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Interactive comment on "Uncertainty caused by resistances in evapotranspiration" *by* Wen Li Zhao et al.

Anonymous Referee #2

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The paper titled 'Uncertainty caused by resistances in evapotranspiration' by Zhao et al aimed at quantifying the uncertainties surface resistance parameterization to understand and improving terrestrial evapotranspiration (ET) models. This is a much-needed idea, however, the presentation of the manuscript needs substantial improvement before being published in HESS. Very surprisingly, the authors did not attempt to review the literatures carefully. It seems they are either not well versed with the recent literature that emphasized on overcoming the resistance estimation uncertainties. The empirical resistance model of Jarvis and KP has no physical basis. Here are my suggestions and comments, which needs to be considered before being approved for publications. (1) Some recently published ET modeling and mapping studies that particularly addressed the challenges of resistance parameterizations (that deserves to be

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considered here); for example,

Mallick et al. (2018). Bridging Thermal Infrared Sensing and Physically-Based Evapotranspiration Modeling: From Theoretical Implementation to Validation Across an Aridity Gradient in Australian Ecosystems, Water Resources Research, 54, 3409–3435. https://doi.org/10.1029/2017WR021357. Mallick et al. (2015). Reintroducing radiometric surface temperature into the Penman-Monteith formulation, Water Resources Research, 51, 6214–6243, http://doi.org/10.1002/2014WR016106. Garcia et al. (2013); Actual evapotranspiration in drylands derived from in-situ and satellite data: Assessing biophysical constraints. https://www.sciencedirect.com/science/article/abs/pii/S0034425712004828.

Morillas et al. (2013); Improving evapotranspiration estimates in Mediterranean drylands: The role of soil evaporation. https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/wrcr.20468.

Mallick et al. (2014). A surface temperature initiated closure (STIC) for surface energy balance fluxes, Remote Sensing of Environment, 141, 243 - 261. Bhattarai et al. (2019). An automated multi-model evapotranspiration mapping framework using remote sensing and reanalysis data. Remote Sensing of Environment, 229, 69 - 92. Gerhards et al. (2019). Challenges and Future Perspectives of Multi-/Hyperspectral Thermal Remote Sensing for Crop Water Stress Detection: A Review, Remote Sensing, 11(10), 1240; https://doi.org/10.3390/rs11101240. Bhattarai et al (2018). Regional evapotranspiration from image-based implementation of the Surface Temperature Initiated Closure (STIC1.2) model and its validation across an aridity gradient in the conterminous United States, Hydrology and Earth System Sciences, 22, 2311-2341, https://doi.org/10.5194/hess-22-2311-2018. Mallick, K., Trebs, I., Boegh, E., Giustarini, L., Schlerf, M., Drewry, D. T., et al. (2016). Canopy-scale biophysical controls of transpiration and evaporation in the Amazon Basin. Hydrology and Earth System Sciences, 20, 4237–4264. https://doi.org/10.5194/hess-20-4237-2016. Katerji et al. (2011), Parameterizing canopy resistance using mechanistic and semiâĂŘempirical estimates of

hourly evapotranspiration: critical evaluation for irrigated crops in the Mediterranean, https://onlinelibrary.wiley.com/doi/abs/10.1002/hyp.7829

(2) Influence of the resistance parameterization on ET: Residual error analysis of ET with respect to resistance, soil moisture, VPD and net available energy (RN – G) needs to be discussed in detail. (3) How the resistance models performed under different soil moisture, VPD and radiation conditions? Without a detailed analysis, it would be difficult to assess the scientific value of the paper. (4) How the 3T model performed under different soil moisture, VPD and radiation conditions? (5) A Table of symbols and their unit for different models would greatly improve the readability of the manuscript. (6) Analysis of Sensible heat fluxes should also be included in a condensed manner.

(7) How 3T model avoids the parameterization of the resistances? This is a good side of the model. However, it needs to be described in a condensed manner.

I believe this manuscript can (and should) be improved substantially to give it good scientific quality.

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