INTEGRATED OCEAN DRILLING PROGRAM MANAGEMENT INTERNATIONAL

1 October 2009 – 30 September 2010

Annual Report

Contract No. NSF OCE 0432224

Submitted by IODP Management International, Inc.

to

The National Science Foundation

February 28, 2011

Blank Page

TABLE OF CONTENTS

MANAGEMENT AND ADMINISTRATION

CONTRACTUAL ACTIVITIES – OCE 0432224

NSF-CMO Prime Contract
NSF issued six contract modifications during FY2010:

- #36 provided $1.8 million initial FY10 incremental funding
- #37 reduced the Key Personnel positions from three (3) to two (2)
- #38 provided $5 million of incremental funding
- #39 closed out the FY09 carry forward; revised the FY10 budget at $21,256,858; and provided $8,384,664 in incremental funding
- #40 reduced the prior-approved FY10 APP budget of $21,256,858 by $2,199,774 to $19,057,084 according to the July 12, 2010 FY10 APP revision.
- #41 approved the FY11 APP budget of $20,384,821 and provided $5 million of incremental funds.

PRINCIPAL SUBCONTRACTOR ACTIVITIES

Advanced Earth Science & Technology Organization (AESTO)
AESTO maintained the IODP-MI office in Sapporo, Japan. The Sapporo office provided support functions to the Science Advisory Structure, including publications and data management.

- Modification #11 extended the term of the subcontract from October 1, 2009 through March 31, 2010
- Modification #12 authorized the FY 2010 subcontract budget at the level of $513,528 as set forth in Appendix G of the approved APP
- Modification #13 de-obligated $20,717 from the FY09 budget and increased the total FY10 subcontract funded amount from $513,528 to $737,377
- Modification #14 reprogrammed funding from the Tokyo office budget to the AESTO FY 2010 subcontract budget and closed out the subcontract effective March 31, 2010

***Ippan Shadan Hojin* IODP-MI (ISHI)**
During the second quarter of FY10, IODP-MI executed subcontract IODP-MI-10-03 with *Ippan Shadan Hojin* IODP-MI (ISHI) to replace AESTO and establish and support the IODP-MI Tokyo office and the FY10-FY13 APPs.

Modification #1 to the ISHI subcontract changed the coverage amounts in Section H.1 (Liability Insurance) and reprogrammed $90,000 to the subcontractor's FY 2010 budget from the approved FY 2009 IODP-MI carry forward request.

Bremen University
Subcontractor provides core repository services for IODP at the Bremen Core Repository. During the reporting period, the parties executed 2 modifications:

Modification #7 approved the FY10 subcontract budget at $338,792 for continued core repository services. $10,690 of accrued funding for the DSDP and ODP core redistribution project from FY 2009 established the total FY10 subcontract budget at the level of $349,482.

Modification #8 de-obligated $58,835 from the final FY09 subcontract budget.

British Geological Survey (BGS)
BGS (acting as the coordinator responsible for overall ECORD science operations) undertakes Mission-Specific Platform (MSP) science operations on behalf of the IODP. During the reporting period, the parties executed two subcontract modifications, including termination of the award:

Modification #11 reduced the prior approved FY 2009 subcontract budget by $2,239,128 from the level of $4,253,200 to $2,014,072. The parties further agreed to terminate the subcontract upon execution of an IODP property custodial agreement.

Modification #12 terminated the subcontract for convenience effective May 25, 2010.

Japan Agency for Marine–Earth Science and Technology (JAMSTEC)
JAMSTEC serves IODP as the Japanese Implementing Organization (IO). Riser-equipped drilling capability, by way of the vessel *Chikyu,* is supplied by CDEX, part of JAMSTEC. CDEX also provides administrative services to the Kochi University Center for Advanced Marine Core Research (CMCR) repository.

During the reporting period, the parties executed subcontract modifications 10 through 12.

Modification #10 authorized the FY10 SOC subcontract budget and work scope at the level of $7,557,390.

Modification #11 de-obligated $5,353 from the final FY09 subcontract budget.

Modification #12 made personnel changes and increased the prior-approved FY10 SOC subcontract budget and work scope by $525,000 to $8,082,390 in accordance with the approved FY10 Annual Program Plan revision.

Consortium for Ocean Leadership (COL)
COL serves IODP as the USIO. During the reporting period, the parties executed subcontract modifications 23 through 28.

- Modification #23 provided $520,000 initial FY10 incremental funding
- Modification #24 approved the FY10 subcontract budget at $3,961,102
- Modification #25 provided $1.5 million incremental funding
- Modification #26 approved the subcontractor's FY09 obligated carry forward request; approved the revised FY10 APP budget in the amount of $3,952,852; de-obligated the FY09 unobligated operating budget amount of $326,255, and reprogrammed $160,356 from IODP-MI's FY10 engineering development budget to the USIO's FY10 SOC budget to cover the FY10 scope and budget for the Multi-Sensor Magnetometer Module (MMM) logging tool project.
- Modification #27 provided $1,000,000 of incremental funding for the FY 2010 subcontract budget

- Modification #28 fully funded the subcontractor's FY 2010 Annual Program Plan SOC budget at $4,113,208

University of California, San Diego (UCSD)
The Scripps Institution of Oceanography at UCSD is the subcontractor providing the services to receive and archive scientific ocean drilling-related electronic and digital data in support of the Site Survey Data Bank (SSDB). The IODP-MI Sapporo office oversees the technical work of the subcontractor and provides support and quality control of previously archived samples and data from the Deep Sea Drilling Project and the Ocean Drilling Program.

During the reporting period, the parties executed 4 subcontract modifications:

- Modification #10 provided $25,000 initial FY10 incremental funding
- Modification #11 approved the FY10 subcontract budget at $270,000
- Modification #12 provided $83,050 in FY09 carry-forward funds and tasks to the FY10 budget
- Modification #13 extended the subcontract performance period through September 30, 2011

FINANCE REPORT

The annual financial report is attached (see Appendix 1).

Total contract funds approved:	$19,057,084	This reflects all modifications made during the fiscal year.
Funds obligated from FY09	$ 3,610,997	
Total funds expended:	$ 20,095,028	
Funds remaining:	$ 2,573,052	

Of the remaining funds, $1,582,192 has been obligated. The balance of $ 990,860 is unobligated. An additional $ 691,435 of unobligated funds is under consideration as a request for carry-forward.

PERSONNEL STATUS

The office consolidation that began during July 2009 continued through June 2010. Program Services are now provided from a new Tokyo office, while Finance and Administrative Support are provided from a smaller Washington, DC office.

The following positions are filled from the Washington, DC office of IODP-MI as of September 30, 2010: The IODP-MI President and Vice-President (the two CMO Key Personnel), Finance and Administrative Officer, and Contracts Accountant.

The following positions are filled under subcontractor employment in the Tokyo office as of September 30, 2010: Operations Manager, Data and Communications Manager, Outreach and Communications manager, Science Manager, Office Manager, Associate Science Manager, Operations Coordinator, Contract Officer, Publication and Web Assistant, SAS Coordinator, Executive Program Assistant, and one part time IT support staff. The vacant position of Associate Data & Information Manager is planned to be filled in FY11.

Summary of Program Services

Ippan Shadan Hojin IODP-MI ("ISHI") was established in November 2009 in Tokyo to succeed the role of the Advanced Earth Science & Technology Organization (AESTO) and to support the IODP CMO functions. ISHI supports appropriate office space, facilities, and staff through its subcontract with IODP-MI, Inc. ISHI is a not-for-profit general incorporated association (*Ippan Shadan Hojin*).

The primary function of ISHI is to provide IODP-MI with all the necessary technical expertise in science planning, science operations and deliverables, data management, and scientific/public outreach from a single collocated office and staff, employed by ISHI, and managed by the two IODP-MI Key Personnel: The IODP-MI President & CEO (Program Manager) and the IODP-MI Vice President (Deputy Program manager).

The ISHI office is located at the Tokyo University of Marine Science and Technology (TUMSAT), Etchujima Campus. Most of the staff and all the functions of the Sapporo office were relocated to the Tokyo office from March 1, 2010. From April 1, 2010 all staffs in the ISHI Tokyo office were employed by ISHI, according to ISHI corporate policies and Japanese employment law. The subcontract with AESTO was terminated effective March 31, 2010.

Both of the CMO Key Personnel are dispatched from IODP-MI, Inc. to ISHI. The IODP-MI President and the Vice President conduct their work from the ISHI offices in Tokyo and have managerial oversight of subcontractor staff.

ISHI has been established anew for the sole purpose of serving the IODP program under IODP-MI. ISHI is structured to complement the CMO functions of IODP-MI except that the accounting, contracting and auditing functions are independently conducted to meet the Japanese legal requirements. The approval of the Annual Program Plan is made by the IODP-MI Board, and not by the ISHI Board. ISHI's Board consists of IODP-MI President, Vice President (VP), and a Japanese IODP-MI Board Member, all residing in Japan. Since November 25, 2010 the sole member of ISHI is IODP-MI. ISHI is configured to be legally operable in Japan and yet totally under the IODP-MI umbrella.

