Seismic petrophysical analysis in the Nankai Trough accetionary prism

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Since the increasing interest on the Nankai Trough over the decades in relation with strong earthquake cycles in the area, geophysical surveys and then drilling related data has been in huge volume in scientists' hand. Among them, 3-D seismic data taken in 1999 and drilling results from two set of legs in 2000 and 2001 are the latest and highest in quality. Based on these datasets, core-log-seismic data integrated seismic petrophysical methods are used to make geological characterization of the decollement zone.

Scientific application of the powerful geophysical data processing and interpretation, which are in enormous volume to handle and complicated to find geophysical and geological meanings, is mostly used in the oil industry and still unfamiliar in the academia. Acoustic impedance inversion (AI) and Elastic Inversion (EI), Amplitude Variation along Offset (AVO) inversion, all these methods have been used to map reservoir properties in 2-D and 3-D seismic volumes in the oil industry, are tried in this study for fluid path and pore-pressure prediction along the decollement.

At first, 3-D prestack depth migration was done through the process of construction and updating of 3-D internal velocity model using the CDP bin gathers for which preconditioning processing including amplitude recovery, deconvolution, and multiple suppression with IFREE's in-house data processing facility (Park et al, oral presentation in this session). Moreover, downhole logging data, physical properties, bio- and litho-stratigraphy data from the ODP Sites 808, 1173, 1174 are used together. Finally, seismic petrophysical analysis was done on commercial geophysical software, including the preparation of the well-log data taken from the ODP are made for in situ and fluid replacement modeling, performing AVO QC and simplified inversion, creation of AVO Attribute Volumes and synthetic seismograms from the well data, making AVO analysis by crossplotting of several AVO attributes.

As the achievement of data integration is best between the 3 drilling sites, various inversion processes are performed in this zone where weak proto-decollement zone gradually changed to strong decollement zone to the landward. Finally, geophysical and geological meaning of the results from these inversion processes on the 3-D seismic volume will present.