



Supplement of

A black carbon peak and its sources in the free troposphere of Beijing induced by cyclone lifting and transport from central China

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Table S1. Statistical indicators for evaluating the simulation results in HN.

Variables	IOA	MB	RMSE	MNB	MFB	TE
T (°C)	0.98	-0.24 ([-0.5, 0.5])	2 (≤ 2.0)	-0.04 ([-0.15, 0.15])	-0.03 ([-0.6, 0.6])	1.58 (≤ 2.0)
RH	0.99	-8.05	11.62	-0.15 ([-0.15, 0.15])	-0.11 ([-0.6, 0.6])	9.43
WS (m·s ⁻¹)	0.55	1.45	2.17	0.57	0.38 ([-0.6, 0.6])	1.73
WD (m·s ⁻¹)	0.92	-14.8	93.54	-0.1 ([-0.15, 0.15])	-0.4 ([-0.6, 0.6])	54.11
BC (μg·m ⁻³)	0.64	0.52	2.2	0.24	0.18	1.49
PM _{2.5} (μg·m ⁻³)	0.71	9.72	33.84	0.2	0.15	26.26

Values that do not meet the threshold criteria are shown in bold.

Table S2. Statistical indicators for evaluating the simulation results in SX.

Variables	IOA	MB	RMSE	MNB	MFB	TE
T (°C)	0.99	-0.25 ([-0.5, 0.5])	1.89 (≤ 2.0)	-0.05 ([-0.15, 0.15])	0.01 ([-0.6, 0.6])	2.55 (≤ 2.0)
RH	0.97	-4.26	14.54	-0.09 ([-0.15, 0.15])	-0.01 ([-0.6, 0.6])	11.52
WS (m·s ⁻¹)	0.54	1.44	2.43	0.52	0.37 ([-0.6, 0.6])	1.83 (≤ 2.0)
WD (m·s ⁻¹)	0.79	16.09	140.23	0.08 ([-0.15, 0.15])	0.2 ([-0.6, 0.6])	98.91
BC (μg·m ⁻³)	0.77	0.17	0.46	0.22	0.16	0.28
PM _{2.5} (μg·m ⁻³)	0.69	3.66	32.29	0.08	0.24	25.82

Values that do not meet the threshold criteria are shown in bold.

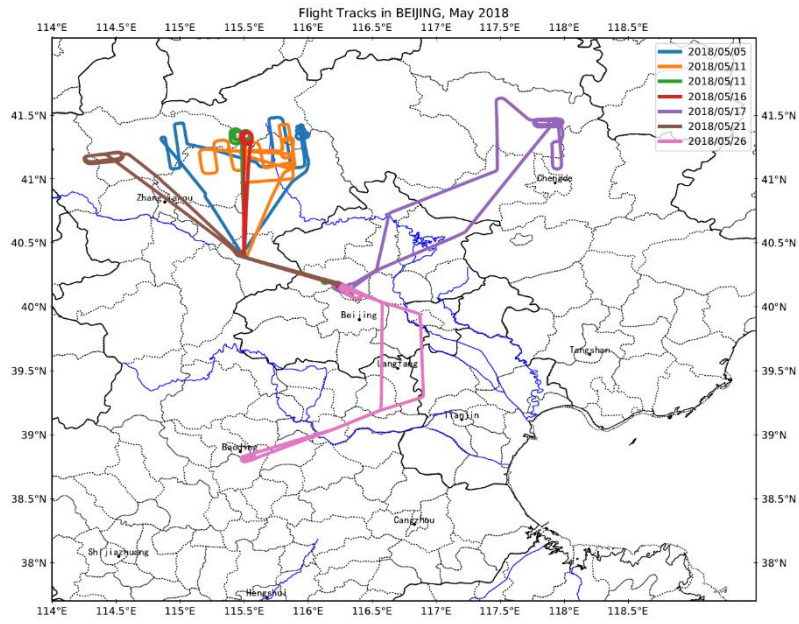


Figure S1. Flight tracks in BJ, May 2018.

