

Supplementary information for “Analysis of Air Pollutants and Their Potential Sources in Eastern Xinjiang, Northwestern Inland China, from 2018 to 2022”

Yuanyuan Zhang ¹, Hui Xu^{1,*}, Yunhui Zhang², Jie Luo³, Fuyao Chen¹, Bo Cao¹ and Mingjie Xie^{4,*}

Text S1. Air quality index (AQI) calculation

First, according to the instructions in technical regulation on ambient air quality index (on trial) (HJ-633-2012), the individual air quality index (*iAQI*) for the six criteria pollutants was calculated as:

$$iAQI_P = \frac{I_{high} - I_{low}}{C_{high} - C_{low}} (C_P - C_{low}) + I_{low} \quad (1)$$

iAQI_P: *iAQI* for air pollutant *P*;

C_P: the concentration of pollutant *P*;

C_{low}: the concentration breakpoint that is $\leq C_P$;

C_{high}: the concentration breakpoint that is $\geq C_P$;

I_{low}: the index breakpoint corresponding to *C_{low}*;

I_{high}: the index breakpoint corresponding to *C_{high}*.

The overall AQI is determined by the highest *iAQI* of all the six pollutants:

$$AQI = \max(I_1, I_2, \dots, I_n) \quad (2)$$

Grade I: 0–50, Good

Grade II: 51–100, Moderate

Grade III: 101–150, Unhealthy for Sensitive Groups

Grade IV: 151–200, Unhealthy

Grade V: 201–300, Very unhealthy

Grade VI: 300–500, Hazardous

when the AQI exceeds 50, the pollutant with the highest *iAQI* value is considered the main pollutant.

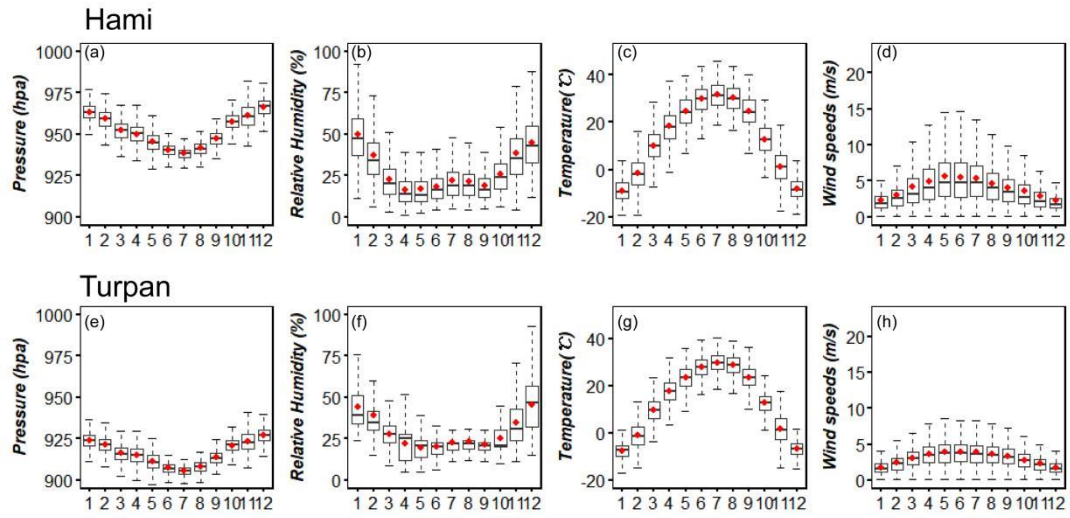


Figure S1. The monthly variations of meteorological factors in Hami and Turpan.

