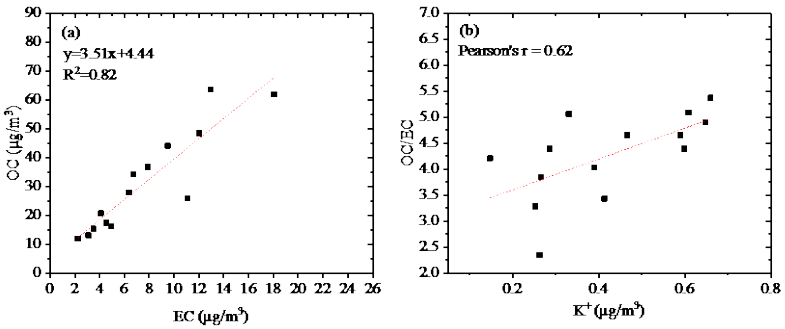


Figure S1 Correlations between OC and EC (a), and between OC/EC and K^+ (b)

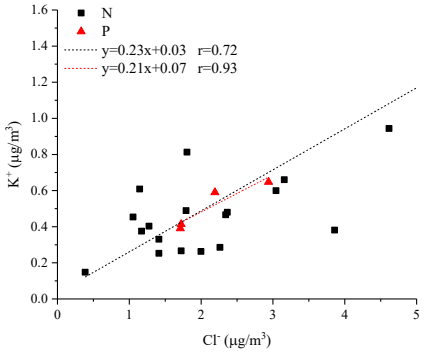


Figure S2 Correlations between Cl^- and K^+ in non-polluted (N) and polluted (P) days.

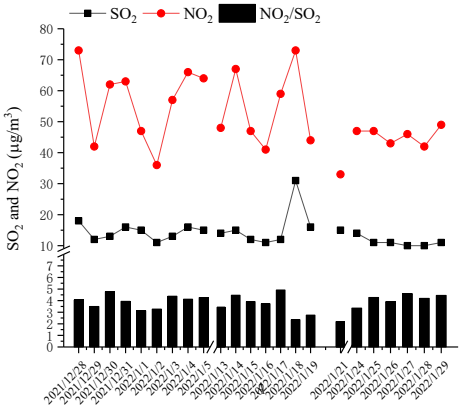


Figure S3 Time series of SO_2, NO_2, and NO_2/SO_2 ratios during sampling period.

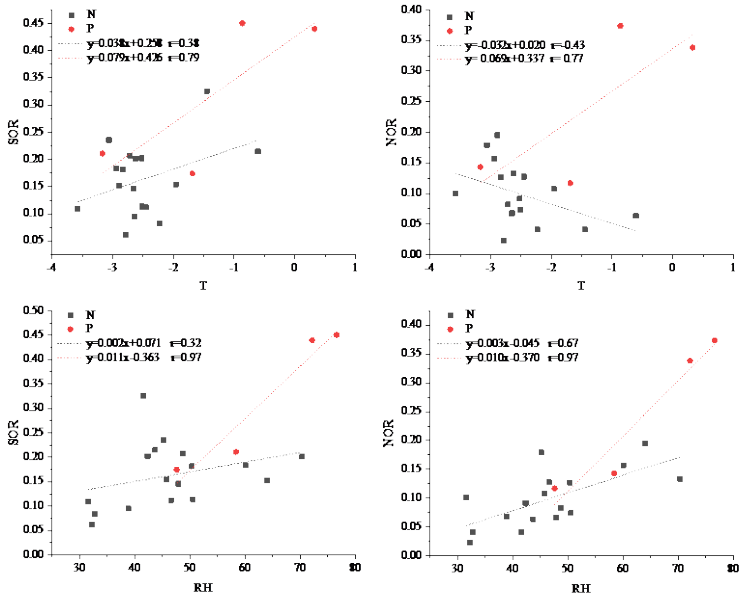


Figure S4 Correlations between SOR or NOR values and air temperature (T) or relative humidity (RH) in non-polluted (N) and polluted (P) days.

