Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05938, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05938
EGU General Assembly 2008

State of Stress in the Nankai Trough Accretionary Complex and Implications for the Seismogenic Cycle: Results from 3D Seismic Data and IODP Expedition 314

H. Tobin (1), M. Kinoshita (2), and IODP Exp. 314 Scientific Party

(1) University of Wisconsin-Madison (htobin@wisc.edu), (2) Japan Agency for Marine-Earth Science and Technology

Integrated Ocean Drilling Program (IODP) Expedition 314 was both the maiden scientific voyage of the new drilling vessel Chikyu and the first leg in the Nankai Trough Seismogenic Zone Experiment (NanTroSEIZE), a multi-year effort designed to investigate fault mechanics and seismogenesis along a subduction megathrust through direct sampling, in situ measurements, and long-term monitoring. During Expedition 314 (September - November 2007), our primary goals were to obtain a comprehensive suite of geophysical logs and other downhole measurements at several sites along a transect focused on the up-dip transition from seismic to aseismic fault behavior, using state-of-the-art logging-while-drilling (LWD) techniques and drilling to depths of 400 to 1400 m. In the Kumano region, the Nankai Trough forearc can be divided into (1) an inner wedge, comprised of a relatively older accretionary complex and overlying forearc basin that are hypothesized to lie over the up-dip end of the locked seismogenic megathrust; and (2) an “outer wedge” that is hypothesized as the active critical state accretionary wedge, with essentially aseismic mechanics. Seismically-imaged structural style and attributes vary markedly across this boundary. Resistivity image logs show borehole breakouts at all sites along the transect, with variable development in different structural/lithologic domains. The orientation of the maximum horizontal stress axis (SHmax) from breakouts across the outer wedge is consistently perpendicular to the local strike of major structure and somewhat oblique to plate convergence

direction. At the inner wedge/forearc basin drill site, the SHmax orientation is sub-parallel to strike, even in the upper part of the accretionary wedge domain beneath the basin. These results are consistent with a compressional to transpressional stress state in the outer wedge, transitioning over a few kilometers maximum distance to an extensional stress state in the inner wedge. We hypothesize that this stress transition is controlled by the position of the outer (up-dip) limit of the locked portion of the megathrust in the interseismic period, and may be temporally variable.