International Ocean Discovery Program

JOIDES Resolution Science Operator

FY20 Q3 Operations and Management Report

1 April–30 June 2020

Cooperative Agreement OCE-1326927

Submitted by the JRSO

to

The National Science Foundation

and

The *JOIDES Resolution* Facility Board

31 July 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 (Transit/Derrick Maintenance) (6 February—16 May 2020) (100 days)							M. Malone
Non-IODP (Dry Dock/Tie-up) (16 May—22 July 2020) (68 days)							M. Malone
Engineering Testing	384	Kristiansand, Norway	20 July–5 September 2020	47 (2/45)	45 (18/27)	N/A	P. Blum
Non-IODP (5 September—5 October 2020) (30 days)							M. Malone
South Atlantic Transect 1	390	Montevideo, Uruguay	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. Uenzel-mann-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 385: Guaymas Basin Tectonics and Biosphere

Postexpedition activities

Because of COVID-19 travel restrictions, the Expedition 385 postcruise editorial meeting is being conducted online using Google Drive collaboration tools from 25 May to 10 August. An in-person Expedition 385 sampling party was canceled, and sampling by JRSO staff was initiated after easing of the local shelter-in-place order. All sediment sampling was completed by the end of the quarter, and sampling the sills was under way and projected to be completed in July.

Expedition 378: South Pacific Paleogene Climate

Postexpedition activities

Because of COVID-19 restrictions, the Expedition 378 postcruise editorial meeting was postponed. The sampling party was deferred to later in the fall, pending improvement of the pandemic. X-ray fluorescence (XRF) measurement of cores, which is required to be completed before the sampling party, was initiated on 1 June when the university allowed some research activities to resume.

Expedition 384: Engineering Testing

Planning

Expedition 384 was previously rescheduled to immediately follow completion of dry dock activities at the end of May. However, because of COVID-19 travel restrictions and related delays in dry dock, the expedition was postponed again. When Expedition 395 was postponed, Expedition 384 was rescheduled for 20 July–5 September 2020 in hopes that travel restrictions would continue to ease and the limited number of JRSO staff that would be needed to conduct the expedition would be able to make it to the ship. Because more time was available than in the previously scheduled window, an assessment of advanced piston corer (APC) core orientation protocols and methods was added as a secondary objective. A new draft *Scientific Prospectus* was circulated for review that reflected the latest schedule change, addition of secondary objective, and updated site selections.

Staffing

Expedition 384 will take place with limited JRSO staff. Because COVID-19 travel restrictions were still in place at the end of the quarter, a travel exemption was sought for JRSO staff and crew. Travel reservations were made in June.

Expedition 395: Reykjanes Mantle Convection and Climate

Planning

Expedition 395 was postponed because of COVID-19 travel restrictions that impacted both the science party and the crew. During the quarter, the standard precruise meeting was held virtually in several break-out meetings between 31 March and 1 May. The Expedition 395 *Scientific Prospectus* was published in mid-June. The science party continued to work on research planning and collaborations, albeit at a reduced pace, to prepare for subsequent rescheduling by the JRFB. Four science meetings were planned for the next quarter.

Staffing

Before the expedition was postponed, staffing was almost completed. The science party invitations were sent out in late April, and 24 scientists accepted. Two Onboard Outreach Officers were invited and accepted the invitation to sail.

Clearance, permitting, and environmental assessment activities

The Environmental Evaluation (EE) required for Expedition 395 acoustic activity associated with check shot surveys was approved by NSF. Because the rescheduled expedition would take place in the same summer weather window if the JRFB places it back on the 2021 schedule, the EE will still be valid.

Expeditions 390 and 393: South Atlantic Transect 1 and 2

Planning

All research plans for Expeditions 390 and 393 were received, and JRSO began working with science party members to assess requirements for shipboard work, including radioisotope tracer experiments. Several virtual precruise meetings between the four Co-Chief Scientists and the two Expedition Project Managers (EPMs) were held during the quarter. Because of the COVID-19 outbreak in Brazil, the starting port for Expedition 390 was changed from Rio de Janeiro, Brazil, to Montevideo, Uruguay.

