Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ACAD1																		
EC	WIN	29	0.13	0.24	0.85	87.47	91.82	0.11	0.12	0.01	108.89	59.88	0.87	113.41	66	0.92	0.15	0.72
EC	SPR	31	0.08	0.14	0.56	61.51	75.3	0.05	0.06	0	132.41	57.23	0.62	138.85	64.89	0.75	0.08	0.31
EC	SUM	27	0.14	0.15	0.81	0.9	33.13	0	0.05	0	34.21	12.56	0.01	56.72	38.73	0.33	0.06	0.66
EC	FAL	30	0.16	0.19	0.68	13.65	40.38	0.02	0.07	0.01	40.11	15.62	0.14	59	38.53	0.4	0.09	0.46
EC	ALL	117	0.13	0.18	0.66	36.58	57.05	0.05	0.07	0.01	80.25	36.91	0.37	93.11	52.37	0.57	0.1	0.43
NO3	WIN	29	0.31	0.77	0.88	149.44	154.76	0.46	0.48	0.26	195.18	70.27	1.49	206.82	86.63	1.55	0.69	0.77
NO3	SPR	31	0.15	0.29	0.36	93.35	138.96	0.14	0.21	0.07	222.54	34.14	0.93	264.61	101.51	1.39	0.29	0.13
NO3	SUM	31	0.13	0.08	0.55	-34.2	61.95	-0.04	0.08	0.01	-17.69	-57.34	-0.52	70.8	88.23	0.94	0.1	0.30
NO3	FAL	30	0.23	0.42	0.77	85.46	108.48	0.19	0.25	0.21	69.85	13.09	0.85	108.15	69.35	1.08	0.49	0.59
NO3	ALL	121	0.2	0.39	0.8	91.58	124.05	0.18	0.25	0.17	116.58	14.14	0.92	162.31	86.57	1.24	0.45	0.64
OC	WIN	29	0.64	1.08	0.84	69.99	71.9	0.45	0.46	0.16	79.98	49.8	0.7	82.11	52.11	0.72	0.6	0.70
OC	SPR	31	0.43	0.61	0.73	40.82	52.32	0.18	0.23	0.06	57.27	35.79	0.41	64.54	44.1	0.52	0.3	0.53
OC	SUM	27	1.14	0.75	0.82	-34.03	40.89	-0.39	0.46	0.3	-24.42	-37.05	-0.52	39.67	48.74	0.62	0.67	0.66
OC	FAL	30	0.8	0.77	0.72	-4.09	33.95	-0.03	0.27	0.12	6.33	-6.22	-0.04	41.05	37.31	0.35	0.35	0.52
OC	ALL	117	0.74	0.8	0.62	8.08	47.35	0.06	0.35	0.24	30.99	11.68	0.08	57.13	45.42	0.47	0.5	0.39
PM-2.5	WIN	29	3.48	4.77	0.83	37.12	44.98	1.29	1.57	2.83	44.03	29.55	0.37	49.99	37.52	0.45	2.12	0.69
PM-2.5	SPR	31	3.12	4.26	0.63	36.35	47.57	1.13	1.49	3.43	60.27	28.38	0.36	69.85	39.69	0.48	2.17	0.40
PM-2.5	SUM	31	5.28	4.26	0.69	-19.27	33.77	-1.02	1.78	5.49	-10.83	-18.97	-0.24	31.38	35.27	0.42	2.55	0.48
PM-2.5	FAL	29	4.16	4.12	0.74	-0.98	32.91	-0.04	1.37	3.64	12.08	0.69	-0.01	37.84	32.22	0.33	1.91	0.55
PM-2.5	ALL	120	4.02	4.35	0.65	8.29	38.67	0.33	1.55	4.76	26.33	9.74	0.08	47.38	36.22	0.39	2.21	0.43
SO4	WIN	29	1.03	0.87	0.86	-15.38	27.88	-0.16	0.29	0.11	-7.68	-12.66	-0.18	26.84	27.95	0.33	0.36	0.73
SO4	SPR	31	0.92	1.83	0.45	97.49	105.95	0.9	0.98	2.13	202.08	47.62	0.97	209.83	56.81	1.06	1.71	0.20
SO4	SUM	31	1.08	1.8	0.7	66.53	79.43	0.72	0.86	1.33	106.14	48.35	0.67	114.52	57.93	0.79	1.36	0.49
SO4	FAL	30	1.13	1.29	0.73	14.28	41.23	0.16	0.47	0.42	44.47	17.34	0.14	64.07	41.63	0.41	0.67	0.53
SO4	ALL	121	1.04	1.46	0.55	40.11	62.98	0.42	0.66	1.19	88.15	25.85	0.4	105.42	46.41	0.63	1.17	0.30

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BADL1																		
EC	WIN	29	0.07	0.11	0.42	55.91	77.49	0.04	0.05	0	78.58	37.67	0.56	93.53	55.67	0.77	0.08	0.17
EC	SPR	31	0.08	0.14	0.5	65.64	97.38	0.05	0.08	0.02	109.75	16.82	0.66	141.54	59.1	0.97	0.15	0.25
EC	SUM	31	0.12	0.11	0.75	-9.18	27.64	-0.01	0.03	0	-3.52	-10.98	-0.1	29.13	30.58	0.3	0.04	0.56
EC	FAL	30	0.09	0.24	0.06	154.75	170.9	0.14	0.16	0.18	212.51	45.89	1.55	222.84	59.41	1.71	0.44	0.00
EC	ALL	121	0.09	0.15	0.19	60.49	88.24	0.06	0.08	0.05	98.74	21.9	0.6	121.39	51.05	0.88	0.24	0.04
NO3	WIN	29	0.37	0.88	0.82	136.36	139.64	0.51	0.52	0.37	199.2	77.04	1.36	205.03	84.42	1.4	0.79	0.67
NO3	SPR	31	0.44	1.14	0.65	160.42	171.74	0.71	0.75	1.35	151.14	37.36	1.6	182.53	82.87	1.72	1.36	0.42
NO3	SUM	31	0.2	0.07	0.06	-65.35	87.28	-0.13	0.18	0.08	-27.27	-84.66	-1.89	91.74	108.29	2.52	0.31	0.00
NO3	FAL	30	0.11	0.24	0.77	124.47	166.31	0.13	0.18	0.14	85.71	-11.09	1.24	148.51	80.44	1.66	0.4	0.59
NO3	ALL	121	0.28	0.58	0.68	107.41	145.33	0.3	0.41	0.6	100.73	3.6	1.07	156.23	89.15	1.45	0.83	0.47
OC	WIN	29	0.29	0.38	0.3	27.85	71.35	0.08	0.21	0.09	46.29	11.79	0.28	77.92	54.33	0.71	0.31	0.09
OC	SPR	31	0.49	0.53	0.61	10.13	67.09	0.05	0.33	0.33	36.85	-23.38	0.1	100.21	68.91	0.67	0.57	0.38
OC	SUM	31	1.08	0.63	0.7	-41.63	43.41	-0.45	0.47	0.12	-40.92	-57.77	-0.71	43.76	60.32	0.74	0.56	0.49
OC	FAL	30	0.6	1.02	0.05	69.3	124.46	0.42	0.75	3.89	205.67	0.14	0.69	252.07	63.44	1.24	2.02	0.00
OC	ALL	121	0.62	0.64	0.2	3.26	70.79	0.02	0.44	1.2	61.05	-17.93	0.03	118.06	61.86	0.71	1.09	0.04
PM-2.5	WIN	29	2.17	2.84	0.61	30.66	47.98	0.67	1.04	1.51	51.97	30.08	0.31	62.58	42.42	0.48	1.4	0.37
PM-2.5	SPR	31	3.1	4.43	0.63	43.15	62.6	1.34	1.94	11.76	45.3	13.11	0.43	70.58	45.09	0.63	3.68	0.40
PM-2.5	SUM	31	4.73	2.78	0.67	-41.23	42.24	-1.95	2	1.47	-40.05	-54.99	-0.7	41.84	56.56	0.72	2.3	0.45
PM-2.5	FAL	30	3.05	3.83	0.02	25.36	68.28	0.77	2.08	22.87	74.34	3.78	0.25	106.43	45.21	0.68	4.84	0.00
PM-2.5	ALL	121	3.28	3.48	0.32	5.91	54.07	0.19	1.78	11.07	32.23	-2.58	0.06	70.19	47.42	0.54	3.33	0.10
SO4	WIN	29	0.74	0.48	0.58	-35.62	55.15	-0.26	0.41	0.36	16.07	-7.18	-0.55	59.12	54.1	0.86	0.66	0.34
SO4	SPR	31	0.87	0.98	0.57	12.06	45.09	0.11	0.39	0.74	32.85	6.06	0.12	61.6	41.21	0.45	0.87	0.33
SO4	SUM	31	0.83	0.64	0.52	-22.73	31.74	-0.19	0.26	0.08	-17.62	-25.87	-0.29	31.41	37.32	0.41	0.34	0.27
SO4	FAL	30	0.54	0.59	0.69	8.82	37.08	0.05	0.2	0.07	26.97	14.17	0.09	45.82	36.68	0.37	0.27	0.47
SO4	ALL	121	0.75	0.68	0.5	-9.74	42.22	-0.07	0.32	0.34	14.44	-3.28	-0.11	49.36	42.18	0.47	0.59	0.25

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BAND1																		
EC	WIN	29	0.14	0.09	0.3	-33.96	54.97	-0.05	0.07	0.01	1.47	-19.19	-0.51	54.36	54.28	0.83	0.11	0.09
EC	SPR	31	0.07	0.07	0.64	7.36	33.37	0	0.02	0	46.2	17.17	0.07	61.37	35.54	0.33	0.03	0.40
EC	SUM	25	0.39	0.31	0.51	-22.29	75.6	-0.09	0.3	0.48	5.11	-17.99	-0.29	49.74	44.32	0.97	0.7	0.26
EC	FAL	25	0.11	0.09	0.38	-10.25	35.32	-0.01	0.04	0	5.69	-6.08	-0.11	40.19	38.09	0.39	0.05	0.14
EC	ALL	110	0.17	0.13	0.55	-19.78	60.77	-0.03	0.1	0.11	15.86	-5.69	-0.25	52.07	43.06	0.76	0.34	0.30
NO3	WIN	28	0.23	0.07	0.29	-68.41	74.7	-0.16	0.17	0.05	-47.72	-89	-2.17	70	101.98	2.36	0.27	0.08
NO3	SPR	31	0.16	0.05	0.74	-70.81	70.81	-0.11	0.11	0.01	-65.71	-100.99	-2.43	65.71	100.99	2.43	0.15	0.54
NO3	SUM	23	0.16	0.04	0.47	-76.6	76.62	-0.12	0.12	0.03	-62.81	-98.85	-3.27	62.87	98.91	3.27	0.2	0.22
NO3	FAL	25	0.09	0.05	0.48	-45.96	52.78	-0.04	0.05	0.01	-23.57	-37.09	-0.85	36.03	47.26	0.98	0.12	0.23
NO3	ALL	107	0.16	0.05	0.4	-67.86	71.1	-0.11	0.12	0.03	-50.53	-82.46	-2.11	59.29	88.25	2.21	0.2	0.16
OC	WIN	29	0.5	0.33	0.29	-34.89	51.8	-0.18	0.26	0.09	-11.26	-29.17	-0.54	49.1	53.4	0.8	0.35	0.09
OC	SPR	31	0.35	0.25	0.7	-27.94	34.62	-0.1	0.12	0.01	-21.68	-30.35	-0.39	32.92	39.56	0.48	0.15	0.49
OC	SUM	25	2.72	1.65	0.51	-39.47	71.94	-1.07	1.96	14.98	-29.83	-50.29	-0.65	48.57	62.65	1.19	4.02	0.26
OC	FAL	25	0.51	0.41	0.47	-20.54	36.49	-0.11	0.19	0.05	-12.48	-22.18	-0.26	35.49	40.7	0.46	0.25	0.23
OC	ALL	110	0.97	0.62	0.58	-35.38	61.1	-0.34	0.59	3.6	-18.69	-32.71	-0.55	41.33	48.71	0.95	1.93	0.33
PM-2.5	WIN	29	1.9	1.95	0.17	2.9	41.45	0.06	0.79	0.88	13.48	2.15	0.03	43.44	39.58	0.41	0.94	0.03
PM-2.5	SPR	31	3.61	2.36	0.55	-34.47	41.02	-1.24	1.48	3.72	-21.69	-31.95	-0.53	33.91	42.37	0.63	2.3	0.30
PM-2.5	SUM	25	7.3	4.91	0.51	-32.82	61.65	-2.4	4.5	60.28	-28.79	-46.41	-0.49	46.49	57.19	0.92	8.13	0.26
PM-2.5	FAL	25	2.39	2.66	0.3	11.55	40.64	0.28	0.97	1.33	30.26	15.47	0.12	49.17	39.17	0.41	1.19	0.09
PM-2.5	ALL	110	3.72	2.9	0.55	-21.99	50.23	-0.82	1.87	16.38	-2.22	-15.47	-0.28	42.75	44.27	0.64	4.13	0.30
SO4	WIN	28	0.32	0.44	0.59	37.82	54.4	0.12	0.17	0.02	54.89	35.08	0.38	64.04	46.35	0.54	0.2	0.35
SO4	SPR	31	0.59	0.5	0.56	-14.66	35.07	-0.09	0.21	0.13	2.97	-5.26	-0.17	32.26	31.61	0.41	0.37	0.31
SO4	SUM	23	0.77	0.52	0.61	-32.61	36.08	-0.25	0.28	0.1	-31.96	-44.16	-0.48	36.19	47.88	0.54	0.4	0.37
SO4	FAL	25	0.51	0.39	0.24	-23.96	37.78	-0.12	0.19	0.12	-2.48	-15	-0.32	36.2	36.41	0.5	0.37	0.06
SO4	ALL	107	0.54	0.46	0.5	-14.11	38.97	-0.08	0.21	0.11	7.77	-5.34	-0.16	42.34	40.09	0.45	0.34	0.25

