International Ocean Discovery Program

JOIDES Resolution Science Operator

FY20 Q2 Operations and Management Report

1 January–31 March 2020

Cooperative Agreement OCE-1326927

Submitted by the JRSO

to

The National Science Foundation

and

The *JOIDES Resolution* Facility Board

8 May 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 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
Non-IODP (16 November 2019–3 January 2020) (48 days)							M. Malone
South Pacific Paleogene Climate (Site 277)	378	Lautoka, Fiji	3 January–6 February 2020	34 (3/31)	31 (20/11)	D. Thomas U. Röhl	L. Childress
Derrick Repair/Dry Dock		Balboa, Panama	25 February–30 May 2020	94 (74/20)	20 (20/0)		
Engineering Testing	384	Amsterdam, Netherlands	30 May–26 June 2020	27 (2/25)	25 (6/19)		P. Blum
Reykjanes Mantle Convection and Climate	395	Reykjavík, Iceland	26 June–26 August 2020	61 (5/56)	56 (3/53)	R. Parnell-Turner A. Briais	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 (3/58)	58 (13/45)	R. Coggon J. Sylvan	E. Estes
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	T. Williams
Non-IODP (6 June—2 October 2021) (118 days)							M. Malone
Rio Grande Cone Methane and Carbon Cycling	394	Montevideo, Uruguay	2 October–2 December 2021	61 (5/56)	56 (5/51)	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 383: Dynamics of Pacific Antarctic Circumpolar Current

Postexpedition activities

The Expedition 383 postcruise editorial, and sampling parties were held 6–17 January in College Station, Texas.

Expedition 385: Guaymas Basin Tectonics and Biosphere

Postexpedition activities

Because of COVID-19 restrictions, the Expedition 385 postcruise editorial meeting was postponed. The sampling party will be conducted by JRSO when shelter in place orders are lifted.

Expedition 378: South Pacific Paleogene Climate

Table 2.2. Expedition 378 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)	2	
Europe and Canada: European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC)	6	1
Republic of Korea: Korea Integrated Ocean Drilling Program (K-IODP)	1	
People's Republic of China: IODP-China	2	
Australia and New Zealand: Australia/New Zealand IODP Consortium (ANZIC)	1	
India: Ministry of Earth Science (MoES)	2	
Brazil: Coordination for Improvement of Higher Education (CAPES)	1	

Clearance, permitting, and environmental assessment activities

In accordance with the New Zealand Exclusive Economic Zone Act, the Notice of Commencement and Notice of Completion Forms were submitted to the New Zealand Environmental Protection Authority on 15 and 25 January, respectively.

