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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Evaluating the degree of oxygenation of organic aerosol during foggy and hazy days in Hong Kong using high-resolution time-of-flight aerosol mass spectrometry (HR-ToF-AMS)" *by* Y. J. Li et al.

Anonymous Referee #2

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This study attempted to evaluate the influences of different processes on the oxygenation degree of organic aerosols in Hong Kong using data from an Aerodyne HR-ToF-AMS. Two foggy periods and one haze episode were analyzed in detail. An aerosol thermodynamic model (EAIM) was applied to estimate the water content, pH, and ionic strength in particles based on the inorganic aerosol speciation observed by the AMS. The EAIM results and the concentrations of Ox were then used to interpret the mechanisms responsible for the changes of the oxygenation degree observed for organic aerosols, mainly based on analyzing correlations among different variables. Understanding the processes of atmospheric organic aerosols is important. The manuscript is quite well written with some insightful discussions. But a main issue is that the AMS results (including the PMF organic factor results), which are the foundation of the work presented here, have not yet been published nor peer-reviewed. It is somewhat difficult to evaluate the results reported in this manuscript without access to some basic information regarding the three OA factors, although it is probably reported in Lee et al., 2013. It does not seem consistent that while noticeable amounts of nitrate were detected in particles (Avg= 0.63 microgram / m3) aerosols were found generally acidic during this study. HNO3 is volatile and unlikely survives in acidic particles. If there are issues with species quantification, all related discussions should be revised.

It is not appropriate to use the Van Krevelen diagram to interpret aerosol processing mechanisms based on the relationship between H/C and O/C observed in total OA. Generally HOA has higher H/C than OOA whereas OOA has substantially higher O/C. HOA accounted for an important fraction of the OA mass during this study (Avg HOA/OA $\sim$ 30%) and its contribution varied as a function of time. For these reasons, the observed slope of O/C vs. H/C could be strongly affected by the mixing of different aerosol types. The discussions on chemical processing should be revised. In addition, since organic aerosol may undergo many changes during its lifetime, its history tends to have a strong impact on its composition and properties. One should be cautious with using in-situ measurements that only represent the instantaneous values in ambient air, to infer aerosol processes.

It is also unclear how the volatility statuses of the two OOA components were inferred? Are there any correlations between LVOOA and sulfate and between SVOOA and nitrate? It seems too much of a speculation to hypothesize adsorptive partition based on just the correlations between HOA and LVOOA mass concentrations and the total organic concentration (Fig. 8).

Detailed comments:

Fig 1d, the three factors do not add up to 100% of OA, why is it?

Line 20- 22, page 3550, how do the authors know that LVOOA is more polar than SVOOA?

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 3533, 2013.