KANSAS STATE UNIVERSITY

Division of Biology Presents:

Improving Understanding and Prediction of Photosynthesis: From Experiments to Earth System Modeling

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Photosynthesis captures the solar energy that powers nearly all life on Earth and is a fundamental process governing ecosystem function, the global carbon cycle, and climate. Yet accurately measuring and predicting photosynthesis across ecosystems remains one of the central challenges in Earth system science. Progress depends on directly confronting model simulations with observations collected at matching spatial and temporal scales. Although this approach is well established in laboratory experiments, equivalent methods remain lacking at the regional and global scales represented in Earth system models. As a result, competing models of photosynthesis and coupled biosphere processes are difficult to rigorously evaluate and improve.

In this talk, I will describe work that addresses this challenge by reformulating the photosynthesis equations used in Earth system models so they can be directly calibrated and tested using observations from flux towers, aircraft, and satellites. I will discuss experimental studies of photosynthesis that have guided the development of this new framework, its integration into canopy radiative transfer and land surface models, and how these advances improve interpretation of observations including solar-induced chlorophyll fluorescence, carbonyl sulfide, and atmospheric carbon dioxide. I will focus on applications to understanding vegetation responses to environmental change as well as improving predictions of terrestrial carbon uptake and other key aspects of ecosystem function and services.

If you would like to visit with Dr. Jennifer Johnson, please contact Dr. Jesse Nippert at nippert@ksu.edu.

Coffee & snacks served preceding the seminar in Ackert Hall, Room 225