Dissertation Defense Announcement

"Hydrology Drives Everglades Ecosystem Function: Implications for Ecosystem Vulnerability to Drought, Energy Balance, Climate Teleconnections and Climate Change"

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Wetlands are an essential component of the terrestrial carbon pool. Hydric conditions slow decomposition and allow for soil carbon (C) accumulation and storage for long time periods. Although wetlands have large carbon sequestering potentials that could potentially serve as a negative feedback to climate change, they are threatened globally by anthropogenic pressures. In particular, water management has greatly altered the Florida Everglades, one of the largest freshwater ecosystems in the United States. To improve degraded areas of Everglades National Park (ENP), water management is being modified by the Comprehensive Everglades Restoration Plan (CERP), which seeks to re-establish water levels and hydroperiods closer to natural regimes. This study strives to understand the complex relationships between Everglades hydrology, climate, and C dynamics at different scales (plot and ecosystem) using multiple approaches (static chamber, eddy covariance, simulation modeling) and analysis techniques (linear, non-linear, and time series modeling techniques). I examined the effects of hydroperiod on the greenhouse C balance and energy balance in Everglades freshwater marsh ecosystems. I also investigated the effect of the El Niño Southern Oscillation (ENSO) and hydro-meteorological parameters on in-situ CO2 dynamics, and the potential impact of projected climate change on ecosystem CO2 exchange rates via simulation modeling using the DAYCENT model. Everglades hydrology was demonstrated to co-vary with changes in greenhouse warming potentials, energy fluxes and ENSO phase, indicating that hydrology is important for creating and maintaining conditions sufficient for wetland ecosystem structure and function. Hydroperiods are likely to change in the future with the implementation of CERP and with climate change, making it extremely important to understand the complex relationships between hydrology, climate, energy exchange and CO2, and how these relationships influence ecosystem structure and function. This research contributes to the understanding of the unique hydrology of Everglades wetland ecosystems and the complex relationships between hydrology, climate and C dynamics.