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Understanding differences between Leaf Area Index (LAI) measurements at various temporal and spatial scales over the Ordway Swisher Biological Research Station in Forida, USA

Michele Kuester[†]; Keith Krause; Courtney Meier; David JP Moore; Andrew Fox; Rebecca Hufft Kao; Joel McCorkel; Brian Johnson; Thomas Kampe
[†] NEON Inc., USA
Leading author: mkuester@neoninc.org

The National Ecological Observatory Network (NEON) is a continental-scale research platform that will collect information on ecosystems across the United States to advance our understanding and ability to forecast environmental change at the continental-scale. NEON will focus on several of the terrestrial Essential Climate Variables (ECV) including albedo, land cover, vegetation type, fraction of absorbed photosynthetically active radiation (FAPAR), above-ground biomass and leaf area index (LAI). These variables are collected throughout a network of 60 sites across the Continental United States, Alaska, Hawaii and Puerto Rico via ground-based and airborne measurements. Recent ground and airborne data collected by NEON over the Ordway-Swisher Biological Research Station, along with coincident satellite-based observations),will be used to explore the differences among the measurement types and to test modeling and scaling approaches for ECVs. Ground based measurements include LAI, aboveground biomass, and spectral reflectances of major vegetation species. Airborne measurements include hyperspectral and waveform LiDAR data. Integration of the satellite data with the targeted regional data from NEON airborne instrumentation provides vital information to scale from NEON's distributed sensor network and in-situ field measurements to plot or stand level observations, and ultimately to the continental scale. The use of ground-collected LAI to validate airborne and satellite measurements is not a strict one-to-one correlation as measurement techniques are fundamentally different and these are further exacerbated by temporal and spatial differences. In this paper we will assess the differences in LAI derived from these measurements. Understanding the need for correction factors such as clumping and how that is applied to the different measurement types is also discussed. We found that the spatial distribution of LAI from ground-based, airborne, and satellite data was generally consistent but that smaller scale measurements may have to be scaled using a calibrated offset to make inferences to larger spatial scales. Changes in vegetation influence carbon, water and energy budgets, directly affecting local and global climate, and LAI is one indicator of vegetation change. Creating a bridge to compare ground, airborne and satellite LAI data that span many temporal and spatial scales can provide a powerful tool for the development of vegetation parameters for climate forecast modeling.