

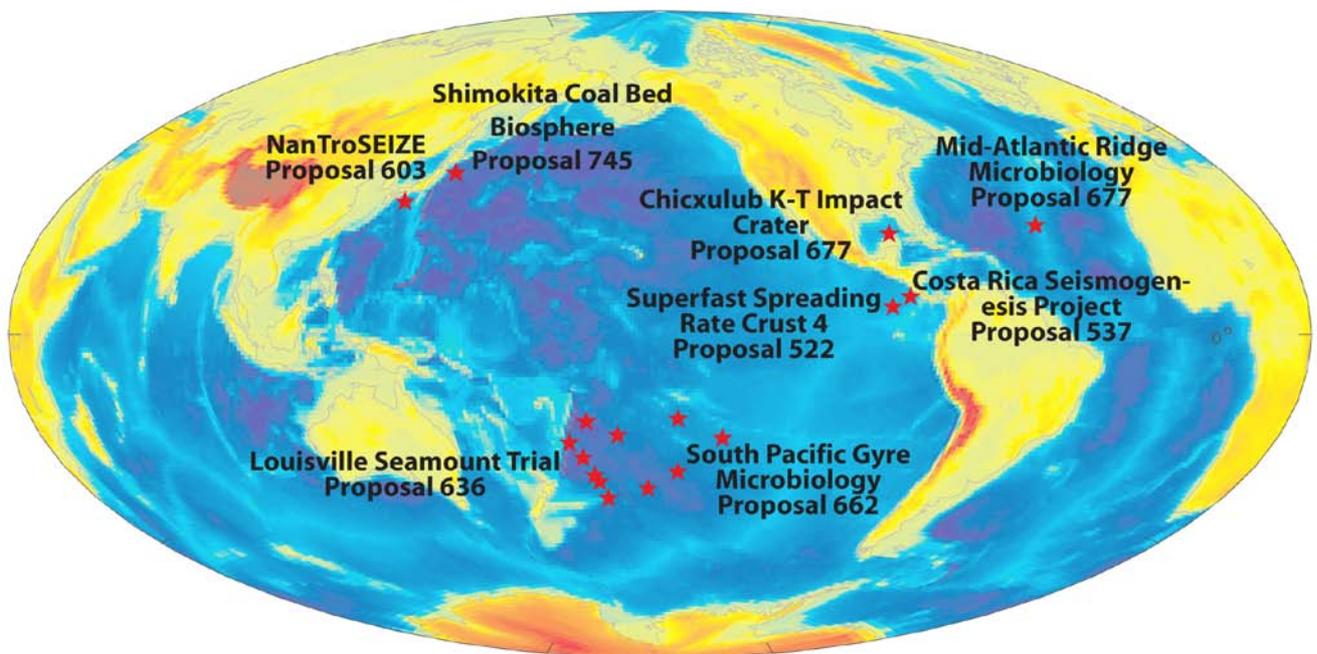
October 25, 2010

# Annual Program Plan 2011

Integrated Ocean Drilling Program



**IODP**  
INTEGRATED OCEAN  
DRILLING PROGRAM



# Annual Program Plan FY2011

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## **1 Introduction**

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

IODP is sponsored by Japan's Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the U.S. National Science Foundation (NSF) as Lead Agencies; by the European Consortium for Ocean Research Drilling (ECORD); the People's Republic of China Ministry of Science and Technology (MOST); the Interim Asian Consortium (KIGAM); the Ministry of Earth Science of India (MoES), and the Australia-New Zealand IODP Consortium (ANZIC).

FY2011 is the eighth year of the 10-year program. In FY2010, the *JOIDES Resolution* (JR) continued operation in the Pacific Ocean and is scheduled to complete 5 Expeditions before entering FY2011. FY2011 will see 5 Expeditions with the deep biosphere and solid Earth cycles themes. The *Chikyu* will transition from Stage II to Stage III of the NanTroSEIZE project in FY2011, and will install borehole observatories and challenge the deep riser target in FY2011-13. Another deep riser target for microbiology will be conducted as Complementary Project borne out of non-IODP funding but conducted under IODP principles and with IODP science support. The Mission Specific Platform operation completed the Great Barrier Reef drilling in FY2010 and may conduct a Hazard Survey for the Proposal to drill into the Chicxulub impact crater.

It is foreseen that the year-round operations of *JR* and *Chikyu* in the remainder of the 10-year program will continue to require extra efforts for the IOs to either engage in non-IODP activities or invite outside funding sources to conduct operations under IODP umbrella. In this regard, FY11 plan includes a complementary project proposal implementation by CDEX, which succeeded in securing non-IODP source of funding to complement the expedition cost. Achieving ISP goals in the face of decreased ship time also forces the proponents and SAS to live in a more competitive ground. Despite these, the IODP New Ventures in Exploring Scientific Targets (INVEST) meeting was immensely successful attracting more than 600 participants from around the globe to discuss exciting new science for the 10 years beyond 2013. We are in a difficult time but at the same time we are in an important time for planning the international scientific ocean drilling towards new and transformative science with aspiration and realities in mind.

The five major functions of IODP-MI are; (1) science support and review, (2) operation support and review, (3) engineering development, (4) data management and publications, and (5) outreach. The new science plan (2013-2023) accompanied with a realistic implementation plan will be produced. Also, the recommendations from the second

## *Integrated Ocean Drilling Program*

Triennium Review Committee's report will guide us for improving the current IODP scheme from soliciting drilling proposals to implementations as projects and delivering science. The remaining 3 years should not be considered as a period of winding down the program. On the contrary, we should be soaring to higher grounds and thus we will continue with engineering developments for better sampling and recovery, better measurements from logging to long-term observations. Wide distribution and easy recovery of data from the program is a key deliverable, and the SEDIS development will continue in collaboration between IODP-MI, the IOs and selected vendors to provide easy entry for data discovery.

## 2 Budget Summary

This Program Plan budget identifies a total program cost of \$174,581,561 for FY2011 (see **Tables APP-1, APP-2 and APP-3**) to meet the high scientific priority needs identified by the SAS. Of this cost, 13% is Science Operation Costs (SOCs) and the remaining 87% is Platform Operation Costs (POCs). SOCs and POCs are originally defined in Annex I of the MOU between the Lead Agencies, NSF and MEXT. Following the latest POC-SOC guidance from Lead Agencies, the Operational SOC of USIO as defined by NSF in October 2007 and was effective for FY08-10 is categorized as POC to simplify budgetary accounting and provide budget clarity consistent with contractual funding. **Table APP-4** is the summary of IODP-MI Contract Budget for FY2011.

	IODP-MI	IODP-MI Operators & Subcontractors				Total
		USIO	CDEX	ESO	Bremen	
<b>SOCs</b>	5,299,913	4,078,906	10,375,859	2,524,041	338,779	<b>\$22,617,498</b>
<b>POCs</b>	-	63,216,642	87,208,523	1,538,898	-	<b>\$151,964,063</b>
<b>Total</b>	<b>\$5,299,913</b>	<b>\$67,295,548</b>	<b>\$97,584,382</b>	<b>\$4,062,939</b>	<b>\$338,779</b>	<b>\$174,581,561</b>

Table APP- 1: Summary IODP Budget for FY2011

Description	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Management and Administration	3,646,110	645,015	781,344	866,514	-	\$ 5,938,983
Technical, Engineering and Science Support	-	447,602	7,611,359	1,019,931	-	\$ 9,078,892
Engineering Development	211,969	96,568	-	-	-	\$ 308,537
Core Curation	-	350,225	669,535	78,411	338,779	\$ 1,436,950
Data Management	593,115	986,206	1,029,901	397,985	-	\$ 3,007,207
Publications	244,048	1,459,000	-	-	-	\$ 1,703,048
Outreach	604,671	94,290	283,720	161,200	-	\$ 1,143,881
<b>Total</b>	<b>\$ 5,299,913</b>	<b>\$ 4,078,906</b>	<b>\$ 10,375,859</b>	<b>\$ 2,524,041</b>	<b>\$ 338,779</b>	<b>\$ 22,617,498</b>

Table APP- 2: SOC Budget Summary for FY2011

Description	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Management and Administration	-	3,977,165	862,011	318,321	-	\$ 5,157,497
Technical, Engineering and Science Support	-	57,027,645	85,772,903	1,220,577	-	\$ 144,021,125
Engineering Development	-	-	-	-	-	\$ -
Core Curation	-	110,075	227,676	-	-	\$ 337,751
Data Management	-	2,007,757	71,667	-	-	\$ 2,079,424
Publications	-	94,000	-	-	-	\$ 94,000
Outreach	-	-	274,268	-	-	\$ 274,268
<b>Total</b>	<b>\$ -</b>	<b>\$63,216,642</b>	<b>\$ 87,208,523</b>	<b>\$ 1,538,898</b>	<b>\$ -</b>	<b>\$ 151,964,063</b>

Table APP- 3: POC Budget Summary for FY2011

Description	IODP-MI	USIO	CDEX	Bremen	Total
Management and Administration	3,646,110	645,015	781,344	-	\$ 5,072,469
Technical, Engineering and Science Support	-	447,602	7,611,359	-	\$ 8,058,961
Engineering Development	211,969	96,568	-	-	\$ 308,537
Core Curation	-	350,225	669,535	338,779	\$ 1,358,539
Data Management	593,115	986,206	1,029,901	-	\$ 2,609,222
Publications	244,048	1,459,000	-	-	\$ 1,703,048
Outreach	604,671	94,290	283,720	-	\$ 982,681
<b>Total</b>	<b>\$ 5,299,913</b>	<b>\$ 4,078,906</b>	<b>\$ 10,375,859</b>	<b>\$ 338,779</b>	<b>\$ 20,093,457</b>

Table APP- 4: IODP-MI Contract Budget Summary for FY2011

**IODP-MI**'s budget is \$5,299,913 (100% SOC). This includes the costs for providing necessary integration/coordination functions to IODP as the Central Management Office/Organization. In FY2010, IODP-MI's organization and offices locations changed; the new Tokyo Office in the Etchujima campus of Tokyo University of Marine Science and Technology (TUMSAT) houses the headquarters function combining the science planning and operations managements. A Japanese corporation (*Ippan Shadan Hojin* (General Corporation) IODP-MI; ISHI) for IODP-MI operations in Tokyo was established in November, 2009. A downsized DC Office retains the accounting and contracting functions for a smooth international operation of IODP-MI. The details of the IODP-MI activities are described in **Appendix A**, which describes both the IODP-MI (US) and ISHI (Japan) activities. Also, the site survey database subcontract is included and not described separately.

The **USIO** budget is \$67,295,548 (6% SOC; 94% POC). The USIO SOC budget of \$4,078,906 includes costs for Management and Administration (M&A), Technical, Engineering, and Science Support (TESS), Engineering Development, Core Curation, Data Management, Publications and Outreach. The details of the USIO activities are described in **Appendix B**.

The **CDEX** budget is \$97,584,382 (11% SOC; 89% POC). The CDEX SOC budget of \$10,375,859 includes costs for Management and Administration (M&A), Technical, Engineering and Science Support (TESS), Core Curation, Data Management and Outreach. The details of the CDEX activities are described in **Appendix C**.

The **ESO** budget is directly funded through **EMA**. The ESO budget is \$4,062,939 (62% SOC, 38% POC). The ESO SOC of \$2,524,041 includes support for planning for MSP expeditions in FY12-13 including preparing for the Chicxulub Drilling Proposal (#548), as well as associated costs for M&A, TESS, Core Curation, Data Management and Outreach. The details of the ESO activities are described in **Appendix D**.

The University of Bremen Core Repository budget is \$338,779 (100% SOC). These funds are primarily for personnel and operating costs associated with IODP/ODP core sampling and core archiving operations separated from ESO Core Curation budget. The details of the BCR activities are described in **Appendix E**.

### 3 Organizational Structure

#### 3.1 Organizational Framework

IODP operations are based on three components:

##### *The Central Management Office (CMO):*

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

##### *The Implementing Organizations (IOs):*

There are three IOs:

1. The USIO is responsible for operations of the riserless vessel, the *JOIDES Resolution*.
2. Center for Deep Earth Exploration (CDEX), which is responsible for the riser-equipped ship, *Chikyu*.
3. ECORD Science Operator (ESO), which is responsible for mission-specific platforms (MSPs).

##### *The Science Advisory Structure (SAS):*

The IODP Science Advisory Structure consists of scientists, engineers, and technologists designated by IODP member organizations.

According to the principles upon which the program was founded, IODP “Science Operations Costs” (SOCs) will be, in principle, supplied to the nonprofit corporation known as IODP Management International, Inc. (IODP-MI), the IODP Central Management Organization (see **Fig. APP-1**). In turn, IODP-MI distributes SOCs to IOs (drilling operators) and to other subcontractors according to the budgets outlined in this and subsequent IODP Annual Program Plans (APPs). SOC funds are collected from IODP Members, commingled by the U.S. NSF, and provided through contract to IODP-MI (see **Fig. APP-1**). The flow of USIO SOC operations funding became an exception as described in Section 2, but the SOC operations USIO activities remain under the umbrella of IODP-MI.

Currently, IODP members are: the U.S.A. represented by the National Science Foundation (NSF); Japan, as represented by the Ministry of Education, Culture, Sports, Science, and Technology (MEXT); the European Consortium for Ocean Drilling (ECORD) as represented by the ECORD Management Agency (EMA); the People’s Republic of China as represented by the Ministry of Science and Technology (MOST); the Interim Asian Consortium represented by the Korea Institute of Geoscience and Mineral Resources (KIGAM); India as represented by the Ministry of Earth Sciences of India (MoES); and the Australia-New Zealand IODP Consortium (ANZIC). The NSF and MEXT are designated as Lead Agencies; EMA is a Contributing Member; and MOST, KIGAM, MoES, and ANZIC are Associate Members.

As detailed in **Figure APP-1**, Platform Operations Costs (POCs) are supplied directly from individual funding agencies of the countries or consortia operating IODP drilling assets: from

## Integrated Ocean Drilling Program

NSF to the USIO (Consortium for Ocean Leadership, Inc., Texas A&M University [TAMU], Lamont-Doherty Earth Observatory [LDEO] of Columbia University) for operation of the SODV; from MEXT to CDEX for the riser-equipped ship *Chikyu*; and from ECORD to ESO for MSP operations.

