

Authors' responses to review comments are in **red, bold**

Anonymous Referee #4

This study presents a calibration of Hargreaves evapotranspiration models. The study borrows its fundamental from numerous published studies on similar work, which present almost the same method. Although the level of novelty is not high, the paper does present an interesting analysis and is an interesting issue in the chosen problem.

Thank you for your interest in this work.

Thus, the paper can be considered for publication provided the following issues are addressed:

Abstract: What is PMTCUH, PMTOUH ? Author needs to define these at its first use., **OK Done.**

The abstract should be revised. In my opinion, it is not necessary to present the values for performance evaluation of fitted models. If you have to show the difference in performance of fitted models, you should note to the performance evaluation of seasonal scale also between annual and seasonal scale.

We have review and reword the Abstract.

Introduction: The introduction needs to sharpened. The justification of the study needs to explains how this work is different from many other similar published studies like "Pandey et al (2014) Calibration and performance verification of Hargreaves Samani equation in a humid region. Irrigation and Drainage 63(5): 659-667. DOI: 10.1002/ird.1874 and Pandey, P.K. & Pandey, V(2016) Evaluation of temperature based Penman–Monteith (TPM) model under the humid environment Model. Earth Syst. Environ. (2016) 2: 152. <https://doi.org/10.1007/s40808-016-0204-9> . In this regard, I suggest that you refer to above mentioned studies in order to improve justification of the study. **We have reviewed the articles and have included in the introduction of the articles by Pandey and Pandey (2016) and Pandey et al. (2014).**

Materials and Methods: The description of study area needs to shortened. **Our study focuses on the Duero Basin. We believe that the calibrations and models tested depend on the study area. The extrapolation of the data in many cases is very difficult and depends on the characteristics of the area.**

The detailed description of the area will guide if possible the extrapolation of the results so we consider this part important. On the other hand, the estimation of ETo in the area is very important due to the high agricultural activity, in our view a vision of this activity is important for the optimization of water use. The main approach of this study to improve Hargreaves model is based on calibrations of Krs coefficient. However, improvement also possible by calibrating exponent of the Eq. The authors Hargreaves and Samani point out that the krs coefficient needs to be adjusted, and subsequently developed procedures to adjust the krs coefficient (Z. Samani, J. of Irrig. & Drainage Engr., 126(4). Analyzing the applications of the HS equation, Hargreaves and Allen (2003) concluded that “recalibrating the exponents and coefficients of the HS equation only increased the complexity of the equation”. Very good results were reported by Todorovic et al. (2013) and Raziei and Pereira (2013a) relative to calibrating kRs for a wide range of climates.

Justification need to explained in this regard. In evaluation of models performance either intercomparing of indices should discussed or author use composite index. The advantages of composite index is that all the selected indices were normalized between 0 and 1 to avoid the potent stimulus of any particular index. Due to this, maxima value of any index is scaled to 1 and minima value to 0 (Pandey & Pandey (2018); doi: 10.2166/wcc.2018.305). Pandey et al. (2018) used a Weighted root mean square error (WRMSE). The index is calculated based on the combined influence of both RMSE and adjusted RMSE (ARMSE). Also used the Global performance index (GPI) for final ranking. The GPI is based on the assumption that if the value of the indicator is higher than the median, then the higher the difference between the two reduces the accuracy of the equation. This index are very interesting and they will be considered in future research.

Results & Discussion: The main problem with this section is poor discussion. I suggest author add separate discussion section to improve presentation of results **Ok, Done** . Also, if possible, add composite index as used by Pandey & Pandey (2018, doi: 10.2166/wcc.2018.305) in evapotranspiration study. **This paper uses the performance indexes most used in the topic; and allow us to properly validate the results. It will be considered in future research.**

Conclusion: As conclusion section is dependent on results and discussion section. In my view author first revise result and discussion section. Afterwards present only core finding in conclusion section.