Improving Predictions of Global Canopy Interception Losses by Leveraging Remotely Sensed Canopy Structure Data

Abigail Sandquist
Scott T. Allen

University of Nevada, Reno

Variation of water fluxes from forest canopies across different ecosystems is not well understood. Interception loss varies widely spatially and temporally, creating challenges for measurements and predictions. Many existing empirical datasets are brief and reflect inconsistent methodologies, limiting their use in informing global estimates of interception loss (e.g., through Earth Systems Models (ESMs)). An exception is the field-measured precipitation and throughfall data from the National Ecological Observatory Network (NEON), representing 24 diverse vegetated sites across the US. Here, we use those data to determine whether canopy structural traits can predict interception losses on a storm-by-storm basis, towards identifying new approaches to predict spatiotemporal variations in interception losses. We use regression approaches to understand how canopy interception varies with forest mean canopy height and mean above ground biomass data (retrieved from NASA's Global Ecosystem Dynamics Investigation (GEDI)). Preliminary random forest models run as a function of storm size and intensity and vegetation structure features captured 70 percent of the variance in interception loss amount, and 25 percent of variance in percent interception loss. Our findings suggest that estimating interception losses based on local storm conditions and forest structure could lead to improved estimates of water fluxes in forest canopies, especially as compared to common conventions of using static parameter sets. This project addresses the NASA Earth Science Division Mission Directorate to 'enable better assessment and management of water quality and quantity to accurately predict how the global water cycle evolves in response to climate change (Water and Energy Cycle).' Applying better canopy interception parameters in ESMs will enable better prediction of water and carbon fluxes at large scales and how they may shift in response to climate change.