



Preliminary results of marine heat flow measurements in the Canadian Beaufort Sea and its implications for intermittent methane fluid expulsion

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Marine heat flow measured at subsurface interval of a few meters using a heat probe is one of useful approaches to show the status of fluid circulation within the marine sediments, even though it can show only a snapshot of long-term variation caused by the fluid circulation. Expedition ARA04C using IBRV Araon was carried out in the Canadian Beaufort Sea during 6-24 September 2013 as Korea/Canada/USA international cooperative research. During the expedition, multidisciplinary programs including multichannel seismic survey, sediment coring, water sampling, atmospheric observation, and heat flow measurement were carried out over the continental shelf and slope area. In particular, Beaufort Shelf, one of regions experiencing fast ocean warming in the past several decades, shows characteristic features associated with degradation of permafrost reaching at the continental shelf. In this context, 8 sites for marine heat flow measurements were chosen: 1) in/outside of the flat-topped mud volcano located in the continental slope as one of fluid expulsion features, 2) along a transect line on the eastern slope of MacKenzie Trough where degradation of permafrost may occur, and 3) at a site closed to IODP pre-proposal #753 as reference. Unfortunately, attempts to measure in-situ thermal conductivity of sediments were failed due to instrument problem. Geothermal gradient observed on the mud volcano flat-top is much higher than ones from the reference site and outside of the volcano, indicating that there occur intermittent fluid expulsions restricted within the volcano. High methane concentration detected in bottom water column by 10 meters above the volcano top is indicative of methane fluid expulsion. Further detailed heat flow study in association with analysis of physical properties of sediment cores through all sites would increase our understanding of nature of methane expulsion emitted from sediments in linkage with degradation of permafrost over the arctic shelf.