

Interactive comment on “The conclusive impact of aerosols vertical structure on low-atmosphere stability and its critical role in aerosol–PBL interaction” by Tianning Su et al.

Anonymous Referee #1

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Aerosol-planetary boundary layer (PBL) interaction is proposed as an important mechanism to stabilize the atmosphere and exacerbate surface air pollution. Attempts to analyze aerosol-PBL interaction by using observation data are rare and worth encouraging. Thus, I recommend a minor revision before publication. The detail comments or suggestions are shown below:

1. My main concern about this study is how to get cause-effect from correlations. As we know, PBL has a strong impact on surface aerosol concentration and aerosol vertical profile (forward effect). Compared to that, the impact of aerosol on PBL (reverse effect) can be treated as a perturbation. Thus, it is hard to get the contribution of reverse

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effect only. For example, Line 265 to 272. It is claimed that “In general, there are stronger correlations between PBLH and PM_{2.5} under inverse aerosols structure. . . . This phenomenon indicates that the absorbing aerosol could play a more important role in the inverse aerosol structure.”. Let’s imagine that the decreasing and inverse profile are formed by specific PBL structure, we may get a similar relationship between PBL height and PM_{2.5} in Figure 5. Moreover, it is possible that the correlations are caused by some other factors, simultaneously, like the front process or precipitation.

2. I don’t quite understand the role of Figure 6 and the corresponding part of the manuscript. It seems that Figure 6 does not support the topic directly and may be considered to be moved to SI.

3. More quantitative analysis is needed in the Results part. I can barely find the detail of quantitative discussion figures, especially in 3.3. I’m not sure if Figure 7 is a specific case, a statistic scenario or just a diagram? It seems there are too many diagrams in the manuscript.

4. It might be helpful to show some statistical information and meteorological condition information. For example, the occurrence/frequency of each aerosol vertical structure within PBL. Does it occur in specific seasons or weather conditions?

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