

3-D resistivity distribution around an intra-plate slow earthquake area in northern Hokkaido, Japan: relationship between serpentine and slow earthquake

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A slow earthquake of Mw 5.4 is estimated in the Dohoku area, northern Hokkaido Island (Ohzono et al., 2015). Because most of slow earthquakes have been reported in the vicinity of plate boundaries, study of the intra-plate events is important to understand the slow earthquakes. In this study, we estimated a resistivity distribution based on the 3-D inversion of magnetotelluric (MT) data at 45 sites in the Dohoku area. The inverted resistivity model shows the following features. 1) A surface conductive layer is distributed in the most part of the study area. The thickness of the conductor increases toward westward and reaches approximately 5 km at the Japan Sea side. The conductive layer is interpreted as Tertiary-Quaternary sedimentary rocks. 2) An ultra-conductive area (0.1-10 ohm-m, 0-10 km depth) is distributed around the fault of the slow earthquakes. Based on the surface geological distribution and magnetic anomaly (GSJ, 2005), the conductor possibly reflects serpentine-related geological unit associated with the slow slip events. However, a careful interpretation is required because a serpentinite sampled from a few ten meters depth at about 10 km south of the study area is not so conductive (10-100 ohm-m) (Okazaki et al., 2011). This possibly indicates that conductive fluid from deep earth fills pores of serpentine and decreased resistivity.