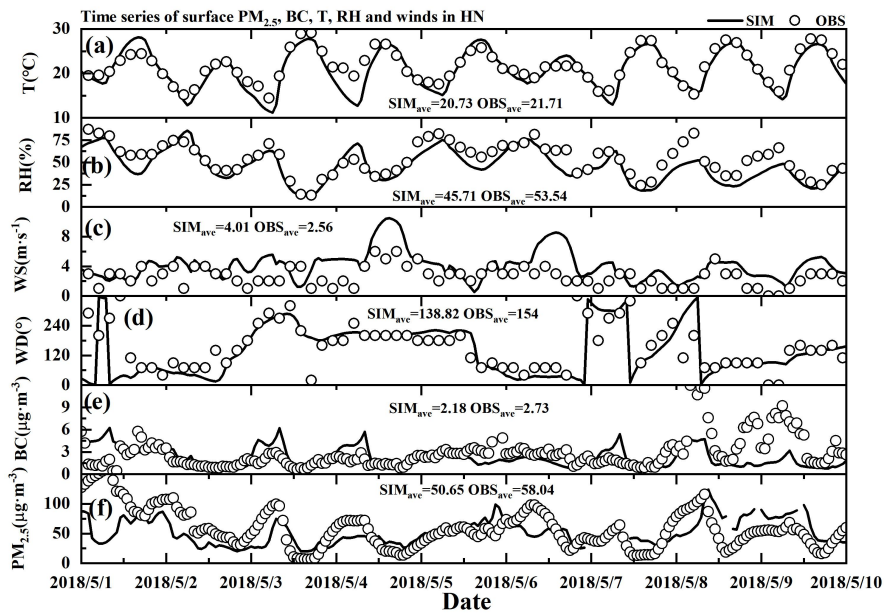


Figure S2. Model validation in HN.

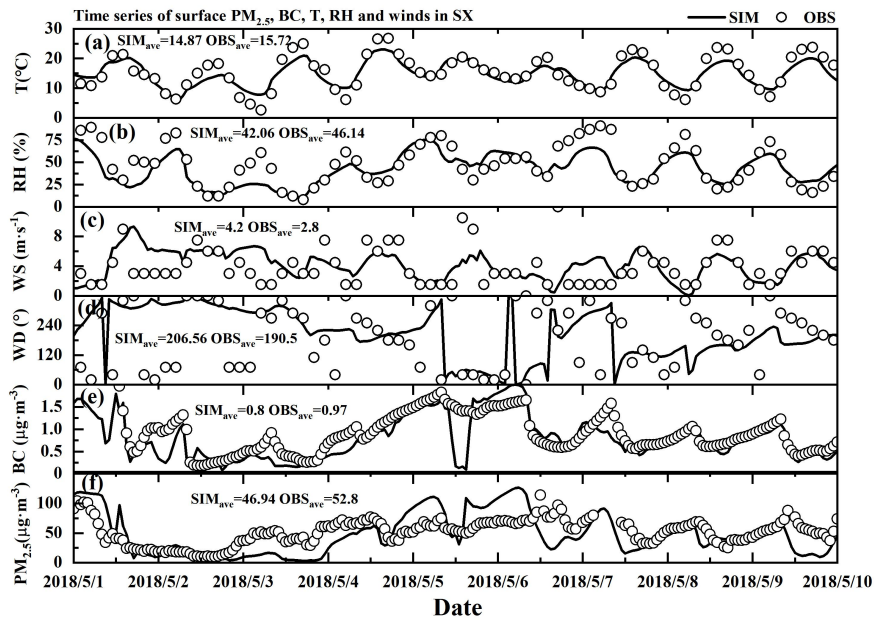


Figure S3. Model validation in SX.

