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Supplement of

Carbon sequestration along a gradient of tidal marsh degradation in response to sea level rise

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Supplementary information

S1: Unvegetated-Vegetated Ratio calculation for characterisation of the degradation gradient

The unvegetated-vegetated ratio is a measure for the degradation within tidal marsh systems (Ganju et al., 2017). The area of unvegetated and vegetated surface was calculated from an Normalised Difference Vegetation Index (NDVI) image (derived from Copernicus Sentinel image [2023]), values greater than 0 were classified as vegetated and values below 0 were classified as unvegetated, in our case water (Fig. S1 left). Within each zone (least, intermediately and most degraded), the ratio of the unvegetated and the vegetated area was calculated inside a circular area with a radius of 200 m (Fig S1 right).

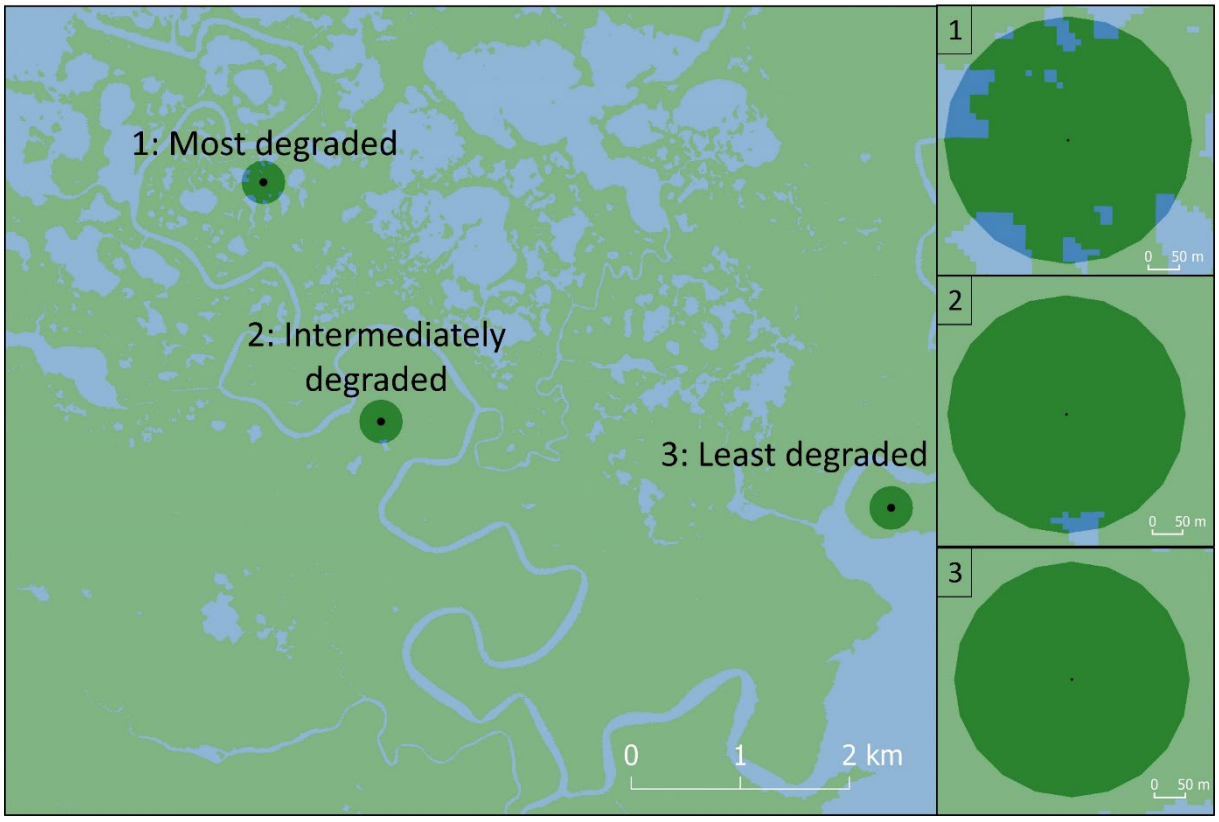

Figure S1: Map showing classified NDVI image, where vegetation is green (NDVI > 0) and water is blue (NDVI < 0). The images in the middle are close-up of the 200 m radius areas where the UVVR was calculated for the most (1), intermediately (2) and least (3) degraded marsh zones. The values on the right give the UVVR for these circular areas (Imagery © 2025 ESA, Map data © 2025 Google).

