

Spatial and seasonal association study between $PM_{2.5}$ and related risk factors in India

Supplementary Material

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Table S1: VIF score for ten explanatory factors to explain $PM_{2.5}$ during different time periods

Explanatory variables	VIF scores of explanatory variables during the period Autumn	VIF scores of explanatory variables during the period Winter	VIF scores of explanatory variables during the period Summer	VIF scores of explanatory variables during the period Monsoon	VIF scores of explanatory variables during 1-year cycle period
Forest_area	2.034744	1.742582	2.020124	2.329739	2.261173
prcp_avg	1.300326	1.150175	2.004449	1.515404	1.543141
wspd_avg	1.486227	1.677321	1.435415	1.772598	1.711861
Density	1.503654	1.444458	1.457021	1.387669	1.445705
CO	2.912848	2.641005	2.910781	3.803537	2.890181
SO2	2.092724	1.651043	2.146574	2.299657	2.023969
temp_min_avg	1.418297	1.725238	1.675159	1.353338	1.612295
Pop	1.525586	1.632352	1.508959	1.438035	1.499626
Literacy	1.163519	1.253109	1.206599	1.142700	1.175445
O3	1.726979	1.388103	2.202473	2.548704	1.929988

Table S2: Parameter estimate for Global Regression Analysis (OLS) during each specific season

Season	Variable Name	Estimate (Est.)	Standard error (SE)	t statistic (Est./SE)	p-value
Autumn	Intercept	-0.000	0.012	-0.000	1.000
	Forest_area	-0.006	0.017	-0.331	0.741
	prcp_avg	-0.033	0.014	-2.361	0.018
	wspd_avg	-0.073	0.015	-4.870	0.000
	Density	-0.079	0.015	-5.250	0.000
	CO	0.933	0.021	44.702	0.000
	SO2	-0.054	0.018	-3.074	0.002
	temp_min_avg	0.132	0.015	9.033	0.000
	Pop	0.057	0.015	3.775	0.000
	Literacy	-0.109	0.013	-8.268	0.000
	O3	0.203	0.016	12.608	0.000
Winter	Intercept	0.000	0.013	0.000	1.000
	Forest_area	-0.033	0.017	-1.979	0.048
	prcp_avg	-0.140	0.014	-10.252	0.000
	wspd_avg	-0.051	0.016	-3.081	0.002
	Density	-0.084	0.015	-5.507	0.000
	CO	1.004	0.021	48.537	0.000
	SO2	-0.116	0.016	-7.113	0.000
	temp_min_avg	0.056	0.017	3.329	0.001
	Pop	0.002	0.016	0.138	0.890
	Literacy	-0.080	0.014	-5.649	0.000
	O3	0.168	0.015	11.177	0.000
Summer	Intercept	-0.000	0.011	-0.000	1.000
	Forest_area	0.157	0.016	9.725	0.000
	prcp_avg	-0.051	0.016	-3.183	0.001
	wspd_avg	-0.039	0.014	-2.852	0.004
	Density	-0.052	0.014	-3.800	0.000
	CO	0.927	0.019	47.988	0.000
	SO2	-0.037	0.017	-2.230	0.026
	temp_min_avg	0.156	0.015	10.654	0.000
	Pop	0.044	0.014	3.153	0.002
	Literacy	-0.038	0.012	-3.022	0.003
	O3	0.238	0.017	14.172	0.000
Monsoon	Intercept	-0.000	0.010	-0.000	1.000
	Forest_area	0.021	0.015	1.437	0.151
	prcp_avg	-0.009	0.012	-0.779	0.436
	wspd_avg	-0.003	0.013	-0.204	0.838
	Density	-0.030	0.012	-2.571	0.010
	CO	0.731	0.019	38.335	0.000
	SO2	0.092	0.015	6.197	0.000
	temp_min_avg	0.110	0.011	9.693	0.000
	Pop	0.019	0.012	1.622	0.105
	Literacy	-0.021	0.010	-1.989	0.047
	O3	0.265	0.016	16.977	0.000

Table S3: Parameter estimate for Global Regression Analysis (OLS) for the corresponding 1-year cycle

Season	Variable Name	Estimate (Est.)	Standard error (SE)	t statistic (Est./SE)	p-value
1-year cycle	Intercept	0.000	0.011	0.000	1.000
	Forest_area	0.070	0.016	4.315	0.000
	prcp_avg	-0.049	0.013	-3.671	0.000
	wspd_avg	-0.081	0.014	-5.740	0.000
	Density	-0.070	0.013	-5.436	0.000
	CO	0.909	0.018	49.622	0.000
	SO2	-0.046	0.015	-3.014	0.003
	temp_min_avg	0.200	0.014	14.629	0.000
	Pop	0.042	0.013	3.196	0.001
	Literacy	-0.081	0.012	-6.969	0.000
	O3	0.256	0.015	17.112	0.000

