

# MEIAT-CMAQ v1.0: A Modular Emission Inventory Allocation Tool for Community Multiscale Air Quality Model Version 1.0

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## 1. Table

Table S1 the species profile of agricultural sector.

Pollutant	Model Variable	Split factor	Molecular Weight	Pollutant	Model Variable	Split factor	Molecular Weight
CB05_ALD2	ALD2	1	44.03499	PM25	PMG	1	\
CB05_ALDX	ALDX	1	39.22808	PM25	PMN	1	\
CB05_ETH	ETH	1	28.05300	PM25	PMOTHR	1	\
CB05_ETOH	ETOH	1	30.06900	PM25	PNA	1	\
CB05_FORM	FORM	1	45.84470	PM25	PNCOM	1	\
CB05_IOLE	IOLE	1	30.02600	PM25	PNH4	\	\
CB05_ISOP	ISOP	1	57.09965	PM25	PNO3	\	\
CB05_MEOH	MEOH	1	68.11700	PM25	PSI	\	\
CB05_OLE	OLE	1	32.04200	PM25	PSO4	\	\
CB05_PAR	PAR	1	0.992943	PM25	PTI	\	\
CB05_TERP	TERP	1	29.63422	SO2	SO2	0	64
CB05_TOL	TOL	1	15.11587	SO2	SULF	0	98
CB05_UNR	UNR	1	136.2352	NH3	NH3	1	17
CB05_XYL	XYL	1	96.79334	CO	CO	0	28
PM25	PAL	\	\	PMC	PMC	\	\
PM25	PCA	\	\	NOx	NO	0	30
PM25	PCL	\	\	NOx	NO2	0	46
PM25	PFE	\	\	NOx	HONO	0	47
PM25	PH2O	\	\	OC	POC	\	\
PM25	PK	\	\				

Table S2 the species profile of industry sector.

Pollutant	Model Variable	Split factor	Molecular Weight	Pollutant	Model Variable	Split factor	Molecular Weight
CB05_ALD2	ALD2	1	44.03499	PM25	PMG	0.0014880	\
CB05_ALDX	ALDX	1	39.22808	PM25	PMN	0.0013680	\
CB05_ETH	ETH	1	28.05300	PM25	PMOTHR	0.5697050	\
CB05_ETOH	ETOH	1	30.06900	PM25	PNA	0.0104500	\
CB05_FORM	FORM	1	45.84470	PM25	PNCOM	0.0789120	\
CB05_IOLE	IOLE	1	30.02600	PM25	PNH4	0.0018190	\
CB05_ISOP	ISOP	1	57.09965	PM25	PNO3	0.0044440	\
CB05_MEOH	MEOH	1	68.11700	PM25	PSI	0.0891350	\
CB05_OLE	OLE	1	32.04200	PM25	PSO4	0.0969410	\
CB05_PAR	PAR	1	0.992943	PM25	PTI	0.0041100	\
CB05_TERP	TERP	1	29.63422	SO2	SO2	1	64
CB05_TOL	TOL	1	15.11587	SO2	SULF	0.0091900	98
CB05_UNR	UNR	1	136.2352	NH3	NH3	1	17
CB05_XYL	XYL	1	96.79334	CO	CO	1	28
PM25	PAL	0.0308380	\	PMC	PMC	1	\
PM25	PCA	0.0469200	\	NOx	NO	0.9000000	30
PM25	PCL	0.0056230	\	NOx	NO2	0.0920000	46
PM25	PFE	0.0298310	\	NOx	HONO	0.0080000	47
PM25	PH2O	0.0077820	\	OC	POC	1	\
PM25	PK	0.0206350	\				

Table S3 the species profile of power sector.

Pollutant	Model Variable	Split factor	Molecular Weight	Pollutant	Model Variable	Split factor	Molecular Weight
CB05_ALD2	ALD2	1	44.03499	PM25	PMG	0.000459	1
CB05_ALDX	ALDX	1	39.22808	PM25	PMN	0.000248	1
CB05_ETH	ETH	1	28.05300	PM25	PMOTHR	0.588929	1
CB05_ETOH	ETOH	1	30.06900	PM25	PNA	0.0001160	1
CB05_FORM	FORM	1	45.84470	PM25	PNCOM	0.0439030	\
CB05_IOLE	IOLE	1	30.02600	PM25	PNH4	0.0036990	\
CB05_ISOP	ISOP	1	57.09965	PM25	PNO3	0.0062010	\
CB05_MEOH	MEOH	1	68.11700	PM25	PSI	0.0774440	\
CB05_OLE	OLE	1	32.04200	PM25	PSO4	0.1591220	\
CB05_PAR	PAR	1	0.992943	PM25	PTI	0.0038770	\
CB05_TERP	TERP	1	29.63422	SO2	SO2	1	64
CB05_TOL	TOL	1	15.11587	SO2	SULF	0.0218000	98
CB05_UNR	UNR	1	136.2352	NH3	NH3	1	17
CB05_XYL	XYL	1	96.79334	CO	CO	1	28
PM25	PAL	0.0502350	\	PMC	PMC	1	\
PM25	PCA	0.0346280	\	NOx	NO	0.9000000	30
PM25	PCL	0.0011520	\	NOx	NO2	0.0920000	46
PM25	PFE	0.0251040	\	NOx	HONO	0.0080000	47
PM25	PH2O	0.0000395	\	OC	POC	1	\
PM25	PK	0.0048440	\				

Table S4 the species profile of residential sector.

Pollutant	Model Variable	Split factor	Molecular Weight	Pollutant	Model Variable	Split factor	Molecular Weight
CB05_ALD2	ALD2	1	44.03499	PM25	PMG	0.0004890	\
CB05_ALDX	ALDX	1	39.22808	PM25	PMN	0.0000248	\
CB05_ETH	ETH	1	28.05300	PM25	PMOTHR	0.0753850	\
CB05_ETOH	ETOH	1	30.06900	PM25	PNA	0.0055600	\
CB05_FORM	FORM	1	45.84470	PM25	PNCOM	0.7932240	\
CB05_IOLE	IOLE	1	30.02600	PM25	PNH4	0.0067730	\
CB05_ISOP	ISOP	1	57.09965	PM25	PNO3	0.0062230	\
CB05_MEOH	MEOH	1	68.11700	PM25	PSI	0.0150330	\
CB05_OLE	OLE	1	32.04200	PM25	PSO4	0.0276620	\
CB05_PAR	PAR	1	0.992943	PM25	PTI	0.0001030	\
CB05_TERP	TERP	1	29.63422	SO2	SO2	1	64
CB05_TOL	TOL	1	15.11587	SO2	SULF	0.0148000	98
CB05_UNR	UNR	1	136.2352	NH3	NH3	1	17
CB05_XYL	XYL	1	96.79334	CO	CO	1	28
PM25	PAL	0.0009060	\	PMC	PMC	1	\
PM25	PCA	0.0034300	\	NOx	NO	0.9000000	30
PM25	PCL	0.0267580	\	NOx	NO2	0.0920000	46
PM25	PFE	0.0006750	\	NOx	HONO	0.0080000	47
PM25	PH2O	0.0000286	\	OC	POC	1	\
PM25	PK	0.0377230	\				

Table S5 the species profile of transportation sector.

