IODP Expedition 392: Agulhas Plateau Cretaceous Climate

Week 1 Report (5–12 February 2022)

The first week of the International Ocean Discovery Program (IODP) Expedition 392, Agulhas Plateau Cretaceous Climate, was comprised of the port call activities in Cape Town, South Africa, and initial transit to proposed primary Site AP-10A (Site U1579). All times in this report are in ship local time (UTC + 2 h).

Operations

IODP Expedition 392 began in Cape Town, South Africa, at Repair Quay 3 at 0918 h on 5 February 2022. Due to the COVID quarantine (seven days), oncoming JRSO technical staff and crew did not board until 7 February, with the previous expedition's staff and crew remaining on board until then. During hotel quarantine, COVID tests were conducted on Days 4 and 6. All but four members of the science party and one JRSO staff (three whose hotel arrival had been delayed) were cleared initially to board. On the morning of 7 February, the outgoing JRSO staff and crew disembarked. For the JRSO, 44 scientists and staff joined the vessel on 7 February. They were joined by three more personnel on 8 February and the final participant on 9 February.

The majority of incoming IODP freight was loaded by the previous crew, which included two core liner boxes, two free-fall funnel kits, and the Schlumberger Ultrasonic Borehole Imager (UBI) tool. On 8 February, the offgoing core and surface freight was loaded into two reefers, and a special air shipment left via World Courier. Fuel bunkering was done via barge on 8 and 9 February, with the vessel taking on 1002 mt. The vessel also took on a load of fresh/frozen produce to top off stores on 8 and 9 February. The final installation, testing, and commissioning of the new 50 kVA uninterruptable power supply (UPS) for the JRSO network was done on 8 and 9 February, requiring temporary blackouts of shipboard IT services. The UPS was deemed fully operational. COVID-19 rapid antigen testing was conducted for all shipboard personnel on 8 February and PCR testing was conducted on 9 February. All tests were negative. Schedules were established for staggered meal times in the mess hall to address COVID-19 concerns.

On 10 February, the pilot boarded at 0942 h. The vessel began the transit to the first site, proposed primary Site AP-10A (Site U1579), with the first line away at 1024 h. The pilot was away at 1045 h and start of the sea passage was recorded as 1048 h. Within minutes of the vessel reaching full throttle, the newly commissioned 50 kVA UPS began rejecting the ship's power and running off the batteries. The vessel was throttled back to half speed at 1116 h. The UPS returned to normal operating mode. This reaction was verified several more times in order to diagnose the problem, and it was decided to take the UPS offline. Beginning at 1245 h, the JRSO IT services were taken offline. The UPS was bypassed and regulated power was restored at 1445 h. The vessel was returned to full throttle at 1448 h, and the sea voyage continued at full

speed. JRSO IT services were fully restored at 1715 h. During the transit, daily COVID-19 antigen testing was conducted in the conference room for the science party and JRSO staff and in the ship's medical office for crew. The testing continues daily for eight days out of port, and every other day after that until the end of the two-week mitigation period.

The ship arrived at Site U1579 on 12 February after a transit of 2.2 days (52.1 h), covering a distance of 557 nmi at an average speed of 10.8 kt. The vessel came on site, ending the sea passage at 1430 h, and the thrusters were lowered and secured at 1451 h. The vessel was switched from cruise mode to dynamic positioning (DP) mode at 1452 h. The rig floor was given the all clear at 1500 h. The precision depth recorder (PDR) was used to get a new sounding of the seafloor, which was calculated to be 2512.4 meters below rig floor (mbrf). On the rig floor, the crew commenced assembling the bottom-hole assembly (BHA) and preparing drill collars for the rotary core barrel (RCB) to be used in Hole U1579C. The advanced piston corer/extended core barrel (APC/XCB) BHA was assembled and run down to 136.8 mbrf. The week ended at midnight on 12 February with the bit at 1147.6 mbrf and the pipe trip continuing.

Expedition Scientific Objectives

The aim of Expedition 392 is to understand the evolution of Earth's climate system from the Cretaceous Supergreenhouse into the Icehouse world of the Oligocene through examination of temperature, ocean circulation, and sedimentation changes as pCO_2 fluctuated from as much as 3500 parts per million by volume (ppmv) to less than 560 ppmv. The Late Cretaceous was marked by reduced meridional temperature gradients and oceanic sedimentation was punctuated by episodic deposition of organic-rich sediment known as oceanic anoxic events (OAEs); however, whether these events resulted from enhanced productivity or sluggish circulation remains unclear. This expedition also seeks to understand the nature and formation of the Agulhas Plateau as a large igneous province (LIP) following the breakup of Gondwana and its impact on the timing of oceanic gateway opening, which has implications for oceanic circulation, carbon cycling, and global climate during the Late Cretaceous.