Figure 2.1. Expedition 378 site map

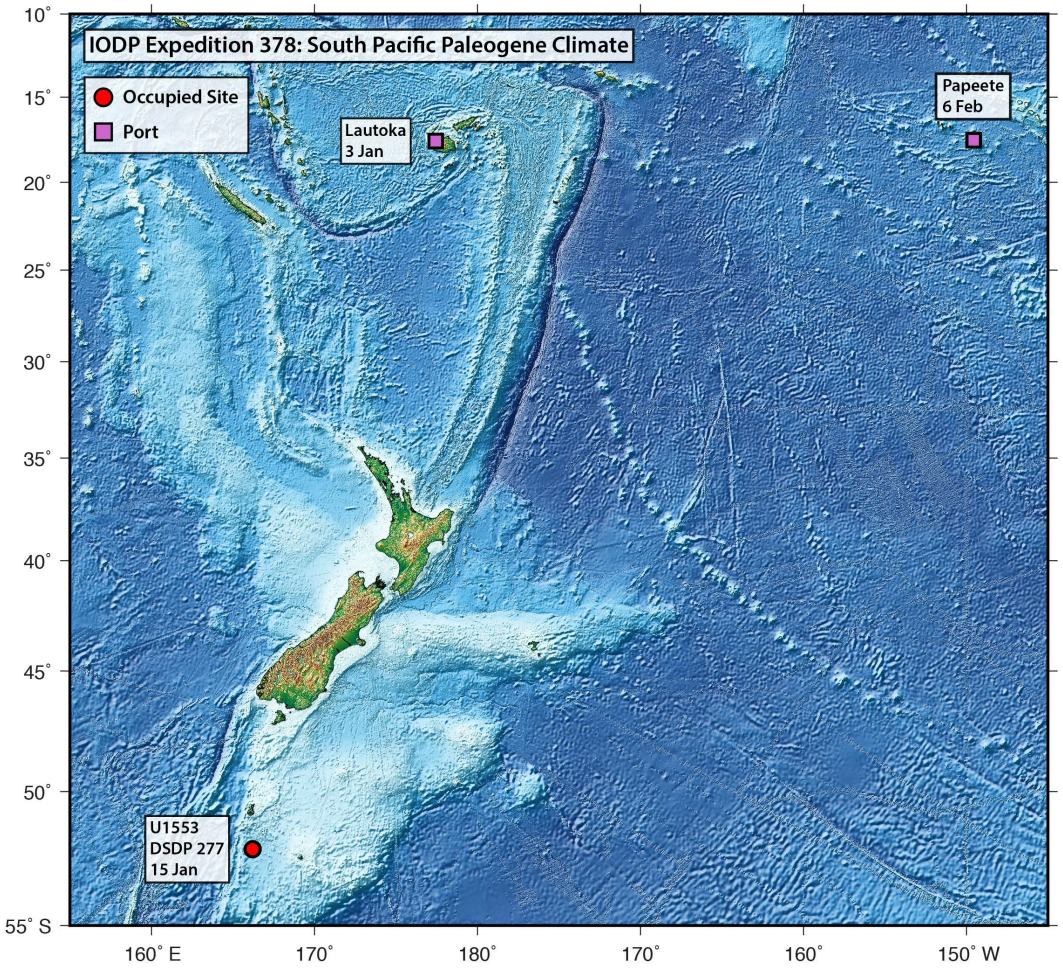


Table 2.3. Expedition 378 coring summary

Site	Hole	Latitude	Longitude	Water depth (mbrf)	Cores (*N*)	Interval cored (m)	Core recovered (m)	Recovery (%)
U1553	U1553A	52°13.4294′S	166°11.4801′E	1221.20	27	216.4	214.0	98.9
	U1553B	52°13.4300′S	166°11.4964′E	1221.66	29	243.0	231.9	95.4
	U1553C	52°13.4412′S	166°11.4975′E	1221.63	43	333.5	158.8	47.6
	U1553D	52°13.4403′S	166°11.4796′E	1221.61	19	184.9	98.0	53.0
	U1553E	52°13.4409′S	166°11.4616′E	1221.26	27	237.6	209.8	88.3
Site U1553 totals					**145**	**1215.4**	**912.4**	**76.6**
Expedition 378 totals					**145**	**1215.4**	**912.4**	**76.6**

Science summary

Expedition 378 was designed to recover the first comprehensive set of Paleogene sedimentary sections from a transect of sites strategically positioned in the South Pacific Ocean to reconstruct key changes in oceanic and atmospheric circulation. These sites would have provided an unparalleled opportunity to add crucial new data and geographic coverage to existing reconstructions of Paleogene climate.

However, evaluation of the *JOIDES Resolution* derrick in the weeks preceding the expedition determined that it would not support deployment of drill strings in excess of 2 km. Because of this determination, only one of the originally approved five primary sites was drilled.

Expedition 378 recovered the first continuously cored, multiple-hole Paleogene sedimentary section from the southern Campbell Plateau at Site U1553. This high–southern latitude site builds on the legacy of Deep Sea Drilling Project (DSDP) Site 277, a single, partially spot-cored hole, providing a unique opportunity to refine and augment existing reconstructions of the past ~66 My of climate history. This also includes the discovery of a new siliciclastic unit that had never been drilled before.

As the world's largest ocean, the Pacific Ocean is intricately linked to major changes in the global climate system. Previous drilling in the low-latitude Pacific Ocean during Ocean Drilling Program (ODP) Legs 138 and 199 and Integrated Ocean Drilling Program Expeditions 320 and 321 provided new insights into climate and carbon system dynamics, productivity changes across the zone of divergence, time-dependent calcium carbonate dissolution, bio- and magnetostratigraphy, the location of the Intertropical Convergence Zone, and evolutionary patterns for times of climatic change and upheaval. Expedition 378 in the South Pacific Ocean uniquely complements this work with a high-latitude perspective, especially because appropriate high-latitude records are unobtainable in the Northern Hemisphere of the Pacific Ocean.

Site U1553 and the entire corpus of shore-based investigations will significantly contribute to the challenges of the "Climate and Ocean Change: Reading the Past, Informing the Future" theme of the IODP Science Plan (How does Earth's climate system respond to elevated levels of atmospheric CO_2? How resilient is the ocean to chemical perturbations?). Furthermore, Expedition 378 will provide material from the South Pacific Ocean in an area critical for high-latitude climate reconstructions spanning the Paleocene to late Oligocene.

Expedition 384: Engineering Testing

Planning

Originally postponed in December because of the derrick maintenance and repair requirements, the subsequent postponement of Expeditions 387 and 388allowed the *JOIDES Resolution* Facility Board (JRFB) to utilize some of the previous Expedition 387 time slot to reschedule Expedition 384 for 30 May–26 June 2020 at a new test site in the North Atlantic Ocean. Given the schedule constraints and the anticipated dry dock in Amsterdam, the best opportunity for the engineering tests is the Expedition 395 proposed Site REYK-13A, pending lifting of travel COVID-19 travel restrictions.

