

International Ocean Discovery Program
JOIDES Resolution Science Operator
FY19 Q3 Operations and Management Report

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to
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and
The *JOIDES Resolution* Facility Board

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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) FY19 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:

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

Table 2.1. JRSO expedition schedule

Expedition		Port (origin)	Dates ¹	Total days (port/sea)	Days at sea (transit ² /ops)	Co-Chief Scientists	Expedition Project Manager	
Iceberg Alley and Subantarctic Ice and Ocean Dynamics ³		382	Punta Arenas, Chile	20 March–20 May 2019	61 (5/56)	56 (9/47)	M. Weber M. Raymo	T. Williams
Dynamics of Pacific Antarctic Circumpolar Current		383	Punta Arenas, Chile	20 May–20 July 2019	61 (5/56)	56 (20/36)	F. Lamy G. Winckler	C. Alvarez Zarikian
Non-IODP (JR100)		379T	Punta Arenas, Chile	20 July–18 August 2019	29 (5/24)	24 (8/16)	TBD	L. Childress
Panama Basin Crustal Architecture and Deep Biosphere: Revisiting Holes 504B and 896A		385T	Antofagasta, Chile	18 August–16 September 2019	29 (1/28)	28 (18/10)	B. Orcutt M. Tominaga	P. Blum
Guaymas Basin Tectonics and Biosphere		385	San Diego, California (USA)	16 September–16 November 2019	61 (5/56)	56 (9/47)	A. Teske D. Lizarralde	T. Höfig
Non-IODP (16 November 2019–3 January 2020) (48 days)							M. Malone	
South Pacific Paleogene Climate		378	Fiji ⁴	3 January–4 March 2020	61 (3/58)	58 (27/31)	D. Thomas U. Röhl	L. Childress
Engineering Testing		384	Papeete, Tahiti	4 March–26 April 2020	53 (5/48)	48 (25/23)	N/A	P. Blum
Amazon Margin		387	Barbados	26 April–26 June 2020	61 (5/56)	56 (8/48)	P. Baker C. Guizan Silva	E. Estes
Equatorial Atlantic Gateway		388	Fortaleza, Brazil	26 June–26 August 2020	61 (5/56)	56 (2/54)	G. Fauth T. Dunkley Jones	L. LeVay
Non-IODP (26 August–5 October 2020) (40 days)							M. Malone	

Expedition		Port (origin)	Dates ¹	Total days (port/sea)	Days at sea (transit ² /ops)	Co-Chief Scientists	Expedition Project Manager
South Atlantic Transect ¹	390	Rio de Janeiro, Brazil	5 October–5 December 2020	61 (5/56)	56 (14/42)	R. Coggon J. Sylvan	T. Williams
Walvis Ridge Hotspot	391	Cape Town, South Africa	5 December 2020–4 February 2021	61 (5/56)	56 (11/45)	TBD	K. Petronotis
Agulhas Plateau Cretaceous Climate	392	Cape Town, South Africa	4 February–6 April 2021	61 (5/56)	56 (6/50)	TBD	D. Kulhanek
South Atlantic Transect ²	393	Cape Town, South Africa	6 April–6 June 2021	61 (5/56)	56 (13/43)	D. Teagle G. Christeson	C. Alvarez Zarikian

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).

³ Proposal 902 combined with APL 846.

⁴ Port in Fiji TBD.

Expedition 368X: Return to Hole U1503A (South China Sea)

Postexpedition activities

The Expedition 368X postcruise core description, editorial meeting, and sampling party was held 15–25 April in College Station, Texas.

Expedition 379: Amundsen Sea West Antarctic Ice Sheet History

Postexpedition activities

The Expedition 379 *Preliminary Report* was published in May. Plans were made for a postcruise core description, editorial meeting, and sampling party to be held 15–22 August in College Station, Texas.

Expedition 382: Iceberg Alley and Subantarctic Ice and Ocean Dynamics

Table 2.2. Expedition 382 Science Party staffing breakdown

Member country/consortium	Participants	Co-Chief Scientists
USA: United States Science Support Program (USSSP)	12*	1
Japan: Japan Drilling Earth Science Consortium (J-DESC)	3	
Europe and Canada: European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC)	8	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)	1	
Brazil: Coordination for Improvement of Higher Education (CAPES)	1	

*Includes two US Advisory Committee for Scientific Ocean Drilling (USAC) outreach officers.

