

## **IODP Expedition 383: Dynamics of Pacific Antarctic Circumpolar Current (DYNAPACC)**

### **Week 1 Report (20–26 May 2019)**

The first week of the International Ocean Discovery Program (IODP) Expedition 383, Dynamics of the Pacific Antarctic Circumpolar Current (DYNAPACC), consisted entirely of port call activities. The *JOIDES Resolution* was berthed at Prat Terminal Pier 1 South, in Punta Arenas, Chile. All times in this report are in ship local time (UTC – 3 h).

### **Operations**

Expedition 383 officially started at 0930 h on 20 May 2019 with the Co-Chief Scientists and IODP JRSO technical staff boarding the ship. The JRSO staff conducted their crossover with the departing staff, and the Co-Chief Scientists and Expedition Project Manager met with members of the Expedition 382 offgoing science party. Port call activities continued throughout the day, but all loading and offloading of freight was postponed until the afternoon due to high winds.

The Expedition 383 scientists boarded the ship in the morning of 21 May. After getting settled in their rooms, the scientists were introduced to life aboard the *JOIDES Resolution*, general laboratory safety, and information technology resources. During the rest of the week, the scientists received training and familiarized themselves with the ship laboratories, scientific instruments, and software applications. They received presentations on the expedition scientific and operational objectives, coring operations aboard the *JOIDES Resolution*, education and outreach plans, the production of a science documentary film by Maylo Films, and safety training. They also worked on preparing their laboratory procedures and developed their shipboard sampling plan.

On 22 May, a press conference was held by the Co-Chief Scientists and the Expedition Project Manager for members of the Chilean national and regional press, followed by a tour of the ship's laboratories for the journalists, coordinated by Christian Molinari from the Columbia Global Center in Santiago. Throughout the rest of the morning, ship tours and presentations were also provided for students and teachers from local high schools. In the afternoon, the Co-Chiefs and Expedition Project Manager hosted a dozen researchers from the Instituto Antártico Chileno and the Centro de Investigación GAIA Antártica from the Universidad de Magallanes for a presentation on the expedition objectives and a tour of the vessel. A Chilean Coastal Observer boarded the ship on the fourth day of port call and was given an orientation. The observer will sail with us during the expedition since some of the proposed sites are in Chilean waters.

Other port call activities included the loading of drilling mud, JRSO air freight and surface freight, fresh and frozen food, and other catering supplies. The Expedition 382 cores were loaded into two 40 ft refrigerated containers for shipment, and all offgoing freight was loaded for

shipment. On 24 May, the vessel transited 19.5 nmi to the Cabo Negro Fuel Terminal for refueling. While taking on fuel, the vessel was informed that clearance had not yet been granted for the sites in Chilean waters, which required us to change the order of operations to give us more time for approval. After fueling was complete, and on receiving approval from the Servicio Hidrográfico y Oceanográfico de la Armada (SHOA) de Chile and the Punta Arenas Maritime Authority to depart from Punta Arenas, the *JOIDES Resolution* set sail at 0036 h on 25 May for the central South Pacific. The ship took the western route through the Strait of Magellan and averaged 10.9 kt in good weather. By 2400 h on 25 May, the vessel had cleared the Magellan Strait and entered the South Pacific on the way to Site U1539 (proposed Site CSP-2B).

## **Science Results**

The Dynamics of the Pacific Antarctic Circumpolar Current (DYNAPACC) Expedition 383 aims to investigate the Pliocene–Pleistocene atmosphere–ocean–cryosphere dynamics of the Antarctic Circumpolar Current (ACC) and their role in the regional and global climate, and atmospheric CO<sub>2</sub> based on sediment records with the highest possible stratigraphic resolution. The expedition will test two major hypotheses: (1) ACC dynamics and Drake Passage throughflow conditioned the global Meridional Overturning Circulation and high–low climate linkages on orbital and submillennial timescales since the Pliocene; and (2) variations in the Pacific ACC determine the physical and biological characteristics of the oceanic carbon pump and atmospheric CO<sub>2</sub>.

Seven primary sites are targeted. Four are located in the central South Pacific between the modern Polar Front and the Sub-Antarctic Zone. These sites will document the Pliocene to Quaternary ACC paleoenvironmental history at water depths ranging from 3600 to 5100 m.

Three sites located along the Chilean margin, close to the Drake Passage, will provide a depth transect (~1000–3900 m) across the major Southern Ocean water masses to document Plio–Pleistocene changes in the vertical structure of the ACC—a key topic for understanding the role of the Southern Ocean in the global carbon cycle. Our planned coring strategy is designed for recovering sediment sequences suitable for ultra-high-resolution studies. The proposed sites are located at latitudes and water depths where sediments will allow the application of a wide range of siliciclastic, carbonate, and opal-based proxies for reconstructing surface to deep ocean variations and their relationship to atmosphere and cryosphere changes with unprecedented stratigraphic detail.

## **Technical Support and HSE Activities**

The IODP JRSO technical staff moved aboard, completed their crossover with the offgoing staff, and started preparing the laboratories and science party for the upcoming expedition.

### *Port Call Activities*

- All oncoming and offgoing freight activities were completed. Expedition 382 core, surface, air, and temperature-controlled shipments were offloaded.
- All supplies were distributed and the storerooms secured for transit.

### *Laboratory Activities*

- The Zoom Station was moved to the User Room area, and a curtain was installed to create a private area where the filmmakers can store all their gear.
- We neutralized all hydrofluoric acid (HF) liquid waste from Expedition 382 and cleaned up the HF hood for general use.
- The science party was introduced to the laboratories by technical staff.
- The laboratories were prepared for coring.

### *Application Support Activities*

- We deployed the new SampleBrowser application and installed it on the core entry station. We started work on the Catwalk module that will be included in the SampleBrowser application.
- We removed Expedition 382 data from the database, set up science software accounts for oncoming scientists and technicians, and configured the database for Expedition 383.
- We worked on application updates, and downloaded documents and training videos for Correlator 3.0.

### *I.T. Support Activities*

- We attended I.T. orientation meeting with scientists.
- We assisted scientists with connecting laptops to network, email, and server access.
- The Diatomware 2007 (BugCam) software in Microscope Laboratory required reregistering to resolve missing or invalid file error messages.
- We assisted the X-ray diffraction (XRD) technician with installation of new Diffrac EVA software to resolve an issue with existing software not able to print preview correctly.

### *HSE Activities*

- We conducted the ship and laboratory safety orientation for scientists and new technical staff.
- We conducted X-ray imaging system safety and operation training.

- The abandon ship and fire drill was held on Sunday 26 May.
- Safety showers and eyewash stations were tested.