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Earth's Cryosphere: Past, Present and Future

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composition of methane: $\delta^{13}C$ (CH_4) values vary from –64 to –79 ‰. Analysis of distribution of methane concentration with depth indicates increase in concentrations upwards from the base of the active layer (~1.8 m).

Based on distribution of methane concentration with depth, we can conclude that the soil temperature of -3.5 to -4.0 ^oC is a threshold for bacterial methane production in conditions of tidal flats of Western Yamal. Methane cannot be produced in frozen saline soils when the temperatures are below this threshold. Frozen soils contain only preserved methane which was produced before the permafrost aggradation.

The study was supported by the RSCF grant #16-17-102. The data on soil properties were obtained during the work on the RFFI project #16-05-00612.

METHANE IN FROZEN DEPOSITS OF THE WESTERN SECTOR OF THE RUSSIAN ARCTIC AS A RISK FACTOR OF NATURAL DISASTERS

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Methane in permafrost Pleistocene and Holocene sediments of the western sector of the Russian Arctic (the coasts and shelves of the Kara and Barents Seas) is a potential factor in forecasting of natural disasters. The identify areas with potentially high risks of natural disasters related to methane emissions is actual scientific task. The solution of this problem will help to decrease the risks associated with industrial development of the Arctic Regions. The effects associated with methane emission from permafrost on global climate system and as a factor potentially increasing the risk of natural disasters are of considerable importance in recent years and bringing attention of mass media, policy makers and scientific community.

A striking example is the formation of deep craters as a result of explosive methane emissions in Yamal, Gydan and Taz Peninsula. The nature of these catastrophic phenomena is under discussion in the scientific literature. The forecast of such catastrophic events should be

based on comprehensive investigations of methane occurrence and distribution in various types of Quaternary sediments, and on the analysis of changing climatic conditions and other environmental and anthropogenic disturbances that may trigger such catastrophic events.

The existing data on methane occurrence mostly available from the permafrost formed in the terrestrial sedimentation environment, however permafrost sediments of the western sector of the Russian Arctic are primarily of marine genesis. Our initial investigations show that methane concentrations in frozen marine sediments is an order or two magnitude higher than in terrestrial counterparts. Abnormally high concentrations of methane are found in ice-wedges and massive tabular ground ice. The key profiles established in Bolvansky Cape (Pechora River mouth), Yamal Peninsula and Western Taymyr. All key profile sections have full representation of the characteristic sedimentation types of sediments formed in the Pleistocene and Holocene.

Hazardous areas with potentially high risks of natural disasters related to methane emissions were defined based on the highest observed and projected rate of climate change or temperature of the seabed, and on high methane content in frozen sediments on coasts and shelves.

The study is supported by RFFI grant № 16-05-00612.

PERMAFROST COASTAL CONTRIBUTION TO THE CARBON FLUX TO KARA SEA, KHARASAVEY SETTLEMENT, WEST YAMAL

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Because of erosion along the Arctic coast, deposits of coastal bluffs previously preserved in the permafrost state erode into the shallow waters of the coastal zone. The organic carbon contained in these deposits can be degraded and converted to greenhouse gases, serve as a source of metabolic energy for primary production in marine ecosystems, be buried in marine sediments, or be transported out of the shallow water zone. Calculation of the volume of organic carbon entering the coastal zone during the erosion of the coasts is the basis for the quantitative and qualitative characterization of this part of the organic carbon cycle, which