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Comment on essd-2022-302

Anonymous Referee #1

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-RC1, 2022

This manuscript introduced a downscaled and continuous daily LST and SNR product across Europe for 2018–2019. The validations of radiation against BSRN in-situ measured are also presented in the paper. And it is said that an improvement of the root mean squared error by ca.8% with a substantial increase in spatial detail compared to the original MSG product. The paper indicates that the resulting pan-European LST and SNR dataset can be used for hydrological modelling and as input to models dedicated to estimating evaporation and surface turbulent heat fluxes. The LST and SNR product is important to describe Earth surface energy balance. Overall, this manuscript is clear. And the study is of great significance to improve the new understanding of energy balance in Europe. However, there are several issues that need to be taken care of before this paper becomes acceptable for publication.

- the high resolution LST product is merged from LEAF (all sky) and Sentinel 3 LST (clear sky). The two LSTs have different spatial and temporal resolutions. While doing the merging, if any cloud effect is considered? If any cloud product is involved? If yes, please indicated it.
- while downscaling the LST product, if any edge effects (coast lines, cloud edges) are considered?
- Line 220, it is said "Extensive validation of the LSAF and Sentinel 3 LST products has already been performed (see below). Both have an average accuracy below 1.5 K, although it varies across space and time. Our goal is to combine their individual strengths in terms of spatial and temporal resolution to obtain an enhanced representation of landscape heterogeneity". Although there are extensive validations of the LSAF and Sentinel 3 LST products, the validations are based on different spatial and temporal resolutions. It does not mean that the merged product could also has a good performance. It is good to give the statistics.
- The paper is lack of statistics. e.g. figure 1, any overall statistics could be summarized in a table? And the absolute RMSEs are given in Figure 1. The percentage-wise is worth known. And so does the validations of outgoing raditaions and SNR. Please summarize the overall statistics (R, bias, RMSE (including percentages)), degree of freedom) in

tables.

- More detailed information of in-situ sites could be given or summarized.
- Figure 2, 3, 4 and A1, A2, A3 could also give the bar chart distribution.
- Please explain the reasons for case selections. e.g. 30 June 2018 in Figure 4 and 30 Sep 2018 in Figure A2.
- If the LST and SNR products are compared with any other reanalysis or satellite products?