



Uncertain Characterization of Flood Hazard Using Bivariate Analysis Based on Copulas

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This study presents a methodology to derive probabilistic flood hazard map in flood prone areas taking into account uncertainties in the definition of design-hydrographs. Particularly, we present an innovative approach to obtain probabilistic inundation and flood hazard maps where hydrological input (synthetic flood design event) to a 2D hydraulic model has been defined by generating flood peak discharges and volumes from a bivariate statistical analysis, through the use of copulas. This study also aims to quantify the contribution of boundary conditions uncertainty in order to explore the impact of this uncertainty on probabilistic flood hazard mapping. The uncertainty of extreme flood events is considered in terms of different possible combinations of peak discharge and flood volume given by the copula. Further, we analyzed the role of a multivariate probability hydrological analysis on inundation and flood hazard maps highlighting the differences between deterministic and probabilistic approaches. The methodology has been applied to a study area located in Sicily that was subject to several flooding events in the past.