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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Relative Humidity Effect on the Formation of Highly Oxidized Molecules and New Particles during Monoterpene Oxidation" *by* Xiaoxiao Li et al.

Anonymous Referee #3

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This manuscript describes the RH effects on HOMs formed from oxidation reactions (ozone and OH) of monoterpernes and on the SOA formation. The authors used HrTOF-CIMS to measure gas phase HOMs (monomers and dimers). The main conclusion is that because HOMs are not affected by RH under the present experimental conditions, formation pathways of HOMs may not include water. The review believes this is a reasonable explanation, considering that the autoxidation reactions take place in the condensed phase and at high temperatures, where water is less available. Considering the increasingly important roles of HOMs in NPF and SOA formation, this conclusion is useful to the community.

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Discussion paper

Since the measured particles sizes in this study are between 20 – 100 nm, it would be difficult to discuss the contribution of RH on NPF from these sizes. It is more likely that the precursors of nucleation (or NPF) and 20 - 100 nm particles have different volatilities and they may be even different precursors. Therefore, the RH effects on these aerosol particles are different from what the community considers regarding to RH effects on NPF (stated in Introduction). Rather, the results shown here indicate the effects on SOA formation. So, I would suggest reorganize Introduction and results/discussion to focus on HOMs. Since RH varies in a large range in the atmosphere, it is still important to understand the effects of RH on HOMs formation.

(1) Lines 38-42: The Amazon NPF or lack of it has little to do with RH, rather it is due to high condensation sink or the lack of nucleation precursors. (2) Line 60: Include Yu, H., et al. (2012). "Effects of amines on formation of sub-3 nm particles and their subsequent growth." Geophys. Res. Lett. 39: Doi: 10.1029/2011gl050099. (3) Section 2.4. Indicate the exact equation that is used to calculate saturation mass concentrations (C*). Later, it is stated that the functional groups are also considered, so it would be useful to show the calculation procedure. (4) Line 210: What is the source of e5 /cc of sulfuric acid? (5) Line 231: Dimers are more abundant from OH oxidation. This is an interesting result, considering that HOMs formed from ozonolysis are found mostly during the nighttime, where NPF does not take place. So this may explain the importance of dimers on aerosol nucleation. (6) Lines 251-252: Show condensation sink, instead of surface area. The size distribution shows aerosol sizes are 20-100 nm, so condensation actually takes place effectively. (7) Lines 260-261: Indicate yields. (8) Line 306: Decomposition to C5 HOMs. Is this new?

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