

Mo B02

## CH<sub>4</sub>-derived Carbonate Crusts of the Barents Sea - Formation Controls and Chronology

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### SUMMARY

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Carbonate crusts forming due to methane oxydation at the seepage sites on the seafloor serve as archives of the past fluid flow and methane discharges into ocean and atmosphere. Incorporation of U into the CaCO<sub>3</sub> during precipitation offers the opportunity to date the crust formation and growth via U-Th systematics. Carbonate crust chronologies have been obtained on samples collected from the SW Barents Sea.

Assessment of the potential impact of past CH<sub>4</sub> discharge from CH<sub>4</sub> hydrate reservoirs into the atmosphere is hindered by the lack of robust age constraints on the timing of such fluxes. Authigenic carbonates formed in shallow sediments can be related to CH<sub>4</sub> fluxes to the ocean-atmosphere via stable isotope analyses and can be dated by using U-daughter decay (e.g., Teichert et al., 2003) affording the opportunity to constrain the absolute timing and estimate the rates of CH<sub>4</sub> release.

CH<sub>4</sub>-derived carbonate crusts exhibiting characteristic <sup>13</sup>C-depleted isotopic signatures were collected from several seepage sites of the Barents Sea. The U-Th dating results of early generation aragonite cementing sandy and gravelly sediments constrain the main event of CH<sub>4</sub> discharge and crust formation to a time interval between c. 14 and 11 ka, continuing until c. 9 ka constrained by late stage cavity filling aragonite. These U-Th dates indicate that the carbonate crust formation in the Barents Sea was coincident with the deglaciation of the area and collapse of the Scandinavian Ice Sheet. The CH<sub>4</sub> flux for the carbonate crust formation was likely provided by the dissociation of CH<sub>4</sub> hydrates that extensively formed in underlying sediments during the last glacial period (Chand et al., 2012), but became unstable due to depressuring effects of retreating ice sheet and related isostatic rebound. Ice core records from Greenland and Antarctica demonstrate two CH<sub>4</sub> concentration peaks at ca. 15-13 ka and 11-8 ka, overlapping with the crust formation episode. Such temporal coincidence implies the involvement of destabilised, sediment hosted CH<sub>4</sub> hydrates influencing atmospheric CH<sub>4</sub> and global climate during the last deglaciation.

Chand, S. *et al.* [2012] *Earth and Planetary Science Letters*, 331-332, 305-314.

Teichert, B.M.A. *et al.* [2003] *Geochimica et Cosmochimica Acta*, **67**, 3845-3857.