3D resistivity structure of a hydrothermal system using magnetometric resistivity data

Noriko Tada[1]; Nobukazu Seama[2]; Motoyuki Kido[3]

[1] Earth and Planetary Sci.,Kobe Univ; [2] Research Center for Inland Seas, Kobe Univ.; [3] RCPEV, Graduate School of Sci., Tohoku Univ.

A three-dimensional forward numerical solution to Magnetometric Resistivity (MMR) method has been developed. We applied this method to the spreading axis in the central Mariana Trough and investigated three-dimensional resistivity structure of hydrothermal system. MMR survey was carried out around the hydrothermal vent called Alice Springs Field in the central Mariana Trough. Alternative current with rectangular wave form with a period of 16 s at a peak value of 19 A is generated at 34 stations from the vertical bipole source and induced magnetic fields were measured by four OBMs which were settled around Alice Springs Field.

We discovered the following four anomalous regions based on newly developed three-dimensional forward numerical solution. [A] A lower resistive region including Alice Springs Field is located on the spreading axis. [B] Two higher resistive regions are juxtaposed on both north and south sides to the lower resistive region along the spreading axis, respectively. [C] A lower resistive region is about 1 km northeastward from Alice Springs Field. Hydrothermal system is responsible to the lower resistive region on the spreading axis, because hot water has less resistive than oceanic crust. We conclude that a block with 100 m depth, 500 m width and 1 km length forms a reservoir of hot water beneath the spreading center.