Modeling Climate and Land Use Change Impacts on Net Ecosystem Carbon Balance in Coastal Wetlands

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Ecosystem- and landscape-level assessments of wetland carbon sequestration are increasingly required to inform greenhouse gas inventories, land management planning, and climate mitigation policies. However, the impact of climate and land use change on wetland net ecosystem carbon balance, and contributions to local-, regional- and national-scale carbon accounting, remains unclear. Over the past decade we have developed the **L**and **U**se **CA**rbon **S**imulator (LUCAS), a modeling framework comprised of integrated sub-models of landscape change and carbon cycling, which allows us to assess multi-scale effects of changes in land cover and climate on carbon stocks and fluxes, including estimates of uncertainty, for a wide range of terrestrial ecosystems.

The focus of this presentation is to highlight recent advances in the LUCAS model, which incorporate wetland-specific vertical and lateral carbon fluxes (e.g., methane emission, lateral flux of dissolved carbon, soil carbon accumulation) in ecosystem carbon estimates for both emergent and forested wetlands. We present a case study from the Mississippi River Alluvial Plain, illustrating historic climate and land use change impacts on net ecosystem carbon balance in emergent and forested wetlands of coastal Louisiana. Using alternative scenario analyses, we highlight the importance of wetland carbon fluxes to regional net ecosystem carbon balance through comparisons of terrestrial versus wetland forest scenarios. This work provides a method for improving carbon accounting at the local-, state-, and national-scale by incorporating wetland carbon fluxes into net ecosystem carbon balance estimates and highlights future research and data needs for broad-scale application.