EGUsphere, referee comment RC3
https://doi.org/10.5194/egusphere-2022-1237-RC3, 2023

Comment on egusphere-2022-1237

Anonymous Referee #3

Referee comment on "Water and energy budgets over hydrological basins on short and long timescales" by Samantha Petch et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-1237-RC3, 2023

General comments

Petch et al presented a new method to derive monthly water and energy flow estimates consistent with observed water and energy budgets. The paper is generally well-written, and the topic is highly relevant to the HESS readership. However, I do have some concerns and suggestions:

- The authors appear to claim that their optimization method works well by evaluating the results with GRACE - a product that was used in the optimization process. Please consider validation/evaluation with an independent product and/or different time periods.
- The authors aim to present better water and energy data and methods. For the effort to be impactful and meaningful, please share the data and the scripts (the scripts were shared, but I could not not find any content in the readme file).
- Since the paper argues that the produced method constitutes an improvement upon current optimisation methods, it would be useful if the evaluation/comparison figures and results section could show a clearer distinction between comparisons with products that are "optimized" datasets and those that are not.
- Since the paper explicitly aims to improve optimization at all time scales (monthly, interannual, trend), it would be useful if the figures and results section could clearly and explicitly show the improvements at each of those time scales.

Specific comments

L53: "is these" should be "in these".

L106: Instead of “short and long time scales”, please consider being more precise (e.g., monthly, interannual, long-term trend). Other parts of the paper suggest that the aim is to both produce optimized estimates and an optimisation method/methodology. Please include all study aims in this “aim” paragraph.

Introduction section: Please consider adding a table providing an overview of optimisation methods. The text already contains a literature review, but it is difficult to gain an overview. Since this paper proposes a methodological advancement, it would be useful to at a glance see in what way this paper presents an advancement.

Table 1: “present” is ambiguous, it would be clearer if you simply state the years that were downloaded for use in this study. Also make sure that the capitalisation of the headings are consistent. “Parameter” should be “Variable”, I think. In addition, please consider adding a column describing the dataset type (e.g., satellite, in-situ measurements etc). For GRACE, should the variable be “water storage anomaly”?

Methods section: Please consider adding an overview figure of the methodological steps. For variable symbols, please consider using single-letter symbols rather than multi-letter symbols.

Figure 4 (and elsewhere), please check - “total water storage” or “total water storage anomaly”?

L350 First use of ITCZ, write out.

L461 Please consider providing the relative error in the unit of % for Amazon as well.

L468 Since the imbalances of the Amazon and Amur were explained by the lack of measurements, it seems odd that Congo is presented in this context as the basin with lowest imbalance without further explanation. Between the lines, the text seems to imply that the lack of measurements is not as much an issue in the Congo, which is not true. If any, the lack of measurements is even a bigger issue in this region. Please consider a revision of the paragraph.

Sect 5.1. Consider moving relevant parts to the Methods.

L551. Could the authors also share the optimized results?

I could not find any content in the readme.md file beside a single row stating “Water-and-energy-budgets”. I have attempted to view it both by downloading it and opening it using a text editor, and by previewing it on GitHub. Please check.