**Anonymous Referee #2**

We thank the reviewer for the helpful comments. We respond to each comment below. Original comments are in black. Our responses are in blue, and changes/additions to the manuscript are in *italics*.

The McVay et al. manuscript reports on the alpha-pinene+OH oxidation mechanism and resultant SOA, investigated using comparative measurements and modeling. Smog chamber experiments were conducted under low NO (< 2 ppb) and low and high OH (2x105 and 2x106 molecules/cm3, respectively) conditions; modeling was performed using the GECKO-A model. The GECKO-A model was updated to include gas-phase chemistry based on Vereecken et al. (2007) and dynamic gas/particle partitioning based on La et al. (2015). The significant finding was that OH levels did not influence SOA growth in the chamber studies but did influence growth in the modeling studies. Explanations for the need of a higher vapor wall loss rate in GECKO-A to match the high UV/OH experiments were explored. It was concluded that GECKO-A overestimates the contribution of later-generation (2nd and higher) species to SOA formation. The manuscript provides good insight into variability of vapor wall loss rates (e.g., in different chambers and in different chemical systems) and the potential for over contribution of later-generation oxidation products in GECKO-A. The manuscript is very well written and easy to follow. It is recommended that following attention to the minor comments provided, the manuscript be accepted for publication in ACP.

Minor comments: p. 33164, line 10: It is suggested that the authors consider adding "near" before explicit. It is my understanding that GECKO-A follows the Master Chemical Mechanism to the point at which the SARs are invoked, including as regards to the assumption that all understudied compounds and chemical reactions can be represented by a subset of studied reactions and similar compounds.

We have added "near" before explicit.

p. 33176, line 8: spelling "preferentially"

We thank the reviewer for catching this typo. It has been corrected.

Fig. 3: It is recommended to increase text size, particularly the high/low UV/OH and the explanation headers.

We agree that Fig. 3 is difficult to read, and we agree with Anonymous Reviewer #1 that this figure adds little to the article. Therefore, we have removed this figure.

Supplement, Fig. S3 discussion: The authors note that the remaining number concentration in the low UV/OH experiment is ~3x less than that of the high UV/OH experiment. Do the authors attribute this to size-dependent or compositionally-dependent wall losses of the particles?

We attribute this primarily to the much longer experiment time of the low UV experiments: these experiments were run for 18-20 h compared to 7-9 h for the high UV experiments. Over the longer time of the low UV experiments, more particles have time to deposit to the wall.

I agree with the first reviewer's comment that underestimation of vapor pressures for multi-functional (later-generation) oxidation compounds should not be ruled out.

We agree with both reviewers that underestimation of vapor pressures for multi-functional compounds should not have been ruled out. We have revised the manuscript to reflect this:

*While the Nannoolal et al. (2008) method generally led to the highest volatilites and the lowest SOA predictions when compared to the Myrdal and Yalkowsky (1997) method and the SIMPOL-1 method from Pankow and Asher (2008), each of these methods estimates vapor pressures via a group contribution method (i.e. summing the contributions of all functional groups). If this approach is less accurate for compounds with many functional groups, the volatilities may be underpredicted and these species may be overpredicted in SOA.*