SUPPLEMENTARY FILE

This supplementary file contains:

- Tables S1 – S3. Some statistics of the dataset for Ardahan, Erzurum and Kars station and Shapiro-Wilk normality test results, respectively
- Table S4. Classification of PM_{10} concentration according to the EAQI
- Tables S5. The values of monthly average of meteorological parameters and 24-h moving PM_{10} concentrations ($\mu g/m^3$) between 2010 and 2022.
- Tables S6 – S8. Spearman's rank correlation coefficients for Ardahan, Erzurum and Kars station, respectively
- Table S9. Classifications of Spearman's rank correlation coefficient for the effect size

Table S1. Some statistics of the dataset for Ardahan station and Shapiro-Wilk normality test results

	Mean	SD	Min.	Median	Max.	Normality test		Number of data point
						Statistics	Prob>|t|*	
Annual (2010-2022)								
PM_{10}	44.43	42.22	2.36	31.35	371.21	0.73447	<0.0001	4 330
Temperature	5.36	9.86	-25.10	6.40	23.50	0.96472	<0.0001	
Relative Humidity	67.69	10.86	24.40	68.70	95.00	0.98238	<0.0001	
Pressure	818.54	4.21	800.50	818.80	830.60	0.98384	<0.0001	
Wind Direction	183.43	128.84	1.00	206.00	360.00	0.86248	<0.0001	
Wind Speed	1.12	0.51	0.00	1.10	3.70	0.93498	<0.0001	
Winter								
PM_{10}	73.35	62.44	3.17	56.01	371.21	0.84035	<0.0001	1 069
Temperature	-6.91	5.97	-25.10	-6.30	6.10	0.97896	<0.0001	
Relative Humidity	74.96	8.03	34.50	75.30	95.00	0.98896	<0.0001	
Pressure	817.57	5.29	801.10	817.90	830.20	0.99003	<0.0001	
Wind Direction	195.92	126.37	1.00	232.00	360.00	0.86758	<0.0001	
Wind Speed	0.88	0.55	0.00	0.70	3.60	0.82035	<0.0001	
Spring								
PM_{10}	35.54	27.13	3.83	27.46	276.75	0.82895	<0.0001	1 064
Temperature	4.91	5.97	-17.80	5.40	18.60	0.97685	<0.0001	
Relative Humidity	65.28	10.98	24.50	66.00	92.30	0.99113	<0.0001	
Pressure	816.80	3.99	800.50	817.20	828.10	0.9837	<0.0001	
Wind Direction	198.31	122.47	1.00	240.00	360.00	0.87549	<0.0001	
Wind Speed	1.38	0.50	0.40	1.30	3.30	0.94565	<0.0001	
Summer								
PM_{10}	29.37	19.31	3.21	23.44	152.06	0.88079	<0.0001	1 092
Temperature	16.24	2.75	7.90	16.30	23.50	0.99597	0.00592	
Relative Humidity	64.18	9.15	29.00	64.70	85.30	0.98677	<0.0001	
Pressure	818.60	2.45	809.00	818.70	825.10	0.99629	0.01041	
Wind Direction	158.78	126.53	1.00	100.00	360.00	0.84898	<0.0001	
Wind Speed	1.25	0.38	0.50	1.20	3.63	0.83103	<0.0001	
Autumn								
PM_{10}	39.87	31.78	2.36	31.41	208.76	0.81357	<0.0001	1 105
Temperature	6.90	6.28	-17.00	7.40	20.50	0.98218	<0.0001	
Relative Humidity	66.47	11.46	24.40	68.10	93.40	0.95688	<0.0001	
Pressure	821.07	3.31	808.50	821.20	830.60	0.99452	4.664E-4	
Wind Direction	181.40	135.67	1.00	206.00	360.00	0.83756	<0.0001	
Wind Speed	0.98	0.43	0.20	0.90	3.70	0.93761	<0.0001	

* ≥ 0.05 level for a normally distributed

Table S2. Some statistics of the dataset for Erzurum station and Shapiro-Wilk normality test results

