

Magnetic anomaly mapping of the southern Mariana Trough by using magnetometers on the AUV

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Magnetic anomalies observed in the ocean are basically originated from the variation of magnetization intensity of oceanic crust. Hydrothermal vent activities are possible cause of reduction of magnetization in the small scale. Anomalous magnetic signals have been observed around past and present hydrothermal vent sites. However, anomalous magnetic signatures of hydrothermal vent sites are usually difficult to elucidate from sea-surface surveys. Near-bottom magnetic survey by using an AUV is an effective method to reveal the detailed of magnetic anomaly of ocean floor such as those around hydrothermal vent sites (e.g. Tivey et al., 2002). In order to detect magnetic signals resulted from the magnetization under the hydrothermal vent sites in the southern Mariana Trough, the magnetic field were measured by using the AUV "URASHIMA" in the Cruise YK09-08. Four three-axis fluxgate magnetometers and an Overhauser magnetometer were attached on the AUV during the cruise. Multiple three-axis fluxgate magnetometers were used in order to figure out the magnetic noises derived from the AUV itself and other equipments on it, and those noise data are used to obtain the real geomagnetic anomaly signals.

Five dives were successfully conducted and the magnetic field was measured along the survey lines of 80-300m height from ocean floor. Three components of the magnetic field were obtained by the four fluxgate magnetometers along the all dive tracks of the AUV. Total intensities of the magnetic field were measured by the Overhauser magnetometer but they were collected only along E-W lines during the Dive No. 94. The failure of measurement is considered to be related to the small angle between the sensor axis and the geomagnetic field direction and the large gradient of the magnetic field near the AUV.

Three components measured by multiple fluxgate magnetometers are very consistent one another. Also, total intensities calculated from the three-components are in agreement with that measured by the Overhauser magnetometer. These results indicate that the magnetic fields measured in those dives are reliable. We present the summary of observation and the preliminary magnetic anomaly maps of the hydrothermal sites of the southern Mariana Trough.

Keywords: magnetic anomaly, hydrothermal site, oceanic crust, AUV, magnetometer, Mariana