

SCG059-P20

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## A reconnaissance for sub-bottom diastrophism and origin of methane hydrate in Toyama Trough, eastern margin of Japan Sea

Akira Takeuchi<sup>1\*</sup>, Toshitaka Gamo<sup>2</sup>

<sup>1</sup>University of Toyama, Graduate School, <sup>2</sup>AORI, University of Tokyo

On 14-15th June 2010, during the JAMSTEC R/V Natsushima cruise NT10-10 Leg2, a reconnaissance investigation was executed in the north-central Toyama Trough in order to search for the microorganism decomposition type of methane hydrate buried under the sedimentary region along the Toyama deep-sea canyon. Research objectives are the verifications of the following hypothesis: The generation origin of methane which seeps out at the sea bottom of the Toyama Trough seems different in a southern part and an north-central part, and such a difference corresponds to the difference in crustal strain concentration and activity of tectonic movement.

We report our results of the sea-truth inspection with the precise swath bathymetry by multi-narrow beam echo sounding (MBES) utilizing SEABAT 8160 system and visual observations by the 1412th submersible dive of ROV Hyper Dolphin (HPD1142).

The surface ship survey was conducted within the rectangular area enclosed by the coordinates 37d56.0mN, 137d35.0mE, 38d15.0mN, 138d10.0mE. In the survey box three subarea, A1, A2, and A3 are filled with 0.5 to 1.0 miles interval of swaths. The system also acquired back-scattering data available to visualize as side scan sonar image. This bathymetric investigation aims mainly to map any tectonic morphology and the following aspects are pointed out. In the survey area A1 more than eighty-two spots of strong backscattering were recognized. Some source materials such as chemosynthesis livings, carbonate crusts, pock marks bared sandy and/or gravel-rich seabed, buried gas-hydrate dome, etc. are estimated during the MBES survey.

### Submersible observation HPD1142:

On the basis of MBES survey in the A1 area NW offing Sadogashima Island, HPD1142 was conducted on the eastern margin of sediment flat of the central Toyama Trough. The vehicle arrived 1785m.w.d. bottom on one of the strong reflective spots which fringe the frontal zone of a debris-flow apron.

The first MBARI corer recovered the oxidized fragile clay, white soft clay and bluish grey colored semi-condensed clay. The middle layer seems like kaolin-like clay derived from eroded part of rhyolites. No outcrop of bedrock was observed through the surveyed route but sometime dense fields of sea anemones were found on muddy bottom. They seem to belong to only one species and stood on buried stones within the surface mud less than several centimeters in thickness. This interpretation was clearly justified by MBARI sampling which recovered bottom materials including a sea anemone and its basement stone. Therefore distribution of numerous sea anemones (density is more than 1-2 individuals per 1 square meters) might indicate spatial distribution of float stones in the muddy floor.

Moreover, bared rocks in larger size were also observed to be foundation of sea anemones. Recovered rock samples are all rhyodacites.

Most interesting is a rubble mound found earlier in the dive, at 1776m.w.d. bottom, where is a little bit higher than the landed point (1785m.w.d.). Most rubble is of rectangular shaped rhyolite but planar carbonate crusts were also observed on the entire mound surface. One tip of carbonate crust was recovered interstitial spaces (matrix) of this rubble mound were filled by pale skin-colored, kaolin clay. Consequently, this mound concluded to be an old vent of a small mud volcano, although it includes many lags of rhyolite and rhyodacite.

To conclude the dive HPD1142, it observed the facies boundary between sedimentary flat and piedmont apron of debris flows, although entire region is covered by fragile mud. The A1 area is composed of an intercalation (alternation) of debris flow deposits and hemipelagic and fluvial (back swamp) formations. The thickness of debris formation would be thickened towards the steep slope of the Sadogashima Island. Ground water discharge is probable more or less in the side of sedimentary flat along the facies boundary zone.

Keywords: Toyama Trough, eastern margin of Japan Sea, strain concentration zone, methane hydrate, submersible dive, neotectonics