Environmental Sciences Graduate Program Student Seminar Series

Mapping microbial substrate utilization across a permafrost thaw gradient

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Join Zoom Meeting

https://osu.zoom.us/j/99820921442?pwd=d3hpTS9wYnc2Z29uZDR4NE4wNy81UT09

Meeting ID: 998 2092 1442

Abstract

Permafrost thaw in northern latitudinal peatlands is likely to create a positive feedback to climate change, as previously frozen carbon (C) becomes bioavailable and is released to the atmosphere as greenhouse gases. The release of the greenhouse gases, carbon dioxide (CO_2) and methane (CH_4) are a result of the microbially mediated transformations of the “old” C and “new” C from plant inputs, and intermediate-age C in the seasonally thawed active layer. However, the inter-relationship of microbial community C use and greenhouse gas emissions as permafrost thaw progresses remains unclear. To investigate microbial C cycling changes with thaw, we examined how microbial community C substrate utilization changed between two progressively thawing features in Stordalen Mire (68.35°N, 19.05°E), in northern Sweden. The first site being a partially thawed Sphagnum moss-dominated bog and the second a fully thawed Eriophorum sedge-dominated fen. We analyzed microbial C substrate utilization by two incubation-based methods: Biolog Ecoplates™ and anaerobic mason jar incubations of peat with selected substrate amendments. Following the end of the anaerobic incubation, 16SrRNA amplicon sequencing was done on peat samples. We found that substrate utilization extent and diversity was greater in the fen at all time points. It was also found that substrate type impacts CO2:CH4 ratios in both sites. Using a linear discriminant analysis on the 16SrRNA data, we found that substrate type can lead to a shift in microbial community composition in both the bog and fen. These findings suggest that C substrates play a role in determining microbial community dynamics and the resulting emissions of important greenhouse gases.