# Three-dimensional imaging of the magma chamber beneath Unzen volcano

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We estimated 3-D P and S-wave velocity structures beneath Unzen volcano using 15,848 P and 8,917 S arrival times from 1,096 local, shallow and intermediate-depth earthquakes. The results show that a prominent cone-shaped low-velocity anomaly (3-6%) exists beneath the Unzen volcano, which may represent a magma chamber that contributed to the recent volcanic eruption. The cut-off depth of the crustal earthquakes becomes shallow toward the crater of the Unzen volcano, and it is coincident with the upper boundary of cone-shaped low-velocity zone. Our results indicate that the crustal seismogenic layer in volcanic areas is controlled by the geothermal regime, and seismic tomography is able to reveal the lateral variations of the transition zone between the brittle to ductile layers.

The Unzen volcano in southwest Japan erupted recently on November 17, 1990. It is located at the central part of Shimabara Peninsula, western Kyushu. The Kyushu subduction zone in southwest Japan is characterized by active subduction of the young Philippine Sea plate beneath the Eurasian plate. Active arc volcanoes form a distinct volcanic front in the central portion of the Kyushu island. The Unzen volcano is separated about 90 km from the volcanic front. A number of previous researchers have investigated the three dimensional (3-D) seismic structure of Kyushu included the Unzen volcanic area, but the structure of magma beneath the volcano has not been imaged clearly yet.

In this study we have estimated high-resolution 3-D P and S-wave velocity structures beneath Unzen volcano using 15,848 P and 8,917 S arrival times from 1,096 local shallow and intermediate-depth earthquakes which occurred in and around Kyushu. The data were collected from the Japan University Network Earthquake Catalog (January 1993 to December 1995) published by the Earthquake Research Institute, University of Tokyo.

The results show that a prominent cone-shaped low-velocity anomaly (3-6%) exists beneath the Unzen volcano. This anomaly may represent a magma chamber that contributed to the recent volcanic eruption. The cut-off depth of the crustal earthquakes becomes shallow toward the crater of the Unzen volcano, and it is coincident with the upper boundary of cone-shaped low-velocity zone. These results indicate that the crustal seismogenic layer in volcanic areas is controlled by the geothermal regime, and seismic tomography is able to reveal the lateral variations of the transition zone between the brittle to ductile layers.