International Ocean Discovery Program

JOIDES Resolution Science Operator

FY22 Q4 Operations and Management Report

1 July–30 September 2022

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Submitted by the JRSO

to

The National Science Foundation

and

The *JOIDES Resolution* Facility Board

27 October 2022

JOIDES Resolution Science Operator

IODP INTERNATIONAL OCEAN DISCOVERY PROGRAM

NSF

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) FY22 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 this quarter);
- Clearance, permitting, and environmental assessment activities;
- Expedition operations (including a site map for each expedition under way during this quarter, a coring summary table for each expedition completed during the quarter, and preliminary science results for each expedition completed during this quarter); and
- Postexpedition activities (including postcruise editorial meetings).

Table 2.1. JRSO expedition schedule

Expedition		Port (origin)[1]	Dates[2]	Total days (port/sea)	Days at sea (transit[3]/ ops)	Co-Chief Scientists	Expedition Project Manager/ Contact
South Atlantic Transect 2	393	Cape Town, South Africa	7 June–7 August 2022	61 (5/56)	56 (17/39)	D. Teagle J. Reece	T. Williams
Non-IODP (Tie up and maintenance) (7 August–10 September 2022) (34 days)							
Transit and Return to Walvis Ridge Hotspot	397T	Cape Town, South Africa	10 September-11 October 2022	31 (2/29)	29 (22/7)	W. Sager K. Hoernle	P. Blum
Iberian Margin Paleoclimate	397	Lisbon, Portugal	11 October–11 December 2022	61 (5/56)	56 (4/52)	D. Hodell F. Abrantes	C. Alvarez Zarikian
Hellenic Arc Volcanic Field	398	Tarragona, Spain	11 December 2022–10 February 2023	61 (5/56)	56 (6/50)	T. Druitt S. Kutterolf	L. LeVay
Non-IODP (Transit and maintenance) (10 February–12 April 2023; Heraklion, Greece to Ponta Delgada, Portugal) (61 days)							

Expedition		Port (origin)[1]	Dates[2]	Total days (port/sea)	Days at sea (transit[3]/ ops)	Co-Chief Scientists	Expedition Project Manager/ Contact
Building Blocks of Life, Atlantis Massif	399	Ponta Delgada, Portugal	12 April–12 June 2023	61 (5/56)	56 (8/48)	A. McCaig S. Lang	P. Blum
Reykjanes Mantle Convection and Climate	395	Ponta Delgada, Portugal	12 June–12 August 2023	61 (5/56)	56 (11/45)	R. Parnell-Turner A. Briais	L. LeVay
NW Greenland Glaciated Margin	400	St. John's, Canada	12 August–12 October 2023	61 (5/56)	56 (13/43)	P. Knutz A. Jennings	L. Childress

Notes: NA = not applicable.
[1]Ports subject to change, pending issues related to the COVID-19 pandemic.
[2]The start date reflects the initial port call day. The vessel will sail when ready.
[3]Preliminary total estimated transit (i.e., to and from operational area and between sites).

Expedition 392: Agulhas Plateau Cretaceous Climate

Postexpedition activities

Activities included X-ray fluorescence (XRF) scanning of cores at the Gulf Coast Core Repository (GCR), as well as the postcruise editorial meeting and shore-based sampling at the GCR in August.

Expeditions 390 and 393: South Atlantic Transect 1 and 2

Planning

Final air freight shipments for Expedition 393 were dispatched to Cape Town, South Africa. A spare drawworks brake was air freighted from Houston, Texas, and repairs were made at the end of Expedition 390. The science party and crew boarded the vessel on 9 June after a 7-day hotel quarantine.

Staffing

Table 2.2. Expedition 393 science party staffing breakdown

Member country/consortium	Participants	Co-Chief Scientists
USA: United States Science Support Program (USSSP)	13	1
Japan: Japan Drilling Earth Science Consortium (J-DESC)	2	
Europe and Canada: European Consortium for Ocean Research Drilling (ECORD) Science Support and Advisory Committee (ESSAC)	9	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)	0	
India: Ministry of Earth Science (MoES)	1	

Note: Two US scientists were not able to sail as a result of COVID-19 travel problems; 1 US scientist who had been unable to sail on Expedition 390 sailed on Expedition 393 instead. Both Chinese participants were unable to obtain visas and did not sail.