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BIBE1																		
EC	WIN	29	0.11	0.08	0.39	-28.57	43.23	-0.03	0.05	0	-7.23	-21.18	-0.4	40.08	46.37	0.61	0.07	0.16
EC	SPR	31	0.27	0.08	0.39	-68.48	71.12	-0.18	0.19	0.05	-52.07	-83.63	-2.17	61.42	90.02	2.26	0.28	0.15
EC	SUM	31	0.2	0.05	0.47	-73.68	77.06	-0.14	0.15	0.11	-8.73	-54.54	-2.8	76.74	77.4	2.93	0.36	0.22
EC	FAL	29	0.12	0.08	0.65	-33.81	40.76	-0.04	0.05	0	-21.96	-37.57	-0.51	41.64	52	0.62	0.07	0.42
EC	ALL	120	0.18	0.07	0.3	-58.26	63.62	-0.1	0.11	0.05	-22.76	-49.89	-1.4	55.44	67.02	1.52	0.24	0.09
NO3	WIN	28	0.25	0.05	0.48	-81.8	84.78	-0.21	0.21	0.1	-81.72	-149.65	-4.49	85.03	152.33	4.66	0.38	0.23
NO3	SPR	31	0.31	0.02	0.2	-92.17	92.17	-0.28	0.28	0.03	-90.03	-165.18	-11.78	90.03	165.18	11.78	0.34	0.04
NO3	SUM	31	0.27	0.02	0.32	-93.85	93.85	-0.26	0.26	0.02	-93.77	-179.21	-15.26	93.77	179.21	15.26	0.3	0.10
NO3	FAL	29	0.13	0.01	0.4	-89.54	89.54	-0.12	0.12	0	-88.34	-160.13	-8.56	88.34	160.13	8.56	0.13	0.16
NO3	ALL	119	0.24	0.02	0.41	-89.79	90.52	-0.22	0.22	0.04	-88.64	-163.95	-8.79	89.42	164.58	8.86	0.3	0.17
OC	WIN	29	0.41	0.26	0.54	-36.67	45.59	-0.15	0.19	0.06	-5.21	-27.03	-0.58	52.34	53.89	0.72	0.29	0.29
OC	SPR	31	1.88	0.39	0.44	-79.37	79.99	-1.49	1.5	2.78	-65.89	-108.3	-3.85	67.76	109.93	3.88	2.24	0.19
OC	SUM	31	1.17	0.44	0.47	-62.08	68.99	-0.72	0.8	2.57	-32.1	-55.07	-1.64	49.62	69.12	1.82	1.76	0.22
OC	FAL	29	0.57	0.44	0.67	-21.84	37.53	-0.12	0.21	0.09	30.11	-22.72	-0.28	81.27	50.07	0.48	0.33	0.45
OC	ALL	120	1.02	0.38	0.4	-62.42	67.72	-0.64	0.69	1.73	-19.3	-54.23	-1.66	62.61	71.38	1.8	1.46	0.16
PM-2.5	WIN	29	3.56	1.99	0.55	-44.24	46.4	-1.57	1.65	3.35	-33.82	-49.03	-0.79	38.91	53.53	0.83	2.42	0.30
PM-2.5	SPR	31	10	2.52	0.36	-74.86	74.86	-7.49	7.49	24.84	-70.47	-112.03	-2.98	70.47	112.03	2.98	9	0.13
PM-2.5	SUM	31	7.03	2.15	0.42	-69.38	69.38	-4.88	4.88	12.26	-66.53	-104.02	-2.27	66.53	104.02	2.27	6	0.18
PM-2.5	FAL	29	6.4	2.48	0.06	-61.24	61.26	-3.92	3.92	39.21	-51.1	-76.78	-1.58	51.11	76.8	1.58	7.39	0.00
PM-2.5	ALL	120	6.81	2.28	0.3	-66.43	66.71	-4.52	4.54	24.36	-55.91	-86.22	-1.98	57.15	87.31	1.99	6.69	0.09
SO4	WIN	28	1.04	0.88	0.64	-15.08	43.52	-0.16	0.45	0.5	27.37	3.83	-0.18	59.28	49.47	0.51	0.73	0.41
SO4	SPR	31	1.74	0.82	0.53	-52.95	53.16	-0.92	0.92	0.92	-44.41	-63.48	-1.13	44.63	63.69	1.13	1.33	0.28
SO4	SUM	31	1.63	0.85	0.42	-47.97	48.21	-0.78	0.79	0.32	-46.47	-67.17	-0.92	46.81	67.5	0.93	0.96	0.18
SO4	FAL	29	1.31	0.95	0.76	-27.46	31.46	-0.36	0.41	0.14	-27.04	-37.69	-0.38	31.98	42.13	0.43	0.52	0.58
SO4	ALL	119	1.44	0.87	0.51	-39.41	45.26	-0.57	0.65	0.57	-23.83	-42.32	-0.65	45.56	56.08	0.75	0.94	0.26

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BLMO1																		
EC	WIN	25	0.21	0.18	0.11	-15.58	47.48	-0.03	0.1	0.02	14.7	-0.68	-0.18	47.45	46.08	0.56	0.15	0.01
EC	SPR	21	0.18	0.21	0.7	12.84	30.56	0.02	0.06	0	23.98	13.24	0.13	37.69	29.79	0.31	0.07	0.49
EC	SUM	28	0.21	0.23	0.68	10.41	26.46	0.02	0.06	0	12.59	7.29	0.1	28.24	26.12	0.26	0.07	0.46
EC	FAL	26	0.27	0.34	0.83	28.28	35.68	0.08	0.09	0.01	30.71	22.13	0.28	37.76	30.59	0.36	0.14	0.69
EC	ALL	100	0.22	0.24	0.6	10.2	35.18	0.02	0.08	0.01	20.22	10.41	0.1	37.5	33.04	0.35	0.11	0.36
NO3	WIN	23	2.21	2.34	0.48	5.6	43.12	0.12	0.95	2.21	32.42	11.18	0.06	55.49	38.78	0.43	1.49	0.23
NO3	SPR	21	2.09	2.32	0.9	11.25	34.71	0.23	0.72	0.83	23.14	1.77	0.11	54.52	43.82	0.35	0.94	0.81
NO3	SUM	28	0.52	0.86	0.73	63.83	89.09	0.33	0.47	0.46	53.41	12.81	0.64	89.69	66.14	0.89	0.76	0.53
NO3	FAL	26	0.96	1.59	0.92	66.36	72.58	0.63	0.69	1.35	55.12	29.82	0.66	67.98	45.76	0.73	1.32	0.84
NO3	ALL	98	1.37	1.71	0.78	25.04	50.84	0.34	0.7	1.22	42.45	14.57	0.25	68.37	49.53	0.51	1.16	0.60
OC	WIN	25	0.69	0.59	0.31	-14.63	32.85	-0.1	0.23	0.09	-0.71	-9.99	-0.17	32.45	34.55	0.38	0.32	0.10
OC	SPR	21	0.69	0.68	0.43	-2.36	42.36	-0.02	0.29	0.23	17.12	3.52	-0.02	43.85	40.64	0.43	0.48	0.19
OC	SUM	28	1.07	0.85	0.52	-20.7	33.92	-0.22	0.36	0.14	-18.29	-26.26	-0.26	32.73	38.55	0.43	0.43	0.27
OC	FAL	26	1.03	0.94	0.64	-9.25	29.81	-0.1	0.31	0.22	-1.92	-10.35	-0.1	30.49	30.92	0.33	0.48	0.41
OC	ALL	100	0.88	0.77	0.58	-13.03	33.86	-0.12	0.3	0.17	-2.2	-11.8	-0.15	34.41	36	0.39	0.43	0.33
PM-2.5	WIN	25	6.78	6.16	0.3	-9.08	38.36	-0.62	2.6	17.51	5.19	-9.43	-0.1	41.93	36.79	0.42	4.23	0.09
PM-2.5	SPR	21	7.3	7.48	0.83	2.54	25.47	0.19	1.86	6.83	9.61	0.93	0.03	29.84	26.34	0.25	2.62	0.69
PM-2.5	SUM	28	6.04	6.08	0.72	0.73	28.69	0.04	1.73	6.04	-0.3	-6.26	0.01	27.7	27.8	0.29	2.46	0.51
PM-2.5	FAL	26	6.32	6.82	0.76	7.9	30.11	0.5	1.9	9.53	11.33	4.31	0.08	29.16	25.7	0.3	3.13	0.58
PM-2.5	ALL	100	6.56	6.59	0.66	0.41	30.79	0.03	2.02	10.14	6.18	-2.8	0	32.09	29.2	0.31	3.19	0.44
SO4	WIN	23	1.03	1.03	0.04	0.26	75.73	0	0.78	2.32	17.39	-23	0	73.31	51.84	0.76	1.52	0.00
SO4	SPR	21	1.45	1.53	0.86	6.04	32.07	0.09	0.46	0.49	9.54	0.61	0.06	31.92	28.63	0.32	0.71	0.73
SO4	SUM	28	1.44	1.38	0.72	-4.11	38.28	-0.06	0.55	0.56	10.4	-1.69	-0.04	43.52	40.39	0.4	0.75	0.51
SO4	FAL	26	0.97	0.89	0.68	-7.9	37.67	-0.08	0.37	0.45	18.65	7.33	-0.09	41.63	36.05	0.41	0.68	0.46
SO4	ALL	98	1.22	1.2	0.58	-1.46	44	-0.02	0.54	0.93	14.05	-3.81	-0.01	47.53	39.41	0.45	0.97	0.34

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BOND1																		
EC	WIN	29	0.3	0.42	0.63	39.69	45.07	0.12	0.14	0.01	42.71	31.84	0.4	46.38	35.85	0.45	0.16	0.39
EC	SPR	31	0.31	0.35	0.64	15.68	33.68	0.05	0.1	0.01	28.27	18.93	0.16	39.89	33.04	0.34	0.12	0.42
EC	SUM	31	0.42	0.35	0.7	-16.24	25.03	-0.07	0.1	0.01	-5.56	-13.08	-0.19	29.35	28.43	0.3	0.13	0.49
EC	FAL	30	0.35	0.45	0.78	29.65	38.42	0.1	0.13	0.02	38.54	26.84	0.3	44.04	34.21	0.38	0.18	0.61
EC	ALL	121	0.34	0.39	0.6	14.33	34.58	0.05	0.12	0.02	25.61	15.79	0.14	39.77	32.82	0.35	0.15	0.36
NO3	WIN	27	3.73	3.02	0.76	-19.13	30.27	-0.71	1.13	2.43	-5.43	-12.91	-0.24	28.66	30.63	0.37	1.71	0.57
NO3	SPR	31	1.73	3.17	0.8	83.46	95.53	1.44	1.65	3.18	126.76	43.01	0.83	143.26	64.99	0.96	2.29	0.64
NO3	SUM	31	0.44	0.29	0.32	-33.62	65.86	-0.15	0.29	0.12	-28.56	-55.34	-0.51	58.48	75.08	0.99	0.37	0.10
NO3	FAL	27	1.07	1.75	0.74	63.75	89.89	0.68	0.96	1.74	80.92	20.56	0.64	115.45	68.74	0.9	1.49	0.55
NO3	ALL	116	1.7	2.04	0.72	19.9	59.24	0.34	1.01	2.53	43.81	-1.51	0.2	87.46	60.56	0.59	1.62	0.52
OC	WIN	29	1.1	1.43	0.58	30.05	37.4	0.33	0.41	0.17	35.76	25.84	0.3	40.86	31.36	0.37	0.53	0.34
OC	SPR	31	1.25	1.13	0.71	-9.36	31.83	-0.12	0.4	0.27	1.7	-6.12	-0.1	32.65	33.21	0.35	0.53	0.50
OC	SUM	31	1.8	1.36	0.79	-24.58	31.93	-0.44	0.57	0.33	-20.52	-30.93	-0.33	35.48	41.71	0.42	0.72	0.62
OC	FAL	30	1.15	1.03	0.83	-10.91	27.64	-0.13	0.32	0.18	-9.58	-15.21	-0.12	26.73	29.45	0.31	0.44	0.69
OC	ALL	121	1.33	1.24	0.71	-7.16	32.06	-0.1	0.43	0.31	1.37	-7.07	-0.08	33.88	34.01	0.35	0.57	0.50
PM-2.5	WIN	29	10.23	9.87	0.66	-3.45	29.03	-0.35	2.97	13.87	12.41	2.99	-0.04	34.91	30.68	0.3	3.74	0.44
PM-2.5	SPR	31	8.2	11.04	0.65	34.64	49.82	2.84	4.09	18.72	44.66	26.91	0.35	56.61	42.17	0.5	5.18	0.42
PM-2.5	SUM	31	10.95	8.8	0.89	-19.58	23.85	-2.14	2.61	7.5	-13.23	-16.59	-0.24	21.9	24.16	0.3	3.48	0.79
PM-2.5	FAL	30	6.84	8.67	0.75	26.79	42.1	1.83	2.88	10.24	35.31	24.21	0.27	44.41	35.32	0.42	3.69	0.56
PM-2.5	ALL	121	9.05	9.6	0.62	6.06	34.7	0.55	3.14	16.38	19.78	9.36	0.06	39.49	33.1	0.35	4.08	0.38
SO4	WIN	27	2.17	1.28	0.66	-40.76	43.75	-0.88	0.95	0.8	-32.81	-46.38	-0.69	38.3	51.3	0.74	1.26	0.44
SO4	SPR	31	2.17	2.17	0.61	0.25	37.56	0.01	0.81	1.3	4.38	-4.59	0	35.16	34.37	0.38	1.14	0.38
SO4	SUM	31	3.26	2.3	0.89	-29.52	34.79	-0.96	1.13	1.89	-14.72	-22.81	-0.42	32.84	36.44	0.49	1.68	0.80
SO4	FAL	27	1.83	1.69	0.5	-7.77	39.24	-0.14	0.72	1.43	18.01	1.39	-0.08	44.88	36.69	0.43	1.21	0.25
SO4	ALL	116	2.38	1.89	0.66	-20.77	38.16	-0.49	0.91	1.56	-6.21	-17.79	-0.26	37.53	39.4	0.48	1.34	0.43

