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Surveys of the oceanic crust resistivity structure using a Magnetometric Resistivity method

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ABSTRACT A Magnetometric Resistivity (MMR) method is one of the controlled source methods, which can be used to survey an electrical resistivity structure of the uppermost oceanic crust. The MMR method is composed of source and receivers. The source consists of two electrodes, one near the sea surface and the other near the seafloor, which supplies an artificial vertical bipole electrical current. The receivers are Ocean Bottom Magnetometers (OBMs), which measure the magnetic field variations generated by the artificial electrical current. The electrical resistivity of the oceanic crust is directly proportional to the electrical current, inversely to the amplitude of the magnetic field variation, and to the square of source-receiver separation. The electrical resistivity of the oceanic crust mainly depends on the porosity of the oceanic crust and the fluid temperature within the oceanic crust. In this paper, six MMR surveys for oceanic resistivity structure are reviewed. One-dimensional resistivity structures estimated from three surveys revealed the resistivity and the thickness of sedimentary layers. The other three surveys have discovered the differences of the oceanic crust resistivity structures between on spreading axis and off spreading axis. In only two of them, one-dimensional inversion was applied to estimate the resistivity structures. Accurate estimations of the three-dimensional resistivity structures (e.g. a hydrothermal circulation system) can not be made by the one-dimensional inversion. Therefore, the development of three-dimensional inversion for the MMR data is prerequisite for precise investigation of the oceanic crust.

Key words: oceanic crust, resistivity structure, Magnetometric Resistivity method

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