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Comparing frequency analysis approaches: a data-based methodological framework.

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Frequency analysis (FA) is one of the cornerstones of hazard quantification and risk assessment. Its basic objective is to estimate the distribution of some environmental variable X, e.g. annual maximum of the areal rainfall over some catchment, annual maximum flood, etc. This distribution can be used to estimate the exceedance probability of a given value of X (often expressed in terms of return period), or alternatively, to estimate the p-quantile of X, i.e. the value having an exceedance probability equal to 1-p. The estimation of quantiles is of primary importance since they are used to design civil engineering structures (e.g. dams, reservoirs, bridges) or to map hazard-prone areas where restrictions may be enforced (e.g. building restrictions in flood zones).

FA has been the subject of extensive research, yielding an abundance of approaches. In practice, FA users and practitioners may feel lost facing such an abundance of methods. Consequently, several initiatives aimed at assisting users in realizing their analyses using best-practice methods. In addition to these end-user-oriented guideline documents, a large number of comparisons between competing methods have been reported in the research literature.

The French National research project EXTRAFLO aims to perform a thorough comparison between FA approaches currently used in France, based on an extensive dataset of long series of rainfall and runoff. This poster provides a detailed description of the methodology used to perform the comparison, and presents preliminary results of its application to a large runoff dataset. More precisely, the following topics are presented:
· Difference between descriptive and predictive ability, and the need to decompose the dataset into calibration / validation sub-samples
· The issue of scrutinizing uncertainty estimates is discussed, and a method based on the concept of predictive distribution is proposed in order to compare the reliability of competing uncertainty estimates.
· Reliability indices are derived in order to compare the performances of competing methods on an objective basis.
· This methodological framework is first applied to synthetic data to verify the ability of the comparison framework to distinguish between “good” and “bad” FA approaches.
· Preliminary results based on a large runoff dataset are then discussed.