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Comment on essd-2021-231

Anonymous Referee #1

Referee comment on "Homogenized century-long surface incident solar radiation over Japan" by Qian Ma et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-231-RC1, 2021

Overall comments

Ma et al. proposed a RHtest-quantile approach to harmonize the observed and SunDu-derived incident solar radiation. This topic is important, and the Harmonized multi-source solar radiation data is valuable for the study of local dimming and brightening and multiple ecology processes. However, there are many major issues should be addressed. I have some comments that I hope can help improve manuscript quality.

1. Quantitative accuracy and uncertainty of the harmonized dataset are missing. Please show more metrics or evidence to present the accuracy and uncertainty of the proposed dataset. This is very important for users. Because the author harmonized the observed and SunDu-derived solar radiation simultaneously, so it's less convincing to use the comparison results of these two datasets before and after homogenization showing the feasibility and validity of the proposed approach. In addition, the figure showing comparison results (Figure. 4) needs to be improved because it's not easy to see the improvement of the close relationship between observed and SunDu-derived solar radiation after the homogenization.

2. The methodology should be clarified clearer with more details. It's very difficult to follow the methodology part, especially how to find the inhomogeneity between the observed and SunDu-derived solar radiation and use the approach to adjust the dataset. It seems that the abstract section shows much more details on this harmonization than the methodology section. Please give more details in the methodology section.

3. The independent homogenization method proposed by Katsuyama was used to harmonize the SunDu-derived solar radiation to valid the accuracy of the proposed approach. I think Katsuyama's approach (Eqs. 2-3 is very simple and efficient), why not directly use this approach to harmonize this solar radiation? Please clarify it.

4. For the data implications, it’s better to give some examples to show the necessity of data harmonization for soar radiation for practical applications. For example, you can compare the trends of solar radiation before and after harmonization to show whether there are any significant improvements in the trend analysis.

Specific comments

L66-70, it’s strange to shift the replacement of thermopile pyranometers in Japan to the instrument replacements-induced inhomogeneity in China.

L171, what’s the meaning of grid?

L172, what’s the meaning of long-term mean cloud cover?

L187-189, why not directly use the monthly data for comparison?

L190, it's quite difficult to find the following results from Figure 4. Please refine this figure to show the key message clearer.

L198-200, rewrite this sentence, please present the key message clearer. For example, the improved patterns of time series of surface incident solar radiation after homogenization highlight the necessity and feasibility…

L204-208, remove this paragraph, it’s not consistent with the sub-title

L207, with the previous results (i.e. Figure 4 in Tsutsumi and Murakami, 2012)