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A probabilistic definition of a characteristic duration of floods relevant for the transformation of rainfall distribution to flood distribution

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article The influence of rainfall distributions on flood distributions is undeniable. However, a basin doesnot really transform a random variable called rainfall into another one called discharge. A more realistic view is to consider that a basin transforms a stochastic process, but it is difficult to represent such a process for extreme values, and to have data to estimate its parameters. Therefore, it is often necessary to stay at the level of random variables, but to work with variables defined at a proper time step, ensuring the closest link between rainfall and runoff. A definition of a characteristic duration is proposed, which requires the use of a rainfall-runoff model, but is not specific of any model. The first step is to run the model on a stochastic model of rainfall, calculate the conditional distribution of discharge for rainfall, for a given return period, and several durations of rainfall. It happens that the probabilty of exceedance of discharge, conditional on rainfall is minimum for a given duration, and that this duration does not vary quickly for high values of discharge. So its value for extreme floods, assuming there is a limit, can be considered as characteristic of the basin under the given rainfall distribution (*pcd*, probabilistic characteristic duration). The function of the model is to generate probability distribution functions, or synthetic data, but the concept is model free and could be estimated on a large set of rainfall and discharge data at short time step. Naturally, this duration depends on the behaviour of the basin and its estimation on synthetic data depends on the parameters of the rainfall-runoff model and are not surprisingly found highly dependent on the parameter of the routage sub-model:the quicker is the answer of the basin, the shorter the *pcd*. We study the distributions of rainfall and runoff whether or not they are taken at duration equal to *pcd*, especially the transform of the scale and shape parameters. Thus, we can consider that the statistical parameters wich govern extreme floods are partly explained by deterministic parameters which can be estimated on short collections of data.