Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG68-P09 Room:Convention Hall Time:May 23 18:15-19:30

Crustal structure beneath the Boso Peninsula revealed by seismic refraction/wide-angle reflection profiling

Yoshitaka Nakayama[1], Hiroshi Sato[1*], Takaya Iwasaki[1], Susumu Abe[2], Tanio Ito[3]

[1]Earthquake Research Institute, The universoty of Tokyo, [2]JGI, Inc., [3]Tekyo-Heisei University

The Philippine Sea plate (PHS) is being subducted beneath Boso Peninsula, and Neogene fore-arc sediments and accretionary complex are widely exposed on land, providing an exceptional opportunity for the research on the structure and tectonic processes of the fore-arc region. In this study, we aimed to understand geological structure of the fore-arc area and geometry of the upper boundary of the subducting PHS.

In Boso peninsula, seismic reflection and refraction survey was conducted in 2002 along a 150-km-long seismic line trending NNE-SSW (Sato et al., 2003). A near vertical seismic reflection section portrays the fore-arc basin structure north of the Mineoka belt and the geometry of PHS. However, ambiguity remains with the geologic structure of the south of Mineoka belt and deep geometry of PHS slab.

In this study, seismic data were analyzed by refraction and wide-angle reflection methods to construct P-wave velocity model. The obtained P-wave velocity profile suggests that the Mineoka belt is marked by higher velocity zone (4 km/s) than that of Neogene sediment cover. The accretionary prism, south of the Mineoka belt, shows lower velocity (Vp $<$ 6 km/s) down to the plate interface.

In the north of the Mineoka belt, thick ($<$ 5 km) Neogene fore-arc sediments are identified as low velocity zone (1.7-3.1 km /s). The pre-Neogene rocks under fore-arc sediments show high velocity (Vp = 4.8-5.1 km/s). The pre-Neogene upper crust suggests higher velocity (Vp = 5.9-6.1 km/s) in the northern part of the seismic line and decrease to the south. The northern part corresponds to the Sambagawa metamorphic belt and the Ryoke belt, the Chichibu and the Shimanto belt are in the central part. We compared the seismic reflection profiling which was obtained by Ito et al. (2009) with our profiling to estimate the structure of basement. A thin Cretaceous sediment cover (Vp = 4.3 ˜ 4.8 km/s) occurs in the northern most part of the seismic line.

The Mineoka belt is estimated the past plate boundary between past subducting Pacific plate and current subducting PHS because the Mineoka belt and the accretionary complex do not show high velocity like the shimanto belt.

Using ray-tracing method, upper surface of PHS slab and Moho discontinuity of the overriding plate were mapped. In the southern end of this section, the upper boundary of PHS is located about 10 km in depth and shows 15 degrees of northward dipping. The thickness of PHS is estimated as 10 km. The depth of Moho of overriding plate is 23 km in northern part and slightly decreases its depth toward south. The upper surface of downgoing slab is traced down to about 30 km. The contact area between the upper boundary of PHS and the crust of overriding plate is coincide with the area of larger slip deficit on the PHS obtained by geodetic observation (Sagiya, 2004).

Keywords: Crustal structure, Boso Peninsula, seismic velocity structure, seismic refraction analysis, fore arc structure, Philippine Sea plate