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High-time-resolution source apportionment of $PM_{2.5}$ in Beijing with multiple models

Yue Liu et al.

Correspondence to: Mei Zheng (mzheng@pku.edu.cn)

Table S1 Statistical summary of identified species of $PM_{2.5}$ in the entire sampling period

	Mean	Std.	Max	Min	Detection limit	BDL%
OC/EC			**μg/m³**			**%**
OC	20.8	17.0	89.9	1.1	0.4	-
EC	5.6	4.4	23.1	0.2	0.1	4.3
SIA			**μg/m³**			**%**
SO_4^{2-}	23.5	20.8	95.8	0.04	0.04	0.21
NO_3^-	22.0	23.3	104.7	0.03	0.03	0.1
NH_4^+	14.0	14.7	66.6	0.04	0.05	1.4
Na^+	0.39	0.32	1.89	0.02	0.04	8.5
Cl^-	4.89	4.19	27.6	0.05	0.05	0.1
Metal		**μg/m³**			**ng/m³**	**%**
K	1.49	1.17	5.28	0.10	2.366	-
Fe	0.769	0.541	2.22	0.015	0.759	-
Ca	0.384	0.277	2.08	0.001	0.902	-
Zn	0.286	0.261	1.85	0.005	0.231	-
Pb	0.107	0.091	0.469	0.004	0.218	-
Mn	0.058	0.046	0.210	0.001	0.283	-
Ba	0.035	0.023	0.160	0.002	0.945	-
Cu	0.027	0.024	0.171	0.002	0.267	-
As	0.022	0.021	0.084	0.000	0.114	17
Cr	0.010	0.010	0.110	0.000	0.288	11
Se	0.008	0.008	0.046	0.000	0.141	5.2
Ni	0.002	0.002	0.044	0.000	0.226	3.4

* BDL% refers to the percentage of data below the detection limit

* The unit of the detection limit of each metal is ng/m^3

* '-' means that all data are above the detection limit

Table S2 Percentage of BS factors assigned to each base case factor with a correlation threshold of 0.6.

Boot Factor	Secondary	Industrial	Dust	Traffic	Coal	Biomass
1	100	0	0	0	0	0
2	0	100	0	0	0	0
3	0	0	100	0	0	0
4	0	0	0	100	0	0
5	0	0	0	0	100	0
6	0	0	0	0	0	100

Table S3 Average local contribution in four types of footprint

Types of footprint	Average local contribution
Local	0.85 ±0.14
South	0.68 ±0.11
North	0.63 ±0.13
East	0.66 ±0.13

Table S4 Average concentration of $PM_{2.5}$ and identified species in different haze and non-haze periods

Unit: μg m^{-3}

Average Conc.	**EP1** n=102	**EP2** n=95	**EP3** n=117	**EP4** n=131	**NH1** n=78
$PM_{2.5}$	97.7±70.7	143.8±119.1	115.3±108.6	241.8±115.5	18.8±20.7
OC	19.1±10.7	24.7±18.7	23.1±21.1	40.3±14.5	3.33±2.85
EC	4.1±2.7	7.1±5.1	5.6±4.3	11.0±3.7	0.9±0.6
SO_4^{2-}	18.6±10.9	25.1±20.4	23.4±19.7	53.3±19.2	4.43±3.89
NO_3^-	19.9±14.6	18.9±16.0	23.3±23.3	56.8±24.8	2.81±3.69
NH_4^+	13.3±8.36	12.6±11.6	13.3±13.2	36.4±16.7	2.42±3.80
Na^+	0.37±0.23	0.35±0.28	0.49±0.41	0.69±0.23	0.10±0.14
Cl^-	5.07±3.05	5.17±3.71	5.66±5.87	8.15±3.41	0.97±1.10
K	2.55±1.33	1.21±0.90	1.23±1.08	2.53±0.78	0.410±0.410
Fe	1.26±0.58	0.724±0.568	0.641±0.480	1.06±0.25	0.144±0.133
Ca	0.530±0.250	0.479±0.447	0.356±0.249	0.360±0.148	0.054±0.033
Zn	0.442±0.242	0.242±0.197	0.252±0.289	0.409±0.170	0.060±0.076
Pb	0.182±0.105	0.087±0.071	0.090±0.084	0.185±0.063	0.024±0.028
Mn	0.093±0.050	0.049±0.038	0.049±0.045	0.082±0.021	0.011±0.012
Ba	0.047±0.016	0.038±0.032	0.032±0.022	0.048±0.012	0.006±0.005
Cu	0.028±0.015	0.023±0.021	0.028±0.026	0.042±0.017	0.007±0.009
As	0.031±0.019	0.019±0.019	0.021±0.023	0.040±0.013	0.003±0.006
Cr	0.019±0.022	0.007±0.009	0.008±0.011	0.014±0.010	0.001±0.001
Se	0.012±0.007	0.006±0.005	0.007±0.007	0.018±0.007	0.001±0.001
Ni	0.003±0.002	0.002±0.001	0.002±0.002	0.004±0.004	0.0006±0.0004

