

## **A metabolomics approach to infer organisms-environment interactions in permafrost soils of the Taymyr peninsula, northern Siberia**

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Along with abiotic conditions, the substrate quality and, thus its availability to the microbial community is a key factor defining the response of permafrost soils to global warming. This concerns in particular to cryoturbation, which has been considered as an important mechanism to preserve soil organic matter in carbon rich permafrost soils.

Here, we made an attempt to apply soil metabolomics as an approach to examine links between in vivo biological activity and environmental parameters in permafrost soils. We compared metabolic profiles of different horizons of cryoturbated soils from Taymyr peninsula, northern Siberia. Our soil metabolome database included 72 samples (observations) and 109 metabolites (variables), among which 71 metabolites were selected as the most important markers (DMs). The relative abundances of almost all sugars, lipids and organic acids were highest in organic and mineral top soils (O and A horizons), and strongly decreased with the soil depth. The results showed a prominent difference in the composition of plant and microbial derived metabolites between the organic and the mineral soils in a line with revealed metabolic similarity between genetically close horizons (i.e., the unburied and buried mineral

topsoils), suggesting that similar microbial processes are occurring in both horizons of same origin, irrespectively of their location. Our data indicates preservation of the metabolites in the permanently frozen part of the soil and confirms the anabolic activity in soils with permanent below zero temperatures.