Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-1146-RC2, 2017
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Atmospheric Chemistry and Physics Discussions

Interactive comment on "TEMIS UV product validation using NILU-UV ground-based measurements in Thessaloniki, Greece" *by* Melina-Maria Zempila et al.

Anonymous Referee #2

Received and published: 17 March 2017

The study makes an important contribution to assess the accuracy in the calculation of UV doses important to health from ground-based and satellite UV data in mid-latitudes. The study focuses on the TEMIS satellite data, identifies problems in retrieving three photobiological UV dose products under cloudy conditions and points to the influence of aerosols in the retrievals using cloudless data. The study is well written, has novelty, text and figures are clear with a good flow, and the paper merits publication in ACP after few clarifications for better understanding. The points that need clarification are the sky conditions used, the seasonality, and the aerosol effect.

Specific comments

1. All-skies and clear-skies in figs 5, 6, 9: The scatter plots in figs 5 and 6 for the

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Discussion paper

case of all-skies are very different. Monthly variations and standard deviations are also very different. In fig. 5 I also note that the all-skies vs clear-skies scatter plots, and associated monthly variations and standard deviations, agree very well, something that is not seen in fig. 9. I understand that the UVB-1 and NILU data have been calibrated to a Brewer instrument before use, while the TEMIS data have not. Given that the Brewer favours measurements when the sun is not covered by clouds, can it be that this pre-calibration affects the measurements so that the all-skies in fig. 5 are not actually all-skies as in figs 6 and 9 but semi all-skies? Also, what filter do you use to define the clear-skies in fig. 5? Moreover, given that fig. 5 compares UVB-1 vs NILU data both calibrated to the same Brewer, while figs 6 and 9 compares TEMIS vs NILU data (NILU pre-calibrated to Brewer, TEMIS being not), would it make sense to calibrate also the TEMIS data to the Brewer for consistency? Potentially this pre-calibration reduces part of the variance in the original UVB-1 and NILU data, and as a consequence a better comparison is achieved between the two radiometers. I am not sure. Have you checked if the calibration to the Brewer affects the measurements denoted as all-skies? Overall I think that a clarification on the definition of all-skies and clear-skies conditions would help the reader.

2. Page 19, line 2: The seasonality of the cloud-free cases is said to match the seasonality of all-skies but it is not shown. My suggestion is to show the seasonality of the cloud-free cases because later in fig. 10 you try to explain the cause of a seasonality which is not actually shown. The seasonality can be added in fig. 9 for the lines shown in fig. 9 accordingly. I expected that the seasonality of the cloud-free cases will match the seasonality of the clear-skies shown in fig. 5 not of the all-skies shown in fig. 6. Cannot understand why since we are talking about cloud-free data. A match between the two clear-skies seasonalities would strengthen the findings about clouds affecting the TEMIS data.

3. Aerosol effect, p. 19 and fig 10: It is claimed that one of the causes for the seasonality seen in the satellite minus ground-based clear-sky differences (which is not

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actually shown) is variability in the aerosol load. The authors use fig. 10 to support this. Fig. 10 shows that there is a relation between the satellite minus ground-based clear-sky differences with increasing AOD (using 10-minute time intervals), revealing a positive correlation between them, but it does not straightforwardly show the link between their seasonal variations. What is the shape of the two seasonalities and how do they match? I suggest adding an extra plot in fig. 10 (below the existing plot) showing explicitly the monthly variation of the differences vs the monthly variation of aerosols. This would strengthen the claim on p.19 line 4.

4. Page 19, lines 8-12: According to section 2.2 (p.5 lines 29-30), for AOD>0.3 the satellite UV data products will overestimate the UV index and UV dose. Indeed, the negative differences in fig. 10 tend to become positive for AOD>0.3 (indicating the satellite overestimation), but it is not clear what you mean by mentioning that the slope changes for AOD>0.4. Do you imply that there is better agreement between the satellite and ground-based data in larger AOD? I think that mentioning about two slopes confuses, unless if you clarify what you mean.

5. Is there relation between the seasonality in aerosols and the seasonality in the UVB-1 minus NILU clear-sky differences?

Minor comments:

Eq. 1: remove the unit (W/m2) from the UV index.

Page 5, lines 6-8: Is it correct that the daily UV dose is calculated from the UV index?

Page 6, line 30: It reads '... the total ozone column (TOC) and are used...'. Is it something missing from the sentence?

Page 10, line 3: correct 'NILY' to 'NILU'.

Page 15, line 9: Usually the correlation values are usually re given by the correlation coefficient R, not the Rˆ2.

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Page 18, line 5: correct ‘bellow’ to ‘below’.

Fig. 5: Please put (a), (b) and (c) to the left side of the titles of the plots, not below the plots.

Fig 6: Indicate that the figure refers to all skies.

Fig. 7: Indicate that the figure refers to all skies. Use thicker lines for the linear lines, and use dots or dashes for the y=x line.

Fig. 10: remove the three ‘y=’ inside the legend since these statistics are not equations. Also, indicate that the figure refers to the >90% cloudless instances, if so.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-1146, 2017.

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