

Spatiotemporal Characteristics of Air Pollutants (PM₁₀, PM_{2.5}, SO₂, NO₂, O₃, and CO) in the Inland Basin City of Chengdu, Southwest China

Supplementary

Table S1. Average annual concentration of PM₁₀, PM_{2.5}, SO₂, NO₂, O₃, and CO at the 23 monitoring stations during the study period.

Sites Code	PM ₁₀ (µg/m ³)				PM _{2.5} (µg/m ³)				SO ₂ (µg/m ³)				NO ₂ (µg/m ³)			
	2014	2015	2016	D	2014	2015	2016	D	2014	2015	2016	D	2014	2015	2016	D
S1	116	104	104	—17	74	64	66	−8	22	15	14	−8	69	63	57	−17
S2	127	122	119	−8	80	68	74	−6	20	14	14	−6	56	45	43	−13
S3	119	95	97	−22	75	60	58	−17	14	11	10	−4	58	54	54	−4
S4	129	112	107	−22	79	64	64	−15	18	15	15	−3	56	52	55	−1
S5	120	108	99	−21	78	70	60	−18	21	16	16	−5	53	53	63	10
S6	117	106	106	−11	75	62	57	−18	20	13	12	−8	59	55	53	−6
S7	126	105	103	−23	74	61	59	−15	21	15	16	−5	61	51	52	−9
S8	137	113	115	−22	82	71	66	−16	35	18	21	−14	58	62	59	1
S9	131	113	105	−26	89	67	64	−25	49	37	22	−27	36	31	50	14
S10	120	104	95	−25	74	66	60	−14	43	23	10	−33	37	35	32	−5
S11	124	108	126	2	85	74	78	−7	50	35	20	−30	34	35	55	21
S12	120	100	118	−2	79	74	71	−8	21	19	16	−5	31	31	32	1
S13	124	114	123	−1	86	79	80	−6	43	21	21	−22	40	36	43	3
S14	127	124	129	2	84	70	77	−7	23	16	14	−9	38	38	42	4
S15	111	103	101	−10	71	69	65	−6	33	29	13	−20	40	41	52	12
S16	94	100	115	21	64	63	72	8	28	24	17	−11	28	34	34	6
S17	99	96	99	0	67	63	69	2	37	23	19	−18	36	34	34	−2
S18	93	87	87	−6	63	57	62	−1	26	16	16	−10	23	25	25	2
S19	83	84	92	9	56	53	59	3	14	14	9	−5	20	26	28	8
S20	105	108	106	1	71	67	73	2	29	25	16	−13	43	38	40	−3
S21	100	98	93	−7	69	58	59	−10	26	25	16	−10	33	28	29	−4
S22	88	84	89	1	61	55	62	1	20	20	12	−8	25	30	27	2
S23	77	79	83	6	48	42	46	−2	21	28	21	0	20	28	27	7
Ave	112	103	105	−7	73	64	65	−8	28	21	16	−12	41	40	43	2
St. Dev.	16	11	12	12	10	8	8	8	10	7	4	9	14	11	12	8

“D” is an abbreviation for “Difference”, which represents the annual average concentration change of pollutants throughout the study period. Where “average annual concentration” exceeded both the Chinese Ambient Air Quality Standards (CAAQS) and the World Health Organization guidelines standards (WHO), the numbers are shown in bold.