Table S5 Previous studies about source apportionment of Beijing

	Sampling period and time resolution	Size fraction	Receptor model	Tracers
Gao et al., 2016	July to August, 2014; 1 hour	2.5 μm	PCA; PMF; ME2	Inorganic tracers
Peng et al., 2016	July to August, 2014; 1 hour	2.5 μm	ME2	Inorganic tracers
Zhang et al., 2013	2009-2010; daily	2.5 μm	PMF	Inorganic tracers

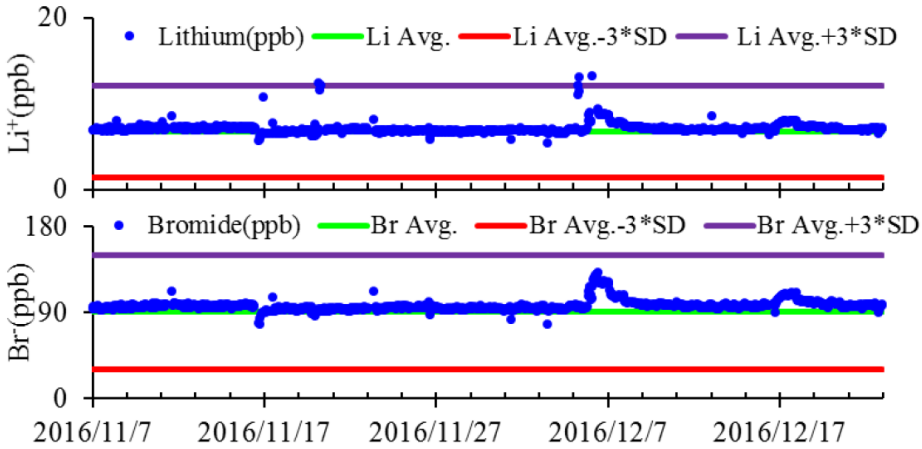

Figure S1. Concentration of the internal standard (LiBr) of IGAC

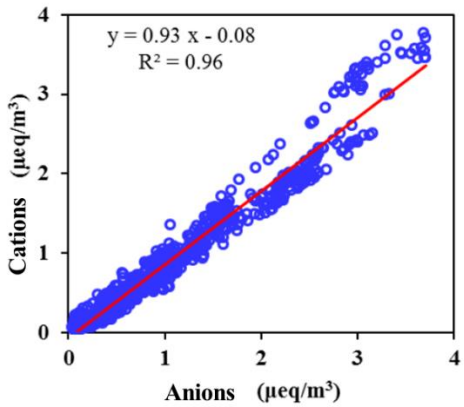