Tokyo Office Overview

The IODP-MI Tokyo office provides a full range of support functions to the Science Advisory Structure. It supports IODP-MI publications, and manages and promotes scientific access to all data and core samples associated with the Integrated Ocean Drilling Program.

SUPPORT FOR SCIENCE PLANNING AND ADVISORY STRUCTURE

The Science Planning team works with the chairs of SASEC and SPC on the broader issues of science planning and review of science achievements. In FY10 the chairs of SASEC and SPC were supported by the IODP-MI science managers in the following fields: meeting agendas, preparation of meeting agenda books, editing of material produced during the meetings and minutes of SPC meetings.

IODP-MI also provides coordination of all other SAS meetings including confirmation and distribution of meeting rosters and logistics, support at meetings for panel chairs and panelists and updates of the IODP web site with all SAS related information. For SPC, SSEP and SSP, IODP-MI edited proposal reviews, secured external reviewers, prepared and distributed proposal and site survey data packages in advance of meetings.

The IODP-MI Tokyo office in FY10 also oversaw data submission to the IODP site survey data bank (SSDB), received 29 drilling proposals submitted at the October 1st and April 1st deadlines, reviewed proposals for completeness and adherence to IODP guidelines, corresponded with proponents, secured and edited external reviews applying to proposals.

During the first quarter of 2010, the Tokyo office gained a new science planning task to support Science Planning Writing Committee (SPWC) in terms of writing and publishing a new Initial Science Plan. The meetings were successfully held in Lake Arrowhead on February 1-5, 2010, and Cambridge, UK on May 14-16, 2010.The committee decided to hold another meeting in October 2010 for continuous work.

The IODP-MI coordinated 1st and 2nd Triennium Review Committee (TRC) to design a potential structure of new Science Advisory Structure starting from fall 2011. IODP-MI supported the meetings held in Sydney, Australia on 23-26 March 2010 and in Vienna, Austria on 9-11 May 2010. The report has been accepted as the foundation for a new SAS structure.

Attended SAS meetings in FY2010 are as follows:

Date	Meeting	Meeting Place	Attendees
November 2009	#13 SSEP	Melbourne, Australia	Zelt, Kawamura
January 2010	#10 SASEC	Seoul, Korea	Kawamura, Larsen
March 2010	#10 STP	Sydney, Australia	Kawamura
March 2010	#15 SPC	Sydney, Australia	Kawamura, Larsen
May 2010	#11 EPSP	Yokohama, Japan	Kawamura
May 2010	#14 SSEP	Kochi, Japan	Kawamura
June 2010	#9 SASEC	Kyoto, Japan	Kawamura, Larsen, Osawa
July 2010	#13 SSP	Brest, France	Yamamoto
August 2010	#11 STP	Geneva, Switzerland	Kawamura
August 2010	#16 SPC	San Diego, California, USA	Kawamura, Yamamoto, Larsen

Attended Science planning meetings in FY 2010 are as follows

Date	Meeting	Meeting Place	Attendees
February 2010	#1 SPWC	Lake Arrowhead, CA, USA	Kawamura, Larsen
March 2010	#1 TRC	Sydney, Australia	Larsen
May 2010	#2 SPWC	Cambridge, UK	Larsen
May 2010	#2 TRC	Vienna, Austria	Larsen

TECHNICAL, ENGINEERING AND SCIENCE SUPPORT

IODP-MI

Platform Scheduling

Throughout the first quarter, IODP-MI worked closely with the OTF, the SAS, the IOs and the PMT to adjust operational schedules to accommodate the changing readiness and availability dates for the *JOIDES Resolution*, *Chikyu* and future MSP expedition planning. To arrive at the final schedule, the OTF worked very effectively and efficiently through email communications; a report summarizing the discussions and decisions made is available at http://www.iodp.org/otf/.

Total three Operations Task Force were met in FY10; 1) Sydney, Australia, March 24, 2010 in association with the SPC meeting 2) IODP-MI Tokyo office in Japan, April 26 – 27, 2010 3) San Diego, USA, August 28, 2010 in association with the SPC meeting. These meetings focused on scheduling options for *Chikyu*, *JOIDES Resolution*, and MSPs for late FY2011 through FY2013.

The full meeting report showing all possible scheduling options is available online at www.iodp.org/otf.

Project Scoping

Total two NanTroSEIZE Project Management Team Meetings (PMT) and two new PMT meeting for FY11 - 13 MSP expedition 1) proposal 548-Full 3 Chixculub K-T Impact Crater and 2) proposal 716-Full 2 Hawaiian Drowned Reefs were held during FY10 to address uncertainties and changes in budget and operational constraint issues

NanTroSEIZE PMT Meeting #18 was held June 15-17, 2010, Bremen, Germany. Main points of discussion at meeting were observatory preparation for FY10/11 operations, detailed planning of deep riser site C0002, and 3 year project planning to the end of FY13.

NanTroSEIZE PMT Meeting #19 was held during AGU in San Francisco, CA on December 18, 2008. The meeting focuses on the effects of change the *Chikyu* operation schedule plan for late FY10 to FY13 and discussed how to maximize scientific achievement on this new schedule.

Chixculub Project Management Team Meeting #1 was held October 12, 2010, Edinburgh, Scotland. Main points of discussion at meeting were scientific background of IODP Proposal 548 and potential operational scenario for a Chicxulub MSP Expedition.

Hawaii Project Scoping Groups meeting was held November 15, 2010, Edinburgh, Scotland. Main points of discussion at meeting were platform capability requirement on the expedition (MSP or *JOIDES Resolution*) and addressing site location, environment, weather and permitting issues.

The NanTroSEIZE PMT meeting report is available at: http://www.iodp.org/project-scoping-groups/.

Expedition Operational Assessment

Following four IODP-MI Operations Review Task Force meetings met on this quarter to review the operational aspects of these expeditions.

1) New Jersey Shallow, Expeditions 313
   July 21st-22nd, 2010
   British Geological Survey (BGS), Edinburgh, Scotland

2) NanTroSEIZE Stage 2, Expeditions 319/322
August 12th-13th, 2010
Japan Agency for Marine-Earth Science and Technology (JAMSTEC), Tokyo, Japan

3) Bering Sea Paleoceanography, Expeditions 323
September 15th-16th, 2010
TAMU, College Station, TX, USA

4) Shatsky Rise, Expeditions 324
September 29th - 30th, 2010
TAMU, College Station, TX, USA

The review concentrated on "lessons learned" from the expedition with an emphasis on "what should be done differently in the future." The committee review was based upon confidential reports submitted by the IO and by the Expedition co-chief scientists.

Each meeting began with a detailed oral presentation by the co-chief scientists. This included a summary of the scientific findings, as well as a series of positive and negative issues that arose before, during and after the two cruises. The IO staff scientists next gave oral presentations regarding the results of the expeditions from the operator perspective. These covered coring operations, achievements, planning and implementation. Following these oral presentations, the Task Force examined the issues identified in the oral reports and in written reports submitted by scientists. The Task Force then developed summaries and recommendations for action by the IO and other IODP entities. The full report of the each expedition Operations Review Task Force is available online at: http://www.iodp.org/ortf/.

CDEX
Three IODP Expeditions were completed during FY10: Expedition 322 "NanTroSEIZE Stage 2: Subduction Inputs" which successfully recovered basaltic basement rocks (sediment/basalt interface in particular), Expedition 326 "NanTroSEIZE Stage 3: Plate Boundary Deep Riser 1" as the first stage of drilling at the Ultra-Deep Riser Site, and Expedition 331 "Deep Hot Biosphere" in the Okinawa Trough.

The year began with the completion of Expedition 322, followed by post cruise offloading and an open ship event at the Port of Shingu. All samples for onshore analysis were sent out to scientists, as per sample requests, and the remaining core sections were transferred to the cold storage in Kochi Core Center (KCC). During the break after Expedition 322, TESS focused on improving onboard facilities and procedures as part of preparations for the upcoming expeditions, based on lessons learned during FY09. In the lab, comments from science party members and lab staff were reviewed and incorporated in the new measurement protocols. The cryogenic magnetometer, which failed during Expedition 322, was returned to the manufacturer for repair.

A field-simulation of the future LTBMS running operation was conducted in March 2010 in the Kuroshio Current, to assess the impact of Vortex-Induced Vibrations (VIV) on LTBMS sensors. Tests showed that attaching ropes to the drill pipe disrupts the current flow around the drill string, and subsequently significantly reduces VIV so that LTBMS sensors can be run safely even in strong current conditions.

The five-year statutory inspection and shipyard maintenance was conducted in Yokohama during April and May 2010. Upon completion, *Chikyu* sailed to Suruga Bay for two weeks of

DPS calibration and other necessary offshore equipment testing. After the offshore equipment calibration and examination, *Chikyu* remained in Shimizu until July for IODP Expedition 326 preparations. During this time, a thorough examination of datasets from past *Chikyu* expeditions was carried out, and found a number of errors and missing data. These deficiencies were corrected, and preventative procedures were put in place to prevent any reoccurrence. CDEX is now confident that the database is correct and up to date. Lab protocol of data handling was modified to reduce the potential of human error.

