Organic carbon export from the Mackenzie basin: Insights from observations spanning 30 years

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In recent decades the Mackenzie drainage basin has experienced perturbations in regional temperatures and hydrological processes in association with on-going climate change. Associated changes such as destabilization of permafrost and shifts in vegetation community are expected to impact the flux of nutrients and organic carbon (OC) in groundwaters, lakes and rivers. Assessing long-term variability in these parameters is crucial for understanding ecological and biogeochemical consequences of climate change on local to regional scales.

Riverine sediment samples collected during a series of field campaigns conducted since 1987 provide an opportunity to examine temporal variability in particulate OC exported by the Mackenzie River. In combination with lake delta cores, we seek to assess the nature and pace of change in carbon cycling within the drainage basin.

Because of the complex sources that contribute OC to riverine sediments, a combination of molecular and bulk properties are used to assess the impact of recent hydrological and ecological changes on OC export by the Mackenzie system. In particular, we evaluate spatial and temporal variability in stable C and H isotopic compositions as well as radiocarbon contents of higher plant biomarkers extracted from suspended, bed, overbank and deltaic lake sediments collected from various sampling locations since 1987.

We will highlight new insights emerging from this novel and comprehensive data set regarding the dynamics of particulate organic carbon transport by this major fluvial system.