H25M-1188: Carbon-Water-Energy coupling relationships from the field to satellite scale

Deanroy Mbabazi[1] and Binayak Mohanty[1]

Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX, United States

Abstract

Carbon, water, and energy cycles are key processes controlling land-atmosphere interactions. Carbon and energy fluxes are both coupled with soil moisture (SM), leading to water-limited and energy-limited regimes. Functional relationships between carbon, water, and energy are key to understanding feedbacks between the land surface and atmosphere and give an estimate of the land-atmosphere coupling strength. Current carbon, water, and energy coupling relationships are commonly estimated at the point or satellite scale. These coupling relationships are expected to vary across scales. We investigated the carbon, water, and energy coupling relationships and the limiting thresholds from the field to satellite scale. We also investigated the effect of weather, seasons, and land cover on carbon-water-energy coupling strength. Carbon (carbon dioxide: CO_2), energy (evapotranspiration: ET), and water (SM) were estimated using Eddy covariance and soil moisture monitoring systems at various FLUXNET sites in the Continental United States. These field measurements were used together with LANDSAT, MODIS, SMAP remote sensing satellites estimates of ET, CO_2, and SM, respectively. Weather variables were obtained from Daymet (a gridded daily surface weather data product) and weather monitoring systems at the FLUXNET sites. This analysis provided insights to the spatial and temporal variations of the carbon, energy, and SM at different scales.