

## ***Interactive comment on “Intercomparison of erythemal broadband radiometers calibrated by seven UV calibration facilities in Europe and the USA” by Hülsen et al.***

### **Anonymous Referee #2**

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#### General comments

The manuscript presents results of an intercomparison of single-channel radiometers designed for measuring erythemal irradiance. Such measurements may be prone to systematic errors caused by the mismatch between the instruments' spectral response functions and the action spectrum of erythema; the cosine error of the instruments; and the challenge of calibrating radiometers of this type in absolute terms. The three sources of error are discussed in the manuscript in detail. For example, measurements of spectral and angular response functions performed by the institutes owning the instruments are compared with similar measurements conducted by the campaign's or-

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ganizer, PMOD/WRC. These data are then used to interpret differences seen in solar measurements. The analysis is scientifically sound and the topic of the paper is appropriate for the readers of ACP. I recommend accepting the manuscript for publication after considering my minor "specific" and "technical" comments below.

### Specific comments

Page 2254, Lines 9-15, Page 2258, Lines 1-9, and Figure 1: All measurements of spectral response functions were performed with light sources of finite bandwidths, which are defined by the bandpasses of the monochromators used by the different UVCFs. Associated systematic errors would not show up in the comparison if bandpasses of all monochromators were similar. The bandpass of the different monochromators should be provided and systematic errors compared to measurements with a hypothetical monochromator with zero bandpass should be estimated.

Page 2255, L20 - Page 2256, L3: Equation (5) is applicable to instruments applying a cosine correction  $C_{\text{coscor}}$ . The authors may consider including a similar equation for those instruments that do not apply this correction:  $E_{\text{CIE}} = (U - U_{\text{Offset}}) C(\text{SZA}) f_n(\text{SZA}, \text{TO}_3)$  This equation would emphasize that the cosine correction is now part of the absolute calibration factor  $C$ , which becomes a function depending on SZA and possibly other factors.

Page 2256, L7: Better define  $U_D$ : Is this  $U$  from Eq. (5) averaged over the time required for measuring a solar spectrum with the Qasume spectroradiometer? Was there any weighting applied when calculating the average to take into account that wavelengths beyond 340 nm contribute only little to  $E_D$ ?

Equation (6): The denominator of the last term should be  $f_n$ , not  $f_0$ .

Page 2256, Line 21 - Page 2257, Line 3 (see also comment above): The statement that "an average cosine correction is already included in the conversion function" (which is  $f$ ) conflicts with the statement on Page 2255, Lines 15-16, that "the average cosine

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error of the radiometer is [included] into its absolute calibration" (which is C). So is the cosine correction part of f or part of C?

Page 2257, Lines 1-2: If  $\text{Coscorr}=1$  and  $f_n=1$ , and there is only a single absolute calibration factor, measurements of STUK would not be corrected for the cosine error nor for the spectral mismatch between the instrument and CIE weighting functions. If so, this should be stated here.

Page 2259, L4: More details on the extrapolation method used by the different laboratories should be provided.

Page 2260, Line 8 and Table 4: The statement "an excellent agreement of the order of +/-2% could be found" is rather optimistic considering that the deviation was larger than +/-2% for four out of six instruments.

Technical corrections

Replace "UVCF's" with "UVCFs" for all instances. The "s" should indicate a plural, not a genitive.

Using the term "owners" when referring to instruments belonging to different institutes sounds awkward. I suggest alternatives for several instances below and encourage the authors to use a different phrase for the remaining occurrences.

Abstract, line 2: "The owners calibrations" -> "Calibrations provided by the instruments' owners..."

Abstract, line 9: "determination .... has" or "determinations ... have"

Page 2251, Line 17: "when all the data was" -> "when all data were"

Page 2251, Line 18: "owners institute" -> "owners' institutes" or "owner's institute" or "institute owning the instrument"

Page 2252, Line 14: slitfunction -> slit function

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Page 2254, Line 18: "... to calculate the simulated solar spectrum ..." -> "... to calculate the solar spectrum ..." or "... to simulate the solar spectrum ..."

Page 2256, Lines 21-24: The two bullet points could be combined: "LAP and UIIMP: ..."

Page 2257, Line 7: "the originating UVCF calibration... each UVCF." -> "calibrations established by the UVCFs and PMOD/WRC."

Page 2257, Lines 8-9: "there was ... UVCF," -> "there were no direct comparisons between the UVCFs,"

Page 2257, Line 17: responsivities -> spectral response functions

Page 2257, Lines 20-23: "Errors ... introduce therefore significant ... radiometer" -> "Potential errors ... may introduce significant ... radiometers".

Page 2258, Line 1: "the owners institute... figures" -> "the other UFCFs .... The ratio of the two data sets is presented in the corresponding lower figures."

Page 2258, Line 58, Line 5: "with two institutes" -> for two institutes"

Page 2258, Line 26: "the owners institute" -> "the other UFCFs"

Page 2261, Line 20: "...function  $f_n$ , which was set to unity." -> "... function  $f_n$  to unity."

Page 2262, Line 19: "are will within" -> "are within"

Figure 3: The difference between the data sets marked with the dashed line and the "solid dashed line" are very hard to distinguish. Please chose a different line style.

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Interactive comment on Atmos. Chem. Phys. Discuss., 8, 2249, 2008.

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