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Large-wave simulation of spilling breaking and undertow current over constant slope beach ATHANASSIOS DIMAS, GERASIMOS KOLOKYTHAS, AGGELOS DIMAKOPOULOS, University of Patras — The three-dimensional, free-surface flow, developing by the propagation of nonlinear breaking waves over a constant slope bed, is numerically simulated. The main objective is to investigate the effect of spilling breaking on the characteristics of the induced undertow current by performing large-wave simulations (LWS) based on the numerical solution of the Navier-Stokes equations subject to the fully nonlinear free-surface boundary conditions and the appropriate bottom, inflow and outflow boundary conditions. The equations are properly transformed so that the computational domain becomes time-independent. In the present study, the case of incoming waves with wavelength to inflow depth ratio λ/d $\approx$6.6 and wave steepness $H/\lambda\approx$0.025, over bed of slope $\tan\beta = 1/35$, is investigated. The LWS predicts satisfactorily breaking parameters - height and depth - and wave dissipation in the surf zone, in comparison to experimental data. In the corresponding LES, breaking height and depth are smaller and wave dissipation in the surf zone is weaker. For the undertow current, it is found that it is induced by the breaking process at the free surface, while its strength is controlled by the bed shear stress. Finally, the amplitude of the bed shear stress increases substantially in the breaking zone, becoming up to six times larger than the respective amplitude at the outer region.

Athanassios Dimas
University of Patras

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