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Numerical investigation on the power of trend detection tests

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The need of fitting time series characterized by the presence of trend or change points has generated in the last few years an increased interest in the investigation of non-stationary probability distributions. Considering that the available hydrological time series can be recognized as the observable part of a stochastic process with a definite probability distribution, two main topics can be tackled in this context: the first is related to the definition of an objective criterion for choosing whether the stationary hypothesis can be adopted, while the second can be related to the analysis of the effects of the application of a non-stationary approach on the return period and flood risk evaluation. Although the time series trend or change points can be recognized using classical test proposed in recent literature (e.g. Mann-Kendal or CUSUM test), the actual problem to be addressed is the correct selection of the stationary or non-stationary probability distribution; in this framework, the issue is shifted toward model selection more than to trend detection, with all of the consequent implications related to this field. The aim of this study is to evaluate relationships between trend in a time series and traditional tools (e.g. Akaike Information Criterion [AIC] and Likelihood Ratio test), used for model selection in fitting of probability distribution. Power of the above mentioned tests for the non-stationarity detection has been investigated in a parametric way through Monte Carlo simulations using Generalized Extreme Value distribution as parent and assuming AIC as statistical test.