Pollutant	Model Variable	Split factor	Molecular Weight	Pollutant	Model Variable	Split factor	Molecular Weight
CB05_ALD2	ALD2	1	44.03499	PM25	PMG	0.040729	1
CB05_ALDX	ALDX	1	39.22808	PM25	PMN	0.0005000	1
CB05_ETH	ETH	1	28.05300	PM25	PMOTHR	0.2643680	1
CB05_ETOH	ETOH	1	30.06900	PM25	PNA	0.0029860	\
CB05_FORM	FORM	1	45.84470	PM25	PNCOM	0.3751070	\
CB05_IOLE	IOLE	1	30.02600	PM25	PNH4	0.0413690	\
CB05_ISOP	ISOP	1	57.09965	PM25	PNO3	0.0167030	\
CB05_MEOH	MEOH	1	68.11700	PM25	PSI	0.0436760	\
CB05_OLE	OLE	1	32.04200	PM25	PSO4	0.0963100	\
CB05_PAR	PAR	1	0.992943	PM25	PTI	0.0019670	\
CB05_TERP	TERP	1	29.63422	SO2	SO2	1	64
CB05_TOL	TOL	1	15.11587	SO2	SULF	0	98
CB05_UNR	UNR	1	136.2352	NH3	NH3	1	17
CB05_XYL	XYL	1	96.79334	CO	CO	1	28
PM25	PAL	0.0056020	\	PMC	PMC	1	/
PM25	PCA	0.0333030	\	NOx	NO	0.9000000	30
PM25	PCL	0.0091790	\	NOx	NO2	0.0920000	46
PM25	PFE	0.0622200	\	NOx	HONO	0.0080000	47
PM25	PH2O	0.0037060	\	OC	POC	1	/
PM25	PK	0.0022760	\				

Table S6 The weekly profile of each sector, with 0 representing Sunday and 1-6 representing Monday to Saturday, respectively.

weekly	Power (POW)	Industry (IND)	Residential (RES)	Transportation (TRA)	Agriculture (AGR)
0	0.130	0.078	0.143	0.108	0.143
1	0.147	0.162	0.143	0.155	0.143
2	0.147	0.162	0.143	0.155	0.143
3	0.147	0.162	0.143	0.155	0.143
4	0.147	0.162	0.143	0.155	0.143
5	0.147	0.162	0.143	0.155	0.143
6	0.135	0.112	0.143	0.117	0.143

Table S7 The hourly profile of each sector.

Hour (UTC)	POW	IND	RES	TRA	AGR	Hour (UTC)	POW	IND	RES	TRA	AGR
0	0.032	0.026	0.038	0.017	0.026	12	0.050	0.068	0.045	0.050	0.089
1	0.030	0.007	0.038	0.013	0.019	13	0.050	0.068	0.038	0.059	0.082
2	0.029	0.007	0.030	0.014	0.019	14	0.050	0.068	0.030	0.060	0.080
3	0.028	0.007	0.045	0.015	0.018	15	0.050	0.068	0.030	0.062	0.070
4	0.029	0.007	0.045	0.016	0.019	16	0.050	0.068	0.038	0.059	0.060
5	0.032	0.007	0.038	0.016	0.021	17	0.049	0.066	0.075	0.057	0.045
6	0.035	0.007	0.030	0.029	0.029	18	0.048	0.063	0.075	0.056	0.031
7	0.040	0.029	0.030	0.056	0.033	19	0.047	0.037	0.075	0.049	0.027
8	0.043	0.045	0.038	0.060	0.047	20	0.047	0.037	0.075	0.045	0.023
9	0.046	0.068	0.038	0.059	0.058	21	0.044	0.037	0.054	0.042	0.021
10	0.048	0.068	0.030	0.059	0.070	22	0.040	0.037	0.018	0.031	0.021
11	0.050	0.068	0.045	0.050	0.089	23	0.035	0.037	0.018	0.022	0.021

Table S8 The vertical profile of each sector.

Pressure (pa)	1.000	0	0	0	0	0
Industry (%)	6	16	75	3	0	0
Power (%)	0	0	0.25	51	45.3	0.2
Agriculture (%)	100	0	0	0	0	0
Transportation (%)	100	0	0	0	0	0
Residential (%)	100	0	0	0	0	0

