Science Question

- What is the net exchange of carbon dioxide and methane between blue carbon ecosystems and the atmosphere?
- How does disturbance and recovery affect carbon fluxes in mangrove ecosystems?
- What is the climate mitigation potential of blue carbon ecosystems when methane emissions are included?

Analysis

- Flux measurements made in Everglades and Big Cypress National Parks across a gradient of healthy, dead and recovering mangrove stands (Fig. 1)
- Chamber measurements made to quantify water, soil and stem to air fluxes.
- Aircraft flights using NASA's CARbon Airborne Flux Experiment payload (CARAFE) to measure fluxes across the region in spring and fall of 2022 and 2023.
- Modeling to up-scale measured fluxes to gridded time series of maps for the MODIS era.

Results/Significance

- Gradients in carbon uptake and methane release were observed and explained by vegetation type, salinity, and hydroperiod. Mangrove systems were more productive and sawgrass systems released more methane.
- Accounting for methane emissions, and simply extrapolating the results from the April 2022 campaign, the region is a carbon sink of 32 TgCO₂-eq.
- Partnerships with tribal nations, local Universities, and non-governmental organizations have helped enable new collaborations and identify stakeholder needs for understanding the role mangrove systems can play in climate mitigation and adaptation.

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