

The manuscript addresses a critical and challenging issue in aerosol effects on weather and climate, i.e. the influence of aerosol vertical structure on boundary layer stability and height. The two-year concurrent observations from micropulse lidar, sun-photometer, and radiosonde were employed to provide direct and quantitative evidence on the aerosol radiative effects on the boundary layer development. The contrasting effects of different aerosol vertical structures identified by this study are important to know and call on a better representation of aerosol vertical profile in numerical models for future aerosol effect assessment. The paper is well written overall, and its scientific merit is clear. I recommend its publication with ACP, while I also have comments below for the authors to address.

1. Figure 2, are the data here from three cases or composites from all available observations? I have the similar question for Figs. 3-7 as well. Please clarify the data source and sampling range in the figure captions.
2. Is  $R^*$  in Figure 3 for linear regression and  $R^*$  in Figure 5 for the inverse fitting? Better to use different symbols for different types of regression.
3. As shown in Figure 5, the weakly absorbing aerosols can also suppress PBLH. I assume it is caused by the reduction in solar radiation reaching the surface and the consequent suppression in surface latent/sensible heat fluxes. Since the authors have performed the radiation transfer simulations, I'm wondering if they can illustrate the importance of atmospheric heating and surface cooling for PBL development when absorbing aerosols are present.
4. L285-286, the sentence is hard to follow. What do you mean by "significant heating in the different parts of PBL"?
5. Since the authors possess ample observations data, can you show the occurrence/frequency of each aerosol vertical structure within PBL (decreasing, inverse, and well-mixed)? It is interesting to know the relative importance of those three structures in the real atmosphere. Moreover, can you sort out what factors determine those distributions within PBL?
6. L309-315 and Figure 9. What is the physical/chemical mechanism of the negative feedback, i.e. stable PBL leads to less aerosol formation? The color of big red arrow in the upper part of Figure should be changed to blue, as it is about negative feedback.
7. L334, it should be Wang et al. 2013.
8. Please remove "conclusive" from the title, as it is a very subjective word.