Sites Code	O ₃ (µg/m ³)				CO (mg/m ³)			
	2014	2015	2016	Dif	2014	2015	2016	Dif
S1	84	87	101	17	1.074	1.191	1.189	0.115
S2	78	96	93	15	1.250	1.157	1.128	−0.122
S3	73	82	84	11	1.253	1.114	1.100	−0.153
S4	79	92	96	17	1.192	1.233	1.217	0.025
S5	77	91	92	15	1.102	1.043	1.111	0.009
S6	79	86	87	8	1.117	1.150	1.132	0.015
S7	85	94	99	14	1.318	1.059	1.231	−0.087
S8	77	91	66	−11	1.056	0.952	0.932	−0.124
S9	83	94	105	22	1.487	1.189	1.121	−0.366
S10	78	106	108	30	1.454	1.233	1.068	−0.386
S11	64	98	102	38	1.282	1.047	1.020	−0.262
S12	76	98	110	34	1.396	1.133	1.078	−0.318
S13	92	110	118	26	0.908	1.172	1.199	0.291
S14	79	95	105	26	1.361	1.242	0.968	−0.393
S15	92	101	100	8	1.079	0.970	0.885	−0.194
S16	88	100	100	12	0.891	1.109	0.914	0.023
S17	104	107	101	−3	0.917	0.842	0.914	−0.003
S18	103	104	102	−1	0.862	0.849	0.841	−0.021
S19	–	88	96	8	–	0.806	0.806	0
S20	–	94	102	8	–	0.973	0.998	0.025
S21	–	102	104	2	–	0.842	0.799	−0.043
S22	–	102	103	1	–	0.764	0.805	0.041
S23	–	83	81	−2	0.722	0.728	1.033	0.311
Ave	83	96	98	15	1.143	1.035	1.021	−0.122
St. Dev.	10	7	11	12	0.211	0.159	0.136	0.186

Table S2. Statistics of daily average concentrations at sites. Shows 75th and 90th percentile concentrations; frequency of exceeding CAAQS and WHO. For each variable, values above the 75th percentile are shown in bold; values under the 25% percentile are shown in italics.

Sites Code	Concentrations												Freq > standard			
	PM ₁₀ (µg/m³)		PM _{2.5} (µg/m³)		SO ₂ (µg/m³)		NO ₂ (µg/m³)		O ₃ (µg/m³)		CO (mg/m³)		PM ₁₀ (%)		PM _{2.5} (%)	
	75th	90th	75th	90th	75th	90th	75th	90th	75th	90th	75th	90th	NAAQS	WHO	NAAQS	WHO
S1	135	202	84	133	20	29	75	90	130	176	1.378	1.695	20.8	85.6	30.5	91.2
S2	159	222	93	141	19	26	58	72	125	173	1.395	1.781	27.7	90.5	35.6	93.1
S3	131	194	79	124	14	19	64	77	118	156	1.380	1.727	18.0	80.5	26.9	89.3
S4	150	212	87	128	18	25	65	80	128	170	1.420	1.750	24.7	87.0	31.1	91.5
S5	142	202	86	138	21	29	68	85	125	168	1.311	1.754	22.3	83.6	31.2	90.1
S6	141	199	80	118	18	25	66	78	117	161	1.306	1.700	21.7	86.2	27.9	89.7
S7	142	205	80	123	22	28	64	77	128	170	1.405	1.808	21.9	84.4	27.9	87.6
S8	151	217	91	134	32	46	73	94	122	168	1.212	1.722	25.5	92.1	35.1	93.8
S9	150	201	94	139	46	64	47	65	131	173	1.553	1.941	25.0	87.7	36.8	90.4
S10	135	181	86	124	38	49	44	57	132	166	1.520	1.772	19.7	84.7	30.3	89.0
S11	152	204	102	148	47	59	52	67	125	177	1.397	1.735	25.8	92.1	40.4	94.5
S12	146	204	94	137	22	29	39	49	132	178	1.497	1.812	22.7	87.7	38.6	94.6
S13	150	208	103	152	35	54	49	62	142	194	1.349	1.651	25.0	92.0	43.9	95.8
S14	156	221	95	144	21	29	48	60	130	179	1.436	1.842	27.3	94.5	39.2	94.0
S15	133	190	86	134	35	44	55	72	136	174	1.196	1.545	19.2	84.8	31.9	90.0
S16	133	188	87	128	29	38	39	51	131	166	1.140	1.375	19.0	83.4	32.5	88.2
S17	128	177	85	127	33	47	43	55	136	185	1.067	1.327	16.8	79.3	31.8	89.7
S18	115	165	78	117	23	33	30	38	140	176	0.964	1.139	12.7	75.1	26.6	82.6
S19	117	163	72	110	16	21	32	41	128	161	0.939	1.163	12.9	70.8	23.1	81.5
S20	135	196	87	134	30	39	50	61	144	180	1.164	1.463	19.3	86.2	31.9	92.5
S21	124	174	78	124	27	36	37	48	135	176	0.944	1.206	16.0	81.8	26.2	86.0
S22	110	157	75	112	22	28	33	40	138	177	0.938	1.172	12.0	74.4	24.6	87.9
S23	101	147	58	93	31	41	30	39	95	134	1.011	1.198	9.3	66.1	14.8	65.5
Ave	136	193	85	129	27	36	50	63	129	171	1.257	1.577	19.1	88.7	30.7	93.5
St. Dev.	15	21	10	13	9	12	14	17	10	12	0.201	0.259	5.1	7.1	6.4	6.3

