

Comment on amt-2022-288

Anonymous Referee #2

Referee comment on "Optical receiver characterizations and corrections for ground-based and airborne measurements of spectral actinic flux densities" by Birger Bohn and Insa Lohse, Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-288-RC2>, 2022

The authors determined the angular response of optical inlets for measuring actinic flux densities and provided corresponding correction functions for ground-based and airborne applications and a wide range of atmospheric conditions. Their approach is based on detailed laboratory measurements combined with extensive radiative transfer calculations. Overall, the manuscript is well suited for publication in AMT. However, some comments might be considered before.

General Comments

The authors give a lot of details to demonstrate what they did. The supplement material even extends their efforts to show everything that was made. This brings me to the main general comment. The reader might be overloaded by the number of plots and information specific to author's optics and applications. Therefore, the authors should consider limiting their plots to those that show significant differences. For example, it is not necessary to show the results for the four selected wavelengths for all investigations.

Specific Comments

P2L46: "the accuracy of measurements in the UV-B range" – I think it is rather a question of sensitivity what is meant here. Technically, the accuracy includes also the uncertainty due to a non-perfect angular response.

P2L52: Maybe also refer to Jäkel et al. (2007) (<https://doi.org/10.1175/JTECH1979.1>) who discussed the stray light correction for a similar instrument.

P3L64: "..., owing to the greater importance of upward radiation, ..." Why is it of greater importance?

P4L96: "of typically high spectral radiances in both hemispheres." This is not necessarily valid, e.g., flights performed over land or open water under cloud-less conditions show a low contribution of upward radiances.

P7 Fig3: I'm wondering if this could be combined with the cross-section plots shown in Fig. 4.

P8L172: "Because of the rotational symmetry of the receivers, dependencies on azimuth angles are minor." From the contour plot (Fig.3b), I would estimate a distinct variation of the angular sensitivity in azimuth direction (for 60° polar angle). Is this considered as minor dependence?

P8L176: "The dependencies on polar angle and the wavelength Z_p dependence are slightly different for the different receivers." Please give the range.

P11 Fig5: Here, azimuthal averages are plotted. Think about to show also the corresponding standard deviation as in Fig. 4.

P12L200: "In panel (b) of Fig. 6 relative sensitivities were multiplied with $\sin(\theta)$ to account for the solid angle contributions consistent with the θ -dependent areas in the projections of Figs. 3 and 5." I'm not sure if this step is obvious for the reader.

P13L242: "The applied ground albedos are based on literature data." Please give reference. Same for the cloud settings (L248).

P14L243: "... considered a normal ground albedo" Maybe it is better to call it a "default albedo" for your study. Same for the aerosol optical depth (L249).

P14L263-P16L285: The authors present the simulations of the diffuse radiance field for cloud-less conditions. I would rather prefer to see a direct comparison to the more interesting cases that are shown in the supplement.

P15 Fig.7: Could be combined with Fig.8.

P16 Fig.8: Is it reasonable to give azimuthal means here, since the distribution for the downward component has such a large azimuthal dependence? Think about a plot showing the principal plane direction instead.

P20L349: "clear-sky corrections": Does clear-sky corresponds with cloud-less conditions?

P22 Fig.11 / P23L390: "solar azimuthal position": Maybe use the term relative azimuth angle instead.

P25 Fig.12: The number of dots should be $3 \times 5 \times 3$ for this scenario, but it looks like less.

P27L474: "altitude-interpolated coefficients": Do the atmospheric profiles of e.g. temperature and pressure have an effect on the altitude dependence?

P27L490: "A detailed description of the correction procedure is given in Sect. S7 of the Supplement." Maybe it is useful to provide a schematic that illustrates the correction procedure directly in the main manuscript.

P32L552ff: The paragraph partly contains advices which are obvious (e.g., "if measurements are made on a pavement or artificial platform in an area dominated by vegetated ground, measured upward flux densities can be misleading."
In my opinion, it goes beyond the scope of this manuscript to go into the question of how to measure actinic radiation. Here the authors could shorten the text.

P35 Conclusions: I would suggest to give a final quantification of the corrections to illustrate their necessity.

Technical Comments

P2L32: lifetimes - lifetime

P8L173: "are obviously invisible" - not visible ?

P9 Fig.4, P11 Fig.6: Please revise the legend. The dashed line is not shown as dashed line there.

P9I192: "in panel (a)" - give also figure number

There are several figures without labeling the four panels.

P28 Fig.14: Maybe adjust the range of the x-axis (zoom in, e.g. 06:00 – 10:15 UTC). The date is not required as x-axis label.

P29 Fig. 15: Use the same y-scale if appropriate. It helps to make the plots more comparable.