Towards electrical resistivity imaging around outer-rise bending normal faults off the Japan trench

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Hydration in the oceanic crust and uppermost mantle beneath the outer-rise area is thought to be main source of aqueous fluid in the subduction zone (e.g. Ranero et al., 2003). Thus the mapping of hydrating fluid in outer rise areas is essential to understand dynamics, earthquakes and volcanic activities in subduction zones. Imaging of electrical distribution is useful to detect hydration beneath the outer-rise area because electrical resistivity reflects amount, composition and connectivity of fluid, temperature, and serpentinization. Recent developments of control source electro-magnetic (CSEM) investigation methods allow us to obtain high resolution images of resistivity distribution beneath the outer-rise area (Naif et al., 2015). Thus CSEM experiments is being planned in an outer-rise zone in Tohoku-oki area (incoming Pacific plate near the NE Japan arc). In this study, we introduce a present resistivity model based on natural source EM (magnetotelluric) surveys in this area. The model shows that surface conductive layer is thicker beneath the EM station closer to the Japan trench compared to the farther station (40 and 60 km from Japan trench, respectively). Sensitivity tests indicate that the observed data require the variation of thickness of conductive layer. Thus resistivity imaging is effective to investigate hydration in the outer-rise zone in the Tohoku-oki area. Because CSEM investigations can image more detailed resistivity distribution, high resolution mapping of hydration will be realized in this area. Thus we plan CSEM experiments around the Magnetotelluric survey line in mid 2017. The details of CSEM survey plan will be introduced in the presentation.