Figure 2.1. Expedition 393 site map

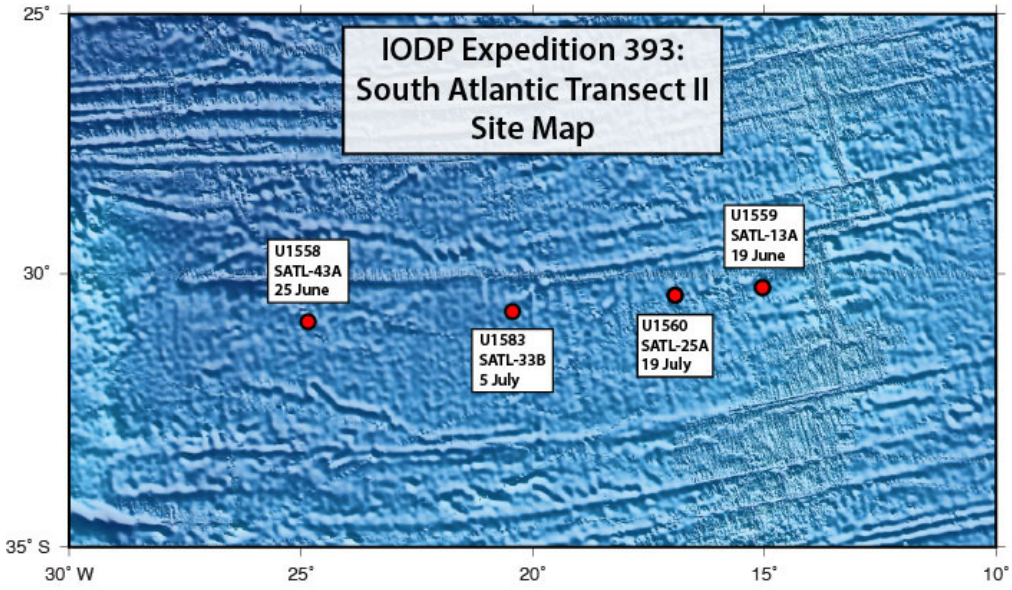


Table 2.3. Expedition 393 coring summary.

Site	Hole	Latitude	Longitude	Water depth (mbsl)	Cores (*N*)	Total penetration (DSF)	Interval cored (m)	Core recovered (m)	Recovery (%)
U1558	U1558D	30°53.7814’S	24°50.4822’W	4334.4	38	220.2	220.2	100.80	46
	U1558E	30°53.7922’S	24°50.4822’W	4336.8	1	9.5	9.5	9.97	105
	U1558F	30°53.7923’S	24°50.4757’W	4337.3	23	177.2	174.2	164.33	94
Site U1558 totals					**62**	**406.9**	**403.9**	**275.1**	**68**
U1559	U1559B	30°15.6336’S	15°2.0941’W	3055.0	12	49.0	49.0	12.82	26
Site U1559 totals					**12**	**49.0**	**49.0**	**12.82**	**26**
U1560	U1560B	30° 24.2057’S	16° 55.3702’W	3723.2	40	192.2	192.2	74.79	39
	U1560C	30° 24.2005’S	16° 55.3703’W	3724.4	17	129.3	127.3	122.75	96
Site U1560 totals					**57**	**321.5**	**319.5**	**197.54**	**62**
U1583	U1583A	30°42.6060’S	20°26.0340’W	4214.6	1	9.1	9.1	9.14	100
	U1583B	30°42.6062’S	20°26.0341’W	4214.6	1	9.4	9.4	9.38	100
	U1583C	30°42.6011’S	20°26.0343’W	4214.6	13	107.5	107.5	110.19	103
	U1583D	30°42.6288’S	20°26.0340’W	4210.0	1	9.5	9.5	10.04	106
	U1583E	30°42.6285’S	20°26.0340’W	4210.0	12	105.2	105.2	105.15	100
	U1583F	30°42.6175’S	20°26.0336’W	4210.1	28	239.5	138.5	45.79	33
Site U1583 totals					**56**	**480.2**	**379.2**	**289.69**	**76**
Expedition 393 totals					**187**	**1257.6**	**1151.6**	**775.15**	**67**

Science summary

The South Atlantic Transect (SAT) is a multidisciplinary scientific ocean drilling experiment designed to investigate the evolution of the oceanic crust and overlying sediments across the western flank of the Mid-Atlantic Ridge. This project comprises four International Ocean Discovery Program expeditions:

fully staffed Expeditions 390 and 393 (April–August 2022) built on engineering preparations during Expeditions 390C and 395E that took place without science parties during the height of the COVID-19 pandemic. Through operations along a crustal flow line at ~31°S, the SAT recovered complete sedimentary sections and the upper ~40–340 m of the underlying ocean crust formed at a slow to intermediate spreading rate at the Mid-Atlantic Ridge over the past ~61 My. The sediments along this transect were originally spot cored more than 50 years ago during Deep Sea Drilling Project (DSDP) Leg 3 (December 1968–January 1969) to help verify the theories of seafloor spreading and plate tectonics.

The SAT expeditions targeted six primary sites on 7, 15, 31, 49, and 61 Ma ocean crust that fill critical gaps in our sampling of intact in situ ocean crust with regards to crustal age, spreading rate, and sediment thickness. Drilling these sites was required to investigate the history, duration, and intensity of the low-temperature hydrothermal interactions between the aging ocean crust and the evolving South Atlantic Ocean. This knowledge will improve the quantification of past hydrothermal contributions to global biogeochemical cycles and help develop a predictive understanding of the impacts of variable hydrothermal processes and exchanges. Samples from the transect of the previously unexplored sediment- and basalt-hosted deep biosphere beneath the South Atlantic Gyre are essential to refine global biomass estimates and examine microbial ecosystems' responses to variable conditions in a low-energy gyre and aging ocean crust.

The transect is located near World Ocean Circulation Experiment Line A10, which provides records of carbonate chemistry and deepwater mass properties across the western South Atlantic through key Cenozoic intervals of elevated atmospheric CO_2 and rapid climate change. Reconstruction of the history of the deep western boundary current and deepwater formation in the Atlantic basins will yield crucial data to test hypotheses regarding the role of evolving thermohaline circulation patterns in climate change and the effects of tectonic gateways and climate on ocean acidification.

During engineering Expeditions 390C and 395E, a single hole was cored through the sediment cover and into the uppermost rocks of the ocean crust with the advanced piston corer (APC) and extended core barrel (XCB) systems at five of the six primary proposed SAT sites. Reentry systems with casing were then installed either into basement or within 10 m of basement at each of those five sites. Expedition 390 (7 April–7 June 2022) conducted operations at three of the SAT sites, recovering 700 m of core (77%) over 30.3 days of on-site operations. Sediment coring, basement coring, and wireline logging were conducted at two sites on 61 Ma crust (Sites U1556 and U1557), and sediment coring was completed at the 7 Ma Site U1559.

