

3次元電気比抵抗モデルによる阿蘇カルデラのマグマ活動解明に向けて 3-D electrical resistivity model beneath Aso caldera for clarifying magmatism in the lower crust

*畑 真紀¹、松島 喜雄¹、高倉 伸一¹、宇津木 充²、橋本 武志³

*Maki Hata¹, Nobuo Matsushima¹, Shinichi Takakura¹, Mitsuru Utsugi², Takeshi Hashimoto³

1. 産業技術総合研究所、2. 京都大学大学院理学研究科附属地球熱学研究施設火山研究センター、3. 北海道大学大学院理学研究院附属地震火山研究観測センター

1. Advanced Industrial Science and Technology, 2. Aso Volcanological Laboratory, Institute for Geothermal Sciences, Graduate School of Science, Kyoto University, 3. Institute of Seismology and Volcanology, Graduate School of Science, Hokkaido University

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 structure 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.