Supplement of

In-situ vertical characteristics of optical properties and heating rates of aerosol over Beijing

Ping Tian et al.

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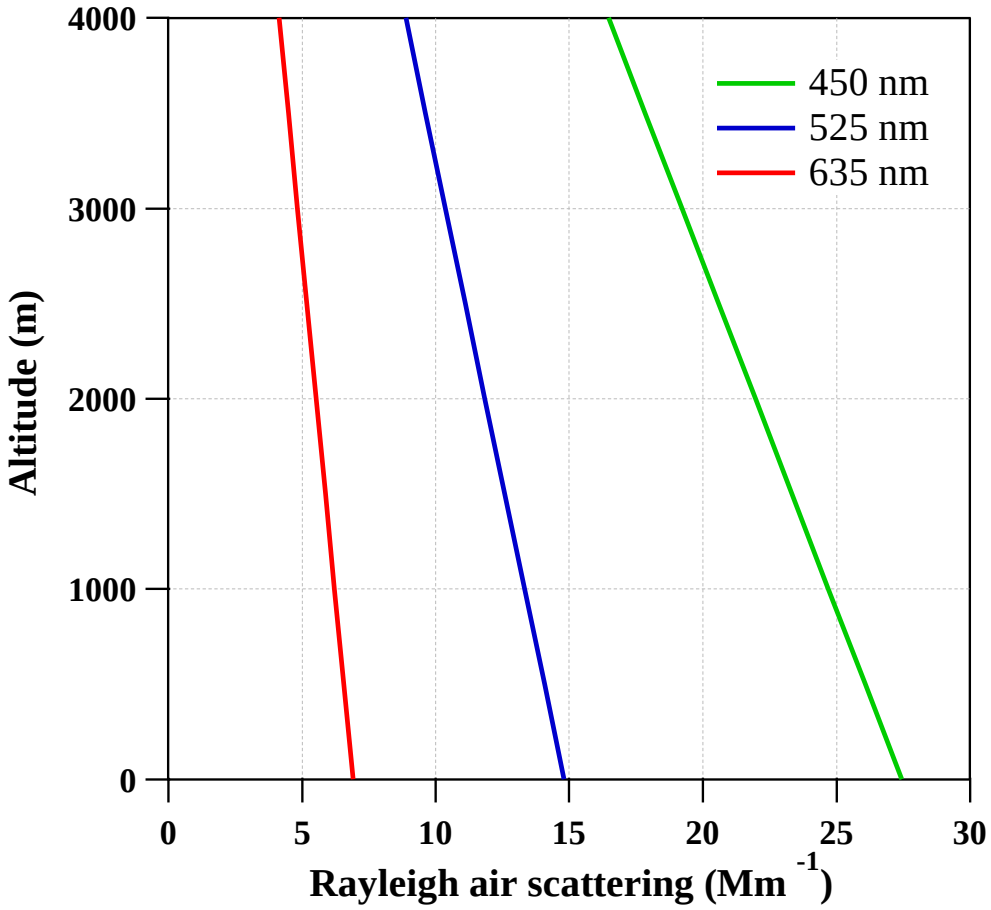

Fig. S1. Profiles of rayleigh air scattering coefficients at 450 nm, 525 nm, and 635 nm, respectively.