Expedition 393 operated at four sites, drilling in 12 holes to complete this initial phase of the SAT. Complete sedimentary sections were collected at Sites U1558, U1583, and U1560 on 49, 31, and 15 Ma crust, respectively, and together with 257.7 m of sediments cored during earlier operations, more than 600 m of sediments was characterized. The uppermost ocean crust was drilled at Sites U1558, U1560, and U1583 with good penetration (~130 to ~204 meters subbasement), but at the youngest ~7 Ma Site U1559, only ~43 m of basement penetration was achieved in this initial attempt. Geophysical wireline logs were achieved at Sites U1583 and U1560 only. Expeditions 390 and 393 established legacy sites available for future deepening and downhole basement hydrothermal and microbiological experiments at Sites U1557, U1560, and U1559 on 61, 15, and 7 Ma crust, respectively.

Postexpedition activities

Large shipments of refrigerated and frozen personal samples were sent to scientists at the end of both expeditions. About a third of the drill pipe was replaced during the tie-up period following Expedition 393.

Expedition 397T: Transit and Return to Walvis Ridge Hotspot

Planning

The *Scientific Prospectus* was published in July. During the tie-up period preceding the expedition, ~100 laboratory computers were replaced, requiring the testing and recalibration of several laboratory instruments. All medical exams and precruise safety training were completed. The science party and crew boarded the vessel on 10 September after a 4-day hotel quarantine as required by the revised COVID-19 operating protocol.

Staffing

Table 2.4. Expedition 397T science party staffing breakdown

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

Note: The scientists who sailed were chosen from the Expedition 391 science party. The group included one US outreach officer. One of the Namibian observers from Expedition 391 also sailed.

Clearance, permitting, and environmental assessment activities

Once coring operations started at the first Walvis Ridge site, it became evident that the shallower locations chosen to save time were unlikely to result in the recovery of appropriate basaltic material. A new drill-down request was made for one of the alternate sites, and the Environmental Protection and Safety Panel recommended its approval on 26 September.

Expedition 397: Iberian Margin Paleoclimate

Planning

All surface and air freight shipments, medical exams, and precruise safety training were completed during the quarter.

Staffing

Staffing was completed during the quarter.

Clearance, permitting, and environmental assessment activities

An observer (sedimentologist) was invited at the request of Portugal. JRSO was notified on 23 September that the Portuguese Navy requires a timetable of when we plan to occupy two of the four primary sites. This information was forwarded to Portugal on 26 September.

Expedition 398: Hellenic Arc Volcanic Field

Planning

Final laboratory preparations and medical exams are in progress. The surface freight shipment was closed.

Staffing

Staffing was completed during the quarter.

Clearance, permitting, and environmental assessment activities

Greece approved the clearance application on 2 August. As requested by the Greek permit, a notice to use a non-Greek-flagged vessel was sent to the Santorini port authority on 7 September. The Environmental Evaluation was sent to NSF and was approved.

Expedition 399: Building Blocks of Life, Atlantis Massif

Planning

The *Scientific Prospectus* was published in June. Laboratory preparations and research plans are in progress.

Staffing

Staffing was completed during the quarter.

Clearance, permitting, and environmental assessment activities

The Environmental Evaluation was completed and is pending NSF approval.

Expedition 395: Reykjanes Mantle Convection and Climate

Planning

The scientists are finalizing core descriptions from the Expedition 395C shore-based sample party that was held at the GCR in May. Another round of sediment sampling by GCR staff is planned for next quarter. Research plans and laboratory preparations are ongoing.

Staffing

Staffing was completed during the quarter.

Clearance, permitting, and environmental assessment activities

Clearance will be required from Greenland/Denmark for one site. The application will be submitted in the next quarter.

Expedition 400: NW Greenland Glaciated Margin

Planning

The *Scientific Prospectus* was published in September.

Staffing

Staffing is in progress.

Clearance, permitting, and environmental assessment activities

Clearance will be required from Greenland/Denmark for all sites. The application will be submitted in the next quarter. An Environmental Evaluation will be needed.

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 third quarter of FY22 (April–June) was submitted to NSF on 29 July (**http://iodp.tamu.edu/publications/AR/FY22/FY22_Q3.pdf**).

Liaison activities

JRSO reports to and liaises with funding agencies and IODP-related agencies (e.g., *JOIDES Resolution* Facility Board [JRFB], JRFB advisory panels, Program Member Offices [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

Mitch Malone (JRSO Director) attended the US Advisory Committee meeting in New York on 25–27 July and the *Chikyu* IODP Board meeting in Kobe, Japan, on 30 and 31 August. Malone, Leah LeVay (JRSO Supervisor of Science Support), and Lorri Peters (JRSO Manager of Publications [remote]) attended the IODP Forum and PMO meetings at Lamont-Doherty Earth Observatory on 14–16 September. Gary Acton (JRSO Assistant Director and Manager of Technical & Analytical Services) attended the European Consortium for Ocean Research Drilling (ECORD) Facility Board meeting in Aix-en-Provence, France, on 20–21 September.

Project portfolio management

JRSO maintained the Core Orientation project on hold; placed the Google Migration project on hold; and continued work on the GEODESC, X-Ray Linescan Core Imager, New Rig Instrumentation System, Sample and Data Request Replacement, and GCR Core Storage Expansion projects.

GEODESC

Scope and deliverables

The purpose of this 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 core description tool set. The project manager is Peter Blum (JRSO Expedition Project Manager [EPM]).

