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Modelling the flooded area extent at the downstream segment of a small basin through a coupled 1D/2D hydraulic model

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A high-resolution Digital Terrain Model 5m x 5m, land use characteristics and a validated output hydrograph from an extreme rainfall event were used as input to the coupled 1D/2D HEC-RAS hydraulic model in order to obtain the flooded area extent at the downstream segment of a small basin in the island of Crete. A spatially varying Manning's roughness coefficient *n* was used to identify the differences between land coverage for the channel bed and the floodplain. Lateral structures were designed along the left and right overbanks of the stream, connecting the 1D stream flow with the 2D flow areas. The weir coefficient, used to convey the flow above the lateral structures, was also chosen for model validation in the control cross section. Detailed flood hazard mapping at the peak discharge was produced, along with the flood depths at times before and after the heavy precipitation event, in order to obtain the time evolution of the flooded area extent. The results obtained by the 1D hydraulic model are limited in their 2D lateral output that is crucial to the floodplain extent. The 1D/2D provides more detailed output concerning the flood extent at the peak discharge, as well as the maximum water depths and velocities at every grid point of the computed mesh. Defining accurate flood inundated areas is of utmost importance in civil protection agencies in order to initiate a proper early flood warning. At the same time, each EU Member State country is required to produce flood hazard maps according to EU Floods Directive at the river basin level. These 1D/2D simulation results can be beneficial in the aforementioned requirements for low probability extreme floods' basin management.