Three-dimensional resistivity structure around the lava dome of Chausu-dake volcano inferred from the AMT measurements

*Takahiro Kishita[1], Wataru Kanda[2], Shinichi Takakura[3], Kaori Seki[1], Yasuo Matsunaga[1], Yusuke Kinoshita[1], Koki Aizawa[4]

1. Department of Earth Planetary Sciences, Tokyo Institute of Technology , 2. Volcanic Fluid Research Center, Tokyo Institute of Technology, 3. National Institute of Advanced Industrial Science and Technology, 4. Volcano Research Center, Earthquake Research Institute, University of Tokyo

Chausu-dake volcano is located in the northern part of Tochigi prefecture, and started volcanic activity about 16000 years ago. Six large-scale eruptive activities including the magmatic eruptions and many phreatic explosions were reported. The last large-scale activity occurred during 1408-1410 and formed a present lava dome in the summit area. After that, several phreatic explosions occurred repeatedly and formed two craters on the northwestern side and western side of the lava dome on July 1st, 1881. Recently, phreatic explosions occurred in these craters in 1953, 1960, and 1963, and fumarolic activities are observed there today.

According to the observation by the Japan Meteorological Agency (2015), the fumarolic temperature decreased gradually after the phreatic eruption of 1963 and is kept at about 100℃ recently. Volcanic earthquakes within the edifice are hardly observed and the plume height is low. It seems that volcanic activity is quiet. It is important to know the subsurface structure of the volcano which is in a decreasing volcanic activity. This is because the inner structure of a quiet volcano provides the basic information to know the present state of volcanoes in the increasing activity. Therefore, we investigated the resistivity structure around the lava dome of Chausu-dake volcano using audio-frequency magnetotelluric (AMT) method.

An AMT measurement was already conducted around Chausu-dake volcano by Aizawa et al. (2009) and two-dimensional resistivity structure was inferred. The result shows that the volcano constitutes a thin resistive layer underlying a thick conductive layer. The conductive layer was considered to be composed of the upper layer which is rich in conductive clay minerals and therefore has low permeability and the lower layer containing hydrothermal fluids. The altered layer was considered to act as both the base for meteoric groundwater flows and the cap for hydrothermal fluids. However, the model of Aizawa et al. (2009) was obtained from a two-dimensional inversion using only the TM-mode data, although the data showed three-dimensional (3-D) features. In addition, the AMT data was measured along a mountain trail south of the lava dome, so a detailed subsurface structure of the lava dome is still unknown..

In this study, we carried out an AMT survey in the whole area of the lava dome in 2016 to clarify more detailed structure beneath the lava dome of Chausu-dake volcano. In the presentation, we are going to report a three dimensional resistivity structure model inferred from the AMT data observed by this study and of Aizawa et al. (2009), in which the topography is incorporated.

Keywords: Nasu volcano group, Chausu-dake volcano, AMT, lava dome, resistivity structure