Status

JRSO applied the last fixes to the Template Manager, Data Capture, and Data Access applications and continued working on catalog content and user documentation. The JRSO leadership team is considering a change request to postpone delivery of the Catalog Manager application until the end of June 2023. JRSO deployed GEODESC on the *JOIDES Resolution*, which will go live on 11 October. The estimated project completion date will likely slide several months in order to complete the Catalog Manager.

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, the 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. Additionally, the 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 (JRSO Research Specialist).

Status

JRSO received the new camera and encountered several technical challenges, including motion control issues, problems with image acquisition, and scaling issues. JRSO assembled the prototype core placement/retrieval tool and continued developing documentation and wiring diagrams. The estimated project completion date remains March 2023.

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 to align the core liner within the core barrel. Specifically, a new gyroscopic orientation tool (GOT) will be developed in house that will be attached directly to the core barrel, avoiding possible problems with misalignment between the sinker bars and core barrel. Because the GOT does not use the magnetic field for orientation, the large magnetic fields associated with the drill string are irrelevant. To improve the alignment of the core liner, JRSO will investigate whether it is possible to modify the advanced piston corer core barrels to allow the core liner to be aligned and attached at both ends. 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 Bill Rhinehart (JRSO Operations Engineer).

Status

This project remains on hold pending completion of the Rig Instrumentation System project. This is a very complex project with many unknowns. The project completion date remains open ended.

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. The project manager is John Van Hyfte (JRSO Supervisor of Engineering and Logistics Support).

Status

All but one sensor is sending data and being captured by the data acquisition portion of the Integrated Rig Instrumentation System (iRIS). The user interface and driller's interface are both active, acquiring data, and writing to the Data Collection subsystem. The new radar unit was installed and is being tested with encouraging results. JRSO is drafting user and developer manuals and the quick start guide. The estimated project completion date was changed to April 2023.

Sample and Data Request Replacement

Scope and deliverables

The scope of this project is to design and implement a replacement program for the current IODP sample and data request replacement (SaDR) application. This project will be used for pre-expedition research planning, along with all postexpedition sample requests, including XRF scanning and education and outreach requests. All existing SaDR functions will be carried over to the replacement program. Some additional functions will be added to overcome shortcomings of SaDR. Work on this project will be conducted in four main phases: creating new requests, administrative functions, integration with the Sample Planning Tool (SPLAT), and data migration from SaDR to the replacement.

Status

JRSO completed significant work and testing to tweak filters that best meet user needs. The ability to export multiple requests summarized in a single excel spreadsheet is also complete. Remaining major tasks include implementing account validation/vetting, transferring old SaDR attachments, completing updated SPLAT login, and fixing bugs. The estimated project completion date remains October 2022.

GCR Core Storage Expansion

Scope and deliverables

The scope of this project is to plan expansion of the core storage facilities within the GCR. This planning will consider how to provide the best long-term storage and preservation of core material while maximizing available space within the GCR at a reasonable budget.

Status

Progress remained slow this quarter as a result of resource commitments for other projects and the need for additional information about how many future expeditions will be scheduled. JRSO met with a representative from the office of the TAMU Vice President for Research to discuss repository space needs and the extension plan. The estimated project completion date remains December 2022.

Google Migration

Scope and deliverables

The scope of this project is to migrate all Google applications including Drive, Sites, Calendar files, and objects from the Google scientific-ocean-drilling.org domain to the Google TAMU.edu domain. Included in this migration is the transfer of responsibility for Google audit and compliance to TAMU's Division of IT.

Status

This project was placed on hold pending availability of TAMU IT engineering resources.

4. Subcontract activities

JRSO continued to interact with ODL AS to ensure efficient and compliant operations of *JOIDES Resolution*. JRSO management meets with ODL AS frequently to discuss evolving travel/shipping restrictions as the pandemic progresses.

JRSO continued to interact with Schlumberger to ensure that wireline logging operations aboard *JOIDES Resolution* continue in an efficient and compliant manner. JRSO and Schlumberger worked successfully to streamline travel, shipping, and maintenance activities. During the tie-up period following Expedition 393, Schlumberger and Siem personnel replaced the wireline winch and the active heave compensator (AHC) unit and its power supply. A plan was created to test the AHC during the following expedition. A new high-temperature wireline cable was received in late September and will be shipped to the vessel in the next quarter.

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 Expedition operations); 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

Onboard Outreach Officers sailed during Expeditions 393 and 397T, and support was provided for social media postings, videoconferences, and other activities. A training session for the US Science Support Program Onboard Outreach Officers took place 24–26 August 2022 in College Station, Texas, for Expeditions 397T, 397, 398, 399, 395, and 400. An exhibit for Expedition 398 is being planned for mid-October in Santorini, Greece. There are also requests for VIPs and TV crews to board the vessel when we are operating at the two Santorini caldera sites; the success of these activities will depend on weather and the COVID situation.

Other projects and activities

Leah LeVay (JRSO Supervisor of Science Support) continued to work on an NSF EarthCube grant to integrate IODP data with the paleobiology database (eIODP), supervised several student workers for this effort, and attended the June EarthCube meeting at Scripps (University of California San Diego). Laurel Childress (JRSO EPM) supported the Pop-Up/Drill-Down Exhibit as a Co-Principal Investigator on that NSF grant. Emily Estes (JRSO EPM) led the JRSO Diversity, Equity, and Inclusion Working Group, which aims to improve inclusion and diversity at TAMU and on the *JOIDES Resolution*. Finally, the EPM group supervised research projects for several undergraduate and graduate students.

