Conductive zone of incoming Pacific Plate in the outer rise region off Japan trench

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Various geophysical surveys have been operated in order to expose the subsurface structure of incoming Pacific plate in the outer rise region off Japan trench. One of the targets is existence of water in the plate, and two geophysical surveys (seismic surveys and heat flow measurements), which were conducted independently, in the outer rise region reported recently the possibility of water existence in the plate. The seismic surveys (e.g., Fujie et al., 2016; Fujie et al., 2018) visualized the subsurface structure indicating low velocity in the oceanic crust and below the boundary between crust and lithosphere (i.e., Moho) although there are high pressures. Also, the heat flow measurements (e.g., Yamano and Kawada, 2017) reported high heat-flow anomalies in the region, and suggested the possibilities that the anomalies were triggered by the water through the permeable layer in the plate. However, the existence of water in the deep portion below the oceanic crust has not been well known, and the source of water is now being discussed. A marine magnetotelluric (MT) survey was conducted in the outer rise region with distant of 100 –200 km from the Japan trench. This survey' s target is to verify the existence of water in the oceanic mantle visualizing the subsurface resistivity structure. We recorded electromagnetic data (MT data) for the analysis of subsurface resistivity structure at four locations with water depth of about 5500 m. Unfortunately, one of four data failed to record the MT data appropriately, and the other data included large noises, whose source were possibly the instruments themselves. We applied the noise-reduction method based on Frequency Domain Independent Component Analysis (Sato et al., 2017) for the estimation of MT responses at the three sites. The resistivity structure was visualized using a 2D inversion code by Uchida and Ogawa (1993) from the derived MT responses. The visualized structure showed two features: i) the boundary between resistive lithosphere and conductive asthenosphere and ii) the conductive zones below the oceanic crust. At the presentation, we will not only show them but discuss the source of conductive zones based on electromagnetic environment, whose model includes the effect of trench or coast.

Keywords: Outer rise region off Japan trench, Conductive zone, Marine magnetotelluric survey

