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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Retrieving high-resolution surface solar radiation with cloud parameters derived by combining MODIS and MTSAT data" *by* W. Tang et al.

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This manuscript describes a new approach to obtain SSR from satellites, and the proposed idea on how to combine MODIS and MTSAT data and offset their respective observation shortcomings indeed is very novel. Throughout the manuscript, the structure, elements, procedures, discussions and analyses all are well organized, and thereby it is fluent to read. In a word, I find the study is interesting and well sound and it is worth publishing in Atmospheric Chemistry and Physics.

Even though I think the study is worth publishing in ACP, it maybe still require some modifications. My main concerns are: 1) Generally speaking, if we want to retrieve

the atmosphric states (e.g. cloud-related parameters) from satellite TOA (Top of the Atmosphere) observations, the surface states must be known or assumed in advance. However, in your method the cloud-related parameters are directly linked with TOA MTSAT observations by an ANN method. Are the fluctuations of surface states, such as different surface reflectance, required to be further accounted for in your retrieving scheme? Do you compare your cloud mask results with MTSAT TOA VIS images through visual identification, and are they in agreement each other? 2) You first use to MTSAT TOA 5 channel data to detrieve cloud parameters, and then use resulting cloud parameters to compute SSR. Why didn't you choose an more straight-forward way to obtain SSR, namely directly retrieving SSR from MTSAT TOA 5 channel data. You also can use MODIS cloud products and the algorithm of Qin et al. (2015) to obtain SSR, and then establish the direct relationship between SSR and MTSAT observations by an ANN method. 3) In the midlatitude regions such as most parts of mainland China, the overpass times of Terra-MODIS and Aqua-MODIS respectively roughly are 11:00 and 13:30. Around these times, the solar zenith angles are relatively small. Therefore, the samples that you used to train ANN maybe lose representativeness for cases that solar zenith angles are large (e.g., the hours around sunrise and sunset). This may also influence your retrieval accuracy. Is this right? My questions may seem a little too harsh, but you should try your best to response them.

Specific comments: 1.P. 35202, L. 16: or 3.52.P. 35203, L. 26: "with inputs" may be more appropriate? 3.P.35204, L. 1: Is it better to change " get their values at. . ." into "them with"? 4.P.35204, L. 3: "their limited. . ." may be more appropriate? 5.P.35205, L. 11: MTSAT1R is 135 degree and MTSAT2R is 140 degree, which one did you use? 6.P.35205, L. 25: Misleading phrase "The spatial resolutions of these MODIS products are 5 km", different MODIS products have different spatial resolutions. 7.P.35208, Sect. 3.2: Here the descriptions are a bit disordered. Maybe, the following revision is better. The conclusion "Comparison between . . . To improve . . .train the ANN" in the end of this paragraph, is adjusted into the end of next paragraph. You respectively describe the training data and validation data, and then conclude their similar behaviors, finally

all data are used to train the ANN. Between the L. 15 and L. 25, the “observed ones” is “the MODIS derived”, isn’t it? In a word, these two paragraphs need to be rephrased. 8.P.35209, L. 23: 2.9 g cm-2 seems to be small. From my experience, under cloudy skies the absorption of water vapor usually is saturated. Maybe 3.5 g cm-2 is more appropriate. 9.P.35210, L. 22-24: Misleading phrase “The lack of three-dimension. . .”, please rephrase it. 10.P.35213, L. 4-5: I do agree with the reasons you presented here. “This would be due to the coarse spectral resolution of geostationary satellites. . .”. I feel that maybe two factors contribute this phenominen. One is satellite observing TOA reflectance has saturated for too thick clouds. Subsequently TOA reflectances can not reflect the change of cloud optical depth, and result in overestimated atmospheric transmittance. Another one is the “representative cloud” and “ climatology average aerosol loading” are used in the calculation of SSR. This means extremely cases can not be accounted for, and a systematic underestimation in certain high value range and a systematic overestimation in certain low value range are certainly resulted in. Frankly, it is weird that GLASS SSR has such large systematic errors on a daily timescale. In summary, my overall recommendation is that this work could go further for publication provided the authors will provide a thorough rebuttal to the aforementioned issues.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 35201, 2015.