Past Methane Emissions in the Storfjordrenna Gas Hydrate-Bearing Mounds

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We investigated gas hydrate-bearing mounds recently discovered in the northern Barents Sea South of the Svalbard archipelago (ca 380 m water depth). These mounds are ~10 meters high and ~500 m wide, contain gas hydrate layers at different sediment depths (40, 70 and 120 cm), and we observed release of methane bubbles from some mounds during video and echosounder surveys. Herein, we report on the results of isotopic investigation of calcitic foraminifera and lipid biomarkers of microbial communities mediating the Anaerobic Oxidation of Methane (AOM) in sediments. We will also explore potential linkages between sea ice retreat and methane release events reconstructed from diagnostic lipids of sea ice diatoms (IP_{25}).

Sediments were recovered by gravity cores from two mounds: one is very active and contained gas hydrate at 40 cm below sea floor (bsf), while the other is inactive showing no evidence of present-day methane ebullition, and we did not find gas hydrates in the recovered sediments. At the inactive mound, we found negative C-isotope excursions of foram-calcite at 85, 105, and 150 cm bsf. This is related to methane-derived autigenic carbonates on the shells corresponding nicely with elevated abundances and $\delta^{13}C$ depletion of lipid biomarkers diagnostic for AOM communities. The methane and sulfate profiles indicate a current SMTZ at 150 cm bsf. Above the current SMTZ, the two horizons with ^{13}C-depleted foram-calcite and AOM-lipids indicate two episodes of methane release in the past.

We will also present results from our ongoing investigations of C-isotopes of foraminifera-calcite and lipid biomarker in sediments of the active mound.