



Comparison of biogeochemical signals between a pingo-like feature and a mud volcano in the Canadian Beaufort Sea

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In this study, we investigated microbial lipid biomarkers by analyzing two push cores recovered from distinct positive relief features which are located on the continental shelf (pingo-like feature (PLF), 107 m water depth) and slope (mud volcano (MV), 746 m water depth) in the Canadian Beaufort Sea. Their origins are thought to be related with fluid flow phenomena. $\delta^{13}\text{C}_{\text{TOC}}$ values of the PLF were more ^{13}C -depleted than those of the MV, indicating a higher contribution of anaerobic methane oxidation (AOM)-related biomass to the organic carbon pool at the PLF site. Furthermore, $\delta^{34}\text{S}_{\text{TS}}$ values were more depleted at the PLF site, resulting from the active AOM-related sulfate reduction. The PLF sediments contained ^{13}C -depleted microbial lipid biomarkers consisting of irregular isoprenoids, isoprenoidal DGDs, non-isoprenoid DGDs, and C30 hopanoids. This suggests that both AOM and aerobic methane oxidation (MOx) occurred at the PLF site where methane fluxes may be moderate. Moreover, higher ratios of sn-2-hydroxyarchaeol over archaeol (>2) and the presence of ^{13}C -depleted saturated PMI analogues (PMI:3 to 5) indicate that ANME-2 and ANME-3 were involved in the assimilation of methane and/or methane-derived inorganic carbons. In contrast, these lipid biomarkers were scarce at the MV site where active eruptions were observed during the core acquisition, indicating that both AOM and MOx were negligible at the time of the sampling at this site. Consequently, our study suggests that different methane fluxes were responsible for the AOM and MOx processes causing the different biogeochemical characteristics in the samples from the PLF and MV sites in the Canadian Beaufort Sea.