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comment

# *Interactive comment on* "Power of parametric and non-parametric tests for trend detection in annual maximum series" *by* Vincenzo Totaro et al.

**Anonymous Referee #1**

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**General comment**

The manuscript investigates the power (and statistical significance) of non-parametric and parametric approaches for non-stationarity detection in annual maxima series. The methods analyzed in the work are the classical Mann-Kendall, likelihood ratio and AIC ratio tests; the investigation is performed thought a detailed numerical Monte Carlo experiment that makes use of the GEV distribution as a reference distribution. The experiment accounts for parent distribution parameter variability, including the parameter describing the non-stationary behavior of the average of the process, and sample variability. The topic is of paramount importance for hydrological applications and the conclusions drawn, which are clearly supported by the performed numerical experi-

ments, give practical indications to practitioners about the application of the methods in real world problem, as discussed extensively in the conclusion section. In general, the manuscript is well written and organized; it deserves to be published in HESS. I have only a couple of suggestions to the Authors, as listed in the following.

- The first is about the assumptions made in this work as their significance with respect to natural phenomena; e.g. the non-stationary model accounts only for the variability of mean in time (which should be explicitly shown for the sake of clarity by reporting the theoretical expressions of the three first order moments a functions of the parameters), yet in nature the non-stationary behavior could imply also a variability in terms of the second order moment. Further, natural time series often depict dependence in time, which significantly affects the power of statistical methods for non-stationarity detection, as also recognized by the Authors themselves. I generally suggest the Authors to improve the discussion on practical limitations of those tests and of the conditions analyzed in their work, yet this is only a personal suggestion to improve the completeness of the discussion.

- Second, I would like to see a deeper comparison with previous literature works on the same topic; e.g. the Authors mention in the conclusion section the paper from Serinaldi et al. (2018), without giving further details. I believe that the comparison with previous literature results could help strengthen the general discussion presented in the conclusion section.

- Finally, the Authors should spend some efforts to improve the readability of the figures, e.g. by making the lines thick, by increasing the character size etc.

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