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Heterogeneous structure of the incoming Philippine Sea plate along the southwestern Nankai Trough

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The next large-thrust earthquake along the Nankai Trough, southwest Japan is concerned to occur within this century. First break of historical large-thrust earthquakes along the Nankai Trough are known to be always located off the Cape Shiono. Non-volcanic deep low-frequency tremors and earthquakes considered as one of indicators of the future large-thrust earthquakes are observed around the down-dip limit of the coseismic rupture zone of the last Tonankai and Nankai earthquakes [Obara, 2002]. However the absence of Nonvolcanic deep low-frequency tremors and earthquakes is recognized between Shikoku Island and Kii Peninsula. One of the causes of these low-frequency seismic phenomena is considered to be fluid generated by dehydration processes from the subducting slab. It is important to investigate structural variation in the incoming Philippine Sea plate, including its fluid content to understand the generation of the low-frequency seismic phenomena as well as large-thrust earthquakes.

In 2014, we conducted the seismic refraction and reflection survey in the northern margin of the Shikoku Basin, where the Philippine Sea plate is subducting beneath the Eurasia plate at the Nankai Trough. We conducted a 360km long seismic profile about 50-60km seaward of the deformation front along the Nankai Trough. 35 OBSs were deployed along the profile with the interval of 10km. A tuned airgun array shot with a total volume of 7800 cu. in. every 200m for OBSs, and 380 cu. in. every 37.5m for a 192-channel, 1.2km-long hydrophone streamer.

In the time-migrated reflection section, variation in the sedimentary layer and basement reflection can be recognized off Shikoku, which may correspond with the boundary of the plate age proposed by magnetic lineation [Okino et al., 1999]. In the southwestern part of the profile, the basement reflection is not always clear, and shows smooth structure. Comparatively in the northeastern part, basement changes in depth drastically with prominent reflection signals. Moreover result of first-arrival tomography based on the wide-angle OBS data shows dramatic change in P-wave velocity just beneath the basement corresponding with the structural boundary observed along the reflection section as mentioned above.

We will show the structural variation of the oceanic crust and the uppermost mantle of the incoming plate, which may be related to the formation of the Shikoku Basin as well as the generation of large-thrust earthquakes and low-frequency events, by using OBS data.

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