
The interaction between aerosols and the boundary layer is a hot topic in the study of the formation mechanism of air pollution in polluted areas. The aim of this paper is to evaluate the fundamental interaction between PM and ABL structure and to further quantitatively estimate the effect of aerosol radiative forcing (ARF) on ABL structure. The paper addressed relevant scientific questions and presented novel concepts, ideas and tools. The scientific methods and assumptions were almost valid and clearly outlined, so that substantial conclusions were reached. The description of experiments and calculations were almost complete and precise to allow their reproduction by fellow scientists except some points. I think the manuscript could be considered to be accepted after major revision.

Major comments:

1. Seven cases spanning a period of 2 months were selected in the paper to discuss the threshold value of the effect of aerosol radiative forcing on the boundary layer structure of the contaminated areas. Are these cases representative, and would the thresholds change in other cases?
2. With only a finite number of points in Fig. 4, does the current fitting relationship pass the significance test?
3. In Fig. 1b, the results for aerosol radiative forcing have values only for individual moments of the day, and a detailed explanation of how they relate to hourly variations in atmospheric conditions and PM concentrations is needed.
4. What is the physical mechanism by which $|SFC-ATM|$ affects the threshold of atmospheric stability?
5. When calculating TKE, why a one-hour wind standard deviation was chosen rather than a half-hour or two-hour standard deviation? In lines 141-152, the temporal and spatial scales of TKE need to be clarified.
6. Fig. 1 is of low quality and should be improved. In Fig. 1-(a)-III, why does the PM not increase with decreasing ABLH?
7. In Figure 1-(b) I and II, the TOA varied significantly. What is the reason?
8. there are very interesting results for PM and temperature in Figure 2. What are the diurnal characteristics of the potential temperature? Does potential temperature

affect the diurnal concentration of PM_{2.5}?

9. In Figure 4, other dots represent mean data. How is it calculated?
10. The empirical relationships of TKE and |SFC-ATM| are very interesting in Figure 6 9 (left upper panel). It established the thermodynamic relationship between ARF and TKE by using the measured data. Why does the fitting relationship fit so well below 300 meters?
11. The ARF threshold is about 55 Wm⁻². What about the concentration of PM_{2.5}? Is it possible to derive a threshold concentration for PM_{2.5} based on current observational relationships. the PM_{2.5} threshold would be a very meaningful target for air pollution control.
12. The review of aerosol radiative forcing in the introduction needs to be strengthened.
13. Conclusion needs to be subdivided and further simplified.
14. In Figure 8, TKE >2 m²S⁻², |SFC-ATM| ~55 W m⁻² . Are these thresholds generalizable?

Minor comments:

English writing should be polished. Some sentences was hard to read.

1. e.g. line 18-20 “Multi-episode contrastive analysis stated the key to determining whether haze outbreak or dissipation was the ABL structure (i.e., stability and turbulence kinetic energy (TKE)) satisfied relevant conditions.” Should be “Multi-period comparative analysis indicated that the key to determining whether the haze outbreak or dissipation occurs is whether the ABL structure (i.e., stability and turbulent kinetic energy (TKE)) satisfies the relevant conditions.”
2. Line 22-23. “SFC and ATM is respectively the ARF at the surface and interior of the atmospheric column” should be “SFC and ATM are the ARFs at the surface and interior of the atmospheric column, respectively.”
3. Line 37-38. (Li et al., 2020; Xu et al., 2019), should be cited at the end of this sentence.

4. Line 316 two “dropped to ”