

Characteristics and Source Analysis of PM₁ in a Typical Steel-Industry City, Southwest China

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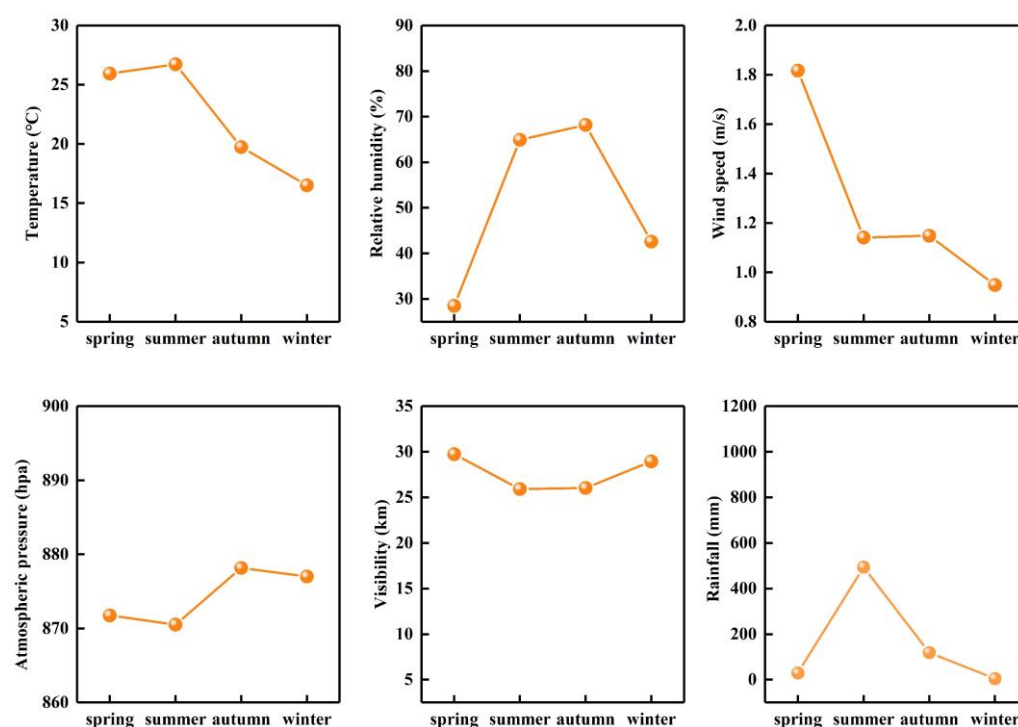


Figure S1. Meteorological parameters of Panzhihua (2018-2019).

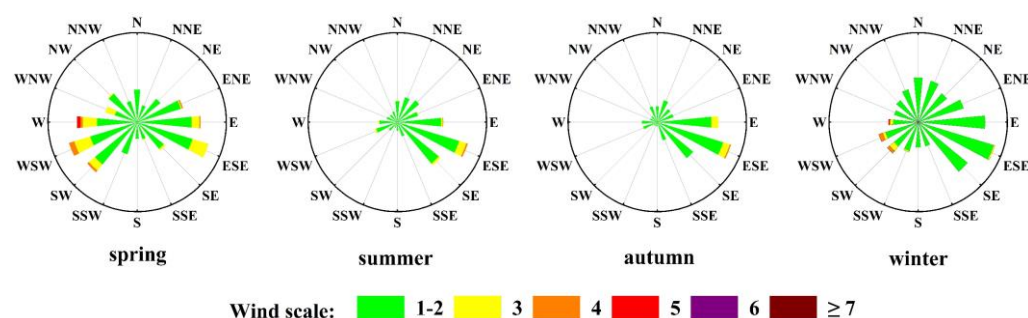


Figure S2. Wind frequency rose chart of Panzhihua (2018-2019).

Table S1. Seasonal distribution characteristics of the PM₁ mass concentrations (µg/m³).

		Spring	Summer	Autumn	Winter
NNP	Max	55.84	39.05	44.73	145.30
	Min	17.95	16.36	12.12	22.10
	Average	30.09	26.86	30.48	43.84
	SD	9.41	6.52	7.13	22.44
HMK	Max	51.49	32.85	37.06	67.02
	Min	14.38	16.45	17.08	20.77
	Average	27.33	25.94	29.33	35.25
	SD	8.89	4.52	5.88	9.36

SD means standard deviation.

