Electrical resistivity modeling of Mt. Tokachidake and the surrounding area, Central Hokkaido using broadband magnetotellurics

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Abstract:

Mt. Tokachidake is an active volcano which is located at the central Hokkaido, Japan. Recently, the volcanic activities have been occurring actively, including eruptions, ground inflation and demagnetization. Previous studies indicate that the shallower part of low-resistivity structure below Mt.Tokachidake is hydrothermal system and the deeper low-resistivity structure extends to 45km in a westward direction. According to Iwama (2021), the deeper anomaly is considered as an upwelling part in the mantle wedge and is related with the volcanic hydrothermal systems and the presence of magma below Mt. Tokachidake.

However, the detail and scale of the deeper anomaly region is unknown. Therefore, it is necessary to conduct further broadband magnetotellurics survey for the deeper structure of Mt. Tokachidake and the surrounding area.

In this study, we conducted broadband magnetotellurics around Furano region in north-south direction to image the deeper subsurface structure of the region. In the southern area of Furano, the sounding curves of apparent resistivity and phase angle are high. The results are indicative of the 1-D structure. In the area which is close to Mt. Tokachidake (R4-P270, Fig. 2f), apparent resistivity decreases, and phase angle remains high. The result indicates the presence of anomaly resistivity structure. These results are consistent with the previous study (Iwama, 2021). In next year (2023), we plan to conduct broadband magnetotellurics at Naka-Furano area and Biei-Cho to obtain more data of the northern area of Furano region to image and confirm the scale and condition of the resistivity structure of the anomaly revealed by Iwama (Fig. 2a~2j, Fig. 3).
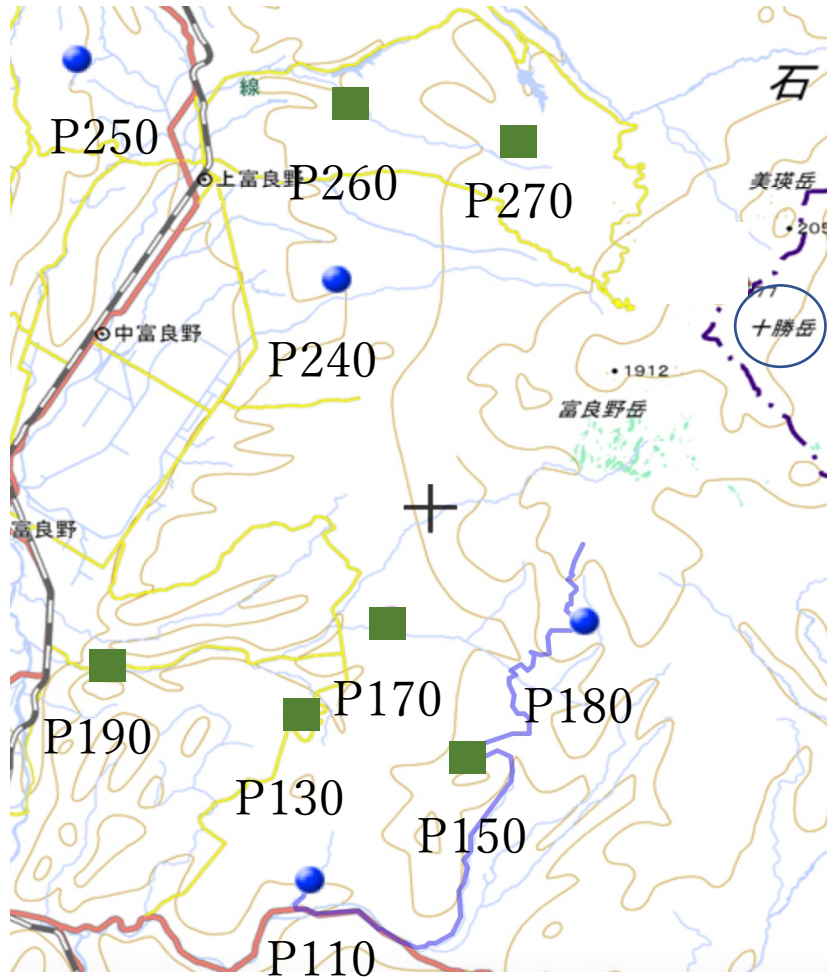
Fig. 1 Observation sites of 2022. Green squares represent sites which obtain magnetic and telluric data, blue circles represent sites which obtain telluric-only data.
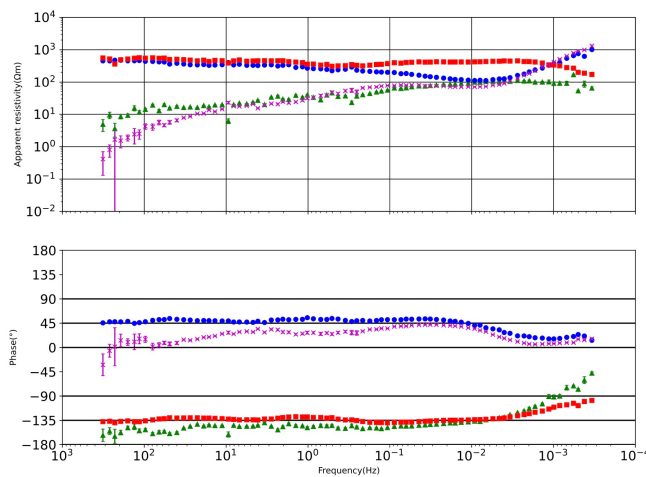