The technical management relationship consists of the following components:

- Overall central management tasks and responsibilities for science operations by IODP-MI
- Science advice provided by the SAS, supported by a planning office at IODP-MI
- Multiple IOs, as listed above – USIO, ESO, and CDEX

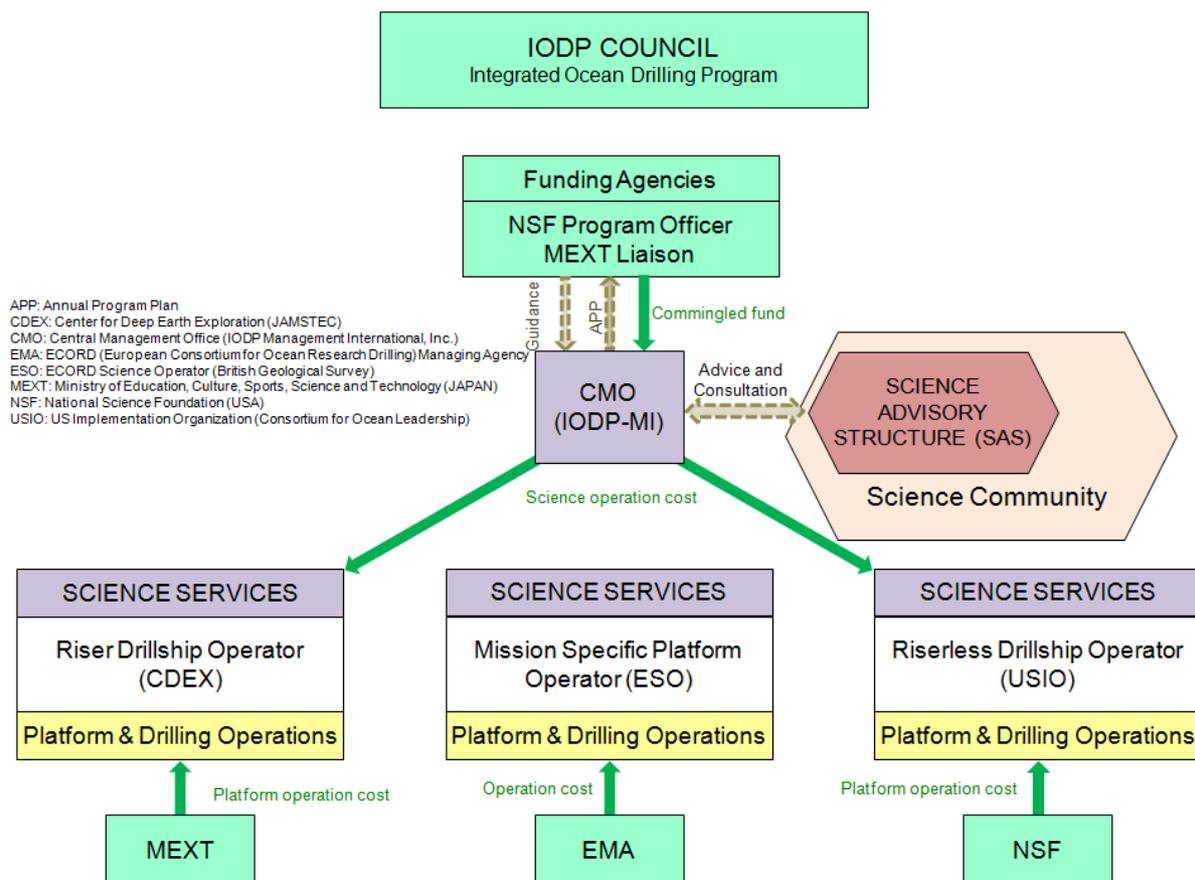


Figure APP- 1: IODP Program Management Structure (in principle).

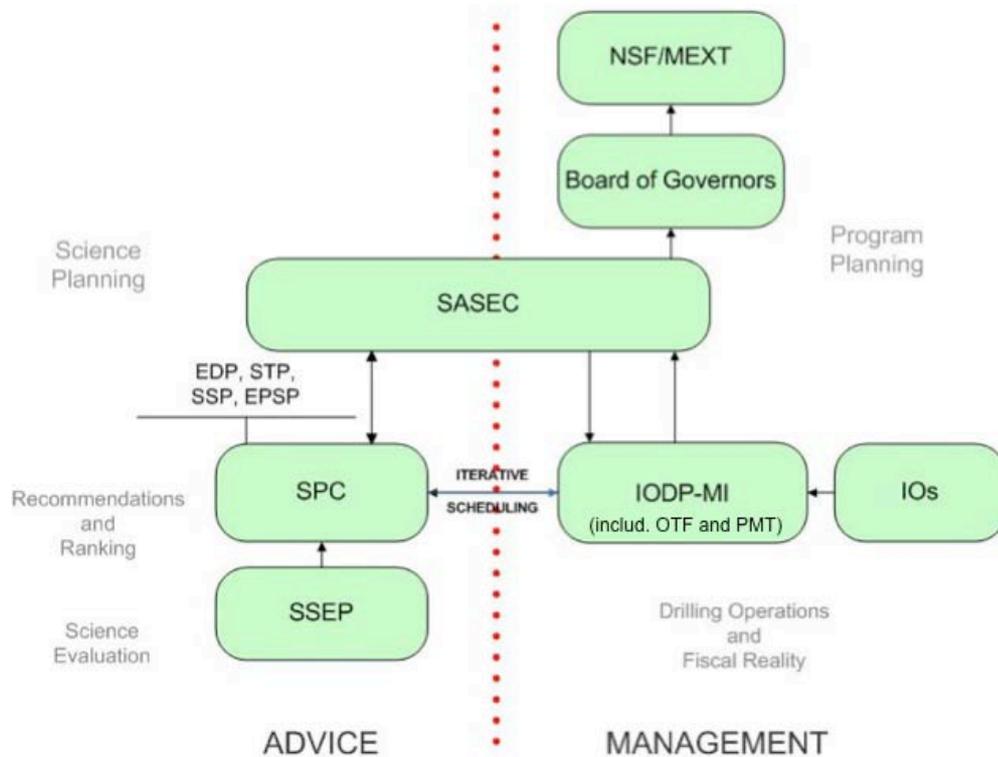
SOCs and POCs are detailed in accompanying budgets, both in the Program Plan and in Appendices A-E. The funding agencies consist of NSF and MEXT (as Lead Agencies), EMA as a Contributing Member, MOST, the Interim Asian Consortium, MOES, and ANZIC as Associate Members. Solid arrows indicate flow of funds. Dotted arrows indicate flow of advice.

### 3.2 IODP-Management International – the Central Management Office/Organization

A Central Management Office (CMO) was established with the concurrence of MEXT and NSF to develop and manage IODP science operations and implementation plans. CMO functions are provided by IODP-MI through a 10-year contract with NSF (**Appendix A**). The CMO: a) receives advice and recommendations from SAS on scientific priorities and plans; b) requests

plans from IOs responsive to this advice; and c) works with IOs and the SAS to produce an integrated IODP Annual Program Plan (APP) (**Fig. APP-2**).

IODP-MI submits the program’s Annual Program Plan to SASEC, which is the executive authority of the SAS and a committee of IODP-MI Board of Governors (BoG), for review and approval prior to consideration by the IODP-MI BoG and Lead Agencies. The NSF is responsible for contractual approval of the Annual Program Plan (APP) in consultation with MEXT. After Lead Agencies’ approval, any significant changes in the Annual Program Plan are to be considered and approved by IODP-MI and the Lead Agencies prior to implementation, in consultation with the SASEC and the IOs, as appropriate.



**Figure APP- 2: The flow of scientific advice towards expedition scheduling.** Scientific advice to the IODP management structure occurs via advisory panels and committees. Scientific planning for the IODP is provided by a Science Advisory Structure (SAS) led by the Science Planning Committee (SPC). IODP-Management International, Inc. (IODP-MI) is the Central Management Organization (CMO) that translates the scientific priorities of the ocean-drilling community into program plans to carry out scientific IODP operations. It does so based on advice from the international IODP Science Advisory Structure (SAS), and in consultation with vessel operators or IOs.

The Annual Program Plan is to be consistent with budget guidance provided to IODP-MI by the Lead Agencies. The Annual Program Plan includes a presentation of total program costs, which include both SOCs and POCs. IODP-MI will manage SOC funds provided under contract with the NSF. Starting FY10, SOC for ESO is provided directly through EMA. 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 Lead Agencies and EMA (**Fig. APP-1**).

### **3.3 Implementing Organizations (IOs)**

Riserless drilling capability is supplied by the NSF through a contract to the USIO, which consists of Ocean Leadership, Inc., the prime contractor and overall manager; Texas A&M University (TAMU), the subcontractor that operates the riserless 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 (LDEO) of Columbia University, responsible for geophysical and geochemical logging services aboard the riserless vessel, and involving acquisition, processing and interpretation of logging measurements. Details of the USIO and its operational plans for FY2011 are presented in **Appendix B**.

Riser-equipped drilling capability, by way of the vessel *Chikyu*, is supplied by CDEX (see **Appendix C**). CDEX is part of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC). CDEX also operates the Kochi Core Center Repository (KCC).

MSP drilling, sampling, and logging capability is supplied by the ESO (see **Appendix D**), a consortium led by the British Geological Survey (BGS), which conducts MSP operations and program-specific engineering development; the European Petrophysics Consortium (EPC) which provides logging services, and the University of Bremen which provides repository services for MSP samples and cores. The ESO has a contractual arrangement with the EMA, affiliated with the Centre Nationale de la Recherche Scientifique (CNRS) based in Paris. Details of ESO and its operational plans for FY2011 are presented in Appendix D. ESO will utilize Bremen curatorial personnel and services during actual MSP operations. These ESO funds are separate from the normal IODP core archive and sampling operations proposed by Bremen in the Annual Program Plan (See **Appendix E**).

### **3.4 Science Advisory Structure (SAS)**

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 SAS consists of the Science Advisory Structure Executive Committee (SASEC), the Science Planning Committee (SPC), as well as several advisory panels (see **Fig. APP-3**) that contain hundreds of scientists from the international geoscience community in IODP member countries and consortia. In January 2008, SASEC decided to name a standing budget subcommittee.

The SASEC is the Executive Authority of the SAS and is composed of representatives from scientific organizations in IODP member countries. SASEC is also a committee of IODP-MI BoG. The SASEC provides scientific oversight and long-term planning. An important responsibility of the SPC is to prioritize the recommendations for the drilling sites. It considers recommendations from the various SAS support panels and is the focus of scientific planning for IODP.

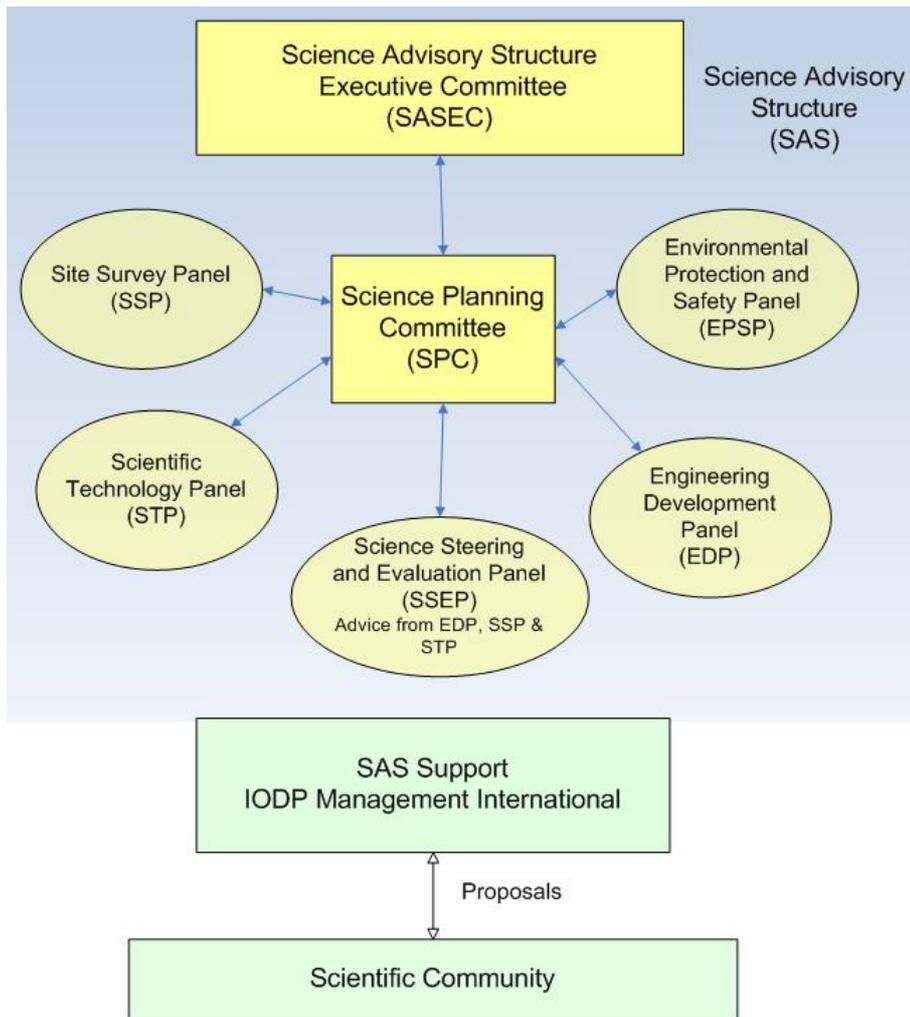


Figure APP- 3: IODP Science Advisory Structure (SAS). There will be a transition to a new SAS starting from FY11.

## 4 FY2011 Expedition Operations

### 4.1 FY2011 Schedule

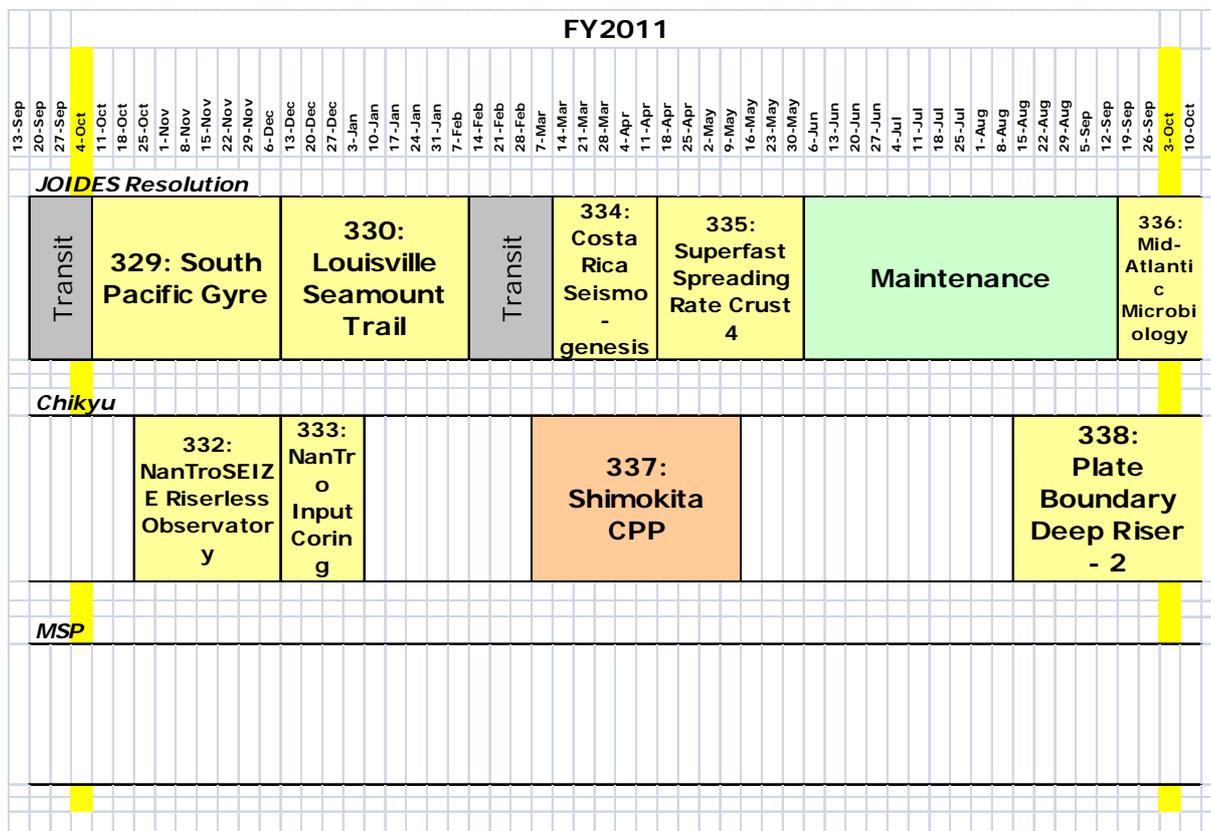


Figure APP- 4: Operation Schedule for FY2011.

#### USIO

The USIO plans to conduct eight months of operations (five expeditions) in FY2011, with four expeditions including two short (about a month long) residing entirely within the fiscal year. The FY2011 program will begin with the transit to South Pacific Gyre expedition, and followed by Louisville Seamount Trail expedition. After the Louisville Seamount Trail expedition, the *JOIDES Resolution* will take another transit to Costa Rica Seismogenesis Project expedition and Superfast Spreading Rate Crust 4 expedition; two short expeditions. Following this period of IODP activity, *JOIDES Resolution* will have a three-month-plus maintenance period that includes deployment of an IODP engineering development project. *JOIDES Resolution* will resume IODP activity at the end of September 2011 for Mid-Atlantic Ridge Microbiology expedition.

