Electrical resistivity structure beneath the southern part of Tohoku, NE Japan, revealed by magnetotelluric (MT) survey

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Following the 2011 great Tohoku earthquake, intense shallow earthquakes were observed at the Iwaki area, which is the fore-arc side of southern Tohoku, Japan. At the same time, high strain rate accumulation at the back-arc side which corresponds to the Niigata-Kobe Tectonic Zone (NKTZ) was observed before the Tohoku earthquake and continues to this day. In addition, prominent geothermal activities are distributed along the backbone range in the central part of the area. We are encouraged to study the mechanism of those crustal activities from the electrical resistivity structure. By combining the result with the seismic and geodetic data, the physical processes of those activities can be comprehensively understood.

We performed a four years wide-band MT campaign (2015-2018) that consists of 3 survey lines along an approximately NW-SE direction running across the southern Tohoku. For the first attempt, we revealed a 2D resistivity structure along the 2015 survey line. MT impedances were obtained using the BIRRP robust MT data processing code by Chave and Thomson (2004). In addition to that, we also estimated the Tippers and inter-station horizontal magnetic field transfer functions (HMTF), in which the spatial variation of the horizontal magnetic field among the stations is examined. To obtain the resistivity structure, we developed a two-dimensional inversion code that reproduces the apparent resistivity, phase, Tipper, and HMTF data. Some prominent features of the resistivity structure will be discussed in the presentation, as well as the comparison of our result to the previous studies and hypocenters around the study area.