Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2017-455-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantifying the relationship among $PM_{2.5}$ concentration, visibility and planetary boundary layer height for long–lasting haze and fog–haze mixed events in Beijing city" *by* Tian Luan et al.

Anonymous Referee #1

Received and published: 26 June 2017

This study quantifies the relationship among PM2.5 concentration, visibility and planetary boundary layer height for long–lasting haze and fog– haze mixed events in Beijing city. They found negative relationships between visibility and PM2.5, PM2.5 and PBL height. They also found a double inversion layer formed in both typical events, which played critical roles in maintaining and enhancing the long–lasting polluted events. The topic of this paper is interesting and is suitable for publication in this journal. However, some improvements are needed before publication. Following are the major and specific issues:

Major issues:

The authors provided a large amount information of the relationships between PM2.5, visibility and PBL height. However, these relationships are reported in many previous studies. The new finding in this study about influence double inversion layer on the meteorology and PM2.5 needs more attention and discussion.

Specific issues:

Abstract: Causal relationship about 'The air quality and visibility are strongly influenced by aerosol loading and meteorological conditions.' It would be better to revise as 'influenced by aerosol loading, which is driven by meteorological conditions'.

Introduction: Haze in China is a very hot topic and raises a bunch of new studies recently. The authors may cite more recent papers to strengthen this part. Climate change (Cai et al., 2017, Nature Climate), Arctic sea ice loss (Zou et al., 2017, Science Advances) and decadal weakening of winds (Yang et al., 2016, JGR) suggested causes in climate view. Dust-wind interaction (Yang et al., 2017a, Nature Communications) and upwind transport (Yang et al., 2017b, ACP) can also intensify haze in China.

Page 6 Line 25: Why haze and fog-haze events were defined like this? The author mentioned humidity in the introduction but the fog-haze was not defined based on humidity.

Figure 3: Are the both MPL and CL31 at site in Beijing?

Page 8 Line 21: How about these PBL height in haze events?

Page 9 Section 3.4.1: Why the authors chose April 2014 as the typical haze? Haze in northern China are more severe in winter season. How about the results for other haze events identified in this study?

Page 9 Line 25: The unit of visibility is m here but km in previous figures. Please unify units for the whole figures and manuscript.

Figure 6: I am confused that why PMcoarse did not increase with time. If aerosols are accumulated in the boundary layer due to decrease in PBL, all coarse and fine aerosol concentrations are expected to increase.

Page 12 Line 6: Why the authors did not choose the same spring season as the haze event analysis above?

Technique issue:

Too much figures in the manuscript, the authors may move some into supplement.

References: Cai W., K. Li, H. Liao, H. Wang, and L. Wu (2017), Weather conditions conducive to Beijing severe haze more frequent under climate change, Nat. Clim. Change, doi:10.1038/nclimate3249. Y. Zou, Y. Wang, Y. Zhang, J.H. Koo, Arctic sea ice, Eurasia snow, and extreme winter haze in China, Sci. Adv., 3 (2017), p. e1602751 Yang Y. et al. (2017a), Dust-wind interactions can intensify aerosol pollution over eastern China, Nature Communications, 8, 15333. Yang, Y., Wang, H., Smith, S. J., Ma, P.-L., and Rasch, P. J.: Source attribution of black carbon and its direct radiative forcing in China, Atmos. Chem. Phys., 17, 4319-4336, doi:10.5194/acp-17-4319-2017, 2017b. Yang, Y., H. Liao, and S. Lou (2016), Increase in winter haze over eastern China in recent decades: Roles of varia- tions in meteorological parameters and anthropogenic emissions, J. Geophys. Res. Atmos., 121, 13,050–13,065, doi:10.1002/2016JD025136.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2017-455, 2017.