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

Superconducting rock magnetometer

The superconducting rock magnetometer (SRM) has been experiencing a higher background signal on two of the superconducting quantum interference detectors (SQUIDs), specifically the *X*- and *Z*-axes. A representative from Applied Physics came to the ship during the Expedition 397P tie-up, and the SRM was disassembled to gain access to the superconducting region. It was determined that the inner circles of shielding had shifted, and part of the *X*- and *Z*-coils were out of the shielded region. The vendor repaired the fault, and the SRM was reassembled and is now functioning at its original noise level.

SPECIM FX10 hyperspectral imaging logger

Experiments with the FX10 camera stopped when the camera suffered a fault and no longer communicated with the computer. The camera was returned to the vendor for a warranty repair, and the vendor was instructed to provide calibrated reflectance data to demonstrate whether the calibration issue mentioned earlier has been resolved.

X-Ray Core Section Imager (XSCAN project)

TAS received the TDI X-ray camera from Hamamatsu. When the lead developer returns from the ship, work will resume to complete this project. An appropriate maintenance period for the shipboard installation will be selected after XSCAN has been thoroughly tested on shore.

Scanning electron microscope–energy dispersive spectrophotometer

The NanoImages scanning electron microscope–energy dispersive spectrophotometer (SEM-EDS) was installed on the ship. Vibration isolation measures have been only partially effective, and the system is more sensitive to the ship's motion and vibration than the older SEM. Work will continue to improve the motion isolation and improve the performance. The Hitachi TM-3000 instrument has been retained on board in case it becomes necessary to revert to that instrument; however, this is not a viable long-term solution because the TM-3000 is no longer supported by the manufacturer.

Handheld/portable X-ray fluorescence spectrometer

Although the Brüker AXS Tracer-5g handheld/portable X-ray fluorescence spectrometer (pXRF) was used successfully during Expedition 393, the instrument suffered a failure postexpedition and had to be returned to the company, where it is currently being repaired.

Laboratory working groups

The laboratory working groups (LWGs) provide oversight, research direction, and quality assurance for the methods, procedures, and analytical systems both on *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 curatorial issues raised in recent cruise evaluations.

Geochemistry and Microbiology

The Geochemistry LWG met this quarter to discuss issues arising from Expeditions 391, 392, and 390 and to hear updates on laboratory equipment recently installed on the ship.

- Expedition 391
    - A scientist complained that the pXRF has no capacity for matrix corrections; this is true of any energy dispersive (ED)-XRF technique unless significant and time-consuming sample preparation steps are taken, so this issue was closed.
    - The science party was unhappy with the time required to switch the inductively-coupled plasma–optical emission spectrophotometer (ICP-OES) over from rock/sediment mode to interstitial

water mode; they suggested providing a tabletop XRF to be used for the rock and sediment samples and keeping the ICP-OES solely in IW mode. The *JOIDES Resolution* previously had both an XRF and an atomic absorption spectrometer, which required additional space and technical support. The community recommendation at the time resulted in the replacement of both with an ICP-OES (ODP Leg 189T) to acquire the same data on board as the previous two instruments. Although it does take some time to change glassware to switch between modes, the LWG feels adding a tabletop XRF unit would be redundant and take additional space and technical time. The issue was closed with a note that it could be considered for the future drilling vessel.

- Expedition 392
    - The science party had concerns about hydrofluoric acid (HF) safety because of the limited, confined spaces on the research vessel; JRSO agrees that the use of HF presents special hazards on the ship, but has also implemented numerous safety procedures to ensure that the risks are minimized. JRSO has collected several non-HF methods for the extraction of palynomorphs and dinoflagellates and presents them to all oncoming Co-Chief Scientists. The LWG will further discuss this issue, along with the possibility of banning the use of HF for future expeditions, after Expedition 400.
    - The source rock analyzer (SRA) had performance issues that were not resolved during the expedition but were resolved subsequently. The use of the SRA was not critical to the mission.
    - One Expedition 392 scientist put forward a request for organic extraction equipment and analytical capabilities for onboard biomarker analysis. With proper preservation, such compounds are stable for postcruise analysis, so this was tabled.
- Expedition 390
    - The science party complained of difficulties with ventilation and temperature control in the radiation isolation van; Siem Offshore was informed of this, and the A/C units and air intake vents were checked with no problems.
- The LWG received an update on the use of the new Brüker AXS Tracer-5g handheld pXRF. The instrument worked exceptionally well, with better sensitivity for many elements than those delivered by its predecessor, the Olympus DELTA Premium. Light elements (Mg, Al, Si) must be handled with care because their performance can vary from day to day, so the user guide will be updated with proper procedures for these elements.
- The new carbon-hydrogen-nitrogen-sulfur analyzer (CHNS) and carbonate coulometers were installed on the ship and are working well.
- The LWG is looking forward to having elemental analysis capabilities for the SEM when the NanoImages SEM-EDS is installed on the ship.
- The LWG also discussed the ever-increasing shortage of He and the possibility of using alternative gases for the mobile phase on the gas chromatographs and the CHNS analyzer. Gases such as Ar (which always contains some O_2) and N_2 are not suitable for performance reasons, which leads to the only non-He possibility, which is H_2. However, the use of H_2 for a carrier gas will require JRSO to develop safety procedures to ensure safe operation. This discussion was tabled for now.

Geology

Although the Geology LWG did not meet this quarter, the membership continues to be heavily engaged in getting the GEODESC program up and running, and there have been many discussions about this. During Expedition 397T, GEODESC went through its final testing prior to planned use during Expedition 397.

