Supplement Information - Impacts of elevated anthropogenic emissions on physicochemical characteristics of BC-containing particles over the Tibetan Plateau

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S1 Model configuration

Table S1. WRF-Chem model configuration options and settings

Domain setting	
Horizontal grid	160 × 180
Grid spacing	20 km × 20 km
Vertical layers	30 eta levels
Configuration options	
Long-wave radiation	RRTMG
Short-wave radiation	RRTMG
Cumulus parameterization	Grell–Deveny
Land-surface	Noah
PBL	YSU
Microphysics	Lin et al.
photolysis	Fast-J
Gas chemistry	CBMZ
Aerosol chemistry	MOSAIC

S2 Intercomparison of b_{abs} from different methods

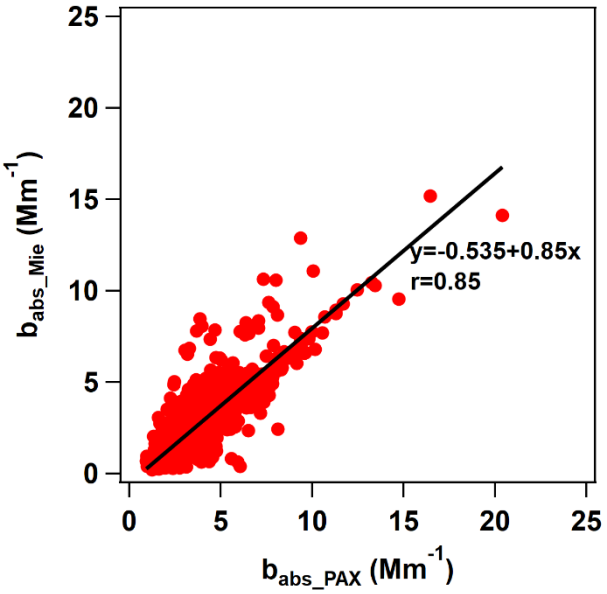

Figure S1: The scatter plot, correlation coefficient and linear regression result of the aerosol light absorption coefficients (b_{abs}) at 550 nm wavelength from different methods. The value of x-axis is the b_{abs} measured by the photoacoustic extinctiometer (PAX), and the value of y-axis is the b_{abs} calculated by Mie theory. The r is Pearson correlation coefficient in the plot.

The more aged black carbon (BC)-containing particles (PM_{BC}) can transport from other regions to Tibet Plateau (Chen et al., 2019). The long-range transport reduces differences in the amount of coating between different BC particles (Cappa et al., 2019). So, it is reasonable that using Mie theory (Mätzler., 2002) to calculate optical parameters of PM_{BC} in Xihai and Lulang. Moreover, the b_{abs} acquired by the Mie theoretical calculations and PAX measurement is very close, and has higher correlation (r=0.85).

