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東北地方３次元上部マントル電気伝導度構造探査
A three-dimensional electrical conductivity distribution model of the upper mantle beneath Tohoku district

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While plenty of three-dimensional (3-D) seismic tomographic images has been revealed (e.g. Zhao et al., 1992; Nakajima et al., 2001), only a few 3-D electrical conductivity distribution model has been proposed in terms of wedge mantle in subduction zones (e.g. Patro et al., 2007). Introducing the state-of-the-art mobile magnetotelluric (MT) observation systems (LEMI-417 and NIMS), we have acquired MT data at Tohoku district, northeastern Japan for the aim of 3-D electrical conductivity distribution in the wedge mantle. Typical observation duration are three months at each site, and MT response functions from 10 to 20000 seconds in period have succesfully collected with fine quality. The site location is arranged with ca. 20 km interval. The MT phase response functions at many sites show over 90 degrees over 5000 seconds and suggest that 3-D distribution beneath this area.

Simple checker board resolution tests have been performed to estimate resolution. Regular cubes with 40 km on side and 10 ohm-m in conductivity embedded in 1000 ohm-m matrix were clearly recovered down to 120 km in depth using the synthetic data, while those with 20 km on side were not recovered clearly.

We carried out the three-dimensional inversion analysis with WSINV3DMT code (Siripuvaraporn et al., 2005). Although the inversion process is still on the way and the conversion is not enough, the east-west profile (acrsss the Japan Arc) of the preliminary result shows that conductive region appears at about 120 km in depth beneath back-arc region and elongates obliquely towards the volcanic front. The north-south profile (along the Japan Arc) shows the vertical conductive and resistive columns appears alternatively. That basic images are well consisted with the seismic tomographic model (Nakajima et al., 2001), provided that conductive and low velocity zone should corresponds with each other. Obtained the final 3-D model, our final destination is to estimate the mantle geotherm and fluid distributions in the wedge mantle using seismic tomographic and electrical conductivity images.