Large scale resistivity structure across the Niigata-Kobe tectonic zone, Japan

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The dense GPS network revealed the Niigata-Kobe tectonic zone (NKTZ, e.g. Sagiya et al., 2000), which is the region with large strain rate. Though various models have been proposed for the cause of the NKTZ, the evaluation of the models requires more information of its subterranean structure. Thus, we investigated the resistivity structure across the NKTZ; the northern part of the Chubu Region, Japan.

Some studies have already investigated resistivity structures in this region (e.g. Goto et al, 2005; Yoshimura et al, 2007), but the resolutions of their structure models are relatively low in deeper parts. In order to construct a model with good resolution even in the deeper parts, we used the Network-MT method. In this method, the voltage differences are measured with very long dipole lengths of several kilometers. Therefore, the data possess high S/N ratio even at the longer periods.

We first estimated impedance tensors for the respective telephone toll areas, with the aid of a robust data processing code (Chave and Thomson, 1989). From Fuchu, Toyama Prefecture to Akigami, Gifu Prefecture, 13 sets of the impedance tensors from 8 to 10^4 seconds could be obtained with excellent quality. We used the magnetic field at Kamitakara, Gifu Prefecture for a local reference and that at Wajima, Ishikawa Prefecture for a remote reference. From the observed data, the electromagnetic strike around the region was estimated to be N65E-S65W, and then we constructed a 2-D resistivity structure on the profile orthogonal to it, with the aid of an ABIC 2-D inversion scheme (Ogawa and Uchida, 1996).

Our structure model has similar features to the one revealed by the wide-band MT surveys (Goto et al., 2005; Yoshimura et al, 2007). For example, the upper crust is resistive (over 1k ohm-meter) from Hosoiri, Toyama Prefecture to Machikata, Gifu Prefecture, while conductive lower crust (several 10 ohm-meter) exists beneath the area to the south of the Atotsugawa Fault (ATF). Around ATF, thickness of the resistive portion becomes thin. Furthermore, thickness of the resistive portion becomes abruptly thin to the south of Hatahoko, Gifu Prefecture . This image also corresponds with a seismic tomography result (Nakajima et al, 2006), and the conductive anomaly in the mid to lower crust may be related to the strain accumulation in the NKTZ.