A three-dimensional crustal electrical resistivity model beneath southern Tohoku district, NE Japan

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On the basis of seismological and geodetic results, Hasegawa et al. (2005) proposed a vertical crustal model profile in the across-arc direction beneath Tohoku district. In the model, the magma and/or fluid reservoir lies in the lower crust beneath Ou backbone range running along the central arc of Tohoku district. On the other hand, Uyeshima et al. (2016) recently modeled a two-dimensional (2-D) crustal electrical resistivity profile in which there are three distinguished conductors in the lower crust, that is, beneath the fore-arc, volcanic front and back-arc of southern Tohoku district. The fore-arc conductor underlies the seismicity beneath around Iwaki city activated after 2011 Tohoku-oki earthquake. However, another 2-D resistivity profile 50 km northwards parallel to the Uyeshima et al’ s one shows no distinguished fore-arc conductor, but volcanic front and back-arc conductors (Motoyama et al., 2018). These results indicate geofluids rise up beneath a part of fore-arc beneath southern Tohoku district. Moreover, a part of back-arc of the southern Tohoku district may have conductive lower crust. Because previous resistivity models are limited to 2-D, we estimated a 3-D resistivity model beneath southern Tohoku district with compiling previous magnetotelluirc (MT) data, and discussed geofluids distribution beneath fore-arc and back-arc.

We compiled electromagnetic data at 118 sites and reassessed all MT responses and geomagnetic transfer functions. The $\Phi_{2,}$ square root of determinant of phase tensor (Caldwell et al., 2004), shows high values in the northern part of back-arc, and in the southern part of fore-arc and of Ou backbone range 10-100 s period range.

To estimate 3-D resistivity model, we used WSINV3D_MPI inversion code (Siripunvaraporn & Egbert, 2009). So far, we have estimated a preliminary model using only MT responses. A vertical model profile in the across-arc direction shows an oblique conductor from deeper crust beneath back-arc to shallower crust beneath Ou backbone range. On the other hand, almost all forearc has high resistivities in the crust. The map view of resistivity profile at 22.5 km depth shows a conductor distributes beneath from Murakami city of back-arc to Koriyama city of Ou backbone range. The calculation is still running by using both MT responses and geomagnetic transfer functions, and we will show the results and discussion in this presentation.

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