Sites Code	Freq > standard							
	SO ₂ (%)		NO ₂ (%)		O ₃ (%)		CO (%)	
	NAAQS	WHO	NAAQS	WHO	NAAQS	WHO	NAAQS	WHO
S1	0	24.6	18.0	–	14.2	36.6	0	–
S2	0	20.2	5.0	–	13.2	36.2	0	–
S3	0	7.8	8.4	–	8.4	32.8	0	–
S4	0	19.0	9.3	–	13.2	37.1	0	–
S5	0	26.1	13.6	–	13.2	35.9	0	–
S6	0	16.1	7.7	–	10.2	33.1	0	–
S7	0	28.5	7.5	–	13.3	38.4	0	–
S8	0	52.0	17.2	–	11.5	34.7	0	–
S9	0	75.4	4.5	–	14.1	38.1	0	–
S10	0	51.7	1.7	–	12.2	42.8	0	–
S11	0	72.6	3.7	–	14.6	33.7	0	–
S12	0	30.3	0.1	–	14.8	38.1	0	–
S13	0	57.6	1.8	–	19.6	45.7	0	–
S14	0	27.2	0.9	–	15.2	39.0	0	–
S15	0	54.4	5.4	–	14.1	44.1	0	–
S16	0	50.1	0.3	–	12.7	40.3	0	–
S17	0	53.6	0.4	–	17.4	43.6	0	–
S18	0	32.2	0	–	16.5	44.4	0	–
S19	0	11.1	0	–	10.1	39.9	0	–
S20	0	50.7	1.5	–	16.6	43.5	0	–
S21	0	52.1	0.4	–	14.3	45.8	0	–
S22	0	30.5	0	–	15.9	45.4	0	–
S23	0	49.4	0	–	4.1	31.8	0	–
Ave	0	49.2	0.8	–	12.0	37.4	0	–
St. Dev.	0	19.0	5.5	–	3.2	4.5	0	–

Table S3. Average seasonal concentration of PM₁₀, PM_{2.5}, SO₂, NO₂, O₃, and CO at the 23 monitoring stations during the study period.

