science (see **Figure ES-5 b. and c.).**

N. Atlantic Neogene-Quaternary Climate (572-Full3) – Expedition 2/301 & 5/304a

The objectives of these two expeditions are to inter-calibrate late Neogene-Quaternary geomagnetic paleointensity records, isotope stratigraphies and regional environmental stratigraphies, and thereby develop a millennial-scale stratigraphic template for the past few million years. Such a template is required for understanding the relative phasing of atmospheric, cryospheric and oceanic changes that are central to our understanding of the mechanisms of global climate change on orbital to millennial time scales. In addition, the high-resolution records of directional, secular variation and geomagnetic paleointensity will greatly improve our knowledge of the temporal and spatial behavior of the geomagnetic field, as well as provide fundamental constraints for numerical models of the geodynamo. Previous drilling and piston coring results indicate that the proposed drill sites: a) contain distinct records of millennial-scale environmental variability in terms of ice-sheet–ocean interactions, deep circulation changes and sea-surface conditions, b) provide the requirements for developing a millennial-scale stratigraphy through geomagnetic paleointensity, oxygen isotopes and regional environmental patterns, and c) document the details of geomagnetic field behavior. The nine proposed drill sites are located in the Labrador Sea, the Irminger Basin, on the Eirik Drift off Orphan Knoll, on the southern part of the Gardar Drift, and at DSDP Site 607/609. (Note: Only the Labrador Sea, Irminger Basin and Eirik Drift sites will be addressed in FY04.) These sites preserve components of ice-sheet–ocean interactions, with potential for chronological control through stable isotopes and geomagnetic paleointensity. Some are located within the North Atlantic belt of ice-rafted debris, between previous drilling sites to the north (60- 77˚N; ODP Leg 162) and south (30-35˚N; ODP Leg 172). These sites also lie in an appropriate bathymetric depth range, 2750 to 3719 m, for detecting millennial-scale changes in the formation of deep and intermediate water masses.

Atlantis Oceanic Core Complex (512-Full2) – Expedition 3/302 & 4/303

These two expeditions will investigate the conditions under which oceanic core complexes develop. Domal massifs capped by corrugated, striated detachment faults have been mapped at several locations on the seafloor. These large, shallow seafloor features apparently form as a result of episodic plate rifting and accretion at slow spreading ridges. However, currently available data are insufficient to characterize the magmatic, tectonic and metamorphic history and to understand the mechanisms of uplift and emplacement of oceanic core complexes. The primary goal is to drill through the basaltic hanging wall of Atlantis Massif, in order to sample rock from just above the detachment, the shallowest part of the unexposed fault, and through a portion of the fault zone. A second goal is to characterize the nature of the alteration front within oceanic peridotite. Oceanic core complexes expose altered upper mantle peridotites and mafic crustal rocks. The alteration of these rocks and the process of serpentinization greatly affect the geophysical properties of the lithosphere. Mantle seismic velocities have been measured at depths as shallow as several hundred meters on the central dome of the massif; therefore, drilling at Atlantis Massif offers an unprecedented opportunity to determine the nature of the Moho, i.e., to test whether it represents a hydration front or the crust–mantle boundary. The potential for recovering fresh peridotite at Atlantis Massif also presents excellent opportunities for advances in understanding residual modes and microstructure within the oceanic mantle. Cores of essentially fresh, *in-situ* peridotite will allow documentation of composition, microstructure, evidence for melt production and migration, and relationships among deformation, melt and syntectonic alteration. Drilling a deep hole on the central dome of Atlantis Massif will also allow sampling of the detachment fault zone and the alteration front, and will penetrate and enable recovery of unaltered mantle.

Norwegian Margin Bottom Water Expedition (543-Full2) – Expedition 5/304b

Knowledge of bottom-water temperature (BWT) variations is important for understanding the vigor and nature of ocean circulation, as well as the nature of climatic interactions between the ocean and atmosphere. The biggest obstacles to understanding variability in bottom water are: a) the lack of an observational network and b) historical records that are too brief and too sparsely spaced. This expedition will investigate the feasibility of reconstructing BWT histories on a decadal to centennial time scale by making highly precise temperature measurements in ODP Hole 642E on the Norwegian margin. Because marine sediment has a low thermal diffusivity, variations in BWT propagate slowly downward, perturbing the background thermal field. These temperature anomalies are a direct thermo-physical consequence of a changing BWT condition and will therefore be used to reconstruct BWT histories. To ensure a conductive thermal environment, a thermistor string will be isolated between a borehole seal, or CORK ("circulation obviation retrofit kit"), at the top of the borehole and a packer below the thermistor string. Hole 642E is ideally located in the climatically sensitive Norwegian-Greenland Sea, with a 50-year time-series of BWT measurements taken and available nearby. A sensitivity analysis using observed variations in BWT at this location indicates the presence of a resolvable signal. Thermal transients will be measured as a function of time at this borehole observatory, in order to isolate directly the transient component of BWT variations.

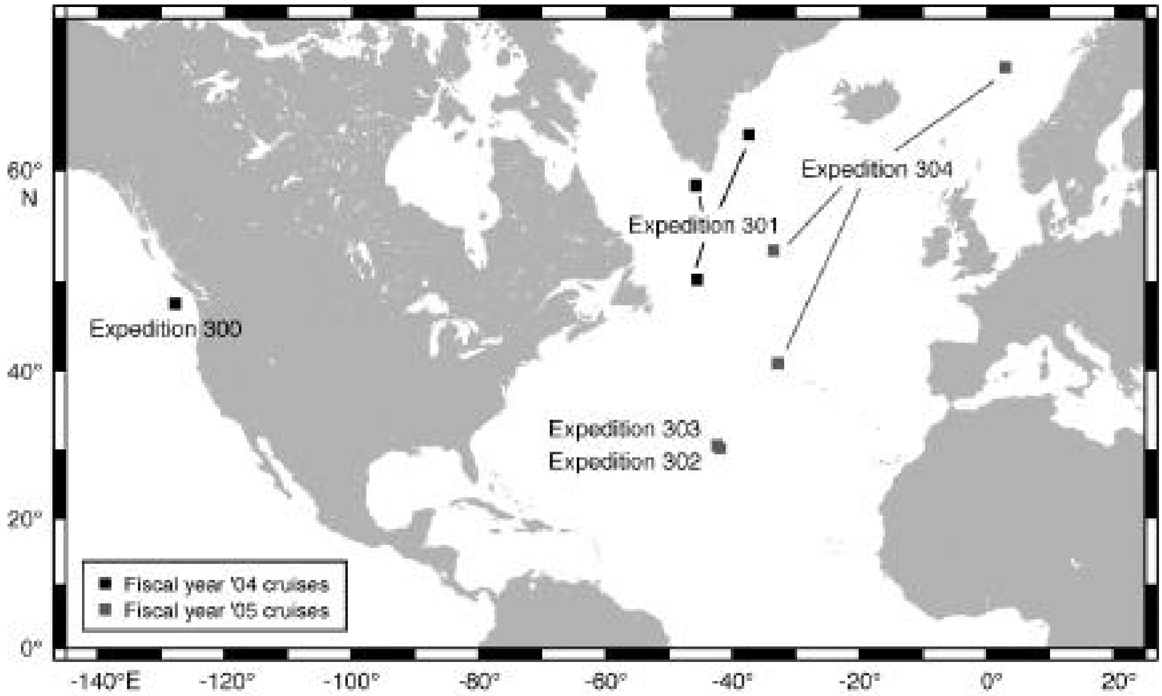
Table ES-1: *IODP operational schedule, FY04 (and provisional FY05)*

Exp. #	Expedition	Port (origin)	Dates[1,2]	Total Days (Port[1]/Sea)	Days at Sea (Transit/Ops[3])
1/300	Juan de Fuca	Astoria	[4]21 June – 29 Aug.	69 (6/63)	11/52
MSP-1	Lomonosov Ridge	Stavanger	~1 Aug. - ~15 Sept.	TBD	~35 (in ice)
	JR transit	Acapulco	29 Aug. – 13 Sept.	15 (1/4)	14/0
2/301	North Atlantic 1	Bermuda	13 Sept. – 30 Oct.	47 (2/45)	14/31
3/302	CORE 1	Ponta Delgada	30 Oct. – 18 Dec.	49 (4/45)	8/37
4/303	CORE 2	Ponta Delgada	18 Dec. – 10 Feb. '05	54 (5/49)	8/41
5/304	N. Atl 2 & Norweg.	Ponta Delgada	10 Feb. – 5 April	54 (5/49)	15/34
	JR transit[5]	Reykjavik	5 April – 23 April	18 (3/15)	15/0

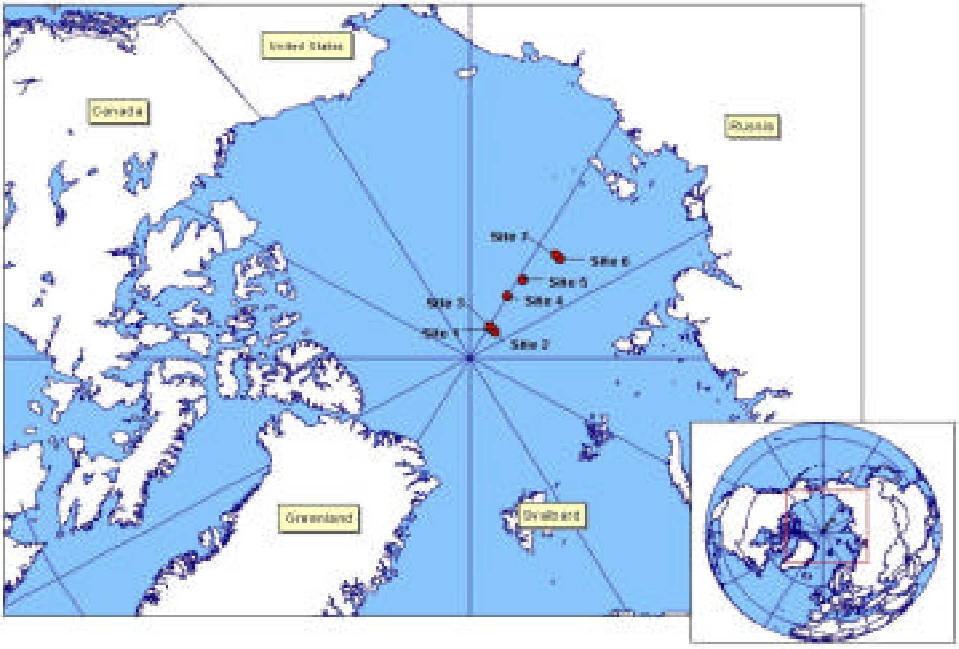
Notes:
[1] Ship is scheduled to arrive 0600 hr on first day of port call
[2] Initial expedition data reflect first day of port call; ship sails when ready
[3] Ops = Operations (includes both on-site and between-site time)
[4] Actual start date needs to be finalized
[5] Demobilization port is to be finalized

Figure ES-5: *Maps showing the locations of non-riser (a.) and MSP (b., c.) expeditions.*

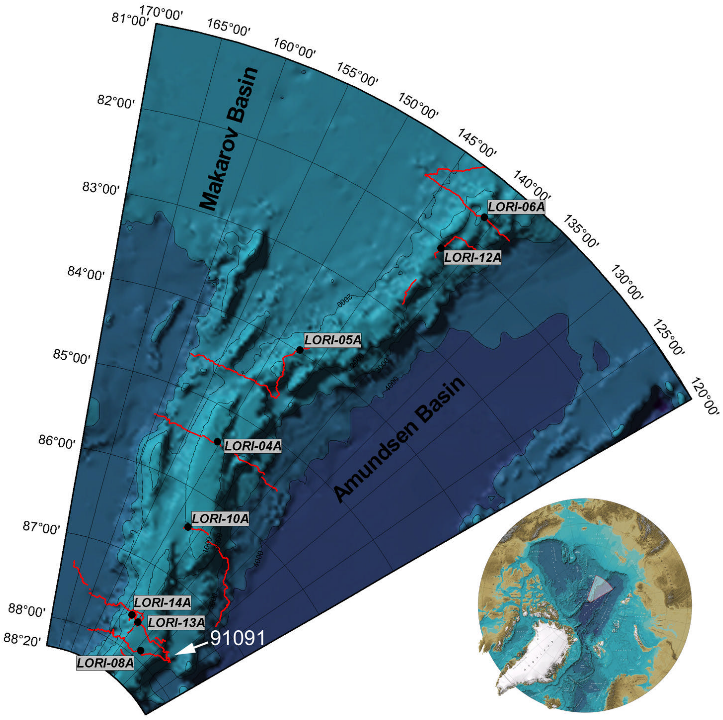
a. Locations of the first five IODP non-riser expeditions.



b. Locations of the proposed MSP coring sites in the central Arctic, Expedition MSP-1.



c. Bathymetric relief map showing the proposed MSP drill sites on the central Arctic's Lomonosov Ridge, Expedition MSP-1.



3. FY04 Budget Overview

The FY04 budget reflects the Science Operation Costs and Platform Operation Costs (SOCs and POCs) associated with non-riser and MSP expeditions, and with activities in support of riser operations that are scheduled to begin in FY07. The budget total of $40,014 K meets the high-priority needs identified by the IODP SAS. The process by which the budget was developed is explained below, in the Program Plan section. Detailed budget information from the IOs is available in the appendices. **Table ES-2** summarizes the FY04 budget. The budgets of the IODP entities are divided into POCs and SOCs. In FY04, the SOCs total 38% of the budget, whereas POCs make up the majority, at 62%.

