Poster #1-60

Carbon Dynamics Across the Terrestrial-Aquatic Interface of Subtropical Ecosystems in Central Florida

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Low-latitude coastal zones are complex landscapes that transition spatially from xeric pine forests on sandy soils to isolated or expansive wetlands with thick hydric soils. These terrestrial- aquatic interfaces have considerable influence on regional-to-global carbon (C) cycles; therefore, representation of these complex, diverse landscapes in Earth System Models (ESMs) is critical. In this project, we use multi-scale C cycle assessments at forest and wetland ecosystems of Disney Wilderness Preserve (DWP) and Blue Cypress Marsh (BCM) in central Florida to evaluate key process and ecosystem characteristics across this hydrologic continuum. Measurements of atmospheric C flux and biomass C stocks have been made in a longleaf pine flatwoods (DWPF) and depression marshes (DWPM) at DWP and a subtropical peatland (BCM), which have captured with multiple prescribed fire events and interannual hydrologic extremes. We found these ecosystems typically serve as a net sink of C; however, the systems become a net source of C immediately following a fire event, recovering to a net sink of C ~6 weeks postfire for herbaceous wetlands (DWPM and BCM) and ~2 months for the pine flatwoods. Using ground penetrating radar approaches, isolated wetlands within the pine flatwoods landscape were shown to be important contributors to the landscape carbon budget. The pine flatwoods site sequestered 190-510 g C m^2 y^{-1}; while ~450 g C m^{-2} was lost during a prescribed fire, the site recovered the biomass C lost from the fire within 2.5 years (the typical fire return interval for this ecosystem is 3 years). At the BCM wetland, hydroperiod was a strong driver of net ecosystem productivity, which was relatively low (65-97 g CO_2-C m^{-2} y^{-1}) in years with periodic drying events (9 mo. hydroperiod) and much greater (284-597 g CO_2-C m^{-2} y^{-1}) during years with constant marsh inundation. Lower rates were primarily the result of increased peat oxidation during periods when marsh water level was below land surface at BCM. Methane emissions from BCM were 38 g CH_4-C M^{-2} y^{-1}, varying seasonally with temperature and water level, while methane emissions from DWPM was 66 g CH_4-C m^{-2} y^{-1}. Simulations of long-term C balance (accounting for drought and fire) indicate the BCM site is a sink for 131 g C m^{-2} y^{-1}. The study found these ecosystems are carbon sinks even in the context of fire and hydrologic disturbances.