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Atmospheric Measurement Techniques Discussions

Interactive comment on "Continuous Light Absorption Photometer for Long-Term Studies" *by* John A. Ogren et al.

Anonymous Referee #1

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GENERAL COMMENT

The manuscript describes a new absorption photometer, designed for the continuous measurement of the aerosol light absorption coefficient. The instrument is based on the well-established PSAP method and extends its approach for continuous measurement. The presented instrument fills an important gap in the available suit of instruments available for measuring aerosol light absorption since the PSAP will no longer be available. The manuscript is in the core focus of Atmos. Meas. Tech., it is well written, and is acceptable for publication after minor changes have been considered.

The main comment refers to the correction scheme applied to the CLAP attenuation coefficient data for converting it into absorption coefficients. In the abstract, the authors state that the improved performance of CLAP compared to PSAP is achieved by

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Discussion paper

means of an improved correction scheme. When reading the manuscript, the differences between the CLAP correction scheme and the Ogren (2010) scheme for PSAP is not clear. On the other hand, the authors provide a detailed analysis of instrument uncertainty terms which is clear and well presented, and results in an improved understanding of the uncertainty of absorption coefficients provided by CLAP, compared to those provided by PSAP. Furthermore, the determination of the spot area is significantly improved, which also helps improving the data quality. Overall, a summarizing section would be helpful, which highlights the new features of the full correction scheme.

The comparison between CLAP and PSAP (Fig. 10) is convincing. Looking at Fig. 11 there seems to be no systematic behavior of the scatter of regression slopes between CLAP and PSAP. To fully understand the meaning of this observation it would be good to see plots similar to Fig. 10 for a couple of stations with slopes close to unity and at the extreme values. Whereas the average ratio of PSAP to CLAP absorption coefficients is 0.94 and the scatter of ratios does not show any dependence on the attenuation coefficient, it would be of interest if the scatter of station correlations can be related to intensive aerosol properties like average single-scattering albedo etc. The overall question here is whether the correlation between CLAP and PSAP is robust for each station, but with a slope different from unity. If this is the case, then a discussion of this finding would be helpful.

MINOR COMMENTS

Page 1, line 32. An overview of existing correction schemes for the Aethalometer are compiled in Collaud Coen et al. (2010). This paper should be cited.

Page 2, line 8: It should read “10 μm” instead of “10 mm”.

Page 2, line 10: The reference to Ogren’s comment (Ogren, 2010) on the calibration of filter-based instruments might be given here since it describes the method used for correcting PSAP data at multiple wavelengths.

Page 2, line 11: Filter-loading and multiple-scattering effects should not be referred to as errors of filter-based methods but as intrinsic effects given by the physical processes involved in the signal generation.

Page 3, line 15: The correction (Virkkula, 2010) to Virkkula's PSAP algorithms (Virkkula et al., 2005) should also be referenced here.

Page 6, line 27-36: This section on CLAP noise versus PSAP noise needs to be further elaborated. So far, only experts knowing the work of SS07 can fully understand this section. The overall conclusion of this section should be mentioned more explicitly.

Page 7, line 7: The noise measurements are presented in Section 3.6.

Page 22,Fig. 10: Why not adding detailed values incl. uncertainties for slope and offset of the regression line? Is the offset statistically significant?

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