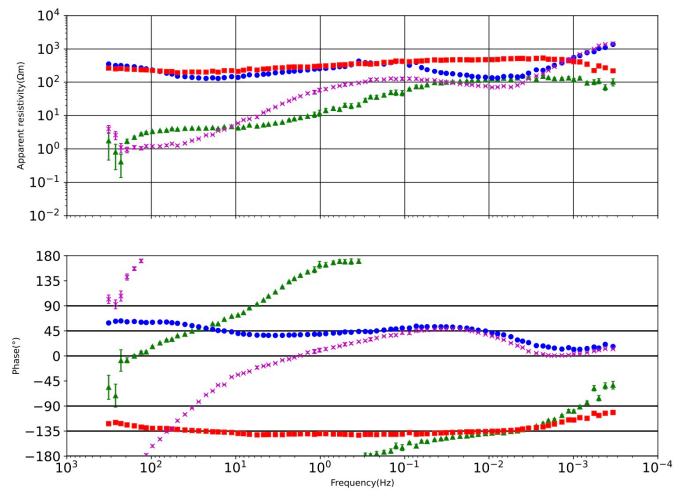Fig. 2a Apparent resistivity and phase angle of R4 – P130

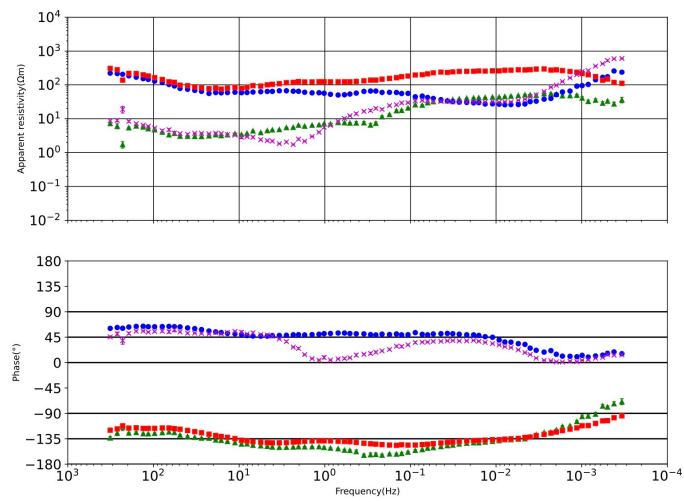Fig. 2b Apparent resistivity and phase angle of R4 – P150

