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Modeling extreme beach retreat and erosion volumes. A tool for susceptibility analysis.

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Beaches are among the most dynamic systems in the coastal zone. This is due to the great variability in the main triggering factors that contribute to morphological change. Dramatic coast line retreat can occur in a short period of time due to episodic extreme wave events endangering people and property and therefore defining the local susceptibility to erosion. This research aims to determinate beach recession and volume erosion due to sediment loss during extreme wave events in non artificialized beaches of the Portuguese west coast, for susceptibility analysis.

The central west coast of Portugal is a wave dominated high energetic coastal environment. Storm frequency and magnitude are very important features on the definition of the annual local sediment budget and on the anthropogenic elements exposure to the direct action of waves through momentary or permanent coastline retreat. Winter offshore mean significant wave values reach 2.5m and waves with a 5 year recurrence period can be higher than 9m.

Results of cross- shore beach profile modeling using storm-induced beach change model (SBEACH) are presented for 3 beach systems, namely Sta. Rita beach, Azul beach and Foz do Lizandro. The calibration tests and the validation process are described and presented. The model run results are based on high definition natural beach profile data of pre- and post-storm measured morphology, on local characteristics of beach sediments and on hydrodynamic variables related to onshore extreme wave data and local tide heights.

Results point out the crucial importance of the local calibration process for the model application, with adjusted values of the transport rate coefficient, K, and the coefficient for slope dependent term, ε, differing from the "recommended" values by excess. In most cases validation values show that the locally calibrated SBEACH model explains 90% of the observed volume changes between pre- and post-storm profiles, computing sediment loss by slight excess.

Final results of the SBEACH model application using extreme wave conditions associated with a secular recurrence period event are mapped for the 3 beach systems, defining the susceptible areas to extreme erosion.