Expedition 395: Reykjanes Mantle Convection and Climate

Planning

Because of the postponement of Expedition 388, the JRFB scheduled Expedition 395 into the time slot of 26 June–26 August 2020. Because of the COVID-19 travel and social distance restrictions and the very short lead time from scheduling to implementation, an in-person precruise meeting in College Station, Texas, was not feasible. Instead, the precruise meeting topics will be covered in a series of video conferencing meetings.

Staffing

Two invitations to sail as Co-Chief Scientist were issued and accepted. A call to apply was issued on 6 March for a very condensed timeline with an application deadline of 30 March. The Program Member Offices (PMOs) will forward applications to JRSO by 10 April, and the science party is expected to be staffed by the end of April. The two Onboard Outreach Officers from Expedition 388 are interested in sailing on this expedition, but they will need confirmation from the Co-Chief Scientists.

Clearance, permitting, and environmental assessment activities

JRSO worked on an environmental evaluation for the use of an acoustic source during a wireline check shot survey, and a draft will be ready by 1 June.

Expedition 387: Amazon Margin

Planning

In late February, JRSO was notified that leaks with some of the *JOIDES Resolution* thruster seals required the ship to go into a dry dock to change the seals before it could resume science operations. The dry dock could not take place until after the derrick repairs were successfully completed at the end of April. The earliest dry dock availability is in May, making it impossible to achieve the objectives of Expedition 387. Therefore, the JRFB removed Expedition 387 from the schedule until such time that it can be implemented (see Expedition 388 clearance, below).

Clearance, permitting, and environmental assessment activities

See Expedition 388 clearance, below.

Expedition 388: Equatorial Atlantic Gateway

Clearance, permitting, and environmental assessment activities

In February, Brazil communicated that it would not allow an exception to a drilling ban in an internal decree governing marine scientific research, despite previously granting an exception for *JOIDES Resolution* operations during ODP Leg 155 in 1994. The Expeditions 387 and 388 Co-Chief Scientists, proponents, and IODP-Brazil continued to try to develop an alternate pathway to allow Expeditions 387 and 388 to be implemented as scheduled until 6 March, when the JRFB removed Expedition 388 from the schedule to allow another expedition to be implemented in that part of the schedule. Expeditions 387 and 388 are back at the JRFB to be rescheduled when Brazil will allow the *JOIDES Resolution* to conduct research in their jurisdictional waters.

Expeditions 390 and 393: South Atlantic Transect 1 and 2

Planning

A joint Expedition 390/393 *Scientific Prospectus* was published in February.

Staffing

The second round of invitations were sent out at the beginning of the quarter, and special calls for sedimentology and inorganic geochemistry were successful. There are currently 22 members of the science

party staffed, but staffing from Brazil, China, and Australia are pending resolution of memoranda of understanding (MOU) agreements.

Expedition 391: Walvis Ridge Hotspot

Planning

Several new sites were approved during the February Environmental Protection and Safety Panel (EPSP) meeting, and an updated operations plan is being revised. A draft of the *Scientific Prospectus* was made available for invited scientists to review, and the finalized version is expected early next quarter.

Staffing

The first round of invitations were sent out, and 20 scientists have accepted. Participation from Brazil, China, and Australia are pending resolution of MOU agreements. A special call was sent out, and the position is being finalized. Two Namibian scientists were invited to sail as observers and accepted the invitation. The position for Onboard Outreach Officer applications are being reviewed.

Clearance, permitting, and environmental assessment activities

The Expedition 391 clearance application was started and is planned to be submitted to the State Department early next quarter.

Expedition 392: Agulhas Plateau Cretaceous Climate

Planning

Depth extensions for two sites and a ribbon at another site were approved at the February EPSP meeting; an updated operations plan is being revised.

Staffing

First round invitations were sent out on 19 March, and special calls for paleomagnetist and nannofossil paleontologists were sent out. A South African scientist was invited to sail as an observer.

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 first quarter of FY20 (October–December) was submitted to NSF on 14 February (http://iodp.tamu.edu/publications/AR/FY20/FY20_Q1.pdf).

Liaison activities

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).

Project portfolio management

JRSO began working on the QC Data Viewer project and continued work on the GEODESC, Data Publishing, X-ray Linescan Core Imager (XSCAN), and Core Orientation projects. The SampleMaster Replacement project remained on hold.

GEODESC

Scope and deliverables

The purpose of the GEODESC project is to replace the DESClogik IODP 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. The project manager is Peter Blum.

Status

The project management team completed the GEODESC project management plan and began the project execution phase in March 2020. This project is now scheduled for completion in late 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. The project manager is Paul Foster.

Status

Based on favorable feedback, JRSO extended this project to upload Expedition 361, 362, and 366 data into Zenodo (https://zenodo.org). The Expedition 361 data upload is complete, and the Expedition 362 and 366 uploads are in progress.

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 Laboratory Information Management System (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. The project manager for the Catwalk Module is Chieh Peng.

Status

The SampleMaster Catwalk Module was placed on hold during this quarter pending availability of testers. The completion date remains open.

