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Characterization of structures of the Nankai Trough accretionary prism from integrated analyses of LWD log response, resistivity images and clay mineralogy of cuttings: Expedition 338 Site C0002

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The objective of our research is a detailed characterization of structures on the basis of LWD oriented images and logs,and clay mineralogy of cuttings from Hole C0002F of the Nankai Trough accretionary prism. Our results show an integrated interpretation of structures derived from borehole images, petrophysical characterization on LWD logs and cuttings mineralogy.

The geometry of the structure intersected at Hole C0002F has been characterized by the interpretation of oriented borehole resistivity images acquired during IODP Expedition 338. The characterization of structural features, faults and fracture zones is based on a detailed post-cruise interpretation of bedding and fractures on borehole images and also on the analysis of Logging While Drilling (LWD) log response (gamma radioactivity, resistivity and sonic logs).

The interpretation and complete characterization of structures (fractures, fracture zones, fault zones, folds) was achieved after detailed shorebased reprocessing of resistivity images, which allowed to enhance bedding and fracture's imaging for geometry and orientation interpretation. In order to characterize distinctive petrophysical properties based on LWD log response, it could be compared with compositional changes derived from cuttings analyses.

Cuttings analyses were used to calibrate and to characterize log response and to verify interpretations in terms of changes in composition and texture at fractures and fault zones defined on borehole images. Cuttings were taken routinely every 5 m during Expedition 338, indicating a clay-dominated lithology of silty claystone with interbeds of weakly consolidated, fine sandstones. The main mineralogical components are clay minerals, quartz, feldspar and calcite. Selected cuttings were taken from areas of interest as defined on LWD logs and images. The clay mineralogy was investigated on the <2 micron clay-size fraction, with special focus on smectite and illite minerals. Based on X-ray diffraction analysis measured at room temperature and a relative humidity of $\sim$30%, we compared the shape and size of illite and smectite, as well as their water content and their polytypes.

The comparison of cuttings mineralogy with logging while drilling (LWD) data allowed us to characterize structural, petrophysical and mineralogical properties at fracture and fault zones. We also analyzed the relationship between deformation structures and compositional and mineralogical changes.

We established a correlation between observed results on clay mineralogy and log responses in relation with the structures and trends characterized on logging data. In general, the log data provide a good correlation with the actual mineralogy and the relative abundance of clay. In particular we analyzed trends characterized by smectite water layers as indication of compaction. These trends were correlated with log response (on sonic velocity) within Unit IV.

Our results show the integration of logging data and cutting sample analyses as a valuable tool for characterization of petrophysical and mineralogical changes of the structures of the Nankai accretionary prism.