Heat flow distribution around the gas hydrate field in the eastern margin of the Japan Sea: Summary of the recent measurements

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The Joetsu Gas Hydrate Field is located around the Joetsu Basin in the eastern margin of the Japan Sea. In the previous research cruises, many mounds, large pockmarks (20 - 50 m deep and 200 - 500 m across), and gas plumes were found in this area, and many massive-type methane hydrates were also sampled by piston coring and ROV. We present the summary of recent heat flow measurement and its anomaly around the Joetsu Basin and in the waters off southwestern Hokkaido.

Heat flow measurement was conducted by the following two methods: 1) in situ measurement using SAHF (Stand-Alone Heat Flow meter) in the ROV surveys, and 2) the measurement using the piston corer equipped with several small temperature data loggers under the coring operation. Thermal conductivity in the SAHF measurement is assumed as 1 W/(mK).

Around the Joetsu Basin, approximately 80 - 100 mW/m^2 of heat flow are comparable to the ambient heat flow in the Japan Sea. On the mounds in the Umitaka Spur and the Joetsu Knoll, more than 400 - 500 mW/m^2 of heat flow was measured not only in the methane venting sites but also in the some bacterial mats. Heat flow values vary from a few meters to a few tens of meters within a mound. Thus, methane migration from the deep subsurface to seafloor occurs on a very local scale, though seismic profiles show the presence of gas chimney just below the mounds.

In the northern part of the Shiribeshi Trough off southwestern Hokkaido, more than 200 mW/m^2 of heat flow was measured around the 'leopard-skin' bacterial mats. These high heat flow values show the presence of active seepage along the active faults in the base of the Minami-Shiribeshi Knoll. On the southern slope off Okushiri Island, approximately 85 - 100 mW/m^2 of heat flow are comparable to the ambient heat flow in the Japan Sea.