

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 #3

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Review of “Quantifying the relationship among PM2.5 concentration, visibility and planetary boundary layer height for long-lasting haze and fog–haze mixed events in Beijing city” by Tian Luan et al. (acp-2017-455)

Summary: In this article, the authors analyzed and quantified the relationships among PM2.5 concentration, visibility and PBL height for the haze and fog-haze mixed events using the data from several state-of-the-art instruments, and then showed the corresponding meteorological conditions for the two typical cases. Similar analyses have been implemented by many previous studies and the novelty of this study is actually

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not enough. However, the detailed estimations of this study can still provide some valuable information for the haze early warnings. I suggest it to be accepted after several corrections. Note I am not an expert on the atmospheric chemistry, so my assessment on this part may not be accurate.

Specific comments: 1. For any journal, the first requirement is that the abstract of the article should be briefly and concisely. However, the abstract of this study is too redundant and including some valueless information that would be lowering the readability. So, this part of the article is suggested to be re-worded in the next version that just the highlights from this research are needed.

2. Since 2013, increased studies have addressed the impact of climate changes on the haze pollutions over China. For example, weakened East Asian winter monsoon (Li, Qiang, et al., 2016: Interannual variation of the wintertime fog-haze days across central and eastern China and its relation with East Asian winter monsoon. *Int. J. Climatol.*, 36, 346-354), reduced Arctic sea ice (Wang, Huijun, et al., 2015: Arctic sea ice decline intensified haze pollution in eastern China, *Atmos. Oceanic Sci. Lett.*, 8, 1–9), Tibetan Plateau warming (Xu, X., et al., 2016: Climate modulation of the Tibetan Plateau on haze in China. *Atmos. Chem. Phys.*, 16, 1365-1375), ENSO variability (Gao, Hui, et al., 2015: Influences of El Nino Southern Oscillation events on haze frequency in eastern China during boreal winters. *Int. J. Climatol.*, 35, 2682-2688), etc. all showed important roles on the haze occurrences across China. I think this part of the work should be reviewed in the introduction. Additionally, there are also some studies presented the meteorological conditions for the haze pollutions from climatological perspectives (Zhang, Renhe, et al., 2014: Meteorological conditions for the persistent severe fog and haze event over eastern China in January 2013. *Sci. China Earth Sci.*, 57, 26–35; Chen, Huopo, et al., 2015: Haze days in North China and the associated atmospheric circulations based on daily visibility data from 1960 to 2012. *J. Geophys. Res. Atmos.*, 120, 5895-5909), which can be compared with the case analyses in this study, further increasing the readability.

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3. The difference of the separating criterions of the long-lasting haze and fog-haze mixed events is the different value of minimum visibility that minimum visibility larger than 1km for haze events and smaller than 1km for fog-haze mixed events. This is the self-criterion or from the other research? The humidity is a key factor for the separation of the fog and haze events, why the relative humidity has not been considered?
4. In the context, the authors mentioned that “The PBL height derived by MPL is usually used as a reference in detecting the aerosol vertical distribution by more advanced and powerful lidars.”, however, the authors also mentioned in the following paragraph that there are also some uncertainty existed for the MPL to determine the PBL height. This seems to be conflict.
5. How about the statistical relationship between PM2.5 ma concentration and PBL height from CL lidars?
6. In this study, the authors just showed the meteorological conditions for two typical haze events? Why chose these two cases from 11 cases? The composite analysis method is suggested for the further analysis if conveniently.
7. The authors presented detailed analyses on the meteorological conditions for the long-lasting haze and fog-haze mixed events. However, I am still not clear what the difference for the meteorological conditions between these two cases. So, the comparison discussion in this aspect should be added in the section of Conclusion and Discussions, not just showing the common features as the current MS did.
8. To increase the readability, the location of Beijing is suggested to be highlighted in Figure 11 and 17.

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