

Mud Volcano Activity Confirmed at the Kumano Basin Edge Fault Zone

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[Introduction]

Mud volcano activity at the Kumano Basin Edge Fault Zone (KBEFZ) was suggested almost 10 years ago, based on the 3D seismic observation of the Nankai Trough seismogenic zone experiment (NanTroSEIZE). The KBEFZ is a tectonic feature along the seaward edge of the Kumano forearc basin (Moore et al., 2009; Martin et al., 2010). The KBEFZ has steep ridges and valleys and is continuous from Tenryu-submarine valley to the east and off-Muroto area to the west. Our acoustic observation using R/V Yokosuka and AUV-Urashima (JAMSTEC) in June 2015 confirmed its mud volcano activity at the southwestern part of the Kumano Basin, the top of the KBEFZ.

[Observed results]

Cruising speed and altitude of the AUV-Urashima during our cruise was 2.0~2.5 knots and 100 m, respectively. Three kinds of acoustic observation equipment mounted on the AUV are multi-beam echo sounder (MBES, 400 kHz, Seabat7125), sidescan sonar (SSS, 120 kHz, EdgeTech2200), and sub-bottom profiler (SBP, 1~6 kHz chirp, EdgeTech2200). A pH sensor was installed on the tail of the AUV. R/V Yokosuka obtains bathymetry data in parallel with backscattering strength of the seafloor using hull-mounted MBES (KongsbergEM122, 12 kHz) with ~7 knots.

Bathymetry data obtained by AUV indicates that there is a small seamount at a location of the suggested mud volcano, whose size is ~500 m-diameter and ~80 m-relative height from surrounding seafloor. The seamount has a caldera-like concave feature on its western flank. The SSS indicates a swell in the concave feature and mega-ripple marks on the swell. The pH sensor indicates a negative anomaly just above the concave feature. The SBP indicates an acoustically transparent body below the seamount that drags sub-seafloor sediment layers upward. These results indicate that the seamount is mud volcano (MV). On seafloor, immediately northwest to the seamount, MBES indicates a fault scarp and SSS indicates a region of high backscattering strength, suggesting some hard materials on the fault scarp and upper side of the seafloor. At the ~5.5 km southwestern part of the seamount (MV), we discover that there are acoustically-observed chimney-like features with a few meters of height.

The shipboard MBES observation indicates that the seamount (MV) is settled at the southeastern part of the uplifted bathymetric feature, diameter is ~12 km, at the southwestern Kumano Basin. The uplift seems cut by linear features trending oblique to the KBEFZ (N30E~N40E near the uplift). A N10E trending linear feature cutting uplift seems continuous from the northern fault to the seamount (MV), with changing its trend (N30E at the seamount (MV) and N10E for westward). Backscattering strength (shipboard MBES) indicates scaly-like characteristic facies covering the area of the seamount (MV) and acoustically-observed chimney-like features, over at least 3 km by 7 km area.

[Interpretation and future work]

The N10E trending linear feature is a part of normal fault (Moore et al., 2013). Based on our observation -some hard materials on the fault scarp and upper seafloor near the seamount (MV) (AUV SSS), the N10E trending feature may play a role of fluid transportation from deep within the underlying accretionary prism. The seamount (MV) is a part of scaly-like facies (shipboard MBES) which is a wedge-shaped part between two obliquely trending KBEFZ and N10E trending features, and a part of uplift of southwestern Kumano Basin. Two-dimensional seismic observation (CDEX Technical Report., 2005) indicates acoustic transparent body below sediment layers at the uplifted

bathymetric feature. We suspect that mud volcano activity may relate to the uplifted bathymetric feature and obliquely trending (N10E) faults near the KBEFZ. In the next stage, we aim to get samples from the MV etc. and try to extract geological activities from DONET observatory system working in the neighborhood.

Keywords: Kumano Basin Edge Fault Zone, Mud Volcano, Acoustic Observation

