

Acoustic and magnetic surveys using AUV Urashima around the hydrothermal sites off Kumejima island in the Mid-Okinawa Trough

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Recently, polymetallic sulfides deposited in seafloor hydrothermal vents have attracted interest as a potential mineral resources for e.g., Cu, Zn, Pb, In, Ga, Ge, Au, and Ag (Schrope, 2007).

Development of effective methods for exploring seafloor hydrothermal activity is an important key for future exploitation of this type of deep-sea mineral resource and thus, more efficient methods for exploration of seafloor hydrothermal vents are expected.

Recent progress in near-bottom geophysical and geochemical surveys using autonomous underwater vehicles (AUV) allows us to perform high-resolution surveys in which the signatures of seafloor hydrothermal activity can be detected (German et al., 2008; Kumagai et al., 2010; Nakamura et al., 2013). Moreover, in the last decade, water column observations using multi-beam echo sounder (MBES) systems equipped on a surface ship have also become successfully applied to exploration of seafloor hydrothermal vents (Tanahashi et al., 2014; Kasaya et al., 2015; Nakamura et al., 2015).

During the YK15-14 cruise in 2015, we conducted the shipboard MBES survey by R/V "Yokosuka" and the near-bottom acoustic and magnetic surveys using AUV "Urashima" around the hydrothermal sites in order to reveal the distribution and characteristics of seafloor hydrothermal vent sites off Kumejima island in the mid-Okinawa Trough. The presence and amplitude of hydrothermal plume signals were first detected by acoustic water column imaging with a shipboard MBES system. A total of four AUV "Urashima" dives (Dives #217-220) were completed around the sites. During these dives, we have successfully obtained high-resolution bathymetric data, side scan sonar image, sub-bottom profile, vector magnetic field and chemical sensor data (ORP, turbidity and temperature). The vector magnetic field were measured by three fluxgate magnetometers mounted in the payload space of AUV "Urashima" to investigate the seafloor magnetic features related to hydrothermal alteration processes. The distribution of crustal magnetization are estimated using the magnetic anomalies by the inversion method. Here we report the overview of the YK15-14 cruise and show new results from AUV "Urashima" dives. Then, the characteristics of the hydrothermal sites in the mid-Okinawa Trough will be discussed by comparing with the results from the ROV surveys during the KR15-16 cruise.

Keywords: seafloor hydrothermal exploration, mid-Okinawa Trough, AUV, detailed bathymetry, magnetic anomaly