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

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S1: Unvegetated-vegetated ratio calculation for characterisation of the degradation gradient

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

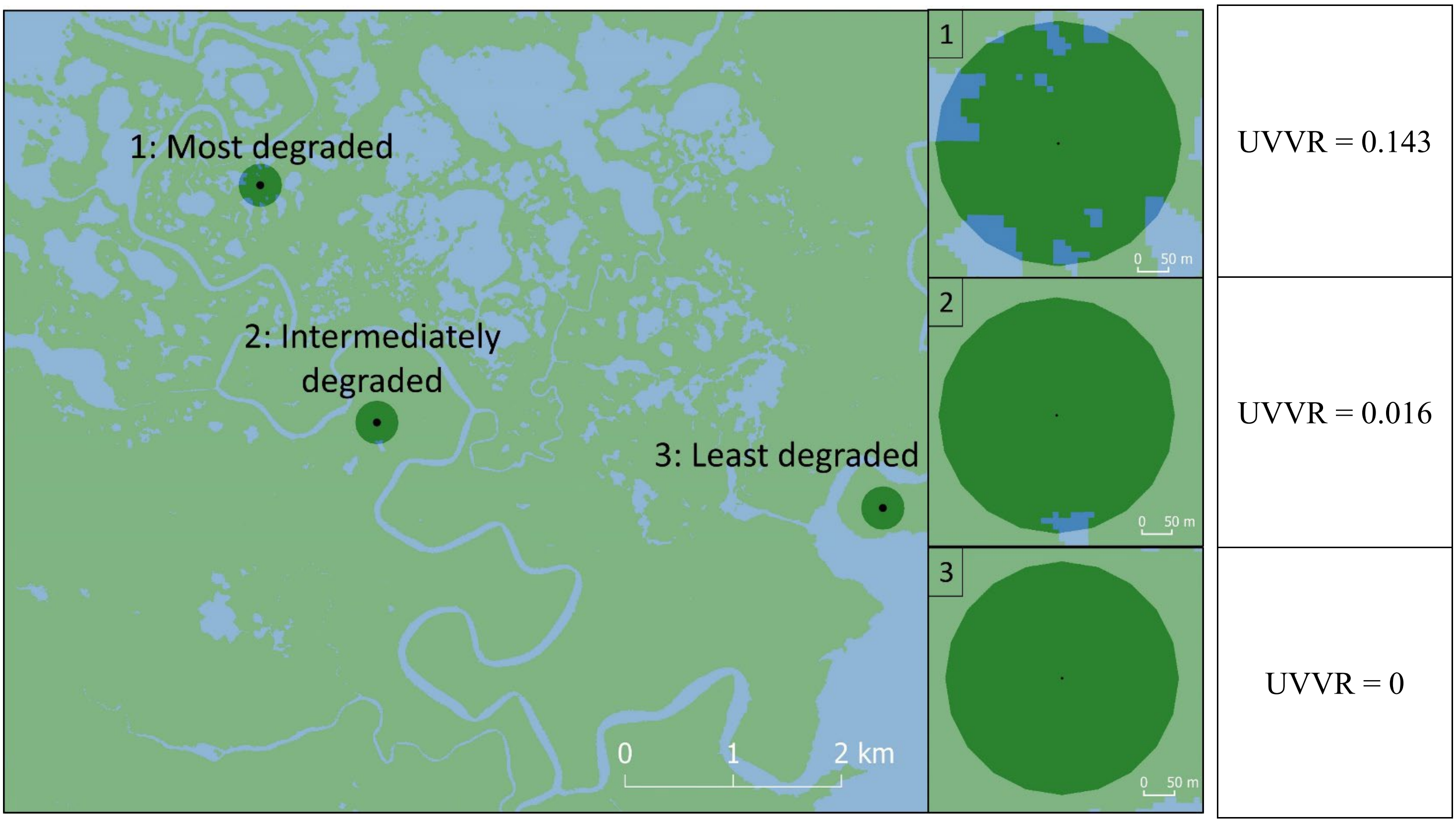

Figure S1: Map showing classified NDVI image, where vegetation is green (NDVI > 0) and water is blue (NDVI < 0). The images in the middle are close-up of the 200 m radius areas where the UVVR was calculated for the most (1), intermediately (2) and least (3) degraded marsh zones. The values on the right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

