Renovated 3D image of Nankai accretionary wedge and shallow seismogenic zone off Kumano through reprocessing of 3D seismic data

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For the next stage of the deep scientific drilling in Nankai Trough seismogenic zone off Kumano, it is essential to obtain precise structural image and depth estimation around the mega-splay and the plate boundary fault, as well as fine structures in accreted sediments around the drilling site. In 2006, three dimensional multi-channel seismic data acquisition and processing were carried out as a cooperative project between the center for deep earth exploration (CDEX) of JAMSTEC and US (NSF). However, obtained data could not necessarily resolve deep structures due to relatively short (4.5 km) streamers and due to the strong Kuroshio current.
In order to obtain the clearer depth image for the next deep drilling target, we decided to reprocess a part of the 3D volume with today’s advanced technology. First, preprocessing with recent technologies of multiple elimination and broadband processing was applied in order to clarify reflection signals. Second, the pre-stack time migration for time domain imaging, the sophisticated velocity model building in depth domain, and the pre-stack depth migration were carried out to obtain the fine depth image.
Although the reprocessed 3D volume will be carefully inspected onward, so far we noticed the following preliminary points. Improved images in the shallow accretionary wedge reveal dynamic deformation features (e.g. branching of splay faults, thrusting of the lower Shikoku Basin formation, BSRs). Lower Shikoku Basin formation below the forearc slope area show anomalously low Vp, consistent with estimation by Park et al. (2010 Geology). Additional reflectors above decollements are identified in the formation.
Low Vp zone (<4km/s) spreads beneath the splay fault and above the top of oceanic crust, consistent with Kamei et al. (2012) estimated from the full-wave inversion analysis of MCS-OBS data.
3D geometry of the megasplay fault below the southeastern Kumano Basin indicates a bending downward feature in its southeastern rim of reprocessed area. This bent area is overlain by an anomalously high-Vp volume (>5 km/s) with ~1km thickness on the hanging wall side. We also identify a couple of landward-dipping reflectors in this high-Vp region, in a good contrast with a region of no remarkable reflectors shallower than 3000m below seafloor (i.e. above the high-Vp region). Careful inspection will modify or add these preliminary interpretations.

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