

Interactive
Comment

Interactive comment on “Calibration of an all-sky camera for obtaining sky radiance at three wavelengths” by R. Román et al.

Anonymous Referee #2

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Comments on the AMT discussion paper “Calibration of an all-sky camera for obtaining sky radiance at three wavelengths”, by R. Román, M. Antón, A. Cazorla, A. de Miguel, F. J. Olmo, J. Bilbao, and L. Alados-Arboledas.

1) General comments

The paper explains a method of measuring the sky radiance field using a CCD camera. The system is calibrated against clear sky outputs of a radiative transfer model, which in turn is compared to measurements taken with a CIMEL sunphotometer. Comparisons are performed for the three equivalent wavelengths corresponding to the bandpass of the filters of the camera sensor. The authors analyze the measurements for three particular cases corresponding to cloud-free, overcast and partially cloudy skies.

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The motivation of the research is clearly stated and justified: cameras have the capability to give sky conditions with both angular and time high resolution. This compares favourably with systems based on progressive radiance scanning over a limited number of directions.

Increasing attention is currently paid to whole-sky camera systems for its capability to give a complete description of the instantaneous sky condition. Thus, research in this field is currently of interest. However, more effort in calibration methods is yet needed for a reliable measurement of radiance with cameras, and this work contributes to enhance these methods.

Given that in the proposed method a radiative transfer model (libRadtran) is used as a reference, the method has the advantage of being of general applicability to any whole-sky camera system. There is no need of calibrated sunphotometers (as the CIMEL) nor laboratory setting-up to formulate the calibration matrix.

In general, the paper is of easy understanding, well structured, clear, and fits formally to a typical scientific report. The use of formulae and units is correct. In the reference list the authors give proper credit to related previous work in the subject. The title reflects the contents of the paper, and the abstract provides a concise summary of the paper. The subject fits to the scope of Atmospheric Measurement Techniques. Conclusions are relevant and correctly derived.

In Section 4.3, only cloudless cases have been considered to evaluate the variability of the calibration matrix. Again, in Section 5.1, only cloudless images are included in the comparison between radiances obtained from the camera and the sunphotometer. I basically agree with these previous treatments. However, I miss a more complete comparison of the radiance field obtained with the camera against the radiances measured with the sunphotometer. In Section 5.2, in which the calibration matrices are applied to three images to obtain the radiance field, it would be very illustrative to show the final agreement between the camera and sunphotometer radiances for cases other

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than cloudless. Also, to show (or at least summarize) results for a somewhat larger number of cases (in particular overcast and partially cloudy) would allow the authors to strengthen their conclusions.

2) Some specific comments

Page 1878, Line 17. Given that only images recorded in 2011 have been used, the details on the degradation of the acrylic dome during 2010 are not relevant, but how the “stability” of the glass dome along 2011 was determined?

Page 1879, Line 6. Angular distortion of the lens is claimed to be less than 0.8%. How is exactly defined the angular distortion? Have the authors performed any test to determine how this parameter is modified by the glass dome? In other words, how is the mapping of the sky hemisphere over the plane CCD sensor? This mapping would affect the determination of the solid angle to be used in Equation (5).

Page 1887, Line 13. The authors assume that the calibration matrix does not depend on SZA, given that the daily variation (estimated through the coefficient of variation) of the matrix coefficients is small. However, did the authors observe any trend (dependency on SZA) in these coefficients?

Section 3.2. When comparing the radiative model against the sunphotometer measurements, authors give the mean and the median of ARE (absolute relative error) in Figure 3. Why the authors do not give statistics of the differences, that is, not only the absolute differences? This would inform about systematic deviations.

In the conclusions, the authors should stress the applicability of the method by other groups with available camera systems, given that only a radiative transfer modelling is needed to obtain the calibration matrix.

3) Some technical corrections

A spelling revision is advisable, for example:

Page 1876, line 24. "...transfer models..."

Page 1880, line 5. "... there is no lo longitudinal..."

Page 1881, Line 24. "... UVPSEC..." should be "... UVSPEC..."

References. Voss and Zibordi (1989) is incorrectly cited as Voss and Zibordi (1988) within the text.

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