3-D electrical resistivity model beneath Aso caldera for clarifying magmatism in the lower crust

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Aso caldera, with a diameter of up to 25 km, is situated on the island of Kyushu in the Southwest Japan Arc. The caldera was formed during 270–90 ka by four huge eruptions that produced hundreds of cubic kilometers of pyroclastic deposits. A number of post-caldera cones/volcanoes exist at the central part of the caldera and Naka-dake, one of the cones, has cyclically erupted since the sixth century. In the past few years, Naka-dake experienced 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.

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., 2010]. 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. [2010] reported a large, low S wave velocity layer at a depth of about 17 km, corresponding to the Conrad discontinuity in and around Aso caldera. Hata et al. [2016] revealed a possible magma pathway in the form of a significant series of electrical conductive anomalies in the upper crust, extending north from Naka-dake at depths of >10 km. However, the space resolution of a magnetotelluric (MT) survey was insufficient to examine the lower crustal structre in the electrical resistivity/conductivity model for a deep-seated magma reservoir associated with the post-caldera magmatism beneath Aso caldera.

We had carried out a MT survey of about 40 sites mainly at the outer part of the caldera from Nov. to Dec. 2016 in addition to the previously obtained about 50 sites in the caldera from Nov. to Dec. 2015. By using the period range between 0.005 and 2,380 s of MT data for about 100 sites in total, we try to perform three-dimensional (3-D) inversion analyses in order to obtain a crustal-scale electrical resistivity structure (model). In the inversion process, we use a parallelized DASOCC inversion code [e.g., Siripunvaraporn and Egbert, 2009]. In this presentation, we will show the new crustal-scale resistivity model beneath Aso caldera.