Table ES-2: *IODP summary budget for FY04 ($K).*

Entity	Specifics	SOCs	POCs	Total ($K)
IMI	TOTAL *	$ 2,000	$ -	$ 2,000
JOI Alliance				
	JOI	$ 730	$ 1,080	$ 1,810
	TAMU	$ 6,889	$ 10,438	$ 17,327
	LDEO	$ 2,367	$ 618	$ 2,984
	TOTAL	$ 9,986	$ 12,136	$ 22,121
ESO				
	Planning & maintenance	$ 694	$ 25	$ 719
	Arctic expedition	$ 2,061	$ 9,713	$ 11,774
	TOTAL **	$ 2,755	$ 9,738	$ 12,493
CDEX	TOTAL	$ 318	$ 3,082	$ 3,400
Grand TOTAL		$ 15,059	$ 24,956	$ 40,014
* Excludes subcontracts for database, repositories, and engin. dev.				
SAS/SAO office costs are included, but amounts are not specified.				
NSF ODP funds, through JOI, will support the data bank in FY04. IMI will be				
responsible for providing data bank services in FY05 and beyond.				
** Excludes the commingled SOCs contribution to the EMA office.				

C. FY04 IODP Program Plan

1. IODP Organizational Framework and Entities

Organizational Framework

According to the principles upon which the Integrated Ocean Drilling Program (IODP) has been founded, the “Science Operating Costs” (SOCs) of the IODP will be supplied to the not-for-profit corporation IODP Management International, Inc. (IMI), which will provide the Central Management Organization (CMO) functionality for the Program (see **Figure PP-1**). In turn, IMI will distribute SOCs to Implementing Organizations (IOs, drilling operators) and to other subcontractors according to the budgets outlined in this and subsequent IODP annual Program Plans. SOC funds will be collected from IODP members, commingled by the U.S. National Science Foundation (NSF), and provided through contract to IMI (see **Figure PP-1**). Currently, the U.S. NSF and Japan, as represented by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), are IODP members and referred to as “Agencies.”

A European consortium of at least 15 countries intends to join IODP in ~December 2003. This consortium is named European Consortium for Ocean Research Drilling (ECORD), and a European Management Agency (EMA) will represent the ECORD funding agencies. China is also pursuing membership in IODP.

The Agencies will establish an IODP Council that: a) provides governmental oversight for all IODP activities, b) assures effective planning, management and operation of the IODP and c) encourages and promotes broad international participation in the IODP. The Council members are to be representatives from each country or entity contributing support to the IODP. The Chair of the Council is to be from the Agencies and is to alternate between them on a yearly basis. The Council is expected to meet at least once per year. The agenda and site for all meetings is expected to be decided through mutual understanding. The responsibility for meeting arrangements is to reside with the Chair. The Chair is expected to be responsible for developing the meeting agenda, in consultation with the other Agency. Meetings of the Council may be open to participation by others through mutual confirmation of the Agencies. The Council is expected to serve as a consultative body reviewing financial, managerial and other matters involving the overall support of the IODP. A formal agenda is to be prepared for each meeting and written records are to be kept. Liaison representatives from the CMO (IMI), IOs, and Science Advisory Structure (SAS) are expected to be available to the Council.

As detailed in **Figure PP-1**, “Platform Operating Costs” (POCs) are supplied directly from individual funding agencies of the countries or consortia operating IODP drilling assets: from NSF to the JOI Alliance (JOI, Inc., Texas A&M University, Lamont-Doherty Earth Observatory of Columbia University) for operation of the non-riser vessel (*JOIDES Resolution* in the first phase of IODP), from MEXT to the Center for Deep Earth Exploration (CDEX) for continued outfitting of the riser ship *Chikyu* and all preparation activities in support of international operations expected to start in FY2007, and from ECORD to the ECORD Science Operator (ESO) for Mission-Specific Platform (MSP) operations.

The technical management relationship consists of the following components: a) overall central management tasks and responsibilities for science operations will be assumed by IMI, with offices to be set up in Washington, D.C. and Hokkaido, Japan; b) science advice is provided by the SAS, supported by a planning office presently in Tokyo, but soon to move to the University of Hokkaido in Sapporo; and 3) multiple IOs, as listed in the previous paragraph – JOI Alliance, ESO and CDEX.

In considering the organization of IODP, it is important to bear in mind that the organizational components are not only physically separated, but they also represent programmatic contributions from vastly differing national cultures and diverse operational experience and background.

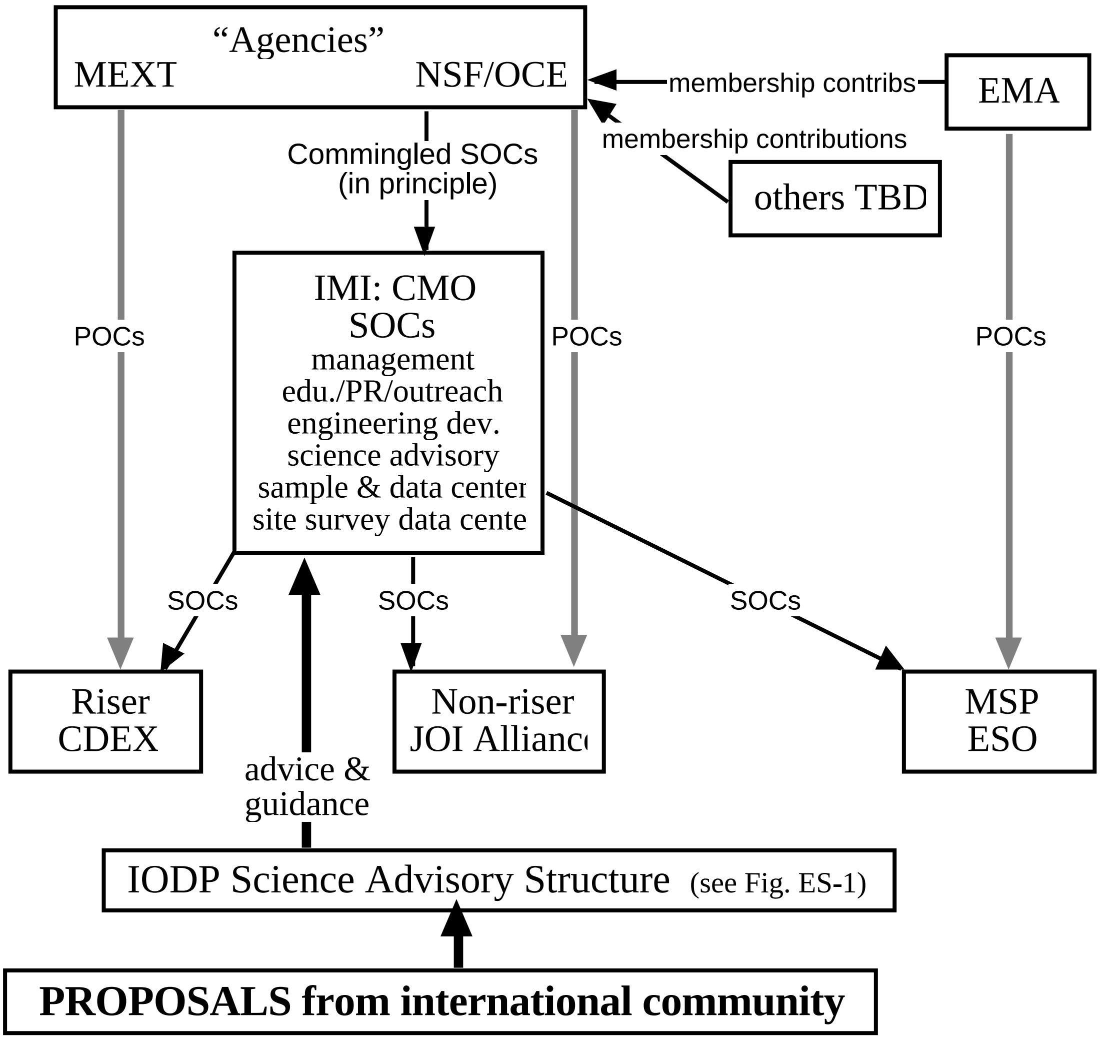


Figure PP-1: *IODP program management structure, when IODP is fully implemented. SOCs represent "Science Operating Costs", while POCs represent "Platform Operating Costs", as defined in IODP principles and since modified by the Agencies. SOCs and POCs are detailed in accompanying budgets, both in the Program Plan and in Appendices A-C. While ESO is the primary provider of MSP capability, additional MSP operators are possible.*

Program Manager

A Central Management Organization (CMO) will be established with the concurrence of MEXT and NSF to develop and manage science operations and implementation plans for the IODP. The CMO will be provided by IMI, Inc. through a long-term contract with NSF. As of November 2003, this contract is under negotiation. The CMO: a) receives advice and recommendations on scientific priorities and plans from the SAS, b) requests plans that are responsive to this advice from IOs, and c) negotiates with IOs and the SAS to produce an integrated annual IODP Program Plan. The annual Plan is to be consistent with budget guidance provided to IMI by the Agencies. The annual Plan includes a presentation of total program costs, which include both SOCs and POCs. IMI will manage SOCs funds provided under contract with the NSF. The NSF is expected to administer the contract with due consideration to the interests of MEXT. POCs will be provided directly to the IOs from the Agencies and ECORD through the EMA (**Figure PP-1**).

We present a provisional organizational wiring diagram of IMI (**Figure PP-2**). IMI provides contractual, management and fiscal links for science operations between NSF and the various operational and advisory components of IODP. IMI will have two offices, one in Washington, D.C., USA, and another at the University of Hokkaido, in Sapporo, Japan. Based on initial estimates, the Washington, D.C. office will have ~14 “full-time equivalent” (FTE) employees.

IMI will submit the annual IODP Program Plan to the Science Planning and Policy Oversight Committee (SPPOC), the executive authority of the SAS and an IMI committee, for review and approval prior to consideration by the Agencies. The NSF has responsibility to approve contractually the annual IODP Program Plan, in consultation with MEXT. After approval by the Agencies, significant changes in the annual IODP Program Plan are to be considered and approved by IMI and the Agencies prior to implementation, in consultation with the SPPOC and the IOs, as appropriate.

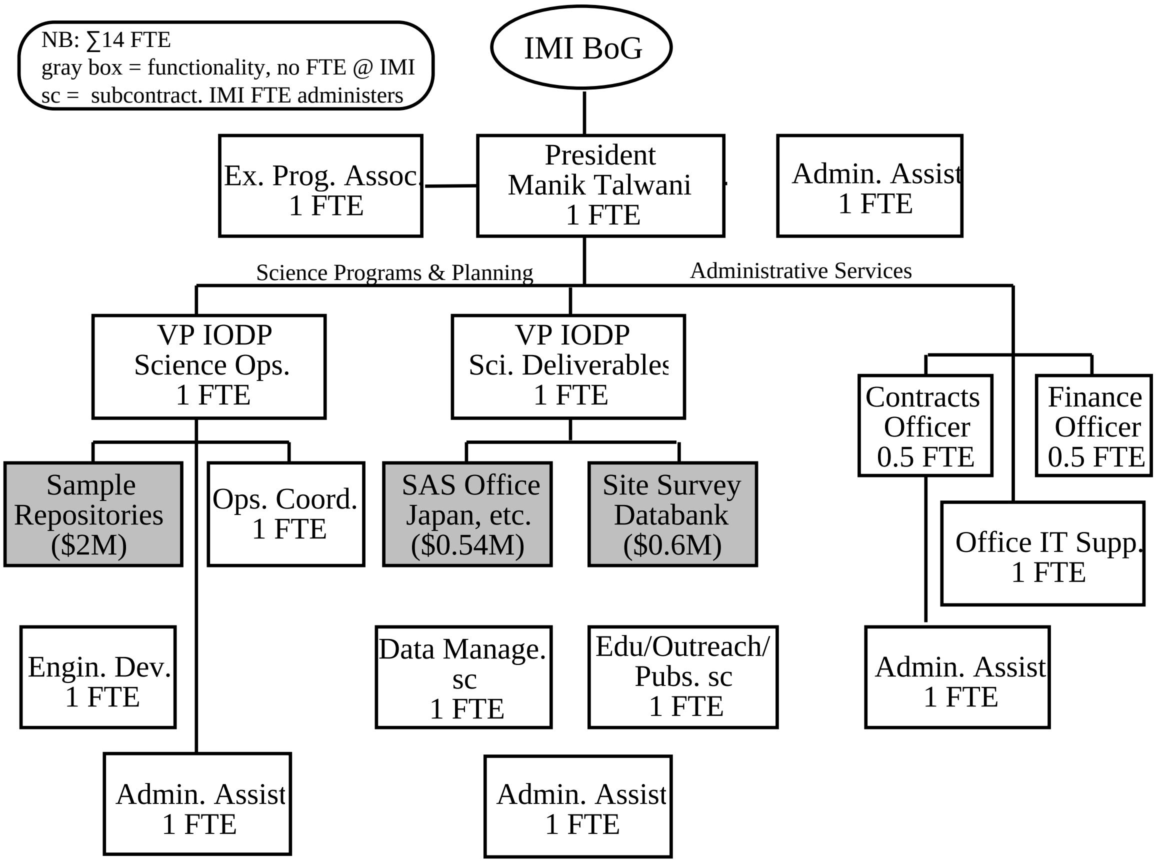


Figure PP-2: *Prospective organization of IODP Management International, Inc. (IMI). In the diagram, "sc" stands for a subcontract (i.e., IMI administration of a particular task, like data management or publications, actually conducted external to the corporation). FTE means "full-time equivalent". The number of FTEs to be employed by IMI is still under discussion. Amounts in some boxes refer to estimates of resources anticipated for those tasks. Please note that the SAS Office is part of IMI, although it is listed as a subcontract.*

Science Advisory Structure

The IODP Science Advisory Structure (SAS) is composed of scientists, engineers and technologists designated by IODP member organizations, such as national or consortia organizations. The SAS provides long-term guidance on the scientific planning of the IODP, and recommends annual science and engineering plans based on proposals from the international science community. The initial scientific objectives of IODP are listed in the IODP Initial Science Plan (ISP) (www.iodp.org/isp.html). Through SAS-sponsored activities, these objectives are pursued, reaffirmed and modified as appropriate by the SAS, and by other international scientists, engineers and technologists engaged in ocean drilling. The SAS consists of several advisory committees, panels and groups (see **Figure PP-3**) containing hundreds of scientists from the international geoscience community in IODP member countries and consortia. The SAS provides planning and program advice and guidance to IMI with regard to scientific goals and objectives, facilities, scientific personnel and operating procedures. In turn, IMI provides support for SAS planning in the form of SOCs.

