

Interactive comment on “Correction for a measurement artifact of the Multi-Angle Absorption Photometer (MAAP) at high black carbon mass concentration levels” by A.-P. Hyvärinen et al.

Anonymous Referee #2

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The authors described an instrumental artefact, which can have a large influence on derived BC concentrations in highly polluted areas. The authors described conditions for which the artifact occurs and developed methods for correcting for it. The manuscript is of great use for MAAPS users.

The paper is well written and clearly structured. The data evaluation and conclusions are sound. The reviewer recommends the paper for publication after addressing following comments.

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Detailed comments:

Page 6556 lines 5-8: The instrument should be introduced by referring to the manufacturers. The references given in this context refer to corrections methods.

Page 6559 line 21-22: The mass-specific absorption cross section was published to be 6.6 m²/g together with the wavelength of 670 nm. Is this mass absorption coefficient still valid for the true wavelength of 637 nm?

Page 6557, line 14: From the context the reader could think that the MAAP method to derive BC concentrations was published in Mueller et al. (2011). In fact, in that publication the wavelengths was corrected to be 637 nm and not 670 as given in previous publications and the user manual of the manufacturer.

Equation (1a): Is it right that $b_{AP,MAAP}$ is the particle absorption coefficient? This equation corresponds to Eq. (2) in in Petzold et al. (2005) and it was written “The final relation between $b_0(MAAP)$ [equals $b_{AP,MAAP}$ in this manuscript] and the aerosol absorption coefficient b_{ap} may require correction factors. . .”. To the reviewers knowledge $b_{AP,MAAP}$ is the absorption by the particle loaded filter. Therefore $b_{AP,MAAP}$ possibly includes an enhancement factor (response function) by the filter scattering. In Petzold et al. (2005) this response function was found experimentally to be close to unity (cf. Eqn. 4 and Fig. 4). A response function of unity does not change the results of this manuscript, but the reviewer thinks that this point should be clarified.

Page 6561 line 14: typo, should be “. . .related to erroneous. . .”

Page 6561 line 13-17: The hypothesis that artifacts are caused by erroneous dark counts and the instrument internal averaging lets to following question. Do different MAAPs show same magnitude of the artefact?

Page 6561 line27: This is related to the previous comment. Was it tested to operate s/n 145 as low flow and s/n 87 as high flow instrument. This could be a test if both MAAPs show quantitatively the same artefact?

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Chapter 3.3: All steps of processing data are described well. Although, the reviewer thinks it would be worth to show the data and fitted curves, which let to equations 7, 9, and 10.

Page 6567 line 13 to 15: The author should explicitly specify for which aerosols Eq. (5) is valid. Is this method applicable for highly scattering aerosols?

Page 6568 line 24 to 26: Print format 12 is stated as being the best data format. Then the full MAAP data evaluation as described in Petzold and Schönlinner (2004) can be done based on measurement of transmittance and two reflectances. Why this method is not suggested? Are the transmittance signals given in PF12 correct or faulty? That should be stated explicitly in the manuscript.

Figure 2: The authors should think about rescaling the figure since it is difficult to see details for 'regime 1'.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6553, 2012.