Staffing

The final two science positions in the science party were filled, and two Onboard Outreach Officers were invited and accepted the invitation to sail. One scientist formally withdrew because of institutional travel restrictions. At the end of the quarter, the *JOIDES Resolution* protocol for safe operations during the COVID-19 pandemic, which requires a reduced science and technical shipboard complement, was circulated to the Co-Chief Scientists and the science party. The EPMs and Co-Chief Scientists began discussions about minimal staff on board to (1) provide safety measurements, (2) drive operational decisions, and (3) capture ephemeral properties. Science party members who do not sail will be shore-based participants and will have the same access and rights to samples and data. Discussions about shore-based description, measurements, and sampling were initiated. A supplementary form for a COVID-19 personal risk assessment was distributed to the Expedition 390 science party.

Expedition 391: Walvis Ridge Hotspot

Planning

The November–December site survey produced 3 new primary sites and 11 new alternate sites; there are now 28 sites in total. The final version of the Expedition 391 *Scientific Prospectus* includes all of these new sites and was published in April.

Although not originally planned, implementation of the *JOIDES Resolution* COVID protocol will necessitate a postexpedition sampling and description party.

Staffing

The final six science positions in the science party were filled, and one Onboard Outreach Officer accepted the invitation to sail. However, both Brazil and the Australia/New Zealand IODP Consortium (ANZIC) informed JRSO that they are not submitting nominations due to COVID-19.

The *JOIDES Resolution* COVID protocol was circulated to the science party at the end of the quarter, and the EPM and Co-Chief Scientists began the task of identifying the minimal required shipboard complement. A supplementary form for a COVID-19 personal risk assessment was added to the medical form.

Clearance, permitting, and environmental assessment activities

The marine scientific research (MSR) application was submitted to the US State Department on 13 May, and the US State Department submitted the application and diplomatic note to the Namibian government on 1 June. The Namibian National Commission on Research, Science, and Technology approved the project, which is step 1 in the overall Namibian clearance process, and requested a nominal registration payment, which was successfully wire transferred on 1 July.

Expedition 392: Agulhas Plateau Cretaceous Climate

Planning

A virtual meeting was held on 9 June, and the Co-Chief Scientists presented the final primary operations plan and objectives for those sites.

Staffing

Science party invitations were sent out in mid-March and early April. The Onboard Outreach Officer and the South African observer were invited, and both accepted the invitation to sail. Science party staffing was completed in mid-May.

The *JOIDES Resolution* COVID protocol was circulated to the science party at the end of the quarter, and the EPM and Co-Chief Scientists began the task of identifying the minimal required shipboard complement. A supplementary form for a COVID-19 personal risk assessment was added to the medical form.

Clearance, permitting, and environmental assessment activities

The Expedition 392 clearance application was started, and plans were made to submit the application to the US State Department early next quarter. Because a science party member is interested in surface water plankton assemblage analyses, the contact for the South Africa Nagoya Protocol was emailed to determine if there are any additional requirements, but they have not responded.

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 second quarter of FY20 (January–March) was submitted to NSF on 8 May (http://iodp.tamu.edu/publications/AR/FY20/FY20_Q2.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 New Rig Instrumentation System and Digital Asset Management System projects, resumed work on the SampleMaster Replacement project, continued work on the GEODESC, QC Data Viewer, X-ray Linescan Core Imager, and Core Orientation projects, and completed the Data Publishing project.

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 GEODESC project remains on track 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

The Data Publishing project was successfully completed on 5 June. The project's outcome was so compelling that JRSO leadership decided to begin using its new data publishing construct to publicly host JRSO-generated expedition data using Zenodo. Specifically, JRSO intends to place all nonmoratorium data in Zenodo, including data hosted in the Janus and LIMS databases.

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

Work resumed on the SampleMaster Catwalk Module project, which is scheduled for final testing during Expedition 384.

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 continues to cause delays in materials acquisition and shipping. The project completion date will likely need to be extended.

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 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 now Bill Rhinehart.

Status

This project is experiencing technical difficulties that will likely extend the scheduled completion beyond 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 IODP expeditions. The project manager is David Houpt.

Status

This project is scheduled for completion in late November 2020.

