International Ocean Discovery Program

JOIDES Resolution Science Operator

FY20 Q1 Operations and Management Report

1 October–31 December 2019

Cooperative Agreement OCE-1326927

Submitted by the JRSO

to

The National Science Foundation

and

The *JOIDES Resolution* Facility Board

14 February 2020

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) FY20 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[2]/ ops)	Co-Chief Scientists	Expedition Project Manager
Guaymas Basin Tectonics and Biosphere	385	San Diego, California (USA)	16 September–16 November 2019	61 (5/56)	56 (9/47)	A. Teske D. Lizarralde	T. Höfig
Non-IODP (16 November 2019–3 January 2020) (48 days)							M. Malone
South Pacific Paleogene Climate (DSDP Site 277)	378	Lautoka, Fiji	3 January–6 February 2020	34 (3/31)	31 (20/11)	D. Thomas U. Röhl	L. Childress
Non-IODP (transit and derrick maintenance)		Papeete, Tahiti	6 February–26 April 2020	80 (56/24)	24 (24/0)		
Amazon Margin	387	Bridgetown, Barbados	26 April–26 June 2020	61 (5/56)	56 (8/48)	P. Baker C. Guizan Silva	E. Estes
Equatorial Atlantic Gateway	388	Fortaleza, Brazil	26 June–26 August 2020	61 (5/56)	56 (2/54)	G. Fauth T. Dunkley Jones	L. LeVay
Non-IODP (26 August–5 October 2020) (40 days)							M. Malone
South Atlantic Transect 1	390	Rio de Janeiro, Brazil	5 October–5 December 2020	61 (5/56)	56 (14/42)	R. Coggon J. Sylvan	T. Williams
Walvis Ridge Hotspot	391	Cape Town, South Africa	5 December 2020–4 February 2021	61 (5/56)	56 (11/45)	W. Sager K. Hoernle	K. Petronotis
Agulhas Plateau Cretaceous Climate	392	Cape Town, South Africa	4 February–6 April 2021	61 (5/56)	56 (6/50)	G. Uenzelmann-Neben S. Bohaty	D. Kulhanek
South Atlantic Transect 2	393	Cape Town, South Africa	6 April–6 June 2021	61 (5/56)	56 (13/43)	D. Teagle G. Christeson	C. Alvarez Zarikian

Expedition		Port (origin)	Dates[1]	Total days (port/ sea)	Days at sea (transit[2]/ ops)	Co-Chief Scientists	Expedition Project Manager
Non-IODP (6 June—2 October 2021 (118 days)							M. Malone
Rio Grande Cone Methane and Carbon Cycling	394	TBD	2 October–2 December 2021	TBD	TBD	TBD	TBD

Notes: TBD = to be determined.
[1] The start date reflects the initial port call day. The vessel will sail when ready.
[2] Preliminary total estimated transit (i.e., to and from operational area and between sites).

Expedition 382: Iceberg Alley and Subantarctic Ice and Ocean Dynamics

Postexpedition activities

The Expedition 382 postcruise editorial meeting was held 14–18 October in College Station, Texas. The expedition postcruise core description and sampling party was held 18–26 November in Bremen, Germany.

Expedition 383: Dynamics of Pacific Antarctic Circumpolar Current

Postexpedition activities

The *Preliminary Report* was published in October. The Expedition 383 postcruise editorial, core description, and sampling party were scheduled for 6–17 January in College Station, Texas.

Expedition 379T: JR100

Postexpedition activities

The *Preliminary Report* for the marine scientific research application was submitted to the State Department on 22 October.

Expedition 385T: Panama Basin Crustal Architecture and Deep Biosphere: Revisiting Holes 504B and 896A

Postexpedition activities

The *Preliminary Report* was published in November.

Expedition 385: Guaymas Basin Tectonics and Biosphere

Table 2.2. Expedition 385 science party staffing breakdown

Member country/consortium	Participants	Co-Chief Scientists
USA: United States Science Support Program (USSSP)	9	2
Japan: Japan Drilling Earth Science Consortium (J-DESC)	3	
Europe and Canada: European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC)	9	
Republic of Korea: Korea Integrated Ocean Drilling Program (K-IODP)	1	
People's Republic of China: IODP-China	3	

Member country/consortium	Participants	Co-Chief Scientists
Australia and New Zealand: Australia/New Zealand IODP Consortium (ANZIC)	0	
India: Ministry of Earth Science (MoES)	1	
Brazil: Coordination for Improvement of Higher Education (CAPES)	0	

