Geophysical Research Abstracts
Vol. 18, EGU2016-16728, 2016
EGU General Assembly 2016

New challenges on uncertainty propagation assessment of flood risk analysis

Luciano Martins (1), Estefanía Aroca-Jiménez (2), José M. Bodoque (2), and Andrés Díez-Herrero (1)

(1) Geological Survey of Spain (IGME), Geological Hazards Division, Madrid, Spain (l.martins@igme.es; andres.diez@igme.es), (2) University of Castilla-La Mancha (UCLM), Toledo, Spain (estefaniaarocajimenez@gmail.com; josemaria.bodoque@uclm.es)

Natural hazards, such as floods, cause considerable damage to the human life, material and functional assets every year and around the World. Risk assessment procedures has associated a set of uncertainties, mainly of two types: natural, derived from stochastic character inherent in the flood process dynamics; and epistemic, that are associated with lack of knowledge or the bad procedures employed in the study of these processes.

There are abundant scientific and technical literature on uncertainties estimation in each step of flood risk analysis (e.g. rainfall estimates, hydraulic modelling variables); but very few experience on the propagation of the uncertainties along the flood risk assessment.

Therefore, epistemic uncertainties are the main goal of this work, in particular,understand the extension of the propagation of uncertainties throughout the process, starting with inundability studies until risk analysis, and how far does vary a proper analysis of the risk of flooding.

These methodologies, such as Polynomial Chaos Theory (PCT), Method of Moments or Monte Carlo, are used to evaluate different sources of error, such as data records (precipitation gauges, flow gauges...), hydrologic and hydraulic modelling (inundation estimation), socio-demographic data (damage estimation) to evaluate the uncertainties propagation (UP) considered in design flood risk estimation both, in numerical and cartographic expression.

In order to consider the total uncertainty and understand what factors are contributed most to the final uncertainty, we used the method of Polynomial Chaos Theory (PCT). It represents an interesting way to handle to inclusion of uncertainty in the modelling and simulation process. PCT allows for the development of a probabilistic model of the system in a deterministic setting. This is done by using random variables and polynomials to handle the effects of uncertainty.

Method application results have a better robustness than traditional analysis techniques of propagation of uncertainty. Physical nature variables present smallest errors associated; and the socio-demographic variables seem to be main component error, as they are difficult to obtain accurately, its very volatile and variable in time and space.

This approach allows for model reusability and definition of more complex scenarios starting from simple component models. These methods are well suited to robust design and control uncertainties propagation when the objectives are strongly dependent on the shape or tails of the distributions of product quality or economic objectives such as flood risk studies.