日本海溝アウターライズ領域における太平洋プレートの比抵抗構造
Resistivity structure of incoming Pacific Plate around the Outer-Rise Region, off Japan Trench

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In the outer rise region off Japan Trench, geophysical researches have been done for elucidation of the subsurface structure of incoming Pacific plate. One of the interests is existence of water in the plate. Recently possibility of water presence in the plate is reported based on two independent geophysical surveys: seismic survey and heat flow measurements in the outer rise region. In the seismic survey, the subsurface structure indicates low velocity in the oceanic crust and below the Moho despite its high pressure (e.g., Fujie et al., 2016). High heat flow anomalies are also reported in the region, possibly caused by the growth of permeable layer and water circulations in the plate (Yamano and Kawada, 2017). However, the distribution of water to the deeper portion below the oceanic crust has not been well known, and source of water is now debated. To verify the presence of water in the oceanic mantle, a marine magnetotelluric (MT) survey was conducted in the outer rise region with distance of about 50-150 km from the trench. In 2014, at four locations, with water depth of about 5500 m, we recorded electromagnetic data (MT data) for visualization of subsurface resistivity structure. Unfortunately, at one of four sites MT data did not recorded appropriately, and the data at other sites included large noises from the instruments itself. We applied new noise reduction method based on Frequency Domain Independent Component Analysis proposed by Sato et al., (2017) to estimate MT response functions at three sites. From the MT response functions at three points, resistivity structure was obtained by using a 2D inversion code by Uchida (1993). As a result, we clearly imaged the resistive lithosphere and conductive asthenosphere, and also found that the resistivity of lithosphere gradually decreased toward the trench. This feature is consistent with the reports based on seismic and heat flow surveys. The resistivity transiton zone between low-resistive and high-resistive lithospheric zones is close to heat flow anomaly areas. This evidence enhanced the possibility of water presence and circulations in the oceanic plate.

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