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Interactive comment on “Improving Langley calibrations by reducing diurnal variations of aerosol Ångström parameters” by A. Kreuter et al.

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General response:

The sun photometer has been calibrated at the PMOD by comparison with two (Langley calibrated) standard instruments, which has been added in the manuscript (line 8, 6485). The quality of the calibration is comparable to a good Langley calibration as shown by the small standard errors of the quoted certificate (line 11, 6485).

The aim of our paper is to propose a method of improving this calibration by using the spectral AOD rather than the AOD for each channel independently. This aim is clearly stated in the title, abstract and conclusion. As noted in the discussion, the reason why

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our method may improve Langley calibrations is because “the spectral AOD relations are more sensitive to calibration errors and independent of natural AOD variations.”

Detailed response:

6480 lines 18-19 One of the main difficulties with filter radiometers is maintaining the calibration because of changes in the filter transmission.

The sentence is indeed misleading, as also noted by referee #1, but the accurate determination of the calibration and its invariance over time are two different issues. The sentence has been modified accordingly:

The main challenges in sun photometry are the calibration as well as ensuring a constant filter transmission [Shaw, 1976].

6482 lines 22-24 Only two of the wavelengths are within 10 nm of the AERONET wavelengths. These two instruments, at least in terms of wavelength sampling, are not especially similar.

This is true. We have rewritten the sentence, including in the list 380 nm as an additional common wavelength amongst AERONET channels:

For comparison, commonly used wavelengths measured by the AErosol Robotic NET-

work (AERONET) are 380 nm, 440 nm, 500 nm, 670 nm and 870 nm [Holben et al.,

1998]. 6483 lines 18-19 The citing of King et al 1978 is incorrect. This is not an accu-

rate description of what was done in that work.

This is true and we have corrected the sentence:

King et al. [1978] have introduced a numerical inversion of the spectral AOD to obtain the aerosol size distribution.

6483 line 24 “in allusion to” not “in allusion of”

This has been corrected.

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6483 lines 26-29 This paragraph is poorly written and difficult to understand, please reword to clarify.

AMTD

The paragraph has been rewritten for improved readability:

With its appealing simplicity, this representation reveals for example diurnal aerosol evolution such as humidification or drying. In this context, calibration errors and resulting artificial DVs of α and γ are specifically relevant, because they modify the AGa-plot and its interpretation.

6487 lines 25-26 Why do you believe that type and size is more likely to remain constant at a site like Innsbruck? Is it dominated by a single aerosol source? It would seem that any location dominated by a single source of aerosol (i.e. type and size) would be amenable to the technique presented in this paper.

A similar question is asked by reviewer #1, so we have carefully rephrased the corresponding paragraph to make this point more clear:

The reduction of the calibration uncertainty achieved here stems from the consideration of the spectral AOD, i.e. the combination of all channels as opposed to each channel individually in the Langley methods. The spectral AOD relations are more sensitive to calibration errors and independent of natural AOD variations. Langley conditions (constant AOD) are hardly met at low elevation stations, while constant spectral AOD conditions do occur more frequently. This is an empirical observation based on our aerosol climatology in Innsbruck and we do not see any principal reason why it should not be more generally applicable to other stations.

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