The Science Planning Committee (SPC) Chair, Vice Chair and the SAS planning office coordinate the SAS. The SAS Office will be permanently based in Hokkaido, Japan, and will provide support for all aspects of the SAS, including the SPC and the Science Planning and Policy Oversight Committee (SPPOC). The Chairs of the SPC and the SPPOC will receive financial and administrative support through the Science Advisory Office (SAO). The SPC Chair rotates every two years. The current Chair is Mike Coffin of the Ocean Research Institute (ORI) of the University of Tokyo. The Vice-Chair-Elect is James Austin, of the University of Texas at Austin, Institute for Geophysics. The Chair of SPPOC is Kensaku Tamaki of ORI. SPC and SPPOC Chairs are expected to rotate, on a 2-year basis, initially between institutions in Japan and the USA.

The SPPOC, which heads the SAS, is considered the “Executive Authority” and is composed of representatives from scientific organizations in the IODP member countries that have a major interest in the study of the sea floor. However, SPPOC is a committee of IMI. The SPPOC formulates scientific and policy recommendations with respect to IODP planning and operations.

The SAS may establish panels and/or committees as needed to address its responsibilities, including panels on platforms and on science operations. The Agency countries are entitled to equal representation on the SAS and all of its panels and committees. In FY04, after ECORD joins IODP, ECORD will be entitled to have three voting members and one non-voting observer on each SAS panel and committee. The USA and Japan will likely be represented by up to seven representatives each.

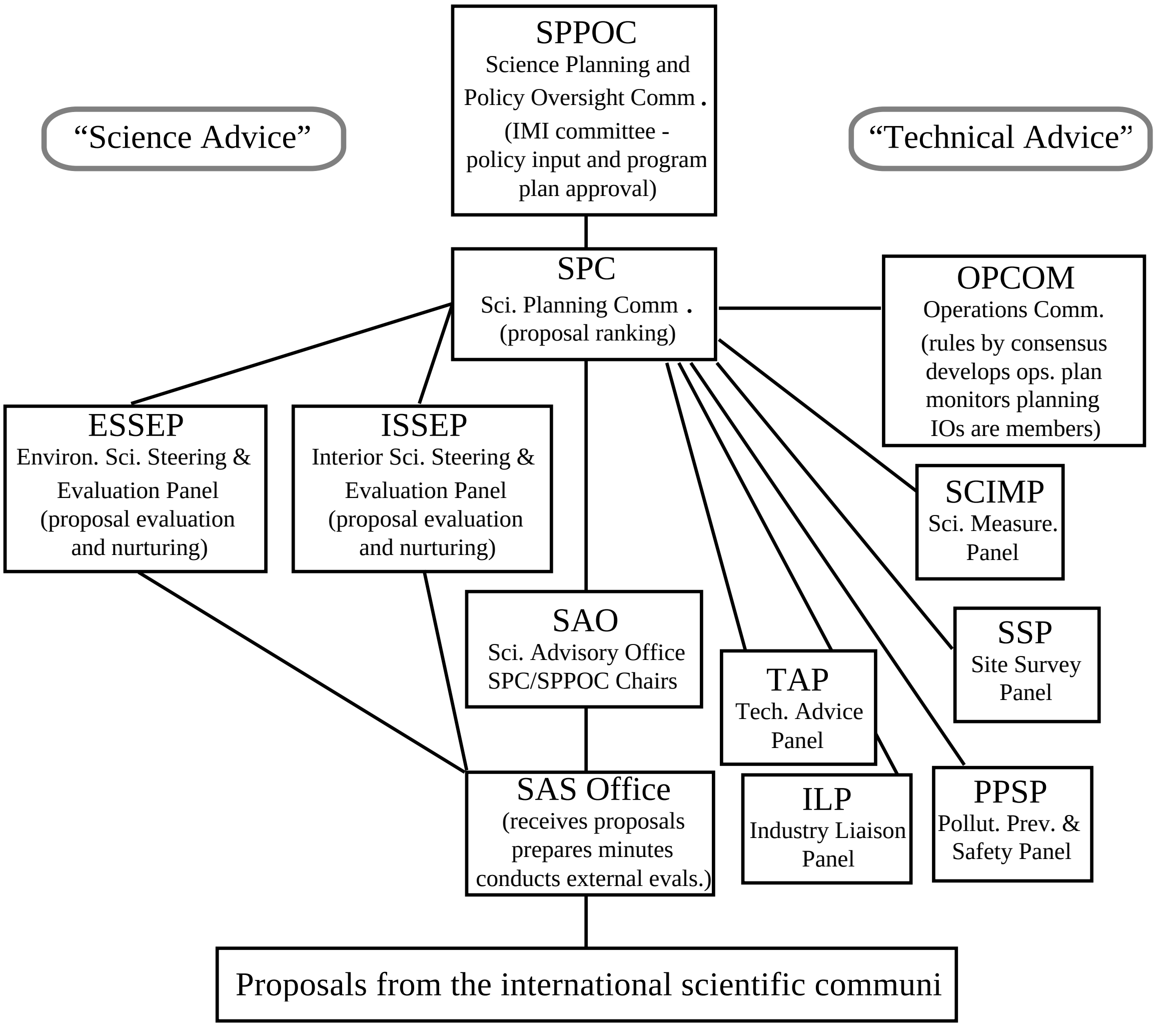


Figure PP-3*: IODP Science Advisory Structure (SAS). Technical and scientific advisory panels liaise as necessary. Technical panels also liaise to OPCOM. Mandates for individual panels can be found at http://www.ig.utexas.edu/imi/ (SPPOC) and www.isas-office.jp (all other panels).*

Implementing Organizations

IODP is the first international scientific ocean-drilling program to have more than one Implementing Organization (IO, drilling operator). The IOs receive SOCs from NSF by way of IMI, and POCs directly from their national or consortia funding agencies (see **Figure PP-1**).

Non-riser drilling capability will be supplied by the NSF through a contract to the JOI Alliance (see Appendix A), consisting of JOI, Inc. (prime contractor and overall management), Texas A&M University (subcontractor that operates a non-riser drillship, and provides associated services and functions such as expedition staffing, logistics, program-specific engineering development and operations, shipboard laboratories, curation, and distribution of core samples and data) and Lamont-Doherty Earth Observatory of Columbia University (geophysical and geochemical logging services aboard the non-riser vessel, involving acquisition, processing and interpretation of logging measurements). In phase one of the IODP (extending to at least May

2005), the Alliance will provide the *JOIDES Resolution* as the non-riser vessel. Five non-riser expeditions are planned between June 2004 and April 2005. A vessel, still to be determined, will be refitted and provided by the Alliance as the phase two non-riser platform.

MSP drilling, sampling and logging capability will be supplied by the ESO, a consortium led by the British Geological Survey (BGS; which will conduct MSP operations and program-specific engineering development), the European Petrophysics Consortium (logging services) and the University of Bremen (repository services for MSP samples and cores). The ESO will have a contractual arrangement with the ECORD Management Agency (EMA), affiliated with the CNRS, based in Paris. The ESO will conduct a coring expedition to the high Arctic in August and September of 2004. (A detailed description of the ESO and its operational plans is provided in Appendix B.)

Riser drilling capability by way of the vessel *Chikyu* will be supplied by CDEX and will begin in FY07. CDEX will also administrate the Kochi University Center for Advanced Marine Core Research (CMCR) repository. This repository will house samples and cores from the *Chikyu*. CDEX is part of the Japan Marine Science and Technology Center (JAMSTEC). (Details on CDEX and its plans for FY04 are presented in Appendix C.)

Site Survey Data Bank

During the Ocean Drilling Program (ODP), the Site Survey Data Bank prepared safety packages for pre-expedition review of designated sites, and supplied each shipboard scientific party with the geophysical data necessary to conduct scheduled drilling expeditions properly. The Data Bank also assisted scientists interested in developing IODP proposals by providing information with respect to scientific problems of interest to the scientific ocean drilling community. In FY2004, Data Bank services to IODP will be provided by the same Data Bank that has provided such services to the ocean drilling community since 1985. This Data Bank, located at the Lamont-Doherty Earth Observatory (LDEO), will service IODP through an extension of the ODP contract between JOI and LDEO. In the future (likely initiating in calendar 2004), IMI will decide the manner in which site survey data bank services are provided to IODP. IMI will likely establish a subcontract for such services (see **Figure PP-2**).

2. FY04-05 Operational Program Development

The prospectus for the first SPC meeting in September 2003 consisted of 17 externally reviewed drilling proposals, including 5 that required MSPs and one that involved some riser drilling. The committee organized the proposals for review into three groups (as follows), corresponding to the three main themes of the IODP Initial Science Plan (ISP):

I. Deep Biosphere and Subseafloor Ocean

545-Full3	Juan de Fuca Ridge Flank Hydrogeology
547-Full4	Oceanic Subsurface Biosphere
553-Full2	Cascadia Margin Hydrates
557-Full2	Storegga Slide Gas Hydrates
573-Full2	Porcupine Basin Carbonate Mounds
584-Full2	TAG II Hydrothermal

589-Full3	Gulf of Mexico Overpressures	

II. Environmental Change, Processes and Effects

482-Full3	Wilkes Land Margin	
519-Full2	South Pacific Sea Level	MSP
533-Full3	Central Arctic Paleoceanography	MSP
543-Full2	Norwegian Margin Bottom Water	
548-Full2	Chicxulub K-T Impact Crater	MSP
564-Full	New Jersey Shallow Shelf	MSP
572-Full3	N. Atlantic Neogene–Quaternary Climate	
581-Full2	Late Pleistocene Coralgal Banks	MSP
595-Full3	Indus Fan and Murray Ridge	Riser (partial)

III. Solid Earth Cycles and Geodynamics

512-Full3	Atlantis Oceanic Core Complex

At the beginning of the meeting, the SPC endorsed a provisional conflict-of-interest (COI) policy nearly identical to the one used previously in the Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES) Advisory Structure of the ODP. The COI policy stipulates that proponents depart from the proceedings during the discussion of their own proposal and that conflicted committee members exclude themselves from participating in any part of the ranking and scheduling process.

SPC Motion 03-09-3: The SPC endorses the conflict of interest policy proposed for provisional use at its first meeting.

Katz moved, Miller seconded; 14 in favor.

Before outlining and discussing the procedure for reviewing and ranking proposals, the SPC decided to forward Proposal 533-Full3 directly to the Operations Committee (OPCOM) without further review because of its history of favorable reviews, top ranking, advanced operational planning, and because IMI considered the program to be in the implementation phase.

SPC Motion 03-09-27: The SPC affirms the high scientific priority and potential of scientific drilling in the central Arctic Ocean and recognizes that Proposal 533-Full3 Central Arctic Paleoceanography is currently in the implementation phase for operations anticipated for August and September 2004. The SPC therefore forwards this previously top-ranked proposal to the OPCOM without re-ranking for consideration for scheduling in FY2004.

Prell moved, Miller seconded; 14 in favor.

Proposal review and ranking procedure

The SPC followed a review and ranking procedure that embodied the essential elements of the procedure used previously by JOIDES Scientific Committee (SCICOM) during the ODP. The participants declared at the outset any potential conflicts of interest regarding specific drilling proposals, and conflicted committee members were excluded from the discussion of their own proposal as well as from the entire ranking and scheduling exercise. The SPC then evaluated each proposal in terms of its relevance to the objectives and priorities of the IODP ISP. The lead watchdogs presented the proposals, followed by comments and discussion among the committee members, panel chairs and other participants. After reviewing all of the proposals, the SPC defined the pool of proposals for global ranking, conducted the ranking by signed paper ballots, and selected the group of ranked proposals to forward to OPCOM for possible scheduling.

Presentation and discussion of proposals

Upon completing the general presentation and discussion of the 16 proposals remaining in the prospectus, the SPC debated several specific options for how best to implement certain proposals and whether or not they should consider those options in the ranking process. SPC eventually agreed not to consider operational judgments in the ranking and instead focused exclusively on the scientific plans as presented in each proposal. The SPC also reached a consensus from a scientific perspective on the following points concerning Proposals 545-Full3 and 572-Full3.

SPC Consensus 03-09-28: The SPC regards the first part of Proposal 545-Full3 Juan de Fuca Ridge Flank Hydrogeology as worth scheduling on its own.

SPC Consensus 03-09-29: The SPC recommends requiring quadruple Advanced Piston Coring (APC) holes at each site of Proposal 572-Full3 North Atlantic Neogene–Quaternary Climate and penetrating deeper than proposed at one site to obtain paleointensity records from beyond 3 Ma.

Global ranking of proposals

To preserve the maximum flexibility for developing a drilling schedule, the SPC agreed by consensus to rank all 16 of the proposals reviewed at this meeting.

SPC Consensus 03-09-30: The SPC will rank all 16 of the proposals reviewed at this meeting.

The SPC conducted the ranking through a closed vote. Each member submitted a signed ballot, assigning the numerical rank of 1 through 16 to the full set of proposals. The iSAS Office staff collected the ballots and tabulated the results, as shown below:

Rank	Proposal #	Short Title	Mean	St dev
1	519-Full2	South Pacific Sea Level	4.43	2.56
2	512-Full3	Atlantis Oceanic Core Complex	4.57	3.16
3	545-Full3	Juan de Fuca Ridge Flank Hydrogeology	4.64	3.88
4	564-Full	New Jersey Shelf	5.21	3.81
5	589-Full3	Gulf of Mexico Overpressures	6.21	5.22
6	553-Full2	Cascadia Margin Hydrates	8.14	4.00
7	572-Full3	N. Atlantic Neogene–Quaternary Climate	8.64	3.67
8	482-Full3	Wilkes Land Margin	8.79	4.59
9	543-Full2	Norwegian Margin Bottom Water	9.14	3.96
10	547-Full4	Oceanic Subsurface Biosphere	9.50	3.25

11	595-Full3	Indus Fan and Murray Ridge	9.57	3.13
12	584-Full2	TAG II Hydrothermal	10.21	3.14
13(t)	557-Full2	Storegga Slide Gas Hydrates	11.14	3.48
13(t)	581-Full2	Late Pleistocene Coralgal Banks	11.14	3.98
15	548-Full2	Chicxulub K-T Impact Crater	11.57	5.77
16	573-Full2	Porcupine Basin Carbonate Mounds	13.07	3.67

The SPC examined the global ranking results and debated which proposals to forward to OPCOM. They stressed again the idea of preserving the maximum flexibility for developing a drilling schedule, but SPC also wanted to send a clear message that the lowest-ranked proposals still need improvement. The SPC finally decided to forward the top 12 ranked proposals in two tiers for possible scheduling.