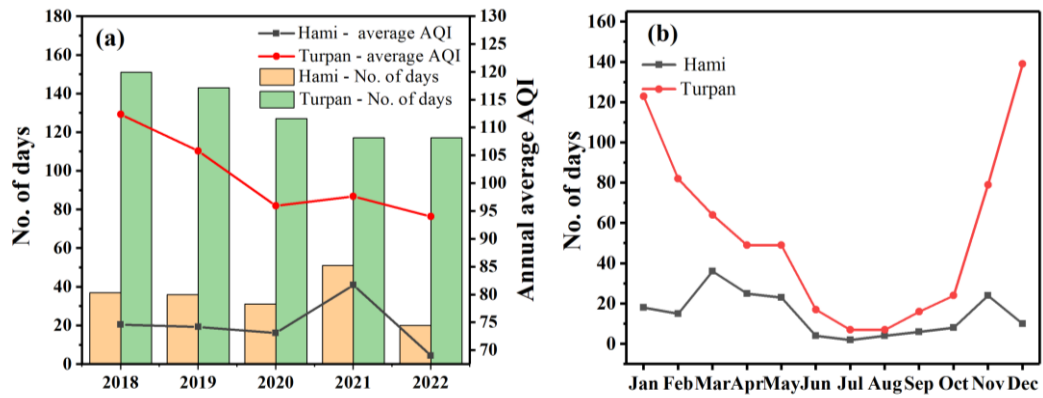


Figure S2. The number of days exceeding AQI standards in each year (a) and month (b) for Hami and Turpan during the whole period.

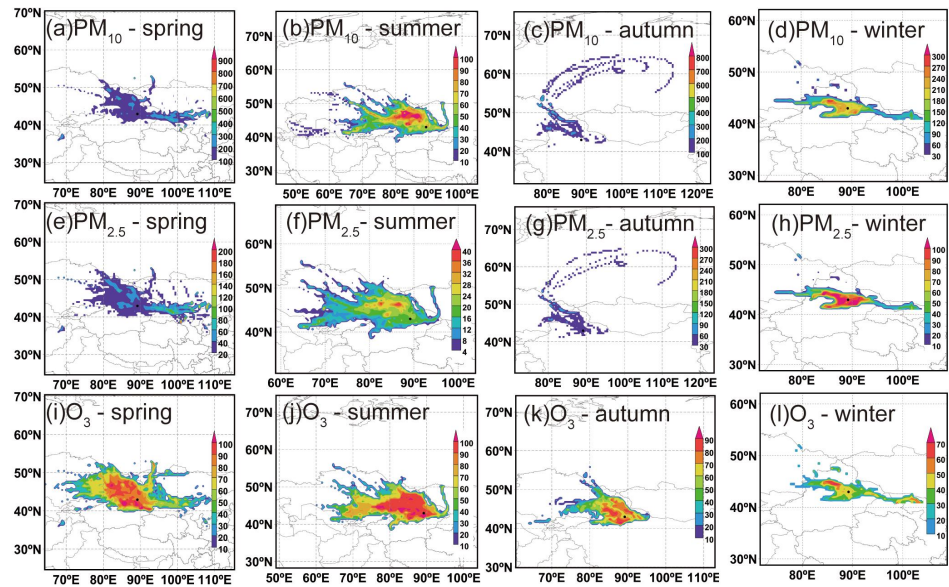


Figure S3. CWT analysis results for PM_{10} , $PM_{2.5}$, and O_3 in the eastern Xinjiang region during different seasons in 2022.

