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Salt marsh and tidal flat shear strength: a comparison between Tillingham marsh, Essex and Warton marsh, Morecambe Bay, UK

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Vegetated intertidal platforms, such as salt marshes, are known for their flood defence value, i.e. their ability to attenuate waves and currents. Marshes therefore protect any landward-lying constructed defences and the hinterland from incoming waves and extreme water levels. While the strength of static and engineered defences is generally well understood, the strength of protective fronting marshes is not. However, marshes are declining in aerial extent both globally and regionally (e.g. in Northwest Europe). In order to understand why a reduction in salt marsh extent due to marsh edge erosion is happening, we must comprehend the resistance of salt marshes to incoming hydrodynamic energy. This resistance likely depends on salt marsh biological, geochemical and sedimentological properties. However, at present there is no systematic research into marsh sedimentological properties and how these may affect both marsh edge and, to a lesser extent, marsh surface erosion processes. This has resulted in an oversimplification of substrate properties in marsh evolution models, with many simply including an erodibility coefficient (e.g. Mariotti & Carr, 2014). In many cases this coefficient has also not been linked to measurable biological or sedimentological properties, nor does it encompass the full range of erosion mechanisms possible (e.g. cliff undercutting, gravitational slumping; Mariotti & Fagherazzi, 2013).

Here, we focus on Tillingham marsh, Essex, South East England, where the sediment is fine-grained (clay/silt–rich) and the marsh canopy is species rich (including Puccinellia maritima, Limonium vulgare, Atriplex portulacoides and Elymus athericus; Möller, 2006). We compare Tillingham marsh to Warton marsh, Morecambe Bay, where the sediment is sand-dominated and the vegetation is species poor (primarily Puccinellia spp.). We present measurements of the sediment erosion threshold and undrained shear strength parameters using a cohesive strength meter, shear vane and torvane. These in situ methods investigate the resistance of the marsh platform and subsurface substrates to waves, tidal and storm surge-induced currents. We then assess how these measures of shear strength vary both across an individual marsh and between marshes of contrasting sediment and vegetation composition. We aim to improve the understanding of the interaction between biological (e.g. vegetation) and physical (e.g. sedimentological) characteristics of salt marshes, and how these links might influence future marsh erosion. This will be particularly useful for the adequate provision of flood defences, as well as the successful implementation of managed realignment sites.

References

Mariotti, G. & Carr, J. (2014). Dual role of salt marsh retreat: Long-term loss and short-term resilience. Water Resources Research, 50, 2963-2974.

Mariotti, G. & Fagherazzi, S. (2013). Critical width of tidal flats triggers marsh collapse in the absence of sea-level rise. Proceedings of the National Academy of Sciences of the United States of America, 110, 5253-5356.

Möller, I. (2006). Quantifying saltmarsh vegetation and its effect on wave height dissipation: Results from a UK East coast saltmarsh. Estuarine, Coastal and Shelf Science, 69(3–4), 337–351.