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New access to the deep interior of the Nankai accretionary complex and comprehensive characterization of subduction inputs and recent mega splay fault activity (IODP-NanTroSEIZE Expedition 338)

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The Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) is a coordinated, multi-expedition Integrated Ocean Drilling Program (IODP) drilling project designed to investigate fault mechanics and seismogenesis along subduction megathrusts through direct sampling, in situ measurements, and long-term monitoring in conjunction with allied laboratory and numerical modeling studies.
IODP Expedition 338 (1 October 2012 - 13 January 2013), extended riser Hole C0002F from 856 meters below the sea floor (mbsf) to 2005 mbsf. Site C0002 is the centerpiece of the NanTroSEIZE project, and is planned to be deepened to eventually reach the seismogenic fault zone during upcoming drilling expeditions. The original Exp. 338 operational plan to case the hole to 3600 mbsf had to be revised as sudden changes in sea conditions resulted in damage to parts of the riser system, thus the hole was suspended at 2005 mbsf but left for future re-entry. The revised operation plan included additional riserless logging and coring of key targets not sampled during previous NanTroSEIZE expeditions, but relevant to comprehensively characterize the alteration stage of the oceanic basement input to the subduction zone, the early stage of Kumano Basin evolution and the recent activity of the shallow mega splay fault zone system and submarine landslides.
Here we present preliminary results from IODP Exp. 338: Logging While Drilling (LWD), mud gas monitoring and analysis on cuttings from the deep riser hole characterize two lithological units within the internal accretionary prism, separated by a prominent fault zone at $\sim$1640 mbsf. Internal style of deformation, downhole increase of thermogenically formed formation gas and evidence for mechanical compaction and cementation document a complex structural evolution and provide unprecedented insights into the mechanical state and behavior of the wedge at depth. Additionally, multiple samples of the unconformity between the Kumano Basin and accretionary prism at Site C0002 shed new light on this debatable unconformity boundary and suggest variable erosional processes active on small spatial scales. Results from riserless drilling at input Site C0012 include 178.7 m of detailed LWD characterization of the oceanic basement, indicating an upper $\sim$100 m zone of altered pillow basalts and sheet flow deposits, and a lower, presumably less altered basement unit without indication for interlayered sediment horizons. Low angle faults identified in X-ray Computed Tomography images and structural investigation on cores from Site C0022, located in the slope basin immediately seaward of the megasplay fault zone, indicate splay-fault-related, out-of-sequence thrusting within slope basin sediments and shed new light on recent activity of the megasplay. Lastly, Exp. 338 added additional coring to improve our understanding of submarine landslides in the slope basins seaward of the splay fault and yields new LWD data to characterize in situ internal structures and properties of mass-transport deposits as it relates to the dynamics and kinematics of submarine landslides.