



Dynamics of the gas hydrate system off Svalbard

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Marine methane hydrate is an ice-like substance stable at high-pressure and low temperature found frequently in continental margins. Since discovery of a large number of gas flares between 380 and 400 m water depth at the landward termination of the gas hydrate stability zone off Svalbard, there is concern that warming bottom waters have already started to melt large amounts of marine gas hydrate and may possibly accelerate global warming. The location of gas flares observed in PARASOUND data, geochemical anomalies in sediment cores, and anomalies in heat flow profiles suggest that hydrates play a role in the observed seepage of gas. However, the observation of thick carbonate crusts during manned submersible dives and their subsequent dating suggest that seepage off Svalbard has been ongoing for at least several hundred years and that decadal scale warming of the West Svalbard Current is at most of minor importance for the bulk of the observed seepage. Thus, the seeps off Svalbard do not necessarily represent the beginning of large-scale hydrate dissociation in the Arctic. Instead, it is likely that seasonal bottom water temperature fluctuations of 1-2°C cause periodic gas hydrate formation and dissociation, which focuses seepage at the observed gas flare depth. The results show that hydrate is highly sensitive to bottom water temperature changes and that bottom water warming will affect the stability of any large hydrate accumulations at the seabed on a short time scale.