S2: Conceptual figure for the calculation of compaction

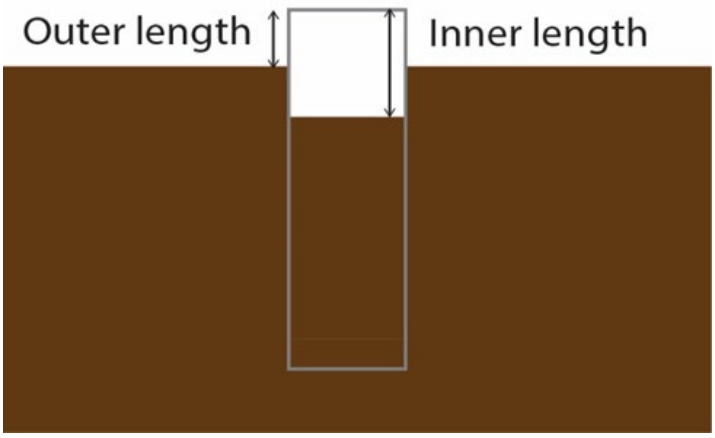

Figure S2: Conceptual figure showing the measurement of the inner and outer length to account for compaction.

S3: Radiometric dating profiles for calculating sediment accretion rates

The calculations of the sediment accretion rate for are explained in paragraph 2.4 of the main manuscript. In some ^{210}Pb profiles, points in the top 10 cm that deviate from the trend too much are removed from the calculation of the sediment accretion rate, as they could be signs of bioturbation.

