Impacts of Thermodynamic and Dynamic Processes on the Vertical Distribution of Carbonaceous Aerosols: lessons from in-situ observations at eastern foothills of LiuPan Mountains, Loess Plateau

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Table S1 Methods to calculate the planetary boundary layer height.

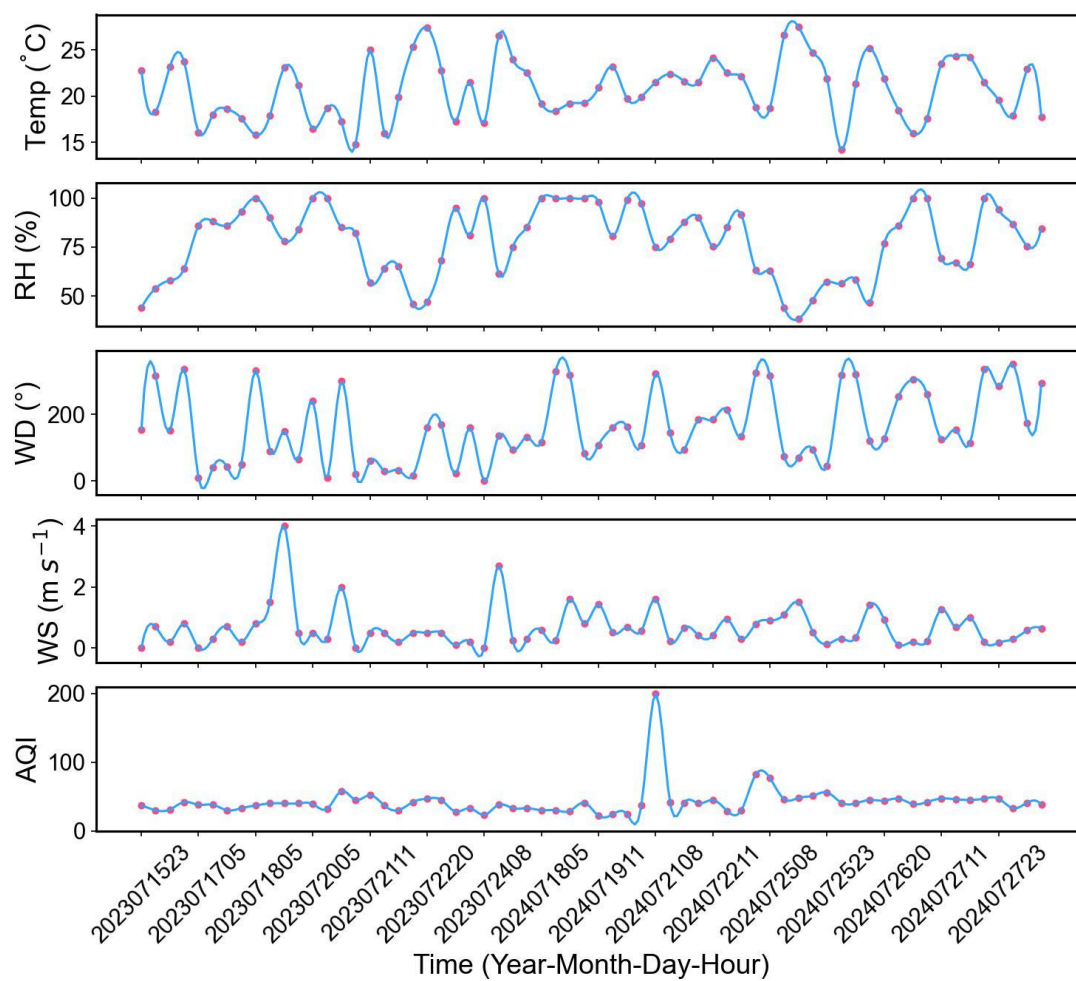| Methods	Formulas	Annotation
Air parcel method	$\theta(h_i) = \theta_1$	θ_1 denotes the potential temperature at the lowest model level, corresponding to the surface layer
Potential temperature gradient method	$\dfrac{d\theta}{dZ}\big|_{Z=h_i} = 0$	

