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Interactive comment on “Spectro-microscopic measurements of carbonaceous aerosol aging in Central California” by R. C. Moffet et al.

Anonymous Referee #3

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General Comments:

The paper presents a new data set utilizing detailed single-particle analysis techniques, and it is generally well written. However, I believe that major changes are needed prior to publication in ACP. The main conclusion, that organic content on particles increases as they age, is rather mundane, especially considering that the case study was especially chosen to be a period when the total organic mass increased over time. The most potentially interesting section, comparison of California to Mexico City organics, is too brief to provide much useful information. In addition, the authors hypothesize changes due to new particle formation, coagulation or condensation, but never show complete size distributions over time to help support these concepts. These data would add value to the paper, and presumably they are available for the CARES experiment.

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Specific or Minor Comments:

Abstract: Suggestions for those who haven't read the whole paper: Line 20: Do you mean for equivalent particle sizes? Line 22: "Less" should be "fewer", since you are talking about discrete features.

p. 9182, lines 9-25: Suggest you refer to these locations on Fig. 1, for the uninitiated reader.

p. 9182, lines 28-29: If data from this case are being supplied to models, how representative is it? Based on the Meteorology section, it seems it is not very typical of conditions in general. A better argument should be made that this unusual case is important, and modelers should be cautioned that it is not typical for the region.

p. 9183: "Fixed-site microscopy sampling" is an odd phrase. I think you mean that samples were taken at fixed sites for later analysis, but as it reads, one might assume the microscopy was done at that site.

Fig. 2: Axis and scale lettering needs to be enlarged. Figure description is too brief to fully describe the complexity of the figure—i.e., what tracer? Units? How was it determined?

2.2: This sub-section seems a little out of place; suggest moving it down to just before the Results section.

2.3: p. 9184, line 25: Approximately what percent of fine-mode particles does the 0.3 micron size limit represent? Presumably optical size distribution measurements are available, and typically this would be a small fraction of the total number or even of those expected to act as CCN.

p. 9189, lines 3-4: It should be mentioned that at T0 site, soot seems to be attached to the edges of particles while at the T1 site, soot is nearer the center of the particle (assuming these images are representative.) This presumably relates to different mixing processes, affects the absorption properties of the soot, and also gives information on

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how appropriate the typical “soot core” model is.

Fig. 4: How is “dominance” determined here? Is it qualitative or quantitative?

p. 9194, discussion: Obviously, gas-phase reactants is likely to condense on existing particles when organic aerosol mass increases. This section could be made more interesting, however, if complete aerosol particle size distributions (not just those measured by STXM) were used to clearly separate condensation on existing particles from formation of new particles, for example.

Fig. 6 and Fig. 7 show different category types. This reflects the different analysis techniques, but can the types be unified to the extent possible?

p. 9196: The MILAGRO data are discussed in the text, but too briefly to provide much of a useful comparison. For example, are time periods and particle sizes similar? Boundary layer thickness? Are total number concentrations similar?—this alone could affect how much mass condenses on individual particles. This comparison seems perfunctory, particularly since its conclusions are included in the Abstract. Specific MILAGRO data such as given for CARES in Figs. 9 and 10 would be helpful. Also, I don’t understand the statement “along the transport path for Mexico City there are anthropogenic precursor emissions along the way from T0 to T1”, since the T0 and T1 sites apply to California, not Mexico, don’t they? Perhaps some of this is already published, it but needs to be discussed in more detail to make this section viable. Also, the Abstract discusses soot number fractions for the two sites, but they don’t seem to be in the text.

Grammar: The author tends to omits commas to separate independent clauses and parenthetical elements. For more clarity, I suggest that some of these should be added. The first text paragraph is one example.

Typos: p. 9187 line 21: “a” should be “as”. p. 9190, line 4: “coarse” is misspelled. p. 9191, line 22: First “clusters” should be “cluster”. p. 9192, line 25: “function” is

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misspelled.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9179, 2013.

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