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Atmospheric Measurement Techniques Discussions

Interactive comment on "Performance of the FMI cosine error correction method for the Brewer spectral UV measurements" *by* Kaisa Lakkala et al.

Anonymous Referee #1

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The paper discusses the performance of the cosine correction method applied to irradiance measurements of Brewer spectroradiometers, which has been introduced in a previous study of the authors. They have used data from different Brewers that took part in an intercomparison campaign, as well as data obtained at two Finish stations. After the evaluation of the method it is concluded that this can be applied to other Brewer instruments, as long as some required specific characteristics are known. In this respect, this work is very useful as it offers a proof for the applicability of the cosine correction method of Lakkala et al., 2008 to other Brewers. The paper contains useful quantitative information on the effect of the cosine error on Brewer spectral UV data, and on the improvements achieved when correction methods are applied.

The paper could be accepted for publication after revisions taking into consideration the specific comments provided below.

There are several grammar errors that could be easily corrected by a more careful reading of the document.

Specific Comments:

3, 2: The light scattered downwards by the diffuser is directed to the spectrometer by two prisms and not mirrors.

3, 21: Differences in the slit functions among different instruments is mainly evident at the wings which are not easily seen in linear plots. I suggest plotting the slit functions of Figure 1 in logarithmic scale.

4, 5: The reference spectroradiometer QASUME has a diffuser with a superior cosine response (very low cosine error) and this is one of the advantages of using this instrument in the current study. I suggest discussing in a couple of lines this feature of QASUME.

6, 22: Cglob is also a function of θ, φ and λ, so it should be also mentioned.

7, 7-8: The ratio F'dir/Fdir is the angular response (as it is correctly mentioned later in the text) and not the cosine error of direct component. Similarly, the ratio for the diffuse irradiance F'diff/Fdiff should be the cosine response of the diffuse component and not the cosine error.

7, 15: Please mention that the integration is performed for the upper hemisphere, so the integral is over 2π.

7, 18-19: In this case, L is not constant but a function of wavelength only, so it should be L(λ), also in eq. (6).

8, 5-11: The assumption made in step (1), that all radiation is diffuse, results in an error in the calculated cosine correction factor. How this error is handled? If it is not taken into account, it should be at least quantified, using model simulations and added to the overall uncertainty.

8, 25-26: Up to this point irradiance was denoted by F. This should be kept consistent for the entire manuscript and not changed to I, as is done for eq. (11). The same stands for wavelength, which should continue denoted by the Greek λ, instead of l. (also in line 31)

12, 22: Please avoid mixing fractions with percentages when discussion the cosine correction factors. Here you use 14% instead of 1.14 and 20% instead of 1.2.

15, Figure 7: Please increase the font size in figure labels and titles because it is very hard to read in its present format. Please do the same for Figures 8 and 9.

18, 6: Please revise to: "The mean differences between the Brewers and . . ..", to make sure that the reader realizes that the quoted 6% difference refers to the mean value. It would be interesting to provide an estimate of the range of differences between the Brewer and QASUME encountered during the audits.

Technical comments:

7, 16: replace L(θ) with L(θ, φ, λ)).

8, 31: I would suggest using "smoothed" instead of "summarized".

12, 16: Please replace "impact" with "contribution"

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