Figure S1. Meteorological parameters and air quality index (AQI) at Pingliang station during the observation period.
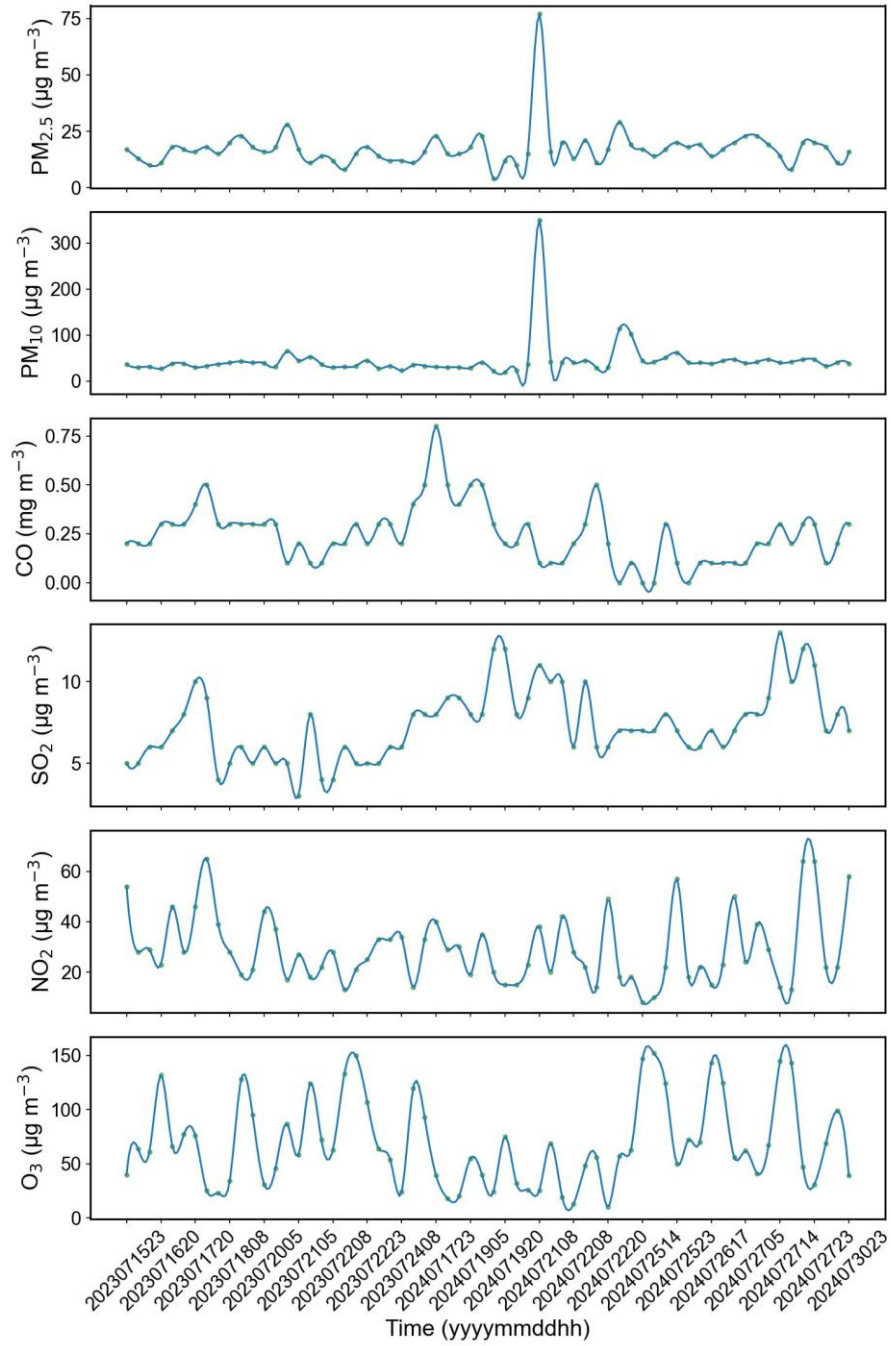
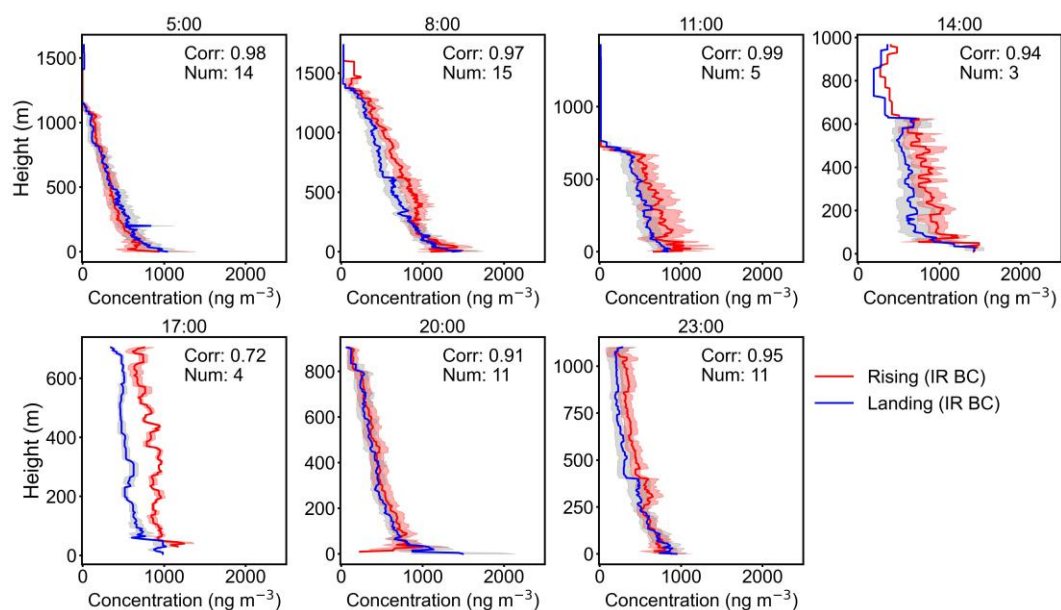Figure S2. Concentrations of conventional air pollutants at Pingliang station during the observation period.

