Three dimensional P- and S- Wave Velocity Structure beneath Mt. Fuji

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In this study, we applied the method proposed by Zhao et al. (1992) to the area from 35N to 35.67N, from 138.33E to 139.17E and shallower than 40km depth to determine three dimensional (3-D) P- and S- Wave velocity structures beneath Mt. Fuji. The grid interval was 0.04 degree horizontally and 5 km vertically. Initial velocity structures for the inversion were those obtained in Nakamura et al. (2003) that were beneath whole Japan. Moreover, we determined structures only in the center 20'x20' area, and outside the area, structures were fixed to those of Nakamura et al. (2003).

We used 2,908 P arrival times and 2,483 S arrival times of 255 regional high frequency normal earthquakes that occurred from October 1997 to December 2003, observed at 43 stations.

We obtain 3-D P and S wave velocity structures beneath Mt. Fuji, which are more accurate than previous ones. Beneath the center area of Mt. Fuji, P and S wave velocities are several percents faster at the depth ranging from 5km to 15km, and are several percents slower bellow the depth on the average, compared to standard velocity structures used in Japan Meteorological Agency (Ueno et al., 2002). We can see prominent P and S wave low velocity zones beneath the depth ranging from 15 km to 20 km. Moreover, we can see a high Vp/Vs ratio beneath about 20 km depth. The latter is magma chamber beneath Mt. Fuji. Low frequency earthquakes that occurred at the northeast of the summit exist upper outside of the magma chamber. Also, high frequency normal earthquakes beneath Mt. Fuji occur at the same circumstance. Furthermore, the low velocity zones are edge parts of prominent and wide P and S wave low velocity zones existing beneath central Japan at the depth ranging from 30km to 40km seen in Nakamura et al. (2003). It suggests that magma genesis processes related to the subducting Pacific and Philippine Sea plate influence the volcanic activity of Mt. Fuji. Prominent P and S wave low velocity zones exist at the south part of the mountain shallower than 5km depth. Nakamura et al. (2003) shows that the low velocity zones spread to Omaezaki along Suruga Bay. It proves that the low velocity zones result from sediment deposits related to accretionary prisms generated by subducting Philippine Sea plate from Suruga trough.

References: Nakamura et al., 2003, Abstr. 2003 Japan Earth Planet. Sci. Joint Meeting, S053-P010.; Ueno et al., 2002, Q. J. Seismol., 65, 123-134.; Zhao et al., 1992, JGR, 97, 19909-19928.