

EXPULSION OF METHANE-RICH WARM FLUID FROM MUD VOLCANO IN THE CANADIAN BEAUFORT SEA, ARCTIC OCEAN

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ABSTRACT

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. Marine heat flow measurements using a 5 m-long Ewing-type heat probe was made at the Canadian Beaufort Sea margin during the 2013 and 2014 R/V Araon Arctic cruises as the Korea-Canada-U.S. cooperative research project. Observation results on the flat top of the mud volcano seem to support the evidence that warm methane-rich fluid has been emitted through sediments into the ocean. For instance, we found: 1) gas hydrates embedded in the sediment as crystal form, 2) a much higher geothermal gradient than that from the outside of the mud volcano as well as the background value from the regular seafloor, 3) a much higher seafloor temperature compared with bottom water temperature, 4) a significantly high methane concentration from the water samples, 5) gas plumes through the water column emitted from the top of mud volcano. Comparison with background thermal conductivity, geothermal gradient, and physical properties from the reference site implies that substantially high heat flow of the mud volcano stems mainly from high thermal gradient. We need a further study on configuration of such warm fluid generating the high geothermal gradient to assess the gas hydrate stability zone across the mud volcano.