

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2022-137

Anonymous Referee #1

Referee comment on "New method to determine black carbon mass size distribution" by
Weilun Zhao et al., Atmos. Meas. Tech. Discuss.,
<https://doi.org/10.5194/amt-2022-137-RC1>, 2022

The presented manuscript describes a new way how to measure size-resolved black carbon mass using a combination of two established aerosol instruments, aerodynamic aerosol classifier and aethalometer. Authors also provide a comparison of the new method to the measurement using SP2 and discuss the uncertainty of the new method. From the presented analyses, the new method seems promising

There are some issues that may be improved before an eventual publication:

The structure of the text may be slightly altered, for example 2. Methods, 2.1. Instrumental setup, 2.2.1. AE, 2.2.2. AAC, 2.2. Field measurement, 2.3. Size resolved calculations, 2.3.1. binned AC, 2.3.2. BCMSD? Also, the conclusions text is a summary rather than conclusions, and L291 to 296 is a summary of a summary and most of the text could be omitted.

In Fig. 1, and the connected text, some more information on the sampling system would be useful; in the plot, it looks as all the instrumentation was on one inlet. Is it so? What was the cut-off? What was the flow? How did authors solved sampling with instruments with very different flow rates (those could be also added to the picture, for an easier understanding of the sampling)? Was an isokinetic subsampling considered?

The agreement between the new method and SP2 data could be made stronger, for example:

- in Fig. S2, the two regressions are somehow confusing and not explained in the text?

Could this be added?

- could the data from Fig. 2a be presented in a scatter plot with a linear regression to see the agreement?
- Would not be better to correlate the below 720 nm data with those 720 to 1500 nm data to see if these are connected, rather than regress them with data not measured in the size range? (L173 to L177)

In the uncertainty analysis, if the BCMSD was negative for below 23 % (L227), does it mean it is the limit of the method? If so, this should be somehow more explained and highlighted. If it is not so, what does it mean for the method if it brings negative values...? It seems a larger problem than the resulting uncertainty in Fig. 4b? Similarly, what is the reason of the incomplete parametrization? (L232) Would it be applicable to all measurements? Can the parametrization be improved?

Technical corrections:

L101 „a“ should be omitted?

L112 c in Cunningham should be in capital?

L118 a verb is missing?

L119 why not to be specific and state that AE33 did not need any correction, instead of „the instrument downstream“

L134 Why the constant MAC is stated when not used in the calculations? L134 and 135 may be omitted.

L143 one „bin“ may be omitted?

L164, could be the pollution episodes somehow highlighted in the plot?

In Fig. 3, the dotted line does not denote mean \pm std, only std...

L205 S2b should be S3b?

L230 is the 1 % uncertainty or difference?

L253 and 254 What was the correlation between the two lines?

L264 limiting instead of limited?