

Dear Dr. ten Veldhuis,

We thank you for the opportunity to submit our minor revisions for *Plant Hydraulic Transport Controls Transpiration Sensitivity to Soil Water Stress* (hess-2020-671) to HESS for publication. We have addressed the remaining comments – all grammatical in nature or involving minor clarifications – and have included a line-by-line response to reviewer comments as well as a track-changes manuscript per your request.

In addition to the requested minor revisions, we have also addressed a minor inconsistency in our model simulations. This results from the use of logarithmic base 2 (instead base e in our original formulation) in one of our model functions (Eq. 13), which led to minor changes in Fig. 3-4 in the main article and Fig. S4-S9, S12-13 Tables S1-S4, S6-S8 in the supplement. These updates do not change our main conclusions, and the updated codes are now publicly available at https://github.com/sloan091/HESS_LSM.

We hope that our manuscript is now suitable for publication in HESS. Please let us know if you require any additional information. Thank you.

Sincerely,

Brandon Sloan

Sally Thompson

Xue Feng

Author Response to Reviewer Comment Set #1

The authors fully addressed my comments and the revised manuscript is easier to follow and technically sound. I commend them for the very thorough revisions. I only have a few remaining editorial comments, listed below.

Main text

(1) L8: “spectrum of transpiration responses...” (plural)

Response: Updated in final manuscript.

L12: suggested rephrasing “... model results using a land surface model at an Ameriflux site” or something along these lines

Response: Updated in final manuscript.

L32: a historical note, perhaps not so relevant—already in Priestley and Taylor (1972) it was shown that the ratio of actual to potential evapotranspiration can be approximated as a piecewise function of cumulative soil moisture deficit, with a breakpoint at a moisture deficit corresponding to the point of incipient stomatal closure

Response: Thank you for this note and the resources you have provided us. We have updated this portion to include references to earlier works of Budyko (1956) and Manabe (1969) (Lines 30-33). We still reference Feddes (1978) as the basis for much of beta usage since their formulation is widely referenced in hydrological literature. We have omitted the Priestley-Taylor (1972) as it is empirical evidence for beta but not actually a proposed formulation.

L93: in other words, here well coupled conditions are assumed

Response: We have added a parenthetical comment stating this and a reference to Jarvis and McNaughton (1986).

L123: other parameters have units of mm/s/MPa

Response: Thank you for catching this, we have changed the units to mm/d/MPa.

L139: just for clarity, is D then defined as the vapor pressure deficit of the open atmosphere?

Response: We have clarified the difference between leaf-to-air vapor pressure deficit and atmospheric vapor pressure deficit (Lines 94-98). We have also added a citation for Grossiord et al. (2020) that discusses this difference.

L168: please include the link to the code

Response: A link to Github (https://github.com/sloan091/HESS_LSM) is in the revised version.

L297: perhaps I would not say that a spectrum is “validated” (it’s not a hypothesis, or a model)

Response: We have clarified this text in the final manuscript.

L302: here and elsewhere, I would use the term “complex PHM”, not “more complex PHM”, to be consistent with the naming in Figure 1

Response: We agree and have updated this in the final manuscript.

Figure 5: panel labels a, b, etc. missing in the figure

Response: Thank you for catching this, we have updated Fig. 5 to have panel labels.

L355: “differences... result” (plural)

Response: We have updated this in the final manuscript.

Supplementary materials

L5: please check the symbol T_d^{phm} —is it meant to be T^{phm} ?

Response: Thank you for catching this. T_d^{phm} and T_s^{phm} in Sect. S1 are supposed to be T_d and T_s as in the main manuscript.

L117 and 119: subscript k, not j

Response: Thank you for catching this, we have updated this in the final version.

L123-124: do you mean that sunlit and shaded leaves behave in the same way? Or that all leaves in a category (sunlit or shaded) behave in the same way?

Response: We mean that all leaves in a category act the same way. We have clarified this in the updated version.

L189: mathematically nearly identical, but the driving force is different

Response: We have clarified that the formulation is nearly identical.

Eq. S61: superscript “d” in $A_{n,k}^d$ is not defined in Table S3; if photosynthetic rates are in mol/m²/s, the 10⁶ coefficient is probably unnecessary

Response: The units in Table S3 should have been micromoles and have been updated. Additionally, we have added text clarifying the differences between net assimilation from diffusion and photosynthesis. Additionally, we have added $A_{n,k}^d$ to Table S3.

L227: “Nitrogen content has been...”

Response: We have updated in the final version.

L286: reference should probably be to Eq. S60 (?)

Response: Thank you, we have updated in the final version.

Eq. S85: I would highlight that the notation has changed and that $g_{s,k}$ here is the actual stomatal conductance, while in Eq. S60 the same symbol was used for the well-watered stomatal conductance

Response: Good catch, we have updated the notation to be consistent. Additionally, we have added text clarifying well-watered and downregulated stomatal conductance (Lines 193-194).

L397: variance of what?

Response: We use the difference in observation variance and simulation variance. We have updated the text to reflect this.

L402: I would not refer to a previously submitted version of the manuscript to avoid confusion

Response: Agreed, we have removed this line.

L425: “provide” (plural)

Response: We have updated in the final manuscript.

L431: “plots” can be deleted

Response: We have updated in the final manuscript.

L432: “effect on the main conclusions...”

Response: We have updated in the final manuscript.

L556: suggested rephrase “... appears to be at the boundary between soil- and transport-limited conditions” (if I understood correctly)

Response: We agree, this is clearer and we have updated in the final manuscript.

Eq. S109: I would move this equation around L562 where it was introduced

Response: We have updated in the final manuscript.

Reference

Priestley, C.H.B., Taylor, R.J., 1972. Assessment of surface heat-flux and evaporation using large-scale parameters. Monthly Weather Review 100, 81–92.

References for Response to Reviewer 3

- Budyko, M. I. (1956). *Teplovoi Balans Zemnoi Poverkhnosti*. Leningrad: Gidrometeoizdat.
- Grossiord, C., Buckley, T. N., Cernusak, L. A., Novick, K. A., Poulter, B., Siegwolf, R. T. W., ... McDowell, N. G. (2020). Plant responses to rising vapor pressure deficit. *New Phytologist*, *nph.16485*. <https://doi.org/10.1111/nph.16485>
- Jarvis, P. G., & Mcnaughton, K. G. (1986). Stomatal Control of Transpiration: Scaling Up from Leaf to Region. *Advances in Ecological Research*, *15(C)*, 1–49. [https://doi.org/10.1016/S0065-2504\(08\)60119-1](https://doi.org/10.1016/S0065-2504(08)60119-1)
- Manabe, S. (1969). Climate and the Ocean Circulation: I. The Atmospheric Circulation and the Hydrology of the Earth's Surface. *Monthly Weather Review*, *97(11)*, 739–774. [https://doi.org/10.1175/1520-0493\(1969\)097<0739:CATOC>2.3.CO;2](https://doi.org/10.1175/1520-0493(1969)097<0739:CATOC>2.3.CO;2)