Atmos. Chem. Phys. Discuss., 14, C79–C82, 2014
www.atmos-chem-phys-discuss.net/14/C79/2014/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Chemistry of new particle growth in mixed urban and biogenic emissions – insights from CARES" *by* A. Setyan et al.

Anonymous Referee #1

Received and published: 6 February 2014

This manuscript describes particle microphysical and chemical properties during new particle events (NPEs) that occurred in an urban-influenced forested site in California. The principal finding is that NPEs occurred primarily under urban transport; new particle formation and growth did not occur in the absence of an anthropogenic trigger. This finding is in contrast with the extensive work on new particle formation and growth in the forests of Finland, where no anthropogenic component is required for frequent regional NPEs. In both cases the growth is primarily due to organic composition, yet in the California case NPEs happen only when the urban plume is over the measurement site.

The manuscript is well written and of interest to ACP readers. I have some suggestions to shorten the manuscript a bit; I recommend it be accepted with minor modification.

Suggested Changes (page numbers and line numbers refer to "printer-friendly" version of manuscript):

1) The Experimental section describes the facilities at the urban (T0) site and the forested (T1) site. Nowhere is it explicitly stated that chemical composition was measured only at the T1 site, while size distributions were measured at both. This is a problem because later in the paper the chemical data are introduced without stating clearly that the measurements are from the T1 site, which caused me some confusion at first.

2) P. 2051, lines 5-12, there is a discussion about thresholds for discriminating "strong" from "weak" NPE cases. There is no mention of the time required for the stated increase–is it 800 particles/cmˆ3/hr? Why is this inconsistent with the number increase shown in Table 1, where the "strong" and "weak" cases are shown? This needs to be clarified both here and in Table 1.

3) At several locations in the paper (e.g., p. 2051, line 14), the word "mode" is used in place of "modal diameter" or "number geometric mean diameter". "Mode" means the entire aerosol population in a given size range. Please search and correct throughout the text.

4) p. 2052, line7, it's not clear that these NPEs occur on a regional scale. They are occurring in the urban center and at a downwind site; does this constitute "regional scale" or "plume scale"?

5) p. 2052, line 16. Are the differences in the growth rates at T0 and T1 statistically significant?

6) p. 2053, line 1. Use "T0" and "T1" consistently instead of "Cool" and "Sacramento".

7) p. 2053, line 7. A nucleation mode is smaller than 10 nm; you are measuring the Aitken mode.

8) p. 2053, line19. By agglomeration do you mean coagulation? Self-coagulation rates

are probably very low; growth in the Aitken mode is vastly dominated by condensation in these circumstances of rapid diameter increase.

9) Recommend removing Fig. 3, as it shows the same information as in Fig. 2. Do you really need both?

10) p. 2054, it would be very useful to show the condensation sink term on one of the diurnally averaged plots, like Fig. 4 or Fig. 5. The sink term may play as big a role in determining NPEs as does the source term.

11) p. 2059, lines 5-8. The compounds you list are not semivolatile and will not partition to the particle phase. They are rather markers of oxidation that are probably correlated with condensable compounds.

12) p. 2059 lines 14-18. You haven't shown that the differences in these compounds between NPE days and non-NPE days are significant. The standard deviations certainly overlap. Use "significantly" only when you've done the statistical testing to verify.

13) p. 2059 line26 through p. 2060 line 13. This is a long discussion for a very minor issue (RH); can it be shortened to, "there was no evident relationship between measured RH and particle growth rates or the occurrence of NPEs"?

14) p. 2061 line 24, again, are these growth rate differences really significant?

15) Figure S5. It would be nice to add a trace of CO to one of these plots so that we can see the urban influence in a non-aerosol tracer. Ozone is good but is secondary and regional, while NOx gets converted to NOy and is not a great tracer.

Technical Edits:

1) p. 2058, "NPE events" should just be "NPEs".

2) References, several place names (e.g., Texas, New England) need to be capitalized. Please thoroughly check the references for typos; I have not.

3) Table 1, column labeled "deltaN" is inconsistent with text describing the "strong"/"weak" classification. Is this a different particle size range than described in the text? Please state what this variable is.

4) Fig. 6 caption, state clearly what the lines+symbols are.

5) Fig. 9 caption. You don't need to define NPE here again. Missing the right-hand column of graphs (d-f)!

6) Change "NPG" to "NPE" in this figure.

7) Supplemental material p. 2, line 22. Define "PToF".

8) Supplemental material p. 2, line 23. Change "data of ammonium was" to "data of ammonium were".

9) Figure S1. I have no idea what the various lines, symbols, and bars on this figure mean, or what it's supposed to show. Is this only for those who process AMS data?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 2043, 2014.