

## ***Interactive comment on “Particle Wall-loss Correction Methods in Smog Chamber Experiments” by N. Wang et al.***

### **Anonymous Referee #1**

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Wang et al. presented a study that evaluated the performance of different particle wall loss correction methods for aging experiments of  $\alpha$ -pinene ozonolysis products. This paper may potentially be useful to the SOA chamber community. However, there are portions of the manuscript that are vague and confusing, and they need to be addressed before it can be considered for publication.

1. Page 5 line 141: How many particle wall loss experiments are typically performed during the year? How reproducible are these particle wall loss rates? It would be useful to show the rates obtained during these (1-year worth of) experiments in the SI.
2. Figure 1: Why are the measured  $k$ 's only shown for particles of diameters  $< 400$  nm and  $< 800$  nm for the 12 m<sup>3</sup> and 1.5 m<sup>3</sup> reactors? What about the particles with larger diameters? Were those measured? If not, why not?

3. Page 8 line 226: I am inferring from Fig 1 that if  $k_a$  is larger than  $k_c$ , coagulation is a significant particle loss process. Is this correct? If yes, this should be stated explicitly in the main text. Currently, there is little explanation in the text of what differences between  $k_a$  and  $k_c$  shown in Fig. 1 means.
4. Page 8 line 232: It would be useful to show in the SI how the particle wall loss rate constants look like after correcting for coagulation.
5. Page 8 line 234: “The uncertainty of... is significantly higher...” How much higher? Please give a number.
6. Page 8 line 236: “This is due to... versus the linear regression that uses the measured.” It is unclear which linear regression fit the author referring to. Is it the linear regression fit to each particle size bin or the linear regression fit of the measured  $k_a$ 's?
7. Figure 2: Why doesn't  $k_c$  correct for the effect of particle wall loss on the number concentration well? This was not explained in the main text.
8. Page 9 line 243: Why weren't the  $K_a$ 's for  $D_p < 50$  nm measured? If they were measured, there would be no need to back extrapolate the data.
9. Page 9 line 249: “As a result, the coagulation effect is almost an order of magnitude higher than the average...” What do you mean by the “coagulation effect”? Are you referring to the rate constants? Please clarify.
10. Page 9 line 259: “Our results are consistent with their low seed...” Which results are you referring to? Your SOA mass yields? Your observation that coagulation plays a minor role in some of your experiments? Please clarify.
11. Page 9 line 262: What were the particle number concentrations used in these ammonium sulfate-only experiments? Were they somewhat similar? Also, the uncertainties are missing from the figure.
12. Page 10 line 283: How did you determine when condensation/evaporation was

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minimal in your experiments? By using your SMPS data? Or the AMS data?

13. Page 10 line 285 to 293: The authors claimed that  $k_a$  and  $k_c$  are almost the same except for particles smaller than 100 nm. Can the observed differences at the smaller particle sizes really explain the differences in the size-independent loss rate constant? A more detailed analysis should be presented.

14. Figure 4: Was the SMPS only scanned up to 300 nm? If yes, why was this the case? It looks like that the entire volume/number concentration distribution was not captured. This may affect the accurate determination of SOA mass concentrations in Fig. 5.

15. Page 10 line 295 and Figure 5: What is the main conclusion of section 4.3? Should the size-independent method be used given that their corrected SOA mass concentrations are so different?

16. Page 11 line 315: “Particles of smaller sizes with larger organic to sulfate ratios. . .” Loza et al. (ACP 2012) previously discussed in detail the effect of size dependence wall loss on the organic to sulfate ratio. Thus, that paper should be cited.

17. Section 4.5: When were the particle wall loss correction applied? Just before the start of SOA formation (time = 0 min) or when the ammonium sulfate seed was first injected into the chamber?

18. Page 14 line 420: It was recommended that metal gloves be used if it was absolute necessary to touch the chamber walls. Was this recommendation tested? Did using metals gloves really resulted in less electrostatic forces in the chamber and thus smaller differences in the measured  $k$ 's? If yes, the data should be shown to back up this recommendation.

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