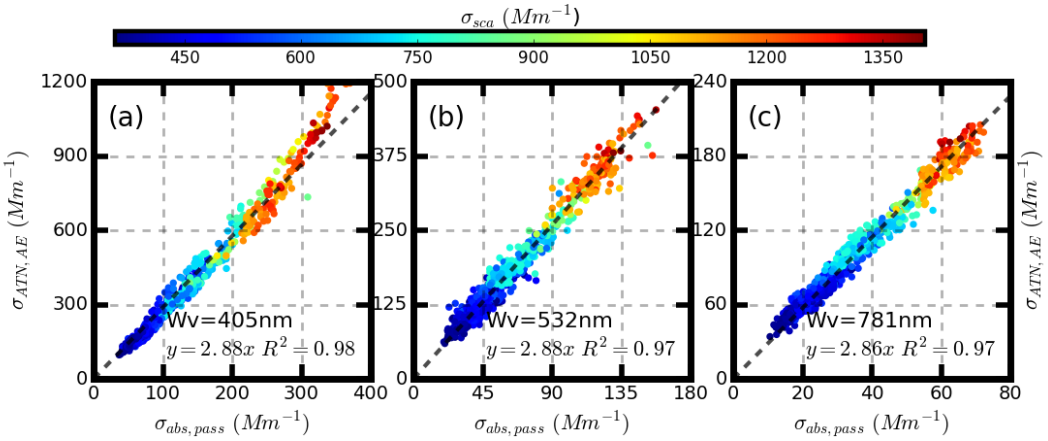

Fig. S2. Comparison of aerosol absorption coefficient measured by PASS-3 and AE33 at (a) 405 nm, (b), 532 nm, and (c) 781 nm.