Table S9 Meteorological verification metrics for 2-m relative humidity in January.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	637	74.40	84.11	0.77	-9.71	11.13	-7.58%	9.10%	-11.54%	13.23%
59270	636	70.22	83.54	0.73	-13.32	14.34	-10.55%	11.72%	-15.95%	17.16%
59271	635	68.78	82.10	0.69	-13.28	14.28	-10.90%	12.10%	-16.17%	17.39%
59276	635	66.81	85.46	0.74	-18.64	18.97	-15.37%	15.71%	-21.82%	22.20%
59278	640	70.23	84.31	0.76	-14.08	14.79	-11.44%	12.13%	-16.70%	17.54%
59279	637	60.59	80.87	0.76	-20.28	20.32	-18.00%	18.06%	-25.08%	25.12%
59284	640	61.25	74.59	0.85	-13.34	13.68	-12.37%	12.88%	-17.89%	18.34%
59285	634	70.15	81.27	0.72	-11.12	12.77	-8.37%	10.66%	-13.68%	15.71%
59287	636	70.62	79.60	0.76	-8.06	10.31	-6.10%	8.91%	-10.12%	12.95%
59288	636	58.05	75.59	0.73	-17.52	17.54	-16.90%	16.93%	-23.18%	23.21%
59289	638	59.34	76.56	0.89	-17.26	17.26	-16.73%	16.73%	-22.54%	22.54%
59290	639	68.30	81.06	0.76	-12.76	13.21	-10.59%	11.19%	-15.74%	16.29%
59294	636	63.06	78.14	0.74	-15.08	15.26	-13.69%	13.89%	-19.30%	19.53%
59297	638	68.10	77.30	0.87	-9.20	10.13	-8.24%	9.21%	-11.90%	13.10%
59298	639	63.81	73.45	0.90	-9.63	10.35	-9.62%	10.28%	-13.12%	14.09%
59473	637	67.63	79.09	0.85	-11.46	12.18	-10.42%	11.05%	-14.49%	15.40%
59475	637	64.24	80.11	0.83	-15.87	15.96	-14.39%	14.48%	-19.81%	19.92%
59476	641	62.88	73.91	0.88	-11.03	11.47	-10.96%	11.33%	-14.93%	15.52%
59477	637	70.63	84.88	0.77	-14.25	14.52	-11.63%	11.89%	-16.79%	17.10%
59478	640	68.45	79.08	0.84	-10.63	11.35	-9.78%	10.36%	-13.44%	14.36%
59480	637	58.46	72.40	0.88	-13.94	13.97	-13.92%	13.97%	-19.25%	19.30%
59481	634	59.42	75.93	0.74	-16.51	16.59	-15.40%	15.56%	-21.75%	21.85%
59485	637	64.38	76.87	0.82	-12.49	12.99	-11.94%	12.40%	-16.24%	16.90%
59487	636	65.96	80.93	0.86	-14.97	15.03	-13.49%	13.56%	-18.50%	18.57%
59488	639	70.21	77.49	0.82	-7.28	8.77	-6.77%	8.06%	-9.40%	11.31%
59492	645	70.88	78.73	0.87	-7.85	9.07	-6.91%	8.16%	-9.97%	11.52%
59493	638	62.41	76.38	0.79	-13.97	14.22	-13.57%	13.77%	-18.29%	18.61%

Table S10 Meteorological verification metrics for 2-m temperature in January.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	637	16.49	14.99	0.93	1.51	1.74	6.98%	8.01%	10.06%	11.59%
59270	636	16.46	14.90	0.94	1.57	1.76	7.67%	8.51%	10.51%	11.82%
59271	635	16.83	14.98	0.92	1.87	2.04	8.81%	9.54%	12.46%	13.60%
59276	635	17.00	15.19	0.93	1.81	1.99	7.69%	8.64%	11.91%	13.12%
59278	640	16.77	16.21	0.93	0.56	1.29	2.03%	5.46%	3.45%	7.94%
59279	637	17.91	16.22	0.94	1.69	1.86	6.40%	7.32%	10.41%	11.49%
59284	640	17.59	16.49	0.94	1.10	1.48	4.17%	5.94%	6.65%	8.98%
59285	634	16.43	15.08	0.90	1.36	1.91	6.61%	9.40%	9.00%	12.66%
59287	636	16.61	15.79	0.94	0.82	1.38	3.26%	6.13%	5.17%	8.74%
59288	636	18.48	16.30	0.93	2.17	2.24	8.46%	8.80%	13.32%	13.71%
59289	638	19.18	17.36	0.95	1.82	1.86	6.82%	7.01%	10.48%	10.74%
59290	639	16.23	15.21	0.92	1.02	1.68	5.10%	8.49%	6.70%	11.05%
59294	636	17.80	16.41	0.92	1.39	1.73	5.58%	7.20%	8.45%	10.52%
59297	638	17.51	16.78	0.94	0.73	1.32	2.62%	5.49%	4.37%	7.86%
59298	639	17.66	16.76	0.94	0.90	1.20	3.40%	4.86%	5.35%	7.17%
59473	637	17.39	16.32	0.93	1.07	1.45	4.42%	6.12%	6.55%	8.88%
59475	637	18.63	16.91	0.95	1.71	1.76	6.94%	7.17%	10.13%	10.43%
59476	641	18.80	17.44	0.94	1.37	1.46	5.42%	5.74%	7.84%	8.35%
59477	637	17.52	16.52	0.95	1.00	1.34	4.29%	5.76%	6.07%	8.13%
59478	640	18.23	17.25	0.92	0.98	1.40	3.93%	5.57%	5.71%	8.10%
59480	637	19.32	17.81	0.96	1.51	1.59	5.58%	5.90%	8.46%	8.91%
59481	634	18.92	17.42	0.90	1.50	1.75	5.78%	6.74%	8.62%	10.02%
59485	637	19.01	17.29	0.94	1.72	1.76	6.96%	7.09%	9.92%	10.15%
59487	636	19.32	17.73	0.94	1.58	1.61	6.13%	6.23%	8.93%	9.08%
59488	639	18.91	17.71	0.94	1.20	1.34	4.86%	5.29%	6.80%	7.54%
59492	645	17.39	16.70	0.94	0.68	1.19	2.68%	4.94%	4.10%	7.12%
59493	638	19.33	18.02	0.94	1.31	1.38	4.83%	5.11%	7.26%	7.64%

Table S11 Meteorological verification metrics for 10-m wind speed in January.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	637	1.77	2.08	0.47	-0.31	0.86	-3.37%	34.15%	-14.70%	41.57%
59270	636	1.53	1.55	0.30	-0.02	0.87	3.42%	42.16%	-1.54%	56.03%
59271	635	1.97	1.65	0.45	0.31	0.86	14.81%	36.26%	18.86%	51.95%
59276	635	1.96	1.90	0.22	0.05	1.04	7.03%	39.29%	2.75%	54.52%
59278	640	1.70	1.76	0.37	-0.06	0.86	0.94%	35.86%	-3.44%	48.88%
59279	637	2.78	3.03	0.69	-0.25	0.97	1.85%	25.63%	-8.37%	32.14%
59284	640	2.83	2.52	0.65	0.31	0.89	11.20%	25.63%	12.26%	35.22%
59285	634	2.55	2.02	0.53	0.53	1.28	22.24%	48.04%	26.18%	63.28%
59287	636	3.00	2.90	0.63	0.09	0.96	6.95%	24.73%	3.18%	33.10%
59288	636	2.71	2.76	0.66	-0.04	0.93	8.62%	28.16%	-1.53%	33.79%
59289	638	2.41	2.55	0.33	-0.14	1.06	5.11%	31.38%	-5.56%	41.60%
59290	639	2.35	2.06	0.52	0.30	0.99	20.22%	38.49%	14.45%	48.24%
59294	636	3.21	2.94	0.70	0.27	1.09	12.81%	30.02%	9.26%	36.97%
59297	638	1.95	2.11	0.33	-0.17	0.94	-2.48%	31.34%	-7.86%	44.66%
59298	639	3.14	2.95	0.67	0.20	1.01	11.85%	25.94%	6.66%	34.45%
59473	637	2.54	2.47	0.65	0.07	0.91	12.62%	31.98%	2.99%	36.84%
59475	637	2.47	2.12	0.58	0.35	0.91	18.92%	35.55%	16.66%	42.99%
59476	641	3.12	3.17	0.73	-0.05	0.99	5.90%	26.79%	-1.42%	31.39%
59477	637	2.18	1.75	0.63	0.42	0.93	20.53%	41.92%	24.22%	52.86%
59478	640	3.11	2.92	0.74	0.19	0.99	16.85%	34.86%	6.64%	33.93%
59480	637	2.69	2.36	0.54	0.33	0.93	15.25%	30.24%	14.10%	39.41%
59481	634	2.75	1.85	0.53	0.91	1.14	35.31%	41.70%	48.99%	61.58%
59485	637	2.64	1.99	0.52	0.66	0.97	28.15%	35.77%	32.99%	49.03%
59487	636	2.58	2.42	0.62	0.16	0.87	11.49%	27.83%	6.76%	36.07%
59488	639	3.33	2.67	0.47	0.66	1.28	27.26%	39.24%	24.82%	47.96%
59492	645	2.66	2.73	0.27	-0.07	1.16	5.94%	31.32%	-2.59%	42.67%
59493	638	2.82	2.29	0.37	0.53	1.14	23.44%	35.82%	23.24%	49.78%

