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A resistivity model of the back arc region in the NE Japan arc based on marine and island MT data

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Distribution of physical properties in the back-arc in NE Japan subduction zone have not been understood because the area is mostly located beneath the sea floor. In this study, we estimated electrical resistivity distribution in this area based on electromagnetic data obtained on the seafloor and islands in the eastern part of Japan Sea. The ocean bottom EM data were obtained with 6 ocean bottom electro-magnetometers (OBEMs) between April and August 2013 by MR13-02A and NT13-18 JAMSTEC scientific cruises. The island data were acquired in the 3 islands in the Japan Sea (Tobishima, Awashima and Sado islands) between April and October 2013. These recorded time-series data were converted to a frequency-domain impedance tensor based on the BIRRP program (Chave and Thomson, 2004). As results, high-quality MT responses and geomagnetic tippers in both the trench and back-arc areas. The phase tensor ellipses (Caldwell et al. 2004) indicates high Φ_{max} ($>$65 degrees) and Φ_{min} ($>$50 degrees) in the long periods ($>$8000 seconds) implying conductive zone in the deep area. The ellipses in the short period show strong contrast between western part (Yamato basin) and eastern part of study area, which indicate heterogeneity in crustal structure. Then we also inverted the MT impedances into resistivity distribution based on the 3-D inversion code (Tada et al., 2012) after the correction local topographic effect. The inversion result shows a significant conductor above the subducting Pacific plate. A surface conductor is also estimated beneath the Yamato Basin. These features are consistent to the phase tensors discussed above. The deep conductor may be related to dehydration in subducting Pacific Plate and convention in the mantle wedge. The surface conductor may reflect sediments rocks formed during back-arc opening in Miocene.

Keywords: NE Japan arc, Japan Sea, Back arc, magnetotelurics, resisitivity, Geofluid