Atmospheric Measurement Techniques Discussions

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

Anonymous Referee #1

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The authors argue quite convincingly using a Monte-Carlo simulation that the calibration of sun photometers using Langley plots can be improved by requiring that the spectral shape of the AOD remains diurnally stable and instead dropping the assumption of a stable AOD. While intriguing how would one now that the spectral shape is diurnally stable? The authors start out with a lamp calibrated sun photometer. What happens if Vo is not known from the outset?

Some other concerns this reviewer has are detailed below in the order they appear in the manuscript.

Page 6480, Line 18: The sentence "Ensuring a constant filter and detector response, the main challenge in sun photometry lies in the calibration (Shaw, 1976)." is mislead-

ing. In fact it is mostly the instability of the filters that cause a change of the calibration of sun photometers in the first place.

Page 6481, Line 18: The Holben et al. (1998) reference does not really discuss the accuracy of Langley plots. A more appropriate reference is Schmid et al. (1998) as they thoroughly discuss the error budget of mountain-top Langley calibrations (see their Table 5).

Schmid, B., P. R. Spyak, S. F. Biggar, C. Wehrli, J. Sekler, T. Ingold, C. Mätzler, and N. Kämpfer, Evaluation of the applicability of solar and lamp radiometric calibrations of a precision Sun photometer operating between 300 and 1025 nm. Appl. Opt., 37(18), 3923-3941, 1998.

Page 6482, Line 10. Is the German word "Ansatz" really used in English as well?

Page 6482, Line 12. The authors' claim that the quadratic equation has only recently been used is not correct. M. King has used the quadratic form in a publication in 1980. King, Michael D., Dale M. Byrne, John A. Reagan, Benjamin M. Herman, 1980: Spectral Variation of Optical Depth at Tucson, Arizona between August 1975 and December 1977. J. Appl. Meteor., 19, 723–732. doi: http://dx.doi.org/10.1175/1520-0450(1980)019<0723:SVOODA>2.0.CO;2

Page 6482, Line 23: The wavelength cited here are not similar as the authors claim

Page 6483, Line 18: The King et al (1978) paper is not represented correctly here. King et al (1980) use an actual inversion on the entire spectral shape and not just based on alpha and no mode radii are preset.

Page 6487 The statement "Furthermore, the Rayleigh scattering contribution to the total optical depth becomes dominant at smaller wavelengths, and leads to decreasing sensitivity to calibration errors for short wavelength channels." seems incorrect. An calibration error of say 2% will lead to an error in AOD of 0.02 for m=1 regardless of the Rayleigh AOD.

Page 6487 Line 24: Why would the spectral shape of the AOD show better diurnal stability in Innsbruck than elsewhere?