The response of *Spartina alterniflora* to multiple stressors of eutrophication, precipitation changes, and sea level rise

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A four month experiment using greenhouse mesocosms was conducted to analyze the effects of eutrophication, sea level rise, and precipitation changes on the salt marsh plant *Spartina alterniflora*. Pots containing plants were placed in six 600L tanks that received seawater pumped from Narragansett Bay and were filled and drained on a semidiurnal tidal regime. The mesocosms were set up as a 3x3x2 factorial design (n=4) to measure three levels of freshwater precipitation (ambient daily rain, biweekly storm, and drought), three elevation levels (low, middle, and high), and two levels of eutrophication (ambient seawater control and nutrient addition of fertilizer). The goal was to analyze the effects these multiple stressors would have on the *Spartina* plants in a controlled greenhouse setting. Results showed varying physiological responses to all sets of treatments. *Spartina* plants in the storm and drought treatments had significantly less above and belowground biomass than those in ambient rain treatments, while plants at the high and middle elevation had significantly greater biomass than those at the low elevation. The treatments for control and eutrophic had more varied results. While nutrients had no effect on overall above and belowground biomass, fertilized pots had significantly higher stem counts and more fine roots than pots in the control tanks. The fertilized pots also showed significantly greater carbon dioxide emissions as measured by soil respiration across the low and middle elevations compared to control pots at the same elevations. However, the control pots had significantly more coarse roots and rhizomes, which are important to building peat in biogenic marshes. These results demonstrate the importance of short-term effects of accelerated sea level rise, changing precipitation patterns, and nutrient over enrichment on *Spartina alterniflora*, and the potential impacts these effects may have long-term on New England salt marshes.