S3 Time series of organic PMF factors

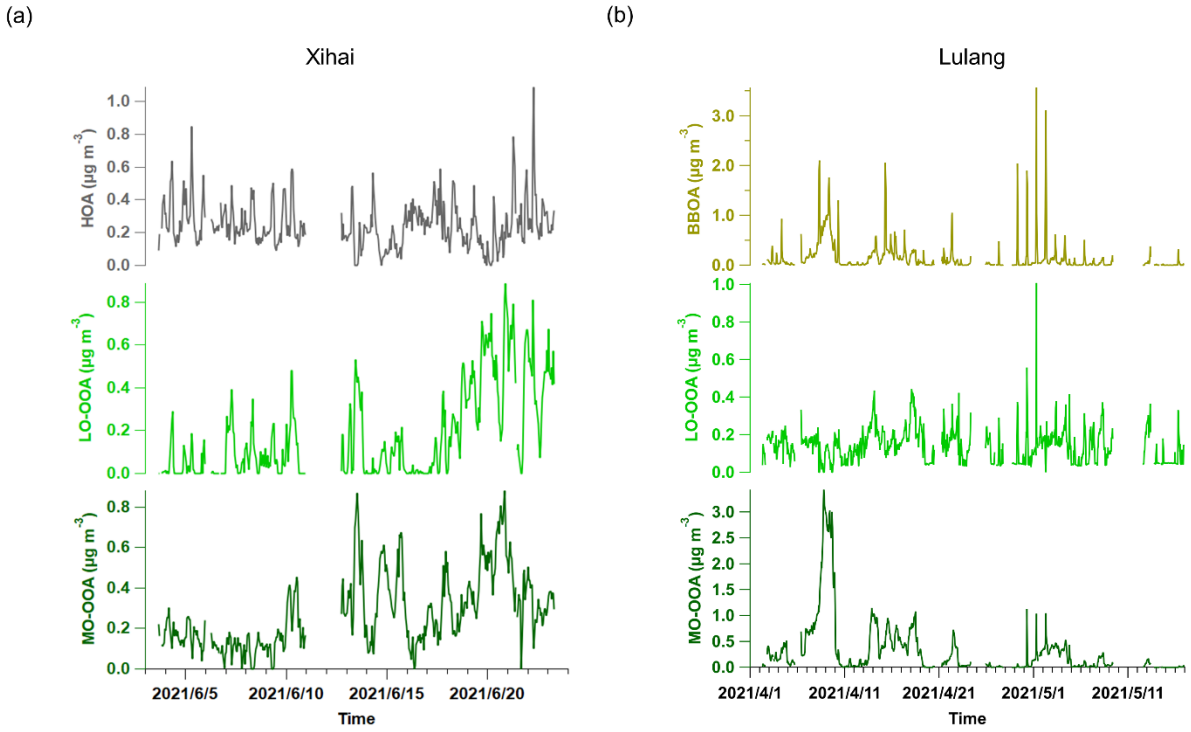

Figure S2: The time series of mass concentration of different organic aerosol factors identified by positive matrix factorization (PMF) in (a) Xihai and (b) Lulang.

S4 Diurnal variation of meteorological factors and Ozone (O_3)

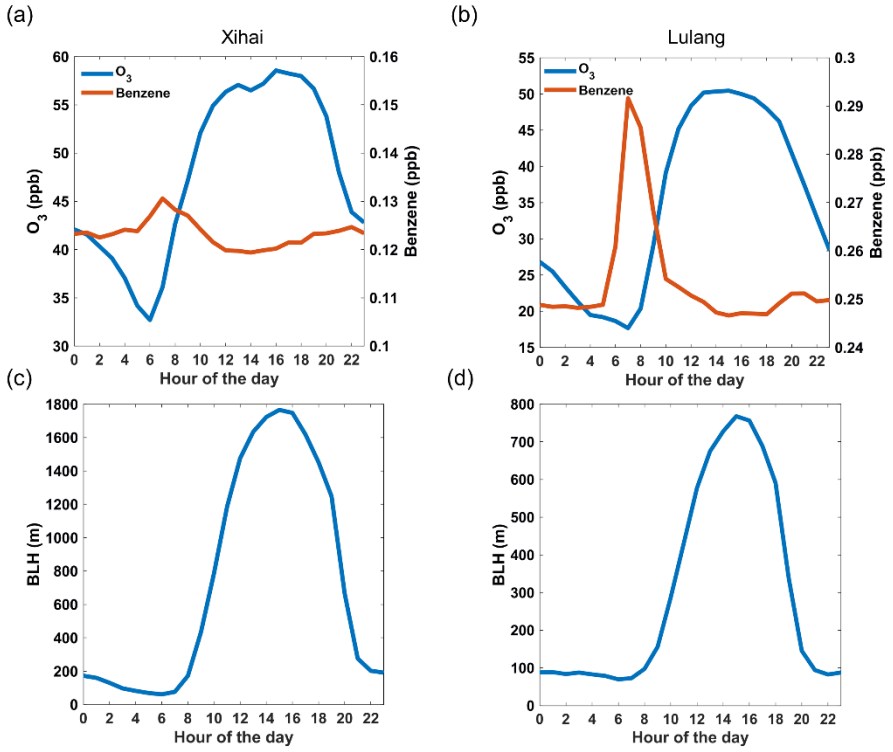

Figure S3: The diurnal variation of ozone (O_3), benzene and boundary layer height (BLH) in Xihai (a,c) and Lulang (b,d).

As the Fig. S3 shows, the O_3 and the benzene did not increase significantly after 3:00 p.m. in Xihai (Fig. S3), indicating that the secondary formation and pollutant emission were relatively stable without strong enhancement. In the afternoon, the boundary layer height was also high in Xihai. It means that the atmospheric diffusion conditions were good but the PM_{BC} at the surface can be elevated to higher altitudes, facilitating pollutant transport. Summarily, not secondary formation, emissions, rather pollutant transport caused that PM_{BC} increased after 3:00 p.m. in Xihai.

References

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