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BOWA1																		
EC	WIN	27	0.08	0.17	0.82	112.88	112.88	0.09	0.09	0.01	144.2	75.81	1.13	144.2	75.81	1.13	0.12	0.67
EC	SPR	28	0.07	0.08	0.53	20.99	53.89	0.01	0.04	0	40.61	14.91	0.21	66.16	47.11	0.54	0.06	0.28
EC	SUM	29	0.14	0.08	0.18	-39.51	56.66	-0.05	0.08	0.01	-10.84	-33.16	-0.65	50.61	57.83	0.94	0.12	0.03
EC	FAL	30	0.44	1.69	0.75	285.36	313.25	1.25	1.37	21.09	135.79	11.7	2.85	180.59	78.76	3.13	4.76	0.56
EC	ALL	114	0.19	0.53	0.76	183.56	221.84	0.34	0.41	5.86	77.1	16.26	1.84	110.8	64.96	2.22	2.44	0.57
NO3	WIN	28	0.75	1.45	0.67	92.56	111.93	0.7	0.84	2.24	190.8	30.96	0.93	219.39	79.59	1.12	1.65	0.45
NO3	SPR	26	0.19	0.29	0.92	52.65	89.34	0.1	0.17	0.08	33.77	-26.18	0.53	101.47	88.54	0.89	0.31	0.84
NO3	SUM	25	0.04	0.03	0.23	-12.05	87.06	0	0.03	0	-13.54	-61.57	-0.14	79.31	80.39	0.99	0.07	0.05
NO3	FAL	26	0.48	0.81	0.93	66.94	80.94	0.32	0.39	0.29	636.03	31.28	0.67	670.03	86	0.81	0.63	0.86
NO3	ALL	105	0.38	0.67	0.79	76.81	98.64	0.29	0.37	0.77	213.51	-5.14	0.77	268.43	83.59	0.99	0.92	0.62
OC	WIN	28	0.4	0.81	0.86	100.83	100.83	0.41	0.41	0.09	178.55	74.09	1.01	178.55	74.09	1.01	0.51	0.74
OC	SPR	28	0.4	0.45	0.5	11.45	44.97	0.05	0.18	0.07	43.46	19.67	0.11	63.16	44.47	0.45	0.26	0.25
OC	SUM	29	1.63	0.72	0.36	-55.67	57.74	-0.91	0.94	1.8	-38.87	-57.23	-1.26	42.92	60.85	1.3	1.62	0.13
OC	FAL	30	6.03	8.03	0.69	33.17	113.55	2	6.85	314.13	58.23	-6.23	0.33	110	76.8	1.14	17.84	0.47
OC	ALL	115	2.18	2.58	0.71	18.53	99.41	0.4	2.17	83.57	59.44	6.77	0.19	98.37	64.25	0.99	9.15	0.50
PM-2.5	WIN	27	2.99	5.15	0.65	72.31	76.33	2.16	2.28	15.39	72.64	41.16	0.72	78.26	47.82	0.76	4.48	0.43
PM-2.5	SPR	28	2.82	3.08	0.71	8.97	28.7	0.25	0.81	1.79	12.2	4.81	0.09	30.8	27.23	0.29	1.36	0.51
PM-2.5	SUM	28	4.94	2.94	0.3	-40.56	47.58	-2	2.35	8.75	-30.93	-45.39	-0.68	39.4	51.89	0.8	3.57	0.09
PM-2.5	FAL	27	5.77	10.05	0.76	74.24	126.98	4.28	7.32	272.18	98.43	21.51	0.74	132.67	70.54	1.27	17.04	0.58
PM-2.5	ALL	110	4.13	5.26	0.68	27.53	76.64	1.14	3.16	78.66	37.22	5.06	0.28	69.64	49.19	0.77	8.94	0.46
SO4	WIN	28	0.75	0.79	0.46	5.37	58.41	0.04	0.44	0.88	11.77	-5.38	0.05	49.35	42.21	0.58	0.94	0.21
SO4	SPR	26	0.88	1.08	0.81	21.79	30.63	0.19	0.27	0.11	55.08	27.32	0.22	60.18	32.86	0.31	0.38	0.66
SO4	SUM	25	0.51	0.61	0.47	20.28	44.38	0.1	0.22	0.09	51.88	24.1	0.2	66.1	40.74	0.44	0.32	0.22
SO4	FAL	26	0.83	1.16	0.65	39.91	55.39	0.33	0.46	0.46	133.7	43.56	0.4	143.58	55.67	0.55	0.75	0.42
SO4	ALL	105	0.75	0.91	0.59	22.09	47.15	0.16	0.35	0.41	62.24	21.85	0.22	79.35	42.88	0.47	0.66	0.35

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BRIG1																		
EC	WIN	28	0.36	0.78	0.9	115.68	115.68	0.42	0.42	0.04	124.29	73.13	1.16	124.29	73.13	1.16	0.47	0.81
EC	SPR	31	0.2	0.33	0.42	60.63	82.58	0.12	0.17	0.02	111.98	54.85	0.61	123.87	70.01	0.83	0.2	0.17
EC	SUM	29	0.35	0.37	0.34	5.69	39.29	0.02	0.14	0.03	24.36	7.68	0.06	49.04	37.68	0.39	0.18	0.11
EC	FAL	29	0.27	0.47	0.81	72.14	75.19	0.2	0.21	0.1	175.52	56.35	0.72	177.86	58.99	0.75	0.38	0.66
EC	ALL	117	0.29	0.48	0.67	63.44	77.98	0.19	0.23	0.07	108.96	47.9	0.63	118.8	60.01	0.78	0.33	0.44
NO3	WIN	28	1.5	2.13	0.67	41.58	57.13	0.62	0.86	0.99	91.26	37.39	0.42	104.92	55.54	0.57	1.18	0.45
NO3	SPR	31	0.7	0.81	0.38	15.37	61.52	0.11	0.43	0.33	40.49	5.01	0.15	78.38	57.22	0.62	0.59	0.14
NO3	SUM	29	0.34	0.2	0.52	-40.94	59.91	-0.14	0.2	0.04	-31.51	-63.96	-0.69	63.52	85.36	1.01	0.24	0.27
NO3	FAL	29	0.5	1.01	0.85	101.3	131.35	0.51	0.66	2.39	68.69	9.8	1.01	111	72.42	1.31	1.63	0.72
NO3	ALL	117	0.75	1.02	0.69	35.67	70.71	0.27	0.53	1.02	41.78	-3.15	0.36	89.13	67.56	0.71	1.05	0.48
OC	WIN	28	1.33	3.24	0.8	142.99	142.99	1.91	1.91	1.55	152.63	80.85	1.43	152.63	80.85	1.43	2.28	0.64
OC	SPR	31	1.07	1.16	0.24	8.01	62.35	0.09	0.67	1.02	48.16	18.39	0.08	72.12	53.3	0.62	1.01	0.06
OC	SUM	29	2.14	1.36	0.34	-36.64	47.87	-0.78	1.02	1.56	-20.92	-37.3	-0.58	43.31	52.63	0.76	1.48	0.12
OC	FAL	29	1.11	1.36	0.58	22.75	50.39	0.25	0.56	1.74	39.32	11.04	0.23	63.32	39.84	0.5	1.34	0.33
OC	ALL	117	1.41	1.76	0.31	24.69	72.84	0.35	1.03	2.38	53.85	17.71	0.25	82.06	56.39	0.73	1.58	0.09
PM-2.5	WIN	27	7.14	12.23	0.9	71.31	71.31	5.09	5.09	8.61	81.49	54.05	0.71	81.49	54.05	0.71	5.87	0.81
PM-2.5	SPR	31	7.2	6.8	0.35	-5.58	35.59	-0.4	2.56	11.85	8.07	-1.12	-0.06	35.9	36.56	0.38	3.47	0.12
PM-2.5	SUM	29	11.21	6.96	0.7	-37.92	40.23	-4.25	4.51	17.24	-30.31	-42.43	-0.61	35.54	46.92	0.65	5.94	0.49
PM-2.5	FAL	29	5.76	7.27	0.56	26.26	47.14	1.51	2.72	31.01	26.57	13.37	0.26	42.78	32.35	0.47	5.77	0.32
PM-2.5	ALL	116	7.83	8.22	0.42	5.01	46.96	0.39	3.68	28.24	20.19	5.02	0.05	48.14	42.17	0.47	5.33	0.18
SO4	WIN	28	1.72	1.3	0.81	-24.5	30.23	-0.42	0.52	0.26	-17.36	-25.02	-0.32	30.67	34.06	0.4	0.66	0.66
SO4	SPR	31	1.99	1.62	0.83	-18.59	24.96	-0.37	0.5	0.29	-11.92	-17.91	-0.23	25.82	28.5	0.31	0.65	0.68
SO4	SUM	29	3.46	2.35	0.83	-32.15	36.38	-1.11	1.26	1.78	-22.57	-34.46	-0.47	37.03	45.35	0.54	1.74	0.69
SO4	FAL	29	1.52	1.53	0.69	0.4	33.31	0.01	0.51	0.5	16.67	5.45	0	40.14	34.89	0.33	0.71	0.47
SO4	ALL	117	2.18	1.7	0.83	-21.76	31.91	-0.47	0.69	0.86	-8.78	-17.92	-0.28	33.31	35.59	0.41	1.04	0.68

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BRIS1																		
EC	WIN	28	0.38	0.82	0.06	117.17	151.32	0.44	0.57	1.11	35279.33	30.6	1.17	35304.94	64.38	1.51	1.14	0.00
EC	SPR	30	0.32	0.35	0.49	8.78	42.94	0.03	0.14	0.05	21.52	6.13	0.09	46.63	36.81	0.43	0.23	0.24
EC	SUM	31	0.33	0.47	0.16	41.82	73.56	0.14	0.24	0.07	78.47	35.82	0.42	97.36	59.54	0.74	0.3	0.03
EC	FAL	25	0.36	0.47	0.41	30.4	61.28	0.11	0.22	0.15	58.62	15.5	0.3	84.1	46.66	0.61	0.4	0.17
EC	ALL	114	0.35	0.53	0.18	51.37	84.15	0.18	0.29	0.36	8704.95	22.27	0.51	8728.58	51.92	0.84	0.63	0.03
NO3	WIN	29	0.75	1.14	0.41	52.3	112.65	0.39	0.85	2.37	52.61	-16.44	0.52	118.61	88.69	1.13	1.59	0.17
NO3	SPR	28	0.35	0.46	0.19	32.54	120.46	0.11	0.42	0.37	34.98	-36.39	0.33	119.21	100.9	1.2	0.62	0.04
NO3	SUM	31	0.26	0.13	0.11	-49.49	87.97	-0.13	0.23	0.07	-40.28	-97.86	-0.98	86.31	117.4	1.74	0.29	0.01
NO3	FAL	25	0.31	0.52	0.21	69.86	144.33	0.22	0.44	0.45	88.26	-12.39	0.7	156.67	95.2	1.44	0.71	0.04
NO3	ALL	113	0.42	0.56	0.47	33.76	115.22	0.14	0.48	0.86	30.64	-42.83	0.34	118.32	101.03	1.15	0.94	0.22
OC	WIN	29	1.23	2.68	0.11	118.5	162.66	1.46	2	17.55	3168.79	14.87	1.19	3206.83	65.95	1.63	4.43	0.01
OC	SPR	30	1.23	1.01	0.37	-18.45	52.55	-0.23	0.65	1	-7.81	-30.54	-0.23	54.36	56.33	0.64	1.02	0.14
OC	SUM	31	1.49	1.81	0.79	20.99	46.86	0.31	0.7	0.8	29.58	11.11	0.21	55.6	46.93	0.47	0.95	0.63
OC	FAL	25	1.39	1.56	0.45	11.99	60.1	0.17	0.84	2.76	11.16	-15.21	0.12	58.25	47.25	0.6	1.67	0.20
OC	ALL	115	1.34	1.77	0.28	32.04	78.05	0.43	1.04	5.9	807.45	-4.53	0.32	850.51	54.25	0.78	2.47	0.08
PM-2.5	WIN	28	6.45	9.21	0.47	42.76	69.47	2.76	4.48	76.82	36.74	7.14	0.43	64.75	40.72	0.69	9.19	0.22
PM-2.5	SPR	28	8.61	6.56	0.22	-23.77	39.75	-2.05	3.42	17.62	-17.45	-30.47	-0.31	38.31	44.55	0.52	4.67	0.05
PM-2.5	SUM	31	10.87	6.82	0.75	-37.29	40.51	-4.06	4.41	11.28	-37.49	-54.78	-0.59	41.5	58.45	0.65	5.26	0.57
PM-2.5	FAL	25	7.12	7.31	0.26	2.64	39.69	0.19	2.83	18.64	10.27	-2.63	0.03	40.21	35.57	0.4	4.32	0.07
PM-2.5	ALL	112	8.36	7.46	0.29	-10.79	45.74	-0.9	3.83	37.58	-3.26	-21.58	-0.12	46.23	45.44	0.51	6.2	0.09
SO4	WIN	29	1.99	1.67	0.64	-16.4	37.48	-0.33	0.75	0.63	-14.3	-24.73	-0.2	38.43	42.79	0.45	0.86	0.41
SO4	SPR	28	2.9	2.2	0.48	-24.04	39.23	-0.7	1.14	1.72	-19.41	-31.1	-0.32	37.52	45.65	0.52	1.49	0.23
SO4	SUM	31	3.42	1.56	0.71	-54.28	54.28	-1.86	1.86	1.16	-56.29	-85.03	-1.19	56.29	85.03	1.19	2.15	0.50
SO4	FAL	25	2.04	1.72	0.62	-15.43	32.42	-0.31	0.66	0.76	-5.08	-12.86	-0.18	31.17	33.84	0.38	0.93	0.38
SO4	ALL	113	2.62	1.78	0.52	-31.9	43.11	-0.84	1.13	1.49	-25.04	-40.23	-0.47	41.5	53.11	0.63	1.48	0.27