New Rig Instrumentation System

Scope and deliverables

This project will provide a drilling/coring driller's display system (DDS) that will replace the existing RigWatch/Tru-VU with a modular DDS that meets the performance and end user experience-related requirements as determined during the design and review phases of the project lifecycle. As much as possible, the system will use the sensor, cabling, computing, and data display infrastructure currently installed on the *JOIDES Resolution* rig instrumentation system.

Status

The project management team began work on the project management plan in May 2020.

Digital Asset Management System

Scope and deliverables

The scope of this project is to identify a Digital Asset Management system to replace Cumulus 10.2, which will no longer be supported. The project involves investigating both the ship and shore requirements, vendor selection, and purchase of a Digital Asset Management system. The scope involves developing a plan to migrate functions with requirements that cannot be met with a new system to alternative existing JRSO systems. The purchase will include the system software and the installation, which will be executed in another project following the completion of this project. The upfront charge of installation is a standard cost when purchasing software system packages. An initial assessment of the migration from the current system will remain in scope of this project, however, the details and the implementation will be redefined in the next deployment project.

Status

The project management team began work on the project management plan in June 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

No outreach events were conducted on the *JOIDES Resolution* during the review period because of restrictions related to COVID-19.

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 core section imager

The XSCAN project continues to receive long-lead items. The project team has finalized most aspects of the design, although work has slowed because of restricted access to workspaces related to TAMU's COVID-19 safety protocols.

Scanning electron microscope–energy dispersive spectrophotometer

The NanoImages SNE-4500M (equipped with a Brüxer XFLASH 630 Mini energy dispersive spectrophotometer [EDS]) was installed, and staff continued 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 scanning electron microscope (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. As with all onsite work, this has slowed because of limited access to workspaces.

Carbon-hydrogen-nitrogen-sulfur analyzer

JRSO received the new Thermo FlashSmart Elemental Analyzer to replace the aging Flash EA1112 on the ship. The FlashSmart utilizes the same combustion, chromatography, and thermal conductivity detection techniques used by the EA1112 and will also allow JRSO to use the same consumables and supplies already on the ship. Installation of the new carbon-hydrogen-nitrogen-sulfur (CHNS) analyzer at headquarters for initial training has been delayed because of travel restrictions on the vendor's end, but the existing EA1112 on the ship is still functional.

Handheld/portable X-ray fluorescence spectrometer

The Geochemistry LWG considered numerous vendors' offerings for a new portable energy-dispersive X-ray fluorescence (pXRF) tool to replace the Olympus DELTA Premium system. Although the DELTA

continues to function, it uses a software architecture that is no longer supported by Microsoft Windows and has had several problems related to this. The LWG decided that we will purchase a Brüker AXS Tracer-5g pXRF because it offers the ability to quantify sodium (atomic number 11) as well as magnesium and heavier elements.

Epifluorescence microscopes

The microbiology epifluorescence microscope, which was purchased in 1985, suffered an internal electronics failure, and parts and service are no longer available for the system. The decision was made to replace the microscope, as well as one of the microscopes in the microscopy laboratory, with identical systems capable of fluorescence/dark-field work as well as differential interference contrast (DIC); additional capacity for DIC has been requested several times in cruise evaluations. The new microscopes will be outfitted for the normal petrographic and fossil examination in addition to the more specialized techniques.

Agico MFK2-FA dual-frequency KappaBridge magnetic susceptibility meter

The Geophysics LWG recommended replacement of the aging Agico KLY-4 KappaBridge magnetic susceptibility (MS) system, which runs via a DOS emulator and is no longer supported by the vendor, with an Agico MFK2-FA system capable of low- and high-frequency MS measurements. Based on input from querying the paleomagnetism community via the American Geophysical Union's Geomagnetism-Paleomagnetism-Electromagnetism bulletin board, the MFK2-FA was the instrument preferred as the replacement for the KLY-4.

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.