IODP Expedition 326 was primarily an engineering expedition at the ultra-deep riser site, preparing the wellhead and setting the first 800 m of casing into Hole C0002F. Upon completion, IODP Expedition 331 started in September. This expedition featured the challenges of drilling in an active hydrothermal area, recovery of H2S-rich cores, and the first-time use in IODP of a large-diameter commercial coring system. Special core handling procedures were introduced to mitigate the H2S hazards; all onboard crewmembers received special H2S-related training before the expedition and subsequently all operations were completed safely and successfully.

A total of 54 laboratory technicians sailed aboard *Chikyu*'s FY10 IODP expeditions; 19 sailed on Expedition 322, 15 on Expedition 326, and 20 on Expedition 331. This included lab officers and curators, and for the first time, a publication assistant from MWJ rather than USIO-TAMU.

CDEX TESS staff attended meetings, including SSEP, STP, NanTroSEIZE PMT, OTF, AGU, and SPC meetings throughout the year. CDEX representatives also attended Mohole and Gold scientific workshops and other future drilling proposals. The First Postcruise Meeting for IODP Expedition 319 was held at TAMU during 22 – 26 March, followed by the IODP Expedition 322 meeting during 26 – 30 April.

During the FY10 IODP expedition, 19 lab technicians sailed on Expedition 322, 15 on Expedition 326, and 20 sailed on Expedition 331. Those included lab officers and curators, and a publication assistant for the first time from MWJ.

CDEX TESS staffs attended meetings, such as SSEP, STP, NanTroSEIZE PMT, OTF, AGU, and SPC meetings throughout the year. CDEX representative also attended scientific workshop for future drilling proposals, such as Mohole and Gold. Expedition 319 First Postcruise Meeting was held at TAMU 22 – 26 March, followed by the Exp. 322 meeting 26 – 30 April.

<u>Expedition 322: NanTroSEIZE Stage 2 Subduction Inputs</u>
NanTroSEIZE Stage 2 Expedition 322 was successfully completed on 10 October 2009. The goals of the 40-day expedition were characterize the composition, architecture, and state of sediments being transported by the Nankai Trough subduction system and entering the seismogenic zone in the future. The drilling operations were carried out at Sites C0011 and C0012 in the Shikoku Basin, the back-arc basin of the Izu-Bonin volcanic chain, where the Philippine Sea plate subducts at Nankai Trough. At Site C0011, scientists began coring from a depth of 340 meters below the seafloor. The coring, however, had to be abandoned at a depth of 881 meters due to deterioration of core quality caused by a significant decrease in drilling speed. At C0012, *Chikyu* drilled through sedimentary sections, to reach basement basalt at C0012 on 2 October 2009. Successful recovery of basaltic rocks, and sediment/basalt interface in particular, was one of the highlights of the expedition. Coring continued to the final depth of 576 mbsf. Unfortunately, CDEX were unable to run wireline

logging due to poor hole conditions and weather-induced time constraints: CDEX had to spend the last four days of the expedition away from the drilling site for typhoon evacuation. Following the return to Shingu Port, Co-chief Scientists had a press conference onboard *Chikyu*. The return of *Chikyu* and the preliminary results were broadcast by local and national media. Science Party finished onboard report by the end of expedition, and Preliminary Report was published online on 10 December 2009. Dr. Saneatsu Saito (Principle Research Scientist, JAMSTEC) and Dr. Michael Underwood, Professor at University of Missouri are the Co-Chief Scientists, and joined by the science party comprises 26 onboard scientists from eight countries.

Expedition 326: NanTroSEIZE Stage 2 Plate Boundary Deep Riser

The expedition left Shingu Port, Wakayama Prefecture on 19 July, following three days of loading operations. This first contribution to NanTroSEIZE Stage 3 saw *Chikyu* return to Site C0002 for drilling and casing the first 800 meters of the Ultra-Deep Riser Site. Eventually, Hole C0002F will be extended to 7 km below sea floor, reaching the plate boundary where the Philippine Sea Plate subducts beneath the Pacific Plate. Drilling began on 25 July, reaching 872.5 mbsf with a 26 inch drill bit two days later. The hole had some tightness issues, and *Chikyu* experienced problems with the HydraRackers™ and hook positioning system, leading to a five-day delay before the casing operation could begin. Running 800 m of casing in strong sea currents, like the Kuroshio, in excess of 4 knots was a very challenging operation. However, due to the success of Vortex-Induced Vibration (VIV) mitigation provided by the new rope system, the casing was eventually successfully run into the hole. Because of the difficulties of operation, Expedition 326 was extended by twelve days and ended on 20 August 2010.

The borehole was fitted with a wellhead system at the seabed and lined with steel casing. A corrosion cap was then installed on the well for subsequent expeditions, completing all the scheduled tasks for this expedition. In future ultra-deep riser-drilling, the blow-out preventor (BOP) will be fitted at the wellhead for riser drilling. Upon completion of all scheduled operations on 20 August, *Chikyu* returned to Shimizu Port, Shizuoka Prefecture.

Expedition 331: Deep Hot Biosphere

This expedition was a first for *Chikyu* since it was not part of the NanTroSEIZE complex drilling project. Expedition 331 aimed to drill and sample hydrothermally active mounds to obtain evidence for microbial communities, including their biomass and ecosystem roles and functions. Drilling and coring operations were conducted at five sites in the Iheya North field in the Okinawa Trough: C0013, C0014, C0015, C0016 and C0017. Two of the drilled boreholes were fitted with casing for future installation of observatories for chemical and microbial studies.

A solely non-riser operation, using HPCS, ESCS, the recently developed EPCS as well as the Baker-Hughes INTEQ 4-inch coring systems to retrieve cores from a tight cluster of sites near active hydrothermal vents in the Okinawa Trough. Elevated H2S presence, high temperatures and difficult conditions for coring made this a challenging Expedition.

Seven holes were drilled at Site C0013. The first five were drilled to shallower-thanexpected depths, as high formation temperatures melted the plastic core liners. At the deepest Hole, C0013E reaching 54.5 mbsf, a guide base was set and the hole was cased with perforated steel casing to produce an artificial hydrothermal vent. *Chikyu* later returned to this site to core two short holes using aluminum core liners.

High temperatures were encountered at Site C0014 as well, but after picking up aluminum core liners for the 2.44-inch coring systems, Hole C0014G was extended to 136.7 mbsf. A guide base and casing was set at Hole C0014G, constructing a second artificial vent. Site C0015 was briefly visited and cored to 7 mbsf before the midexpedition crew change in Nago Bay.

Site C0016 was visited twice for coring with the industrial four-inch coring system. The first attempt, at the top of the hydrothermal mound 'North Big Chimney' Hole C0016A, did not recover any core as the barrel broke upon retrieval. A third guide base was set at the foot of the same mound, and C0016B was cored there to a total depth of 45 mbsf. The casing and capping operation there, to finish the third artificial vent, was the last operation performed during Expedition 331. Between Holes C0016A and C0016B, *Chikyu* visited Site C0017, coring four holes, the deepest being Hole C0017D, cored to 150.6 mbsf. Using a combination of APCT-3 downhole temperature measurements and hightemperature thermal stickers, a good temperature profile could be established for this site.

At the end of the 2010 reporting period, Expedition 331 was still underway and nearing completion.

ESO (BGS)

Expedition 313: New Jersey Shallow Shelf

Following normal procedure for Mission Specific Platforms (MSPs), the New Jersey Shallow Shelf (NJSS) Expedition continued with the Onshore Science Party (OSP) which was held in the laboratories of the Bremen Core Repository (BCR) and MARUM, and in other labs at Bremen University from 6 November to 4 December. At the OSP, the complete Science Party met as a unit for the first time, with 25 scientists from 11 countries and 40 ESO staff working to complete all minimum and most standard measurements on the Expedition 313 cores. All necessary reporting was also completed at the OSP, and was refined at the 1st post‐expedition meeting that took place at College Station from 3 to 7 June 2010. ESO presented the Expedition QA/QC report at the STP meeting held in Sydney, Australia.

The Expedition 313 Operations Review Task Force took place at the offices of the British Geological Survey, Edinburgh, from 21‐22 July, 2010. Several ESO staff members were in attendance. IODP‐MI's report will be posted at http://www.iodp.org/ortf/.

Expedition 325: Great Barrier Reef Environmental Changes

At the end of the last reporting period, it had been agreed with Bluestone that the *Greatship Maya* would arrive in Townsville on 7 January 2010 for an offshore operation expected to have duration of about 45 days, following mobilization of the ESO containers in Singapore in late November. It had been decided to start the Onshore Science Party at the BCR on 2 July. The Science Party was asked to confirm their availability for this new date. A new Marine Scientific Research (MSR) permit was also being sought from the Australian authorities for the *Greatship Maya*, and an application made for an export permit for the core. The permit from GBRMPA still stood subject to agreed modifications to the Environmental Management Plan.

As developments proceeded ESO were regularly advised by Bluestone that there were delays in the finalisation of the construction and acceptance of the *Greatship Maya*, and its modification into a drilling platform, from the shipyard. Activities that required completion prior to transiting from Singapore included: ship trials and certification prior to delivery from the

shipyard to Rieber/Bluestone, installation of the mezzanine deck, derrick and drilling system followed by certification and wet trials, hull cleaning and inspection to satisfy GBRMPA requirements and mobilisation of ESO containers. This information was passed during weekly conference calls, some key steps of which were:

- 17 November: the schedule was for the *Greatship Maya* to leave Singapore on 6 January and arrive in Townsville on 16 January.

