Mangroves facing climate change: landward migration potential in response to projected scenarios of sea level rise

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Abstract

Mangrove forests prominently occupy an intertidal boundary position where the effects of sea level rise will be fast and well visible. This study in East Africa (Gazi Bay, Kenya) addresses the question whether mangroves can be resilient to a rise in sea level by focusing on their potential to migrate towards landwards areas. The combinatory analysis between remote sensing, DGPS-based ground truth and digital terrain models (DTM) unveils how real vegetation assemblages can shift under different projected [minimum (+9cm), relative (+20cm), average (+48cm) and maximum (+88cm)] scenarios of sea level rise (SLR). Under SLR scenarios up to 48 cm by the year 2100, the landward extension remarkably implies an area increase for each of the dominant mangrove assemblages, except for *Avicennia marina* and *Ceriops tagal*, both on the landward side. On one hand, the increase of most species in the first 3 scenarios, including the socio-economically most important species in this area, *Rhizophora mucronata* and *Ceriops tagal* on the seaward side, strongly depends on the colonization rate of these species. On the other hand, a SLR scenario of +88 cm by the year 2100 indicates that the area flooded only by equinoctial tides strongly decreases due to the topographical settings at the edge of the inhabited area. Consequently, the landward *Avicennia*-dominated assemblages will further decrease as a formation if they fail to adapt to a more frequent inundation. The topography is site-specific; however non-invadable areas can be typical for many mangrove settings.

Keywords
topography, DTM, Gazi Bay, inundation, GIS