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

SCG68-02 Room:303 Time:May 23 14:30-14:45

Configuration of Moho discontinuity beneath Japanese Islands estimated with seismic tomography

Makoto MATSUBARA[1]*

[1]NIED

1. Introduction

P-wave seismic velocity is up to 7.0 km/s in the lower crust, however, that in the mantle is over 7.5 km/s. There is a large velocity gradient at the Moho discontinuity between the crust and mantle. Zhao et al. (1992) estimated the Moho discontinuity based on the seismic velocity model. Ryoki (1999) gathered the Moho models obtained by reflection and refraction seismology. Katsumata (2010) estimated the Moho discontinuity with tomographic method.

Fine-scale three-dimensional seismic velocity structure beneath Japanese Islands is estimated using data obtained by dense seismic network (Matsubara and Obara, 2011). I can calculate the velocity gradient between the grid nodes. I estimate the configuration of Moho discontinuity with the isovelocity plane with large velocity gradient.

2. Data and method

I calculate the P-wave velocity gradients between the vertical grid nodes between a P-wave velocity from 6.5 to 8.0 km/s with interval of 0.1 km/s. The largest velocity gradient is 0.078 (km/s)/km at velocities of 7.2 and 7.3 km/s. In this study, I define the isovelocity plane of 7.2 km/s as the Moho discontinuity.

3. Result

The Moho discontinuity deepens over 35 km beneath Tohoku backbone range, Kitakami mountains, Eastern Chubu district, northern Kinki district, Chugoku mountains, northern Kyushu district, and eastern Kyushu district. The shallower Moho discontinuity shallower than 30 km depth is distributed beneath the southeastern Hokkaido district, northern and southern Kanto district except Tokyo district, Noto peninsula, southern Tokai, Kinki, and Shikoku district, and southwestern Kyushu district.

The characteristic shallow Moho discontinuity beneath the southeastern Hokkaido district and deep Moho discontinuity beneath the Tohoku backbone range, eastern Chubu district, and eastern Kyushu district are also estimated by Zhao et al. (1992), Ryoki (1999), and Katsumata (2010). The shallow Moho discontinuity beneath the northern and southern Kanto district and deep Moho discontinuity beneath Tokyo is one of the characteristic Moho configuration of this study and is consistent with the model by Katsumata (2010). I can estimate the complex configuration of Moho discontinuity not only along the isodepth line not parallel to the coastal line as well as that parallel to the coastal line same as Katsumata (2010), however, Ryoki (1999) and Zhao et al. (2010) estimated that only parallel to the coastal line. The Moho discontinuity beneath the Chugoku district deeper than 35 km is also one of the characteristic structures of this study, however, that by Katsumata (2010) is shallower than 30 km. My model is consistent with that by Ryoki (1999) and Shiomi et al. (2006). Ryoki (1999) estimated the deep Moho discontinuity beneath the central Chugoku and Shikoku district and Shiomi et al (2006) estimated the Moho configuration deeper than 35 km beneath the Chugoku mountains using receiver function method.

It is difficult to identify the Moho discontinuity of the Eurasian plate where the lower crust of the Eurasian plate contacting the oceanic crust of the Philippine Sea plate using seismic velocity structure since there is no mantle high-velocity material. However, I can detect the Moho discontinuity if there is a mantle material since there is a high-velocity zone. Deep low-frequency tremors are observed beneath the southwestern japan (e.g. Obara, 2002). They occur at the boundary of the partly serpentinized mantle wedge in the Eurasian plate and the oceanic crust at the uppermost part of the subducting Philippine Sea plate (Matsubara et al., 2009). It is possible that the Moho discontinuity on the south side of the tremor zone is the Moho discontinuity within the subducting Philippine Sea plate. The shallow Moho discontinuity shallower than 30 km beneath the southern Tokai and Kinki district is consistent with Shiomi et al. (2008).

Keywords: Moho discontinuity, tomography, Japanese Islands, seismic velocity, 7.2 km/s