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: BRMA1																		
EC	WIN	25	0.21	0.39	0.79	83.88	83.88	0.18	0.18	0.02	105.23	62.06	0.84	105.23	62.06	0.84	0.22	0.63
EC	SPR	31	0.11	0.19	0.72	66.42	72.58	0.07	0.08	0	88.22	53.31	0.66	92.15	57.74	0.73	0.1	0.52
EC	SUM	31	0.22	0.17	0.7	-22.8	32.95	-0.05	0.07	0.01	-11.1	-19.01	-0.3	31.23	35.11	0.43	0.1	0.48
EC	FAL	30	0.22	0.23	0.81	3.35	28.06	0.01	0.06	0.01	16.78	8.9	0.03	33.27	29.05	0.28	0.08	0.66
EC	ALL	117	0.19	0.23	0.64	24.73	49.98	0.05	0.09	0.02	47.22	24.63	0.25	63.71	45.31	0.5	0.13	0.41
NO3	WIN	21	0.35	1.17	0.68	232.62	237.08	0.82	0.83	0.53	347.88	104.32	2.33	353.17	111.64	2.37	1.1	0.46
NO3	SPR	30	0.12	0.36	0.57	197.34	209.28	0.24	0.26	0.08	277.34	73.38	1.97	294.06	98.04	2.09	0.37	0.33
NO3	SUM	31	0.08	0.07	0.59	-19.95	66.75	-0.02	0.06	0.01	-23.72	-55.85	-0.25	67.45	80.43	0.83	0.08	0.35
NO3	FAL	30	0.15	0.32	0.73	113.95	139.1	0.17	0.21	0.21	81.92	15.35	1.14	117.29	67.96	1.39	0.49	0.53
NO3	ALL	112	0.16	0.42	0.74	159.99	182.8	0.26	0.3	0.26	154.9	27.87	1.6	195.07	87.66	1.83	0.57	0.55
OC	WIN	25	1	2.09	0.77	108.85	108.85	1.09	1.09	0.48	133.21	72.53	1.09	133.21	72.53	1.09	1.29	0.59
OC	SPR	31	0.6	0.96	0.81	58.73	62.01	0.35	0.37	0.12	66.12	43.05	0.59	69.66	46.96	0.62	0.5	0.65
OC	SUM	31	1.5	0.93	0.49	-38.16	44.51	-0.57	0.67	1.15	-29.58	-42.46	-0.62	38.05	49.62	0.72	1.22	0.24
OC	FAL	30	1.02	1.05	0.8	2.82	30.58	0.03	0.31	0.16	16.52	6.99	0.03	36.9	32.38	0.31	0.4	0.64
OC	ALL	117	1.03	1.22	0.42	17.56	56.96	0.18	0.59	0.82	42.38	17.45	0.18	66.47	49.39	0.57	0.92	0.17
PM-2.5	WIN	25	4.23	7.71	0.84	82.5	84.69	3.49	3.58	6.49	88.55	56.73	0.83	90.98	59.59	0.85	4.32	0.70
PM-2.5	SPR	31	2.89	4.96	0.78	71.87	71.87	2.08	2.08	3.08	92.72	52.34	0.72	92.72	52.34	0.72	2.72	0.60
PM-2.5	SUM	31	6.47	4.22	0.6	-34.89	41.46	-2.26	2.68	9.92	-28.89	-41.19	-0.54	38.27	49.02	0.64	3.88	0.36
PM-2.5	FAL	30	4.18	4.58	0.74	9.36	32.24	0.39	1.35	3.6	23.69	11.69	0.09	41.17	33.73	0.32	1.94	0.55
PM-2.5	ALL	117	4.46	5.25	0.49	17.89	53.22	0.8	2.37	10.25	41.91	18.07	0.18	64.7	48.24	0.53	3.3	0.24
SO4	WIN	21	1.04	0.92	0.83	-11.19	24.46	-0.12	0.25	0.1	-0.1	-4.69	-0.13	24.69	25.08	0.28	0.34	0.68
SO4	SPR	30	0.86	1.55	0.59	79.78	85.37	0.69	0.74	1.35	161.57	46.38	0.8	166.15	51.45	0.85	1.35	0.34
SO4	SUM	31	1.36	1.47	0.65	7.97	53.48	0.11	0.73	1.13	34.72	9.03	0.08	67.55	51.1	0.53	1.07	0.42
SO4	FAL	30	1.06	1.18	0.65	11.15	40.89	0.12	0.43	0.41	45.17	15.83	0.11	65.55	40.29	0.41	0.65	0.43
SO4	ALL	112	1.09	1.31	0.57	20.64	51.76	0.22	0.56	0.89	64.97	18.28	0.21	85.39	43.42	0.52	0.97	0.32

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CABA1																		
EC	WIN	25	0.38	0.42	0.79	8.08	34.88	0.03	0.13	0.03	22.31	8.36	0.08	45.36	36.75	0.35	0.17	0.62
EC	SPR	31	0.16	0.28	0.51	77.74	87.77	0.12	0.14	0.02	120	59.4	0.78	124.41	64.64	0.88	0.17	0.26
EC	SUM	25	0.32	0.31	0.82	-0.53	25.17	0	0.08	0.01	18.46	8.21	-0.01	36.64	30.41	0.25	0.11	0.68
EC	FAL	23	0.37	0.38	0.78	1.26	28.25	0	0.11	0.02	19.79	5.6	0.01	40.07	30.49	0.28	0.15	0.61
EC	ALL	104	0.3	0.34	0.75	14.83	38.78	0.04	0.12	0.02	49.95	22.93	0.15	65.66	42.15	0.39	0.16	0.56
NO3	WIN	24	0.46	1.3	0.77	183.83	187.9	0.84	0.86	0.72	206.21	84.58	1.84	208.88	87.48	1.88	1.19	0.59
NO3	SPR	30	0.2	0.54	0.48	169.18	185.77	0.34	0.37	0.23	216.32	64.04	1.69	230.81	85.86	1.86	0.59	0.23
NO3	SUM	25	0.18	0.23	0.67	27.5	82.62	0.05	0.15	0.04	30.9	-12.04	0.28	86.07	70.88	0.83	0.22	0.45
NO3	FAL	26	0.21	0.44	0.34	105.25	140.24	0.23	0.3	0.22	132.96	28.6	1.05	167.28	80.31	1.4	0.52	0.11
NO3	ALL	105	0.26	0.61	0.72	138.62	160.27	0.36	0.41	0.38	149.22	41.85	1.39	175.6	81.29	1.6	0.71	0.52
OC	WIN	25	1.65	1.89	0.82	14.99	33.3	0.25	0.55	0.46	27.36	15.68	0.15	42.93	33.95	0.33	0.72	0.67
OC	SPR	31	0.73	1.13	0.51	54.92	76.27	0.4	0.56	0.39	72.81	40.5	0.55	84.4	55.54	0.76	0.74	0.26
OC	SUM	25	1.68	1.21	0.78	-27.56	36.02	-0.46	0.6	0.45	-26.77	-37.61	-0.38	36.22	45.03	0.5	0.82	0.60
OC	FAL	23	1.48	1.29	0.91	-12.5	20.8	-0.18	0.31	0.13	-7.14	-12.51	-0.14	25.18	27.04	0.24	0.41	0.83
OC	ALL	104	1.34	1.37	0.73	2	38.03	0.03	0.51	0.49	20.27	4.04	0.02	49.75	41.52	0.38	0.7	0.54
PM-2.5	WIN	21	5.63	7.82	0.86	38.75	44.55	2.18	2.51	7.76	38.4	27.08	0.39	44.19	33.37	0.45	3.54	0.74
PM-2.5	SPR	31	3.62	5.97	0.69	64.91	67.82	2.35	2.46	5.5	81.21	49.66	0.65	82.35	50.85	0.68	3.32	0.48
PM-2.5	SUM	24	6.98	5.61	0.77	-19.71	30.94	-1.38	2.16	6.79	-12.44	-18.98	-0.25	28.92	32.37	0.39	2.95	0.59
PM-2.5	FAL	26	5.6	5.77	0.88	3.04	24.49	0.17	1.37	2.69	14.02	6.63	0.03	33.31	29.22	0.24	1.65	0.77
PM-2.5	ALL	102	5.33	6.22	0.69	16.57	39.79	0.88	2.12	7.89	33.23	17.89	0.17	49.42	37.39	0.4	2.94	0.48
SO4	WIN	24	1.19	1.04	0.86	-12.94	25.03	-0.15	0.3	0.12	-3.94	-8.54	-0.15	26.18	27.06	0.29	0.37	0.74
SO4	SPR	30	1.09	1.71	0.67	57.57	60.66	0.63	0.66	1.09	89.09	37.39	0.58	92.53	41.16	0.61	1.22	0.45
SO4	SUM	25	1.17	1.53	0.65	30.12	55.65	0.35	0.65	1.06	51.78	22.69	0.3	73.23	48.05	0.56	1.09	0.42
SO4	FAL	26	1.18	1.34	0.69	13.28	43.95	0.16	0.52	0.49	34.45	14.77	0.13	56.8	42.26	0.44	0.72	0.48
SO4	ALL	105	1.16	1.42	0.63	23.06	46.8	0.27	0.54	0.79	45.41	17.79	0.23	63.92	39.85	0.47	0.93	0.40

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CACO1																		
EC	WIN	27	0.16	0.28	0.91	78.21	78.9	0.12	0.12	0.03	89.05	53.99	0.78	89.89	54.86	0.79	0.2	0.83
EC	SPR	31	0.11	0.18	0.62	63.27	84.32	0.07	0.09	0.01	145.24	61.38	0.63	152.85	71.01	0.84	0.12	0.38
EC	SUM	26	0.23	0.27	0.91	20.44	31.23	0.05	0.07	0.01	33.18	25.05	0.2	39	31.35	0.31	0.09	0.83
EC	FAL	30	0.18	0.24	0.92	31.9	42.91	0.06	0.08	0.01	112.51	43.29	0.32	120.28	52.01	0.43	0.1	0.85
EC	ALL	114	0.17	0.24	0.83	44.24	54.73	0.07	0.09	0.01	97.76	46.58	0.44	103.4	53.14	0.55	0.13	0.69
NO3	WIN	23	0.6	1.08	0.84	80.75	98.32	0.48	0.59	0.44	130.02	44.92	0.81	153.82	82.81	0.98	0.82	0.71
NO3	SPR	31	0.31	0.64	0.48	101.9	142.44	0.32	0.45	0.52	122.9	18.52	1.02	166.46	82.38	1.42	0.79	0.23
NO3	SUM	25	0.26	0.21	0.56	-16.85	70.91	-0.04	0.18	0.05	-10.71	-52.89	-0.2	78.94	88.98	0.85	0.22	0.32
NO3	FAL	13	0.37	0.64	0.94	69.4	89.21	0.26	0.33	0.27	26.11	-6.32	0.69	73	72.57	0.89	0.58	0.88
NO3	ALL	92	0.38	0.63	0.76	67.14	104.38	0.25	0.39	0.37	74.7	2.2	0.67	126.31	82.89	1.04	0.66	0.58
OC	WIN	27	0.7	1.06	0.96	51.5	52.85	0.36	0.37	0.27	43.54	31.02	0.52	46.36	34.28	0.53	0.63	0.91
OC	SPR	31	0.62	0.69	0.72	10.03	41.89	0.06	0.26	0.18	30.72	18.09	0.1	43.95	34.42	0.42	0.43	0.52
OC	SUM	26	1.48	1.2	0.87	-18.96	29.68	-0.28	0.44	0.27	-25.95	-38.81	-0.23	37.21	47.99	0.37	0.59	0.75
OC	FAL	30	0.89	0.76	0.89	-14.9	28.85	-0.13	0.26	0.1	-22.06	-34.32	-0.18	35.27	43.46	0.34	0.35	0.79
OC	ALL	114	0.91	0.91	0.8	0.42	35.99	0	0.33	0.26	6.94	-5.62	0	40.7	39.86	0.36	0.51	0.64
PM-2.5	WIN	29	4.75	5.79	0.9	21.81	30.61	1.04	1.45	4.45	17.26	12.69	0.22	26.45	23.09	0.31	2.35	0.82
PM-2.5	SPR	31	5.03	5.7	0.66	13.42	35.9	0.67	1.81	6.45	28.24	9.65	0.13	48.25	34.22	0.36	2.63	0.43
PM-2.5	SUM	26	7.42	6.54	0.84	-11.87	25.44	-0.88	1.89	5.33	-9.15	-15.36	-0.13	27.01	30.52	0.29	2.47	0.70
PM-2.5	FAL	30	5.03	4.89	0.87	-2.88	24.15	-0.14	1.22	2.53	-5.87	-12.34	-0.03	25.84	29.32	0.25	1.6	0.75
PM-2.5	ALL	116	5.5	5.7	0.78	3.73	28.81	0.2	1.58	5.21	8.29	-0.88	0.04	32.24	29.34	0.29	2.29	0.60
SO4	WIN	23	1.22	0.97	0.82	-19.96	26.85	-0.24	0.33	0.14	-13.64	-18.43	-0.25	24.36	27.45	0.34	0.45	0.67
SO4	SPR	31	1.41	1.91	0.76	35.94	46.45	0.51	0.65	0.63	47.83	26.01	0.36	58.16	38.03	0.46	0.94	0.58
SO4	SUM	25	1.81	2.28	0.75	25.94	49.94	0.47	0.91	1.24	48.73	22.69	0.26	68.93	48.16	0.5	1.21	0.57
SO4	FAL	13	1.35	1.17	0.94	-13.15	23.59	-0.18	0.32	0.12	-4.25	-12.32	-0.15	31.47	31	0.27	0.39	0.88
SO4	ALL	92	1.46	1.67	0.76	14.52	40.56	0.21	0.59	0.72	25.35	8.59	0.15	48.86	37.14	0.41	0.87	0.58

