Dear Reviewer,

Thank you very much for your effort and comments. We addressed them one by one below. Hope you find our revisions useful. Thank you again.

Yours faithfully,

Steve
Associate Professor
Department of Geography and Resource Management

The Chinese University of Hong Kong, Shatin, Hong Kong
Tel: (852) 3943 6534
Fax: (852) 2603 5006
Email: steveyim@cuhk.edu.hk
GRMD@CUHK: http://www.grm.cuhk.edu.hk/eng/

This manuscript studied the relationship between surface PM2.5 and AOD, and also the influence of meteorology and topography on the relationship in high spatial resolution. The topic is critical the improved knowledge can contribute to the research field, enhancing air pollution research using satellite-retrieval technology. I suggest to accept this work for publication after revisions.

(1) Title: AOD should be replaced by aerosol optical depth.

Response: Thanks for your suggestion. We have replaced AOD with aerosol optical depth in the revised manuscript.

(2) Line 159: the word "vs." should be revised.

Response: We have replaced "vs." by "and".

(3) Table 1: Why the result is missing in Northern Tianshan in winter? Is it because cloudy weather over there during the season?

Response: In Northern Tianshan in winter, PM2.5-AOD pairs are not available. This is partly due to cloud contamination and the limitation of retrieval algorithm such that a few of AOD retrievals have been provided during that season. In addition, it is also partly because there is a limited number of monitoring sites over this region.

(4) Figure 1: the texts in the legends are small. They should be enlarged.

Response: We have enlarged the texts in the legends in the revised version.

(5) Line 623: The figure should be the spatial distribution of annual mean ground-level PM2.5 and satellite AOD in China in 2019. It is better to add "annual mean" to make the meaning clearer.

Response: Correct, thanks for your suggestion. We have added "annual mean" in the caption of Figure 1.

(6) Figure 2: the texts of the legend are too small.

Response: We have enlarged the texts of the legend in the revised version.

(7) Line 174: What is the reason about the U-shape trend? Why is the PM2.5 concentration lower during Jun-Aug?

Response: The PM2.5 concentration is generally higher in winter and lower in summer. The higher value in wintertime is related to relatively higher human air pollutant emissions (e.g., more coal and biomass burning for heating in winter) and unfavorable meteorological conditions for pollution dispersion (e.g., lower boundary layer in stable atmosphere). In contrast, the lower value in summertime is probably related to lower human air pollutant emissions (e.g., reduced coal and biomass burning for heating during summer) and favorable meteorological conditions for pollution dispersion (e.g., enhanced convection and more precipitation during summer). We have added the discussion in the second paragraph of Section 3.1.

(8) Line 188: the sum of the stations (559+519+50) is not equal to 1494. Please check the number of the stations.

Response: Thanks for your question. The values are correct; nevertheless, the writing is confusing. The content is revised to avoid confusion.

Revised version:

Among the 1494 monitoring stations, the largest diurnal PM2.5 concentration appeared in the evening (19:00-23:00) at 638 sites (~42.70%), followed by 567 sites (~37.95%) with the maximum concentration in morning (7:00-11:00). There were only 50 sites (~3.35%) reaching its maximum in afternoon (12:00-18:00), whereas the remaining 239 sites (~16.00%) had their maximum in midnight (00:00-06:00).

(9) Line 171: It should be explicitly mentioned Figure S3 is shown in supplementary information.

Response: We have clarified that Figure S3 is located in supplementary information in the revised manuscript.

(10) Figure S9 in supplementary information: the word of "elevatior" should be "elevation" The caption of Figure S9: the second sentence should be revised: Note that the asterisk after r values represent statistically insignificance (p>0.05).

Response: We have revised the word "elevation" and the caption for the figure.