- 19 November: the schedule was for the *Greatship Maya* to leave Singapore on 8 January and arrive in Townsville on 18 January.

- 12 December: the schedule was for the *Greatship Maya* to leave Singapore on 11 January and arrive in Townsville on 21 January, and this schedule was confirmed on 23 December.

- 30 December: ESO was advised by Bluestone of further significant slippage and it was reluctantly agreed that the arrival of the vessel in Townsville would be delayed until 30 January 2010, although the ESO team would travel to Singapore for mobilisation on 4 January as planned. [Note: in the event there were further delays such that the vessel did not leave Singapore until 29 January, and arrived in Townsville on 4 February. Final amendments to the BGS ‐ Bluestone contract were completed on 26 January].

Throughout this time the Science Party and PMOs were kept informed of developments. Following the delay to the Onshore Science Party, 2 scientists were unable to attend and were replaced. Changes were also required to the Offshore Science Team. The petrophysics role was taken by a palaeomagnetist, and no sedimentologists from the Science party were available and so were replaced by two ‘technicians’, one an Australian post ‐ doc and the other a BGS petrologist.

The revised MSR/PSV application to conduct marine research was submitted through the UK FCO and British High Commission in Canberra after it was established that the Singapore Authorities were reluctant to carry out this task. The permit was finally approved on 15 January, although it required subsequent modification to the dates specified, which were approved on 8 February.

The Environmental Management Plan was updated as requested by GBRMPA, and was approved. Permits were obtained to export the coral cores from Australia, and also for the separate export of samples for dating.

Mobilisation and sea trials of the *Greatship Maya* took place in Singapore 4 ‐ 29 January. Transit from Singapore to Townsville, Australia, took place 29 January ‐ 4 February. Second mobilisation in Townsville took place 4 ‐ 11 February.

The offshore part of the Expedition set sail on 11 February, and cored for 55 days off NE Australia on the Great Barrier Reef, and returned to Townsville for demobilisation 6 ‐ 7 April.

Although the recovery was less than expected (c.f. 57.5% for Expedition 310 Tahiti, which had slightly different lithologies, i.e. higher portion of microbialites), some impressive cores were recovered, including continuous massive coral frameworks characteristic of very high

energy and shallow (probably <5 m paleowater) environments, ideal for sea level reconstruction.

Planning for the GBREC Onshore Science Party continued throughout the reporting period. Three EPC Research Associates and one technician were involved in pre‐OSP activities for GBREC. During this time, whole core thermal conductivity measurements were undertaken on appropriate core sections. In addition, the time was used to set up equipment and make final preparations for the GBREC Onshore Science Party.

Remaining ESO staff arrived in Bremen on 28 June to make final preparations for the Onshore Science Party. The Co‐chief Scientists arrived on 30 June.

The GBREC Onshore Science Party (OSP) was held in the laboratories of the Bremen Core Repository (BCR) and MARUM, and in other labs at Bremen University from 2‐16 July 2010. At the OSP, the complete Science Party met as a unit for the first time, and all minimum and most of the standard measurements were carried out.

The GBREC OSP began on 2 July at the IODP Bremen Core Repository with all Science Party members present. The OSP was attended by 27 participating scientists from 9 countries, and 39 ESO staff: Bremen (25 including 10 student workers), BGS (7), EPC (6), TAMU (1).

All necessary reporting was completed at the OSP by the Science Party and ESO staff, and will be refined at the 1st Post‐Expedition Meeting to take place at College Station, Texas. Note: this meeting took place from 7‐11 December 2010.

Other

ESO has continued to implement QA/QC within MSP operations as asked by IODP‐MI. Various work packages related to this topic which encompass overall policies and procedures for QA/QC are either in progress or already completed. The Exp. 313 QA/QC report was updated along the new STP guidelines (STP Consensus Statement 1003‐03: Modification of QA/QC Reporting Procedures).

ESO keep improving the online tutorials for both the Offshore Phase and the Onshore Science Party (OSP) available on the web:
http://www.marum.de/en/Offshore_core_curation_and_measurements.
http://www.marum.de/en/Onshore_Science_Party_OSP.html

USIO

The U.S. Implementing Organization (USIO) completed four full expeditions and one short expedition during FY10, along with a working transit and operational hiatus/maintenance period. Over the course of these expeditions, the USIO drilled in locations that have not been previously drilled; added detail to existing transects to test hypotheses regarding massive magmatic episodes; recovered proof that Antarctica was once
a subtropical environment; investigated the history of global sea level change, including ice volumes and tectonic activity; set a number of scientific ocean drilling records; and installed several subseafloor observatories, some of which will be connected to a cabled seafloor observatory network.

Expedition Planning

USIO operational planning during FY10 included planning and staffing for IODP Phase 2 expeditions and acquiring the clearances and environmental assessments needed for those expeditions. The USIO held pre-expedition planning meetings in College Station, Texas, for FY10 Expedition 327 (Juan de Fuca Hydrogeology) and FY11 Expeditions 329 (South Pacific Gyre), 334 (Costa Rica Seismogenesis Project [CRISP]), and 336 (Mid-Atlantic Ridge Microbiology). Ancillary Project Letter (APL) 762 sites were incorporated as the highest priority alternate sites for Expedition 327, and detailed scoping of proposed APL 734 (Cascadia CORK) and initial scoping of proposed APL 757 (South Pacific Gyre) were provided to the Operations Task Force (OTF).

The radioisotope van was installed on the *JOIDES Resolution* for Expedition 329, and planning efforts focused on identifying unique needs of the Science Party. Planning for Expedition 330 (Louisville Seamount Trail) continued on all fronts, including efforts associated with meeting requirements for deploying the third-party Göttingen tri-axial borehole magnetometer. The USIO worked with the OTF to develop scientific priorities for Expedition 334 and with IODP Management International, Inc. (IODP-MI), to extend Expedition 335 (Superfast Spreading Rate Crust 4) by two weeks at the proponents' request.

Engineering planning meetings were held in College Station to finalize major design changes to subseafloor borehole observatories (circulation obviation retrofit kits [CORKs]) deployed at the Juan de Fuca Ridge during Expedition 327 and complete the design of an advanced CORK (ACORK) deployed at the Cascadia margin during Expedition 328 (Cascadia ACORK Observatory). An additional engineering planning meeting was also held for Expedition 336, and proponents continued ordering long–lead time completion hardware from an externally funded grant. In addition, a meeting was held in Sydney, British Columbia (Canada), to scope the borehole observatory engineering requirements to complete implementation of Cascadia Margin Gas Hydrates proposal (553). Observatory costs were estimated based on this scoping meeting with the proponents, and all information was used to assess the feasibility of placing this proposal on the expedition schedule.

Expedition staffing

Science staffing was completed for Expeditions 327, 328, 329, and 330 (Louisville Seamount Trail). Science Party staffing was altered for Expeditions 317 (Canterbuy Basin Sea Level) and 318 (Wilkes Land Glacial History) to accommodate scientist withdrawals and gaps in expertise; the USIO worked with Program Member Offices (PMOs) and Co-Chief Scientists to successfully fill these vacant positions. The USIO also identified and contracted an ice observer to sail during Expedition 318. Shipboard berths were made available to accommodate diversity, education, and outreach efforts during Expeditions 324 (Shatsky Rise Formation), 317, 327, and 328.

Clearances

The USIO received approval to enter the Canadian Exclusive Economic Zone during operations for Expeditions 327 and 328. Port call applications for Expeditions 329 and 330 were submitted to New Zealand and accepted. A clearance application was also submitted to the State Department for Expedition 334 and, because the contingency option for Expedition 335 includes coring at the CRISP operational area, planning began for submission of a separate clearance application to Costa Rica.

Environmental assessment

The USIO obtained approval to conduct vertical seismic profile operations at all primary and alternate Expedition 317 sites with either the dual-G gun cluster or the single-G gun and

submitted a revised Environmental Assessment for Expedition 318 to address new requirements for seismic activities and to add new sites to be occupied. The Environmental Protection and Safety Panel and Texas A&M University (TAMU) Safety Panel recommended approval of USIO-submitted plans for deepening Hole 1027C and adding APL 762 sites for Expedition 327, site sheets and associated data for Expedition 328, a request for an extra 100 meters depth penetration at the three Expedition 329 basement sites, and plans for three additional Expedition 330 sites.

Expedition 324: Shatsky Rise Formation

In September 2009, an international team of scientists set sail on the scientific drilling vessel *JOIDES Resolution* for an 8-week Integrated Ocean Drilling Program (IODP) expedition to Shatsky Rise, a 145-million-year-old volcanic plateau 1,500 km east of Japan. The Shatsky Rise volcanic mountain chain represents one of the largest "supervolcanoes" in the world; the top of Shatsky Rise lies 3.5 kilometers below the sea surface, while its base plunges to nearly 6 kilometers below the surface. Eruptions of supervolcanoes, also referred to as large oceanic plateaus when they occur on the ocean floor, have been blamed for causing mass extinctions, belching large amounts of gases and particles into the atmosphere, and repaving the ocean floor. Researchers debate their formation, which results either from a huge bulbous magma source (a plume head) rising from deep in the Earth to the surface or from tectonic processes at the intersection of three tectonic plates, known as a triple junction.