SPC Motion 03-09-31: The SPC forwards the top 12 ranked proposals to the OPCOM in two groups, with the top five proposals in Group I and the next seven in Group II. The SPC requests that the OPCOM propose scheduling options that honor and adhere to these ranking groups as closely as possible.

Moran moved, Prell seconded; 12 in favor, 2 opposed (Kato, Ito).

Development of scheduling options

After hearing a report on the advanced status of operational planning for the Arctic drilling project, the OPCOM recommended including it in the FY2004 operations schedule for MSP programs.

OPCOM Consensus 03-09-1: The OPCOM recommends Proposal 533-Full3 Central Arctic Paleoceanography to the SPC for inclusion in the FY2004 operations schedule to institute the necessary steps for program implementation. Its final implementation is contingent upon ECORD participation in the IODP.

For the non-riser drilling vessel, OPCOM considered as many as ten different possible scheduling scenarios, each with shortcomings or complicating factors. Important constraints that transcended all of the scenarios included the short lead-time available for planning at least the first two expeditions, a heavy dependence on expensive tools and equipment, a wide geographic range of proposed drilling areas, and strong competition for the same weather windows. An effort to maximize the scientific return and safety, while minimizing the overall costs and transit times, resulted in the three potential scheduling scenarios shown below. The OPCOM expressed a clear preference for the last scenario, because it includes four of the six highest-ranked proposals for the non-riser vessel, it completes three of them, and it involves the lowest estimated costs.

OPCOM Consensus 03-09-2: The OPCOM recommends the following three scenarios to the SPC for consideration as possible drilling schedules for FY2004 and FY2005, with preference given to Scenario 10:

Exp.	Scenario 8	Scenario 9	Scenario 10

1	545-Full3 (Pt. 1)	545-Full3	545-Full3 (Pt. 1)
2	572-Full3 (Pt. 1)	572-Full3 (Pt. 1)	572-Full3 (Pt. 1)
3	584-Full2	584-Full2	512-Full3 (Pt. 1)
4	512-Full3 (Pt. 1)	512-Full3 (Pt. 1)	512-Full3 (Pt. 2)
5	512-Full3 (Pt. 2)	572-Full3 (Pt. 2) + 543-Full2	572-Full3 (Pt. 2) + 543-Full2
6	589-Full3 or 543-Full2	-----	-----
Cost:	$6.2-7.0M	$5.6M	$4.6M
Transit:	42 days	52 days	52 days

Review of scheduling options and vote on final schedule

The SPC readily accepted the OPCOM recommendation on including Proposal 533-Full3 in the operations schedule for FY2004, pending ECORD participation in IODP.

SPC Motion 03-09-32: The SPC recommends including Proposal 533-Full3 Central Arctic Paleoceanography in the MSP operations schedule for FY2004, pending ECORD participation in the IODP.

Byrne moved, Kato seconded; 13 in favor, 1 absent (Moran).

In addition, the SPC created a project-scoping group (the Arctic Scoping Group, ASG) to satisfy the concerns of the ESO about conducting an independent technical review of the latest operational plans for the Arctic drilling project.

SPC Consensus 03-09-33: The SPC establishes a project-scoping group to review the operational plan for implementing Proposal 533-Full3, Central Arctic Paleoceanography. The group will report to OPCOM and should include SPC member Keir Becker as the leader, SPC chair and OPCOM co-chair Mike Coffin, and several other appropriate members, such as an icebreaker captain. The group should conduct its review by late October 2003 to ensure enough time for including the Arctic drilling project in the annual program plan for FY2004.

The SPC then reviewed the three scheduling scenarios proposed by OPCOM for operating the non-riser drilling vessel in FY2004 and provisionally in FY2005. SPC also preferred scenario 10 for the same reasons as OPCOM, and the subsequent debate focused on developing a contingency plan in case of any difficulties in securing the use of the necessary third-party tools for 545-Full3, pt. 1 (now referred to as Expedition 1/300. After identifying the non-A-CORK component of Proposal 553-Full2, Cascadia Margin Hydrates, as an acceptable alternate for 545-Full3, pt. 1, the SPC voted to approve the expedition schedule as follows.

SPC Motion 03-09-34: The SPC approves the following expedition schedule for the non-riser vessel during June 2004 through May 2005:

1.	545-Full3	Juan de Fuca Ridge Flank Hydrogeology (Part I)
2.	572-Full3	N. Atlantic Neogene-Quaternary Climate (Part I)
3.	512-Full3	Atlantis Oceanic Core Complex (Part I)
4.	512-Full3	Atlantis Oceanic Core Complex (Part II)
5a.	572-Full3	N. Atlantic Neogene-Quaternary Climate (Part II)

5b. 543-Full2 Norwegian Margin Bottom Water
The SPC also identifies the non-A-CORK component of Proposal 553-Full2 Cascadia Margin Hydrates as an alternate first expedition in case any significant delays arise in the logistical planning for Proposal 545-Full3.

Prell moved, Moran seconded; 14 in favor.

Highly ranked but unscheduled proposals

Several of the other highly ranked but unscheduled proposals at the September 2003 SPC meeting received various measures of commitment, as stated in the following motions and consensus.

SPC Motion 03-09-36: The SPC recommends that the ECORD develop an operational plan as soon as feasible for Proposals 519-Full2, South Pacific Sea Level, and 564-Full, New Jersey Shelf, in light of their respective global rankings of #1 and #4 at this meeting.

Quinn moved, Moore seconded; 14 in favor.

SPC Motion 03-09-37: The SPC forwards Proposals 519-Full2, South Pacific Sea Level, 564-Full, New Jersey Shelf, and 589-Full3, Gulf of Mexico Overpressures, to the OPCOM for consideration at the next OPCOM scheduling meeting without re-ranking

Katz moved, Moore seconded; 14 in favor.

SPC Consensus 03-09-38: The SPC chair and the IMI interim program director will work with CDEX to establish an initial project-scoping group for the riser-drilling component of Proposal 595 Indus Fan and Murray Ridge.

3. FY04-05 Expedition Descriptions

Based on the decisions of SPC and OPCOM, the operational schedule (**Table PP-1**) was developed. The field programs are shown (**Figure PP-4**). The schedule consists of five expeditions (divided into six discrete field programs) in three oceans, the Atlantic, the Arctic and the Pacific. These expeditions address all three major themes of the ISP: a) the deep biosphere and the subseafloor ocean, b) environmental change, processes and effects, and c) solid earth cycles and geodynamics. The Atlantic and Pacific expeditions will use the non-riser drilling platform, whereas the Arctic expedition will involve an MSP (i.e., ice-strengthened drilling vessel) and two attending icebreakers. Detailed information on the five expeditions follows. (Expedition specific budgets for the non-riser expeditions are presented in **Table PP-7**. A glossary of expense categories follows this table). Specific budget items for the Lomonosov Ridge expedition are presented in Appendix B.

Table PP-1: *IODP Operational Schedule, FY04 (and provisional FY05). The convention for assigning numbers to IODP non-riser and MSP expeditions has not yet been agreed upon.*

Exp. #	Expedition	Port (origin)	Dates[1,2]	Total Days (Port[1]/Sea)	Days at Sea (Transit/Ops[3])
1/300	Juan de Fuca	Astoria	[4]21 June – 29 Aug.	69 (6/63)	11/52
MSP-1	Lomonosov Ridge	Stavanger	~1 Aug. - ~15 Sept.	TBD	~35 (in ice)
	JR transit	Acapulco	29 Aug. – 13 Sept.	15 (1/4)	14/0
2/301	North Atlantic 1	Bermuda	13 Sept. – 30 Oct.	47 (2/45)	14/31
3/302	CORE 1	Ponta Delgada	30 Oct. – 18 Dec.	49 (4/45)	8/37
4/303	CORE 2	Ponta Delgada	18 Dec. – 10 Feb. ‘05	54 (5/49)	8/41
5/304	N. Atl 2 & Norweg.	Ponta Delgada	10 Feb. – 5 April	54 (5/49)	15/34
	JR transit[5]	Reykjavik	5 April – 23 April	18 (3/15)	15/0

Notes:
[1] Ship is scheduled to arrive 0600 hr on first day of port call
[2] Initial expedition data reflect first day of port call; ship sails when ready
[3] Ops = Operations (includes both on-site and between-site time)
[4] Actual start date needs to be finalized
[5] Demobilization port is to be finalized

Figure PP-4*: FY04 (and provisional FY05) expedition locations.*

Expedition 1/300	**Juan de Fuca Ridge Flank Hydrogeology**
Proposal	**545-Full3**
Title	**The hydrogeologic architecture of basaltic oceanic crust: Compartmentalization, anisotropy, microbiology and crustal-scale properties on the eastern flank of Juan de Fuca Ridge**
Proponents	**Andrew T. Fisher, Jeffrey C. Alt, Wolfgang Bach, John A. Baross, Keir Becker, Jim Cowen, Steven D'Hondt, Earl E. Davis, Michael Hutnak, David Kadko, Matthew D. McCarthy, James S. McClain, Michael J. Mottl, Martin Sinha, Glenn Spinelli, Volkhard Spiess, Damon A. H. Teagle, Heiner Villinger, C. Geoffrey Wheat, and Lars Zühlsdorff**

Science Description

This expedition comprises a multidisciplinary research program to evaluate the formation-scale hydrogeologic properties (transmission, storage) within oceanic crust; determine how fluid pathways are distributed within an active hydrothermal system; establish linkages among fluid circulation, alteration and geomicrobial processes; and determine relations between seismic and hydrologic anisotropy. These goals will be accomplished through replacement of two existing sub-seafloor observatories penetrating the upper crust, and through drilling two new holes (600 m and 200 m into the crust) that will be cored, sampled, instrumented and sealed. The first multi-dimensional, cross-hole experiments ever attempted in oceanic crust will be conducted, including hydrologic, microbiological, seismic and tracer components. After completion of drill-ship operations, multiyear tests using this network of sub-seafloor observatories will be initiated, allowing examination of a much larger volume of the crustal aquifer system than has been tested previously. By monitoring, sampling and testing within multiple depth intervals, scientists will: 1) evaluate the extent to which oceanic crust is connected vertically and horizontally; 2) assess the influence of these connections on fluid, solute, heat and microbiological processes; and 3) determine the importance of scaling on hydrologic properties. The study area is characterized by: a) thick sediment cover isolating permeable basement, allowing small pressure transients to travel long lateral distances, b) outstanding coverage of seismic, heat flow, coring, geochemical and observatory data, allowing detailed hypotheses to be posed and tested, c) existing ODP drill holes and long-term observatories, providing critical monitoring points for pre- and post-drilling experiments, d) a naturally over-pressured formation that will drive multi-year, cross-hole experiments, and e) a planned, cabled seafloor observatory network facilitating long-term experiments, data access and instrument control. Alternate sites are located within a shallow hydrothermal up-flow zone and in deeper basement areas where the crust is more mature. This work will elucidate the nature of permeable pathways in the crust, the depth extent of circulation, the importance of permeability anisotropy, and the significance of hydrogeologic barriers in the crust. It will demonstrate where viable microbiological communities live and how these communities cycle carbon, alter rocks, and are influenced by flow paths. It will also quantify lateral scales over which solute transport occurs, the extent of flow channeling and mixing in the crust, and how these processes relate to rock structure and fabric, and it will determine how to relate seismic velocities and velocity anisotropy to hydrogeologic properties.