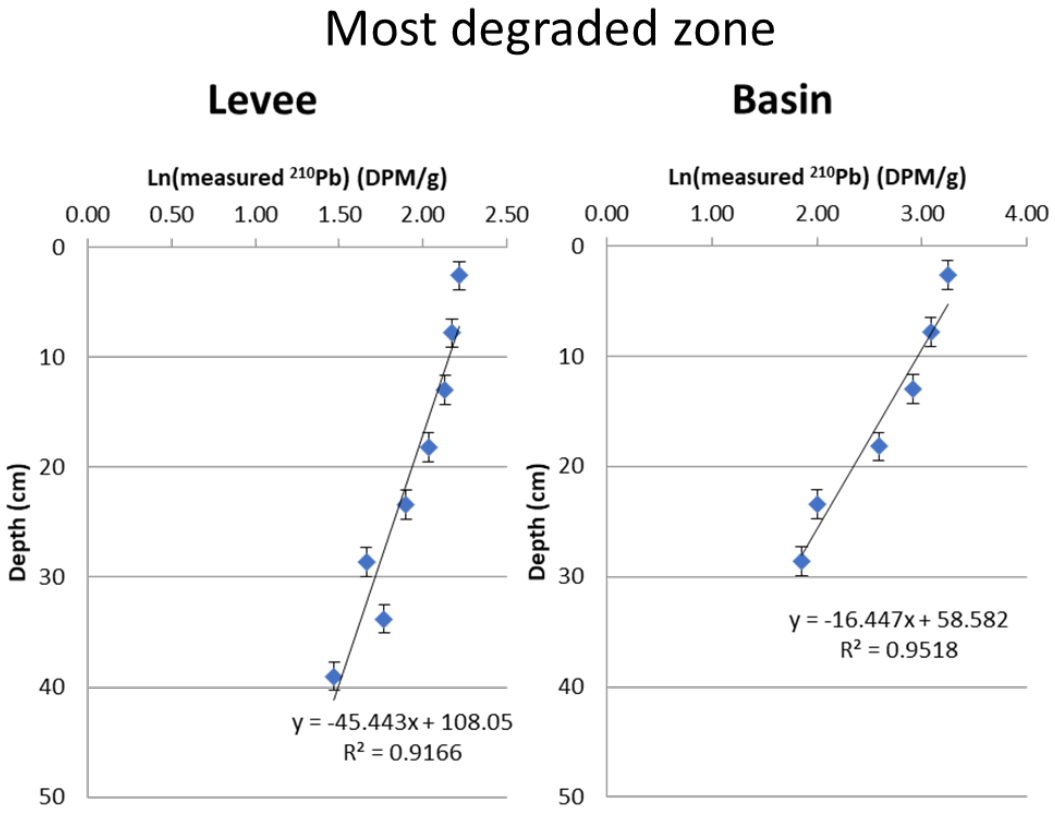

Figure S3A: ^{210}Pb activity curve with depth for the levee (left) and basin (right) of the most degraded zone. The equation shows the linear regression between depth (expressed in cm) and natural logarithm of the ^{210}Pb activity (expressed in Disintegrations Per Minute (DPM) per gram) and the R^2 value for the regression curve.

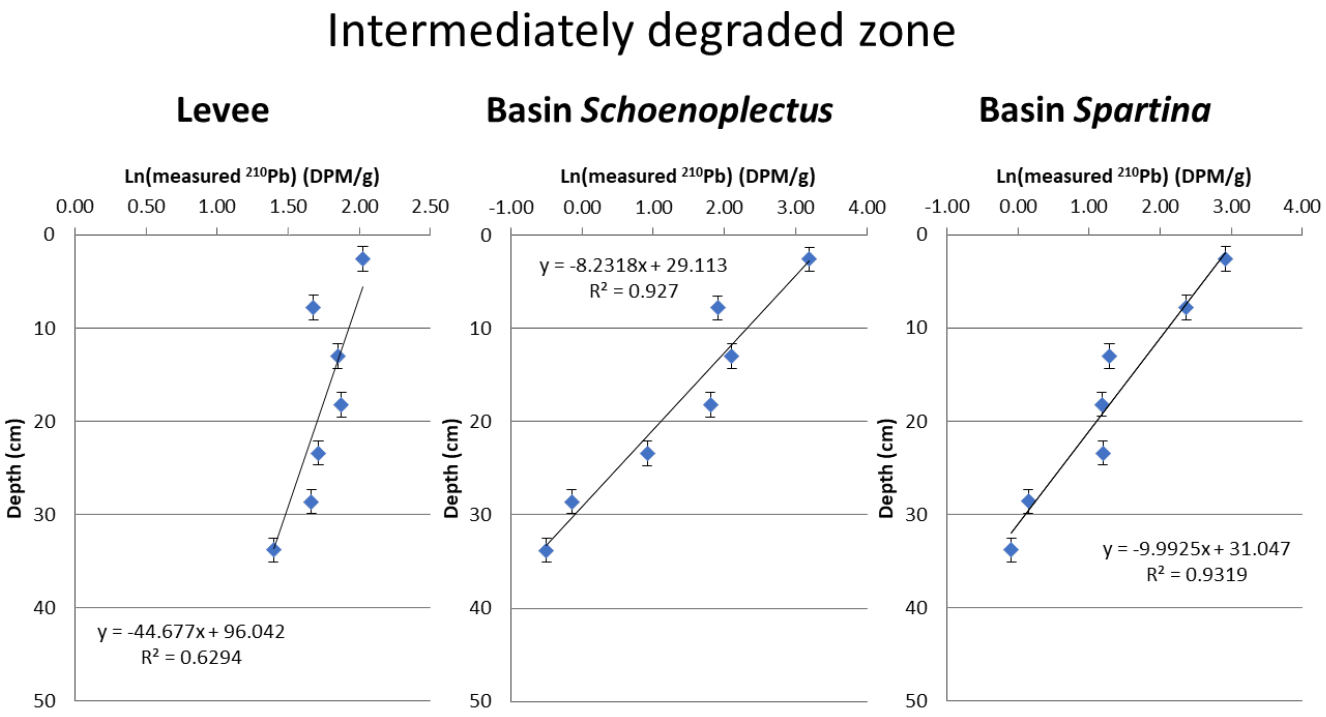

Figure S3B: ^{210}Pb activity curve with depth for the levee (left), the basin with Schoenoplectus (middle) and basin with Spartina (right) of the intermediately degraded zone. The equation shows the linear regression between depth (expressed in cm) and natural logarithm of the ^{210}Pb activity (expressed in Disintegrations Per Minute (DPM) per gram) and the R^2 value for the regression curve.

