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Bacterial oxidation of methane within seeps in the northern Laptev Sea

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Increase of methane concentration in atmosphere due to emission from Arctic shelf subsea deposits can play considerable role in climate change [1-2]. Methane seeps in East-Siberian and Laptev Seas were investigated in frames of complex research cruise AMK-78 onboard R/V «Akademik Mstislav Keldysh», (September 17 - October 22, 2019).

In the seep areas gas was collected to study its molecular and stable isotopes composition and reveal the genesis of discharging methane. Sediments were collected using box-corer for detailed lithological investigations and characterization of mineral inclusions. At the sampling station within methane seep in the Northern Laptev Sea, dark grey to black clays with hydrotroilite were collected. They contained rounded inclusions of light grey carbonates with size up to 3x4cm.

Methane that migrates to the seafloor surface is characterized by wide range of stable isotopes composition values with predominance of ^{13}C depleted biogenic component [3-4].

Stable carbon and oxygen isotopes composition of carbonate inclusions was measured. The carbonates are strongly depleted in ^{13}C up to -32,4 ‰VPDB. $\delta^{18}O$ varies in wide range between -3 and +4,4 ‰VPDB. Depletion of the carbonates in ^{13}C indicates its formation as a result of bacterial oxidation of methane in anaerobic conditions. Anaerobic oxidation of methane is an important biogeochemical process in the areas of methane emissions. The size and isotopes data of the authigenic methane-derived carbonates provide information on the intensity and time of methane discharge, geochemical characteristics of the fluids, including water. Enrichment of the carbonate inclusions in ^{18}O can be explained by the migration of isotopically heavy water from dissociating gas hydrates [5].

Obtained results of the complex study of discharging fluids and authigenic minerals allow to characterize the biochemogenic processes in seep sediments, local variations in the environmental conditions and methane flux and isotopic effects during bacterial oxidation of methane.

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