

Drilling of Mud Volcano in Hyuga-nada: The destination of Seismogenic fluid with Linkage between the activities and subduction dynamics

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Slow earthquakes in Hyuga-nada have been occurring frequently. Nakata et al. (2019) has focused on shallow slow earthquakes and proposed to drill and install observatories in Hyuga-Nada to address the effect of the seamount subduction. The creation of fluid pathways related to the seamount subduction, as same as a change of subseafloor stress field, can be considered as a possibility to induce slow earthquakes. However, the slow earthquakes that are occurring are not all slow earthquakes at allowed drilling depth. One of the possible slow earthquakes at unexplorable depths causes of this is mud volcano (MV) activity around the forearc basin in southwest Japan.

Mud volcanoes might be associated with seismic motions such as recurring constant and slow earthquakes as they transport fluids and sediments from seismogenic depths to the seafloor. It is also possible that MV activity itself is related to multi-scale seismic activity. The eruption history of MVs which is recorded within sediment layers reveals seismic events in the past.

We propose Chikyu Shallow Core Program (SCORE) to drill in Hyuga-Nada and clarify the timing, origin, and the path of the association between seismic events and MV activities. Drilling and coring will provide key constraints on 1) Relationship between MV activity and earthquakes, 2) Relationship between fluid erupted from MV and seafloor fluid movement. The histories of MV eruptions are evaluated by ²¹⁰Pb isotope ratio dating and microfossil dating. Lithostratigraphy, structure, and microfossil ages will be determined, and the source rocks of the eruptions at the depth of occurrence will be discussed. To understand the origin of the fluids (e.g., dehydration of clay minerals, generation of thermogenic and biogenic gases, spatial advection, etc.), isotopic analysis of fluids ejected from mud volcanoes will be conducted. We will reveal the relationship between the distribution of mud volcanoes and the distribution of earthquakes on a spatio-temporal scale.

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