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Atmospheric Measurement Techniques Discussions

Interactive comment on "A new method for nocturnal aerosol measurements with a lunar photometer prototype" *by* A. Barreto et al.

Anonymous Referee #2

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General Comments:

This paper presents a new technology to use it for Moon measurements, based on a modification of the present used sun photometer type CIMEL 318 and new analyze procedure by using of the ROLO (RObotic Lunar Observatory) model. Moon photometry is an important tool to close the gap during night and is very attractive especially for polar region, where we have over several months the only possibility to use the Star photometer technology up to now. Which the present systems (combined Sun and Moon photometer) for night measurements based on the original idea from Berkhoff et al., (published in Journal of Atmospheric and Oceanic Technology 2011) it will be possible to collect data during night. In compare to the sophisticated star photometers,

motivated for measurements during night, the present Moon photometer technology is an attractive tool for measurements at every place continuously with one system. But please don't forget the Moon photometer using cannot cover the entire night period due to the changing of the Moon phase. The complete night can only covered by the operation with the star photometer.

The paper shows the new technology and the different possibilities to calibrate the Moon measurements. The presentation of the background and technical modification is excellent and very good understandable (Section 1-3, 5). The presentation of the Calibration procedure and Discussion should be improved; sometime a clear line is missing due to a mixture of calibration procedure and data interpretation (Section 4 and 6). The paper is well written and the original manuscript is now improved within the actual review phase. However, I am wondering that few comments from Reviewer 2 (D. Perez Ramirez) were not better answers/explained, especially, question 11, 13, 14.

Specific comments:

1) The detailed discussion on the limitation of Moon measurements is still poor. It is well-known, that during the half Moon phase the measured Moon light is only 10% in compare the full Moon phase and I am doubtful that you can get proper results in case of Moon phase less then 50%. In all figures it would be night to give the information on the present Moon phase. It would be great if in the summary exist also an recommendation in which case we can use the Moon technology. The advantage and disadvantage could be summarized here too.

2) One of the objectives of the paper is the presentation of new calibration procedure for Moon measurements and the author present three different methods, but the advantage and disadvantage of the different measurements is shown only by few episodes – August, and October 2011 and February 2012. AOD measurements during night are presented in Figure 1,2,3 is based on measurements with the system CE-1, but which

is the accuracy of the derived AOD. I am missing information on he quality of the calibration procedure and the final demonstration of it, similar to Berkoff et al paper, see Figure 5 (Langley analysis of the data from Figure 4, with linear regression fits - solid lines - to independently determine optical depths).

3) Some of the information under 2 (Site information) are not really relevant for the actual discussion and this part could be shorter. The authors mentioned in 3.4 (Ancillary information for data validation) to use FLEXTRA, but later on it is not really use.

3) The number of tables should be reduced and combined. It is for the reader not completely clear, which additional information occurred by separation of the long list of tables. The main focus should be here to present the results from calibration Method 1 and Moon system CE-1.

4) Section 6.1 (Mehtod#1). In case of the focus of the paper lie in the calibration procedure, then you should start the discussion in section 6.1.2 with the discussion on low and stable aerosol burden, which are occurred in February 2012. The quality of the Langley procedure is strongly depended on the quality of the atmospheric conditions. The measurements in August (Section 6.1.1) are can demonstrate here only the variation during day and night and the conclusion should be, that this time period is not really useful for calibration. I think this are the concern from D. Perez Ramirez.

5) Section 6.2 (Method#2): You have written: "δa comparison for the day after the calibration (10 February) shows a good concordance between the values obtained from the master and the secondary instrument, with averaged differences up to 0.002." – I cannot agree it, this is only true for few wavelengths, see my comments point 10. Please specify it better in the text.

6) Section 6.3 (Method#3): It seems that Mehtod#3 is less accurate in compare to Mehtod#1 due to uncertainly by the determination of solid angle Ω. I cannot read, what do you proposed to increase the accuracy of this parameter. You mentioned only that the quality of Method#3 will improved. Please specify it in more detail

7) Section 6.4 (Ångström's exponent) could be removed completely. The topic of the paper is to present a new method of nocturnal aerosol measurements with a new lunar photometer. The derivation of Ångström parameter and their interpretation is a separate story and more attractive when you discuss separately the differences between aerosol burden during day and night. The aim of the day measurements here is only to show the coincidence between day and night measurements, based on the selected calibration procedure

8) Table 5 could be removed. Here is the only important information, that CIMEL and PFR during night measurements are comparable, that can be mentioned in the text. The comparability between Sun and Moon measurements is shown in different. Table 6 is also not really substantial due to doubling information with Table 7, where the absolute difference between two different Moon photometers is clearly present. I don't see a real reason to present here the results in more detail of the second Moon photometer, called CE-2. I think it is enough to present with table 7 the comparability of both systems during night measurements and concentrate of the output of CE-1.

9) Table 9 – 10 and Table 11 and 12 could be combined in each one table. I don't see a reason, why you have it separated. But you have to consider giving here detailed information on the differences between day and night and on the quality of the calibration. The number of tables is here not really attractive. Sometime it is better do present the difference between different methods by plots.

10) Table 7 and Figure 4 give the same information, whereby the Table 7 is much better, whereby it seems for channel 440 nm, 550 nm and 1020 nm the absolute differences are at least partly bigger. Based on Figure 4, I had concluded, that not for all wavelengths exist an excellent coincidence.

11) Are Figure 1,2,3 based on the calibration values derived from Method#1 ? To see the still existing differences (uncertainty in determination of calibration values in Method#3) it would be nice to have a similar plot like Figure 4 to show the coincidence

or discrepancy in the derived AOD. Exist here a wavelength dependence or is the coincidence similar for each wavelengths.

12) Section 7 (Summary and Conclusion): I mentioned under point 1, that for the reader finally some statements on constrains, advantage and disadvantage of the Moon measurements would be helpful. It is true, that your recommendation is finally to use Method#3 instead of using Method#1, after improvement of the solid angle Ω.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5527, 2012.