International Ocean Discovery Program

JOIDES Resolution Science Operator

FY18 Q3 Operations and Management Report

1 April–30 June 2018

Cooperative Agreement OCE-1326927

Submitted by the JRSO

to

The National Science Foundation

and

The *JOIDES Resolution* Facility Board

3 August 2018

Contents

1. Introduction

This quarterly operations and management report reflects activities and deliverables outlined in the International Ocean Discovery Program (IODP) *JOIDES Resolution* Science Operator (JRSO) FY18 Annual Program Plan to the National Science Foundation (NSF), as implemented by Texas A&M University (TAMU), acting as manager and science operator of the research vessel *JOIDES Resolution* as a research facility for IODP. Administrative services in support of JRSO activities are provided by the Texas A&M Research Foundation (TAMRF) through TAMU Sponsored Research Services (SRS).

2. Expedition operations

This section provides information on the following aspects of JRSO expedition support:

- Planning (including logistics and engineering development);
- Staffing (including a staffing table for expeditions under way during the quarter);
- Clearance, permitting, and environmental assessment activities;
- Expedition operations (including a site map for each expedition under way during the quarter, a coring summary table for each expedition completed during the quarter, and preliminary science results for each expedition that was completed during the quarter); and
- Postexpedition activities (including postcruise editorial meetings).

Table 2.1. JRSO expedition schedule

Expedition		Port (origin)	Dates [1]	Total days (port/ sea)	Days at sea (transit/ ops)	Co-Chief Scientists	Expedition Project Manager
Hikurangi Subduction Margin	375	Lyttelton, New Zealand	8 March–5 May 2018	58 (5/53)	53 (2/51)	L. Wallace D. Saffer	K. Petronotis
Brothers Arc Flux	376	Auckland, New Zealand	5 May–5 July 2018	61 (5/56)	56 (2/54)	C. de Ronde S. Humphris	T. Höfig
Non-IODP (5 July–14 October 2018) (101 days)							M. Malone
South Pacific Paleogene	378	Lyttelton, New Zealand	14 October–14 December 2018	61 (4/57)	57 (11/46)	D. Thomas U. Röhl	L. Childress
Non-IODP (14 December 2018–18 January 2019) (35 days)							M. Malone
Amundsen Sea West Antarctic Ice Sheet History	379	Punta Arenas, Chile	18 January–20 March 2019	61 (3/58)	58 (12/46)	K. Gohl J. Wellner	A. Klaus
Iceberg Alley and South Falkland Slope[3]	382	Punta Arenas, Chile	20 March–20 May 2019	61 (5/56)	56 (9/47)	M. Weber M. Raymo	T. Williams
Dynamics of Pacific Antarctic Circumpolar Current	383	Punta Arenas, Chile	20 May–20 July 2019	61 (5/56)	56 (20/36)	F. Lamy G. Winckler	C. Alvarez Zarikian
Non-IODP (20 July–19 September 2019) (62 days)							M. Malone

Expedition		Port (origin)	Dates [1]	Total days (port/ sea)	Days at sea (transit/ ops)	Co-Chief Scientists	Expedition Project Manager
Guaymas Basin Tectonics and Biosphere	385	San Diego, California (USA)	19 September–19 November 2019	61 (5/56)	56 (9/47)	TBD	T. Höfig
Non-IODP (19 November 2019–January 2020) (TBD)							M. Malone
Panama Basin Crustal Architecture and Engineering Testing	384	TBD	February–March 2020	TBD	TBD	TBD	P. Blum
Amazon Margin	387	TBD	April–May 2020	TBD	TBD	TBD	L. Childress
Non-IODP (June–July 2020) (TBD)							M. Malone
Equatorial Atlantic Gateway	388	TBD	August–September 2020	TBD	TBD	TBD	L. LeVay
South Atlantic Transect 1	390	TBD	October–November 2020	TBD	TBD	TBD	C. Alvarez Zarikian
Walvis Ridge Hotspot	391	TBD	December 2020–January 2021	TBD	TBD	TBD	K. Petronotis
Agulhas Plateau Cretaceous Climate	392	TBD	February–March 2021	TBD	TBD	TBD	D. Kulhanek
South Atlantic Transect[2]	393	TBD	April–May 2021	TBD	TBD	TBD	C. Alvarez Zarikian

Notes: TBD = to be determined.
[1] The start date reflects the initial port call day. The vessel will sail when ready.
[2] Combined expedition with Ancillary Project Letter (APL) 841 and logging while drilling (LWD) from Proposal 781A (Expedition 375).
[3] Proposal 902 combined with APL 846.

Expedition 372: Creeping Gas Hydrate Slides and Hikurangi LWD

Postexpedition activities

A joint postcruise editorial meeting for Expeditions 372 and 375 was planned for 5–9 November 2018 in College Station, Texas. The Expedition 372 *Preliminary Report* was published in March 2018.

Expedition 374: Ross Sea West Antarctic Ice Sheet History

Postexpedition activities

A postcruise editorial meeting and sampling party was planned for 30 July–10 August 2018 in College Station, Texas. The Expedition 374 *Preliminary Report* was published in May 2018.

Expedition 375: Hikurangi Subduction Margin

Table 2.2. Expedition 375 Science Party staffing breakdown

Member country/consortium	Participants	Co-Chief Scientists
USA: United States Science Support Program (USSSP)	9	1
Japan: Japan Drilling Earth Science Consortium (J-DESC)	3	0
Europe and Canada: European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC)	8	0

Republic of Korea: Korea Integrated Ocean Drilling Program (K-IODP)	1	0
People's Republic of China: IODP-China	3	0
Australia and New Zealand: Australia/New Zealand IODP Consortium (ANZIC)	3	1
India: Ministry of Earth Science (MoES)	0	0
Brazil: Coordination for Improvement of Higher Education (CAPES)	1	0

Clearance, permitting, and environmental assessment activities

In accordance with the New Zealand Exclusive Economic Zone (EEZ) Act, the Post-Activity Report was submitted to the New Zealand Environmental Protection Authority (EPA) on 30 May 2018.

