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Coastal wetland inland migration in response to sea level rise: field and modelling evidence

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Abstract

Coastal wetlands, including intertidal saltmarshes and mangroves, are highly valuable ecosystems which are sensitive to environmental changes, including global sea level rise (SLR). Coastal wetland loss from accelerated environmental forcing could significantly impact global carbon budgets and increase coastal flooding. However, estimates of coastal wetlands loss with future SLR diverge significantly between different researchers. Some suggest global losses of up to 90% by 2100, others suggest much lower global losses (or even gains) due to the wetlands' ability to persist through vertical sediment accretion with increasing SLR rates, as well as to migrate inland in response to SLR. While vertical sediment accretion in coastal wetlands has been extensively studied in recent decades, the process of wetland inland migration has received little attention. Nevertheless recent modelling suggests that inland migration could be the main driver for the ability of coastal wetlands to adapt to future SLR.

This paper reviews existing field evidence for the process of coastal wetland inland migration, analyses the degree to which existing modelling approaches are supported by local field data, and discusses the environmental drivers for landward migration. It considers the implications of these findings for the ability of coastal wetlands to adapt to future accelerated SLR. The combination of field and modelling evidence from various locations and spatial scales suggests that future coastal wetlands, subject to inland migration in response to SLR, may be less persistent than coastal wetlands as we know them. They are likely to be subject to rapid landward shifts of the upper wetland boundary and the simultaneous loss of lower wetland areas. The changing nature of future coastal wetlands raises questions with regards to their ecological value and the provisioning of ecosystem services.

Keywords

Coastal wetlands, Sea level rise, Adaptation, Inland migration