Figure 1. Expedition 382 Site Map

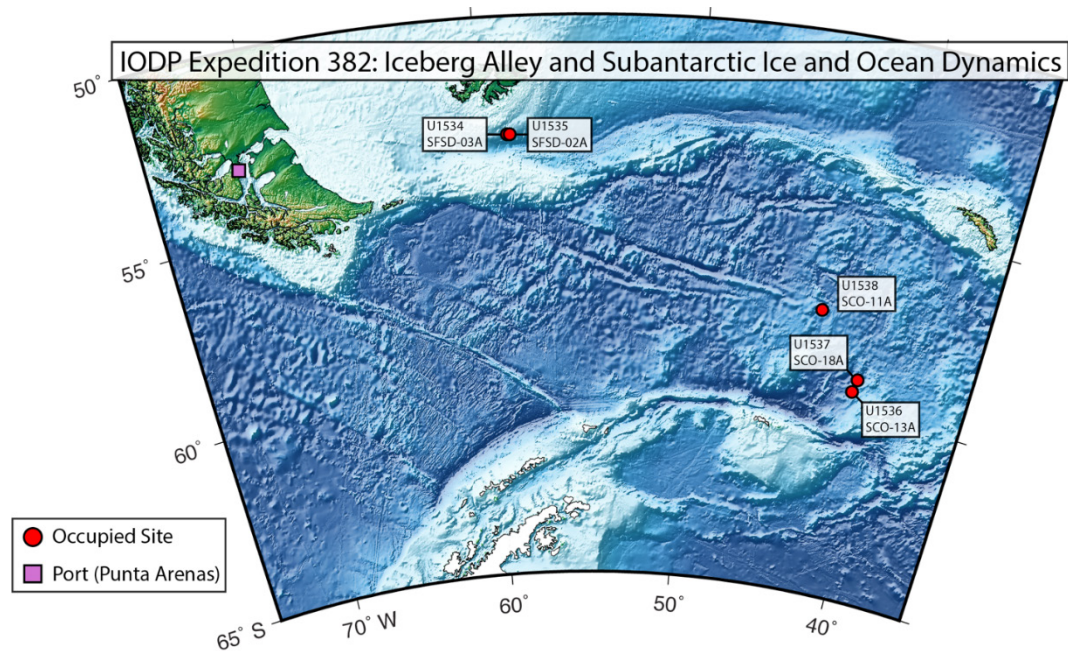


Table 2.3. Expedition 382 coring summary

Site	Hole	Latitude	Longitude	Water depth (mbrf)	Cores (N)	Interval cored (m)	Core recovered (m)	Recovery (%)
U1534	U1534A	53°11.3777'S	58°45.6479'W	605.09	45	265.3	270.84	102.09
	U1534B	53°11.3763'S	58°45.6298'W	605.07	1	1.5	1.51	100.67
	U1534C	53°11.3865'S	58°45.6296'W	606.27	19	159.2	159.55	100.22
	U1534D	53°11.3879'S	58°45.6259'W	606.07	3	28.5	29.64	104.00
Site U1534 totals					68	454.5	461.54	101.55
U1535	U1535A	53°11.4899'S	58°38.6048'W	646.86	17	117.3	112.47	95.88
Site U1535 totals					17	117.3	112.47	95.88
U1536	U1536A	59°26.4602'S	41°3.6596'W	3219.52	53	354.4	364.27	102.78
	U1536B	59°26.4608'S	41°3.6399'W	3220.06	24	224.1	230.71	102.95
	U1536C	59°26.4604'S	41°3.6191'W	3222.05	34	208	187.42	90.11
	U1536D	59°26.4501'S	41°3.6198'W	3221.72	1	6.9	6.86	99.42
	U1536E	59°26.4496'S	41°3.6392'W	3219.08	32	305.4	110.55	36.20
Site U1536 totals					144	1098.8	899.81	81.89
U1537	U1537A	59°6.6458'S	40°54.3725'W	3712.91	31	264	268.86	101.84
	U1537B	59°6.6583'S	40°54.3516'W	3712.01	1	7.4	7.4	100
	U1537C	59°6.5197'S	40°54.0870'W	3713.61	2	15.3	11.92	77.91
	U1537D	59°6.6597'S	40°54.3677'W	3713.09	50	354.3	348.94	98.49
Site U1537 totals					84	641	637.12	99.40
U1538	U1538A	57°26.5248'S	43°21.4691'W	3130.58	75	676	476.43	70.48
	U1538B	57°26.5368'S	43°21.4454'W	3129.81	1	8.5	8.49	99.88
	U1538C	57°26.5387'S	43°21.4521'W	3130.21	12	105.9	98.92	93.41
	U1538D	57°26.5335'S	43°21.4723'W	3130.4	14	126.4	114.6	90.66
Site U1538 totals					102	916.8	698.44	76.18
Expedition 382 totals					415	3228.4	2809.38	87.02

Science summary

Expedition 382, Iceberg Alley and Subantarctic Ice and Ocean Dynamics, investigated the long-term climate history of Antarctica seeking to understand how polar ice sheets responded to changes in insolation and atmospheric CO₂ in the past and how ice sheet evolution influenced global sea level and vice versa. Five sites (U1534–U1538) were drilled east of the Drake Passage: two sites at 53.2°S at the northern edge of the Scotia Sea and three sites at 57.4°–59.4°S in the Southern Scotia Sea. We recovered continuously deposited late Neogene sediment to reconstruct the history and variability in Antarctic Ice Sheet (AIS) mass loss and associated changes in oceanic and atmospheric circulation.

The sites from the southern Scotia Sea (Sites U1536–U1538) will be used to study the Neogene flux of icebergs through “Iceberg Alley,” the main pathway along which icebergs calve from the margin of the AIS travel as they move equatorward into the warmer waters of the Antarctic Circumpolar Current (ACC). In particular, sediments from this area will allow assessment of the magnitude of iceberg flux during key times of AIS evolution since the middle Miocene. The records recovered will also address interhemispheric phasing of ice sheet growth and decay and allow us to study the distribution and history of land-based versus marine-based ice sheets around the continent over time and explore the links between AIS variability and global sea level. Expedition 382 sediments will be used to compare north–south variations across the Scotia Sea between the Pirie Basin (Site U1538) and the Dove Basin (Sites U1536 and U1537). This comparison will deliver critical information on how climate changes in the Southern Ocean affect ocean circulation through the Drake Passage, meridional overturning in the region, water mass production, ocean–atmosphere CO₂ transfer by wind-induced upwelling, sea ice variability, bottom water outflow from the Weddell Sea, Antarctic weathering inputs, and changes in oceanic and atmospheric fronts in the vicinity of the ACC.

The principal scientific objective of Subantarctic Front Sites U1534 and U1535 at the northern limit of the Scotia Sea is to reconstruct and understand how ocean circulation and intermediate water formation responds to changes in climate, with a special focus on the connectivity between the Atlantic and Pacific Basins, the “cold water route.” The Subantarctic Front contourite drift, deposited between 400 and 2000 m water depth on the northern flank of an east-west–trending trough off the Chilean continental shelf, is ideally situated to monitor millennial- to orbital-scale variability in the export of Antarctic Intermediate Water beneath the Subantarctic Front. During Expedition 382, we recovered continuously deposited sediments from this drift spanning the late Pleistocene (from ~0.78 Ma to recent) and from the late Pliocene (~3.1–2.6 Ma). These sites are expected to yield a wide array of paleoceanographic records that can be used to interpret past changes in the density structure of the Atlantic sector of the Southern Ocean, track migrations of the Subantarctic Front, and give insights into the role and evolution of the cold water route over significant climate episodes, including the most recent warm interglacials of the late Pleistocene and the intensification of Northern Hemisphere glaciation.

Postexpedition activities

Plans were made for a postcruise editorial meeting to be held 14–18 October in College Station, Texas.

