On 3-D resistivity structure obtained from the Network-MT survey in the SW part of Shikoku-Island, SW Japan

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In the Bungo channel region at the western margin of the Nankai megathrust rupture zones, the long-term slow slip events (SSE) repeatedly occurred about every 6 or 7 years and we expect the next event soon. The SSE also activate deeper episodic tremors and slips (ETS) on the plate interface.

In order to investigate influence of interstitial fluids on occurrence of the SSE and/or ETS activities, we have started the Network-MT survey in the western part of the Shikoku Island facing the Bungo channel since April, 2016. We use metallic telephone line network of the Nippon Telegraph and Telephone Corp. to measure the electrical potential difference with long baselines of from several kilometers to 10 and several kilometers. We selected 17 areas in the western part of the Shikoku Island and installed 3 or 4 electrodes in the respective areas. The electrical potential differences measured in this way are known to be less affected by small scale near-surface lateral resistivity heterogeneities (e.g. Uyeshima, 2007). We also measure the geomagnetic field at two stations in the target region.

With the aid of the BIRRP code (Chave and Thomson, 2004), we could estimate the frequency-domain response functions of good quality. By using a 3-D DASOCC inversion code (Siripunvaraporn et al., 2004) specially designed for configuration of the Network-MT survey, we tried to obtain the 3-D resistivity structure beneath the target region. In the inversion, response functions between potential differences on respective long dipoles and two component magnetic field at a reference station, were directly inverted to yield a 3-D resistivity structure. Site (dipole) number and period number, used in the inversion, are, respectively, 53 and 10 (from about 20 s to about 10^4 s).

The most remarkable low resistivity anomalies are detected in the middle crust of the hanging wall of the subducting Philippine Sea slab. As was often pointed out in the previous studies (e.g. Ichihara et al., 2014; Aizawa et al., 2017), earthquakes also in this region tend to occur in the resistive area avoiding those low resistivity anomalies. Due to existence of these shallower crustal conductive anomalies, it was difficult to resolve resistivity distribution of the deeper parts along the subducting slab. After careful inspection of the structure, however, we can detect a weak and vague low resistivity zone along the subducting slab, whose thickness is about several kilometers, and whose conductance is estimated as about 63 S. Since the EM method is not very sensitive to the conductivity (or resistivity) itself, but to the conductance (thickness times conductivity), the thinner and the more conductive zone may exist along the surface of the subducting slab.

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