Table 2.3. Expedition 375 coring summary

Site	Hole	Latitude	Longitude	Water depth (mbrf)	Cores (*N*)	Interval cored (m)	Core recovered (m)	Recovery (%)
U1518	U1518C	38°51.5692′S	178°53.7616′E	2631.7	1	9.1	9.13	100.3
	U1518D	38°51.5699′S	178°53.7634′E	2628.2	1	9.6	9.61	100.1
	U1518E	38°51.5669′S	178°53.7618′E	2626.1	32	175.6	160.96	91.7
	U1518F	38°51.5694′S	178°53.7619′E	2626.1	31	297.2	126.82	42.7
	U1518G	38°51.5505′S	178°53.7617′E	2629.8	NA	NA	NA	NA
	U1518H	38°51.5402′S	178°53.7642′E	2631.1	NA	NA	NA	NA
	U1518H	38°51.5402′S	178°53.7642′E	2631.1	NA	NA	NA	NA
Site U1518 totals					**65**	**491.5**	**306.52**	**62.4**
U1519	U1519B	38°43.6426′S	178°36.8655′E	1000.4	NA	NA	NA	NA
	U1519C	38°43.6483′S	178°36.8773′E	1000.3	23	215.6	119.17	55.3
	U1519D	38°43.6516′S	178°36.8831′E	1000.4	3	23.3	23.64	100.1
	U1519E	38°43.6572′S	178°36.8949′E	1000.3	13	85.8	88.98	100.4
Site U1519 totals					**39**	**324.7**	**231.79**	**71.4**
U1520	U1520C	38°58.1532′S	179°07.9112′E	3522.1	NA	NA	NA	NA
	U1520C	38°58.1532′S	179°07.9112′E	3522.1	43	408.1	235.40	57.7
	U1520D	38°58.1475′S	179°07.8991′E	3520.3	65	515.8	318.38	61.7
Site U1520 totals					**108**	**923.9**	**553.78**	**59.9**
U1526	U1526A	39°01.3203′S	179°14.7594′E	2890.1	14	83.6	29.26	35.0
	U1526B	39°01.3146′S	179°14.7481′E	2888.4	5	33.5	31.56	94.2
Site U1526 totals					**19**	**117.1**	**60.82**	**51.9**
Expedition 375 totals					**231**	**1,857.2**	**1,152.91**	**62.1**

Science summary

Slow slip events (SSEs) at the northern Hikurangi subduction margin, New Zealand, are among the best-documented shallow SSEs on Earth. SSEs in this region recur every 1–2 years and thus provide an ideal opportunity to monitor deformation and associated changes in chemical and physical properties throughout the slow slip cycle. Expedition 375 was undertaken to investigate the processes and in situ conditions that underlie subduction zone SSEs at the northern Hikurangi Trough by (1) coring at four

sites, including an active fault near the deformation front, the upper plate above the high-slip SSE source region, and the incoming sedimentary succession in the Hikurangi Trough and atop the Tūranganui Knoll Seamount and (2) installing borehole observatories in an active thrust near the deformation front and in the upper plate overlying the slow slip source region.

The scientific objectives of IODP Expedition 375, together with the Hikurangi subduction logging-while-drilling (LWD) component of Expedition 372, were as follows:

- Document the in situ conditions, material properties, and composition of the subduction inputs and the shallow plate boundary near the trench. These rocks comprise the protolith and reveal the initial conditions for fault rocks that are transported into the SSE source zone at greater depth. In the case of the shallow fault zone, these materials may host SSEs if the events propagate to the trench.
- Define the stress regime, thermal structure, porosity, permeability, lithology, pore fluid pressure state, fluid chemistry, flow pathways, and structural geology of the upper plate overlying the SSE source region.
- Monitor changes in hydrogeology, temperature, and deformation related to SSEs via two multi-instrument borehole observatories installed in the upper plate and in an active thrust fault near the deformation front.

Both of the complex, nested observatory installations were completed successfully. At Site U1518, the observatory included monitoring of fluid pressure at three separate intervals and fluid sampling in the interior of the casing via a complex hole completion design. At Site U1519, the observatory design was somewhat simpler but also included multiple nested casing strings and installation of a 270 m instrument string.

The primary drilling and sampling objectives were met at all of the coring sites. At Site U1518, the formation was highly overconsolidated at the seafloor; as a result, we were unable to drill with the advanced piston corer (APC)/extended core barrel (XCB) systems as deeply as planned and switched to rotary core barrel (RCB) coring at a relatively shallow depth (<200 meters below seafloor [mbsf]) to drill across the thrust fault.

At Site U1520, we used a drill-in reentry system to case the upper portion of the sediment section. This system worked as planned and allowed us to reach our depth target in the volcaniclastic sequence. At Site U1526, we were able to obtain a nearly complete section of the sedimentary sequence overlying the seamount. At Site U1519, we opted to spot core with the RCB system to collect material only from depths corresponding to the screen intervals of the observatory and in the lower part of the section where wellbore breakouts were observed in LWD data. A second APC/half-length APC (HLAPC) hole

targeted shallow temperature measurements at Site U1519. This targeted approach yielded the key data needed to meet expedition science objectives.

The suite of cores obtained at Sites U1520 and U1526 reveal a surprising diversity of lithologies entering the subduction zone, including clastic trench fill material, carbonate-rich pelagic sediments, and a thick volcaniclastic sequence. Postexpedition research will focus on the composition, diagenetic state, and physical properties of these lithologies and reveal the role they play in SSE occurrence. At Site U1518, coring across an active shallow thrust fault provided new insights into the fault architecture, small-scale structural features, physical properties, and pore fluid geochemistry of an active fault that may be involved in SSEs. Postexpedition investigation, particularly investigations related to fault structure and microstructures, will illuminate the hydrological and mechanical behavior of this active fault. Postexpedition research will also provide an analysis of pore fluid geochemistry variations across the fault and laboratory studies of fault and wall rock friction, strength, and hydrological properties. Coring at Site U1519 aimed to characterize the upper plate's physical and mechanical properties, as well as its thermal state. The approach of targeted spot coring was successful in obtaining samples necessary to interpret observatory pressure and temperature data and to extract quantitative information about in situ stress state from wellbore breakouts deeper than ~590 mbsf. Temperature measurements in the APC hole were also successful and provided valuable constraints for models that will define the thermal structure of the subduction zone and the temperature regime of the SSE source region.

Together, Expeditions 372 and 375 implemented a complex, linked data sharing and sampling plan that spanned two expeditions and involved several shore-based investigators and a high volume of sample requests for mission-critical postexpedition studies of rock properties, composition, structures, and deformation.

