Geophysical Research Abstracts
Vol. 15, EGU2013-6783-1, 2013
EGU General Assembly 2013


# Sensitivity analysis of SCHADEX extreme flood estimations to observed hydro-meteorological variability

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Extreme floods estimation methods are developed since many years within the hydrological and statistical communities. More recently, approaches based on the statistical analysis of flood streamflow samples simulated by rainfall-runoff models which are forced by simulated rainfall spread in the scientific literature. These approaches, called stochastic simulation methods, are typically composed by a probabilistic rainfall model and a rainfall-runoff model. Each of these two models are usually calibrated over observed hydrometeorological series such as daily precipitation series for the probabilistic rainfall models or such as daily streamflow, precipitation and temperature series for the rainfall-runoff models. Since extreme flood observations are by definition particularly rare, the validation of the proposed extreme flood estimations is one of the main critical issues, whatever the method - statistical or physically-based – used. Moreover, the observed hydrometeorological series used for the calibration of the stochastic simulation methods may be subject to significant variability over time, due to global climate oscillations such as El Niño Southern Oscillations for example. If the estimation of total involved uncertainty is a difficult task, investigating to what extent the proposed extreme flood values are dependent on the calibration period is an interesting first step.

The general aim of this study is to propose a methodology for performing a sensitivity analysis of extreme flood estimations to the variability of observed series used for the model calibrations in a stochastic simulation framework. The methodology proposed is based on the nonparametric bootstrap concept and consists to perform a set of block-bootstrap experiments, thus generating different sets of observed series sub-samples. The generated observed series sub-samples are then used for the calibration of the different models considered within the stochastic simulation method. The main originality of the proposed approach is the fact that the parameters are not analyzed individually but by block, allowing thus to distinguish between rainfall hazard, catchment saturation hazard and characteristics of the rainfall-runoff transformation.

The sensitivity analysis methodology will be tested within the application of the SCHADEX method (Simulation Climato-Hydrologique pour l'Appréciation des Débits EXtrêmes) proposed by Paquet et al. (2006, 2013). SCHADEX is a 'semi-continuous' stochastic simulation method (rainfall hazard is simulated at the event-base while the catchment saturation hazard is simulated trough continuous rainfall-runoff modeling), which is currently used at Electricité De France since 2006 for the dam spillway design. The sensitivity analysis of the SCHADEX method will be illustrated over four catchments which are located in different regions of the world and are thus in different hydrometeorological contexts.

References:

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Paquet, E., Garavaglia, F., Gailhard, J. and Garçon, R. (2013), The SCHADEX method: a semi-continuous rainfall-runoff simulation for extreme flood estimation, Journal of Hydrology, under revision.