Figure 2.1. Expedition 385 site map

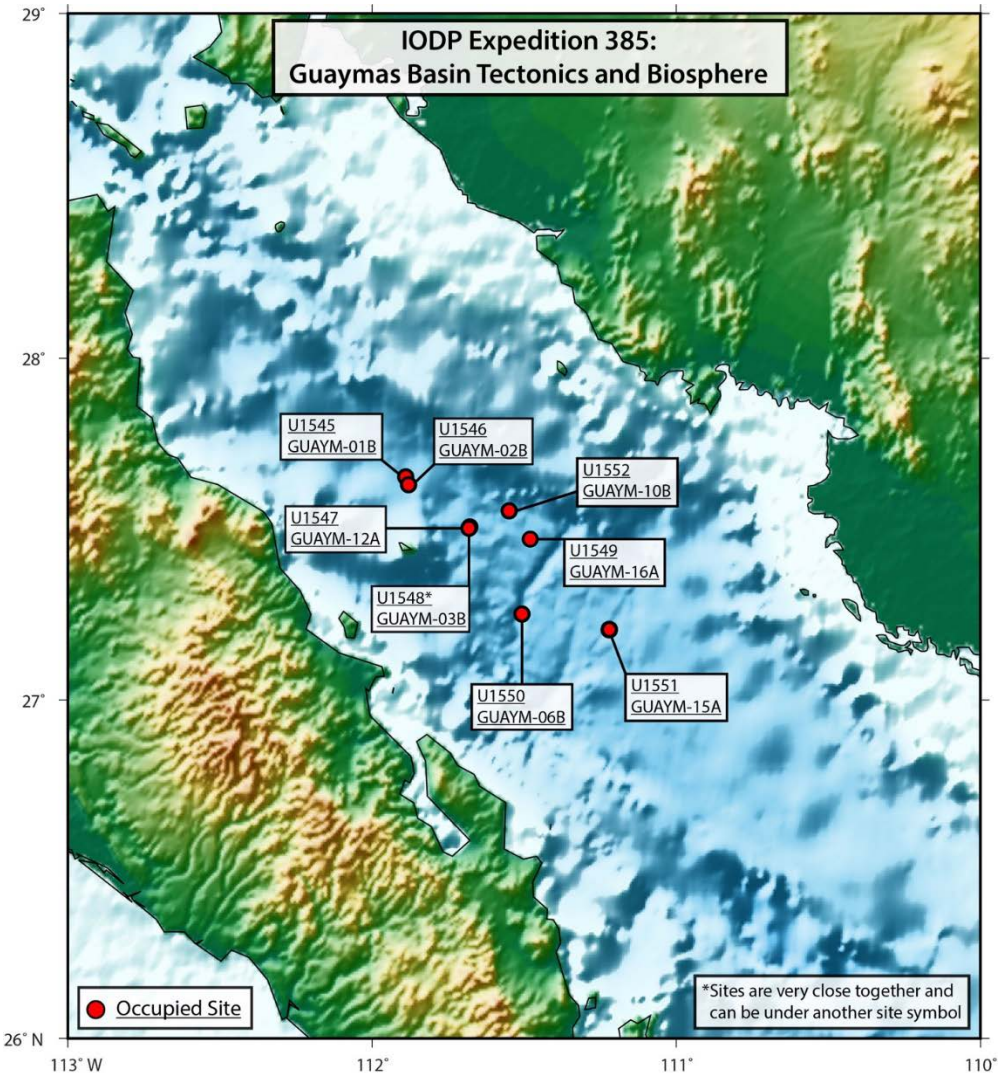


Table 2.3. Expedition 385 coring summary

Site	Hole	Latitude	Longitude	Water depth (mbrf)	Cores (*N*)	Interval cored (m)	Core recovered (m)	Recovery (%)
U1545	U1545A	27°38.2325′N	111°53.3406′W	1593.52	74	503.3	389.0	77.3
	U1545B	27°38.2301′N	111°53.3295′W	1594.24	67	387.3	340.1	87.8
	U1545C	27°38.2420′N	111°53.3290′W	1594.96	63	329.0	324.6	98.7

Site	Hole	Latitude	Longitude	Water depth (mbrf)	Cores (*N*)	Interval cored (m)	Core recovered (m)	Recovery (%)
Site U1545 totals					**204**	**1219.6**	**1053.7**	**86.4**
U1546	U1546A	27°37.8851′N	111°52.7939′W	1586.10	64	361.2	365.7	101.3
	U1546B	27°37.8840′N	111°52.7809′W	1585.58	59	333.8	351.2	105.2
	U1546C	27°37.8724′N	111°52.7568′W	1585.56	41	232.0	139.7	60.2
	U1546D	27°37.8943′N	111°52.7812′W	1585.92	47	300.1	314.7	104.9
Site U1546 totals					**211**	**525.1**	**532.57**	**95.5**
U1547	U1547A	27°30.4561′N	111°40.6980′W	1733.72	27	141.3	145.3	102.9
	U1547B	27°30.4128′N	111°40.7341′W	1732.22	50	209.8	161.3	76.9
	U1547C	27°30.4455′N	111°40.7064′W	1732.22	8	77.9	9.0	11.5
	U1547D	27°30.3947′N	111°40.7483′W	1732.22	20	111.7	34.9	31.3
	U1547E	27°30.3598′N	111°40.7756′W	1732.09	23	129.4	44.9	34.7
Site U1547 totals					**128**	**670.1**	**395.4**	**59.0**
U1548	U1548A	27°30.2466′N	111°40.8665′W	1739.94	20	103.4	114.0	110.2
	U1548B	27°30.2540′N	111°40.8601′W	1738.94	12	95.1	87.7	92.2
	U1548C	27°30.2698′N	111°40.8476′W	1737.03	10	69.8	71.0	101.7
	U1548D	27°30.5316′N	111°41.3855′W	1729.33	13	110.0	120.5	109.6
	U1548E	27°30.4829′N	111°41.2922′W	1729.93	12	110.0	115.2	104.8
Site U1548 totals					**67**	**488.3**	**508.5**	**104.1**
U1549	U1549A	27°28.33167′N	111°28.7844′W	1840.07	18	168.0	166.9	99.3
	U1549B	27°28.3383′N	111°28.7927′W	1841.17	18	166.9	164.4	98.5
Site U1549 totals					**36**	**334.9**	**331.3**	**98.9**
U1550	U1550A	27°15.1602′N	111°30.4163′W	2000.81	32	207.0	190.9	92.2
	U1550B	27°15.1704′N	111°30.4451′W	2001.21	23	174.2	160.8	92.3
Site U1550 totals					**55**	**381.2**	**351.7**	**92.3**
U1551	U1551A	27°12.3887′N	111°13.1943′W	1844.11	19	120.3	122.1	101.5
	U1551B	27°12.3832′N	111°13.1841′W	1843.90	6	48.5	50.0	103.1
Site U1551 totals					**25**	**168.8**	**172.1**	**102.0**
U1552	U1552A	27°33.2906′N	111°32.9665′W	1841.59	12	107.5	73.9	68.7
	U1552B	27°33.2885′N	111°32.9640′W	1841.09	6	55.0	40.0	72.6
	U1552C	27°33.2181′N	111°32.8557′W	1844.29	11	99.3	78.3	78.8
Site U1552 totals					**29**	**261.8**	**192.2**	**73.4**
Expedition 385 totals					**755**	**4751.8**	**4176.2**	**87.9**