Table S12 Meteorological verification metrics for 2-m relative humidity in April.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	777	71.41	82.24	0.75	-10.83	12.32	-9.23%	10.58%	-13.17%	14.98%
59270	779	70.04	80.58	0.75	-10.53	12.08	-8.99%	10.43%	-13.07%	15.00%
59271	777	69.42	80.45	0.75	-11.03	12.28	-9.81%	10.93%	-13.72%	15.26%
59276	781	68.70	85.22	0.76	-16.52	16.96	-14.05%	14.46%	-19.39%	19.90%
59278	779	73.37	84.85	0.75	-11.48	12.83	-9.75%	10.91%	-13.53%	15.13%
59279	780	61.16	82.93	0.78	-21.77	21.82	-19.44%	19.49%	-26.25%	26.32%
59284	779	58.08	77.53	0.81	-19.45	19.52	-18.69%	18.78%	-25.08%	25.18%
59285	778	68.20	83.98	0.72	-15.78	16.68	-13.19%	14.20%	-18.79%	19.86%
59287	781	68.72	82.14	0.75	-13.45	14.65	-11.28%	12.82%	-16.38%	17.84%
59288	780	58.12	75.87	0.78	-17.75	17.84	-17.53%	17.61%	-23.39%	23.52%
59289	776	61.46	81.06	0.81	-19.61	19.69	-18.15%	18.23%	-24.19%	24.29%
59290	779	66.78	85.40	0.78	-18.61	18.83	-15.89%	16.13%	-21.79%	22.06%
59294	778	60.71	81.03	0.76	-20.33	20.37	-18.40%	18.45%	-25.09%	25.14%
59297	779	67.76	82.09	0.79	-14.33	14.80	-12.63%	13.15%	-17.45%	18.02%
59298	779	64.46	78.90	0.80	-14.45	14.88	-13.51%	14.00%	-18.31%	18.86%
59473	778	71.80	82.58	0.81	-10.78	11.97	-9.63%	10.58%	-13.05%	14.49%
59475	779	67.67	83.99	0.76	-16.32	16.60	-14.34%	14.64%	-19.43%	19.77%
59476	779	67.46	78.82	0.81	-11.35	12.26	-10.73%	11.50%	-14.41%	15.55%
59477	778	74.11	86.42	0.73	-12.30	13.36	-10.26%	11.20%	-14.24%	15.46%
59478	780	73.10	83.24	0.74	-10.13	11.76	-8.83%	10.24%	-12.17%	14.13%
59480	780	60.33	77.58	0.81	-17.25	17.36	-16.41%	16.52%	-22.24%	22.38%
59481	779	60.78	78.63	0.77	-17.86	17.95	-16.74%	16.86%	-22.71%	22.83%
59485	778	67.68	80.30	0.76	-12.62	13.40	-11.42%	12.13%	-15.72%	16.69%
59487	778	71.40	85.02	0.72	-13.62	14.22	-11.68%	12.26%	-16.02%	16.72%
59488	779	77.66	84.66	0.73	-7.01	9.11	-6.05%	7.75%	-8.28%	10.76%
59492	778	73.16	81.49	0.78	-8.33	10.23	-7.06%	9.09%	-10.22%	12.55%
59493	779	67.06	82.50	0.70	-15.45	15.69	-13.48%	13.73%	-18.72%	19.02%



Table S13 Meteorological verification metrics for 2-m temperature in April.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	777	23.43	22.01	0.89	1.42	1.91	4.37%	5.87%	6.44%	8.68%
59270	779	23.19	21.82	0.89	1.37	1.88	4.20%	5.76%	6.28%	8.63%
59271	777	23.49	21.52	0.89	1.96	2.22	6.22%	6.99%	9.12%	10.32%
59276	781	23.89	21.88	0.88	2.02	2.28	6.19%	6.97%	9.22%	10.44%
59278	779	23.36	22.47	0.86	0.88	1.85	2.48%	5.53%	3.93%	8.23%
59279	780	25.01	22.86	0.89	2.14	2.24	6.22%	6.48%	9.37%	9.79%
59284	779	25.12	22.65	0.91	2.47	2.53	7.05%	7.24%	10.89%	11.18%
59285	778	23.41	21.42	0.90	1.99	2.25	6.37%	7.20%	9.27%	10.53%
59287	781	23.45	21.70	0.90	1.75	2.09	5.45%	6.43%	8.09%	9.62%
59288	780	25.43	22.92	0.89	2.51	2.56	7.30%	7.43%	10.97%	11.19%
59289	776	24.89	22.68	0.90	2.21	2.32	6.51%	6.82%	9.73%	10.24%
59290	779	23.16	21.31	0.92	1.85	2.02	5.83%	6.36%	8.68%	9.48%
59294	778	24.79	22.23	0.91	2.56	2.62	7.58%	7.75%	11.51%	11.79%
59297	779	23.88	22.22	0.92	1.66	1.84	4.82%	5.38%	7.48%	8.27%
59298	779	23.95	22.21	0.92	1.74	1.82	5.13%	5.37%	7.82%	8.19%
59473	778	23.57	22.42	0.85	1.15	1.84	3.56%	5.56%	5.14%	8.22%
59475	779	24.58	22.78	0.87	1.80	2.06	5.53%	6.24%	7.90%	9.06%
59476	779	24.28	23.15	0.85	1.13	1.66	3.47%	4.91%	4.89%	7.18%
59477	778	23.77	22.28	0.87	1.49	1.89	4.53%	5.72%	6.68%	8.48%
59478	780	23.81	23.02	0.83	0.79	1.71	2.45%	5.06%	3.43%	7.41%
59480	780	25.48	23.49	0.90	1.99	2.08	5.64%	5.87%	8.47%	8.85%
59481	779	25.20	23.11	0.90	2.09	2.18	6.07%	6.32%	9.04%	9.44%
59485	778	24.37	22.91	0.90	1.46	1.72	4.45%	5.16%	6.35%	7.51%
59487	778	24.03	23.06	0.84	0.97	1.53	3.00%	4.53%	4.20%	6.66%
59488	779	22.74	22.61	0.84	0.13	1.21	0.66%	3.66%	0.57%	5.36%
59492	778	22.83	22.07	0.91	0.77	1.41	2.48%	4.39%	3.48%	6.39%
59493	779	24.19	22.95	0.90	1.24	1.46	3.80%	4.37%	5.42%	6.38%

