

IODP Expedition 391: Walvis Ridge Hotspot

Week 1 Report (6–11 December 2021)

The first week of the International Ocean Discovery Program (IODP) Expedition 391, Walvis Ridge Hotspot, was comprised of the port call activities in Cape Town, South Africa, and initial transit to proposed primary Site CT-04A (Site U1575). All times in this report are in ship local time (UTC + 2 h).

Operations

The Walvis Ridge Hotspot Expedition 391 officially began at 0800 h on 6 December 2021. The *JOIDES Resolution* had just completed Expedition 396T, a transit and subsequent tie-up period at Repair Quay 3 in the port of Cape Town, South Africa. On the first day of the port call, incoming IODP JRSO air freight was loaded on board, including a new 50 kVA uninterruptible power supply unit. All oncoming Expedition 391 personnel, including a reduced JRSO technical staff and science party contingent, had arrived in Cape Town five days prior to the start of the expedition to complete a seven-day quarantine period in a local hotel as part of preboarding COVID-19 mitigation protocols. On 7 December, six pallets of food stores were loaded and shipboard antigen/PCR COVID-19 testing was performed on offgoing personnel. After clearing immigration on 8 December, the Siem Offshore staff, JRSO technical staff, and science party boarded the vessel following the seven-day quarantine period. There were no positive COVID-19 cases detected on either of the two tests administered during the quarantine period. On 9 December, the crew loaded frozen and dry catering stores and the ship bunkered 500.2 mt of fuel. A second barge load of 508.3 mt of fuel was bunkered on 10 December. Other port call activities on that day included the loading of four flats, containing a mud motor, casing, knobby drilling joints, and core liners, as well as loading a shipment of fresh fruits and vegetables. After a late urgent air freight shipment required by Siem Offshore had been delivered at 1310 h on 11 December, the vessel was secured for transit. In anticipation of this late shipment delivery, a passage plan and arrangements made with the port agent, tugboats, and harbor pilot slated the ship for a departure at 1400 h. However, just prior to the scheduled departure, the captain was notified that because of early morning fog and the resulting backlog of other ships waiting to depart, the departure would experience a delay. The pilot came on board at 1642 h. Two harbor tugboats arrived, and the mooring lines were released and pulled back on board with the last line being released from the Repair Quay 3 at 1709 h. The vessel proceeded to the pilot station and the pilot departed the vessel at 1738 h after a 5 nmi transit. The vessel began its sea passage at 1800 h on 11 December 2021. The remaining time of the day was spent in transit, and we completed 67 nmi of the 973 nmi voyage from Cape Town to proposed primary Site CT-04A (Site U1575).

Science Results

Amounting to a total length of ~3,100 km, the Tristan-Gough-Walvis (TGW) Ridge volcanic hotspot track is one of the longest linear seafloor features on Earth. The TGW track has a complex nature that makes this long-lived hotspot a paramount study object to provide important clues to interaction of mantle plumes with lithospheric boundaries, plume zonation, complications (e.g., morphological, geochemical) related to a second hotspot event superimposed onto the first, microplate formation and evolution, as well as plume movement and true polar wander. IODP Expedition 391 investigates these complexities by coring and logging six drill sites, of which three are situated in the Guyot Province and three locations reside on Valdivia Bank. We plan to recover about 1,200 m of core material, of which 450 m is expected to be igneous rock.

During the seven-day hotel quarantine period from 1–7 December 2021, the Expedition 391 scientists and JRSO staff began virtual expedition preparation and received laboratory safety training and an orientation to life aboard the *JOIDES Resolution* (including the JRSO Code of Conduct). Other virtual meetings addressed expedition science objectives, coring and downhole logging operations, curation, core description, core imaging, IT and publication services, as well as individual research and shipboard outreach plans. The laboratory teams started drafting their laboratory methods chapters and began discussing shipboard sampling plans for the expedition. At 1100 h on 8 December, most of the Expedition 391 scientists boarded the vessel and moved into their cabins. Following the shipboard COVID-19 mitigation protocols, the science party split up into shifts immediately. The day shift scientists and new JRSO staff had their pictures taken, received a general presentation on ship safety, and were given a safety tour of the vessel. Scientists began setting up their computers to access the ship's network and orienting to their laboratories. On 9 December, the night shift scientists had their pictures taken, received a general presentation on ship safety, and were given a safety tour of the vessel while all scientists continued setting up their computers and orienting to the laboratories. One JRSO staff member boarded the vessel. On 10 December, scientists were given core flow tours in the laboratory, introduced to core imaging, and continued with laboratory preparation. At 0830 h, one science party member boarded the vessel upon completion of the hotel quarantine. On 11 December, the last remaining scientist arrived on board at 0815 h after completing the hotel quarantine. The night shift scientists received training on IODP sampling procedures. The science party continued setting up their laboratory instruments and drafting the associated methods. Shipboard COVID-19 mitigation protocols continued to be followed.

