

Comment on hess-2021-616

Anonymous Referee #1

Referee comment on "Attribution of global evapotranspiration trends based on the Budyko framework" by Shijie Li et al., Hydrol. Earth Syst. Sci. Discuss.,
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Accurate quantification of the climatic contributions for global land evapotranspiration change is necessary for understanding variability in the global water cycle. This study assembled four ET datasets based on various methodological sources, further adopted the Budyko framework and sensitivity experiment analysis to quantifying the contribution of climatic variables (P, Rn, T, VPD and u) to ET trend. The analysis identified the main climatic factor controls ET trend on a global scale. This research is systemic and detailed, helps reveal the controlling factors of global ET change. The main comments can be found as follows:

1. The expression should be improved.
2. Budyko method was used to conduct a control experiment to compare with ET product results, and the ω parameters were obtained by least squares fitting, did the authors use annual data for the entire period for the fitting? If this were the case, it would not be possible to consider the effect of land use changes on the ω parameters and thus bias the estimated ET simulations, especially considering that such a long study period (1980-2010) with significant land use changes must have an important impact on ω .
3. Figure 7: As the percentage of grids in each dominant factor controlling annual ET linear trends has been distinguished in Table 2, I suggest to focus on the regions where VPD plays a dominant factor in Figure 7.
4. 3.3 Validations of attribution method belongs to the 4.2 Uncertainties, as this section discusses the reliability of Budyko method in ET estimation and attribution analysis.
5. Abstract Line 22: "land-atmosphere interactions" & Page 10 Line 24: "The positive feedbacks": The main conclusion of this article is demonstrating the main factor affecting ET trend. However, it appears that this study did not address the interaction or feedback between ET and VPD.
6. As the authors mentioned choice of ET data may add significant uncertainties into the ET attribution. The authors need to show how the impact of the results due to ET datasets uncertainty is reduced and summarize the combined results from multiple data sets, rather than one data set with one result without giving a combined conclusion. And this should also be summarized in Conclusion.
7. Table 2 gives the percentage of grids in each dominant factor controlling annual ET linear trends with positive and negative. Meanwhile, Figure 2 shows the spatial distribution of annual ET linear trends for 4 datasets, opposite trends between different products in the same pixel can be found. My concern is whether the areas with positive ET trend in one dataset are changing negatively in the other dataset.

Some specific comments:

1 Page 1, Line 25: As you mentioned "terrestrial water flux component", "accounting for more than 60% of global precipitation" should be "land precipitation".

2 Page 3, 2.1 Data: Forcing data in Budyko framework and Köppen climate classification should also be summarized.

3 Page 5, Line 35: What's the meaning of C_i ?

4 Figure 4: The image color scheme can be more distinguishable.

5 Page 5, Line 10: How do you define the "dominant factor of ET trends"? Please give an explanation or algorithm.

6 Figure 5 & 8: Please use density scatter plot to improve image quality.

7 Please avoid citing a large number of references in one place.