#### CDEX

FY2011 operations for *Chikyu* will consist of continuing efforts toward completion of the NanTroSEIZE program, and will conduct first IODP CPP (Complementary Project Proposal) expedition at Shimokita-Oki enabled by additional non-IODP source of funding. *Chikyu* will start IODP operations with NanTroSEIZE Riserless Observatory Installation at site C0002 including memory sensor replacement at site C0010, and followed by NanTroSEIZE

Input Site Coring & Heat Flow expedition. NanTroSEIZE program will resume in summer 2011 with reentering C0002 deep riser hole and deepening it.

### *ESO*

The offshore phase of Chicxulub is assumed to be a scheduling target for FY2012. In 17m water depth, this proposal requires a lift boat or jack-up rig and thus hazard site surveys over the proposed sites will be required. ESO will aim to contract a hazard site survey in FY2011, perhaps as part of a larger contract to provide the platform and drilling services in FY2012. Only the site survey cost is included in this FY2011 Annual Program Plan. No Mission Specific Platform Onshore Science Party will take place in FY2011.

## **4.2 USIO Operations**

### **4.2.1 South Pacific Gyre Expedition**

#### **4.2.1.1 Proposed Operations**

The main objectives of the South Pacific Gyre Expedition are to (1) document the habitats, activities, composition and biomass of microbial communities in subseafloor sediments with very low total activity; (2) test how oceanographic factors (such as surface ocean chlorophyll content and organic flux to the seafloor) control variation in sedimentary habitats, activities, and communities from gyre center to gyre margin; (3) quantify the extent to which these sedimentary communities may be supplied with electron donors by water radiolysis, a process independent of the surface photosynthetic world; and (4) determine how basement habitats, potential activities, and communities vary with crustal age and hydrologic regime in a region of fast seafloor spreading and thin sediment cover. To meet these objectives, we will core the entire sediment column at seven sites and the upper 100 m of basement at three sites. The three basement sites and the deepest sediment site will be logged.

#### **4.2.1.2 Logistics**

Operations for the South Pacific Gyre Expedition require an estimated 65 days (4 in port, 9 in transit to and from the first/last sites, and 52 in operations, which includes ~18 days of transit between sites).

#### **4.2.1.3 Core Storage**

Cores for the South Pacific Gyre Expedition will be stored at the Gulf Coast Repository.

### **4.2.2 Louisville Seamount Trail Expedition**

#### **4.2.2.1 Proposed Operations**

The Louisville seamount trail is a 4,300 km long volcanic chain that is inferred to have been built in the past 80 m.y. as the Pacific plate moved over a persistent melt anomaly or hotspot, and is the South Pacific counterpart of the more extensively studied Hawaiian-Emperor seamount trail. The Louisville Seamount Trail Expedition is designed to examine (1) the possible motion of the Louisville hotspot and its geodynamical implications and (2) the eruptive cycle and geochemical evolution of the seamount trail. To address these objectives, we will core and log at least 350 m into igneous basement at three small and one larger Louisville guyots.

#### **4.2.2.2 Logistics**

Operations for the Louisville Expedition are budgeted based on an estimated 61 days (5 in port, 8 in transit, and 48 in operations).

#### **4.2.2.3 Core Storage**

Cores for the Louisville Expedition will be stored at the Gulf Coast Repository.

### **4.2.3 Costa Rica Seismogenesis Project Expedition**

#### **4.2.3.1 Proposed Operations**

The CRISP Expedition is part of a complex drilling project designed to understand the processes that control nucleation and seismic rupture of large earthquakes at erosional subduction zones. The FY11 CRISP Expedition is based on part of IODP Proposal 537-Full5. Overall scientific objectives include constraining the architecture and evolution of the plate boundary megathrust, the role of fluids, and the nature of the upper plate in a tectonically erosive margin. The CRISP Expedition will focus on coring two slope sites (Site CRIS 3B—middle slope and Site CRIS 4A—upper slope).

#### **4.2.3.2 Logistics**

Operations for the CRISP Expedition are budgeted based on an estimated 30 days (2 in port, 3 in transit, and 25 in operations).

#### **4.2.3.3 Core Storage**

The cores for the CRISP Expedition will be stored at the Gulf Coast Repository.

### **4.2.4 Superfast Spreading Rate Crust 4 Expedition**

#### **4.2.4.1 Proposed Operations**

The Superfast Spreading Rate Crust 4 Expedition follows on the results of three previous expeditions (Ocean Drilling Program [ODP] Leg 206 and IODP Expedition 309/312) and aims to continue the mission to understand the accretion of oceanic crust formed at a superfast spreading rate at the East Pacific Rise. Previous drilling in ODP Hole 1256D reached a total penetration of 1506 m, including 1250 m into the igneous crust. The hole passed through 345 m of sheeted dikes and continued 100 m into gabbroic rock. This fourth expedition will deepen Hole 1256D as far as possible into gabbro to complete coring and logging of an entire upper to mid-oceanic crustal section. If problems are encountered and it becomes operationally impossible to deepen the hole, contingency sites at CRISP will be drilled.

#### **4.2.4.2 Logistics**

Operations for the Superfast Expedition are budgeted based on an estimated 51 days (4 in port, 8 in transit, and 39 in operations).

#### **4.2.4.3 Core Storage**

The cores for the Superfast Expedition will be stored at the Gulf Coast Repository.

### **4.2.5 Mid-Atlantic Ridge Microbiology Expedition**

#### **4.2.5.1 Proposed Operations**

The Mid-Atlantic Ridge Microbiology Expedition will examine the microbiology of a sediment pond and the underlying young, cold, and hydrologically active flank of the Mid-Atlantic Ridge. Drilling operations at three sites will include sediment/basalt coring, basement logging, and installation of three long-term subseafloor observatories. The primary science objectives are to investigate (1) the nature of microbial communities in young ridge flanks and their role in crustal weathering and (2) the origin of deep-seated microbial communities.

#### **4.2.5.2 Logistics**

Operations for this expedition will straddle FY11 and FY12. Operations for the FY11 portion of the Mid-Atlantic Ridge Microbiology Expedition are budgeted based on an estimated 13 days (5 in port, 4 in transit, and 4 in operations).

4.2.5.3 Core Storage

The cores for the Mid-Atlantic Ridge Microbiology Expedition will be stored at the Bremen Core Repository.

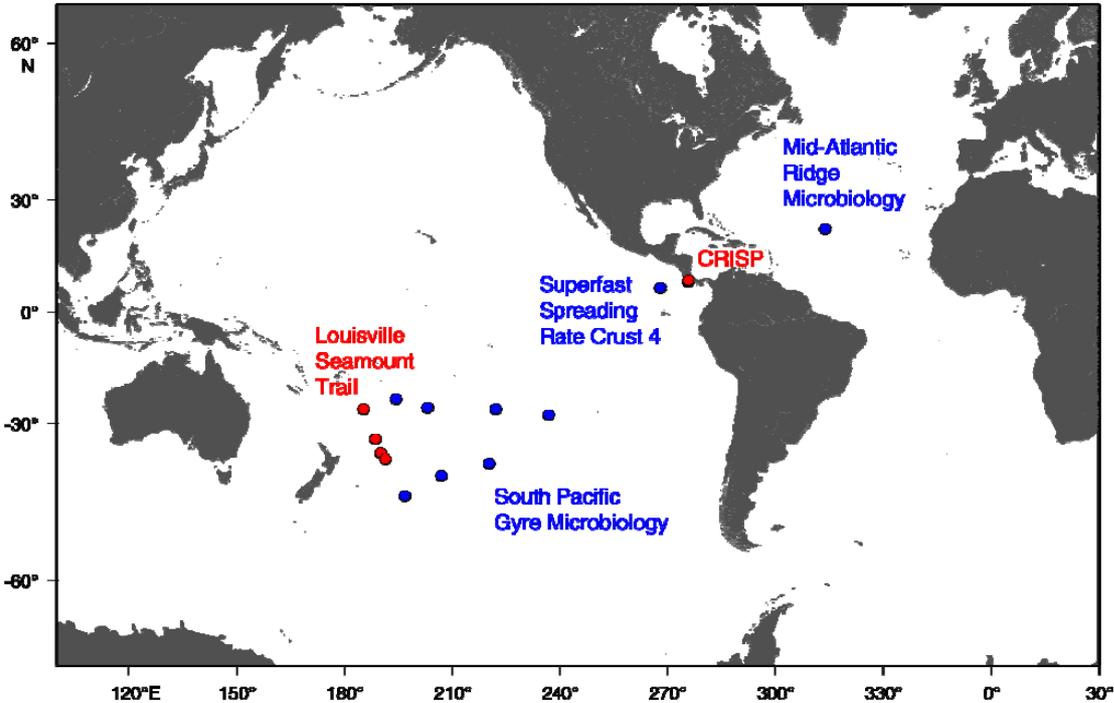


Figure APP- 5: IODP-USIO FY11 Site Map.

4.3 CDEX Operations

FY2011 operations for *Chikyu* will consist of continuing efforts toward completion of the NanTroSEIZE program. Specifically, the FY2011 program will conduct C0002 site riserless observatory installation and Input site coring and heat flow measurement. In mid August 2011, *Chikyu* will resume IODP operations with the start of riser drilling at site C0002, where drilling will proceed intermittently over the course of several years to reach the megasplay fault, décollement, and the oceanic crust, with an expected total depth of drilling to ~7,000 m below sea floor.

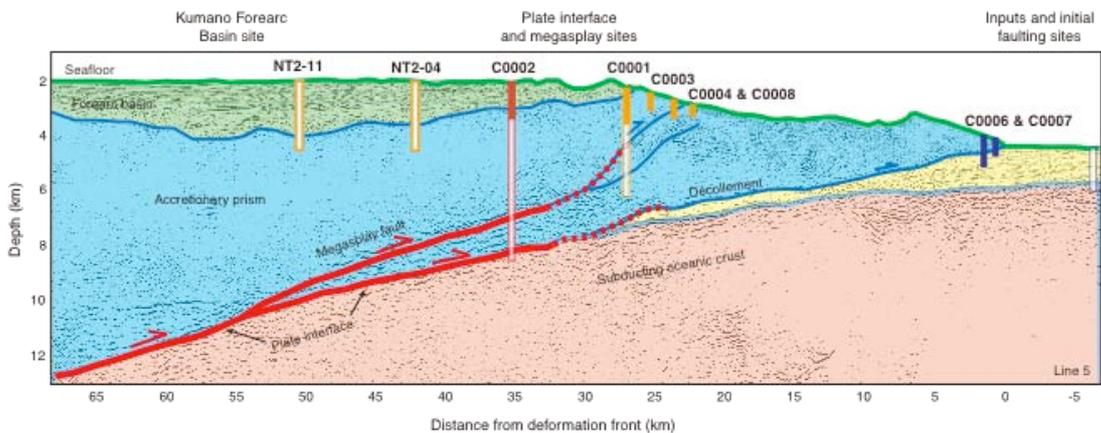


Figure APP- 6: Stylized cross-section of NanTroSEIZE area of operations.

#### **4.3.1 Expedition 332 NanTroSEIZE Subduction Inputs**

##### **4.3.1.1 Proposed Operations**

This IODP drilling expedition's main objective is to prepare a cased riserless hole for deployment of a permanent observatory at Site C0002. As part of this year's operations, a riserless hole (at Site C0002) will be drilled and cased to 1000 mbsf, into which a permanent observatory (the first in NanTroSEIZE) will be installed. The SmartPlug observatory deployed in Site C0010 will be recovered and evaluated for future deployment plans, and a new, upgraded; sensor package will be installed in its place.

##### **4.3.1.2 Experiments**

During this expedition, we plan on casing the riserless Site C0002 to 1000 mbsf. A permanent observatory will be deployed, and the SmartPlug installed at Site C0010 will be recovered and replaced with a "GENIUSPlug."

##### **4.3.1.3 Environment and Safety**

The site was selected based on scientific reasons, mainly concerned with reaching the main splay fault and the seismogenic zone where the main asperity underlying the accretionary wedge can be reached by drilling. The observatory sites have been chosen on the basis of targeting specific faults in the upper reaches of the accretionary wedge, as preparation for the final, permanent observatory installation projected at a depth of 6000 mbsf.

##### **4.3.1.4 Logistics**

This expedition will last for 45 days. One EPM (Expedition Project Manager/Staff Scientist) is assigned and 2 Co-Chief scientists are being selected. The expedition observatory team will consist of 12 members, who will embark and disembark *Chikyu* at CDEX's base in the Port of Shingu. Supply boats and a patrol ship will be employed during the expedition.

##### **4.3.1.5 Core Storage**

No coring.

#### **4.3.2 Expedition 333 (Inputs Sites & Heat Flow)**

##### **4.3.2.1 Proposed Operations**

These plans include: HPCS sediment coring with downhole temperature measurements at the subduction inputs sites (C0011 and C0012), and basement coring at Site C0012. There is drilling plan for NanTroSLIDE coring (IODP Proposal 738, Proposed Site NTS-1A), addressing recent slope sedimentation in relation to seismic and faulting activity.

##### **4.3.2.2 Experiments**

Numerous downhole measurement experiments will be conducted (temperature, pressure, etc).

##### **4.3.2.3 Environment and Safety**

The site was selected based on scientific reasons, mainly concerned with inputs and reaching basement by drilling. The secondary site has been chosen on the basis of targeting submarine landslide history and the constraints for slope deposit sliding behavior and tsunamigenic potential.

##### **4.3.2.4 Logistics**

This expedition will last for 28 days. One EPM (Expedition Project Manager/Staff Scientist) is assigned and 2 Co-Chief Scientists are being selected. The 27 expedition scientists will embark and disembark *Chikyu* at CDEX's base in the Port of Shingu.

##### **4.3.2.5 Cores Storage**

Cores and cuttings will be stored at Kochi Core Center.

#### **4.3.3 Expedition 337: Complementary Project Proposal: Coal-Bed Hydrocarbon System and Deep-Biosphere (Tentative)**

##### **4.3.3.1 Proposed Operations**

This project will extend C9001D, which was drilled and cased during *Chikyu* shakedown cruise in 2006, to the depth of 2200 mbsf by riser drilling to investigate the coal-bed hydrocarbon-associated deep microbial ecosystem. Eocene to Cretaceous lignite layers (~60% TOC) of approximately 100m thick hosts large amount of coal-bed methane, which creates a microbial habitat that has never been explored by scientific ocean drilling.

### **4.3.3.2 Experiments**

Numerous wireline logging experiments will be conducted.

### **4.3.3.3 Environment and Safety**

The site was selected based on extensive seismic surveys and a nearby MITI Sanriku-Oki well. Previously drilled borehole C9001A was cased to the depth of 511 mbsf, and suspended for the future drilling.

### **4.3.3.4 Logistics**

This expedition will last for 75 days. Detailed plan of staffing and logistics is to be decided.

### **4.3.3.5 Cores Storage**

Cores and cuttings will be stored at Kochi Core Center.

## **4.3.4 Expedition 338: Plate Boundary Deep Riser – 2**

### **4.3.4.1 Proposed Operations**

The proposed site has already been drilled in part during Chikyu shakedown IODP Expedition 326, and during IODP Expedition 338, this hole will be extended to approximately 3300 mbsf. Operations planned for this expedition include:

- Riser drilling, with continuous cuttings and mud gas analysis from ~856 mbsf to the Total Achieved Depth (TD), currently planned for ~3300 mbsf,
- Coring of several hundred meters at intervals deep within the inner wedge accretionary complex,
- LWD and wireline logging, downhole stress, pore pressure and permeability tests,
- A zero-offset and/or walkaway vertical seismic profile (Z-VSP, or W-VSP).

