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:

In this paper, the authors generated 16-year dataset of surface solar radiation (SSR) with high resolution, according to the latest ISCCP and ERA5 data. The SSR is required for land surface process simulations and solar energy estimation. The proposed method for SSR estimation is the physical scheme that used in the previous studies of Qin and Tang et al. The paper is clear and well written. However, the following questions are not satisfactorily answered:

Response:

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

Comment:

1. In recent years, Zhang et al 2014 developed SSR high-resolution products based on multi-source satellite data e.g. MODIS. It is recommended that the author describe the characteristics of the study in Line 104, indicating the differences and individual characteristics of the products developed in this study.

Zhang, Xiaotong, et al. "Generating Global LAnd Surface Satellite incident shortwave radiation and photosynthetically active radiation products from multiple satellite data." Remote Sensing of Environment 152 (2014): 318-332.

Response:

More description about Zhang's article will be added into in the revised manuscript as "The GLASS SSR products were retrieved by a look-up table method with the visible band top-of-atmosphere (TOA) radiance from multi-source geostationary and polar-orbiting satellite data".

Comment:

2. L157, cloud top temperature was used to discriminate the water and ice cloud, are there any more details about this? MODIS has a cloud top temperature product. Why not use this product?

Response:

More details about the determination of cloud phases will be added in the revised

manuscript as "In the ISCCP H-series cloud product, cloud types are roughly defined by two phases (liquid and ice), which are determined by cloud top temperature (TC) with liquid for TC ≥ 253.1 K, and ice for TC < 253.1 K."

Yes, MODIS has a cloud top temperature product, but there are big mismatches between the times of MODIS and ISCCP H-series cloud product, which would lead to great uncertainty.

Comment:

3. L166, MOD08 was used to provide aerosol data, what's the parameters used? AOD?

4. MOD08 has three temporal resolutions: daily, 8-day and monthly. So which one was used in your SSR calculation, and how do you solve the coarse temporal resolution of MOD08 to match the high temporal of other input data? Please write the details information on this in your manuscript.

Response:

In this study, we used the MODIS AOD product of the combined dark target and deep blue AOD at 0.55 micron for land and ocean. Thus, the information about the MODIS aerosol will be added in the revised manuscript as "The MODIS AOD product of the combined dark target and deep blue AOD at 0.55 micron for land and ocean was used".

In this study, we used the MOD08 daily product. Thus, the word "MOD08 and MYD08" in the original manuscript will be changed to"MOD08_D3 and MYD08_D3" in the revised manuscript.

To match the temporal of ISCCP HXG products, we re-sampled MODIS aerosols and albedo to 3 hour by assuming that their values are constant within a day. This sentences will be added in the revised manuscript.

Comment:

5. Validated data, 42 stations from BSRN and 90 stations from CMA were used to evaluate the performance of the estimated SSR. For site data applications, have quality control of site data during the verification process of remote sensing products? What standard to control?

Response:

The BSRN radiation data 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 CMA radiation data used in this study were quality controlled by a two-steps procedure developed by Tang et al. (2010). One is the physical threshold test to eliminate the obvious errors, and the other is the statistical test using artificial neural network method to eliminate the more insidious errors. More detailed information about the two-steps procedure can be found in the article of Tang et al. (2010).

Tang, W., Yang, K., He, J., and Qin, J.: Quality control and estimation of global solar radiation in China, Sol. Energy, 84, 466–475, 2010.