***Table PP-2**: Juan de Fuca Ridge Flank Expedition drill site locations.*

			Penetration (m)			
Site name	Latitude	Longitude	Water Depth	Sediment	Basement	Total
SR-2	47°45.64' N	127°45.59' W	2600	275	200	475
FR-1	47°53.9' N	128°34.50' W	2600	40-70	0-40	50-110
DR-1	47°46.69' N	127°21.52' W	2600	500	20-50	520-550
DR-2	47°46.07' N	127°10.12' W	2600	900	20-50	920-950

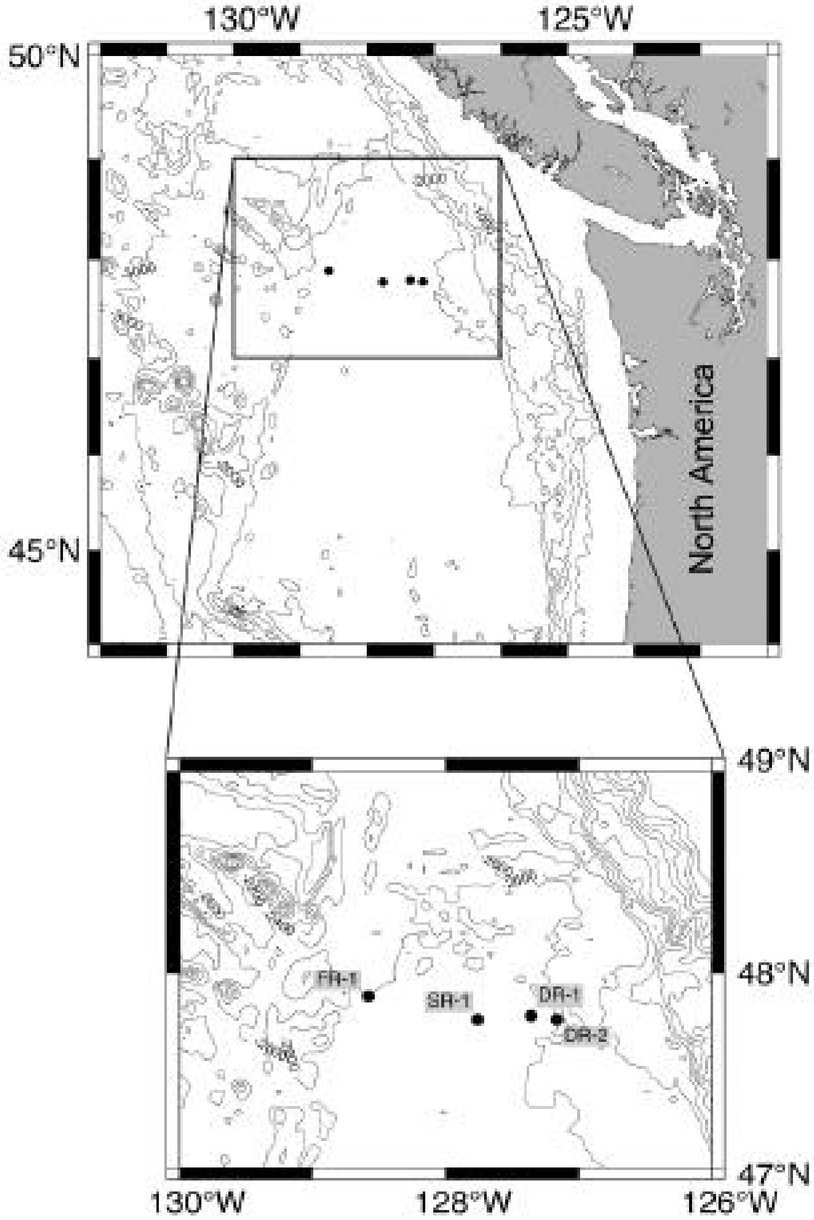


***Figure PP-5**: Juan de Fuca Ridge Flank Expedition drill site locations.*

Operational Plans
The highest priority objective is to complete Site SR-1 on Second Ridge in the Juan de Fuca region (see **Figure PP-5**). Proposed Site SR-1 will be cored to 600 mbsf. Site SR-1 is located on 3.5-Ma crust over a buried basement ridge. Experiments at this site are designed to resolve the distribution and properties of distinct hydrothermal systems within the crust and reveal how hydrological compartmentalization relates to constructional, tectonic, alteration, microbial and seismic processes and properties.

Existing CORKs at previously instrumented ODP Sites 1026 and 1027 will be replaced. In addition, a new Site SR-1A will be located ~1000 m S-SW of Site 1026, where sediment thickness is 260-275 m. A reentry cone will be installed, and continuous rotary core barrel (RCB) coring will commence. Temperature will be measured, and sediments will be sampled for microbes and fluid chemistry, with the detailed sampling occurring near the sediment/basement interface. RCB coring will continue 20-30 m into basement, and the hole will be reamed to allow the installation of casing into the uppermost basement. RCB coring will continue to ~600 m into basement. The nature and extent of alteration within the upper crust will be documented. The hole will be logged using conventional tools (density, resistively, sonic, formation micro-scanner, borehole televiewer) to delineate fine-scale lithostratigraphy, alteration patterns and fracture distribution. Packer experiments will be run in straddle mode to evaluate near-hole permeability distribution within distinct crustal intervals, and a multi-level ACORK will be installed to isolate three to four crustal intervals housing independent sensors and fluid samplers.

Experiments
1. Multidimensional Hydrological Experiments
On a yet-to-be scheduled expedition, after completing the coring programs (Sites SR-1 [Expedition 1/300] and SR-2 [a future expedition]) and setting packers in basement, fluid will be injected into a hole at Site SR-2. CORKs installed in holes at nearby Sites 1026B, 1027C and SR-1A will allow the first controlled, multidirectional, cross-hole hydrological test in oceanic crust. Fluids will be spiked with inert tracers, allowing single-hole and cross-hole geochemical tracer testing.
2. Microbiological Experiments
The proposed drilling, experimental and post-drilling plan includes three stages of biological and biogeochemical study: 1) biological sampling and analysis of the sediment column, 2) sampling and analysis of basement, and 3) time series analyses of biological communities and formation fluids. These experiments will require collection of co-located biological and pore fluid samples, and temperature measurements. Sample studies may include molecular analyses (nucleic acids, organic biomarkers), cultivation experiments and activity experiments (radiotracer, FISH).
3. Borehole VSP Experiments
The conventional basement-logging program will be augmented with vertical and offset seismic profile (VSP and OSP) experiments at Site SR-1. The VSP requires one or more geophones clamped within an open or cased hole and a seismic source at the surface. These experiments will require a three-component Array Seismic Imager and, for the vertical experiments, standard air gun or water gun sources run from the drilling ship. The offset experiments will require seismic sources mounted on a second ship.

4. Tracer Tests
These experiments will help improve understanding of porosity, permeability and dispersivity in order to understand water mixing and water-rock interaction with an aquifer deposit. Tracer experiments will also help to quantify rates of fluid transport in basement.

Environment and Safety
Potential major risks that could affect the successful achievement of expedition objectives are two-fold. First, reentry cones and casing hangers are long lead-time items; typically, casing hangers require 14 months to fabricate. Orders will be placed as soon as requirements are clearly specified to minimize this risk. Second, hole-stability problems may be encountered at Sites SR-1 and SR-2 over the long sections of basement required for CORK installation and packer work. We will attempt to mitigate this difficulty by using a long BHA (bottom-hole assembly). Other minor risks include the presence of gas hydrates in the sediment section, operational time limitations, and special shipping arrangements required for microbiological samples. Procedures will be adopted to minimize risk to marine mammals from the proposed seismic experiments, including: 1) posting observers while experiments are in progress in order to record the presence and proximity of marine mammals, 2) gradually increasing the amplitude of the sound sources to allow animals time to move away, and 3) suspending operations if animals approach within 800 yds.

Logistics
All coring and logging operations will require an estimated 69 days (6 days in port, 11 in transit, and 52 on site) (see **Table PP-1**). Drill pipe, other hardware and science supplies will be loaded in Astoria.

Logging
This is a two-expedition proposal and only the logging operations pertaining to IODP Expedition 1/300 are discussed below. The entire first expedition will be devoted to drilling a new hole to a depth of ~ 900m (SR-1A), and replacing two CORKs from preexisting holes. Logging operations will take place in Hole SR-1A. The sedimentary section and likely the uppermost unstable basement section of this hole will be cased before any logging operations take place.

Number of holes, targets depths, and proposed logging plans:

Site	*Sediment (m)*	*Basement (m)*	*Downhole Measurements*	*Special Experiments*
SR-1A	275	600	Triple Combo FMS/Sonic UBI (televiewer) WST-3 Temperature Cement Bond Log	CORK

Assumptions for Hole SR-1A:
Water Depth = 2600 m
Casing Depth = 375 mbsf

Hole Depth = 900 mbsf
Open Hole Interval Logged = 525 m

The wireline logging program will consist of four deployments (funding for the UBI deployment is pending). A thermistor will be placed on the cable head to allow us to monitor and record borehole temperatures in real time, similar to the procedure used during ODP Leg 193. This will give advance warning if (high) temperatures become a problem for the wireline tools; thermistor readings can also be used as a "rough" temperature log. The estimated total time required for logging is ~37 hrs, with longer times needed for increased resolution of the televiewer data.

Expedition MSP-1	**Central Arctic Paleoceanography**
Proposal	**533-Full3**
Title	**Paleoceanographic and tectonic evolution of the central Arctic Ocean**
Proponents	**Jan Backman, Nikita Bogdanov, Bernard Coakley, Margo Edwards, Rene Forsberg, Ruth Jackson, Martin Jakobsson, Wilfried Jokat, Yngve Kristoffersen, Larry Mayer, Kathryn Moran**

Science Description
Five drill sites lie on the ridge crest of the Lomonosov Ridge in the central Arctic Ocean. They are distributed between 81°N and 88°N, in water depths ranging between 800 and 1415 m. All are located in international waters. The Lomonosov Ridge was rifted from the shelf in the Kara and Barents Sea during early Paleogene time and subsequently subsided to its present water depth. Sediments of biogenic, eolian and ice-rafted origins have since accumulated on the ridge crest. In the primary target area between 87°N and 88°N, this ~flat-lying sediment cap is ~450 m thick, indicating an average sedimentation rate of ~10 m/m.y. throughout the course of the Cenozoic. Sampling of this presumed pelagic sediment cap will provide an unprecedented and unique opportunity to acquire first-order knowledge about the paleoceanographic history of the central Arctic Ocean. Sampling of the underlying bedrock beneath a pronounced angular (seismic) unconformity provides a similarly unique opportunity to decipher the tectonic history of the Lomonosov Ridge and the formation of the Eurasian Basin. Scientific objectives are to investigate: a) the long-term (50 Ma) climate history of the central Arctic Ocean and its role in the transition from one global climate extreme (Paleogene greenhouse, lacking glaciation) to another (Neogene icehouse, exhibiting bipolar glaciation), b) the shorter-term (Neogene) climate history, connecting the Neogene history of the Arctic Ocean to that of the North Atlantic Ocean at sub-millennial scale resolution, c) the composition and origin of presumed pre-Cenozoic bedrock underlying the sediment cap, and d) the rifting and subsidence history of the Lomonosov Ridge. The widely spaced latitude and partially overlapping goals of the five drill sites will make the overall expedition less vulnerable to severe local ice conditions. The major goals of this proposal can be achieved by completing one site (i.e., by means of multiple penetrations, if necessary and as required) to ~450 mbsf, the base of the presumed pelagic cap. If ice conditions prohibit success at this site, a suite of sites from other areas along the Lomonosov Ridge corridor will be drilled to achieve the proposed science.

Table PP-3: Central Arctic paleoceanography expedition drill site locations.

				Penetration (m)		
Site name	Latitude	Longitude	Water Depth	Sediment	Basement	Total
LORI-013A	87° 39.45' N	144° 37.80' E	1070	450	30	480
LORI-06A	81° 28.54' N	140° 50.71' E	802	400	0	400
LORI-04A	85° 23.28' N	150° 20.62' E	798	90	110	200
LORI-05A	83° 58.90' N	147° 25.02' E	982	400	0	400
LORI-10A	86° 24.89' N	147° 15.56' E	1132	400	0	400
Alternates						
LORI-08A	87° 53.99' N	138° 38.60' E	1124	450	0	450
LORI-14A	87° 37.55' N	147° 14.65' E	1415	90	110	200
LORI-12A	82° 04.30' N	142° 02.58' E	1392	400	0	400

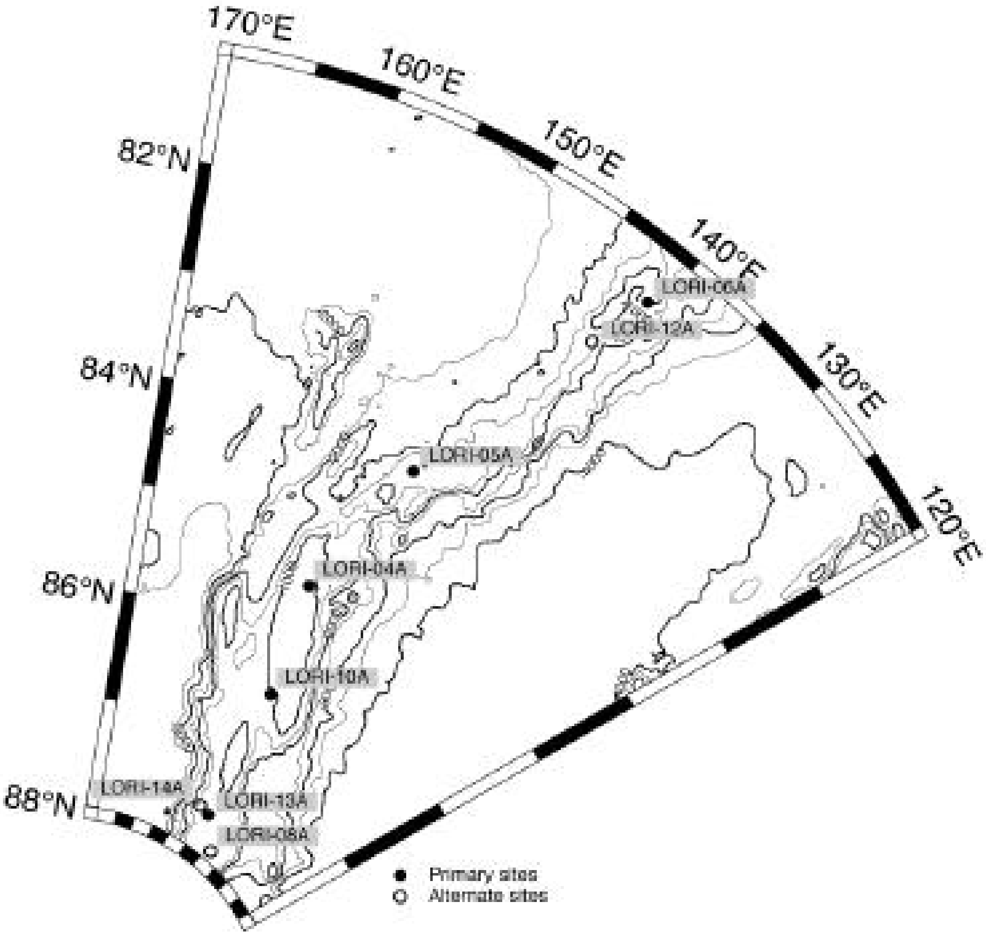


Figure PP-6: Central Arctic paleoceanography expedition drill site locations.

Operational Plans (for additional details, see Appendix B.)