S2: Conceptual figure for the calculation of sediment compaction that results from sediment core sampling

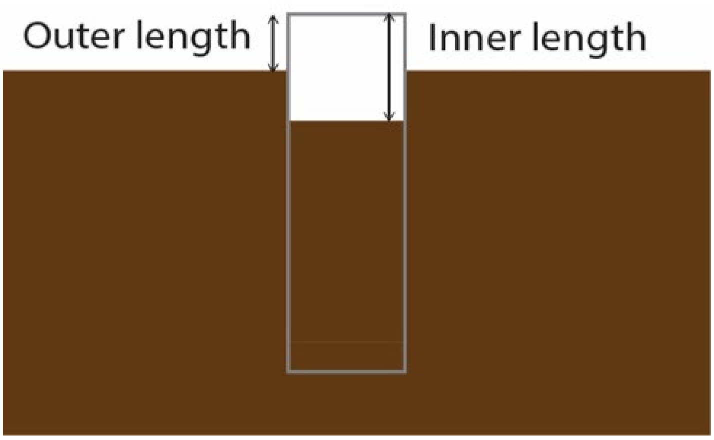

Figure S2: Conceptual figure showing the measurement of the inner and outer length to account for sediment compaction due to pushing of the sampling tube into the sediment bed. The sediment core inside the tube is compressed as a result of friction between the tube walls and the sediment core. The compaction correction factor is measured as the ratio between the inner length and the outer length. The compaction is compensated for when estimating the thickness of sediment slices by dividing by the compaction correction factor.

S3: Radiometric dating profiles for calculating sediment accretion rates

The calculations of the sediment accretion rate are explained in section 2.3.2 of the main manuscript. In some ^{210}Pb profiles, data points that deviate too much from the trend are removed for the calculation of the sediment accretion rate, as they could be signs of bioturbation. These removed data points are indicated in red in figures S3C.

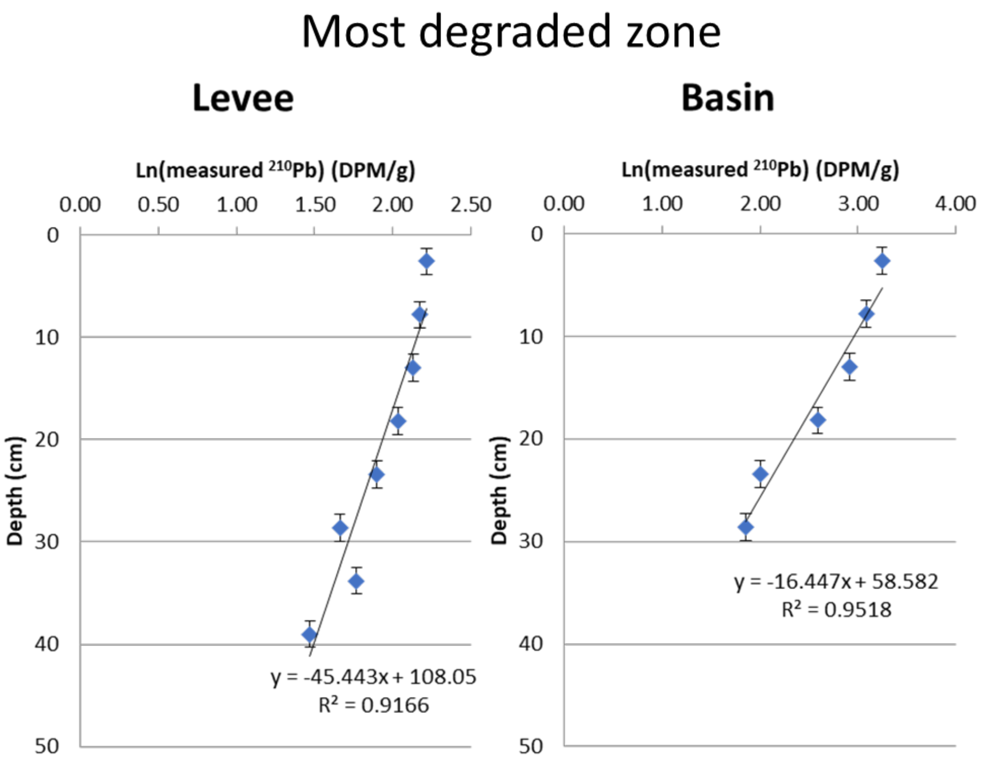

Figure S3A: ^{210}Pb activity curve with depth for the levee (left) and basin (right) of the most degraded zone. The equation shows the linear regression between depth (expressed in cm) and natural logarithm of the ^{210}Pb activity (expressed in disintegrations per minute (DPM) per gram) and the R^2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

