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TITLE: Satellite remote sensing to monitor mangrove forest resilience and resistance to sea level rise

AUTHOR: ['Clare Duncan', 'Harry Owen', 'Julian R. Thompson', 'Heather J. Koldewey', 'Jurgenne H. Primavera', 'Nathalie Pettorelli']

ABSTRACT:

Abstract Coastal ecosystems, such as mangroves, provide key ecosystem services for climate change mitigation and adaptation. However, combined anthropogenic activities and climatic change?driven sea level rise (SLR) pose a severe threat to their global persistence, and to the continued delivery of these services. Mangrove vulnerability to SLR depends upon capacity for both resilience (landward migration) and resistance (maintained functioning with the existing distribution), which are in turn hindered by extractive activities and coastal infrastructure development. Limited landscape?scale data availability means existing SLR vulnerability assessment frameworks lack rigorous quantification of these discrete processes. Here we develop and implement a novel multi?product (multispectral, microwave, derived?product) open?access satellite remote sensing approach to assess both coastal ecosystem SLR resilience and resistance capacity in multiple mangrove sites across the world, and landscape?level and anthropogenic factors driving these capacities. Our approach allows comparative ranking of resilience and resistance capacities across sites, based on relative observed ecosystem change (biomass, distribution) and in constraints to these two components of SLR vulnerability. We observe mostly low SLR resilience and resistance across our case study sites. Furthermore, we find that site?specific resilience and resistance capacities and constraints can be highly incongruent, highlighting the importance of comprehensive SLR vulnerability monitoring for effective management. High within?site variation was also detected in resilience and resistance capacities and their constraints. This underlines the importance of spatially explicit monitoring at extensive spatial scales to inform decision making. The methodology developed and repeat?pass imagery employed adds to the remote monitoring and assessment toolkit for adaptive coastal ecosystem management under SLR , providing a new approach to inform conservation and management priority assessments in data?deficient regions.

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