RELATIONSHIP BETWEEN WAVE ENERGY AND COASTAL MORPHOLOGY IN THE CENTRAL ALGARVE ROCKY COAST (GALÉ TO OLHOS DE ÁGUA)

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1. Geographical and geological setting of the study area

The study coastal area (Galé to Olhos de Água, central Algarve, Portugal), exposes the Lagos-Portimão Carbonate Formation from the Miocene (Pais, 1982). The layers of metric thickness alternate vertically between biocalcarenites, siltstones and limestone inclined up to 10º SW and show remarkable lateral continuity. An exception is the sector between São Rafael and Baleeira, where coastal cliffs respectively expose Cretaceous marls and Jurassic crystalline limestone (Marques, 1997; Albardeiro, 2004; Moura *et al.*, 2006).

2. Methodology

The coastal zones' geomorphological evolution is the result of subaereal weathering and marine abrasion. To quantify the role of the waves' action as a geomorphic process particularly on shore platforms sculpture is the main goal of the current work. For that purpose, a numerical modeling for wave propagation (STWAVE) was used to determine differences on breaking wave characteristics along the study area. This program was used inside an operational toolbox (SMS 9.2) that allows data pre-processing from a GIS software (ArcGIS 9.2). The MATLAB R2007a software was used to obtain significant wave heights and wave energy at the breaking position along the study area, for each tested condition. The different coastal morphologies and mass movements were identified on the field and compared with the described evolution in literature (Marques, 1997). Since the study area presents strong longshore variation in exposition to the waves and different wave energies, several sections were defined. It was then possible to analyze the frequency of occurrence of a given coastal morphology and the frequency of mass movements for each section and compare with longshore variations on wave energy for both average and storm conditions.

3. Results and the main finding

The modeling and evolution of littoral landscapes depend on continental and marine processes and on the rock characteristics (e.g., lithology, texture, structure, joints and faults). In addition, the rock vulnerability to direct waves' attack is directly proportional to its degree of weathering and inversely proportional to its hardness. The intensity of the waves' attack on the cliff foot depends on the offshore and onshore wave characteristics, the surrounding bathymetry, the beach and shore platforms topography, the coastline orientation, the existence of storm surge and the tidal range. The marine action can be enhanced by specific weather conditions in the coastal zone, such as the occurrence of strong winds (Emery & Kuhn, 1982; Sunamura, 1983, 1992).

The results of this study indicate a clear energetic differentiation between the considered coastal sections, depending on their exposure to the waves (e.g. SW vs. SE), with some sections showing higher energy incident and others a reasonable protection to the wave action. It was still possible to observe a clear contrast between areas of promontories and headlands (high energy) and bays or pocket beaches (low energy) regarding wave incidence and energy.

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4. References

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