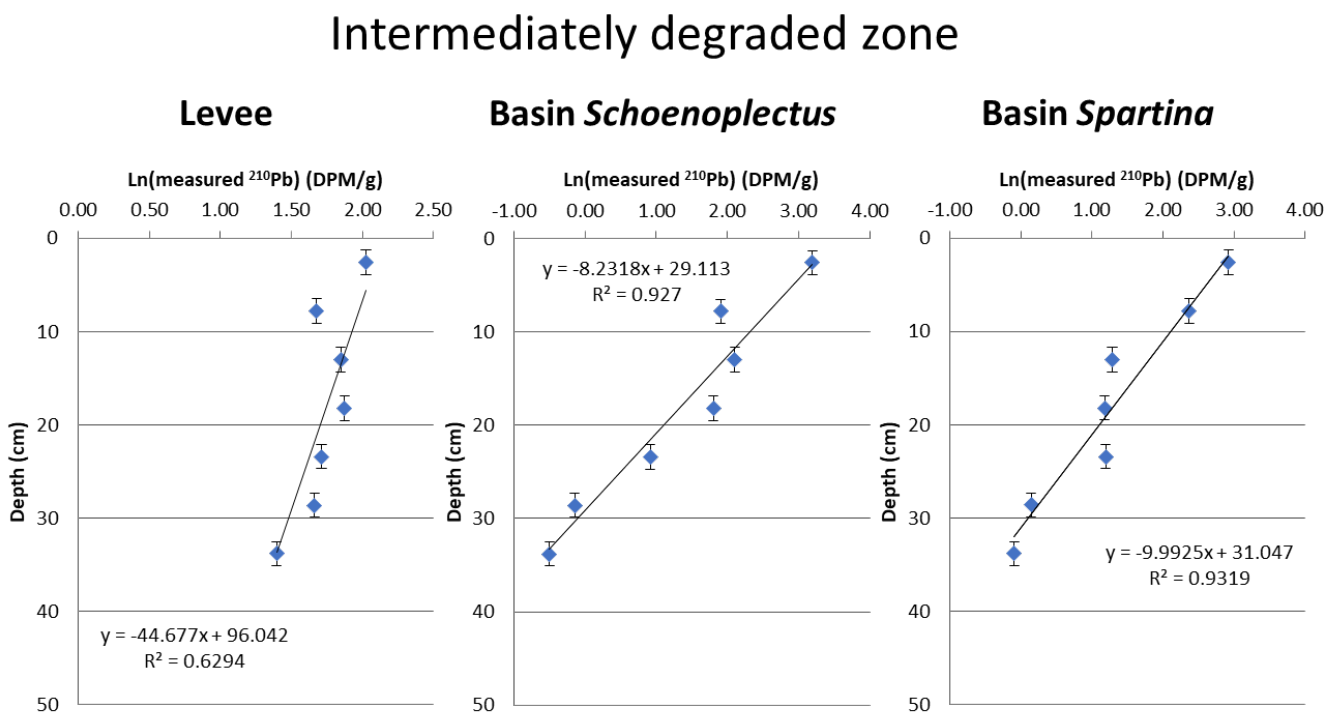

Figure S3B: ^{210}Pb activity curve with depth for the levee (left), the basin with Schoenoplectus (middle) and basin with Spartina (right) of the intermediately degraded zone. The equation shows the linear regression between depth (expressed in cm) and natural logarithm of the ^{210}Pb activity (expressed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

