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Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurements on pointing error and field of view of Cimel-318 Sun photometers in the scope of AERONET-Europe" *by* B. Torres et al.

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We would like to thank Referee #2, C. Werhli, for all the constructive suggestions he proposed. They have been certainly useful and we have incorporated them in the revised version of the paper.

Before starting the analysis of the "detailed comments" we would like to apologize for the several typing mistakes contained in the manuscript. In our "tex" sources files, the numbers were correct but it seems that during the latex-conversion done in the editing process there were some errors that we did not detect. We will check more carefully

the revised version.

To make the discussion clear from the beginning: 0.05° is the minimum step of the motor, 0.01° is the difference in the pointed error obtained between matrix and cross analysis and 0.1° is the typical pointing error obtained in the analyzed sun-photometers.

On the other hand, we have added a discussion on the scientific relevance of a more accurate knowledge of the Cimel pointing in the end of the paper, as suggested by the referee. Finally, we have tried to improve the English grammar throughout the text.

Answers to the specific questions/comments follow here:

"From the conclusions it remains unclear what impact the inclusion of the CROSS scenario will have on AERONET protocols: will the list of instrument check flags be extended; or will also the accuracy of AERONET data products be further improved?"

These flags will be incorporated to the quality checks the we perform internally for the sites we are in charge of (calibrated at GOA or LOA). However we can only propose these to NASA and it is not in our hands that such flags are incorporated to the AERONET protocols. Note that many instruments in the network do not have the capability to perform the CROSS scenario (old Cimel versions, etc.). Nevertheless, the new CIMEL-sun photometer version (release Dec.2013) will have incorporated the CROSS measurement.

P3017 to 3019 I might miss an essential point made here, but the relation of (8) to (2) seems a trivial one, please advise.

We think that the idea of defining the pointing error in terms of the scattering angle is quite illustrative, therefore we would prefer to retain it in the paper, as a theoretical basis for the discussion. This discussion could allow the reader to understand the concept of the pointing error a bit better, even though some terms or equations can be found redundant, as it is the case with eq. 2 and 8, in which we reach the same results from 2 ways.

P3020, L 5 - 12 the style of this section explaining relations between next subsections is hard to read and understand. Consider reformulating the single phrase consisting of a sequence of dependent clause to a clearer structure of statements.

Its true. We have reformulated the sentence and we hope that now its clearer.

P3020, L21 2.2 Field of View In this chapter, the terms field of view (degrees) and solid angle (sterad) are used indiscriminately, please reformulate.

We have added a footnote the first time we name field of view in the section indicating the relation between field of view and solid angle. We have also replaced field of view by solid angle in those places where it was pertinent in the whole chapter.

P3022, L9 "New scenarios" The term "scenario" is well known in the AERONET community, but would need more explanation for the general reader. "Procedure" might be a better term

It is true, a more general term is needed that's why we replaced it by "procedure".

P3023, L8 it remains unclear why the tolerance for the GOSUN scenario is as low as 0.03°. Given a field of view of 1.2° and a solar (angular) diameter of 0.5° , I would estimate a tolerance of $\pm$0.35° . The demonstrated pointing accuracy of 0.01° would then be excellent indeed, but just marginally OK if the tolerance is just 0.03° .

As mentioned, there was an extra "0" in the number. We wanted to write: "the tolerance is about 0.3° in the Cimel sun photometers". In fact, you are right and the exact number should be assuming a field of view of 1.2° and a solar diameter of 0.5° the tolerance is 0.35°. In a parallel study, which will be mentioned in the discussion, we assume a maximum pointing error of 0.4° (a bit larger than 0.35°) in order to estimate the consequence of the pointing error in AERONET retrievals.

P3024 section 3.1.2 Solar movement during the matrix scan were to be anticipated and could be explained analytically: the solar hour angle changes at a fixed rate 15"/sec in equatorial coordinates, thus the transformation to the horizontal system is just a

trigonometric one, taking the annual changes of solar declination into account. The manuscript could become more readable by shortening this section and eliminating parts or all of Figures 3 to 6.

Although the sun "speed" is constant in equatorial coordinates, the implications to the horizontal system depends on the solar zenith angle and the time of the day. We think that plotting the correction per second needed using a real example will allow a general reader to better understand the need of the sun movement correction than if we merely say that the solar hour angle changes at a fixed rate 15"/sec in equatorial coordinates. Again, we reckon that the details are not out of place in this section.

P3027, L27 How can the new scenario perform scans with 0.01° resolution (sect. 3.1.1) when the basic step size of the Cimel robot is 0.05°?

This was a typing mistake. The correct value in the sentence is 0.1°, as it can be deduced from the data of Table 2 and Table 3.

P3030 no explanation is provided why results for visible and infrared (1640nm?) channels are given as separate columns in Table 5. If the intention is to demonstrate the parallelism of collimators for Sun- and Sky measurements, please state explicitly in the caption and text.

Thank you. We state it explicitly in the caption and in the text.

P3032 on the Laser measurements Expanded laser beams have a Gaussian intensity distribution for the TEM-00 mode, and may show inhomogeneous beam profiles for higher order modes. Did your setup include a spatial mode filter, and what fraction of the beam diameter was scanned during the matrix measurements?

We have introduced a spatial filter using an aperture of 12 microns situated in the focal plane of the microscope objective lens with f'=16 mm. The collimator lens has had a focal length of 30 cm producing a expanding relation around 1:20. After the beam is expanded, only the part limited by the entrance pupil of the photometer, which has a

diameter around 5 mm, is used. Consequently, with both systems expander and optical filter, the uniformity of the beam is guaranteed and without coherence noise (Speckle). This is explained and added in the article.

*Technical corrections: P3017, L5 "dr = 0" seems out of context P3020, L1 the phrase seems out of its context P3023, L2 'slack' instead of "game" Tables 2 to 7 although obvious, the unit "degree" should be given in the caption Table 5 first column lacks header "Photo" and # indication for serial number

Thank you for the corrections. All of them were followed.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3013, 2013.