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On the influence of using binary and distributed information for 2D hydraulic model calibration and uncertainty evaluation

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Floods are considered the most frequent natural disaster world-wide and may have serious socio economic impacts in a community. In order to accomplish flood risk mitigation, flood risk analysis and assessment are required to provide information on current or future flood hazard and risks. Hazard and risk maps involve different data, expertise and effort, depending also on the end-users. More or less advanced deterministic approaches can be used, but intuitively probabilistic approaches seem to be more correct and suited for modelling flood inundation given typical uncertainties. Two very important matters remain open for research: the calibration of hydraulic models (oriented towards the estimation of effective roughness parameters) and the uncertainties (e.g. related to data, model structure and parameterisation) affecting flood hazard mapping results. Both matters are strictly connected and the performance measures represent the "metric" of this connection.
Here, we test the ability of different performance measures based on binary and distributed information to calibrate and evaluate model predictions in a credible and consistent way and to reduce the uncertainty in probabilistic flood inundation maps for two hydraulic models: a two-dimensional inertial finite element model and a recently developed version of the LISFLOOD-FP model which solves a reduced form of the full shallow water equations in a highly efficient manner. These models are applied to the Imera river basin in Sicily probabilistic flood inundation maps constructed for each performance measure calibration. Through a comparison of the resulting hazard maps, the influence these measure data on calibration and derivation of probabilistic flood mapping will be shown.