Dear Editor-in-Chief,

We wish to thank you once again for offering us another chance to revise our manuscript (**hess-2022-185**). We detail below all of the revisions that we have undertaken in response to the issues raised by reviewer 1.

With kind regards

Elias Nkiaka (on behalf of the co-authors).

Reviewer 2 recommended that the manuscript should be published in its present form!

Reviewer 1 appreciated the fact that we were able to address most of the issues s/he raised during the first round of review. However, this reviewer was still unsatisfied with some aspects of the manuscript and requested additional work to deal with uncertainties in precipitation and GRACE-derived TWSC estimates.
The Editor also appreciated our detailed and constructive responses to the referees' comments but also insisted that we follow the recommendations of reviewer 1 highlighted above.

Response to reviewer 1 comments

Comment: I have now carefully reviewed the revised version of the manuscript by Nkiaka et al. I find that the authors have addressed many of the concerns that I raised during the first round. However, I still have concerns about the water balance-based ET estimates being used as the 'ground truth'. I elaborate on my concerns below
The authors use only one satellite-based data product for precipitation (CHIRPS) and TWS (GRACE). The uncertainty estimates accounted for in the study are only random errors, which are pertaining to measurement errors from the satellites and not the systematic error or uncertainty, which arises from whether the precipitation or TWS estimate is close to the truth or not. The authors point to other studies which have used the same methodology. However, the use of water balance as a methodology is not the issue here. The way it is used (only one data product per water balance component is). For example, Weerasinghe et al. 2020 (a paper which the authors refer to) uses the average of 3 precipitation datasets over large watersheds. Moreover, most of these studies use these datasets at an annual timescale which averages out sub-annual fluctuations and potentially reduces uncertainty.

Response: Thanks for insisting that we provide a more transparent and scientifically robust methodology on how we dealt with uncertainty in the precipitation data used in estimating basin-wide evapotranspiration in our study.

Uncertainty in precipitation input
To deal with uncertainty in precipitation estimates, we used satellite-based precipitation estimates from three different sources including CHIRPS, GPM and PERSIANN-CDR which have been validated and used in other studies in the region. The precipitation products have spatial resolutions of 0.05°, 0.1° and 0.25° for CHIRPS, GPM and PERSIANN-CDR respectively. We then calculated the ensemble mean of the three precipitation estimates for each basin and used this ensemble mean as the precipitation input in this study. See revised manuscript L177 – 187.

<u>Comment:</u> Regarding the use of GRACE for small watersheds: Again, the fact that other studies use GRACE for small watersheds in a specific region does not imply that the dataset is suitable over all regions. Here again, the authors misinterpret instrument error as the error/uncertainty in how well GRACE represents TWS. The authors need to justify the use of GRACE over small watersheds better.

<u>Response:</u> Thanks for insisting that we provide a more transparent and scientifically robust methodology on how we dealt with uncertainty GRACE-derived TWSC used in estimating basin-wide evapotranspiration in our study.

<u>Uncertainty in GRACE estimates</u>

To minimize errors and uncertainty in the GRACE-derived TWSC estimates, we used an ensemble mean of three GRACE mascon solutions derived from different processing centres including Jet Propulsion Laboratory (JPL) RL06M Version 2.0 GRACE mascon solution with a spatial resolution of 0.5° x 0.5°, Center for Space Research at University of Texas, Austin (CSR GRACE/GRACE-FO RL06 v02 Mascon Grids) with a spatial resolution of 0.25° x 0.25° and NASA GSFC GRACE and GRACE-FO MASCON RL06 v1.0 with spatial resolution of 0.5° x 0.5°. GRACE data were used to estimate basin-wide water balance evapotranspiration (ET_{WB}). See revised manuscript L189 – 203.

To further minimize errors and uncertainty in the GRACE-derived TWSC in our smaller-size basins, we re-gridded the GRACE mascon solutions from JPL and NASA to a spatial resolution of 0.25° which is the same spatial resolution for the mascon solutions from CSR. We then proceeded to extract and average the timeseries of all coincident GRACE grid cells for each basin from the three different mascon solutions with the same spatial resolution. Gaps in the time series were infilled using the linear function in Python. Finally, we calculated the ensemble mean of the three solutions to represent GRACE-derived TWSC estimate for each basin. See revised manuscript L264 – 271.

Due to the changes, we made in the methodology, we had to remove sub-section “2.6 Estimating relative uncertainty in basin-scale water balance ET (ET_{WB})” and sub-section “3.2.4 Estimating relative uncertainty in ET_{WB}”. We also removed Figure 9 in the previous version of the manuscript.

In addition, due to the changes, we made in the precipitation and GRACE-derived estimates used in calculating basin-wide water balance estimates, we changed Figures 6, 7, & 8 and the adjusted the relevant portions of the manuscript accordingly.

We equally replaced the Figure in the supplementary material with two figures showing precipitation and GRACE estimates and their ensemble mean used in our subsequent calculations in the manuscript.