Fleet

The proposed fleet for the Lomonsov Ridge project comprises three vessels:

- The icebreaker/drillship *Vidar Viking*
- Close-support icebreaker *Oden*
- A large Russian icebreaker, probably the (non-nuclear) *Krasin*

(As of November 7, it must be stressed that, with the exception of Oden, these are preferred vessels and that detailed contract negotiations, in particular for Vidar Viking and Krasin, have yet to be completed.)

The large Russian icebreaker will be either the conventionally powered *Krasin* or a nuclear powered vessel (NIB) based in Murmansk. ESO stresses that a nuclear powered vessel is not essential to the expedition, and indeed it may be argued that the use of a nuclear icebreaker would be damaging to the image of the expedition, and could be fraught with contractual difficulties related to environmental protection and liability in the case of any accident involving the nuclear icebreaker. To date, ESO has had little information from the owners of the nuclear vessel, whereas a deputation is to visit the *Krasin* and its owners in Vladivostok during November 2003. It seems most likely that the *Krasin* will be contracted; the *Krasin* is the only Russian vessel for which ESO has received a detailed quotation. All coring operations will be conducted from the dynamically positioned *Vidar Viking* with the *Oden* in close support. The *Krasin*/NIB will operate some distance upsteam, breaking ice as it drifts towards the drilling location. The *Oden* will break the ice further and divert it as it approaches the drillship, allowing the latter to maintain station in relatively clear water, or without significant ice pressure as the ice drifts past it. The *Oden* will act as the command and communication center and will carry the Fleet Manager, the ice management team, most of the science team, and will be the base for helicopter operations. The three vessels will either transit together through the pack ice to and from the working area, with *Krasin*/NIB and *Oden* escorting the *Vidar Viking*, or the *Krasin* will sail directly from Vladivostok to the chosen drill site. The latter may be cost-effective in view of the substantial cost of the *Krasin* steaming from Vladivostok to Tromsø or the 'Atlantic' ice edge, whereas the route from Vladivostok direct to the drill sites is relatively small. This decision will be dependent on the eventual contracted agreement and costs.

Coring

Coring in the Arctic in water depths of ~1000 m requires the use of a robust and flexible drill-string, coupled to a strong and compatible BHA able to withstand a limited amount of lateral movement in the water column and sudden lateral movements, which will occur due to passing ice and thus affect both the drill-string and the drilling vessel. This requires the use of an oilfield-type API drill-string (preferably 5" drill-pipe and 7" OD x 4" ID drill collars, both with 5" FH connections), and an API-compatible core-barrel assembly. An element of protection to the drill-string in the area below the moonpool is also required; observation of the ship-model test results indicates that this can be achieved with a 2 m extended skirt, which will be deployed through the moonpool prior to the start of drilling operations.

The science plan calls for extensive use of a piston corer similar to that currently used by ODP (i.e., the Advanced Piston Corer or APC), in order to obtain as much high-quality core recovery as possible in the presumed soft sediment environment of the pelagic cap. Such a facility also needs to be compatible with other coring methods, in order that any stratigraphic formations encountered can be cored as well as possible. Unfortunately, the well-tried and proved ODP core barrel equipment cannot be used, as the derrick capacity available is not suitable for handling the tool lengths used in ODP. The *Vidar Viking* will have the capacity to handle only single pipe lengths. Research has been carried out to find the core barrel required to meet these requirements. Two systems have been considered in detail:

- The QD TECH/DOSECC system currently used for lake drilling in shallow water, which uses a mining drill-string.
- The BGS Marine Wireline Corebarrel system, which is based on API oilfield tubulars.

Neither system is immediately suitable without modifications. We propose to use a modified version of the existing BGS Marine Wireline Corebarrel System, with the incorporation of a 4.5-m piston corer to be built according to the ODP APC design. Discussion has taken place with Stress Engineering Services, Inc. in Houston and ROK MAX UK, Ltd (who design and build the BGS equipment) regarding design issues and modification implications. The modifications and their incorporation into a combined and robust set of coring tools are feasible and have begun. The system will be bench- and field-tested prior to any actual operation (see the Arctic Scoping Group report, available from the SAS Office); OPCOM will be kept informed as tool development proceeds.

Seacore, an over-water drilling contractor with extensive experience and high-calibre personnel, has been selected as the preferred drilling contractor. Seacore has installed modular drilling rigs on a number of vessels for geotechnical coring work and has operated with BGS and their equipment for both scientific and commercial work, including the Ormen Lange Gas Field for Norsk Hydro/Statoil. The work at Ormen Lange is believed to be very similar in water/hole depths and anticipated geological formation to that at Lomonosov Ridge. A modular drilling rig (C200 Model), with Wirth or similar top drive of sufficient lifting capacity, will be installed for coring operations. Drilling tubulars will be to API standard, with up-to-date thread and crack inspections; they will comprise 7” OD x 4” ID drill collars and 5” API Range 2 drill-pipe, both with 5” FH connections. The drill-pipe tool joints also will have a minimum 4” ID. Sub-zero modification is required for this project and will be implemented. The rig comes complete with pipe rack, pipe handling, power packs, mud tanks and all accessories and spares. Bio-degradeable polymer mud of the cellulose variety will be used while drilling.

Logistics

The estimate for total time for Expedition MSP-1 is yet to be determined, but the science objectives require ~35 days in the ice. This expedition will take place in August-September 2004 (see **Table PP-1**).

Logging

The Lomonosov Ridge Project, as will be the case for all MSP operations, presents some specific challenges for downhole logging operations. The overarching approach being applied by the European Petrophysics Consortium towards downhole logging for this expedition is flexibility. Under the most favorable conditions, it may be possible to stay on-site for the duration of all operations, which would facilitate data acquisition by wireline logging. However, we consider it more likely that ice conditions will require periodic hole abandonment, thus precluding wireline logging. Under these circumstances, in order to maximize the data collected in any single hole, a tool-string will be deployed through the BHA, logging formation properties in memory mode, as pipe is tripped to clear the seafloor. We anticipate that most, if not all, of the Lomonsov Ridge holes can be logged in this manner, providing a robust method of hole-to-hole correlation and a template for core-splicing and stratigraphic correlation. Using combined memory mode and wireline downhole logging, downhole logging and core data can then be integrated to provide a means of continuous sampling of the cored stratigraphy at all sites.

The following is a generic list of minimum and additional tools based on formation properties and not 'operator'-based trademark names:

Minimum measurements

1. Borehole diameter - for quality control and borehole corrections.
2. Natural gamma (total counts and spectral) – for log-log and core-log correlation (total counts), clay typing, mineralogy and ash-layer detection (spectral).
3. Porosity (this may require a radioactive source) – for physical properties, core-log correlation, quality control, lithology, etc.
4. Electrical resistivity (shallow-deep measurement) – multiple usages, a robust measurement even under poor borehole conditions.
5. Density (this may require a radioactive source) – for physical properties, core-log correlation, borehole-seismic integration, lithology/geochemistry, etc.
6. Temperature – for heat flow and hydrogeology.
7. Sonic measurements – for core-log correlation, borehole-seismic integration, quality control etc.

Additional measurements (should be viewed as preferred, along with 1-7 above)

8. High-resolution borehole imaging (electrical, acoustic and/or optical) – for core-log correlation, cyclostratigraphic analyses, oriented sedimentological and structural information.
9. Check-shot – direct measurement of acoustic travel time for core/borehole-seismic integration.

We envisage that all the above (including the check-shot - conditions permitting) will be employed on the Lomonosov Ridge.

Expeditions 2/301 + 5/304	**North Atlantic Neogene-Quaternary Environments**
Proposal	**572-Full3**
Title	**Ice-sheet–ocean–atmosphere interactions on millennial time scales during the late Neogene–Quaternary using a paleointensity-assisted chronology for the N. Atlantic**
Proponents	**James E. T. Channell, Joseph S. Stoner, Gerard C. Bond, David A. Hodell and Ellen E. Martin**

Science Description (Note: This science program will be undertaken in two parts, as expeditions 2/301 and 5/304, see Figure ES-5a.; operations and logging for expedition 5/304 will be discussed in more detail as part of the FY05 Program Plan.)

This expedition involves drilling late Neogene to Quaternary age sediments at nine sites in the North Atlantic Ocean. Previous drilling and piston coring results indicate that the proposed drill sites: a) contain distinct records of millennial-scale environmental variability in terms of ice-sheet–ocean interactions, deep circulation changes and sea-surface conditions, b) provide the requirements for developing a millennial-scale stratigraphy through geomagnetic paleointensity, oxygen isotopes and regional environmental patterns, and c) document the details of geomagnetic field behavior. The objectives are to intercalibrate the geomagnetic paleointensity records, isotope stratigraphies and regional environmental stratigraphies, and thereby develop a millennial-scale stratigraphic template for the past few million years. Such a template is required for understanding the relative phasing of atmospheric, cryospheric and oceanic changes that are central to our understanding of the mechanisms of global climate change on orbital to millennial time scales. In addition, the high-resolution records of directional, secular variation and geomagnetic paleointensity will greatly improve our knowledge of the temporal and spatial behavior of the geomagnetic field, as well as provide fundamental constraints for numerical models of the geodynamo. The drill sites are located in the Labrador Sea, the Irminger Basin, on the Eirik Drift off Orphan Knoll, on the southern part of the Gardar Drift and at DSDP Site 607/609. (*Only the Labrador Sea, Irminger Sea and Eirik Drift sites will be addressed in FY04*.) These sites preserve components of ice-sheet–ocean interactions, with potential for chronological control through stable isotopes and geomagnetic paleointensity. Some are located within the North Atlantic belt of ice-rafted debris, between previous drilling sites to the north (60 to 77˚N; ODP Leg 162) and south (30 to 35˚N; ODP Leg 172). The proposed sites also lie in an appropriate bathymetric depth range (2750 to 3719 m) for detecting millennial-scale changes in the formation of deep and intermediate water masses.

__Table PP-4__: North Atlantic Neogene-Quaternary climate expedition drill site locations.

				Penetration (m)		
Site name	Latitude	Longitude	Water Depth	Sediment	Basement	Total
IRM-3A	62° 20.11' N	36°12.3' W	2600	400	0	400
IRM-2A	62°40.20' N	37°27.61' W	2088	350	0	350
LAB-3A	58°2.17' N	48°27.57' W	3350	400	0	400
LAB-5A	58°48.36' N	45°50.38' W	2400	350	0	350
ORPH-2A	50°12.40' N	45°41.22' W	3539	350	0	350
GAR-1A	56°21.78' N	27°48.9' W	2840	350	0	350
GAR-2A	53°3.40' N	33°31.78' W	3024	350	0	350
IRD-1A	49°52.67' N	24°14.29' W	3884	400	0	400
IRD-3A	41°0.068' N	32°57.44' W	3426	350	0	350
Alternates						
LAB-1D	57°8.97' N	44°44.13' W	3480	400	0	400
LAB-2D	58°13.48' N	45°11.29' W	2100	350	0	350

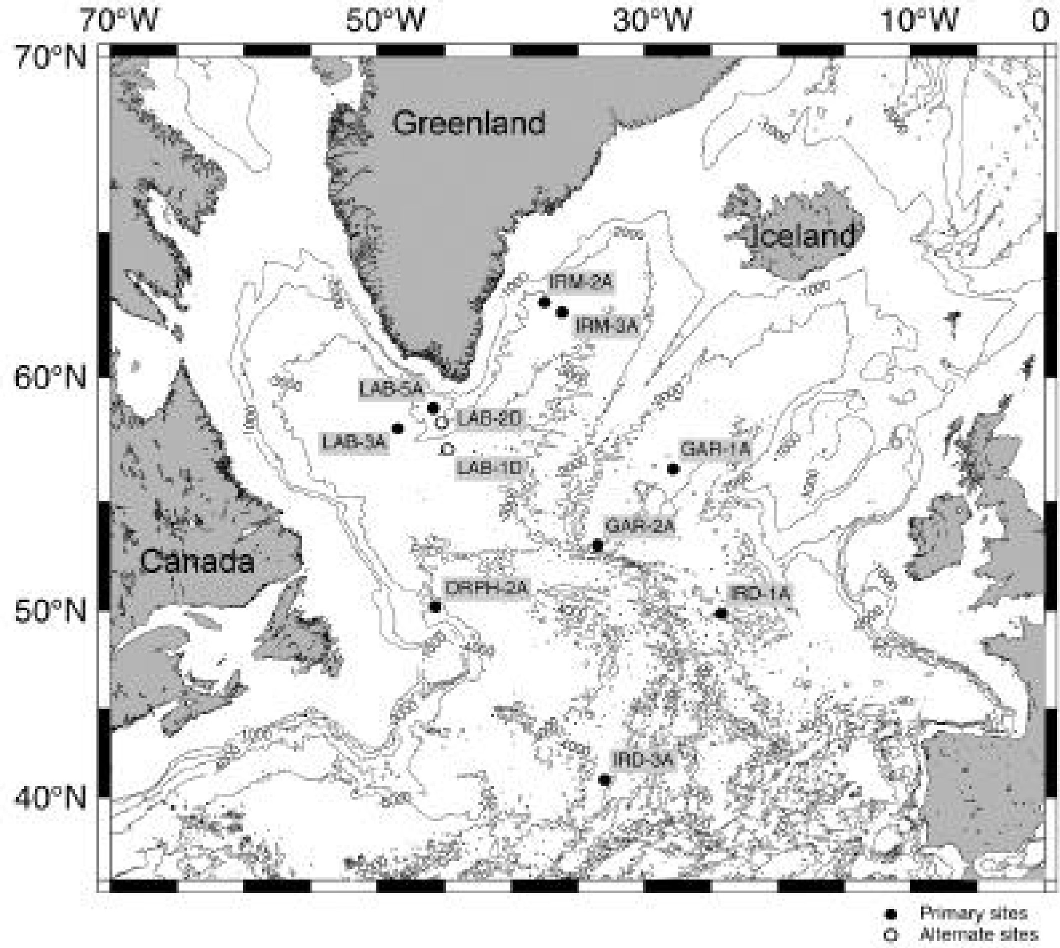


__Figure PP-7__: North Atlantic Neogene-Quaternary climate expedition drill site locations.

Operational Plans

Both expeditions will involve routine sediment coring. Each site will be quadruple APC cored to assure recovery of the complete sediment section. APC coring will extend to ~150 m below seafloor. One hole at each site will be deepened to 350–400 m for logging purposes.