Expedition 383: Dynamics of Pacific Antarctic Circumpolar Current

Planning

Port call logistics were finalized. Preparations for air freight were completed, and shipments were dispatched. A press conference and ship tours for the press, local high schools, and various local institutions were held on 22 May in Punta Arenas, Chile.

Staffing

A documentary film crew secured funding for expedition participation and accepted the invitation to sail.

Clearance, permitting, and environmental assessment activities

Chile required submission of an internal environmental assessment, but the JRSO was not notified until 4 weeks prior to the expedition. We subsequently learned through investigation on our own that the submission into the environmental review must be done by a Chilean national. A contact in Chile was engaged to submit the environmental assessment on the JRSO's behalf, which was submitted and positively reviewed by the environmental agency before the start of the expedition. However, authorization from Chile to conduct research in the Chilean Exclusive Economic Zone (EEZ) was not obtained until 31 May, 11 days after the official start of the expedition and 6 days after departure from port. Because of the late approval, the planned order of sites was changed to start in international waters and end in Chilean waters.

Expedition 379T: JR100

Planning

The JRSO continued working with the science party to make sure that adequate supplies and materials were on board. The plankton tow was removed from the expedition plan. Preparations for surface and air freight were completed, and shipments were dispatched. Port call logistics were finalized.

Staffing

Science Party restaffing from the change in expedition schedule was completed.

Clearance, permitting, and environmental assessment activities

Similar to Expedition 383, an environmental assessment was required in addition to permitting from the department of fisheries because of the biological sampling associated with the originally planned plankton tows. The JRSO informed Chilean authorities that the biological sampling had been removed and worked with two different Chilean agencies to remove fisheries permitting from the requirements. On 11 June we received an official note from Chile informing us of a deadline in early July for the final environmental response from their internal agency review as well as denying any scientific work in their territorial seas (<12 nmi) and in their inland waters. We engaged the same contact in Chile who helped us with Expedition 383 to handle the environmental assessment, which was submitted for internal review on 17 June.

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

Planning

The JRSO continued to work on addressing essential engineering questions and accommodating a third-party water-sampling tool.

Staffing

The third Outreach Officer accepted the invitation to sail. Two JR Academy Instructors were invited and both accepted the invitation to sail. Twelve JR Academy Students were invited, and all accepted the invitation to sail.

Expedition 385: Guaymas Basin Tectonics and Biosphere

Planning

The JRSO continued to work on addressing questions regarding scientists' third-party tools. The JRSO is working with the science party to make sure that adequate supplies and materials are on board.

Staffing

Two new scientists were invited and accepted the invitation to sail. An addendum to the *Scientific Prospectus* will be created to reflect the updated schedule and operations.

Clearance, permitting, and environmental assessment activities

JRSO is currently investigating and planning for science party and technical staff to obtain the required Mexican Research Visa (Visa de Cooperante). These visas cannot be obtained until Mexico supplies an access code 1–2 weeks before the start of the expedition, which presents a logistical challenge for all participants.

Expedition 378: South Pacific Paleogene Climate

Planning

The JRSO is working with the science party to make sure that adequate supplies and materials are on board. An addendum to the *Scientific Prospectus* will be created to update the operational plan based on the new ports.

Staffing

A stratigraphic correlator was invited and accepted the invitation to sail. Most positions where participants had to drop out due to the scheduled change have been restaffed, and the Co-Chief Scientists are working to fill the remaining positions.

Clearance, permitting, and environmental assessment activities

Authorization for the expedition was received on 5 June. In accordance with the New Zealand EEZ Act, a notification of Marine Scientific Research (MSR) to key Māori groups was issued on 27 June. ODL is currently investigating the best options for hull biofouling requirements for the lesser standard of a short stay vessel (as opposed to the long stay standard experienced for Expeditions 372, 375, and 376) for the site in New Zealand waters.

Expedition 384: Engineering Testing

Planning

The JRSO is working with the bit vendors to develop specifications for operation of the bits and motors for expected lithologies, and quotes are being solicited for purchase or rental next quarter. One vendor's

internal technical experts determined that their most robust reamer could not open a hole in hard rock. Other reamer vendors are still being explored.

Expedition 387: Amazon Margin

Planning

The end port call was changed from Recife, Brazil, to Fortaleza, Brazil. A draft of the *Scientific Prospectus* was made available in June for invited scientists to review. The *Scientific Prospectus* will be published early next quarter.

Staffing

A call for a US Science Support Program (USSSP) Onboard Outreach Officer was sent out, and applicants will be reviewed in July. The Program Member Offices (PMOs) forwarded nominations to JRSO in May. An initial staffing meeting was held, and a preliminary staffing model was developed.

Clearance, permitting, and environmental assessment activities

The upcoming steps regarding necessary forms and documentation were discussed with the Brazilian Co-Chief Scientist. Final documentation to meet Brazil MSR requirements were assembled. The MSR application forms in English and Portuguese were completed. JRSO will submit the application packet early next quarter. A draft of the Environmental Evaluation required for Expedition 387 and 388 acoustic activity was completed and submitted to NSF for review.

Expedition 388: Equatorial Atlantic Gateway

Planning

The port call was changed from Recife, Brazil, to Fortaleza, Brazil.

Staffing

The USSSP Onboard Outreach Officer applications will be reviewed in July. The PMOs forwarded nominations to the JRSO in June.

Clearance, permitting, and environmental assessment activities

A draft of the Environmental Evaluation required for Expeditions 387 and 388 acoustic activity was completed and submitted to NSF for review.

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 FY19 (January–March) was submitted to NSF on 22 April (http://iodp.tamu.edu/publications/AR/FY19/FY19_Q2.pdf).

Liaison activities

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

Planning meetings

Brad Clement (Director), Mitch Malone (Assistant Director and Manager of Science Operations), Gary Acton (Manager of Technical & Analytical Services), Katerina Petronotis (Supervisor of Science Support), Tobias Höfig (Expedition Project Manager [EPM]), and Stephen Midgley (Operations Superintendent) attended the NEXT: Scientific Ocean Drilling Beyond 2023 workshop on the US priorities for scientific drilling. Clement, Malone, Acton, and Petronotis also attended the JRFB meeting held 8 and 9 May in Denver, Colorado.