Table S14 Meteorological verification metrics for 10-m wind speed in April.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	777	2.67	2.28	0.51	0.39	1.12	18.01%	37.27%	17.14%	49.22%
59270	779	2.44	2.15	0.47	0.29	1.11	14.27%	36.82%	13.55%	51.55%
59271	777	2.57	1.80	0.44	0.77	1.20	24.71%	41.14%	42.51%	66.53%
59276	781	2.82	2.40	0.30	0.43	1.36	13.85%	38.62%	17.76%	56.83%
59278	779	2.59	2.57	0.45	0.02	1.18	6.10%	32.14%	0.89%	45.70%
59279	780	3.35	2.91	0.56	0.44	1.26	16.57%	32.55%	15.18%	43.45%
59284	779	3.15	2.64	0.53	0.52	1.17	17.24%	30.70%	19.53%	44.29%
59285	778	3.00	2.01	0.51	0.99	1.42	33.46%	45.94%	49.30%	70.74%
59287	781	3.39	2.66	0.58	0.73	1.34	23.10%	35.26%	27.41%	50.30%
59288	780	3.43	3.09	0.60	0.33	1.27	17.16%	32.71%	10.80%	41.04%
59289	776	2.97	2.95	0.52	0.03	1.20	5.51%	30.54%	0.89%	40.72%
59290	779	2.72	1.75	0.43	0.97	1.38	31.72%	48.46%	55.13%	78.68%
59294	778	3.09	2.30	0.60	0.79	1.31	25.14%	41.06%	34.32%	56.84%
59297	779	2.55	2.34	0.48	0.20	1.21	6.14%	34.85%	8.71%	51.56%
59298	779	3.03	2.83	0.64	0.20	1.11	8.35%	28.51%	7.06%	39.14%
59473	778	3.11	3.03	0.58	0.08	1.27	12.10%	33.56%	2.57%	41.83%
59475	779	3.13	2.58	0.64	0.55	1.19	22.41%	36.60%	21.30%	45.92%
59476	779	3.32	3.12	0.67	0.19	1.20	11.09%	30.85%	6.22%	38.54%
59477	778	2.64	2.14	0.54	0.49	1.34	17.10%	47.31%	23.07%	62.35%
59478	780	3.64	2.84	0.67	0.80	1.36	22.80%	37.94%	28.10%	47.88%
59480	780	3.32	2.76	0.53	0.56	1.23	19.20%	32.17%	20.45%	44.43%
59481	779	3.33	2.15	0.53	1.18	1.46	39.41%	45.26%	54.96%	67.85%
59485	778	3.11	2.39	0.60	0.73	1.21	28.50%	37.85%	30.47%	50.72%
59487	778	3.05	2.84	0.65	0.21	1.05	11.58%	29.00%	7.35%	36.86%
59488	779	3.16	3.33	0.52	-0.17	1.38	3.01%	33.03%	-5.16%	41.38%
59492	778	3.26	3.35	0.62	-0.09	1.24	1.68%	28.62%	-2.61%	36.90%
59493	779	2.95	2.46	0.59	0.49	1.13	21.24%	34.58%	19.85%	45.81%

Table S15 Meteorological verification metrics for 2-m relative humidity in July.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	776	67.51	88.83	0.76	-21.32	21.57	-17.98%	18.21%	-24.00%	24.28%
59270	778	67.65	82.62	0.75	-14.97	15.80	-13.35%	14.10%	-18.12%	19.13%
59271	778	64.60	83.74	0.70	-19.15	19.51	-16.85%	17.21%	-22.87%	23.30%
59276	778	61.94	87.10	0.69	-25.16	25.22	-21.69%	21.74%	-28.88%	28.95%
59278	776	68.50	89.69	0.75	-21.19	21.22	-17.77%	17.79%	-23.63%	23.66%
59279	779	54.65	88.15	0.65	-33.49	33.49	-29.41%	29.41%	-38.00%	38.00%
59284	780	54.28	79.01	0.71	-24.73	24.83	-23.87%	23.95%	-31.30%	31.42%
59285	778	64.24	86.48	0.63	-22.22	22.61	-19.07%	19.39%	-25.70%	26.14%
59287	787	63.67	85.22	0.64	-21.55	21.80	-18.62%	18.84%	-25.29%	25.58%
59288	784	53.15	79.31	0.66	-26.16	26.26	-25.27%	25.35%	-32.98%	33.11%
59289	776	55.67	86.15	0.68	-30.48	30.53	-27.21%	27.26%	-35.38%	35.43%
59290	779	65.62	86.15	0.73	-20.53	20.99	-17.76%	18.16%	-23.83%	24.36%
59294	775	56.39	84.90	0.66	-28.51	28.51	-25.65%	25.65%	-33.58%	33.58%
59297	780	64.07	85.17	0.73	-21.09	21.29	-18.49%	18.68%	-24.76%	25.00%
59298	781	60.78	82.76	0.77	-21.97	22.01	-20.14%	20.17%	-26.54%	26.59%
59473	775	66.34	83.83	0.75	-17.49	17.86	-15.59%	15.89%	-20.86%	21.31%
59475	774	62.95	84.08	0.65	-21.14	21.42	-18.90%	19.15%	-25.14%	25.48%
59476	782	62.40	82.03	0.73	-19.63	19.95	-17.98%	18.27%	-23.93%	24.32%
59477	777	71.16	90.45	0.66	-19.29	19.57	-15.99%	16.22%	-21.32%	21.64%
59478	777	70.23	86.37	0.74	-16.13	16.59	-13.94%	14.29%	-18.68%	19.21%
59480	778	54.17	81.23	0.77	-27.06	27.06	-25.47%	25.47%	-33.31%	33.31%
59481	779	54.29	79.11	0.72	-24.82	24.87	-23.89%	23.92%	-31.37%	31.43%
59485	778	62.55	83.74	0.74	-21.19	21.30	-19.03%	19.12%	-25.30%	25.43%
59487	777	67.36	82.22	0.74	-14.86	15.82	-13.76%	14.48%	-18.07%	19.25%
59488	779	76.13	83.54	0.76	-7.41	11.30	-7.03%	9.93%	-8.87%	13.53%
59492	773	69.50	86.06	0.73	-16.56	17.04	-13.99%	14.43%	-19.24%	19.80%
59493	775	63.42	83.01	0.77	-19.59	19.90	-17.69%	17.97%	-23.60%	23.98%