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CACR1																		
EC	WIN	29	0.23	0.38	0.69	65.38	71.91	0.15	0.16	0.03	93.51	48.72	0.65	99.46	55.45	0.72	0.22	0.47
EC	SPR	31	0.27	0.35	0.48	27.39	66.83	0.08	0.18	0.14	29.69	0.43	0.27	64.81	48.55	0.67	0.38	0.23
EC	SUM	30	0.23	0.22	0.25	-4.54	46.58	-0.01	0.11	0.02	18.28	-4.25	-0.05	54.63	41.23	0.49	0.16	0.06
EC	FAL	25	0.23	0.3	0.51	28.7	45.59	0.07	0.11	0.03	29.91	15.44	0.29	45.8	34.48	0.46	0.18	0.26
EC	ALL	115	0.24	0.31	0.46	28.56	58.52	0.07	0.14	0.06	42.86	14.65	0.29	66.76	45.32	0.59	0.25	0.21
NO3	WIN	14	1.37	0.89	0.56	-35.22	53.97	-0.48	0.74	1.37	174.37	-24.53	-0.54	242.21	70.66	0.83	1.27	0.31
NO3	SPR	13	0.35	0.24	0.31	-32.45	62.6	-0.11	0.22	0.06	-27.98	-63.31	-0.48	67.79	88.08	0.93	0.27	0.09
NO3	SUM	31	0.24	0.03	0.36	-87.97	87.97	-0.21	0.21	0.02	-83.15	-145.84	-7.31	83.15	145.84	7.31	0.26	0.13
NO3	FAL	27	0.42	0.37	0.63	-11.24	70.64	-0.05	0.3	0.24	-22.88	-66.78	-0.13	78.53	91.66	0.8	0.5	0.40
NO3	ALL	85	0.5	0.31	0.64	-37.64	65.22	-0.19	0.33	0.34	-13.15	-88.12	-0.6	105.53	107.41	1.05	0.61	0.41
OC	WIN	29	1.16	1.51	0.66	30.67	51.32	0.36	0.59	0.66	57.56	24.31	0.31	73.71	42.86	0.51	0.89	0.44
OC	SPR	31	1.7	1.69	0.56	-0.51	59.69	-0.01	1.01	2.63	7.27	-19.34	-0.01	63.09	58.2	0.6	1.62	0.32
OC	SUM	30	2.07	3.15	0.53	52.64	59.68	1.09	1.23	2.6	59.22	29.63	0.53	70.91	44.62	0.6	1.95	0.28
OC	FAL	25	1.38	1.47	0.76	6.84	31.14	0.09	0.43	0.45	5.96	-1.28	0.07	29.72	28.24	0.31	0.68	0.57
OC	ALL	115	1.59	1.98	0.62	24.63	52.76	0.39	0.84	1.84	33.22	8.37	0.25	60.55	44.28	0.53	1.41	0.38
PM-2.5	WIN	29	6.04	7.66	0.59	26.79	49.9	1.62	3.02	11.87	56.77	22.94	0.27	73.75	44.74	0.5	3.81	0.34
PM-2.5	SPR	31	8.3	7.83	0.51	-5.67	41.95	-0.47	3.48	23.5	-0.38	-12.23	-0.06	41.01	40.37	0.44	4.87	0.26
PM-2.5	SUM	29	10.21	8.72	0.65	-14.64	31.1	-1.5	3.18	12.56	-13.92	-23.92	-0.17	33.94	39.65	0.36	3.85	0.42
PM-2.5	FAL	27	6.11	6.63	0.78	8.55	25.65	0.52	1.57	3.92	12.66	5.65	0.09	30.04	26.3	0.26	2.05	0.61
PM-2.5	ALL	116	7.7	7.73	0.59	0.35	36.91	0.03	2.84	14.64	13.56	-2.2	0	44.88	38.01	0.37	3.83	0.34
SO4	WIN	14	1.07	0.97	0.21	-9.84	55.09	-0.11	0.59	0.71	78.72	-6.85	-0.11	124.07	54.47	0.61	0.85	0.05
SO4	SPR	13	2.03	1.88	0.78	-7.46	26.36	-0.15	0.54	0.54	7.59	0.77	-0.08	29.45	29.66	0.28	0.75	0.62
SO4	SUM	31	2.72	1.36	0.7	-50.21	50.21	-1.37	1.37	0.68	-47.85	-67.06	-1.01	47.85	67.06	1.01	1.6	0.49
SO4	FAL	27	1.59	1.57	0.93	-1.38	18.42	-0.02	0.29	0.16	9.89	1.7	-0.01	27.88	22.85	0.19	0.4	0.86
SO4	ALL	85	1.99	1.44	0.63	-27.5	38.82	-0.55	0.77	0.89	-0.18	-24.92	-0.38	51.25	45.22	0.54	1.09	0.40

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CEBL1																		
EC	WIN	26	0.11	0.15	0.65	46.44	51.42	0.05	0.05	0.01	88.2	42.81	0.46	91.35	46.3	0.51	0.1	0.42
EC	SPR	29	0.17	0.21	0.82	24.17	46.28	0.04	0.08	0.02	23.4	8.07	0.24	47.63	37.97	0.46	0.13	0.67
EC	SUM	31	0.15	0.18	0.6	18.2	36.36	0.03	0.06	0	27.4	16.63	0.18	40.51	32.83	0.36	0.07	0.36
EC	FAL	30	0.14	0.15	0.37	9.67	35.88	0.01	0.05	0.01	24.65	10.84	0.1	40.34	31.42	0.36	0.09	0.14
EC	ALL	116	0.14	0.18	0.68	22.49	41.66	0.03	0.06	0.01	39.32	18.86	0.22	53.64	36.77	0.42	0.1	0.47
NO3	WIN	24	1.45	1.31	0.76	-9.2	40.62	-0.13	0.59	0.69	11.46	-4.64	-0.1	50.16	47.35	0.45	0.84	0.58
NO3	SPR	27	1	1.11	0.95	11.52	37.62	0.12	0.38	0.26	-11.33	-37.66	0.12	55.29	69.13	0.38	0.53	0.90
NO3	SUM	28	0.31	0.16	0.8	-47.01	57.9	-0.14	0.18	0.02	-56.73	-98.29	-0.89	67.46	105.33	1.09	0.2	0.63
NO3	FAL	30	0.37	0.33	0.74	-10.31	53.34	-0.04	0.2	0.06	-20.89	-46.33	-0.11	58.69	73.27	0.59	0.25	0.55
NO3	ALL	109	0.75	0.7	0.88	-6.47	43.17	-0.05	0.32	0.25	-20.61	-48.35	-0.07	58.22	74.77	0.46	0.5	0.78
OC	WIN	26	0.4	0.53	0.36	30.25	60.89	0.12	0.25	0.2	83.21	16.01	0.3	110.68	50.14	0.61	0.46	0.13
OC	SPR	29	1.02	0.77	0.7	-24.53	46.29	-0.25	0.47	0.52	-17.62	-34.5	-0.32	45.97	55.18	0.61	0.76	0.49
OC	SUM	31	1.3	1.17	0.68	-10.3	33.95	-0.13	0.44	0.25	-11.36	-20.08	-0.11	34.71	39.04	0.38	0.52	0.46
OC	FAL	30	0.71	0.5	0.42	-28.75	46.02	-0.2	0.32	0.29	-4.52	-29.05	-0.4	54.84	50.38	0.65	0.58	0.18
OC	ALL	116	0.88	0.75	0.65	-14.09	42.85	-0.12	0.38	0.34	10.04	-17.91	-0.16	59.76	48.5	0.5	0.59	0.42
PM-2.5	WIN	26	4.01	4.53	0.86	12.97	28.5	0.52	1.14	2.16	30.5	18.91	0.13	40.91	31.09	0.28	1.56	0.73
PM-2.5	SPR	29	5.86	5.21	0.71	-11.06	36.73	-0.65	2.15	10.19	-5.39	-18.9	-0.12	41.27	45.74	0.41	3.26	0.51
PM-2.5	SUM	31	7.02	5.07	0.61	-27.85	33.85	-1.96	2.38	4.33	-26.49	-35.34	-0.39	33.08	41.02	0.47	2.85	0.37
PM-2.5	FAL	30	3.72	3.59	0.49	-3.72	33.72	-0.14	1.26	3.78	8.26	-3.23	-0.04	37.31	33.95	0.35	1.95	0.24
PM-2.5	ALL	116	5.2	4.6	0.69	-11.6	33.71	-0.6	1.75	5.99	0.55	-10.77	-0.13	37.97	38.15	0.38	2.52	0.48
SO4	WIN	24	0.86	0.75	0.83	-12.12	34.47	-0.1	0.3	0.21	19.46	1.97	-0.14	49.56	40.71	0.39	0.47	0.68
SO4	SPR	27	1.19	0.92	0.74	-22.71	31.2	-0.27	0.37	0.27	-15.83	-24.92	-0.29	30.51	36.66	0.4	0.59	0.55
SO4	SUM	28	1.53	1.03	0.66	-32.83	36.88	-0.5	0.57	0.28	-30.41	-41.15	-0.49	35.68	45.59	0.55	0.73	0.43
SO4	FAL	30	0.74	0.72	0.83	-2.84	29.87	-0.02	0.22	0.09	13.13	4.09	-0.03	37.52	34.94	0.31	0.3	0.69
SO4	ALL	109	1.08	0.86	0.76	-20.8	33.59	-0.22	0.36	0.25	-3.84	-15.18	-0.26	37.96	39.37	0.42	0.54	0.58

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CHAS1																		
EC	WIN	29	0.48	0.51	0.61	7.56	39.22	0.04	0.19	0.09	25.04	11.8	0.08	42.95	36.45	0.39	0.31	0.37
EC	SPR	31	0.33	0.36	0.78	8.53	25.79	0.03	0.08	0.01	21.1	11.65	0.09	36.01	29.33	0.26	0.11	0.60
EC	SUM	26	0.21	0.29	0.12	38.39	69.36	0.08	0.14	0.04	60.54	25.45	0.38	80.48	51.51	0.69	0.22	0.01
EC	FAL	30	0.37	0.31	0.43	-14.55	42.83	-0.05	0.16	0.06	7.71	-3.34	-0.17	37.9	36.91	0.5	0.25	0.18
EC	ALL	116	0.35	0.37	0.57	5.92	40.86	0.02	0.14	0.05	27.46	10.9	0.06	48.2	38.04	0.41	0.23	0.33
NO3	WIN	29	0.4	0.72	0.51	80.24	124.2	0.32	0.49	0.53	76.81	8.86	0.8	124.46	81.95	1.24	0.8	0.26
NO3	SPR	31	0.32	0.36	0.55	13.28	79.35	0.04	0.25	0.13	17.9	-21.31	0.13	80.8	71.82	0.79	0.36	0.30
NO3	SUM	26	0.22	0.24	0.23	8.94	101.41	0.02	0.23	0.09	22.47	-46.36	0.09	112.52	96.86	1.01	0.31	0.05
NO3	FAL	30	0.25	0.43	0.66	69.89	138.25	0.18	0.35	0.28	42.84	-18.3	0.7	113.31	91.72	1.38	0.56	0.43
NO3	ALL	116	0.3	0.44	0.56	47.16	110.82	0.14	0.33	0.27	40.1	-18.6	0.47	107.23	85.11	1.11	0.54	0.31
OC	WIN	29	1.95	1.95	0.83	-0.07	35.92	0	0.7	1.51	12.55	1.45	0	37.41	33.1	0.36	1.23	0.70
OC	SPR	31	1.5	1.36	0.74	-9.37	31.8	-0.14	0.48	0.31	-7.66	-16.27	-0.1	35.49	35.93	0.35	0.58	0.55
OC	SUM	26	1.3	1.22	0.17	-6.43	56.13	-0.08	0.73	1.35	-0.36	-22.35	-0.07	53.49	50.65	0.6	1.16	0.03
OC	FAL	30	1.5	1.2	0.53	-19.51	46.46	-0.29	0.69	0.77	-17.75	-31.97	-0.24	42.04	49.93	0.58	0.92	0.28
OC	ALL	116	1.57	1.43	0.69	-8.43	41.24	-0.13	0.65	0.97	-3.58	-17.26	-0.09	41.7	42.14	0.45	0.99	0.47
PM-2.5	WIN	29	7.71	8.98	0.81	16.56	32.67	1.28	2.52	9.36	24.11	13.97	0.17	38.82	31.2	0.33	3.32	0.66
PM-2.5	SPR	31	7.65	7.26	0.78	-5.11	18.94	-0.39	1.45	2.9	-4.27	-7.32	-0.05	20.15	21.03	0.2	1.75	0.60
PM-2.5	SUM	26	7.8	4.91	0.12	-37.05	47.02	-2.89	3.67	16.91	-30.16	-47.02	-0.59	42.97	54.24	0.75	5.03	0.02
PM-2.5	FAL	28	6.27	6.28	0.61	0.21	34.54	0.01	2.16	7.6	3.46	-6.78	0	37.78	36.7	0.35	2.76	0.38
PM-2.5	ALL	114	7.36	6.92	0.6	-5.95	32.65	-0.44	2.4	11.06	-1.06	-10.83	-0.06	34.44	35.04	0.35	3.35	0.36
SO4	WIN	29	2.07	2.04	0.58	-1.47	35.64	-0.03	0.74	0.96	14.13	1.75	-0.01	40.24	34.08	0.36	0.98	0.34
SO4	SPR	31	2.18	1.97	0.47	-9.7	30.64	-0.21	0.67	0.66	-4.85	-12.01	-0.11	30.94	31.79	0.34	0.84	0.22
SO4	SUM	26	2.06	0.85	0.56	-58.51	61.36	-1.2	1.26	1.3	-54.99	-83.5	-1.41	58.67	86.47	1.48	1.66	0.31
SO4	FAL	30	1.48	1.38	0.69	-7.2	36.42	-0.11	0.54	0.55	-3.79	-15	-0.08	36.65	40.98	0.39	0.75	0.47
SO4	ALL	116	1.95	1.58	0.51	-18.59	40.39	-0.36	0.79	1.06	-11.07	-25.37	-0.23	40.96	47	0.5	1.09	0.26

