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The three-dimensional conductivity structure of the stagnant slab: preliminary result

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We performed a three-year-long seafloor electromagnetic (EM) survey in the Philippine Sea, including the western edge of the Pacific Ocean, to image electrical features of a deep mantle slab and the surrounding mantle in three-dimensions (3-D). The project iterated one-year-long deployment of ocean bottom electromagnetometers (OBEMs), involving a total of 37 instruments installed at 18 sites. The data obtained have been analyzed in the order of their recovery based on a magnetotelluric (MT) method.

In this study, we attempt to obtain a 3-D electrical conductivity model from the observed data. The seafloor topography is known to significantly affect the EM response functions obtained by OBEMs. We assume that the distorted EM fields are separated into long-wavelength (more than a few tens of km) and short-wavelength (less than a few tens of km) components, and propose their separate treatment: The long-wavelength parts are incorporated into a newly developed 3-D inversion code (Tada et al., submitted), and effects of the short-wavelength topographies are corrected with other 3-D forward code (e.g. FS3D; Baba and Seama, 2002).

From a preliminary 3-D electrical conductivity model, we find three significant features so far. (1) The conductivity of the Pacific Plate is much lower than that of the Philippine Sea Plate in the top of the upper mantle. (2) The difference of conductivity between the Pacific Plate and the Philippine Sea Plate becomes small at the depth of 200km. (3) The conductivity beneath the central Mariana Trough is lower than that of surrounding area at the depth of somewhere between 100 and 200 km. We will explain more detail about the 3-D result and discuss it in the presentation.

Keywords: Stagnant slab, 3-D conductivity structure, Marine MT method, Inversion