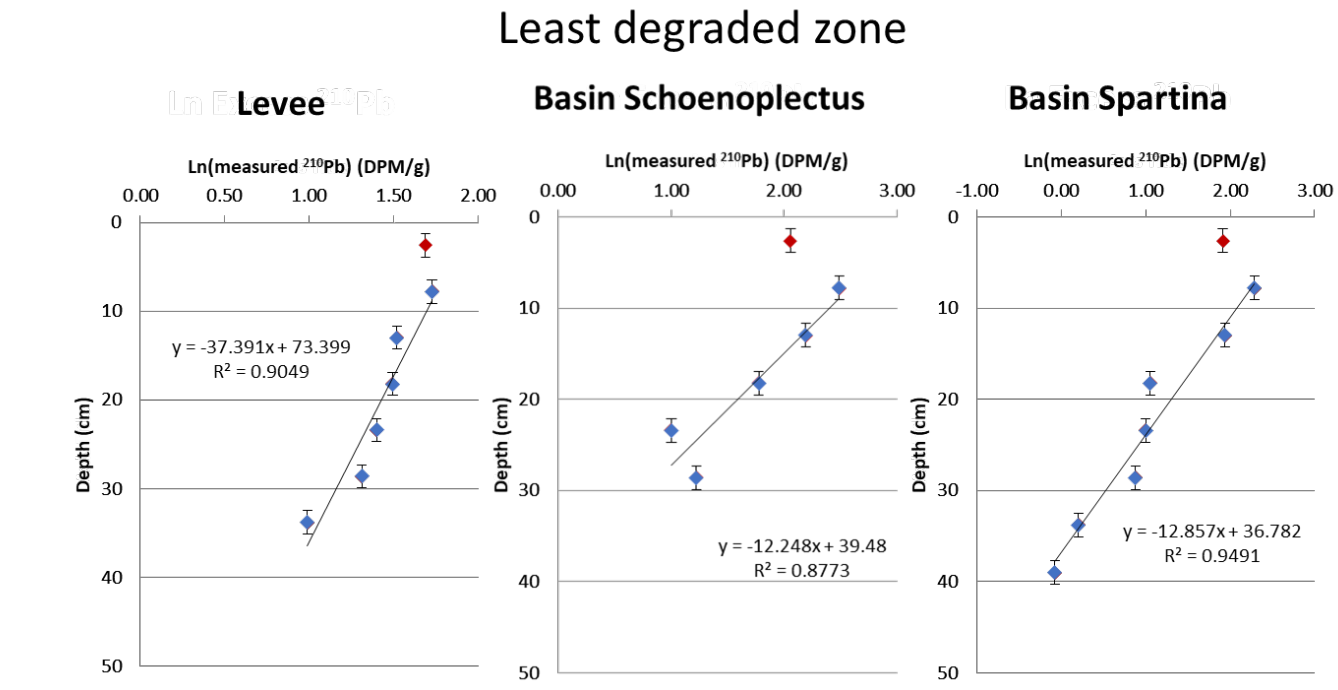

Figure S3C: ^{210}Pb activity curve with depth for the levee (left), the basin with Schoenoplectus (middle) and basin with Spartina (right) of the least degraded zone. The red dots indicate measurements that are excluded for the regression calculation. The equation shows the linear regression between depth (expressed in cm) and natural logarithm of the ^{210}Pb activity (expressed in Disintegrations Per Minute (DPM) per gram) and the R^2 value for the regression curve.

