Three-dimensional body-wave velocity structures beneath Mt. Fuji

Yoshie Ogami[1]; Masaki Nakamura[2]; Akimichi Takagi[3]; Kenji Fujiwara[2]; Motoo Ukawa[4]; Hidefumi Watanabe[5]

[1] MC; [2] JMA; [3] MRI; [4] NIED; [5] Earthq. Res. Inst., Univ. Tokyo

We applied the double difference tomography method proposed by Zhang and Thurber (2003) to the area beneath Mt. Fuji to determine three dimensional P and S wave velocity structures. The grid interval was 2 km. We used 36,244 P arrival times, 32,930 S arrival times, 138,426 P catalog double differences, 122,953 S catalog double differences, 623 P cross-correlation double differences and 365 S cross-correlation double differences of 2,378 earthquakes, including no low frequency quakes, observed at 54 stations. Here, because JMA did not pick phases for the stations on the mountain, we made picked data of those stations. Initial velocity structures for the inversion were those obtained in Nakamura et al. (2008) that were beneath whole Japan.

We obtained 3-D P and S wave velocity structures beneath Mt. Fuji, which were more precise than previous ones. The models were generally consistent with the previous studies (Nakamichi et al., 2007; Nakamura et al., 2004). We could see low Vp zone at the depth deeper than 15 km beneath the summit. Nakamura et al. (2008) showed that there were a low Vs zone and a high Vp/Vs ratio at the deeper depth. Those were probably magma chamber. A low Vp, a low Vs and a low Vp/Vs ratio existed around the depth of 5 km beneath the mountain. Nakamichi et al. (2007) pointed out that a low Vp, a low Vs and a low Vp/Vs ratio would show abundant volatile fluid, which would facilitate the generation of low frequency earthquakes. Therefore, the depths of low frequency tremors could be shallower, which were estimated to be from 10 km to 15 km. Low Vp and low Vs zones existed on the eastern and southeastern parts of the mountain at the depth of 0 km, which would correspond to deposits of volcanic mudflows and avalanche deposits. We could see high velocity zones at the depth of 10 km, rising a little beneath the summit. In those zones, high frequency earthquakes occurred. Therefore, those zones might correspond to the subducting Philippine Sea plate beneath Mt. Fuji.

I would like to thank the members who operate the above observation network to provide useful data.

References: Nakamichi et al., 2007, JGR, 112, doi:10.1029/2005JB004161; Nakamura et al., 2004, Abstr. 2004 Japan Earth Planet. Sci. Joint Meeting, V055-P012; Nakamura et al., 2008, PEPI, 168, 49-70; Zhang and Thurber, 2003, BSSA, 93, 1875-1889.