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Project Title:
Changes in Dissolved Organic Matter along a Permafrost Thaw Chronosequence in a Subarctic Peatland

Project Description:

The fate of carbon stored in permafrost-zone peatlands represents a significant uncertainty in global climate modeling. Given that the breakdown of soil organic matter (SOM) is often a major pathway for decomposition in peatlands, knowledge of organic matter reactivity under different permafrost regimes is critical for determining future climate feedbacks. To explore the effects of permafrost thaw and resultant plant succession on SOM reactivity, we used Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS) to examine the SOM composition gathered from various sites along a permafrost thaw sequence in Stordalen Mire, a thawing subarctic peatland in northern Sweden. This impact of permafrost thaw on organic matter chemistry could intensify the predicted climate feedbacks of increasing temperatures, permafrost carbon mobilization, and hydrologic changes. In this study, we tested the hypotheses that organic matter reactivity increases with permafrost thaw due to thaw-induced subsidence and associated shifts in hydrology and plant community. Our study specifically addresses the effect of thawing permafrost, and its attendant shifts in hydrology and plant communities, on CH4 and CO2 production potentials and mechanisms, via changes in organic matter chemical composition (commonly referred to as organic matter "quality") in a thawing peatland complex.