Cold seep hibernation in Arctic sediments during cold bottom water conditions

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Résumé

Large amounts of methane are trapped within gas hydrate in sub-seabed sediments in the Arctic Ocean, and bottom-water warming may induce the release of methane from the seafloor. Yet, the effect of seasonal temperature variations on methane seepage activity remains unknown, as surveys in Arctic seas are mainly conducted in summer. Here, we compare the activity of cold seeps along the gas hydrate stability limit offshore Svalbard during cold (May 2016) and warm (August 2012) seasons. Hydro-acoustic surveys revealed a substantially decreased seepage activity during cold bottom-water conditions, corresponding to a 43 % reduction of total cold seeps and methane release rates compared to warmer conditions. We demonstrate that cold seeps apparently hibernate during cold seasons, when more methane gas becomes trapped in the sub-seabed sediments. Such a greenhouse gas capacitor increases the potential for methane release during summer months. Seasonal bottom-water temperature variations are common on the Arctic continental shelves. We infer that methane-seep hibernation is a widespread phenomenon that is underappreciated in global methane budgets, leading to overestimates in current calculations.

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