

Response to Referee #2

We would like to thank the reviewer for the comments and suggestions, which help to improve the quality of our work. We have made revisions and have replied to all comments and suggestions. Please find a detailed point-by-point response to each comment.

Comment:

This paper describes a 16-year global Surface Solar Radiation (SSR) dataset that is produced using the newest ISCCP cloud products. The new SSR data is more accurate than ISCCP-FD, CEWEX-SRB, which may provide a better alternative for surface studies of hydrology, ecology and land processes because SSR is a basic input for them. The paper is well written and organized. Therefore, I recommend its publishing on the Earth System Science Data.

Response:

We thank Referee #2 for the encouraging comments. All comments and suggestions have been considered carefully and well addressed.

Comment:

1. Line 22 with -> using

Response:

Accepted!

Comment:

2. Line 31-34, please rephrase this sentence.

Response:

We have changed the sentence to “When the estimated instantaneous SSR data were upscaled to 90 km, its error was clearly reduced with RMSE decreasing to 93.4 W m^{-2} and R increasing to 0.95.” in the revised manuscript.

Comment:

3. Line 78-79. This sentence seems awkward, please rephrase it. There is a high-level discussion on the category of how to derive SSR from satellites in the review paper of Huang et al (2019). Huang, G.H., Li, Z.Q., Li, X., Liang, S.L., Yang, K., Wang, D.D., & Zhang, Y., 2019. Estimating surface solar irradiance from satellites: Past, present, and future perspectives. *Remote Sensing of Environment*, 233.

Response:

We have changed the sentence to “The many methods that have been developed to retrieve SSR from satellite data can be roughly divided into two categories: statistical methods and methods based on radiative transfer processes (Huang et al., 2019). According to Sengupta et al. (2018), these methods can also be subdivided into three types: empirical, semi-empirical and physical” in the revised manuscript.

Comment:

4. Line 344. I would suggest you delete the word of “retrieval”.

Response:

Accepted!

Comment:

5. The first paragraph of Section 6 seems a little bit wordy and boring. Please consider to condense it.

Response:

We have changed the first paragraph of Section 6 to “This study produced a 16-year (2000-2015) global dataset of SSR (with resolutions of 3 h and 10 km) based on recently updated ISCCP H-series cloud products, new ERA5 reanalysis data and MODIS albedo and aerosol products with a physically based scheme. The retrieved SSR dataset was evaluated globally with observations collected at BSRN and CMA radiation stations. Validation against observations collected at BSRN showed that the MBE and RMSE were -11.5 and 113.5 W m^{-2} for the instantaneous SSR estimates, and -6.1 and 38.0 W m^{-2} for the daily SSR estimates, but their accuracies were clearly improved when upscaled to more than 30 km. For example, the RMSEs were decreased to 93.4 and 33.1 W m^{-2} when our estimates were upscaled to 90 km. Validation against observations collected at CMA indicated that our estimates of daily and monthly SSR produced RMSE values of 32.4 and 16.3 W m^{-2} , respectively, but these values were decreased to 26.9 and 14.9 W m^{-2} when our estimates were

upscaled to 90 km. Comparisons with other global satellite SSR products indicated that the accuracies of our SSR estimates were clearly higher than those of GEWEX-SRB, ISCCP-FD and CERES products.” in the revised manuscript.