# Magma pathway in the crust beneath Aso caldera imaged by 3-D electrical resistivity model

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Aso caldera, at the island of Kyushu in the Southwest Japan Arc, was formed during 270–90 ka by four huge eruptions with hundreds of cubic kilometers of pyroclastic deposits. Numerous post-caldera volcanoes occurred at the central part of the caldera after the huge eruptions. Naka-dake, one of the post-caldera volcanoes, has frequently erupted since the sixth century. In the past few years, the first crater of Naka-dake experienced several types of small eruptions: a magmatic eruption in November 2014, a phreatomagmatic eruption in September 2015, and an explosive eruption with spewing volcanic ash 11,000 m into the air in October 2016. Thus, it is important to characterize the magma supplying system beneath the caldera for understanding the activity of Aso volcano.

The crustal structure beneath Aso caldera has been studied previously by electromagnetic and seismic surveys. Seismic tomography of the crust has identified low-velocity anomalies beneath the caldera that may correspond to magma chambers [e.g., Sudo and Kong, 2001; Abe et al., 2017]. Sudo and Kong [2001] reported a spherical low-velocity anomaly centered at 6 km depth that flattens at 10 km depth to the west of Naka-dake. Abe et al. [2017] reported that two large low-velocity layers exist at depths of 8–15 beneath the northeastern part of the caldera and at depths of 15–23 km in the western part. We revealed a magma pathway imaged as a conductive anomaly of north inclination, extending to Naka-dake from depths of >10 km, based on an electrical resistivity model obtained by inverting magnetotelluric (MT) data for 55 sites [Hata et al., 2016]. The anomaly appears on a sill-like deformation source inferred from GPS data at a depth of 15.5 km beneath the caldera [*Geographical Survey Institute*, 2004], and partially overlaps with the respective low-velocity anomalies [Sudo and Kong, 2001; Abe et al., 2017]. On the other hand, we now need a high-resolution resistivity model in the horizontal and vertical directions to perform more detailed verification about magma supplying system beneath Aso caldera.
We carried out an additional MT survey for 45 sites to improve the spatial resolution of a resistivity model by increasing the density of survey sites in and around the caldera. Then, we performed three-dimensional (3-D) inversion analyses to obtain a crustal-scale resistivity model with higher resolution than the previous model, by using the period range between 0.005 and 2,380 s of MT data for about 100 sites in total. In the inversion process, we use a parallelized DASOCC inversion code [e.g., Siripunvaraporn and Egbert, 2009]. Based on the new resistivity model, a magma supplying system beneath Aso volcano is imaged as follow: a magma of north inclination migrates upward from deeper depths of ~20 km through the northern part of the sill-like deformation source and the western part of the spherical low-velocity anomaly, and then extends toward the first crater of Naka-dake.

Keywords: Aso caldera, 3-D electrical resistivity model, Magma supplying system

 