

Medium-term evolution of an intermediate beach with an intertidal bar (Amoreira beach, Southwest Portuguese rocky coast).

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ABSTRACT

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The subaerial beach and low tide terrace morphology of the Amoreira beach (Southwest Portuguese Coast) was assessed using a DGPS system between December 2006 and October 2008. The offshore wave conditions were described by the SWAN model, and the nearshore wave using the COULWAVE model. DEMs show significant variations on beach width and berm elevation, and intertidal bar migration. The seasonal variation of the beach width (from the 2 m contour line above the MSL to the dune baseline) is significant (88 to 66 m) indicating a subaerial beach retreat of 13 m. The berm height elevation ranges between 3.3 and 2.5 m. The obtained results also show that beach sedimentary budget results from a close relationship between the volumes of sediment retained on the subaerial beach (mainly the width variations) and the morphology of the intertidal bar. The effect of intertidal bar morphology variations on the wave height for the field surveys of 6th April and 18th October 2008 was analysed. The obtained data set indicates that: 1) the intertidal bar migrated in the landward direction welding to the beachface lower limit by infilling a runnel of -0.61 m (minimum elevation); 2) the frontal berm increased the width and elevation in 8 m and 0.7 m, respectively; 3) the intertidal bar morphology with a trough on its landward side allows the dissipation of about 0.029 kJm⁻²/m of the wave energy along the surf zone; and 4) the wave spectrum shows a frequency band between 0.03 and 0.35 Hz.

ADDITIONAL INDEX WORDS: *beach morphodynamics, DGPS, SWAN, COULWAVE, wave breaking, digital elevation model.*

INTRODUCTION

The intertidal zone of intermediate beaches is generally characterized by the presence of one or more intertidal bars (Wright *et al.*, 1985). These intertidal bars are morphological features of the sub-tidal zone. Nearshore bars can present a cyclic movement in onshore and offshore direction (Larson and Kraus, 1994) according to annual wave energy incidence. The energy dissipation rate is a crucial term in the modeling of wave propagation across the surf zone (e.g. Huang *et al.*, 2009; Aagaard *et al.*, 2010). Between July 1998 and October 2001, the Amoreira beach, showed a significant retreat of the subaerial beach. During the same time, a persistent intertidal bar was characterized by significant variability in morphology and volume (Gama, 2005).

In this paper, the morphological variability of the subaerial

Amoreira beach is documented over two years. The intertidal bar migration and welding to the lower beachface was also followed. The sediment volume in the subaerial beach and intertidal bar welding is analyzed and related to the intertidal bar effect on wave energy decay along the surf zone.

STUDY SITE

The Amoreira beach is an embayed beach located at the Southwest Portuguese Atlantic Coast. Is an intermediate beach approximately 450 m long, backed by a dune field and bounded in the south by the Aljezur rivulet mouth (Figure 1). The subaerial beach has a maximum elevation of 5 m, the berm elevation varies between 2.5 and 3.3 m, while the berm width reaches values between 65.3 and 88.8 m.