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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Analysis of multiple new-particle growth pathways observed at the US DOE Southern Great Plains field site" *by* Anna L. Hodshire et al.

Anonymous Referee #4

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This is a very nice paper that combines measurements with modelling. It is based in a technically challenging frontier of aerosol science: determining and verifying the composition of the smallest nucleating particles. It is generally well-defined and clearly written. The authors acknowledge the limitations of their methods and describe the approximations and assumptions they have relied on.

My major concern in this paper relates to the way in which the findings are communicated to the reader. Rather than having a huge data dump, it would be better to both group and separate the scenarios/simulations more clearly. Some methods are suggested below:

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Discussion paper

- In Tables 4-6, for each group of three simulations, the first and last identifiers are constant and the middle one changes. Either change the order of the identifiers or the order in which the simulations are presented. I think it would be clearer to have all the MAL simulations first, divided into thirds by 1ox/10ox/100ox, each of which is further divided based on DMA_L and TMA_L. After that, a similar breakdown of MAL_LoVP, then OX, then OX_LoVP. This would give a logical progression, while still leaving the reference scenario in second place on the list. However, the authors may prefer to use another system based on what they feel is the most important characteristic to group simulations for important comparisons. Based on my reading, it seems that the characteristics change from case to case, and so the ordering may be less important from that perspective.
- Add vertical lines between the case identifiers and growth rates, and between growth rates and mole fractions.
- Colour code simulations which differ significantly from the base case, or which provide the best reproduction of observations; at the very least, those which are discussed in-depth in the text. Refer to the cases by colour in the figure caption, for ease of understanding.
- Add explanatory text to the captions of Tables 4-6. As a general rule, a caption should provide enough information that the item can be at least minimally understood without any other context.

Using T to represent Total amines measured at SGP is quite confusing in the text, because it usually means Temperature (as it does in Table 1, for example). Maybe use TAm?

Use the format A.B $\times$ 10^C in e.g. Table 1. ($\times$ in LaTeX, Insert $\rightarrow$Symbol $\rightarrow\times$ in MS Word)

In Figure 1, please add units to the colour bar for panels (a)-(c) (and it would be better to label the colour bar as “log N”, or to only label whole powers of ten).

In panel (f) of Figures 2-4, ELVOCs and organic acids seem to be the same colour. Is this intentional? The mole fractions are shown separately in Tables 4-6, so I assume they can be distinguished at all

I would like to see an explicit equation for “the same calculations as used for April 19”. I’m more of a physicist than a chemist, and while I tinkered around with the numbers in some of the tables, I couldn’t reproduce 12.5% by mole. Of course, there were quite a lot of scenarios in the tables, so it was hard to be sure exactly which numbers I was meant to be using...

The growth rates listed in Table 3 show a single number, whereas the text references three different numbers for each day. It would be better to see those numbers explicitly rather than be given a range.

Aside from these minor concerns, I found the paper interesting and feel that it makes an important contribution to its field. I would recommend that it be published subject to minor revisions.

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