

IODP Expedition 358: The Final(?) Megathrust Drilling Challenge for NanTroSEIZE

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IODP Site C0002 is the deep centerpiece of the NanTroSEIZE Project, intended to access the major seismic reflector believed to be the main plate interface fault system at a depth of approximately 5000 meters below the sea floor. This drilling target is within a location where a cluster of slow slip, very low frequency (VLF) seismic events and tremor has been found, while rapid seismic slip has also been inferred from past events, including the 1944 M8 tsunamigenic earthquake. This suggests that diverse fault processes all related to the up-dip limit of megathrust seismogenic mechanics are active at this site. Previous major riser drilling efforts on IODP Expeditions 338 and 348 have advanced the main riser Hole at Site C0002 (Hole C0002F/N/P) to a depth of 3058 meters below the sea floor (mbsf), and casing has been installed in that hole to a depth of 2922 mbsf.

Expedition 358 is scheduled for 164 days beginning October 2018 to extend Hole C0002P to approximately 5000 mbsf, crossing and sampling the main plate boundary reflector. The principal strategy is to rely on drilling with continuous real-time logging- (and/or measurement)-while-drilling (LWD/MWD), analysis of drill cuttings & mud gases, a series of downhole measurements and tests, and coring of ~100 m or as much as time allows. The hole will be started from the previous casing depth of 2922 mbsf. The planned final configuration is to leave the hole cased and capped and ready for a future long term borehole monitoring package. The main scientific objectives are: (1) to sample and log the hanging wall, the fault zone, and some of the footwall; and (b) to make downhole measurements to determine the state of effective stress as the fault is approached and crossed. Previous drilling at Site C0002 suggests that the stress state down to 3000 mbsf is in a normal- to strike-slip stress state, with relatively small differential stress and little to no elevated pore fluid pressure. Whether this transitions to reverse stress state and greater differential and shear stress upon deepening is a major question. This talk will review what we already know from NanTroSEIZE drilling at Site C0002 and other sites in this transect, and how the Expedition 358 plan will address the key questions in the NanTroSEIZE science plan.

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