Three-dimensional seismic attenuation structure around Mt. Hakone from temporary observation data

Hirokazu Kashiwagi[1], *Junichi Nakajima[1], Yohei Yukutake[2]

1. Department of Earth and Planetary Sciences, Tokyo Institute of Technology, 2. Hot Springs Research Institute of Kanagawa Prefecture

Mt. Hakone is located at the northern end of a volcanic chain along the Izu–Bonin arc and is known for frequent occurrences of shallow earthquake swarms (e.g., Harada et al., 2013) and deep low-frequency earthquakes (e.g., Yukutake et al., 2019), both of which seem to be related to the migration of magmatic fluid. Yukutake et al. (2015) found a low-velocity and high-Vp/Vs region at depths of 10–20 km beneath Mt. Hakone and interpreted it as a magma chamber. However, deeper part of the magmatic system is poorly understood. It is considerably important to reveal fine-scale heterogeneous structure beneath Mt. Hakone for better understanding of volcanic activities and for the disaster prevention.

We therefore estimate three-dimensional (3-D) P-wave attenuation (Q_p^{-1}) structure around Mt. Hakone to investigate magmatic system in the crust. We used temporary observation data collected by Hot Springs Research Institute of Kanagawa Prefecture. We first determine the corner frequencies of the earthquakes, and then conduct a joint inversion to determineattenuation terms. The 3-D Q_p^{-1}structure is finally obtained via a tomographic inversion.

Shallow high-attenuation zones observed around Mt. Hakone are consistent with the distribution of deposits and fracture zone filled with hydrothermal fluid. A vertical moderate-attenuation area is imaged beneath Mt. Hakone at depths of 10–20 km, which is connected with the zone of partial melting in the uppermost mantle. Because deep low-frequency earthquakes occur in this area and some fluid-related structures such as fractured zone and earthquake swarms are located above this area, we interpret the moderate-attenuation area as a fluid-feeding pathway, through which magmatic fluids may be supplied from the uppermost mantle to the shallow crust immediately beneath Mt. Hakone.