To recruit the science party for IODP Expedition 338, a “Call for application” will be issued early November 2010 and CDEX expects to receive applications from each PMO by the end of January 2011. We also expect to hold pre-expedition meeting in the beginning of February and publish Scientific Prospectus by the end of March 2011.

### **4.3.4.2 Environment and Safety**

The uppermost 1400 mbsf section at Site C0002 was previously logged with a comprehensive LWD program during Expedition 314 (Shipboard Scientific Party, 2009a), and intervals 0-204 mbsf and 475-1057 mbsf were cored during Expedition 315 (S.S.P., 2009b). The Kumano forearc basin sedimentary package composes the interval from 0-940 mbsf, and it is underlain by the “inner wedge” deformed accretionary wedge package. The seismic reflection character of the entire zone from ~ 940 mbsf to the megasplay reflector at ~5200 mbsf exhibits virtually no coherent reflectors indicative of intact stratal packages, in contrast to the outer accretionary wedge seaward of the mega-splay fault system. IODP Site C0002 is the centerpiece of the NanTroSEIZE project, intended to access the plate interface fault system at a location where it is believed to be capable of seismogenic locking and slip, and to have slipped coseismically in the 1944 Tonankai earthquake (e.g. Ichinose et al., 2003).

### **4.3.4.3 Logistics**

Scientists with interest and expertise in accretionary complex evolution, state of stress in a plate boundary setting, physical and hydrological properties and their evolution, pore fluid properties and processes, core-log-seismic integration (CLSI) in structurally-complex settings, and deep subsurface biology are invited to apply. A shipboard party size of ~13 scientists at a time for each of three 6-8 week periods is anticipated, for ~ 40 scientists in total.

## 4.4 ECORD Science Operator Operations

### 4.4.1 Chicxulub: Drilling the K-T Impact Crater

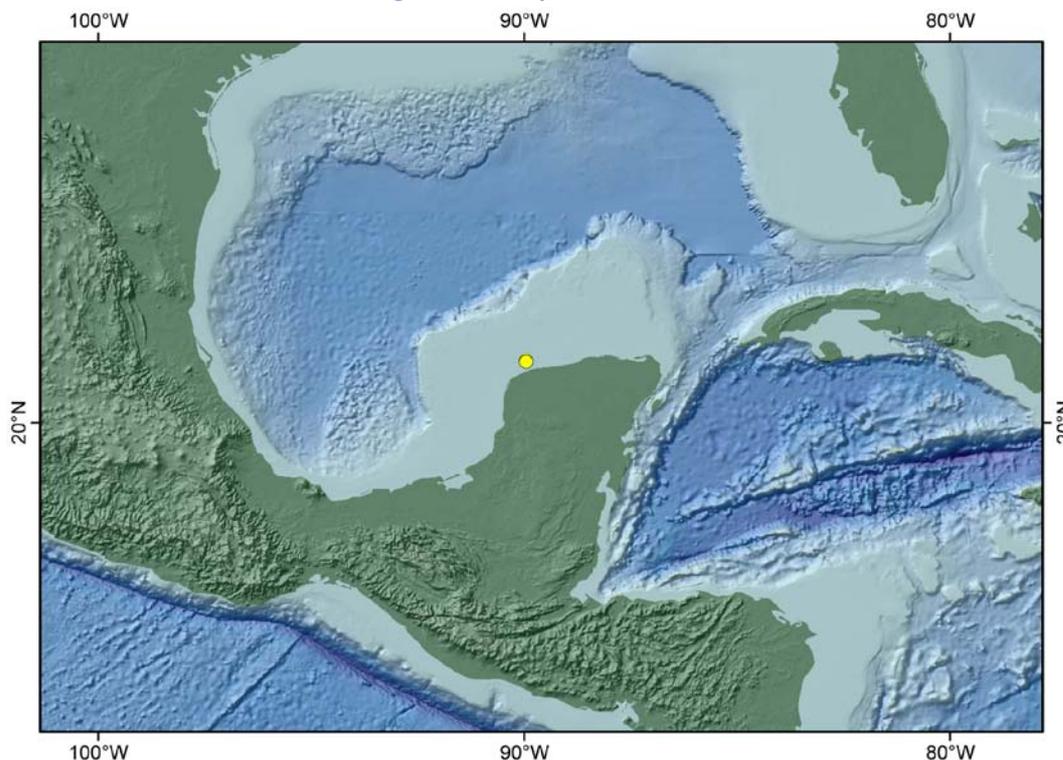


Figure APP- 7: ESO Drilling site for FY2011.

#### 4.4.1.1 Proposed Operations

The 2 proposed primary sites and 1 alternative site have been approved by SSP and preliminarily reviewed EPSP. Initial scoping of this project has included discussions on permitting issues with ICDP, who have conducted scientific drilling onshore. ESO will begin exploring permitting with the Mexican authorities immediately. A tender to provide a hazard site survey in FY2011 or in FY2012, possibly combined with a tender to provide a drilling vessel and coring services in FY2013 will be issued to core in water depths of 17 metres, with penetrations not exceeding 1500 metres. It is anticipated that a technique similar to that used for the New Jersey Shallow Shelf Expedition will be employed, but the precise methodology will be dependent upon the eventual contract.

#### 4.4.1.2 Experiments

No experiments are anticipated.

**4.4.1.3 Environment and Safety**

ESO will contract a geotechnical site investigation of the seabed in the vicinity of the proposed sites, and will seek an independent gas-hazard survey if required. ESO will investigate and apply for all necessary permits to work in Mexican waters.

**4.4.1.4 Logistics**

No major logistics are envisaged, other than the mobilisation of the hazard site survey which will be handled by the contracted survey company.

**4.4.2 Onshore Science Party (OSP)**

The Onshore Science Party for the Chicxulub Expedition may take place at the Bremen Core Repository during late FY2013 or FY2014, and so no costs are presented for a Mission Specific Platform Onshore Science Party in this budget.

## **5 Management and Administration**

### **5.1 Goals**

The goal of Management and Administration of various IODP related entities, including IODP-MI, IOs, SAS, and Program Offices is to plan and coordinate with other IODP-related entities; oversee, review, and report on IODP activities.

### **5.2 Deliverables in FY2011**

- Annual Program Plan – The Annual Program Plan (APP) is the central document in IODP, which describes all the planned activities and costs in Science and Platform Operations. APP is drafted by IODP-MI in close coordination with the IOs. After being approved by SASEC and the Board of Governors, the APP is finalized by approval of the Lead Agencies. Both IODP-MI and IOs are required to assure the implementation of activities written in the APP.
- Quarterly and Annual Reports – IODP-MI and IOs develop quarterly and annual reports, including financial reports.
- Reporting and Liaising (Mostly for IOs) – Report and liaise with funding agencies and with IODP-related entities (e.g., SAS meeting), Program Member Offices and other national organizations and participate in IODP-MI Task Forces, working groups, etc.
- Coordination (for IODP-MI) – IODP-MI “coordinates” with IOs, SAS Panels, SPC, SASEC, Board of Governors, Program Offices, funding agencies and various subcontractors. “Coordination” is the major deliverable of Management and Administration of IODP-MI, and various task forces play a key function in this coordination.
- Contract Services – Provide contract services for IODP-related activities.

### 5.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	1,633,561	350,735	344,111	619,514	-	\$ 2,947,921
Travel	414,333	34,725	170,000	192,000	-	\$ 811,058
Supplies	45,000	7,750	20,000	15,000	-	\$ 87,750
Shipping	27,333	2,270	-	-	-	\$ 29,603
Communication	76,250	10,736	8,000	-	-	\$ 94,986
Contractual Services	157,333	6,000	76,600	-	-	\$ 239,933
Equipment	25,000	50	-	15,000	-	\$ 40,050
Other Direct Costs	1,242,167	5,735	-	25,000	-	\$ 1,272,902
<b>Total Direct Costs</b>	<b>3,620,977</b>	<b>418,001</b>	<b>618,711</b>	<b>866,514</b>	<b>-</b>	<b>\$ 5,524,203</b>
Modified Direct Costs (If applicable)	-	72,401	542,111	-	-	\$ 614,512
Consumption tax (5%)	25,133	-	-	-	-	\$ 25,133
<b>Indirect Costs/Administrative Fee</b>		<b>227,014</b>	<b>162,633</b>	<b>-</b>	<b>-</b>	<b>\$ 389,647</b>
<b>Total</b>	<b>\$ 3,646,110</b>	<b>\$ 645,015</b>	<b>\$ 781,344</b>	<b>\$ 866,514</b>	<b>\$ -</b>	<b>\$ 5,938,983</b>

Table APP- 5-1: Management and Administration Budget Summary for FY2011.

Expense Category	IODP-MI	USIO	CDEX	Bremen	Total
Salary and Fringes	1,633,561	350,735	344,111	-	\$ 2,328,407
Travel	414,333	34,725	170,000	-	\$ 619,058
Supplies	45,000	7,750	20,000	-	\$ 72,750
Shipping	27,333	2,270	-	-	\$ 29,603
Communication	76,250	10,736	8,000	-	\$ 94,986
Contractual Services	157,333	6,000	76,600	-	\$ 239,933
Equipment	25,000	50	-	-	\$ 25,050
Other Direct Costs	1,242,167	5,735	-	-	\$ 1,247,902
<b>Total Direct Costs</b>	<b>3,620,977</b>	<b>418,001</b>	<b>618,711</b>	<b>-</b>	<b>\$ 4,657,689</b>
Modified Direct Costs (If applicable)	-	72,401	542,111	-	\$ 614,512
Consumption tax (5%)	25,133	-	-	-	\$ 25,133
<b>Indirect Costs/Administrative Fee</b>		<b>227,014</b>	<b>162,633</b>	<b>-</b>	<b>\$ 389,647</b>
<b>Total</b>	<b>\$ 3,646,110</b>	<b>\$ 645,015</b>	<b>\$ 781,344</b>	<b>\$ -</b>	<b>\$ 5,072,469</b>

Table APP- 5-2: Management and Administration Contract Budget for FY2011.

### 5.4 Justification

#### 5.4.1 IODP-MI

**Salaries and Fringes** – Include an anticipated cost-of-living allowance and estimated fringe benefits rate for IODP-MI and ISHI M&A staff.

**Travel** – Includes all domestic and foreign travel for the IODP-MI and ISHI M&A staff, the SPC and SASEC chairs, multiple task forces and work groups, Project Management Teams, Board of Governors and Executive Committee meetings.

**Supplies** – Office supplies and expendables.

**Shipping** – Includes costs for regular postage, overnight deliveries and bulk mailings.

**Communication** – includes inter-office (Tokyo-DC) communication charges.

**Contractual Services** – Include Contracts Officer position (currently a contractor).

### **Other Direct Costs –**

**IODP-MI** (\$911,500) - Includes association dues, meeting expenses, compensation for SPC and SASEC Chairs, honoraria for Panel Chairs and Specialty Coordinators. Includes supporting New Science Plan Writing Committee activity and scoping groups. Covers general audit, legal and administration service fees and corporate licenses and insurance, DC office and equipment rental.

**ISHI Subcontract** (\$330,667) - includes Tokyo office rental and equipment lease. Covers general audit, legal and administration service fees and corporate licenses and insurance. It also includes relocation and recruiting fee, education and back transfer fee.

### **5.4.2 USIO**

**Salaries and Fringes** – Salaries, fringes, and sea pay, including an anticipated cost-of-living allowance and estimated fringe benefits rate.

**Travel** – Transportation, per diem, lodging, and other associated costs.

**Supplies** – General office supplies and expendables and operational supplies.

**Shipping** – Postage, express mail, courier services and freight.

**Communication** – Telephone and fax charges.

**Contractual Services** – Consultant and contract services.

**Equipment** – Procurement, upgrading, or fabrication of equipment with an acquisition cost of more than \$5,000, plus those items as defined by Columbia University and TAMRF policy.

**Other Direct Costs** – Costs not covered in other categories:

- **Training** – Registration, transportation, per diem, and lodging expenses related to professional training.
- **Business Conferences** – Incidental expense associated with meetings hosted by the USIO.
- **Insurance** – Annual insurance premium.
- **Services** – Expert assistance.
- **TAMU Computing Services** – Use of TAMU’s financial and management information System (FAMIS).
- **Equipment Rental** – Rental of equipment for when it is more economical to rent than purchase.
- **Furniture** – Office furniture.
- **Recruiting** – Employee recruitment.
- **Maintenance and Repair** – Equipment agreements and equipment repairs.
- **Library** – Books, journals, resources, and subscriptions to professional materials.

**Indirect Costs** – Administrative and financial costs associated with operating the Program. The specific equations used to calculate these costs vary by institution (For details, see **5.3 of Appendix B**).

#### **5.4.3 CDEX**

**Salaries and Fringes** - Salaries and fringes for staff in CDEX (For details, see Appendix C.3)

**Travel** – Transportation, per diem, accommodation and other associated cost for all foreign and domestic travel including international meetings (IODP related meetings), domestic meetings, travel to shore base, travel to Heli base, travel to subcontractor site.

**Supplies** - General office supplies

**Communication** - Telephone charges, Mobile phone charges, fax charges and postage.

**Contractual Service** – Part time worker and computer and software rental.

#### **5.4.4 ESO (directly funded through EMA)**

**Salaries and Fringes** – Portion of salaries at standard institution rates, including overheads.

**Travel** – Transportation, per diem and accommodation for all tasks, including ESO internal meetings, IO meetings, ECORD Council meetings, ESSAC meetings, meetings of other IODP bodies including panels and committees, IODP-MI task forces, operational reviews and a range of appropriate scientific conferences (including conference fees) and workshops.

**Supplies** – General office supplies.

**Equipment** – Miscellaneous items, upgrades, etc.

**Other Direct Costs** – Training for all partners.

## 6 Technical, Engineering and Science Support (TESS)

### 6.1 Goals

Goals for this Work Breakdown Element (WBE) primarily relate to the Implementing Organizations and include managing, coordinating, and performing the activities and providing the services, materials, platforms, and ship- and shore-based laboratories necessary to support IODP expeditions.

### 6.2 Deliverables for FY2011

Generic deliverables for this Work Breakdown Element are presented below. These deliverables are applicable to the specific IO expedition operations described in **Section 4** of the main text of this report, as well as in **Appendices B** (USIO), **C** (CDEX), and **D** (ESO).

- Expedition Planning and Implementation: Provide scientific and operational planning and execution for each scheduled expedition, including provision of a drilling platform. Conduct long-range operational planning for out-year expeditions.
- Reporting: Provide expedition-related reports and content for expedition publications (e.g., *Scientific Prospectus*, *Preliminary Report*, etc.). Act as a liaison to Science Advisory Structure (SAS) and other panels and task forces as appropriate.
- Expedition Staffing: Provide selection and support for scientific staffing and Co-Chief Scientist selection for each scheduled expedition. Provide support for shipboard and shorebased technical personnel and activities.
- Logistical Support: Provide for expedition and shore-based activities including procurement, shipping, and inventory of equipment and supplies.
- Analytical Systems: Provide and maintain shipboard and shore-based analytical facilities and associated quality control/quality assurance protocols. Ensure effective capture and transfer of expedition data to database systems.
- Logging: Provide for the delivery of logging services including back-off/severing services where needed.
- Engineering Support: Provide engineering support for maintaining and developing shipboard and shore-based drilling, coring, logging, and downhole systems including third-party developments.
- Applications Development: Provide maintenance and support for custom software
- Applications for the capture and shipboard management of operational, sampling, and analytical information.
- Legacy Documentation.