Expedition 324 offered a unique opportunity to study the origin of supervolcanoes because Shatsky Rise Plateau formed at a rapidly spreading triple junction with characteristics that could be attributed to either model of formation and is also the only large oceanic plateau formed during a time when Earth's magnetic field reversed frequently. The magnetic reversal process created "magnetic stripe" patterns in the seafloor that will allow scientists to better understand the formation of Shatsky Rise and its relationship to the surrounding tectonic plates and triple junctions, making Shatsky Rise one of the best locations on Earth to test the plume versus plate-tectonic origin hypotheses of ocean plateau formation.

Magnetic lineations show that Shatsky Rise Plateau formed along the trace of a triple junction and its formation was intimately related to ridge tectonics. Existing data, however, demonstrate that several aspects of Shatsky Rise's history (e.g., massive, rapid initial growth; transition from large to small magma flux; and capture of ridges) fit the plume model. On the other hand, the coincidence of volcanism with the triple junction, ridge jumps, and the lack of isotopic evidence for a hotspot-type mantle source can all be taken as favoring a plate-controlled origin.

During the expedition, 1,400 meters of sediments and igneous basement were penetrated at five sites. Basalt flows were recovered at four of the sites, and volcaniclastic deposits were found at the fifth site. Sediments recovered immediately above the lava flows imply that the summits of Shatsky Rise volcanoes were near sea level or emergent, likely forming large islands. The recovered core samples will be used to examine the history, magma sources, and evolution of Shatsky Rise.

Expedition 317: Canterbury Basin Sea Level

In November 2009, IODP scientists embarked on an expedition to collect and analyze geological data to investigate the history of global sea level change, including ice volumes and tectonic activity, over the last 30 million years. For this expedition, the *JOIDES Resolution* carried scientists to the Canterbury Basin, a tectonically active region located off

the eastern coast of the South Island of New Zealand, to recover sediment samples from as deep as 1,927 meters beneath the seafloor.

Expedition 317 objectives focused on understanding the relative importance of global sea level versus local tectonic and sedimentary processes in controlling continental margin depositional cyclicity. The emphasis was on the last 30 million years, when global sea level change was dominated by glacial–interglacial ice volume fluctuations, primarily on Antarctica. The deepest target was the early Oligocene Marshall Paraconformity, hypothesized to mark the initiation of thermohaline circulation and the proto-Antarctic Circumpolar Current. Data from the expedition may also yield new information on the early history of the Alpine Fault plate boundary.

Canterbury Basin offered the opportunity to study the complex interactions between processes responsible for the preserved stratigraphic record of sedimentary sequences. Melting of Antarctic ice increases the volume of water in the oceans and therefore influences sea level globally. However, other processes such as vertical movement of the Earth's crust can also affect sea level locally. To ensure that the sea level signal recorded within a particular sedimentary basin is indeed global, it is necessary to correlate results from that basin with similar data from other widely separated locations. The Canterbury Basin is an ideal location for this study because it is far from sites previously drilled to study global sea level, primarily located in the North Atlantic. Furthermore, Canterbury Basin sediments were laid down on the seafloor rapidly, resulting in a detailed geological record. The transect of sites drilled during Expedition 317 provides a stratigraphic record of depositional cycles across the shallow-water environment most directly affected by relative sea level change.

Expedition 317 set a number of scientific ocean drilling records, including the deepest hole drilled on a shallow continental shelf (1,024 meters) and the deepest hole drilled during a single IODP expedition (1,927 meters). The team also recovered sediment from the shallowest scientific drilling site (85 meters water depth) ever drilled with the *JOIDES Resolution* for scientific purposes.

Cores taken during Expedition 317 have revealed cyclic changes in sediment type and physical properties that are believed to reflect switches between glacial and interglacial time periods. Sedimentary records from one site provide an archive of changes in ocean circulation that occurred when movements in Earth's tectonic plates separated Antarctica from Australia. With current climate models predicting a sea level rise of possibly more than 1 meter in the next 100 years, a direct analysis of samples chronicling the history of rising sea levels can help us prepare for further changes to Earth's coastlines.

Expedition 318: Wilkes Land Glacial History

In January 2010, the *JOIDES Resolution* carried IODP scientists to the Wilkes Land margin off the coast of Antarctica to investigate records of climatic and oceanographic changes in Antarctica over the last 53 million years. Working near the Antarctic coast due south of Australia, the Expedition 318 team negotiated icebergs and near gale-force winds to recover sediment samples from 1,006 meters beneath the seafloor in waters as deep as 3,992 meters to broaden USIO's understanding of the Antarctic cryosphere. These sediment samples are a direct record of waxing and waning of ice in Antarctica and show that approximately

53 million years ago Antarctica was a warm, lush, subtropical environment. During this period, known as greenhouse Earth, atmospheric carbon dioxide (CO_2) levels exceeded those of

today by a factor of ten. Subsequent decreases in atmospheric CO2 led to a transition to the cold, dry icehouse Earth, when large ice sheets began to form around 34 million years ago.

The transition from greenhouse to icehouse Earth impacted global sea level, albedo, and oceanographic and biotic evolution, among other changes. Climate models combined with paleoclimatic proxy data suggest that decreasing levels of CO2 concentration in the atmosphere was the main triggering mechanism for inception and development of Antarctic glaciation. With the current rising atmospheric greenhouse gases resulting in rising global temperatures, studies of polar climates and the Antarctic cryosphere behavior in particular are prominent on the research agenda. Drilling in the Antarctic Wilkes Land margin was designed to provide a long-term record of Antarctic glaciation and its intimate relationships with global climatic and oceanographic change obtained from sedimentary archives along an inshore to offshore transect.

Principal goals of the expedition were to obtain the timing and nature of the onset of glaciation at the Wilkes Land margin; a high-resolution record of Antarctic climate variability during the late Neogene and Quaternary; and an unprecedented, ultrahigh resolution (i.e., annual to decadal) Holocene record of climate variability. More than 330 cores were collected during Expedition 318, with a combined length of nearly 2 miles and a geological history of 54 million years. The Wilkes Land cores and downhole logs reveal details of regional tectonic history, document the rifting between Australia and Antarctica, and provide a direct record of the severe and sudden changes in Antarctica's environment. Cores from one site preserve unprecedented seasonal variability of the last deglaciation that began some 10,000 years ago. Data from Expedition 318 will be used to create more effective global climate models and, therefore, more accurate predictions of future climate changes.

Expedition 327: Juan de Fuca Ridge Flank Hydrogeology

In July 2010, scientists set sail on the second IODP expedition to Juan de Fuca Ridge in an effort to complete the installation of a series of subseafloor observatories designed to allow scientists to investigate the hydrogeology of oceanic crust. Expedition 327 built on the achievements of IODP Expedition 301 and subsequent submersible and remotely operated vehicle (ROV) expeditions. Scientists installed subseafloor observatories in two new holes into oceanic crust and replaced part of an instrument string deployed in an existing hole to facilitate long-term monitoring (pressure, temperature, geochemistry, and microbiology) and to conduct cross-hole hydrologic experiments using a network of observatory systems.

The overarching goal was to conduct the first multidimensional, cross-hole experiments attempted in the oceanic crust to include hydrologic, microbiological, and tracer components. Data collected during and after the expedition will help scientists evaluate the formation-scale hydrogeologic properties of the oceanic crust, determine how fluid pathways are distributed within an active hydrothermal system, and elucidate relations between fluid circulation, alteration, microbiology, and seismic properties.

These experiments are being conducted where (1) thick sediment cover isolates permeable basement, allowing small pressure transients to travel long lateral distances; (2) outstanding coverage of seismic, heat flow, coring, geochemical, and observatory data allow detailed hypotheses to be posed and tested; (3) existing Ocean Drilling Progam (ODP)/IODP drill holes and long-term observatories provide critical monitoring points for pre- and postdrilling experiments; (4) the formation is naturally overpressured to drive multiyear cross-hole experiments; and (5) a planned cabled seafloor observatory network will facilitate long-term experiments, data access, and instrument control.

In addition to observatory installation, a program of shallow sediment coring was completed adjacent to Grizzly Bare outcrop, a suspected site of regional hydrothermal recharge. Thermal measurements and analyses of pore fluid and microbiological samples from a series of holes aligned radially from the outcrop edge will elucidate rates of fluid transport and evolution during the initial stages of ridge-flank hydrothermal circulation. Expedition 327 also featured a new pilot program comprising the largest group of education and outreach personnel ever to sail on a full-length IODP expedition. Participants from the United States and France assisted in shipboard science and produced educational andmultimedia activities.