Figure S2. Anion-cation balance of IGAC during the sampling period

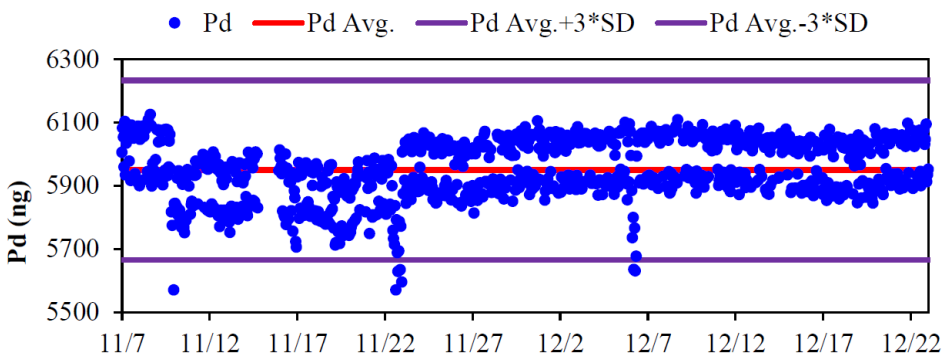

Figure S3. Concentration of the internal standard (Pd) of Xact

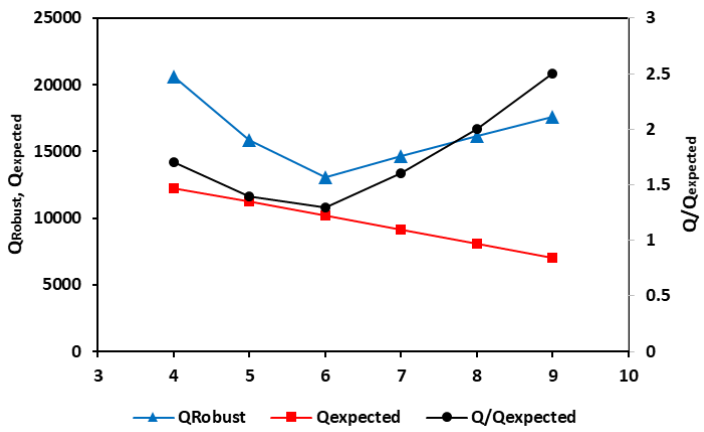

Figure S4. The variation of Q parameters from four factors to ten factors

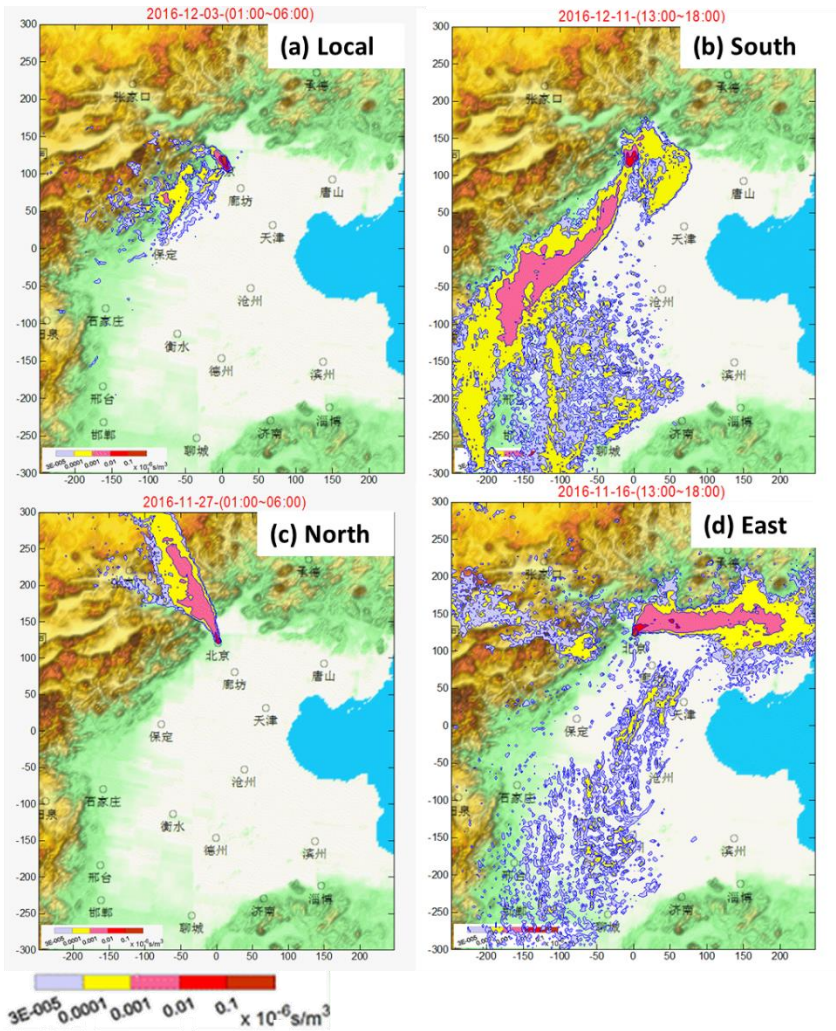

Figure S5. Typical example of different types of footprint (N represents for number of cases. Local: N=79; South: N=45; North: N=51; East: N=30)

