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Spatial variations of sediment size, organic carbon, and porewater salinity of surface sediments in Jeungdo tidal flat, Shinangun, West Coast of Korea

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The role of organic carbon (OC) in pollutant transport and the carbon cycle is crucial. However, the interrelation among sediment particle size (key sediment textural characteristics), deposition environment, porewater salinity, and altitude remains poorly understood. Surface sediments (n=124) were collected from the Ujeon tidal flat, Jeungdo in June 2023 to examine the sediment size, total organic carbons (TOC), dry bulk density, porosity, and water content. Additionally, digital elevation model (DEM) values were processed using a drone, and altitude values for the collection site were obtained. The average levels of total organic carbon (0.44%, ranging from 0.00–1.42%) and C/N ratios (12.5, ranging from 9.9–30.3, excluding sand sediments) in the Ujeon tidal flat's surface sediments were relatively low compared to European and North American salt marshes. The average particle size, porewater salinity, and altitude values were 4.98 Φ (1.06–9.75), 48.09 psu (0.00–93.82), and 1.27 m (-0.38–+3.15), respectively. High correlations (R^2 values of 0.77, 0.81, and 0.71) were observed between average particle size and TOC, porewater salinity, and altitude. TOC concentrations varied spatially, being highest in the mud zones and lowest in the sandbar at the tidal flat entrance, correlating with the sediment grain size distribution. This pattern correlates with sediment grain size distribution, where clay-rich sediments in the high mud zones resulted in elevated TOC contents. Our findings indicate a potential underestimation of OC properties and concentration in various sedimentary environments. This study offers new insights into coastal eco-environment management and protection and underscores the importance of accurate organic carbon and porewater salinity estimation in adapting to sedimentation environments along Jeungdo, Shinangun's West Coast of Korea.