Poster #33

ORNL's Terrestrial Ecosystem Science – Scientific Focus Area (TES SFA) A 2017 Overview

Paul J. Hanson[1], Daniel M. Ricciuto[1] and SPRUCE Project Participants

[1] Climate Change Science Institute, Oak Ridge National Laboratory Oak Ridge, Tennessee

Contact: Paul J. Hanson [hansonpj@ornl.gov]

Understanding responses of ecosystem carbon (C) cycles to climatic and atmospheric change is the aim of the Terrestrial Ecosystem Science Scientific Focus Area (TES SFA). Our vision is to: **Improved integrative understanding of terrestrial ecosystem processes to advance Earth System predictions through experiment-model-observation synergy**

The TES SFA is guided by the vision that sensitivities, uncertainties and recognized weaknesses of Earth System Model (ESM) predictions inform observations, laboratory and field experiments and the development of ecosystem process modeling. In turn, predictive understanding and findings from the field and laboratory and improved process modeling are incorporated (with the associated uncertainties) into ESMs as explicitly and expeditiously as possible. Overarching science questions are:

1. How will atmospheric and climate change affect the structure and functioning of terrestrial ecosystems at scales from local to global and from decadal to centuries?
2. How will fossil fuel emissions and terrestrial ecosystem processes, mechanisms, interactions and feedbacks control the magnitude and rate of change of atmospheric CO_2 and other greenhouse gases?
3. What are the climate change-induced shifts in terrestrial hydrologic and ecosystem processes that inform assessment of climate change impacts on ecosystem services and society?

The proposed science includes large manipulations, C-Cycle observations, database compilation, and process studies integrated and iterated with modeling activities. The centerpiece of our climate change manipulations is the SPRUCE experiment testing multiple levels of warming at ambient and elevated CO_2 on the C feedbacks from a black spruce–*Sphagnum* ecosystem. **New results in 2017 include new publications on SPRUCE project performance, bog biogeochemistry and deep peat heating results. The root traits task has initiated the FRED data base.** The TES SFA aims to integrate experimental and observational studies with model building, parameter estimation, and evaluation to yield reliable model projections. This integrated model-experiment approach fosters an enhanced, interactive, and mutually beneficial engagement between models and experiments to further our predictive understanding of the terrestrial biosphere. **Cooperatively funded work with researchers at the University of Oklahoma, has led to the development of the Ecological Platform for the Assimilation of Data (Eco-PAD) in the context of a SPRUCE ecological forecasting system.**