Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2020-223-RC1, 2020

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Rapid mass growth and enhanced light extinction of atmospheric aerosols during the heating season haze episodes in Beijing revealed by aerosol-chemistry-radiation-boundary layer interaction" *by* Zhuohui Lin et al.

Anonymous Referee #1

Received and published: 14 June 2020

This manuscript is to investigate the dependency of the aerosol number size distribution, mass concentration and chemical composition on the daytime mixing layer height (MLH) in urban Beijing. The valuable measurement datasets, especially for oxygenated organic molecules (HOMs), are firstly showed during heating time in China, according to my knowledge. These results show that the haze pollution is rapidly formed by aerosol-chemistry-radiation feedback, which is an interesting topic. By using measured aerosol chemical composition and Mie calculation of light extinction, they reached a

conclusion that ammonium nitrate was the dominated compound under lowest MLH. The conclusion is reasonable considering large amount of on-road vehicles and previous publications. Generally, the results in this manuscript are useful to support policy-makers on air pollution controls in the future. Also, this manuscript is easy to follow and the figures are presented in proper forms. Nevertheless, several statements are needed to be clarified. I suggest this paper could be published after minor revisions as below.

Minor comments:

1. Please clarify the differences between mixing layer height (term used in this study) and boundary layer height.

2. This work is mainly focused on particle number size distribution measurements. A Particle Sizer Magnifier (PSM) and a Differential Mobility Particle Sizer (DMPS) is used in the measurement, so this reviewer is wondering how is the variation of particle number size distribution looks like under different mixing layer height condition under haze and non-haze days? You have already showed how are the response of aerosol chemical component with different mixing layer height. This kind of analysis may tell us particle growth under haze and non-haze period.

3. In your schematic picture, you show haze evolution with the daily mixing layer height. Light extinction of dry aerosol is also assigned to different chemical compounds, however, this information was not mentioned in figure caption, please explain more on these two pie charts in the figure caption.

4. In page4 line 83, ". . .particles with diameters of a few hundred nm", a given range of the diameters with the constant will be better, if possible, please give them; please add the references for this sentence.

5. In page9 line 221: ". . . increase from few ug/m3", please change the "few" to specific value.

6. In page10 line 249: if the “NH4NO3” is appeared first, please give the full name.

7. In page10 line 249: if the “EC” is appeared first, please give the full name, also please check for NH4Cl.

8. In page11 lines 277-279: the English grammar tense is inconsistent in the sentence of “We may see that in general, particles with dry diameters in the range of 300-700 nm explained more than 80% of the total aerosol light extinction (Figure 4b).”

9. In page 12 lines 303: the units of “ug m-3” is inconsistent with that of “ug/m3” in page 9 line 222, make sure they are consistent in the full manuscript.

10. Figure 1 caption: explain what PM2.5 represents.

11. Figure 2 caption: “The legends in the left side . . .”, it is “right”?

12. Figure 3 caption: please explain the range for the “daytime conditions”.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2020-223, 2020.