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Short-term evolution of a reflective beach sector in front of a coastal lagoon (Southwest Portuguese coast)

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The subaerial beaches act as detrital barriers in the opening and closing of lagoons located in sandy coastal areas. The study of beach morphodynamics, considering the

evolution of the beachface and the berm, in these cases is critical to coastal management. The studied area located in an embayed sandy coastline at the Portuguese Southwest Atlantic Coast, is a 308m long subaerial, coarse to very coarse, sandy beach adjacent to the Melides lagoon entrance. In order to characterize the morphodynamics of the study area under the effects of storms (pre and post-storm) and tides (spring and neap tides) during a period of one year (April 2010 to April 2011), 26 field surveys were conducted. A survey grid with an alongshore length of 308m and a width of 14-40m defined between the lower limit of the beachface and the backshore limit (entrance of the coastal lagoon or frontal dune) was used. We performed 12 cross-shore profiles 40m apart from each other. The alongshore profiles describes the main topographic variations (e.g. top of the beachface, berms elevation, beach cusps definition). Horizontal and vertical positioning was provided by Real-Time Kinematics (RTK) GPS. The results obtained allowed to develop high resolution Digital Elevation Models (DEM) using the ArcGIS software. DEM models were used to describe beach morphologic changes. The nearshore wave characteristics were described by the SWAN wave model considering as boundary conditions the wave data recorded at the Sines wave rider buoy. The run-up levels were calculated using the wave parameters and the beachface slope (0.12 to 0.18). During the study period were documented two episodes of opening and closing of the Melides lagoon due to storms effect, and one artificial opening episode. A conceptual model for the reconstruction of the sandy beach detrital barrier that controls the opening and closing of the lagoon was performed. This study shows that the evolution of the sandy beach detrital barrier is characterized by a cyclical behaviour of recovery marked by the occurrence of storms. The developed conceptual model is characterized by rapid sediment transport between the submarine beach and the beachface. The incidence of more energetic storms ($H_s=5m$) induces the destruction of the sandy beach detrital barrier leaving open the Melides lagoon to the Atlantic Ocean. Due to storms the beach profile is destroyed and about $1.9 \times 10^3 m^3$ of sand is remobilized above -0.5m (MSL). Beach recovers much of its original morphology and sediment volume 10-12 days after the storm. At the stage of equilibrium, the sandy beach detrital barrier presents a wide berm (35 m), a berm with an elevation close to 5m (MSL) and a reflective beachface. This study was funded by the Administração da Região Hidrográfica do Alentejo (ARH). Bathymetric source was provided by GEBCO_08Grid and the wave data by the Instituto Hidrográfico (Portugal) web site.