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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Relationships between the planetary boundary layer height and surface pollutants derived from lidar observations over China" *by* Tianning Su et al.

Anonymous Referee #3

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The manuscript investigates relationship between the PBLH and surface PM based on ground-based and onboard lidar, ground environmental and meteorological observations, reanalysis data, and so on. The relationships at different topographic and meteorological conditions over China are specially considered. Although most, if not all, variables show a relatively low correlation with the PBLH, the comprehensive and systematic study reveal the difficulties to drew the relationship between PBLH and surface PM. Generally, the manuscript discusses an important topic, and the methods and discussions are solid and meaningful.

General comments:

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Discussion paper

1. Some general information about the environmental and meteorological stations used for the four regions should be presented, such as number of stations used in each region, the basic types of them (are them all in the city?). Is there any quality control carried out for the results?

2. Figure 2 can be reorganized for better comparison. The CALIPSO and MERRA results can be shown in the left and right panel, respectively, and, then, results from the same season can be directly compared.

3. The MERRA PBLH is not well introduced in the text. Meanwhile, after Figure 2, most results are compared with the CALIPSO results. The MERRA data can be used to evaluate the CALIPSO data, and if it is not used in the discussion for relationship with the PM, why the authors still discuss it in the manuscript.

4. Section 3.5 and Figure 10 that show the relationship between multiple gases and PBHL are the only part discussing about the gases. Again, relatively poor corrections are obtained, and also considering that this study focuses on the relationship of PBHL and PM, it is not necessary to present those results. This will keep the manuscript more focused.

5. Even the relationship between PM and PBLH is relatively weak, how would it possible to further discuss the aerosol absorption feedback in section 3.6.

6. Considering the relatively low correlations shown in the paper, the conclusions are too strong. For example, in the abstract, the authors mentioned that "(line 31) A generally negative correlation is obtained between PM and the PBLH", while the largest correction obtained is only 0.36 from Figure 3. Multiple 'strong correlations' are mentioned in conclusion section.

7. Besides the conclusions, some relatively strong statements in the manuscript should be reconsidered. For example, on line 146, "This method can handle all possible weather conditions and aerosol layers. . . . . ."

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