Geophysical Research Abstracts
Vol. 12, EGU2010-8002, 2010
EGU General Assembly 2010

Sediment strength contrasts and decollement localization in Nankai subduction zone

Hugues Raimbourg (1,2), Kohtaro Ujiie (1), Yozo Hamano (1), Saneatsu Saito (1), Masataka Kinoshita (1), and Achim Kopf (3)

(1) JAMSTEC, IFREE, Yokosuka, Japan, (2) ISTO, University of Orleans, France, (3) MARUM, University of Bremen, Germany

We experimentally characterized the mechanical properties of marine sediments entering the Nankai Trough subduction zone (southwestern convergent margin of Japan). The mechanical tests, based on the independent application of isotropic confining Pc and pore pressure Pp, aimed at assessing both the poroelastic compressibility as well as the resistance to compaction samples from ODP Site 1173 regularly spaced over the 250-700 meter below seafloor (mbsf) depth interval. The resistance to compaction, estimated as the irreversible uniaxial shrinkage upon application of an effective pressure in the order of twice in-situ value, shows large and non-linear variations. In a shallow domain (0-450 mbsf), samples are affected by large compaction, whereas in a deep domain (550-700 mbsf) compaction is much more limited; the transition zone between the two domains occurs at depths compatible with the actual decollement localization. Building on such experimental results, we designed a model to assess the effect of the increase in stress in a sedimentary column approaching the prism toe, which is based on the assumptions that (i) the porosity reduction associated with stress variations in the column varies strongly with depth according to our experimental results as well as drill core data, and that (ii) at least a small fraction of this porosity reduction results from horizontal compression (i.e. lateral shortening). In this modeling framework, differential compaction in response to horizontal compression between shallow and deep sections of an incoming column results in large differential displacement, i.e. shear strain in the transition zone, which may facilitate decollement propagation and therefore poses some control its localization.