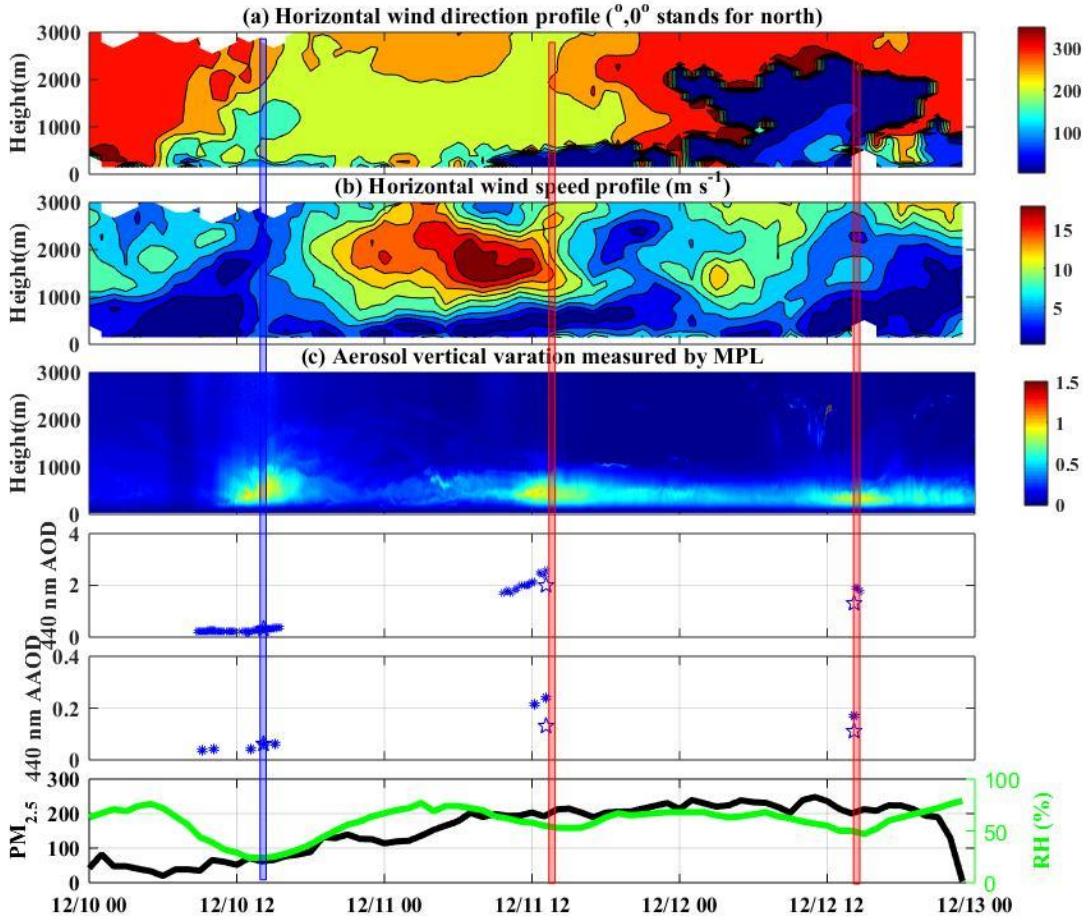

Fig. S3. Temporal variations from Dec. 10th to 12th of vertical profiles of wind direction (a), and wind speed (b) measured by wind profile radar; (c) particle extinction measured by MPL lidar; aerosol optical depth (d) and aerosol absorption optical depth (e) from AERONET (asterisk) and derived from aircraft in-situ measurements (open star); (f) surface $PM_{2.5}$ and RH.). The vertical bars denote the periods with flight profiles, with blue, black and red bars representing the clean period, transition period and heavy pollution respectively during the pollution event.

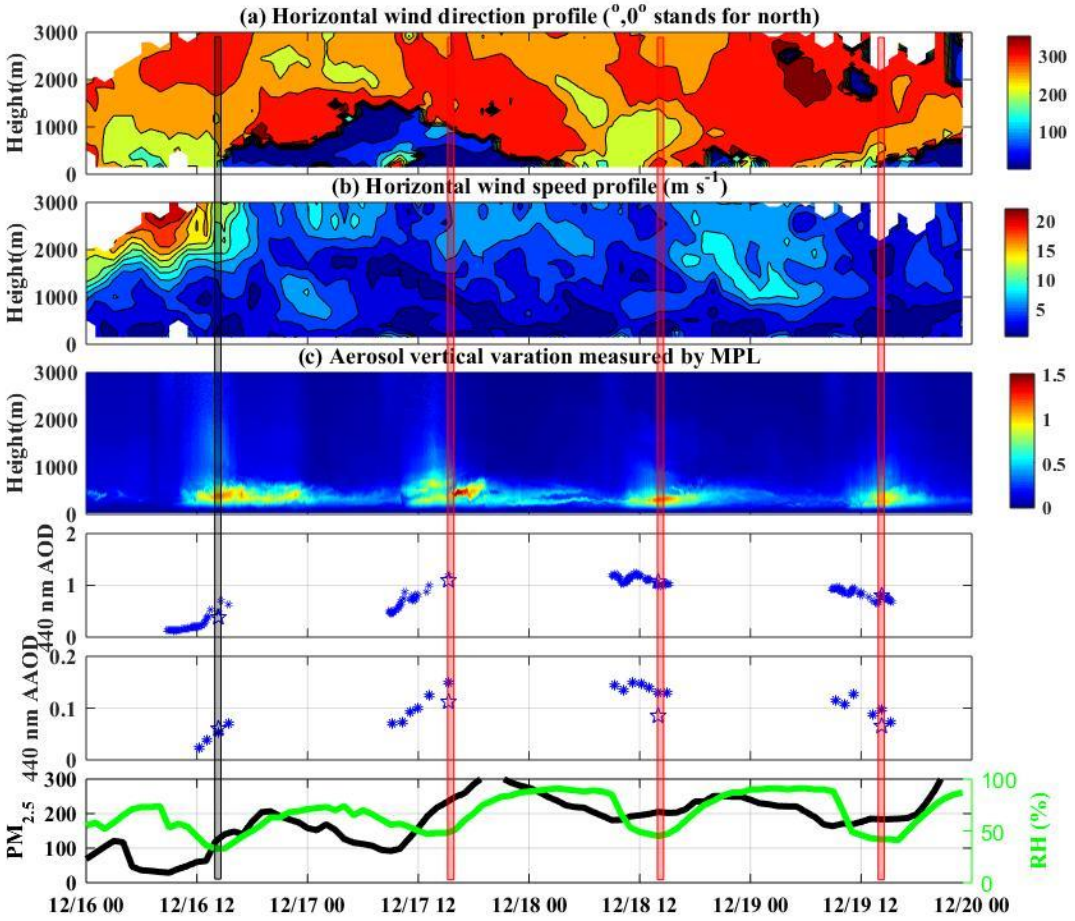

Fig. S4. Identical plots with Fig. S3 but for Dec. 16th to 19th.