	Mean	SD	Min.	Median	Max.	Normality test		Number of data point
						Statistics	Prob>|t|*	
Annual (2010-2022)								
PM_{10}	48.36	41.50	1.89	36.57	572.29	0.73104	<0.0001	4 377
Temperature	6.18	10.80	-28.80	7.10	26.10	0.97203	<0.0001	
Relative Humidity	66.58	16.37	25.40	68.00	98.50	0.97296	<0.0001	
Pressure	823.78	4.09	805.80	823.80	837.40	0.99119	<0.0001	
Wind Direction	166.41	108.59	1.00	138.00	360.00	0.89927	<0.0001	
Wind Speed	2.96	1.51	0.00	2.80	10.90	0.97321	<0.0001	
Winter								
PM_{10}	76.89	57.85	5.63	61.57	465.62	0.84501	<0.0001	1 097
Temperature	-7.07	6.67	-28.80	-6.20	5.70	0.96839	<0.0001	
Relative Humidity	82.96	7.29	52.50	83.60	98.50	0.98622	<0.0001	
Pressure	823.69	5.27	805.80	823.90	837.40	0.98857	<0.0001	
Wind Direction	175.98	118.55	1.00	192.00	360.00	0.88998	<0.0001	
Wind Speed	2.19	1.56	0.00	1.70	9.60	0.89121	<0.0001	
Spring								
PM_{10}	37.25	30.37	4.49	28.66	324.50	0.63344	<0.0001	1 109
Temperature	5.72	6.03	-16.10	6.60	18.00	0.96302	<0.0001	
Relative Humidity	68.34	12.22	31.20	68.70	97.40	0.98819	<0.0001	
Pressure	822.47	3.84	806.90	822.80	833.90	0.98963	<0.0001	
Wind Direction	189.58	96.45	1.00	228.00	358.00	0.92015	<0.0001	
Wind Speed	3.29	1.33	0.40	3.10	8.30	0.97284	<0.0001	
Summer								
PM_{10}	34.72	20.17	3.53	31.31	279.97	0.80335	<0.0001	1 059
Temperature	18.64	3.23	9.00	19.10	26.10	0.97933	<0.0001	
Relative Humidity	51.66	11.77	25.40	51.10	86.90	0.99043	<0.0001	
Pressure	822.71	2.33	814.50	822.70	829.80	0.99876	0.68215	
Wind Direction	126.80	98.33	1.00	80.00	360.00	0.82405	<0.0001	
Wind Speed	3.61	1.31	0.40	3.40	7.70	0.96729	<0.0001	
Autumn								
PM_{10}	43.79	28.35	1.89	37.84	189.90	0.87124	<0.0001	1 112
Temperature	7.85	6.68	-16.90	8.10	23.60	0.98646	<0.0001	
Relative Humidity	62.86	15.13	25.90	64.25	96.40	0.98748	<0.0001	
Pressure	826.22	3.12	814.70	826.30	835.10	0.99696	0.03156	
Wind Direction	171.58	109.32	1.00	159.50	360.00	0.88963	<0.0001	
Wind Speed	2.76	1.43	0.00	2.50	10.90	0.94743	<0.0001	

* ≥ 0.05 level for a normally distributed

Table S3. Some statistics of the dataset for Kars station and Shapiro-Wilk normality test results