### 6.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	-	231,197	1,264,750	587,431	-	\$ 2,083,378
Travel	-	57,901	-	77,500	-	\$ 135,401
Supplies	-	2,000	150,000	-	-	\$ 152,000
Shipping	-	4,397	80,000	-	-	\$ 84,397
Communication	-	1,905	-	-	-	\$ 1,905
Contractual Services	-	-	5,668,184	315,000	-	\$ 5,983,184
Equipment	-	-	-	20,000	-	\$ 20,000
Other Direct Costs	-	-	-	20,000	-	\$ 20,000
<b>Total Direct Costs</b>	-	297,400	7,162,934	1,019,931	-	\$ 8,480,265
Modified Direct Costs (If applicable)	-	283,400	1,494,750	-	-	\$ 1,778,150
<b>Indirect Costs/Administrative Fee</b>	-	150,202	448,425	-	-	\$ 598,627
<b>Total</b>	\$ -	\$ 447,602	\$ 7,611,359	\$ 1,019,931	\$ -	\$ 9,078,892

Table APP- 6-1: Technical, Engineering, and Science Support Budget for FY2011.

Expense Category	IODP-MI	USIO	CDEX	Bremen	Total
Salary and Fringes	-	231,197	1,264,750	-	\$ 1,495,947
Travel	-	57,901	-	-	\$ 57,901
Supplies	-	2,000	150,000	-	\$ 152,000
Shipping	-	4,397	80,000	-	\$ 84,397
Communication	-	1,905	-	-	\$ 1,905
Contractual Services	-	-	5,668,184	-	\$ 5,668,184
Equipment	-	-	-	-	\$ -
Other Direct Costs	-	-	-	-	\$ -
<b>Total Direct Costs</b>	-	297,400	7,162,934	-	\$ 7,460,334
Modified Direct Costs (If applicable)	-	283,400	1,494,750	-	\$ 1,778,150
<b>Indirect Costs/Administrative Fee</b>	-	150,202	448,425	-	\$ 598,627
<b>Total</b>	\$ -	\$ 447,602	\$ 7,611,359	\$ -	\$ 8,058,961

Table APP- 6-2: Technical, Engineering, and Science Support Contract Budget for FY2011

### 6.4 Justification

#### 6.4.1 IODP-MI

None.

#### 6.4.2 USIO

**Salaries and Fringes** – Salaries, fringes, and sea pay, including an anticipated cost-of living allowance and estimated fringe benefits rate.

SOC – Salaries and fringes for staff providing technical support during CDEX expeditions.

**Travel** –Transportation, per diem, lodging, and other associated costs.

SOC– Travel for USIO staff who will sail on the *Chikyu* during CDEX expeditions.

**Supplies** – Office and operational supplies.

SOC – General office supplies; electronic media and other computer supplies with an acquisition cost of less than \$1,000 (for TAMU); printer and copier supplies; laboratory, logistic, and shipping supplies for FY11 expeditions and shipboard and shore-based analytical

## Integrated Ocean Drilling Program

and engineering laboratory and test facilities. Other drilling or science supplies may be purchased in support of USIO deliverables using cost avoidances gained during the fiscal year.

**Shipping** – Postage, express mail, and freight.

SOC – Shipping of tools to the *Chikyu* for use during CDEX expeditions.

**Communication** – Satellite, telephone, and fax charges.

SOC – Standard telephone line, long distance, and fax charges.

**Indirect Costs** – Administrative and financial costs associated with operating the Program.

SOC/POC—For LDEO, indirect costs at 53% are assessed on all charges except permanent equipment. In addition, subcontracts are charged indirect costs on the first \$25,000 of each contract. The indirect costs for subcontracts established prior to FY11 have already been paid, so these subcontracts are not subject to indirect cost during FY11. MTDCs are the total direct costs minus these exceptions.

### 6.4.3 CDEX

**Salaries and Fringes** - Salaries and fringes for staff in CDEX (For details, see Appendix C.3)

**Supplies** - Consumables for onboard lab equipment and stationeries.

**Contractual Service** -

**1) Lab Technical Services** - Annual lump-sum contract for Lab Technical Services. The contractor provide 24 hours on-board lab technical services during expeditions as well as preparation works, equipment maintenance and procurement of lab consumables throughout the year. SOC covers personnel cost for lab technicians while POC covers travel expense, overhead and personnel cost for lab technicians during Exp.337 operation period. (SOC – \$2,209,422)

**2) Logistic Support** - Transportation cost for science party (including Publication Assistants and APCT/DVTP engineers from TAMU) between hotel to Minami-Ise Heliport, hotel to Shingu shore base and their baggage transportation between Minami-Ise Heliport to Shingu base if necessary. (SOC – \$20,000)

**3) V-SAT** - V-SAT communication during expedition. The bandwidth has been upgraded from 512kbps to 768kbps to provide better communication services together with network accelerator. (SOC – \$70,000)

**4) Equipment Maintenance** - Annual maintenance for *Chikyu* Lab measurement instrument including the X-CT scanner's annual maintenance contract, which is required by Japanese law. (SOC – \$250,000).

**5) Wireline Logging** - Contract for wire line logging for Exp.337 including data processing. (SOC – \$2,032,307)

**6) LWD** - Contract for LWD for both expedition 332 and C0002 Riser hole including data processing. (SOC- \$1,086,455)

### 6.4.4 ESO

**Salaries and Fringes** – Portions of salaries at standard institution rates, including overheads for planning of future MSP Expeditions.

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**Travel** – Scoping, planning and preparation will require a variety of meetings among ESO staff, with co-chiefs and scientists, scoping groups, discussion with actual or potential contractors, for contractual issues and staff exchanges.

**Contractual services** – Costs for purchasing eight slimline logging tools, and associated equipment are included in the Logging Budget for future expeditions. (For details, see Appendix D6.5.4)

**Equipment** – Logging-related computer hardware is required, in order to ensure measurement compatibility.

**Other Direct Cost** – Bremen University laboratory upkeep and certification.

## **7 Engineering Development**

### **7.1 Goals**

IODP-MI has limited staff resources in the area of Engineering Development and therefore outsources most implementation of engineering related development and all IO-related science support. IODP-MI's primary role in the Engineering Development process is to facilitate acquisition of technology needed for IODP to meet the objectives described in the Initial Science Plan and to oversee the contracts that are implemented to develop the required technology. IODP-MI will utilize the SAS-derived IODP Technology Roadmap as the primary guide for the acquisition this technology.

In addition to the projects funded by Science Operating Costs, IODP-MI Engineering project oversight has extended to Platform Operating Costs (POC) projects from FY2010 as a service to the funding agencies (when requested). The goal of this additional service is to provide uniform review and oversight to all areas of engineering within the Integrated Ocean Drilling Program. IODP-MI will not have any fiscal authority over POC-funded engineering projects, but will only offer advice to funding agencies for their use in prioritizing and monitoring POC-funded projects.

### **7.2 Deliverables in FY2011**

IODP-MI will manage new and on-going engineering projects to ensure their successful completion using internal and external oversight resources. IODP-MI utilizes the programmatic, high-level advice from the Science Advisory Structure to complete broad reviews of projects. To implement this advice from SAS and to conduct detailed, low level engineering reviews of projects and initiatives, IODP-MI may assign external reviewer. The external reviewer will be industry and academic experts possessing experience in areas of specific technology of interest to the program.

IODP-MI will continue to receive unsolicited proposals and may solicit proposals if technology needs demand the solicitation of proposals from outside the pool of received proposals.

IODP-MI will continue its initiative to quantify coring and to identify the factors controlling the quantity of collected core.

IODP-MI will be actively managing two specific engineering projects in FY2011. And USIO will be managing one project in FY2011.

- A. Simple Cabled Instrument for Measuring Parameters In-situ (SCIMPI).
  - The land test, data calibration, QA/QC test and operation manual execution will be conducted in FY2011.
- D. Core Quality and Quantity Study.
  - Expand coring study and generate final report.
- C. Multi-sensor Magnetometer Module logging tool (MMM): by USIO.
  - Complete tool delivery, modifications, and completion of third party tool certification requirements.

### 7.2.1 Simple Cabled Instrument for Measuring Parameters In-situ (SCIMPI)

The detailed design and the prototype fabrication of the SCIMPI, simple observatory tool, have been completed in FY2010. Following the construction of a working prototype in FY2010, the land test, data calibration, QA/QC test and operation manual execution will be conducted in FY2011 and prepared for testing in FY2011-12.

Task	FY2009						FY2010						FY2011						FY2012					
	O	D	F	A	J	A	O	D	F	A	J	A	O	D	F	A	J	A	O	D	F	A	J	A
SCIMPI																								
High Level Design																								
Detailed design																								
Prototyping																								
Fabrication																								
Testing																								
Common Deployment System																								
Begin design																								
Finalize design																								
Fabrication																								

Figure APP- 8: The multiple year SCIMPI development plan.

### 7.2.2 Core Quality and Quantity Study

IODP-MI personnel initiated the first phase of a study in FY2008 to quantitatively evaluate coring results in an effort to identify, and ultimately remediate, factors that affect the quantity and quality of recovered core. IODP-MI personnel coordinated case studies to help identify factors controlling the quantity and quality of core collected by IODP. IODP-MI will conclude the study with consultation of expert in FY2011 and generate the final report.

### 7.2.3 Multi-sensor Magnetometer Module logging tool (MMM); by USIO

The MMM is a new project that proposed two years ago and subsequently vetted through SAS and IODP-MI engineering management.

Multisensor Magnetometer Module (MMM): A new magnetometer tool under development at LDEO (FY11 will be the second year of the project). The MMM will produce continuous records of the magnetic field in the borehole, from which magnetization and polarity of the rocks surrounding the borehole can be calculated. This downhole magnetic information will complement core sample magnetic measurements and significantly enhance IODP’s ability to magnetostratigraphically date sediment sequences. Deliverables for this project include tool delivery, modifications to extend LDEO and Schlumberger telemetry systems and surface panel software, and completion of third party tool certification requirements in FY11, followed by bench and field tests at the LDEO test well and sea deployment in FY12.

Task	FY2010						FY2011						FY2012					
	O	D	F	A	J	A	O	D	F	A	J	A	O	D	F	A	J	A
Multi-Sensor Magnetometer Module																		
Design																		
Sensor acquisition																		
Electronics and software creation																		
Tool calibration																		
Testing																		
Deployment																		

Figure APP- 9: The multiple year Multi-sensor magnetometer module development plan. The area highlighted in red represents the tasks have been completed in FY2010.

### 7.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	-	50,269		-	-	\$ 50,269
Travel	30,000	7,500		-	-	\$ 37,500
Supplies	-	2,000		-	-	\$ 2,000
Shipping	-	2,500		-	-	\$ 2,500
Communication	-	500		-	-	\$ 500
Contractual Services	181,969	-		-	-	\$ 181,969
Equipment	-	-		-	-	\$ -
Other Direct Costs	-	347		-	-	\$ 347
<b>Total Direct Costs</b>	211,969	63,116		-	-	\$ 275,085
Modified Direct Costs (If applicable)	-	63,116		-	-	\$ 63,116
<b>Indirect Costs/Administrative</b>	-	33,452		-	-	\$ 33,452
<b>Total</b>	\$ 211,969	\$ 96,568	\$ -	\$ -	\$ -	\$ 308,537

Table APP- 7: Engineering Development Budget for FY2011.

### 7.4 Justification

#### 7.4.1 IODP-MI

**Travel** – Travel costs for engineering development personnel required to attend science advisory structure panel meetings, contractor oversight and workshops as needed.

**Contractual Services** – IODP-MI is requesting \$181,969 for subcontracts to complete two projects above. The third year of the contractual award will be made to the University of Rhode Island to conduct the modification of the SCIMPI device and test. The award to URI will be in amount of \$156,969 and is based on the existing three year contract with IODP-MI. \$25,000 is requested to retain an engineering/drilling consultant to conclude the Core Quality and Quantity Study.

#### 7.4.2 USIO

**Salaries and Fringes** – Salaries, fringes, and sea pay, including an anticipated cost-of-living allowance and estimated fringe benefits rate.

SOC – Salaries and fringes for staff supporting the USIO.

**Travel** – Transportation, per diem, lodging, and other associated costs.

SOC – Travel for meetings with contractors and calibration tests of the MMM tool in the Schlumberger calibration facility for magnetic tools.

**Supplies** – Office and operational supplies.

SOC – Operational, logistic, and shipping supplies.

**Shipping** – Postage, express mail, and freight.

SOC – Shipment of the MMM tool for calibration at Schlumberger in Texas.

**Communication** – Satellite, telephone, and fax charges.

SOC – Standard telephone line, long distance, and fax charges.

**Other Direct Costs** – Costs not covered in other categories.

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**Indirect Costs** – Administrative and financial costs associated with operating the Program.

SOC—Indirect costs at 53% are assessed on all charges except permanent equipment. In addition, subcontracts are charged indirect costs on the first \$25,000 of each contract. The indirect costs for subcontracts established prior to FY11 have already been paid, so these subcontracts are not subject to indirect cost during FY11. MTDCs are the total direct costs minus these exceptions.

### **7.4.3 CDEX**

No budget for CDEX is requested.

### **7.4.4 ESO**

No budget for ESO is requested.

## 8 Core Curation

### 8.1 Goals

The major goal associated with this Work Breakdown Element is to provide services in support of IODP core sampling and curation of the core collection archive. IODP supports operations at three core repositories: the Gulf Coast Repository (GCR) operated by the USIO, the Kochi Core Center Repository (KCC) operated by CDEX, and the Bremen Core Repository operated by Bremen University (**Table APP-7**).

Repository	Institution	Geographic Location
GCR	Texas A&M University	Pacific Ocean (east of western trench boundaries); Caribbean Sea and Gulf of Mexico; Southern Ocean (>60°S, except Kergurlan Plateau)
BCR	University of Bremen	Atlantic Ocean, Mediterranean Sea, Arctic Ocean (north of Bering Strait)
KCC	Kochi University	Western Pacific Ocean (west of trench boundaries); Indian Ocean, Kerguelan Plateau; Bering Sea

Table APP- 7: Core Distribution Scheme for IODP.

### 8.2 Deliverables in FY2011

The primary deliverables for the repositories during FY2011 are listed below.

- Policy and Procedures: Work with other IOs, the Science Advisory Committee (SAS), and the IODP central management office (IODP-MI) to implement a policy for IODP core curation. Work closely with staff to coordinate, standardize, and document curatorial procedures for IODP cores and samples.
- Sample and Curation Strategies: Plan sample and curation strategies for specific expeditions identified in Section 4 of this Annual Program Plan and review all shipboard and moratorium-related requests in coordination with the other members of the Sample Allocation Committee (SAC) for each expedition.
- Sample Materials Curation System (SMCS): Produce a design document for a successor to the SMCS system and test the new database during its development.
- Sample Requests: Respond to post-moratorium sample requests from the scientific community.
- Core Sampling: Provide curator specialist on board the drillship to supervise core sampling during ship operations.
- Core Curation: Conduct all responsibilities associated with curation of core collections.
- Use of Core Collection: Promote the outreach use of the core collection in collaboration with Implementing Organization (IO) and IODP-MI education/outreach personnel by providing materials for display at meetings or museums, as well as conducting tours and supporting other program outreach activities.
- Meetings: Host and/or participate an annual IODP curatorial staff meeting. Act as IO liaison for meetings with the other IOs, IODP-MI, and the SAS, as appropriate.

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- Prepare legacy documentation on sampling activities.

### 8.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	-	276,125	296,835	62,911	185,085	\$ 820,956
Travel	-	33,000	-	7,000	6,050	\$ 46,050
Supplies	-	15,000	50,000	2,500	10,850	\$ 78,350
Shipping	-	18,750	50,000	6,000	40,000	\$ 114,750
Communication	-	2,625	4,000	-	-	\$ 6,625
Contractual Services	-	-	148,449	-	-	\$ 148,449
Equipment	-	-	-	-	-	\$ -
Other Direct Costs	-	4,725	-	-	-	\$ 4,725
<b>Total Direct Costs</b>	-	350,225	549,284	78,411	241,985	\$ 1,219,905
Modified Direct Costs (If applicable)	-	-	400,835	-	-	\$ 400,835
<b>Indirect Costs/Administrative Fee</b>	-	-	120,251	-	96,794	\$ 217,045
<b>Total</b>	\$ -	\$ 350,225	\$ 669,535	\$ 78,411	\$ 338,779	\$ 1,436,950

Table APP- 8 -1: Core Curation Budget for FY2011.

