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Atmospheric Measurement Techniques Discussions

Interactive comment on "Correcting spaceborne reflectivity measurements for application in solar ultraviolet radiation levels calculations at ground level" *by* P. N. den Outer et al.

Anonymous Referee #3

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The paper entitled "Correcting spaceborne reflectivity measurements for application in solar ultraviolet radiation levels calculations at ground level" focuses on a comparison of cloud modification factors based on different time series of spaceborne reflectivity measurements and cloud modification factors (CMF) inferred from solar irradiance measurements of a large ground-based network of pyranometers. By using empirically based fitting functions to the spacebased CMFs, the authors show an improved correlation with groundbased CMFs. Further, the spacebased CMFs is applied in a validation of clear sky daily UV doses modified with the spacebased CMFs, and measured daily UV doses at a few selected sites. The work is highly relevant in at least 3 respects: 1. it provides a closer link between cloud reflectivity measurements from

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space and cloud effects on the ground level UV, for reflectivity measurements covering the globe for a period of more than 3 decades. 2. Utilization of a large set of pyranometer data, quality checked and harmonized with a radiometric reference scale, for the satellite validations, 3. A long term trend in cloudiness is seen.

1. My general comment is that this is a valuable work, worth publication, but structural modifications may be required in order to justify the use of WRDC pyranometer data as a benchmark for reflectivity validations, and to avoid attempting to cover everything from measurements, modelling, comparisons, long term trend etc. in one paper.

2. I think the work on homogenisation and quality control of the WRDC pyranometer data, as well as the long-term change in cloudiness for Europe in itself is worth a paper. This would provide a stronger basis for the following paper analysing spaceborne reflectivity measurements. This applies also to the quality of the UV measurements. Keywords: method of calibration and homogenisation of pyranometer and UV data, as applied by WRDC and by COST-726, modelling of CMF_gb from pyranometer data for geographically and topographically different sites, intercomparisons etc.

3. The modelling of surface UV at the selected sites with surface UV measurements takes cloud effects, surface albedo and total ozone into account, but how was aerosol effects implemented? How was surface albedo estimated?

4. A best fit UV model has been applied for the validation of reflectivity based UV doses. The best fit model was based on a weigthing of 5 different UV models, including neural network models adapted to the selected UV stations. Is this best fit model applicable for other climate regimes also, so the LER data set can be utilized globally?

5. In figure 6, selecting RCF=0, a scatter in CMF_gb is seen for large SZA, due to the effect of misinterpreting cloud reflections as cloudfree case and enhanced surface albedo. I miss a further discussion on this, attempting to separate cloud effects from albedo effects in spaceborne reflectivity measurements.

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6. As far as I understand (page 72 lines 16-17) the measurements of LER is close to local noon whereas the groundbased CMF is based on daily sum of pyranometer data. If so, the time is not quite representative, and the paper discusses this in relation with cloud transport across the FOV. I would imagine using overpass time for selecting CMF_gb would improve the correlation with LER. Is this actually the case?

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