Using nitrogen stable isotope tracers to track climate change impacts on coastal salt marshes

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Climate change impacts on coastal salt marshes are predicted to be complex and multi-faceted. In addition to rising sea level and warmer water temperatures, regional precipitation patterns are also expected to change. At least in the Northeast and Mid-Atlantic U.S., more severe storms and longer droughts are predicted. As the ecological community is gaining a better understanding of how individual factors may impact salt marsh communities, we conducted experimental work to examine at how the combination of sea level rise, precipitation changes, and variations in nutrient loading may stress the salt marshes. These multiple stressor experiments are complicated and data rich but nitrogen stable isotope ($\delta^{15}N$) tracers have proven to be a valuable tool in unraveling some of the complexities—particularly those that are not captured in measured physical parameters (aboveground biomass, plant height, etc.). By adding $\delta^{15}N$ enriched in the heavy isotope (^{15}N), we can quantify how efficiently nitrogen is taken up by the system and how it is allocated by plants. Our results from multiple mesocosm experiments and an in-situ salt marsh organ experiment indicate that climate change will decrease the ability of coastal salt marshes to intercept and retain nutrients before they reach sensitive coastal waters.