MT 法による雌阿寒岳北麓の比抵抗構造探査：序報

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Preliminary report on the magnetotelluric surveys on the northern foot of Meakandake volcano

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Abstract

We performed the broadband MT survey in the northern part of Mt. Meakandake, one of the active volcanoes in eastern Hokkaido to clarify the relationship between the subsurface electrical structure and the volcanic activities of this area. On the northeastern foot of Meakandake, remarkable crustal deformation has been reported on the basis of the GNSS observation and InSAR analysis from late 2016 through 2017. The provisional deformation source model (Geospatial Information Authority of Japan, 2018) suggested an opening of sill–like crack at a depth of about 6 km. Around Meakandake, a MT survey was previously conducted in the eastern area as a part of the Geothermal Development Promotion Survey by NEDO (NEDO, 1992). More recently, an AMT survey was performed across the summit along a NE–SW direction as a volcano study (Takahashi et al., 2018). However, because of the limited sounding depths and the measurement locations of these previous surveys, the resistivity structure related to the above–mentioned deformation source has not been clarified. Therefore, in this study, we planned a NW-SE trending measurement line across the inflation source on the northern to eastern foot of the volcano. We deployed 12 broadband MT sites along the survey line in August to September in 2018 (Fig. 1).

The overall characteristics of the apparent resistivity and phase curves suggested the structure of roughly high–low–high resistivity from the surface toward deeper part. Based on the estimate of the skin depth, we expected that the depth of the intermediate low resistivity layer would be a few kilometers. Meanwhile, the induction vectors and phase tensors suggested an electrical regional strike of N60°W, which was almost parallel to the survey line. For this reason, we considered that the present data set were inappropriate for a 2–D

analysis. Thus, as the first trial in this study, we sought 1–D models for the individual sites based on the Occam's inversion code of Constable et al. (1987), in which we used the apparent resistivity and the phase that were calculated from the ssq impedance (Szarka and Menvielle, 1997; Rung–Arunwan et al., 2016) as the input data. In the inversion, we only used a frequency range between about 0.1 and 100 Hz, in which the responses showed approximately a 1–D feature. The inverted 1–D models exhibited distinct low resistivity layer (1–10 Ωm) at depths around a few hundred meters to 1 km at all sites. In addition, at the sites in the SE half of the survey line, another low resistivity layer of approximately 10 Ωm was associated at a depth around 2–3 km.

Considering the approximate coincidence in the horizontal location, we suspect that the latter low resistivity has some relation to the inflation source, although their depths are different. This should be further investigated and discussed through additional measurements and more robust modeling, as well as in combination with updated deformation models in the future.

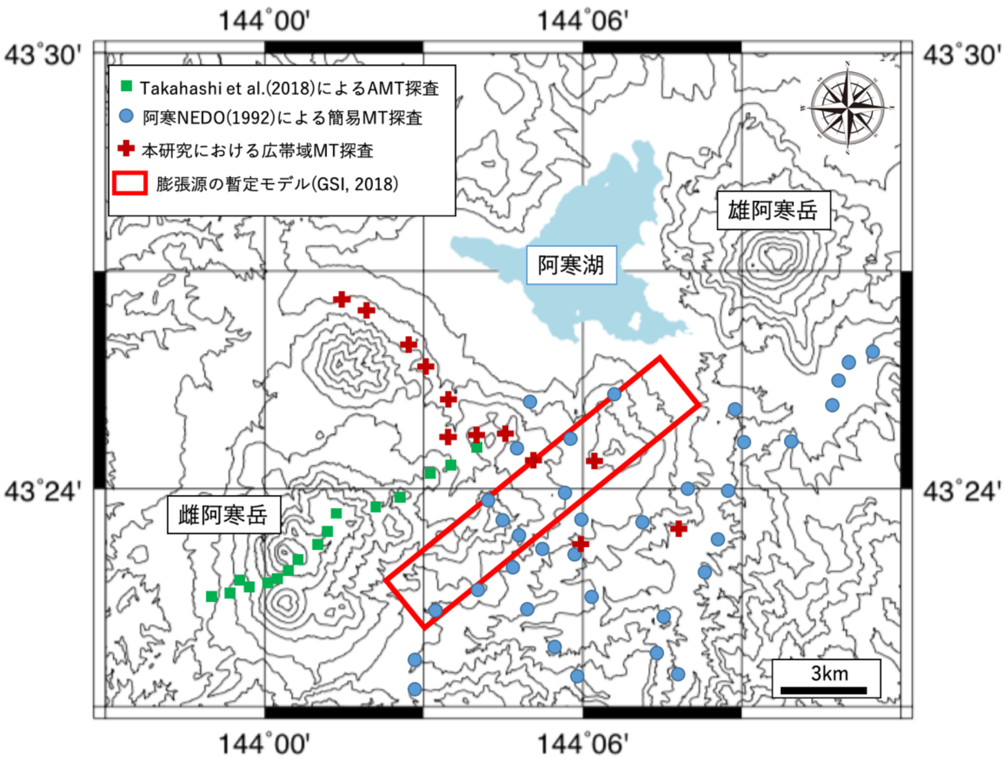

Fig. 1: Location map of the MT sites in this study and the previous studies.

Acknowledgments

We are grateful to Prof. S. Sakanaka of Akita University for the instrumental support. Dr. R. Tanaka and Mr. S. Narita at ISV, Hokkaido University are thanked for their supports in the fieldwork and helpful advice for the study. We also express our sincere thanks to Prof. T. Mogi for his discussion and advice.

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