Geophysics

The Geophysics LWG did not meet this quarter.

7. Development, IT, and Databases

The Development, IT, and Databases (DITD) department manages data supporting IODP activities, operates and maintains shipboard and shore-based computer and network systems, and monitors and protects 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 IT services.

Expedition data

LIMS database

Data from Expeditions 390 and 393 were added to the Laboratory Information Management System (LIMS) database on shore this quarter. These data are currently under moratorium and available only to the Expedition 390, 390C, 393, and 395E scientists. Data from Expedition 379T (a JR100 project) 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	United States	867	United States	923
2	China	293	United Kingdom	686
3	United Kingdom	135	China	571
4	Germany	90	Germany	291
5	France	37	Japan	86
6	Canada	36	India	59
7	Australia	31	France	58
8	Italy	28	Canada	54
9	Japan	26	New Zealand	49
10	Russian Federation	23	Australia	37
11	Other	230	Other	273
	Total	**1,796**	**Total**	**3,087**

Table 7.2. Top 20 database web queries

Rank	Janus database		LIMS database*	
	Query	Views	Query	Views
1	Site summary	2,889	Samples	1,333
2	Images—core photo	1,381	Section summary	901
3	Sediments—smear slides	692	Images—core photo	722
4	Sample	676	Images—section photo	567
5	Core summary	550	Hole summary	550
6	X-ray—XRD	472	Chemistry—interstitial water	468
7	Chemistry—carbonates	439	Core summary	351
8	Physical properties—AVS	395	Chemistry—carbonates	347
9	Hole summary	360	Physical properties—MAD	326
10	Physical properties—GRA	277	Physical properties—GRA	314
11	Physical properties—MS	260	X-ray—XRF	241
12	Special holes summary	257	Physical properties—MS	211
13	X-ray—XRF	253	Physical properties—NGR	202
14	Paleontology—age model	243	X-ray—XRD	170
15	Physical properties—MAD	243	Physical properties—color reflectance	165
16	Images—closeup	191	Images—closeup	132
17	Images-prime data	183	Physical properties—PWL	131
18	Chemistry-rock eval	177	Chemistry—ICP-AES	129
19	Physical properties—downhole temperature	172	Images—thin section	118
20	Physical properties—color reflectance	160	Paleomag—SRM-section	116
	Other	1,575	Other	2,657
	Total	**11,845**	**Total**	**10,151**

Table 7.3. Data requests to the TAMU Data Librarian

Requests	Total
How to	9
Data not available	2
Forwarded—GCR	1
Forwarded—Pubs	1
Photo	1
Total	**14**

Country	Total
USA	9
United Kingdom	3
Taiwan	1
Unknown	1
Total	**14**

Network systems operation, maintenance, and security

JRSO conducted routine system maintenance in accordance with the TAMU IT security policy and completed the FY22 annual TAMU IT Risk Assessment.

Other projects and activities

JRSO approved Siem Offshore's request to purchase a new, higher resolution closed-circuit camera system for use in monitoring important activities in the external spaces of the ship. Estimated delivery and installation dates are unknown.

8. Core curation

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

Sample and curation strategies

This quarter, JRSO planned sample and curation strategies for Expeditions 393 and 397T. The GCR prepared for and hosted the Expedition 392 sample party on 13–19 August, during which 15,092 samples were collected from sediment and hard rock.

Sample requests and core sampling

The following table provides a summary of the 4,564 samples taken at the GCR during this quarter. Sample requests that show zero samples taken may represent cores that were viewed by visitors during this 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
096028IODP, Liu, Australia	56	0
096039IODP, Gai, China	223	0
096104IODP, Evangelinos, Spain	114	0
096083IODP, Singh, India	139	0
096614IODP, Yi, China	827	0
096642IODP, Zhong, China	250	0
096699IODP, Dove, USA	20	0
096746IODP, Bahr, Germany	182	1
096735IODP, Liu, China	59	0
096763IODP, Bahr, Germany	100	1
096842IODP, Hopkins, New Zealand	70	0
097135IODP, Guillermic, USA	358	0
097086IODP, Hunt, USA	11	0
097178IODP, Kender, China	35	3
096905IODP, Li, China	464	0
097252IODP, Kong, USA	147	0
097376IODP, Davidson, USA	4	0
097443IODP, Nirenberg, USA	145	0
097327IODP, Privat, Australia	36	0
097623IODP, Kim, South Korea	19	3
097648IODP, Bablon, France	52	0
097642IODP, Pirmez, USA	99	0
092101IODP, Guballa, Canada	16	0
097779IODP, Romero, Germany	421	0

Sample request number, name, country	Number of samples taken	Number of visitors
097794IODP, Hunt, USA	11	0
097867IODP, Si, USA	94	0
097906IODP, Haettig, Netherlands	44	0
098046IODP, Cassarino, Sweden	25	0
098054IODP, Woodhouse, USA	8	0
098319IODP, Yao, China	41	0
097645IODP, Wan, USA	40	0
098216IODP, Bhattacharya, USA	0	0
098145IODP, Kasbohm, USA	0	0
096935IODP, Moretti, Germany	62	0
098335IODP, Friedrich, Germany	39	0
098391IODP, Si, USA	131	0
098416IODP, Kaya, Germany	49	0
098633IODP, Dunlea, USA	29	0
098768IODP, Figus, Poland	6	0
098983IODP, Penman, USA	13	0
099029IODP, Dove, USA	123	0
Tours/demonstrations (6)		90
Totals	**4,564**	**95**

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. GCR staff gave tours to 80 middle school students this quarter as part of the TAMU Summer Science Safari Camp. The GCR also hosted a film crew working on a documentary on the K/Pg extinction event and the Chicxulub impact crater. The crew filmed Expedition 364 cores and an interview with Co-Chief Scientist Sean Gulick. A group of visiting congressional staffers also toured the GCR this quarter.