Expedition 376: Brothers Arc Flux

Planning

The Expedition 376 pre-expedition meeting was held in College Station, Texas, on 11 April. Preparations for surface and air freight were completed, and the shipments were dispatched. A final crew and Science Party list was submitted to New Zealand immigration. Logistical staff coordinated with Science Party members with third-party instrument and tool shipments. A joint interview of Expedition 375 and 376 Co-Chief Scientists with Radio NZ was held on 5 May, and several PR tours of the ship took place on 5 and 6 May.

Staffing

An Inorganic Geochemist had to withdraw from the expedition, and the expedition leadership decided not to refill the position. A potential filmmaker withdrew from consideration due to lack of funding approval.

Clearance, permitting, and environmental assessment activities

Feedback received from the Nga Potiki Resource Management Unit led to a meeting on 20 April 2018 that included one Co-Chief Scientist and key representatives of GNS Science and resolved concerns about the expedition. During the expedition, two replacement sites, one primary and one alternate, were proposed based on results from initial drilling. The Environmental Protection and Safety Panel (EPSP) reviewed the sites and recommended approval. The clearance documentation for these two sites was completed, and both sites were approved by the New Zealand Ministry of Foreign Affairs and Trade on 8 June.

Expedition 378: South Pacific Paleogene

Planning

Research plans for the expedition were submitted in April. The JRSO began a detailed review of plans and coordination with the Science Party to configure special shipboard nonstandard measurements and ephemeral samples.

Staffing

A second outreach officer candidate was invited and accepted the invitation to sail.

Expedition 379: Amundsen Sea West Antarctic Ice Sheet History

Planning

Discussions with the Siem Offshore Captain and Overseas Drilling Limited (ODL) management finalized ice management support requirements. An initial Co-Chief Scientist presentation with the Science Party was held via video conference, and several participants held informal discussions at the 2018 POLAR Meeting in Davos, Switzerland. Discussions were initiated concerning satellite imagery products for the expedition. The JRSO began reviewing how to supply basic manual X-ray imaging capability for Expeditions 379 and 382.

Staffing

The Radiolarian Specialist position was filled, and science staffing was completed. A second outreach officer position is under review.

Clearance, permitting, and environmental assessment activities

After discussions with NSF, it was determined that NSF will complete the Environmental Evaluation required to conduct research in Antarctic Treaty waters.

Expedition 382: Iceberg Alley Paleoceanography & South Falkland Slope Drift

Planning

The *Scientific Prospectus* was published in May. The JRSO is reviewing how to supply basic manual X-ray imaging capability for Expeditions 379 and 382. Discussions with the Siem Offshore Captain and ODL management finalized ice management support requirements. Informal discussions occurred among participants attending the 2018 POLAR Meeting in Davos, Switzerland.

Staffing

Second-round invitations were sent in April. Science Party staffing was completed on 18 April. Interviews for the outreach officer positions were conducted on 4–7 June.

Clearance, permitting, and environmental assessment activities

After discussions with NSF, it was determined that NSF will complete the environmental evaluation required to conduct research in Antarctic Treaty waters.

Expedition 383: Dynamics of Pacific Antarctic Circumpolar Current

Planning

The Expedition 383 pre-expedition meeting was held in College Station, Texas, on 26 and 27 April. One primary site was relocated due to the presence of an underwater cable. This site and seven additional alternate sites will undergo EPSP review in September. Downhole measurements were reduced to three sites with the modified triple combo tool string only. No Formation MicroScanner (FMS)-sonic or vertical seismic profiles (VSPs) are currently planned. Operations changes were agreed to during a precruise meeting to allow for coring at all six sites without impacting the primary objectives.

Staffing

First-round invitations were sent out.

Clearance, permitting, and environmental assessment activities

After discussions with NSF, it was determined that NSF will complete the environmental evaluation required to conduct research in Antarctic Treaty waters.

Expedition 384: Panama Basin Crustal Architecture and Engineering Testing

Planning

At the May *JOIDES Resolution* Facility Board (JRFB) meeting, a decision was made to reschedule Expedition 384 in FY20 based on overall budget guidance for FY19. The expedition has been moved to the February–March 2020 window.

Expedition 385: Guaymas Basin Tectonics and Biosphere

Planning

The Expedition 385 pre-expedition meeting was planned for 3 and 4 September at College Station, Texas. An expedition webinar sponsored by the United States Science Support Program (USSSP) was held on 4 April.

Staffing

A second Co-Chief Scientist accepted the invitation to sail. The initial staffing meeting was held with the Co-Chief Scientists on 29 May, and review of applications began in mid-June after receipt of nominations from the Program Member Offices (PMOs). The initial first round of invitations is expected to be issued early next quarter.

Expedition 386: Gulf of Mexico Methane Hydrate

Planning

The US Coast Guard informed ODL that the *JOIDES Resolution* will need to fulfill all requirements of the Mobile Offshore Drilling Unit (MODU) 1989 Standard to receive permitting for Expedition 386 in the US EEZ of the Gulf of Mexico. Given the high costs and insufficient available time for the large number of upgrades required, the JRFB cancelled Expedition 386 and removed it from the *JOIDES Resolution* schedule. The JRFB forwarded proposal 887-CPP2 and 887-ADD2 to the European Consortium for Ocean Research Drilling (ECORD) Facility Board (EFB) for consideration of potential implementation as a mission-specific drilling project.

3. Management and administration

Management and administration (M&A) activities include planning, coordinating (with other IODP-related entities), overseeing, reviewing, monitoring, assuring compliance for, and reporting on IODP activities.

Program planning

The FY19 Annual Program Plan was submitted to NSF and the JRFB on 26 June 2018, along with the Addendum: JR100 summary.

Progress reporting

The JRSO operations and management report for the second quarter of FY18 (January–March 2018) was submitted to NSF on 11 May 2018 (http://iodp.tamu.edu/publications/AR/FY18/FY18_Q2.pdf).

Liaison activities

The JRSO reports to and liaises with funding agencies and IODP-related agencies (e.g., JRFB, JRFB advisory panels, PMOs, and other national organizations and facility boards) and participates in facility board, advisory panel, and IODP Forum meetings. Minutes from the facility board meetings are available online (http://iodp.org/boards-and-panels/facility-boards).

