Geophysical Research Abstracts
Vol. 18, EGU2016-11684, 2016
EGU General Assembly 2016

The impact of permafrost-associated microorganisms on hydrate formation kinetics

Manja Luzi-Helbing, Susanne Liebner, Erik Spangenberg, Dirk Wagner, and Judith M. Schicks
GFZ German Research Centre for Geosciences, Helmholtz Centre Potsdam, Potsdam, Germany (mluzi@gfz-potsdam.de)

The relationship between gas hydrates, microorganisms and the surrounding sediment is extremely complex: On the one hand, microorganisms producing methane provide the prerequisite for gas hydrate formation. As it is known most of the gas incorporated into natural gas hydrates originates from biogenic sources. On the other hand, as a result of microbial activity gas hydrates are surrounded by a great variety of organic compounds which are not incorporated into the hydrate structure but may influence the formation or degradation process. For gas hydrate samples from marine environments such as the Gulf of Mexico a direct association between microbes and gas hydrates was shown by Lanoil et al. 2001. It is further assumed that microorganisms living within the gas hydrate stability zone produce biosurfactants which were found to enhance the hydrate formation process significantly and act as nucleation centres (Roger et al. 2007). Another source of organic compounds is sediment organic matter (SOM) originating from plant material or animal remains which may also enhance hydrate growth.
So far, the studies regarding this relationship were focused on a marine environment. The scope of this work is to extend the investigations to microbes originating from permafrost areas. To understand the influence of microbial activity in a permafrost environment on the methane hydrate formation process and the stability conditions of the resulting hydrate phase we will perform laboratory studies. Thereby, we mimic gas hydrate formation in the presence and absence of methanogenic archaea (e.g. Methanosarcina soligelidi) and other psychrophilic bacteria isolated from permafrost environments of the Arctic and Antarctic to investigate their impact on hydrate induction time and formation rates. Our results may contribute to understand and predict the occurrences and behaviour of potential gas hydrates within or adjacent to the permafrost.

Lanoil BD, Sassen R, La Duc MT, Sweet ST, Nealson KH (2001). Bacteria and Archaea Physically Associated with Gulf of Mexico Gas Hydrates. Appl Environ Microbiol 67: 5143-5153.
Rogers R, Zhang G, Dearman J, Woods C (2007). Investigations into surfactant/gas hydrate relationship. J Petrol Sci Eng 56: 82-88.