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Salt marshes adjustment to anthropogenic pressures and sea-level rise

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It is predictable that salt marshes in regions, where sediment loads are high, should be stable against a broader range of relative sea level scenarios than those in sediment-poor systems. Despite extensive theoretical and laboratory studies, additional syntheses of marsh 'persistence' indicators under human interventions and accelerated sea-level rise rates are still needed. This study investigates the recent lateral changes occurring in lagoon-type marshes of the Ria Formosa lagoon (south Portugal) in the presence of human interventions and sea-level rise, to identify the major drivers for past marsh evolution and to estimate potential future trends. The conducted analysis assessed the past geomorphological adjustment based on imagery analysis and assessed its potential future adjustment to sea-level rise (~100 years) based on modelled land cover changes (by employing the SLAMM model within two sea-level rise scenarios).

Salt marshes in the Ria Formosa showed slow lateral growth rates over the last 70 years (<1 mm$\cdot$yr^{-1}), with localized erosion along the main navigable channels associated with dredging activities. Higher change rates were noted near the inlets, with stronger progradation near the natural inlets of the system, fed by sediment influx pulses. Any potential influence of sea-level increase to an intensification of marsh-edge erosion in the past, could not be distinguished from human-induced pressures in the area. No significant sediment was exchanged between the salt marshes and tidal flats, and no self-organization pattern between them was observed in past. The related analysis showed that landcover changes in the salt marsh areas are likely to be more prominent in the future. The obtained results showed evidence of non-linearity in marsh response to high sea-level rise rates, which could indicate to the presence of critical thresholds and potential negative feedbacks within the system, with significant implications to marsh resilience.

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