Expedition 328: Cascadia ACORK Observatory

In September 2010, a small group of scientists set sail on the *JOIDES Resolution* for a 2-week expedition to install a new permanent hydrologic borehole observatory near Ocean Drilling Program Site 889. The format of the new installation followed the advanced circulation obviation retrofit kit (ACORK) design, which will facilitate pressure monitoring at multiple formation levels on the outside of a 10¾ inch casing string. The successfully installed observatory will document the average state of pressure in the frontal part of the Cascadia accretionary prism, pressure gradients driving flow from the consolidating sediments, mode of formation of gas hydrates, influence of gas hydrates and free gas on the mechanical properties of their host lithology, response of the material to seismic ground motion, and magnitude of deformation at the site caused by secular strain and episodic seismic and aseismic slip in this subduction setting. The casing was sealed at the bottom, leaving the inside available for future installation of additional monitoring instruments. At a later date, the observatory will be connected to the NEPTUNE Canada fiber-optic cable for power and real-time communications from land.

The School of Rock 2010 was held on board the *JOIDES Resolution* during Expedition 328, enabling participants to observe tool deployment and learn about observatory installation.

Engineering Support

The USIO acquired a number of new analytical systems and completed several engineering projects in FY10 and continued others, making significant progress with technology enhancements and infrastructure improvements.

The USIO built or acquired new analytical systems, representing new capabilities and replacing damaged or obsolete equipment. Acquisitions include a new chloride autotitrator to automate chloride determination on board the *JOIDES Resolution*, a handheld energy-dispersive X-ray fluorescence (XRF) spectrophotometer to provide additional shipboard elemental analysis capabilities, and a total organic carbon (TOC) analyzer that is capable of both combustion and wet persulfate oxidation and is equipped with a nitrogen detector, providing analytical capabilities (total nitrogen) in addition to the usual TOC. USIO staff also designed and constructed a system to facilitate easy and efficient capture of thin section images in transmitted light, polarized light, and crosspolarized light. Using the petrographic image capture and archiving tool (PICAT), a user can see the live image on the screen before it is captured and then easily upload it to the database along with key metadata. One PICAT was deployed on the *JOIDES Resolution* and one was installed in the Gulf Coast Repository (GCR) for imaging the thin section archive.

Large-diameter pipe handling infrastructure: The USIO contracted Howard and Associates, Inc. (HAI), to provide expertise in the large-diameter pipehandling infrastructure project. HAI finalized the request for quotations (RFQ) for the design and fabrication of infrastructure for

safely and efficiently handling large-diameter ($6^{5}/_{8}$ inch) pipe on board the *JOIDES Resolution*. The USIO and HAI reviewed responses to the RFQ and selected Blohm & Voss (B&V) to perform preliminary engineering work on 350- and 500-ton dual side elevators, bushings, and base plates. The USIO and HAI will review drawings of the B&V elevator design, including overall dimensions, weight, and center of gravity location to determine if the elevator can be used with the existing Overseas Drilling Limited pipe-handling system. If so, the USIO will contract with B&V to manufacture the necessary infrastructure. Lamont-Doherty Earth Observatory (LDEO) of Columbia University-Borehole Research Group (BRG) will be responsible for overall project oversight on behalf of the USIO and will retain the services of HAI through a subcontract for interaction with the main contractor, review engineering drawings, oversee testing procedures, and provide the USIO with status reports and recommendations throughout the project. The USIO is also exploring possibilities for a functional test at sea of the large-pipe handling infrastructure.

Magnetic susceptibility sonde rebuild: The USIO began working to build two new magnetic susceptibility sonde (MSS)-B tools to replace the MSS-A that was lost at sea during Expedition 320 (Pacific Equatorial Age Transect). In contrast to the MSS-A tool, the electronics section of the MSS-B tools will be separate from the high-resolution sensor/housing, and both the high- and low-resolution sensors will be able to use temperature readings for more accurate processing of the tool responses. A new coil configuration for the low-resolution sensor was modeled, and specifications and engineering drawings were sent to a local vendor for spinning the coils. The coils will be integrated with the sensor's electronic board, which was purchased and successfully tested during the last quarter of FY10. Completion of remaining tasks and bench testing for the low- and high-resolution sensors and temperature compensation is anticipated during the second quarter of FY11.

Multisensor magnetometer module: The USIO began the design and fabrication of a multisensor magnetometer module (MMM), purchasing sensors for the tool and working on design and construction of the power supply and communications boards. Other main tasks were scheduled for completion during FY11 and FY12, and the tool should be ready for the first expedition deployment in early FY13.

The USIO also focused on designs and specifications of the nonmagnetic pressure housings for both the MMM and the MSS-B and explored methods for integrating both instruments into a single tool string.

Multifunctional telemetry module: The USIO completed the multifunctional telemetry module (MFTM) and surface control panel that will be used for the motion decoupled hydraulic delivery system (MDHDS) project. The MFTM was successfully tested at the LDEO test well facility in combination with the University of Texas at Austin penetrometer (temperature to pressure [T2P]). Final bench testing with the entire MDHDS and T2P assembly is scheduled for early 2011.

The USIO worked with IODP-MI to develop an MFTM for use in a proposed Simple Cabled Instruments for Measuring Parameters In-situ deployment. This initiative is a collaborative effort between the USIO, University of Rhode Island, and Stress Engineering for a potential deployment in 2011.

The USIO began working with the Center for Dark Energy Biosphere Investigations (C-DEBI) at the University of Southern California (USC) to build an MFTM that will be used for

deploying a combination of LDEO and Schlumberger tools with a deep exploration biosphere investigative tool (DEBI-t) that is being developed by scientists and engineers from USC, the National Aeronautic and Space Administration Jet Propulsion Laboratory at the California Institute of Technology, and Photon Systems, Inc. The target for this deployment is Deep Sea Drilling Project (DSDP) Hole 395A during Expedition 336 in September 2011.

Wireline heave compensating system: Successful wireline heave compensator (WHC) tests were conducted during Expedition 324. The USIO began analyzing all WHC data acquired during recent expeditions to determine the system's effectiveness while operating in different water depths and sea states and to identify potential improvements. The initial assessment of the system was good, with the system reaching a maximum 80% level of compensation in some instances. Data collection continued under different conditions (i.e., water depth, heave, and so on) prior to logging operations in open holes for optimizing the system's capabilities. The USIO will continue to routinely assess results and work with Schlumberger to optimize the system.

Geosciences Laboratory (ODASES): The IODP XRF core scanner at the TAMU Ocean Drilling and Sustainable Earth Science (ODASES) Geosciences Laboratory attracted increasing numbers of analysis requests, with most of the work performed consisting of surveying core material for areas of interest. USIO staff trained visiting scientists on instrument use and oversaw operations.

Construction began on two core loggers that will provide a bed for testing improvements before they are deployed to the operational environment. A shorebased Section-Half Imaging Logger was installed in the laboratory to provide an applications testing facility. When not used for development, the core loggers will be made available for use by visiting scientists.

Licensing IODP technology: The TAMU Office of Technology Commercialization licensed the commercial use of the Pressure Core Sampler to DOWDCO, an oilfield services contractor, and licensed an option to Hydril USA Manufacturing LLC, a Houston-based oil services firm, to incorporate the Common Data Acquisition System into Hydril's proprietary dual gradient pump system. In both cases, IODP reserves the right to use the technologies for nonprofit research.

ENGINEERING DEVELOPMENT

Engineering Development Proposals

The Fourth Engineering Development Proposal submission season ended April 15, 2010. Total one proposal was received, shown below. The proposal was first reviewed by IODP-MI and then by the Engineering Development Panel (EDP), which met July 14-16, 2010 for competition for Science Operating Cost (SOC) funds.

Engineering Development Proposals Submitted by April 15th, 2010

Proposal No.	Title	Proponent, Institution
ED-2012-01-B	Wireline hydraulic testing and borehole imaging tool for stress measurement	Ito, JAMSTEC

Development of FY2012 Engineering Development Plan
Based on proposal ranking and discussion from the July 2010 EDP meeting, IODP-MI developed the FY2012 engineering development plan. This plan temporary includes second year of development for the Wireline Hydraulic Testing Tool. Continuation of the Wireline Hydraulic Testing Tool is depend on second review at EDP meeting on February, 2011 and feasibility study result on FY11.

Offshore Technology Conference
Through personal interface, booth visuals, brochures, and other handouts, the IODP Engineering Development initiative was successfully promoted at the Offshore Technology Conference (OTC) held in Houston, Texas, May 3-6, 2010.

IODP-MI Managed Projects (Third-Party)
Motion Decoupled Hydraulic Delivery System (MDHDS): System design and fabrication is proceeding by Mohr Engineering and Lamont Doherty Earth Observatory (LDEO). A meeting was held on for March 1 with IODP-MI representatives at Mohr to discuss progress of project. There are some delays on delivery of manufacturer parts and the completion of design and fabrication at Mohr Engineering. A full bench top system test is scheduled for mid-January, 2011 and down hole test is tentatively envisioned for May 2011.

Simple Cabled Instruments for Measuring Properties InSitu (SCIMPI): Team requesting URI's R/V Endeavor ship time in March 2011 for a SCIMPI field verification in the water column to a 1000-foot (305m) depth. The Operations Task Force meeting in August recommended scheduling deployment during the JR down-time between CRISP in Costa Rica and Superfast at the Mid Atlantic next summer. The SCIMPI team is now preparing a new deployment proposal for decision from OTF. Sites under evaluation so far are U1322 and U1324 for the IODP Expedition 308, located in the Ursa Basin in the Gulf of Mexico.

