

We deeply appreciate the detailed and constructive comments provided by anonymous reviewers. Following their suggestions and comments, we have extensively revised the manuscript and provided a point-to-point response to each comment. The original comments are in **bold** font, our response is in regular font, and the changes in the text are in blue.

Report 1

Firstly, I would like to acknowledge all the work that you put in to revise the manuscript. I think that your revision of the manuscript addresses most of the previously raised comments adequately and clarifies the overall methods and outcome of the study.

(1) However, there is still a misunderstanding in the closure of the water balance in the use of the UTrack dataset, which becomes apparent in lines 155-171 of the revised manuscript. By converting the tracked volumes back into ratios and then using provincial P you are indeed making sure that there is the data-given amount of P. However, this quick-fix only makes sure that there is not too much or too little water but it does not correct the allocation of water from ET from the source cells. Therefore, stating that this fully avoids the bias in the estimation (lines 167-170) seems to me as an overstatement that can lead to misunderstandings. I urge you to correct this by changing the phrasing of the sentence (e.g. in line 168 from ‘avoiding the estimation bias’ to ‘decreasing the estimation bias’). While this may seem like an almost in differentiable change, it ensures that it is clearer that the bias in the trajectories is still there. Moisture tracking model, in general, still diverge significantly in their estimations, even with the exact same forcing, making it even more important that the bias in a ‘single-model estimation’ needs to be treated right and communicated clearly.

Response: Thank you for the comments.

We acknowledge that the non-closure of water balance in the UTrack dataset due to the non-closure between precipitation and evaporation data from ERA5 dataset is not addressed in this manuscript. Using the provincial precipitation data can't avoid the bias in allocation of ET from source cells. The statement in our previous manuscript was inappropriate. The revised texts are shown below:

This practice ensures that provincial precipitation is fully decomposed into different sources, reducing the estimation bias of sink precipitation due to unclosed water balance

by ET and precipitation data (De Petrillo et al., 2024).

In this study, the non-closure of water balance in the UTrack dataset impacts the green water flow trajectory, and affects the share of precipitation contribution from each province's green water to others. This point was added in the Discussion. The revised texts are shown below:

It is noted that the non-closure of the hydrological balance from ERA5 (De Petrillo et al., 2024) and divergence in moisture tracking models (e.g., simplifications and assumptions) also add uncertainty and impact the accuracy of the tracked green water flow (Tuinenburg and Staal, 2020; Zhang et al., 2023).

Very minor comment:

(2) In line 156 you mention the abbreviation 'ET' before its explanation in line 158. Also, you could consider using P as abbreviation for precipitation to stay consistent.

Response: Thank you for the comments.

We added the explanation of the abbreviation 'ET' in line 156, and removed the explanation in line 158. The revised texts are shown below:

At each sink grid, the evapotranspiration (ET) to precipitation (ET-to-P) fractions from the moisture trajectory datasets were multiplied by ERA5 ET to obtain monthly precipitation contribution by moisture from its source grids.

We used the abbreviation of precipitation in the special variable "ET-to-P". We think it's unnecessary to use the abbreviation elsewhere.

References:

De Petrillo, E., Fahrländer, S., Tuninetti, M., Andersen, L. S., Monaco, L., Ridolfi, L., and Laio, F.: Reconciling tracked atmospheric water flows to close the global freshwater cycle, <https://doi.org/10.21203/rs.3.rs-4177311/v2>, 30 April 2024.

Tuinenburg, O. A. and Staal, A.: Tracking the global flows of atmospheric moisture and associated uncertainties, *Hydrology and Earth System Sciences*, 24, 2419–2435, <https://doi.org/10.5194/hess-24-2419-2020>, 2020.

Zhang, C., Chen, D., Tang, Q., and Huang, J.: Fate and Changes in Moisture Evaporated From the Tibetan Plateau (2000–2020), *Water Resources Research*, 59, e2022WR034165, <https://doi.org/10.1029/2022WR034165>, 2023.