X-ray Linescan Core Imager

Scope and deliverables

The purpose of this project is to design and fabricate a standalone X-ray Linescan Imager (XSCAN) 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 that can be viewed in the LIVE application or used for stratigraphic correlation or other analyses similar to the images produced by the Section Half Imaging 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. The project manager is Margaret Hastedt.

Status

This project is scheduled for completion by October 2020. However, COVID-19 is causing delays in materials acquisition and shipping.

Core Orientation

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. The project manager is Steve Midgley.

Status

This project is scheduled for completion by January 2021.

QC Data Viewer

Scope and deliverables

The purpose of this project is to design and implement a QC viewer program to visualize QC data acquired during ODP expeditions. The project manager is David Houpt.

Status

This project was approved for project execution in March 2020.

4. Subcontract activities

JRSO continued to interact with ODL AS to ensure efficient and compliant operations of the *JOIDES Resolution*. JRSO continued to interact with Schlumberger Technology Corporation (Schlumberger) to ensure that wireline logging operations aboard the *JOIDES Resolution* continue in an efficient and compliant manner. 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. 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 facilitated onboard outreach activities during Expedition 378.

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.

Maintenance period activities

During the tie-up off Balboa, Panama, for Expedition 387P (Derrick Repairs), the following tasks were completed:

- Installed a new *P*-wave velocity caliper (PWC) frame that was designed at IODP and updated the PWC software. The changes were initiated to reduce uncertainties in *P*-wave velocity measurements thought to be caused by slight misalignment of the transducers in the old PWC frame.
- Modified the layout of the tables in the Core Description area to improve the use of the space and to provide additional desktop space and storage shelves for scientists.
- Installed and tested new lights for the SHIL.
- Removed old deteriorating flooring in the Core Splitting Room and then sanded and painted the underlying metal floor in preparation for use until new flooring is installed during an upcoming dry dock.
- Evaluated poor performance of QE-Pro color reflectance spectrometers and determined that two of these are faulty and will be returned to the vendor for repairs.
- Replaced a faulty Cahn balance with a spare.

Analytical systems

X-ray Linescan Core Imager (XSCAN project)

The XSCAN Project is in the process of receiving long–lead-time items and the final design of the protective radiation shielding that will make the area around the device safe enough to be an uncontrolled space (see more on the XSCAN Project in Section 3, above).

Scanning Electron Microscope—Energy Dispersive Spectrophotometer (SEM-EDS)

The NanoImages SNE-4500M scanning electron microscope (SEM), equipped with a Brüker XFLASH 630 Mini energy dispersive spectrophotometer (EDS), was installed on shore, and staff have begun the process of defining workflows to allow the upload of images and data from the device into the LIMS database. 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.

Magnetic Susceptibility meters

The Bartington MS3 magnetic susceptibility meters were delivered to the vessel, and work is in process to integrate them into the laboratory. MS3 meters will be installed on the Whole-Round Multisensor Logger (WRMSL), Special Task Multisensor Logger (STMSL), Section Half Multisensor Logger (SHMSL), and in the paleomagnetism laboratory to run the MS2B dual-frequency discrete-sample sensor and a small-diameter MS2C loop sensor.

CHNS analyzer

JRSO has purchased a new Thermo FlashSmart Elemental Analyzer to replace the aging Flash EA1112, which had developed a fracture in one of its combustion furnaces. The FlashSmart utilizes the same combustion, chromatography, and thermal conductivity detection techniques as the EA1112 and will also allow JRSO to use the same consumables and supplies already on the ship. The new CHNS analyzer will be delivered this summer for later installation on the vessel.

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 met this quarter to discuss and evaluate a number of issues.

- The LWG was informed of the status of the SampleMaster replacement project. The first module of the new sampling software (Sample Planning Tool, or SPLAT) will be used for upcoming sampling parties to aid in planning and selecting sample intervals.
- A standard operating procedure document for shipping and receiving core sections will be provided to other institutions to ensure cores are returned to IODP undamaged.

- The LWG discussed space limitations in the Gulf Coast Repository (GCR) because the refrigerated storage area is approaching full capacity. A project team will be assigned to determine the best path forward to expand the GCR's capacity.
- The LWG also discussed reported user issues with the Sample and Data Request (SADR) tool, and it was determined that a project needs to be submitted to replace it in the future.

Geochemistry and Microbiology

The Geochemistry and Microbiology LWG met this quarter to discuss any issues arising from Expeditions 383 (no issues reported), 385, and 378, as well as ongoing issues.