Onshore XRF scanning

During this quarter, 965 core sections and discrete samples were scanned on the XRF instruments at the GCR. Documentation relating to the operation, advanced configurations, maintenance, and troubleshooting of the XRF is available at **https://sites.google.com/scientific-ocean-drilling.org/xrf-iodp/home**. It was observed that the X-ray tubes of the XRF scanners were deteriorating, so an Avaatech technician installed new X-ray tubes in both scanners.

Table 8.2. Core sections scanned

Request type	Expedition, name, country	XRF 1	XRF 2	SHIL	WRMSL*
Programmatic	392, Childress, Westerhold, Jana, Kulhanek, Shannon, USA, Germany	385	360	0	0
Personal	395C, LeVay, USA	0	75	0	0
Programmatic	390/390C, Lowery, Estes, Wee, Reece	0	116	0	0
Totals		**385**	**551**	**0**	

Notes: XRF = X-ray fluorescence, 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 Expedition operations) and editing, production, and graphics services for required Program reports (see Management and administration), technical documentation (see Technical and analytical services), 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 DSDP publications.

Scientific publications

Table 9.1. Newly published content on the IODP Publications website

Reports and publications	JRSO	Other
Scientific Prospectuses	10.14379/iodp.sp.399.2022 10.14379/iodp.sp.397T.2022 10.14379/iodp.sp.400.2022	
Preliminary Reports	10.14379/iodp.pr.392.2022	
Data Reports	10.14379/iodp.proc.378.201.2022 10.14379/iodp.proc.378.202.2022 10.14379/iodp.proc.376.201.2022 10.14379/iodp.proc.359.201.2022 10.14379/iodp.proc.374.202.2022 10.14379/iodp.proc.362.206.2022	

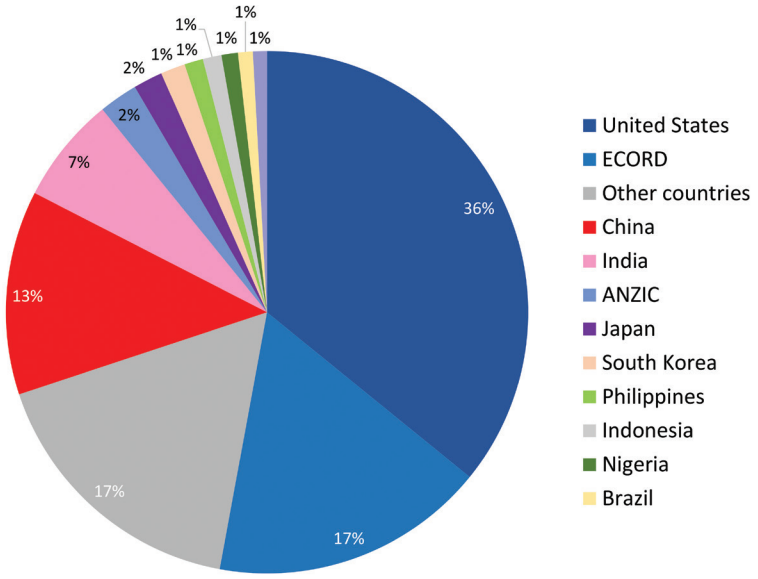
Notes: Other = European Consortium for Ocean Research Drilling Science Operator (ESO), The Institute for Marine-Earth Exploration and Engineering (MarE3), Integrated Ocean Drilling Program US Implementing Organization (USIO), and Oman expedition publications.

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 348,306 page views and 34,696 site visits, and the IODP Publications website received 551,042 page views and 60,517 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 210 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	FY22 Q4 page views*	FY22 Q4 site visits*
www-odp.tamu.edu	348,652	34,777
www.odplegacy.org	4,458	3,361
www.deepseadrilling.org	73,137	11,598
Total	**426,247**	**49,736**

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

Publications coordination

Data reports related to Expeditions 353, 354, 359, 361–363, 367/368, 374, 376, 378, and 385 were submitted, sent to peer review, accepted, and/or published this quarter. In addition, peer-reviewed post-cruise research publications related to 349, 352, 353, 355, 358, 360, 362, 364, 366, 369, 371, 372/375, 376, and 382 that were published this quarter were added to the publications database.

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 this quarter are shown in the tables below.

Table 9.3. Number of online DOI resolutions

Reports and publications	DOI prefix	July 2022	August 2022	September 2022	FY22 Q4 total
IODP	10.14379	11,004	9,424	12,375	32,803
Integrated Ocean Drilling Program	10.2204	9,586	9,068	11,668	30,322
ODP/DSDP	10.2973	16,619	30,528	21,639	68,786

