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Patterns of sediment distribution on the Portuguese southeastern coast

Padrões de distribuição sedimentar na costa sudeste portuguesa

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Sumário: *A granulometria dos sedimentos pode fornecer informações importantes sobre a origem e evolução dos ambientes sedimentares da zona costeira.*
Este trabalho apresenta a distribuição espacial da granulometria dos sedimentos no sotavento algarvio, resultante da análise de 395 amostras recolhidas em 133 perfis posicionados ao longo de uma faixa de 55km, desde a península do Ancão até Vila Real de Santo António.
A análise preliminar dos resultados, apresentados em função do valor da média e agrupados nas classes normalizadas da escala de tamanho de grão (classificação de Wentworth), revela a ausência das classes granulométricas de areia muito fina e fina, mesmo na zona dunar, onde a classe de areia média domina no sector leste, e a de areia grosseira, no sector ocidental.
O padrão geral de distribuição espacial da granulometria dos sedimentos exibe uma variação distinta ao longo da área de estudo, decorrente da exposição aos principais agentes forçadores (ondas e correntes).

Palavras-chave: *Distribuição granulométrica, Dinâmica costeira, Ilhas-barreira, Litoral português, Algarve*

Key words: Grain-size distribution, Coastal dynamics, Barrier islands, Portuguese coast, Algarve

The need of an increasing knowledge of the littoral dynamic processes, has been progressively growing, in parallel with the reported evidence of the urgent need of adaptation to the climate change scenarios. Thus, a holistic approach on the understanding of coastal dynamics is crucial for an effective adaptive coastal governance, under the inevitable consequences on coastal zones.

Sediment characterization as a tool to infer sediment sources, transport, and natural dynamics of coastal sediments, is among some of the important aspects that constitute a valuable information for an efficacious planning and management of shore areas.

The eastern southern Portuguese coast, which is the focus of the current work, is a low-lying sandy shore, comprising a complex and highly dynamic barrier island system, that culminates at the Guadiana River mouth (Fig. 1-A).

The coastline evolution at this region depends on many processes such as the shoreline retreat, longshore drift, overwash, dune building, tidal delta incorporation, inlet- associated processes and, with a negligible effect for the Ria Formosa barrier islands system, the erosion of backbarrier regions of the islands by spring tides (Andrade, 1990). Moreover, human activities induced relevant changes on coastal behaviour during the last decades, increasing processes complexity and hampering the understanding of coastal evolution (Ferreira *et al.,* 2016).

This study was made within the "Geological and Coastal Hazard Mapping at a 1:3000 resolution scale" programme, developed by the Portuguese National Laboratory of Energy and Geology (Nave and Rebêlo 2018) [https://geoportal.lneg.pt/mapa/?escala=4000000&mapa=geologiacosteira#].

A total of 395 samples were collected in April 2019, during a 2 week-field operation where, besides samples and images, 133 beach profiles, spaced 500 meters, were measured between Ancão peninsula and Guadiana River mouth. In each profile 3 samples were taken, at dune-beach-surf zone system, for sedimentary characterization (Fig. 1-B).

The results of grain-size data are presented as average value and were clustered into the normalized classes of the grain-size scale (Wentworth classification). The minimum grain size average value for the analysed fraction of the total amount of samples is 252 μm, and the maximum value is 1344 μm, leading to a class range between medium sand and very coarse sand. Coefficient of Variation (C.V.), determined by the method of moments, varies between 0,27 and 0,72. Most of the analysed samples stand at between very well sorted and moderately well sorted.

Grain-size data from dune, beach, and surf zone system from Ancão Peninsula to Guadiana River mouth shows that sediment distribution is controlled mainly by the type and proximity to the

sediment sources, and by prevailing coastal dynamics (such as waves, currents, and wind).

Patterns of sediment distribution at the westernmost sector, with coarser grain-size, are controlled mainly by sediment sources from cliff erosion, between Garrão and Quarteira, that is incorporated in the littoral drift and redistributed eastward along the coast. The overwash events at this high-energy western sector also explains the coarser grain size patterns at dune environment. Sediment pattern eastwards, in the vicinity of Cape Sta. Maria, is similar to the observed westwards of the cape, as it is exposed to energetic wave regimes and reveal similar sediment sources. At Ria Formosa barrier island system sediment patterns seems to be forced by inlets sediment dynamics. The sector from Cacela inlet to Guadiana River mouth shows a sediment pattern driven by the influence of Guadiana River discharges, constituting the main source of sediments at this segment.

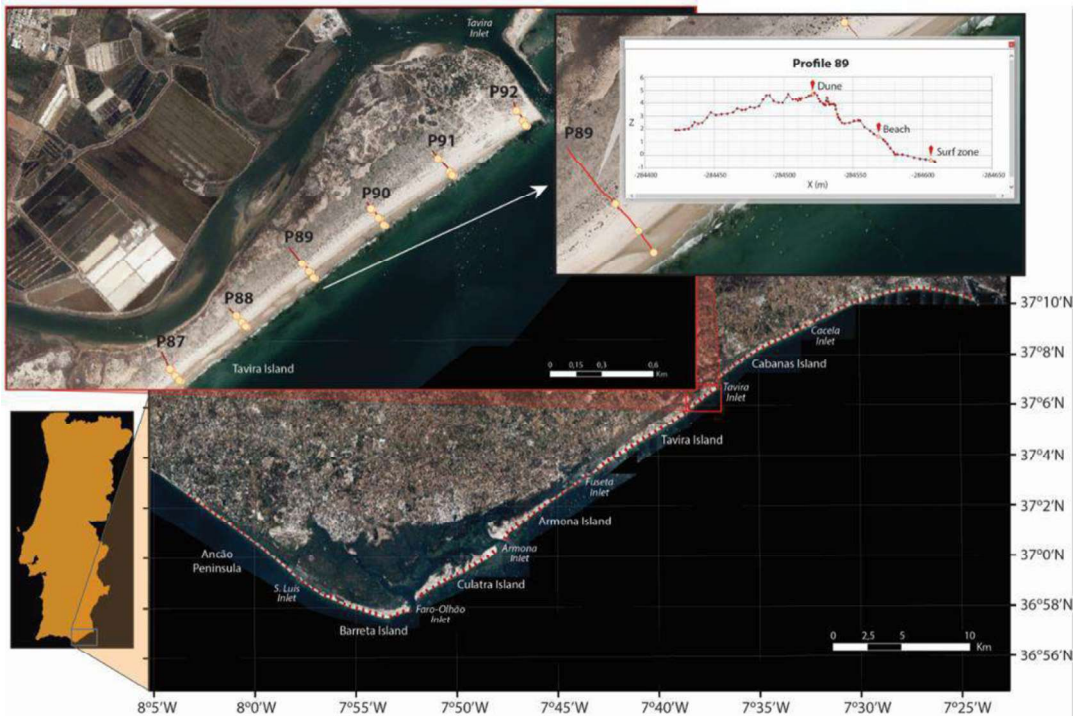

Fig. 1. A- Study area and location of the 133 profiles, spaced approximately 500 m, and positioned between Ancão peninsula and Guadiana River mouth. B- Example of the location of the samples collected at each profile, using as reference profile P89 positioned at Tavira island. Background photo retrieved from the WMS service from DGT: Ortofotos 25 cm – Mainland Portugal – 2018.

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