Planning meetings

Two members of the JRSO attended the JRFB meeting on 15 and 16 May at the NSF office in Alexandria, Virginia. Four members of the JRSO attended the Science Evaluation Panel (SEP) meeting on 26–28 June in Potsdam, Germany.

Project portfolio management

The JRSO continued work on the following three projects: SampleMaster Replacement, Data Publishing, and DESClogik Replacement (a branch of the GEODESC Project, which remains on hold).

GEODESC

Scope and deliverables

The purpose of this project is to replace DESClogik, with the principal goal of increasing performance and reliability. The GEODESC project proposes to design, build, and deliver a new and improved GEODESC tool set.

Status

Because GEODESC would require a very significant investment of resources, the JRSO decided to keep the GEODESC project on hold while exploring additional options for a core description tool, including the use of commercial software. This action spawned the new DESClogik Replacement project.

DESClogik Replacement

Scope and deliverables

The purpose of the DESClogik Replacement project is to review commercially available core description software capable of replacing DESClogik. This project explores options for delivering a new and improved GEODESC tool set using commercial, off-the-shelf software.

Status

The project team completed its work on 22 June and submitted recommendations for the management team to review in July.

Data Publishing

Scope and deliverables

The purpose of the Data Publishing project is to build a framework, tools, and processes capable of publishing expedition information for long-term repository storage and discovery of referenceable information. This project will also support publication of data files not currently available online. When completed, all published information will be available for science community use via the JRSO publications website, a dynamic search engine (similar to Laboratory Information Management System [LIMS] Online Report Environment [LORE]/OVERVIEW), and web-based searches.

Status

This project remains on track for completion in November 2018.

SampleMaster Replacement

Scope and deliverables

The purpose of the SampleMaster Replacement project is to replace SampleMaster with a modular program. SampleMaster is an application that provides for all initial IODP data entry into the LIMS database. This interface is used across the organization by a wide range of people who fall into groups of users, and those users perform specific tasks.

Status

This project remains on track for completion in February 2021.

4. Subcontract activities

The JRSO continued to interact with ODL to ensure efficient and compliant operations of the *JOIDES Resolution*.

The JRSO continued to interact with Schlumberger Technology Corporation to ensure that wireline logging operations aboard the *JOIDES Resolution* continue in an efficient and compliant manner. The JRSO and Schlumberger worked successfully to streamline travel and shipping activities.

5. Science operations

The Science Operations (SciOps) department provides scientific, operational, engineering, and logistical planning and implementation for *JOIDES Resolution* drilling expeditions in response to the IODP science planning structure. The JRSO is responsible for scoping, planning, managing, and implementing science expeditions (see Section 2); conducting long-range operational planning for out-year JRSO expeditions; providing services and materials for the platform, oversight to drilling and logging contractors, and technical advice and assistance for ECORD Science Operator (ESO) and Center for Deep Earth Exploration (CDEX) expeditions; and utilizing IODP resources to oversee engineering development projects.

Expedition outreach support

JRSO staff assisted with planning and implementation of seven tours for VIPs, media, and general science groups on 5 and 6 May in Auckland, New Zealand, during the Expeditions 375 port call. The JRSO also assisted with planning for the 2018 School of Rock that will utilize the ship for part of their activities at the upcoming July Auckland port call at the end of Expedition 376.

6. Technical and analytical services

The primary responsibilities of the Technical and Analytical Services (TAS) department are to facilitate core flow and oversee laboratories. TAS activities include staffing the shipboard laboratories; operating scientific measurement equipment and providing support to shipboard scientists; maintaining, repairing, and developing scientific equipment and laboratories; providing support for downhole tools and measurements; and supporting shore-based laboratories.

Technical support

Two Assistant Laboratory Officers (ALOs) were hired this quarter to fill vacant positions.

Maintenance period activities

TAS prepared for the *JOIDES Resolution* transit, dry dock, and tie-up activities that will take place after Expedition 378. The primary planned work for TAS includes the following:

- Installing three new air-conditioning units in the science conference room;
- Recarpeting the science conference room and other IODP offices;
- Removing the fantail crane;
- Removing the sonar dome for inspection, repairs, and maintenance and then reinstalling it;
- Removing and refurbishing the Radiation Van and then reinstalling it;
- Installing insulation under the logging office; and
- Repairing laboratory floors.

Analytical systems

Activities, purchases, and repairs during this quarter include the following:

- A mini-project was initiated to design and build a manual X-ray system for use on upcoming high-latitude expeditions, particularly Expeditions 379 and 382. An X-ray system was the most commonly cited shortcoming for the shipboard laboratories in the JR Assessment Report, and the need for an X-ray system was reiterated by the scientists for the upcoming Antarctic expeditions. TAS thus decided to move forward on a manual system that could be completed in a short time frame and that would take about one-third the space of an automated X-ray/CT scanner system. Specifications for X-ray sources and detectors were obtained, and modeling was completed on the shielding needs to ensure radiation safety. Final selection, assembly, and testing of components will be completed during the next quarter.
- The method for selecting the first *P*-wave arrival from the *P*-wave logger (PWL) on the Whole-Round Multi-Sensor Logger (WRMSL) was improved, which will increase the number of valid *P*-wave velocities obtained from the whole-round measurements.
- A freeze dryer, used for storing microbiological samples, was purchased to replace a malfunctioning unit.
- A fluxgate magnetometer was repaired and recalibrated.
- An Agico JR-6 spinner magnetometer was repaired by the vendor.

- The X-ray diffraction (XRD) system was serviced and a new detector installed.
- A new scintillator was purchased to replace a faulty one in the Natural Gamma Radiation Logger (NGRL).

Laboratory working groups

The laboratory working groups (LWGs) provide oversight, research direction, and quality assurance for the methods, procedures, and analytical systems both on the *JOIDES Resolution* and on shore. The groups meet regularly to review cruise evaluations and expedition technical reports and issues management communications to provide advice on corrective actions and potential developments for laboratories.

Curation and Core Handling, Geochemistry and Microbiology, and Geology

These LWGs will meet next quarter to discuss ongoing issues and issues arising from recent expeditions.

Geophysics

The Geophysics LWG met this quarter to discuss ongoing issues and issues arising from Expeditions 374 and 375.

