

IODP Expedition 379: Amundsen Sea West Antarctic Ice Sheet History

Week 3 Report (27 January–2 February 2019)

This week we completed the transit to our first drill site in the Amundsen Sea and initiated advanced piston corer (APC) coring operations at Site U1532 (proposed Site ASRE-08A). All times in this report are in ship local time (UTC – 3 h).

Operations

This week started while in the midst of our transit to the Amundsen Sea. The remaining 1577 nmi was completed in 3.9 d at an average speed of 11.1 nmi/h. At the start of our transit, ice and weather data indicated that none of the continental shelf sites and only a few of the continental rise sites could be occupied, and forecasts led us to aim for proposed Site ASRE-09A. During our transit, evolving data and forecasts, along with science priorities, led us to change our first site to proposed Site ASRE-08A. We arrived at Site U1532 (proposed Site ASRE-08A) at 2100 h on 30 January 2019. The complete transit was 1770 nmi over 7.3 d with an average speed of 10.1 nmi/h. We lowered the thrusters, switched to dynamic positioning mode at 2145 h, and began drill floor operations. After assembling the outer core barrel and spacing out of the inner core barrel, we started assembling and lowering the bottom-hole assembly to the seafloor. On 31 January, we finished assembling the remaining drill collars and spent the first half of the day lowering the drill string to the seafloor (including verifying the internal diameter clearance and length of each piece of the drill string). At 1200 h on 31 January, we installed the top drive and pumped two pigs down through the drill string to clean the inside of the drill pipe before coring. After adjusting the bit to 3268.6 m below the rig floor, we installed the APC core orientation tool, lowered the APC core barrel, and started coring in Hole U1532A at 1650 h on 31 January.

Core U1532A-1H recovered 5.63 m, resulting in a seafloor depth of 3961.5 m below sea level. Cores 1H to 11H penetrated from 0 to 100.6 m and recovered 103.04 m (102%). All APC cores were oriented and formation temperature measurements were made with the advanced piston corer temperature tool (APCT-3) coring shoe while taking Cores 4H (34.0 m), 7H (62.6 m), and 10H (91.1 m). After recovering Core 11H, we had to stop coring at 0645 h on 1 February due to a combination of approaching ice as well as increasing difficulty observing ice (due to fog/snow and a slight swell). We raised the bit up to 50 m below the seafloor with the intention of resuming coring in Hole U1532A after conditions improved. Instead, we pulled the bit out of the hole at 0930 h, raised the bit 100 m above the seafloor, and spent the rest of 1 February adjusting our position as required to maintain a safe distance from ice.

Science Results

During our final days of transit to the Amundsen Sea, the science party made final preparations for coring and logging at Site U1532. These included (1) an introduction to coring hardware; (2) continued laboratory-specific preparation (instruments, methods, etc.); (3) core curation and sample data entry training; (4) finalizing and receiving approval for shipboard sampling and methods; and (5) attending a series of science presentations about the onset and history of Antarctic glaciation, Antarctic Peninsula and Amundsen Sea sediment drifts, pore water geochemistry, and application of biomarkers to understanding the deep biosphere. The Co-Chief Scientists and Expedition Project Manager participated in a series of meetings to plan for coring/logging operations as well as ice and weather data procedures. The Co-Chief Scientists also presented the science objectives to the IODP JRSO staff and ship's crew.

Expedition 379 drilling began at Site U1532 (proposed Site ASRE-08A) on the eastern Amundsen Sea continental rise at 3962 m water depth. The drilling target is a thick sediment drift with the coring site slightly off the crest of the drift. The goal for drilling at this site is to recover high-resolution, continuous records of Plio–Pleistocene climatic and oceanographic changes through glacial-interglacial cycles. If the full target depth is reached, cores are expected to reach the mid-Miocene climatic optimum. Coring in Hole U1532A reached 100.6 m below seafloor.

