

P- and S-wave velocity imaging of the Izu-Oshima volcano using dense onshore-offshore active-source and noise datasets

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The Izu-Oshima volcano is an active stratovolcano of the Izu-Bonin arc offshore Japan, that last erupted in 1986-1990. Imaging viscoelastic structures of the volcano and surrounding tectonic settings is essential to understand the volcanic system of the Izu-Oshima volcano. We analyze a unique seismic dataset acquired in 2009, and image regional tectonic and fine-scale local volcanic structures by exploiting active-source and ambient noise data. Four days of seismic data were recorded using existing 36 seismographs, 286 temporary geophones, and 37 temporary Ocean Bottom Seismographs (OBSs). During the period, large-volume air-gun sources and explosives were densely excited along a 200-km OBS line and around the Izu-Oshima island. Traveltime tomography of the active-source data provides a P-wave velocity model of the large-scale tectonic structure, as well as of the detailed volcanic structures beneath the island. Our image shows a low velocity area in the northeast of the summit at the location of the caldera. We also reveal that a low velocity zone extends downwards from the summit to the north-east side of the volcano. This low velocity zone coincides with the location of frequent volcanic earthquakes, and may suggest the overpressured region. From the cross-correlation of the ambient noise data, we estimate S-wave velocity structures of the shallow subsurface. The estimated S-wave model indicates several high-velocity areas in the caldera, that may be related to previous eruptions.

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