☒ **Talk** ☐ **Poster**

# Molecular controls on nutrient and carbon fluxes in coastal soils and sediments

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Sea level rise and warming temperatures have unleashed unprecedented disruptions to the hydrological, biological, and geochemical networks in coastal ecosystems. Soils and sediments within these ecosystems mediate the exchange of nutrients (N, P, S, Fe) and carbon between terrestrial and marine environments, exerting a major control on biological productivity and carbon budgets at a global scale. However, it remains to be seen how rising seas and warming temperatures will affect this exchange and potentially alter the storage and release of carbon along the coast. Here, we consider climate effects on carbon storage and release in two contrasting coastal environments. First, we examine the impacts of seawater intrusion on the chemical forms of sulfur in saltmarsh soils from the Great Marsh in Lewes, DE, and we discuss the implications of these changes on long-term carbon storage within the saltmarsh-upland ecotone. Second, we assess the impacts of warming temperatures on dissolved iron fluxes to the Southern Ocean from sediments along the Antarctic continental margin. Dissolved iron is the limiting nutrient in the Southern Ocean, and its supply controls rates of biological productivity in Antarctic coastal waters. Due to their high productivity, these waters play a central role in controlling atmospheric $CO_2$ concentrations. With both case studies, we employ a mix of synchrotron techniques, mass spectrometry analyses, and field measurements to elucidate molecular mechanisms and understand their influence on carbon and nutrient exchange in coastal environments. We use the case studies to illustrate possible feedbacks on the global climate system as coastal environments undergo unprecedented change.