Ongoing issues

- Quality control for WRMSL measurements (magnetic susceptibility, gamma ray attenuation, and *P*-wave velocity) needs to be further refined and implemented. Advances were made in the accuracy and precision with which the *P*-wave first arrivals were picked. The new method will be further tested and documented. All output data fields will be reviewed for accuracy once software revisions are completed.
- Rob Harris (LWG member from Oregon State University [OSU]) reported on a comparison he made between the Teka TK04 system used by IODP and the Hukseflux TYPSYS02 system used at OSU. The mean thermal conductivities results were found to be insignificantly different between the two systems, and both systems provided accurate estimates of calibration standards. The Hukseflux system, however, had about three times the scatter of the Teka system. Each system had capabilities that the other did not: the Teka system has more automated features but does not store the full time series of data. Recommendations were made to contact Teka (the vendor) to see if the output could be modified to include these data.
- The LWG discussed whether the P-wave bayonet measurements should be discontinued. Although the bayonets do provide P-wave velocity estimates in two orthogonal directions, it is unclear

whether those estimates are accurate enough to determine velocity anisotropy, which is the purpose of using the bayonets. The downside to making these measurements is that the bayonets disturb the sediment significantly. A request was made for the LWG to investigate whether P-wave bayonet data had produced publications on velocity anisotropy and, if not, to seek opinions from seismologists on whether further collection of these data is warranted.

- The LWG requested that a logging team be created to assess logging issues in more detail. This team would consist of a few Expedition Project Managers, downhole technicians, Schlumberger engineers, and external scientists with logging expertise.

Expedition 374 issues

- A request was made to have an X-ray system available for high-latitude expeditions. As noted above, a system will be ready for use before the start of the next Antarctic expedition.
- A request was made to have a shipboard X-ray fluorescence (XRF) scanner. Space is currently not available on the ship, and current models of XRF scanners are not fast enough to keep up with core flow. We instead have two XRF scanners in the GCR that are available for postexpedition use.

Expedition 375 issues

- A request was made to improve access to Techlog and Petrel manuals because they are not readily accessible or easily downloaded from the ship. The manuals are maintained by the companies as large e-manuals with numerous topics. The LWG suggested that a library of topics be created and those parts of the manuals downloaded for use on the ship.
- Minor adjustments to GUI interface for the superconducting rock magnetometer were requested and will be made.
- Currently, the description of the method used for correcting densities determined by gamma ray attention for diameter variations is inconsistent between the methods chapters of the Expedition Reports and the laboratory manuals. This will be fixed.
- Pycnometer data from some cells were thought to be suspect during the expedition. A detailed postexpedition analysis of these showed that all cells were functioning properly and within tolerance ranges. The concern expressed by shipboard scientists probably was caused by a poorly labeled column of data in the LORE database. This will be fixed.
- Shipboard scientists were concerned with the quality of some of the P-wave bayonet data. The poor data were traced to poor coupling of the transducers to the sediment, which happens when a small air gap forms between the bayonet and sediment. This is typically fixed by squirting water in the gap.

To aid the shipboard scientists in interpreting poor versus good data, the manual will be updated to show both types of data and will reiterate how to improve coupling between the bayonet and sediment.

- More metal sample holders were requested for moisture and density measurements because 2 cm × 2 cm × 2 cm cubes are too large to fit in the more commonly available glass vials. The number of metal samples holders will be increased to 50.

7. Development, IT, and databases

The Development, IT, and databases (DITD) department manages data supporting IODP activities, operates and maintains shipboard and shore-based computer and network systems, and monitors and protects the JRSO network and server resources to ensure safe, reliable operations and security for IODP data and IT resources. Additional activities include managing expedition and postexpedition data, providing long-term archival access to data, and supporting JRSO Information Technology (IT) services.

Expedition data

LIMS database

Data from Expedition 375 were added to the LIMS database on shore this quarter. These data are currently under moratorium and available only to the scientists who sailed on the expeditions. Data from Expedition 363 (Western Pacific Warm Pool) were released from moratorium during this quarter.

Expedition data requests

The following tables provide information on JRSO web data requests from the scientific community. Where possible, visits by JRSO employees were filtered out.

Table 7.1. Top 10 countries accessing JRSO web databases

	Janus database		LIMS database	
Rank	Country	Visitor sessions	Country	Visitor sessions
1	USA	1,049	USA	1,076
2	China	386	China	260
3	United Kingdom	353	United Kingdom	233
4	Germany	267	Germany	221
5	Japan	193	Japan	215
6	Australia	150	Unknown	154
7	Unknown	141	Russia	81
8	Brazil	106	New Zealand	75
9	New Zealand	95	France	67
10	Canada	61	Italy	60

Rank	Janus database		LIMS database	
	Country	Visitor sessions	Country	Visitor sessions
	Others	393	Others	341
	Total	**3,194**	**Total**	**2,783**

Table 7.2. Top 20 database web queries

Rank	Janus database		LIMS database	
	Query	Views	Query	Views
1	Imaging—core photos	1,904	Imaging—core photos	19,547
2	Core summaries	922	Samples	1,202
3	Site summaries	914	Imaging—section scans	884
4	Samples	848	Hole summaries	675
5	Paleontology—range tables	513	Section summaries	613
6	Site details	508	Core summaries	437
7	Special holes	473	Physical properties—RSC	395
8	Hole summaries	342	Physical properties—MS	376
9	Paleontology—age models	306	Physical properties—GRA	233
10	Chemistry—carbonates	304	Chemistry—carbonates	220
11	Physical properties—GRA	284	Chemistry—IW	206
12	Physical properties—MAD	238	Physical properties—NGR	188
13	Imaging—prime data images	232	Physical properties—MAD	174
14	Physical properties—MSL	220	Chemistry–solids	141
15	Physical properties—shear strength	211	Imaging–SEM	131
16	Physical properties—RSC	198	Imaging—core close-up photos	130
17	Hole trivia	194	Chemistry–gas	124
18	Imaging—core close-up photos	177	Chemistry–XRF sum	121
19	Paleomagnetism	134	Imaging—microimages	107
20	Leg summaries	123	SRM section	98
	Others	2,119	Others	2,191
	Total	**11,164**	**Total**	**28,193**

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total	Country	Total
How to	6	USA	15
Photo	5	United Kingdom	3
Chemistry	3	Norway	2
Depths	2	Spain	2
Paleo	2	Germany	1
Shear strength	2		
NGR	1		
P-wave	1		
RSC	1		
Total	**23**	**Total**	**23**

8. Core curation

The JRSO provides services in support of Integrated Ocean Drilling Program and IODP core sampling and curation of the core collection archived at the Gulf Coast Repository (GCR).

