



Past Methane Emissions at the Storfjordrenna Gas Hydrate-Bearing Mounds

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We investigated gas hydrate-bearing mounds, so called Pingos, that were 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 echo sounder 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.

Sediments were recovered by gravity coring from two mounds: Pingo 3 is active showing release of methane bubbles and contained gas hydrate at 40 cm below sea floor (bsf), while the other Mound, Pingo 5, is inactive with no evidence of present-day methane ebullition, and gas hydrates in the recovered sediments. At the inactive mound, we found negative C-isotope excursions of foraminifera -calcite at 85, 105, and 150 cm bsf. These negative excursions are related to methane-derived autigenic carbonates on the shells, which corresponds nicely with elevated abundances and $[U+F064]$ ^{13}C depletion of lipid biomarkers diagnostic for AOM communities. The methane and sulfate profiles from pore-water analyses indicate a current sulphate-methane transition zone (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.