Postdoctoral research associate: Imaging spectroscopy and plant functional traits
NASA Goddard Space Flight center

Expected start date: May/June 2021
2 years of guaranteed funding

To apply, please send a short (<1 page) cover letter and CV to Dr. Alexey Shiklomanov (alexey.shiklomanov@nasa.gov). Due to the proximity of the expected start date, applications will be reviewed, and candidates selected, on a rolling basis. Please feel free to reach out to me with questions.

Position description

Plant functional traits are a vital component of functional biogeography and are important as parameters in vegetation models. Although databases of in-situ trait measurements are larger and more open than ever before, large gaps and sampling biases in these datasets continue to pose a challenge in trait ecology. Several decades of research have demonstrated that an effective way to fill these gaps is through estimating traits from imaging spectroscopy. However, existing airborne spectroscopy data can only sample a small areal fraction of the world's terrestrial ecosystems and are limited in their ability to monitor changes through time. The NASA Surface Biology and Geology (SBG) designated observable—a planned global satellite imaging spectroscopy mission—represents a significant new opportunity for studying plant traits worldwide. **The overarching objective of this project is to evaluate state-of-the-art approaches and explore new techniques for estimating traits from spectra across vegetation types and measurement conditions.**

This project has three major components. The first component is to **evaluate the performance of common trait estimation algorithms** against a large database of **existing field measurements of leaf spectra and traits**. The second component is to perform a **similar analysis at the canopy scale**, applying trait retrieval algorithms to NEON Airborne Observing Platform reflectance observations and evaluating their performance against in situ NEON plot-level trait measurements. In addition to evaluating algorithm performance, traits estimated from these analyses will be used to **characterize the multivariate trait space and its relation to plant characteristics and measurement context**, thereby tackling important questions in plant functional trait ecology. The final component of this project is to **assess the impacts of measurement conditions and instrument characteristics on trait retrievals from simulated imaging spectroscopy measurements** using a novel approach combining Bayesian model-fitting methods and canopy and atmospheric radiative transfer models to simulate top-of-atmosphere radiance from known trait values. **The candidate for this position would have an opportunity to contribute to any or all of these tasks, depending on their technical skills, scientific expertise, and research interests.**

The ideal candidate will have *one or more of the following*:
- Proficiency in scientific programming and data analysis in R, Python, Julia, or a similar scripting language
- Familiarity with remote sensing technology and principles, especially as they relate to hyperspectral remote sensing
- Scientific background in terrestrial vegetation ecophysiology, especially related to causes and consequences of variability in plant functional traits
- Proficiency in statistics and data science, especially Bayesian and multivariate methods, and including the ability to independently perform, summarize, visualize, and effectively communicate the results of complex statistical analyses to a variety of audiences