Poster #9-24

A Site- to Global-Scale Soil Biogeochemical Model in ELM with Vertically-Resolved Microbe- and Mineral-Surface Representations: Application to the LBNL TES SFA Warming Experiment

Zhou Lyu[1*], William Riley[1], Jinyun Tang[1], Rose Abramoff[1,2], Jennifer Soong[1], Cristina Castanha[1], and Margaret Torn[1]

[1] Lawrence Berkeley National Laboratory, Berkeley, CA
[2] Le Laboratoire des Sciences du Climat et de l'Environnement, Paris, France

Contact: zlyu@lbl.gov

BER Program: TES
Project: LBNL TES SFA on Belowground Biogeochemistry
Project Website: https://tes-sfa.ornl.gov/

Accurately predicting soil carbon responses to a changing climate is difficult, and has been limited by the lack of long-term soil warming experimental observations that can be used to develop and test mechanistically based soil biogeochemical (BGC) models. Most soil BGC models simulate soil organic matter dynamics based on decay rates of conceptually defined organic matter pools. They lack explicit description of interactions among components actively involved in soil reactions, which are influenced by environmental factors such as temperature and moisture. The lack of explicit reaction processes can result in unrealistic BGC responses to both sudden and gradual changes in environmental drivers. To provide more realistic simulations of dynamic soil physical, chemical, and biological processes—and thus of the soil response to environmental change—we have developed a model in ELM-BeTR that explicitly represents microbial physiology and their interactions with soil minerals, substrates, and plants. We applied the newly developed model to the deep soil-warming experiment at Blodgett forest in northern California with the goal to reproduce the observed soil biogeochemical responses to multi-year warming. Our preliminary results indicate a good comparison with vertical profiles of soil organic matter content and CO2. The new model will contribute to a more comprehensive and realistic terrestrial ecosystem model that can be applied to site and global simulations.