Project portfolio management

GEODESC

Scope and deliverables

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

Status

The JRSO Management Team approved the GEODESC project management plan for project execution, which commenced on 28 May. This project remains on track for completion in February 2021.

Data Publishing

Scope and deliverables

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

Status

The Data Publishing project extended beyond the estimated completion date but is nearly complete, with publication of splice data sets remaining. New estimates put project completion between August and September 2019.

SampleMaster Replacement

Scope and deliverables

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

Status

The JRSO Management Team approved the SampleMaster Catwalk Module project management plan for project execution, which commenced in May. The SampleMaster Catwalk Module remains on track for completion by December 2019, and the entire project, comprising multiple modules, remains on track for completion in February 2021.

West Campus Data Center Move

Scope and deliverables

The purpose of the West Campus Data Center Move project is to move the physical location of JRSO moderate- or high-impact information resources to the new TAMU-managed West Campus Data Center prior to 15 August in order to comply with a TAMU System directive and TAMU Standard Administrative Procedure (SAP) 29.01.03.M0.05.

Status

JRSO completed this project as planned on 20 June.

JR Communications Update

Scope and deliverables

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

Status

JRSO signed an agreement with Overseas Drilling Ltd. (ODL) to leverage Siem Offshore's existing satellite communications vendor agreement. JRSO's shipboard bandwidth will increase to 3 Mbps synchronous for approximately half of the current cost. Installation planning continues. This project remains on track for completion during the November 2019 San Diego port call.

4. Subcontract activities

The JRSO continued to interact with ODL to ensure efficient and compliant operations of the *JOIDES Resolution*. The JRSO is working with ODL to produce a restatement of the TAMRF/ODL contract, which is intended to simplify the document by removing irrelevant material and condensing amendments into simplified text.

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

The JRSO started the process of recompeting the wireline logging subcontract by issuing a call for proposals. Schlumberger Technology Corporation (Schlumberger) was the sole respondent and a Letter of Intent was issued to Schlumberger on 17 May.

5. Science operations

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

Expedition outreach support

JRSO staff assisted with planning for and implementation of Expedition 383 port call public relations and outreach activities. A press conference and ship tours on 22 May were conducted for members of the regional and national press, students and teachers of local high schools, and researchers from the Instituto Antártico Chileno and the Centro de Investigación GAIA Antártica, both from the Universidad de Magallanes. The press conference resulted in local articles and news spots on local and national television.

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 Diffractometer

A new Malvern Panalytical AERIS X-ray diffractometer (XRD) was purchased because the Brüker AXS D4 ENDEAVOR is close to the end of its support life with the manufacturer and has broken down several times recently. The AERIS is a benchtop unit that provides similar data quality as the larger floor-mounted D4 unit. The AERIS is scheduled for installation at the mid-September San Diego port call. The D4 will remain on the ship while the AERIS is tested and will provide redundancy for as long as maintaining the D4 remains economical.

The purchase of the AERIS also provided an opportunity to assess new XRD data reduction software and to address requests from shipboard scientists for improved data analysis capabilities. Initial evaluations indicated that Malvern Panalytical's HighScore software has expanded functionality over software currently supported by IODP, including the ability to analyze both AERIS and Brüker data.

X-ray Core Section Imager

Early in Expedition 382, one of the X-ray sources failed earlier than its expected lifetime (5,000 to 10,000 hours). A third source was purchased to ensure upcoming expeditions have a spare, even if one of the units is off-vessel being repaired by the manufacturer.

Upright Microscope

A Zeiss Axioscope.A1 was shipped to the vessel to replace the oldest upright microscope, which is located in the core description area and usually utilized for smear slide analysis. The older Zeiss Axioskop will remain on board and will be available if an additional petrographic scope is needed.

Section Half Imaging Logger

A new color linescan camera was purchased in order to try to address the “green flash” that is seen occasionally during use of the Section Half Imaging Logger (SHIL). It will be installed and tested during Expedition 379T or Expedition 385T, as time permits.

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 to provide advice on corrective actions and potential developments for laboratories.

Curation and Core Handling

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

Geochemistry and Microbiology

The Geochemistry LWG met twice this quarter to discuss ongoing issues as well as those arising from Expeditions 368X and 376.

Ongoing issues:

- The microbiology workshop paper authored by Jason Sylvan was delivered to JRSO and is under revision by the microbiology group for publication as a Technical Note on contamination testing best practices.
- The LWG discussed the evaluation done by EPM Tobias Höfig on scanning electron microscope—energy dispersive spectrometer (SEM-EDS) systems and will do further work to evaluate JRSO’s need for such a system.
- The LWG further discussed the hydrofluoric acid (HF) use guidelines and the successful use of non-HF methods on some samples during Expedition 379.
- The LWG recommended that all handheld/portable X-ray fluorescence (pXRF) data be stored in the database and reported without units. This was recommended because pXRF data on section halves and cut rock samples are qualitative only, and without significant postacquisition (and usually postcruise) work to calibrate these results, they should not be assumed to be quantitative. The LWG felt that the presence of a unit (% or ppm) implies quantitation and could lead to confusion for later users of the data.
- The LWG discussed (and approved) the purchase of a new XRD as mentioned above. The JRSO will keep the D4 ENDEAVOR on board for as long as it continues to be supported, giving the ship redundancy for situations when one or the other instrument is down.

- The LWG discussed how to catalog and reference liquid samples, which may or may not come from the borehole or water column (e.g., sampled with the KUSTER tool), and developed recommendations for how these samples could be differentiated from squeezed IW and RHIZON samples in the curation and data reports.

Expedition 368X and 376 issues:

- The LWG discussed a single comment from a scientist requesting that a DNA sequencer be put on board for direct DNA sequencing data acquired during the cruise. The LWG recommended against acquiring such a system at this time because such data are more appropriately collected and analyzed postcruise.

Geology

The Geology LWG met this quarter to discuss ongoing issues and any arising from Expedition 379.