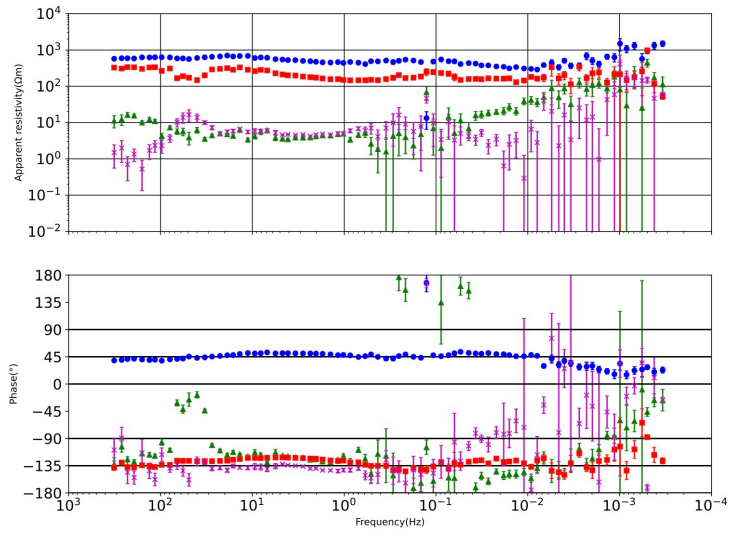Fig. 2c Apparent resistivity and phase angle of R4 – P170

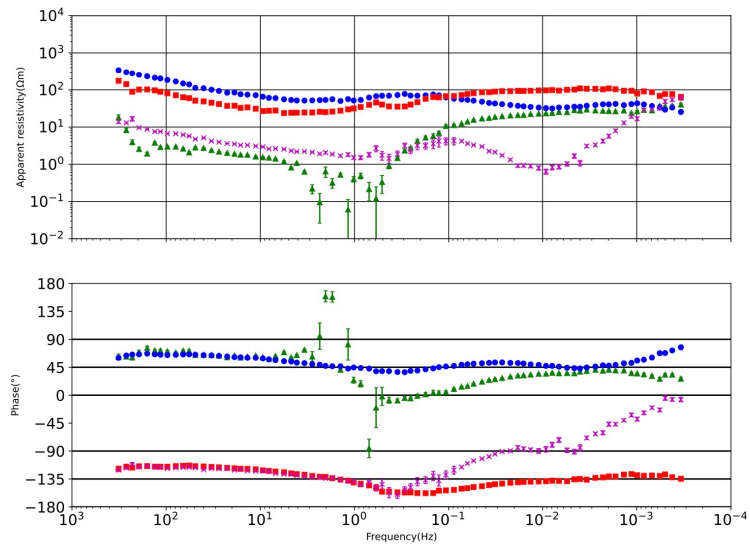Fig. 2d Apparent resistivity and phase angle of R4 – P190

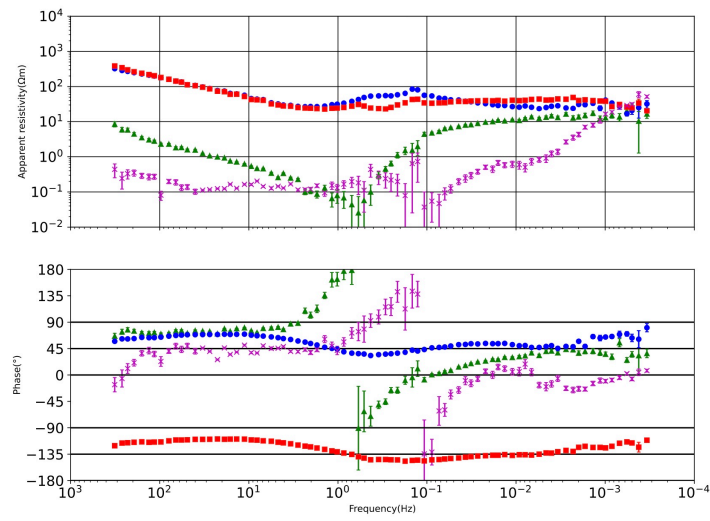Fig. 2e Apparent resistivity and phase angle of R4 – P260