Science summary

Expedition 385 drilled organic-rich sediments with sill intrusions on the flanking regions and in the northern axial graben of Guaymas Basin, a young marginal rift basin in the Gulf of California. Drill sites extend from the northwestern to southeastern flanking regions of Guaymas Basin, covering an ~81 km long transect. Adjacent Sites U1545 and U1546 recovered the oldest and thickest sediment successions (down to ~540 meters below seafloor [mbsf]) without sill emplacement (Site U1545) and with a deeply buried sill (~356–430 mbsf) that impacted the sediment column (Site U1546). Sites U1547 and U1548 are located within the central sedimented bowl and on the outer periphery of a circular hydrothermal mound, termed Ringvent, where a shallow (≥82 mbsf [Site U1547] and ≥65 mbsf [Site U1548]), slowly cooling sill is driving steep hydrothermal gradients, which in turn shift the zones of authigenic mineral precipitation and compress the microbial abundance profile toward shallower depths. The Ringvent sill was drilled several times and yielded remarkably diverse igneous rock textures, sediment/sill interfaces, and hydrothermal alteration mainly expressed by various secondary minerals in veins and vesicles. It thus became the target of an integrated sampling and interdisciplinary research effort that included

geological, geochemical, and microbiological specialties. The thermal, lithologic, geochemical, and microbiological contrasts between the two deep northwestern sites and the Ringvent sites form the scientific centerpiece of the expedition. These observations are supplemented by results obtained from sites that represent attenuated cold seepage conditions in the central basin (Site U1549) and hydrate occurrence near the Sonora margin (Site U1552), complex sediments and sills in the northern axial trough (Site U1550), and terrigenous sedimentation events on the southeastern flanking regions (Site U1551).

The scientific outcomes of Expedition 385 will (1) revise long-held assumptions about the role of sill emplacement in subsurface carbon mobilization versus carbon retention, (2) comprehensively examine the subsurface biosphere of Guaymas Basin and its responses and adaptations to hydrothermal conditions, (3) redefine hydrothermal controls of authigenic mineral formation in sediments, and (4) yield new insights into many geochemical and geophysical aspects of both architecture and sill-sediment interaction in a nascent spreading center.

Postexpedition activities

The Expedition 385 postcruise editorial meeting and core description and sampling party were scheduled for 16–27 March in College Station, Texas.

Expedition 378: South Pacific Paleogene Climate

Planning

The Expedition 378 schedule was altered because of required but unplanned derrick maintenance. Testing and evaluation of the *JOIDES Resolution's* derrick has determined that it will not support deployment of drill strings in excess of 2 km. This means that only the first site of Expedition 378 will be implemented (the redrill of DSDP Site 277). The *JOIDES Resolution* expedition schedule was revised as follows: the vessel will depart Fiji as planned; transit to DSDP Site 277; spend ~10 days coring that site; and then transit to Papeete, Tahiti, arriving 6 February and departing 7 February. The science party and most of the JRSO staff will depart the vessel in Tahiti. The engineering expedition will be canceled (see below). Instead of Expedition 384, the *JOIDES Resolution* will transit to Balboa, Panama (arriving 25 February), where ODL AS will begin extensive repairs on the derrick so that it will be ready to conduct deepwater expeditions in the Atlantic Ocean. The work should not impact any other expeditions, and the *JOIDES Resolution* should be back on schedule for the Expedition 387 Barbados port call. For Expedition 378, the port call logistics were finalized. Preparations for air freight were completed, and the shipments were dispatched.

Staffing

Two science party members were unable to sail due to the altered expedition schedule. Two additional scientists withdrew because of medical issues that prevented them from sailing.

Clearance, permitting, and environmental assessment activities

In accordance with the New Zealand Exclusive Economic Zone (EEZ) Act, the Environmental Protection Authority (EPA) Report of Pre-Activity Notification of Relevant Iwi (EPA Form 2) was submitted on 16 December.

Expedition 384: Engineering Testing

Planning

A draft of the *Scientific Prospectus* was prepared during the quarter. However, because of required, unplanned derrick maintenance, Expedition 384 was delayed/canceled (see the Expedition 378 planning section). The opportunity to conduct testing during the approved *JOIDES Resolution* schedule will be reviewed at the *JOIDES Resolution* facility board (JRFB) meeting in May.

Staffing

The Japan Agency for Marine-Earth Science and Technology (JAMSTEC)/Institute for Marine-Earth Exploration and Engineering (MarE3) office was contacted to confirm whether they still had interest in sailing engineers during Expedition 384 and to discuss possible testing of the JAMSTEC Turbine Driven Coring System (TCDS) during the expedition contingency time.

Clearance, permitting, and environmental assessment activities

A site in international waters was identified as a contingency location if Costa Rica does not approve the clearance application.

Expedition 387: Amazon Margin

Planning

JRSO worked with the science party to make sure adequate supplies and materials are on board. JRSO contacted the Brazilian General Consulate in Houston, Texas, about the type of visa needed for the expedition, and the consulate responded with additional questions. JRSO also contacted the ODL AS port agent and other Brazilian consulates in an attempt to determine the required visa type.

Staffing

A Stratigraphic Correlator withdrew, and the expedition leadership decided not to refill the position.

Clearance, permitting, and environmental assessment activities

Brazil requested clarification on the drilling process and additional clearance documentation, and JRSO submitted the requested information and supplemental material. The cooperation agreement between TAMU and the Co-Chief Scientist's institution is under review by the respective universities and is expected to be submitted next quarter.

Expedition 388: Equatorial Atlantic Gateway

Planning

JRSO is working with the science party to make sure adequate supplies and materials are on board.

Staffing

The science party staffing was completed.

Clearance, permitting, and environmental assessment activities

The additional clearance documentation that was requested for Expedition 387 was also added to the Expedition 388 application, which the embassy had not yet submitted to Brazil. The embassy submitted the application on 4 November 2019. The cooperation agreement between TAMU and the Co-Chief Scientist's institution was completed and will be submitted next quarter.

Expeditions 390 and 393: South Atlantic Transect 1 and 2

Planning

A joint Expedition 390/393 precruise meeting was held 4–6 November in College Station, Texas. A draft of the *Scientific Prospectus* was made available for invited scientists to review.

Staffing

The Program Member Offices (PMOs) forwarded nominations to JRSO in October, and the first round of invitations were sent out at the end of the quarter.

Expedition 391: Walvis Ridge Hotspot

Planning

The Expedition 391 precruise meeting was held 21 and 22 October in College Station, Texas.

Staffing

The PMOs forwarded nominations to the JRSO in December.

Clearance, permitting, and environmental assessment activities

At the end of the quarter, the listed contact for Namibian Nagoya Protocol was emailed to see if any additional clearance documentation will be required for microbiology research. A response is expected next quarter. A site survey was conducted in December, and several new sites will be reviewed by the Environmental Protection and Safety Panel (EPSP) in February.

