

Comment on hess-2022-210

Anonymous Referee #2

Referee comment on "Improved soil evaporation remote sensing retrieval algorithms and associated uncertainty analysis on the Tibetan Plateau" by Jin Feng et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2022-210-RC2>, 2022

This manuscript improves satellite-based algorithm for estimating soil evaporation by adding the frameworks for quantifying moisture constraints to ET into P-LSH model, and assesses the impact of moisture constraint uncertainty on the estimated ET. Mechanism studies about ET and their components (e.g., transpiration, soil evaporation etc) in alpine barren areas, especially for Tibetan Plateau (TP), are very limited, and this study of ET mechanism in TP region is quite necessary. There are still some issues should be addressed before a publication.

The main comments:

- The authors have paid more attention to soil evaporation, and neglected the vegetation transpiration. For example, in line 538-539 of page 23, "On the barrens of the TP, vegetation is sparse, and only soil evaporation exists". This addressing is not very rigorous. Grasslands account for 20.2% in Qaidam basin and 39.7% in Qiangtang Plateau, respectively, and Nelson et al (2020) indicate that transpiration in grasslands accounts for 40%-60% ET during growing seasons. I think that the authors should pay some attentions to transpiration estimation by considering the uncertainties of some others vegetation canopy conductance models. And, it is not clear the canopy conductance is calculated by which model; is it the empirical relationship between conductance and climatic variables, or the Jarvis-Stewart model? If the later, Jarvis model has poor performances in capturing the responses of conductance to climatic variables (e.g. air temperature), compared to other models such as Ball-Berry model, Ball-Berry-Leuning model and Mdelyn model. The uncertainties caused by choice of conductance model on ET may result in 32%-53% errors (Zhao et al., 2020). Therefore, I suggest the authors can also consider the influences of vegetation conductance model on estimated ET in TP.
- The method description for estimating soil evaporation is not clear in section 3. The authors introduced five existing soil evaporation algorithms and then proposed two improvements. In each algorithm, descriptions of main parameters are needed. For example, how the biome-specific constants are determined in the PM-Brust soil

evaporation algorithm?

- What is the difference between P-LSH soil evaporation algorithm (P-LSHp) and PML soil evaporation algorithm? How the potential evaporation was calculated? Actually, it is not fair to compare soil evaporation algorithms with different potential evaporation equations. If the authors use the same equations, it is reasonable to compare soil evaporation algorithms. And, the difference between P-LSH soil evaporation algorithm (PLS θ) and PML soil evaporation algorithm is f_{wet} . Why the authors do not add the f_{wet} into PLS θ ?
- Figure 3 and 4 have showed the results of A1-A6 for five existing soil evaporation algorithms. I suggest that two improvement soil evaporation algorithms proposed by the authors should be added into the comparisons.

Some specific comments:

- Line 68: "32 days" is right?
- Sometimes, the logical relationship between some context sentences is not strong. For example, line 110-111: "Saline lakes and deserts cover approximately one-quarter 110 and one-third of the Qaidam Basin, respectively. This region is thus very dry."
- Figure 1 should include scale bar and compass.
- Line 301: the description "vegetation evapotranspiration" is not right.

References

Nelson JA, Pérez-Priego O, Zhou S, et al. Ecosystem transpiration and evaporation: Insights from three water flux partitioning methods across FLUXNET sites. *Glob Change Biol.* 2020;00:1–15. <https://doi.org/10.1111/gcb.15314>.

Zhao, Wen Li; Qiu, Guo Yu; Xiong, Yu Jiu; Paw U, Kyaw Tha; Gentine, Pierre; Chen, Bao Yu (2020). Uncertainties caused by resistances in evapotranspiration estimation using high-density eddy covariance measurements. *Journal of Hydrometeorology*, doi:10.1175/JHM-D-19-0191.1.