Table S4: Parameter estimate for Local Regression Analysis (GWR using Gaussian kernel function) during each specific season

Season	Variable Name	Mean	Standard deviation (Std.)	Min	Median	Max
Autumn	Intercept	0.092	0.162	-0.357	0.133	0.339
	Forest_area	-0.016	0.054	-0.139	-0.010	0.073
	prcp_avg	0.097	0.175	-0.194	0.025	0.442
	wspd_avg	-0.010	0.058	-0.115	-0.020	0.131
	Density	-0.053	0.040	-0.156	-0.039	-0.002
	CO	0.885	0.104	0.538	0.904	1.031
	SO2	-0.079	0.146	-0.402	-0.047	0.172
	temp_min_avg	0.108	0.068	-0.073	0.109	0.244
	Pop	0.041	0.050	-0.028	0.027	0.149
	Literacy	-0.065	0.027	-0.135	-0.066	-0.006
	O3	0.182	0.041	0.087	0.179	0.281
Winter	Intercept	-0.026	0.153	-0.484	0.017	0.183
	Forest_area	-0.051	0.071	-0.181	-0.057	0.073
	prcp_avg	-0.156	0.111	-0.443	-0.146	0.002
	wspd_avg	0.021	0.054	-0.078	0.033	0.124
	Density	-0.069	0.055	-0.213	-0.062	0.008
	CO	0.923	0.108	0.572	0.939	1.100
	SO2	-0.134	0.137	-0.426	-0.096	0.071
	temp_min_avg	0.004	0.088	-0.181	0.000	0.202
	Pop	0.027	0.052	-0.045	0.019	0.163
	Literacy	-0.069	0.046	-0.174	-0.062	0.015
	O3	0.143	0.050	0.034	0.146	0.228
Summer	Intercept	-0.048	0.182	-0.338	-0.118	0.315
	Forest_area	0.062	0.067	-0.087	0.074	0.178
	prcp_avg	-0.073	0.093	-0.236	-0.100	0.145
	wspd_avg	-0.019	0.022	-0.099	-0.015	0.022
	Density	-0.023	0.033	-0.122	-0.009	0.015
	CO	0.897	0.096	0.661	0.886	1.100
	SO2	-0.041	0.073	-0.219	-0.031	0.131
	temp_min_avg	0.135	0.120	-0.070	0.105	0.523
	Pop	0.030	0.026	-0.025	0.032	0.078
	Literacy	-0.032	0.054	-0.116	-0.050	0.102
	O3	0.199	0.065	0.078	0.206	0.341
Monsoon	Intercept	0.024	0.137	-0.321	0.003	0.282
	Forest_area	-0.038	0.070	-0.225	-0.013	0.053
	prcp_avg	0.028	0.078	-0.121	0.062	0.146
	wspd_avg	0.018	0.043	-0.060	0.017	0.132
	Density	-0.004	0.031	-0.052	-0.013	0.076
	CO	0.711	0.138	0.391	0.733	0.918
	SO2	0.049	0.109	-0.198	0.073	0.271
	temp_min_avg	0.054	0.052	-0.042	0.052	0.186
	Pop	0.016	0.053	-0.051	-0.003	0.164
	Literacy	-0.015	0.020	-0.056	-0.018	0.041
	O3	0.237	0.070	0.052	0.245	0.382

Table S5: Parameter estimate for Local Regression Analysis (GWR using Gaussian kernel function) for the corresponding 1-year cycle period

Season	Variable Name	Mean	Standard deviation (Std.)	Min	Median	Max
1-year cycle	Intercept	0.068	0.144	-0.365	0.087	0.330
	Forest_area	-0.004	0.062	-0.142	0.002	0.088
	prcp_avg	0.053	0.116	-0.169	0.061	0.300
	wspd_avg	0.019	0.056	-0.071	0.018	0.138
	Density	-0.037	0.035	-0.128	-0.034	0.028
	CO	0.873	0.082	0.634	0.887	1.004
	SO2	-0.078	0.132	-0.387	-0.040	0.088
	temp_min_avg	0.135	0.047	0.051	0.139	0.275
	Pop	0.032	0.041	-0.033	0.028	0.133
	Literacy	-0.066	0.038	-0.142	-0.067	0.028
	O3	0.216	0.071	0.045	0.228	0.368