None of the LWGs met this quarter because their previous meetings were held late in the previous quarter and because the ship was under repair and did not complete any science expeditions during the 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 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

No new data were added to the LIMS database on shore this quarter. Data from Expedition 368X 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	881	USA	1,236
2	China	464	China	646
3	United Kingdom	334	Canada	314
4	Australia	211	unknown	273
5	Germany	176	United Kingdom	192
6	Brazil	121	Germany	151
7	Canada	119	France	148
8	France	92	Japan	147
9	unknown	89	Mexico	104
10	Malaysia	72	Australia	93
	Others	437		468
	Total	**2,996**	**Total**	**3,590**

Table 7.2. Top 20 database web queries

	Janus database		LIMS database	
Rank	Query	Views	Query	Views
1	Core summaries	1,603	Images—core photos	1,668
2	Images—core photos	1,502	Samples	1,365
3	Site summaries	1,452	Hole summaries	712
4	Physical Properties—GRA	779	Images—LSIMG	539
5	Samples	677	Core summaries	480
6	Physical Properties—MSL	588	Section summaries	453
7	XRF	558	Chemistry—IW	404
8	Physical Properties—RSC	477	Physical Properties—MAD	374
9	Paleontology—age model	371	Mixed samples	370
10	Chemistry—carbonates	366	Chemistry—carbonates	342
11	Hole summaries	348	XRD	308
12	Special holes	334	Physical Properties—GRA	302
13	Physical Properties—MAD	313	Physical Properties—MS	281
14	Physical Properties—NGR	293	Physical Properties—RSC	227
15	Chemistry—IW	263	Physical Properties—Tcon	207
16	Paleontology—range table	257	Physical Properties—NGR	206
17	Physical Properties—PWS	247	Physical Properties—MSPoint	196
18	Hole trivia	228	XRF Summaries	196
19	Physical Properties—Tcon	206	Physical Properties—PWC	173
20	Paleontology—Paleo investigation	168	Chemistry—ICPAES	173
	Others	1,990	Others	4,327
	Total	**13,020**	**Total**	**13,303**

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total
How to	6
Photos	5
Paleo	4
Physical Properties—MS	2
Samples	2
Chemistry	1
MAD	1
PMAG	1
RSC	1
Seismic	1
Total	**24**

Country	Total
USA	11
Germany	4
United Kingdom	4
New Zealand	2
Austria	1
Brazil	1
China	1
Total	**24**

Network systems operation, maintenance, and security

JRSO kicked off its annual IT risk assessment in May in accordance with TAMU policy. The assessment is scheduled for completion in August.

Tie-up activities

Marine Computer Specialist staff are observing cloud software running on a Macintosh computer to better understand its behavior in the shipboard environment. Additionally, JRSO IT staff are coordinating with Siem Offshore and netnordic on the installation of a new shipboard video entertainment system called SnapTV.

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 Gulf Coast Repository (GCR).

Sampling parties and curation policies and procedures

JRSO curation and technical staff collected approximately ~9,500 Expedition 385 samples after the original sample party was cancelled in March because of COVID-19.

Sample and curation strategies

JRSO planned sample and curation strategies this quarter for upcoming Expedition 395, which was subsequently postponed because of COVID-19.

Sample requests and core sampling

The following table provides a summary of the 801 samples taken at the GCR during the quarter. Sample requests that show zero samples taken may represent cores that were viewed by visitors during the quarter, used for educational purposes, or requested for XRF analysis. For public relations or educational visits/tours, the purpose of the visit is shown in brackets in the “Sample request number, name, country” column, and no 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
074653IODP, Wagner, USA	92	
078496IODP, Saitoah, Japan	179	
079343IODP, Davis, USA	46	
079128IODP, Lear, United Kingdom	168	
079944IODP, Burke, USA	93	
078959IODP, Yao, Canada	28	
079974IODP, Yedema, Netherlands	57	
078797IODP, Crockford, Germany	11	
080175IODP, Phelps, USA	48	
082022IODP, Fontorbe, Germany	66	
080306IODP, Knappertsbusch, Switzerland	4	
08092IODP, Hornbach, USA	9	
Totals	**801**	**0**

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. Because of COVID-19 related shutdown and visitor restrictions, the GCR did not host any tours or visitors this quarter.

