Three-dimensional electrical resistivity structure beneath the back-arc side of the southern Tohoku region

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In the back-arc area of the southern Tohoku region, there are several quaternary volcanos. In the vicinity of some of the volcanoes, deep low-frequency earthquakes occur, implying the transfer of melt or aqueous fluid. So as to reveal the magma supply system, it is important to reveal the distribution of the subsurface fluid. In addition, in the area, there are a number of active faults that have the potential to cause M7-class inland earthquakes. Because it is thought that aqueous fluid has an important role in generating inland earthquakes, understanding the fluid distribution also helps elucidate the earthquake generation process. An effective approach for imaging the subsurface fluid distribution is conducting an electromagnetic induction survey which delineates the subsurface electrical resistivity structure. Since the electrical resistivity of fluid is generally lower than that of dry rocks by more than several orders of magnitude, the electrical resistivity is sensitive to the interconnected fluid in subsurface rocks. Thus, the authors estimated the resistivity structure in the back-arc area of the southern Tohoku region by performing magnetotelluric surveys. Our previous study (Usui et al. 2021) indicated the probable presence of the conductive areas under Chokaisan and Gassan, which reach the lower crust, and suggested the possibility that the bottom of the seismogenic layer is locationally consistent with the boundary between shallow resistive layer and deep conductive layer. In addition, Asamori et al. (2011) revealed a conductive area under the Asahi Mountains, containing the fluids that originated from the mantle. In this study, using both datasets of the previous two studies, the authors estimated the 3-D resistivity structure with more high resolution. In this study, we show the resultant electrical resistivity structure and discuss the subsurface fluid distribution as well as its relationship with the volcanic and seismic activities around the study area.

Keywords: electrical resistivity structure, crustal fluid, magnetotelluric method, magma supply system, subduction zone, northeastern japan