Environment and Safety

There is a high risk of losing operating time as a result of severe weather and ice conditions. The optimum weather window for drilling these sites is July through September. Given the scheduling constraints for FY04, scheduling this expedition in the September to October time frame is unavoidable (see **Table PP-1**). This increases the risk of operational downtime as a result of adverse weather to ~10%. To minimize safety risks to personnel and equipment, we will arrange for daily site-specific forecasts from a weather service experienced in North Atlantic conditions. Three additional operating days have been added to this program to accommodate operating time lost because of weather. The risk of encountering poor hole conditions is low.

Logistics

Operations for Expedition 2/301 will require an estimated 47 days (2 days in port, 14 in transit, and 31 on site [2 days in port, 7 in transit, and 8 on site in FY04]).

Logging

During Expedition 2/301, two sites (see table below) will be logged both with the standard geophysical tool string for density, porosity, resistivity and gamma ray information and the FMS/Sonic tool string for high resolution resistivity logs and images and sonic velocity data. Total logging time is ~38 hrs. Data generated will be critical for hole-to-hole correlation, core-log integration and hole-to-seismic correlation, and correlation of results from Expeditions 2/301 and 5/304. Furthermore, given sufficient sedimentation rates, it should be possible to investigate cyclostratigraphy using the downhole geophysical data. Successful core-log integration will also be necessary to determine the completeness of the recovered section and thereby assess the accuracy of the stratigraphic framework. *(Note: Costs for Expedition 2/301 and 5/304 logging operations will be incurred in FY05, and therefore are not included in the FY04 Program Plan budget.)*

Site	Water depth (mbsl)	Hole depth (mbsf)	Logging operations
IRM3A	2600	400	Standard, FMS/sonic
LAB3A	3350	400	Standard, FMS/sonic

Expeditions 3/302 + 4/303	**Atlantis Oceanic Core Complex**
Proposal	**512-Full3**
Title	**Oceanic core complex formation: Deformation, alteration, and accessible mantle peridotite**
Proponents	**Donna Blackman, John Collins, Javier Escartin, G. Früh-Green, Kevin Johnson, Chris MacLeod, Monique Seyler**

Science Description

The primary objective of Expeditions 3/302 and 4/303 is to document the conditions under which oceanic core complexes develop. Domal massifs capped by corrugated, striated detachment faults have been mapped at several locations on the seafloor. These large, shallow seafloor features apparently form as a result of episodic plate rifting and accretion at slow spreading ridges. However, currently available data are insufficient to characterize the magmatic, tectonic and metamorphic history of oceanic core complexes, and understand the mechanisms of their uplift and emplacement. The first goal is to drill one hole through the basaltic hanging wall of Atlantis Massif, in order to sample rock just above the detachment, the shallowest part of the unexposed fault, and through a portion of the fault zone. A second goal is to characterize the nature of the alteration front within oceanic peridotite. Oceanic core complexes expose altered upper mantle peridotites and mafic crustal rocks. The alteration of these rocks and the process of serpentinization greatly affect the geophysical properties of the lithosphere. Mantle seismic velocities have been measured at depths as shallow as several hundred meters on the central dome of the massif; therefore, drilling at Atlantis Massif offers an unprecedented opportunity to determine the nature of the Moho. Is it a hydration front rather than the crust–mantle boundary? The potential for recovering fresh peridotite at Atlantis Massif presents excellent opportunities for advances in understanding residual modes and microstructure within the oceanic mantle. Cores of essentially fresh, *in-situ* peridotite will allow documentation of composition, microstructure, evidence for melt production and migration, and relationships among deformation, melt and syntectonic alteration. Drilling a second, deep hole on the central dome of Atlantis Massif will: 1) allow sampling of the detachment fault zone and the alteration front, and 2) penetrate and recover unaltered mantle.

***Table PP-5**: Atlantis oceanic core complex expedition drill site locations.*

			Penetration (m)			
Site name	Latitude	Longitude	Water Depth	Sediment	Basement	Total
AMFW-01A	30° 10.2' N	42° 7.6' W	1630	1	> 700	> 700
AMHW-01A	30° 10.0' N	42° 4.0' W	2550	1-2	4-500	4-500

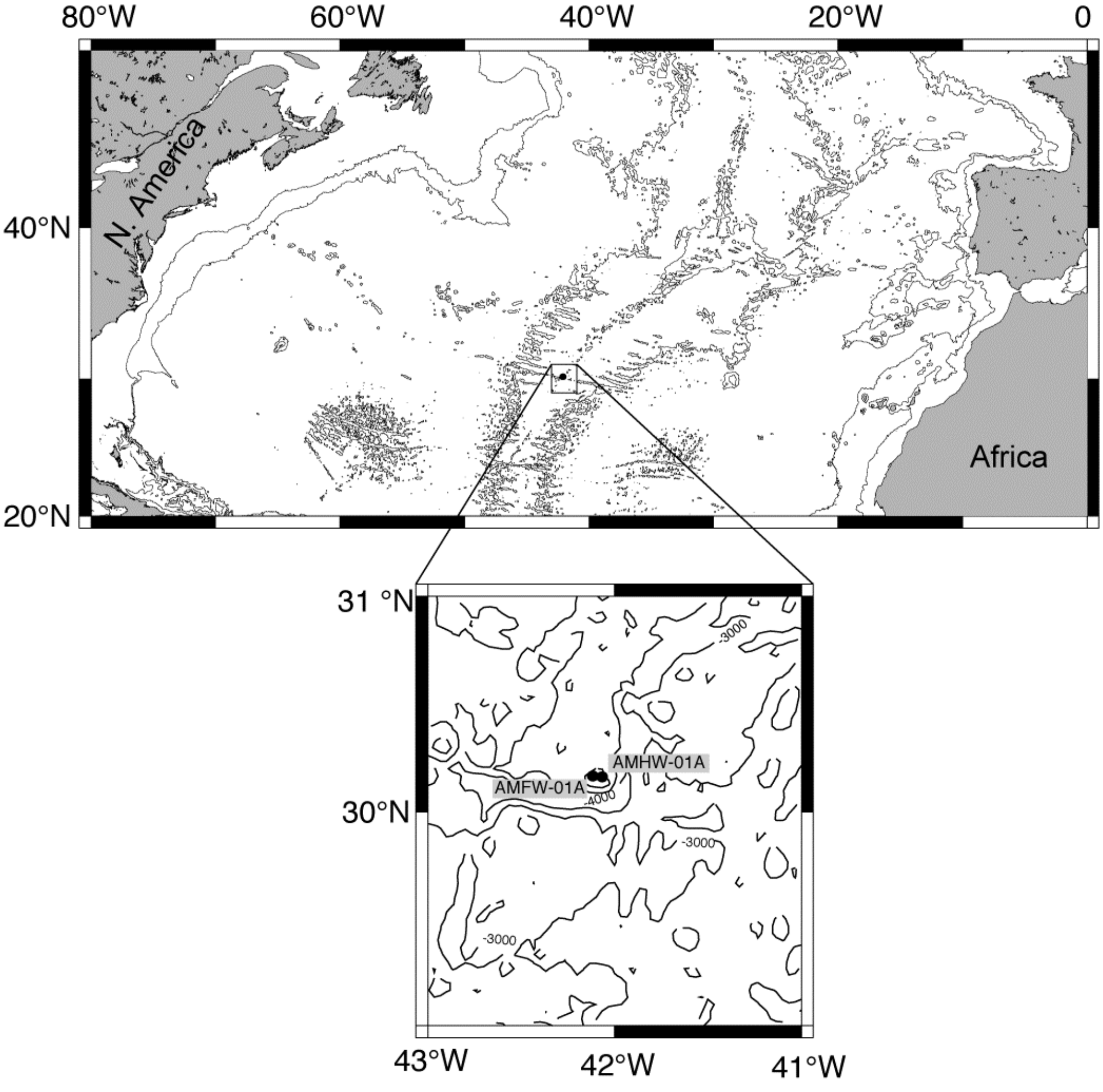


***Figure PP-8**: Atlantis oceanic core complex expedition drill site locations.*

Operational Plans and Experiments

Both sites will require casing into basement in order to maximize the chances of achieving deep penetration. The first casing string will be set in basement, using the

HRRS Hammer Drill-in Casing system. Each site will then be RCB-cored to ~130 m, then opened using a bi-centered bit and underreamer, which will allow a second casing string to be set. Next, each hole will be RCB- cored to maximum depth.
This is a two-expedition program. (Note: The second expedition, 5/304 [see **Table PP-1**], will occur in FY05 and therefore will be discussed in more detail as part of the FY05 Program Plan.) During Expedition 3/302, both sites will be drilled to casing depth and casing will be set. The remaining time will be devoted to drilling and coring the (first) deep hole as deeply as possible. The second expedition will be devoted to deepening both holes.

Environment and Safety
The principal risks to this program are the difficulty of starting a hole on bare rock and the possibility of encountering unstable hole conditions. The difficulty of starting a hole on bare rock will be mitigated via use of the HRRS Hammer Drill-in-Casing system. Experience has shown that in hard rock drilling, the upper part of the hole is most prone to instability; hence, the upper 120 m of each hole will be cased off. Below that sub-seafloor depth, we expect to encounter more competent rock that will provide stable conditions and thereby allow deep penetration. The shallower (hanging wall) site may exhibit unstable hole conditions throughout. Sufficient supplies and hardware will be carried to allow a third hole to be started, in the event that one of the primary holes is lost through instability. Weather conditions should not be a limiting factor, even though this expedition is scheduled for late fall 2004 (see **Table PP-1**). Procedures will be adopted to minimize risk to marine mammals from the proposed seismic experiments, including 1) posting observers while experiments are in progress to record the presence and proximity of marine mammals, 2) gradually increasing the amplitude of the sound sources to allow animals time to move away, and 3) suspending operations if animals approach within 800 yds.

Logistics
Operations for Expedition 3/302 will require an estimated 49 days (4 days in port, 8 in transit, and 37 on site) (see **Table PP-1**).

Logging
The tectonic and structural objectives will particularly benefit from logging data. Recording of *in situ* physical properties data is essential to core-log integration studies and a continuous lithological and acoustic characterization of penetrated structures, allowing the linkage of seismic velocity, lithology and degree of alteration, as well as the distribution of fractures at each site. High-resolution (cm-scale) image data will provide an accurate description of tectonic and structural features. Standard geophysical logs should be run for each hole, including a VSP, as well as the Formation MicroScanner (FMS) and the Ultrasonic Borehole Imager (UBI) (as outlined in the table below). Collecting standard logs and VSP information during Expedition 3/302 will provide accurate calibration of the sites to available seismic surveys (limited amounts of legacy data are available at this location). Prior to completion of the drilling and logging program, two-ship offset VSP experiments will be conducted during Expedition 4/303. All VSP experiments will occur pending environmental clearances. (*Note: Costs for both*

Expedition 3/302 and 4/303 logging operations will be incurred in FY05, and therefore are not included in the FY 04 Program Plan budget.)

Site	Water Depth (mbsl)	Sediment Thickness (m)	Basement thickness (m)	Logging Operations
AMFW-01A	1630	1	>700	Standard, UBI, WST3, Mag Susc (DLL if fresh gabbros encountered)
AMHW-01A	2550	1-2	400-500	Standard, UBI, Mag Susc (DLL if fresh gabbros encountered)

Expedition 5/304	**Norwegian Margin Bottom Water**
Proposal	**543-Full2**
Title	**Installation of a CORK in Hole 642E to document and monitor bottom-water temperature variations through time**
Proponents	**Robert N. Harris**

Science Description

Knowledge of bottom-water temperature (BWT) variations is important for understanding the vigor and nature of ocean circulation as well as the nature of climatic interactions between the ocean and atmosphere. The biggest obstacles to understanding variability in bottom water are: a) the lack of an observational network, and b) historical records that are too brief and too sparsely spaced. Part of Expedition 5/304 will also investigate the feasibility of reconstructing BWT histories on a decadal to centennial time scale by making highly precise temperature measurements in ODP Hole 642E. Because marine sediment has a low thermal diffusivity, variations in BWT propagate slowly downward, perturbing the background thermal field. These temperature anomalies are a direct thermophysical consequence of a changing BWT condition and will be used to reconstruct BWT histories. To ensure a conductive thermal environment, a thermistor string will be isolated between a borehole seal, or CORK, at the top of the borehole and a packer below the thermistor string. Hole 642E is ideally located in a climatically sensitive region with a 50-year time-series of BWT measurements taken nearby. A sensitivity analysis using observed variations in BWT at this location indicates the presence of a resolvable signal. Thermal transients will be measured as a function of time at this borehole observatory to isolate directly the transient component of BWT variations.

Operational Plans and Experiments - Environment, Safety, and Logistics – Logging for this part of Expedition 5/304 will be determined in early calendar 2005 and included in the FY05 IODP Program Plan.