Sites	PM ₁₀ (µg/m ³)				PM _{2.5} (µg/m ³)				SO ₂ (µg/m ³)				NO ₂ (µg/m ³)			
Code	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win
S1	109	70	96	157	66	41	58	109	17	13	16	22	65	56	60	71
S2	131	85	96	178	72	47	62	114	15	12	15	23	51	38	44	59
S3	107	65	83	160	63	41	50	104	13	10	10	14	57	49	53	60
S4	117	76	99	171	65	43	57	112	16	13	14	19	57	49	52	58
S5	118	66	89	164	71	39	55	113	17	14	17	22	56	47	58	64
S6	110	75	95	159	65	41	53	99	15	11	14	20	56	47	55	64
S7	115	74	92	164	70	40	48	101	15	15	17	22	57	50	49	62
S8	131	83	98	174	71	46	57	113	23	25	24	26	59	49	58	70
S9	124	86	91	162	67	54	59	112	42	38	29	34	40	35	39	43
S10	112	74	87	151	65	45	53	104	28	23	24	25	37	25	29	48
S11	126	89	101	160	78	54	65	119	35	40	29	35	42	37	39	47
S12	114	76	98	164	72	51	63	112	17	15	19	24	34	24	30	37
S13	120	88	108	163	77	54	69	124	32	26	23	34	41	32	38	48
S14	128	89	107	179	74	54	59	118	18	14	18	22	41	27	39	49
S15	111	71	88	149	70	43	50	110	26	25	25	25	45	33	46	53
S16	114	74	82	142	75	41	47	100	26	23	22	34	36	25	35	43
S17	112	63	79	139	72	41	52	101	26	23	22	34	36	25	35	43
S18	97	55	74	130	63	33	46	99	19	22	17	18	24	17	24	32
S19	106	56	61	123	61	33	41	91	14	13	10	13	29	25	19	26
S20	123	73	84	144	77	45	54	106	26	21	21	25	43	33	39	47
S21	109	68	73	136	65	40	44	98	20	22	22	26	30	24	28	38
S22	98	58	69	123	62	36	46	93	18	17	15	20	29	25	24	30
S23	88	53	58	121	47	24	31	79	23	22	17	30	21	21	24	33
Ave	114	73	87	153	68	43	53	106	22	20	19	25	43	34	40	49
St. Dev.	11	11	14	18	7	8	9	10	7	8	5	6	12	11	12	13

Sites Code	O ₃ (µg/m ³)				CO (µg/m ³)			
	Spr	Sum	Aut	Win	Spr	Sum	Aut	Win
S1	123	128	67	45	1.111	0.966	1.111	1.420
S2	115	132	64	46	1.060	0.958	1.167	1.527
S3	104	119	54	41	1.109	0.939	1.142	1.436
S4	110	138	63	46	1.222	1.046	1.082	1.521
S5	110	130	63	44	0.982	0.793	1.028	1.547
S6	106	126	62	43	1.030	1.004	1.098	1.399
S7	110	135	71	52	1.174	1.022	1.116	1.507
S8	105	129	65	41	0.896	0.659	0.870	1.475
S9	113	136	76	52	1.075	1.004	1.275	1.734
S10	115	125	81	68	1.174	1.100	1.199	1.547
S11	107	133	67	45	1.028	0.789	1.095	1.559
S12	104	141	80	53	1.108	0.949	1.180	1.591
S13	129	152	85	63	1.018	0.870	1.073	1.405
S14	112	143	71	47	1.267	0.940	1.121	1.423
S15	117	135	71	67	0.956	0.773	0.870	1.309
S16	127	145	81	62	0.795	0.694	0.924	1.155
S17	127	145	81	62	0.795	0.694	0.924	1.155
S18	131	141	75	65	0.775	0.764	0.843	1.021
S19	111	132	71	52	0.753	0.662	0.751	1.062
S20	122	147	72	54	0.865	0.799	0.957	1.312
S21	126	142	82	65	0.744	0.695	0.769	1.074
S22	126	144	75	63	0.719	0.570	0.771	1.080
S23	88	120	68	51	0.827	0.707	0.825	0.956
Ave	115	136	72	53	0.978	0.843	1.008	1.357
St. Dev.	10	9	8	9	0.168	0.150	0.156	0.216

