Beachface and berm morphodynamics on a steep beach: Melides beach, Southwest Portugal.

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Abstract

The Melides beach, a sector of the Tróia-Sines Embayed Coast with 2.5km long, corresponds to a steep beach exposed to high-wave energy, with rapid erosion and accretion cycles related to winter storm incidence. The alongshore and cross-shore beach volume and width variability of the Melides beach were studied in detail using a survey methodology based on DGPS (Global Positioning System in Differential mode) and a Geographical Information System application. This survey methodology is based on a network of longitudinal and transversal DGPS profiles established on all subaerial beach. The three-dimension approach provided by DGPS methodology allowed a more robust description of the mean subaerial beach profile variations than bi-dimension studies provided by classical geodetic studies. The high match between alongshore patterns of the profile volumes variability before and after storm incidence in the Melides beach, suggests that the main factor that controls beach morphodynamics is the cross-shore sediment transport The seasonal cycle of erosion and accretion of the Melides beach seems to be triggered by variations in the wave incident energy (storm events). The incidence of a storm on January of 2008 led to significant shoreline shift with beachface retreat (24m) as well as, significant erosion of the frontal berm that experienced a decrease of width and volume. After the storm incidence the recovery of the pre-storm original conditions occurred during a period of fair-weather conditions through two stages: a first stage with increment of the frontal berm height (overtopping process) and recover of part of the beach width (by horizontal progradation of the berm) and a second stage, in which the frontal berm height continued to increase up to 5m, as well as the second berm that reached 6.5m.

1 Introduction

Beach exposed to high-wave energy experience rapid erosion and accretion describing quasi-cyclic patterns of volumetric changes (Daily et al. 2000). These patterns of volumetric changes have been analysed using Differential Global Positioning System (DGPS) measurements along several kilometres of the northwest Oregon and southwest Washington coasts (Ruggiero, 2005) and western Portuguese coast (Baptista, 2006; Baptista et al., 2006). The DGPS techniques can be efficient to monitor coastal areas, since a proper methodology is applied to produce spatial- temporal series of