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Resolving soil organic carbon pools in coastal Louisiana wetlands using thermal and isotopic approaches

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Wetland ecosystems hold ~1/3 of the global soil carbon pool. Louisiana's wetlands represent ~40% of wetlands in the conterminous US and are experiencing some of the greatest extent of loss in the country. Thus, future wetland changes in coastal Louisiana may have an outsized impact on national carbon accumulation and burial rates. Variability in the stability and persistence of soil organic carbon pools in Louisiana coastal marshes, across salinity gradients and under frequent disturbance, limit accurate assessments of wetland carbon storage and restoration outcomes. We characterize sediment organic carbon thermal reactivity (*via* ramped pyrolysis/oxidation), source ($\delta^{13}C$), and age ($F^{14}C$), as well as mineral soil age (^{137}Cs, ^{210}Pb), from two coastal marshes in Barataria Bay, Louisiana, at the upper and lower end of the coastal salinity gradient. Thermal reactivity data identify two distinct pools of organic matter at both fresh and salt marsh sites. Redeposition of old carbon, likely from storm overwash, is represented by several shallow soil horizons in the salt marsh and at the surface of the fresh marsh. In contrast, changes in organic carbon and mineral soil ages observed in deeper (>20 cm) soils indicate burial of *in situ* material that has decomposed over time, which is supported by decreasing thermal reactivity with depth. These data are used to address the research questions: (1) are the different sources of soil organic carbon pools endogenous or exogenous, (2) what is the rate of carbon storage in these marsh systems, and (3) over what timescales are different soil organic carbon pools stable. This work will be synthesized to determine net ecosystem carbon balances in Louisiana fresh and salt marsh ecosystems to provide a baseline for assessments of restoration activities.

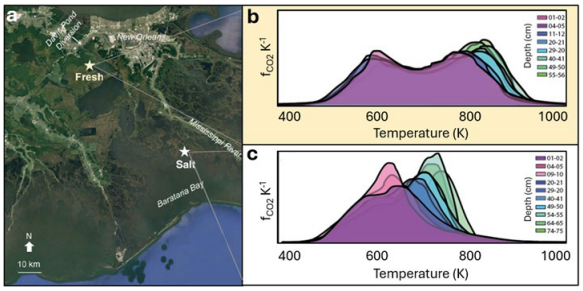

Figure 1 : (a) Fresh and salt marsh sites are located in Barataria Bay, south of New Orleans. Down core thermograms from the (b) fresh and (c) salt marsh sites were generated by combusting soils at 5º/min and quantifying the amount of CO_2 released. f_{CO2} K^{-1} represents the fraction of total carbon released per degree.