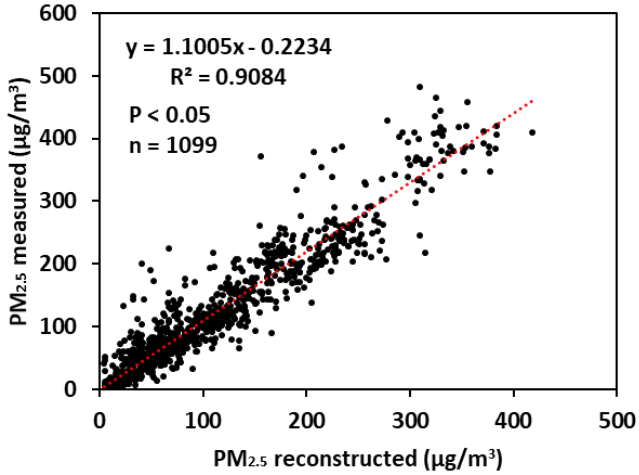

Figure S6 Correlation of measured and reconstructed $PM_{2.5}$ mass

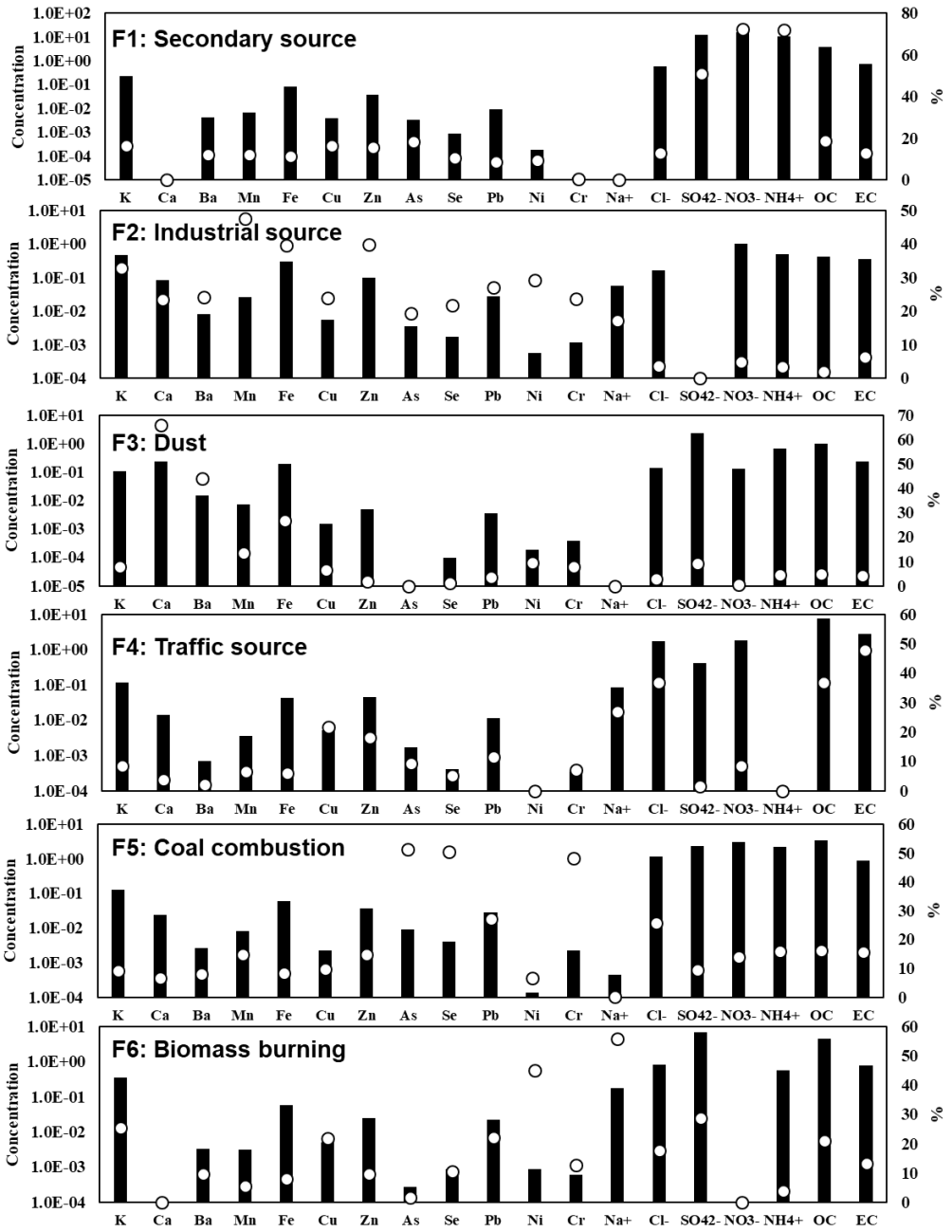

