

Atmos. Chem. Phys. Discuss., author comment AC1
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Reply on RC1

Li Liu et al.

Author comment on "Strong light scattering of highly oxygenated organic aerosols impacts significantly on visibility degradation" by Li Liu et al., Atmos. Chem. Phys. Discuss.,
<https://doi.org/10.5194/acp-2022-218-AC1>, 2022

Responses to anonymous referee #1

General Comment:

This work tried to estimate the relative importance of secondary organic aerosol in visibility impairment via light scattering. Based on the field measurements on aerosol components and aerosol extinction in Guangzhou city, the authors found that more oxidized oxygenated organic aerosol is the most efficient light scattering aerosol component due mainly to its large mass proportion and high hygroscopicity, which highlights the importance of light extinction of organic aerosol in visibility degradation. Generally, this manuscript is well written and fits the scope of ACP. I have a few comments as listed below.

Response: Many thanks, we have improved the manuscript according to your comments.

Major comments:

Comment: The principal finding of the work is the hygroscopicity and light extinction of secondary organic aerosol. I do think that the method for estimating hygroscopicity and light extinction of various secondary organic aerosols as well as its validation need to be detailed. I am a little bit confused about the treatment of organic aerosol hygroscopicity parameters for different organic components, especially for MOOA and LOOA. More descriptions and arguments are suggested to be added in Section 2.

Response: Many thanks for your suggestion. More details about and derivations are added in Sect.2.4 of the revised manuscript as the following:

“Using the ZSR mixing rule, the derived at RH of 80% can be further expressed as:

(2)

Where represents volume fractions of primary and secondary organic aerosol components

in total organic aerosols. Assuming values of HOA and COA as zero, Eq.2 can be simplified as . Considering the noisy characteristics of derived as shown in Fig.4a, this simplified formula was not directly used to fit all derived values. Instead, average diurnal variations of derived were firstly acquired and then fitted using with average diurnal volume fractions of MOOA and LOOA (and) in total organic aerosol as inputs, which yields average and .”

Minor comments

Comment: Line 43-45: This sentence is suggested to be rephrased for clarity.

Response: Thanks, this sentence is revised as “Overall organic aerosol hygroscopicity parameter was quantified directly through hygroscopicity closure, however, hygroscopicity parameters of SOA components were further retrieved using multilinear regression model by assuming hydrophobic properties of primary organic aerosols.”

Comment: Figure 1: typo "right axis" in the caption; SIA need to be spelt out in Figure 1c.

Response: Revised accordingly.

Comment: Line 230: typo “PM_{2.5}”.

Response: Revised accordingly.