☒ **Talk** ☐ **Poster**

Sulfur and phosphorus interactions with iron in a coastal freshwater marsh

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The distribution and function of coastal ecosystems are shifting in response to increased flooding and salt-water intrusion. These changes are particularly evident along the Louisiana coast where widespread ground subsidence exacerbates flooding and has led to substantial land loss. The objective of this project is to evaluate how fluctuating water tables shape redox biogeochemistry in wetland soils spanning freshwater to saline systems along the Louisiana Gulf coast. Here, we investigate how variable inundation influences phosphorus (P) and sulfur (S) storage and mobilization in a freshwater marsh. Surface soils (~5 cm depth) and soil cores (~30 cm depth) were collected from along elevation transects representing persistently flooded (subtidal) to periodically drained (supratidal) conditions. Soil P (i.e., organic P, Fe-bound P, Al-bound P, and carbonate P) and S (e.g., organic-S, sulfide, sulfate) were quantified using chemical and physical fractionations and bulk X-ray Absorption Spectroscopy. Additional X-ray microprobe analysis of soil thin sections was used to examine P and S speciation and co-location with other elements at the grain-scale. Soil water was collected during relatively flooded and drained conditions and measured for a suite of analytes including redox potential (Eh), sulfate, and phosphate. Sulfate was depleted in saturated soils under flooded conditions in the spring but increased in late autumn when water tables dropped, possibly due to oxidative dissolution of iron sulfides that accumulate in saturated soils. Phosphate increased with decreasing Eh and was correlated with dissolved Fe, consistent with the release of Fe-bound phosphate under reducing conditions. We conclude that variable inundation exerts strong control over S and P dynamics in this freshwater marsh through their interactions with redox-sensitive Fe. In-situ biological processes that interact with Fe redox likely play an important role. Consequently, S and P cycling in freshwater systems may be particularly sensitive to Fe supply from deposited sediments.