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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatial and temporal UV irradiance and aerosol variability within the area of an OMI satellite pixel" *by* S. Kazadzis et al.

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We would like to thank the anonymous referee for his/her comments on the manuscript. The referee's initial comments are included in this manuscript.

Ref: P. 7279: "Same results have been found for the irradiance at 305 nm (more overestimation) ..." Except the repetition of the word "for", this sentence is confusing. Where were these same results found? Within the scope of which study? Of the present study? Is this information not already included in the previous sentence?

To clarify this sentence we have altered the text as follows:

New text:

Results of this campaign period have been showed more overestimation for the irradiance at 305nm and less overestimation for 380nm in agreement with the results in Kazadzis et al., 2009.

Ref: P. 7279, line 24: "Occasionally and under variable cloudiness, OMI reported twice as high irradiance, at least...." in fig. 3, I can not see that the OMI values are twice as high as the measured ground UV.

Figure 3 shows comparison of NILU-UV and OMI based on 30 minute NILU averages around OMI overpass time. The comment about the double OMI irradiance was a result of instantaneous measurements comparison. This was clarified in the text that was altered as seen below:

New text:

When comparing instantaneous measurements of the NILU-UV instruments (measurements at the exact minute of OMI overpass) with OMI, occasionally and under variable cloudiness, OMI reported irradiance values twice as high, at least in one of the three sites.

Ref: It seems that there is an increase in the difference between OMI derived and ground based irradiance with increasing duration of the cloudless sky periods. Can you say something about that.

Text added: For the specific campaign the number of days with variable or overcast cloud conditions was limited. Similar work of Weihs et al., 2008 showed under partly cloudy conditions the satellite UV-values are, on average, in the order of 30% higher than the ground observations. The ratio OMI to ground UV becomes even larger for overcast conditions. The satellite overestimates the observed ground values by more than 50%. However, it is difficult to determine partly or overcast conditions for a number of stations since having overcast conditions in one location and broken cloud conditions in another, is the case that causes the larger uncertainties even when integrating irra-

diance measurements for large time intervals.

Ref: In general I miss X-Y graphs which show the dependence of e.g. erythemal UV as a function of aerosol optical depth. Most of the graphs show timely sequences. Figures including other kind of presentations of the interdependence of the different quantities would be valuable.

The interdependence of satellite-ground based UV measurement bias against different quantities such as ozone, aerosol optical depth, aerosol absorption optical depth, cloud presence and solar zenith angle, have been presented in the publications of Kazadzis et al., 2009. In the above mentioned work we have used a large dataset of three and a half years of data in order to have statistically significant results. We have decided not to repeat this in this work as this one month campaign could not provide additional information on the way that those factors affecting the satellite and ground based biases. Instead we tried to focus on the temporal and spatial variability of part the above mentioned parameters (aerosols and clouds) inside the OMI subpixel. So even if the interdependence of UV biases with any of these factors would be fully explained and post-corrected within the OMI UV algorithm, the OMI and GB measurement agreement would be still limited by the sub-pixel variability

The final paragraph of the conclusions was altered according to the above discussion as follows:

Future studies related with OMI UV algorithm improvements should include information about spatial characteristics of clouds and aerosols in the area of an OMI pixel. These characteristics should be quantified and reported in the validation results in addition to possible GB instrument or/and satellite algorithm absolute level deviations. This is because even if the interdependence of UV GB and OMI biases with factors such as clouds and aerosol optical properties would be fully explained and taken into account in a future OMI-UV post correction algorithm, the OMI and GB UV measurement agreement will be still limited by the sub-pixel spatial and temporal variability of such

factors.

S. Kazadzis, A. Bais, A. Arola, N. Krotkov, N. Kouremeti, and C. Meleti, Ozone Monitoring Instrument spectral UV irradiance products: comparison with ground based measurements at an urban environment Atmos. Chem. Phys., 9, 585–594, 2009

All typing mistakes have been corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7273, 2009.