

***Interactive comment on* “Characterization of submicron aerosols at a rural site in Pearl River Delta of China using an Aerodyne High-Resolution Aerosol Mass Spectrometer” by X.-F. Huang et al.**

Anonymous Referee #2

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In this paper, the authors report the HR-AMS measurement results in a rural site downwind of a highly polluted area of the Pearl River Delta region in China. Results show that in addition to a substantial fraction of organics (~34%), sulfate still has a substantial fraction (~34%) in the non-refractory PM₁ materials measured by AMS. Among the organics, PMF analysis reveals that organic aerosols during the sampling period contain mainly LV-OOA, SV-OOA, and BBOA. Elemental analysis was performed and compared with values from the literature, as well as lab experimental results from the same group. Meteorological conditions were also examined to understand the concentration variation during the campaign. The results are interesting and fit well in

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the scope of ACP, in that they show several features, including high sulfate content, aged organics, BBOA influence etc., of the aerosols in this rural site. These features, however, scattered throughout the manuscript. It is recommended for publication after some modification concerning several points as below.

Major comments:

1. Introduction. As mentioned above, the major points that the authors want to deliver are not easy to grasp. One of the reasons is that the introduction does not provide enough general information in the very beginning. Some information is provided in paragraph 1, but it would be better to expand this paragraph with the actual focus of the results in the current study. Paragraph 2 is remotely related to the science that is discussed here thus can be shrunk into a few sentences.

2. P25846, L26. Alfarra et al. (2007) used a CE of 0.7 for BBOA based on comparison of NR-PM1 + EC vs. TEOM mass. The last part of the sampling period of the current study was strongly influenced by BBOA, as stated by the authors. The authors need to justify the usage of CE 0.5 throughout the whole campaign.

3. P25851, L20. The authors attribute the relatively high N/C ratio during the biomass-burning period to the secondary reactions of NH₃ and NO_x (better clarify that the reactions under concern are with organics) and burning of N-containing soil materials. These are reasonable, but what would be more plausible is the explanation from Laskin et al. (ES&T, 2009, 43, 3764), which shows that the N-heterocyclic alkaloid compounds (ubiquitously present in biomass fuels) might contribute substantially to the N-containing compounds of BBOA.

4. P25851, L25. “the evolution of bulk organic. . . of PRD might be somewhat different from that. . .”. Heald et al. (2010) talked about the possible reasons for the deviation of the slope from -1 in the Van Krevelen diagram. To support the characteristics of aerosols in this rural site during the campaign, it would be better to discuss more specifically about what is the possible reason(s) for this deviation observed.

5. P25864, Fig 2. The numbers of mass percentages in (f) are totally different from those in the text. It should be stated in the caption if these numbers are calculated in a different way from those in the text (33.8%, 33.75, 14.0% etc.). The color code for BC (black) in (f) is ambiguous because in (c) it refers to PM1.

6. The diurnal patterns of BC, N/C, and PMF-resolved BBOA, which should all be strongly related to the biomass burning activity as suggested by the authors, are quite different if not completely distinct. Any reason behind this?

7. Overall, the manuscript has several good points on: 1) relatively high mass concentration and high sulfate fraction in NR-PM1 compared to other regions in the world; 2) aged aerosols supported by several types of analyses including O/C, LV-OOA fraction, and correlation of OOA with sulfate and nitrate etc.; 3) evidence of BBOA influence at the end of the campaign. To connect the dots, it would be better to summarize these in a coherent conclusion, rather than merely repeating the abstract as it is now.

Minor comments:

1. P25850, L20-23. Looks odd. “an absence of morning peak” of BC because of rush-hour traffic?

2. P25851, L26. This statement needs more caution and some updated references, since 1.4 has been used for a while and there are a whole lot more of other suggested numbers (Table 1 in Chan T.W. et al., ACP, 2010, 10, 2393).

3. Typos. P25843, L22, a redundant comma; P25848, L13, L25, the symbol of “~” should be between letters and numbers?

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