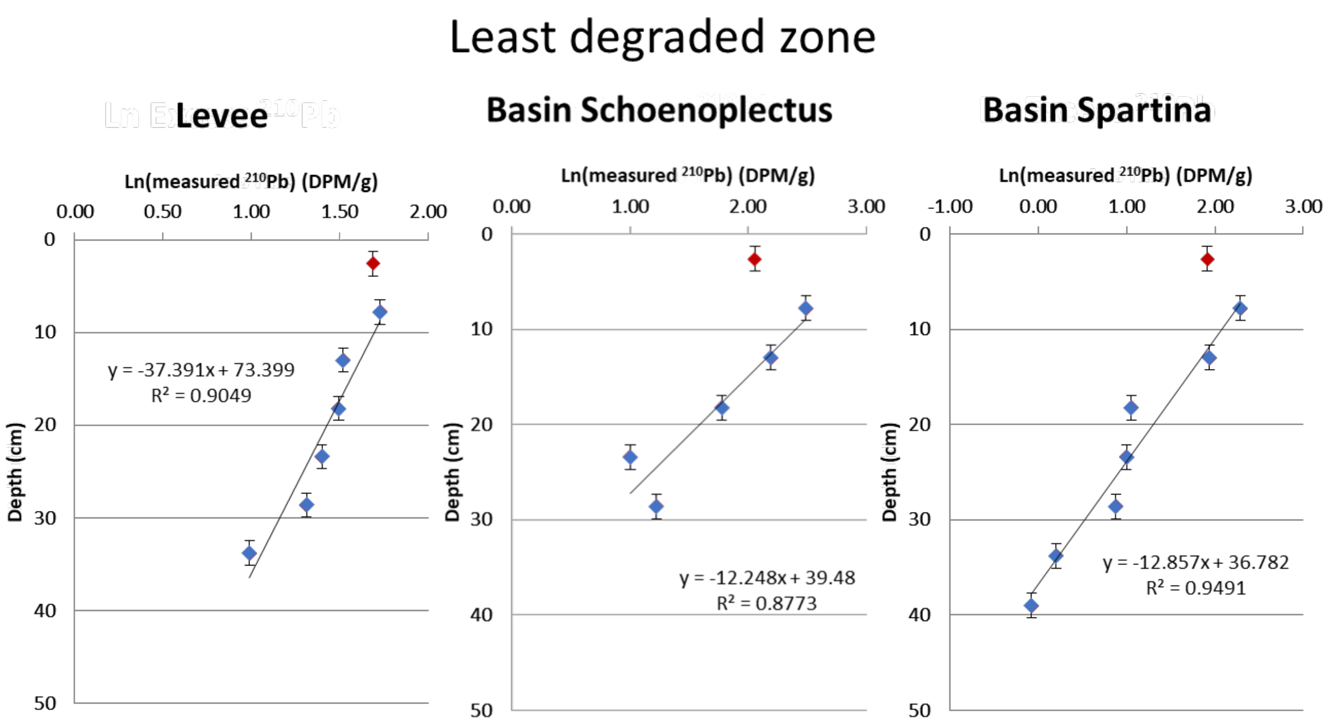

Figure S3C: ^{210}Pb activity curve with depth for the levee (left), the basin with Schoenoplectus (middle) and basin with Spartina (right) of the least degraded zone. The red dots indicate measurements that are excluded for the regression calculation. The equation shows the linear regression between 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

