Title: **Effects of ecohydrological patches on methane emissions and carbon sequestration in coastal wetlands**

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Project: University Project (DE-SC0021067) – Functional-type modeling approach and data-driven parameterization of methane emissions in wetlands

Project Abstract: Methane emissions from coastal wetlands represent an important portion of the global greenhouse gas budgets. Coastal wetland experience increasing disturbance rates associated with changes to hydrology, sea level, and climate. At our Ohio wetland site, OWC, long term water level rise of Lake Erie (~1 m in the last decade) provides drive changes to the wetland's ecology, and as OWC gets deeper, mudflats and cattails give way to open water and floating-leaf vegetation.

We conduct chamber-based patch-level measurements and site-scale eddy covariance measurements of methane and carbon fluxes at the wetland sites. Our observations quantify the ecological and physical differences that lead to very large differences in flux rates at different eco-hydrological patch types. We used soil cores a long depth transects at areas of the wetland with different hydrological regimes to study the relationships between carbon and nutrient sequestration at different areas of the wetland. We developed an approach to classify the eco-hydrological patch type from remote sensing images. We used seasonal time series of NDVI from HLS (a composite dataset of Sentinel and Landsat) to develop a decadal map of patch type locations and extent at our Ohio wetland.

Our observations represent a valuable foundation towards a more robust models of methane fluxes in wetlands at the resolution of within-wetland vegetation patch type and resolving the effects of seasonal and within-season vegetation phenology in ecosystem-scale models. We are currently working on implementing insight from our observations in an advance version of E3SM-ELM that treats wetlands as land units and resolves within-wetland patch functional types.