A 3-D crust and uppermost mantle electrical conductivity model of subduction zone beneath NE Japan

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The crustal fluids beneath NE Japan is originated from dehydration of subducting Pacific slab or from convection in the backarc mantle, as is shown by seismic tomography [e.g. Zhao, 2017]. We investigated the fluid transportation paths from upper mantle to crust of subduction zone using electrical conductivity exploration.

We expanded electromagnetic field observation sites (96 sites) to northern part of NE Japan and obtained magnetotelluric responses and geomagnetic transfer functions in the period range of 20 –30720 seconds (22 periods) by BIRRP code [Chave and Thomson, 2004]. We used WSINV3D [Siripunvaraporn and Egbert, 2009] to invert those responses into three dimensional electrical resistivity model.

The preliminary model gives normalized root mean square misfit 5.87. A prominent conductor appears in the crust to uppermost mantle and the conductor spreads towards backarc direction. In our previous model [Ichiki et al., 2015], we found the overturned shape conductor towards backarc direction in the mantle wedge beneath central part of NE Japan. This study has found it beneath northern part NE Japan as well.

Those imply the crustal fluid and/or melt is transported along the pathway that is the plate boundary beneath the volcanic front to the backarc crust. The fluid transportation can explain the presence of enigmatic backarc volcano in the NE Japan. In this presenation, we speculate and discuss evolution of this pathway in geological time on the basis of the chlonological data of igneous rocks [Yoshida et al., 2013].

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