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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new method for the absolute radiance calibration for UV/vis measurements of scattered sun light" *by* T. Wagner et al.

Anonymous Referee #2

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General Comments

Is the method applicable to solving the vexing question of irradiance calibrations too? Langley methods to calibrate direct beam irradiance are not generally applicable to global irradiances because of differences in the entrance optic configuration between the two modes of measurement.

This is an interesting and potentially very useful paper that makes ingenious use of what may be a fortuitous sza-dependence in zenith radiance signals, to calibrate radiances by means of the corresponding variations calculated with a RT model. The

authors show that the calibration is largely independent of the aerosol parameters they tested (though further testing is recommended). The method seems to be most accurate in the UV-A region, with accuracies decreasing at longer visible wavelengths due to effects of aerosols, and decreasing at shorter UV-B wavelengths due to uncertainties in ozone absorptions. In addition to its demonstrated applicability with MAX-DOAS systems, the method may also be applicable to calibrating measurements of global diffuse irradiance (and hence global total irradiance).

Also, in addition to providing an independent radiance calibration, the method can also be applied to estimate aerosol parameters, such as aerosol optical depth, and single scattering albedo. The latter is a particularly important parameter controlling irradiances in the UV-B region, where some anthropogenic organic aerosols absorb strongly. It would therefore be worth further exploring the extent to which the method can be used to infer aerosol properties in the UV-B region.

The paper is well-written and clear. I recommend acceptance for publication in AMT subject to the minor changes suggested, and I look forward to open discussion around the points noted above.

Minor Points

Line 74. . . .and other instruments? Not confined to just MAX-DOAS?

Line 77. UV-B (UV-A is largely unaffected by ozone).

Line 81. In this application it could be argued that irradiance (not radiance) is the "essential" quantity.

Line 94. Should this be "zenith sky irradiance"? Is there any dependence on the field of view?

Line 168. Seems odd that the validation paper precedes the publication by 6 years.

Line 176 (and elsewhere). Should this word be "convolved"?

Line 189. How does it vary with wavelength. Linearly, or otherwise? A plot might help.

Line 209. For some aerosol conditions, the single scattering albedo might be very different from your assumed value of 0.9. I think some sort of sensitivity analysis is needed to investigate possible effects of changes in the assumed value (e.g., in the range 0.8to 0.99).

Line 239. Add ”in this wavelength range”.

Line 270. To test this more fully, Temperature differences and pressure differences should be perturbed separately.

Line 312. Should this be “smallest”, rather than “largest”? (see Fig 6).

Line 359. Same Earth-Sun separation? Also, would you expect close agreement in radiances, unless aerosol extinctions at both sites were similar?

Line 415. It would be useful, if possible, to quantify the additional uncertainty (as a function of wavelength) that would result from reasonable specified changes in ozone or aerosol properties. Perhaps the sensitivity to ozone can be derived from Fig A3?

Line 579. I would suggest adding a vertical dashed line at SZA=79 too, and to label the key SZA values in the upper x-axis.

Line 629. Shows that the sky radiance at 435 nm is about half that at 335 nm, despite the lower ET spectrum. You could make the point that this demonstrates the importance of increased scattering at shorter wavelengths.

Line 856. Please clarify if this is “ratio”, or a “difference”. Also, a smaller range for the y-axis (e.g., 3% rather than 30%) would be appropriate in the lowest panel. Or could use a log y-axis in all cases?

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 5329, 2015.