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Atmospheric Measurement Techniques Discussions

Interactive comment on "On Aethalometer measurement uncertainties and multiple scattering enhancement in the Arctic" *by* J. Backman et al.

Anonymous Referee #2

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Review on ' On Aethalometer measurement uncertainties and multiple scattering enhancement in the Arctic' by J. Backman et al.

General comments

The articles deals with two issues of filter based absorption photometers: First, the reduction of noise by data post-processing, and second, an empirical determination of an enhancement factor due to multiple scattering. These issues have physically different origins and are not related. Anyway, it is justified to present both one article. The noise reduction is essential for deriving multiples enhancement factors in environments with low ambient absorption coefficients as it is the case for Artic aerosols.

The article presents new insights in characterising filter based absorption photometers and gives good advices to other scientists for instrument setup and data processing in environments with low aerosol concentrations. The existence of scattering enhancement factors is a known fact in the scientific community. It is the first time that enhancement factors were derived for the Artic.

The paper is well written and clearly structured. The content meets the requirements to be published in AMT. The reviewer suggests the article for publication with minor corrections.

Specific comments

Page 9, line 5: The authors estimate an uncertainty of determining the filter spot area to be 2%. Is that the actual uncertainty derived from the spot to spot variability or is it the precision of the measurement of a single spot area. Were time series corrected for systematic deviations of the spot size (cf. Eq. 2) as described in Bond et al. (1999) for the PSAP.

Note: Page 7 line 26 ff.: The reviewer thinks that it needs to be better explained why data from CLAP are corrected using the "Bond" corrosion. One possibility could be as follows. PSAP and CLAP use the same type of filter and similar design. Nakayama et al. (2010) showed that similar instruments, COSMO and PSAP, with the same type of filter have a similar size-dependent scaling factor. A similar size dependent scaling factor is a hint that the overall correction could be similar. Are there other publications showing that CLAP and PSAP are similar in the literature?

Page 7, line 16 ff: Why is it justified to use PSAP, MAAP, and CLAP as reference instruments? On page 14 line 13 the authors wrote "...the reference absorption measurements also rely on measurements using filter-based absorption measurements - it remains unclear to which extend this will affect the absolute value of C_ref ...". The reviewer agrees that a full analysis of the error of C_ref under this circumstances is not possible. Anyway, the question still is what are the advantages of PSAP, MAAP, and

CLAP compared to Aethalometers and what are the reasons for using this instruments as reference. Otherwise, C_ref would merely be a harmonisation factor for comparing results from instruments of different type.

Chapter 4.2 The reviewer thinks that estimated uncertainties and detection limits for the reference instruments should be presented along with that values for the Aethalometers.

The reviewer is wondering how the noise reduction algorithm affects the final results, the value and uncertainty of C_ref.

Technical corrections

The article is well written. Figures and tables are of good quality. There is no need for technical corrections.

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