## Sources and controls of organic carbon in subarctic lakes across the Fennoscandian tree line

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High-latitude aquatic ecosystems are highly responsive to climate variability. Climate-induced changes in their structure and functioning are often mediated through altered carbon regime driven by landscape-scale ecosystem transformation. To investigate the dynamic catchment-lake interaction, we examined variable catchment parameters, limnological properties and surface sediment features of 31 subarctic lakes across a tree line gradient in northern Finland.

Multivariate statistical analyses were used to first identify catchment features that most strongly influence the limnology of the lakes, with a focus on dissolved organic carbon (DOC) concentrations and its colored dissolved organic matter (CDOM) fraction. Then, we investigated how the limnological characteristics were reflected in the geochemical properties of the lake sediments, including the elemental (carbon [C], nitrogen [N], C/N ratio) and isotopic ($\delta^{13}$C, $\delta^{15}$N) composition of sediment organic matter.

The quantity and quality of organic carbon were identified as key variables differentiating the lakes across the tree line transect, with wetland cover as the primary catchment control on carbon concentrations and quality in the lake water. Terrestrial carbon inputs were mirrored also in the surface sediments of the lakes, yet the sediment geochemistry showed particularly strong coupling with nutrient concentrations related to high benthic production in the shallow lakes of the region. The results have implications for the responses of northern lake ecosystems to climate-mediated changes in vegetation cover and hydrology, and provide reference data for temporal assessment of carbon dynamics in subarctic lake ecosystems.