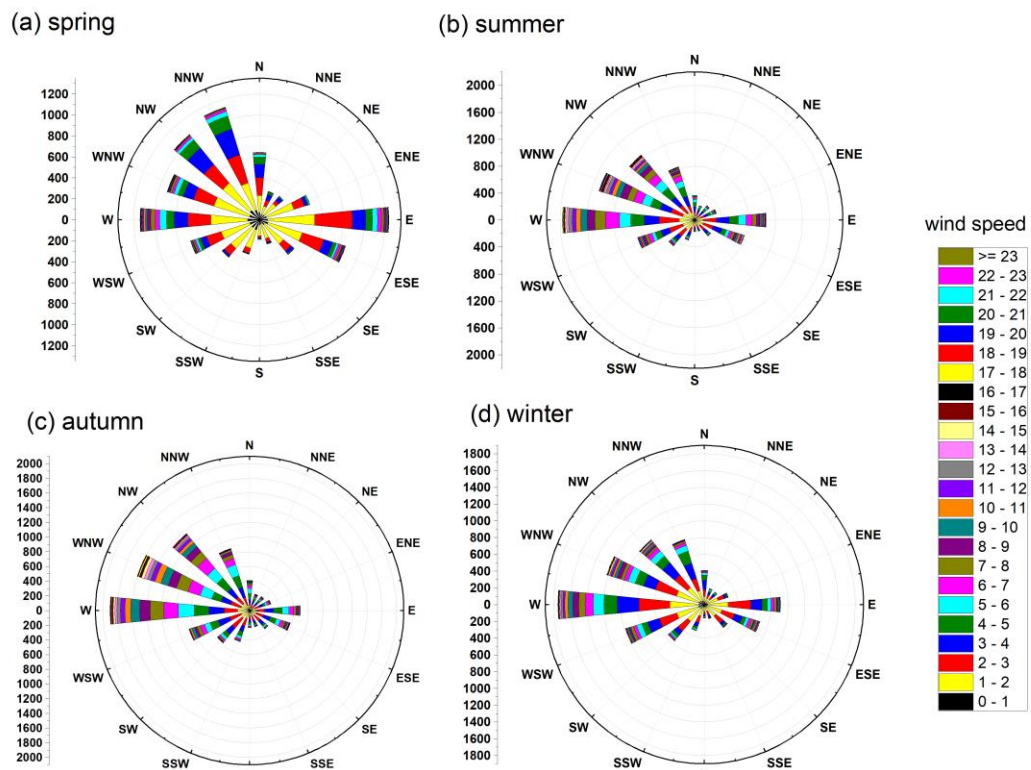


Figure S4. Seasonal wind rose diagram for the Turpan Region in 2022.

Table S1. Statistics of hourly measurements of the six criteria air pollutants for AQI calculation.

		PM _{2.5}	PM ₁₀	CO	NO ₂	O ₃ -8h	SO ₂	AQI
		µg·m ⁻³	µg·m ⁻³	mg·m ⁻³	µg·m ⁻³	µg·m ⁻³	µg·m ⁻³	
Hami (No. of obs.: 43130) ^a	min	1.00	2.00	0.10	1.00	1.00	1.00	9.00
	median	22.0	69.0	0.60	21.0	61.0	5.00	60.0
	Mean ± stdev ^b	29.0 ± 26.6	95.5 ± 144	0.79 ± 0.64	28.0 ± 22.1	60.0 ± 33.3	8.50 ± 11.8	71.9 ± 56.7
	max	535	4574	8.70	145	230	353	500
	missing% ^c	5.20%	8.97%	5.49%	5.22%	4.19%	4.95%	6.93%
Turpan (No. of obs.: 43720)	min	1.00	5.00	0.10	4.00	3.00	1.00	16.0
	median	36.0	114	0.70	27.0	59.0	7.00	84.0
	Mean ± stdev	54.3 ± 61.8	160 ± 212	1.12 ± 0.92	32.6 ± 20.5	60.2 ± 32.1	9.25 ± 6.70	110 ± 88.8
	max	1801	3840	7.30	124	156	294	500
	missing%	6.55%	7.19%	6.69%	7.80%	5.71%	6.33%	8.25%

^a Number of observations; ^b standard deviation; ^c missing% = number of missing values/total number of observations × 100%.

Table S2. Average PM_{2.5}, PM₁₀, and O₃ concentrations in different clusters of eastern Xinjiang during the four seasons of 2022.

Season	Clusters	Probability %	Average mass concentration (µg·m ⁻³)		
			PM _{2.5}	PM ₁₀	O ₃
Spring	1	20.5	31.4	114	88.2
	2	19.4	42.1	166	93.0
	3	3.63	41.1	214	94.7
	4	30.8	29.5	112	87.7
	5	5.00	40.2	208	88.2
	6	5.09	120	423	87.1
	7	15.5	40.1	181	87.3
	All	100	39.6	158	89.0
Summer	1	38.1	22.3	74.3	94.9
	2	14.5	21.1	75.3	101
	3	17.7	17.5	52.8	94.6
	4	12.3	24.7	77.4	98.7
	5	17.5	21.6	73.7	91.9
	All	100	21.5	71.1	95.7
Autumn	1	12.9	30.7	98.1	70.8
	2	22.3	35.6	120	75.4
	3	2.43	37.0	142	69.9
	4	44.3	30.9	80.9	68.6
	5	4.59	37.5	108	79.5
	6	0.83	288	1555	61.2
	7	3.44	68.6	210	74.0
	8	9.23	28.7	74.3	64.7
	All	100	35.7	112	70.7
Winter	1	18.6	98.7	209	40.9
	2	28.1	97.2	203	39.1
	3	6.59	86.0	213	55.3
	4	1.30	54.9	157	61.3
	5	41.8	97.8	203	42.8
	6	3.62	66.6	182	46.0
	All	100	95.5	203	42.6