Ongoing issues:

- The LWG discussed the request to have TimeScaleCreatorPro (TSCPro) aboard the ship to create geological timescale graphics. This subject had been tabled for several months because of the rescheduling of Expedition 378 (South Pacific Paleogene). The software and its necessity aboard ship will be evaluated by EPM Laurel Childress and expedition scientist (and TSCPro expert) Wendy Zhang. They will report back to the LWG on this issue.
- The LWG was informed that the GEODESC project to replace DESClogik was approved by management and that work will begin in May with a duration of approximately 18–24 months.

Expedition 379 issues:

- The LWG discussed the reports of the “green flash” and recommended that TAS replace the camera with a newer model; this is in process, as mentioned above.
- The LWG also discussed a scientist recommendation that JRSO place a Fritsch Analysette sieving system (or similar device) on board and recommended further investigation to determine if it would be suitable for use on board. This subject will be discussed further at the next meeting.

Geophysics

The Geophysics LWG met this quarter to discuss ongoing issues and those arising from Expeditions 379 and 382.

Ongoing issues:

- Natural gamma radiation (NGR) edge effects were reduced by better positioning of the detectors relative to the home switch in software. The user guide will be updated to provide the technicians with a method to test this and ensure it remains the best position possible.
- The LWG discussed the initiation of a project to build a long-term X-ray imager system and will discuss the matter further once TAS puts together a proposal.

Expedition 379 and 382 issues:

- The “green flash” issue continued to be reported on both expeditions; see earlier comments about new camera purchase.
- NGR Detector 7 developed a severe drift in energy calibration during Expedition 382; the data from that channel will require additional postcruise calibration if the spectra are to be used. The problem

was traced to a faulty potentiometer. The component was replaced, and the NGR is now working normally.

- Systematic shifts in *P*-wave velocities of about 20 m/s (about 1% error) were noted between the *P*-wave sensors on the whole-round logger and the discrete/section-half measurement system. These differences are within the uncertainty of the measurements but are systematic rather than random; the LWG recommends using the same energy-ratio method on both systems to minimize any differences in picking the first arrival of the *P*-wave, as this could be the origin of the systematic difference.
- Problems continue with the core orientation tools, and the LWG was informed that a project is being initiated to develop a gyroscopic orientation tool to replace the magnetic orientation tools, which may perform poorly because of the large magnetic fields associated with the drill string.
- A set of standard J-cube samples will be sent to the ship by scientist Lisa Tauxe to provide known materials to measure and ensure the superconducting rock magnetometer (SRM) and spinner magnetometer are functioning properly.
- The LWG discussed the need to save red-green-blue color space (RGB) data at a higher resolution. The imaging logger software and LORE reports will be modified to save such datasets as auxiliary files.
- Downhole logging magnetic susceptibility sonde (MSS) data was mislabeled (as conductivity and vice-versa) in a number of data sets; EPM Trevor Williams will investigate how far back this goes and ask Lamont-Doherty Earth Observatory (LDEO) to correct the labeling on affected data sets. Schlumberger and LDEO will be asked to ensure this won't occur in the future. Williams will also further investigate quality issues with the susceptibility data being acquired.
- The LWG discussed the 3.5 kHz PDR surveys made over three of the Expedition 382 sites, with the ship slowing to ~5 kt and passing over the site locations. These results recorded good reflections down to a depth of 70 meters below seafloor (mbsf) and were scientifically useful during the expedition.

7. Development, IT, and databases

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

Expedition data

LIMS database

Data from Expedition 382 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. Data from Expeditions 369, 372, and 375 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

Rank	Janus database		LIMS database	
	Country	Visitor sessions	Country	Visitor sessions
1	USA	755	USA	1,217
2	China	334	China	462
3	Germany	268	UK	307
4	Australia	196	Germany	174
5	UK	181	Japan	151
6	France	179	Russia	135
7	Unknown	94	Unknown	107
8	Netherlands	91	France	94
9	Japan	57	Brazil	80
10	Malaysia	54	Australia	75
	Others	366	Others	294
	Total	2,575	Total	3,096

Table 7.2. Top 20 database web queries

Rank	Janus database		LIMS database	
	Query	Views	Query	Views
1	Imaging—core photos	1,353	Imaging—core photos	17,797
2	Core summaries	884	Samples	1,159
3	Site summaries	726	Imaging—LSIMG	649
4	Samples	685	Physical properties—MS	598
5	Hole summaries	397	Physical Properties—GRA	403
6	Physical properties—MSL	332	Hole summaries	396
7	Physical Properties—GRA	295	Section summaries	392
8	Hole trivia	211	Core summaries	357
9	Imaging—core close-up photos	192	Chemistry—carbonates	253
10	Imaging—prime data images	177	Chemistry—IW	221
11	Special holes	177	Physical properties—NGR	205
12	Paleontology—age models	162	Physical properties—RSC	198
13	Chemistry—IW	157	Physical properties—MAD	181
14	Physical properties—color	154	Physical properties—MS point	169
15	Chemistry—carbonates	153	Imaging—TS image	149
16	Paleontology—age profiles	148	XRF summary	147
17	Physical properties—MAD	147	Imaging—core close-up photos	140
18	Chemistry—rock eval	103	Magnetics—SRM section	108
19	Leg summaries	102	XRD	100
20	Site details	100	Physical Properties—PWC	90
	Others	1,609	Others	2,112
	Total	8,264	Total	25,824

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total	Country	Total
U/W	3	USA	12
DSDP	2	UK	3
Samples	2	Colombia	1
Splices	2	Norway	1
XRD	2		
Ages	1		
How to	1		
Mag Sus	1		

Requests	Total	Country	Total
Paleo	1		
Splice	1		
SRM	1		
Total	17	Total	17

8. Core curation

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

Sample and curation strategies

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

Sample requests and core sampling

The following table provides a summary of the 3,940 samples taken at the GCR during the quarter. Sample requests that show zero samples taken may represent cores that were viewed by visitors during the quarter, used for educational purposes, or requested for X-ray fluorescence (XRF) analysis. For public relations or educational visits/tours, the purpose of the visit is shown in brackets in the “Sample request number, name, country” column and “No samples” is recorded in the “Number of samples taken” column if no new samples were taken.

