

## Geomorphological features of the Southern Mariana Trough spreading center obtained from near-bottom surveys using the AUV Urashima

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We characterized field-scale geomorphological features at the sea-floor spreading center in the southern segment of the Southern Mariana Trough back-arc basin to understand its crustal formation in fine-scale. The Southern Mariana Trough is a currently active back arc basin, and it has fast spreading morphologic and geophysical characteristics (e.g. axial high), suggesting an abundant magma supply, even though the full spreading rate is categorized as slow spreading (e.g. Seama et al., 2015). Bathymetry and geomagnetic field data in the Southern Mariana Trough show highly asymmetric seafloor spreading; much faster spreading in the west side of the spreading axis compared to the east side (Seama and Okino, 2015). They estimated the spreading rate of the southern segment as 46 km/Myr with its half rate of 33 km/Myr for the west side and 13 km/Myr for the east side. We analyzed near-bottom acoustic survey data along an axial relief in the southern segment to obtain fine scale topographic map and back-scatter images. The near-bottom acoustic survey during JAMSTEC YK09-08 cruise was conducted using the AUV Urashima, in which a 120 kHz side-scan sonar and a 400 kHz multi-beam echo sounder are mounted. Seven survey lines along spreading axis cover 2.5 km by 0.9 km area along and across the spreading axis, respectively. The topographic map and the back-scatter images together with eight dive observation data acquired by the submersible Shinkai 6500 allow us to derive characteristic features at the sea-floor spreading center. The current active spreading axis is identified by six mounds with their diameters of 100-300 m; the mounds are in line parallel to the axial high in the southern segment and they are composed by pillow lavas without sediment. The mounds are divided into two groups that probably show fine scale different ridge segments; three mounds in the south are more active with their height of 10-25 m, while three mounds in the north are a few meters high, and two groups have a 100 m offset in line parallel to the axial relief. Further, we found asymmetric geomorphological features at the spreading center in small-scale (< 1 km scale). A lot of fault scarps and lineaments parallel to the axial axis exist in the topographic map and the back-scatter images, respectively, and their locations show high asymmetry; many of them locate in the northwest side of the axial axis, but few exist in the southeast side. The small scale asymmetric geomorphological features near the current spreading axis provide an important constraint on the style of the highly asymmetric seafloor spreading in the Southern Mariana Trough back-arc basin.

Keywords: Southern Mariana Trough back-arc basin, asymmetric seafloor spreading, near-bottom acoustic survey