

Response to Referee #1

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 manuscript produced a long-term and high-resolution global gridded PAR product based on the latest ISCCP-HXG cloud product and reanalysis data. PAR data is required for researches in the ecological, agricultural, and global change fields. The algorithm used to estimate PAR in this study is the physical scheme that used in the previous study of Tang et al. (2017), and was proven to be a more accurate algorithm than previous ones. The produced gridded PAR product was evaluated against surface observations collected at more than 80 experimental stations worldwide. Compared with the well-known CERES PAR product, the PAR product produced in this study was found to be a more accurate dataset with higher resolution. The topic is highly interesting and appropriated for ESSD. The paper is clear and well written. Therefore, I recommend its publishing on the ESSD after answering the following several minor issues.

Response:

We thank Referee #1 for the encouraging comments. All comments and suggestions have been considered carefully and well addressed.

Comment:

1. In this study, aerosol data from the reanalysis data MERRA-2 was used? Why not use the satellite-based aerosol products with higher accuracy?

Response:

Although satellite retrieved aerosol products may be more accurate than other aerosol products, there are some defects in satellite retrieved aerosol products, such as many missing values when clouds exist, no observations before 2000.

Alternatively, the MERRA-2 can provide long-term gridded aerosol product. In addition, the accuracy of MERRA-2 aerosol product is comparable to those of satellite-retrieved aerosol products because it assimilates ground-observed and satellite-retrieved aerosol data. Therefore, the MERRA-2 aerosol product is more suitable than satellite-based aerosol product for this study.

Comment:

2. Cloud top temperature was used to discriminate the water and ice cloud in this study. Since MODIS has a cloud top temperature product, and why not use this product?

Response:

Yes, MODIS has a cloud top temperature product. It would be valuable to use the MODIS cloud top temperature product since it was considered to be the benchmark for cloud product, but its temporal resolution is too low and there was no product before 2000. In addition, the big mismatches between the times of MODIS and ISCCP H-series cloud product will introduce great uncertainty.

Comment:

3. In section of in-situ measurements, seven experimental stations from SURFRAD, 42 experimental stations from NEON, and 38 experimental stations from CERN were used to evaluate the performance of the estimated PAR. Did you do quality control on these observations and what are the criteria for control?

Response:

The PAR observations collected at the SURFRAD and NEON networks used in this study were quality controlled by station scientists before release, and are regarded as the most reliable radiation data due to the instruments of highest available accuracy and careful maintenance.

The PAR observations collected at the CERN network used in this study were quality controlled by the data sharers, more details about the quality control procedure can be found in the article of Liu et al. (2017). This information will be added in the revised manuscript as “The PAR observations collected at the CERN network were quality controlled by the data sharers, more details about the quality control procedure can be found in the article of Liu et al. (2017)”.