

A Comparison of Three Soil Profiles along a Small Subwatershed in North Siberia

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Recent research suggests thermokarst lakes produce large amounts of methane due to active layer thawing of permafrost and increasing thaw bulb activity. In order to quantify the amount of methane generation potential and subsequent processing of labile carbon a basic understanding of elements is needed from permafrost. In this presentation we compare permafrost profiles from a watershed with continuous permafrost. Three profiles (upslope, adjacent to the lake, and near an alas adjacent to the lake) were obtained along a small subwatershed entering a thermokarst lake. One centimeter soil samples were collected once every five centimeters and analyzed for moisture and organic matter content using a drying oven and muffle furnace. Water soluble extracts were conducted on three sub-samples from each profile and tested for phosphorus (orthophosphate), nitrogen (ammonium and nitrate), and dissolved organic carbon. Soil moisture contents are highest in the alas (56-26%) and next to the lake (42-20%), and lower on the slope (21-12%). The organic matter content seems steady throughout the profiles (5-2.4%), except for spikes at shallower depths (28%) and slightly elevated levels in the alas and towards the bottom of the water table (7%). Soil organic matter content correlates with moisture content in that samples with higher organic matter contents also have higher water contents. Orthophosphate and dissolved organic carbon extract values correlate with the organic matter content in the soils. Higher organic content soils contained less water soluble amounts of phosphorus and dissolved organic carbon. Orthophosphate concentrations increased with depth for the alas and water table and decreased with depth for the slope. Orthophosphate was much higher for the slope (28.4-17.9 ug/L) compared with the other two profiles (22.2-7.4 ug/L). Nitrate concentrations were highest in the alas (34.7-12.0 ug/L), while ammonium was low and decreased with depth on the slope (14.7-3.7 ug/L) and the alas (3.8-2.8 ug/L) with very large concentrations (26.6-127.1 ug/L) at the lake profile.