Referee #2:

The authors are thankful to the reviewer for the comments on this study and the suggestions. We have incorporated reviewer's suggestions by performing additional analysis as shown below. Our response to the reviewer's comments is the following:

1) The modelled cloud modification factor (CMF) is compared against the observed one over Ostend, as shown in Figure 1. Despite the scatter, the modelled and observed CMF match in a satisfactory manner with a root mean square error of 0.19 and a correlation coefficient of 0.71. The bias has a value of 0.046.

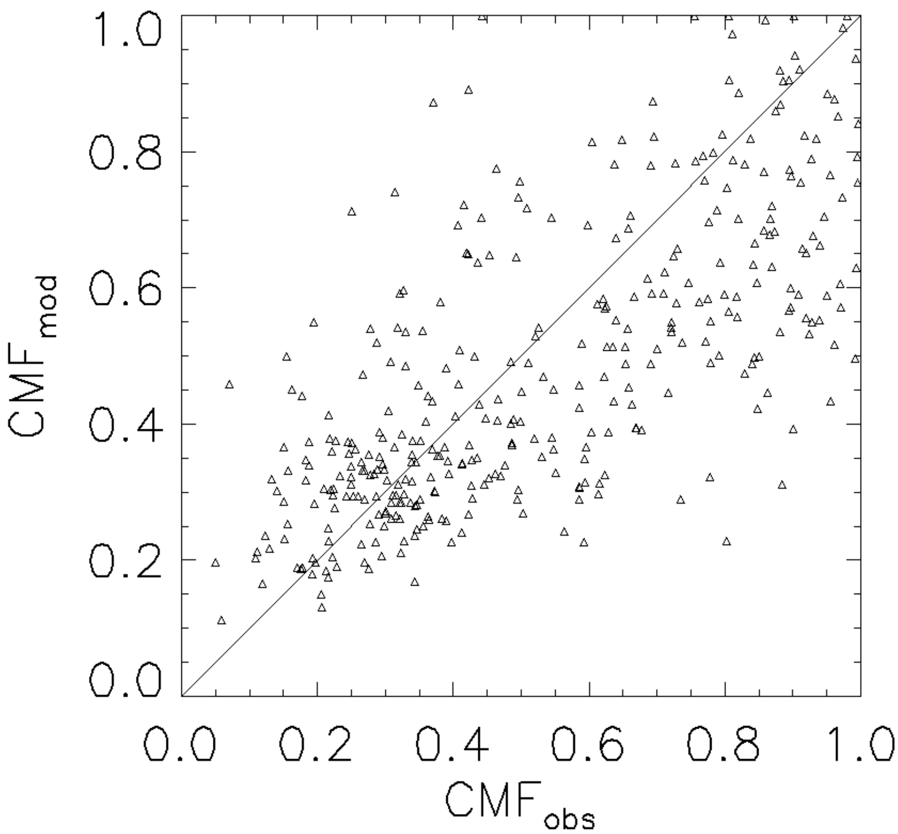

Figure 1. A scatter diagram of modelled cloud modification factor (CMF_{mod}) versus observed cloud modification factor (CMF_{obs}) over Ostend.

2) The reviewer suggests using total column ozone value either from satellite or measurement. This is exactly what has been done in this study, as mentioned on page 698, line 26 of the discussion paper. We apologise, if it was not explicit from the text in the discussion paper. The text will be adapted as following "The multi sensor re-

analysis (MSR) data set created from fourteen total ozone satellite retrieval datasets measured by polar orbiting satellites (van der A et al., 2010) is used to obtain the total ozone column value. Following which, the total column ozone value is set to 335 Dobson units for the month of June 2006 at 51° N and 4.5° E, which is near the centre of our study domain". It should be noted also that the purpose of our paper is not to derive a new parameterization for surface UV radiation, incorporating all possible effects, including columnar ozone. Instead, we only wanted to verify the capacity of the retrieved SCOT to yield reasonable surface UV irradiance, using simple parameterizations to do so. Of course, even then columnar ozone concentrations need to be taken into account, which we actually did (see above), but then only for the domain/period studied in the paper.

