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2D-BOUSSINESQ MODELLING OF THE SAND DIKE EROSION DUE TO OVERTOPPING

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ABSTRACT

In the present work a Boussinesq type model is adopted to simulate the breaching and erosion of a sand dike by overtopping. An existing two-dimensional (breaking and non-breaking) wave propagation and bed morphology evolution model (Karambas and Koutitas, 2002) is adopted to simulated wave and flow overtopping, by introducing appropriated simple boundary conditions both on the upstream and downstream dike slope). By incorporating sediment transport formulae (for both bed load and suspended load) the model is applied to simulate bed morphology evolution and erosion process. The paper focuses on the hydraulics of water flowing over a dike (subcritical flow from the reservoir to the dike crest, transcritical flow on the crest, supercritical flow on the downstream dike, hydraulic jump formation), as well as on the erosion process in two dimensions. Initially, one-dimensional (along the dike crest and the landward slope) model results are compared with experimental data of Van Emelen et al (2013) which have been analysed briefly by Prinos and Karambas (2015). In addition, two-dimensional model results (along and across the dike crest and the landward slope) are compared against three-dimensional laboratory experiments (Frank and Hager, 2014).

Keywords: dike breaching, 2D-Boussinesq model, overtopping, erosion.

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