Expedition 392: Agulhas Plateau Cretaceous Climate

Planning

The Expedition 392 Precruise Meeting was held 4 and 5 December in College Station, Texas.

Staffing

The call for applications closed on 2 December.

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.

Progress reporting

The JRSO operations and management report for the fourth quarter of FY19 (July–September) was submitted to NSF on 14 November (http://iodp.tamu.edu/publications/AR/FY19/FY19_Q4.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

Brad Clement (JRSO Director) attended the European Consortium for Ocean Research Drilling (ECORD) Council meeting held 5–7 November in Dublin, Ireland. Mitch Malone (JRSO Assistant Director and Manager of Science Operations), Gary Acton (JRSO Manager of Technical & Analytical Services), and Katerina Petronotis (JRSO Supervisor of Science Support) attended the US leadership meeting held 11 December in conjunction with the IODP town hall meeting at the American Geophysical Union (AGU) Fall Meeting held in San Francisco, California.

Project portfolio management

JRSO began working on the X-ray Linescan Core Imager (XSCAN) and Core Orientation Projects, continued work on the GEODESC and Data Publishing projects, and placed the SampleMaster Replacement project on hold this quarter.

GEODESC

Scope and deliverables

The purpose of the GEODESC project is to replace the DESClogik core description interface, 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

The project management team is working on the project management plan and expect to complete it next quarter. This project remains on track for completion in February 2021.

Data Publishing

Scope and deliverables

The purpose of the Data Publishing project is to build a framework, tools, and processes capable of publishing expedition data sets 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 a respected, FAIR (findable, accessible, interoperable, and reusable) compliant, long-term scientific repository.

Status

JRSO determined that Zenodo, a repository run by CERN, the European Organization for Nuclear Research, offers the best delivery platform in support of the data publishing project and began testing using Expedition 361 data, which will be released to the public during the next quarter.

SampleMaster Replacement

Scope and deliverables

The purpose of the SampleMaster Replacement project is to replace the SampleMaster application 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

The SampleMaster Catwalk Module was placed on hold during this quarter pending availability of testers. JRSO anticipates completing this module by April 2020.

JR Communications Update

Scope and deliverables

The purpose of the JR Communications Update project is to replace the aging satellite communication system on the *JOIDES Resolution* with the goal of finding a higher capacity service for less cost.

Status

JRSO successfully completed this project on time in November.

X-ray Linescan Core Imager

Scope and deliverables

The purpose of this project is to design and fabricate a standalone X-ray Linescan Imager to replace the prototype X-ray imager that has been in use since Expedition 379 (Amundsen Sea West Antarctic Ice Sheet History). Like the prototype, the XSCAN will provide the fundamental 2-D X-ray images for scientists to observe structures or objects such as dropstones, lamination, shells, burrows, faults, and fractures that might aid in the interpretation of geologic processes, depositional settings, environmental conditions, alteration, and tectonics. Similarly, it will produce images that might aid in core splitting decisions aimed at targeting specific material for sampling or minimizing damaging or disturbing important structures or objects. Unlike the prototype, XSCAN will be capable of producing line-scanned X-ray images of each core section, which can be viewed in the LIVE application or used for stratigraphic correlation or other analyses similar to the images produced by the Section-Half Image Logger (SHIL). Additionally, XSCAN will be able to rotate the source and detector around the core, which will provide different angular views of structures within the sections and could also be incorporated into volume estimates to be used to improve other datasets.

Status

This project is scheduled for completion by October 2020.

Core Orientation Project

Scope and deliverables

The purpose of this project is to (1) develop a new nonmagnetic orientation tool that will be directly attached to the core barrel and (2) improve methods used in aligning the core liner within the core barrel. Specifically, a new gyroscopic orientation tool (GOT) will be developed in house that will be attached directly to the core barrel, avoiding possible problems with misalignment between the sinker bars and core barrel. Because the GOT does not use the magnetic field for orientation, the large magnetic fields associated with the drill string are irrelevant. To improve the alignment of the core liner, JRSO will investigate whether it is possible to modify the advanced piston corer (APC) core barrels to allow the core liner to be aligned and attached at both ends of the core barrel. Currently, the top of the liner is oriented and attached to the core barrel with a screw but the bottom of the liner is free to twist, which it might do as sediment enters the liner.

Status

This project is scheduled for completion by January 2021.

4. Subcontract activities

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

The JRSO also 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 and oversight to drilling and logging contractors; and utilizing IODP resources to oversee engineering development projects.

Expedition outreach support

JRSO staff assisted with planning for Expedition 385 port call public relations and outreach activities, which included a symposium at Scripps and facilitated/conducted tours of the *JOIDES Resolution* for 160 people in San Diego, California, including media, NSF, TAMU dignitaries, and local universities at the September port call. During the second San Diego port call in November, a School of Rock spent one day on the ship and two small tours for local colleges were conducted.

6. Technical and analytical services

The Technical and Analytical Services (TAS) department develops, maintains, and operates a diverse array of scientific equipment for analyzing cores and core samples; staffs the shipboard laboratories with

skilled technicians; provides support for shipboard scientists; assists with downhole tools and measurements; and facilitates shipboard core curation, handling, and shipping.

Analytical systems

X-ray Linescan Imager Project

The XSCAN project was approved by management and design work began on a standalone linescan X-ray system for imaging whole-round and split-core sections. The linescan images will be analogous to the linescan color images (i.e., core photos) acquired by the SHIL. The XSCAN will replace the X-ray Imager on a Multisensor Logger (XMSL), which acquires 12 cm long images along a core section. Those images could not be stitched into a continuous core section image because of the geometry of the X-rays generated by the pulsed X-ray source. XSCAN will alleviate this issue because it produces a continuous linescan of core sections. More significantly, when the XMSL is in use, one of our two Whole-Round Multisensor Loggers (WRMSLs) cannot be used to collect magnetic susceptibility or density data, which impedes timely stratigraphic correlation. One of the milestones of ODP and IODP has been coring complete, continuous stratigraphic sections through the use of real-time stratigraphic correlation, a process that requires the simultaneous operation of two WRMSLs. Currently, science parties must cease taking X-rays if they want to use both whole-round loggers. XSCAN will alleviate this issue because it is a standalone system. XSCAN is planned for completion in late 2020, after which it will be installed on the ship, the XMSL will be removed, and the second WRMSL will be returned to its original configuration.

