



Supplement of

The spatiotemporal relationship between $PM_{2.5}$ and aerosol optical depth in China: influencing factors and implications for satellite $PM_{2.5}$ estimations using MAIAC aerosol optical depth

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Figure S1. The study area and the eleven urban agglomerations filled with colors. The boundaries of the cities in the eleven urban agglomerations are shown by grey lines. Note that the names of the major cities are not shown due to the limited space.



Figure S2. Spatial distribution of multi-year mean values of AOD data availability for each pixel in 2019 over the mainland China.



Figure S3. Boxplot of monthly variations of (a) mean PM_{2.5} concentration and (b) AOD in the study period. The boxplot uses the first and third quartiles grouped by month, and the red asterisk in the box represents the mean values in each month.



Figure S4. Diurnal variations in PM_{2.5} concentrations during 2019 throughout China.



Figure S5. Overall correlation coefficient r (right axis) and fraction of matchup pairs in each season (left axis) at different $PM_{2.5}$ levels. The matchup pairs are separated into 11 bins along with ground-level $PM_{2.5}$ concentrations starting from 0 with the interval of 15 μ g/m³. The magenta asterisk stands for statistically significant r with p level<0.05.



Figure S6. Spatial distribution of Angström exponent (AE or α) at different AERONET monitoring stations during (a) spring, (b) summer, (c) autumn, (d) winter and the whole period from 2001 to 2019. For figure e, only stations with AE values in all four seasons are remained. Generally, AE ranges from 0 to 2.0, and the larger AE value indicates a smaller aerosol particle size.



Figure S7. Spatial distribution of relationship between hourly PM_{2.5} measurements and Terra/Aqua AOD at the satellite overpass time of (a) 11 am and (b) 2 pm in 2019.



Figure S8. The diurnal variation of correlation coefficients between ground-level PM_{2.5} measurements and the AERONET AOD observations.



Figure S9. Spatial distribution of PM_{2.5}-AOD correlations at different elevations. Note that the asterisk after r values represents statistically insignificance (p>0.05).