Expedition 385

- The LWG discussed the suggestion to have *n*-heptane (nC_7) and *iso*-heptane (iC_7) standards, as well as branched hydrocarbon standards, aboard for expeditions like 385, where these gas species were found in the headspace samples. JRSO will add *n*-heptane and *iso*-heptane to the regular gas standard mixes in the future. Other gas mixes will be handled on a by-expedition basis because the additional compounds are usually not present in normal drilling operations.
- The LWG had an extensive discussion of the oxygen contamination problem caused by failure of the nitrogen (N_2) generator during Expedition 385, requiring that one site be redrilled. The contamination was caused by the failure of a solenoid valve in the N_2 generator that was not initially detected. The N_2 generator was repaired and serviced following the expedition, and preventive actions were taken to ensure N_2 quality during microbiology expeditions (e.g., improved O_2 monitoring and continuing the practice of keeping ultra-high-purity (UHP) N_2 cylinders for backup).
- The LWG discussed replacement and/or modification of the glove boxes on the ship. A survey of the microbiology community will be sent out to inquire about this as well as other space and equipment needs for the microbiology laboratory.
- The LWG discussed the poor lighting in parts of the microbiology laboratory, and TAS will purchase LED lighting strips to enhance lighting in certain areas.
- The LWG discussed the problems with the epifluorescence microscope (internal electronics failure of 20+ year old scope), and TAS will be replacing both fluorescence scopes in the near future.
- A complaint about expired supplies, specifically RHIZON samplers found to be "discolored," was addressed by the manufacturer, who stated that they changed the glue they use between the two involved batches; the difference in color does not indicate a problem.
- The LWG discussed two scientists' suggestions to improve the KOACH clean bench performance. The first is that JRSO obtain a portable air particle counter to ensure that the KOACH clean benches are set up and operating properly. The second is to add an ionizer to the KOACH assembly. TAS will purchase both of these and add them to the equipment available in the microbiology laboratory.

Expedition 378

- The LWG discussed a scientist's comment about delineation of responsibilities between the scientists and the technical staff; the LWG decided that the shipboard responsibilities document needs to be updated.

Ongoing Issues

- The LWG discussed the need to replace the Thermo Flash EA1112 CHNS analyzer and endorsed the TAS decision to purchase the Thermo FlashSmart system mentioned above.
- The LWG discussed the need to update the portable X-Ray Fluorescence (pXRF) instrument on the ship with a newer model that will increase science capability because some pXRF models now "see" sodium in addition to heavier elements. In addition, the Olympus DELTA Premium uses an obsolete communication protocol that has caused loss of data on at least one occasion. TAS will research options and a selection will be made by the LWG in the future.
- The LWG discussed obtaining various EDS standards to assist in quantification of SEM-EDS samples. The LWG recommended obtaining the XCS-5 EDS standard and handling further standards purchased on a by-expedition basis.
- The LWG discussed a general need to redesign the available microbiology space and equipment (e.g., hard- or soft-shell anaerobic chambers and additional equipment needs), and an external survey will be created to poll the community.

Geology

The Geology LWG met this quarter and discussed items from recent expeditions as well as ongoing issues.

Issues arising from Expeditions 382, 383, 379T, 385T, 385, and 378

- Core description area space and lighting were issues of concern with a number of scientists, and the LWG recommended that TAS investigate what could be done to improve the situation.
    - The department created several proposed layouts by moving the tables into multiple configurations and filming mock coreflow through the area. The description area will be rebuilt with reoriented and redesigned tables to improve the space.
    - Lighting, however, is a challenge because of the low ceiling and the lack of any additional space above the drop-down ceiling tiles because of ducting and electrical cabling. Existing lighting in the area, including self-illuminating magnifiers, is about as good as possible.
- The LWG discussed complaints that the core laboratory and microscope laboratory air conditioning is extremely cold. TAS will install logging thermometers in these areas to monitor conditions and present the findings to the ship operator to see what can be done to mitigate this.
- The LWG discussed the need to thoroughly photograph hard rock core materials taken by the microbiologists for destructive testing so there is a record of what was recovered. The LWG will form a working group to discuss this because it has a larger impact than simply obtaining a camera; it impacts curation, imaging/description, and microbiology.
- The LWG tabled discussion of SHIL image artifacts until the new lighting is installed and fully tested. It is expected that the new lighting will alleviate reported issues.
- The LWG discussed poor color representation in the JPG images created by the SHIL. This is caused by the need to create a usable image for various purposes (e.g., printed VCD sheets for handwritten annotation), so the gamma and contrast values for the JPGs are often altered from the color-calibrated values saved in the TIFF images to create images more pleasing to the human eye. The JPGs are used for many purposes that require this kind of enhancement when the cores are very dark or very white. A subcommittee of the LWG will be formed to discuss this and come up with a solution.

- The LWG requested that the SHIL filenames for the batch downloader be altered to allow them to be sorted alphabetically by Exp-Site-Hole-Core-Section; a recent change to the batch downloader affixed serial numbers ahead of those identifiers. This has already been addressed by the developers.
- The LWG discussed the possibility of adding a centimeter-scale bar to the LIMS Viewer (LIVE) tool display by some mechanism. The LWG will create a team to explore this with the developer group.
- The LWG discussed making the X-Ray Diffraction (XRD) analysis software available on more computers in the laboratory stack. TAS will explore making one of the copies of Malvern-Panalytical HighScore and its accompanying ICDD XRD database a virtual installation that could be accessed from any computer on board.