Expense Category	IODP-MI	USIO	CDEX	Bremen	Total
Salary and Fringes	-	276,125	296,835	185,085	\$ 758,045
Travel	-	33,000	-	6,050	\$ 39,050
Supplies	-	15,000	50,000	10,850	\$ 75,850
Shipping	-	18,750	50,000	40,000	\$ 108,750
Communication	-	2,625	4,000	-	\$ 6,625
Contractual Services	-	-	148,449	-	\$ 148,449
Equipment	-	-	-	-	\$ -
Other Direct Costs	-	4,725	-	-	\$ 4,725
<b>Total Direct Costs</b>	-	350,225	549,284	241,985	\$ 1,141,494
Modified Direct Costs (If applicable)	-	-	400,835	-	\$ 400,835
<b>Indirect Costs/Administrative Fee</b>	-	-	120,251	96,794	\$ 217,045
<b>Total</b>	\$ -	\$ 350,225	\$ 669,535	\$ 338,779	\$ 1,358,539

Table APP- 8 -2: Core Curation Contract Budget for FY2011.

### 8.4 Justification

#### 8.4.1 IODP-MI

None budgeted

#### 8.4.2 USIO

**Salaries and Fringes** – Salaries, fringes, and sea pay, including an estimated fringe benefits rate.

SOC/POC – Salaries, fringes, and sea pay for staff supporting the USIO.

**Travel** – Transportation, per diem, lodging, and other associated costs.

SOC/POC – Travel to IODP meetings and workshops, IO meetings, and USIO meetings, including an annual IODP Curators meeting; an AGU meeting; and travel costs for TAMU staff that will sail on FY11 expeditions.

**Supplies** – Office and operational supplies.

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SOC/POC – General office supplies, printer supplies, general laboratory supplies, specialized supplies for sampling and curatorial tasks, and supplies for packing extra-large shipments, packing deep frozen microbiological shipments, and hosting sampling parties.

**Shipping** – Postage, express mail, and freight.

SOC/POC – Postage for regular correspondence, regular-sized sample shipments to scientists, and as many as 10 special sample shipments for FY11 (for deep-frozen microbiological samples, U-channels, or whole core sections for XRF scanning) at an average cost of \$1,000 each.

**Communication** – Telephone and fax charges.

SOC/POC—Standard telephone line, long distance, cellular phone, and fax charges.

### **8.4.3 CDEX**

**Salaries and Fringes** - Salaries and fringes for staff in KCC. (For details, see Appendix C.3)

**Supplies** - General office supplies, general laboratory supplies and curatorial tasks.

**Shipping** - Courier and postage for sample shipping, containers and other associated cost for shipping, u-channels.

**Communication** - Telephone charges, Mobile phone charges, fax charges and postage.

**Contractual Service** -

**1) Curation technical Services** - Annual lump-sum contract for curatorial specialist services in KCC. SOC covers personnel cost for curatorial specialist. (SOC – \$95,949)

**2) Industrial waste disposal** - Disposal cost for industrial waste designated by the local government. Most core storage-materials and materials used for core transport are in this category. (SOC – \$10,000)

**3) Core management system maintenance** - Annual maintenance cost for the core storage management software being used at KCC. (SOC – \$15,000)

**4) Rental** - Annual rental cost of one forklift used at KCC to move IODP cores from yard to storage and computer for IODP curation staff. (SOC – \$20,000)

**5) Brochures, DVD** - KCC's own outreach materials to introduce core data archived in KCC and how to submit sample request, etc. (SOC – \$7,500)

### **8.4.4 ESO**

**Salaries and Fringes** - SOC – Portions of salaries at standard institution rates, including overheads.

**Travel** - SOC – This category is an estimated projection for travel to meetings related to IODP curatorial topics. It may include visits to the Gulf Coast and Kochi Repositories for technical and training exchange, as well as cooperative work.

**Supplies** - SOC – The bulk of this category is for materials related to sampling needs. This includes plastic scoops and tubes, u-channels, Pmag cubes, Styrofoam plugs, sample bags, shipping boxes, labels and ink bands for the printers; tape for the d-tubes and for packing, etc. The amount is loosely based on past needs for MSP core sampling, but future sampling activity levels are difficult to assess. We can only assume that sampling levels will increase as the size of our collection increases.

**Shipping** - SOC – These costs are primarily for courier shipping of samples (incl. u-channels, and archive core halves for non-destructive measurements requests) worldwide to the requesting investigators. As with the Supplies category, the amount depends on the amount of sampling activity, which certainly will continue to increase with the size of our collection.

### **8.4.5 Bremen**

**Salaries and Fringes** - SOC - This category is the equivalent of 1.6 FTE positions, and is used to cover 80% of the salaries of W. Hale and A. Wülbers. Due to an expected standard 4 per cent annual salary increase, based on our (80%) FY09 salary expenditure of \$171,121.71, prorated for 2 years to 2011, we have added \$13,963.53 to this category.

**Travel** - SOC - This category is an estimated projection for travel to meetings related to IODP curatorial topics. It may include visits to the Gulf Coast and Kochi Repositories for technical and training exchange, as well as cooperative work.

**Supplies** - SOC - The bulk of this category is for materials related to sampling needs. This includes plastic scoops and tubes, u-channels, Pmag cubes, Styrofoam plugs, sample bags, shipping boxes, labels and ink bands for the printers; tape for the d-tubes and for packing, etc. The amount is loosely based on past needs, but future sampling activity levels are difficult to assess. We can only assume that sampling levels will increase as the size of our collection increases.

**Shipping** - SOC - These costs are primarily for courier shipping of samples worldwide to the requesting investigators. As with the Supplies category, the amount depends on the amount of sampling activity, which certainly will continue to increase with the size of our collection. In addition, the increasing use of non-destructive scanning instruments by many institutes to analyze DSDP/ODP/IODP archive-half core material is creating an uncertain situation with regard to shipping large volumes of core sections around the world, with costs running into the thousands of dollars per shipment. Furthermore, the growing importance of microbiological investigations to the program will likely also have an impact on these costs, because shipping samples in a frozen state is more expensive by an order of magnitude. It is impossible to predict how many of these kinds of shipments will be required, and therefore what the costs will be, even for the near future. Therefore, we would like to have at least \$40,000.00 for this category, and hope that this amount is not exceeded.

**Indirect costs** - This is a flat-rate cost for university and institute administration costs and materials of 40%, based on the high-maintenance nature of this contract and extraordinary size of the operation.

## 9 Data Management

### 9.1 Goals

The goals of data management include: management of data supporting IODP activities, management of expedition and post-expedition data, management of sample and data requests and core repository inventory tracking, ensuring long-term archiving, increasing access to data, IT support services, and the IODP Site Survey Data Bank.

### 9.2 Deliverables in FY2011

The IOs are responsible for capturing and storing all drilling-related data generated during shipboard operations. They use their own specific protocols and databases for this. The system used by the USIO is a customized LIMS (Laboratory Information Management System) data system put into production in FY2009, with upgrades made in FY2010. USIO will utilize LIMS to manage all new data, whether it is generated from new drilling activities or from new analysis of sample materials collection prior to FY2009. The JANUS system has been transitioned to an archival system. Updates to JANUS will hereafter be limited to corrections of inaccurate data. The system to be used by CDEX is the J-CORES system and was modified in FY2010 to improve data access and visual core description (VCD) generation. For expedition use (shipboard and shore-based core description), ESO is using a modified version of the DIS developed for the International Continental Drilling Program (ICDP). ESO-generated expedition data are subsequently legacy-stored in the World Data Center (WDC) PANGAEA system. In FY2011, each IO is responsible for providing access to metadata describing data stored in their respective databases as well as access to data resources (core measurements data, borehole logging data and core photographs and digital images), for providing access to data for caching of core measurement, borehole logging and digital images data, and for providing curatorial data for central inventory and sample request data management systems. The Scientific Drilling Information Service (SEDIS) will provide central access to the distributed IO databases (see **Figure APP-10**) by harvesting metadata from each IO and by integrating the distributed data systems using a web services approach. SEDIS will cache IOs data resources and present data from the distributed data systems in an integrated system for discovery, retrieval and querying. SEDIS serves as the “one-stop” access point for accessing IOs data, supporting service-oriented software applications access and query access to the source data systems. Sample requests and related core repository data will be handled by the Sample Materials Curation Management System (SMCS). A re-engineering and enhancements to SMCS is underway as of FY2010, in order to improve the usability of the Sample and Data Request Management (SDRM) system web interface.

Completion of SEDIS contracts will be a strong focus of data management development in FY2011. The SEDIS Phase I portal is currently online and serves as a central data discovery for the scientific community. SEDIS II was completed in FY2009 and serves as the IODP publications catalogue, as well as supporting publication obligation tracking for IODP sample requests. SEDIS III development will began in FY2010 and will focus on providing web services access to IOs data systems. By developing an integrated access point for IODP web services data with documented schemas, vocabularies and namespaces, software application

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developers will be able to build automated access to IODP data into analytical tools used by the IODP scientific community and geoscience educators. The SEDIS III contracts will continue into mid-FY2011, at which time major outreach efforts will be undertaken to inform the IODP community and other scientific data networks about the IODP data resources available via the SEDIS system.

The SMCS-SDRM system is being re-engineered in FY2010 to overcome major user interface and performance issues that have limited its utilization by shipboard and post-expedition requestors. The SDRM system version 2 is expected to be in production use in first quarter FY2011. The completed SDRM system will improve management and coordination of sample requests.

The IODP Proposal Database maintenance and upgrades will be performed in FY2011 in support of the post-2013 new Science Plan. The maintenance and upgrades will focus on improving the administrative interface for reviewing and managing the IODP proposal process, including versioning and revisions of proposals, and increasing the integration of proposals coversheet information with the SEDIS data inventory, and on ensuring support for changes to the proposal themes and processes related to the post-2013 scientific ocean drilling program.

The IODP Central Registry LDAP (Lightweight Directory Access Protocol) system is currently operational. Maintenance of the Central Registry, including integration with other IODP systems, is expected during FY2011.

Further details of IO data management activities are included in **Appendices B to D**.

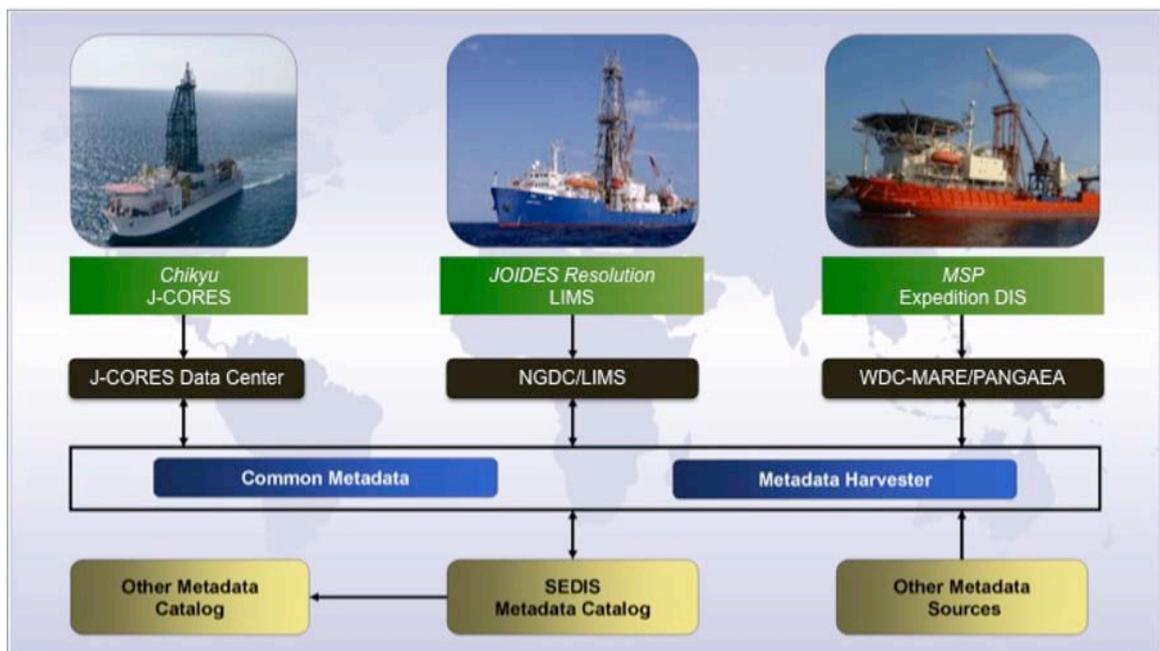


Figure APP- 10: Major Aspects of IODP Data Management.

### 9.2.1 Expedition Data

Maintain and manage databases supporting expedition-planning data. Operate and maintain data management and harvesting systems (including QA/QC) for storage and archiving of expedition and post-expedition data, including core and sample tracking.

- a. **Completion of data access services:** CDEX is currently modifying J-CORES Public Data Center to accommodate access to cached J-CORES data at a more granular level and for the creation and harvesting of related metadata for SEDIS. SEDIS Phase III will make J-CORES data via SEDIS as a web services during FY2010. This effort will build upon FY2009 work to create a framework and reference implementation for J-CORES to expose data via web services. USIO has completed initial shipboard and shore-based rollout of LIMS. SEDIS Phase III will make archived data sets available via web services data from JANUS and LIMS available via SEDIS during FY2010. This effort will build upon FY2009 work to create a framework and reference implementation for JANUS to expose data via web services for integration with SEDIS and to provide access other types of core measurements data and digital images. ESO will continue to use the DIS system for collection of data and the WDC-PANGAEA for access to data sets and web services via SEDIS.
- b. **Acquisition of core and logging data:** Each IO is responsible for capturing the scientific data that will be collected during the scheduled expeditions for FY2011 and arranging for storage of the data in a database so it is accessible to the expedition participants and to the scientific communities via SEDIS. FY2009 work to develop OGC standards-compliant web services for borehole logging data was completed in FY2010 and now provides web services access to borehole logging data from all IOs via SEDIS web services.

### 9.2.2 Program-wide access portal

Provide program-wide access portal including supporting metadata.

- a. **Metadata access from each IO:** Each IO is responsible for providing metadata describing the datasets they have in their own databases. This metadata will continue to be regularly harvested by SEDIS to provide central access to the program data by the scientific community.
- b. **SEDIS Phase II:** Publication search engine linked to data discovery: SEDIS Phase II development was completed in FY2009. Publications metadata will continue to be regularly harvested by SEDIS via access to AGI-GeoRef Ocean Drilling Citations Database metadata.
- c. **SEDIS Phase III strategies:** Caching and providing access to IOs data via web services: SEDIS Phase III commenced in FY2010 and is scheduled to be completed during FY2011. Completion of Phase III of SEDIS will mark a significant accomplishment in the integration of IODPs data systems by providing a one-stop portal for discovering, accessing and querying data from all of IODP IOs and IODP-MI data systems.
- d. **SEDIS system maintenance:** Starting in FY2010 and continuing into FY2011 SEDIS will be extended with web services access to IO's data to enable users to dynamically

compile data from the distributed IOs data systems. Plans for a permanent IODP data archive are being developed in 2010 with implementation to start in FY2012.

- e. **SMCS enhancements:** An upgraded version (v.2) of SMCS Sample Materials Request Systems (SRMS) will be completed in FY2010 to overcome user interface and performance issues. System hosting, maintenance and administration fees are included in FY2011 budget.

### **9.2.3 Operation and maintenance**

Provide operation and maintenance of computer and network systems.

