Quantifying the relationship between inlet size, tidal prism and salt marsh accretion in a regime of accelerating sea-level rise: the role of winter processes in regional differences.

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Salt marshes comprise much of the back-barrier environment of East and Gulf coast shorelines. These wetlands respond to increases in sea level primarily by vertical accretion, via mineral sediment influx and bioproductivity. There is a limit, however, to annual accretion rates in salt marshes, making this environment extremely vulnerable to the predicted acceleration of rising sea level (IPCC).

Marshes are characterized by a flat topographic profile and often cover a sizable area. As the marsh is flooded, a significant volume of water is added to the tidal prism. This can generate dramatic shoreline erosion due to increased current velocities and greater sequestration of sand in the ebb tidal delta. Many of these wetlands have been accreting at ~20-28 cm/century, comparable to historic rates of rising sea level, but the future behavior of coastal environments if sea-level rise accelerates is difficult to predict.

If salt marshes can not accrete at comparable rates, then at what threshold will they become inundated, and what will be the response of the back-barrier environment? Numerical models can provide insights into the future coastal evolution of salt marshes. These models must reflect the forcing mechanisms that determine if and when a marsh inundates, and so it is critical to carefully quantify the common factors controlling vertical accretion in salt marshes. Differences between largely intertidal southern marshes and northern marshes dominated by high marsh must be considered as well, to determine regional factors controlling marsh elevation. Winter processes may play an important role in observed regional differences.