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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling analysis of the seasonal characteristics of haze formation in Beijing" *by* X. Han et al.

Anonymous Referee #1

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This work analyzes the mechanism of haze formation in winter (February) and Summer (July) of 2011 using a regional air quality modeling system, and identifies that higher relative humidity (RH) is an important factor for the haze formation in summer. Considering the serious air pollution and deteriorated air quality in China, this kind of study is important and potentially useful for air pollution controls. This manuscript is in general well written although in some places there are wording issues.

I have some general comments that the authors need to address before I recommend its publication in ACP. I suggest that the authors do more in-depth analysis of haze formation mechanisms and also evaluation of models results.

(1) In addition to RH, are there other factors affecting the haze formation? Even within

one single month (e.g., February or July) there are huge changes in the visibility, while emissions should not change a lot. The authors briefly touch the stability and convection. I suggest the authors to do more qualitative analysis by calculating the atmospheric stability based on the temperature profiles. I also suggest the authors to plot the surface precipitation as an indicator of wet scavenging of aerosols. (2) The authors mention that nitrate, sulfate and ammonium are the three major aerosol components in Beijing. How about the contribution of organic carbon (OC) to PM2.5? The model underpredicts OC mass concentration (Figure 8). Are there any aerosol mass spectrometry data available in Beijing in winter and summer to evaluate modeled aerosol components? How about the role of temperature in affecting the secondary formation of these aerosols between winter and summer? (3) The authors discuss the change of aerosol size distribution influencing the threshold of haze occurrence. Are there aerosol size distribution data available for model evaluation?

Specific comments:

1. Page 30577. Lines 13-16. Why the mass burden of PM2.5 remain at high levels while SO2 emission has been reduced? 2. Page 30577. Line 25. Change "the said" to "these" 3. Page 30579. Line 23. Remove "efficiently" 4. Page 30580. Add brief description how the model treats SOA. 5. Page 30580. Line 24. Remove "efficiently" 6. Page 30582. Line 12. Remove "efficiently" 7. Page 30589. Lines 13-15. The authors conclude that the importance of nitrate from the transportation sector as the major sources of secondary particles in Beijing. How does this reconcile with the recent study of Zhang et al. (ACP, 13, 7053-7074) 2013 "Chemical characterizations. . .". Please add some discussions.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 30575, 2013.