Onshore XRF scanning

During this quarter, 294 core sections were scanned on the XRF at the GCR. Work to repair the XRF1 door was completed in May. 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 8.2. Core sections scanned

Request type	Expedition, name, country	XRF 1	XRF 2	SHIL	WRMSL*
Program	378, Childress, USA	146	148	148	0
Totals		**146**	**148**	**148**	**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

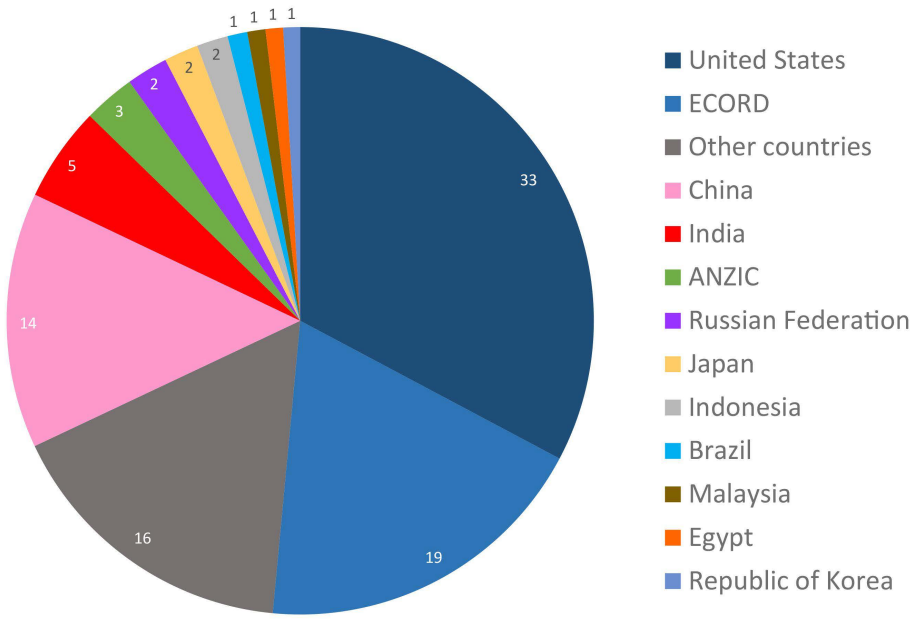
Reports and publications	JRSO	USIO	MarE3	ESO	Oman Drilling Project
Scientific Prospectus	10.14379/iodp.sp.395.2020 10.14379/iodp.sp.391.2020 10.14379/iodp.sp.392.2020				
Preliminary Report	10.14379/iodp.pr.378.2020				
Expedition Reports	10.14379/iodp.proc.368X.101.2020 10.14379/iodp.proc.368X.102.2020 10.14379/iodp.proc.368X.103.2020				10.14379/OmanDP.proc.2020: 3. Methods and explanatory notes 5. Introduction to Science Theme 1A 6. Site GT1 8. Site GT3
Data Reports	10.14379/iodp.proc.363.201.2020 10.14379/iodp.proc.361.201.2020 10.14379/iodp.proc.354.203.2020 10.14379/iodp.proc.353.202.2020 10.14379/iodp.proc.362.203.2020 10.14379/iodp.proc.372B375.201.2020	10.2204/iodp.proc.320321.221.2020 10.2204/iodp.proc.341.206.2020		10.14379/iodp.proc.364.201.2020	

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 305,960 page views and 34,880 site visits and the IODP Publications website received 312,080 page views and 26,023 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 208 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 Q3 page views*	FY20 Q3 site visits*
www-odp.tamu.edu	228,708	27,502
www.odplegacy.org	3,616	2,111
www.deepseadrilling.org	99,879	6,962
Total	**332,203**	**36,575**

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

Publications coordination

Data reports related to Expeditions 320/321, 347, 361, 362, and 363 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	April 2020	May 2020	June 2020	FY20 Q3 total
IODP	10.14379	5,617	6,157	6,081	17,855
Integrated Ocean Drilling Program	10.2204	6,821	7,041	5,627	19,489
ODP/DSDP	10.2973	18,999	29,500	24,278	72,777

