

Crustal and upper mantle structure beneath the southwestern part of Japan

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Beneath the southwestern Japan, the Philippine Sea plate is subducting from south. Yamauchi et al. (2003) and Shiomi et al. (2004) estimated the configuration of the upper boundary of the plate with receiver function method. Zhao et al. (2001) obtained velocity structures of P- and S-wave with resolution of about 20 km. In this study, we obtained the fine P- and S-wave velocity structure beneath the southwestern Japan.

Detailed P- and S-wave velocity structures beneath southwestern Japan are obtained by applying the tomographic method (Zhao et al., 1992) with spatial correlations of velocities (Matsubara et al., 2004) to 817,357 P-wave arrival times from 683,873 earthquakes recorded at National Research Institute for Earth Science and Disaster Prevention's (NIED) high-sensitivity seismograph network of Japan (Hi-net). The investigated region is 31-38N, 130-139E, with depth range of 0-600 km. The horizontal spacing of the grid nodes is 0.05 degree at depths of 0-25 km, 0.1 degree at depths of 25-45km, and 0.125 degree at depth of 45-600 km and that in the vertical direction is 2.5 km at depth of 0-10 km, 5 km at depth of 10-50 km, and 15 km at depths of 50-600 km. The corresponding resolution is twice as grid interval, say, 0.1, 0.2, 0.25 degree at each depth, horizontally.

We found high velocity anomaly within depths of 30-70 km beneath Kii peninsula, Shikoku region, and eastern Kyushu. Seismicity accompanying the subducting Philippine Sea plate is active in the high velocity zone beneath the eastern Shikoku region and low velocity zone in the uppermost subducting plate beneath the western Shikoku region. At depths of 45 and 50km, high velocity zone as the mantle of Philippine Sea plate coincides with the result of the receiver function analysis (Shiomi et al., 2004).

Seismicity in the crust beneath the Chugoku region is active in high velocity zone. Beneath the southwestern Chugoku region, microseismicity is active around depths of 30 km, however, beneath the northwestern region, that is active within the depths of 5-15 km. High velocity anomaly beneath the northwestern region is also shallower than that beneath the southwestern region. Deep low-frequency event occur at depths around 35 km beneath the boundary of Tottori and Shimane prefecture, westward of Mt. Daisen and low velocity zone also exist within depths of 20-30 km beneath Mt. Daisen.

Low velocity zones exist at depths around 25 km beneath the eastern Shikoku region and at depths around 30 km beneath Awaji Island. These structures coincide with those derived from receiver function method (Shiomi et al., 2004) and from tomographic method (Zhao et al., 2001).