

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
<https://doi.org/10.5194/hess-2022-290-RC1>, 2022
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Comment on hess-2022-290

Anonymous Referee #1

Referee comment on "Revisiting the hydrological basis of the Budyko framework with the principle of hydrologically similar groups" by Yuchan Chen et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-290-RC1>, 2022

The authors used global data sets to analyze an impressive number of catchments in order to calculate their position on the Budyko curve. They use the results to establish correlation between the single parameter of a parametric expression of the Budyko curve and various catchment characteristics. In the discussion, the results are analyzed to provide physical explanations for some of these correlations.

Overall, the paper is sound and the analysis provides new insights, making this an interesting paper that I enjoyed reading. I would like the Introduction to clarify better the role of the parameter. The results indicate there is a temporal trend in the quality of the runoff reconstruction. I would like to see some examples of this for individual catchments, and if possible some more discussion of this.

The readability of the figures is poor because too much information is jammed in many panels comprising a single figure. Trying to read Fig. 7, I had to enlarge it so such a degree that the resolution became too coarse. At times, the English is a bit hard to comprehend.

Carefully check the notation and explanation of all variables and make them consistent throughout. Two examples: PET and ET_0 both denote the potential evapotranspiration, and Pw and m denote the watershed characteristic parameter.

Figs. 5 and 6 present quantitative data in poorly readable color scales. But placing these in tables is not manageable because of the large number of catchments. Still, information for individual catchments would be useful. Perhaps add such a table as a supplement? Perhaps you can expand the table for annual data, so we can see the trend that you report in the aggregate in the main text for individual catchments.

Additional minor comments are given in the annotated manuscript.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2022-290/hess-2022-290-RC1-supplement.pdf>