箱根大涌谷の３次元比抵抗構造
A 3-D resistivity structure of Owakudani Steaming Area, Hakone Volcano

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Phreatic eruptions occurred in recent years in many volcanoes in Japan, for example, at Shinmoe-dake on October 11, 2017 and at Mt. Motoshirane on January 23, 2018. Since the eruption scale is generally small, it is difficult to detect the precursor signals relevant to phreatic eruptions. Therefore a mechanism of phreatic eruptions has not been clarified yet. However the hydrothermally altered minerals were contained in ejecta of the eruption in many cases, which suggested that the phreatic eruptions is strongly related to the hydrothermal system developed within a volcanic edifice.

Hakone Volcano has several geothermal fields including Owakudani, Sounzan, and Kamiyuba in the northern area of Mt. Kamiyama, which is one of the post-caldera cones of the volcano. In this volcano, a small phreatic eruption occurred at Owakudani on June 29, 2015, and four new craters and dozens of fumaroles were newly formed. During the eruption, and its precursor activities, several intrusion events of hydrothermal fluid beneath the post-caldera cones were implied by the seismic and geodetic observation.

The objective of this study is to image the hydrothermal system beneath the Owakudani from a three-dimensional (3-D) resistivity structure, and to discuss the relationship between the distribution of hydrothermal fluids and the source of volcanic activities. In addition, the comparison with the resistivity structure obtained in other volcanoes becomes highly important information to reveal the occurrence mechanism of phreatic eruptions, because the phreatic eruption at Owakudani occurred following to the remarkable precursory activity.

The audio-frequency magnetotellurics (AMT) data were collected at 29 sites around Owakudani in April and June, 2017. The quality of data was moderate at most of the sites in a frequency range between 5 Hz and 10400 Hz. A 3-D resistivity structure was estimated using the inversion code based on a finite element method with unstructured tetrahedral elements in which detailed topography was incorporated (Usui, 2015; Usui et al., 2017).

The inferred 3-D resistivity model indicated that a slightly resistive portion is present underneath a thin conductive area just beneath Owakudani. This surface conductive area seems to be distributed along an inverse U-shape, and the northern part of the area reaches to Kamiyuba that was formed after the seismic swarm activity in 2001. In the presentation, we will give the detailed description of resistivity features and interpretation of them.

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