Table S16 Meteorological verification metrics for 2-m temperature in July.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	776	29.68	27.57	0.87	2.11	2.21	5.01%	5.23%	7.65%	8.01%
59270	778	29.62	28.00	0.85	1.62	1.83	3.78%	4.27%	5.78%	6.54%
59271	778	30.04	27.78	0.84	2.26	2.35	5.36%	5.56%	8.14%	8.46%
59276	778	30.61	27.96	0.80	2.65	2.70	6.16%	6.28%	9.49%	9.67%
59278	776	29.50	27.99	0.82	1.51	1.84	3.47%	4.28%	5.41%	6.58%
59279	779	31.69	28.79	0.77	2.90	2.96	6.54%	6.68%	10.06%	10.27%
59284	780	31.64	29.09	0.83	2.55	2.66	5.73%	5.98%	8.75%	9.13%
59285	778	29.76	27.67	0.83	2.08	2.31	4.99%	5.52%	7.53%	8.35%
59287	787	29.68	27.85	0.80	1.83	2.13	4.30%	5.03%	6.57%	7.65%
59288	784	31.91	29.09	0.80	2.82	2.87	6.29%	6.41%	9.69%	9.88%
59289	776	30.97	28.31	0.79	2.65	2.73	6.11%	6.29%	9.37%	9.66%
59290	779	29.32	27.92	0.87	1.40	1.69	3.29%	4.00%	5.00%	6.05%
59294	775	30.98	28.23	0.82	2.75	2.79	6.35%	6.45%	9.74%	9.89%
59297	780	29.71	28.39	0.88	1.34	1.56	3.05%	3.58%	4.70%	5.50%
59298	781	29.77	28.24	0.87	1.53	1.66	3.53%	3.82%	5.43%	5.88%
59473	775	29.41	28.30	0.85	1.11	1.51	2.54%	3.50%	3.93%	5.34%
59475	774	30.06	28.17	0.76	1.89	2.21	4.35%	5.12%	6.71%	7.85%
59476	782	29.89	28.83	0.81	1.06	1.56	2.40%	3.59%	3.68%	5.41%
59477	777	28.97	27.30	0.79	1.67	1.95	3.95%	4.64%	6.12%	7.16%
59478	777	28.88	28.41	0.80	0.47	1.44	1.04%	3.37%	1.67%	5.06%
59480	778	31.56	29.45	0.84	2.11	2.19	4.73%	4.90%	7.18%	7.44%
59481	779	31.45	29.08	0.84	2.36	2.44	5.32%	5.50%	8.13%	8.40%
59485	778	29.77	28.56	0.83	1.21	1.53	2.77%	3.53%	4.24%	5.36%
59487	777	28.83	28.79	0.77	0.03	1.52	-0.03%	3.56%	0.12%	5.27%
59488	779	26.67	28.61	0.81	-1.94	2.25	-4.79%	5.48%	-6.78%	7.86%
59492	773	28.35	28.08	0.85	0.27	1.13	0.64%	2.69%	0.96%	4.03%
59493	775	29.35	28.73	0.78	0.62	1.34	1.42%	3.08%	2.16%	4.66%

Table S17 Meteorological verification metrics for 10-m wind speed in July.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	1505	2.39	1.92	0.44	0.46	1.17	19.92%	41.06%	24.13%	61.09%
59270	1513	2.36	2.12	0.51	0.24	1.13	6.79%	35.00%	11.28%	53.33%
59271	1507	2.43	1.95	0.48	0.48	1.24	21.01%	46.10%	24.57%	63.52%
59276	1509	2.86	2.67	0.40	0.19	1.46	7.80%	37.89%	7.27%	54.75%
59278	1506	2.54	2.65	0.51	-0.11	1.32	4.34%	37.46%	-4.01%	49.84%
59279	1512	3.29	2.80	0.53	0.48	1.34	19.30%	35.51%	17.20%	47.68%
59284	1509	3.20	2.70	0.52	0.50	1.28	20.19%	35.20%	18.62%	47.58%
59285	1508	2.97	1.89	0.53	1.08	1.46	37.98%	48.58%	57.37%	77.40%
59287	1526	3.33	2.66	0.54	0.68	1.39	21.53%	36.68%	25.51%	52.36%
59288	1522	3.45	2.99	0.57	0.46	1.31	19.71%	34.04%	15.27%	43.93%
59289	1508	3.27	2.92	0.57	0.35	1.24	16.22%	31.93%	12.06%	42.53%
59290	1510	2.49	1.74	0.50	0.75	1.26	26.89%	45.99%	42.86%	72.36%
59294	1509	2.91	2.20	0.44	0.71	1.35	22.39%	39.67%	32.37%	61.18%
59297	1505	2.77	2.39	0.57	0.39	1.17	12.49%	33.20%	16.17%	48.84%
59298	1512	3.06	2.70	0.57	0.36	1.19	15.76%	31.51%	13.39%	43.96%
59473	1504	2.97	2.66	0.61	0.31	1.19	15.44%	33.16%	11.59%	44.76%
59475	1504	3.12	2.63	0.52	0.49	1.40	22.31%	39.72%	18.51%	53.32%
59476	1519	3.10	3.12	0.58	-0.03	1.32	7.05%	30.53%	-0.93%	42.10%
59477	1510	2.49	2.19	0.41	0.31	1.45	9.33%	46.06%	14.00%	66.37%
59478	1512	3.35	2.46	0.53	0.88	1.51	25.85%	41.15%	35.85%	61.10%
59480	1512	3.42	3.02	0.58	0.39	1.15	13.05%	27.17%	13.02%	38.19%
59481	1512	3.47	2.21	0.53	1.26	1.59	41.34%	47.70%	56.90%	72.06%
59485	1515	3.22	2.63	0.61	0.60	1.24	24.60%	34.96%	22.72%	47.22%
59487	1504	2.87	2.81	0.63	0.06	1.10	9.97%	30.47%	2.19%	39.06%
59488	1511	2.74	3.60	0.64	-0.85	1.50	-12.20%	30.95%	-23.75%	41.77%
59492	1501	3.36	3.38	0.56	-0.02	1.39	5.24%	30.65%	-0.56%	41.24%
59493	1504	3.05	2.58	0.52	0.47	1.43	25.10%	43.60%	18.33%	55.40%

