

SIT002-06

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Volcanic and tectonic activities shown by a high-resolution acoustic survey, the case of the Southern Mariana Trough

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Mariana Trough is one of back-arc basins which developed from 11N to 23N on south-east part of the Philippine Sea plate. There are 3 known hydrothermal sites on the Southern part of the Mariana Trough: the Snail site develops on spreading axis, the Archean site develops on the eastern foot of the spreading axis, and the Pika site develops on the top of off-axis seamount which stands on ~5 km SW from the spreading axis. The three hydrothermal sites seem in line. The water samples from the Snail site and the Pika site indicate an opposite features to these geological setting. To investigate geological background of these 3 hydrothermal sites, the detailed geophysical and hydrological survey using *AUV-Urashima* (JAMSTEC) followed by the eye observation using *Shinkai6500* was conducted on 2009 and 2010.

We obtained following results.

1. The *AUV-Urashima* detected backscattering signals in water column over the known (Snail site, Archean site, and Pika site) and also unknown hydrothermal sites. Eye-observation using *Shinkai6500* in 2010 indicate that one of the backscatter signals in water column detected undiscovered hydrothermal site. We named the new hydrothermal site as the "Urashima site". We also found dead chimneys ~10 m height and turbid water, at the other sites of ackscatter signals in water column except the known and the Urashima hydrothermal sites.

2. The Archean, Pika, and Urashima hydrothermal sites shows small topographic features. Combination of the detailed acoustic survey using *AUV-Urashima* and the eye observation using *Shinkai6500* indicate extent of the area of hydrothermal vents. The Archean site going trend along ridge-line of the hydrothermal mound. The Pika site is developed not only the center of the summit, but also over the top (center~western edge) of the off-axis seamount. The newly found hydrothermal site, the Urashima site, is developed from the northern foot of the off-axis seamount to the northern flat terrain, at least 150 m x 180 m area.

3. Snail site is not accompanied with small topographic features. It is difficult to decide the exact point of the snail site on 2-D mosaic map, but backscatter signals in water column help us. There are few faults and fissure around the Snail site. On the other hand, the other hydrothermal site named Yamanaka site, which is thought as a decadent hydrothermal site on the same spreading axis, is cut by clear fissures. There is no geological connection on seafloor between these two hydrothermal sites.

4. Several spots of ultra-low backscattering seafloor are found along spreading axis, between the Snail site and the Yamanaka site. Eye observation by *Shinkai6500* reveals that there are fragments of black-colored lava. Normally, we interpret low-backscatter areas as a thickly sedimented field, or such kind of an absorber material, covering seafloor. The rubble of lava on seafloor suggests that low-backscattered area may indicate fresh (non sedimented) lava field. We should reconsider interpretations of acoustic data sets over volcanic area.

5. Distribution of hydrothermal vents, length and distribution of linear features (fault and fissure), and distribution of newly looking lavas indicate a detailed position of active seafloor along spreading axis and around the off-axis seamount which holds the Pika and the Urashima sites.

Keywords: High-resolution acoustic survey, AUV, water column, ultra-low backscattering intensity, lava flow