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NanTroSEIZE LWD IODP Expedition 314: interpretation of logging units based on LWD borehole images and LWD measurements.

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Expedition 314 shipboard science party**

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Integrated Ocean Drilling Program (IODP) Expedition 314 was the inaugural scientific drilling mission of the new vessel, Chikyu, and the first expedition in the multistage Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE). This drilling project was designed to investigate fault mechanics and seismogenesis along subduction mega-thrusts through direct sampling, in situ measurements, and long-term monitoring.

Primary goals of Expedition 314 were to obtain a comprehensive suite of geophysical logs and other downhole measurements at sites along a transect from the incoming plate to the Kumano forearc basin using state-of-the-art logging-while-drilling (LWD) technology.

Drilling and logging was successfully completed at four sites, ranging in depth below the seafloor from 400 to 1400 m, and partial success at a fifth site. The logging program included the measurement with LWD tools of natural gamma radiation, azimuthal gamma ray density, neutron porosity, full waveform sonic velocity, azimuthal

resistivity imaging, zero-offset vertical seismic profile, ultrasonic caliper, and annular fluid pressure. Not all logs in this suite were collected at all sites.

Oriented resistivity and natural radioactivity images are available from sites C0001, C0002, C0004 and C0006. LWD logs and the oriented images were used to develop an integrated log-based characterization and logging unit and subunit definition. Textural and other sedimentary features like bedding and layering were analyzed on the LWD images. Based on LWD log response compositional features were constrained and interpreted. Main vertical trends and/or cyclicity analysis was performed also at each site and within the different units. Finally logging units were defined and characterized, based on this type of analysis and statistical analysis. Three logging units were defined for site C0001, four logging units for site C0002, three logging units for site C0004 and four logging units for site C0006. Three logging units were also defined for site C0003, in this case the interpretation was based only on a reduced measuring while drilling dataset.

The analysis of bedding features and dips on the oriented images, combined with the compositional features inferred from LWD logs analysis allowed us also to characterize also unit boundaries, main discontinuities and unconformities.

The methodology applied on the LWD was successful for definition and characterization of the main geological units at each site.