Figure S3. Comparison of infrared black carbon (IR BC) vertical profiles during tethered balloon ascent and descent.
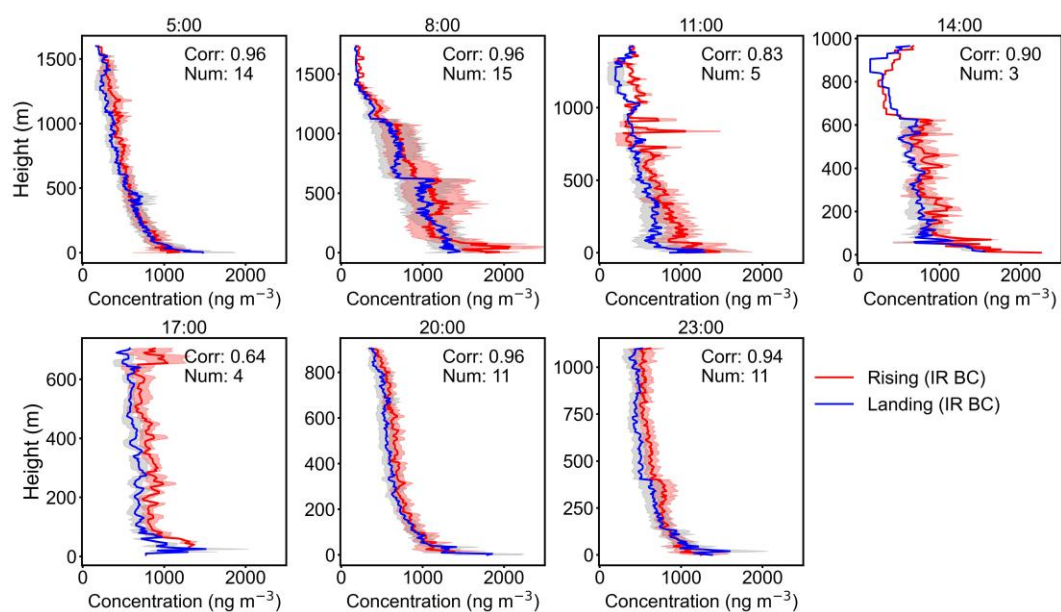