Sampling parties and curation policies and procedures

The GCR hosted the Expedition 369 sampling party from 18 to 22 May, during which more than 12,000 samples were taken. Preparations began this quarter for the Expedition 374 sampling party that will be held in August.

Sample and curation strategies

The JRSO planned sample and curation strategies this quarter for upcoming JRSO Expeditions 379 and 382.

Sample requests and core sampling

The following table provides a summary of the 3,373 samples taken at the GCR during the quarter. Sample requests that show zero samples taken may represent cores that were viewed by visitors during the quarter, used for educational purposes, or requested for XRF analysis. For public relations or educational visits/tours, the purpose of the visit is shown in brackets in the "Sample request number, name, country" column and "No samples" is recorded in the "Number of samples taken" column if no new samples were taken.

Table 8.1. GCR sample requests

Sample request number, name, country	Number of samples taken	Number of visitors
60261IODP, Liu, USA	25	
59853IODP, Pinzon, Argentina	136	
60834IODP, Haynes, USA	35	
60884IODP, Mitchison, United Kingdom	10	
58229IODP, Cardich, Peru	491	1
61045IODP, Si, USA	6	
61069IODP, Lilley, Switzerland	15	
61239IODP, Hasegawa, Japan	20	
59877IODP, Novak, USA	2	
60621IODP, Guin, USA	67	1
61458IODP, Witkowski, Poland	30	
61543IODP, Jacobel, USA	20	
61789IODP, OConnell, USA	27	
61563IODP, Thomas, USA	11	
61772IODP, Bablon, France	54	

Sample request number, name, country	Number of samples taken	Number of visitors
61812IODP, Kast, USA	20	
61583IODP, Galazzo, United Kingdom	2	
61411IODP, Rafter, USA	86	
61634IODP, Pasquier, USA	126	
61859IODP, Kim, USA	49	1
60542IODP, Alves, Brazil	46	
60933IODP, Mimura, Japan	341	
61703IODP, Pasquier, USA	166	
62106IODP, Bhattacharya, USA	63	
62466IODP, Sullivan, USA	0	1
62265IODP, Okawara, Japan	46	
62342IODP, John, United Kingdom	45	
62142IODP, Rizzo, USA	57	
61727IODP, Biester, Germany	82	
62480IODP, Zhou, USA	139	
61001IODP, Abell, USA	192	
62284IODP, Bralower, USA	22	
62769IODP, Jones, USA	37	
61496IODP, Westerhold, Germany	0	
61791IODP, OConnell, USA	116	
61907IODP, Slowey, USA	4	
61762IODP, Smeaton, USA	384	
62127IODP, Condon, New Zealand	0	2
61663IODP, Condon, New Zealand	347	
62385IODP, Kuroda, Japan	54	
Tours/Demonstrations (9)		102
Total	**3,373**	**108**

Use of core collection and education and outreach support

The JRSO promotes outreach use of the GCR core collection by conducting tours of the repository and providing materials for display at meetings and museums. The repository and core collection are also used for classroom exercises. This quarter, the GCR hosted visitors from TAMU and local schools and also gave six tours for the Summer Science Safari Camp (a summer camp for middle school children.)

Table 8.2. GCR tours/visitors

Type of tour or visitor	Number of visitors
Scientist visitors	6
Educational tours/demonstrations (9)	102
Public relations tours (0)	0
Total	**108**

Onshore XRF scanning

During this quarter, 1,152 core sections were XRF scanned at the GCR. Documentation relating to the operation, advanced configurations, maintenance, and troubleshooting of the XRF can be found at https://sites.google.com/scientific-ocean-drilling.org/xrf-iodp/home.

Table 8.3. Core sections scanned

Request type	Expedition, name, country	XRF 1	XRF 2	SHIL	WRMSL
Program	369, Science Party, multiple	258	192	12	0
Program	374, Science Party, multiple	234	210	0	0
Personal	112, Cardich, Peru	20	0	21	0
Personal	178, Ohneiser, New Zealand	38	21	55	0
Personal	363, Kulhanek, USA	133	0	0	0
Personal	113, O'Connell, USA	0	27	70	0
Personal	368, Hoefig, USA	1	0	1	0
Personal	368, Carlos, USA	0	18	0	0
Total		**684**	**468**	**159**	**0**

Notes: SHIL = Section Half Imaging Logger, WRMSL = Whole-Round Multisensor Logger.

9. Publication services

The Publication Services (Pubs) department provides publication support services for IODP riserless and riser drilling expeditions (see Section 2) and editing, production, and graphics services for required Program reports (see Section 3), technical documentation (see Section 6), and scientific publications as defined in the JRSO cooperative agreement with NSF. The Pubs department also maintains legacy access and archiving of Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Program (DSDP) publications.

Shipboard publications support

The Pubs department provided onboard publication specialists for Expeditions 375 and 376.

Postcruise editorial meetings

The Expedition 369 postcruise editorial meeting was held 14–17 May in College Station, Texas.

Scientific publications

Table 9.1. Newly published content on the IODP Publications website

Reports and publications	JRSO	USIO	CDEX
Scientific Prospectus	10.14379/iodp.sp.382.2018		
Preliminary Report	10.14379/iodp.pr.374.2018		10.14379/iodp.pr.380.2018
Expedition Report		10.14379/iodp.proc.363.2018 10.14379/iodp.proc.363.101.2018 10.14379/iodp.proc.363.102.2018 10.14379/iodp.proc.363.103.2018 10.14379/iodp.proc.363.104.2018 10.14379/iodp.proc.363.105.2018 10.14379/iodp.proc.363.106.2018 10.14379/iodp.proc.363.107.2018 10.14379/iodp.proc.363.108.2018 10.14379/iodp.proc.363.109.2018 10.14379/iodp.proc.363.110.2018 10.14379/iodp.proc.363.111.2018	
Data Report	10.14379/iodp.proc.352.202.2018 10.14379/iodp.proc.352.203.2018 10.14379/iodp.proc.366.110.2018	10.14379/iodp.proc.346.202.2018 10.14379/iodp.proc.346.204.2018 10.14379/iodp.proc.342.207.2018 10.2973/odp.proc.174AXS.112.2018	10.14379/iodp.proc.370.201.2018

Web services

In addition to internal JRSO web page updates and additions, new content is regularly added to IODP expedition web pages at http://iodp.tamu.edu/scienceops/expeditions.html.

