Resistivity structure around the Ishikari-teichi-toen fault zone, Hokkaido, Japan

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In order to understand source processes of inland earthquake, it is an important element to reveal a crustal structure and behavior of fluids around the fault zone. Resistivity sounding using magnetotelluric (MT) method can detect resistivity structure down to a few dozen km, depending on a frequency band that is used for analysis, and resistivity is a sensitive quantity to the presence of fluids. MT survey is one of the best approaches to resolve this problem. Ishikari-teichi-toen fault zone is located in the eastern edge of Ishikari Lowland of Hokkaido, Japan. The main part of this active fault zone has a potential to cause an earthquake of M 7.9 (The Headquarters for Earthquake Research Promotion, 2003). MT survey around this fault zone was concluded in order to reveal the fluid distribution beneath the fault zone and to investigate the correlation between the faults and the crustal structure. Two parallel survey lines crossing the fault zone were extended to the east-west direction with approximately 80 km long. We obtained the wideband-MT data from new 16 stations along these lines.

The 2-D resistivity inversion code developed by Ogawa and Uchida (1996) estimated resistivity sections that were perpendicular to the fault zone. These sections were consistent to the seismic reflection profile and represented the complicated structures that due to development of thrust faults. The supposed resistivity sections approximately corresponded to geological units. The surface of the study area indicated relatively high resistivity, corresponding to the Quaternary sediments. A resistivity beneath the fault zone was detected lower than that of surroundings, associated with the thrust zone of the Tertiary system. The Neogene sediments that occupied the lowland had extremely low resistivity (less than 10 ohm-m), and extended to NS direction, keeping its thickness of more than 4 km. Seismic hypocenters were distributed within and the edge of resistive bodies at deeper than 5 km. This positional relation suggested a stress concentration to the structural boundaries.