Hydrology and Earth System Sciences Discussions

Interactive comment on "Partitioning of evaporation into transpiration, soil evaporation and interception: a combination of hydrometric measurements and stable isotope analyses" *by* S. J. Sutanto et al.

Anonymous Referee #2

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This study is concerned with the partitioning of total evaporation into its components of interception evaporation, soil evaporation and transpiration. The authors use essentially two techniques to do this in a careful laboratory lysimeter experiment. The first technique is to use a soil water model (HYDRUS-1D) and the second involves (water) isotope mass balance. The topic is certainly timely and relevant to this journal. Likewise, the approach of using a careful laboratory setup is refreshing as many partitioning studies have been performed in the field, resulting in a more constrained and

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limited scope.

The study could benefit by a better presentation of the material and focus. The presentation could be substantially improved by first concentrating on the techniques and results of the partitioning alone (i.e., the HYDRUS model and the isotope mass balance) rather than estimates of total evaporation. The PM model in this case provides a reference crop evaporation that gives little information on the actual evaporation (from the lysimeter mass balance) and has nothing to do with partitioning. Likewise, the methods are described far too compactly. As the partitioning in HYDRUS model is entirely dependent on model setup and calibration, the paper should focus more on how the isotope approach provides real information on the partitioning which is useful to assess model performance.

Main issues:

1. The authors incorrectly describe and name reference crop evaporation as Penman-Monteith evaporation. The PM equation is a model for E from a surface (leaf to canopy scale). Reference crop evaporation is a particular application of the model meant to estimate E from a surface with well-known and defined properties (non-water limited, canopy height, canopy resistance, etc). While it is fine to mention what reference crop evaporation in the results, entirely too much time is used to describe that this is not an actual evaporation rate and why it would differ with the mass balance estimate.

2. Introduction and conclusions. In the introduction the authors claim to novel contributions of their study. 1. That this study will estimate interception and 2) that their method gives more reliable results (p. 3661, L. 10-15). The first contribution is disappointing in that interception was modeled, not measured, with a standard approach. The second contribution seems unsubstantiated. The authors would seemingly need to show results from other methods to demonstrate that theirs were more reliable.

3. End of Results and Conclusions. There is very little real discussion here about the significance of the results as well as how this study advances the science of E

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partitioning. What are the major impacts of this study? Likewise, what are some of the smaller scale insights that can be learned from this study? How would one improve upon it? What are the next steps?

Manuscript specific points and suggestions: 1. Title. Maybe change to indicate that this is really a model vs.isotope study on partitioning.

2. Abstract. First two sentences are overly general. Is this an issue of "food security"? Change "grassland" to "grass" lysimeter. Delete "UNESCO-IHE"

p. 3659. L. 24. Define "best practice agriculture"

p. 3660. L. 5-15. This paragraph combined with the next could be more descriptive, covering how this approach has advanced though the decade. What do you mean by "widely proved"? Also, are you implying that this is a better method for partitioning? Missing some important references like: Yepez et al. 2003 AgForMet 119, p. 53-68. Also, Zhang et al. 2011 JofHydro, 408, p203-211. What have these studies shown in terms of limitations or advantages of the technique? What has been learned and why is your study relevant and different?

P. 3661, L. 19. "grassland" to "grass" or "grass-covered", L. 26. "is" to "was" Move and consolidate Sec. 2.2 and 2.3 into Sec. 2.1 on the experimental setup.

Sec. 2.4. I couldn't find information on the timing of the isotope measurements? How often is a measurement needed and how often were they made?

Sec. 2.5 Sec. 2.5.1 and 2.5.2 Combine into one short section to essentially say that you made measurements of the water balance with the exp. setup and you also compute a ref crop ET for comparison with a potential rate.

Sec. 2.5.3. There was no mention that interception was considered/modeled here even though later you mention that it was.

Change "schematized" to "defined"

More details needed on the optimization processes. What parameter search algorithm was used, what was the convergence criteria, how many parameters and which ones (explicitly) were optimized, etc? Also, I find it hard to believe that optimization was done to maximize R^2. Normally one would want to improve the agreement between the modeled and measured soil moisture values (using a measure like root-mean-square error for example)....R^2 could be high with little 1-1 to agreement.

Sec. 2.5.4 P. 3669. L. 18-19. Wouldn't the average delta value of the soil water over time be affected by the history of soil evaporation since water fractionated by soil E in the top layer would be flushed and diffused downward into the soil column? If so, how can this be used as an estimate of the delta in transpired and percolated water?

L. 25. Do you really mean Eq. 5? Also, "transpiration water is assumed ....final soil water" was just mentioned in the sentence above.

P. 3670. L. 1-5. Is " Eq. 2 can be derived into Eq. 6? Also, you say "solve (for) xt and xv but the equations are both for xv?

L. 11-15. It seems late to be giving a definition for interception here. This should be moved up to intro when you first mention it. Eq. 17. SCF? Not defined.

P. 3671. L. 22. Again, R^2 alone is not an indication of model/data agreement.

P. 3673.

L 11. The "effect of evaporation occurs ...until 20cm"? Couldn't this also just be an indication that new rainfall events push evaporated-effect soil water deeper into the soil column?

L. 14-16. By diffusion do you mean molecular diffusion within the vapor or liquid phase, or are you talking about mixing?

L. 16. Change "6b" to "7b"

P. 3674. L. 21. "This is logical"

L. 23-25. No need to restate these quantities as they are already in the table.

L. 26. "it is shown that there was water shortage..." No, this is not correct. This may be simply due to the error in inputs into the ref crop evaporation, the incorrect ref crop parameters, etc.

P. 3675.

L. 3-6. Again, talk about the results without simply reiterating what the table reports.

Figures Overall, the figure quality is poor. The fonts are often much too small and very hard to read. Much of the legend information could be included either in the figure proper or in the caption. Personally, I don't find excel graphs usually give presentation quality results.

Fig. 1. Delete the photo and just include the schematic

Fig. 2. Necessary if Fig. 3 has the same information on P?

Fig. 3. Could 1 or 2 of the depths be excluded without loss of information?

Fig. 4. Since percolation is so insignificant in this study, do you really need Fig. 5?

Fig. 7a. Do all of these dates need to be plotted to convey your message?

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