Table 9.4. Top 10 IODP DOIs resolved during FY22 Q4

DOI (10.14379)	Resolutions	Title
10.14379/IODP.PR.396.2022	399	*Preliminary Report*: Expedition 396 Mid-Norwegian Margin Magmatism and Paleoclimate Implications
10.14379/IODP.PROC.378.2022	391	*Proceedings* Volume 378: South Pacific Paleogene Climate
10.14379/IODP.PROC.363.2018	375	*Proceedings* Volume 363: Western Pacific Warm Pool
10.14379/IODP.PROC.385.2021	349	*Proceedings* Volume 385: Guaymas Basin Tectonics and Biosphere
10.14379/IODP.SP.390393.2020	328	*Scientific Prospectus*: Expedition 390/393 South Atlantic Transect
10.14379/IODP.SP.399.2022	244	*Scientific Prospectus*: Expedition 399 Building Blocks of Life, Atlantis Massif
10.14379/IODP.SP.398.2022	237	*Scientific Prospectus*: Expedition 398 Hellenic Arc Volcanic Field
10.14379/IODP.SP.397.2022	215	*Scientific Prospectus*: Expedition 397 Iberian Margin Paleoclimate
10.14379/IODP.PR.363.2017	207	*Preliminary Report*: Expedition 363 Western Pacific Warm Pool
10.14379/IODP.PROC.367368.2018	192	*Proceedings* Volume 367/368: South China Sea Rifted Margin

Table 9.5. Top 10 Program DOIs resolved during FY22 Q4

DOI (10.14379, 10.2204, 10.2973)	Resolutions	Title
10.14379/IODP.PR.396.2022	399	*Preliminary Report*: Expedition 396 Mid-Norwegian Margin Magmatism and Paleoclimate Implications
10.14379/IODP.PROC.378.2022	391	*Proceedings* Volume 378: South Pacific Paleogene Climate
10.14379/IODP.PROC.363.2018	375	*Proceedings* Volume 363: Western Pacific Warm Pool
10.14379/IODP.PROC.385.2021	349	*Proceedings* Volume 385: Guaymas Basin Tectonics and Biosphere
10.14379/IODP.SP.390393.2020	328	*Scientific Prospectus*: Expedition 390/393 South Atlantic Transect
10.2973/ODP.PROC. SR.112.147.1990	289	*Proceedings* Volume 112: 32. Gas Hydrates of the Peruvian Outer Continental Margin
10.2204/IODP.PROC.323.2011	254	*Proceedings* Volume 323: Bering Sea Paleoceanography
10.14379/IODP.SP.399.2022	244	*Scientific Prospectus*: Expedition 399 Building Blocks of Life, Atlantis Massif
10.2204/IODP.PROC.346.2015	238	*Proceedings* Volume 346: Asian Monsoon
10.14379/IODP.SP.398.2022	237	*Scientific Prospectus*: Expedition 398 Hellenic Arc Volcanic Field

ScienceOpen

Integrated Ocean Drilling Program and IODP expedition reports and data reports are indexed at ScienceOpen. JRSO deposited data reports from Volumes 358, 367/368, and 369 into ScienceOpen this quarter.

Table 9.6. ScienceOpen collection statistics (**https://www.scienceopen.com/collection/IODP_Publications** and **https://www.scienceopen.com/collection/8b0582f6-47bf-4988-b90a-8533135e6fcc**)

Collection	Number of articles	Article views	Altmetric score (collection)	Number of authors	Referenced articles
Proceedings of the International Ocean Discovery Program collection	807	21,006	319	1,992	9,591
Scientific Ocean Drilling Expedition Research Results collection	9,560	50,437	70,444	20,787	97,418

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 data reports for Volumes 358, 367/368, and 369.

Legacy activities

Closeout

Integrated Ocean Drilling Program publications closeout activities continued during the reporting period. Data reports published during this quarter in the *Proceedings of the Integrated Ocean Drilling Program* are listed above in Scientific publications. Peer-reviewed postcruise research result publications related to Expeditions 301–303/306, 308, 317–321, 323–325, 327, 330, 333, 334, 336, 338–342, 345, and 346 were added to the publications database. In addition, dissertations/theses from Expeditions 301T–331, 333, and 335–348 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 are archived at the Internet Archive, a long-term archive specializing in full website backups. Scheduled crawls incrementally update the archive with new files. Currently, our collection houses 1.7 TB of data and more than 8 million files.

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 40,500 records for Program-related scientific ocean drilling publications from 1969 to the present. This quarter, IODP Pubs sent 290 expedition-related publication citations for consideration for inclusion in the database.

Table 9.7. Scientific Ocean Drilling Bibliographic Database statistics

Program-related publications	July 2022	August 2022	September 2022	FY22 Q4 total
Searches	326	208	121	655
Citation views	111	84	61	256

Downloadable IODP bibliographies

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 import the content of the RIS files into most bibliographic software. RIS-format citation data lists are also available for expedition-related bibliographies for Expeditions 301–396. The IODP program publication and JRSO staff-authored publication lists are updated quarterly. Expedition-related bibliography lists are updated monthly.

Articles authored by JRSO staff

- Clementi, V.J., Rosenthal, Y., Bova, S.C., Thomas, E.K., Wright, J.D., Mortlock, R.A., Cowling, O.C., Godfrey, L.V., **Childress, L.B.**, Aiello, I.W., Avila, A., Biggs, W., Charles, C.D., Cheung, A.H., deLong, K., Dove, I.A., Du, X., **Estes, E.R.**, Fuentes, U., García-Lasanta, C., Goldstein, S.L., Golub, A., Hagemann, J.R., Hatfield, R.G., Haynes, L.L., Hess, A.V., Irvali, N., Kiro, Y., Monteagudo, M.M., Lambert, J.E., Li, C., Longo, W.M., McGrath, S., Riechelson, H., Robinson, R.S., Sarao, J., Sproson, A.D., Taylor, S., Yokoyama, Y., Yu, S.M., and the Expedition 379T Scientists, 2022. Deep submarine infiltration of altered geothermal groundwater on the south Chilean Margin. Communications Earth & Environment, 3(1):218. https://doi.org/10.1038/s43247-022-00541-3
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Appendix: JRSO quarterly report distribution

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