Table 9.4. Top 10 IODP DOIs resolved during FY20 Q3

DOI	Resolutions	Title
10.2204/iodp.pr.329.2011	620	Expedition 329 *Preliminary Report*, South Pacific Gyre subseafloor life
10.2973/odp.proc.ir.162.106.1996	462	North Atlantic - Arctic Gateways II, Vol. 162 Initial Report Site 984
10.2973/odp.proc.sr.131.105.1993	356	ODP Volume 131: Provenance and Dispersal Patterns of Sediments in the Turbidite Wedge of Nankai Trough
10.14379/omandp.proc.2020	243	Oman Drilling Project
10.2973/odp.proc.ir.110.102.1988	193	Barbados Ridge, Vol 110 Initial Report, Introduction and Explanatory Notes
10.2973/dsdp.proc.13.1973	172	DSDP Volume XIII Table of Contents
10.14379/iodp.pr.369.2018	168	Expedition 369 *Preliminary Report*, Australia Cretaceous Climate and Tectonics
10.2973/dsdp.proc.2.APP2.1970	166	DSDP Volume II, Appendix II: Shipboard Scientific Procedures
10.14379/iodp.sp.392.2020	162	Expedition 392 *Scientific Prospectus*, Agulhas Plateau Cretaceous Climate
10.2973/odp.proc.sr.130.025.1993	155	ODP Volume 130: Late Quaternary Stable Isotope Record of Benthic Foraminifers: Sites 805 and 806, Ontong Java Plateau

Table 9.5. Top 10 Program DOIs resolved during FY20 Q3

DOI (10.14379)	Resolutions	Title
10.14379/omandp.proc.2020	243	Oman Drilling Project
10.14379/iodp.pr.369.2018	168	Expedition 369 *Preliminary Report*, Australia Cretaceous Climate and Tectonics
10.14379/iodp.sp.392.2020	162	Expedition 392 *Scientific Prospectus*, Agulhas Plateau Cretaceous Climate
10.14379/iodp.pr.379.2019	150	Expedition 379 *Preliminary Report*, Amundsen Sea West Antarctic Ice Sheet History
10.14379/iodp.pr.378.2020	146	Expedition 378 *Preliminary Report*, South Pacific Paleogene Climate
10.14379/iodp.proc.367368.2018	117	Volume 367/368, South China Sea Rifted Margin
10.14379/iodp.proc.370.102.2017	111	Expedition 370: Methods
10.14379/iodp.proc.353.2016	104	Volume 353, Indian Monsoon Rainfall
10.14379/iodp.pr.354.2015	101	Expedition 354 *Preliminary Report*, Bengal Fan
10.14379/iodp.proc.353.202.2020	82	Data report: revised late Miocene splice of IODP Site U1448

ScienceOpen

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. JRSO deposited data reports from Volumes 369 and 372B375 into ScienceOpen this quarter.

Table 9.6. 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
FY20 Q3	4	634	214	1,804	28
Total to date	**735**	**10,132**	—	—	**8,716**

Table 9.7. 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
FY20 Q3	223	2,101	32,047	11,571	2,834
Total to date	**4,600**	**14,111**	—	—	**45,479**

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 369 and 372B375.

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 303/306, 311, 314/315/316, 317, 320/321, 325, 329, 336–347, 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. We are making adjustments to our crawls; data will be available again next quarter.

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 9.8. Scientific Ocean Drilling Bibliographic Database statistics

Program-related publications	April 2020	May 2020	June 2020	FY20 Q3 total
Searches	172	381	514	1,067
Citation views	353	565	287	1,205

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).

Geological Society of America South Central Meeting 2020 (from FY20 Q2)

- Briseno, A., **Kulhanek, D.K.**, Ravelo, A.C., and Aiello, I., 2020. IODP Site U1489 carbonate records from the uppermost Miocene to recent [poster presented at the Geological Society of America South Central Meeting 2020, Fort Worth, Texas, 9 and 10 March 2020].