Outreach

One Onboard Outreach Officer is sailing on Expedition 391, a high school teacher who is based in the United States. She presented her outreach plans for the expedition to the science party during the quarantine period. She spent the initial days on board preparing for upcoming live outreach events, including setting up and testing the videoconferencing equipment, maintaining

and establishing contacts with schools, arranging scientists for next week's ship-to-shore events, and collecting images for social media and educational activities. The major goal of the expedition's outreach activities is to effectively engage with both local (Namibian media and public) and global audiences.

Following the shipboard COVID-19 mitigation protocols, no in-person outreach activities took place during the Expedition 391 port call. The first outreach event was implemented during the hotel quarantine with the Co-Chief Scientists, Expedition Project Manager, and Outreach Officer giving a virtual talk on IODP and the objectives of Expedition 391 to the Society of Economic Geologists (SEG) student chapter of the University of Namibia. This video call had 35 students in attendance. The first shipboard live connection took place during the port call when one micropaleontologist from Austria introduced the ship, its capabilities, and the Expedition 391 goals to an audience of 40 people at the virtual Austrian Academy of Sciences Symposium on Scientific Drilling.

In terms of social media ([Facebook](#), [Instagram](#), [Twitter](#)), two posts on Facebook reached 6,191 people, received 633 engagements, inspired 241 reactions, evoked 15 comments, and were shared 10 times. Three posts were published to Twitter, receiving 4,624 impressions and 204 engagements in total as well as generating 15 new followers. Two posts were published to Instagram, leading to eight new followers. Together these reports reached 1,800 people, received 268 reactions, evoked 3 comments, and were shared two times. A press release was written and shared with the media offices of IODP JRSO and the United States Science Support Program (USSSP) for publication.

Technical Support and HSE Activities

The quarantine period in a Cape Town hotel focused on the virtual crossover with the offgoing JRSO technical staff. The first days on board focused on unloading and loading of freight as well as providing safety and laboratory orientations for the Expedition 391 scientists.

Laboratory Activities

- The JRSO staff change occurred on 8 December. The scientific participants also boarded 8 December. An additional JRSO staff member and two scientists arrived on 9, 10, and 11 December, respectively.
- The oncoming and offgoing freight was handled and distributed.
- Orientation and training presentations were held for the scientists and new JRSO technical staff over Zoom while in hotel quarantine. All remaining training was completed after boarding the ship starting 8 December.
- Sample plans, laboratories, and instrumentation were prepared for coring operations.
- The scientists were given ship orientation tours in small groups.
- The Ship Safety Introduction video was presented to small groups on board the ship.

- Training sessions were held for new JRSO staff in assigned laboratories.
- The initial attempts to make fused beads with the Bead Maker failed at standard operational settings and temperature of 1055°C. Settings were adjusted until beads could be fused at a temperature read out of 1220°C. It is unclear where the problem is, and troubleshooting will continue once on site.

IT Support Activities

- The Marine Computer Specialists (MCS) boarded the ship and proceeded to assist expedition participants connected to the ship's network.
- The MCS started working on IT port call procedures.
- Initial helpdesk activities, computer setup, and training with new and regular participants took place.
- Multiple expedition-related distribution lists were created per the Expedition Project Manager's request.
- Staff were notified by the shore-based JRSO IT department of a Zero-Day Exploit issue with an embedded application. The Oracle management console was disabled due to the exploit, and we are awaiting further details and action items.
- Stratigraphic Correlator Mac was updated with scientific data analysis software IGOR Pro 9.
- Started installing Paragon software for MacOS on designated workstations, but encountered issues with software installation and notified the shore-based IT department.
- Continuing to work on MCS beginning-of-expedition (BOX) procedures.

Application Support Activities

- Application accounts were created for all the scientists and new technical staff.
- Passwords were reset upon request.
- The current expedition and current project were input into the Laboratory Information Management System (LIMS).
- The developer's personal accounts, such as Oracle, Cumulus, Novell, wi-fi, Server, etc., were configured.
- Technicians and the Laboratory Officer were trained on how to display a new component in the red-green-blue (RGB) color space or LSIMG report.

HSE Activities

- Laboratory and ship safety orientations were held for new JRSO staff and scientists.
- The safety shower and eye wash stations were tested.