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RANS Modelling of Swash Zone Hydrodynamics

Alec Torres-Freyermuth (1), Jack A. Puleo (2), Duvrabka Pokrajac (3), and Paulo Salles (1)

(1) Instituto de Ingeniería, Universidad Nacional Autónoma de México, Sisal, Yucatán, Mexico (atorresf@iingen.unam.mx;psallesa@iingen.unam.mx), (2) Ocean Engineering Laboratory, Department of Civil and Environmental Engineering, University of Delaware, Newark DE, USA (jpuleo@udel.edu), (3) School of Engineering, University of Aberdeen, King's College, Aberdeen, United Kingdom (d.okrajac@abdn.ac.uk)

Swash-zone hydrodynamics can alter foreshore morphology on a wave by wave basis, resulting in longer-term shoreline retreat or advance. However, the flow description at the water-land interface represents a challenging task for mathematical and numerical modelers. In order to achieve a satisfactory prediction of processes occurring within this region we require of transient, fully nonlinear, numerical model. Therefore, numerical models solving the Reynolds-Averaged Navier-Stokes equations with a VOF-tracking scheme are suitable for the study of this region. Although the RANS-VOF model has been widely validated within the surf zone, less effort has been devoted to model validation inside the swash zone. This is partially ascribed to the lack of highly-resolved, spatio-temporal velocities in this region. Novel experiments of dam-break-driven swash recently conducted at the University of Aberdeen provides a unique data set for the validation and calibration of the hydrodynamic model. Measured water-depth, velocity, run-up, turbulence intensity, and bottom shear stresses, at different cross-shore locations, during the swash event are employed for a thorough model-data comparison. Limitations regarding the RANS modeling of swash zone hydrodynamics are also discussed.