

Satellite-Based Assessment of Intertidal Vegetation Dynamics in Continental Portugal with Sentinel-2 Data

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RESUMO

Vegetated intertidal ecosystems, such as seagrass meadows, salt marshes, and macroalgal beds, are vital for biodiversity, coastal protection, and climate regulation; however, they remain highly vulnerable to anthropogenic and climate-induced stressors. This study aims to assess interannual changes in intertidal vegetation cover along the Portuguese mainland coast, with an analysis focused on the Minho estuary, from 2015 to 2024 using Sentinel-2 satellite imagery calibrated with high-resolution multispectral unoccupied aerial vehicle (UAV) data, to determine the most accurate index for mapping intertidal vegetation. Among the 16 indices tested, the Atmospherically Resilient Vegetation Index (ARVI) showed the highest predictive performance. Based on a model relating intertidal vegetation cover to this index, an ARVI value greater than or equal to 0.214 was established to estimate the area covered with intertidal vegetation. Applying this threshold to time-series data revealed considerable spatial and temporal variability in vegetation cover, with estuarine systems showing the greatest extents and marked fluctuations. At the national level, no consistent overall trend was identified for the study period. Despite limitations related to satellite image resolution and single-site validation, the results demonstrate the feasibility and utility of combining UAV data and satellite indices for long-term, large-scale monitoring of intertidal vegetation.

Palavras-chave: Sentinel-2; continental Portugal; Vegetation Index; vegetation cover; UAV

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