During the last quarter, the IODP TAMU website received 45,117 site visits and 345,237 page views and the IODP Publications website received 23,892 site visits and 297,483 page views. Where possible, visits by JRSO employees and search engine spiders were filtered out of the counts.

The ODP science operator, ODP legacy, and DSDP publications websites are hosted at TAMU. Key data, documents, and publications produced during DSDP and ODP are preserved in the legacy websites, which highlight the scientific and technical accomplishments of these ground-breaking precursors to the Integrated Ocean Drilling Program and IODP. The legacy websites contain downloadable documents that cover a wide spectrum of Program information, from laboratory and instrument manuals to Program scientific publications, journals, and educational materials.

Table 9.2. Legacy website statistics

Legacy website	FY18 Q3 page views*	FY18 Q3 site visits*
www-odp.tamu.edu	473,901	35,175
www.odplegacy.org	3,977	1,523
www.deepseadrilling.org	87,396	10,536
Total	**565,274**	**47,234**

*Where possible, visits by JRSO employees and search engine spiders were filtered out.

Publications coordination

Data reports related to Expeditions 342, 344, 346, 352, and 355 were received, sent to peer review, accepted, and/or published this quarter, and expedition reports from Expedition 375 were received.

Discovery and accessibility

Digital object identifiers

IODP is a member of CrossRef, the official digital object identifier (DOI) registration agency for scholarly and professional publications. All IODP scientific reports and publications are registered with CrossRef and assigned a unique DOI that facilitates online access, as are the Integrated Ocean Drilling Program, ODP, and DSDP scientific reports and publications. CrossRef tracks the number of times a publication is accessed, or resolved, through the CrossRef DOI resolver tool. Program statistics for the reporting quarter are shown in the table below.

Table 9.3. Number of online DOI resolutions

Reports and publications	DOI prefix	April 2018	May 2018	June 2018	FY18 Q3 total
IODP	10.14379	2,949	4,136	2,961	**10,046**
Integrated Ocean Drilling Program	10.2204	7,683	9,876	7,728	**25,287**
ODP/DSDP	10.2973	21,437	14,471	7,468	**43,376**

Science Open

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. IODP deposited data reports from Volumes 320/321, 337, 342, and 347 into ScienceOpen this quarter.

Table 9.4. ScienceOpen Proceedings of the International Ocean Discovery Program collection statistics (https://www.scienceopen.com/collection/IODP_Publications)

Period	Articles added	Article views	Altmetric score (collection)	Number of authors	Share count	Cited by articles
FY18 Q1	613	1,652			87	
FY18 Q2	19	831	107	1,511	20	
FY18 Q3	4	1,063	116	1,521	8	221
Total	**636**	**3,546**	—	—	**115**	**221**

Table 9.5. ScienceOpen Scientific Ocean Drilling Expedition Research Results collection statistics (https://www.scienceopen.com/collection/8b0582f6-47bf-4988-b90a-8533135e6fcc)

Period	Articles added	Article views	Altmetric score (collection)	Number of authors	Share count	Cited by articles
FY18 Q2	2,086	3,585	11,162	6,198	14	
FY18 Q3	409	1,006	13,221	7,740	2	6,903
Total	**2,495**	**4,591**	—	—	**16**	**6,903**

Legacy activities

Closeout

Integrated Ocean Drilling Program publications closeout activities continued during the reporting period. Expedition reports and postexpedition research publications published during the quarter in the *Proceedings of the Integrated Ocean Drilling Program* are listed above in "Scientific publications." In addition, publication obligation papers and data reports related to Expeditions 313–317, 323, 325, 327, 329, 331, 333–344, and 346–349 were submitted to English language peer-reviewed journals or the Program.

Publications archiving

The main IODP publications website (http://publications.iodp.org/index.html), which includes full content from all Integrated Ocean Drilling Program and IODP volumes, is archived at Archive-it, a long-term archive specializing in full website backups. Quarterly crawls incrementally update the archive with new files. In addition, the archive houses legacy publications sites for DSDP and ODP, for a grand total of 1.1 TB of data and more than 5 million documents. The archive can be viewed at https://archive-it.org/collections/9148.

Table 9.6. Archive-it crawl statistics (http://publications.iodp.org/index.html)

Period	Total data	Total docs
FY18 Q1	183.2 GB	176,563
FY18 Q2	183.9 GB	178,626
FY18 Q3	187.0 GB	182,195

Note: Totals reflect data and documents archived since June 2017.

Citation management

IODP Pubs contracts with the American Geosciences Institute to maintain the Scientific Ocean Drilling Citation Database, a subset of the GeoRef database that contains records for Program-related scientific ocean drilling publications from 1969 to the present. This quarter, IODP Pubs sent 128 expedition-related publication citations for consideration for inclusion in the database.

IODP Pubs also maintains a current list of publications and conference presentations/abstracts authored by JRSO staff.

Abstracts authored by JRSO staff

Abstracts of conference presentations during this quarter authored by JRSO staff include the following. Bold type indicates JRSO staff (http://iodp.tamu.edu/staffdir/indiv.html).

