

SCG059-20

Room:105

Time:May 26 17:15-17:30

Geological setting and hydrothermal system at southern Mariana Trough: approach from high-resolution bathymetric survey

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To investigate the complex seabed morphology created by volcanic and tectonic processes and hydrothermal venting, near-bottom high-resolution bathymetric mapping of deep-water environment started at fast and slow spreading ridges during the last twenty years. As more recent technological and scientific advance, detailed feature and distribution of vent, fissure, fault, and lava morphology etc. have been well understood. In general, a localized hydrothermal system is mainly organized by interaction between tectonic and volcanic control. The occurrence and/or existence of fault, fissure, and fracture play an important role as formation of hydrothermal conduit (e.g. Humphris et al., 2002; Glickson et al., 2007; Ondreas et al., 2009).

In the study area, southern Mariana Trough, near 12°57'N, 143°37'E, have several hydrothermal systems. Three hydrothermal sites (Snail, Archaeon, Pika) are located just on the active backarc spreading axis, the eastern foot of the axial high, and the top of an off-axis seamount about 5 km from the axis, respectively (Ishibashi et al., 2004; Kakegawa et al., 2004, 2008; Urabe et al., 2004), and these are aligned roughly perpendicular to the spreading axis. According to observation of the hydrothermal fluid, the system of on-axis site (Snail) is ephemeral, on the other hand, the two off-axis sites (Archaeon and Pika) seem to have longevity of life (Urabe et al., 2004). The topography of sulfide mound, lava morphology, occurrence of fault and fissure, and chemistry of volcanic rock and sulfide deposit at each site has unique characteristic respectively, despite these sites are closely located. Thus, we will discuss that "what is necessary to maintain or develop these system?". The high-resolution bathymetric data for the examination was collected by AUV (autonomous underwater vehicle) URASHIMA in 2009 during the YK09-08 cruise.

Keywords: hydrothermal system, geological setting, Southern Mariana Trough, high-resolution bathymetric survey, lava morphology, sulfide mound