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Comparison of a beach parametric morphodynamic model results with in situ measurements

Caroline Ferreira (1), Paulo A. Silva (1), Paulo Baptista (2), and Tiago Abreu (3)

(1) CESAM & Department of Physics, University of Aveiro, 3810-193 Aveiro, Portugal. carolineferreira@ua.pt;psilva@ua.pt, (2) CESAM & Department of Geociences, University of Aveiro, 3810-193 Aveiro, Portugal. renato.baganha@ua.pt, (3) CESAM & Department of Civil Engineering, Polytechnic of Porto, School of Engineering,Porto, Portugal. taa@isep.ipp.pt

The south coastal stretch of Aveiro inlet in the Northwest coast of Portugal is subject to a highly energetic wave climate and presents generalized erosion. To characterize the morphodynamic behavior of this coastal stretch it is important to establish the relationship between the hydrodynamic forcing and beach topography changes. Furthermore, it is necessary to develop methods which enable to estimate its behavior at a short and medium term. This work presents a model which estimates the cross-shore sediment transport from the shoaling into the swash zone. The transformation of the waves (shoaling and refraction) as they propagate towards the shore are computed from the incident wave field assuming conservation of the wave energy flux and take into account the tidal level and the beach bathymetry and topography. Wave breaking is described according to Battjes & Janssen (1978) and wave dissipation follows Baldock et al.'s (1998) formulation. The cross-shore sediment transport rates in the shoaling, surf and swash zones are computed from Tinker et al.'s (2009) suspended load shape function as a function of the normalized depth, h/ hb, where hb represents the water depth at wave breaking.
The performance of the model was assessed by comparing the computed significant wave height and sediment fluxes with water-level measurements and morphological variations at a transept in the coastal stretch. The hydrodynamic measurements were obtained with pressure transducers placed in the inter-tidal zone during one tidal cycle and topographic surveys with the INSHORE system (Baptista et al., 2011a,b).
The results show that the computed sediment fluxes are qualitatively in agreement with the topographic observations, meaning that the parameterized sediment flux shape function provide a good basis for prediction of the beach morphodynamic behavior with low computational cost.

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