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The role of beach morphodynamic state on infragravity swash on beaches: field observations.

Paula Gomes da Silva, Mauricio González, and Raul Medina

Environmental Hydraulics Institute "IH Cantabria", University of Cantabria, Santander, Spain
(paula.gomes@alumnos.unican.es)

The runup generated by waves can be defined as the maximum height above sea water level on the coastline and is an important criterion for costal structures/nourishment design and erosion/flooding risk analysis. Given the complexity of nonlinear processes involved in the runup generation, its prediction is commonly made by means of empirical formulations that relate wave and beach parameters. The most accepted parametrization presented till the moment was proposed by Stockdon *et al.* (2006), in which the runup exceeded by 2 percent of the waves (R_2) is described in terms of setup (η - the steady superelevation of the mean water level caused by breaking waves) and incident and infragravity swash (S_{inc} and S_{ig}- time-varying fluctuations around the setup caused by non-breaking waves). Such formulation has been widely accepted and its efficiency was appraised in many works. Nevertheless, although empirical parametrization of infragravity swash using incident wave's parameters shows reasonable skill, the correlation can still present considerable scatter.

The amount of infragravity energy on swash is directly related to the morphodynamic beach state, in a way that beach profiles classified as reflective (low wave energy, coarse sediment and higher beach slope) tend to show lower S_{ig} values than dissipative ones (high wave energy, fine sediment and lower beach slope). However, since Stockdon's formula for predicting infragravity swash consider only wave parameters, its use implies that beaches receiving the same wave energy but with different grain size and beach slope would present the same S_{ig} values.

This work assumed the hypothesis that the scatter verified on the predictions of the infragravity swash is mainly related to the lack of information about the beach state in Stockdon formula. Based on that, a field campaign was designed and carried out in Somo-El Puntal beach, north Spain, with the aim of generating data to be analyzed in terms of infragravity swash. An important aspect about this field site is that, given the gradient of wave energy that reaches each part of the beach, it can present many morphodynamic states simultaneously, allowing a high range of measurements in a single beach. Thus, wave, currents, sediment and runup data were measured in three different profiles, as well as the whole beach topography, bathymetry and video camera images. These data, summed to those available from Stockdon study, were used to verify the validity of the hypothesis and to propose a new approach for empirically determining infragravity swash on beaches.