Scanning electron microscope–energy dispersive spectrophotometer

In response to numerous requests from science parties' evaluations, JRSO has acquired a scanning electron microscope–energy dispersive spectrophotometer (SEM-EDS) system for the ship. The NanoImages SNE-4500M will be equipped with a Brüxer XFLASH 630 Mini EDS and has been delivered to JRSO headquarters. It will be installed by the vendor for testing by the end of January 2020. This system will replace the Hitachi TM-3000 SEM on the ship, and the older SEM will be transferred to College Station, Texas, where it will be available for use by visiting scientists and staff. Estimated delivery to the ship is summer of 2020, once workflow, database, and reporting methods are developed.

Magnetic susceptibility meters

Leveraging work done by external scientists, JRSO developed code to integrate the Bartington MS3 magnetic susceptibility meter into the IMS code base that runs the core loggers. A number of MS3 meters were purchased and will be integrated into the WRMSLs (MS2C loops) and the Section Half Multisensor Logger (SHMSL, MS2K loop). The new meters have a considerably wider range (26 SI instead of 0.1 SI) and have a faster integration time than the MS2 meter. In addition, JRSO purchased a Bartington MS2B dual-frequency sensor for rapid determinations of susceptibility on discrete samples as a supplement to the Agico KLY-4 KappaBridge.

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, expedition technical reports, and any concerns raised by the IODP Issues Management Team and provide advice on corrective actions and potential developments for laboratories.

Curation and Core Handling

The Curation and Core Handling LWG did not meet this quarter because there were no new issues raised on recent expeditions.

Geochemistry and Microbiology

The Geochemistry and Microbiology LWG did not meet this quarter.

Geology

The Geology LWG did not meet this quarter.

Geophysics

The Geophysics LWG did not meet this quarter.

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 385 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 expedition. No data 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	883	USA	1,242
2	China	832	China	443
3	United Kingdom	259	United Kingdom	213
4	Italy	98	Japan	189
5	Germany	87	Germany	112
6	Netherlands	73	Unknown	97
7	Brazil	65	South Korea	79
8	Unknown	62	France	73
9	France	58	Canada	47
10	Sweden	47	Australia	37

Rank	Janus database		LIMS database	
	Country	Visitor sessions	Country	Visitor sessions
	Others	361	Others	307
	Total	**2,825**	**Total**	**2,839**

Table 7.2. Top 20 database web queries

Rank	Janus database		LIMS database	
	Query	Views	Query	Views
1	Site summaries	2,319	Images—core photos	7,374
2	Images—core photos	1,581	Physical properties—MAD	774
3	Physical properties—GRA	1,012	Physical properties—GRA	760
4	Samples	670	Samples	669
5	Core summaries	498	Hole summaries	489
6	Hole summaries	486	Section summaries	442
7	Special holes	337	Images—LSIMG	396
8	Physical properties—MSL	268	Physical properties—MS	365
9	Hole trivia	212	Core summaries	360
10	Chemistry—carbonates	201	XRFSUM	226
11	Images—prime images	189	Physical properties—RSC	198
12	Paleontology—age models	187	Images—TSimage	145
13	Physical properties—MAD	167	Chemistry—carbonates	144
14	Images—closeups	145	Physical properties—NGR	127
15	Site details	125	XRD	105
16	Leg summaries	115	Chemistry—IW	104
17	Physical properties—color	111	Images—closeups	93
18	Physical properties—PWL	106	SRM section	85
19	Chemistry—IW	105	Physical properties—RGB	85
20	Physical properties—NGR	98	Images—microimages	81
	Others	1,370	Others	1,382
	Total	**10,302**	**Total**	**14,404**

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total
How To	13
Photos	6
Depth	2
Color	2
Carbonates	1
Description	1
Logging	1
MAD	1
PMAG	1
Seismic	1
XRF	1
Total	**30**

Country	Total
USA	12
UK	7
Angora	2
China	2
Germany	2
Italy	2
Japan	1
New Zealand	1
Sweden	1
Total	**30**

Network systems operation, maintenance, and security

JRSO and ODL AS replaced the very small aperture terminal (VSAT) system during the November San Diego, California, port call. This initiative added dual-band capability (C and Ku bands) and increased

the JRSO's available bandwidth to a 3 Mbps synchronous committed information rate (CIR) in support of voice and data applications. Moreover, this new service provided by MARLINK includes burstable asynchronous rates of at least 6 Mbps download to the ship and 5 Mbps upload from the ship when available.

Tieup activities

JRSO migrated remaining computers to Windows 10 where possible, added a new disk-based backup system, and completed a migration to Java 11.

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).

Sample and curation strategies

The JRSO planned sample and curation strategies this quarter for upcoming JRSO Expeditions 385 and 378. The GCR also prepared for the Expedition 383 Sample Party scheduled to take place in early January.

Sample requests and core sampling

The following table provides a summary of the 2,425 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 X-ray fluorescence (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
74080IODP, Reinthal, USA	13	
74100IODP, Furukawa, Japan	651	
73305IODP, Herbert, USA	10	
74639IODP, Hodel, France	27	
74719IODP, Bablon, France	24	
74690IODP, Kodama, USA	5	
74751IODP, Zhang, USA	113	3
74886IODP, Hu, China	284	
74894IODP, Anderson, USA	16	
74940IODP, Lowery, USA	88	
75092IODP, Notaro, Italy	13	
74657IODP, Obrochta, Japan	30	1
75098IODP, Ford, United Kingdom	294	
75151IODP, Jacobel, USA	20	
75293IODP, Mueller, Germany	16	
75505IODP, Hess, USA	30	
75415IODP, Mejia, Switzerland	17	
76265IODP, Caissie, USA	6	

Sample request number, name, country	Number of samples taken	Number of visitors
76210IODP, Kutterolf, Germany	54	1
76354IODP, Mastro, USA	48	
76537IODP, Hoogakker, United Kingdom	50	
70807IODP, Ravelo, USA	646	1
Tours/Demonstrations (5)		125
Totals	**2,425**	**131**

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, providing materials for display, and facilitating classroom exercises. The repository hosted an annual workshop for Austin Community College (ACC) this quarter and gave tours to Dr. Julia Reece's TAMU Oceanography class. IODP staff conducted GCR public relations tours this quarter for the International Association of Drilling Contractors (IADC) student drilling organization, Chevron fellows, and future Education and Outreach Officers on the *JOIDES Resolution*.

