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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new method for estimating UV fluxes at ground level in cloud-free conditions" *by* William Wandji Nyamsi et al.

Anonymous Referee #3

Received and published: 24 August 2017

The manuscript describes a fast method based on a modified k-distribution method and a resampling technique, to estimate ground level UV fluxes. The manuscript is well-organised and include description and verification of new/adopted model results.

The manuscript is acceptable for publication after consideration of the suggestions for changes given below.

- **Page 1, lines 29-31**: It is claimed that improvements in the modelling of the Earth's reflectivity in the UV region are necessary. However, I can not see that the manuscript identifies high reflectivity to be a problem when discussing the model versus measurement results in Figs. 2-6 and 8 or elsewhere in the manuscript. Some weak hints are given, but no strong evidence supports the claim in the

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abstract. It should be possible to identify measurements made during high and low albedo situtations and compare these with the model to quantify differences caused by differences in the Earth's reflectivity.

- **Page 3, line 25**: "A very large underestimation" is mentioned. To make the manuscript complete and self-contained: may you please include numbers quantifying this underestimate?
- **Page 3, lines 29-30**: Please include numbers quantifying how much the "novel parameterization" improved the transmissivity.
- **Page 6, lines 4-5**: If I understand this correctly, the SHICrivm software is used to obtain the full UV spectrum from the measurements. The Sodankylä Brewer stops at 325 nm while the Jokionen Brewer stops at 365 nm. Thus, for the Sodankylä Brewer nearly the whole UV-A is extrapolated from the UV-B using SHICrivm. This approach should be justified and the errors in the extrapolated part assessed and documented. For the Jokionen Brewer the extrapolation is less severe, but needs nevertheless to be justified and the uncertainty discussed.
- **Page 6, line 8**: Please do not use tinyurl and elsewhere. It is just obfuscating.
- **Page 6, lines 15-16**: The sentence "If there is no cloud, the sky should be clear and steady for a long period" is pretty obvious and may be omitted. But maybe you intended to say something else?
- **Page 7, line 5**: Please be a little more specific than "one of several available databases" and mention which one you used, including references and/or URLs.
- **Page 7, lines 20-25**: You seem to be concerned that the albedo changes when approaching the NIR. But that should be of no relevance for the work presented here as you only discuss UV-B and UV-A. Hence, the discussion about NIR albedo may be omitted.

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- **Page 9, line 22**: Nine variables are used to build the atmospheric states. One is the solar zenith angle which is sampled uniformly between 0 and 89°. It should be noted that the solar zenith angle dependence of the radiative transfer equation is best described by the cosine of the solar zenith angle and not the solar zenith angle. Hence, in your table 2 it would have been preferable to have $\cos\theta_s$ instead of the θ_s.
- **Page 10, line 8**: What is meant by "excepted for KB_5"?
- **Page 13, lines 22-23**: I do not comprehend the sentence "Further investigation reveals a systematic overestimation at the low irradiance from the method itself". What is this systematic overestimation of the method itself? Is there a problem with the method? Why has not that problem been corrected?
- **Page 22, Table 2**: The solar zenith angle is sampled uniformly between 0 and 89°. Was your radiative transfer calculations done in plane-parallel or pseudo-spherical geometry? Please include this information in the model description part.
- **Page 22, Table 2**: Include a column that for each variable gives the total number of samples for each variable (for Aerosol type that is obviously 7, for many of the others it is not possible to tell from the table as is). Also, where applicable, include steps. That is, for uniform distributions you include start and stop, but should also include step size.
- **Page 24, Table 4**: Why is the rBias so much worse for the direct than the global irradiance? Is this due to a worse sampling as in Fig. 1 for the direct irradiance? The global irradiance includes the direct irradiance. Is thus the error in the global irradiance mostly due to the error in the direct irradiance?
- **Pages 25-26, Tables 5-6**: Please include the number of data points included in the analysis for each station. This is valuable information to be able to better

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assess the numbers in the tables, as a station with more data points may be considered more “valuable” than one with fewer.

- **Page 27, Fig. 1**: Please indicate (label) where the various KT_{KB3}, KT_{KB4}, KT_{KB5}, and KT_{KB6} bands are on the green line.
- **Pages 27-32, Figs. 2-6**: Please combine these Figures into one as you have already done in Figure 8. Figure 8 is much easier to read and allows for much easier comparison of results from the different stations than Figs. 2-6.

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