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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 #4

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In the present manuscript "Correcting spaceborn reflectivity measurements for application in solar ultraviolet radiation levels calculations at ground level" assessments of satellite retrievals of lambert equivalent reflections (LER) of TOMS onboard Nimbus 7, TOMS on board Earth Probe and of OMI on AURA are made. The determination accuracy of the cloud modification factor (CMF) and ground ultraviolet (UV) daily radiation sums retrieved using the different LERs and the OMI radiative cloud fraction (RCF) is investigated. The LER produced by the TOMS instruments and OMI are compared to ground based cloud modification factors. A solar zenith angle dependent uncertainty mainly of the OMI LER is found. Satellite retrieved UV is compared with ground measurements of daily UV sums. Emphasis is also put during this analysis on the optimal

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field of view for the CMF retrieval and the ground UV determination which is found to be between 1° and 1.5° . The optimal field of view is not identical to the lowest field of view because information on the cloudiness in the surroundings (included when using a larger FOV) allows to take into account the movement of the clouds during the day and their influence on the daily UV sum. Two LER correction methods are then presented and their accuracy analysed. In the end, the authors also analyse the cloudiness trend by analysing the change in CMF during the chosen spaceborn observation period.

Altogether this manuscript reads quite difficult. This manuscript is a “technical” paper, and it would add some value to include in the introduction, in the methods section but also in the analysis section more equations. In the introduction more statements regarding the various existing ground UV retrieval algorithms and which of those methods use the LER should be included. The authors should also, first, explicitly mention, in the introduction, what are the innovative aspects that are addressed in this manuscript. Explanation of the results and of the methods is, in some instances insufficient.

I however think that this manuscript includes results that are innovative and worth being published: The analysis regarding the difference of LER –still a relevant quantity in some UV retrieval algorithms - determined with the different satellites and the analysis of the potential to determine the CMF is quite interesting. The consideration of the field of view is also relevant, but I think that the discussion and interpretation could be extended. The trend analysis of the retrieved CMF is also a valuable information for the scientific community.

I suggest major revisions before the acceptance of the manuscript may be considered.

More specific comments follow:

At the end of the introduction you define the focus of your paper and following statement is included: “Additionally, important health topics currently under debate are UV-induced production of vitamin-D and its attributed beneficial effects versus the instances of skin cancer caused by UV radiation. Since both put different weights on the

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UV spectrum, stand-alone cloud effect proxies are required to address this topic."

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Do you really define different cloud effect proxies in the present paper? Is this remark not only confusing for the reader?

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The different time resolutions should be addressed: you use instantaneous satellite measurements to derive quantities (e.g. daily UV sums) for the whole day. This is in connection with the FOV resolution, but you should clearly explain it at the beginning and show the logical structure and the link between the different sections of your paper.

End of section 2: you have defined the data that you use. What about the aerosol effect? Is the CMF taking the aerosol effect totally into account? What is the accuracy?

Sect. 2 A modelled daily UV sums => A modelled daily UV sum

End of sect. 2.3. . .the total number and WRDC stations. . .????

Sect. 3.: "The sky properties at mid day dominate because of the high solar elevation angle which delivers the largest portion of the total daily UV sum"

What does the largest portion mean? Please give some numbers (in percent of daily sum) . . .

Please also specify what is a representative fraction of a cloud layer. Please give some examples of the movement of the clouds as a function of wind speed during a given time period and which FOV resolution you need to have these clouds in the FOV.

Fig 5.: Have you written somewhere the connection between (1-LER) and Fsat?

I do not understand what you show in Fig. 6. Are the corresponding ground based CMFs of this subset (clipped data of OMICRF) satellite retrieved or measured? I think you should improve the explanations regarding this fig. . .

You also need to explain in more details your 3 correction methods. E.g. how did you exactly correct to the one to one line. Did you divide the "fitting line" by 1? It would add

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some clarity to show equations. . . .

End of section 4.2. Discussion of fig. 8 is a little bit scarce. How good is the agreement in terms of per cent deviation. How good is the accuracy of the ground UV determination (e.g. absolute error in summer and in winter?) Can you see any trends? How big are these trends etc. . . ?

Conclusions

My personal interpretation of fig 8 is that the Cor211 is the best. I think you should better explain which criteria you use to draw your conclusion regarding method Cor2A1.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 61, 2012.

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