沖縄トラフ伊平屋北海丘の３次元比抵抗構造

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Three-dimensional resistivity structure around the Iheya North Knoll in the middle Okinawa trough

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The Iheya North Knoll is located on the northern termination of the Iheya Graben, a depression in the middle Okinawa Trough extending around 100 km in an ENE-WSW strike. In the knoll, the volcanic body penetrates through a sedimentary sequence and rises about 500 m above the seafloor (Tsuji et al., 2012). On the eastern flank of the western peak of the knoll, hydrothermal field with about tens of active hydrothermal mounds were situated, facing the Central Valley (Ishibashi et al., 2015). In the middle Okinawa trough, Shimakawa and Honkura (1991) revealed the two-dimensional resistivity structure along a profile orthogonal to the Ryokyu trench-arc system by using the magnetic transfer function. Since, however, the minimum period of the data was 30 minute and the observation sites were sparsely distributed, detailed resistivity structure in the crust has not ever been obtained in the middle Okinawa Trough, including the area around the Iheya North Knoll.

In order to reveal the resistivity structure around the Iheya North Knoll, we performed three-dimensional inversions with the data obtained by marine magnetotelluric survey of Japan Agency for Marine-Earth Science and Technology (JAMSTEC). In the inversions, so as to prevent the misinterpretation of subsurface structure due to the bathymetric effects on the observed response functions, we utilized the scheme proposed by Usui (2015), which enabled us to incorporate precise bathymetry around the knoll into the computational mesh with the aid of the unstructured tetrahedral element. In the obtained resistivity structure, there was a conductive surface layer (lower than 3 Ohm-m) and an underlying resistive layer (higher than 100 Ohm-m). The former conductive layer is considered to be consistent with the pelagic/hemi-pelagic sediments and the highly permeable zones within the upper crust where hydrothermal fluid migration occurs (Tsuji et al., 2012).