

STATE OF COASTAL DUNES USING MORPHOLOGICAL PARAMETERS

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ABSTRACT

The characterisation of coastal dunes through morphological parameters (*i.e.*, beach and dune width and dune elevation) permits to evaluate the state of these systems and assess their vulnerability. This work characterises two different coastal dunes systems by analysing different morphological parameters.

Keywords: beach width; dune crest; orthophoto maps; digital terrain models; hydrodynamic parameters.

1. INTRODUCTION

Coastal dunes are ecosystems that provide different services, as biodiversity and socio-economic resources, and constitute the first barrier of defence against the impact of erosional events. The state of these systems defines their vulnerability level and resilience capacity, dictating also if the provided services can be maintained over time. To assess the state of coastal dunes, different morphological parameters can be analysed and integrated, informing about the adaptative capacity of the systems and eventually their resilience. Here, the spatial variability of different morphological parameters is analysed along two coastal barriers (Peninsula of Ancão and Tavira Island, Ria Formosa, south Portugal) with distinct exposure to meteo-oceanic conditions, evaluating the implications of this variability to the characterization of dune states.

2. METHODS

The two coastal barriers analysed are Ancão Peninsula and Tavira Island, both in the Ria Formosa barrier island system, south of Portugal. The dataset analysed covers the period between 2008 and 2018, consisting of digital terrain models (DTMs, horizontal resolution between 0.5 and 1 m and vertical RMSE between 0.035 and 0.15 m) and orthophoto maps (made available by *Direção Geral do Território*). Indicators were mapped (see Figure 1-A), and their positions, each 10 m alongshore, were extracted to estimate the width of the dry beach and of the dune. The DTMs were used to extract the elevation of different parameters, such as dune crest and dune toe height (Figure 1-B). Hydrodynamic conditions (waves and water levels) for both sites were collected from Puertos del Estado (Spain) to calculate the wave runup for both sites, considering the beach orientation, sediment grain sizes and beach slopes that characterise each system.

3. RESULTS AND DISCUSSION

The dune crest height and the beach width vary alongshore Ancão Peninsula, separating morphologically the east and west sides of the peninsula. Higher elevations and narrower beaches were found along the western part and lower elevations and wider beaches characterise the eastern one. In Tavira, the dune elevation also varies alongshore, however the spatial distribution does not divide the island as clearly as in Ancão, showing three modal values similar to the ones along eastern Ancão. The beach width in Tavira is wider at the east side of the island (> 100 m), and between 30 and 50 m in most of its extension, showing rhythmic patterns alongshore. Runup values were higher in Ancão than in Tavira for the period of analysis. The intra-barrier and inter-barrier differences

documented by the morphological parameters evaluated suggest that different drivers (*e.g.*, runup or sediment availability) can control the variability of these barriers. The state (from vulnerable to robust) of these dunes can be evaluated using different parameters, as the ones analysed, with some sections of the systems presenting dune crest fragmentation but the overall view indicating that they maintained their morphological characteristics over the analysed period.

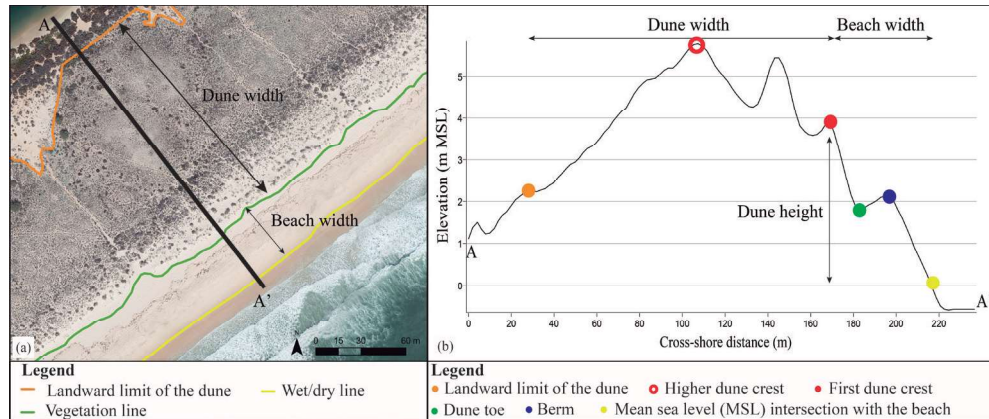


Figure 1 – (a) Parameters retrieved using orthophoto maps. (b) Example of topographic profile obtained from a DTM.

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