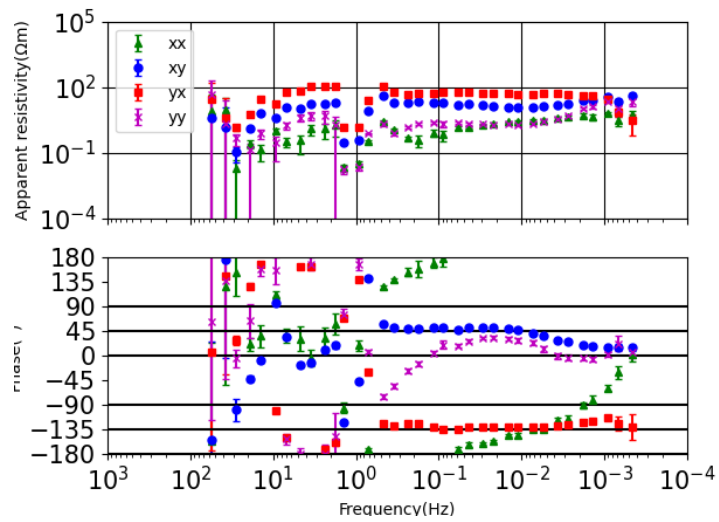Fig. 2f Apparent resistivity and phase angle of R4 − P270

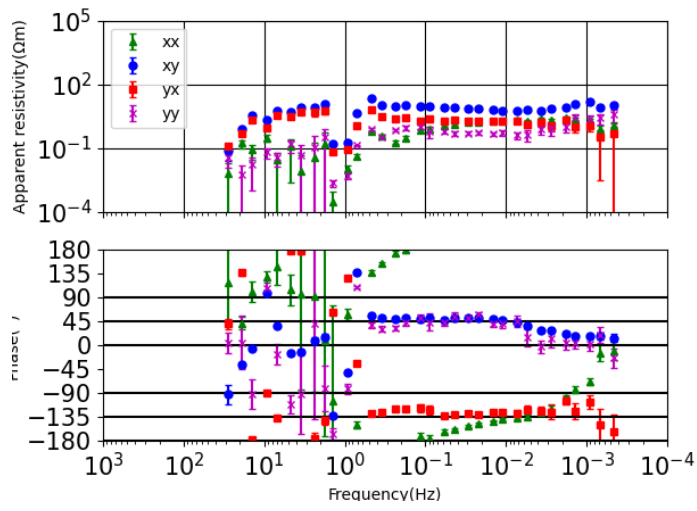Fig. 2g Apparent resistivity and phase angle of R4 − P110

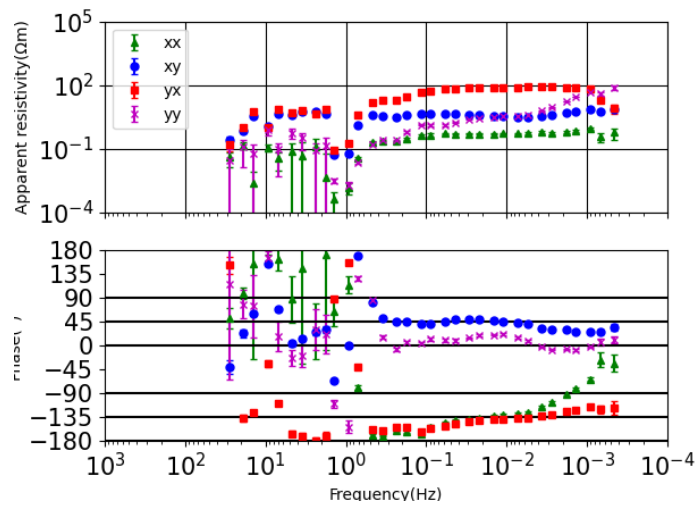Fig. 2h Apparent resistivity and phase angle of R4 - P180

