

Comment on **essd-2021-61**

Anonymous Referee #2

Referee comment on "A harmonized global land evaporation dataset from model-based products covering 1980–2017" by Jiao Lu et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-61-RC2>, 2021

Lu et al., 2021 present a new merged global land evaporation dataset based on three existing products. While the paper is interesting for publication in this journal, my current recommendation is for a major revision for the following reasons. First, there is the issue of considering GLEAM as an observational dataset. GLEAM is really just another data source, and the authors even show that the individual models they are comparing outperform GLEAM in terms of R and RMSD compared to flux sites. I think the comparisons with GLEAM are okay, as long as authors specifically mention that it is not used for validation. My other major concerns are some inconsistencies I see in figures, that need to be reevaluated or at least better explained (see more detailed comments below). One example in Figure 7, high NDVI values are incorrectly linked solely to humidity conditions, and the authors do not discuss the potential saturation issues at high NDVI values often seen in remote sensing datasets. The authors omit some necessary details (i.e. the use and source of NDVI is never explained in methods). Lastly, there are some grammar errors which should be addressed.

Line 36: Since 'the' land surface

Line 37: resulted should be resulting

Line 46: Should say flux tower data

Line 74: Pixel should not be capitalized

Line 82: Lately for Lastly

Line 88-90: What is the reference for this?

Table 1: If using GLEAMv3, should include the Martens et al., 2017 reference (<https://doi.org/10.5194/gmd-10-1903-2017>)

Line 119: Can you give some examples of the empirical parameters you mean? If not, might be best to remove.

Section 2.1.2. Perhaps it's worth to mention that ERA-5 still appears to overestimate the latent heat flux, <https://gmd.copernicus.org/articles/13/4159/2020/>

Line 168: three is spelt out and then indicated by numeric.

Section 2.1.5: was any masking done to the dataset? I.e. removal of snowy, frozen or rainy days?

Figure 2&3: While I can understand Figure 2, I am not sure how to interpret it relative to Figure 3. It appears in Figure 2, that over some regions (i.e. the Amazon), the three datasets are in good agreement (CV close to 0). I would think this translates to evenly distributing the weight of each dataset on the merged product, but Figure 3 shows that MERRA2 is much less considered. Some patterns do make sense, for example in northern latitudes, it appears ERA5 is most closely related to the other datasets, despite their being greater CV, so it's more weighted.

Figure 4: How can the authors explain the nearly symmetrical -50 to 50 mm/year the GLEAM model shows, versus the anomalies in the other products never going below 0?

Figure 5: This figure highlights one point which is that GLEAM does not even perform better as some of the individual models for tower comparisons. If it is only used for comparisons, and not used as a validation source, that is still acceptable.

Figure 7: The authors do not state where NDVI was obtained from and at what resolution.

Line 303: NDVI >0.7 is not only under humid conditions, rather just optimal conditions for vegetation growth which widely vary depending on the ecosystem.

Figure 7: Can the authors comment on the potential issue of vegetation index saturation at high amounts of NDVI or LAI? Could that also explain some of these patterns?

Line 306: This is true, also it brings the question of what land cover classifications are assigned for each model. If some models for example are using MODIS IGBP versus another data source, this could be a huge reason for discrepancies.

Line 322: GLEAM is not the only product from even this study which considers soil moisture estimates from satellites.

Figure 8: Why are there missing areas in REA which is not observed in the other datasets? Especially in Northern Africa and Asia?

Line 405: 0.5 degree or 0.25 degree?