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Salt marsh organic matter quality and decomposition under sea-level rise scenarios: from leaves to fine absorptive roots

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Salt marshes are among the most efficient blue carbon (C) sinks in the world, partly due to the slow decomposition of their plant-derived organic matter (OM) in the soil. The fate of this C sink under sea-level rise is still uncertain due to limited knowledge about the processes controlling OM decomposition under different inundation levels. In an in-situ manipulative experiment, we compared salt marsh OM decomposition and quality across simulated sea-level scenarios and litter types (absorptive root, fine transportive root, leave, and rhizome of the shrubby C3 halophyte Halimione Portulacoide) for 170 days. The OM decomposition rate varied only between the longest and shortest inundation treatments, that was lower than the mean inundation of our site. The OM decomposition and C loss rates varied strongly across litter types. Fine absorptive was the slowest to decay, releasing up to 40% less C than the other litter types. Changes in lignin composition varied across litter types, but were unaffected by sea-level rise scenarios. Our study suggests that 1) the assessment of soil C dynamics in salt marshes based on aboveground litter or bulk belowground litter patterns is inadequate because of a marked difference in OM decomposition across litter types; 2) belowground litter lignin quality could be a good proxy for OM decomposition in salt marshes; and 3) sea-level rise is unlikely to decrease OM decomposition under current sea-level rise projections.