Preliminary results of lithostratigraphy in IODP Expedition 375: Hikurangi subduction margin coring and observatories

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Slow slip events (SSEs) are common phenomena in subduction zones and are observed as transient aseismic slip on a fault for weeks to months and are faster than plate convergence rate and slower than the slip rate for regular earthquakes. SSEs at the northern Hikurangi subduction zone are the best-documented ones in the world. Recent geophysical studies have revealed that the SSEs occur at shallow plate boundary where one can reach the materials by drilling, and the SSEs recur every 2 years systematically. These characteristics of SSEs at the northern Hikurangi margin provide a good opportunity to core sediments and install observatories to understand the nature and mechanisms of SSEs.

In International Ocean Discovery Program (IODP) Expedition 375, three scientific objectives have been targeted: 1) Characterization of materials (lithology, structure, frictional and soil-mechanical properties, and so on) associated with SSEs area, 2) Characterization of conditions (temperature, stress, and so on) in the upper plate above SSEs source area, and 3) Monitoring of deformation, hydrogeology and chemistry via borehole observatories. These scientific objects are linked to test the hypotheses: 1) SSEs propagate to the trench, 2) Pore fluid pressure is elevated in the source region, 3) SSEs occur in regions of conditional frictional stability, 4) There is a continuum of SSEs, and 5) Slow slip events drive fluid flow along faults.

The transect for the cruise is located in the region where the Pacific Plate subducts westward beneath the North Island of New Zealand along the Hikurangi Trough at a convergence rate of 4.5-5.5 cm/y. To achieve the scientific objectives, four drill sites are chosen for the cruise: 1) Upper slope site, 2) frontal thrust site and 3) two subduction input sites (thick sedimentary input close to a front of Hikurangi Trough and thin sedimentary input above a seamount). Coring will be conducted in all sites and observatories will be installed in the sites except for the input site above a seamount. Logging while drilling (LWD) was conducted also at the sites except for the site above a seamount in IODP Expedition 372, which was operated at the same sites previously.

On the basis of regional and seismic interpretations, the upper slope site includes ~440 m of Quaternary deposits with muds, sand and ash, and sandy and muddy turbidites underlying that. In the frontal thrust site, Pleistocene trench-fill sediments of sand and mud turbidites with ash is expected. At the thick

sedimentary input site a succession of clastic trench turbidites will additionally overlie the older pelagic and volcanic sediments observed at the thin sedimentary input site. To achieve the objectives we will firstly achieve the lithostratigraphic information by drilling to understand basic circumstances for the Hikurangi subduction zone.

In this presentation, we mainly focus on the preliminary results of lithostratigraphic work from the onboard descriptions that is just after the end of cruise.

Keywords: slow slip events, Hikurangi Margin, IODP

