

# ***Interactive comment on “An urban agglomeration effect on surface UV doses: Comparison of the Brewer measurements in Warsaw and at Belsk, Poland, for the period 2013–2015” by Agnieszka E. Czerwińska et al.***

**S. Kazadzis (Editor)**

stelios.kazadzis@pmodwrc.ch

Received and published: 11 October 2016

I would like to include here some comments on the revised manuscript.

Page 2, line 14, clouding – clouds

P 2, L31: trends – positive trends

P3 L16: "We will strive to support (or disprove) the hypothesis by comparing the erythral and UV-A (324 nm) radiation measurements by the BSs in Warsaw and Belsk for the period May 2013-December 2015."

Printer-friendly version

Discussion paper



I think this can be eliminated as at this point as you can clearly say if this hypothesis is correct or not.

Page 4 , L2 stray light needs a reference.

P4, L28 the same ratio – Which one (wavelengths/erythemal) ?

P5 line 8-13

Since there are other publication that are showing significant differences of UV ssa compared with the visible one especially at urban areas I would suggest to change the paragraph (and remove non used references after that) :

"We used SSA at 440 nm as a constant for the whole ultraviolet spectrum, as it was found that monthly averages estimated from BS at Uccle were in close agreement with the CIMEL measurements at 440 nm, especially for 320 nm (Nikitidou et al., 2013). Furthermore, Liu et al. (1991) performed Mie calculations for the rural aerosol model (Shettle and Fenn, 1979) and suggested that for this type of aerosol, SSA is approximately independent of wavelength. There are no measurements performed for SSA at the UV wavelength range."

To:

Since there are no AERONET related measurements of SSA at UV wavelengths , we used SSA at 440 nm as a constant for the whole ultraviolet spectrum, as it was found that monthly averages estimated from BS at Uccle were in close agreement with the CIMEL measurements at 440 nm, especially for 320 nm (Nikitidou et al., 2013).

Also, because the suggestion here that SSA is independent of wavelength is in contradiction with your discussion hypothesis of SSA can be lower in the UV.

P5 line 20 The mean ratio of which wavelength range (erythemal)?

P6 line 8 : (local noon - 3h, local noon-0.5h) is not 3 hours

[Interactive  
comment](#)

[Printer-friendly version](#)

[Discussion paper](#)



Figure 8a: AOD ratios are misleading in this case. In addition, absolute AOD differences are related with changes in solar radiation and not their ratio. I would suggest to put AOD differences instead and change the text accordingly.

I would suggest to include a table in the end of section 3 including all mean cloudless sky ratios and standard deviations for all factors analyzed (intercomparison, solar angle, ozone, AOD, actual ratios). In order to summarize the quantification of all effects.

I still think that the latitude difference of the two stations (solar zenith angle effect) was also pointed out from the reviewers can be eliminated. This is because including it to the factors affecting the differences among the sites introduces an uncertainty as it changes from day to day and in the end in terms of percentage is the most important difference.

This can be done by either normalizing the irradiance of one of the stations using the solar zenith angle functions and compare them again. Or, as suggested, use ratios of measurements (and not 3 or 6 hour averages) for certain solar zenith angle windows e.g.  $X \pm 1$  degrees where  $X$  can be e.g. 45 – 60 – 75 degrees. (75 degrees will capture the whole year). Then even if the measurements correspond to different time for the two stations, they are only slightly affected by the solar zenith angle issue.

conclusions

As you write (e.g. for the erythemal) you have (roughly) a 6% difference that can be attributed 3-4% on the different solar angles, 1% on the instrument differences and 2% to aerosol difference. So more or less everything is explained. Thus in the paragraph describing albedo and SSA you are mentioning two hypothetical (there are no measurements) suggestions (a: albedo might be higher in Warsaw site and b. SSA might be lower). I would suggest rewriting this paragraph mostly suggesting that these two parameters (albedo and SSA); a. has been just assumed, b. they can be different and c. there is a possibility that (based on the modeling calculations) the effect of the one is masking the effect of the other. All the above, having in mind that this is a

[Printer-friendly version](#)[Discussion paper](#)

discussion that is not based in actual measurements.

“Our study proves that the UV level in Warsaw is slightly lower than that found in cleaner suburbs of the city. Thus urban aerosols and clouds over Warsaw do not provide an effective shield against excessive UVR”

I would change that to “Our study proves that the UV level in Warsaw is slightly lower than that found in cleaner suburbs of the city. The differences that were attributed due to AOD differences are in the order of the accuracy of the instruments used. Based on the Brewer measurements, urban aerosols and clouds over Warsaw only partially act as an effective shield against excessive UVR.

In addition, it would be interesting to try to justify this conclusion.

---

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-366, 2016.

[Printer-friendly version](#)

[Discussion paper](#)

