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Earth's Cryosphere: Past, Present and Future

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hydrate D_{nd} (approximately by 5 times) while water phase dispersity and the water to hydrate transformation half-time in "dry water" varied not much (no more than 40%).

It was shown the hydrophobic fumed silica BET surface area that was used to prepare "dry water" might significantly influence on sizes of the water droplets and the gas hydrate formation rate and effectiveness their preservation. Then, with increase in the hydrophobic fumed silica BET surface area by 2 times the water droplet size in "dry water" decreased approximately by 4 times while the water to hydrate transformation half-time decreased approximately by 10 times, the fraction of undissociation hydrate D_{nd} decreased by 3 times.

This study was supported by the Council for Grants of the President of the Russian Federation for Support of Leading Scientific school of the Russian Federation NSh no. 9880.2016.5 and Russian young researchers MK-8546.2016.8, Russian Fond of Fundamental Investigation (RFFI) no. 16-38-00279.

METHANE IN GROUND ICE AND FROZEN QUATERNARY DEPOSITS OF NORTH OF WESTERN SIBERIA

Oblogov G.[2,3], Vasiliev A.[2,3], Streletskaya I.[1], Zadorozhnaya N.[1], Fedin V.[1]

[1]Lomonosov Moscow State University, Moscow, Russia
[2]Earth Cryosphere Institute SB RAS, Tyumen, Russia, oblogov@mail.ru
[3]Tyumen State University, Tyumen, Russia

Due to the natural processes and technogenic influences gases from the upper horizons of rocks including conserved in the permafrost released into the atmosphere. Particular attention of researchers is attracted to methane (CH4) as one of the main greenhouse gases. When analyzing the relationship between climate change and greenhouse gas flows, the main problem is the lack or insufficient amount of empirical data on methane content in natural sources, including permafrost and underground ice. In this regard, it is not possible to adequately assess the contribution of a specific region to the overall global methane budget of the atmosphere.

We carried out studies of the methane content in the permafrost, underground ice and in the seasonal thawing layer for the area of the geocryological station Marre-Sale (Western Yamal). A total of about 420 samples were collected. The CH4 concentration was measured by headspace-equilibration, using KhPM-4 (Russia) gas chromatograph with

flame ionization detector and hydrogen used as a carrier gas (Pushchino, Russia).

Initial data indicate that methane concentrations in frozen marine clay sediments (more than 5000 ppm) are an order of magnitude or more higher than in sandy terrestrial sediments (about 100 ppm). The highest concentrations of methane are noted for the massive ice (an average of about 6000 ppm). In the ice wedges concentration of methane are greatly varies from the air concentrations to more than 4000 ppm, an average of about 500-600 ppm.

Based on the average values of methane content in frozen sediments and underground ice, an attempt was made to estimate the annual emission of methane during the retreat of a 100-meter specific section of the sea shore with a known geological section. The amount of retreat for this section of the coast is known and is 1.7 m per year. From the calculations follows that about 14 m3 (or about 10 kg) of methane per year emitted for the selected 100 m shore.

For the first time of the study area, the methane content by the depth in the seasonal thawing layer for different types of landscapes was analyzed. The data obtained show that the greatest amount of methane is realized from the landscapes of highly waterlogged lowland areas and flood plains, in contrast to the watershed landscapes with well drained deposits. Based on the map of landscape zoning for the area of the geocryological station Marre-Sale, a preliminary map of the methane content in the seasonal thawing layer for different types of landscapes was constructed.

The study is supported by RSF grant № 16-17-00102.

INFLUENCE OF FREEZE-THAW PROCESSES ON SOIL RHEOLOGICAL PROPERTIES

Romanenko K.[1,2], Khaydapova D.[2], Yudina A.[1,2], Skvortsova E.[1]

[1]V.V. Dokuchaev Soil Institute, Moscow, Russia
[2]M.V. Lomonosov MSU, Soilscience department, Moscow, Russia

The mechanism of cryogenic structure formation of soils, as the processes of swelling and shrinkage, is very interesting. The study of the processes of freezing and thawing, as well as swelling and shrinkage, will provide a deeper understanding of the nature of the formation of soil structures. The results of the research can find application in predicting the behavior of soils in conditions of changing climate.