

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-46

Anonymous Referee #1

Referee comment on "Determination of the multiple-scattering correction factor and its cross-sensitivity to scattering and wavelength dependence for different AE33 Aethalometer filter tapes: a multi-instrumental approach" by Jesús Yus-Díez et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-46-RC1>, 2021

The paper provides a comprehensive analysis of the multiple scattering artifact (C) that affects Aethalometer (AE) measurements by comparing AE to reference techniques. The authors used ambient data from three different measurement stations and provided a cross-sensitivity analysis on how scattering affects C. The findings presented here are particularly important for Aethalometer measurement studies in remote locations where SSA can be larger than 0.90, and to BC-brC apportionment studies. The paper is well written and should be published after addressing the following comments:

General comments:

- Offline absorption coefficient measurements were done using the PP_UniMI technique. However, it is not clear if the samples could have been affected between sampling time and measurement in Milan. The authors should provide more details on how the samples were handled and how long it took from sampling to analysis. One of the issues is, for example, that brown carbon could have been modified on the filter, thus affecting absorption wavelength dependence.

- Section 3.1: How valid is a comparison between C values for the different tapes when the measurements were done at different times, with different aerosol conditions/properties?

- I understand the authors use a 3- or 7-wavelength log-log fit to retrieve AAE from Aethalometer measurements. However, this method is inaccurate. Please check <https://doi.org/10.1140/epjb/e2004-00316-5>

- One of the key arguments of the article is the wavelength dependence of the multiple scattering correction factor, C , at a remote station. Is this finding specific to remote stations? To remote stations subject to Saharan dust influence? Or only to this particular station? Please comment. It would be useful if the authors can provide other references showing similar findings.

Specific comments:

L172: Please remove comma after "Thermo".

L174: Please avoid starting a sentence with an acronym.

L188: When were the PP_UniMI measurements done?

L214: Please remove comma after "Pty"

L275: Please detail how you calculated the AAE.

Fig 2: You mentioned previously that high SSA was observed in summer season and it increases with C but here it is shown that the highest C values are reached in winter, at least for MSY and MSA.

L370: I guess the "3.3" is a typo.

L423: Could you please provide more references here? Other remote sites with SSA > 0.95?