Past Methane Emissions at the Storfjordrenna Gas Hydrate-Bearing Mounds

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We investigated gas hydrate-bearing mounds (GHM), that were discovered in the northern Barents Sea, south of the Svalbard archipelago. These mounds contain gas hydrate layers at different sediment depths and we observed release of methane bubbles from some mounds during video and echo sounder surveys. Herein, we report on the results of different proxies e.g. XRF Ca/Ti and Ba/Ti ratios, $\delta^{13}C$ of foraminiferal calcite and lipid biomarkers of microbial communities mediating the Anaerobic Oxidation of Methane (AOM) in sediments to infer the past methane emission events in this area.

We will discuss the differential applicability of each proxy for the reconstruction of methane fluxes. We evaluated the stability and sensitivity of each proxy to gain a complete overview of the methane emission history in the area using two cores from active Mound 3, and two cores from inactive Mound 5 and two cores from a reference site. The results show that XRF Ca/Ti is not sufficient to resolve methane derived authigenic carbonates (MDAC), because this proxy is also affected by abundance of foraminiferal calcite tests, but can be supplementary to identify the MDAC. The $\delta^{13}C$ of foraminiferal calcite is very stable but cumulative of all past events that it's difficult to identify the timing of each event. For the lipid biomarkers, the $\delta^{13}C$ was more stable than their concentrations, this means the $\delta^{13}C$ can preserve information longer than the concentration of the lipid biomarkers.

The methane emission history in this area is highly variable depending on the gas/fluid migration pathways. We evaluated the pros and cons of each proxy and found that application of multiple proxies provide a more comprehensive record.