EGU23-16310, updated on 25 Feb 2024
https://doi.org/10.5194/egusphere-egu23-16310
EGU General Assembly 2023

Accretion capacity in Mediterranean coastal ecosystems. Study case: Ebro Delta

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Coastal ecosystems exist at the interface between land and sea and are characterized by their high dynamism, related to the interaction between marine agents (winds, waves, currents, sea level changes) and continental forms and processes. These environments are well known for their great diversity of habitats and communities, a high capacity for sequestering carbon and a range of ecosystem services, but they are also highly sensitive to a variety of natural and anthropogenic factors. The ability to repeatedly observe and quantify the accretion capacity of the environments located in the shoreline is key to present-day coastal management and future coastal planning. This study focused on the Ebro Delta, where we evaluated how the ability to retain sediment in coastal ecosystems, both emerged and submerged (dunes, salt marshes and seagrass meadows), is influenced by the presence or absence of vegetation and other ecological variables such as the patch area, biodiversity orspecies dominance. We carried out transects with a differential GPS to measure ground elevation inside and outside vegetation patches in contrasting habitats to understand the mechanism of sediment retention. In addition, we complemented this data with UAVs orthomosaic data to gather data on a bigger spatial scale. Our results show that the presence of vegetation facilitates sediment retention in all ecosystems. Greater species diversity and larger patch areas increased sediment retention capacity. In dune ecosystems, Ammophila arenaria was significantly better at retaining sediment than any of the other species surveyed, while in salt marshes and seagrass meadows we did not find significant differences between species. We believe that while understanding the abiotic environment and physical drivers of sediment retention in coastal habitats is key, we also need to focus on the ecology of coastal vegetated ecosystems if we are to use them as nature-based solutions. Our study sheds light to how vegetation presence, patch size, patch plant diversity and plant traits influence sediment retention capacity across habitat types and scales, which is useful to face event-scale shoreline changes (e.i. individual storms) and others related to the climate change.