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Record of methane emissions from the Arctic during the last Deglaciation

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The methane hydrates of the Arctic represent potentially significant carbon resources that are sensitive to climate change. Methane hydrate provinces are widespread in the Arctic, but their stability and longevity through time, and the significance of their contribution to the global carbon budget, is still poorly understood. It is, therefore, critical to resolve the frequency of methane (CH4) seafloor emissions through time, in relation to past climate change with a special focus on periods of climate warming.

The values of δ13C in benthic foraminifera have been measured in two cores, one collected from an area of active methane venting and one from an inactive area on the Vestnesa Ridge (NW Svalbard continental margin), in order to reconstruct the local history of methane emissions over the past 16,000 years BP. The chronostratigraphic framework of the cores has been derived from biostratigraphic analysis and AMS 14C dates. While foraminifera from some intervals have δ13C within the normal marine range (0 to -1‰), several intervals are characterized by much lower δ13C, as low as -17.4‰ in the active core and as low as -4.37‰ in the inactive core. These intervals are interpreted to record the incorporation of 13C-depleted carbon in the presence of methane emissions at the seafloor during biomineralization of the carbonate foraminiferal tests and subsequent secondary mineralization. The longest of these 'methane emission events' (MEE) coincides with the start of the warm Bølling-Allerød Interstadial (GI-1 in the Greenland ice core record). The lack of correlation between the values of δ13C and δ18O, however, appears to preclude warming of bottom waters as the principal control on methane release. Rather, it seems likely that methane release is related to changes in gas migration pathways, or other geological processes still under debate. Details on the CAGE research plan and organization can be found on www.cage.uit.no to foster opportunities for cross-disciplinary collaboration. Based in Tromsø, at the world's northernmost University, CAGE establishes the intellectual and infrastructure resources for studying the amount of methane hydrate and magnitude of methane release in Arctic Ocean environments on time scales from the Neogene to the present. The Centre of Excellence is funded by the Norwegian Research Council (grant No. 223259) over a period of ten years.