



## **Organic geochemical signatures controlling methane outgassing at active mud volcanoes in the Canadian Beaufort Sea**

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Based on the water column acoustic anomalies related to active methane (CH<sub>4</sub>) venting, numerous active Mud Volcanoes (MVs) were recently identified at ~282, ~420, and ~740 m water depths on the continental slope of the Canadian Beaufort Sea (Paull et al., 2015). While geophysical aspects such as the multibeam bathymetric mapping are thoroughly investigated, biogeochemical processes controlling outgassing CH<sub>4</sub> at the active MVs are not well constrained. Here, we investigated three sediment cores from the active MVs and one sediment core from a non-methane influenced reference site recovered during the ARA-05C expedition with the R/V ARAON in 2014. We analyzed lipid biomarkers and their stable carbon isotopic values ( $\delta^{13}C$ ) in order to determine key biogeochemical processes involved in CH<sub>4</sub> cycling in the MV sediments. Downcore CH<sub>4</sub> and sulphate (SO<sub>4</sub><sup>2-</sup>) concentration measurements revealed a distinct sulfate-methane transition zone (SMTZ) at the shallow sections of the cores (15 - 45 cm below seafloor (cm bsf) at 282 m MV, 420 m MV, and 740 m MV). The most abundant diagnostic lipid biomarkers in the SMTZ were sn-2-hydroxyarchaeol (-94‰ and archaeol (-66‰ with the sn-2-hydroxyarchaeol: archaeol ratio of 1.1 to 5, indicating the presence of ANME-2 or -3. However, we also found substantial amounts of monocyclic biphytane-1 (BP-1, -118‰, which is rather indicative for ANME-1. Nevertheless, the concentration of sn-2-hydroxyarchaeol was 2-fold higher than any other archaeal lipids, suggesting a predominant ANME-2 or -3 rather than ANME-1 as a driving force for the anaerobic methane oxidation (AOM) in these systems. We will further investigate the microbial community at the active MVs using nucleic acid (RNA and DNA) sequence analyses in near future. Our study provides first biogeochemical data set of the active MVs in the Canadian Beaufort Sea, which helps to better understand CH<sub>4</sub> cycling mediated in these systems.

### Reference

Paull, C.K., et al. (2015), Active mud volcanoes on the continental slope of the Canadian Beaufort Sea. *Geochemistry, Geophysics, Geosystems* 16, doi:10.1002/2015GC005928.