浅間山の3次元比抵抗構造
Three-dimensional resistivity structure of Asama Volcano

*臼井 嘉哉[1,2]、小川 康雄[1,2]、相澤 広記[3]、神田 径[1,2]、橋本 武志[4]、小山 崇夫[5]、山谷 祐介[6]、三品 正明、鍵山 恒臣[7]
*Yoshiya Usui[1,2], Yasuo Ogawa[1,2], Koki Aizawa[3], Wataru Kanda[1,2], Takeshi Hashimoto[4], Takao Koyama[5], Yusuke Yamaya[6], Masaaki Mishina, Tsuneomi Kagiyama[7]

1.東京工業大学大学院理工学研究科、2.東京工業大学火山流体研究センター、3.九州大学大学院理学研究院附属地震火山観測研究センター、4.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、5.東京大学地震研究所火山噴火予知研究推進センター、6.産業技術総合研究所福島再生可能エネルギー研究所、7.京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
1.Graduate School of Science, Tokyo Institute of Technology, 2.Volcanic Fluid Research Center, Tokyo Institute of Technology, 3.Institute of Seismology and Volcanology, Faculty of Sciences, Kyushu University, 4.Institute of Seismology and Volcanology, Faculty of Science, Hokkaido University, 5.Volcano Research Center, Earthquake Research Institute, University of Tokyo, 6.Fukushima Renewable Energy Institute, National Institute of Advanced Industrial Science and Technology, 7.Aso Volcanological Laboratory Institute for Geothermal Sciences Graduate School of Science Kyoto University

Asama volcano is an andesitic composite volcano located in central Japan. The present active crater locates at the eastern part of the complex. At the west of the crater, there is a horseshoe-shaped caldera, which was formed after the collapse of an old stratovolcano at around 24,000 years ago. In order to reveal the relationship between volcanic activities and subsurface structure, two-dimensional resistivity structure of Asama volcano has already been obtained by Aizawa *et al.* (2008) from the data of dense magnetotelluric survey. However, three-dimensional steep topography around Asama volcano can distort the observed response functions. Therefore, in this study, we performed three-dimensional inversion with the same data set as the previous study. In the inversion, we utilized the scheme proposed by Usui (2015), which enabled us to incorporate precise topography around the mountainous area into the computational mesh with the aid of the unstructured tetrahedral element.
The measurement stations used in the inversion consist of 36 magnetotelluric stations and 37 audio-magnetotelluric stations, and we used full components of the impedance tensor and the vertical magnetic transfer function. Though some stations of them measured only electric fields, the different locations of electric and magnetic fields were taken into account in the inversion algorithm. Galvanic distortion parameters were also estimated as model parameters in addition to subsurface resistivity values.
In the obtained resistivity structure, there is a spherical resistive body at the altitudes from 0.5 to 1.5 km under the collapse caldera. From impedance phases, Aizawa *et al.* (2008) inferred that the resistive body was isolated. By the three-dimensional inversion, we confirmed that the resistive body under the caldera was isolated. We found that hypocenter locates around the isolated resister under the caldera. Aizawa *et al.* (2008) suggested that this resistive body is old solidified magma and it impedes the ascending magma. The result of our analysis supports the suggestion.
In addition, at the depths deeper than 0 km below sea level, resistivity of the west of the summit was relatively higher than surrounding area. This higher resistivity area is elongated to WNW-ESE direction and locates over the location of dyke intrusions estimated from seismic and geodetic measurements (Takeo *et al.*, 2006). This high resistivity area also corresponds to high P-wave

velocity and high-density area revealed by Aoki *et al.* (2010). They suggested that the high velocity is due to the solidification of repeatedly intruded magma. Our result is consistent with this interpretation since the porosity of solidified magma is considered to be low and it can lead to high resistivity in that area. On the other hand, the surrounding conductive area may consist of higher porosity rocks with saline water.

キーワード：MT法、火山構造、3次元地形、3次元インバージョン、非構造四面体要素
Keywords: magnetotelluric method, volcanic structure, 3-D topography, 3-D inversion, unstructured tetrahedral element

