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Atmospheric Measurement Techniques Discussions

Interactive comment on "Non-parametric and least squares Langley plot methods" *by* P. W. Kiedron and J. J. Michalsky

Anonymous Referee #4

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General comments:

The authors describe 11 different mathematical procedures or methods based on the Classical Langley Plot method for radiometer calibration in field sites (or in situ) in order to determine the best Langley plot or the best method (between them) that obtains the best calibration. The general topic of this work is of general interest for radiometer calibration but as the authors mentioned it is not possible to give an answer on which method is the most appropriate because the results demonstrated that there is not a significant difference between them in order to determine the calibration constants when they are smoothed or interpolated.

Certainly I have not major objection about the paper, as a whole is well structured

and written, although some points are difficult to follow for the detailed mathematical description. Also Figure 2 is not easy to understand. What I can not derive of the paper is if the authors do a Langley plot for every day of measurements or they put some criteria to select special days where apparently the AOD might be a constant. This point must be said explicitly.

My major objection is related with the calibration methodology itself. At the end the authors develop or analyse all these procedures in order to get the best possible calibration method based on the application of the Langley Plot Method. They have chosen the Classical Langley Plot Method (avoiding other related methods that do not meet their approaches) where the main assumption is the constancy of the aerosol optical dept (AOD) in the morning or the afternoon. However, they have forgotten to reference the works of Cachorro et al., 2008a,b, c; and 2004 (and some other references inside), that in my opinion contain one of the most advanced procedure (they named KCICLO method) about this problem based on the Classical Langley Method and where the authors consider other references that analyse the same problem.

The authors insist in the use of statistical-mathematical methods to solve the problem of calibration forgetting in part the physic of the problem, when the exposed procedures are only the auxiliary tools. Precisely, as auxiliary tools these analysed procedures are necessary because always the fitting of the observations need to be done, with a more o less modification of the original equation of the Langley method. In this sense the analysis made in this paper is valid and of interest. The authors mention the parabolic shape of AOD (the authors call anomalous Langley plot) as an external problem when it is consubstantial with the Langley plot procedure itself according to Cachorro et al. papers. Therefore a justification is necessary of the convenience or not of using the method of the KCICLO.

A suggestion to the authors, it would be good the application of the KCICLO method extensively described in the four papers of Cachorro et al., to determine the calibration constants of their AOD data series and analyse the results in comparison with these

11 procedures. Otherwise, bear in mind that the KCICLO method can be applied as a correction method of the actual AOD data without any information about the calibration constant (this is one of the major advantages) but if the previous calibration constants are known the new can be determined. Besides the KCICLO can be also used for a direct calibration process. The latter is not used in Cachorro et al., (2008a, b) but the authors describe this possibility as a two-step Langley Plot calibration.

In any case a good statistical or mathematical method is necessary to avoid outliers and do a correct fit and hence all the procedures described in the article are valid in a general context. Hence I found valid this article but it must bear in mind that to assume the best statistical method as the best procedure to solve the calibration problem is not the best solution, as the authors want to reflect in their article.

REFERENCES Cachorro et al., 2004. The fictitious diurnal cycle of aerosol optical depth: a new approach for “in situ”calibration and correction of AOD data series. Geophysical Research Letters, 31, L12106 (2004).

Cachorro et al., (a) An “in situ” calibration-correction procedure (KCICLO) based on AOD diurnal cycle: Application to AERONET-El Arenosillo(Spain) AOD data series. Journal Geophysical Research, 113, D12205, (2008).

Cachorro et al., (b) An “in situ” calibration-correction procedure (KCICLO) based on AOD diurnal cycle: Comparative results between AERONET and reprocessed (KCICLO method) AOD-alpha data series 2000-2004 at El Arenosillo (Spain). Journal Geophysical Research 113, D02207, (2008).

Cachorro et al., © Comment on “On Langley plots in the presence of a systematic diurnal aerosol cycle centered at noon: A comment on recently proposed methodology” by F. Marenco. Journal Geophysical Research, 113, D11210 (2008).

Specific correction 1. Page 4207 line 17. the sentence “We conclude that the OA, if it errs, it errs on being conservative, i.e., What means errs?

2. Page 4208, line 8: please check "by a moving a boxcar filter"

3. The word Centrete as Center in the Acknowledgements.

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