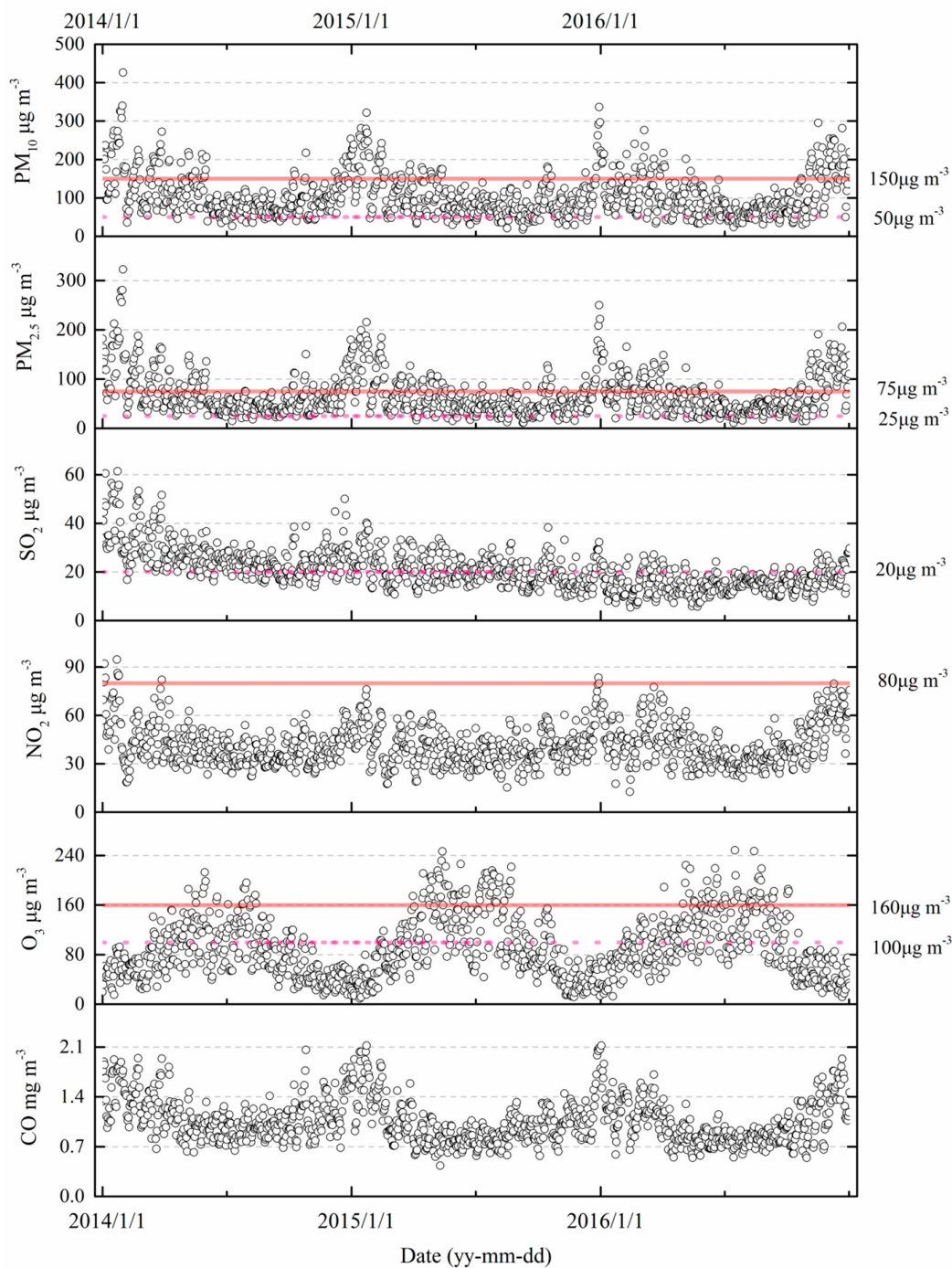


Figure S1. Variations in the daily concentrations of PM₁₀, PM_{2.5}, SO₂, NO₂, O₃, and CO in the ambient air in Chengdu during the study period. The pink dotted lines represent limits specified by the Chinese Ambient Air Quality Standards (CAAQS) and the red solid lines represent limits specified by the World Health Organization guidelines standards (WHO).