Table S18 Meteorological verification metrics for 2-m relative humidity in October.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	750	65.61	79.11	0.71	-13.50	15.03	-11.51%	13.00%	-17.07%	19.00%
59270	751	63.88	68.84	0.71	-4.95	10.41	-4.15%	10.10%	-7.20%	15.12%
59271	751	61.72	76.34	0.69	-14.63	15.29	-13.22%	13.92%	-19.16%	20.03%
59276	752	63.58	78.29	0.76	-14.71	15.36	-12.96%	13.60%	-18.79%	19.62%
59278	754	66.99	78.63	0.69	-11.64	14.11	-9.77%	12.47%	-14.80%	17.95%
59279	757	55.50	69.42	0.72	-13.92	14.50	-13.98%	14.69%	-20.05%	20.88%
59284	753	55.94	66.00	0.74	-10.06	10.94	-10.21%	11.40%	-15.24%	16.57%
59285	754	67.23	76.85	0.55	-9.62	14.08	-7.28%	12.09%	-12.52%	18.32%
59287	759	65.47	74.10	0.67	-8.63	11.45	-6.96%	10.20%	-11.65%	15.45%
59288	752	51.69	68.37	0.71	-16.68	16.85	-17.43%	17.68%	-24.40%	24.64%
59289	752	52.08	69.57	0.76	-17.49	17.54	-18.27%	18.32%	-25.13%	25.21%
59290	754	64.35	77.18	0.64	-12.83	14.24	-10.77%	12.39%	-16.62%	18.45%
59294	752	56.63	74.36	0.62	-17.73	17.90	-16.85%	17.02%	-23.84%	24.07%
59297	753	66.65	75.34	0.71	-8.69	11.10	-7.58%	9.99%	-11.54%	14.73%
59298	754	57.79	69.55	0.77	-11.76	12.10	-11.95%	12.32%	-16.91%	17.40%
59473	752	63.59	71.94	0.77	-8.35	10.55	-7.74%	10.23%	-11.60%	14.66%
59475	753	59.15	72.86	0.75	-13.70	14.35	-13.07%	13.82%	-18.81%	19.70%
59476	756	55.11	66.88	0.79	-11.77	12.49	-12.53%	13.35%	-17.59%	18.68%
59477	754	71.28	81.47	0.66	-10.19	12.76	-7.95%	10.69%	-12.51%	15.66%
59478	751	64.91	74.06	0.84	-9.15	10.40	-8.80%	9.92%	-12.36%	14.04%
59480	754	51.16	64.23	0.79	-13.07	13.42	-14.31%	14.73%	-20.34%	20.89%
59481	751	52.36	66.49	0.69	-14.13	14.49	-14.65%	15.12%	-21.26%	21.80%
59485	755	55.42	72.48	0.79	-17.05	17.23	-17.42%	17.57%	-23.53%	23.78%
59487	776	57.19	70.52	0.82	-13.33	13.80	-14.13%	14.55%	-18.90%	19.57%
59488	761	60.84	69.61	0.80	-8.77	9.58	-9.36%	10.13%	-12.60%	13.76%
59492	754	67.90	75.72	0.78	-7.82	9.87	-6.67%	8.85%	-10.33%	13.03%
59493	752	54.49	67.29	0.79	-12.80	13.17	-13.87%	14.23%	-19.02%	19.57%

Table S19 Meteorological verification metrics for 2-m temperature in October.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	750	23.36	23.19	0.94	0.17	1.37	0.08%	4.21%	0.73%	5.93%
59270	751	23.34	23.81	0.94	-0.48	1.45	-1.70%	4.40%	-2.01%	6.09%
59271	751	24.10	23.00	0.95	1.10	1.49	3.38%	4.57%	4.78%	6.50%
59276	752	24.11	23.32	0.95	0.80	1.31	2.11%	3.70%	3.41%	5.61%
59278	754	23.94	24.16	0.92	-0.22	1.41	-1.09%	4.20%	-0.91%	5.86%
59279	757	25.64	24.49	0.94	1.15	1.63	2.84%	4.37%	4.69%	6.64%
59284	753	25.41	24.84	0.93	0.57	1.37	1.37%	3.66%	2.30%	5.50%
59285	754	23.38	23.17	0.91	0.22	1.71	0.64%	5.41%	0.95%	7.39%
59287	759	23.87	23.53	0.95	0.34	1.23	0.90%	3.67%	1.44%	5.24%
59288	752	26.38	24.84	0.94	1.55	1.78	3.94%	4.65%	6.23%	7.15%
59289	752	26.73	25.07	0.94	1.66	1.79	4.24%	4.61%	6.62%	7.14%
59290	754	23.47	23.10	0.95	0.37	1.34	1.44%	4.21%	1.62%	5.79%
59294	752	25.46	24.22	0.95	1.23	1.54	3.47%	4.36%	5.09%	6.34%
59297	753	24.17	24.27	0.96	-0.10	1.07	-0.57%	3.16%	-0.41%	4.42%
59298	754	25.21	24.50	0.95	0.71	1.06	1.94%	2.91%	2.90%	4.31%
59473	752	24.70	24.51	0.92	0.19	1.33	0.32%	3.75%	0.78%	5.41%
59475	753	25.65	24.37	0.91	1.28	1.65	3.42%	4.57%	5.24%	6.76%
59476	756	26.41	25.42	0.91	0.99	1.34	2.54%	3.46%	3.88%	5.26%
59477	754	23.60	23.59	0.92	0.01	1.23	-0.14%	3.65%	0.06%	5.22%
59478	751	24.86	24.79	0.92	0.07	1.19	0.05%	3.25%	0.30%	4.79%
59480	754	27.11	26.03	0.94	1.08	1.38	2.64%	3.47%	4.14%	5.31%
59481	751	26.69	25.51	0.91	1.18	1.61	3.08%	4.30%	4.61%	6.33%
59485	755	26.71	24.99	0.90	1.71	1.80	4.71%	4.95%	6.86%	7.22%
59487	776	26.69	25.87	0.92	0.82	1.25	2.18%	3.25%	3.16%	4.82%
59488	761	26.62	25.84	0.90	0.78	1.21	2.17%	3.20%	3.01%	4.70%
59492	754	23.96	24.16	0.96	-0.20	1.03	-0.73%	3.01%	-0.82%	4.27%
59493	752	26.73	25.60	0.93	1.13	1.41	2.88%	3.65%	4.41%	5.52%

Table S20 Meteorological verification metrics for 10-m wind speed in October.

