Using ESA NoR high-resolution data to support coastal management: the Baleal–Óbidos lagoon case study

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Resumo

The study of coastal cliffs is essential for territorial management, public safety, and environmental preservation, given their inherently dynamic and geomechanically unstable nature. The significant rise in coastal area occupation requires the development of strategically focused methodologies that facilitate efficient and rapid monitoring of coastlines featuring sea cliffs, where mass movements are more likely to occur. Monitoring these landforms requires decimetre-scale spatial resolution to capture geomorphological changes such as clifftop retreat, block detachment, and the development of structural discontinuities. This study examines a small section from a cliffed coastline bordered by a continuous sandy beach located on the western coast of Portugal, between Baleal and the Óbidos Lagoon, a gently curved stretch of coast with approximately northeast to southwest orientation. The sea cliffs, reaching up to 50 meters above sea level, with varying slopes and heights, are broken up by two fluvial valleys, forming a local beach-dune system in those areas. The multi-sensor analysis carried out in this analysis enabled the precise identification of clifftop retreat and structurally significant discontinuities along the Praia d'El Rey sector. Multi- temporal differencing of Vexcel Elevate DTMs (2020–2024) revealed spatially coherent zones of material loss along the cliff face and beach interface (Figure 1). However, these results remain preliminary: uncertainty persists due to (i) tidal stage differences between acquisitions affecting intertidal elevations, (ii) co-registration offsets between epochs, and (iii) unvalidated vertical accuracy of the DTM products at this site. This study highlights the critical role of initiatives like the ESA Network of Resources, supported by the European Union Space Programme, in advancing efficient and timely monitoring of sea- cliff morphology. By reducing barriers to the use of commercial ultra-high-resolution satellite data, these programmes enable high-precision coastal research. In the absence of such institutional support, sub-metre imagery would remain largely inaccessible to public research institutions, underscoring the strategic significance of European Earth Observation programmes in supporting evidence-based coastal hazard management.

Agradecimentos

This work was supported by the ESA NoR (IDs 5403mk, 5320ti). We thank Airbus for Pléiades Neo imagery, 21AT for Beijing-3A data, and Vexcel Imaging for UltraCam orthophotos and Elevate DEMs data access. Anexos Figure 1: Multi-temporal analysis of coastal cliff retreat using Vexcel aerial imagery and derived elevation models. (A) Vexcel orthophotomosaic (2020). (B) Vexcel orthophotomosaic (2024). (C) Digital Surface Model (DSM) from 2020 with mapped cliff crest (cyan line); (D) DSM from 2024 with mapped cliff crest (orange line). (E) 2024 orthophoto overlaid with areas of negative elevation change (red), derived from the subtraction of DSM_{2020}–DSM_{2024}, highlighting zones of potential material loss along the cliff face.