**Response to Editor**

Authors' response to Editor comments on "Evaluation of the uncertainty of the spectral UV irradiance measured by double- and single-monochromator Brewer spectrophotometers". The authors thank the Editor for their insight as well as their careful and constructive examination of the manuscript and reply to all comments below.

The answer is structured as follows: (1) comments from Editor, (2) authors' response and (3) authors' change in the manuscript.

(1) Dear authors, I think the paper has been improved after the two rounds of revisions. It would be more easy and more valid if a few very well characterized (including the characterization related uncertainties) have been investigated and instrument with additional issues (lack of characterization and also measurement issues) were not included. However this is the reality for various operational Brewers. In a way you can mention such things in the discussion and try to talk about the analysis of well characterized instruments and others that their measurement deviations from reference instrument could be expected larger for the additional above mentioned reasons.

(2, 3) We agree with the Editor that the paper can be further improved. Consequently, a discussion has been added at the beginning of Section 4 (results) to explain why some of the studied Brewers have a cosine correction implemented, while others are lacking a characterisation of their angular response. Furthermore, Sections 4.1 and 4.2 have been modified to compare the performance and uncertainties of well characterised Brewers with those of instruments with a less complete characterisation. Moreover, the sensitivity analysis (Section 4.3) has been broadened to include remarks on the importance of maintenance and calibration, which can result in larger uncertainties if the frequency of such procedures is inadequate. Finally, the conclusions (Section 6) have also been modified to reflect the changes made in the analysis of the results.

(1) Concerning the responses

(1) I would include a summary of the discussion you include in the response of comment 1 reviewer 3 (page 3 in the author responses document), in the revised document.

(2, 3) A summary of the response given to comment 1 of Reviewer #3 has been added by modifying former lines 448–454 as follows:

"To present the results, the Brewers studied have been separated into two groups, depending on their degree of characterisation. Ideally, all instruments would be fully characterised. Unfortunately, this is not the case as there are no standard protocols for studying the cosine error and temperature dependence of the global UV irradiance measured by Brewer spectrophotometers. Consequently, most Brewers worldwide lack both temperature and angular characterisation. This situation is expected to improve as the Brewer community has recognised the importance of temperature and cosine errors and is making efforts to systematically correct these two sources (e.g. Lakkala et al., 2018).

Within this framework, the first group used in this work includes the five Brewers whose angular responses had been measured (#150, #158, #185, #186, and #256). The remaining five Brewers were gathered in a second set as their characterisation is less complete. Therefore, the second

group has two single (#117 and #151) and three double (#172, #202, and #228) Brewers. The uncertainty evaluation of the Brewer spectrophotometers in this second group is limited as the cosine correction, which is one of the key uncertainty sources in solar radiometry, is missing. As a result, the uncertainties determined are underestimated. Nevertheless, the inclusion of these Brewers is of interest as it allows both the comparison with fully corrected ones and the determination of uncertainties that, although underestimated, are representative for most Brewers worldwide".

(1) Also for comment 4 (page 5 of the responses) I would discuss a bit more on the basis of my comments above and the more detailed comments of the reviewer 3 and I would add a paragraph discussing the uncertainty estimation of well characterized instruments operating according to certain protocols ( e.g. calibration frequency, wavelength calibration accuracy, etc), compared with instruments that in addition to this uncertainty, could have additional problems that can be randomly low or high according to their additional operational issues.

(2, 3) The sensitivity analysis has been revised to acknowledge the problematic uncertainty sources for those Brewers that do not follow strict calibration and maintenance protocols. Moreover, the text has been modified to highlight the need for better characterisation of certain uncertainty sources (especially noise) and for defining calibration protocols and their frequency (to reduce the uncertainty in wavelength shifts, radiometric stability, the uncertainty of the reference lamp, and the dead time).

On the other hand, a paragraph comparing instruments that follow calibration protocols with those that can have additional problems have been added in the conclusions section as follows: "Regarding the relative values (the absolute combined standard uncertainty divided by the UV irradiance measured) of all Brewers (single and double), it is instrument specific and depends on both the instrument individual characteristics as well as its calibration and maintenance protocols. Thus, a well-maintained Brewer can reach relative uncertainties of 2–3 % for wavelengths above 310 nm. On the other hand, instruments not following strict calibration and maintenance protocols can have large fluctuations in their uncertainties, due to operational issues. As a result, they show lager uncertainties, of 3–5 % for wavelengths above 310 nm, and higher deviations from the QASUME (the European reference unit)". Moreover, to include the concerns expressed by Reviewer #3 the following information has been added regarding wavelength shifts (in line 720, Section 6): "Thus, it is important to monitor the wavelength calibration of the instrument to keep wavelength shifts below 0.1 nm as this shift lead to uncertainties of 3 % in the UV-A region".