	Mean	SD	Min.	Median	Max.	Normality test		Number of data point
						Statistics	Prob>|t|*	
Annual (2010-2022)								
PM_{10}	49.81	31.57	6.25	42.06	339.58	0.87156	<0.0001	4 155
Temperature	6.03	10.15	-29.90	6.70	25.60	0.97089	<0.0001	
Relative Humidity	64.22	13.88	20.80	64.90	97.70	0.99335	<0.0001	
Pressure	822.35	4.16	804.80	822.50	834.70	0.98676	<0.0001	
Wind Direction	145.68	105.17	1.00	154.00	360.00	0.92923	<0.0001	
Wind Speed	2.10	0.89	0.30	2.00	8.90	0.91993	<0.0001	
Winter								
PM_{10}	72.59	37.84	8.28	65.30	321.13	0.94208	<0.0001	1 073
Temperature	-6.33	5.42	-29.90	-5.90	5.70	0.9814	<0.0001	
Relative Humidity	75.77	9.06	44.30	76.20	97.70	0.99638	0.01367	
Pressure	821.87	5.15	805.00	822.30	834.00	0.98933	<0.0001	
Wind Direction	150.98	85.65	1.00	163.00	360.00	0.95149	<0.0001	
Wind Speed	1.68	0.88	0.30	1.40	7.80	0.8101	<0.0001	
Spring								
PM_{10}	52.28	27.29	7.61	36.74	160.19	0.85129	<0.0001	1 085
Temperature	5.70	5.83	-13.90	6.20	18.90	0.97979	<0.0001	
Relative Humidity	63.11	12.49	30.80	63.20	94.90	0.99475	7.947E-4	
Pressure	820.88	4.00	804.80	821.30	832.00	0.98105	<0.0001	
Wind Direction	174.03	100.43	1.00	184.00	360.00	0.95365	<0.0001	
Wind Speed	2.49	0.99	0.50	2.30	6.90	0.90121	<0.0001	
Summer								
PM_{10}	34.80	16.70	8.47	31.46	140.21	0.91426	<0.0001	986
Temperature	17.79	2.99	9.20	17.80	25.60	0.99542	0.00478	
Relative Humidity	55.58	11.10	20.80	55.90	86.30	0.99547	0.00518	
Pressure	822.02	2.55	812.90	822.00	829.50	0.99796	0.27724	
Wind Direction	103.76	115.58	1.00	46.00	360.00	0.75659	<0.0001	
Wind Speed	2.36	0.61	0.90	2.30	4.70	0.97508	<0.0001	
Autumn								
PM_{10}	48.57	27.72	6.25	42.85	220.21	0.90807	<0.0001	1 011
Temperature	8.03	6.80	-13.30	8.20	23.60	0.98816	<0.0001	
Relative Humidity	61.59	13.97	21.00	62.00	95.50	0.99469	0.00127	
Pressure	824.77	3.30	813.00	824.80	834.70	0.99607	0.01145	
Wind Direction	150.52	105.93	1.00	155.00	360.00	0.9363	<0.0001	
Wind Speed	1.86	0.73	0.70	1.70	8.90	0.88848	<0.0001	

* ≥ 0.05 level for a normally distributed

Table S4. Classification of PM_{10} concentration according to the EAQI (https://ecmwf-projects.github.io/copernicus-training-cams/proc-aq-index.html)

PM_{10} 24 h ($\mu g/m^3$)	Category
0–20	Very good
20–40	Good
40–50	Medium
50–100	Poor
100–150	Very poor
150–1200	Extremely poor

Table S5. The values of monthly average of meteorological parameters and 24-h moving PM_{10} concentrations ($\mu g/m^3$) between 2010 and 2022

Station	Month	Temperature (°C)	R. Humidity (%)	Pressure (hPa)	Wind S (m/s)	24-h moving PM_{10} ($\mu g/m^3$)
Ardahan	January	-8.2	74.4	816	0.9	76.6
	February	-6.7	73.8	817	1.0	67.4
	March	-0.8	68.8	816	1.3	41.5
	April	5.5	63.2	817	1.5	36.4
	May	10.3	63.6	818	1.4	28.4
	June	14.4	64.9	818	1.3	28.2
	July	17.0	66.1	818	1.3	27.3
	August	17.3	61.6	819	1.2	32.7
	September	13.0	62.9	820	1.1	30.3
	October	7.4	65.5	822	1.0	36.6
	November	0.3	71.1	821	0.8	53.0
	December	-5.8	76.7	820	0.8	75.8
Erzurum	January	-8.5	82.6	823	2.2	78.9
	February	-7.0	82.7	823	2.2	71.8
	March	-0.5	74.6	822	3.3	47.1
	April	6.4	65.2	822	3.4	37.1
	May	11.0	65.5	823	3.2	29.5
	June	15.6	59.1	823	3.2	32.7
	July	19.8	50.1	822	3.8	33.9
	August	20.4	45.9	823	3.9	37.6
	September	15.1	49.7	825	3.1	36.0
	October	8.3	64.0	827	2.8	41.0
	November	1.0	73.4	827	2.4	53.5
	December	-5.7	83.6	826	2.1	79.2
Kars	January	-7.8	75.9	821	1.7	78.2
	February	-5.5	74.5	821	1.8	64.0
	March	0.1	66.7	820	2.5	50.0
	April	6.2	60.4	821	2.6	43.7
	May	11.1	61.9	822	2.4	32.1
	June	15.6	59.1	822	2.2	34.4
	July	18.6	56.9	822	2.4	32.6
	August	19.1	50.9	823	2.4	37.4
	September	15.0	51.5	824	2.1	38.6
	October	7.9	63.3	825	1.9	46.3
	November	0.8	70.6	825	1.6	61.5
	December	-5.5	76.8	824	1.5	74.5

