北海道北部の地震発生境界域における三次元比抵抗構造解析

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3-D resistivity modeling around a seismicity gap in the Dohoku area, northern Hokkaido

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A high seismicity zone associated with rapid crustal deformation is recognized in the eastern margin of Japan Sea (e.g., Sagiya, 2001). Because a heterogeneity in the crust is known as one of the major causes of the localized deformation (Iio et al., 2002), a detailed investigation of crustal structure is essential to understand the crustal dynamics. An obvious seismicity gap, a boundary between high and low seismicity areas, is recognized in the Dohoku area, northern Hokkaido Island (Takahashi and Kasahara, 2005). In addition, a slow earthquake of Mw 5.4 is estimated around the gap (Ohzono et al., 2015). Thus, an imaging of crustal structure in this area will provide us important knowledge to discuss the localized crustal deformation and slow earthquakes. In this study, we conducted a magnetotelluric survey at 45 sites in the Dohoku area and modeled a resistivity distribution based on 3-D inversion procedure. 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) A dyke-shaped conductive zone is distributed near the seismicity boundary. It possibly reflects the pore-fluid rich area between Sorachi-Yezo and Hidaka belts which was discussed for the southern Hokkaido Island by Ichihara et al. (2016). It may relate to the cause of the seismicity gap. 3) An ultra-conductive area (0.1-10 ohm-m, 0˜10 km deep) is distributed around the fault of the slow earthquakes. Based on the surface geological distribution, the conductor possibly reflects serpentine-related geological structure, which may be associated with the slow slip events. However, a careful interpretation is required because a serpentine in the same geological unit is not so conductive (10-100 ohm-m) (Okazaki et al., 2011).