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On the asymptotic behavior of probability distribution of discharges and rainfall

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Extreme rainfalls and floods cause each year heavy damages all around the world.

The communities strongly need an actual prediction in terms of probability of occurrence of the extremes in order to reduce the risk associated with them.

The choice of a probabilistic model is thus a key factor with relevant economic consequences.

We are thus interested on a correct estimation of the asymptotic behavior of the probability distribution since it plays an important role on the extrapolation of rare quantiles. Moreover, when using physical or conceptual models to reproduce the extreme value behavior, they must be able to simulate a correct asymptotic trend. In particular, historically, in hydrology two class of asymptotic behavior have been considerate: exponential and power law.

Therefore, the aim of this work is to investigate a large database of daily discharges composed by 173 series (Base RM, MEDD) in the south of France and by 243 daily rainfall series (Base Precip., MétéoFrance) all over the France, in order to characterize their asymptotic behavior.

We investigate the interest of multifractal estimations and semi-parametric estimations. Semi-parametric estimators (such as Hill estimator and some of its variants) strive to approximate a target distribution locally, instead of setting an a priori global form; which is, at the contrary required by parametric estimators.

Multifractals technique exploits the scaling properties of the series to infer the probability of occurrence of the extreme.

The results are compared with parametric estimations (L-moments and Max-Likelihood).

We conclude on the performance of different estimators and on the fact that, independently on their choice the most frequent asymptotic behavior is a power-law both for rainfall and floods.