Geophysical Research Abstracts
Vol. 20, EGU2018-820, 2018
EGU General Assembly 2018


# Permafrost peatlands soils under the climate change impact: the alteration of hydrological conditions and cryogenic processes

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Permafrost Peatlands (PP) cover 70% of arctic region, and PP soils store enormous amount of organic carbon (C) - about 15-30% of world's soil stock, that makes PP incredibly important to the global climate system. Cryogenic processes, such as freeze-thaw cycles (FTCs) and cryoturbations play a key role in the development and maintenance of PP soils and landscapes. Nowadays PP are subjected to climate change which leads to permafrost thawing, and therefore one of the potential critical ways of PP landscapes evolution is water flooding of territory. Thus, the aim of the study was to estimate the effect of freeze-thaw cycles and cryoturbations on organic C of PP soils in case of flooding development.

The PP soils were studied in the northwest Siberia in forest-tundra transition zone of discontinuous permafrost (Nadym region, N65°19', E72°53'). The increase of annual temperature in the last 20 years is noted for the region and promotes thawing of permafrost. PP soil cover is represented by a complex of Turbic Cryosol and Cryic Histosols. Peat soil profiles were divided into horizons due to decomposition degree (from 15 to 55-60%), age (from 1000 to 5700 yrs.) and botanical composition. The effects of water content, FTCs and cryoturbations on basal respiration, microbial biomass C (Cmic), and dissolved organic carbon (DOC) contents were studied under laboratory conditions (+4°C) by model experiment. To study effect of water content on soil samples, they were incubated at a range of WHC - from 50 (natural, field water content) to 100% during 5 days. Later, samples were subjected to 10 FTCs (3 days each) at the temperatures of -10°C and +4°C. For the half of samples cryoturbations after every FTC were provided.

$CO_2$ efflux from soil samples subjected to flooding after FTCs was in 1.3 time higher than from the samples under field water content (2,3 and 1,8 C-$CO_2$ g-1 h-1) and in 1.2 times higher compared to cryoturbated samples. Cmic was not affected by flooding, however cryoturbations increased Cmic in 1.3 times compared to not cryoturbated samples (from 1180 to 1515 mkg g-1). DOC content raised from 965 to 1390 mg kg-1 with the highest value found in flooded cryoturbated samples.

Thus, FTCs in case of water flooding increase decomposition of organic matter and peat mineralization. Cryoturbations, in turn, promote peat decomposition due to increasing physical disintegration of organic matter, which increase DOC release from polymeric organic matter composition. This additional DOC efflux promotes microbial biomass growth, however, does not intensify microbial mineralization of peat soils.