Magnetic Interactions 2020 (from FY20 Q2)

- van Peer, T.E., Sugisaki, S., Zhao, X., Patterson, M., Xuan, C., Bohaty, S.M., Wilson, P.A., Taylor, V.E., McKay, R.M., De Santis, L., and **Kulhanek, D.K.**, 2020. Bottom-water oxygenation in Ross Sea Bottom Water reconstructed from maghemitisation in sediment cores from IODP Exp. 374 (Ross Sea, Antarctica). *Magnetic Interactions 2020*, Southampton, UK, 9–10 January 2020.

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).

- Clift, P.D., Pandey, D.K., and **Kulhanek, D.K.**, 2020. Climate–tectonic interactions in the eastern Arabian Sea. *Geological Magazine*, 157(6):829–833. https://doi.org/10.1017/S0016756820000461
- De La Houssaye, B., Flaming, P., Nixon, Q., and **Acton, G.**, 2020. Machine learning and deep learning applications for International Ocean Discovery Program geoscience research, 2019. *SMU Data Science Review*, 2(3):9. https://scholar.smu.edu/datasciencereview/vol2/iss3/9
- Hahn, A., Bowen, M.G., Clift, P.D., **Kulhanek, D.K.**, and Lyle, M.W., 2020. Testing the analytical performance of handheld XRF using marine sediments of IODP Expedition 355. *Geological Magazine*, 157(6):956–960. https://doi.org/10.1017/S0016756819000189
- Khim, B.-K., Lee, J., Ha, S., Park, J.K. Pandey, D.K., Clift, P.D., **Kulhanek, D.K.**, et al., 2020. Variations in $\delta^{13}C$ values of sedimentary organic matter since late Miocene time in the Indus Fan (IODP Site

1457) of the eastern Arabian Sea. *Geological Magazine*, 57(6):1012–1021. https://doi.org/10.1017/S0016756818000870

- LaRowe, D.E., Arndt, S., Bradley, J.A., **Estes, E.R.**, Hoarfrost, A., Lang, S.Q., Lloyd, K.G., et al., 2020. The fate of organic carbon in marine sediments—new insights from recent data and analysis. *Earth-Science Reviews*, 204:103146. https://doi.org/10.1016/j.earscirev.2020.103146
- Lu, H., Liu, R., Cheng, L., Feng, H., Zhang, H., Wang, Y., Hu, R., et al. (including **D.K. Kulhanek**), 2020. Phased evolution and variation of the South Asian monsoon, and resulting weathering and surface erosion in the Himalaya–Karakoram Mountains, since late Pliocene time using data from Arabian Sea core. *Geological Magazine*, 157(6):864–878. https://doi.org/10.1017/S0016756820000291
- McNeill, L., Dugan, B., **Petronotis, K.**, Milliken, K., Francis, J., and the Expedition 362 Scientists, 2020. Late Miocene wood recovered in Bengal-Nicobar submarine fan sediments by IODP Expedition 362. *Scientific Drilling*, 27:49–52. https://doi.org/10.5194/sd-27-49-2020
- Pandey, D.K., Pandey, A., Clift, P.D., Ramesh, P., **Kulhanek, D.K.**, and Yadav, R., 2020. Flexural subsidence analysis of the Laxmi Basin, Arabian Sea and its tectonic implications. *Geological Magazine*, 157(6):834–847. https://doi.org/10.1017/S0016756818000833
- Saraswat, R., Kurtarkar, S.R., Yadav, R., Mackensen, A., Singh, D.P., Bhadra, S., Singh, A.D., et al. (including **D.K. Kulhanek**), 2020. Inconsistent change in surface hydrography of the eastern Arabian Sea during the last four glacial–interglacial intervals. *Geological Magazine*, 157(6):989–1000. https://doi.org/10.1017/S0016756819001122
- Screaton, E.J., Torres, M.E., Heeschen, K.U., Mountjoy, J.J., Ayres, C., Rose, P.S., Pecher, I.A., Barnes, P.M., and **LeVay, L.J.**, 2020. Reply to comments by N. Sultan on "Sedimentation controls on methane-hydrate dynamics across glacial/interglacial stages: an example from International Ocean Discovery Program Site U1517, Hikurangi Margin." *Geochemistry, Geophysics, Geosystems*, 21(6):e2020GC009005. https://doi.org/10.1029/2020GC009005

Appendix: JRSO quarterly report distribution

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