AMT Paper Reviewer #2 Response

1. Although the scope of the paper was to address the repeatability of smog chamber experiments by decreasing variability of particle metric measurements between replicate experiments, we appreciate the reviewer's concern regarding the low VOC concentrations and how they will affect the distribution of oxidation products and oxidation state of the formed SOA. Nonetheless, current work in the authors' laboratory is exactly this, exploring the chemical behavior of SOA at these low concentrations.

2. The reviewer is correct that reliability of the method should include supporting evidence of chemical and physical properties of the SOA formed. Although we demonstrate that repeatability is enhanced for physical properties (and can be implied for chemical properties), a lack of research infrastructure limits the ability to make chemical measurements at low concentrations. Current work in the authors' laboratory is develop a methodology for the chemical analysis of SOA at these low concentrations.

3. By implementing the stop/flow valve and the split valve on a conventional VOC injection setup, we have decreased variability (relative standard deviation, RSD) of replicate SOA experiments in a batch-mode atmospheric chamber. For both 50 ppbv and 10 ppbv α-pinene, the RSDs for N_{max}, $C_{SOA,\ max}$, and GMD_{max} were all $\leq$ 3.5 % and $\leq$ 7.8 %, respectively. Maximum particle number concentration, maximum SOA mass, and maximum geometric mean diameter were measured metrics that were used as a means to demonstrate experimental repeatability. Since the RSDs were significantly lowered compared to the variability for the conventional injection setup, it can be inferred that the RSD for partitioning of gas phase VOC to the chamber walls would simultaneously decrease. By using N_{max}, $C_{SOA,\ max}$, and GMD_{max} as a metric for measuring repeatability, the authors have provided an upper limit to replicate chamber-experiment variability.

4. The authors appreciate the reviewer's correction; the manuscript has been updated accordingly.

5. Prior to this study regarding the improvement of repeatability for replicate batch-mode atmospheric chamber measurements, a study regarding the flow rate of carrier gasses was conducted. Based on the results from **figure 3**, a carrier gas flow rate of 2000 mL min^{-1} was implemented as standard procedure for all experiments performed in the Petrucci Research Laboratory. Although this work was conducted using *cis*-3-hexen-1-ol (HXL) as the precursor VOC, the authors though it necessary to include in this manuscript as justification for the use of a 2000 mL min^{-1} carrier gas flow rate. However, for the main scope of this manuscript, the improved repeatability of replicate batch-mode atmospheric chamber experiments, α-pinene was sole VOC used (**table 1**).

6. The calculation of RSD for each particle metric (particle number concentration, SOA mass, and particle geometric mean diameter) is based on the individual metric's maximum measurement throughout the experiment. For example, the RSD for each experiment's particle number concentration was determined by the maximum particle number (N_{max}) throughout the duration of the experiment. The maximum measurement for each particle metric was not always the end of each experiment. In fact, an upcoming report from the authors will specifically address the time evolution of various particle metrics. However, for this manuscript, the maximum measurement for each particle metric was used as a means to demonstrate improved repeatability of replicate experiments.