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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Extreme haze pollution in Beijing during January 2013: chemical characteristics, formation mechanism and role of fog processing" *by* K. Huang et al.

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This article addressed the extreme pollution in northern China in January 2013. By compared with the historical PM and AOD over Beijing as well as the meteorological conditions, and the authors presented the impact of abnormal meteorological conditions on air pollution, such as RH and PBLH. But these influence factors have been

discovered by previous work (e.g. the references cited by the authors). The description of this manuscript is right, but what's the new insight or new finding? The explanation about the sources of chemical species was also more confusing as mentioned in the specific comments. Which kind of sources and transformation process dominated during the pollution episode? There many literatures reported the chemical profiles and sources of fine particle during haze days, what's the new insight or finding of this manuscript? This should be addressed in revised version. A half-month field measurement of chemical compositions of PM2.5 at an urban site of Beijing was also presented. Impact of RH on aerosol chemistry was also discussed, but the statement seems to be confused. For example, why the relationship of Cl- (K+) to RH showed similar patterns as those second inorganic ions (i.e. SO4=, NO3- and NH4+), but Na+ not? Cl- or K+ should also be dominated by the primary sources as the conclusion of this paper, but it is not the fact as many literatures reported before. The conclusion 'enhanced coal combustion during the winter heating season along with traffic and industrial emissions were the major sources for this severe haze' is very bland as many literatures reported. I don't know, except in the dust weather, which source will be major in Beijing beyond these three sources illustrated by the authors.

1. What's the difference between fog and haze? Did the manuscript address the fog or haze? 2. Page 7519 Line 2-6: The definition of haze should be accurately cited while not be pronounced according to the understanding of the authors. 3. Page 7519-7520: The statements in 'Introduction' should be more targeted and more critical references related to the aim of the work should be cited, such as the previous research on aerosols chemical properties and sources analysis in Beijing. 4. Page 7526 Line 18-19: Whether the decrease in PM and AOD in Beijing during 2006-2011 attributed to the metrological factors? 5. Page 7527 Line 12-13: 'Figure 2 illustrates . . . in northeastern China . . .' The statement of 'northeastern China' should not be apposite. 6. Page 7531 Line 5: 'Angstrom exponent (470-880 nm)'? seems to be 440-870 nm? Besides, 'Angstrom' should be 'Ångström' through the paper. 7. Page 7531 Line 8: The decimal numbers should be unified. 8. Page 7531 Line 22: How to calculate

the mean visibility? Directly arithmetic mean should not be suitable for the visibility for the inverse relationship between visibility and extinction. 9. Page 7532 Line 9-10: The units of the AOD/PM2.5 should be m3 mg-1. 10. Page 7532 Line 27-29: 'the Angstrom exponents were all below 1.0 and this should be generally caused by a significant contribution of coarse particles'. The statement – 'coarse particles' should not be suitable. Coarse particles usually represent the particles with size greater than 0.6 μm in the research on columnar aerosol optical properties. Che et al. (2014) specially analyzed the columnar aerosol optical properties in northern China during January 2013 and presented the dominated contribution of fine mode particles to AOD during pollution. Meanwhile Che et al. (2014) also found a trimodal size distribution (dV/dlnR) (bimodal submicron pattern) during the heaviest pollution during 12-14 January and attributed it to the effect of high RH. The authors should cite this reference. 11. Page 7534 Line 15-18: Coal combustion should be the major cause for the high level Cl-. The average concentration of Cl- was close to the average Cl- level in Beijing reported by previous work. What the sources of the secondary ions (SO4=, NO3-, NH4+)? The authors should be noted that biomass burning is also one important contributor to Cl-. 12. Page 7535 Line 12: I think traffic emissions should not vary a lot day by day in Beijing. The authors should not be simply attributed the increase in trace elements to enhanced industrial and traffic emissions. Many factor such as accumulation of local emission under stable metrological conditions or regional transmission of pollutants from surrounding areas will have great impact on the concentration of the trace elements. 13. Page 7536 Line 1-4: Why Cl- and K+ underwent similar growth patterns as SO2=, NO3- and NH4+. Na+ is dominated by primary sources, Cl- and K+ are dominated by secondary sources? 14. Page 7536 Line 11: 10 January was a fog day?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 7517, 2014.