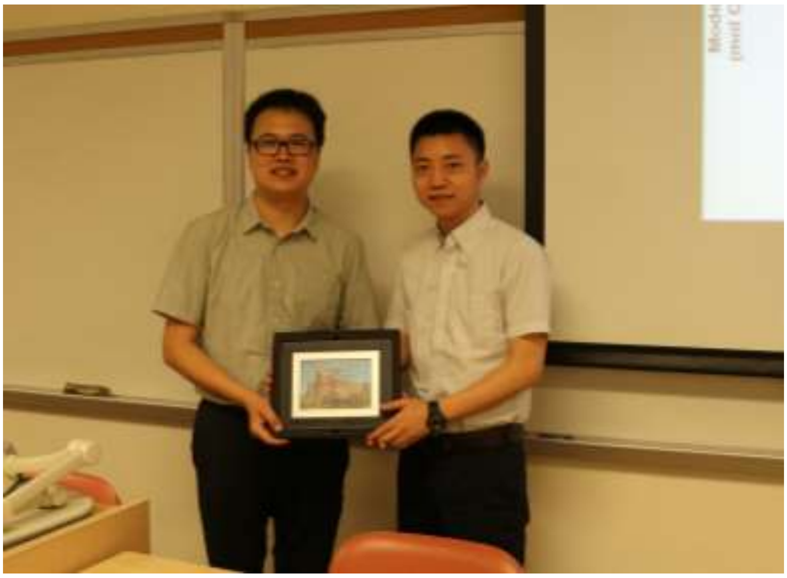
LSGI Public Lecture Series

"Scaling carbon cycling from leaves to ecosystems: an integrative approach to predicting tropical forest response to climate change"

Overview

It was our pleasure to invite Dr. Jin WU, Brookhaven National Laboratory, Environmental & Climate Sciences Department, US, to deliver a seminar of the LSGI Public Lecture Series on 16 May 2018.



Biographies

Dr. Jin Wu is a Goldhaber Distinguished Postdoctoral Fellow at Brookhaven National Laboratory. He received his B.S. in GIS at Wuhan University in 2007, equivalent M.S. in Remote Sensing at Beijing Normal University in 2009 and Ph.D.

in Ecology and Evolutionary Biology at University of Arizona in 2015. Jin is a broadly trained environmental scientist studying the interaction of forest ecosystems with climate. He shares a very broad research interest in plant physiology, ecosystem science, ecological strategies, biodiversity, and community assembly. Jin is especially keen to advance our understanding of these topics by using multi-discipline approaches (remote sensing, gas exchange measurements, biometry surveys, earth system modeling) undertaken across a wide range of scales (leaf, canopy, landscape, globe). His current research is focused on understanding and model representation of the processes that underlie the response of tropical forest ecosystems to global change. His research was published in top journals, including a first-authored paper published in Science as the cover story. (More information can be found: https://www.bnl.gov/envsci/bio/wu-jin.php)

Scaling carbon cycling from leaves to ecosystems: an integrative approach to predicting tropical forest response to climate change

Tropical forest photosynthetic metabolism helps sustain the ecosystem productivity and biodiversity, and largely regulates large-scale carbon and water cycling, generating various important climate feedbacks at regional and global scales. However, considerable uncertainties remain regarding how best to represent tropical forest photosynthesis in current Earth system models (ESMs), especially its sensitivity to climatic vs. biotic variation. Here, I develop a new approach to partition the photosynthetic controls to show that climatic factors dominate photosynthetic dynamics at shorter (hourly to daily) but not at longer (monthly to yearly) timescales. Focusing on seasonal timescales, I combine camera and ecosystem carbon flux observations of forests across a rainfall gradient in Amazonia to show that high dry season leaf turnover shifts canopy composition towards younger, more efficient leaves. This seasonal variation in leaf quality (per-area leaf photosynthetic capacity) can explain the high photosynthetic seasonality observed in the tropics. Further, I show that the novel spectroscopy technique has the capability to accurately estimate leaf age and age-dependent photosynthetic capacity both within and across tropical tree species and forests, suggesting a potential, promising way to monitor tropical forest carbon and water dynamics using state-of-the-art space-borne techniques. Throughout, I demonstrate how such an integrated approach, which connects advanced ecological theories and cutting-edge remote sensing technology with ESMs, can lead to an improved understanding of how terrestrial ecosystems respond to current and changing climates.