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Discussions

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Interactive comment on "Chemical Characterization of Secondary Organic Aerosol at a Rural Site in the Southeastern U.S.: Insights from Simultaneous HR-ToF-AMS and FIGAERO-CIMS Measurements" *by* Yunle Chen et al.

Anonymous Referee #1

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Chemical Characterization of SOA at a Rural site in the SE US: Insights from simultaneous HR-ToF-AMS and FIGAERO-CIMS measurements Chen et al.,

This paper describes the simultaneous use of FIGAERO-CIMS and AMS to carry out improved characterisation of the sources and transformation of organic aerosol at a rural site in the SE US. PMF has been used to split the mass spectra obtained by the two online methods and characterized factors that could be attributed to isoprene and

monoterpenes and with day-night separation. This is an interesting and well described study and shows the power of combining multiple instruments to obtain additional insights into SOA formation mechanisms. I recommend publication after the following minor points are addressed. I would also request some additional figures in the SI as the multi-part figures in the paper make it quite difficult to see the trends and detail (outlined below).

Minor comments Page 6, line 18: I think you need to make it clearer here that this unit is not an actual mass concentration, rather it is a scalar of the ion signal based on MW. Page 8, line 18: The NO levels are very low with a large error. Is the chemiluminescene detector use capable of giving accurate signals at these low mixing ratios? Page 9, line 15: The assumption here is that all the signal for CHON can be attributed to nitrates (-ONO2) rather nitrophenols (OH + NO2), which can also have three or more O and an odd number of H. I realise this is a rural site and therefore biogenic SOA may dominate but is there any evidence that nitrophenols are not important (i.e. biomass burning sources?). Also, is there evidence of how nitrophenols fragment in the AMS? Leading on from this, on page 10, line 27, you split into C6-C10. Are you sure there is no contribution to C6-C8 from nitrophenol type compounds? Page 15, line 23: Do you have an idea of the fraction of isoprene RO2 reacting with NO? Multiple times you discuss formation of products in the presence of NOx and it would be useful to estimate the fate of the isoprene peroxy radical in your field conditions. Page 17, lines 10-20: It is not very clear to my why you have chosen these particular isomers as being the "likely" source of these ions? The same is true on page 18, line 1-6. Surely there are multiple possible MT oxidation products at this formula? Are there any speciated MT VOC data to back this up? Im not sure why these ions are evidence of "aqueous processing"

Specific comments Page 7, line 15: can you suggest here why this data is different and needs the ME-2 approach to be used? Page 9, figure 1: What does the difference between the dotted and solid red lines tell you about the other N-containing species in

the aerosol? Also for N:C, I cant see what the trend in the dotted line is at this scale. In the O:C plot, the FIGAERO diurnal does show some enhancement in the afternoon but it is not entirely convincing. Are there a-typical days that cause this average to be more noisy? Page 10, line 18: I don't think table 1 has been mentioned before this point. I think it should be introduced earlier. Page 12, line 16: I feel this sentence just hangs there – can you clarify what you are using the nitrate tracer for LO-OOA to do? Page 13, line 2: I cant see the diurnal variability of the isoprene-OA in Figure 3, looks like a fairly straight line on this scale. Page 17: Is there any evidence of OS or NOS formation from the FIGAERO? Page 18, line 7: could it be that you are underestimating the amount of IEPOX-SOA using the FIGAERO because it is often converted to an OS? Page 19, line 1: The $C_5H_9NO_7$ peaks at 6pm. Is this still daylight? Page 19, line 10: Does this species correlate with NO? Page 19, line 26: Is it possible that $C_8H_{12}O_6$ is not a unique tracer for MT SOA? Page 21, line 1: Does a R=0.71 reall show they are "well correlated"? Page 22, line 7: The sentence starting "this can be explained" is hard to follow. Please rewrite.

Figure 2: What is going on in figure 2b in the morning? Seems very spiky. Figure 2e and 2f and in a few other places: I can see why you would put all the diurnals on one plot, but it is impossible to see if there is any trend in the minor factors. I would like to see additional figures in the SI with more appropriate axes. Figure 3 and 4: It is hard to see what is actual data in the time series. Remove the interpolation across missing data points. Figure 4: I would like to see a bigger version of the MS in the SI, with the major ions labelled. It is really hard to tell what ions are present. I would also suggest a table with the top 20 ions for each factor. Figure 6: It is really hard to see the true trends in each tracer when the factors are placed on top of each other. Can you add a figure to the SI showing the individual diurnals for each species? (i.e. similar to figure 4d) Page 15, line 2: I would like to see Figure 5 as a % of total signal plot in the SI.

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