

The authors present an interesting and comprehensive analysis of correlation between MODIS AOD and ground-based PM_{2.5} at Beijing. More importantly, influential factors affecting the PM-AOD relationship have been analyzed from the perspective of diurnal variation, which has the potential to shed light on the possibility to PM remote sensing from space. Overall, the paper is well written and I only have the following comments for the authors to address before its acceptance for publication in ACP.

Major points to be considered:

1. Section 2.1: The authors only depicted the use of 1:30 LT MODIS AOD data. They should better clarify the time of day for other data used here, including PM_{2.5}, and related meteorological variables. In addition, the spatial and temporal averaging scheme they took should be clarified as well, given their large diurnal variability and spatial variation.

2. Figure 14: More discussion is necessary for the statement "the slopes of linear regression lines vary a lot for heights 500 m, 1000 m and PBLH, but much smaller for H above PBLH". For instance, PBLH exhibits large diurnal variation, which is quite different from 500m, 1000m for different seasons. This will inevitably affect the correlation between AOD and PM_{2.5} and its slope.

Minor points to be considered:

1. Abstract: "atmospheric boundary layer height (PBLH)" -> "planetary boundary layer height (PBLH) "

2. Page 2 line 10: it is better to clarify the four seasons in "with aerosol type in four seasons respectively "

3. Introduction: With regard to the investigation of the relation between MODIS AOD and ground-based PM concentrations, several important references have been missing. For example, Guo et al. (2009) for the first time reported the correlation between MODIS AOD and ground-based PM₁/PM_{2.5}/PM₁₀ across eastern China

based on long-term collocated MODIS AOD and hourly PM measurements from China Atmosphere Watch Network (CAWNET) of Chinese Meteorological Administration. They also discussed the potential influences of PBLH and RH on the correlation between PM and AOD. This CAN be added before " Xin et al. (2015) investigated the relationships " IN PAGE 5.

Reference:

Guo J.P., Zhang X.Y., Che H.Z., Gong S.L., An X.Q., Cao C.X., Guang J., Zhang H., Wang Y.Q., Zhang X.C., Zhao P., and Li X.W., 2009. Correlation between PM Concentrations and Aerosol Optical Depth in Eastern China, Atmospheric Environment, 43(37): 5876-5886.

4. Page 7, line 6-7: " U.S Department of State"-> "U.S. Embassy Beijing "

5. Page 7: line 14: the latitude and longitude for the MEP site should be given.

6. Page 8 line 1: " MEP.... away from the U.S. Department of State site are provided by CMA, ": I am curious how the meteorological data observed at the site of MEP can be obtained from CMA? It will be better if the authors can plot a map showing the locations of US Embassy Beijing, MEP site, and CMA site.

7. Page 9 line 6: Beijing (39°N, 116°E) - > " Beijing (39°N, 116°E) "

8. Page line 16: " sit" is a typo.

9. Page 10 line 4: " the AOD profiles " should be revised to "the aerosol extinction coefficient profile" or sth else because AOD is a notion of integration and can not be defined as a profile.

10. Page 19 lines 8-9: " is contributed " -> "could be attributed to"

11. Page 19 line 21: " increase and decrease " -> "increasing and decreasing"

12. Page 20 line 3: " After PBLH and RH corrections " -> "After being corrected for

PBLH and RH"

13. Page 20 line 10: " weak variation, which make " - > " weak temporal variation, which makes"?

14. Page 26 line 9: " in 532 nm band " - " at 532 nm band "

15. Page 27, line 13: " but varies " -> "and varies"

16. Figure 2 cannot be seen clearly. Cautions should be taken when insert a figure. What do the red dash lines in Figure 14 mean? It will be better to give some necessary description in the caption of Figure 14.