Geophysical Research Abstracts
Vol. 12, EGU2010-13277, 2010
EGU General Assembly 2010

Characterization of compactant and dilatant deformation in the Nankai accretionary margin and implications for stress paths

Marianne Conin (1,2), Aurelien Boiselet (2), Sylvain Bourlange (2), Pierre Henry (1), and Philippe Gaillot (3)
(1) CEREGE, CNRS-U. Aix Marseille III-Collège de France, Aix en Provence, France (conin@cdf.u-3mrs.fr), (2) CRPG, INPL, Vandoeuvre lès Nancy, France, (3) ExxonMobil, Houston, TX, USA

Stage 1 of the Nantroseize project extended from the trench to the Kumano forearc basin and succeeded in drilling and coring the frontal thrust, a major splay fault, the forearc basin and the older wedge. The first approach we use is to combine LWD resistivity, moisture and density data, and other properties (physical and physico-chemical) obtained on core samples to infer the compaction state of the sediments. A correction of surface (and smectite interlayer) conductivity and amount of bound water (interlayer and adsorbed) present in clays is applied to resistivity and resistivity-derived porosity data to discriminate physical property contrasts due to variations in sediment composition. Second, we infer the physical properties of fault zones from logging data and images, and from X-Ray absorption using 3D CT-scan images on cores. The comparison of porosity variations associated with deformation zones on cores and in situ is used to distinguish dilatant structures, from compactant structures. This analysis shows that structures identified as conductive fractures on LWD images correspond in spatial distribution and orientation with compactant shear bands in the cores. Small faults are generally imaged as conductive fractures, and appear to be more common. However, most fault zones display both dilatant and compactant structures, as observed previously in the Muroto transect (Bourlange and Henry, 2003). The inner part of the accretionary wedge at Site C0001, located above the main splay fault, is the only zone where fluid induced dilatancy is inferred. There is no evidence for dilated overpressured zones at the toe of the main splay fault (Site C0004) nor at the frontal thrust (Site C0006). The presence or absence compactive shear bands depends on lithology and stress path. They are notably absent when the sediment is deformed on an unloading path or while in an over-consolidated state. Compactive shear bands are only frequent in the accreted sediment at site C0001. They are absent in equivalent lithologies at Site C0004 and Site C0006, except for a few occurrences within fault zones. There is also evidence of recent erosion at Site C0004 and Site C0006, which are located near the tip of thrust sheets. The distribution of compactive shear bands may thus be explained if active thrusts (either in sequence or out of sequence) define long term erosion and deposition patterns in accretionary wedges that also determine spatial variations in stress paths.