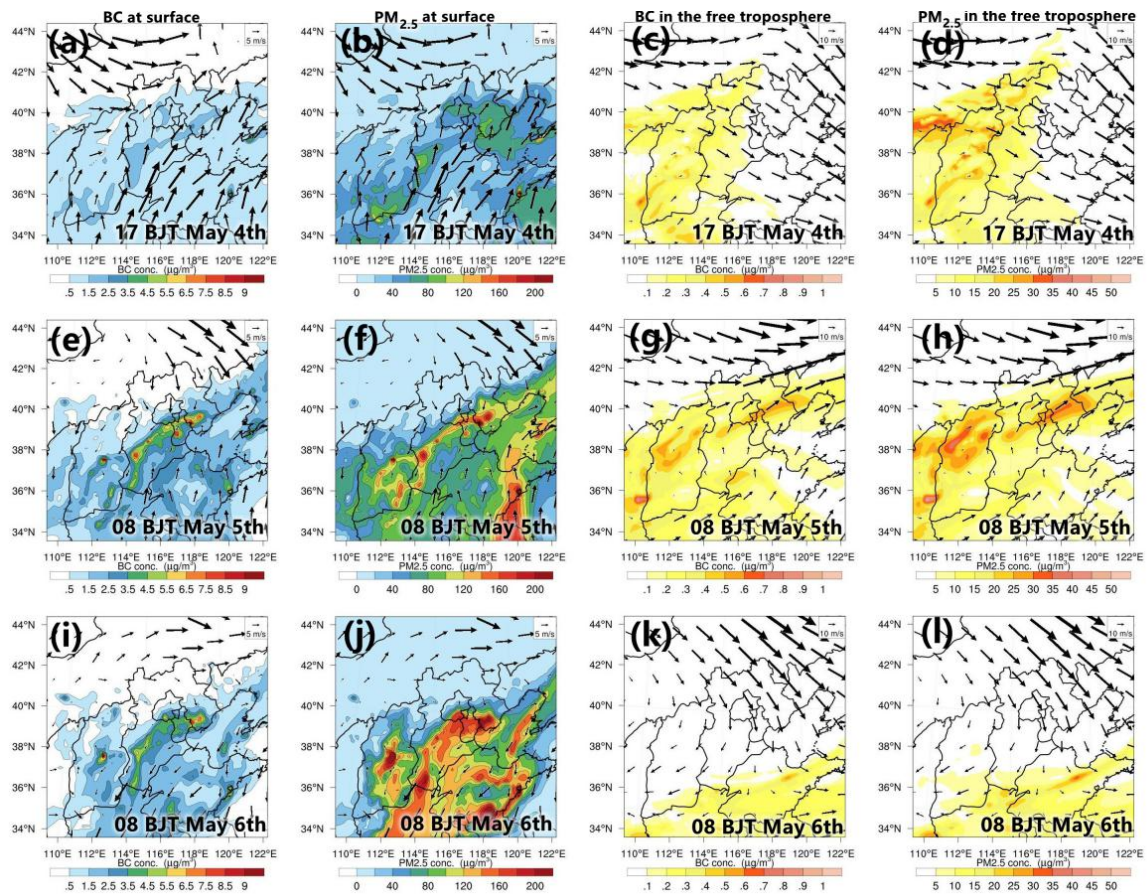


Figure S4. Near-surface BC (a, e, i) and PM_{2.5} (b, f, j). BC (c, g, k) and PM_{2.5} (d, h, k) in the free troposphere.

We acknowledge the use of imagery from NASA's Fire Information for Resource Management System (FIRMS) (<https://earthdata.nasa.gov/firms>), part of NASA's Earth Observing System Data and Information System (EOSDIS). MODIS Collection 6 Hotspot / Active Fire Detections MCD14ML distributed from NASA FIRMS. Available on-line (<https://earthdata.nasa.gov/firms>). doi: <https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms/mcd14ml>.



Figure S5. Fire maps on (a) May 4th, (b) May 5th and May 6th.

