

Seismic reflection profiles from multichannel seismic survey in southwestern offshore of the Kii Peninsula

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To investigate characteristics of the subducting Philippine Sea Plate and overlying sediments and their relation with seismic activities in the Nankai Trough, southwest Japan, we conducted seismic surveys using multichannel seismic (MCS) system and ocean-bottom seismographs (OBS). In this study, we present seismic imaging results from the two-dimensional dense MCS survey in a southwestern offshore area off the Kii Peninsula. We acquired the MCS data during the cruise KM18-10 from November to December in 2018 using R/V Kaimei. The data were collected along a total of approximately 2,500 km two-dimensional survey lines using a 4.5 –5.7 km hydrophone streamer and a totaling 10,600 cubic-inch airgun array firing at 50 m intervals. The depth of the streamer and airguns were 25 m and 10 m, respectively. To obtain subsurface reflection profiles every 4 km intervals, we processed the MCS data along 27 survey lines; 23 lines in the NW-SE direction and 4 lines in the EN-WS direction. After preprocessing including noise attenuation, deghosting, designature, demultiples, and Q compensation, we carried out prestack migration in both time and depth domains. Interpreting structural features from the new seismic images, we observed depth and topographic variation of the subducted plate interface. The deepest portion of the subducted plate was located in the south of the Kii Peninsula. We also recognized the variation of sediment thickness on the incoming plate along the trench, and we identified past seamounts in the western part and depression of the oceanic crust in the eastern part which were buried with thick sediments in the Shikoku Basin. These buried structures in the incoming plate suggest an analogy of possible origin of the topographic variation of the subducted plate interface. On the accretionary prism with imbricated thrust faults, thick slope basins that contains several unconformities with dipping strata and past landslides were clearly imaged outside of the eastern Muroto Trough. The structural features imply the intermittent deposition in the basins or drastic structural change during the development of thrust faults in the underlying sediments of the accretionary prism. The reflection amplitude at the bottom of sediments of the eastern Muroto Trough at the south of the Kii Peninsula is higher than that in other parts, and this fact suggests existence of some specific rocks generating high impedance contrast beneath the eastern Muroto Trough only at the south of Kii Peninsula. In addition to the geometrical factors on the subducting plate interface, detailed investigations on structures and lithologies in the overlying sediments are important to better understand seismic activities with structural development in this region.

Keywords: Seismic reflection profile, multichannel seismic, Nankai Trough