地殻流体の電磁イメージング

Electromagnetic Imaging of Geofluid

小川康雄（東工大）・地殻流体の電磁イメージング班

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Abstract:

Geofluid plays an important role in the subduction system for the generation of magmatic melt and the earthquakes. One of the most sensitive physical parameters to the existence of fluid is the electrical conductivity (resistivity). Thus the distribution of geofluid at depth can be inferred from the resistivity structure by using electromagnetic induction.

For the exploration of the deep crust and upper mantle, we usually use natural electromagnetic field in the period range 0.01s to 30,000 s, arising from lightning and magnetic storms. In the last two decades, we have successfully imaged deep resistivity structures in seismically active regions and volcanic zones. In particular, we have found the inhomogeneous distribution of mid-crustal resistivity and its correlation to crustal deformation, seismicity, and geotherm. These previous studies usually assumed that the resistivity structure is two-dimensional, partly because of the limited availability of the 3d modeling codes and partly because of the difficulty in occupying the sites as grids rather than a profile. The new project "Electromagnetic Imaging of Geofluid" aims at obtaining the three-dimensional resistivity structure at the NE-Japan subduction system. Our final model will cover from crust to the upper mantle. For this work, we will have wide-band (periods 0.0003s - 2000s) magnetotelluric measurements with 3km grid spacing around the core region Naruko Volcano. In addition, we will have long period (periods 10s - 100,000s) measurements with 20km grid spacings to cover the whole NE Japan.

In order to interpret fluid content and fluid geochemistry, modeled resistivity structure is not enough. We need a tool to interpret resistivity in terms of fluid. Thus, in the new project "Electromagnetic Imaging of Geofluid", we also have an important laboratory works to measure fluid resistivity and bulk resistivity at high pressure and high temperature.

http://www.geofluids.titech.ac.jp/