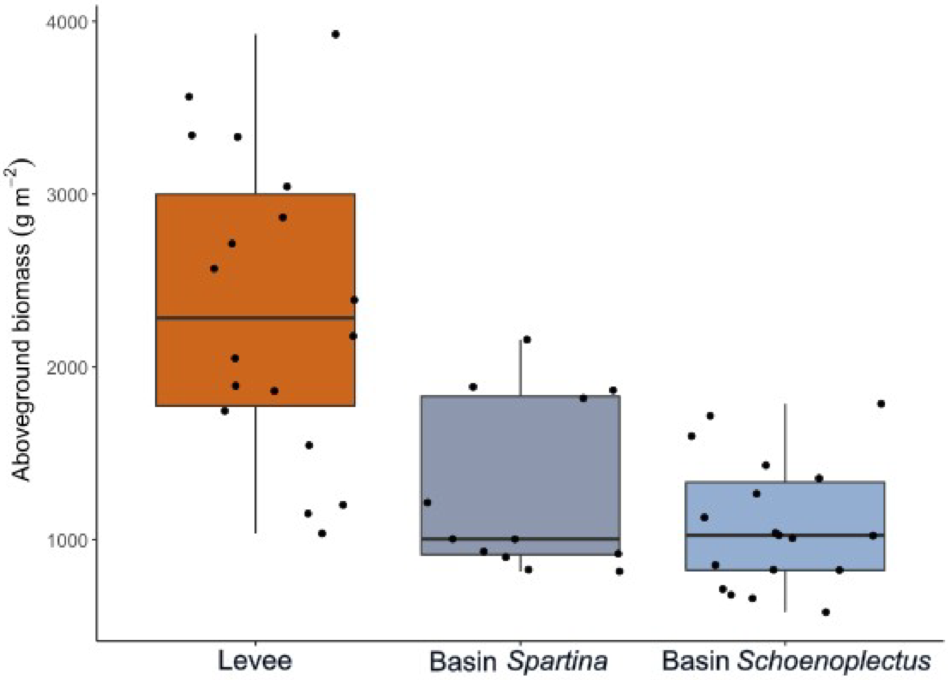

Figure S4: Aboveground biomass (g m^{-2}) measured along the levee-basin gradient. Values are shown for the three zones along the degradation gradient.

S5: Relationship between organic carbon content and dry bulk density

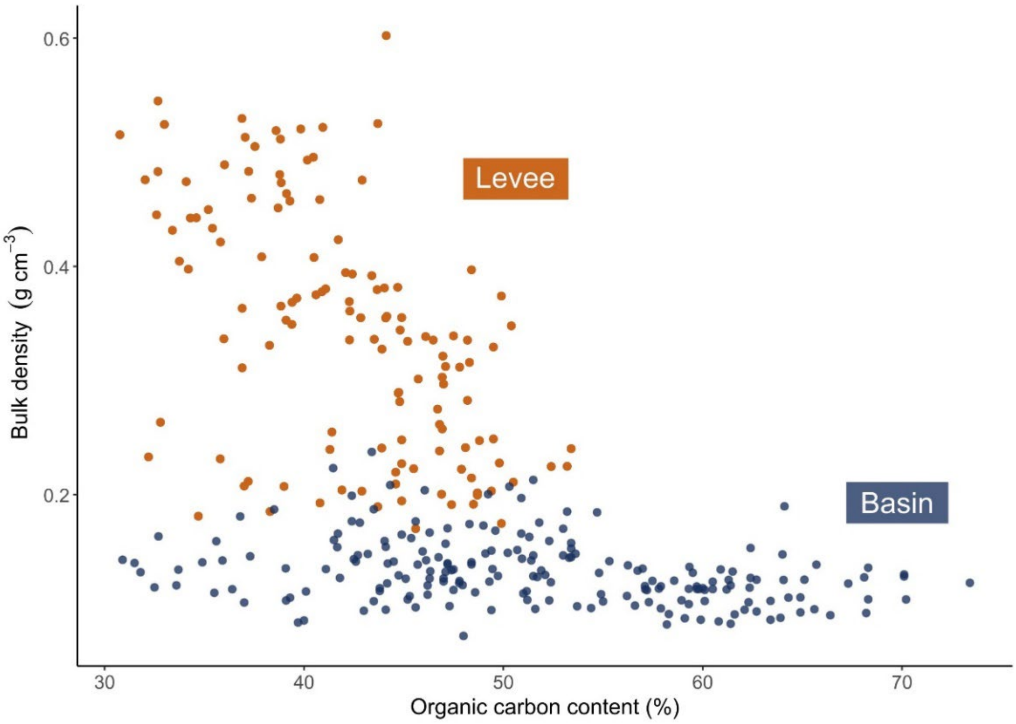

Figure S5: Relationship between organic carbon content (%) and dry bulk density (g cm^{-3}). Colours show the difference between levee and basin (the latter both with Spartina and Schoenoplectus vegetation).

References

Ganju, N. K., Defne, Z., Kirwan, M. L., Fagherazzi, S., D'Alpaos, A., & Carniello, L. (2017). Spatially integrative metrics reveal hidden vulnerability of microtidal salt marshes. *Nature Communications*, *8*. https://doi.org/10.1038/ncomms14156