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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of equivalent black carbon (EBC) source appointment using observations from Switzerland between 2008 and 2018" *by* Stuart K. Grange et al.

Anonymous Referee #3

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Grange et al. present an evaluation of source apportionment via the aethalometer model from six Swiss sites. They compare their obtained fossil and wood burning fractions from the model to expected diurnal patterns and ambient temperature. They also compare the aerosol Ångstroem exponents (AAE) they use in the model to the binned AAEs of the full (non-apportioned) time series. Finally, they also show and discuss the trends in fossil/ wood burning fractions. This article is informative the figures are well designed and illustrative. However, there are some important issues regarding the data processing, at least as it is outlined in the text. I also note that the technical aspects of the paper are not as in depth as work by e.g. (Fuller et al., 2014) or (Zotter et al., 2017) who compare their data to external tracers, such that an experienced user

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of aethalometer data might learn more from the reported trends and source apportionment than the technical aspects presented. Nevertheless I recommend publication after the following issues are addressed.

Major issues:

Most data in the paper are from the Swiss National Air Pollution Monitoring Network (NABEL). I tried to access this site using the link in the references, but found that the link was no longer active, whereas the authors state that data are available as described in the text. Furthermore there is no description of data quality control / assurance. Are all data aggregated to hourly resolution or are some data points removed due to instrumental issues etc.? If points are removed, what is the threshold at which an hourly data point is still reported (i.e. what number of missing points are allowed?). The authors should update the information they provide on data availability and describe the quality control measures. Payerne and Rigi are EMEP sites and aethalometer data are publicly available at ebas.nilu.no.

The authors do not seem to have access to time series at the original time resolution of the instruments since they write 'Generally, the observations were stored as hourly means, but for the data which was at higher resolution (10 and 30 minute means)', implying that raw instrument output was not available? Checking these time series is important for several reasons, e.g. to ensure correct application of the automatic loading compensation in the AE33 instruments (i.e. there should be no structure in the absorption or EBC time series related to tape advances), or that no short term spikes are present in the data which could bias the averaging. Plotting the AAE over time is also useful. This lack of information weakens the arguments the authors make regarding the failure of the aethalometer model apparent at the San Vittore site. In the text they assert that this failure is due to the presence of a third source (fresh wood smoke). Here it is important to rule out other causes of failure, which might arise due to errors in the data processing (e.g. incorrect loading compensation). If possible, time series should be shown in the annex. If not, this weakness should be mentioned in the

text.

Minor comments

Change ‘appointment’ in the title to ‘apportionment’.

Pg 1, ln 16: change ‘has be’ to ‘has been’

Pg 1, ln 17: PM2.5 is undefined

Pg 2, ln 19: Suggest using ‘direct legal limits’ since in the unlikely event that BC is itself above the limit values for PM2.5 then BC would be above the legal limit. Non-binding provisions for BC limits are also included in the Gothenburg protocol, see also (Shapovalova, 2016).

Pg 5, ln 12: Data from AE31 instruments are included and the authors write ‘All absorption observations had been compensated for the filter loading and shadowing effects with the instrument model’s respective algorithms before this analysis was undertaken’. However, the output from the AE31 is slightly different to that of the AE33 in that a correction factor for loading is not automatically applied by the instrument and must be done in post processing. Please clarify.

Pg 7, ln 9: The authors write ‘When using aethalometer and EC data together, the aethalometer observations were aggregated (as arithmetic means) to daily 10 resolution’. I assume the data were averaged to the start and end times of the filters? In which case it would be better to write something like ‘data were window averaged to the start and end times of the filter sampling’.

Pg 7, ln 23: Use ‘recommended by’ instead of ‘reported by’.

Pg 8, ln 12: What was the least squares algorithm used? Given that there is uncertainty in both x and y, orthogonal distance regression should be used.

Pg 8, ln 14: Here it would be better to use ‘an average of‘, rather than a ‘range of’ since the range is later given as 3 m2/g. I.e. write an average of 10$\pm$3 m2/g

Pg 8, ln 18. The report by Anonymous Referee #2 discusses the issue of the large variability in MAC. How much of the variation in MAC is actually due to instrument differences? It is natural to expect some variability due to this. The effect of this will have been somewhat obscured by using the rolling average presented in the paper, so that Fig. A1 likely does not show the full magnitude of the effect. It would be informative to include e.g. seasonal MAC values on an instrument by instrument basis e.g. for each line of Table 2. A version of Fig. 3 highlighting instrument shifts would also be informative.

Pg 8, ln 27: change 'is' to 'are'.

Pg 14, ln 12: change 'negative' to 'negatively'

Pg 22, Figure A2 caption: Please change the caption to reflect that these are the steps used in the paper and not a general requirement, e.g. to 'A flow chart of the data processing steps used to apply the aethalometer model'. Some of the steps could have been done in a different order, and apportionment of absorption coefficients is also possible without conversion to EBC.

References

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