Summary

Cheung et al. conducted a set of ambient measurements from which they calculated size-dependent volatility shrinkage factors (VSF) of aerosols in Guangzhou after heating to 300ºC in a tandem differential mobility analyzer. Size-selected particles ranging from D_m = 40 to 300 nm were examined. Mass concentrations of OC and EC were also measured. Particles were classified as "completely volatile" (CV; VSF ~ 0), "high volatility" (HV; VSF< 0.4), "medium volatility" (MV; 0.4<VSF< 0.9) and "low volatility" (LV; VSF > 0.9). Three primary results are reported: (1) the number and volume fraction of CV particles decreases with increasing particle size, while the LV particle number and volume fractions increase with increasing diameter (2) size-resolved measurements combined with average diurnal patterns suggest that 40 nm CV and LV particles represent local, fresh emissions, whereas >80 nm HV and MV particles represent aged emissions. (3) A closure analysis of VHTDMA and OC/EC analyzer measurements suggests that organics comprise a significant fraction of the measured MV and LV. Overall, the results are interesting, but I suggest additional analysis of the data before I would support publication in ACP. In particular, I think it would be useful to present more of the OC/EC results to assist with, and expand on, the interpretation of the VHTDMA measurements.

Main Comments

1. In my opinion, the closure analysis -- which currently focuses on a comparison of EC + OC2 + OC3 + OC4 versus LV + MV – is incomplete. The volatility-resolved VHTMDA and OC/EC analyzer measurements should in principle allow for a more comprehensive closure/intercomparison study. Because the volatility fractions in both instruments are affected by the specific operation conditions, I think expanding on this subject in Section 3.3 would be interesting and possibly help with the interpretation of the VHTDMA measurements. I suggest that this subject be a major focus of a revised manuscript. For example:
    a. CV versus OC1
    b. HV versus OC1 and/or OC2
    c. MV and OC2 and/or OC3
2. I think the authors should plot and discuss campaign-average mass fractions of OC1, OC2, OC3, OC4 and EC to accompany the volume fractions of VM, CV, HV, MV and LV that are presented in Figure 6 and related discussion.
3. Similarly, the authors could plot time series and diurnal patterns of OC1, OC2, OC3, OC4 and EC mass fractions as is done in Figure 7 and related discussion of the volume fractions of VM, CV, HV, MV and LV.

Minor/Technical Comments

4. It is not clear to me how understand the difference between "Volatile Materials" (VM) are defined. I assumed that "VM" becomes "CV" after heating to 300ºC, but this does not seem to be the case because separate volume fractions of "VM" and "CV" are presented in Figures 6 and 7. Please clarify the definition of VM.
5. OC2, OC3 and OC4 are never defined in the manuscript.

6. What is the residence time in the heated section of the VTMDA, and how sensitive are the HV/MV/LV classifications to the residence time?
7. P25275, L8-10: The authors state: “Upon heating at 100ºC and beyond, volatile components of the particle such as sulfate, nitrate and volatile organics vaporize”. Please plot VSF (at 300ºC) of ammonium sulfate, perhaps as a supplemental figure, over a few sizes ranging from 40 nm to 300 nm. I would not have thought that ammonium sulfate completely vaporizes at only 300ºC.