Table 8.1. GCR sample requests

Sample request number, name, country	Number of samples taken	Number of visitors
69105IODP, Garroni, Canada	46	
69232IODP, Jovane, Brazil	409	
69312IODP, Hoefig, USA {XRF}	0	1
69333IODP, Chenot, France	1	
69668IODP, Yanchilina, Israel	44	
70008IODP, Klein, USA	3	
69674IODP, Moore, USA	50	
70121IODP, Mclachlan, Canada	20	
70167IODP, Braaten, Norway	161	
70388IODP, Lowery, USA	83	
70417IODP, McCartney, Poland	64	
70464IODP, Calves, France {XRF}	No samples	1
70489IODP, Bova, USA	30	
70541IODP, Stoll, Switzerland	10	
70436IODP, Frijia, Italy	93	
70481IODP, Modestou, Norway	24	
70711IODP, Virgil, Israel	20	
70721IODP, Cappelli, Italy	340	
70850IODP, Prunella, USA	394	
70849IODP, Strojje, USA	21	
70845IODP, Bhattacharya, USA	48	
71293IODP, McCartney, Poland	28	
71215IODP, Notaro, Italy	29	

Sample request number, name, country	Number of samples taken	Number of visitors
71266IODP, Riess, USA {education}	No samples	
71350IODP, Head, Canada	137	
71356IODP, Browne, USA	53	
71398IODP, Hou, Netherlands	189	1
71591IODP, Bralower, USA	7	
71687IODP, Kumar, USA	188	
71716IODP, Algeo, USA	101	
70845IODP, Bhattacharya, USA	48	
71672IODP, Novak, USA	32	
71849IODP, Stolper, USA	47	
71114IODP, Li, Canada	34	
71305IODP, Hironao, Japan	76	
71929IODP, Trubovitz, USA	13	
71896IODP, Chen, China	176	
71785IODP, Herrle, Germany	4	
72095IODP, Wang, USA	53	
71803IODP, Tibbett, USA	74	
72111IODP, Strojic, USA	6	
72129IODP, Coolen, Australia	9	
72218IODP, Jones, USA	1	
72201IODP, Zurli, Italy	0	2
72267IODP, Tejada, Japan	21	
72284IODP, Seidenstein, USA	21	2
72295IODP, Gillis, Canada	11	
72265IODP, Desai, USA	16	1
72358IODP, Thole, Netherlands	38	
72375IODP, Hoem, Netherlands	14	
72208IODP, Peck, UK	32	
72606IODP, Duke, New Zealand	68	
72245IODP, Randle, USA	260	3
72760IODP, Salvatelli, Germany	144	
66397IODP, Herbert, USA	63	
72786IODP, Herbert, USA	83	
72662IODP, Kasbohm, USA	3	
Totals	3,940	11

Use of core collection and education and outreach support

The JRSO promotes outreach use of the GCR core collection by conducting tours of the repository and providing materials for display at meetings and museums. The repository and core collection are also used for classroom exercises. Several TAMU geology and oceanography classes toured the GCR this quarter. The GCR also hosted Dr. Sean Gulick's group from The University of Texas at Austin to view Expedition 364 core material. The University of Svalbard in Norway, which is in the process of building a core repository, sent representatives to the GCR for a tour.

Table 8.2. GCR tours/visitors

Type of tour or visitor	Number of visitors
Scientist visitors	11
Educational tours/demonstrations (4)	83
Public relations tours (1)	2
Totals	96

Onshore XRF scanning

During this quarter, 310 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	368X, Science Party, USA	37	0	37	0
Education	Antarctic Workshop, Kulhanek, USA	35	0	8	35
Personal	113, O'Connell, USA	238	0	0	0
Totals		310	0	37	35

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

9. Publication services

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

Scientific publications

Table 9.1. Newly published content on the IODP Publications website

Reports and publications	JRSO	USIO	CDEX	ESO*
<i>Preliminary Report</i>	10.14379/iodp.pr.376.2019 10.14379/iodp.pr.379.2019			
Expedition Reports	10.14379/iodp.proc.372A.2019 10.14379/iodp.proc.372A.101.2019 10.14379/iodp.proc.372A.102.2019 10.14379/iodp.proc.372A.103.2019 10.14379/iodp.proc.372Asupp.2019 10.14379/iodp.proc.372B375.2019 10.14379/iodp.proc.372B375.101.2019 10.14379/iodp.proc.372B375.102.2019 10.14379/iodp.proc.372B375.103.2019 10.14379/iodp.proc.372B375.104.2019 10.14379/iodp.proc.372B375.105.2019 10.14379/iodp.proc.372B375.106.2019 10.14379/iodp.proc.372B375supp.2019			

Reports and publications	JRSO	USIO	CDEX	ESO*
	10.14379/iodp.proc.369.2019 10.14379/iodp.proc.369.101.2019 10.14379/iodp.proc.369.102.2019 10.14379/iodp.proc.369.103.2019 10.14379/iodp.proc.369.104.2019 10.14379/iodp.proc.369.105.2019 10.14379/iodp.proc.369.106.2019 10.14379/iodp.proc.369.107.2019 10.14379/iodp.proc.369supp2019			
Data Reports	10.14379/iodp.proc.366.202.2019	10.2204/iodp.proc.346.205.2019		