Fig S7. Source profiles of six factors by PMF

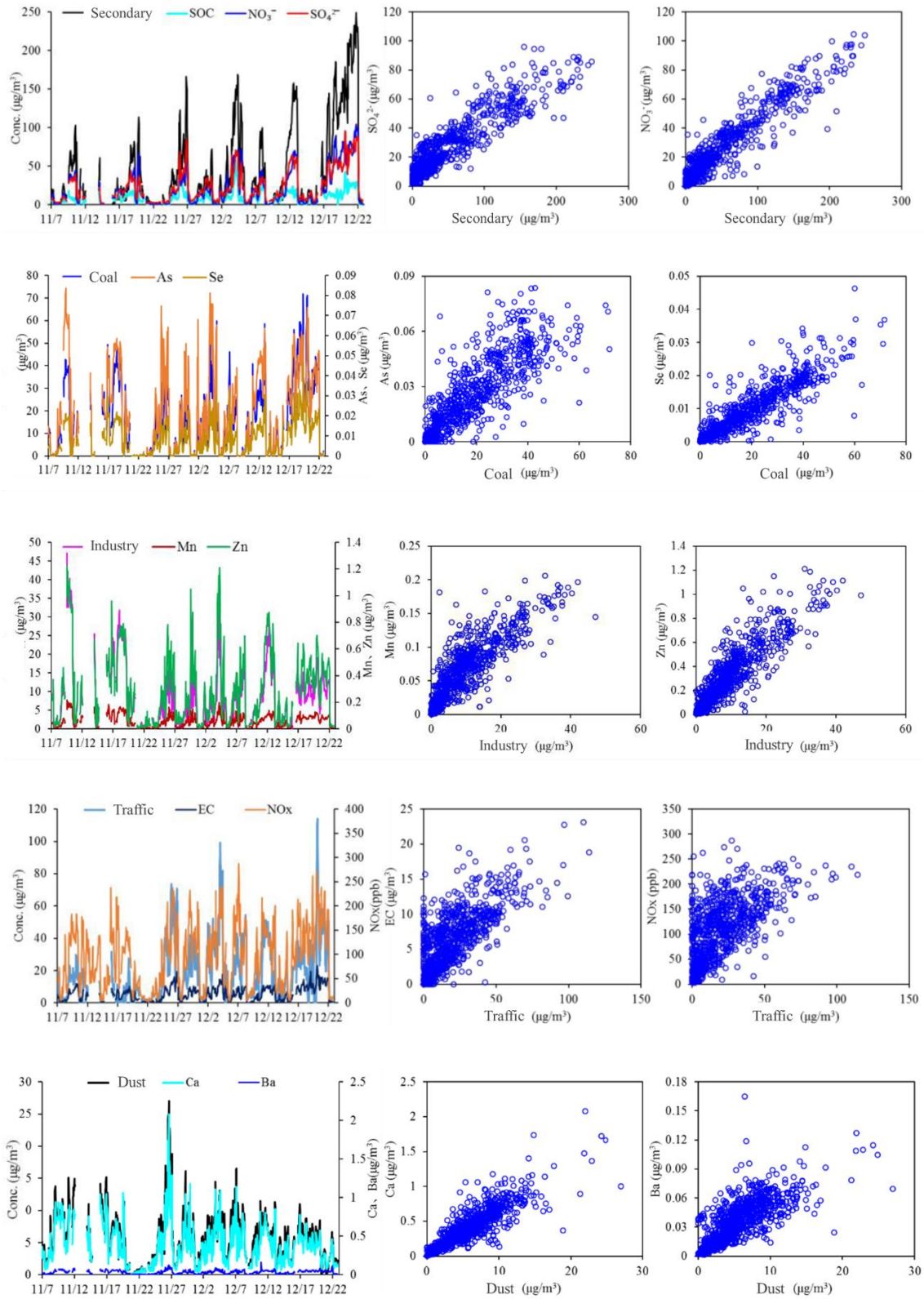

Figure S8. Relationships between the tracers of identified sources and sources mass concentrations

