

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-321

Anonymous Referee #1

Referee comment on "Measurement report: Investigation of pH- and particle-size-dependent chemical and optical properties of water-soluble organic carbon: implications for its sources and aging processes" by Yuanyuan Qin et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-321-RC1>, 2022

The manuscript exhibited the effects of pH and particle size on optical properties and functional groups to identify the chemical structure, aging and sources of WSOC. Considering that the characteristics of WSOC are influenced by many factors and the complexity of atmospheric processes, this is an attractive study that can improve data support for climate effect of WSOC. There are several issues that need to be point out before publication (see additional comments):

Additional comments:

Line 38: Avoid lumping references as in (Yu et al., 2017; Park et al., 2015; Du et al., 2014) and all other. Instead summarize the main contribution of each referenced paper in a separate sentence.

For example, "...derived from the biomass combustion and atmospheric oxidation reactions of organic compounds (Yu et al., 2017; Park et al., 2015; Du et al., 2014), ...".

Line 41-42: "...air quality and human health". Please provide references to other literature on the environmental and health effects of WSOC.

Line 75: Please supplement the information of the sampling location, such as what is the major impact on the surrounding environment, whether there is a residential area, etc.

Line 78: In Section 2.3.2, quantitative information is required to calculate SUVA, MAE and FI/TOC. Therefore, filters need to be weighed after sampling until analysis. Please supplement the weighing details.

Line 80: "...similar to previous studies (Qin et al., 2018)". Please provide more references.

Line 83: Please provide the blank concentration of WSOC in the method section.

Line 85 and Line 95: "HCl" should be "HCl".

Line 88: Section 2.1.3: Is the pH characteristic of the sample lost after adjusting the pH value of WSOC, then it can not represent the environmental samples? Can we use the pH value of the sample?

Line 89: "50 ml" should be "mL".

Line 100: Section 2.2.2, these quality assurance and control (QA/QC) procedures for these experiments should be explained in details.

Line 130: In Section 2.3.3, please provide how Raman scattering and Rayleigh scattering are removed in EEM.

Line 166-170: The author showed the difference of WSOC sources through different MAE, so please give a specific value or range in order to more intuitively express the MAE difference between biomass burning and secondary formation. In addition, the authors has only discussed biomass burning and secondary formation before, however, it points out three primary sources (biomass burning, coal combustion, and vehicle exhaust) at the end of this sentence (Line 172), please elaborate on this point.

Line 175: The unit of "Stokes shift" - " μm^{-1} " should be " μm^{-1} ".

Line 186, Line 340 etc: The article has repeatedly mentioned statistical terms, such as "significant" or "significantly". Therefore, when make the comparison of data between seasons, authors should supplement the statistical analysis in Section 2 (Experimental methods) and provide the statistical results (t-test or ANOVA) in Section 3 (Results and discussion).

Line 199-200: Please supplement references.

Line 205: The title showed the identification of structure by pH value and particle sizes, but author only reflects the influence of particle sizes on functional groups in Section 3.1.2. Please provide the pH value of Figure 1. Additionally, please provide the effect of different pH values on functional groups (Figure and text description).

Line 209-210: "pH titration enables qualitative and quantitative analyses of functional groups on the surface of substances (Zhang et al., 2011; Xiao et al., 2014)." Suggest put it in Section 2 (Experimental methods). "However, measurements of such type have not yet been performed for particles with different sizes." Suggest put it in Section 1(Introduction) and supplement it appropriately.

Line 223-255: Although phenols account for a high proportion in winter, it seems that the proportion of carboxylic acids cannot be ignored in the particle size range of 1.40-2.50 μ m. In addition, although the proportion of carboxylic acid groups in summer is higher than that in winter, the proportion of phenolic groups is greater than 50% in both winter and summer, except for 1.40-2.50 μ m in winter. The explanation in Line 223-225 is insufficient, and it is suggested to revise this sentence.

Line 281: A redshift of fluorescence peak positions with increasing pH can be observed in summer. The phenomenon could not be seen in Figure 7. Is it Figure 6?

Line 290: It is advised to choose the unified color represents each size. For example, Figure 5 and Figure 7.

Line 312: Please provide references.

Line 371: Some newly references should be cited in this paper, such as:

Light absorption properties and molecular profiles of HULIS in PM_{2.5} emitted from biomass burning in traditional "Heated Kang" in Northwest China. *Science of the Total Environment*, 2021, 776, 146014-146022.

Seasonal and diurnal variation of PM_{2.5} HULIS over Xi'an in Northwest China: Optical properties, chemical functional group, and relationship with reactive oxygen species (ROS). *Atmospheric Environment* 268.

Optical properties, chemical functional group, and oxidative activity of different polarity levels of water-soluble organic matter in PM_{2.5} from biomass and coal combustion in rural areas in Northwest China. *Atmospheric Environment*, 283, (2022)119179

References: Please check the references and unified format. For example, "Effect of the Urban Heat Island on Aerosol pH" in Line 378.