Geochemical insights into a changing Arctic carbon cycle

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Circum-arctic frozen soils contain twice as much organic carbon as is currently present as greenhouse gases in the atmosphere. When permafrost thaws, the soil organic carbon within it becomes available for remobilization and introduction into inland and coastal aquatic systems. Here it can either be degraded, generating greenhouse gases, or be transported and buried in short and long-term reservoirs, attenuating greenhouse gas emissions. Geochemical techniques (e.g. isotopes, biomarkers) can be used to identify the quantity and quality of organic matter that is, upon thaw, transported from permafrost soils to streams, rivers, and ultimately the ocean. Here I will present the results of a selection of studies by me and many colleagues to provide insights into provenance, degradation potential, transport routes and ultimate fate of carbon in thawing permafrost.