

## ***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 #1**

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General comments:

This manuscript reports the chemical characteristics of submicron aerosol particles measured by high-resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS) at a rural site in the Pearl River Delta (PRD) of China. Since the sampling site located at the downwind of the central PRD area, the field data reported help to better understand how the rapid urbanization and industrialization of PRD influencing the regional air quality. This field study captured active biomass-burning (BB) activities during the later period of study but there are a few points to be clarified. To the best of my knowledge, it is the first HR-ToF-AMS field dataset reported in the PRD region and the authors

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discussed the observations with enough details. Overall, I suggest the publication of this work in ACP with minor revision. The specific comments are shown below.

Specific comments:

1. This work clearly shows the significant increase of biomass burning aerosols concentration after November 12. As shown in Figure 2d, BB event generated a huge amount of organic aerosols. To better compare with the literature, I suggest showing the average mass concentrations of BB and non-BB data individually in Figure 2g. It also help to know the background levels of each PM<sub>1</sub> components at Kaiping before BB period
2. In Section 3.3, the average diurnal pattern of N/C ratio has a large peak in the late afternoon. The authors suggest that this is due to the continuous accumulation of biomass burning aerosols generated in daytime. From Figure 4a, the daily peak position of N/C ratio looks matching quite well with that of O/C ratio in October, which means that the N/C ratio may be enhanced by the active photochemistry in noontime. It would be useful to average the BB and non-BB N/C ratio separately to see if there is any significance difference between them. Conducting the same diurnal analysis for other ratios and PM<sub>1</sub> components is highly recommended.
3. It is recommended to highlight the BB data on the Van Krevelen diagram because the characteristics of freshly formed BB aerosols can be very different to the aged SOA.
4. According to the PMF analysis, the N/C ratio of BBOA component is about 0.06, which is much higher than those of their laboratory-generated BB aerosols (N/C < 0.02). What are the possible reasons causing such large difference? Also, it would be worth to compare the N/C ratio of BBOA identified in previous studies.
5. There are contradictory descriptions about the origin of BB aerosols. In Section 3.1, the authors mention that fresh BB aerosols are the major contributor to organic mass with smaller particle size, implying that there is a significant local BB aerosols

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emission. However, in Section 3.5, they conclude that regional transport from central PRD rather than local emission was the major origins of BBOA component based on the meteorological information. Please clarify.

6. Page 25854, L7-10: Revised the following sentence "...with LV-OOA correlating best with nitrate due to the common semi-volatility and SV-OOA correlating best with sulfate due to the common low volatility" to "...with SV-OOA correlating best with nitrate due to the common semi-volatility and LV-OOA correlating best with sulfate due to the common low volatility".

7. The HR-ToF-AMS can measure PM1 non-refractory components. However, I expect that the MAAP measured BC in PM2.5 instead of in PM1 in this study. If this is the case, it is not very appropriate to describe the measured BC as PM1 component in Section 3.2-3.3 and Figure 2. If not, please clarify in the section of experimental methods.

8. It is necessary to make Figures 2, 3 and 7 with higher resolution. Some axis labels and legends are not clearly shown. The wind speed data is totally covered by the wind direction data in Figure 2.

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