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Hydrology and Earth System Sciences
Discussions

Interactive comment on "An evapotranspiration model self-calibrated from remotely sensed surface soil moisture, land surface temperature and vegetation cover fraction: application to disaggregated SMOS and MODIS data" *by* Bouchra Ait Hssaine et al.

Anonymous Referee #1

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The paper titled 'An evapotranspiration model self-calibrated from remotely sensed surface soil moisture, land surface temperature and vegetation cover fraction: application to disaggregated SMOS and MODIS data' by Ait Hssaine aimed to used LST and disaggregated soil moisture to better constrain the soil evaporation of TSEB model. This is a good idea; however, the presentation of the manuscript needs substantial improvement before being published in HESS. Here are my suggestions and comments, which needs to be considered before being approved for publications. (1) The abstract is

poorly written and does not give a clear message about the novelty of the work. Rework is necessary. (2) Introduction: The flow should be logical. Since the objective of the manuscript is to improve the soil evaporation in TSEB to meet up field-scale ET mapping challenges, I do not see any need of line 5 – 10 in page 2. (3) Introduction: 'Evapotranspiration (ET) is a crucial water flux in semi-arid areas'; should be supported by recent literature. The authors should be aware about some recently published ET modeling and mapping studies that particularly addressed the challenges semi-arid and arid ecosystems (that deserves to be cited here); for example,

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. 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 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. Garcia et al. (2013); https://www.sciencedirect.com/science/article/abs/pii/S0034425712004828.

Morillas et al. (2013); https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/wrcr.20468.

(4) P2: L15-L20 (Introduction). The authors mentioned that LST based ET models

fall into two categories. It is worth mentioning other categories where LST is integrated into Penman-Monteith energy balance (PMEB) equation to directly estimate ET. (5) P3: L12 – L20: I do not see the necessity of such texts. This paper talks about TSEB model improvement and constraining soil evaporation. Yao et al. (2017); Purdy et al. (2018) only used soil moisture data into empirical PT model. I do not see any relevance of these sentences here. The current study is LST based, and the authors should mention why the additional use of SM alongwith LST can produce good ET estimates. (6) P3: L25-L30: This is very significant. Therefore, the texts 'One difficulty lies in developing a consistent representation of the soil evaporation (as constrained by SM, (Chanzy and Bruckler, 1993)), the total ET (as constrained by LST, (Norman et al., 1995)). ...' should replace the texts in P3 L12 – L20. (7) Site description: Please provide a table describing the characteristics of S1, S2 etc.

(8) Suggesting to provide a Table on main equations of TSEB-SM and sub-equations related to LEsoil; the parameters involved in LEsoil model, their significance, what parameters did you calibrate, what are their value range etc. This would improve the readability of the manuscript.

(9) Section 2.3: There should be a separate sub-section on Retrieval and calibration of rss, arss, brss. The current description is unclear. How the parameters were calibrated? With respect to which observation they were calibrated? All these aspects should be crystallized in the methods section.

(10) There should also be a sub-section on daily ALFApt (Priestley-Taylor parameter) retrieval.

(11) Results and discussion: I am surprised to see the use of old reference (e.g., Sellers et al., 1992). There should be huge amount of literature on soil resistance and soil moisture that deserved citation.

(12) Scatterplot of ALFApt (Priestley-Taylor parameter) versus residual ET and H errors (TSEB-SM – observed) should be shown to reveal the importance of this variable.

(13) How the retrieved soil resistance is related to the residual ET and H errors (TSEB-SM – observed)? What is the magnitude of variability of rss with LST? Such analysis would look excellent.

(14) Residual error analysis should be done to show how the errors in ET and H estimates (TSEB-SM – observed) are related to both DisPATCH soil moisture and observed soil moisture.

I believe the authors put major emphasis to improve the ET and sensible heat flux simulation. But the intermediate parameters should be thoroughly analyzed to give it good scientific quality.

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