Table 8.2. GCR tours/visitors

Type of tour or visitor	Number of visitors
Scientist visitors	6
Educational tours/demonstrations (2)	90
Public relations tours (3)	35
Totals	**131**

Onshore XRF scanning

During this quarter, 1,239 core sections were scanned on the XRF 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	382, science party, multiple	129	172	0	0
Program	383, science party, multiple	441	452	0	0
Program	385, science party, multiple	18	27	0	0
Totals		**588**	**651**	**0**	**0**

Notes: SHIL = Section Half Imaging Logger, WRMSL = Whole-Round Multisensor Logger. *The WRMSL is currently unavailable because it is serving as the development track for a new X-ray system.

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 Project (DSDP) publications.

Scientific publications

Table 9.1. Newly published content on the IODP Publications website

Reports and publications	JRSO	USIO	CDEX	ESO*
Scientific Prospectus				10.14379/iodp.sp.386.2019
Preliminary Report	10.14379/iodp.pr.383.2019 10.14379/iodp.pr.385T.2019		10.14379/iodp.pr.358.201	
Data Reports		10.2204/iodp.proc.339.205.2019 10.2204/iodp.proc.341.205.2019		

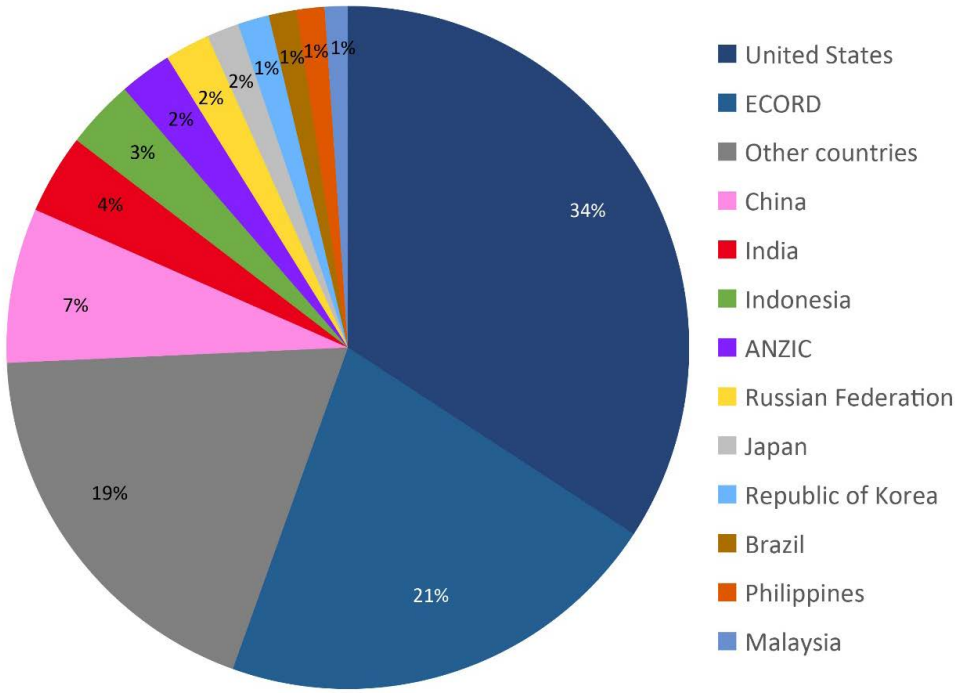
*ESO publications are produced under contract with the British Geological Survey.

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 371,362 page views and 42,297 site visits and the IODP Publications website received 366,759 page views and 23,568 site visits. Where possible, visits by JRSO employees and search engine spiders were filtered out of the counts. Visitors to the IODP TAMU website came from more than 222 countries.

Figure 9.1. Top 12 countries/consortia of visitors to the IODP TAMU website



Notes: ECORD = European Consortium for Ocean Research Drilling. ANZIC = Australia/New Zealand IODP Consortium.
ECORD countries include Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

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 these legacy websites that highlight the scientific and technical accomplishments of these ground-breaking precursors to the Integrated Ocean Drilling Program and IODP. These 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	FY20 Q1 page views*	FY20 Q1 site visits*
www-odp.tamu.edu	244,107	24,426
www.odplegacy.org	4,290	2,061
www.deepseadrilling.org	44,945	6,508
Total	**293,342**	**32,995**

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

Publications coordination

Data reports related to Expeditions 338, 339, 341, 353, 354, 361–364, 369, and 372B/375 were received, sent to peer review, accepted, and/or published this quarter.

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. 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	October 2019	November 2019	December 2019	FY20 Q1 total
IODP	10.14379	4,932	3,615	4,532	13,079
Integrated Ocean Drilling Program	10.2204	7,497	3,752	4,526	15,775
ODP/DSDP	10.2973	32,563	13,215	22,917	68,695

Science Open

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. IODP deposited data reports from Volumes 314/315/316, 362, 374, and 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	Referenced articles
Total FY19	712	8,382	171	1,745	8,377
FY20 Q1	16	658	187	1,793	302
Total to date	**728**	**9,040**	—	—	**8,679**

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	Referenced articles
Total FY19	4,196	13,340	22,630	10,505	40,473
FY20 Q1	181	771	24,698	10,912	2,172
Total to date	**4,377**	**14,111**	—	—	**42,645**

Altmetric.com

The JRSO contributes publications metadata to TAMU's Symplectic Elements database, which feeds data to http://altmetric.com, a platform that enables monitoring of the online activity surrounding academic research. This quarter the JRSO uploaded DOIs of Integrated Ocean Drilling Program and IODP *Proceedings* volumes and data reports for Expeditions 314/315/316, 362, 374, and 376.

Legacy activities

Closeout

Integrated Ocean Drilling Program publications closeout activities continued during the reporting period. Data reports published during the quarter in the *Proceedings of the Integrated Ocean Drilling Program* are listed above in "Scientific publications." In addition, peer-reviewed postcruise research result publications related to Expeditions 301, 302, 303/306, 307, 309/312–318, 320/321, 323, 325, 327, 329, 330, 333-335, 338–343/343T, 346, 348, and 349 were added to the publications database.

