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Magnetic anomaly mapping and rock-magnetism of seafloor rocks at the hydrothermal sites in the southern Mariana Trough

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Magnetic anomalies observed in the ocean are basically originated from the variation of magnetization of oceanic crust. Hydrothermal vent activity is a possible cause of reduction of magnetization intensity in the small scale due to alteration of oceanic crust by the fluid circulation. In order to detect magnetic signals resulted from the variations of crustal magnetization under the hydrothermal vent sites area in the southern Mariana Trough, the magnetic field at the hydrothermal sites were measured by using the AUV URASHIMA during the cruise YK09-08.

Three components of the magnetic field were measured by using four fluxgate magnetometers attached to the AUV along the survey lines of 100-300m height from the seafloor. Crustal magnetizations were calculated from downward component of magnetic anomalies assuming a constant thickness source layer (250m). Some of the hydrothermal sites show lower magnetization than those of the surrounding areas. These low magnetization areas suggest that the basaltic rocks have been altered by hydrothermal activities.

In the cruise of Taiga10M, 1-4 m length cores were collected from the seafloor rocks using the BMS (Boring Machine System) of the Hakurei-Maru No. 2. Also, in the nine dives of SHINKAI-6500 during the cruise YK10-11, rock samples were collected from the seafloor. We have been studying remanent magnetization and basic magnetic property of these samples. Preliminary data show that remanent magnetization intensities of fresh basalts are 20-80 A/m and those of altered basalts are of the order of 1 A/m. These measured rock-magnetic data can be used in calculation of crustal magnetization and thus provide a better understanding of the geological structures of the hydrothermal sites.

Keywords: Mariana, hydrothermal activity, magnetic anomaly, rock magnetism