Table S2. Seasonal distribution characteristics of PTEs in PM₁ of NNP (ng/m³).

		V	Cr	Mn	Ni	Cu	Zn	As	Cd	Pb
Spring	Max	4.34	15.49	25.31	18.47	440.88	174.95	8.64	2.89	262.43
	Min	0.92	0.14	7.37	0.88	106.76	18.72	1.68	0.64	38.68
	Average	2.50	5.22	14.91	4.76	213.39	69.33	4.62	1.49	129.67
	SD	0.87	3.77	5.56	3.64	88.01	42.80	1.87	0.69	69.72
Summer	Max	13.68	22.50	21.37	11.00	514.99	244.70	14.44	2.47	315.59
	Min	0.76	2.07	5.47	0.75	109.28	28.08	2.08	0.17	31.71
	Average	3.97	6.27	13.55	4.21	232.52	77.39	5.85	0.98	123.41
	SD	2.59	4.17	4.29	2.26	123.96	57.30	3.12	0.68	76.71
Autumn	Max	6.64	13.08	41.31	6.88	407.56	563.12	14.13	4.77	580.37
	Min	1.26	0.98	6.09	0.55	77.87	19.48	1.95	0.28	21.32
	Average	3.01	4.54	16.64	3.15	172.63	109.77	6.82	1.68	177.20
	SD	1.25	2.90	7.50	1.47	79.17	100.48	2.82	1.12	128.87
Winter	Max	7.02	12.99	73.17	24.24	348.83	243.10	13.49	7.56	589.77
	Min	0.86	1.68	7.03	2.73	86.07	11.33	2.04	0.58	64.12
	Average	2.92	5.24	24.14	5.61	199.87	108.32	5.50	2.40	200.23
	SD	1.68	2.17	13.38	4.56	86.15	59.86	2.64	1.51	135.36

Table S3. Seasonal distribution characteristics of PTEs in PM₁ of HMK (ng/m³).

		V	Cr	Mn	Ni	Cu	Zn	As	Cd	Pb
Spring	Max	2.54	19.14	37.85	11.70	31.39	131.55	9.31	1.92	136.07
	Min	0.43	0.29	3.21	0.19	8.89	15.68	0.57	0.31	16.82
	Average	1.26	3.22	9.14	2.16	18.59	56.39	3.40	1.00	68.39
	SD	0.62	3.58	6.37	2.30	5.26	27.90	2.14	0.37	32.56
Summer	Max	7.99	6.94	17.21	3.90	62.53	268.86	13.58	2.23	290.82
	Min	1.04	2.07	4.88	0.23	15.47	27.53	1.18	0.70	49.46
	Average	3.09	3.72	10.33	1.48	35.41	98.68	5.20	1.37	146.60
	SD	2.08	1.16	3.50	1.21	13.24	59.30	2.92	0.50	67.12
Autumn	Max	11.16	9.88	25.19	20.51	100.39	387.21	12.70	3.43	273.82
	Min	0.83	2.33	2.96	0.38	15.40	19.26	0.53	0.49	26.08
	Average	2.97	5.26	13.01	4.53	36.90	128.90	5.57	1.64	148.91
	SD	2.12	1.88	5.55	5.04	18.48	89.83	2.90	0.78	63.23
Winter	Max	4.50	24.51	42.86	37.17	83.29	358.35	7.13	3.53	254.79
	Min	0.45	3.08	4.88	1.87	9.05	27.37	0.75	0.42	25.90
	Average	1.51	7.38	12.93	5.86	25.53	83.88	3.67	1.57	101.48
	SD	1.04	5.19	7.89	6.43	14.61	63.26	1.98	0.77	58.66

SD means standard deviation.

Table S4. QA/QC parameters for ICP-MS analysis of PTEs.

Species	LOD (ng/m ³)	Repeatability (%)
V	0.08	≤ 10
Cr	0.10	≤ 10
Mn	0.05	≤ 10
Ni	0.04	≤ 10
Cu	0.04	≤ 10
Zn	0.10	≤ 10
As	0.30	≤ 10
Cd	0.01	≤ 10
Pb	0.03	≤ 10

Table S5. The reference concentration limits for PTEs (GB 3095-2012).

Species	Reference concentration limits (µg/m ³)
Cr(VI)	0.000025
As	0.006
Cd	0.005
Pb	0.5