Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SSS031-02 Room:105 Time:May 23 11:00-11:15

Plate structure below the Boso Peninsula, central Japan, estimated from converted waves observed by the MeSO-net (2)

Hisanori Kimura[1*], Tetsuya Takeda[1], Kazushige Obara[2], Shin'ichi Sakai[2], Keiji Kasahara[2], Naoshi Hirata[2]

[1]NIED, [2]ERI, Univ. of Tokyo

The Philippine Sea plate (PHS) is subducting below the Kanto region, central Japan. The great 1923 Kanto earthquake (M7.9) occurred on the PHS and its largest aftershock (M7.6) occurred in the next day of the mainshock off the Boso Peninsula, southeastern Kanto. Knowledge about the factors which control source regions of these phenomena is important to reveal their generation mechanisms. Converted waves are often observed between P and S arrivals for earthquakes off the Boso Peninsula. Detailed examination of numerous seismograms and seismic survey revealed that they are converted at the submarine volcaniclastic and volcanic rock layer (hereinafter, VCR-layer) widely distributed on the PHS (Kimura et al., 2010). Recently, dense seismographic network, called 'MeSO-net', has been under construction at the Tokyo metropolitan area. In the previous study, we showed that clear later phases are also observed by the MeSO-net and they correspond to the SP converted waves excited at the bottom of the VCR-layer. In this study, we determined a configuration model of the conversion plane by taking advantage of the dense distribution of the MeSO-net.

We determined the configuration model by try and error. Initial velocity model was constructed based on the structure revealed by Kimura et al. (2010). We also considered surface thick sedimentary layer to evaluate traveltimes accurately. For this purpose, we incorporated the subsurface structure of the Japan Seismic Hazard Information Station (J-SHIS) (Fujiwara et al., 2009). We considered layers with Vp smaller than 3800 m/s as sediments and replaced shallow part of our velocity model with J-SHIS model. For analysis, finite difference traveltime calculation program, called 'FAST' (Zelt and Barton, 1998), was used.

We obtained a preliminary model in which the conversion plane has a dipping angle of 45 degree with a strike in the N20E direction at the eastern coast of the Boso Peninsula 18 km depth. This model has the smallest RMS (root-mean-square) of traveltime residuals. In the case that the observed wave is the SP converted wave at the bottom of the VCR-layer, this model shows that the plate boundary of the PHS is dipping westward. SP converted waves were also observed for nearby earthquakes and they can be explained by this model, too.

Such significant undulation of the plate boundary is likely to affect the occurrence of earthquakes. Location of the undulation corresponds to the western edge of the region of repeating earthquakes. The southern extension along the strike of the dipping plane coincides with the boundary between the source regions of the 1923 Kanto earthquake and its largest aftershock. These observations imply that the configuration of the plate boundary controls the distribution of repeating earthquakes and the segment boundary of the great earthquakes. Takeda et al. (2007) made a unified configuration model of the PHS near the subduction entrance (Sagami trough) by compiling previous seismic surveys and showed that the dipping angle of the PHS is larger at the western part of the Sagami trough. Our result is consistent with the result of Takeda et al. (2007), however, our result indicates that the spatial change of the dipping angle is more abrupt. Further study considering the spatial change of the plate boundary structure including the VCR layer is necessary to reveal the plate dynamics in more detail.

Acknowledgements: We used the subsurface structure of the Japan Seismic Hazard Information Station (J-SHIS) (Fujiwara et al., 2009).

Keywords: Kanto region, MeSO-net, converted wave, plate boundary, 1923 Kanto earthquake, segment boundary