Table S6. Spearman's rank correlation coefficients for Ardahan

			PM_{10}	Temperature	R. Humidity	Pressure	Wind D.	Wind S.
Annual	2010-2022	PM_{10}	1					
		Temperature	-0.31270*	1				
		R. Humidity	0.03350*	-0.46906*	1			
		Pressure	0.11177*	0.06961*	-0.17753*	1		
		Wind D.	0.04695*	-0.07081*	0.03890*	-0.02017	1	
		Wind S.	-0.21509*	0.37751*	-0.24872*	-0.31612*	-0.01203	1
Seasonal	Winter	PM_{10}	1					
		Temperature	-0.46835*	1				
		R. Humidity	0.19036*	0.15675*	1			
		Pressure	0.23228*	-0.28763*	-0.01675	1		
		Wind D.	0.09488*	0.02517	0.14365*	-0.01209	1	
		Wind S.	-0.35927*	0.46239*	-0.11809*	-0.41727*	0.04890	1
	Spring	PM_{10}	1					
		Temperature	-0.04500	1				
		R. Humidity	-0.13002*	-0.38587*	1			
		Pressure	0.17826*	0.25783*	-0.38814*	1		
		Wind D.	0.09464*	-0.02661	-0.02549	0.04268	1	
		Wind S.	0.03276	0.14827*	-0.15979*	-0.17014*	-0.03243	1
	Summer	PM_{10}	1					
		Temperature	0.32422*	1				
		R. Humidity	-0.31735*	-0.46146*	1			
		Pressure	0.04727	0.17840*	-0.23190*	1		
		Wind D.	-0.13549*	-0.03109	-0.02641	0.02071	1	
		Wind S.	0.23443*	-0.03895	0.01071	-0.13764*	-0.10651*	1
	Autumn	PM_{10}	1					
		Temperature	-0.16006*	1				
		R. Humidity	-0.26165*	-0.40779*	1			
		Pressure	0.08248*	-0.09291*	-0.20255*	1		
		Wind D.	0.05145	0.03266	-0.02168	-0.03729	1	
		Wind S.	-0.12300*	0.34220*	-0.02850	-0.36185*	0.07918*	1

*Correlations is significant at the 0.05 level (2-tailed test)

