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Carbon dioxide production and water extractable organic matter of soils in discontinuous permafrost zone of Western Siberia.

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According to the existing world assessments, northern ecosystems represent the main source of carbon dioxide and provide its planetary maximum in the atmosphere.
The research area is located in the north of Western Siberia (Nadym, Yamalo-Nenets Autonomous District, Russia) within the northern boundary of north taiga.
It's zone of discontinuous permafrost. It's absent under forest site and bogs, and exist under peatlands.
The research was carried out at three sites: the forest site, the flat-topped polygonal peatland and the degrading peatland.
The forest site represents lichen-pine forest without permafrost in the soil profile. The soil was classified as Podzols.
The flat-topped polygonal peatland represents flat and slightly inclined main surfaces of peatlands with cloudberry-sphagnum cover. The active layer is peaty horizon with underlying mineral stratum. Permafrost occurs below 55 cm. The following type of soil was identified as Turbic Cryosols.
The degrading peatland is characterized with locally bare peat spots, sparse vegetation and permafrost from 60 cm in the peat layer. It's relict formation. The soil is classified as Cryic Histosols.
Regime monitoring of the carbon dioxide emission and concentration in soil horizons, regime monitoring of the temperature were determined in field conditions, and some of general properties of the soil – in laboratory.
Results and discussion.
The carbon dioxide emission are low in this region (115 $\pm$ 77 mg2/m2hr), which indicates the low biological activity of research soils. Maximum emissions are characterized by Podzols of forest ecosystem, minimal - Cryic Histosols of degrading peatland. Mean emissions are identical for the three years of measurement and placed in the confidence intervals for ecosystems.
Change in the concentration of CO_2 in the soil profile depends on the depth and presence of permafrost and hydrothermal conditions: soils with deep permafrost are characterized by increasing of concentration CO_2 with depth.
The daily dynamics of gas emission and concentration, with a maximum in the afternoon, is associated with the daily air temperature dynamics.
Soils of forest are characterized by the highest biological activity, which related with favorable geo-cryological, hydrothermal conditions in comparison with other objects.
Research ecosystems are characterized with high variation of the total carbon content (37-53%) and very high variation of water extractable organic carbon (0,35-1,65% of C total) in organic profile of the soils. The maximum carbon content found in organic profile of Podzols.
Based on the correlation analysis we revealed a high and significant correlation carbon dioxide emissions with reserves of water-soluble carbon in the upper 20 cm soil layer (beta=0,899; p-level=0,00) and with geo-cryological conditions - existence of permafrost in the soil profile (beta=0,993; p-level=0,00).
We consider the main factor which determine amount of soil CO_2 production is the existence and depth of permafrost, as it determines the type of ecosystem in such transitional landscapes and organic matter transformation processes.
Underestimation of the spatial heterogeneity of soil and vegetation cover in the region of discontinuous permafrost can lead to substantial distortion of estimates of the total emissions.