Ongoing Issues

- The LWG discussed the need to make the replacement epifluorescence microscopes also capable of differential interference contrast (DIC) because this capability is important for some microfossil applications.
- The LWG discussed several suggestions to improve the Correlator program for possible incorporation in the next upgrade to Correlator.
- The LWG discussed the possibility of acquiring a Fritsch Analysette system for sieving samples, and TAS will investigate this (possibly getting a hands-on demonstration for LWG members) and report back at the next LWG meeting.

Geophysics

The Geophysics LWG met this quarter to discuss issues arising from recent expeditions as well as ongoing issues.

All of the expeditions were very appreciative of the X-ray Imager, despite some workflow challenges the new system created. The addition of the X-ray capability greatly enhanced science according to numerous science party participants.

Expedition 383

- The LWG discussed the moisture and density balances “not taring” properly during the expedition, something “corrected” by powering the balances down and up. However, the actual tare value between the two balances doesn’t have a correct value or range and is entirely arbitrary. The physical properties technicians will be informed of this and will explain the situation to the scientists in the future.

Expedition 379T

- The LWG discussed problems with the Ocean Optics QE Pro color reflectance spectrometer. Two of the devices have electronics or calibration problems and will be sent to the manufacturer, and the QE Pro on shore will be sent to the ship to ensure there is an active spare.
- The LWG discussed the failure of the superconducting rock magnetometer (SRM) cryo compressor (eventually traced to clogging of the coolant line with debris from the ship’s chill water lines). The spare compressor was installed and SRM measurements resumed. TAS is discussing whether to isolate the cryo compressor from the ship’s water by acquiring a liquid-liquid Haskris cooling unit.

Expedition 385

- The LWG discussed modification of the half-space needles for thermal conductivity measurements so that they will fit inside the core liner. Users are not satisfied with the poorer precision (~5%) of the mini-probe relative to the normal-sized ones (~2%).
- The Giesa Automated Vane Shear instrument failed, and the LWG discussed the possibilities for repair or replacement, including a purely manual system like the Humbolt GeoVane. The final decision will be made at the next LWG meeting.
- The LWG discussed the extensive number of downhole temperature runs. The advanced piston corer temperature tool was run 72 times, and the Sediment Temperature 2 tool was run 25 times. In addition, one tool of each type was modified to measure higher temperatures than normal (from 55°C to 85°–90°C) by Mike Meiring (JRSO Engineer). All of the modified tools will be sent to shore to be reset and recalibrated.
- The LWG discussed the failure of the downhole magnetic susceptibility sonde (MSS) to communicate at rig-up. The Schlumberger engineer restored one tool to function, but the other remains dead. The failed MSS will be returned to headquarters for testing.

Ongoing Issues

- The LWG discussed the ongoing development project to create a new orientation tool, as well as improvements to the rig-floor practices to try to correct the existing core orientation tool performance.

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 information technology (IT) resources. Additional activities include managing expedition and postexpedition data, providing long-term archival access to data, and supporting JRSO IT services.

Expedition data

LIMS database

Data from Expedition 378 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	1,179	USA	1,018
2	China	570	China	442
3	United Kingdom	159	South Korea	205
4	South Korea	108	Germany	193
5	Canada	106	France	169
6	Germany	101	United Kingdom	155
7	France	91	Unknown	135
8	Switzerland	67	Japan	102
9	Unknown	57	Netherlands	90
10	Italy	49	Canada	75
	Others	446	Others	541
	Total	**2,933**	**Total**	**3,125**

Table 7.2. Top 20 database web queries

	Janus database		LIMS database	
Rank	Query	Views	Query	Views
1	Images—core photos	2,424	Images—core photos	19,330
2	Leg summaries	1,860	Samples	1,397
3	Hole summaries	1,613	Images—LSimg	822
4	Physical properties—GRA	1,501	Physical properties—PWL	726
5	Core summaries	1,490	Section summaries	706
6	Site summaries	1,390	Physical properties—GRA	628
7	Samples	1,205	Hole summaries	628
8	Physical properties—MSL	1,027	Core summaries	453
9	Images—prime data images	987	Physical properties—MS	407
10	Physical properties—Color	811	Physical properties—RSC	362
11	Physical properties—MAD	786	Physical properties—MAD	279
12	Physical properties—PWS	751	Chemistry—IW	266
13	Physical properties—NGR	737	Chemistry—carbonates	233
14	Physical properties—smear slide data	684	Images—TSimage	231
15	Chemistry— IW	651	XRD	228
16	Chemistry—carbonates	650	Physical properties—NGR	219
17	Physical properties—PWL	636	Physical properties—MSpoint	203
18	PMAG	592	Expanded - LSimg	180
19	Imaging - Closeups	578	XRF	178
20	XRD	575	Chemistry—SRANL	167
	Others	6,658	Others	3,259
	Total	**27,606**	**Total**	**30,902**

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total
How to	6
Photos	4
Hole data	2
Depths	1
Descriptions	1
Lithology	1
Physical properties	1
Paleo	1
VCD	1
Total	**18**

Country	Total
USA	11
United Kingdom	3
Germany	1
South Korea	1
Spain	1
Yemen	1
Total	**18**

Network systems operation, maintenance, and security

JRSO configured and successfully placed new Oracle Database Appliances (ODAs) into service on ship and shore, providing customers with vastly improved data query performance and availability.