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CLPE1																		
EC	WIN	21	0.02	0.03	0.76	48.69	70.31	0.01	0.02	0	336.37	63.69	0.49	341.55	69.93	0.7	0.02	0.57
EC	SPR	29	0.03	0.03	0.53	10.93	58.24	0	0.02	0	338.39	37.5	0.11	360.18	66.09	0.58	0.02	0.28
EC	SUM	23	0.12	0.19	0.13	51.76	112.26	0.06	0.14	0.22	50.93	-25.9	0.52	107.05	49.01	1.12	0.47	0.02
EC	FAL	26	0.1	0.14	0.79	41.72	60.38	0.04	0.06	0.01	54.57	14.59	0.42	84.34	52.99	0.6	0.11	0.62
EC	ALL	99	0.07	0.1	0.37	42.8	83.29	0.03	0.06	0.05	196.64	22.31	0.43	224.98	59.5	0.83	0.23	0.14
NO3	WIN	24	0.07	0.13	0.66	86.11	122.96	0.06	0.09	0.06	111.83	-14.63	0.86	181.99	97.79	1.23	0.25	0.43
NO3	SPR	29	0.13	0.11	0.13	-11.56	109.72	-0.01	0.14	0.05	173.86	-43.35	-0.13	267.27	104.75	1.24	0.22	0.02
NO3	SUM	21	0.07	0.02	0.05	-73.54	77.85	-0.05	0.06	0	-66.82	-110.59	-2.78	72.63	115.04	2.94	0.07	0.00
NO3	FAL	25	0.07	0.03	0.69	-50.52	68.42	-0.03	0.05	0	-52.18	-86.04	-1.02	62.89	94.62	1.38	0.06	0.48
NO3	ALL	99	0.09	0.08	0.35	-10.7	98.64	-0.01	0.09	0.03	50.69	-61.43	-0.12	153.7	102.69	1.1	0.18	0.13
OC	WIN	21	0.12	0.11	0.55	-3.54	61.43	0	0.07	0.01	143.91	24.5	-0.04	180.52	74.76	0.64	0.09	0.30
OC	SPR	29	0.14	0.11	0.57	-19.34	46.05	-0.03	0.06	0.01	43.96	-0.9	-0.24	81.92	50.53	0.57	0.1	0.33
OC	SUM	23	1.12	1.08	0.35	-2.81	82.15	-0.03	0.92	4.89	-17.35	-52.52	-0.03	66.83	65.45	0.85	2.21	0.12
OC	FAL	25	0.75	0.71	0.75	-5.97	53.54	-0.04	0.4	0.35	14.52	-12.82	-0.06	69.01	64.14	0.57	0.59	0.56
OC	ALL	98	0.52	0.49	0.49	-5.3	67.78	-0.03	0.35	1.24	43.48	-10.61	-0.06	96.21	62.7	0.72	1.11	0.24
PM-2.5	WIN	26	0.88	0.97	0.71	10.07	38.1	0.09	0.34	0.28	30.52	17.8	0.1	44.13	34.55	0.38	0.53	0.50
PM-2.5	SPR	30	1.94	1.38	0.63	-28.71	46.47	-0.56	0.9	3.13	0.13	-14.29	-0.4	42.11	42.73	0.65	1.85	0.40
PM-2.5	SUM	23	3.95	3.1	0.41	-21.64	68.27	-0.86	2.7	22.78	-29.64	-56.53	-0.28	61.48	67.78	0.87	4.85	0.17
PM-2.5	FAL	26	2.66	2.37	0.8	-11.15	36.25	-0.3	0.97	1.58	-3.29	-13.65	-0.13	39.49	39.94	0.41	1.29	0.64
PM-2.5	ALL	105	2.3	1.9	0.47	-17.33	50.96	-0.4	1.17	6.46	0.29	-15.44	-0.21	46.21	45.5	0.62	2.57	0.22
SO4	WIN	24	0.23	0.34	0.42	47.96	87.02	0.11	0.2	0.06	141.69	62	0.48	150.33	73.75	0.87	0.27	0.17
SO4	SPR	30	0.47	0.49	0.67	3.18	45.12	0.02	0.21	0.1	81.71	17.26	0.03	105.91	48.2	0.45	0.32	0.45
SO4	SUM	21	0.51	0.34	0.57	-33.38	34.72	-0.17	0.18	0.01	-33.28	-42.28	-0.5	34.33	43.28	0.52	0.2	0.33
SO4	FAL	25	0.4	0.44	0.59	8.97	31.91	0.04	0.13	0.03	19.33	6.83	0.09	41.16	32.22	0.32	0.16	0.34
SO4	ALL	100	0.4	0.41	0.58	1.21	44.91	0	0.18	0.06	56.36	12.89	0.01	85.35	49.3	0.45	0.25	0.33

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: COHU1																		
EC	WIN	23	0.25	0.39	0.93	54.36	56.91	0.14	0.14	0.02	68.47	45.21	0.54	70.42	47.29	0.57	0.2	0.86
EC	SPR	23	0.34	0.34	0.91	-0.3	23.46	0	0.08	0.01	13.81	5.67	0	33.04	28.65	0.24	0.1	0.82
EC	SUM	26	0.27	0.22	0.59	-18.95	28.17	-0.05	0.08	0.01	-12.06	-18.23	-0.23	28.27	30.11	0.35	0.1	0.35
EC	FAL	25	0.23	0.26	0.59	11.94	33.05	0.03	0.08	0.01	59.26	16.21	0.12	73.37	33.02	0.33	0.1	0.34
EC	ALL	97	0.27	0.3	0.8	9.44	34.21	0.03	0.09	0.02	31.55	11.36	0.09	51.02	34.59	0.34	0.13	0.65
NO3	WIN	23	0.59	0.79	0.56	34.52	62.49	0.2	0.37	0.26	48.14	16.78	0.35	72.7	50.43	0.62	0.55	0.31
NO3	SPR	20	0.4	0.52	0.19	30.27	83.3	0.12	0.33	0.57	36.9	-22.89	0.3	95.94	57.66	0.83	0.77	0.04
NO3	SUM	26	0.12	0.11	0.28	-7.47	62.01	-0.01	0.08	0.02	-4.46	-36.79	-0.08	65.14	63.18	0.67	0.14	0.08
NO3	FAL	25	0.22	0.37	0.38	71.26	109.48	0.16	0.24	0.15	102.39	21.68	0.71	137.31	72.27	1.09	0.42	0.14
NO3	ALL	94	0.32	0.44	0.54	35.55	76.41	0.11	0.25	0.24	45.63	-5.17	0.36	92.74	61.31	0.76	0.5	0.29
OC	WIN	23	1.18	1.37	0.91	16.29	36.62	0.19	0.43	0.55	15.26	7.97	0.16	31.78	27.5	0.37	0.77	0.84
OC	SPR	23	2.28	1.6	0.81	-29.56	36.53	-0.67	0.83	1.21	-6.52	-18.12	-0.42	38.99	40.12	0.52	1.29	0.65
OC	SUM	26	2.23	2.11	0.75	-5.32	25.8	-0.12	0.57	0.6	-5.52	-10.86	-0.06	26.55	27.84	0.27	0.78	0.57
OC	FAL	25	1.19	1.16	0.73	-3.06	39.41	-0.04	0.47	0.7	-5.86	-15.21	-0.03	34.39	36.21	0.41	0.84	0.53
OC	ALL	97	1.72	1.57	0.75	-9	33.35	-0.16	0.58	0.85	-0.92	-9.24	-0.1	32.76	32.83	0.37	0.94	0.56
PM-2.5	WIN	23	4.79	6.47	0.88	35.1	42.62	1.68	2.04	5.81	50.97	30.2	0.35	56.74	36.7	0.43	2.94	0.77
PM-2.5	SPR	23	10.05	7.83	0.64	-22.14	34.27	-2.23	3.44	16.51	-3.83	-16.09	-0.28	38.24	37.59	0.44	4.63	0.40
PM-2.5	SUM	26	11.12	8.08	0.72	-27.35	30.86	-3.04	3.43	8.04	-26.26	-33.32	-0.38	30.07	36.55	0.42	4.16	0.52
PM-2.5	FAL	25	5.48	5.7	0.83	4.01	25.5	0.22	1.4	3.73	15.55	7.26	0.04	33.2	28.86	0.26	1.94	0.69
PM-2.5	ALL	97	7.91	7.02	0.72	-11.22	32.61	-0.89	2.58	11.95	8.15	-3.72	-0.13	39.14	34.85	0.37	3.57	0.51
SO4	WIN	23	1.35	1.32	0.62	-2.59	37.12	-0.04	0.5	0.38	18.65	4.07	-0.03	47.41	39.93	0.38	0.61	0.38
SO4	SPR	20	2.47	2.24	0.51	-9.4	33.92	-0.23	0.84	0.97	3.63	-5.93	-0.1	37.73	37.85	0.37	1.01	0.26
SO4	SUM	26	3.49	2.35	0.62	-32.64	36.01	-1.14	1.26	1.11	-30.3	-40.4	-0.48	34.18	43.97	0.53	1.55	0.39
SO4	FAL	25	1.52	1.58	0.78	3.57	29.32	0.05	0.45	0.47	19.15	9.26	0.04	34.49	28.57	0.29	0.69	0.60
SO4	ALL	94	2.23	1.87	0.71	-16.12	34.47	-0.36	0.77	0.97	2.05	-8.98	-0.19	38.26	37.59	0.41	1.05	0.50

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: CRES1																		
EC	WIN	26	0.07	0.13	0.59	94.31	98.46	0.06	0.06	0	139.66	63.91	0.94	142.39	67.24	0.98	0.09	0.35
EC	SPR	31	0.14	0.14	0.79	0.23	47.19	0	0.07	0.01	26.3	7.93	0	53.4	44.5	0.47	0.11	0.62
EC	SUM	31	0.12	0.14	0.62	14.34	34.7	0.02	0.04	0	23.24	11.3	0.14	40.25	32.75	0.35	0.06	0.38
EC	FAL	30	0.09	0.14	0.77	54.37	58.55	0.05	0.05	0	71.68	44.23	0.54	76.01	49.17	0.59	0.06	0.60
EC	ALL	118	0.11	0.14	0.71	28.81	52.68	0.03	0.06	0.01	62.01	30.38	0.29	75.3	47.61	0.53	0.08	0.50
NO3	WIN	26	0.78	0.71	0.88	-8.1	35.87	-0.06	0.28	0.17	23.12	-2.22	-0.09	62.73	48.18	0.39	0.41	0.77
NO3	SPR	31	0.85	1.01	0.68	18.19	67.45	0.16	0.58	1.37	31.61	-4.67	0.18	78.6	62.4	0.67	1.18	0.46
NO3	SUM	31	0.2	0.13	0.26	-31.7	96.66	-0.06	0.19	0.1	-16.12	-92.67	-0.46	108.31	112.05	1.42	0.32	0.07
NO3	FAL	30	0.21	0.29	0.92	39.29	71.54	0.08	0.15	0.05	30.63	-14.36	0.39	88.45	68.36	0.72	0.23	0.85
NO3	ALL	118	0.5	0.53	0.74	6.33	60.1	0.03	0.3	0.44	16.95	-29.71	0.06	85.41	73.83	0.6	0.67	0.54
OC	WIN	26	0.27	0.29	0.23	8	54.65	0.02	0.15	0.06	16.78	-6.13	0.08	53.73	43.42	0.55	0.25	0.05
OC	SPR	31	0.76	0.46	0.71	-38.84	53.88	-0.3	0.41	0.5	-31.29	-53.07	-0.64	52	67.61	0.88	0.77	0.50
OC	SUM	31	1.03	0.72	0.54	-30.44	36.48	-0.31	0.38	0.19	-30.39	-42.95	-0.44	36.27	47.92	0.52	0.54	0.29
OC	FAL	30	0.5	0.43	0.74	-14.6	34.46	-0.07	0.17	0.04	-0.12	-15.12	-0.17	44.84	44.62	0.4	0.22	0.55
OC	ALL	118	0.66	0.48	0.69	-26.45	43	-0.17	0.28	0.23	-12.54	-30.42	-0.36	46.43	51.26	0.58	0.51	0.47
PM-2.5	WIN	26	2.59	2.64	0.67	1.89	36.19	0.05	0.94	1.62	20.44	5.1	0.02	45.61	36.77	0.36	1.27	0.45
PM-2.5	SPR	31	4.56	4.07	0.56	-10.88	52.6	-0.5	2.4	19.57	-5.88	-22.35	-0.12	47.05	51.09	0.59	4.45	0.32
PM-2.5	SUM	31	4.82	3.33	0.57	-30.83	38.83	-1.49	1.87	2.75	-30.74	-43	-0.45	38.74	49.61	0.56	2.23	0.32
PM-2.5	FAL	29	3.08	2.67	0.6	-13.29	29.84	-0.41	0.92	1.76	-0.08	-8.55	-0.15	32.26	32.28	0.34	1.39	0.36
PM-2.5	ALL	117	3.83	3.21	0.58	-16.1	40.99	-0.62	1.57	7.02	-5.18	-18.3	-0.19	40.86	42.85	0.49	2.72	0.34
SO4	WIN	26	0.57	0.48	0.48	-15.41	40.47	-0.09	0.23	0.13	14.93	1.09	-0.18	43.65	40.7	0.48	0.37	0.23
SO4	SPR	31	0.88	0.85	0.5	-3.12	51.18	-0.03	0.45	0.81	7.77	-11.97	-0.03	48.64	45.7	0.53	0.9	0.25
SO4	SUM	31	0.93	0.74	0.54	-20.36	39.04	-0.19	0.36	0.17	-19.16	-28.8	-0.26	36.86	42.91	0.49	0.45	0.29
SO4	FAL	30	0.54	0.54	0.75	0.13	29.75	0	0.16	0.04	15.33	5.42	0	37.89	32.92	0.3	0.21	0.56
SO4	ALL	118	0.74	0.66	0.53	-10.31	41.38	-0.08	0.31	0.3	4.19	-9.09	-0.12	41.71	40.62	0.46	0.56	0.28

