A review of: **Real-time measurements of secondary organic aerosol formation and aging from ambient air in an oxidation flow reactor in the Los Angeles area**

(Ortega et al. Atmos. Chem. Phys. Discuss., 15, 21907–21958, 2015)

The authors report a study investigating the aging of ambient air masses using an oxidation flow reactor. By exposing the samples in real-time to high OH exposures, they replicate the equivalent oxidative aging of 0.8 days to 6 weeks. A clear day/night cycle is observed in the enhancement of organic aerosol formation, attributed to the depletion of short-lived VOC precursors during daytime photo-oxidation. High reactor exposures were associated with a decrease in the SOA formation enhancement as heterogeneous oxidation leading to fragmentation and evaporation becomes dominant. The study highlights the advantages and insights that may be made by application of traditionally laboratory-based instrumentation to a field campaign, which may provide crucial measurements to help constrain model predictions of SOA formation. The scope of the study is fully appropriate for publication in ACP.

Overall the manuscript is well-written and insightful. The following comments should be addressed to improve the clarity of the manuscript:

1. The authors should make the outlet configuration in the text (p21915 lines 1-4) and in the experimental schematic clearer. How narrow is the residence time distribution using this method? Have the “plug-flow” conditions been verified, either experimentally or using fluid dynamics simulations?

2. Explain in more detail the particle loss correction. For instance, what does a “time varying way” mean in the context of applying the correction? A figure in the SI showing the uncorrected mass concentrations from the ambient and reactor sampling lines would help clarify. Further, might the temperature changes in the reactor with the lights on influence wall losses? Any temperature perturbation in the chamber should be reported.

3. It seems the OH exposure is established in part by assuming the reactivity of the constituents. I’d be interested to see how an appropriate uncertainty placed on the assumed rate constant influences the inferred OH exposure.

4. In section 2.4, the possible reasons for underestimating SOA are discussed, all consequences of the short residence time and high oxidant concentration – (ambient) aerosol condensation, wall condensation, further reaction with OH, or reactor exit. The discussion that follows on the correction for these is unclear. Is all loss of SVOC by condensation onto aerosol, rather than formation of SOA, corrected? For example, at an exposure of $10^{12}$ (note units on x-axis of figure S6), approximately half of the SVOC is lost by condensation onto aerosol. Thus, dividing by this gives a correction of a factor 2×, much larger than the 1.2× reported. There is some confusion here that should be made clear.

5. In Figure 3, the pie charts display average fractions – are these averages over the whole sampling period or just for the time shown in panel b? Why are the inorganic components enhanced in the reactor relative to ambient (nitrate in particular)? Does this suggest NOx chemistry in the reactor? Does this distribution change as a function of exposure in the reactor?

6. The discussion of Ox species suggests the enhancement is brought about due to there being less Ox (as stated in reference to the “steep inverse relationship”). Ox results from photochemistry, and SOA result from photochemistry. It should be made clearer than Ox as discussed here is a proxy for ambient photochemistry, and that Ox itself is not playing a role in the reactor (unless I’ve misinterpreted the discussion, in which case I recommend clarifying it). Also, the plot in Figure 5 needs appropriate error bars.

7. Please clarify line 14, starting “At the same…” on page 21925.

8. In Figure 9, the reactor data with wall loss correction and without are binned differently, and the uncorrected data spans a wider range on the x-axis. Why is this?

9. The errors bars used throughout do not appear to be representative of the variance in the data. Given that you are reporting on a single sample population, the standard deviation, rather than the standard error, is more appropriate.

10. On page 21930 line 20, a diameter of 285 nm is reported as the volume averaged value. From Figure S7, the average looks like it should be closer to 500nm. Please check this and clarify any difference. Furthermore, for estimating the OH surface flux, the surface-weighted diameter should be used. How different are these values?