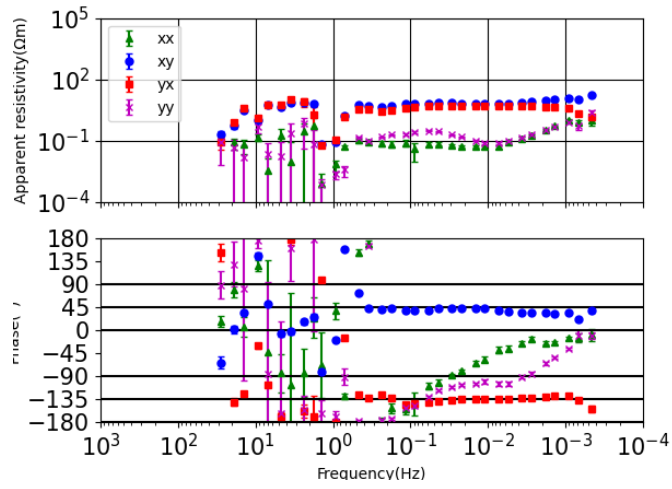Fig. 2i Apparent resistivity and phase angle of R4 - P240

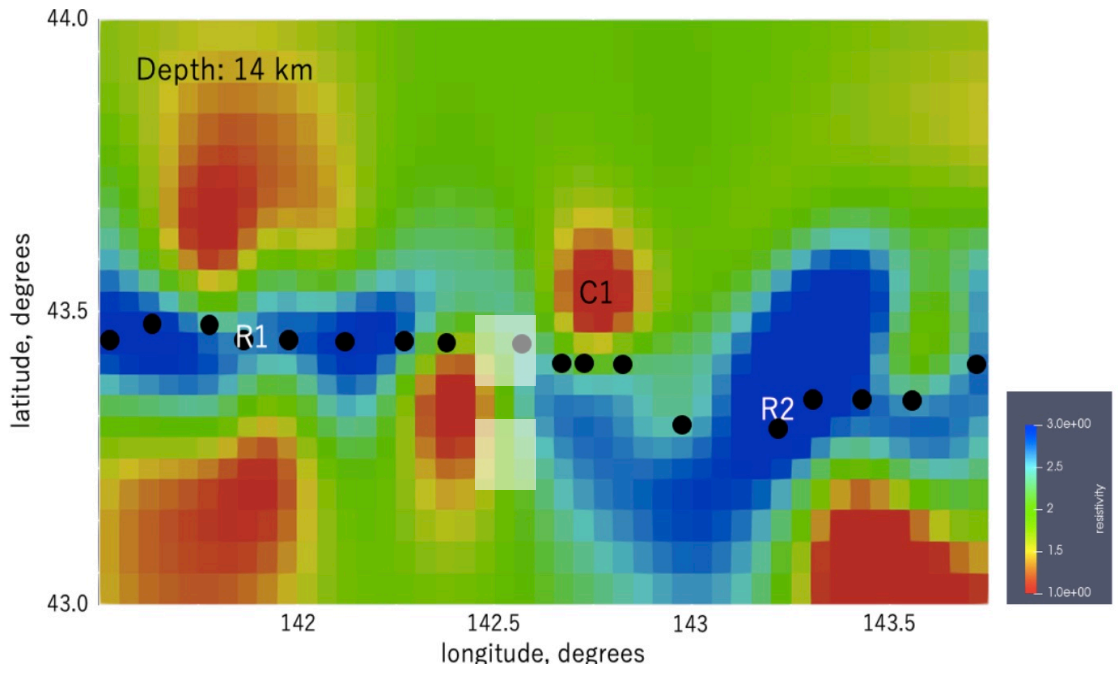Fig. 2j Apparent resistivity and phase angle of R4 – P250

Fig. 3 Horizontal slices of 3-D resistivity structure of Central Hokkaido at depth 14km. White squares represent the region (Furano and Kamifurano) which we conducted the survey in 2022.