Science Results

The Expedition 392 science party includes scientists from 10 IODP member countries, one Outreach Officer from the USA, and an observer from South Africa. During the seven-day hotel quarantine period from 31 January–6 February 2022, the Expedition 392 scientists and JRSO staff began virtual expedition preparation. These virtual meetings included an introduction to the expedition science objectives, coring and downhole logging operations, core and sample curation, publications obligations, laboratory safety, shipboard outreach, stratigraphic correlation, life at sea, onboard computing, shipboard software, and a brief presentation by each

scientist on individual postexpedition research goals. The laboratory teams began drafting their laboratory methods chapters and discussing shipboard sampling plans for the expedition.

At 1000 h on 7 February, most of the Expedition 392 scientists boarded the vessel and moved into their cabins. Following shipboard COVID-19 mitigation protocols, the science party split up into shifts immediately. The day shift scientists and new JRSO staff received a general presentation on ship safety, and they were given a safety tour of the vessel followed by a tour of core flow. Scientists began setting up their computers to access the ship's network and orienting to their laboratories.

On 8 February, the night shift scientists received a general presentation on ship safety, and they were given a safety tour of the vessel followed by a tour of core flow. All scientists continued setting up their computers and orienting to the laboratories. One JRSO staff member and two additional members of the science party boarded the vessel. COVID-19 testing for all personnel on board was conducted midday on the pier.

On 9 February, the last remaining member of the science party boarded the vessel. One JRSO staff member departed the vessel. Scientists continued working on drafts for laboratory methods, orientation to the laboratories, and laboratory specific safety training. COVID-19 testing for all personnel on board was conducted midday on the pier. Throughout the remainder of the week all scientists received an introduction to IODP core sampling procedures, finalized the whole-round sediment core sampling plan, and received a presentation on Site U1579 from the Co-Chief Scientists. A towed magnetometer was deployed to measure seafloor magnetic data during transit outside of the exclusive economic zone (EEZ) of South Africa. Surface water sampling was also conducted outside of the EEZ of South Africa during the transit. Shipboard COVID-19 mitigation protocols continued to be followed and all shipboard personnel were tested daily following departure from port.

Outreach

The following outreach activities took place during Week 1.

- Posted three blogs with photos on the Expedition 392 page on the *JOIDES Resolution* website (two written by the Outreach Officer, and one written by a Co-Chief Scientist).
- Posts on Facebook: 8
- Posts on Twitter: 7, plus retweets of scientist posts
- Stories posted on Instagram: 3
- Worked with four scientists on pitching prospects, and contacted various websites and publications: Debadrita Jana (Rice News), Derya Gürer (ANU media), Matt Jones (Smithsonian.org).

- Wrote daily haiku for *3-9-2 haiku* (a proposed postexpedition book) and collected haiku from the science party.
- Scheduled one ship-to-shore event for the coming week.
- Conducted interviews with various members of the science party and JRSO technicians.

Technical Support and HSE Activities

The following technical support activities took place during Week 1.

Laboratory Port Call and Transit Activities

- Offloaded cores and freight from Expedition 391.
- Distributed oncoming freight.
- Troubleshooting of Navi Pac system continued.
- Continued troubleshooting of Section Half Imaging Logger (SHIL) light temperature controller. We suspect the heating output relay may have arced; we will switch it out and monitor it.
- Moved limit switches on the SHIL to make space for the 360° imaging holder.
- Replaced upper limit switch on *P*-wave caliper to eliminate intermittent fault.
- Reinstalled previous Nanopure unit in the Chemistry Laboratory.
- Moved new Axio Imager A2 from the Imaging Office to the Microscopy Laboratory in place of the stereoscope.
- Superconducting rock magnetometer showing interference of the cryocooler in the X and Z SQUID signals.

Application Support Activities

- Issues with the SHIL not loading the working half label were resolved by changing the LIMS from SHLF-A to WRND sample types; fixed issue of SHIL setting the cropped image length to zero.
- Updated X-ray system software.
- The Whole-Round Multisensor Logger (WRMSL) was modified to run both "FAST" and "NORMAL" assigning the data to instrument groups "STMSL and WRMSL." This was done without reloading the track or going through a full reconfiguration.
- DESClogik XML settings manually edited to prevent past projects from appearing.

IT Support Activities

- Scientists were set up on the shipboard network and granted internet access to one personal device.

- Supported Eaton UPS installation during port call and managed UPS malfunction and Data Center power down/up during initial hours of sea voyage.
- UPS currently disconnected; we are working with Siem Offshore to get UPS logs to the manufacturer.
- Updated Stratigraphic Correlator computer with latest version of Correlator.
- R/RStudio installed on Stratigraphic Correlator computer and Paleomagnetism Laboratory computers.

HSE Activities

- Completed safety tours for the science party and new JRSO technical staff.
- All crew completed a daily COVID-19 antigen test.
- Inspected and distributed hydrofluoric acid (HF) safety gear.
- Completed an HF safety review with the science party.
- Conducted Sunday safety checks (showers and eye wash stations).
- Conducted a fire and boat drill.