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Floodplain mapping uncertainty framework for ungauged streams

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A Monte Carlo framework, for ungauged streams, have been developed for the uncertainty analysis of floodplain mapping due to roughness coefficient. HEC-RAS 1-D hydraulic-hydrodynamic model have been linked to the Monte-Carlo simulations framework. Terrestrial Laser Scanner data have been used in order to have a better estimation of Digital Elevation Model (DEM) and minimize the uncertainty introduced by DEM. The Manning's n roughness coefficient has been estimated using several empirical formulas employing pebble count and field survey data. Various probability distributions were fitted on the empirical probability distribution of the estimated values of roughness coefficient and they are evaluated according to several goodness-of-fit criteria. Latin Hypercube Sampling algorithm has been used for the generation of different sets of Manning roughness coefficients. The validation process is based only on the flood extent derived from historical flood records for a specific extreme flash flood event. After a preliminary analysis the statistical criterion of Median Absolute Percentage Error was selected in the validation process. The Monte Carlo simulations employed to conduct several realizations of flood inundation maps. A binary wet-dry reasoning was selected for the estimation of flood inundation probability of each cell. Finally, several flood inundation probability maps have been created. The proposed framework has been implemented at the ungauged Xerias River, Volos, Greece. The study demonstrates that the proposed framework could be used to produce probability maps of flood plain areas for ungauged catchments.