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Uncertainty and sensitivity analysis for hydraulic models with dependent inputs

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Nowadays, flooding hazard is usually assessed through numerical modelling. However, the modelling of physical phenomena is generally affected by uncertainties related to the lack of knowledge of the physical parameters describing the system, and to the numerical parameters of the model. As a consequence, in order to improve the quantification of the flooding hazard, a better understanding of the uncertainties is necessary and Uncertainty Analyses (UA) and Sensitivity Analyses (SA) are useful tools. Traditionally, to perform these kinds of analyses with the classical methods (i.e. Monte-Carlo sampling or Sobol Indices computation) the input parameters of the study are supposed to be independent, which is not always the case, especially in hydraulic studies. In this context, our objective is to perform UA and SA in hydraulic models by considering dependent parameters. With this aim, we tried two different methods: a screening method taking into account the dependencies between input parameters through copulas and a variance-based method allowing computing multidimensional sensitivity indices. These methods were first tested on a simplified model of river flood inundation which simulate the height of a river and compare it to the height of a protection dyke. The results were compared to them obtained with the classical approach for UA and SA based on the hypothesis of independent inputs. As perspective, the final goal of our research is to apply these methods to large scale bi-dimensional hydraulic models, usually employed for the estimation of flooding hazard. In fact, to date, almost no study about this has been published to our knowledge.