Abstract title: Carbon Dynamics of the Greater Everglades Watershed and Implications of Climate Change

We continued Eddy covariance (EC) tower measurements for CO_2, H_2O, and CH_4 along a hydrologic gradient at three sites: longleaf pine flatwoods (CO_2 and H_2O only), seasonally inundated depression marsh, and peat accumulating sawgrass marsh (Blue Cypress). Selected findings to date include:

- Blue Cypress marsh has been a sink for CO_2 in all measurement years.
- Eddy flux measurements interannual variability in net ecosystem exchange (NEE) of CO_2 , which ranged from -72 g C $m^{-2}$to -602 g Cm $^{--2}$, was driven largely by hydroperiod, mainly as a result of increased peat oxidation during dry periods.
- A fire in March 2014 released 963±165 g C. Photosynthesis was reduced immediately following fire, but recovered within 1-2 months.
- Methane emissions were 44 g C m^{-2} in 2013. Considering that 1 ton CH_4 has a Greenhouse Gas (GHG) equivalence of 24 tons of CO_2, CH_4 emissions may negate the benefit of CO_2 sequestration.
- Based on the assumption that dry years occur 30% of the time and a fire return interval of 6 years, long-term C sequestration within the marsh would average ~150 g C m^{-2} y^{-1}.

In addition to the eddy covariance measurements, transects were established at all sites for chamber measurements of NEE. Closed-chamber carbon exchange over a range of light conditions was conducted at all three sites as well as along an ecotonal transect at a small depression marsh within the pine flatwoods tower fetch. Additionally at the sawgrass marsh, leaf gas exchange (photosynthesis and transpiration) is being monitored for sawgrass and willow to evaluate the impact of wetland shrub encroachment on landscape water and carbon cycling. A new effort to partition methane production, oxidation, and transport along the soil-atmosphere continuum has been initiated.

Ground Penetrating Radar (GPR) surveys focused on two studies related to carbon dynamics: 1) to estimate the contribution of depression wetlands as carbon stocks at the pine flatwoods and depression marsh sites; and 2) to investigate the spatial variability of biogenic gas releases from peat monoliths from the three study sites at the laboratory scale. In the first case 3D GPR surveys were combined with direct coring and carbon content analysis to estimate total carbon content as based on peat volume estimates along depression wetlands, and satellite imagery were used to upscale estimates beyond the plot scale. In the second case time-lapse GPR was combined with gas traps and time-lapse cameras to investigate biogenic gas dynamics (i.e. methane and carbon dioxide build-up and release) in samples from all three study sites along the hydrological gradient. Future work with the GPR will include exporting this approach to the field site in order to investigate in-situ gas dynamics at the three study sites.