8. Core curation

JRSO provides services in support of Integrated Ocean Drilling Program and IODP core sampling and curation of the core collection archived at the GCR.

Sampling parties and curation policies and procedures

JRSO hosted the Expedition 383 sample party held 11–18 January in the GCR. Approximately 30,000 samples were taken during the sample party.

Expedition 385 sampling was started by IODP staff because travel restrictions due to COVID-19 prevented science party participation. Approximately 1,100 samples were taken before all GCR sampling was halted due to further COVID-19 restrictions and a local stay-at-home order.

Sample and curation strategies

JRSO planned sample and curation strategies this quarter for JRSO Expedition 378.

Sample requests and core sampling

The following table provides a summary of the 1,344 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 number 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
77420IODP, Lazarus, Germany	25	
77451IODP, Minton, United Kingdom	14	
77565IODP, Markul, France	0	4
77577IODP, Aubry, USA	48	
77554IODP, Yang, USA	9	
77606IODP, Hickey-Vargas, USA	29	
77459IODP, Lamyman, United Kingdom	31	
77743IODP, Riesselman, New Zealand	45	
77854IODP, Bhattacharya, USA	36	
77986IODP, Crundwell, New Zealand	348	
78085IODP, Zakharov, Switzerland	5	
74247IODP, Moretti, Germany	154	
78259IODP, Stolper, USA	15	
78409IODP, Kim, USA	91	1
78184IODP, Misra, India	142	
78636IODP, Smith, USA	6	
78642IODP, van de Flierdt, United Kingdom	1	
078708IODP, Hess, USA	324	
078718IODP, Michael, USA	17	
078724IODP, Michael, USA	1	
078892IODP, Li, Canada	49	
078947IODP, O'Connell, USA		
Totals	**13,447**	**5**

Use of core collection and education and outreach support

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. 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. During this quarter, the GCR hosted a French-based visual artist, Angelika Markul, who is working on a video installation exhibit that incorporates Expedition 364: Chicxulub: Drilling the K-Pg Impact Crater. This work was done in collaboration with Expedition 364 Co-Chief Scientist Sean Gulick (University of Texas at Austin). The GCR also hosted a public relations tour for the Texas A&M University OCEANS club and was used for several hand-on exercises for TAMU undergraduate research classes.

Table 8.2. GCR tours/visitors

Type of tour or visitor	Number of visitors
Scientist visitors	1
Educational tours/demonstrations (3)	0
Public relations tours (8)	4
Totals	**5**

Onshore XRF scanning

During this quarter, 580 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	385, Science Party, USA	0	462	0	0
Program	383, Science Party, USA	0	64	0	0
Program	382, O'Connell, USA	0	40	0	0
Personal	113, O'Connell, USA	0	10	0	0
Personal	Non-IODP, vanHengstum, USA	0	4	0	0
Totals		**0**	**580**	**0**	**0**

Notes: SHIL = Section Half Imaging Logger, WRMSL = Whole-Round Multisensor Logger. *XRF 1 is currently unavailable due to technical issues (broken door). *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

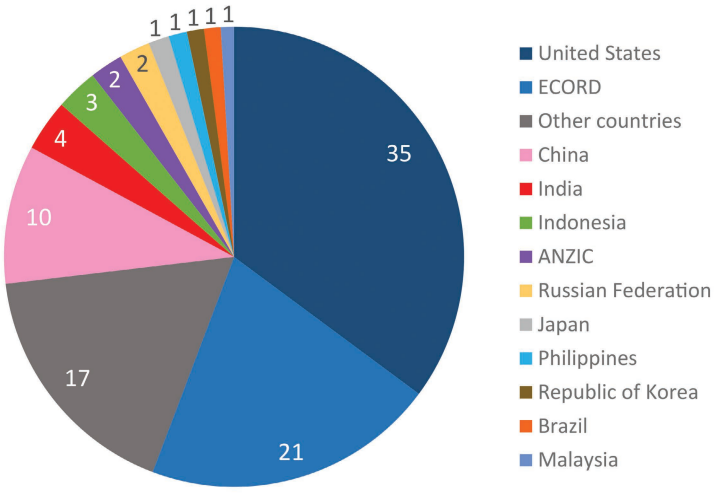
Reports and publications	JRSO	USIO	CDEX	ESO
Scientific Prospectus	10.14379/iodp.sp.390393.2020			
Preliminary Report				
Expedition Reports				
Data Reports	10.14379/iodp.proc.369.201.2020 10.14379/iodp.proc.369.202.2020 10.14379/iodp.proc.372B375.203.2020 10.14379/iodp.proc.372B375.202.2020			