Table S7. Spearman's rank correlation coefficients for Erzurum

			PM_{10}	Temperature	R. Humidity	Pressure	Wind D.	Wind S.
Annual	2010-2022	PM_{10}	1					
		Temperature	-0.30671*	1				
		R. Humidity	0.15394*	-0.78728*	1			
		Pressure	0.30396*	-0.12361*	-0.0486*	1		
		Wind D.	-0.02764	-0.12436*	0.03516*	-0.09071*	1	
		Wind S.	-0.44111*	0.43559*	-0.33342*	-0.36652*	-0.02958	1
Seasonal	Winter	PM_{10}	1					
		Temperature	-0.49324*	1				
		R. Humidity	-0.00849	0.1401*	1			
		Pressure	0.45312*	-0.33425*	-0.0487	1		
		Wind D.	-0.09765*	0.05816	-0.12175*	-0.12237*	1	
		Wind S.	-0.59989*	0.59021*	-0.15065*	-0.48132*	0.07666*	1
	Spring	PM_{10}	1					
		Temperature	-0.02638	1				
		R. Humidity	-0.09610*	-0.51603*	1			
		Pressure	0.23913*	0.19617*	-0.35406*	1		
		Wind D.	-0.09380*	-0.02227	-0.12543*	-0.06775*	1	
		Wind S.	-0.23008*	0.12922*	-0.16404*	-0.32837*	0.04419	1
	Summer	PM_{10}	1					
		Temperature	0.38557*	1				
		R. Humidity	-0.34653*	-0.73333*	1			
		Pressure	0.12438*	0.06921*	-0.12797*	1		
		Wind D.	0.09421*	-0.08556*	-0.08655*	-0.06551*	1	
		Wind S.	-0.01692	0.21822*	-0.08336*	-0.01377	-0.09651*	1
	Autumn	PM_{10}	1					
		Temperature	-0.14334*	1				
		R. Humidity	-0.06976*	-0.66071*	1			
		Pressure	0.31122*	-0.22679*	-0.00959	1		
		Wind D.	0.00219	0.01382	-0.04520	-0.18619*	1	
		Wind S.	-0.44878*	0.30797*	-0.12252*	-0.37750*	-0.02796	1

*Correlations is significant at the 0.05 level (2-tailed test)

Table S8. Spearman's rank correlation coefficients for Kars

			PM_{10}	Temperature	R. Humidity	Pressure	Wind D.	Wind S.
Annual	2010-2022	PM_{10}	1					
		Temperature	-0.39116*	1				
		R. Humidity	0.07138*	-0.63890*	1			
		Pressure	0.21201*	0.01371	-0.13432*	1		
		Wind D.	0.06471*	-0.18465*	-0.03332*	-0.15628*	1	
		Wind S.	-0.40756*	0.41762*	-0.36742*	-0.36656*	0.13650*	1
Seasonal	Winter	PM_{10}	1					
		Temperature	-0.51661*	1				
		R. Humidity	0.02847	0.15821*	1			
		Pressure	0.36913*	-0.23954*	-0.09389*	1		
		Wind D.	-0.21155*	0.03269	-0.24165*	-0.0959*	1	
		Wind S.	-0.54033*	0.30183*	-0.27263*	-0.40595*	0.44894*	1
	Spring	PM_{10}	1					
		Temperature	-0.04032	1				
		R. Humidity	-0.33540*	-0.36622*	1			
		Pressure	0.19183*	0.26327*	-0.32285*	1		
		Wind D.	0.09991*	-0.10657*	-0.11993*	-0.21673*	1	
		Wind S.	-0.05241	0.09252*	-0.16319*	-0.31671*	0.23608*	1
	Summer	PM_{10}	1					
		Temperature	0.54980*	1				
		R. Humidity	-0.48189*	-0.59110*	1			
		Pressure	0.13196*	0.18442*	-0.21616*	1		
		Wind D.	0.10981*	-0.09810*	-0.09383*	-0.17694*	1	
		Wind S.	0.09132*	0.21765*	-0.15106*	-0.01186	-0.02925	1
	Autumn	PM_{10}	1					
		Temperature	-0.22701*	1				
		R. Humidity	-0.16234*	-0.62248*	1			
		Pressure	0.18675*	-0.14723*	-2.70454E-4	1		
		Wind D.	0.04921	0.00415	-0.09393*	-0.23895*	1	
		Wind S.	-0.40703*	0.38756*	-0.24999*	-0.43664*	0.16940*	1

*Correlations is significant at the 0.05 level (2-tailed test)

Table S9. Classifications of Spearman's rank correlation coefficient for the effect size*

Spearman's rank correlation coefficient (r_s)	Strength of relationship
≥ 0.70	Very strong
0.40 – 0.69	Strong
0.30 – 0.39	Moderate
0.20 – 0.29	Weak
0.01 – 0.19	No or negligible

* https://doi.org/10.1016/j.jclepro.2023.140514