Responses to anonymous referee #2

Specific comments

Comment: I found the discussion in Section 3.3 to be a little confusing given all of the definitions of kappa. Perhaps a table that lists the different kappas and measurements they are based on would be helpful.

Response: Thanks for your suggestion. A Table as the following was added to improve the readability of the manuscript.

Table 2. Different κ and their physical meanings

$\kappa_{f(\mathrm{RH})}$	A uniform κ for all particle sizes which describes $f(\mathrm{RH})$ accurately
κ_{chem}	A bulk κ assuming different chemical compositions of aerosol populations are internally mixed and calculated with the ZSR mixing rule
κ_i	hygroscopicity parameter κ of chemical species i
κ_{D_p}	The κ assuming different chemical compositions of particles with diameter of D_p are internally mixed and calculated with the ZSR mixing rule

Comment: Line 105: Explain why this diameter range (200 to 800 nm) is represented by the dependence of light scattering on RH.

Response: This is too complex to be explained in a few sentences within the Introduction part, which is why detailed explanations are given in Sect3.3.

Comment: Figure 1: The text says that the ACSM measured PM2.5 but the figure indicates an upstream cut-off diameter for PM1. Please clarify.

Response: As introduced in Sect.2.1 and shown in Fig.1, the upstream impactor of

ACSM switches between PM1 and PM10 every 15 minutes.

Comment: Line 182: Please provide a brief description of the CV and how it allows for the collection of particles as large as 2.5 um.

Response: Thank the reviewer's comments. In the revised manuscript, we expanded the description of CV. It now reads: "The CV was designed with an enclosed cavity to increase particle collection efficiency (CE) at the detector (Xu et al., 2017). Both laboratory and field measurements indicate that the CE of CV was fairly robust and was roughly equivalent to 1. Therefore, a CE of 1 was applied to all measured species in this study (Hu et al., 2017; Hu et al., 2018b)."

Aerodyne Research Inc. redesigned the aerodynamic lens by changing the geometry of the exit nozzle (Xu et al., 2017). Compared with the traditional PM_1 standard lens, the transmission efficiency of the new lens is about 50% at 3.5 µm vacuum aerodynamic diameter, which is approximately equal to a 2.8 µm aerodynamic diameter assuming an average ambient particle density of 1.7 g/cm^3. Therefore, the new aerodynamic lens allows for the collection of particles as large as 2.5 µm.

Comment: Lines 185 – 187: Is the CE for the capture vaporizer dependent on chemical composition? Has a unit CE been observed for the composition of the aerosol sampled here?

Response: The collection efficiency for the capture vaporizer (CV) is independent of chemical composition. Hu et al. (2017) evaluated comprehensively the CV in three field studies, and found that the CE of CV was fairly robust and was roughly equivalent to 1. Therefore, a CE of 1 was applied to all measured species in this study.

Comment: L126: Figure 4 caption: "…distributions shown in Fig. 4". Should this be Fig. S4?

Response: Thank you for noticing. We have changed Fig. 4 as Fig.S5.

Comment: Lines 449 – 450: Why is the reported maximum PM2.5 concentration less than the PM1 concentration? Same for the PM10 and PM1 light scattering coefficients.

Response: Thank you for noticing, these are typing errors, it should be the other way around.

Reference:

Hu, W., Campuzano-Jost, P., Day, D. A., Croteau, P., Canagaratna, M. R., Jayne, J. T., Worsnop, D. R., and Jimenez, J. L.: Evaluation of the new capture vaporizer for aerosol mass spectrometers (AMS) through field studies of inorganic species, Aerosol Sci. Tech., 51, 735–754, 10.1080/02786826.2017.1296104, 2017.