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: DOSO1																		
EC	WIN	29	0.23	0.27	0.63	18.65	37.17	0.04	0.09	0.02	37.17	15.77	0.19	51.79	32.59	0.37	0.14	0.40
EC	SPR	31	0.2	0.16	0.46	-23.35	38.74	-0.05	0.08	0.01	-14.28	-27.76	-0.3	39.21	46.15	0.51	0.11	0.21
EC	SUM	30	0.23	0.15	0.62	-32.66	36.17	-0.07	0.08	0	-28.81	-38.66	-0.49	34.75	43.27	0.54	0.1	0.38
EC	FAL	29	0.22	0.17	0.69	-20.55	32.12	-0.04	0.07	0.01	-12.31	-21.91	-0.26	32.71	37.59	0.4	0.1	0.47
EC	ALL	119	0.22	0.19	0.55	-14.39	36.07	-0.03	0.08	0.01	-4.92	-18.47	-0.17	39.57	40.03	0.42	0.12	0.30
NO3	WIN	29	0.56	0.8	0.62	41.08	85.52	0.23	0.48	0.34	154.84	27.65	0.41	195.04	88.06	0.86	0.62	0.38
NO3	SPR	31	0.4	0.43	0.71	7.39	76.74	0.03	0.3	0.25	16.81	-42.28	0.07	98.08	91.95	0.77	0.5	0.51
NO3	SUM	30	0.13	0.07	0.55	-49.19	52.94	-0.06	0.07	0	-47.08	-70.91	-0.97	50.43	73.99	1.04	0.09	0.30
NO3	FAL	29	0.3	0.25	0.44	-19.22	71.66	-0.06	0.22	0.11	97.38	-24.73	-0.24	164.86	83.21	0.89	0.34	0.20
NO3	ALL	119	0.35	0.38	0.67	9.73	76.9	0.03	0.27	0.19	53.98	-28.18	0.1	125.97	84.34	0.77	0.43	0.45
OC	WIN	29	1.09	0.96	0.61	-11.88	40.22	-0.13	0.44	0.4	9.36	-14.12	-0.13	54.9	43.79	0.46	0.65	0.37
OC	SPR	31	1.22	0.72	0.64	-41.08	43.88	-0.5	0.54	0.33	-34.89	-52.81	-0.7	42.12	57.74	0.74	0.76	0.42
OC	SUM	30	1.42	1.19	0.46	-16.57	34.15	-0.24	0.49	0.6	-5.15	-16.13	-0.2	35.42	35.94	0.41	0.81	0.21
OC	FAL	29	0.91	0.74	0.77	-18.71	40.66	-0.17	0.37	0.26	-22.18	-35.52	-0.23	37.05	47.78	0.5	0.54	0.60
OC	ALL	119	1.16	0.9	0.58	-22.61	39.43	-0.26	0.46	0.42	-13.51	-29.92	-0.29	42.31	46.42	0.51	0.7	0.34
PM-2.5	WIN	28	5.17	5.22	0.72	0.83	28.61	0.04	1.48	3.48	10.94	0.87	0.01	37.06	31.01	0.29	1.87	0.52
PM-2.5	SPR	31	6.54	4.8	0.72	-26.6	33.74	-1.74	2.21	6.46	-16.24	-27.32	-0.36	34.46	41.02	0.46	3.08	0.52
PM-2.5	SUM	30	11.4	7.12	0.7	-37.58	40.55	-4.28	4.62	14.34	-34.45	-45.54	-0.6	37.96	48.67	0.65	5.72	0.49
PM-2.5	FAL	29	5.3	4.34	0.89	-17.98	29.82	-0.95	1.58	5.54	-3.17	-12.13	-0.22	33.07	34.09	0.36	2.54	0.79
PM-2.5	ALL	118	7.15	5.38	0.77	-24.77	34.91	-1.77	2.49	10.08	-11.21	-21.53	-0.33	35.63	38.88	0.46	3.63	0.59
SO4	WIN	29	1.63	1.27	0.7	-22.1	33.57	-0.36	0.55	0.38	-12.24	-20.99	-0.28	33.96	36.86	0.43	0.71	0.50
SO4	SPR	31	1.97	1.67	0.77	-15.56	31.84	-0.31	0.63	0.72	1.32	-10.19	-0.18	38.44	37.49	0.38	0.9	0.59
SO4	SUM	30	4.5	3.36	0.77	-25.36	33.27	-1.14	1.5	3.16	-21.17	-28.02	-0.34	28.9	34.8	0.45	2.11	0.60
SO4	FAL	29	1.72	1.5	0.83	-12.62	41.18	-0.22	0.71	1.52	35.12	5.42	-0.14	66.53	46.06	0.47	1.25	0.69
SO4	ALL	119	2.46	1.96	0.84	-20.62	34.36	-0.51	0.85	1.58	0.58	-13.51	-0.26	41.79	38.75	0.43	1.36	0.70

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ELDO1																		
EC	WIN	22	0.35	0.42	0.47	20.35	47.6	0.07	0.16	0.07	26.17	11.62	0.2	46.87	36.7	0.48	0.26	0.22
EC	SPR	29	0.28	0.36	0.79	31.55	53.2	0.09	0.15	0.05	28.03	11.63	0.32	52.13	41.56	0.53	0.23	0.63
EC	SUM	27	0.25	0.25	0.48	0.01	25.71	0	0.06	0.01	10.83	3.57	0	29.91	26.57	0.26	0.09	0.23
EC	FAL	30	0.31	0.32	0.67	4.01	31.49	0.01	0.1	0.02	6.38	-0.68	0.04	31.58	30.51	0.31	0.14	0.44
EC	ALL	108	0.29	0.33	0.64	14.04	39.62	0.04	0.12	0.03	17.34	6.19	0.14	39.8	33.75	0.4	0.19	0.41
NO3	WIN	23	3.6	2.82	0.79	-21.72	42.48	-0.78	1.53	3.47	13.3	-8.96	-0.28	57.94	50.44	0.54	2.02	0.63
NO3	SPR	25	1.06	1.15	0.94	8.44	43.67	0.09	0.46	0.37	-4.61	-24.46	0.08	53.22	58.05	0.44	0.62	0.89
NO3	SUM	27	0.22	0.06	0.16	-71.37	71.37	-0.16	0.16	0.01	-67.12	-106.93	-2.49	67.12	106.93	2.49	0.19	0.02
NO3	FAL	30	0.75	0.84	0.86	11.3	52.39	0.08	0.39	0.45	13.51	-17.29	0.11	67.33	64.65	0.52	0.68	0.75
NO3	ALL	105	1.31	1.15	0.85	-12.69	45.58	-0.17	0.6	1.1	-11.58	-40.22	-0.15	61.86	70.83	0.52	1.06	0.72
OC	WIN	22	1.46	1.46	0.5	0.39	43.26	0.01	0.63	1.19	0.1	-11.58	0	39.26	37.37	0.43	1.09	0.25
OC	SPR	29	1.69	1.48	0.78	-12.47	40.08	-0.21	0.68	0.82	-14.46	-26.6	-0.14	39.14	46.12	0.46	0.93	0.61
OC	SUM	27	1.76	1.82	0.77	3.58	27.82	0.06	0.49	0.4	9.43	1.67	0.04	33.24	29.66	0.28	0.63	0.59
OC	FAL	30	1.32	1.23	0.74	-6.78	35.63	-0.09	0.47	0.43	-9.17	-18.41	-0.07	33.52	37.57	0.38	0.66	0.55
OC	ALL	108	1.56	1.49	0.72	-4.15	36.17	-0.06	0.56	0.69	-4.05	-14.2	-0.04	36.13	37.85	0.38	0.83	0.51
PM-2.5	WIN	22	9.95	9.91	0.62	-0.43	33.36	-0.04	3.32	18.78	15.11	3.96	0	40.47	33.57	0.34	4.33	0.39
PM-2.5	SPR	29	8.12	7.94	0.83	-2.26	28.18	-0.18	2.29	8.24	-1.47	-8.08	-0.02	30.9	32.34	0.29	2.88	0.69
PM-2.5	SUM	27	9.51	6.61	0.64	-30.53	36.06	-2.9	3.43	8.32	-25.41	-34.52	-0.44	34.59	42.35	0.52	4.09	0.41
PM-2.5	FAL	30	6.79	6.78	0.56	-0.09	33.4	-0.01	2.27	11.05	5.11	-2.07	0	31.01	29.41	0.33	3.32	0.31
PM-2.5	ALL	108	8.47	7.69	0.66	-9.27	32.79	-0.79	2.78	12.69	-2.25	-10.57	-0.1	33.8	34.28	0.36	3.65	0.44
SO4	WIN	23	2	1.45	0.73	-27.89	40.08	-0.56	0.8	0.97	-18.38	-28.67	-0.39	35.51	43.25	0.56	1.13	0.53
SO4	SPR	25	2.23	1.77	0.78	-20.46	30.21	-0.46	0.67	0.59	-14.86	-22.07	-0.26	30.69	35.34	0.38	0.89	0.61
SO4	SUM	27	2.39	1.47	0.61	-38.61	44.16	-0.92	1.06	0.89	-30.88	-46.28	-0.63	43.65	56.07	0.72	1.32	0.37
SO4	FAL	30	1.39	1.34	0.6	-3.28	33.27	-0.05	0.46	0.61	15.6	4.64	-0.03	36.77	31.27	0.34	0.78	0.36
SO4	ALL	105	1.98	1.5	0.67	-24.31	37.34	-0.48	0.74	0.86	-11.04	-22.11	-0.32	36.81	41.24	0.49	1.04	0.45

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ELLI1																		
EC	WIN	29	0.16	0.18	0.86	8.4	21.05	0.01	0.03	0	13.19	7.66	0.08	24.48	20.95	0.21	0.05	0.74
EC	SPR	31	0.27	0.23	0.7	-16.44	33.57	-0.04	0.09	0.03	-1.47	-8.71	-0.2	31.73	33.62	0.4	0.18	0.49
EC	SUM	28	0.17	0.14	0.77	-17.34	29.72	-0.03	0.05	0	0	-19.05	-0.21	46.28	37.29	0.36	0.06	0.60
EC	FAL	30	0.17	0.16	0.74	-3.98	24.03	-0.01	0.04	0	-2.03	-6.33	-0.04	24.78	24.46	0.25	0.05	0.55
EC	ALL	118	0.2	0.18	0.72	-8.77	28.08	-0.02	0.05	0.01	2.34	-6.53	-0.1	31.63	29.05	0.31	0.1	0.52
NO3	WIN	28	1.65	0.98	0.58	-40.91	49.67	-0.68	0.82	1.02	-25.8	-47.44	-0.69	48.75	64.07	0.84	1.22	0.34
NO3	SPR	31	0.87	0.56	0.86	-35.48	52.11	-0.31	0.45	0.32	-53.67	-89.92	-0.55	61.5	96.61	0.81	0.65	0.74
NO3	SUM	28	0.24	0.03	0.01	-86.83	86.83	-0.21	0.21	0.02	-82.87	-144.8	-6.59	82.87	144.8	6.59	0.24	0.00
NO3	FAL	30	0.36	0.25	0.78	-30.94	59.5	-0.11	0.21	0.08	-31.24	-59.36	-0.45	60.9	81.39	0.86	0.31	0.61
NO3	ALL	117	0.78	0.45	0.77	-41.5	54.31	-0.32	0.42	0.4	-48.24	-85.05	-0.71	63.41	96.45	0.93	0.71	0.60
OC	WIN	29	0.55	0.51	0.69	-7.11	38.65	-0.04	0.21	0.08	-2.69	-16.15	-0.08	42.28	42.41	0.42	0.29	0.47
OC	SPR	31	1.74	0.86	0.73	-50.34	54.25	-0.87	0.94	1.78	-40.82	-60.49	-1.01	48.56	66.32	1.09	1.6	0.53
OC	SUM	28	1.32	1.19	0.77	-9.9	27.79	-0.13	0.37	0.18	-10.52	-16.31	-0.11	28.2	31.14	0.31	0.44	0.60
OC	FAL	30	0.71	0.53	0.79	-24.87	31.91	-0.18	0.23	0.04	-27.3	-38.79	-0.33	34.19	45	0.42	0.27	0.63
OC	ALL	118	1.08	0.77	0.66	-29.05	40.95	-0.32	0.44	0.65	-20.82	-33.59	-0.41	38.53	46.67	0.58	0.87	0.44
PM-2.5	WIN	29	4.87	4.2	0.83	-13.67	27.17	-0.67	1.32	2.63	-1.61	-7.14	-0.16	27.77	28.41	0.31	1.75	0.68
PM-2.5	SPR	31	8.07	4.91	0.53	-39.16	48.87	-3.16	3.94	24.53	-27.15	-42.96	-0.64	43.89	56.21	0.8	5.87	0.29
PM-2.5	SUM	28	8.35	4.51	0.56	-46.02	47.05	-3.84	3.93	4.98	-45.4	-62.79	-0.85	46.78	64.04	0.87	4.45	0.32
PM-2.5	FAL	30	4.1	3.49	0.65	-14.75	28.56	-0.6	1.17	2.01	-9.98	-18.79	-0.17	31.57	33.9	0.34	1.54	0.42
PM-2.5	ALL	118	6.34	4.28	0.6	-32.48	40.87	-2.06	2.59	10.87	-20.84	-32.72	-0.48	37.48	45.56	0.61	3.89	0.36
SO4	WIN	28	0.98	0.83	0.68	-14.98	39.22	-0.15	0.38	0.33	8.06	-7.12	-0.18	47.63	44.21	0.46	0.59	0.47
SO4	SPR	31	1.47	1.04	0.41	-29.23	44.73	-0.43	0.66	0.73	-19.55	-32.19	-0.41	38.63	45.42	0.63	0.96	0.17
SO4	SUM	28	1.79	1.05	0.67	-41.34	45.28	-0.74	0.81	0.23	-40.6	-56.57	-0.7	46.37	60.94	0.77	0.88	0.45
SO4	FAL	30	0.89	0.83	0.84	-6.66	23.24	-0.06	0.21	0.09	3.99	-2.6	-0.07	28.16	27.04	0.25	0.3	0.71
SO4	ALL	117	1.28	0.94	0.6	-26.65	40.08	-0.34	0.51	0.42	-11.94	-24.44	-0.36	39.95	44.13	0.55	0.73	0.36

