Carbon Dynamics of the Greater Everglades Watershed and Implications of Climate Change

Ross Hinkle (rhinkle@ucf.edu) - University of Central Florida (PI), Brian Benscoter and Xavier Comas, Florida Atlantic University; David Sumner and Don DeAngeles, United States Geological Survey (Co-PIs).

Peatlands (wetlands with thick soil organic layers) are common globally, containing more than 30% of the terrestrial carbon (C) pool. While most research has focused on more expansive high latitude peatlands, subtropical and tropical peatlands have comparable depths of soil C (often >10m) and are at equal if not greater risk of degradation and soil carbon loss due to altered climate and disturbance regimes as well as land use change. The Florida Everglades are an example of a low latitude wetland watershed with extensive peatland carbon stocks subjected to a myriad of environmental pressures due to climate change and anthropogenic forces that place these C stocks at risk. Within the headwaters region of the Everglades watershed, we are quantifying ecosystem C cycling along a hydrologic gradient ranging from xeric pine flat wood forests to inundated sawgrass peatlands using an array of methodological approaches. Eddy covariance measurements of $\text{CO}_2$ and H2O were collected at all sites, with added at the depression marsh and sawgrass peatland sites. Preliminary results from 2013 indicate that all sites are acting as a sink for $\text{CO}_2$, although the sites are distinct in their seasonal source/sink dynamics. The sawgrass peatland is the largest $\text{CO}_2$ sink while the depression marsh is the smallest. The two wetlands are both sources of CH4, though the sawgrass peatland has produced only 60% of that of the depression marsh, despite having a longer hydroperiod. Additionally, a series of closed chambers have been installed at each site to quantify community-scale C exchange and develop response functions with environmental drivers. Open-top chambers will be installed on a subset of these chambers to examine the effects of passive heating on C flux. Ground Penetrating Radar (GPR) surveys are being used to estimate peat thickness at high spatial resolution and belowground root biomass. Aboveground biomass has been collected seasonally in plots across all the study sites. Initial development has been completed to represent the mixed pine/depression marsh landscape within the Community Landscape Model (CLM). Using the stock quantifications and flux response functions developed through this study, we will further parameterize our model framework to better incorporate low-latitude wetland watersheds in CLM and Earth System Models.