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Interactive comment on “The role of low volatile organics on secondary organic aerosol formation” by H. Kokkola et al.

Anonymous Referee #2

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General comments:

The authors present measurements and simulations of aerosol formation from VOC ozonolysis in a teflon chamber, focussing on the loss of gas-phase compounds to the chamber walls. Modelled and measured size distributions are compared in order to infer the extent to which low volatility compounds are lost to the walls. They conclude that SOA yields reported in the literature are erroneously low because wall losses of these SOA forming compounds have not been taken into account - a factor of four underestimation was found in this study.

Very few details of the SALSA model set up are given in the manuscript which makes it very difficult to follow the results sufficiently well to be able to assess the scientific merits

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of the paper. I would be interested to see a revised submission of this manuscript which includes detailed descriptions of the model implementation. I have expanded on some key areas below.

Specific comments:

2.2 Wall losses Measuring the time evolution of the ammonium sulphate size distribution will give you a measure of the wall loss rate as a function of size. However, I find this sentence to be rather vague: "A functional form of the wall loss rates was obtained by minimizing the difference between the measured and modeled size distributions." Does this mean the wall loss rates were calculated from the measurements, but then tuned in the model to get the best reproduction of the size distribution? Please give further details as to how wall losses are implemented in the model.

In 3.1/Fig 2a it is claimed that the injected compounds decreased in concentrations over a few minutes and then reached an equilibrium concentration without further decrease. To my eyes, the concentrations look constant within the noise, rather than decreasing over a few minutes to a stable level. I assume the initial spike at each level is what is being referred to, but the figure isn't very clear. I would suggest smoothed traces in addition to the raw data to clearly illustrate this point.

3.2 "According to the measurements, when the nucleation mode appears in the size distribution, organic mass fraction in the seed aerosol rapidly increased to about 0.3 supporting the conclusion that the new particles were grown by LVOC's." The seed aerosol is ammonium nitrate. How can this have an organic mass fraction? Are you referring to the particles in this size range having an overall organic mass fraction of 0.3? The AMS can't measure nucleation mode particles, so this is presumably what was meant - this needs to be made clearer, because the implication in this paragraph is that the organic mass fraction and O:C ratios apply to the nucleation mode (too).

3.3 This section would really benefit from more details regarding the implementation of the SALSA model. There are hardly any details of the model set up given so it's very

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hard to follow the analysis. For example, the SALSA paper describes optimising the number of bins and their spacing over the size distribution depending on the application of the model. How many bins were used for the simulations shown here and how were they distributed (i.e. what were the bin size cuts)? Why are the simulated and measured size distributions (fig. 3) not shown over the whole size range, instead of starting at 10nm? The SALSA paper details an expression for the nucleation rate, but the nucleation rate here is constrained by the measurements. This I would have thought severely undermines the optimisation performed for the stoichiometric coefficients for the lowest VBS class?

Technical corrections: Figures 2a and 2b need labelling a and b.

3.3 The text suggests that figure 2b was the intended figure instead of the first reference to fig 3b.

The graphs in Fig3 are too small (especially the axis and colour scale labels), but even zoomed in, it's difficult to discern the magnitude of the differences between the plots. Some 2d snapshots at key times would be useful for ease of comparison.

Several sections of the manuscript are hard to read due to poor grammar. The manuscript would benefit from more thorough proof reading to improve clarity.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 14613, 2013.

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