B53F-1806 Quantifying Gross Rates of Methane Production and Consumption in a Northern Forest

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13:40 - 17:30

Hall B-C (Poster Hall) (Convention Center)

Abstract

Northern forest soils are vital for climate change mitigation since upland sandy soils favor the net consumption/oxidation of atmospheric methane (CH_4). We are studying biogeochemical CH_4 cycle processes in a Northern Forest (Howland Research Forest, Maine), where upland soils are interspersed with wetland (*Sphagnum* bog), and upland-wetland transition soils along with hummock-hollow microtopography. This complex mosaic of microsites with sources and sinks of CH_4 is subjected to change under future wet climates projected for this region, with a potential for these forests to shift from a net CH_4 sink to a net CH_4 source. Net CH_4 emissions in a wet climate can increase either by inhibiting methanotrophs or favoring methanogens, or both. Thus, quantifying underlying processes of gross CH_4 production and consumption can reduce the uncertainty of CH_4 sink/source estimation in this critical ecosystem. We have collected baseline soil data across the forest's landscape including Total Carbon and Total Nitrogen with the Elemental Analyzer, Gravimetric Soil Moisture, and pH. Furthermore, stable isotope dilution method will serve as a proxy for methanogenic and methanotrophic activities to quantify gross rates of CH_4 production and consumption from a flooding (wet-up) experiment in Howland Forest. We will differentiate between CH_4 consumption and production by measuring both the change in the amount of CH_4 and the ratio between labeled and unlabeled CH_4 in a closed system. We will analyze the stable C isotope in $^{13}CH_4$ to determine gross rates of CH_4 production and oxidation in situ and within laboratory incubations. The in situ stable isotope dilution technique will be compared with the gas push-pull method, to test the suitability of a simple, low cost method to quantify gross CH_4 oxidation rates. Novel data obtained in this study will constrain CH_4 cycle processes in a biogeochemical model to quantify CH_4 source-sink potential in Northern Forests under current and future climatic conditions.

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