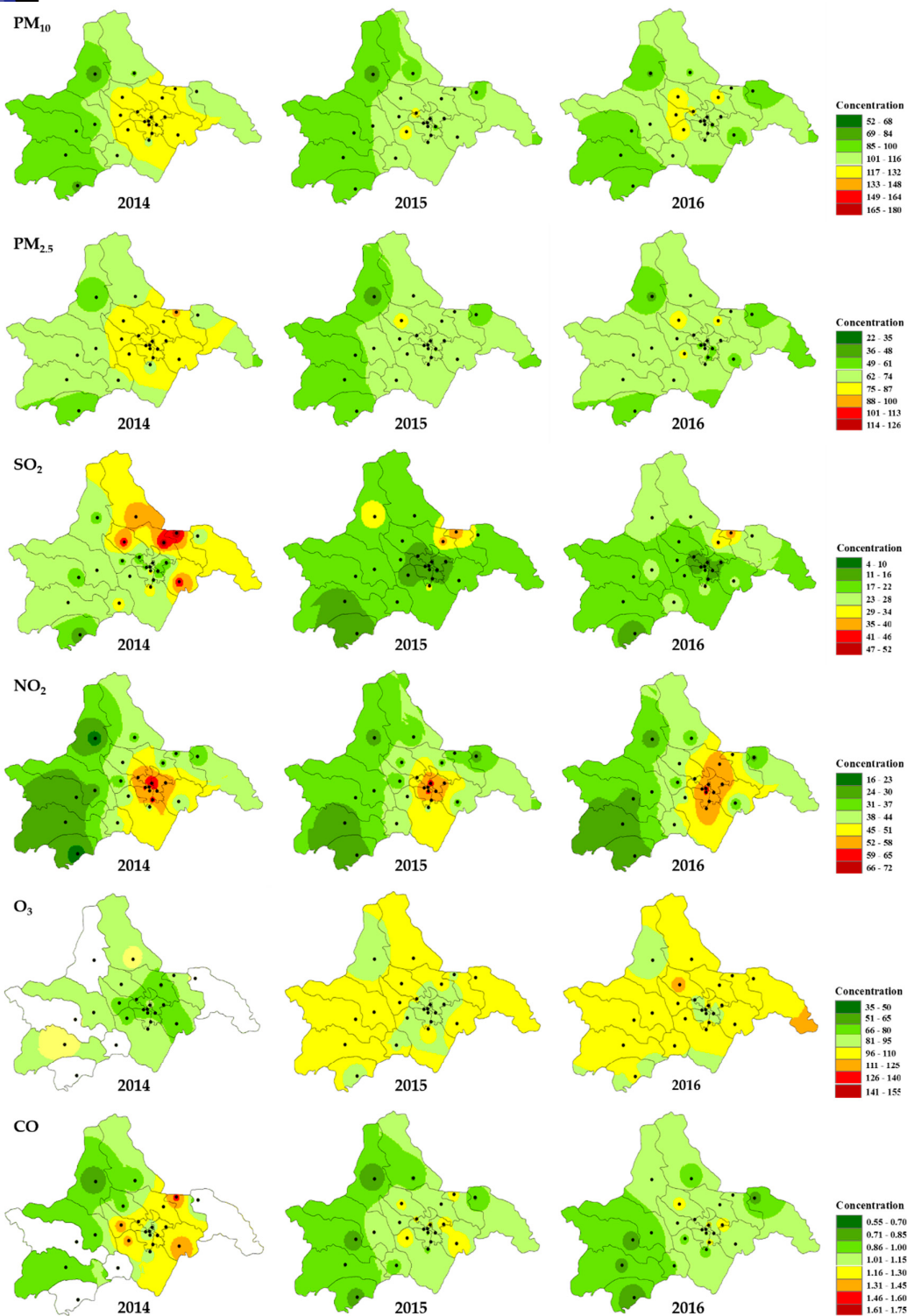


Figure S2. Interannual variations of PM₁₀, PM_{2.5}, SO₂, NO₂, O₃ and CO concentrations during 2014–2016 in Chengdu. The blank area indicates that the monitoring stations in the region of the year have no monitoring data for the corresponding air pollutants. The units for PM₁₀, PM_{2.5}, SO₂, NO₂, and O₃ are $\mu\text{g m}^{-3}$, whereas that for CO is mg m^{-3} .