Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2022-216

Anonymous Referee #1

Referee comment on "Getting the leaves right matters for estimating temperature extremes" by Gregory Duveiller et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2022-216-RC1, 2023

Review of

Getting the leaves right matters for estimating temperature extremes

by Duveiller et al.

General comments:

This paper shows that the ERA5-Land product should be used with caution and that the ERA5-Land production chain should use a more modern approach for representing vegetation or include satellite-derived LAI into their LSM. I am not sure this paper has much practical value from a modelling point of view. "Getting the leaves right matters" is perfectly right but far from being a new requirement. The added-value of this work should be better explained. Interesting recommendations are given in the Discussion section. For example, the recommendation to use hourly LST data from geostationary satellites. It is well known that solutions to integrate LAI into LSMs do exist. They are not mentioned and not used in ERA5-land. Could ERA-Land incorporate interactive LAI at some stage? Assimilation of LAI observations? Why not using another more advanced LSM forced by ERA5 atmospheric variables? The joint use of LAI and LST is interesting and offers a good benchmarking framework for assessing model performance. However, this paper may give the wrong impression that LST biases are completely explained by LAI. Other factors include the absence of representation of irrigation, snow misrepresentation, altitude solar radiation bias in mountainous areas, and slope effects in complex terrain. Overall, the paper is well written and a few changes could be sufficient to address my remarks.

Recommendation: minor revisions.

Particular comments:

- L. 40: I don't understand well the LAI definition used by the authors: "LAI is defined as half of the total green leaf area per unit horizontal ground surface area". Why half? Because only one side of the leaf is counted? For the sake of clarity, I would recommend using this more precise definition: "LAI is the one-sided green leaf area per unit horizontal ground surface area".

- L. 152 (GEOV2/AVHRR): The THEIA LAI data portal web page should be given. Not only

the LTDR web page.

- L. 202 (GLEAM): Which satellite date are used in this version of GLEAM? Is LST used for example?

- L. 241 ("darker than"): I am not sure this can be considered as a general rule. At wintertime, wet soils might be darker than senescent vegetation. Is this represented in the model? Adding a reference showing what is occurring in the real world would be useful.

- L. 266 (Fig. 4): Figure 4 interpretation is not straightforward. This Figure does not show much more than Fig. 3 and has too many tiny sub-figures, difficult to read. The complete Figure could be moved to a Supplement and a selection of meaningful sub-figures could be left in the paper. Why not plotting the two HI and BD indices in a SM - Temperature space instead? I.e. replace Fig. 4 by the two left sub-figures of Fig. 5?

- L. 311 (Fig. 6): Connecting maps to the colour scale is difficult. I suggest plotting only 3 colour classes: one for significant positive correlation, one for significant negative correlation (significant meaning p-value < 0.01), and white for non-significant correlation.

- L. 324 (Fig. 7): The top Cfb subfigure is not readable (dark green is difficult to distinguish from the dark gray color used for ocean surfaces).