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, and other publications pages (http://iodp.tamu.edu/publications) are archived at the Internet Archive, a long-term archive specializing in full website backups. Quarterly crawls incrementally update the archive with new files, which included 30,816 new documents (80.8 GB) for this quarter. In addition, the archive houses legacy publications sites for DSDP and ODP, for a grand total of 1.2 TB of data and 6,882,323 documents. The archive can be viewed at https://archive-it.org/collections/9148.

Citation management

IODP Pubs contracts with the American Geosciences Institute (AGI) to maintain the Scientific Ocean Drilling Citation Database, a subset of the GeoRef database that contains more than 35,000 records for Program-related scientific ocean drilling publications from 1969 to the present. This quarter, IODP Pubs sent 143 expedition-related publication citations for consideration for inclusion in the database.

Table 9.7. Scientific Ocean Drilling Bibliographic Database statistics

Program-related publications	October 2019	November 2019	December 2019	FY20 Q1 total
Searches	237	249	436	922
Citation views	505	509	545	1,559

IODP Pubs also maintains a current PDF list of publications and conference presentations/abstracts authored by JRSO staff and Research Information Systems (RIS)-format citation data lists for IODP program publications and staff-authored journal articles (http://iodp.tamu.edu/staffdir/indiv.html). RIS is a standardized tag format that enables citation programs to exchange data. Users can copy the content of the RIS files and import it into most bibliographic software. The IODP program publication and JRSO staff-authored lists are updated quarterly.

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).

American Geophysical Union Fall Meeting 2019

- Bova, S.C., Rosenthal, Y., Holbourn, A., Linsley, B.K., **Kulhanek, D.K.**, and IODP Expedition 363 Scientists, 2019. Variable response of rainfall in the Western Pacific Warm Pool at orbital and millennial timescales over the last 1.5 My [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP51C-1386)
- **Childress, L.B.**, **Acton, G.D.**, **Percuoco, V.P.**, and **Hastedt, M.**, 2019. Mining the IODP database for relationships between lithology and physical, chemical, and magnetic properties [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP11D-1416)
- Coenen, J.J., Dodd, J.P., Gruetzner, J., Hall, I.R., **LeVay, L.J.**, Lathika, N., Jimenez, F.J., Hemming, S.R., Scherer, R.P., and the IODP Expedition 361 Scientists, 2019. Intermediate water dynamics at the Indian-Atlantic Ocean gateway during the Pliocene inferred from opal accumulation and diatom assemblages at IODP Site U1475 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1451)
- de Ronde, C.E.J., Humphris, S.E., **Höfig**, **T.W.**, and Reyes AG, 2019. Critical role of caldera collapse in the formation of seafloor mineralization: Brothers volcano, Kermadec arc [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V32B-02)
- Dodd, J., Lehman, A., Abbott, T., Ash, J., Xiong, X., van de Flierdt, T., McKay, R., De Santis, L., **Kulhanek, D.**, and IODP Expedition 374 Scientists, 2019. Oxygen isotope values of biogenic silica: Diagenesis and utility as a paleoenvironmental proxy [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP13A-03)
- Hall, I.R., Starr, A., Hemming, S.R., Barker, S., van der Lubbe, J., Cartagena Sierra, A., Berke, M.A., et al. (including **L. LeVay**), 2019. Surface and deep-water variability on the southern Agulhas Plateau: Interhemispheric links over the past 2 Ma [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP52A05)
- Hoernle, K., Jicha, B.R., Müller, D., Portnyagin, M., Werner, R., Hauff, F., Bezard, R., **Höfig, T.W.**, and Yogodzinski, G., 2019. Role of the Aleutian Arc and NW Pacific seafloor in Pacific-wide plate

reorganization in the Paleogene [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract T51A-02)

- **Höfig**, **T.W.**, Zhang, C., Peate, D.W., Humphris, S.E., and Horkley, L.K.S., 2019. Tracing the evolution of a submarine arc-hosted hydrothermal system through phosphate mineralization: Brothers volcano, Kermadec arc [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V33E-0234)
- Holbourn, A., Kuhnt, W., Joehnck, J., Lübeers, J., Beil, S., Matsuzaki, K.M., Andersen, N., Rosenthal, Y., **Kulhanek, D.K.**, and IODP Expedition 363 Scientists, 2019. Australasian monsoon variability on a warmer Miocene Earth [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP12A-03)
- Humphris, S.E., Blusztajn, J., de Ronde, C.E.J., **Höfig**, **T.W.**, Cai, Y., Jamieson, J.W., Martin, A.J., et al., 2019. Variations in REE and Sr isotope compositions of altered rocks from magmatic- and seawater-influenced hydrothermal systems at Brothers volcano, Kermadec Arc, New Zealand (IODP Expedition 376) [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V33E-0232)
- Jasper, C.E., Dyer, B., Raymo, M.E., García, M., **Williams, T.**, Reilly, B.T., Weber, M., and the IODP Expedition 382 Scientists, 2019. Early Pleistocene record of Antarctic ice discharge events quantified by ice-rafted debris at Site U1537, IODP Expedition 382 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1462)
- Lamy, F., Winckler, G., **Alvarez Zarikian, C.A.**, and Expedition 383 Scientists, 2019. Investigating the dynamics of the Pacific Antarctic Circumpolar Current – initial results from International Ocean Discovery Program Expedition 383 (DYNAPACC) [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP52A-07)
- Lee, B.K., Gutjahr, M., Seki, O., Lyons, T.W., Weber, M., Raymo, M.E., **Williams, T.**, and IODP Expedition 382 Scientists, 2019. Early diagenetic processes in sub-Antarctic deep marine sediments and implications for deciphering primary palaeoceanographic records (IODP Expedition 382) [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1465)
- **LeVay, L.J.**, Fraass, A.J., Sessa, J.A., and Peters, S.E., 2019. Extending Ocean Drilling Pursuits [eODP]: Making Scientific Ocean Drilling Data Accessible Through Searchable Databases [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP11D-1418)
- Martin, A.J., Jamieson, J.W., de Ronde, C.E.J., Humphris, S.E., **Höfig**, **T.W.**, Roberts, S., Cai, Y., et al., 2019. Magmatic versus seawater-dominated hydrothermal alteration: evidence from deep-sea drilling at Brothers Volcano, Kermadec Arc, New Zealand [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V33E-0226)
- Massiot, C., McIntosh, I.M., Farough, A., Reyes, A.G., de Ronde, C.E.J., Humphris, S.E., and **Höfig**, **T.W.**, 2019. First downhole and core-based petrophysical and hydrological measurements in a submarine volcano: Brothers Volcano, Kermadec Arc [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V33E-0236)
- McKay, R.M., De Santis, L., **Kulhanek, D.K.**, and the IODP Expedition 374 Scientific Party, 2019. Ross Sea West Antarctic Ice Sheet history in the late Cenozoic: initial sediment core results from IODP Expedition 374 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP52A-03)

