SHORE PLATFORMS IN THE ALGARVE (SOUTH PORTUGAL) ROCKY COAST, AN INHERITANCE OF THE LAST INTERGLACIAL STAGE?

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Shore platforms, notches, and marine caves are common yet distinctive morphological features along the southern coast of Portugal. The central Algarve rocky coast has provided a favorable setting in which to understand the processes contributing to shore platform development. This is because the morphology and characteristics of the features vary along the coast, as do several factors implicated in their development such as wave climate (including wave direction and frequency), seabed morphology and depth, bedrock lithology, karstification and geological structure.

Although shore platforms are a common morphological feature on rocky coasts, the first-order factors that determine their genesis remain contentious. This constitutes a challenge to ongoing investigations on shore platforms and, in particular, to studies concerning the interpretation of raised platforms. Raised platforms (shore platforms higher than the present mean sea level) have been frequently interpreted as inherited morphological features of marine abrasion during the Pleistocene highstands or as the result of emerging coasts [1; 2; 3; 4; 5]. Raised platforms may thus represent former sea level highstands and/or coastal uplift, or they may be formed by sub-aerial weathering. Determining the genesis of such platforms is a challenge in areas where, as in the Algarve coast, several raised platforms occur but contain no marine deposits, thereby making it difficult to investigate paleo-shorelines.

Large-scale morphologic features characteristic of the study area include: i) step cliffs with at least two different raised shore platforms; ii) merging cliffs; iii) zeta bays; and iv) pocket beaches. The measured wave climate in the area shows that waves approach from the WSW for 90 % of the year on average, and from the ESE during the remaining 10 % [6]. Wave height ranges from 0.30 m to 1.8 m, with rare exceptional heights of more than 3.7 m. Such high waves are associated with storms from the SW, during which waves attain an average 2-3 m height with a period of 7-8 s [7]. The tidal regime is semidiurnal and mesotidal with tides ranging from 2.70 to 1.36 m during neap tides and from 3.82 to 0.64 m during spring tides. The mean rate of relative sea level rise is 1.5 ± 0.2 mm/yr according to data from the Lagos tide gauge's series registered between 1908 and 1987 [8].

In order to correlate the shore platforms' dimensions and morphologies with heterogeneities in bioerosion/bioprotection, karstification, and joint patterns, these aspects were described by field observation. In the study area two lithofacies were individualized based on the rock's compressive strength which increases with increasing $CaCO_3$ content [9]: a) fine calcarenite with large fossil shells and strength values from 1 to 3 MPa, and b) shelly limestone which strength range from 5 to 15 MPa. Accordingly, and considering that rock's resistance and hardness are positively correlated, $CaCO_3$ content is used in the present work as a proxy of rock strength. Several pools in the shore platforms' surfaces remain filled by sea water during low tides. In order to evaluate salt saturation during exposure to evaporation conditions, and then the possibility of salt precipitation, salinity in the water pools was measured with a multiparametric sound. The width, length, and height of each platform were measured using a Real Time Kinematic Differential GPS with a 1cm precision.

In the Algarve south coast, the occurrence of shore platforms is closely tied to exposure to the prevailing wave direction. Wave attack is therefore the first order factor on sculpting shore platforms, whereas platform dimensions are influenced by the degree of wave exposure and by the lithology and structural trend of geological layers. Smaller-scale morphological variations are caused by chemical weathering, bioerosion, and bioprotection.

Shore platforms lying above the present tidal range are inherited from older sea-level highstands. These platforms are currently undergoing differential subaerial weathering in sympathy with local lithologic variations. Karstic features and joints contribute to the roughness and discontinuity of the platforms' surface. They can promote both reduced or increased platform's width by means of water percolation easiness to attain some locals at the cliff-platform junction. Wide platforms occur when platform is scraped into the contact between calcarenite and softer sediments, and when sea water washes the surface several times a year. Narrow platforms are due to rock fall or granular disintegration both processes favored by karst and joint discontinuities.

Acknowledgements

The research was supported by COCHAL Project (POCTI/34162/CTA/00), funded by the Portuguese Foundation of Science and Technology, FEDER and OE.

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