- a. **Evaluation, maintenance, and possible enhancements:** The systems developed in FY2009 and FY2010 will need to be closely monitored and maintained in FY2011. This could require some minor adjustments and enhancements.
- b. **Continuing operation of the SSDB:** No development is expected in FY2011. The SSDB is now mature and should only require normal operation and maintenance tasks from Scripps Institute of Oceanography.

### **9.2.4 Common vocabularies and terminology within IODP**

This is an important aspect of data management within IODP. The process will continue during FY2011 with development of consistent and common vocabularies and terminologies for specific disciplines to be coordinated by IODP-MI. FY2010 work included development controlled vocabularies to create semantic relationship between different terminologies in the IOs source data. The IODP controlled vocabularies provide interoperability of the IODP data systems within the SEDIS integration framework. Updates, maintenance and expansion of the IODP controlled vocabularies and the IODP will continue FY2011.

Standardization of vocabularies paleontonomic data will be continued in FY2011. The CHRONOS system has been selected as the “master” Taxonomic Names List server from which all IOs will derive paleontonomic terms, synonyms, relationships, etc.

### 9.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	178,615	642,437	595,616	237,985	-	\$ 1,654,653
Travel	22,500	25,390	-	39,000	-	\$ 86,890
Supplies	-	24,640	12,000	6,000	-	\$ 42,640
Shipping	-	1,165	-	-	-	\$ 1,165
Communication	-	7,940	-	-	-	\$ 7,940
Contractual Services	386,190	-	240,000	75,000	-	\$ 701,190
Equipment	-	44,850	-	40,000	-	\$ 84,850
Other Direct Costs	-	146,890	-	-	-	\$ 146,890
<b>Total Direct Costs</b>	587,305	893,312	847,616	397,985	-	\$ 2,726,218
<b>Consumption Tax (5%)</b>	5,810					\$ 5,810
Modified Direct Costs (If applicable)	-	175,272	607,616	-	-	\$ 782,888
<b>Indirect Costs/Administrative Fee</b>	-	92,894	182,285	-	-	\$ 275,179
<b>Total</b>	<b>\$ 593,115</b>	<b>\$ 986,206</b>	<b>\$ 1,029,901</b>	<b>\$ 397,985</b>	<b>\$ -</b>	<b>\$ 3,007,207</b>

Table APP- 9-1: Data Management Budget for FY2011.

Expense Category	IODP-MI	USIO	CDEX	Bremen	Total
Salary and Fringes	178,615	642,437	595,616	-	\$ 1,416,668
Travel	22,500	25,390	-	-	\$ 47,890
Supplies	-	24,640	12,000	-	\$ 36,640
Shipping	-	1,165	-	-	\$ 1,165
Communication	-	7,940	-	-	\$ 7,940
Contractual Services	386,190	-	240,000	-	\$ 626,190
Equipment	-	44,850	-	-	\$ 44,850
Other Direct Costs	-	146,890	-	-	\$ 146,890
<b>Total Direct Costs</b>	587,305	893,312	847,616	-	\$ 2,328,233
<b>Consumption Tax (5%)</b>	5,810				\$ 5,810
Modified Direct Costs (If applicable)	-	175,272	607,616	-	\$ 782,888
<b>Indirect Costs/Administrative Fee</b>	-	92,894	182,285	-	\$ 275,179
<b>Total</b>	<b>\$ 593,115</b>	<b>\$ 986,206</b>	<b>\$ 1,029,901</b>	<b>\$ -</b>	<b>\$ 2,609,222</b>

Table APP- 9-2: Data Management Contract Budget for FY2011.

### 9.4 Justification

#### 9.4.1 IODP-MI

**Salaries and Fringes** — Include an anticipated cost-of-living allowance and estimated fringe benefits rate for IODP-MI staff.

**Travel** – Travel cost for staff attending data management coordination and task force meetings, visits to vendors and professional meetings.

**Contractual Services** – The Data Management budget for FY2011 will be mainly used for the Sample Material Request System to make IODP sample materials more easily available to members of the geosciences community. The SMCS, SEDIS, proposal database, user registry, and other IODP-MI applications (e.g., Google Earth data layers) will be maintained and hosted in FY2011. As part of SEDIS publications index and search system, an annual fee for digital object identifier (DOI) and access to the American Geological Institute (AGI) citation database are required.

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**Other Direct Costs** – Salaries and fringes of staff supporting data management (including ISHI subcontracts).

### 9.4.2 USIO

**Salaries and Fringes** – Salaries, fringes and sea pay, including an anticipated cost-of-living allowance and estimated fringe benefits rate.

**Travel**—Transportation, per diem, lodging, and other associated cost.

**Supplies** – Office and operational supplies.

**Shipping** – Postage, express mail, and freight.

**Communication** – Telephone and fax charges.

**Equipment** – Procurement, upgrading or fabrication of equipment with an acquisition cost of more than \$5,000, plus those items as defined by Ocean Leadership, Columbia University, or TAMRF policy.

**Other Direct Costs** – Costs not covered in the other categories:

**Relocation** – Relocation costs for new employees.

**Training** – Registration, transportation, per diem, and lodging expenses related to professional training.

**Business Conferences** – Incidental expenses associated with meetings hosted by USIO.

**Software** – Software purchases and upgrades.

**Services** – Expert assistance.

**Recruiting** – Employee recruitment.

**Maintenance and Repair** – Maintenance agreements and equipment repair.

**Library** – Books, journals, and other resources.

**Indirect Costs** – Administrative and financial costs associated with operating the Program.

### 9.4.3 CDEX

**Salaries and Fringes** - Salaries and fringes for staff in CDEX (For details, see Appendix C.3)

**Supplies** – Computer consumables.

**Contractual Service :**

1) J-CORES Maintenance include normal maintenance, QA/QC work to assure data base reliability and necessary modifications (SOC – \$120,000)

2) Annual maintenance costs for IODP specific software(GeoFrame, GeoLog, SeizEarth, etc.) and computer on *Chikyu* and on Land(Wireline/Log data storage/computers, etc.)

(SOC – \$120,000)

### 9.4.4 ESO

**Salaries and Fringes** – Portion of salaries at standard institution rates, including overheads.

**Travel** – ESO database group meetings, Data Management Coordination Group meetings, data management liaison and travel to offshore expedition.

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**Supplies** – Computer consumables.

**Contractual Services** – Offshore DIS support and developments; continuous upgrading is planned in line with IODP-MI requirements, including VCD development.

**Equipment** – ESO computer infrastructure upgrade and maintenance, and Bremen computer infrastructure upgrade and maintenance. BSCW license for communication and data transfer.

## 10 Publication

### 10.1 Goals

The goals of IODP Publications are editing, production, and distribution of IODP scientific drilling expedition results and program activities.

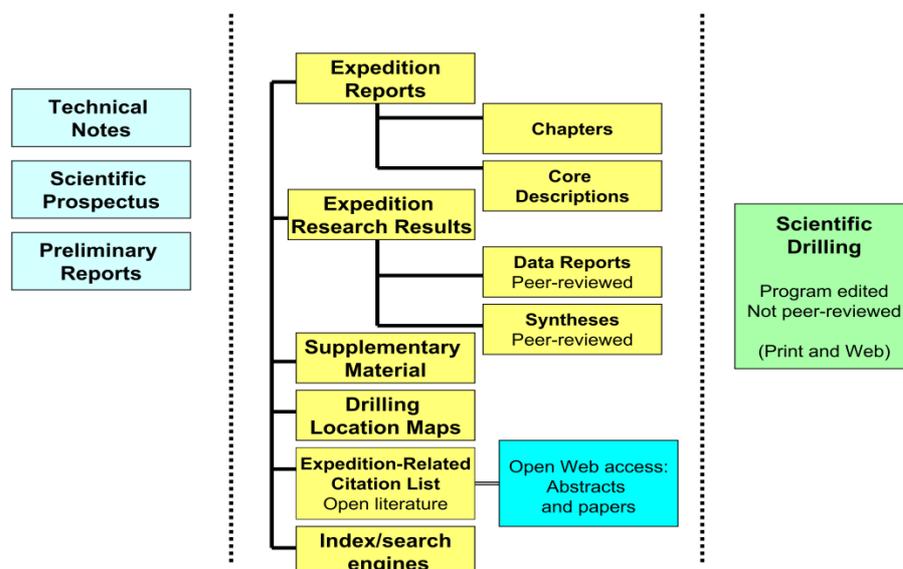


Figure APP- 11: IODP Main Publications.

IODP Publications fall into four categories: Reports, IODP *Proceedings*, publications in open literature, and the *Scientific Drilling* journal published jointly with ICDP (Figure APP-11):

- Documentation of IO specific technology and data (Technical Notes);
- Proper scientific documentation of all drilling expeditions (Scientific Prospectus);
- Rapid documentation and publications of major findings (Preliminary Reports);
- Wide community distribution of IODP science achievements and program activities (*Scientific Drilling*) in a journal type fashion;
- Extensive legacy documentation of all expedition results (Expedition Reports of the *Proceedings*); and
- Peer-reviewed publication of post-expedition research results (open literature and data reports in *Proceedings*).

### 10.2 Deliverables in FY2011

The following major deliverables are covered by the FY2011 APP:

- Approximately 10 Scientific Prospectuses for FY 2010/2011 expeditions;
- Approximately ten Preliminary Reports;
- Nine *Proceedings* of the IODP volumes covering expedition reports;
- Ten *Proceedings* volumes covering expeditions research content;
- Two issues of the journal *Scientific Drilling*;

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- Publications specialist support for nine expeditions (6 USIO, 2 CDEX, 1 ESO);
- Recording publication citations and post-expedition research submissions;
- Professional scientific writing services for post-2013 Science Plan summaries, press releases and promotion.

IODP-MI oversees all publication activities and is the program publisher. However, except for *Scientific Drilling*, actual editing, production and distribution is outsourced to the IOs. *Scientific Drilling* is produced and published by IODP-MI in cooperation with ICDP. Each IO is contractually responsible for the production of the Technical Notes, Scientific Prospectus, Preliminary Reports and the *Proceedings* on each respective expedition; thematically related expeditions conducted within a short period of time may be considered one single project for which an integrated set of *Proceedings* is produced. Scientific Prospectus is due six months pre-expedition. Preliminary Reports are due two months post-expedition and *Proceedings* 12 months post-expedition. As in FY2010, in FY2011 the final editing and production of all IODP Reports and *Proceedings* is provided by the USIO in order to secure cross-program consistency in appearance. CDEX and ESO will deliver the edited draft material, including all necessary content and scientific editing. Tracking of IODP scientific publications in the open literature for inclusion in the *Proceedings* volume in FY2011 is provided by the USIO and IODP-MI, based on an IODP-MI contract for generating the necessary data. *Scientific Drilling* is delivered in both print and electronic format on the Web. Printed copies (c. 5,500) are distributed by IODP-MI to funding agencies, member institutions, libraries, the PMOs, the IODP scientific community, and to ICDP (for further distribution).

Technical Notes, Scientific Prospectus, Preliminary Reports and *Proceedings* are all published electronically on the Web in html and PDF formats. Volumes of electronic *Proceedings* are also available on DVD in PDF format. The latter is supplied to funding agencies, libraries, expedition members, and also used for scientific outreach.

A professional science writer will be contracted in FY2011 to assist in production of post-2013 Science Plan summaries, press releases and promotional materials. This effort will increase the coverage of the post-2013 coverage in media outlets and at outreach events. These services will be coordinated with other efforts to launch significant promotional campaign for the post-2013 scientific ocean drilling program.

### 10.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	133,548	1,323,000	-	-	-	\$ 1,456,548
Travel	6,000	26,000	-	-	-	\$ 32,000
Supplies	3,333	38,000	-	-	-	\$ 41,333
Shipping	22,381	21,000	-	-	-	\$ 43,381
Communication	-	8,000	-	-	-	\$ 8,000
Contractual Services	73,810	-	-	-	-	\$ 73,810
Equipment	-	-	-	-	-	\$ -
Other Direct Costs	-	43,000	-	-	-	\$ 43,000
<b>Total Direct Costs</b>	239,072	1,459,000	-	-	-	\$ 1,698,072
<b>Consumption Tax (5%)</b>	4,976					\$ 4,976
Modified Direct Costs (If applicable)	-	-	-	-	-	\$ -
<b>Indirect Costs/Administrative Fee</b>	-	-	-	-	-	\$ -
<b>Total</b>	<b>\$ 244,048</b>	<b>\$ 1,459,000</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 1,703,048</b>

Table APP- 10: Publication Budget for FY2011.

### 10.4 Justification

#### 10.4.1 IODP-MI

**Salaries and Fringes** — Include an anticipated cost-of-living allowance and estimated fringe benefits rate for IODP-MI staff.

**Travel** – Travel costs for staff providing publications support.

**Shipping** – Shipping cost for *Scientific Drilling*.

**Contractual Services** – Services for publishing *Scientific Drilling* (IODP contribution - excluding ICDP support).

#### 10.4.2 USIO

**Salaries and Fringes** — Salaries, fringes, and sea pay, including an estimated fringe benefits rate.

**Travel** — Transportation, per diem, lodging, and other associated costs.

**Supplies** – Office and operational supplies.

**Shipping**—Postage, express mail, and freight.

**Communication** – Telephone and fax charges.

**Other Direct Costs** – Costs not covered in the other categories:

**Training** – Registration, transportation, per diem, lodging expenses, and membership dues related to professional training.

**Business Conferences** – Incidental expenses associated with meetings hosted by the USIO.

**Services** – Expert assistance.

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**Equipment Rental** – Rental of equipment when it is more economical to rent than purchase such as Water cooler rental.

**Maintenance and Repair** – Maintenance agreements and equipment repairs.

**Library** – Books, journals, and other resources.

## **11 Outreach**

### **11.1 Goals**

- Work collaboratively to heighten visibility of IODP expeditions and build awareness of scientific ocean drilling, particularly its value to the public and society-at-large.
- Strengthen support among current stakeholders, and attract new support externally.

### **11.2 Deliverables in FY2011**

#### **11.2.1 Outreach material**

Includes print collateral (expedition news releases, brochures, newsletters), online content (images, editorial), and raw and edited video footage. Also includes communications plans. An FY2011 initiative will produce informational materials highlighting the achievements of IODP and the societal impact of IODP research activities in important global environmental issues. These informational material will be produced in coordination with efforts to promote the post-2013 scientific ocean drilling program and the new Science Plan.

Standard Reference for Sediment Analysis will be developed in FY2011 and utilized as an education and promotional tool to explain an important part of the science conducted by IODP. These reference materials will be available for use at international scientific conferences, by IO outreach staff and in other IODP outreach efforts.

#### **11.2.2 Exhibit booths**

High-profile exhibits at internationally important scientific conferences, including AGU, EGU, JPGU, and AOGS.

#### **11.2.3 Town Hall Meetings**

To be held at major science conferences, including AGU, EGU, and JPGU, to facilitate direct outreach to stakeholders in the IODP community.

#### **11.2.4 Heightened public and media awareness**

To be achieved through rigorous promotion of IODP, highlighting: 1) scientific objectives; 2) IODP's value as a global leader in the collection of Earth systems data; 3) IODP's international cooperation, in terms of human resources, budgetary resources, shared technologies, and core archives; 4) individual scientists participating in IODP research activities; 5) how IODP contributes to solutions for challenges the world faces today.

