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Beach Morphology and Sediment Budget Variability Based on High Quality Digital Elevation Models Derived from Field Data Sets

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ABSTRACT

The morphological and volumetric changes of a sandy beach were investigated through a series of two-monthly filed surveys carried out over a 2-year period from April 2005 to January 2007. This paper discusses the ability of 3-D digital elevation models (DEMs) derived from high accurate data to assess and quantify beach morphodynamics in relation with wave forcing. The methodology and data acquisition are described and consist mainly in the production of interpolated DEMs from which a variety of representations can be made, including as elevation change maps, two-dimensional cross-sections of the beach, calculation of net volume. The results of the analysis highlight seasonal changes in beach morphology due to variations in wave energy. This behavior is characterized by beach erosion and bar decay under high-energy waves and net accretion and bar formation during relatively fair weather conditions. The sand budgets adjustments show that the loss of volume in the winter months is compensated for by accumulation to the beach during summer. This trend suggests that there is a mechanism which controls the beach evolution. The correlation between beach changes and wave energy variations highlights a net relation between them. The results from this investigation state the value of DEMs utilized and demonstrate the efficiency of the 3-D approach employed here to assess the erosion and accretion patterns which would not be visualized using 2-D profiles.

KEYWORDS

Moroccan Coast, Beach Change, Wave Forcing, Digital Elevation Model, 3-D Approach

Cite this paper

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