Geoscientific
Model Development
Discussions

Interactive comment on "Evaluating the surface energy partitioning in ERA5" *by* Brecht Martens et al.

Anonymous Referee #2

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General comments:

This is a very interesting and useful study of the representation of the land surface energy budget in European global atmospheric reanalyses. A large number of diverse in situ observations are used to benchmark several simulations at a global scale. Overall, the paper is well written, apart from the mixing of results and discussion/interpretation. Quality of some Figures could be improved. Colour scales are sometimes confusing as "green" tends to look blue. Violin plots are useful but do not provide a point by point comparison. Could all the corresponding scatter plots be given in a Supplement? A discussion on the impact of land cover is lacking.

Recommendation: minor revisions.

Particular comments:

- P. 1, Title: should be more specific. For example: "Evaluating the land surface energy partitioning in European global atmospheric reanalyses".

- P. 3, L. 1-2 ("perform better than ERA5"): any reference on this?

- P. 4, L.7: I would be more specific. For example: "the more evolved HTESSEL land surface model in ERA5".

- P. 4, L. 19: could you explain how these anomalies are defined and calculated?

- P. 5, L. 1-3: It seems that a key issue was not addressed. Land cover type in ERA5 may not correspond to the tower's one. E.g. a grassland Fluxnet site may be located in an ERA5 grid cell mainly covered by forests. How did you handle this?

- P. 6, L. 5: could you define "non-overlapping moving windows"?

- P. 6, L. 12 (G as a fixed fraction of Rn): Could this explain the poor scores obtained for sensible heat flux in Figure 8? The soil heat flux is related to soil properties and can be influenced by sensible heat exchange with rainwater (e.g. Zhang et al. https://doi.org/10.5194/acp-19-5005-2019).

- P. 6, L. 12 ("land cover"): which land cover? Is it the land cover used in the model?

- P. 8, L. 3: Is there an impact of the land cover type?

- P. 8, L. 17: Seasonality removal should be described is chapter 2.

- P. 8, L. 28: what about Fluxnet site distribution in terms of vegetation types?

Editorial comments (Figures):

- Figure 1: Sites cannot be easily spotted. Colors of dots and background should be changed. What about land cover types? Format of the subfigure on the right should be consistent with format of Figure 3.

- Figure 6: green or blue?

- Figure 10 (top subfigures): meaning of the red lines? These metrics are a bit obscure. Why not comparing scatterplots of ABL heights?

- Figure 11: Not readable. Difference figures should be expanded. Green or blue?

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