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Characterization of an optical signature of the DOM of the coastal permafrost in the Mackenzie delta, by PARAFAC analysis

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Global warming increases the thawing rate of the permafrost in high northern latitudes. The Arctic soil organic carbon accounts for over 50% of global soil carbon which is roughly twice the amount present in the atmosphere. An increasing amount of the newly mobilized old organic carbon, and its associated compounds, originating from permafrost thaw, is expected to be delivered to the Arctic Ocean by rivers and groundwater discharges all along the Arctic coastline. Absorbance and fluorescence spectroscopy can be used to identify a specific optical signature of permafrost-derived solutes with the objective of studying their transport and transformation to coastal waters. Emission-excitation spectra (EEMs) from three sampling sites along the coastal area of the delta were assessed and parallel factor analysis (PARAFAC) was used to identify three different components characterizing the origin and the nature of the organic carbon present in various types of samples (massive ice, groundwater, seawater and water samples on top/bottom of slumps). This study suggests that the carbon originating from the thawing of the permafrost could indeed be traced along the coastal area of the Delta.