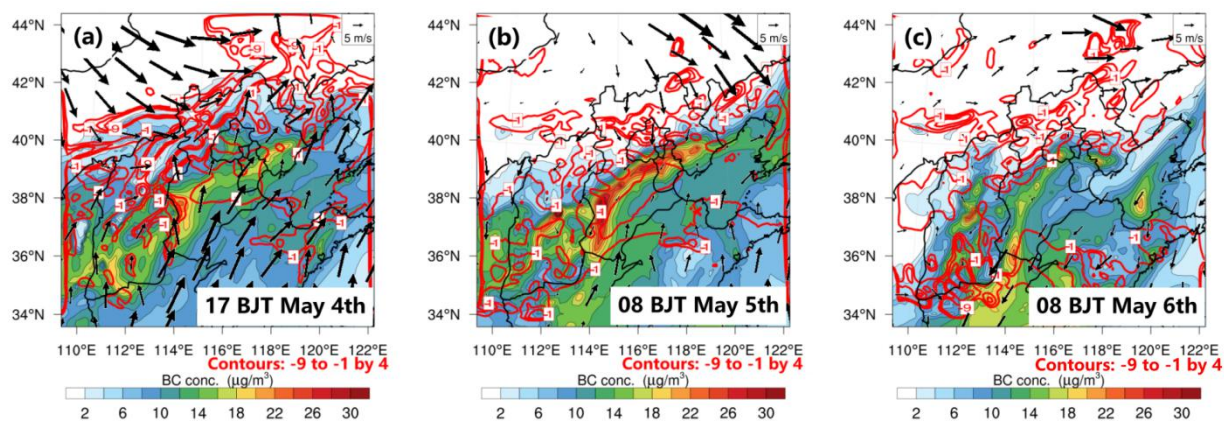


Figure S6. The integral results from surface to the free troposphere. The red line represents the convergence region (divergence < 0 ; unit: $\times 10^{-6} \text{ s}^{-1}$).

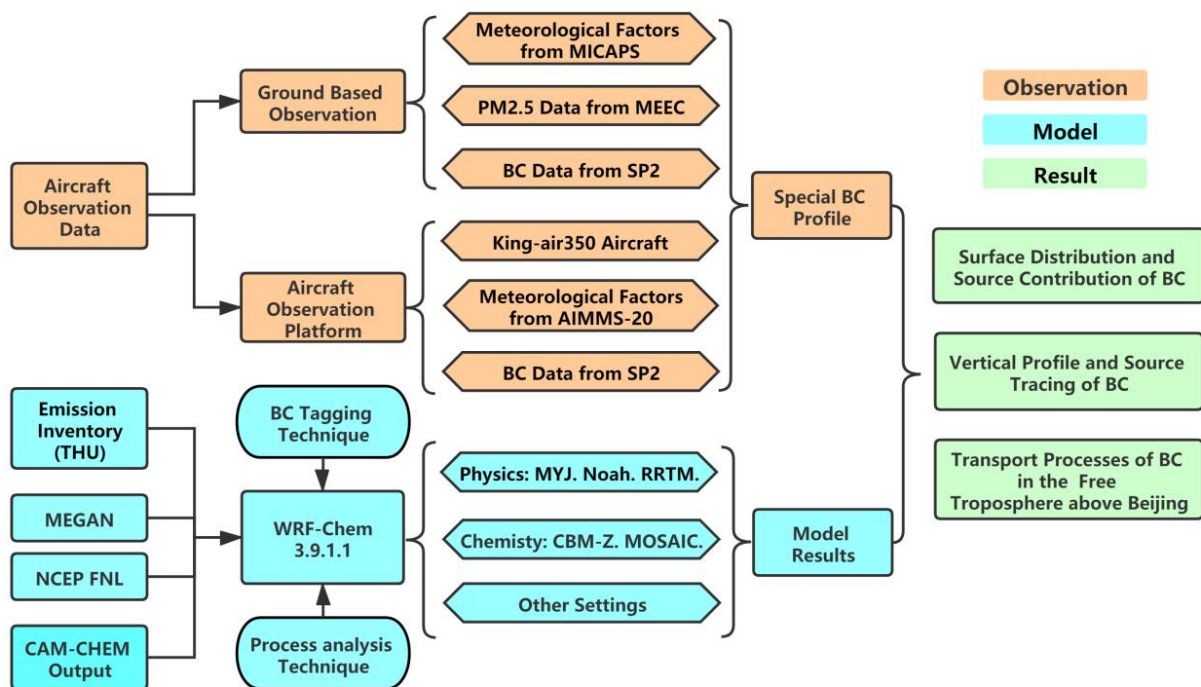


Figure S7. Technical flowchart.