***Table PP-6**: Norwegian Margin bottom water expedition drill site location.*

				Penetration (m)		
Site name	Latitude	Longitude	Water Depth	Sediment	Basement	Total
Hole 642E	67°13.2' N	2°55.8' E	1277	0	0	0

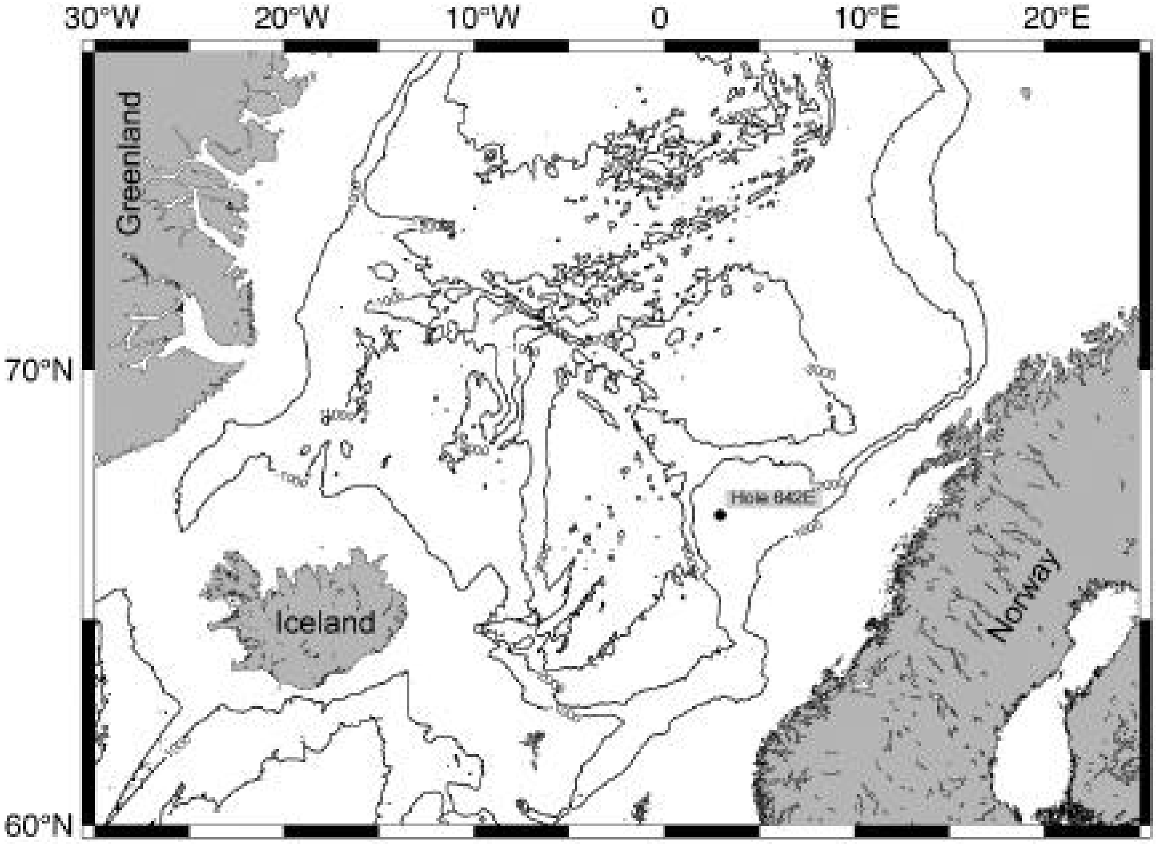


***Figure PP-9**: Norwegian Margin bottom water expedition drill site location.*

Table PP-7*: Expedition summary budget ($K) for non-riser operations FY04-05. (FY05 costs are for long lead-time purchases in support of FY05 operations)*

Description	**Expedition 1**		**Transit**		**Expedition 2**		**Expedition 3**	
	POC	**SOC**	**POC**	**SOC**	**POC**	**SOC**	**POC**	**SOC**
TAMU Costs ($K):								
Payroll	627	926	145	215	155	228	-	-
Travel	38	13	9	1	9	4	-	-
Travel To/From Port	34	59	-	-	34	56	-	-
Training	110	31	23	6	35	11	-	-
Per Diem	88	-	20	-	22	-	-	-
Supplies	777	76	-	0	88	40	261	20
Fuels & Lubricants	690	-	160	-	170	-	-	-
Software	-	8	-	-	-	8	-	-
Insurance	122	-	28	-	30	-	-	-
Shipping	39	26	-	-	16	11	-	-
Telecommunications	-	15	-	4	-	4	-	-
Ship-to-Shore Communications	48	-	11	-	12	-	-	-
Professional Services	16	52	1	5	12	36	-	-
Recruiting	4	6	1	1	1	2	-	-
Maintenance and Repairs	0	60	-	-	0	60	20	-
Day Rate	4,514	-	1,047	-	1,112	-	-	-
Port Call	140	-	-	-	140	-	-	-
Equipment	126	-	-	-	126	-	25	-
Library	-	0	-	-	-	-	-	-
Subtotal (TAMU)	**7,372**	**1,271**	**1,446**	**232**	**1,961**	**459**	**306**	**20**
LDEO Costs ($K):								
Payroll	15	-						
Equipment	2	-						
Supplies	4	-						
Travel	3	-						
Communications	1	-						
Shipping	2	-						
Maintenance and Repairs	3	-						
Total Direct Costs	29	-						
Modified Direct Costs	27	-						
Computing	1	-						
Schlumberger	173	267						
Insurance	32	1						
Indirect Costs	14	-						
Subtotal (LDEO)	**249**	**268**						
Total POC+SOC per expedition		**9,161**		**1,678**		**2,419**		**326**
Grand total ($K)								**13,585**

Glossary of Expense Categories – Expeditions

TAMU Costs

***Payroll*—**This category contains salary, fringe, and sea pay directly associated with specific expeditions, along with *pro rata* amounts of the same items for employee efforts in support of expedition activities.
***Travel*—**Travel in support of expedition activities (e.g., post-expedition travel), exclusive of port call travel, are contained in this expense category.
***Travel to/from Port*—**Funds in this category support travel to and from the ship at port calls for all seagoing personnel and other Program employees attending port call. All funds are expedition-specific.
***Training*—**This category contains funds that support training of the shipboard staff and other Program employees who receive specific training (e.g., Labview, Novell, etc.) that supports shipboard activities. The costs are both expedition-specific and *pro rata*.
***Per Diem*—**This category reflects catering charges for 45 personnel per month based on the most recent averages of shipboard participants. This category does not include ODL, SOS or Catermar personnel, as they are accounted for in the day rate.
***Supplie*s—**In this category are expedition-specific supplies (e.g., drilling supplies, laboratory supplies, core liners, etc.), safety equipment for the ship and personnel and departmental *pro rata* expenses associated with the annual cost of supporting the science plan at sea.
***Fuel & Lubricants*—**Fuel and lubricants are budgeted for refuelings at an average cost per metric ton and associated costs.
Software—Funds used to support upgrades to existing software.
***Insurance (Ship Ops-ODL/ODP)*—**Funds in these categories are to reimburse ODL for Hull & Machinery and Removal of Wreck coverage and the ODP/TAMRF Marine Package insurance (refer to Appendix III).
***Shipping*—**The majority of costs contained in this category are expedition-specific costs and involve shipment of equipment and supplies to and from the ship. There is a small amount of funds associated with shipment/mailing of items in support of expedition activities throughout the year.
***Telecommunications*—**This expense is associated with shore-based cost incurred in support of expedition activities. Some costs are expedition-specific, while others are incurred in support of multiple expeditions.
***Ship-to-Shore Communications*—**Satellite and regular communications charges between the *JOIDES Resolution* and shore-based personnel are included in this category.
***Professional Services*—**In this category are costs associated with temporary employees hired through companies/corporations, drill pipe maintenance, wireline severing charges, shipboard maintenance service calls, transfer fees, weather reports, and physical examinations for seagoing personnel.
Recruiting—Funds for recruitment of seagoing personnel.
***Maintenance and Repairs*—**Funds contained in this category are for repairing drilling, coring, operations, and laboratory equipment for the ship.
***Day Rates*—**Covers the cost of staffing the ship to include the sailing crew, drilling personnel, and catering personnel. It does not cover the cost of TAMU's crew or the scientists on board the

ship. The day rate varies according to the mode of the ship that is generally operating, standby, or cruising. While it is a fixed rate per day, the day rate is adjusted for changes in the Consumer Price Index-Urban (CPI-U) and Employment Cost Index (ECI). When the cumulative change in the CPI-U and ECI (since the last increase) equals or exceeds 2%, the day rates will be adjusted by the percentage change. The adjustment takes effect at the beginning of the month following the increase and cannot occur more frequently than every six months.
Port Calls—Locations have a definite effect on the cost of port calls that covers agents' expenses and freight associated with resupplying the ship. During each port call, cores and equipment are off-loaded from the previous expedition and supplies are loaded for the upcoming expedition. ODL is reimbursed for port agent charges and the shipment of food and related supplies. Shipment of cores, drilling equipment, and laboratory supplies is arranged and paid by TAMU and paid for by TAMRF. Similarly, TAMRF purchases all drilling equipment and laboratory supplies necessary for meeting the objectives of the expedition. These costs are covered in other areas, not Ship Operations.
Equipment—Includes costs associated directly with equipment (computer, scientific, and drilling) intended solely for use on the ship over a period of time greater than one expedition, equipment purchased for a specific expedition and pro-rata cost of shore-based equipment used partially to support expedition activities.
Library—Funds for books, journals and other scientific resources.

LDEO Costs

Payroll—Expedition-based salaries include fringe and sea pay for logging scientists during the expedition. Salaries for pre- and post-expedition work are not included. Salaries for shore-based processing and other technical support are also not included.
Equipment—Prorated costs of computer, scientific, and engineering equipment for use on the ship over a period of time greater than one expedition.
Supplies**—**The cost of replenishing supplies for the Downhole Measurements Lab and for upgrades/additions to the software for this lab.
Travel—Travel of sea-going personnel to and from the drillship. It does not cover pre- and post-expedition travel associated with the expedition (e.g., pre-expedition meetings).
Communications— The costs for phone and fax communication to the ship, as well as satellite transmission of data.
Shipping—The costs for routine shipments to and from the ship.
Maintenance and Repairs— Upgrade, modifications, and repair of non-Schlumberger tools and data acquisition systems.
Computing—The LDEO Computer Group provides computer maintenance, system backup, and Internet access. Repair, upgrade, and backup of Sun Microsystems hardware and software will be covered under the LDEO network subscription. Calculations for this category are based on a charge of 3% of the Modified Direct Costs.
Schlumberger—Covers the costs associated with the leasing of standard tools and the associated engineering support services. POC costs are for equipment needed for back-off and severing services, including the Schlumberger engineer day rate.
Insurance—Insurance for standard and specialty logging tools during below-the-keel deployments. POC costs are for equipment needed for back-off and severing services.

Indirect Costs— Indirect costs (53%) are assessed on all charges except permanent equipment, tuition remissions, LDEO computer services, and downhole tool insurance.

4. FY04 Budget Overview

This Program Plan budget identifies a total program cost of $40,014 K for FY04 (see **Table PP-8**), the inaugural year of the IODP, to meet the high-priority needs identified by the SAS. Of this cost, 38% is considered to be Science Operation Costs (SOCs) and the remaining 62% is Platform Operation Costs (POCs). These costs are distributed among the three IOs and IMI.

IMI's budget is not yet available in details because it is currently subject to negotiation between NSF and IMI. An approximate figure of $2 M is provided, and this excludes the cost of several activities and services, such as databases, core repositories, engineering development and support for the SAS and SAO offices, as well as for a site survey data bank. Note that NSF, through JOI, is providing support for the data bank in FY04 via the ODP contract.

The JOI Alliance budget of $22,121 K for FY04 includes support for the final transit of the *JOIDES Resolution*, one full expedition (Juan de Fuca), partial support for the second expedition (North Atlantic 1) that bridges over into FY05, and approximately $326K for the third expedition (CORE 1) that will be conducted in FY2005. Of the Alliance's total budget, 61% is directly affiliated with the final transit and operations (see **Table PP-7**).

Of the total ESO budget of $12,493 K, 78% ($9,738) is allocated to POCs, primarily in support of the Arctic expedition. Other funds are in support of long-term planning, maintenance and onshore activities.

Of the total CDEX budget of $3,400 K, $318 K will go towards science services, and the remainder ($3,082 K) will be used for site survey needs.

Budget Process

After the IODP scientific needs for FY04 were identified, the budget process began by determining the expedition-based scientific and operational requirements, including the operating costs of vessels, drilling and down-hole operations, logging science, and laboratory needs, among others. Most funds within the science and logging operational budgets have been allocated to, and apportioned within, leg-based budgets. Detailed budgets for the non-riser expeditions in FY04 are presented in the previous section. Similar detail for the MSP expedition is provided in Appendix B. Note that resources are requested in this Plan for items or services affiliated with FY05 expeditions that require long lead-time purchases or commitments.

The second step in the budget process is assessing program needs that are not directly affiliated with FY04 expeditions, such as services in science, technical support, operations, publications, information, management, administration, logging, SAS/SAO advisory, site assessment, public affairs and technical development projects. Some of these funds will become part of the IMI budget that is currently under negotiation. The remainder is incorporated into the IO budgets presented in the appendices.

The third step in the process is determining whether an expense is a POC or a SOC. These costs are defined, at least at an overarching level, in the IODP memorandum between the US and Japan. Refinements of these definitions are ongoing, subject to approval by the Agencies.

Table PP-8: *IODP summary budget for FY04 ($K).*

Entity	**Specifics**	**SOCs**	**POCs**	**Total ($K)**
IMI	TOTAL *	$ 2,000	$ -	$ 2,000
JOI Alliance				
	JOI	$ 730	$ 1,080	$ 1,810
	TAMU	$ 6,889	$ 10,438	$ 17,327
	LDEO	$ 2,367	$ 618	$ 2,984
	TOTAL	$ 9,986	$ 12,136	$ 22,121
ESO				
	Planning & maintenance	$ 694	$ 25	$ 719
	Arctic expedition	$ 2,061	$ 9,713	$ 11,774
	TOTAL **	$ 2,755	$ 9,738	$ 12,493
CDEX	TOTAL	$ 318	$ 3,082	$ 3,400
Grand TOTAL		$ 15,059	$ 24,956	$ 40,014
* Excludes subcontracts for database, repositories, and engin. dev.				
SAS/SAO office costs are included, but amounts are not specified.				
NSF ODP funds, through JOI, will support the data bank in FY04. IMI will be				
responsible for providing data bank services in FY05 and beyond.				
** Excludes the commingled SOCs contribution to the EMA office.				