Geophysical Research Abstracts
Vol. 20, EGU2018-8271, 2018
EGU General Assembly 2018

An integrated stochastic model of the river discharge process with emphasis on floods and bridge scour

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Floods have an important influence on society, being able to affect human life, human properties and also cultural heritage. Nevertheless, the dynamics of floods and their interaction with infrastructure over time is still unexplored. Therefore, there is a significant need for the development of new hydrologic and hydraulic modeling techniques able to represent the process in a realistic way. With this aim, the stochastic structure of the discharge has been modeled by a generalized Hurst-Kolmogorov (HK) process in terms of dependence structure (from long to short term) and marginal distribution (from left to right distribution tail). Several long length discharge time series have been filtered with the aim to ensure a minimum human influence on the discharge regime. Time series were analyzed using the climacogram stochastic tool for the analysis because of its good properties, such as small statistical errors, a priori known bias and a mean close to its mode. Finally, a general and parsimonious discharge model, with emphasis on floods, is coupled with a hydraulic model for long run numerical simulations. The authors are seeking to apply these ideas to evaluate the hydraulic infrastructure risk due to the discharge uncertainty and, in particular, to assess the bridge scour risk.

Keywords: Floods, Short- and Long-Term Persistence, Uncertainty, Climacogram.