**Atmospheric
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Discussions

Interactive comment on "New characteristics of submicron aerosols and factor analysis of combined organic and inorganic aerosol mass spectra during winter in Beijing" *by* J. K. Zhang et al.

Anonymous Referee #1

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This manuscript reports the results from PMF analysis of an ambient AMS data collected in winter 2014 in Beijing. Six organic factors were determined through analyzing the aerosol spectra including both organic and inorganic signals. Discussions on aerosol sources and processes are made based on these results. Some comparisons with the AMS observation from winter 2013 are also discussed. This work fits well to the scope of ACP and the manuscript is overall well written. I recommend this manuscript for publication after the authors address the following comments. Page 18456 – 18457, the discussions of aerosol aging based on the O/C of bulk organic aerosol is problem-

atic. Oxidative aging is not the only reason for changing bulk O/C observed in ambient aerosol. Mixing of OA from difference sources and with different degrees of oxidation can lead to O/C changes as well. For example, a decrease of O/C can be observed simply because of a larger contribution from chemically reduced POA from vehicle emissions and coal combustion, which often happens at night when temperature is usually lower and RH higher compared to daytime. The relationships observed between O/C and T (and RH) don't necessarily suggest a definitive connection between oxidative aging of OA and meteorological conditions. It is thus inappropriate to use the observed increase trend of O/C with RH to claim aqueous processes. In fact, what's the liquid water content? Water-uptake by particles is likely very low at RH $\sim$ 45%, even for particles composed mostly of hydrophilic inorganic salts. What's the base to claim that OA aging is dominated by aqueous-phase processes when RH was higher than 45%? In this study particles appeared to be significantly acidic according to the charge balance between NH4 and anions (i.e., sulfate, nitrate and chloride). The observation of large amounts of nitrate and chloride in acidic particles, however, is intriguing, as HCl and HNO3 are both highly volatile and Chl and NO3 tend to partition into the gas phase when particles are acidic. It would be helpful that the authors elaborate on this and provides some explanation for the observation. In addition, it might be worthwhile to check whether correct RIE values are used for ammonium and sulfate. While the RIE for NH4 is commonly determined during IE calibration, the RIE for sulfate is not determined and a default value of 1.2 is used for sulfate. However, previous studies found the RIE for sulfate could be quite different depending on instrument tuning. Was ammonium sulfate analyzed to determine the RIE for sulfate? If not, I suggest the authors consider doing so. Are there chemical differences between the nitrate associated with NO3-OA1 and NO3-OA2? For example, what are the NO+/NO2+ ratios for those two factors and how do they compare to the ratio in NH4NO3? It appears that some NO+ and NO2+ are associated with CCOA and HOA too, what are the NO+/NO2+ ratios in them? What's the logic of using the distribution of the 6 OA factors on the f44 - f43 space or the VK diagram to infer the aging pathways of OA as discussed on page

18554 – 18555? Detailed comments: Last paragraph on page 18539, a comprehensive review of the PMF analysis of AMS data is given in "Zhang, Q., Jimenez, J. L., Canagaratna, M., Ng, N. L., Ulbrich, I., Worsnop, D., and Sun, Y. L.: Understanding organic aerosols via factor analysis of aerosol mass spectrometry: A review, Analytical and Bioanalytical Chemistry, 401, 3045-3067, 10.1007/s00216-011-5355-y, 2011." Line 28, page 18550, change ug m-3 to um.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 18537, 2015.

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