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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The 2005 Study of Organic Aerosols at Riverside (SOAR-1): instrumental intercomparisons and fine particle composition" *by* K. S. Docherty et al.

Anonymous Referee #1

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Review

"The 2005 Study of Organic Aerosols at Riverside (SOAR-1): Instrumental Intercomparisons and Fine Particle Composition"

K.S. Docherty et al.

General Comments

This is a very strong manuscript that fully merits publication in ACP after minor revisions. It presents a rather large amount of information concerning the fine PM compositional measurements during the SOAR-1 field experiment. While much of this data

has been reported in the numerous previous papers from this experiment, this new study still has significance as a intercomparison and synthesis of that earlier work. The analyses included here are each on one of manuscript's two major themes: 1) to characterize the performance of the several aerosol composition instruments used during SOAR-1 with respect to each other; and 2) to synthesize the data from these instruments as a group to present a representative characterization of the fine PM composition observed during the study.

While the great majority of this information included in the study are valuable, the overall impact of the manuscript in its current form is inhibited by some shortcomings in its organization. The first few sections- the introduction, the study overview, and the measurement descriptions- are quite good and do not require significant modification. However, in the results section, the authors should consider more explicitly organizing and presenting the analyses in response to their chosen themes. They might also consider more carefully what material should be included in the main text, what should be in the supplementary material, and, perhaps, what might be safely removed from the manuscript.

My impression is that sections 4.1 and 4.2 are essentially preliminary material relative to the intent of this study. If similar analysis was included in the previous SOAR-1 papers these could be cited. If not, the site representativeness and meteorological analyses could be safely moved to the study overview (section 2). The inclusion of the SOAR-2 met analysis does not add significant value to the paper, even as supplementary material, since SOAR-2 compositional data are not used in the paper.

Sections 4.3 through 4.6 present the aerosol composition intercomparisons. There is enough analysis here to be a standalone section on the intercomparison theme, and this is recommended. This would allow the reader to better see where each section serves the overall goal of the paper. It would also help retain readers who may not be as interested in the extended focus on measurement techniques- while these analyses are very important, they are not critical for readers who are mainly seeking the average

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aerosol compositional properties during SOAR-1. There is also a need within this group of sections to more fully commit to a decision on whether material should be included in the main text or as a supplement. Figure S2 has a whole paragraph devoted to it in the main text, and figure S3 has a whole section devoted to it. If a figure merits a whole section in the manuscript, why would the figure itself be moved to the supplement? This is especially confusing because the results are clearly in line with the overall theme of the paper. If the authors feel strongly that the figure should be in the supplement, then perhaps the bulk of the accompanying text might also be moved there.

Sections 4.8 through 4.10 synthesize the SOAR-1 fine PM composition measurements to produce an overall assessment of these properties. These sections directly relate to second theme of the paper and should be more explicitly lumped together.

The placement of section 4.7 is a more challenging concern. EA analysis is still relatively novel, but it is obviously highly valuable and will soon be a standard component of the analysis for HR-AMS. Its potential is highlighted in the manuscript in that the results of the EA analysis are key to the value of two other analyses in the study (the OC intercomparison in section 4.5 and the ion balance analysis in section 4.9). The difficulty arises because, with respect to the two dominant themes of the overall manuscript, the EA analysis as a standalone section is somewhat of a distraction. It does not involve any instrument intercomparison directly, nor does it synthesize the overall composition in a way that will be useful to most readers. Several possibilities exist to fix this- the section might be rewritten to better merge it into the greater synthesis of aerosol composition. Or the section might be moved to an appendix or to the supplementary text.

Figures and tables were generally very good. The authors might consider adding some indication of the uncertainty associated with the diurnal pattern plots presented. Range values are sometimes given in the text, but it is difficult to assess the strength or consistency of these patterns when only the average is provided on the figures.

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Specific Comments

Line 455: The reference to “our group” should be changed unless the manuscript’s entire author list is included in the group.

Line 459-461: This sentence has grammar and/or spelling errors that make its meaning unclear.

Line 516: Should “Figure 1” in this sentence refer to Figure 2?

Lines 659-664: These sentences seem extraneous to this paper. Consider removing them.

Lines 691-694: There seem to be several other possible reasons to explain the mismatch between the SO4 measurements. How does one explain that NO3 is found almost entirely on submicron particles, but that SO4 is largely supermicron? The authors should defend their conclusion here in more detail. Could it not be an HR-AMS collection efficiency or data analysis issue?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 6301, 2011.