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Identifying the drivers for temporal variations in salt marsh sedimentation: a case study from the UK east coast

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Coastal salt marshes are highly valuable coastal landscape features located at the interface between land and sea. In many regions around the world, they provide an important buffer for coastal protection which relies on the morphological stability of the marsh platform. Regularly inundated by tides and storm surges, coastal salt marshes are very sensitive to environmental change, particularly to accelerated sea level rise (SLR).
Via sedimentation processes, coastal salt marshes are in principle able to adapt to global SLR, but limits to their ability to accrete sediment in pace with SLR are set by the availability of fine sediments in the system. Sediment availability for coastal salt marshes is highly variable in time, but little is known about the processes controlling these variations, which may substantially vary between different marsh sites. One potential source of sediment for coastal salt marshes is the resuspension of sediment from the intertidal mudflats adjacent to the salt marshes, a source that is difficult to measure due to its highly stochastic behaviour.
Using two high-resolution suspended sediment profilers (Argus Surface Meters IV) along an intertidal profile, we measured suspended sediment concentrations (SSC) over the intertidal mudflat and in the pioneer marsh zone and related them to sedimentation measurements on the marsh platform. Measurements were conducted at a wave-exposed salt marsh along the UK east coast (Tillingham) during a 6-week period in summer and an 11-week period in winter. Our results confirm a pronounced temporal variability in intertidal sediment resuspension with a clear seasonal signal. Most interestingly, the sedimentation on the marsh platform appears to be correlated with the difference in SSC between the seaward and the landward suspended sediment profilers.
Our field measurements confirm that sediment availability is the major driver for sedimentation processes on coastal salt marshes and suggests that intertidal sediment resuspension is their major contributor of sediment, at least in wave-exposed systems like our study site at Tillingham. This implies that the ability of coastal salt marshes to accrete sediment in pace with SLR relies on intertidal sediment resuspension which, in turn, is controlled by the topography of the intertidal mudflat, namely its size, slope and characteristic water depths.