3D seismic velocity structures at the off-Boso Peninsula

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1. Introduction

In the Kanto region, the North American plate, the Philippine Sea plate (PHS) and the Pacific plate are mutually interrelated. Thus various seismological events have occurred along the Sagami Trough, for example, the 1923 Kanto earthquake and the Boso slow slip events (e.g., Ozawa et al., 2003). To reveal the process of these events, it is required to obtain the detailed structure at the Off-Boso area. The purpose of this research is to estimate 3D seismic velocity structure at the Off-Boso peninsula.

2. Methods and data

We applied the Double-Difference tomography (Zhang and Thurber, 2003) to arrival data obtained by steady observation stations and ocean bottom seismometers (OBSs). Data from the OBSs improve resolutions in the oceanic area. We used the unified catalog of the Japan Meteorological Agency for the period between August 2009 and March 2012. After several iterations, travel time residuals reduced from 183 msec to 83 msec for P wave, from 328 msec to 131 msec for S wave. As results of checkerboard resolution tests, our results can resolve 10 km scale in horizontal direction and 5~10 km scale in depth direction for P wave.

3. Results

Our results show subducting PHS in the direction of northwest for P and S wave velocity structures. The PHS seems like a flat form under the Off-Boso. We estimated geometry of the upper surface of the PHS by tracing the Moho which is estimated from the velocity structures. As a result, we can estimate a rough trend of the geometry under the oceanic area. The isodepth contour of 10km runs in parallel with the Sagami Trough. On the other hand, the isodepth contours of 20km and 30km have curved forms toward northeast.

It is pointed out that there is a serpentinized mantle in the mantle wedge of the PHS (e.g., Kamiya and Kobayashi, 2000). So we investigated distribution of this serpentine area. The serpentine area distributes under northeast of the Off-Boso, and the boundary of this area has strike of NW-SE, but it locally curves toward south beneath Mobara city. This geometry is similar to that proposed by Nakajima et al. (2010), but our results moves northward compared with the result by Nakajima.

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