

Seismic reflection image of the Nankai accretionary wedge

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We carried out multi-channel seismic (MCS) reflection survey to study structure of the Nankai Trough seismogenic zone since 1999, using R/V Kairei of the Japan Marine Science and Technology Center (JAMSTEC). We used a 12,000 cubic inch array of air-guns as the controlled sound source whose signal was received by a 156-channel streamer with 25 m group spacing (i.e., 4 km).

In this paper, we show migrated MCS profiles crossing the Nankai Trough, and describe the structural features of plate-boundary decollement in the 1946 Nankai coseismic rupture zone. Particularly, we focus on the plate-boundary decollement off Kii peninsula. Compared with off Shikoku island, large (more than 2 m) coseismic slip of the 1946 event unusually extends seaward off Kii peninsula. We identify a clear seismic reflector of the Philippine Sea plate subducting beneath the overriding Eurasian plate, which can be observed more than 60 km landward from trough axis. Most of the decollement steps down to the top of the oceanic crust at most ~20 km landward from trough axis, suggesting incipient interplate coupling (lock) there. Updip end of the 1946 coseismic rupture that was estimated from tsunami inversion, is in good agreement with the decollement stepdown portion. This fact indicates that full interplate coupling occurs soon after the incipient coupling. Shorter distance of the decollement occurrence suggests that interplate coupling off Kii peninsula becomes strong faster than that off Shikoku island. We propose that a diversity of thermal regime along the Nankai Trough may produce such a different patterns of the plate-boundary decollement occurrence and subsequent interplate coupling.