European Geosciences Union General Assembly 2018

- Albers, E., Klein, F., Bach, W., and the Expedition 366 Scientists [including **T. Williams**], 2018. Carbonate–silicate–sulfate veins in metavolcanic clasts recovered from serpentinite mud volcanoes in the Mariana forearc (IODP Exp. 366). *Geophysical Research Abstracts*, 20:EGU2018-13879-1. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-13879-1.pdf

- Auer, G., De Vleeschouwer, D., **Bogus, K.**, Groeneveld, J., Henderiks, J., and Castañeda, I., 2018. Indonesian Gateway restriction between 4.0 and 2.8 Ma and its impact on Indian Ocean surface waters based on calcareous nannoplankton assemblages. *Geophysical Research Abstracts*, 20:EGU2018-12127. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-12127.pdf

- De Santis, L., McKay, R.M., **Kulhanek, D.K.**, and the IODP Exp. 374 Science Party, 2018. Late Cenozoic ocean-ice sheet interactions and West Antarctic Ice Sheet vulnerability: initial results from International Ocean Discovery Program Expedition 374 in the Ross Sea continental margin. *Geophysical Research Abstracts*, 20:EGU2018-1671. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-1671.pdf

- Grunert, P., García Gallardo, Á., Balestra, B., Richter, C., Auer, G., van der Schee, M., Flores, J.-A., Sanchez, F.J., Jiménez-Espejo, F., **Alvarez Zarikian, C.**, et al., 2018. Pliocene history of Mediterranean-Atlantic exchange. *Geophysical Research Abstracts*, 20:EGU2018-14790-1. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-14790-1.pdf

- Hahn, A., Ando, S., Bowen, M., Clift, P., Gorgas, T., **Kulhanek, D.**, Lyle, M., and Saraswat, R., 2018. Variation of terrestrial input and paleoproductivity in the Arabian Sea: millennial-scale variations of the Indian monsoon during the Quaternary as recorded at IODP Exp. 355. *Geophysical Research Abstracts*, 20:EGU2018-13447. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-13447.pdf

- Kurz, W., Grunert, P., Auer, G., Reuter, M., and IODP Expedition 366 Scientists [including **T. Williams**], 2018. Seamount subduction and exhumation by serpentinite mud volcanism in the Mariana convergent margin system. *Geophysical Research Abstracts*, 20:EGU2018-6156-1. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-6156-1.pdf

- Nirrengarten, M., Geoffroy, M., Gutiérrez, L., Corrado, S., Schito, A., Bowden, S., and the IODP 367-368 Expedition Scientists [including **C.A. Alvarez Zarikian**, **A. Klaus**, and **T. Höfig**], 2018. Thermal signatures of continental breakup at the northern South China Sea margin: preliminary results of IODP 367-368. *Geophysical Research Abstracts*, 20:EGU2018-9131. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-9131.pdf

- Pecher, I., Barnes, P., Heeschen, K., Torres, M., Cook, A., Moore, G., Dugan, B., Mountjoy, J., Crutchley, G., and the Expedition 372 & 375 Scientific Party [including **L. LeVay** and **K. Petronotis**], 2018. Gas hydrates beneath the Tuaheni Landslide Complex, New Zealand. First results from IODP Expedition 372. *Geophysical Research Abstracts*, 20:EGU2018-4221-1. https://meetingorganizer.copernicus.org/EGU2018/EGU2018-4221-1.pdf

Articles authored by JRSO staff

Program-related science and other articles authored by JRSO staff published during this quarter include the following. Bold type indicates JRSO staff. Other Program-related science articles are available online through the Scientific Ocean Drilling Bibliographic Database (http://iodp.tamu.edu/publications/bibliographic_information/database.html) and the IODP expedition-related bibliographies (http://iodp.tamu.edu/publications/citations.html).

- Gallagher, S.J., Sagawa, T., Henderson, A.C.G., Saavedra-Pellitero, M., De Vleeschouwer, D., Black, H., Itaki, T., et al. [including **C.A. Alvarez Zarikian**], 2018. East Asian Monsoon history and paleoceanography of the Japan Sea over the last 460,000 years. *Paleoceanography and Paleoclimatology*. https://doi.org/10.1029/2018PA003331

- Kender, S., **Bogus, K.A.**, Cobb, T.D., and Thomas, D.J., 2018. Neodymium evidence for increased Circumpolar Deep Water flow to the North Pacific during the Middle Miocene Climate Transition. *Paleoceanography and Paleoclimatology*. https://doi.org/10.1029/2017PA003309

Appendix: JRSO quarterly report distribution

J. Allan, NSF, USA, jallan@nsf.gov

T. Janecek, NSF, USA, tjanecek@nsf.gov

T. Kashmer, NSF, USA, tkashmer@nsf.gov

D. Thomas, Texas A&M University, USA, dthomas@ocean.tamu.edu

A. Koppers, JRFB Chair, Oregon State University, USA, akoppers@coas.oregonstate.edu

W. Bach, JRFB Member, University of Bremen, Germany, wbach@uni-bremen.de

B.K. Bansal, JRFB Member, MoES, India, bansalbk@nic.in

G. Camoin, JRFB Member, European Management Agency, CEREGE, France, camoin@cerege.fr

M. Coffin, JRFB Member, ANZIC, University of Tasmania, Australia, Mike.Coffin@utas.edu.au

B. John, JRFB Member, University of Wyoming, USA, bjohn@uwyo.edu

G.Y. Kim, JRGB Member, KIGAM, Korea, gykim@kigam.re.kr

C. Neal, JRFB Member, University of Notre Dame, USA, neal.1@nd.edu

G.N. Sobrinho, JRFB Member, CAPES, Brazil, geraldo.nunes@capes.gov.br

Y. Sun, JRFB Member, MOST, China, suny@most.cn

P. Wilson, JRFB Member, University of Southampton, United Kingdom, paul.wilson@noc.soton.ac.uk

L. Zhou, JRFB Member, Peking University, China, lpzhou@pku.edu.cn

J. Austin, JRFB Liaison, IODP Forum Chair, University of Texas at Austin, USA, jamie@utig.ig.utexas.edu

S. Davies, JRFB Liaison, University of Leicester, United Kingdom, sjd27@leicester.ac.uk

H. Given, JRFB Liaison, IODP Support Office, Scripps Institution of Oceanography, USA, hgiven@ucsd.edu

S. Gulick, JRFB Liaison, SEP Co-Chair, East Carolina University, sean@ig.utexas.edu

B. Katz, JRFB Liaison, EPSP Chair, Chevron Corporation, USA, BarryKatz@chevron.com

S. Kuramoto, JRFB Liaison, CDEX, JAMSTEC, Japan, s.kuramoto@jamstec.go.jp

G. Lericolais, JRFB Liaison, ECORD Facility Board Chair, IFREMER, France, Gilles.lericolais@ifremer.fr

K. Miller, JRFB Liaison, SEP Co-Chair, Rutgers University, USA, kgm@rci.rutgers.edu

Y. Tatsumi, JRFB Liaison, CIB Chair, Kobe University, Japan, tatsumi@diamond.kobe-u.ac.jp