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Investigation of the uncertainty of spatial flood inundation among widely used 1D/2D hydrodynamic models

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On several occasions, hydrodynamic models are applied in order to establish flood risk and flood hazard maps and evaluate the impacts of floods. More often these models are treated as deterministic tools and, as a result, the uncertainties stemmed from the modelling simplifications and assumptions are ignored. Specifically, when the spatial propagation of a flood wave is of interest the highest uncertainties emerge at the boundary conditions, at the model input parameters and even at the model structure. The aim of this research is to examine the aforementioned sources of uncertainty in benchmark scenarios. Three models are tested (i.e. the one-dimensional HEC-RAS, the quasi-two-dimensional LISFLOOD-FP, and a two-dimensional scheme of the OpenFOAM) on steady hydraulic conditions and uniform channel geometry. In each model a sensitivity analysis is performed by varying the grid resolution, the input discharge, the roughness coefficient in the channel and floodplain, and the channel longitudinal and lateral gradient. After statistically analyzing the fluctuation of the output parameters (i.e. the mean water velocity at the inflow and outflow cross section, and the water volume), the uncertainty in the different model configurations is quantified and compared.