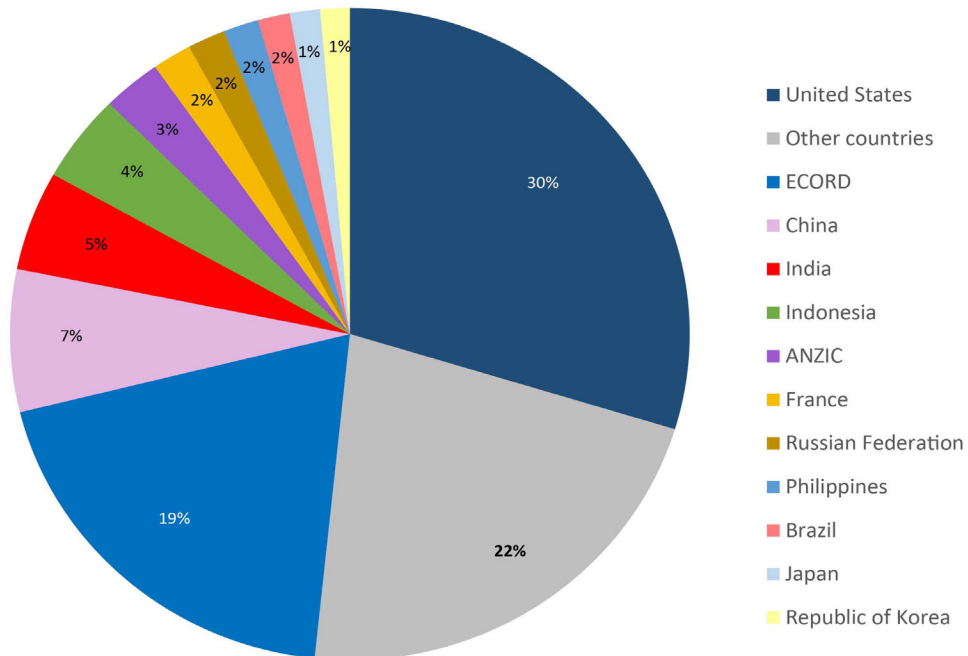
*ESO publications are produced under contract with the British Geological Survey.

Web services

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

During the last quarter, the IODP TAMU website received 362,665 page views and 48,819 site visits and the IODP Publications website received 253,137 page views and 25,450 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 225 countries.

Figure 9.1. 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 the legacy websites that highlight the scientific and technical accomplishments of these ground-breaking precursors to the Integrated Ocean Drilling Program and IODP. The legacy websites contain downloadable documents that cover a wide spectrum of Program information, from laboratory and instrument manuals to Program scientific publications, journals, and educational materials.

Table 9.2. Legacy website statistics

Legacy website	FY19 Q3 page views*	FY19 Q3 site visits*
www-odp.tamu.edu	212,881	25,109
www.odplegacy.org	3,752	1,739
www.deepseadrilling.org	29,452	8,105
Total	246,085	34,953

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

Publications coordination

Data reports related to Expeditions 314/315/316, 339, 341, 344, 346, 354, 362, 366, 369, and 372B/375 were received, sent to peer review, accepted, and/or published this quarter.

Discovery and accessibility

Digital object identifiers

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

Table 9.3. Number of online DOI resolutions

Reports and publications	DOI prefix	April 2019	May 2019	June 2019	FY19 Q3 total
IODP	10.14379	5,469	6,074	5,355	16,898
Integrated Ocean Drilling Program	10.2204	6,848	6,803	8,513	22,164
ODP/DSDP	10.2973	25,511	23,148	28,893	77,552

Science Open

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. IODP deposited data reports from Volumes 313, 355, 362, and 381 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
FY19 Q1	55	238	135	1,592	
FY19 Q2	8	822	136	1,605	
FY19 Q3	18	1,018	155	1,673	
Total to date	694	7,668	—	—	8,134

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
FY19 Q1	74	2,103	16,234	8,563	
FY19 Q2	196	1,247	18,860	8,961	
FY19 Q3	72	1,835	20,342	9,112	
Total to date	3,043	10,775	—	—	38,787

Altmetric.com

The JRSO contributes publications metadata to TAMU’s Symplectic Elements database, which feeds data to <http://altmetric.com>, a platform that enables monitoring of the online activity surrounding academic research. This quarter the JRSO uploaded DOIs of Integrated Ocean Drilling Program and IODP *Proceedings* volumes and data reports for Expeditions 301–348, 367-368, and 380.

Legacy activities

Closeout

Integrated Ocean Drilling Program publications closeout activities continued during the reporting period. Expedition reports and postexpedition research publications published during the quarter in the *Proceedings of the Integrated Ocean Drilling Program* are listed above in “Scientific publications.” In addition, publication obligation papers and data reports related to Expeditions 301–303/306, 308, 310, 314/315/316–318, 320/321, 323, 324, 327–331, 336–339, 343/343T, 344, and 346–348 were submitted to English language peer-reviewed journals or the Program.

Publications archiving

The main IODP publications website (<http://publications.iodp.org/index.html>), which includes full content from all Integrated Ocean Drilling Program and IODP volumes, 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 10,956 new documents (5 GB) for this quarter. In addition, the archive houses legacy publications sites for DSDP and ODP, for a grand total of 189.3 GB of data and 6,366,823 documents. The archive can be viewed at <https://archive-it.org/collections/9148>.

Citation management

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

Table 9.7. Scientific Ocean Drilling Bibliographic Database statistics

Program-related publications	April 2019	May 2019	June 2019	FY19 Q3 total
Searches	298	538	242	1,078
Citation views	694	826	540	2,060

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

Abstracts authored by JRSO staff

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

AAPG Annual Convention and Exhibition 2019

- Romans, B.W., De Santis, L., McKay, R., **Kulhanek, D.**, and Exp 374 Scientists, 2019. Understanding ice-sheet vulnerability using an integrated subsurface sedimentary geoscience approach: Preliminary results from Neogene and Quaternary records acquired during IODP Expedition 374 to the Ross Sea, Antarctica (presented at the AAPG Annual Convention and Exhibition 2019, San Antonio, Texas [USA], 19–22 May 2019).

Dutch Earth Sciences Congress 2019

- Sangiorgi, F., Wubben, E., Browne, I., Shevenell, A., Hoem, F., Bijl, P.K., McKay, R.M., De Santis, L., **Kulhanek, D.K.**, and the Expedition 374 Scientists, 2019. Ocean properties and Antarctic cryosphere dynamics during the Miocene Climatic Optimum: results from the IODP Expedition 374 (Ross Sea) in a circum-Antarctic context (presented at the Dutch Earth Sciences Congress 2019, Utrecht, The Netherlands, 14–15 March 2019).
- Wubben, E., Sangiorgi, F., Hoem, F.S., Bijl, P., McKay, R.M., De Santis, L., **Kulhanek, D.K.**, and the Expedition 374 Scientists, 2019. A palynological study of the upper ocean conditions during the Miocene Climatic Optimum in the Ross Sea (Antarctica): results from the IODP Expedition 374 Site U1521 record (presented at the Dutch Earth Sciences Congress 2019, Utrecht, The Netherlands, 14–15 March 2019).