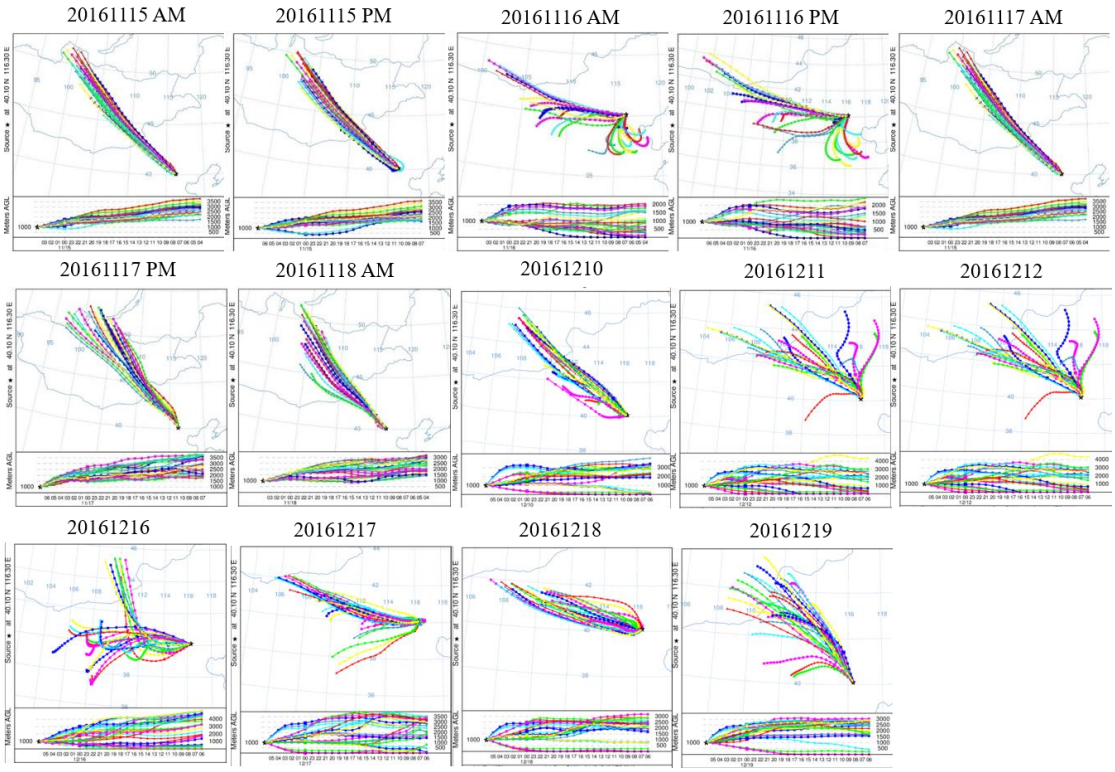

Fig. S5. The HYSPLIT 24h backward trajectories with ending points at 1000 m of Beijing (39.54ºN, 116.23ºE) for all flights.

Table S1. Summary of input parameters for the radiative transfer calculation using Discrete Ordinates Radiative Transfer Code (DISORT)

Parameter	Input value
Radiative transfer solver	DISORT, 12-streams, delta-m method
Gas absorption parameterization	LOWTRAN/SBDART parameterization
Wavelength range	250-2550nm
Atmosphere	Standard Mid-latitude atmosphere
Aerosol	The 25 layers from the surface to 5000 m was chosen inside the DISORT, and every 200 m average aerosol optical properties at 550 nm was used; AOD values are derived from in-situ Aurora3000 and AE33 measurements, also applying an exponential λ-dependent function SSA values are from in-situ σ_{sca} and σ_{abs} measurement SAE values are from in-situ Aurora3000 measurement AAE values are from in-situ AE33 measurement Asymmetry factor (g) is derived from the Aurora3000 measurement and uses Henyey-Greenstein phase function
Location	39.54ºN, 116.23ºE
Time	Flight time
Solar zenith angle	Effective solar zenith angle Using local time and aircraft location
Surface albedo	IGBP surface type 13 (Urban)