Figure S4. Comparison of ultraviolet particulate matter (UVPM) vertical profiles during tethered balloon ascent and descent.
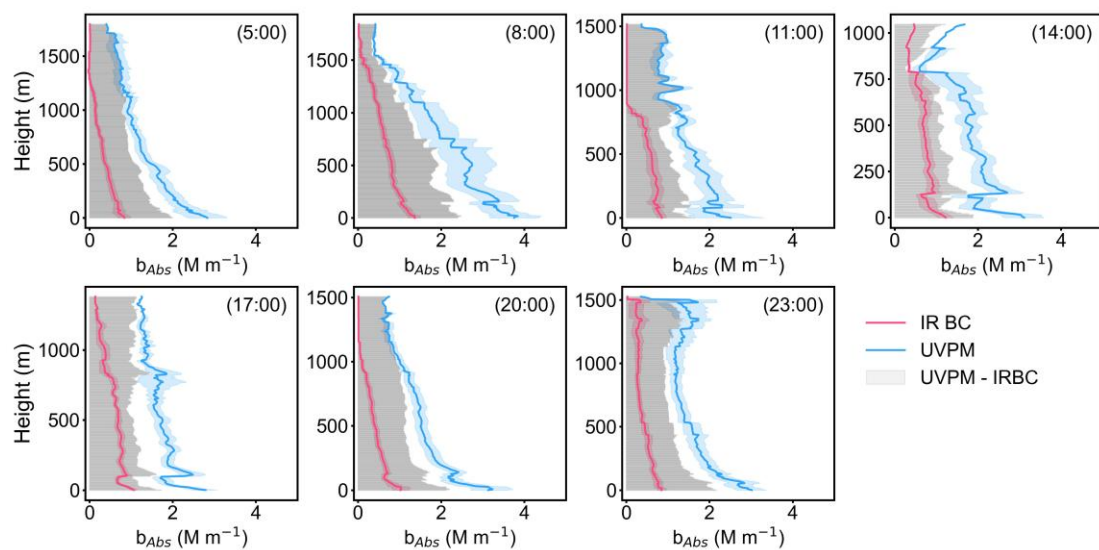
Figure S5. Vertical variations of light absorption coefficients for UVPM and BC at Pingliang observation site during summer 2023 and 2024.
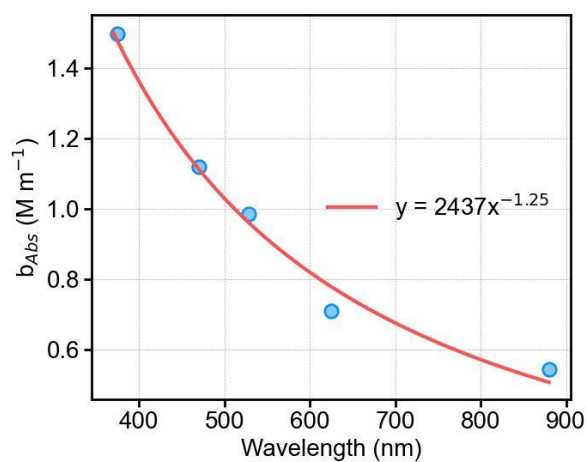

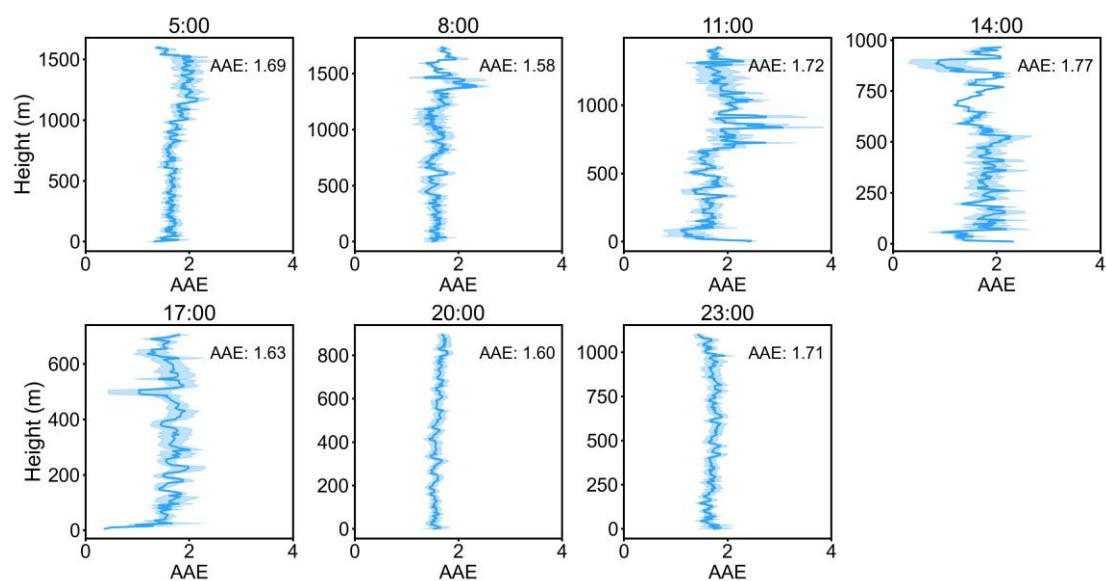Figure S6. Example of absorption Ångström exponent (AAE) fitting calculation.

