Interactive comment on "**Bias correction of daily satellite-based rainfall estimates for hydrologic forecasting in the Upper Zambezi, Africa**" *by* **Rodrigo Valdés-Pineda et al.**

Anonymous Referee #2

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This study compares three satellite-based precipitation products adjusted by two bias correction methods and evaluates performance of streamflow modeling forced by these products. This manuscript is a well-written case study for a data-sparse catchment where satellite precipitation information can play an important role to improve real-time hydrologic forecasting. However, throughout the manuscript, it was difficult to find a novel contribution or a new finding. A newly developed bias correction method, PCBC, lacks description on detailed procedures and advantages and could not demonstrate its improved performance over the conventional approaches in the most comparative results. Although the authors argued inclusion of additional components would improve the performance of PCBC, demonstration of superiority of a new algorithm is not a kind

of work which can be left as a future endeavor. In addition, applications and analysis on hydrologic forecasting lack essential components required for forecasting and do not provide improved understanding. Therefore, the manuscript is not recommended to be published in a high ranked journal, HESS. Despite this objection, if this manuscript would be accepted, I hope the followings would be addressed before final publication:

1. Detailed description, justification and demonstration of a new bias correction algorithm, PCBC:

- What are the advantages of PCBC over the conventional bias correction methods? Please elaborate the limitations of the conventional methods and how PCBC could overcome these limitations. In addition, please describe what advantages can be expected using this method from statistical and computational perspectives.

- Authors argued that performance of PCBC could be improved if additional components would be included. As mentioned above, this demonstration could not be left as a future research because the current results do not prove advances of the proposed methodology.

2. Limitation of PCBC:

- SPPs are crucial information for hydrologic forecasting in poorly gauged or ungauged basins (PUB). However, PCBC requires grid-based statistics on observation, which could make applications of this method for PUB inefficient or nearly impossible.

- More importantly, there is an unresolved question about whether adaptation of principal component without using the main benefit, reduction of the dimensionality, can be statistically useful to correct biases in precipitation information. As shown Figs. 12 and 13, PCBC failed to not only correct spatial pattern of bias in the raw data (Fig. 12) but also reduce the variance of bias (Fig. 13). The current version of PCBC seems to work only for reducing total sum of bias without significant improvement in spatial pattern and variance.

3. Hydrologic forecasting or retrospective modeling:

- The methodology used in this study can be used for a part of hydrologic forecasting, but lacks important other steps in hydrologic forecasting. Since satellite precip products are information for the current time step, without addressing and demonstrating the methodology using forecasted forcings, the current work is about not hydrologic forecasting, but hindcasting using historical data. If the manuscript could be meaningful in terms of hydrologic forecasting, the following research questions should be addressed and demonstrated: What precipitation and weather forcing could be used in the forecasting step without losing consistency to satellite precip info in the current time step? What sorts of bias correction would be used to adjust forecasted forcing having different spatio-temporal biases with varying lead times?

Specific comments:

4. Fig. 12: The range of legend should be the same among different sub-plots for the fare comparison. This rule should be applied for all figures comparing spatial distribution.

5. Many potential readers wonder how distribution of principal components and singular values in Eq. (5) look like. Please add one example in the appendix if available.

6. Fig. 13: Why do hydrologic simulations by PCBC show significant underestimation in the several flooding seasons?

7. Figs. 3 and 4 may not be required because observations are being presented in the other plots.