CDEX
Long-Term Borehole Monitoring System (LTBMS)
The CDEX LTBMS project team worked very closely with the NanTroSEIZE PMT Observatory Team scientists in developing the LTBMS implementation plan. Based on results from the test runs studying VIV reduction strategies performed at sea aboard *Chikyu* and with models in pool testing facilities ashore, the effectiveness of using rope to reducing VIV was established, so VIV-reduction operation criteria for high-current areas were defined. The operation procedures were also refined, so that the LTBMS assembly will be deployed in the low current area, and then towed toward the target site while the vessel is drifting with the current, and finally run into the wellhead for completion.

Telemetry System: As part of the SOC-supported final work on LTBMS development, system life tests were performed using an experimental prototype mockup under the anticipated environmental conditions for the deep LTBMS installation. Fast sampling analog-to-digital converters (ADC: ADS1281, ADS1282) were tested at 139°C and 150°C, and the ceramic downhole telemetry system high temperature tests at 175°C. All tests were completed and the results submitted in final reports to IODP-MI.

Both downhole modules showed intermittent connection failures of the power supply line (+2.5 VD supply line) to FPGA (Field Programmable Gate Array), but at different times. Upon microscopic investigation, severe deformation and cracks were found on the PCB (Print Circuit Board), and therefore, system life tests were suspended. One module's total life-test

time was 832 hours at 140°C and 2036 hours at 139°C (equivalent to 10.9 months at 125°C). For the other module, total life test time was 2390 hours at 139°C (equivalent to 8.9 months at 125°C).

High temperature tests of the ceramic downhole telemetry system at 175°C was completed on schedule without any failures. The cumulative test time was 650 hours.

CORE CURATION

Bremen Core Repository

Bremen Core Repository (BCR) experienced another busy year, with the major activities including regular sampling for scientists' requests and adapting data from legacy cores, samples and sample requests into the DIS database system. The period was also characterized by numerous outreach activities and a large number of prominent visitors. Two Onshore Science Parties (OSPs) for ESO-operated expeditions were also held at BCR/MARUM/Bremen University: Exp. 313 (New Jersey Shallow Shelf, November 6 to December 4, 2009) and Exp. 325 (Great Barrier Reef Environmental Changes, July 2 to July 16 2010). A total of 50,345 samples were taken at the BCR for 249 requests during this fiscal year (Table 1), including those for both normal operations and OSPs. BCR has processed a substantial number of sample requests for DSDP and older ODP cores (redistribution cores), and the total number of samples taken is high compared to the average over past years, in part due to the additional activity of the two Onshore Science Parties within the reporting term.

During this fiscal year IODP Expedition 325 “Great Barrier Reef Environmental Changes” was drilled in the western Pacific from February through April 2010, recovering 225.28 m of new core to be stored temporarily at the BCR. In terms of total core storage, this is a relatively small addition to the BCR inventory, which is now around 142 km of DSDP, ODP, and IODP cores. These IODP Expedition 325 cores, because they were drilled in the western Pacific, will be transferred to the Kochi Core Center at the end of the moratorium year.

<u>DSDP/ODP Core Redistribution Project</u>

Although the core redistribution project itself was completed during FY09, the arrival of DSDP cores in Bremen brought to their attention a deficiency in the existing JANUS corelog database – that is, the basic core and section length data for a large portion of the DSDP core collection has numerous mistakes that need to be corrected by looking at all of the core photos and entering the correct section numbers and lengths into a table. BCR is still employing student workers to carry out this relatively long-term project, and so far 24 DSDP Legs have been completed and the tables for each leg have been sent to the database group at TAMU for review and update of the JANUS database. When this project is complete, the corrected values will assure accuracy of the depth calculations for all of their sampling. Completion of this task is the only remaining work to be done for the core redistribution project.

CDEX

The year 2010 marked the beginning of curating Routine Microbiological Samples (RMS), as well as the curation of larger diameter cores and cores collected in aluminum liners. Samples taken during the Bering Sea core (Expedition 323) sampling party at the Kochi Core Center

(KCC) set a new record – highest number of samples taken by a science party in the history of the scientific drilling program.

Sample Requests
KCC received and processed 82 IODP Legacy core sample requests. Three requests were received for IODP cores, including one for LWD data. Over 200 core sections (202) were shipped to China for high resolution XRF scanning. 2 sections were sent to the National Science Museum, Tokyo for a special exhibition. Sample requests are regularly received from the researchers all over the world.

Chikyu onboard curation
Curation services were provided during Expeditions 322, 326, 331, and non-IODP Expeditions 904 and 905. There are presently 46 sample requests for Expedition 331 "Deep Hot Biosphere" samples. KCC has collected and curated 124 core sections and 295 cuttings samples from Expedition 319, and 1288 core sections from Expedition 322, and the first RMS was collected during Expedition 322. An industry-standard coring system was used for the first time to recover large-diameter cores from high temperature hard rock formations during Expedition 331. Core recovery was very low; however, it helped in getting core material from formations where the standard systems could not be used. For database purposes, two new core types were defined in consultation with the ESO, USIO and IODP-MI: The type 'L' is for industry type coring system, and type 'T' is for the recently developed Extended Punch Coring System (EPCS).

Sampling party
The sampling party for IODP Expedition 323 "Bering Sea Paleoceanography" cores was organized during 2009 – 2010 in 2 phases involving 37 researchers and 10 – 15 supporting staff, who took about 2000 – 4000 samples per day. In total, about 53,000 samples were taken as a shore-based sampling party – a record in IODP history. The sample shipment amounted to 211 sample boxes, including 136 boxes for international addresses.

USIO
In addition to the Expedition 318 (Wilkes Land) routine sampling party held 21–25 June 2010 at the GCR, the USIO hosted an unprecedented special sampling and measurement party 27 June–2 July 2010 on board the *JOIDES Resolution* in Victoria, British Columbia (Canada). USIO staff assisted scientists in collecting 11,416 samples from APL 638 (Adelie Drift) cores that were collected during Expedition 318 but could not be adequately sampled during the expedition. The sampling party coincided with the external laboratory system review, which enabled the review team to witness real-time core flow and sampling processes.

DATA MANAGEMENT

IODP-MI data management services in FY10 included a number of important activities to increase the dissemination and integration of IODP and legacy program data and information resources. IODP-MI also began planning for permanent archive of IODP data resources in FY10, and will continue permanent archive planning implementation from FY11 through FY13. IODP-MI manages the Program-wide data systems, including Scientific Earth Drilling Information Service (SEDIS), Site Survey Database (SSDB), Proposal Database, Sample Materials Curation System (SMCS), Central Registry LDAP, the drilled sites database and map resources, and other systems.

The SEDIS phase III RFP, issued in FY09, was brought to conclusion with multiple contracts and multiple vendors in FY10. Development of SEDIS phase III began in June 2010. Completion of SEDIS phase III development is scheduled for end of FY11. The SEDIS system will form a basis for a permanent accessible archive of IODP data.

During FY10, SEDIS was included a searchable catalogue of IODP data, post-expedition IODP data, IODP-published and IODP-related publications. The SEDIS publications catalogue includes links from publication metadata to publication data sets. The SEDIS publications metadata is harvested from an American Geological Institute (AGI) GeoRef database. SEDIS III development will implement services oriented architectures (SOA) at IOs and IODP-MI source data systems to deliver relational data, file-based data, and core photo and other image data via web services with open discovery functionality along with pre-arranged integration with analytical applications currently in use within the IODP community.

Extension of the SSDB contract with Scripps Institute of Oceanography (SIO) was agreed upon for FY11-13. SIO will continue operations and maintenance of the SSDB. Issues such as management of time-consuming uploads, the portable SSDB-in-a-box for meeting support, and education of Site Survey Panel member on SSDB functionality were covered in the FY11-13 service agreement.

The Proposal Database was operated and maintained during FY10, and planning begun for enhancements to the Proposal Database system to support the new drilling proposal process, science themes, and ultimately drilling proposals for post-2013 scientific ocean drilling. The functional requirements for upgrades to the Proposals Database system were defined in FY10 with contracting for development to be commenced in first half of FY11. The updated Proposal Database system will be launched by August 2011.

The SMCS system continues to be hosted by IODP-TAMU, with major re-engineering planned and started during FY10. The Sample Request Management system (SDRM) is being re-engineered to make it faster and more user friendly and to increase the functionality for IOs, core repositories and sample allocation committees. The re-engineered SDRM is being designed to accommodate spreadsheet import and export for ease of desktop data entry and sample request review processes. The SDRM version 2 will be launched in FY11. IODP-MI also began planning for modernization of the Central Inventory (CI) of IODP sample materials in FY10. The modernization would enhance synchonization methods with repository inventory systems and improve develop a search interface to allow end users to search for IODP materials from any of the repositories. The updated CI will be developed and launched in FY11.

IODP-MI coordinated two meetings of the IODP Data Management Coordination group in FY10. This group includes technical representatives from all IOs and applications developers from the IODP scientific community (e.g., GeoMapApp, DBSeaBed, etc.). These meetings were used to coordinate plans and actions for SEDIS, SMCS and other Program-wide data systems.

