

Review of ACPD manuscript:
New particle formation from the oxidation of direct emissions of pine seedlings
L. Q. Hao *et al.*, 2009

This manuscript presents results of ozone and hydroxyl radical initiated oxidation of emissions of Scots pine seedlings in a reaction chamber. The work utilised tetramethylethylene (TME) and 2-butanol in order to control the concentrations of O₃ and OH. A chemical kinetics model was constructed and used to simulate particle nucleation and condensational growth rates. The main conclusion of this work is that the OH-initiated oxidation of VOCs plays an important role in the nucleation process during the initial new particle formation stage, while the ozonolysis of monoterpenes appears to be more efficient in the aerosol growth process following nucleation. The manuscript also reports the density of the formed SOA using a combination of mobility and vacuum aerodynamic diameter measurements. The determined densities are consistent with other work reported in the literature on density of SOA generated from single VOC precursors. This manuscript comes as a welcome addition to the literature on a recent line of research using “real life” emissions in smog chamber experiments. This is a good piece of work and deserved to be published, but only after certain parts of the manuscript -detailed below- are improved through required clarifications and further discussions.

8225, P5: The authors should cite an appropriate reference for the statement “SOA can directly affect the Earth’s radiation budget by scattering and absorbing incoming solar radiation.”

8227, P20: Activated charcoal, Purafil™ select and absolute HEPA filter were used to provide the supply of clean air required for the experiment. This setup does not include a way of cleaning Methane, do the authors have evidence that this did not interfere with the results? i.e. Methane representing a possible sink for OH.

8232, P1 and P10: It is not very clear to me how the authors determined the correction factors used to account for the secondary loss of OH and O₃. This should be explained and clarified. Is this applicable only to reactions with the second generation products? did the authors consider the wall losses of O₃ and OH as possible sinks?

8233, P15: Section 2.6 needs to be expanded in order to explain the experimental procedures in more detail. For example, the second addition of O₃ in the experiments and its rationale should be mentioned in this section.

8234: Section 3.1 and Table 3: A discussion of the possible effect of the large variation of the emitted species between experiments on the overall results of this work should be provided here or elsewhere in the manuscript. For example, delta3-carene represented the biggest percentage of emitted compounds in E1a and E1b (40, 31%, respectively) while it was 0% in E1c and E3 (the only OH-scavenged experiment).

Fig 2, Panel B: The authors should comment on what appears to be a systematic difference between the model and measurements in the case of formaldehyde. Also the use of Y-axis log scales in both panels seems to be “hiding” possible large differences for some cases, as a result the comparison between the model and the measurements should be quantified and reported more clearly.

8257: The quality of Figure 3 is poor and it needs to be improved.

8238 and Fig 6: A massive decrease in the contribution of m/z 44 to total mass in the second hour averaged mass spectrum compared to the first hour is evident in experiments E1b (~20 to 5%) and E1c (~14 to 5%). The second hour data in E1a is also similar (~6%). This should be discussed and explained in the light of fact that m/z 44 is generally considered as a marker for highly oxygenated organic compounds.

8240, P1: The statement about the similarities of the measurements and the ambient mass spectra needs to be quantified. It is certainly not enough to “see” the same fragments, the overall mass spectral fragmentation pattern and the contribution of each fragment to the total mass spectral signal need to be taken into account for such claim to be valid.

8241, P15: Isoprene should not be stated as a major emitted VOC from Scot pine given that it accounted for a maximum of 3.9% to the pine emissions (Table 3)

Minor Corrections:

8225, P10: replace “low volatile products” with “low volatility products”

8225, P20: Remove “etc.”

8226, P10: replace “was” with “were”

8227, P20: “...for over night” this sentence should be rewritten as “...the chamber was continuously flushed overnight by compressed laboratory clean air.”

8230, P1: “flight of time” should be replaced with “time of flight”

8230, P5: “the interested particle” should be replaced with “the particle of interest”

8230, P10: “FMPS instead” should be rewritten as “The FMPS, on the other hand, provides...”

8233, P15: “in the presence OH” should be “in the presence of OH”

8235, P15: It should be “modelled and measured” instead of “modelled and modeled”

8256: Delete the word “be” in the last line of the fig caption. It should read “.. are not shown here.”

8237, P1, line 4: Delete “and” from the beginning of the sentence.

8238, P5: “..are in strong agreement...” instead of “..are strong agreement..”

8240, P5: “calculated following the...” instead of “calculated followed the...”

8241, P1: “larger than 1.25..” instead of “larger 1.25...”

A mixture of “modelled” and “modeled” are used in the manuscript, use a consistent spelling.