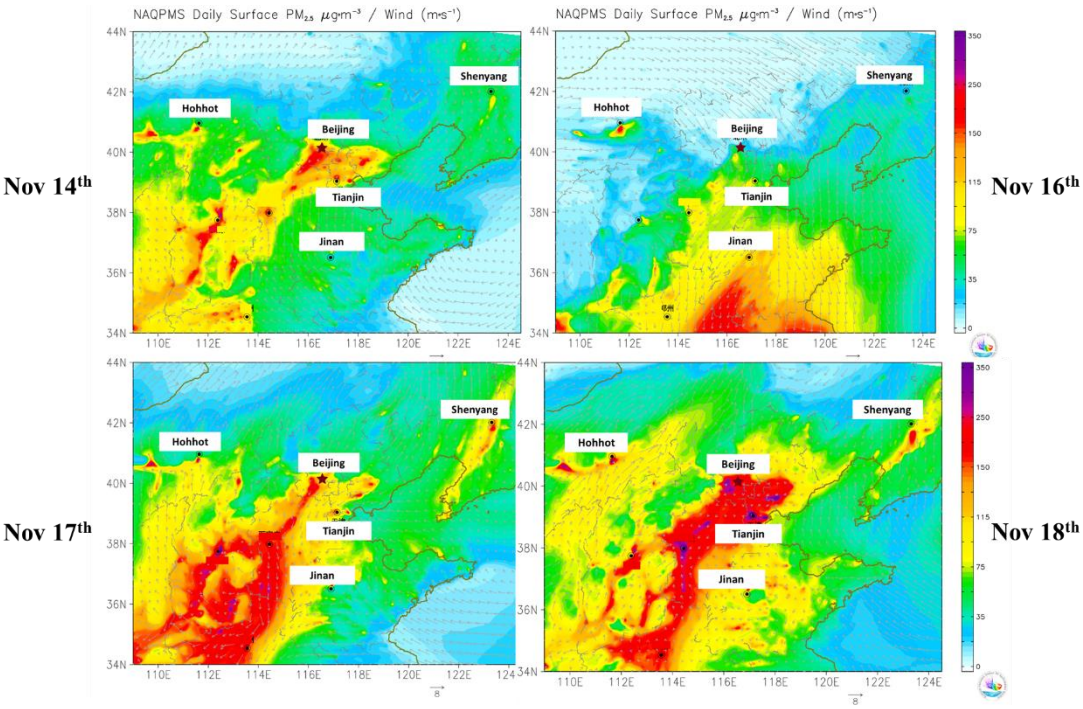

Figure S9. The spatial mass concentrations of $PM_{2.5}$, wind speed and wind direction during EP1 by NAQPMS

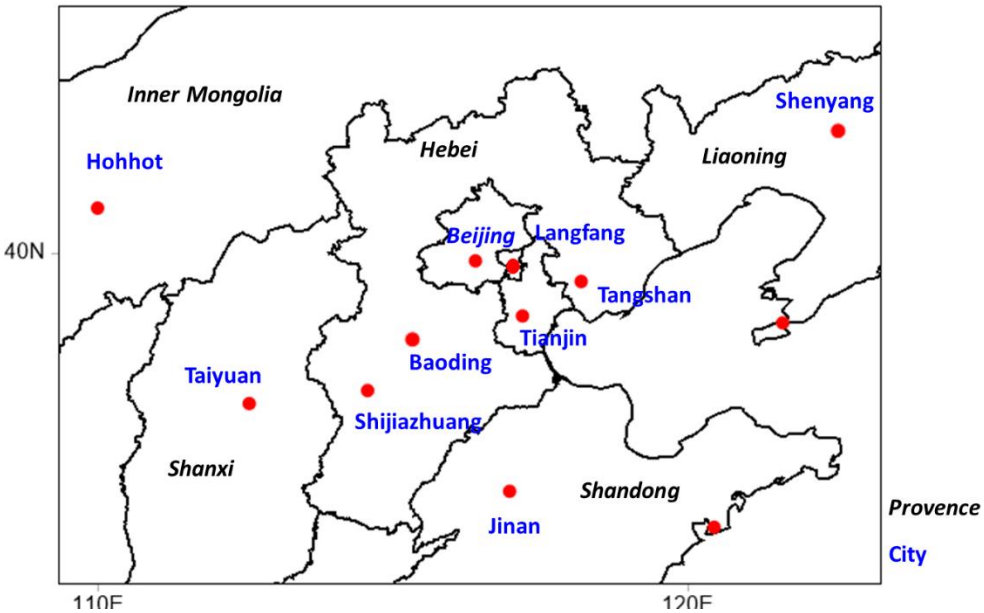

Figure S10. Surrounding provinces and cities of Beijing