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Overview of the extensive logging use in the scientific ocean drilling's most challenging project- NanTroSEIZE

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First of its kind in scientific drilling history, Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE) < www.iodp.org/nantrosize > is complex drilling project with multiyear and multistage effort, aimed at drilling, coring, logging, and instrumenting the seismogenic zone of an active subduction margin, in a region thought to generate megathrust earthquakes of magnitude > 8.0 on the moment-magnitude scale. Four stages are divided to realize ambitious scientific objectives using CHIKYU, most advanced floating laboratory in scientific drilling. Unlike the industry use of logging technology, expeditions in the scientific ocean drilling used logging data in much wider applications by working various software onboard Chikyu and laboratory measurements of core-cuttings throughout single or multiple expeditions, ranging from 40 to 56 days. Instead of traditional full coring, logging-while-drilling was made across the transect at the beginning to quickly access the geological and structural information from the formation. In line with changing tactic of heavy use on logging, four working groups were organized; lithologic characterization/lithostratigraphy, physical properties and hydrogeology, structural geology and geomechanics and cuttings/core-log-seismic integration (CLSI), and worked with few to 16 logging scientists.

During the Stage 1 with three expeditions, a transect of eight sites were drilled frontal thrust region, the midslope megasplay fault region, and the Kumano forearc basin region using full suite of Measurement-While-Drilling (MWD)/Logging-While-Drilling (LWD) tools and made coring and downhole measurements.

Stage 2 composed of two expeditions with the aims of building on the results of Stage 1 and preparing for later observatory installations for long-term monitoring of deformation at the updip limit of the seismogenic zone. Extensive logging program at riser site, first ever in scientific ocean drilling history, includes conventional wireline logging with long-awaited formation stress measurements and wide-angle walk-away VSP with longest-ever offset to have better velocity information of the very deep mega-splay fault, ultimate target of this project. Four sites including two sites which were missed in the Stage 1 were drilled, cored and logged with some basement rocks from the subduction inputs.

In addition to the common difficulties in drilling and logging planning, two major operational challenges, strong Kuroshio Current covering the area and borehole conditions from the tectonically active faulting environment, obviously caused substantial loss of operational time, failure of equipments and loss of logging toolstring. Presentation will focus on wide range of lessons-learnt during these operations and results from thorough reviews made on those difficulties and failures as part of the preparations for more challenges in coming stages to drill 7-km deep mega-splay and setting long-term borehole monitoring instruments.

Keywords: NanTroSEIZE, CHIKYU, MWD/LWD, Cuttings/core-log-seismic integration (CLSI)