Geoscientific
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Discussions

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Interactive comment on "Evaluation of Climate Change Impact on Extreme Temperature Variability in the Blue Nile Basin, Ethiopia" *by* Mostafa A. Mohamed and Mohamed El-Sayed El-Mahdy

Anonymous Referee #1

Received and published: 17 November 2020

This manuscript investigated climate change effects on extreme temperatures in the Blue Nile Basin. After a description of dataset and case study, authors described applied methodologies, among which emerges the widely employed Mann-Kendall test. The investigation was carried out by applying these tools to extreme temperatures detected in Blue Nile Basin. The topic is of paramount importance for hydrological applications to be implemented in the areas covered by this study. However, to my opinion the paper needs substantially improvements, both in its structure and results analysis, that are of major importance.

General comments: The paper deals with a relevant topic for modern hydrology, high-lighting the need of such analyses for a wide field of real applications. However, to my opinion the paper needs to be improved substantially in the introduction and in the result analysis, and the abstract reformulated in a more readable way. In particular, the introductive section should be rebuilt in order to provide a more logical discussion about the general framework and local situation, clearly specifying motivations and goals of the paper. More detailed comments will be shown in specific comments section. The second – and, to me, more important – issue is related to the analysis on Mann-Kendall test results and arise from the citation of the paper of Yue et al. (2002) at line 168. This is one of the most famous papers (1048 citations on Scopus ad November 17, 2020) on the use of Mann-Kendall test for detecting trends in hydrological series, highlighting the role of power evaluation when applying this test. In this way, a complete analysis of applications to real data can be performed, investigating both type I and II errors. A lot of papers discussed on the practical implications that the assessment of power can generate. Among the most recent, I suggest to refer to the following for the specific reference to Mann-Kendall (published in 2020): - Totaro, V.; Gioia, A.; Iacobellis, V. Numerical investigation on the power of parametric and nonparametric tests for trend detection in annual maximum series. Hydrol. Earth Syst. Sci. 2020, 24, 473–488. - Wang, F.; Shao, W.; Yu, H.; Kan, G.; He, X.; Zhang, D.; Ren, M.; Wang, G. Re-evaluation of the Power of the Mann-Kendall Test for Detecting Monotonic Trends in Hydrometeorological Time Series. Front. Earth Sci. 2020, 8.

This about an application of power evaluation with parametric Likelihood Ratio test: - Németh, L., Hübnerová, Z., Zempléni, A. Comparison of trend detection methods in GEV models. Communications in Statistics-Simulation and Computation, 2020, 1-16. And these latter to implications and concerns on the need of evaluating the power: - Vogel, R. M., Rosner, A., and Kirshen, P. H.: Brief Communication: Likelihood of societal preparedness for global change: trend detection, Nat. Hazards Earth Syst. Sci., 2013 13, 1773–1778. - Serinaldi, F., Kilsby, C. G., and Lombardo, F.: Untenable nonstationarity: An assessment of the fitness for purpose of trend tests in hydrology,

Clarified this issue, I know that lots of hydrological applications are carried out in the same way as you did. However, to my opinion you should base your findings reporting some notes supported by literature references about Mann-Kendall test power, to reinforce your statements, in order to provide a more complete and appropriate interpretation of results. Finally, in addition to these two remarks, I would like to see a more detailed discussion in Par. 3, that I found too short and an inversion between order of Par. 2.1 and 2.2.

Specific comments: - Line 13: specify which data; to me, monthly is too generic and is repeated at lines 13-14; - Lines 15-17: please, provide a clearer summary of your methodologies; - Line 28: there has been...I think that it still is; - Line 29: its direction. Please, use a more specific term; - Line 30: and the potential river basins in the Nile Basin: what do you mean? - Line 35: please, remove comma; - Lines 39-40: this statement should be moved to the Conclusion section; - Lines 42-44: please, support your statement with references; - Line 46: what consequences are you referring to? - Lines 48-51: please, support your statements with references; - Line 59: it is not clear what basins are you referring to; - Lines 63-64: is this statement referred to the work of Gleick (2000)? - Lines 71-72: to me, you can better specify the type of variable you are analyzing; - Lines 79-86: this detailed discussion should be moved to case study description, leaving only some notes about climate of Ethiopia that are strictly essential for developing the introduction; - Line 103: please, remove &; - Lines 104-107: to me, you have to provide a better declaration of hydrological variables you are investigating and to which you are applying tests; - Lines 108-110: please, report more details on the occurrence and treatment of missing data; - Line 118: Figure 1, pleas improve readability of words and numbers (e.g., increase dimensions); - Lines 142-144: please, provide a reference for your statement; - Lines 153-154: I think you can rephrase your statement in a clearer way. I can't understand what do you mean; - Line 163: specify what do you mean with homogeneity and why you apply Pettitt test; - Lines 163-167:

why describe this test only with words and dedicate little less to a full page to Mann-Kendall test with all formulas? - Line 181: Z_c? - Line 196: I think you are referring to Z_c (attention when using the term p-value), and must declare it as the title of MK column in tables 2, 4, 6, 7. Furthermore, when you use *, **, *** in those tables I think that you have to clearly give meanings to these symbols in each caption. However, I understood what they mean, but they need an explicit explanation; - Line 199-201: why reporting global statistics before showing your results? They can have place in the Discussion section, and only if compared with local findings; - Lines 218-219: where? - Lines 223-224: I think you should address the use of the word significant in the whole document, also in the light of considerations about test power.

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