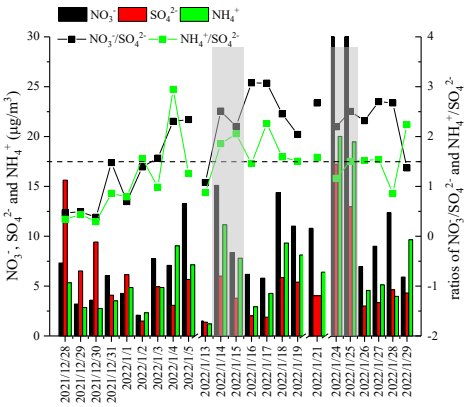


Figure S5 Time series of NO_3^-, SO_4^{2-}, NH_4^+ concentrations and the ratios of NO_3^-/SO_4^{2-} and NH_4^+/SO_4^{2-}.

Table S1: Average enrichment factors of trace elements

element	EF
Ca	2.46
Fe	1.99
K	0.74
Zn	200.91
Mn	19.65

Pb	130.78
Cu	48.07
As	33.25
Hg	2114.09

Table S2: Pearson's coefficients

	Cl^-	NO_3^-	SO_4^{2-}	NH_4^+
Cl^-	1	0.30	0.20	0.34
NO_3^-		1	0.68	0.93
SO_4^{2-}			1	0.72
NH_4^+				1

Table S3: PMF results of PM_{10}/$PM_{2.5}$ obtained in some studies of "2+26" cities

Time	Site	SS	TR	BB	CC	IN	CD	Size
Winter in 2021	This study	32.5	20.9	15.0	9.4	13.9	8.3	PM_{10}
Spring in 2016	Tianjin[a]	28.0	17.0	4.0	20.0		18.0	PM_{10}
Annual 2015-2016	Baoding[b]	38.1	10.2		22.6	13.5	8.7	$PM_{2.5}$
Annual 2015-2016	Cangzhou[b]	39.1	11.9		17.1	10.7	16.7	$PM_{2.5}$
Autumn in 2016	Shijiazhuang[c]	42.4	12.2		18.8	10.2	16.4	$PM_{2.5}$
Annual in 2014	Beijing[d]	19.9	25.2	24.0		18.0	12.9	$PM_{2.5}$
Annual in 2014	Langfang[d]	4.3	12.0	40.7		21.6	21.4	$PM_{2.5}$
Winter in 2015	Handan[e]	30.3	8.2	8.9	26.9	15.6	10.1	$PM_{2.5}$
Winter in 2018	Jinan[f]	49.0	17	4.0		24.0	6.0	$PM_{2.5}$
Winter in 2018	Linfen[g]	19.0	24.8	0.6	17.05		19.6	$PM_{2.5}$

SS, TR, BB, CC, IN,and CDrefer to Secondary source, Traffic, Biomass burning, Coal combustion, Industry and Crustal dust, respectively

[a] Liu et al. (2020)[1], [b] Xu et al. (2019)[2], [c] Lang et al. (2018)[3], [d] Gao et al. (2018)[4], [e] Chen et al. (2020)[5], [f] Gao et al. (2020)[6], [g] Li et al. (2020)[7]

Table S4: WRF-Chem performance metrics

		IOA	MBE	RMSE	NMB
Zhuozhou	PM_{10}	0.69	28.99	58.99	0.28
	NO_2	0.66	3.45	27.42	0.07
	SO_2	0.59	1.76	6.17	0.20
	O_3	0.61	7.54	29.48	0.28
Wanshou	PM_{10}	0.70	11.86	45.31	0.22
	NO_2	0.75	10.38	23.99	0.25
	SO_2	0.69	2.32	5.16	0.31
	O_3	0.74	10.49	25.34	0.27
Langfang	PM_{10}	0.78	-36.89	51.43	-0.32
	NO_2	0.80	-5.11	20.57	-0.11
	SO_2	0.65	3.51	7.02	0.30
	O_3	0.74	15.93	26.83	0.34
Baoding	PM_{10}	0.72	8.08	61.47	0.09
	NO_2	0.64	19.91	26.19	0.32
	SO_2	0.62	4.47	9.98	0.31
	O_3	0.69	-10.29	25.48	-0.36

IOA: index of agreement, MBE: mean bias error, RMSE: root mean squared error, NMB: normalized mean bias

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