

Title: Photosynthetic acclimation to global change: improved understanding for more reliable predictions

Abstract: Photosynthesis by land plants is the largest flux of carbon between the atmosphere and the Earth's surface and is more than 20 times greater than the flux of fossil fuel emissions by anthropogenic activities. Thus, the response of this and other plant physiological processes to ongoing and projected global change will greatly influence the rate and magnitude of these changes. Our lab has been developing theory, rooted in first principles of plant physiology, to better understand and predict how physiological processes respond and feed back to global change. The theory posits that plants optimize resource use to maintain the fastest possible rates of photosynthetic carbon assimilation in a given environment. From this, we can predict key plant traits that are important for biogeochemical cycling at the ecosystem scale. In addition to generating model predictions, we are also using the theory to better understand observational and experimental results at different scales. The topics we are addressing that I will cover in the talk include physiological optimization, photosynthesis-soil nutrient relationships, physiological acclimation effects on biogeochemical cycling, and physiological drivers of C3-C4 plant competition. The studies will highlight how we are using a combination of experiments, observations, and theoretical modeling to glean greater insight into plant ecophysiology than could be done by one approach alone. I hope the talk will convince you that plants are dynamic organisms that actively, and in some cases rapidly, adjust to environmental change. I also hope to show that it is critical that this dynamism is represented in global climate models and provide a path forward for achieving that.