

IODP Expedition 375: Hikurangi Subduction Margin

Week 1 Report (8–10 March 2018)

Operations

Port Call Activities

IODP Expedition 375 began with the first line ashore at No. 2 Wharf, Timaru, New Zealand, at 0848 h on 8 March 2018. The IODP JRSO technical staff, Co-Chief Scientists, and two additional scientists moved onto the ship at 1100 h after a bus ride from Lyttelton to Timaru. The remainder of the science party boarded the vessel on 9 March at 1100 h. Port call activities in Timaru were minimal as all casing, drill pipe, and observatory equipment was already loaded while the vessel was tied up in Lyttelton.

During the port call, observatory scientists assembled the osmosampler that will be deployed at Site U1518. The rig crew manufactured a storage shuck for the osmosampler, and the completed osmosampler was stored in the shuck and racked in the derrick in preparation for the transit to Site U1518, scheduled to begin on the morning of 11 March.

Science Results

The Expedition 375 science party includes scientists from 10 IODP member countries and two Outreach Officers from the USA and New Zealand. The first three days of the expedition consisted of the science party and technicians moving onto the ship, safety orientations, and meetings about the expedition science objectives, what we need to accomplish onboard, computing resources, core flow and sampling procedures, and research plans.

Expedition Scientific Objectives

The aim of Expedition 375 is to improve our understanding of slow slip events (SSEs) along the Hikurangi subduction margin (IODP Proposal 781A-Full). SSEs are a poorly understood form of transient creeping fault behavior observed at several subduction zones. At the northern Hikurangi subduction margin, they are among the best-documented and shallowest on Earth. They recur every 1–2 y and extend close to the trench, where clastic and pelagic sediments ~1.0–1.5 km thick overlie the subducting Hikurangi Plateau. The northern Hikurangi subduction margin provides an ideal setting to use IODP capabilities to discern the mechanisms behind slow slip fault behavior.

These objectives are being implemented across Expeditions 372 and 375. Expedition 372 (26 November 2017–4 January 2018) collected logging-while-drilling (LWD) data at three sites targeting the upper plate, the frontal thrust, and the sediment entering the subduction zone. Expedition 375 will core the same sites, and potentially a fourth site on Tūranganui Knoll on the subducting Pacific Plate. In addition, two borehole observatories will be installed at the frontal thrust and upper plate sites. Collectively, the LWD and coring data will be used (1) to characterize the compositional, structural, thermal, and diagenetic state of the incoming plate and the shallow plate boundary fault near the trench, which comprise the protolith and initial conditions for fault zone rock associated with SSEs at greater depth, and (2) to characterize the material properties, thermal regime, and stress conditions in the upper plate above the SSE source region. The LWD data collected during Expedition 372 are being used to guide Expedition 375 operations and installation of CORK observatories at the frontal thrust and in the upper plate above the SSE source. These observatories will monitor temporal variations in deformation, fluid flow, and physical and chemical properties throughout the SSE cycle to test a suite of hypotheses about the fundamental mechanics and behavior of SSEs and their relationship to great earthquakes along the subduction interface.

Education and Outreach

The Outreach Officers started organizing videoconferences and other outreach activities. One tour was conducted for a reporter from New Zealand’s TV3 news and two students and their teacher from Gisborne Boys High who won a competition to name the Site U1518 Observatory. The winning entry “Te Matakite” (in Maori) can be interpreted as “See into the future.” Additional tours were conducted for ~35 students from the University of Otago. Several news stories and press releases came out, including the following:

- [Deep-sea observatories to offer new view of seabed earthquakes](#)
- [Our sleeping taniwha: Hikurangi’s tsunami threat](#)
- [Scientists to probe NZ’s tsunami danger zone](#)
- [Scientists’ pioneering probe into NZ’s most dangerous fault line](#)

Technical Support and HSE Activities

The following technical support activities took place during Week 1.

Laboratory Activities

- Crossover with offgoing IODP JRSO technical staff was completed on 8 March.
- Installed a new sample grabber on Bruker D4 XRD. Following the installation, problems were encountered when attempting to run the instrument, which we are troubleshooting.

- New rails installed on both whole-round physical properties tracks.
- An additional pore water squeezing station was set up in the Core Reefer.
- The SeaSpy magnetometer towfish connector was replaced and will be tested during the transit.
- Laboratories are being prepared for coring.

IT Support Activities

- Imported Expedition 372 data for use on Expedition 375.
- Uploaded Expedition 375 site survey data to the server.
- Assisted scientists with connecting their laptops to the network, servers, and printers.
- Created email distribution lists for the current expedition.

HSE Activities

- Conducted ship and laboratory safety orientation for scientists and new personnel.
- Held the weekly fire and boat drill as scheduled.
- Tested safety showers and eye wash stations.