

## Comment on **essd-2022-302**

Anonymous Referee #2

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Referee comment on "High-resolution (1 km) all-sky net radiation over Europe enabled by the merging of land surface temperature retrievals from geostationary and polar-orbiting satellites" by Dominik Rains et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2022-302-RC2>, 2022

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The manuscript "High-resolution all-sky land surface temperature and net radiation over Europe" has been reviewed. The authors presented a methodology to combine the advantages of geostationary observations at high temporal resolution with observations from polar-orbiting satellites at high spatial resolution, resulting in a gap-free all-sky LST and net radiation dataset at 1-km spatial resolution and daily frequencies for 2018-2019 across Europe. This dataset is important for hydrological modelling and as input to models dedicated to estimating evaporation and surface turbulent heat fluxes. However, more comprehensive analysis on this dataset is required before further consideration.

- Lines 223-225. As the dataset includes all-sky land surface temperature, I think it is necessary to implement accuracy assessment to tell us the uncertainties of the produced LST data.
- A discussion section is required to explain the results and to compare against existing datasets. For example, lines 217-218, why there are worse accuracy in Belgium for *SWin* and around the Alps for *LWin*?
- Pearson's correlation coefficient and RMSE are not enough for validation. Examples of comparison of temporal patterns between estimated values and in-situ observations at typical stations are suggested. Meanwhile, the impact factors on the estimated variables can also be analyzed. For example, how does the RMSE change across seasons? Do land cover types significantly affect the accuracy of estimated variables? How about the accuracies in areas with and without missing satellite observations?
- Lines 42-57. A comprehensive summary of existing studies/datasets (including advantages and drawbacks) may help to emphasize the novelty of this study.
- Lines 58-61. What research gaps have the authors solved? It is better to describe it here.
- Lines 108-111. What is the overpass time for clear-sky LST estimates from Sentinel 3A and 3B, respectively? Why do the authors only use the data from Sentinel 3A.
- Section 3.3. The performance of the merging method needs to be evaluated.
- Line 199. More details on the Kalman Filter can be added to make an easier understanding by readers.