High-resolution 3-D prestack depth imaging of the Nankai Trough off southeast Kii Peninsula

Jin-Oh Park[1]; Tetsuo No[2]; Kaoru Takizawa[3]; So Sato[4]; Yoshiyuki Kaneda[5]

[1] The University of Tokyo, ORI, CIC; [2] IFREE, JAMSTEC; [3] JAMSTEC, IFREE; [4] JGI, Inc.; [5] JAMSTEC,IFREE

The Nankai Trough subduction zone off southwest Japan is one of the best-suited convergent plate margins for studying large interplate subduction-zone earthquakes as well as the growth of accretionary prism. At this margin, the Philippine Sea Plate (PSP) is subducting beneath the Eurasian Plate (EP) to the NNW. The plate convergence rate is estimated to be 4 - 5 cm/yr. Megathrust earthquakes have repeatedly occurred along the Nankai subduction zone with a recurrence interval of 100-200 years. In late 2007, the IODP NanTroSEIZE project is going to drill into the seismogenic portion of the megathrust along which the 1944 Tonankai earthquake (M = 8.1) has occurred off the Kii Peninsula.

In order to figure out high-resolution architecture and physical property of the subducting PSP consisting of oceanic crust and incoming sedimentary strata, we have performed a high-resolution, three-dimensional (3-D) multi-channel seismic (MCS) reflection survey in the Nankai Trough off Kii Peninsula using R/V Kairei (KR06-02) of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) in March 2006. For this high-resolution 3-D MCS survey, we used a ~5-km, 204-channel streamer and ~100 m separated dual source, each of which is composed of two G-guns plus a GI-gun. Flip-flop shooting with 30 m interval yields ~50 m separated two CDP lines, resulting in 3.5 X 52 km 3-D seismic volume. Recording length with 1 msec sampling interval is 10 sec. Depths of source and streamer cable are 5 m and 8 m, respectively. We used REFLEX system for onboard real-time 3-D QC binning as well as SPECTRA navigation system. For the 3-D data, we applied pre-filtering, amplitude recovery, signature deconvolution, multiple suppression, 3-D geometry, flexible binning, NMO velocity analysis, and stacking. We have constructed and updated interval velocity volume model for 3-D prestack depth migration (PSDM) following 3-D prestack time migration using the CDP bin gathers.

A preliminary 3-D PSDM result shows high-resolution seismic images of Miocene to Pliocene Shikoku Basin sedimentary layer including three remarkable turbidite sequences, and oceanic crust underthrusting the overlying the accretionary prism. The oceanic crust of the subducting PSP is traceable over the entire inlines. The 3-D interval velocity model demonstrates a significant landward velocity increase within subducting upper Shikoku Basin sedimentary layer beneath the trench turbidite fill and the prism toe, suggesting compaction and dehydration due to the overburden of overlying sediments.