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Arctic Gas hydrate, Environment and Climate

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Arctic methane hydrate exists on land beneath permafrost regions and offshore in shelf and continental margins sediments. Methane or gas hydrate, an ice-like substrate, consists mainly of light hydrocarbons (mostly methane from biogenic sources but also ethane and propane from thermogenic sources) entrapped by a rigid cage of water molecules. The pressure created by the overlying water and sediments offshore stabilizes the CH4 in continental margins at a temperature range well above freezing point; consequently CH4 exists as methane ice beneath the seabed. Though the accurate volume of Arctic methane hydrate and thus the methane stored in hydrates throughout the Quaternary is still unknown it must be enormous if one considers the vast regions of Arctic continental shelves and margins as well as permafrost areas offshore and on land.

Today's subseabed methane hydrate reservoirs are the remnants from the last ice age and remain elusive targets for both unconventional energy and as a natural methane emitter influencing ocean environments and ecosystems. It is still contentious at what rate Arctic warming may govern hydrate melting, and whether the methane ascending from the ocean floor through the hydrosphere reaches the atmosphere. As indicated by Greenland ice core records, the atmospheric methane concentration rose rapidly from ca. 500 ppb to ca. 750 ppb over a short time period of just 150 years at the termination of the younger Dryas period ca. 11600 years ago, but the dissociation of large quantities of methane hydrates on the ocean floor have not been documented yet (Brook et al., 2014 and references within). But with the major projected warming and sea ice melting trend (Knies et al., 2014) one may ask, for how long will CH4 stay trapped in methane hydrates if surface and deep-ocean water masses will warm and permafrost continuous to melt (Portnov et al. 2014). How much of the Arctic methane will be consumed by the micro- and macrofauna, how much will contribute to ocean acidification, what is the marine benthic uptake rate and response time and how much will bypass the natural ocean filter systems to the atmosphere?

We do have a strong commitment to collaborating with relevant research entities in USA, Russia, Canada and Europe. CAGE creates needed science and technology sectors and enhance the ability in Norwegian Arctic regions to prosper by facilitating recruitment of early career scientists and active cooperation between hydrocarbon industry, technology providers and prominent Arctic research teams. The Research Council of Norway is funding the Centre of Excellence for a 10 years period under grant no. 223259.