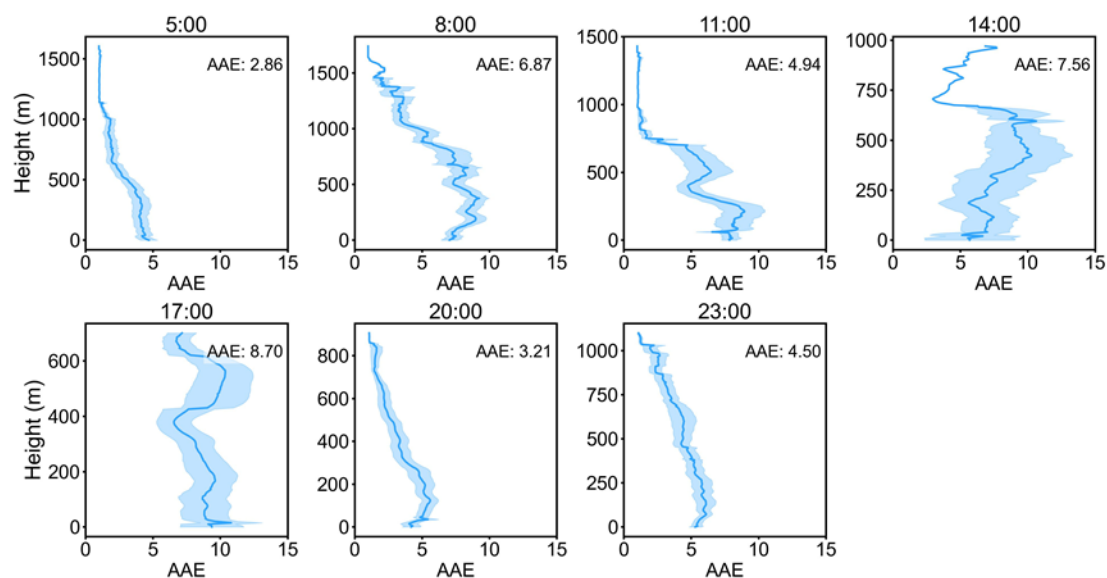Figure S7. Diurnal variations of mean absorption Ångström exponent (AAE) vertical profiles.

Figure S8. Vertical profile of absorption Ångström exponent (AAE) for brown carbon (BrC).
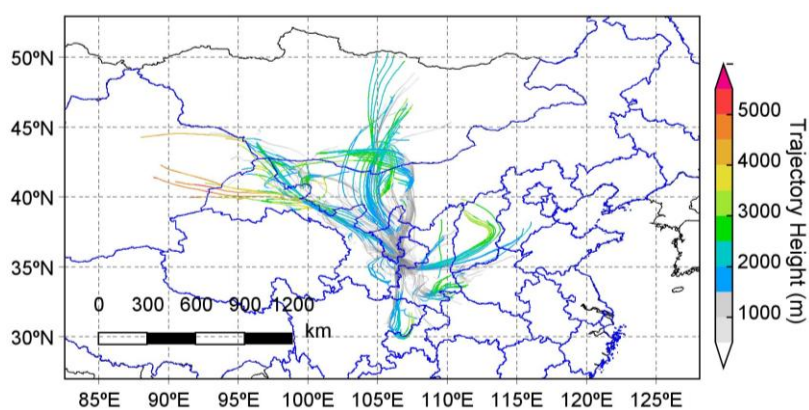

Figure S9. Altitude variations of air mass trajectories at 500 m height over Pingliang Observatory during the measurement campaign.