

Interactive comment on “Intercomparison and characterization of 23 Aethalometers under laboratory and ambient air conditions: Procedures and unit-to-unit variabilities” by Andrea Cuesta-Mosquera et al.

Anonymous Referee #1

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The article presents data from different Aethalometer intercomparisons done in a workshop campaign where lab generated soot, nigrosin and ambient aerosol were used as source of particles for the measurements. A reference Aethalometer is used to assess the unit-to-unit variability. The results of the workshop are analyzed by comparing data before and after applying different maintenance tasks to the compared instruments. The results are valuable for the ambient BC monitoring community and the paper is well written.

I would recommend the publication of the article after addressing the following issues.

Major comments

- The authors have mentioned the scattering effect and its compensation constant, C. Not much is detailed in the manuscript about this artifact and they claim this aspect is out of the scope of the study. However, this seems to be a relevant issue for Aethalometers. It would be nice if the authors could provide an estimate of how sensitive the AE is to the different artifacts; filter-loading, scattering by deposited particles, scattering by filter fibers.
- The CAST soot particles seem to have a particle number mean diameter at around 50 nm according to figure 4. This size might be too small for Aethalometer measurements given the particle penetration in the filter. Can the authors comment on that?
- The authors used an AE33 as a reference but it is not clear why this instrument is the reference and how it was calibrated. I encourage the authors to provide details on this.
- When discussing the wavelength-dependency of the unit-to-unit variability the authors should comment on the effects of different artifacts that affect Aethalometer measurements. Since the unit-to-unit variability is only based on a comparison to a reference Aethalometer, the whole wavelength-dependency seem to fit quite well but it is well known that, for example, scattering artifacts will be different at the different wavelengths. The way it is presented might lead to the reader to understand that Aethalometers would be good for retrieving the absorption Angstrom coefficient. Is that the case? Can the authors comment on that? Lines 531-534 is a strong statement that can not be supported with the evidence presented here.

Minor comments

- I. 87 "When optical methods are used, black carbon is called equivalent black carbon (eBC), because the mass concentration is indirectly retrieved from measurements of light attenuation" Please detail more, why BC measured by FBAP is called equivalent BC?

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Interactive
comment

I. 146 "In the end, it is provided a series of recommendations for operation and maintenance." Please rephrase.

I. 247 Remove the n from "ration".

I. 257 Please avoid starting sentences with an acronym or abbreviation.

I. 278 I encourage the authors to mention the R version they used instead of the IDE version (Rstudio).

I. 305 This filter tape was used when? Before the 2016-2017 tape (M8050)?

I. 392 What about D02 and D05 in the beginning of the comparison? It looks like the deviation is $>10\%$.

Fig. 9 It looks like D01 and D03 performed better before maintenance. Could you please comment on that?

Fig. 9-11 Please use decimal points and not commas in the annotations.

Table 4 The slope values in the table do not seem to be the same ones shown in Fig. 9. Am I missing something?

Please define the acronyms EBAS, EMEP.

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