Other data management activities conducted during FY10 include operation and maintenance of the OGC web services for SEDIS metadata, updating, hosting and maintenance of the IODP Google Earth database, hosting and maintenance of the IODP Central Registry LDAP system, development of the Taxonomic Names List database,

standardization of lithology classification systems, drafting of an updated IODP Depth Scale Terminology document, and internal office IT resource operations and maintenance.

PUBLICATIONS

Publications activities in FY10 included:
1) Publication of the program journal *Scientific Drilling*,
2) Oversight and coordination of program reports and proceedings,
3) Review and updating of publication policies and procedures, and
4) Planning and preparation permanent and accessible archive of IODP Publications

During FY10, IODP published 14 Scientific Prospectuses for the following expeditions: Expedition 324, Expedition 326, Expedition 327, Expedition 328, Expedition 329, Expedition 330, Expedition 331, Expedition 332, and Expedition 332, Expedition 333, Expedition 334, Expedition 335, Expedition 336, Expedition 337. IODP published 10 Preliminary Reports in FY10: Expedition 313, Expedition 317, Expedition 318, Expedition 319, Expedition 322, Expedition 323, Expedition 324, Expedition 325, Expedition 332, and Expedition 323. IODP also published Proceedings Volumes for 5 Expeditions; Expedition 313, Expedition 317, Expedition 319, Expedition 322, Expedition 324.
Up-to-date publications information, including links to all FY09 IODP publications can be found here: http://www.iodp.org/scientific-publications/

The bi-annual journal *Scientific Drilling* published jointly with the International Continental Scientific Drilling Program (ICDP) features articles about ongoing and finished drilling projects, as well as reports on technical developments and program outlook. *Scientific Drilling* published two issues, in March and September of FY10. The print run of *Scientific Drilling* No. 9 and issue No. 10 were approximately 5000 copies each. It was distributed to subscribers and at international scientific conferences such as AGU, EGU JpGU, AOGS and OTC. An electronic version of the journal is available for download from the website of both IODP and ICDP. In addition to unique, single subscribers, a large number of printed copies are sent as bulk subscriptions to IODP related institutions (e.g., Program Member Offices) for a most cost effective distribution. A new program member office in Australia has established processes for handling and distributing the journal throughout the ANZIC community. Editorial Review Board was used for peer review of science reports articles in FY10. Editors for the board were invited by IODP-MI and ICDP from the scientific drilling community, covering all main aspects and fields of *Scientific Drilling*, on land and in the ocean. The experience so far has been efficient and the feedback to the authors improved manuscripts significantly.

IODP-MI planned for roll out of CrossRef Cited-by-linking services to IODP published reports and Proceedings in FY11. The cited-by-linking services is currently implemented for *Scientific Drilling* and changes at CrossRef have made it available to IODP reports and Proceedings. Implementation of the Cited-by-linking services will be completed in FY11.

IODP-MI coordinated multiple meetings with IODP-TAMU Publications Services Group during FY10, including a meeting with AGI in Washington, D.C. and several meetings during IODP-MI travel to IODP-TAMU offices. The close communication and coordination with IODP-TAMU Publications group has been helpful in dealing with a number of publication extension requests, in responding to delays in some Scientific Prospectuses and Preliminary

Reports, in planning for Cited-by-linking implementation and in reviewing and updating IODP Publications Policy.

IODP-MI began review of the electronic format of IODP publications in FY10, at the request of IODP-TAMU. This issue was presented to SAS for discussion in FY10 and will be followed up in FY11. Under review is the cost/benefit of both HTML and PDF versions of IODP publications. No changes for these electronic publications formats are planned for FY11, but recommendations will be prepared for the post-2013 scientific ocean drilling program.

IODP-MI coordinated a review and updating of IODP Depth Scale Terminology in FY10. An IODP Task Force was convened to develop a version 2 of the IODP Depth Scale Terminology Document and to develop Guidelines for Use of the IODP Depth Depth Scales Terminology in IODP Publications and Reports. The updated depth scale terminologies and guidelines for use in publications were released for community review and comment, and will be reviewed by SAS in FY11. The Depth Scale Terminologies v.2 and publications guidelines will be released after SAS approval.

OUTREACH

IODP-MI Communications and Outreach activities in FY10 included successful improvement and development of media relations, IODP.org website, graphic and publication with reaching the target audiences; the science community, Lead Agencies, IOs and Program Members, media and the general public.

During FY10, IODP-MI Outreach activities continued updating and maintaining of the IODP.org website. The contents were enriched with videos, news coverage and newsletters, expedition and engineering reports, SAS and panel information, calendar listings.

Re-engineering of content management system (CMS) to update the backend of the IODP.org website started in FY09 was scheduled for completion in FY11. This project enables to reduce administrative cost, increase efficiency of daily updating and creating more user friendly website. The goal of this project is IODP.org website will be applied as website for the 2013 Program.

IODP-MI Outreach issued a lot of press releases and tracked the success of IODP press releases. The news stories were placed in notable media, both on printed and online outlets with covering each expedition. Significant scientific findings of the program and highlights of FY10 were also released.

IODP-MI outreach actively involved in coordinating video coverage aboard all platforms to capture the scientific operations of the program for use in media coverage, informational videos, and website features.

As parts of these activities, video about IODP’s activities and expeditions were created and presented in international conferences (AGU, EGU and OTC). Developing and finalizing video on INVEST started in FY10 will be completed in FY11 Q1. The deliverables will be presented at the international conferences as well as distributed to the scientific community, IOs and Lead Agencies and stake holders.

In addition, the video project started in FY10 as a carry forward project with highlighting expeditions by MSPs such as Great Barrier Leaf and New Jersey Shallow Shelf expeditions and IODP activities will be in completion in FY11 Q2.

From FY09, the activities were assigned to direct management by IODP Publications and Data Manager due to open position for Outreach Manager. Since July 2010, all the IODP-MI Communications and Outreach activities have been under the responsibility of the new IODP Outreach and Communications Manager, Miyuki OTOMO.

Other FY10 IODP-MI Communications and Outreach activities included:

Outreach to Scientists

- IODP-MI organized IODP exhibition booths at the international conferences including AGU(14-18 December), EGU(2-7 May), OTC(3-6 May), JPGU(23-28 May), AOGS(5-9 July)

- IODP-MI held Town Hall Meeting at AGU and EGU (the latter cosponsored with ICDP and ECORD) and each event attracted over 350 scientists and conference attendees. The program agenda included updates on IODP and IODP-MI activities, 2009-2010 expeditions and INVEST report.

- IODP press conference was held at EGU, resulting in numerous articles in scientific publications and international media. The program included IODP Exp.323 (New Jersey Shallow Shelf), Exp.325 (Great Barrier Environmental Change) and Post 2013 future ocean drilling research program.

- Other geosciences conferences IODP-MI involved were:

1) Sedimentological Society of Japan Annual Meeting
2) Japanese Geological Society
3) NSF Tokyo Regional Office 50 years Symposium
4) 5th International Symposium on Submarine Mass Movements and Their Consequences

- IODP-MI outreach produced and distributed new edition of *IODP E-News*: November-December issue distributed on November 11 2009.

- IODP-MI outreach produced and submitted advertisements to *Eos* for publication (Call for proposal/IODP Town Hall Meeting at AGU Fall Meeting)

- IODP-MI distributed Scientific Drilling to 1000 subscribers in each issue.

External Outreach

- IODP-MI outreach supported port call activities, educational and training programs for teaches and young scientists under the corporation with IOs. The activity attracted media and general public to Nan TroSEIZE, OKINAWA DEEP BIOSPHERE (streamed on line and broadcasted), and educational activities in Japan, U.S., Canada, Australia and New Zealand.

Internal Communications

- IODP-MI outreach coordinated with Communications and Outreach specialists at IOs and developed informational materials for the science community, media and the public.

- Outreach Task Force Meeting in Tokyo (14-15 September) was coordinated, set an agenda and acted as a chair by IODP-MI Communications and Outreach Manager.

- INVEST Report was released on 10 June 2010. E-mail notification was sent to all registered INVEST participants.

Design and Publication

- IODP-16 page brochures started to be re-designed, edited and re-printed, and IODP calendars and flyers on Post New Program 2013 begun to be developed during FY10 will be for completion in FY11 Q1. They will be distributed at the international conferences and to the science community, Lead Agencies, IOs, PMOs, media and the public.

Media Relations

- IODP-MI Communications and Outreach activities coordinated and conducted press releases for IOs and IODP-MI activities:

1) "School of Rock" Gives Teachers Hans-on Science Research Experience (6 April)
2) Chikyu-Successful Start to Drilling to the Earthquake zone (23 August 2010)
3) Subseafloor Observatories Installed for Experiments (5 September 2010)
4) Seafloor Observatory Explores Planet in Pac.NW (18 September 2010)

- IODP-MI monitored IODP and IODP related news coverage.

- IODP-MI received interviews by NHK, Japan Broadcasting Corporation, related IODP DEEP HOT BIOSPHERE expedition. This resulted in creation of several scientific and introductory TV programs.

IODP-MI ANNUAL REPORT DISTRIBUTION LIST

D. Conover, NSF
J. Allan, NSF
T. Janecek, NSF
I. Ridley, NSF
M. Rouse, NSF
R. Batiza, NSF
T. Nakagawa, NSF

Appendix 1

Financial report