Hydrograph stochastic generation associated to SCHADEX simulated floods

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For several years, EDF has been using a new method called SCHADEX (Climatic -Hydrological Simulation of Extreme Floods) to estimate extreme flood quantiles in order to design dam spillways. SCHADEX uses a stochastic simulation process which allows, thanks to a rainfall-runoff model, to simulate the effect of various rainfalls (up to extreme quantiles) on a wide range of hydrological states of the watershed. This simulation is carried out at a suitable time step, producing the CDF of flood volumes up to extreme quantiles. This time step is chosen in a such way that the average peak-to-volume ratio on a collection of hydrographs of observed floods is around 1.5. The CDF of simulated flood peaks is then deduced of the volumes by applying this constant peak-to-volume ratio. If a design hydrograph is needed, it can be computed, for example by avering all the adimensionalized hydrographs of the collection.

However, using such an unique peak-to-volume ratio (and design hydrograph) is a very restrictive hypothesis, which doesn't account for the diversity of floods, being observed or simulated by SCHADEX. In particular, the flood volumes distribution around the flood peak gives some information about the flood dynamics and can be used to propose a plausible shape for each flood.

The presented work proposes a method to combine observed hydrographs with a suitable weighting scheme, in order to generate a "synthetic" hydrograph for a flood whose distribution of volumes is known. This generator will allow to use the variety of flood dynamics which can be deduced from a collection of observed hydrographs.

The methodological background of this generator will be presented, as well as its settings and validation results, and its perspectives.