European Geophysical Union (EGU) General Assembly 2019

- Couvin, B., Georgiopoulou, A., Mountjoy, J., Crutchley, G., and IODP Expeditions 372 and 375 Participants (including **K. Petronotis** and **L. LeVay**), 2019. Investigating the morphology of large landslide deposits on the Hikurangi margin, offshore New Zealand. *Geophysical Research Abstracts*, 21:EGU2019-5610. <https://meetingorganizer.copernicus.org/EGU2019/EGU2019-5610.pdf>
- Eijsink, A., Ikari, M., Wallace, L., Saffer, D., Barnes, P., Pecher, I., **Petronotis, K.**, **LeVay, L.**, IODP Expedition 375 Scientists, and IODP Expedition 372 Scientists, 2019. Frictional behavior of sediment inputs to the Hikurangi subduction margin (New Zealand) at plate-rate and slow slip velocities. *Geophysical Research Abstracts*, 21:EGU2019-1084. <https://meetingorganizer.copernicus.org/EGU2019/EGU2019-1084.pdf>
- Gales, J., Rebesco, M., De Santis, L., Zgur, F., Bergamasco, A., Kim, S., Olivo, E., et al. (including **D. Kulhanek**), 2019. Role of cold, dense water in the development of submarine canyon morphology. *Geophysical Research Letters*, 21:EGU2019-523. <https://meetingorganizer.copernicus.org/EGU2019/EGU2019-523.pdf>

- Zurli, L., Perotti, M., Talarico, F.M., McKay, R., De Santis, L., **Kulhanek, D.**, and the IODP Expedition 374 Scientists, 2019. Petrography and provenance study of gravel size clasts from Miocene glacio-marine sequences in the IODP_exp374 Ross Sea drillcores (Antarctica): preliminary study. *Geophysical Research Letters*, 21:EGU2019-13864. <https://meetingorganizer.copernicus.org/EGU2019/EGU2019-13864.pdf>

Geochemistry Group Research in Progress Meeting 2019

- Marschalek, J., van de Flierdt, T., Carter, A., Vermeesch, P., Siegert, M., Licht, K., McKay, R.M., De Santis, L., **Kulhanek, D.**, and the Expedition 374 Scientists, 2019. A multi-proxy sediment provenance record of Antarctic ice sheet change in the early to middle Miocene: Preliminary results from IODP Site U1521 (Ross Sea) (presented at the Geochemistry Group Research in Progress Meeting 2019, Portsmouth, United Kingdom, 15–17 April 2019).

Geological Society of America (GSA) 53rd South-Central/53rd North-Central/71st Rocky Mountain Section Meeting (held during FY19 Q2)

- Chapman, J., **Kulhanek, D.K.**, Aiello, I., Rosenthal, Y., and Holbourn, A., 2019. Elucidating changes in carbonate production and burial during the Plio–Pleistocene in the western equatorial Pacific (IODP Site U1490) using geochemistry and sedimentology. *Geological Society of America Abstracts with Programs*, 52(2):6-36. <https://doi.org/10.1130/abs/2019SC-326828>
- McLaughlin, J.R., **Kulhanek, D.K.**, Patterson, M.O., McKay, R.M., De Santis, L., and the IODP Expedition 374 Scientists, 2019. A sedimentological and geochemical approach to elucidating Antarctic ice sheet extent in the late Miocene to Pliocene: Initial results from IODP Site U1522 on the Ross Sea continental shelf. *Geological Society of America Abstracts with Programs*, 52(2):6-37. <https://doi.org/10.1130/abs/2019SC-326834>
- Martinez, D., **Kulhanek, D.K.**, Ravelo, A.C., Aiello, I., Gibson, K., Rosenthal, Y., and Holbourn, A., 2019. Variations in carbonate production, dissolution, and burial in the Miocene of the western equatorial Pacific (IODP Site U1489): an integrated geochemical and sedimentological approach. *Geological Society of America Abstracts with Programs*, 52(2):6-38. <https://doi.org/10.1130/abs/2019SC-326837>

Japan Geoscience Union Meeting 2019

- Ishino, S., Suto, I., McKay, R.M., De Santis, L., **Kulhanek, D.K.**, and the IODP Expedition 374 Scientists, 2019. Changes in composition of fossil diatoms from Ross Sea under gradual warming climate from MIS M2 (presented at the Japan Geoscience Union Meeting 2019, Chiba, Japan, 26–30 May 2019).

Magnetic Interactions 2019 (held during FY19 Q2)

- Van Peer, T.E., Sugisaki, S., Xuan, C., Bohaty, S.M., Wilson, P.A., McKay, R.M., De Santis, L., **Kulhanek, D.K.**, and the Expedition 374 Scientists, 2019. West Antarctic glacial-interglacial variability reconstructed from magnetic characteristics (presented at Magnetic Interactions 2019, Liverpool, United Kingdom, 3–4 January 2019).

Northeast Geobiology Symposium (held during FY19 Q2)

- Seidenstein, J.L., Leckie, R.M., McKay, R.M., De Santis, L., **Kulhanek, D.**, and the IODP Expedition 374 Scientists, 2019. Quaternary paleoceanography of the Ross Sea, Antarctica based on benthic and planktonic foraminifera (presented at the Northeast Geobiology Symposium, Amherst, Massachusetts (USA), 29–30 March 2019).

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>).

- Boulton, C., Niemeijer, A.R., Hollis, C.J., Townend, J., Raven, M.D., **Kulhanek, D.K.**, and Shepherd, C.L., 2019. Temperature-dependent frictional properties of heterogeneous Hikurangi Subduction Zone input sediments, ODP Site 1124. *Tectonophysics*, 757:123–139. <https://doi.org/10.1016/j.tecto.2019.02.006n> (published in FY19 Q2)
- Dailey, S.K., Clift, P.D., **Kulhanek, D.K.**, Blusztajn, J., Routledge, C.M., Calvès, G., O’Sullivan, P., et al., 2019. Large-scale mass wasting on the Miocene continental margin of western India. *GSA Bulletin*, <https://doi.org/10.1130/B35158.1>
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