

***Interactive comment on* “Characterization of submicron particles by Time-of-Flight Aerosol Chemical Speciation Monitor (ToF-ACSM) during wintertime: aerosol composition, sources and chemical processes in Guangzhou, China” by Junchen Guo et al.**

Anonymous Referee #2

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This manuscript reports a ToF-ACSM measurement study of sub-micron particles conducted during winter time in Guangzhou, South China. PMF with ME-2 algorithm was applied on the dataset to identify the major sources of organic aerosols (OA). Discussions are made on concentrations, compositions, and sources ambient PM₁, highlighting the important roles of SOA. Additionally, the relationship with SOA and peroxy radicals was examined to reveal the different mechanisms responsible for SOA formation between non-pollution period and pollution Eps. The manuscript is well written and

provides some interesting results for understanding ambient primary and secondary organic aerosol sources and processes. I would recommend the publication of this manuscript in Atmospheric Chemistry and Physics after the authors address the following comments.

1. The resolution and font sizes need to be improved? (e.g., Fig. 1, Fig. 4b and Fig. 5)
2. Please check the subscript in the texts and figures.
3. Page 7, Line 191-194: It would be good to add a more accurate discussion of the calculated composition-dependent CE values (e.g., range, highest frequency and uncertainty of CE values).
4. Page 8, Line 237-241: Recently, a large number of AMS/ACSM studies have been conducted in China in recent years. Is it possible to add more references and discuss with more results?
5. Page 15, Line 455-477: I suggest the authors put these parts in introduction and highlight the differences of your results from previous ones.
6. Page 28, Fig. 4: The factors of HOA and COA were resolved using the constrain mode (α -value), but SVOOA and LVOOA were identified using the PMF free mode. So, to be more directly clear for readers, the authors may consider adding the corresponding label in each mass spectrum of POA factors (e.g., constrained or a specific α -value) and SOA factors (e.g., unconstrained or free).
7. Page 29, Fig. 5: The diurnal profile of NO_x appears to be bi-modal, yet no morning traffic feature is visible in the HOA diurnal plot during pollution Eps. Have the authors looked for the variation of HOA mass fraction during early rush hour? More explanation about the diurnal profile of HOA would be good.
8. Section 3.5.2: It would be interesting to see how the SOA changes during different conditions. The authors may consider adding the correlations between SVOOA and LVOOA with RO₂^{*}, perhaps in the supplement.

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