A preliminary resistivity model in the south part of Mt. Ontake volcano

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Investigating underground structure in volcano such as distribution of magma chamber and hydrothermal area is essential to understand mechanisms of eruptions. Around the Mt. Ontake volcano, two previous studies investigated 3-D resistivity distribution. Abd Allah & Mogi (2016) modeled subsurface resistivity distribution beneath the top of Mt. Ontake volcano using the grounded electrical-source airborne transient electromagnetic (GREATEM). They found a conductive zone in the east part of the volcano, the resistive zone at about 1 km deep, and moderately resistive zones in the other most part in the volcano. Ichihara et al. (2018) clarified resistivity distribution below the southeast flank of Mt. Ontake volcano based on the magnetotelluric (MT) investigations. They found two conductive zones interpreted as hydrothermal areas. However, resistivity structures over 1 km deep have not been investigated around the top of Mt. Ontake volcano. In this study, we conducted MT measurements around the top of Mt. Ontake volcano to clarify the 3-D resistivity structure including deep area.

We measured MT data at 9 sites using ADU-07e system from Metronix Geophysis Co. around the top of Mt. Ontake volcano on 10-12 September and 7-11 October, 2019. The sampling frequencies are 32, 1024, 32k, and 524kHz. The data were recorded 1-2 days for the 2 lower frequencies and 1-3 hours for the 2 higher frequencies. We estimated MT impedances at observed site using BIRRP program (Chave & Thomson, 2004). To reduce noise, the remote reference technique was applied. For the 1k, 32k, and 524kHz data, we used horizontal magnetic field data at the observation site which observed the same time with observation site. For the 32Hz data, we used horizontal magnetic field data from site OKR at Okura village, Yamagata Prefecture observed by Geothermal Energy Research & Development Co.

We then estimated preliminary 1-D resistivity structure based on grid search which find minimum RMS misfit between observed impedance and calculated responses. We supposed that resistivity structures consist of horizontal 2 and 3 layers from sounding curves at the site 009 (this study) and the site 305 (Kanehiro et al., 2018), respectively. The obtained resistivity structure beneath the site 305 is consistent to the previous structure by Abd Allah & Mogi (2016). Trend of the resistivity structure is also similar to the model by Abd Allah & Mogi (2016) at the site OTT008 although more conductive resistivity is estimated in this study. We will conduct additional MT surveys and then analyze 3-D resistivity distribution in the future.

Keywords: Ontake, magnetotelluric method

