

Towing bipole electric current for marine magnetometric resistivity method

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We propose that nearly vertical bipole electric current towed by a ship is used as a source for Magnetometric Resistivity (MMR) method, which is one of the controlled source methods to investigate of a shallow oceanic crust. This proposal requires precise positioning of the bottom electrode for the bipole electric current, and our MMR system achieved the requirement. We compared results of towing bipole electric current source with those of conventional vertical bipole electric current supplied at several transmission stations to evaluate the towing bipole electric current source. Those data were obtained along a survey line during a MMR experiment in the central Mariana Trough using our MMR system. Precise positioning of the bottom electrode allows us to determine horizontal distance between the surface electrode and the bottom electrode. The horizontal distance varies from 30 m to 500 m with 3600 m of the bottom electrode depth, which indicates the bipole source tilts with angles of 0.5-8 degrees. We found that relations between the source-receiver separation and the amplitude of induced magnetic field coincide for the two different sources, when the source-receiver separation for towing bipole electric current source is defined as horizontal distances from the receiver to the mid-point of the bipole electric current source. Moreover, the towing bipole electric current source results show higher spatial resolution and it is a powerful tool for MMR method to image a shallow oceanic crustal structure efficiently.