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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 #1

Received and published: 10 May 2012

Scientific Significance: Good

Scientific Quality: Fair

Presentation Quality: Poor

Suggestion to Editor: Reconsidered after major revisions (I would be willing to review the revised paper)

General Comments: Sutanto et. al. present an interesting study of evapotranspiration

partitioning conducted though analysis of the isotopic composition of soil water. Comparison with the HYDRUS model results provides reasonable cross validation. I feel the scientific significance of the work is good, yet the the presentation and discussion of the experiment and its results should be reworked. In my opinion the authors should refocus their manuscript as a comparison between only the isotopic partitioning results and the HYDRUS model results. The methods (Penman-Monteith and mass balance) which do not partition the ET flux should be removed from the inter-comparison as the Penman-Monteith method provides little additional insight and the mass balance is already used in the isotope partitioning. This will allow for more detailed description and comparison of the HYDRUS model and isotopic partitioning methods and their results, which I feel is the important contribution of this work.

Specific Comments:

Abstract: As stated above, I feel the manuscript should be reworked as a comparison between the isotopic partitioning and the HYDRUS model results. Estimation of the total ET flux should not be a focus of the manuscript, as there is already a very large body of more detailed work on the subject of total ET flux.

Section 2.4.2: This section is very incomplete. The derivation of the isotopic composition of evaporated water is a key parameter necessary to estimate the partitioning and is not described. Furthermore, the authors poorly explain and separate the equilibrium and kinetic fractionation factors, using the same notation for both. How are you including both these fractionation factors? Are you using some form of the Craig-Gordon model, show the equation and its terms? Where is the evaporation occurring? Are you using the liquid water isotopic composition of only the evaporation front, the entire soil column, some sort of average?

Section 2.5.1: Rearrange the equation such that the inputs and output equal the change in storage. Also use the less confusing L for percolation leakage. Also include evaporation and transpiration. Thus ds/dt = P - E - T - L.

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Section 2.5.2: Remove the Pennman-Monteith section, or use it as an estimate of transpiration only. As is classically formulated by Penman, the PM equation is an estimate of only transpiration, not evpotranspiraiton. All energy exchange is defined and evaluate for a fully vegetated surface. No interaction with the bare ground, and thus no surface evaporation is included. Perhaps you could use a stomatal conduct model to transpiration (Jarvis, Ball and Berry?). See Dingman's Physical Hydrology for a detailed description of the PM equation. Use lambda for the laten heat of vaporization, and what is the constant C?

Section 2.5.3: This section could also be expanded a bit. How does the HYDRUS model estimate transpiration and evaporation? What parameters and inputs are required to run the model?

Section 2.5.4: The development of the equations in the section should be expanded as this is the core contribution of the research. Use L as a subscript for percolation loss instead of z. Use e as a subscript instead of v. Rewrite equation (7) in terms of 'x' so that the two equations (7) and (8) that you are solving simultaneously are in the same terms. Your references to equations are either incorrect or very unclear. From my understanding, given (7) and (8) of your manuscript the only unknown terms are x_t and x_e (x_v in your terminology). This is then a simple system of two equations and two unknowns. In previous sections you should explain how you are measuring or estimating all the other terms (especially delta_e).

Section 2.6: I did not follow this section. How are you estimating interception from the isotopic compositions, when you are assuming that through-fall has the same composition as the original precipitation? How does HYDRUS estimate interception. Where do equations 15-17 come from, what is the constant 0.24 or the SCF term?

Results/Discussion: A more detailed discussion of how the HYDRUS model and isotope measurements relate would be useful. How did these two methods compare through time or after rain events? What were the trends in E, T and T/ET through

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time after watering? How did the modeld isotopic composition of leakage relate to the measured value?

Figure 2: This figure is redundant as all the information here is in figure 3.

Figure 3: Split this into two separate figures.

Figure 5: Plot these two model results against each other and versus a 1:1 line. Digits on axis?

Add plots of each of the water fluxes (T, E, L) estimated versus each other and a 1:1 line

Figure 7: The top figure is difficult to read. Choose a few examples and depict them. State what the four points for each event in the bottom figure are (four depths?).

Figure 8: Compare the evaporation and transpiration fluxes not the ET, much more interesting.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 3657, 2012.