

## Heat flow measurement and seafloor observation around the Umitaka Spur and the Joetsu Knoll, off Naoetsu, Japan Sea

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Methane hydrates are distributed around the Umitaka Spur and the Joetsu Knoll, off Naoetsu in the eastern margin of the Japan Sea. In the previous research cruises (UT04: piston coring of using R&T/V Umitaka-maru of Tokyo University of Marine Science and Technology; NT05-09: diving surveys using ROV Hyper-Dolphin of JAMSTEC; KY05-08: piston coring and marine DC resistivity survey using R/V Kaiyo of JAMSTEC), they found a number of mounds, large pockmarks (20-50 m deep and 200-500 m across), and gas plumes, and many methane hydrate was sampled by piston coring. Furthermore, methane hydrate exposed on the Umitaka Spur was firstly discovered around the Japan. In 2006, two research cruises were carried out off Naoetsu area: one is piston coring and CTD using R&T/V Umitaka-maru (UT06), another is diving surveys using ROV Hyper-Dolphin (NT06-19). We present the outline of seafloor observation and the results of heat flow measurement in these research cruises.

The diving surveys using ROV Hyper-Dolphin have revealed the following evidences:

- 1) Hydrated methane bubbles (methane bubbling) were discovered on the mounds in the Umitaka Spur and the Joetsu Knoll,
- 2) Past methane venting topography was found within the northern and southern mounds on the Umitaka Spur,
- 3) A characteristic bacteria mat is distributed within the northern mound on the Umitaka Spur,
- 4) Chemosynthetic communities including bacteria mats and sponges are also developed within/around mound on the Joetsu Knoll.

Heat flow measurement was carried out by two methods. We used the piston corer equipped with several small temperature data loggers in UT06 Cruise, and SAHF (Stand-Alone Heat Flow meter) was used for the measurements during the ROV diving surveys in NT06-19 Cruise. Heat flow measurement shows the following:

- 1) Approximately 80-100 mK/m of geothermal gradient and 80-100 mW/m<sup>2</sup> of heat flow around the survey area are comparable to the ambient heat flow in the Japan Sea,
- 2) Geothermal gradient values in the vicinity of methane hydrate and methane bubbling was anomalously high, more than 300 mK/m. On the other hand, geothermal gradient values around the 'normal' muddy seafloor are relatively low (60-80 mK/m).
- 3) More than 450 mK/m geothermal gradient was measured at the methane bubbling site on the Joetsu Knoll.

Since geothermal gradient values vary within a few tens of meters in the mound, methane migration from the deep subsurface to seafloor is considered to occur on an extremely local scale.