Site	N	Ave.		R	MB	ME	MFB	MFE	NMB	NME
		Sim.	Obs.							
59264	750	2.29	2.38	0.45	-0.09	1.04	5.13%	31.58%	-3.90%	43.61%
59270	751	1.94	2.23	0.45	-0.29	1.13	-5.53%	38.52%	-13.12%	50.59%
59271	751	2.57	2.01	0.45	0.56	1.25	36.98%	52.99%	28.10%	62.11%
59276	752	2.21	2.71	0.33	-0.51	1.35	-12.07%	38.10%	-18.70%	49.71%
59278	754	2.10	2.73	0.35	-0.63	1.40	-6.42%	39.86%	-23.24%	51.26%
59279	757	3.86	3.52	0.72	0.33	1.20	14.22%	27.01%	9.44%	34.17%
59284	753	4.05	3.11	0.68	0.93	1.35	24.93%	30.93%	29.99%	43.22%
59285	754	3.32	2.58	0.61	0.74	1.44	28.80%	43.60%	28.78%	55.92%
59287	759	4.10	3.43	0.76	0.67	1.35	21.02%	29.59%	19.50%	39.27%
59288	752	4.04	3.64	0.68	0.40	1.37	17.09%	31.42%	10.86%	37.54%
59289	752	3.84	3.21	0.64	0.63	1.29	20.74%	31.46%	19.54%	40.28%
59290	754	3.07	2.46	0.68	0.61	1.17	23.82%	38.03%	24.67%	47.38%
59294	752	3.99	3.28	0.65	0.71	1.44	23.55%	34.70%	21.67%	43.96%
59297	753	2.89	3.12	0.58	-0.23	1.35	2.61%	31.12%	-7.30%	43.25%
59298	754	4.43	3.69	0.65	0.74	1.47	18.33%	28.95%	20.03%	39.85%
59473	752	3.10	3.74	0.72	-0.64	1.45	-0.83%	31.15%	-17.04%	38.83%
59475	753	3.26	3.19	0.72	0.07	1.28	12.85%	32.44%	2.15%	39.99%
59476	756	4.23	4.40	0.77	-0.17	1.42	4.16%	26.37%	-3.84%	32.28%
59477	754	2.36	2.39	0.58	-0.03	1.20	7.85%	39.60%	-1.08%	50.16%
59478	751	3.61	3.49	0.77	0.12	1.12	13.04%	30.97%	3.51%	32.17%
59480	754	3.96	3.27	0.68	0.69	1.26	17.96%	28.41%	21.21%	38.44%
59481	751	4.07	2.42	0.67	1.65	1.83	45.40%	49.35%	68.06%	75.51%
59485	755	3.71	2.77	0.64	0.94	1.40	30.06%	37.83%	33.74%	50.30%
59487	776	3.61	3.01	0.66	0.60	1.25	17.49%	29.72%	19.74%	41.62%
59488	761	4.84	4.36	0.47	0.48	1.72	12.51%	28.83%	11.10%	39.48%
59492	754	3.17	3.52	0.44	-0.35	1.43	2.55%	29.62%	-9.91%	40.72%
59493	752	4.11	3.25	0.59	0.86	1.51	25.77%	34.66%	26.59%	46.46%

Table S21 The overall validation metrics for all stations for O<sub>3</sub> and PM<sub>2.5</sub>.

		January			April			July			October		
		NMB	NME	R	NMB	NME	R	NMB	NME	R	NMB	NME	R
		(%)	(%)		(%)	(%)		(%)	(%)		(%)	(%)	
O <sub>3</sub>	BASE	-4.24	17.08	0.69	-1.32	17.28	0.76	-4.16	15.36	0.89	-3.44	13.72	0.78
	EXPR	-4.04	17.12	0.69	-0.6	16.92	0.76	-4.04	14.96	0.89	-3.12	13.44	0.78
	EXPR-V	-3.24	16.64	0.70	-0.12	16.48	0.77	-3.48	14.6	0.89	-2.4	13	0.79
		NMB	NME	R	NMB	NME	R	NMB	NME	R	NMB	NME	R
		(%)	(%)		(%)	(%)		(%)	(%)		(%)	(%)	
PM <sub>2.5</sub>	BASE	-11.0	23.3	0.59	-40.3	40.3	0.77	-30.0	30.0	0.95	-31.7	32.0	0.93
	EXPR	-7.7	21.8	0.62	-35.1	35.1	0.78	-22.0	22.0	0.95	-27.5	29.1	0.93
	EXPR-V	-2.5	21.3	0.62	-26.8	27.4	0.78	-9.5	13.2	0.95	-20.0	24.3	0.93



## 2. Equation

$$MB = \frac{1}{n} \sum_{i=1}^n (M_i - O_i) \quad (\text{Eq. S1})$$

$$ME = \frac{1}{n} \sum_{i=1}^n |M_i - O_i| \quad \text{Eq. S2)}$$

$$RMSE = \sqrt{\frac{\sum_{i=1}^n (O_i - M_i)^2}{n}} \quad (\text{Eq. S3})$$

$$MFE = \frac{2}{n} \sum_{i=1}^n \left| \frac{M_i - O_i}{M_i + O_i} \right| \quad (\text{Eq. S4})$$

$$MFB = \frac{2}{n} \sum_{i=1}^n \left( \frac{M_i - O_i}{M_i + O_i} \right) \quad (\text{Eq. S5})$$

Where  $M_i$  and  $O_i$  are the simulated and observed data, respectively.  $\bar{M}_i$  and  $\bar{O}$  are the average of the simulated and observed data, respectively.  $n$  is the number of samples.