Once coring began, we slowly ramped up core processing through the laboratories, including the first use of the newly installed X-ray core section imaging system. After collecting X-ray images of whole-round cores, cores were passed through the whole-round track systems. Cores U1532A-1H through 6H were split and described. The uppermost 5.6 m of Hole U1532A consists of brown and greenish gray mud with minor biosiliceous ooze and foraminifer-bearing mud. Down to Core U1532A-3H the sediments consist of brown and olive silty clays with prominent foraminifer-bearing intervals. Cores 4H–6H were characterized by interbedded olive brown to greenish gray silty clay and dark grayish brown clay with only rare biogenic components. Silt laminae and color banding were common. Rare pebbles, silt pockets and dispersed sand grains were found in the silty clay intervals.

Outreach

The two Expedition 379 Outreach Officers were busy staying up to speed with everything that is going on, updating social media (<https://joidesresolution.org>), and sending photos, posts, and comics to shore so that they can be uploaded over time in the event that we lose internet coverage. This also included facilitating transfers of blogs and social media posts for scientists. A trailer was filmed for our expedition that will be edited and distributed on shore. The Core Description Laboratory responded enthusiastically to a fruitcake brought to the ship by one of the Outreach Officers. The fruitcake was put to work as an analog for core sample material (it has a

matrix and many interesting clasts) with which to practice their core description protocol. It was imaged, its density and velocity were measured, and it was sampled to make a wet slide for observation under magnification. A series of three comics was produced that shed light on the activities of the laboratory and on the philosophy and work of our sedimentologists. Other work on additional comics, a poster, and book are in progress. Several scientists and crew members have contributed translations to the lead comic, allowing it to be posted in German, Portuguese, and Dutch. Stories about the expedition are being pitched to various media.

Technical Support and HSE Activities

Staff focused on supporting science activities at Site U1532.

Laboratory Activities

- Chemistry
 - Completed calibration of titrators and preparation of stock solutions for analytical work.
 - Completed setup of the hood and adjacent work area for hydrofluoric acid (HF) preparation of palynology samples.
 - Oil leaking was detected on one of the hydraulic squeezers and was refilled. Deep scratches were observed on the interior sealing surfaces on a spare hydraulic jack.
- X-Ray Imaging
 - Unable to resolve issues with automation of the X-ray imaging system. Scientists currently use the manual method for core placement and imaging.
 - We are having issues with “bowed” core liners and liner patches interfering with the section passing through the shields and affecting alignment with the detector.
- NGR: Looking into an issue with detector #7 losing calibration.

Application Support Activities

- LORE and LIME: The software for generating these reports has been updated to receive http calls from Tomcat 9.
- LimsM and LimsW: These applications have been migrated to Java 11.
- MUT: Updated application to upload natural gamma ray (NGR) files.
- ALKLINITY: Updated code to place the correct file extension on the data file name.
- IMS Track Software:
 - Section Half Imaging Logger (SHIL): Found and resolved issue in code preventing the software from connecting to the database to update section information.
 - Issue currently being addressed regarding meaningful error messages being returned by web service calls when the call fails.

IT Support Activities

- Iridium Phones
 - Finished configuration; systems are fully operational for the science and operations offices.
 - Implemented security protocols as directed.
 - Assisted Siem Offshore in resolving an issue with their phone's data port.
- Adobe Creative Suite: Investigating issue requiring licensed reactivation on some workstations.
- RIGNET:
 - Maintaining communications with shore required continuous monitoring and adjustment throughout the transit.
 - On site we have exclusively used the bow VSAT dome.
 - Experiencing daily losses due to the low satellite elevation at our current location. However, we continue to have sufficiently reliable email, internet, and telephone services.
- SRM Time Sync: Resolved issue with the time sync on the SRM computer. Found that the National Instrument Time sync process was installed and interfering with the Windows OS time sync service.
- Computer Virus: TAMU Campus directly notified the ship of malicious traffic on shipboard network. Investigated source and remediated matter. No further incidents encountered and campus is monitoring for a reoccurrence.

HSE Activities

- Conducted weekly fire and boat drill.
- Completed instrument-specific safety training for staff and science party working with the X-ray imaging and handheld X-ray fluorescence (XRF) systems.
- Conducted HF safety training classes for staff and science party working with HF acid.