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Atmospheric Measurement Techniques Discussions

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

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The authors greatly acknowledge the anonymous reviewer (Referee #1) for carefully reading the manuscript and providing constructive comments.

We would like to thank the Referee for his positive comment on the scientific relevance of the manuscript and on the interest in its publication in AMT. On the other hand, we understand his comment on the shortcoming of the method, based on modelled sky radiances. For this reason the reviewer suggests the use of a calibration method based on the experimental radiances derived from a CIMEL sun-photometer that could be considered as 'calibration standard'. In the next lines we will explain the two main advantages of the modelled radiances against experimental data to calibrate the all-sky camera:

1. The effective wavelength. First, due to the spectral response of the camera, we calculated the effective wavelengths as is indicated in the manuscript. These effective wavelengths differ significantly with respect to the CIMEL's wavelengths, thus, we cannot use directly CIMEL radiances to calibrate the all-sky camera. For that, we should extrapolate the CIMEL radiances to the effective wavelengths, increasing the error in the reference measurements. Another possibility could be to set as effective wavelengths of the camera the CIMEL wavelengths, but this increases the error too. It is true that the use of the modelled radiances as reference produces 5-15% (due to uncertainties in the inputs), which is higher than the 5% of the CIMEL radiances (Holben et al., 1998, cited in the paper). However, the uncertainty in the CIMEL radiances will increase if is extrapolated to the camera wavelengths. Therefore, we think that a radiative transfer model is a useful tool to obtain radiances in the effective wavelengths of the all-sky camera in order to calibrate it.

2. Field of view. Another great advantage of the method proposed in our paper is the full-sky calibration of the camera. Thus, reference radiances can be simulated for each pixel of the camara (full image of the sky radiance), getting the calibration of all pixels. In contrast, the use of the CIMEL radiances as 'calibration standard' limits substantially the number of the pixels that could be calibrated. This is due to that the camera is mounted in a sun-tracker, which cause that the principal plane is always viewed by the same pixels. This implies that the use of principal plane is useful to calibrate only a few pixels. Additionally, the AERONET almucantar measurements are only available for solar zenith angles higher than 40°. Therefore, the use of the CIMEL-AERONET measurements allows calibrating only a portion of the sky camera.

In conclusion, we understand the reasons to use the method suggested by the Referee, but we think that the use of modelled radiances as reference in the camera's calibration is an useful alternative method with two relevant advantages with respect the use of CIMEL sun-photometer as 'calibration standard'.

In reference to the comment of the reviewer on the utility of the methodology described in the manuscript, we consider that the proposed calibration method can be useful to improve cloud cover detection algorithms, for the retrieval of cloud properties, and for global studies of sky radiances under different sky conditions.

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