

Does temperature acclimation of plant carbon exchange improve land model performance?

Project Coordinator

Nicholas Smith, Purdue University, ngsmith@purdue.edu, 765-496-1764

Participants

Jeffrey Dukes, Purdue University

Andrew Richardson, Harvard University

Research objectives

Temperature acclimation of plant carbon exchange is an often observed response in field and laboratory studies and the inclusion of this response into models has been shown to dramatically alter projected plant productivity in a future, warmer world. However, many models have still not incorporated this response, and while the incorporation of temperature acclimation is certainly a mechanistic improvement for models, it has not yet been shown to improve overall model performance. This goal of this proposed study will be to systematically examine whether current algorithms for temperature acclimation of plant carbon exchange can improve a land model's ability to reproduce observed rates of terrestrial carbon cycling.

To achieve our goal, we propose to incorporate published carbon exchange algorithms that include temperature acclimation into the NOAA/GFDL land model, LM3. Using reanalyzed forcing data, we will simulate terrestrial rates of carbon cycling using versions of the model that do and do not include the acclimation algorithms. These simulations will be performed at individual $1^{\circ}\times 1^{\circ}$ gridcells in locations near FLUXNET tower sites. Using the La Thuile dataset, we will then compare the net ecosystem exchange of CO_2 (NEE) output from these simulations to observed NEE flux data. These comparisons will be done at all sites within the dataset for which the data meet a set of criteria that will be based upon data availability and data quality (similar to Richardson et al. 2010).

Throughout the experiment, we will follow the FLUXNET protocol as defined for the La Thuile data. We will keep the site PIs for each site we use informed of the results as we progress and will invite them to make intellectual contributions to the project. We will further invite site PIs that provide data and intellectual contributions to be coauthors on any manuscripts that result from the project. All data providers will be acknowledged in such manuscripts.