

Low-velocity oceanic crust at the top of subducting plates resolved by a tomographic method with spatial correlation

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The detailed velocity structure beneath Japan arc is obtained applying the tomographic method (Zhao et al., 1992) with spatial correlations (Matsubara et al., 2001) to 1,061,936 P-wave arrival times from 19,943 earthquakes recorded at National Research Institute for Earth Science and Disaster Prevention's (NIED) high-sensitivity seismograph network of Japan (Hi-net) at 664 stations. The investigated region is 29-46N, 129-146E, with depth range of 0-200 km. The horizontal spacing of the grid nodes is 0.125 degree in the crust, 0.25 degree in the mantle, and that in the vertical direction is 2.5-5 km in the crust and 7.5-15 km in the mantle. The corresponding resolution is twice as grid interval, say, 0.25 degree in the crust and 0.5 degree in the mantle, horizontally.

We found a 5-7 % low velocity zone within depths of 30-50 km beneath the northeastern Japan arc corresponding to the upper boundary of the subducting Pacific plate. In Kanto region, two low-velocity zones have been found at depths of 40-100 km in the southern part and around 30 km in the western part. The deeper section is 5 % lower than the average velocity corresponding to the upper boundary of the Pacific plate and coincides with the S-wave reflector proposed by Obara and Sato (1988). The shallower one is about 10 % lower than the average velocity and indicates the upper boundary of the subducting Philippine Sea plate supporting the results of Ohmi and Hurukawa (1996). We conclude that these low velocity zones are the oceanic crusts that exist at the top of the subducting Pacific and Philippine Sea plates.

We also found the low velocity zones along both the volcanic front beneath the northeastern Japan arc and the back-arc side in the upper mantle. These zones are parallel to the subducting Pacific plate. The high velocity zone indicating the subducting Philippine Sea plate beneath the eastern Kyushu district, the western edge of Japan arc is also shown clearly.