S4: Aboveground biomass

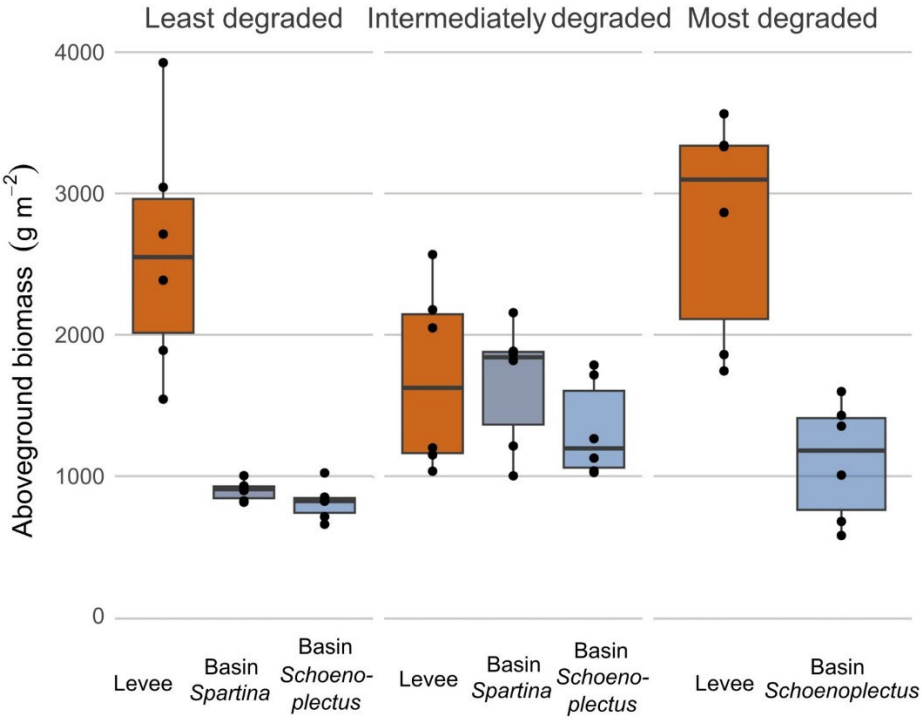

Figure S4: Aboveground biomass (g m^{-2}) measured along the levee-basin gradient. Values are shown for the three zones along the degradation gradient.

S5: Relationship between organic carbon content and dry bulk density

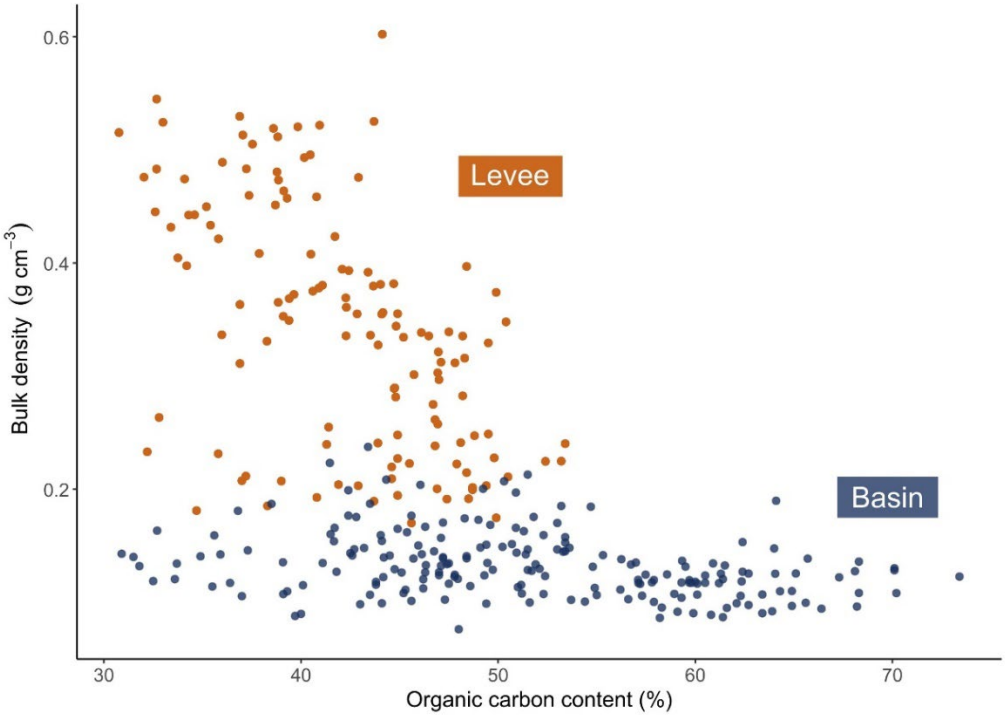

Figure S5: Relationship between organic carbon content (%) and dry bulk density (g cm^{-3}). Colours show the difference between levee and basin (both with Spartina and Schoenoplectus vegetation).