Belowground Bio- and Necromass Allocation and Soil Shear Strength Across Northern Gulf of Mexico Mangroves

Andre Scarlate Rovai[1,2], *Mohamed Hassan*[3], *Ivan Vargas Lopez*[2], *Youssef R. Mousa*[3], *Aaron Meyers*[2], *Hamed Nasiri*[3], *Jorge A. Pineda Gomez*[2], *Daniel J. Jensen*[4], *Annemarie E. Peacock*[4], *John Paul Bourgeois*[3], *Anna R. Armitage*[5], *Jamie Brinkley*[5], *Briana Sebastian*[5], *Jacob Berkowitz*[1,2], *Marc Simard*[4], *Navid Jafari*[3], *Robert R. Twilley*[2]

[1]U.S. Army Engineer Research and Development center, Vicksburg, MS, USA
[2]Department of Oceanography and Coastal Sciences, Louisiana State university, Baton Rouge, LA, USA
[3]Department of Civil and Environmental Engineering, Louisiana State university, Baton Rouge, LA, USA
[4]NASA Jet Propulsion Lab, Pasadena, CA, USA
[5]Department of Marine Biology, Texas A&M University at Galveston, Galveston, TX, USA

Mangroves dominate most of the world's tropical and subtropical sedimentary coastlines. Outside the tropics, however, mangroves' extent expands and contracts in response to changes in climate and relative sea level rise. At range limits such as the northwest Atlantic coastline, the environmental setting nears physiological tolerance thresholds, and mangrove's ability to cope with acute (hurricanes, frosts) and chronic (sea level rise) impacts is reflected in biomass allocation strategies (i.e., above- vs belowground growth). Mangrove mortality events can lead to rapid soil organic matter collapse resetting ground elevations below the point at which even more flooding tolerant saltmarsh species establish, resulting in coastal wetland land loss. Here, we assessed mangrove belowground bio- and necromass (BGB and BGN) across the northern Gulf of Mexico. To capture the diversity of coastal typologies along GoM, we sampled a tide-dominated lagoon in Texas and a river-dominated estuary in Louisiana. Mangrove BGB and BGN were approximately 2 and 5 times higher in the river-dominated estuary relative to the wave-dominated lagoon. These patterns in root mass allocation should reflect differences between coastal typologies and may be partly attributable to successional trajectories following distinct disturbance legacies (e.g., hurricanes, frosts). Our findings strengthen our understanding on biotic feedbacks (e.g., root productivity) that control soil elevation capital in critically endangered mangrove ecosystems with implications for coastal management practices aimed at improving resilience along land-ocean boundaries (e.g., targeted species composition in wetlands creation and restoration projects).