Poster #1-52

Effects of Experimental Warming & Elevated CO_2 on Trace Gas Emissions from a Northern Minnesota Black Spruce Peatland

Adrien C. Finzi[1*], Allison L. Gill[1,2], I-Fang Hsieh[1], and Marc-André Giasson[1]

[1]Boston University, Boston MA;
[2]Unniversity of Minnesota, St. Paul, MN

Contact: afinzi@bu.edu

BER Program: TES
Project: University

High latitude peatlands represent a particularly significant terrestrial carbon sink, containing nearly half of the soil carbon pool on Earth. As result of their anoxic conditions, peatlands are simultaneously a large C sink but also a major source of CH4 to the atmosphere. The greatest rates of warming are occurring at high latitudes and warming is predicted to accelerate the loss of the C stored in peat as a result of faster rates of decomposition. The magnitude of forms of these C losses as CO2 and CH4 remains highly uncertain. To address these uncertainties, this project uses a measurement and modeling campaign at the DOE-funded *Spruce and Peatland Responses Under Changing Environments* (SPRUCE) experiment in the Marcell Experimental Forest, MN. The objectives of the research are intended to bridge a gap between data and models for policy-relevant outcomes by:

1. making high-precision, high-temporal resolution measurements of the flux and ^{13}C-isotopic composition of CO_2 and CH_4 from a boreal, black spruce peatland exposed to high concentrations of atmospheric CO_2 and experimental warming up to 9^{o}C;
2. testing fundamental hypotheses regarding the effects of warming and elevated CO_2 on C-based greenhouse gas efflux in a peatland ecosystem; and
3. expanding and testing *a soil process model of O_2, CO_2, and CH_4 production and consumption guided by formal data-model assimilation* and using a novel, parsimonious, statistical representation of redox conditions across populations of soil microsites that *could be incorporated into larger EESMs*;

By utilizing a "*systems approach*" this research "s*eeks to improve the representation of these integrated processes in coupled models"* by further developing a belowground terrestrial-aquatic interface, process-based model with the specific goal of using a model structure that could be integrated with larger ecosystem and global models (Sihi et al., 2018). This project directly addresses the TES's interest in Terrestrial-Aquatic Interfaces. The proposed ModEx framework is central to "*understanding of the roles of Earth's biogeochemical systems*" at decadal to centennial time scales, a centerpiece of the Office of Biological & Environmental Research mission.