

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

Anonymous Referee #3

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The authors describe a new filter photometer which has been extensively laboratory and field tested. The manuscript is very concise and compact and should be published as soon as possible subject to the recommendations below.

It would be beneficial to the article to present more comparisons to a more varying set of different instruments for the measurement of Black Carbon or the determination of the aerosol absorption coefficient. The comparison to the PSAP is important for continuity, but intercomparisons of the CLAP with other instruments have been performed and could be reported here.

The fixed parameters in Eqs. 3 and 4 are a “widely accepted correction scheme” for the PSAP. This does not necessarily mean the most accurate one for each particular site, as the filter-particle interaction in filter photometers depends on the sample, not just the

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filter properties. A wider and more comprehensive discussion on the applicability of a fixed scheme for the sites where the PSAPs and CLAPs were installed would benefit the readers, especially the discussion of the limitations of a fixed scheme. This would be appropriate for the article and should be included. Please see also the comment below (page 1, line 32).

Detailed comments

Page 1, Line 7: The authors mention the “measurement” of the absorption coefficient. In fact the measurement is of attenuation and the absorption coefficient is “determined”, using a correction scheme. I would recommend to use “determination” here and throughout the manuscript.

P 1, L 16: “... light absorption measurements are recommended for all stations in the [GAW] network...”. Please add a reference.

P 1, L 32: “...the Aethalometer doesn’t yet have a widely accepted correction scheme.” Several sentences describing the different schemes would help, including the most widely used ones for the PSAP (Bond et al., 1999; also in light of Virkkula, 2010) and the Aethalometer (Weingartner et al., 2003). The discussion on the separation of the influences of the loading effects and the multi-scattering on the measurement would be highly appropriate, especially since the final goal is to determine the absorption coefficient.

P 2, L 8: “... 10 mm aerodynamic diameter;” 10 micro-meters.

P 2, L 11: Filter loading and multiple scattering are not “errors”, but effects that need to be taken into account when the absorption coefficient is determined.

P 3, L 21: The influence of the internal heater on the sample should be elaborated on, for example, temperature specified and the influence on the volatile fraction of the sample discussed.

P 4, L 1: Specify the model of the TSI nephelometer.

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P 4, L 13: Since there is no flow control, the needle valve will have a varying influence on the flow which will depend on the loading of the sample spot. What is the variation of the flow at the start and end of the sampling through one of the 8 spots? Does the variation of the face velocity matter for the correction scheme?

P 4, L 24: Please add the model of the external pump which was used in the laboratory and ambient experiments.

P 5, L 32-34: Please explicitly mention that the sample interval Δt is the 8 hour period.

P 6, L27-36: For the readers not familiar with the Springston and Sedlacek (2007) paper, please add a description of Cases I-III and the reason for the different slopes.

P 7, L 17: "Fig. 8 shows the results of evaluating Eq. 6. . ." It is Eq. 7 that is evaluated.

P 8, L 12: The intercept in the regression here is not fixed, but it is in a later comparison (PSAP to CLAP). It would be more concise to use a single approach, given the small intercept, I recommend forcing the regression through the origin in all regressions in the manuscript.

P 10, L 2: "... has proven to be...". Please add references, especially for the aircraft operation.

P 10, L. 13: "...yielding results that are about 25% higher..." Please specify the parameter, rather than "results".

Figure 10: "The slope of the regression line is 1.04 ..." Is this the inverse of the regression line slope mentioned in the text (are the x and y axes different than the ones referred to in the text)?

I applaud the authors in releasing the technical information of the new instrument, including the technical drawings, PCB layouts and the source code. It would be clearer if the license for this documentation would be explicitly mentioned.

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References

Bond, T. C., Anderson, T. L., and Campbell, D.: Calibration and intercomparison of filter-based measurements of visible light absorption by aerosols, *Aerosol Sci. Tech.* 30(6): 582-600, 1999.

Virkkula, A.: Correction of the Calibration of the 3-wavelength Particle Soot Absorption Photometer (3λ PSAP), *Aerosol Science and Technology*, 44: 8, 706-712, 2010.

Weingartner, E., Saathoff, H., Schnaiter, M., Streit, N., Bitnar, B., and Baltensperger, U.: Absorption of light by soot particles: determination of the absorption coefficient by means of aethalometers, *J. Aerosol Sci.*, 34, 1445–1463, doi:10.1016/S0021-8502(03)00359-8, 2003.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2017-212, 2017.

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