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Development of a magnetic exploration system for seabed resources using AUV and deep-tow system: tests in the Bayonnaise

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Seabed resources like seafloor hydrothermal deposits have recently attracted much attention. It is, however, difficult to estimate accurate abundance of those resources. Conventional marine (sea-surface) geophysical explorations do not have enough resolution, and an exploratory drilling needs much time and money. Thus, new technology of geophysical exploration near the seafloor is required in order to discover and estimate the resources precisely. From such a standpoint, we have been developing electrical and magnetic exploration systems by using AUV (Autonomous Underwater Vehicle), ROV (Remotely Operated Vehicle), and a deep-tow system in order to estimate structures of the seafloor in detail. Since this study started in 2008, we have made each device of magnetic and electrical exploration systems on an experimental basis. In this presentation, we will report the current situation of the development of the magnetic exploration system, especially about the tests in Bayonnaise knoll area. The magnetic exploration system was tested in the Kumano Basin using AUV "Urashima" and towing vehicle "Yokosuka Deep-Tow" during the R/V Yokosuka cruise in 2009. In this test, we examined the performance of the system through an artificial magnetic target set on the seafloor. In 2010, it was tested more practically in the Bayonnaise knoll area both using a titanium towing frame during the R/V Bosei-maru cruise and using AUV "Urashima" during the R/V Yokosuka cruise. The purpose of these tests was to evaluate the magnetic exploration system in an actual seafloor hydrothermal deposit area for practical applications of that. From these tests, we have succeeded in measuring three components and total intensity of the geomagnetic field using the AUV and total intensity of that using the deep-tow system. The obtained data will contribute to develop the magnetic exploration system for seabed resources, to study magnetic structures of the Hakurei deposit area, the seafloor hydrothermal deposit area, in the Bayonnaise knoll caldera. We will also improve the accuracy of the magnetic measurement, the measurement of three components of the geomagnetic field using the deep-tow system, positioning of the deep-tow system, etc. in order to construct practical magnetic exploration system. Note that this study has been supported by MEXT.

Keywords: seabed resources, sea-floor hydrothermal deposits, geophysical exploration, magnetic, development of instruments