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 334,611 page views and 44,070 site visits and the IODP Publications website received 325,490 page views and 22,552 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 228 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 Q2 page views*	FY20 Q2 site visits*
www-odp.tamu.edu	175,827	22,409
www.odplegacy.org	4,246	2,203
www.deepseadrilling.org	33,558	5,734
Total	**213,631**	**30,346**

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

Publications coordination

Data reports related to Expeditions 338, 341, 353, 354, 361–364, and 369 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	January 2020	February 2020	March 2020	FY20 Q2 total
IODP	10.14379	4,475	3,508	4,008	**11,991**
Integrated Ocean Drilling Program	10.2204	6,004	3,947	3,464	**13,415**
ODP/DSDP	10.2973	22,594	14,774	18,246	**55,614**

Science Open

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. JRSO deposited data reports from Volumes 317, 339, and 341 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
FY20 Q2	3	498	189	1,800	9
Total to date	**731**	**9,498**	—	—	**8,688**

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
FY20 Q2	0	0	24,912	10,912	9
Total to date	**4,377**	**14,111**	—	—	**42,645**

Altmetric.com

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, JRSO uploaded DOIs of Integrated Ocean Drilling Program data reports for Expeditions 339 and 341.

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 302, 303/306, 320/321–323, 325, 327, 333, 336, 338, 339, 341–343/343T, 346, 347, 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 71,231 new documents (141.4 GB) for this quarter. In addition, the archive houses legacy publications sites for DSDP and ODP, for a grand total of 1.3 TB of data and 6,942,821 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 9.6. Scientific Ocean Drilling Bibliographic Database statistics

Program-related publications	January 2020	February 2020	March 2020	FY20 Q2 total
Searches	303	139	512	**954**
Citation views	481	522	548	**1,551**

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. RIS-format citation data lists are also available for expedition-related bibliographies for Expeditions 349–388. The IODP program publication, JRSO staff-authored, and expedition-related bibliography 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 (AGU) Chapman Conference 2020
Bova, S.C., Rosenthal, Y., Holbourn, A.E., Linsley, B.K., and **Kulhanek, D.K., 2020**. Orbital-scale variability in Western Pacific Warm Pool rainfall over the last 1.5 My [presented at the American Geophysical Union 2020 Chapman Conference, Washington, DC, 5–9 January 2020]. https://agu.confex.com/agu/20chapman1/meetingapp.cgi/Paper/658583

AGU Ocean Sciences Meeting 2020
Estes, E.R., Berti, D., Findlay, A., Hochella, M.F., Yücel, M., and Luther, G.W., 2020. Differential behavior of metal sulfides in hydrothermal plumes and diffuse flows [presented at the American Geophysical Union 2020 Ocean Sciences Meeting, San Diego, CA, 16–21 February 2020]. https://agu.confex.com/agu/osm20/meetingapp.cgi/Paper/651870

Geological Society of America South Central Meeting 2020
Tatge, E., **Kulhanek, D.K.**, and **Acton, G.D.**, 2020. Pleistocene calcareous nannofossil assemblages from the Mozambique Channel. *Geological Society of America Abstracts with Programs*, 52:23-10. https://doi.org/10.1130/abs/2020SC-343777

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).

- Barnes, P.M., Wallace, L.M., Saffer, D.M., Bell, R.E., Underwood, M.B., Fagereng, A., Meneghini, F., et al. (including **K.E. Petronotis** and **L.J. LeVay**), 2020. Slow slip source characterized by lithological and geometric heterogeneity. *Science Advances*, 6(13):eeay3314. https://doi.org/10.1126/sciadv.aay3314
- Dailey, S.K., Clift, P.D., **Kulhanek, D.K.**, Bulsztajn, J., Routledge, C.M., Calves, G., O'Sullivan, P., e tal., 2020. Large-scale mass wasting on the Miocene continental margin of western India. *GSA Bulletin*, 132(1–2):85–112. https://doi.org/10.1130/B35158.1
- Fryer, P., Wheat, C.G., **Williams, T.**, Kelley, C., Johnson, K., Ryan, J., Kurz, W., et al., 2020. Mariana serpentinite mud volcanism exhumes subducted seamount materials: implications for the origin of life. *Philosophical Transactions of the Royal Society, A: Mathematical, Physical and Engineering Sciences*, 378:20180425. https://doi.org/10.1098/rsta.2018.0425
- Hull, P.M., Bornemann, A., Penman, D.E., Henehan, M.J., Norris, R.D., Wilson, P.A., **Blum, P.**, et al., 2020. On impact and volcanism across the Cretaceous–Paleogene boundary. *Science*, 367(6475):266–272. https://doi.org/10.1126/science

Appendix: JRSO quarterly report distribution

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