### 11.3 Budget

Expense Category	IODP-MI	USIO	CDEX	ESO	Bremen	Total
Salary and Fringes	191,171	30,545	113,631	121,200	-	\$ 456,547
Travel	35,500	10,000	-	28,000	-	\$ 73,500
Supplies	-	6,375	10,000	12,000	-	\$ 28,375
Shipping	25,714	1,070	10,000	-	-	\$ 36,784
Communication	-	987	-	-	-	\$ 987
Contractual Services	334,976	23,000	110,000	-	-	\$ 467,976
Equipment	-	-	-	-	-	\$ -
Other Direct Costs	3,810	-	-	-	-	\$ 3,810
<b>Total Direct Costs</b>	<b>591,171</b>	<b>71,977</b>	<b>243,631</b>	<b>161,200</b>	<b>-</b>	<b>\$ 1,067,979</b>
<b>Consumption Tax (5%)</b>	<b>13,500</b>					<b>\$ 13,500</b>
Modified Direct Costs (If applicable)	-	-	133,631	-	-	\$ 133,631
<b>Indirect Costs/Administrative Fee</b>		<b>22,313</b>	<b>40,089</b>			<b>\$ 62,402</b>
<b>Total</b>	<b>\$ 604,671</b>	<b>\$ 94,290</b>	<b>\$ 283,720</b>	<b>\$ 161,200</b>	<b>\$ -</b>	<b>\$ 1,143,881</b>

Table APP- 11-1: Outreach Budget for FY2011.

Expense Category	IODP-MI	USIO	CDEX	Bremen	Total
Salary and Fringes	191,171	30,545	113,631	-	\$ 335,347
Travel	35,500	10,000	-	-	\$ 45,500
Supplies	-	6,375	10,000	-	\$ 16,375
Shipping	25,714	1,070	10,000	-	\$ 36,784
Communication	-	987	-	-	\$ 987
Contractual Services	334,976	23,000	110,000	-	\$ 467,976
Equipment	-	-	-	-	\$ -
Other Direct Costs	3,810	-	-	-	\$ 3,810
<b>Total Direct Costs</b>	<b>591,171</b>	<b>71,977</b>	<b>243,631</b>	<b>-</b>	<b>\$ 906,779</b>
<b>Consumption Tax (5%)</b>	<b>13,500</b>				<b>\$ 13,500</b>
Modified Direct Costs (If applicable)	-	-	133,631	-	\$ 133,631
<b>Indirect Costs/Administrative Fee</b>		<b>22,313</b>	<b>40,089</b>		<b>\$ 62,402</b>
<b>Total</b>	<b>\$ 604,671</b>	<b>\$ 94,290</b>	<b>\$ 283,720</b>	<b>\$ -</b>	<b>\$ 982,681</b>

Table APP- 11-2: Outreach Contract Budget for FY2011.

### 11.4 Justification

The total Outreach budget reflects the resources of the three IOs and IODP-MI in producing effective outreach to the scientific community (academic, government), the active/participant IODP community (stakeholders), emerging generations of researchers, related professional audiences (commercial/ industry engineers, petrologists, geophysicists), and the media (general and special interest/science) Deliverables are tied to reaching these target audiences and to the shared goals of expanding awareness about the value of scientific ocean drilling and generating public interest in IODP's activities.

#### 11.4.1 IODP-MI

**Salaries and Fringes** – Salaries for IODP-MI Outreach personnel including ISHI subcontracts.

**Travel** – Travel costs for staff to one Task Force meeting per year and to conferences where booths must be staffed.

**Contractual Services** – Website hosting, maintenance; Video production and library maintenance; Exhibition Booths at national and international conferences; Town Hall

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Meeting; News monitoring, distribution and informational resources; Printing and Graphic Design.

**Other Direct Costs** – Salaries and Fringes of ISHI Subcontractor Outreach personnel.

### **11.4.2 USIO**

**Salaries and Fringes** – Salary and fringes, including an anticipated cost-of-living allowance and estimated fringe benefits rate.

**Travel** – Transportation, per diem, lodging, and other associated costs. A portion of the cost of participating in outreach to stakeholders, press events, media training, and staffing of booths at national and international meetings.

**Supplies** – Office and operational supplies.

**Shipping** – Postage, express mail, and freight.

**Communication** – Telephone and fax charges.

**Contractual Services** – Consultant and contract services. Platform enrichment activities, including preparation of public relations materials, posters and videos; media training; and booth rentals and associated costs at national meetings.

**Indirect Costs** – Administrative and financial costs associated with operating the Program.

### **11.4.3 CDEX**

**Salaries and Fringes** - Salaries and fringes for staff in CDEX. (For details, see Appendix C.3)

**Supplies** - General office supplies.

**Shipping** - Shipping for JPGU etc.

**Contractual Service** -

- 1) **WEB Maintenance** - Annual maintenance/licensing/rental costs for CHIKYU HAKKEN Website. <http://www.jamstec.go.jp/chikyu/eng/index.html> (SOC – \$10,000)
- 2) **Expedition Filming/editing** - Contract for filming/interview/editing for Expeditions. The products will be published /broadcasted /distributed to public to raise understanding and awareness of earth sciences and studies, along with scientific challenges by IODP/CDEX Expedition. (SOC – \$50,000)
- 3) **Outreach publication** - To publish bi-annual news letter “CHIKYU HAKKEN News Letter” both in English and in Japanese etc. (SOC – \$50,000)

### **11.4.4 ESO**

**Salaries and Fringes** – Portions of salaries at standard institution rates, including overheads.

**Travel** – Attend outreach meetings associated with the New Jersey Shallow Shelf (onshore) and Great Barrier Reef Environmental Changes (offshore and onshore) expeditions, conferences (EGU, AGU, IGU) and other E&O activities

**Supplies** – Printing of brochures for expeditions, support of booths, materials etc.

## **12 FY2009-2010 Scientific Results Summary**

### **12.1 Relation to IODP Initial Science Plan**

IODP Initial Science Plan contains three major themes and eight initiatives. IODP strive addressing these themes and initiatives. During FY2009-2010, IODP completed nine IODP successful expeditions addressing all three major themes and six initiatives.

#### **12.1.1 Theme 1 The Deep Biosphere and Subsurface Ocean**

Despite of no dedicated expeditions during FY2009-2010, IODP addressed Theme 1 Deep Biosphere and Subsurface Ocean and two initiatives by obtaining opportunistic samples in following expeditions. Additionally IODP implemented Routine Microbiology Sampling (RMS) on Chikyu and MSP in FY2009.

Initiative: Deep Biosphere

- Expedition 319 and 322 NanTroSEIZE Stage 2
- Expedition 323 Bering Sea Paleooceanography (APL part).
- Expedition 317 Canterbury Basin.
- Expedition 318 Wilkes Land.

Initiative: Gashydrate

- Expedition 319 and 322 NanTroSEIZE Stage 2.

#### **12.1.2 Theme 2 Environmental Change, process, and effects**

IODP spend major platform time addressing Theme 2 Environmental change, process and effects during FY2009-2010. Six dedicated expeditions addressed Theme 2 and two initiatives.

Initiative: Extreme Climate

- Expedition 320& 321 Pacific Equatorial Age Transect I & II.
- Expedition 313 New Jersey Shallow Shelf.
- Expedition 317 Canterbury Basin.
- Expedition 318 Wilkes Land.

Initiative: Rapid climate change

- Expedition 323 Bering Sea Paleooceanography.
- Expedition 325 Great Barrier Reef Environmental Changes.

#### **12.1.3 Theme 3 Solid Earth Cycles and Geodynamics**

Two expeditions addressed Theme 3 Solid Earth Cycle and Geodynamics and two initiatives. DV Chikyu continue addressing Initiative: Seismogenic Zone in Nankai Trough

Initiative: Large Igneous Provinces

- Expedition 324 Shatsky Rise.

Initiative: Seismogenic Zone

- Expedition 319 and 322 NanTroSEIZE Stage 2.

## **12.2 Expedition Specific Scientific Highlights**

Achieving expedition specific objectives will require considerable shore-based analysis and integration among disciplines, and it is too early to gauge how scientifically successful an expedition will be. Nonetheless, there are several positive indications from each expedition, among which are the following.

### **12.2.1 Expedition 313 New Jersey Shallow Shelf (ESO)**

- Recovered high-quality middle to early Miocene sediments.
- Proved the value of a drilling transect strategy from continental passive margin setting.
- Clinoform structures investigated during the Expedition were deposited during times of global sea level oscillations.
- Achieved nearly complete composite record of 1 m.y. sea level cycles for 22-12 Ma

### **12.2.2 Expedition 317 Canterbury Basin (USIO)**

- Achieved its goal of recovering a 10 m.y. record of sea level fluctuations, when global sea level change was largely controlled by glacial/interglacial ice volume changes.
- One hole records extend back to 35 m.y., documenting changes in ocean circulation that began when Antarctica separated from Australia, creating a new seaway between the two continents about 34 Ma ago.
- Successfully correlate lithologic boundaries with seismic boundaries

### **12.2.3 Expedition 318 Wilkes Land (USIO)**

- Obtained ~2000 m of high-quality upper Eocene–Quaternary sediments at seven sites (from 400 to 4000 m water depth).
- Tectonic history of the onset (at 53 Ma) of the 2nd phase of rifting between Australia and Antarctica.
- History of the Wilkes Land Antarctic margin (~53 m.y.) from an initially shallow, broad subtropical shelf setting into a deep basin with a narrow ice-infested margin (onset of glaciation ~33 Ma ago).
- Thick, unprecedented "tree ring style" records (starting ~10,000 y ago) with seasonal resolution of the last deglaciation.

### **12.2.4 Expedition 319 and 322 NanTroSEIZE Stage 2 (CDEX)**

- Collected the data sets, that provide constraints on present-day in situ stress orientation and magnitude, as well as on past deformation.
- Obtained *in situ* hydrological properties of sediments and rocks for scientific analysis for the first time.
- Recovered the basal pelagic deposits in contact with pillow basalt at Site C0012, that indicates age of the basement to be older than ~18.9 Ma.
- Captured the fundamental compositional, geotechnical, and fluid properties of the Shikoku Basin.

#### **12.2.5 Expedition 320& 321 Pacific Equatorial Age Transect I & II (USIO)**

- Collected the carbonates from the upper Eocene and across the Eocene-Oligocene boundary, and the first complete Miocene sediments from the equatorial Pacific.
- Obtained detailed bio-, magneto-, and chemostratigraphies for the Cenozoic from the early Eocene to the present, within an astronomically tuned age model.
- Obtained detailed correlation of all major fossil groups, a detailed magnetostratigraphy with over 800 dated reversals, and sedimentary cycles, that can be correlated across large distances in the Pacific Ocean.
- Obtained detailed reconstruction of the Cenozoic CCD (the early Eocene (~49 Ma) equatorial CCD at <3 km paleodepth, the late Oligocene (23-27 Ma) CCD at ~4.5 km paleodepth, Neogene carbonate minima between 17 Ma and 18 Ma, a 'carbonate crash' interval ~10 Ma, and a newly delineated CCD minimum at ~4 Ma).
- Collected the data, that can confirm seismic stratigraphy and also tie the eastern Pacific seismic stratigraphy with that of the central Pacific.

#### **12.2.6 Expedition 323 Bering Sea Paleooceanography (USIO)**

- Accomplished the goal of penetrating to ~5 Ma at two sites, without hiatuses and appropriate for high-resolution Pliocene–Pleistocene paleooceanography.
- Obtained high quality continuous sediments for high-resolution Pliocene–Pleistocene paleooceanography study for last ~5 Ma.
- Recovered the first sign of sea ice (the presence of IRD pebbles) starting at >3.8 Ma at Site U1340.
- The past vertical water mass distribution and the reconstruction of the history and distribution of the Oxygen Minimum Zone in the region can be deciphered based on data from sites ranging in depth from 818 to 3174 m.

#### **12.2.7 Expedition 325 Great Barrier Reef Environmental Changes (ESO)**

Expedition sampling party took place on 1-15 July. Preliminary results indicate that following three main objectives can be met with core s recovered.

- Reconstruction of the course of postglacial sea level change in the GBR.
- Reconstruction of sea-surface temperature variations for the region over the period 20–10 ka.
- Analysis of the impact of sea level changes on reef growth and geometry.

#### **12.2.8 Expedition 324 Shatsky Rise (USIO)**

- Recovered potential evidence for shallow submarine and/or subaerial eruption of Shatsky Rise.
- Recovered potential evidence that much of the lava erupted rapidly and formed an archipelago during the early Cretaceous period (about 145 Ma ago) at/or near the Equator.
- Subsidence for the basement sites (except for Site U1350) is 3200–3400 m.
- Successfully recovered lava suitable for high-quality radiometric age dating and planned geochemical/isotopic studies.

### **12.3 Major peer-reviewed publications in FY2009-2010**

- Asami, R., Felis, T., Deschamps, P., Hanawa, K., Iryu, Y., Bard, E., Durand, N., Murayama, M. (2010) Evidence for tropical South Pacific climate change during the Younger Dryas and the Bolling-Allerod from geochemical records of fossil Tahiti corals, *Earth and Planetary Science Letters* 288 (1-2).
- Channell, J. E. T., Xuan, C., Hodell, D. A. (2009) Stacking paleointensity and oxygen isotope data for the last 1.5 Myr (PISO-1500), *Earth and Planetary Science Letters* 283(1-4).
- Davies, A., Kemp, A. E. S., Pike, J. (2009) Late Cretaceous seasonal ocean variability from the Arctic, *Nature* (London) 460 (7252).
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- Ferretti, P., Crowhurst, S. J., Hall, M. A., Cacho, I. (2010) North Atlantic millennial-scale climate variability 910 to 790 ka and the role of the equatorial insolation forcing, *Earth and Planetary Science Letters* 293 (1-2).
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- Hodell, D. A., Minth, E. K., Curtis, J. H., McCave, I. N., Hall, I. R., Channell, J. E. T., Xuan, C. (2009) Surface and deep-water hydrography on Gardar Drift (Iceland Basin) during the last interglacial period, *Earth and Planetary Science Letters* 288(1-2).
- Kitamura, Y., Kanamatsu, T., Zhao, X. (2010) Structural evolution in accretionary prism toe revealed by magnetic fabric analysis from IODP NanTroSEIZE Expedition 316, *Earth and Planetary Science Letters* 292 (1-2).
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- Menabreaz, L., Thouveny, N., Camoin, G., Lund, S. P. (2010) Paleomagnetic record of the late Pleistocene reef sequence of Tahiti (French Polynesia), a contribution to the chronology of the deposits Source, *Earth and Planetary Science Letters* 294(1-2).
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- Morris, A., Gee, J. S., Pressling, N., John, B. E., MacLeod, C. J., Grimes, C. B., Searle, R. C. (2009) Footwall rotation in an oceanic core complex quantified using reoriented Integrated Ocean Drilling Program core samples Source, *Earth and Planetary Science Letters* 287(1-2).
- Mueller, R. D. (2010) Sedimentary basins feeling the heat from below, *Science* 329 (5993).
- Ogawa, Y., Takahashi, K., Yamanaka, T., Onodera, J. (2009) Significance of euxinic condition in the middle Eocene paleo-Arctic basin, a geochemical study on the IODP Arctic Coring Expedition 302 sediments, *Earth and Planetary Science Letters* 285(1-2).
- Pohlman, J. W., Kaneko, M., Heuer, V. B., Coffin, R. B., Whiticar, M. (2009) Methane sources and production in the northern Cascadia margin gas hydrate system, *Earth and Planetary Science Letters* 287(3-4).
- Riedinger, N., Brunner, B., Formolo, M. J., Solomon, E., Kasten, S., Strasser, M., Ferdelman, T. G. (2010) Oxidative sulfur cycling in the deep biosphere of the Nankai Trough, Japan, *Geology* (Boulder) 38 (9).

- Roberts, C. D., LeGrande, Allegra N., Tripathi, A. K. (2009) Climate sensitivity to Arctic seaway restriction during the early Paleogene, *Earth and Planetary Science Letters* 286 (3-4).
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- Thomas, A. L., Henderson, G. M., Deschamps, P., Yokoyama, Y., Mason, A. J., Bard, E., Hamelin, B., Durand, N., Camoin, G. (2009) Penultimate deglacial sea-level timing from uranium/thorium dating of Tahitian corals, *Science* 324 (5931).