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TITLE: Salt marsh?mangrove ecotones: using structural gradients to investigate the effects of woody plant encroachment on plant?soil interactions and ecosystem carbon pools

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ABSTRACT:

Summary Changing winter climate extremes are expected to result in the poleward migration of mangrove forests at the expense of salt marshes. Although mangroves and marshes are both highly valued ecosystems, the ecological implications of mangrove expansion have not been fully investigated. Here, we examined the effects of mangrove expansion on below?ground properties related to peat development and carbon storage. We investigated plant ? soil interactions in marshes and across mangrove forest structural gradients in three locations in the northern Gulf of Mexico (USA). We compared our results to those from terrestrial grasslands where the effects of woody plant encroachment are often influenced by rainfall and plant traits. Abiotic conditions at our study locations differed, particularly in terms of physicochemical properties related to precipitation. Marsh species composition, marsh above?ground biomass, and mangrove forest structural complexity also varied across these locations. Marshes in the driest location (Central Texas) had higher salinities and were dominated by low biomass succulent plants and lower soil carbon pools. Marshes in the wetter, less saline locations (Louisiana and North Florida) contained high biomass grasses and higher soil carbon pools. At all locations, above?ground biomass and above?ground carbon pools were higher in mangroves than marshes; however, below?ground soil carbon pools were only higher in mangroves than marshes in the driest location. In the wetter locations, the linkages between mangrove forest structure and soil properties were minimal or not significant. However, in the driest location, there was a significant increase in soil properties related to peat development and carbon storage with increased mangrove forest structural development. Synthesis : Our results indicate that the ecological implications of woody plant encroachment in tidal saline wetlands are dependent upon precipitation controls of plant ? soil interactions. Although the above?ground effects of mangrove expansion are consistently large, below?ground influences of mangrove expansion appear to be greatest along low?rainfall coasts where salinities are high and marshes being replaced are carbon poor and dominated by succulent plants. Collectively, these findings complement those from terrestrial ecosystems and reinforce the importance of considering rainfall and plant ? soil interactions within predictions of the ecological effects of woody plant encroachment.

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