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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Analysis of the combined and single effects of LULC and climate change on the streamflow of the Upper Blue Nile River Basin (UBNRB): Using statistical trend tests, remote sensing landcover maps and the SWAT model" *by* Dagnenet F. Mekonnen et al.

Anonymous Referee #2

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The submitted study presents results on the effect of LULC and climate change on the streamflow in the Upper Blue Nile River Basin using a statistical and a modelling approach. The topic of the study is in general relevant and the approach provides also new insights relevant to readers of HESS. However, there are many shortcomings in the paper of methodological and structural nature but also in regard of format, language and style.

Main shortcomings:

1. An overall discussion of the results is completely missing. Very interesting findings like the recovery of landcover during a certain period and its reflection in time series are not discussed at all. Some discussions are added to the results section but not in a coherent or comprehensive way.

2. There are several methodological shortcomings, some of them explained like the use of ground truth data. Others like how gaps in data records have been filled or the problems of the curve number approach for a LULC study are not discussed. Therefore an additional chapter within a new discussion section on all the uncertainties and how they impact the interpretation of the data is crucial for the paper.

3. The language and the style of the paper is in general poor. The paper should be carefully revised since in the current form it is very difficult to understand.

4. Figure 4: It seems that there a processing relics in the reclassified imagery. In figure a) on the western side of the map is a rectangular section with forest, that completely disappears in b). In b) there is a rectangular forest cover in the northern part of the country which again disappears completely in c). In d) a forest cover with completely linear edges (N-S) appears on the eastern side of the map. How can these be explained and if these are problems with the classification method, does it not add a lot of uncertainty to the results?

Minor comments:

Abstract P1/L19f: from 12.2% to 15.6% is no decreaseAnd from 67.5% to 63.9% is no increase.

Introduction: There are many statements without any source, e.g.: catchment are etc, 200 million people rely directly on the Nile river, 94% unbalanced water , Ethiopia only using 5% of water,...

P1/L29: What do you mean with largest river? P2/L4: is this sentence stated here as

fact not the research topic? P2/L11: here and often after acronyms are not explained in the right order P2/L16: These are not few studies and many are missing. Please add all current literature. P2/21: Belg is mentioned here for the first time but only explained in later in the manuscript.

2. Study area: P3/14: Rainfall distribution should be mentioned P3/L15: mean, max and min mentioned but only 2 numbers provided.

3. Input data sources: P4/L20ff: It is crucial to understand which gaps have been filled how. Please provide table summarizing gaps. How did you evaluate the best performance. This is a very critical point of the study and needs to be discussed.

4.1. Trend analysis Often R or Python Packages have been used to do this basic trend analysis. Please provide the source if this has been used for this study as well since this helps the reader to understand the method. P5/L16: It is not necessary to describe the Mann Kendall test in detail since this is a standard method.

4.2.1 Landsat image acquisition Please provide a table at least in the suppl. Mat. Which images have been used for which period. This is a potential source of large uncertainties. Please show the borders of the images in figure 4.

4.2.2 Pre-processing and processing images P7/L12: How can you assume that there were no significant landcover changes between 2017 and 2010. It is wrong and has strong implications on the result and is therefore methodological not acceptable.

5.1.1 Rainfall: All this has been done, so please shorten.

5.1.2 Streamflow: This changes can also be explained by a change in temporal rainfall distribution, e.g. increase of extremes. Therefore the conclusion that the change can be solely attributed to LULC change is not compulsory and therefore not correct.

5.2. LULC change analysis: You are suing a 2010 image with 2017 data. This is wrong and cannot be done. P13/L18-25: This is a short discussion and should be extended and part of a discussion section. E.g. it should be checked if these results are also

reflected in the streamflow.

6. Conclusions: P16/L4-16: The first section only repeats old research findings. P16/L18-25: E.g. the strong recovery is not discussed at all. P16/L28-P17/L7: It is not true that the climate did not change. Even if it would hold true that precipitation did not change, this is certainly false for temperatures. In the Ethiopian climate, evaporation is one of the main drivers of streamflow and this is not reflected at all. This statement alone makes the results and the interpretation questionable and vulnerable.

Table 8: Here you can see an extreme change in PET which is not discussed. Same holds for the extreme trend of Qb/Qt from 20.6 to 3.2 and back to 20.

Figure 1: Some points are hidden behind triangles and the colour cannot be identified. What is the "value" I assume metres above sea level, but please indicate. Gabay and Gumatra cannot be distinguished.

Figure 2: Years with commas.

Figure 4: See main shortcomings.

Figure 6: Make scale uniform since otherwise they cannot be compared.

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