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Process understanding of coastal wetland dynamics for ecosystem-based coastal protection

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Relying on salt marsh and mangrove vegetation as coastal protection requires an understanding of temporal and spatial scales of their lateral dynamics as ecosystem services are directly linked to wetland extent. Lateral retreat and progradation of coastal wetlands, however, show non-linear behavior that is difficult to predict. Here, we present conceptual advances in understanding lateral dynamics by highlighting the importance of stochastic external forcing to biogeomorphic feedback mechanisms. Moreover we demonstrate how novel accelerometer technology can help to assess external hydrodynamic forcing to wetland change at ecologically relevant spatial and temporal scales. Mini-buoys made from low-cost off-the shelf materials were deployed along a cliffed macro-tidal salt marsh at the Bay of Fundy (Canada) and at the salt-marsh tidal-flat transition at Belhaven Bay (Scotland). The data are analysed for magnitude-frequency relationships and spatial differences of hydrodynamic energy during tidal immersion to further elucidate pattern of forcing which could not be measured using available hydrodynamic measurement equipment at similar costs. This method has thus the potential to be used globally to study abiotic drivers to wetland dynamics and to carry out site suitability assessments for wetland restoration.