3) Although we do not propose a retrieval algorithm of UV irradiance from a remote sensing instrument, yet, we compare the results obtained using our approach with the results obtained in other studies that were dedicated to the estimation of UV irradiance using satellites. Chubarova et al. (2002) compared the ground based UV measurements at Moscow, Russia, against TOMS (Total Ozone Mapping Spectrometer), which has a spatial resolution of 50×200 km². They found that the relative mean difference between TOMS UV estimate and the ground measurements is between ±10%. They also found that TOMS overestimated the ground measurements under overcast condition as the value of the bias reached 15-17%. Fioletov et al. (2002) found that TOMS UV estimate versus ground measurements at Toronto, Canada, has a correlation coefficient of 0.9 with a bias of 9%. McKenzie et al. (2001) found an average correlation of 0.81 between TOMS estimate and ground measurements of UV erythemal dose at four stations around the world. Peeters et al. (2000) compared the UVB estimated by GOME (Global Ozone Monitoring Experiment) against measurements over Uccle, Belgium. They found that the satellite estimations were twice as high as the measurements, particularly in the case of cloudy conditions. This difference pertains to the spatial resolution of GOME ~ 40×320 km², among other factors such as overestimation of cloud fraction. Our study presented in the discussion paper yielded a mean correlation of 0.91 between modelled UV irradiance and ground based measurements with a low bias. The detailed error statistics were tabulated in Table 2 of the discussion paper. The intercomparison between different approaches with that of ours is complicated by the fact that the

different instruments/approaches do not measure exactly the same quantities and also are focused at different geographical domains. Moreover, the difference in spatial resolution of different remote sensing instruments, SEVIRI = 3 × 3 km^2 at nadir, TOMS = 50 × 200 km^2 and GOME ~ 40 × 320 km^2, possess additional complications for comparisons together with the fact of using different spectral bands. Despite of the abovementioned complications, the intercomparison of our results with other studies shows that the results of this study are reasonably satisfactory.

4) In the manuscript use was made of an aerosol optical thickness (AOT) value of 0.235. In order to assess the effect of the variability of this quantity, we considered aerosol optical thickness measured by the AERONET (AErosol RObotic NETwork) station at Ostend (Belgium), which is very near the UV observation station. For the month of June 2006, the mean measured AOT amounted to 0.25, with a standard deviation of 0.15. The effect of the variability of the AOT on the resulting surface UV (UVA and UVB) irradiance was evaluated by calculating this quantity using the mean AOT (0.25), as well as the mean AOT plus and minus one standard deviation (AOT values of 0.10 and 0.40, respectively). Perturbing the AOT as just explained induces mean normalised absolute difference (MNAD), which was calculated as following:

$$MNAD(\%) = \overline{\left(\frac{\left|UV_{modelled_i} - UV_{perturbed_i}\right|}{UV_{modelled_i}}\right)} \times 100$$

where, $MNAD$ is Mean Normalised Absolute Difference in percent, $UV_{modelled_i}$is modelled UV (UVA or UVB) irradiance at i^{th} time interval, $UV_{perturbed_i}$ is UV (UVA or UVB) irradiance associated with different values of aerosol optical thickness. Table 1 quantifies the MNAD for UVA and UVB under varying AOT. It can be seen that the differences are less with maximum value of MNAD being 5.44 % for UVB irradiance.

Aerosol optical thickness (AOT)	*MNAD* for UVA (%)	*MNAD* for UVB (%)
0.1	3.22	3.43
0.25	0.0	0.57
0.40	3.22	5.44

Table 1. Mean normalised absolute difference (MNAD) for UVA and UVB under varying AOT values

5) Previous studies, e.g., Krotkov et al. (2001) and Chubarova et al. (2002) used the Lambert equivalent reflectivity to calculate the UV irradiance from TOMS. The retrieval of cloud optical thickness from SEVIRI in our study is also based on the assumption of underlying Lambertian surface, as we make use of the semi-analytical cloud retrieval algorithm (Kokhanovsky et al., 2003).

Other remarks:

P. 698 line 16. will be modified to "In each case, the corresponding ice or liquid water LUT is used to interpolate $R_0^{\infty}(\mu, \mu_0, \varphi)$ for ice and liquid water respectively."

The new version of the manuscript will be adapted accordingly and the points mentioned here will be incorporated.

References:

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Krotkov, N.A., Herman, J. R., Bhartia, P. K., Fioletov, V., and Ahmad, Z.: Satellite estimation of spectral UV irradiance 2. Effects of homogeneous clouds and snow, J. Geophys. Res., 106, 11743-11759, 2001.

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Acknowledgements:
We would like to thank Dr. Kevin Ruddick for making the Ostend AERONET data available.