

Three dimensional P- and S-Wave Velocity Structure beneath Kirishima Volcanoes

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In this study, we applied the method proposed by Zhao et al. (1992) to the area from 31.68N to 32.10N, from 130.60E to 131.14E and shallower than 40 km depth to determine three dimensional (3-D) P- and S-Wave velocity structures beneath Kirishima volcanoes. The grid interval was 0.03 degree horizontally and 3 km vertically. Initial velocity structures for the inversion were those beneath whole Japan obtained in Nakamura et al. (2003). Moreover, we determined structures only in the center area from 31.77N to 32.01N, from 130.72E to 131.05E and shallower than 14 km, and outside the area, structures were fixed to those of Nakamura et al. (2003).

We used 2,708 P arrival times and 1,553 S arrival times of 339 regional high frequency normal earthquakes that occurred from October 1997 to December 2004, observed at 15 stations and the explosion experiment conducted there in 1994 (Kagiya et al., 1995).

We obtain 3-D P- and S-wave velocity structures beneath Kirishima volcanoes, which are wider and more accurate than previous ones, and are almost consistent with those by previous studies (e.g. Nishi, 1997; Yamamoto and Ida, 1994). In the target area, P- and S-wave velocities are several percents slower at all depths on the average, compared to standard velocity structures used in Japan Meteorological Agency (Ueno et al., 2002). Judging from resolution tests, the patterns of the both P- and S-wave velocity structures are almost realistic, but are not similar. Prominent low velocity zones of P- and S-waves exist along the Kagoshima volcanic graben at the depth ranging from 5 km to 15 km. We can see low velocity zones of P- and S-waves beneath Ogiri and Kirishima hot springs shallower than dozen kilometers and beneath Takaharu-cho shallower than several kilometers, where is the geothermal field. Also, a high velocity zone exists beneath the south of Karakuni-Dake shallower than 1 km. Moreover, we can recognize a low velocity zone of P-wave beneath the area from northern Hinamori-Dake to the direction of Kobayashi basin and Kakuto caldera shallower than 1 km. The low velocity zone is probably for sedimentary deposits. Kagiya et al. (1994) presented that an anomaly related to a magma, which was detected by an MT survey and seismic waves, exists beneath northwestern volcanoes, which are norther than Nakadake, at the depth deeper than 10 km and extends to craters but no chamber beneath southeastern volcanoes. We can see these features for the S-wave velocity structure.

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