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Comment on hess-2022-155

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Referee comment on "Revisiting large-scale interception patterns constrained by a synthesis of global experimental data" by Feng Zhong et al., Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2022-155-RC2, 2022

Comment on “Revisiting large-scale interception patterns constrained by a synthesis of global experimental data” by Zhong et al

Zhong et al provide a new global dataset of rainfall interception loss (I) for last 40 years (1980-2019). The dataset was estimated by a revised version of vD-B model driven by using remote sensing fPAR-based vegetation information and observational surface climate factors. The model’s major parameters were carefully constrained and validated by 268 past observations of 183 sites over global land, covering both tall and short vegetation types. Result shows that both I and I/P for tall vegetation ecosystems generally agree well with field observations, while I and I/P for short vegetation have an underestimation compared to the relatively small number of observations. The new global dataset shows similar spatial patterns with existing datasets like GLEAM3.5a and PML-V2. The authors took into consideration some different schemes for estimating model key parameters when including the meta-analysis of global field experimental data, and produced the new high spatial resolution (0.1 º x0.1º) global *I* dataset for future large-scale hydrological studies and climate model evaluation. This manuscript is well written, and easy to follow. I request for minor to moderate revisions. In the following sections, I provide major concerns and minor comments.

Major comments:

- The advantage to use fPAR to estimate the cc has not been demonstrated. In Figure 3, please also show the comparison between the observed and the simulated using traditional LAI dataset. This is particularly important for displaying the novelty of this study.
- The variation in cc. The authors state that the time various parameter cc can be larger than unity. I would like to see the time variations of cc estimated from fPAR and estimated from LAI, respectively. There will be never an issue based on the exponential function of LAI using Beer–Lambert's Law. This should be shown for at least the representative sites, such as EBF and DBF.
- EBF results. The intercepted evaporation from EBF using the modified approach is very high. It is noticeably larger than the PML-V2 estimate. So, it is necessary to extract EBF sites for validation analysis. I am keen to know how much the modified approach improves the estimate at EBF sites, compared to the original one using the exponential equation.

Some minor comments

- For the estimation of Ec. Line 286-292, the authors found that the Ec for short vegetation from 8 publications exhibits lager variability and is on average higher than that for tall vegetation, which is not consistent with previous expectations of lower Ec for short vegetation than that for tall vegetation. The aerodynamic resistance is one reason, as wind speed on the top of canopy for tall vegetation should be higher than for short vegetation. But, in my opinion, surface temperature and available energy for short vegetation could be higher, leading to a higher Ec than that for tall vegetation. Finally, the authors used potential evaporation (Ep) as a proxy of Ec for short vegetation in the vD-B model. My question is which equation is used to calculate the potential evaporation (Ep)? Is it FAO P-M method? as the FAO P-M was setup for short vegetation. How about the comparisons between Ep and Ec (from the 8 publications) for short vegetation?

- For short vegetation interception. Line 325-329, result shows both the modeled I and I/P for short vegetation are smaller than observations, and authors think lower estimates of Ec from Ep for short vegetation caused this underestimation. Therefore, I may not agree that Ec for short vegetation should be lower than that for tall vegetation. On the other hand, Zhang et al (2016a, 2017) (in lines 340-342) reports about two times I/P values that this study's modeled values. I guess that differences in vegetation index, eg, LAI between grassland, crop, and shrub can also largely affect the lower modeled I/P values. Can you compare how modeled or observed I/P change over LAI for short vegetation?

- Figure 5, “a”, “b”, “c”, “d” are not shown in each plot.

- Lines 405-409, “that the measured *I* is overall higher than the global estimates, except in EBF.” I think this may also partly because that the precipitation input for the vD-B model is systematically lower than the observed precipitation from filed experiments.

- PML-V2. A wrong reference is used for PML-V2. Please cite Zhang et al. (2019) as well (See line 425). Zhang, Y., Kong, D., Gan, R., Chiew, F.H.S., McVicar, T.R., Zhang, Q., and Yang, Y., 2019. Coupled estimation of 500m and 8-day resolution global evapotranspiration and gross primary production in 2002-2017. Remote Sens. Environ. 222, 165-182, doi:10.1016/j.rse.2018.12.031

Reviewed by Yongqiang Zhang with help from Xuanze Zhang