- Menapace, W., Tangunan, D., Maas, M., **Williams, T.**, and Kopf, A., 2019. Spatial and temporal evolution of Fantangisña mud volcano, Mariana forearc [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract V51G-0208)
- Mintz, M., Jasper, C.E., Hernández-Almeida, I., Warnock, J., Glueder, A., Reilly, B.T., Raymo, M.E., **Williams, T.**, Weber, M., and the IODP Expedition 382 Scientists, 2019. Early Pleistocene multiproxy record from Dove Basin, Scotia Sea: new data to evaluate the 41 kyr world problem [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1457)
- Moy, C.M., Arz, H.W., Farmer, J.R., Gottschalk, J., Iwasaki, S., Lawson, V., Lembke-Jene, L., et al. (including **C.A. Alvarez Zarikian**), 2019. Sedimentary perspectives of Pleistocene ocean circulation and climate change from the southernmost Chilean continental margin [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1460)
- Nichols, M., Xuan, C., Wilson, P.A., Crowhurst, S., Hodell, D.A., Richter, C., and **Acton, G.D.**, 2019. Orbitally paced variability of Mediterranean outflow water on the West Iberian margin through the Late Pleistocene, [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract GP31B-0726)
- Perez, L.F., Martos, Y., García, M., Weber, M., Raymo, M.E., **Williams, T.**, Bohoyo, F., and IODP Expedition 382 Scientists, 2019. Reviewed stratigraphy of the southern Scotia Sea basins (Antarctica): preliminary results on core-log-seismic integration from IODP Expedition 382 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP52A-02)
- **Petronotis**, **K.E.**, **Edwards**, **P.**, **Foster**, **P.**, **Hastedt**, **M.**, **Hesse**, **J.**, **Houpt**, **D.**, **LeVay**, **L.**, **Novak**, **B.**, **McWilliams**, **A.**, **Percuoco**, **V.P.**, **Peters**, **L.**, and **Williams**, **T.**, 2019. Making scientific ocean drilling data discoverable [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP11D-1420)
- Raymo, M.E., Jasper, C.E., Mintz, M., Dyer, B., Meyers, S.R., Lisiecki, L.E., Warnock, J., et al. (including **T. Williams**), 2019. The Mid-Pleistocene Transition: the inevitable result of long-term evolution of the East Antarctic Ice Sheet? [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP22B-02)
- Riesselman, C.R., Brombacher, A., Esper, O., de Souza, A., Malinverno, E., Middleton, J.L., Ravelo, A.C., et al. (including **C.A. Zarikian**), 2019. Magneto-biostratigraphic integration of Neogene sequences from the subantarctic Pacific Ocean: initial results from IODP Exp. 383 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1467)
- Sangiorgi, F., Wubben, E., Browne, I., Shevenell, A., Dodd, J.P., Prebble, J., Bijl, P.K., et al. (including **D.K. Kulhanek**), 2019. Ocean properties and Antarctic cryosphere dynamics during the early and middle Miocene: results from the IODP Expedition 374 (Ross Sea) [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP21B-1602)
- Seidenstein, J.L., Leckie, R.M., McKay, R.M., De Santis, L., **Kulhanek, D.**, and the IODP Expedition 374 Scientists, 2019. Quaternary paleoceanography of the Ross Sea, Antarctica based on benthic and planktonic foraminifera (Site U1523) [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1459)

- Shevenell, A., Browne, I.M., Dodd, J.P., Leckie, R.M., Desai, D., Sangiorgi, F., Seki, O., et al. (including **D.K. Kulhanek**), 2019. Orbital-scale record of Ross Sea ocean temperature across the Miocene Climatic Optimum and Middle Miocene Climate Transition [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP14A-06)
- Starr, A., Hall, I.R., Hemming, S.R., Bigg, G.R., Barker, S., van der Lubbe, J., Cartagena Sierra, A., et al. (including **L.J. LeVay**), 2019, Icebergs at the Agulhas Plateau through the Pleistocene: accumulation, provenance, and interpretation of ice-rafted debris [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1454)
- Teske, A.P., Lizarralde, D., **Höfig, T.W.**, and the Expedition 385 Scientists, 2019. Guaymas Basin IODP Expedition 385: first overview & roundup [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract OS43A-02)
- Varela, N., Romans, B.W., Patterson, M., Dodd, J., McKay, R., De Santis, L., **Kulhanek, D.**, and IODP Expedition 374 Scientists, 2019. A physical record of Antarctic Bottom Water (AABW) outflow in the Ross Sea from the late Pliocene (3.3 Ma) through present [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1456)
- Weber, M.E., Raymo, M.E., **Williams, T.**, and IODP Expedition 382 Scientists, 2019. IODP Expedition 382 (Iceberg Alley) – goals and first results [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1449)
- **Williams, T.**, Hemming, S.R., Webner, M., Raymo, M.E., Watkins, C., Jasper, C.E., Brachfield, S.A., et al., 2019. Provenance of iceberg-rafted detritus during glacial terminations of the last 500 ka at Site U1537, IODP Expedition 382 [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract PP53C-1458)
- Zhang, Y., Ravelo, A.C., Andrade, T., Aiello, I.W., and **Kulhanek, D.K.**, 2019. The effect of the Australian monsoon on paleoproductivity and terrigenous flux during the mid-Pleistocene [presented at the 2019 American Geophysical Union Fall Meeting, San Francisco, CA, 9–13 December 2019]. (Abstract GC33E-1459)

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).

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