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Comment on acp-2021-231

Anonymous Referee #2

Referee comment on "Sources of black carbon at residential and traffic environments obtained by two source apportionment methods" by Sanna Saarikoski et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-231-RC2, 2021

This article presents interesting insights on BC sources in different kind of urban environments, from state-of-the-art instrumentation. BC source appportionment was performed on SP-AMS with PMF, and on AE33 with the so-called aethalometer model. The paper fits well within the scope of ACP and is well structured. It deserves publication after the following comments are adressed.

- the introduction could be shortened, especially regarding the exhaustive listing of SA methods for carbonaceous aerosols. I don't think it is needed here.

- it should be clearer in the text (eg abstract) that the measurement campaigns were not carried out at the same period of the year. For instance, biomass burning is the main BC sources at residential site in winter only.

- Some clarifications would need to be added about SP-AMS measurements. Why a different time resolution was applied for the 2 sites ? the CE of 1 applied on SP-AMS data is not well justified. Were they any co-located PM1 measurements which could validate SP-AMS concentrations ? Wouldn't the "imperfect laser-to-particle beam alignment" be included during rBC RIE calibration ? Is it a regular feature of SP-AMS to underestimate AE-derived BC compared to aethalometer measurements ?

- The strategy for PMF should be more explicit. For instance, the authors never mention the investigation of residuals, which is nevertheless a critical issue to adress. Was the uncertainty matrix calculated using the regular algorithm for AMS ?

- The authors present average values at different time averages (sometimes 1h,

sometimes 10min). I suggest to choose one, and keep it throughout the paper.

- Long-range transport episodes and characteristics are not sufficiently supported. The author may want to investigate this issue with eg trajectory and/or wind analysis.

- About Angstrom Exponent : why didn't the authors calculate the AAE from all wavelengths (should better take spectral dependance into account) ? The set of α values could have been calculated from diurnal variation of probability distribution function. Have the authors investigated this ? This work also highlights the limitation of the aethalometer model to characterize LRT of BC and coating, which may be associated to different α values. An interesting outcome would have been here to retrieve the AAE for each SP-AMS-PMF factors by either i) multi-linear regression, or ii) injecting all BC(1-7) within PMF. Have the authors ever considered this ?