

ARCTIC CHANGE 2014

The main question

The Circumpolar Active Layer Monitoring (CALM) program developed over the last decade as a leading edge in comprehensive efforts to study the impacts of climate change in permafrost environments. CALM sites are convenient for the study of spatial and temporal variation of soil parameters at fine scales. What does determine biological activity and function of permafrost-affected soils?

Research area

Research area is located on the north of Western Siberia (Nadym District, Russia) within the northern boundary of north taiga, in the contour part of the 3rd lacustrine-fluvial plain of the Nadym River. It's zone of discontinuous permafrost. It's absent in forest and present under peatlands.



Continuous Sporadio Discontinuous 🗾 Isolated

1-ha (100m*100m) grid (N65°20', E72°55') consists of a square array of permanent stakes separated by 10 m (**121 data points** per grid for all measurements). Permafrost is closely associated with frozen peatlands, bog and frost mounds. The typical soils are Turbic Cryosol of young frozen peatland and Histosols of bog.

Methods

Regime monitoring of the carbon dioxide efflux from the soil surface (close non-steady-state non-through-flow chambers method)



Measurement of active layer thickness

+ content of the total organic carbon (TOC), carbon of water - extractable organic matter (WEOC) (extraction of 0.005M K₂SO₄), carbon of microbial biomass (MC) in the upper 10 cm of soil (by chloroform fumigation–extraction (FE) method) and common soil properties were analized in laboratory





+ regime monitoring of the temperature of air, soil surface and soil (Thermochron iButtonTM); description of soil and vegetation cover

Spatial and temporal variability of CO2 efflux of frozen peatland soils at fine scale (Russia, CALM SITE R1)





The values of microbial biomass are high, but geocryological and hydrothermal conditions inhibit all soil biological processes. Permafrostaffected soils of peatlands are characterized by the **low biological** activity which leads to the preservation of organic matter, so these ecosystems are the sink of carbon.

efflux is the depth of permafrost table, it determines the ty ecosystem in such transitional landscapes and organic ma transformation processes.

•Underestimation of the spatial variability of soil and veg cover in the region of discontinuous permafrost can lead t substantial distortion of estimates of the total greenhouse balance.

Acknowledgments

Financial support was provided by the Russian Foundation for Basic Research, grant RFBR №13-04-01577 "Cryogenesis is a subfactor of soil formation on north of Western Siberia".



Key references

1) Goncharova, O.Yu., Matyshak, G.V., Bobrik, A.A., Moskalenko, N.G., 2014. dioxide production by northern taiga soils of Western Siberia (Nadym site). Ea Cryosphere, 18, 66–71, 2) Goncharova, O.Yu., Matyshak, G.V., Bobrik, A.A., Moskalenko, N.G., 2015. Soils thermal regime in sporadic permafrost areas (Western Siberia, Russia). Eurasian Soil Science, In Press.

ems nafrost-
rized by
rbon /pe of atter
etation o
gases
Carbon rth