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: EVER1																		
EC	WIN	29	0.22	0.24	0.66	8.35	43.99	0.02	0.1	0.01	25.59	9	0.08	53.97	45.87	0.44	0.12	0.43
EC	SPR	31	0.21	0.11	0.78	-46.64	47.31	-0.1	0.1	0.01	-41.82	-59.94	-0.87	45.41	62.88	0.89	0.13	0.61
EC	SUM	28	0.13	0.07	0.6	-48.83	79.13	-0.07	0.11	0.04	118.72	-3.98	-0.95	180.83	92.5	1.55	0.22	0.36
EC	FAL	21	0.11	0.13	0.61	27.46	65.71	0.03	0.07	0.01	47.65	4.93	0.27	88.74	63.47	0.66	0.09	0.37
EC	ALL	109	0.17	0.14	0.54	-19.88	54.61	-0.03	0.09	0.02	34.59	-14.73	-0.25	90.82	66.08	0.68	0.15	0.29
NO3	WIN	18	0.42	0.43	0.34	1.02	85.1	0	0.36	0.23	-6.27	-56.43	0.01	86.55	99.27	0.85	0.47	0.12
NO3	SPR	23	0.41	0.32	0.18	-22	78.45	-0.09	0.32	0.15	-20.24	-73.76	-0.28	79.78	107.28	1.01	0.4	0.03
NO3	FAL	2	0.32	0.58	1	84.06	162.25	0.27	0.51	0.26	72.87	-19.21	0.84	157.06	126.17	1.62	0.58	1.00
NO3	ALL	43	0.41	0.38	0.26	-8.32	84.3	-0.03	0.35	0.19	-10.06	-63.97	-0.09	86.21	104.81	0.92	0.44	0.07
OC	WIN	29	0.79	0.84	0.85	5.68	26.3	0.04	0.21	0.07	9.37	2.96	0.06	30.28	27.81	0.26	0.27	0.72
OC	SPR	31	1.23	0.5	0.83	-59.48	59.48	-0.73	0.73	0.56	-57.64	-83.78	-1.47	57.64	83.78	1.47	1.05	0.69
OC	SUM	29	1.14	0.32	0.55	-71.82	71.82	-0.82	0.82	0.21	-69.66	-111.73	-2.55	69.66	111.73	2.55	0.93	0.30
OC	FAL	22	0.78	0.47	0.32	-40.11	52.14	-0.31	0.41	0.16	-30.53	-58.7	-0.67	56.83	71.64	0.87	0.51	0.10
OC	ALL	111	1	0.53	0.53	-46.7	55.15	-0.47	0.55	0.39	-37.9	-63.45	-0.88	53.47	74.05	1.03	0.78	0.28
PM-2.5	WIN	29	4.87	5.73	0.64	17.63	25.54	0.86	1.24	1.85	22.3	16.67	0.18	29.11	24.14	0.26	1.61	0.41
PM-2.5	SPR	30	7.81	4.27	0.49	-45.39	46.96	-3.55	3.67	10.1	-40.62	-56.49	-0.83	43.02	58.7	0.86	4.76	0.24
PM-2.5	SUM	30	6.79	2.33	0.49	-65.7	65.88	-4.46	4.47	5.21	-63.5	-99.96	-1.92	63.84	100.29	1.92	5.01	0.24
PM-2.5	FAL	30	4.85	3.38	0.05	-30.23	42.66	-1.47	2.07	4.44	-25.4	-44.68	-0.43	43.96	57.12	0.61	2.57	0.00
PM-2.5	ALL	119	6.09	3.91	0.22	-35.78	47.24	-2.18	2.88	9.59	-27.22	-46.64	-0.56	45.12	60.36	0.74	3.79	0.05
SO4	WIN	18	1.81	2.21	0.44	22.1	33.75	0.4	0.61	0.63	27.32	17.1	0.22	37.61	28.8	0.34	0.89	0.20
SO4	SPR	23	2.29	1.58	0.6	-31.08	38.23	-0.71	0.88	0.47	-27.14	-39.15	-0.45	38.54	47.68	0.55	0.99	0.37
SO4	FAL	2	1.2	1.03	1	-14.44	14.44	-0.17	0.17	0.01	-12.43	-13.48	-0.17	12.43	13.48	0.17	0.21	1.00
SO4	ALL	43	2.04	1.82	0.37	-10.87	35.91	-0.22	0.73	0.81	-3.66	-14.41	-0.12	36.94	38.19	0.4	0.93	0.14

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: FLTO1																		
EC	WIN	10	0.04	0.06	0.53	37.26	63.61	0.02	0.03	0	89.76	34.83	0.37	108.61	56.24	0.64	0.04	0.28
EC	FAL	9	0.06	0.08	0.05	47.51	104.91	0.03	0.06	0.01	68.91	4.16	0.48	112.46	64.62	1.05	0.11	0.00
EC	ALL	19	0.05	0.07	0.17	43.02	86.82	0.02	0.04	0.01	79.88	20.3	0.43	110.43	60.21	0.87	0.08	0.03
NO3	WIN	10	0.09	0.05	0.61	-47.77	58.69	-0.04	0.05	0.01	-54.38	-91.73	-0.91	61.83	98.01	1.12	0.08	0.37
NO3	FAL	9	0.06	0.12	0.5	111.57	187.84	0.07	0.11	0.06	69.26	-24.79	1.12	141.59	81.58	1.88	0.26	0.25
NO3	ALL	19	0.08	0.08	0.25	10.55	105.96	0.01	0.08	0.03	4.18	-60.02	0.11	99.61	90.23	1.06	0.19	0.06
OC	WIN	9	0.19	0.21	0.47	6.49	53.68	0.01	0.1	0.02	22.29	2.86	0.06	58.17	47.9	0.54	0.15	0.22
OC	FAL	9	0.35	0.34	0.25	-0.85	77.74	0	0.27	0.19	-2.8	-36.41	-0.01	67.68	65.11	0.78	0.43	0.06
OC	ALL	18	0.27	0.27	0.34	1.8	69.07	0	0.19	0.1	9.74	-16.78	0.02	62.93	56.51	0.69	0.32	0.12
PM-2.5	WIN	10	0.97	1.24	0.71	27.7	36.95	0.27	0.36	0.27	29.96	19.46	0.28	39.29	31.17	0.37	0.58	0.50
PM-2.5	FAL	9	1.87	1.75	0.15	-6.44	52.17	-0.12	0.97	2.31	-0.45	-16.92	-0.07	43.36	41.97	0.56	1.53	0.02
PM-2.5	ALL	19	1.39	1.48	0.35	6.03	46.61	0.08	0.65	1.27	15.55	2.23	0.06	41.22	36.28	0.47	1.13	0.13
SO4	WIN	10	0.25	0.43	0.77	75.23	75.37	0.19	0.19	0.02	90.95	54.54	0.75	91.07	54.67	0.75	0.24	0.60
SO4	FAL	9	0.46	0.45	0.42	-3.32	34.64	-0.02	0.16	0.04	12.56	4.16	-0.03	35.34	35.34	0.36	0.21	0.18
SO4	ALL	19	0.35	0.44	0.51	25.91	49.8	0.09	0.17	0.04	53.82	30.68	0.26	64.67	45.52	0.5	0.23	0.26

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: FOPE1																		
EC	WIN	17	0.07	0.08	0.61	2.84	31.89	0	0.02	0	20.25	7.34	0.03	42.9	36.01	0.32	0.03	0.38
EC	SPR	27	0.11	0.08	0.64	-22.72	36.39	-0.02	0.04	0	-4.08	-18.2	-0.29	38.05	42.57	0.47	0.07	0.41
EC	SUM	29	0.11	0.12	0.25	3.24	50.2	0	0.06	0.01	36.63	14.8	0.03	57.47	43.81	0.5	0.09	0.06
EC	FAL	30	0.13	0.16	0.53	20.83	54.17	0.03	0.07	0.01	45.88	18.1	0.21	66.87	45.67	0.54	0.1	0.28
EC	ALL	103	0.11	0.11	0.49	2.75	46.1	0	0.05	0.01	25.95	5.88	0.03	52.71	42.74	0.46	0.08	0.24
NO3	WIN	17	0.63	1.47	0.71	135.9	149.4	0.85	0.93	1.21	195.24	71.93	1.36	205.19	86.23	1.49	1.39	0.50
NO3	SPR	27	0.89	1.2	0.75	33.81	71.09	0.3	0.64	0.94	57.78	8.33	0.34	97.89	73.4	0.71	1.01	0.56
NO3	SUM	29	0.11	0.08	0.59	-19.56	69.41	-0.02	0.07	0.01	-31.63	-66.97	-0.24	69.06	88	0.86	0.1	0.35
NO3	FAL	30	0.2	0.62	0.77	211.31	223.41	0.42	0.45	0.6	285.5	44.84	2.11	318.67	94.92	2.23	0.88	0.60
NO3	ALL	103	0.43	0.76	0.72	79.12	110.8	0.34	0.47	0.71	121.62	8.26	0.79	171.79	85.89	1.11	0.9	0.52
OC	WIN	17	0.4	0.25	0.26	-38.72	46.15	-0.16	0.19	0.03	-24.93	-42.34	-0.63	45.56	56.74	0.75	0.24	0.07
OC	SPR	27	0.47	0.22	0.42	-53.27	54.28	-0.25	0.25	0.04	-47.05	-70.29	-1.14	49.7	72.57	1.16	0.31	0.18
OC	SUM	29	1.1	0.46	0.4	-58.43	59.5	-0.64	0.66	0.29	-56.82	-84.96	-1.41	57.76	85.84	1.43	0.84	0.16
OC	FAL	30	0.8	0.69	0.44	-14.1	46.6	-0.11	0.37	0.29	-1.31	-18.16	-0.16	47.41	48.49	0.54	0.55	0.20
OC	ALL	103	0.73	0.43	0.47	-41.62	53.3	-0.31	0.39	0.23	-32.83	-54.62	-0.71	50.62	66.68	0.91	0.57	0.22
PM-2.5	WIN	17	2.67	3.27	0.74	22.24	41.29	0.59	1.1	2.2	28.15	16.43	0.22	43.46	34.92	0.41	1.6	0.55
PM-2.5	SPR	27	4.03	3.62	0.81	-10.09	35.61	-0.41	1.43	3.87	1.28	-13.08	-0.11	41.22	44.62	0.4	2.01	0.66
PM-2.5	SUM	29	4.29	2.35	0.56	-45.14	45.14	-1.94	1.94	1.84	-42.87	-57.77	-0.82	42.87	57.77	0.82	2.36	0.31
PM-2.5	FAL	30	3.44	3.65	0.64	5.98	42.97	0.21	1.48	4.08	26.58	9.57	0.06	53.03	43.61	0.43	2.03	0.41
PM-2.5	ALL	103	3.71	3.21	0.63	-13.31	41.38	-0.49	1.53	4.01	0.65	-14.19	-0.15	45.49	46.43	0.48	2.06	0.40
SO4	WIN	17	0.65	0.49	0.7	-23.61	45.03	-0.15	0.29	0.1	9.58	-10.96	-0.31	59.81	52.97	0.59	0.35	0.49
SO4	SPR	27	1.3	0.86	0.79	-33.4	40.83	-0.43	0.53	0.53	-19.09	-33.72	-0.5	39.87	49.4	0.61	0.85	0.63
SO4	SUM	29	0.72	0.61	0.56	-14.72	29.81	-0.11	0.21	0.06	-11.1	-18.33	-0.17	30.46	33.84	0.35	0.27	0.32
SO4	FAL	30	0.5	0.64	0.68	28.34	49.22	0.14	0.24	0.07	48.61	30.9	0.28	59.13	43.45	0.49	0.3	0.46
SO4	ALL	103	0.79	0.67	0.74	-16.09	40.11	-0.13	0.32	0.24	7.61	-6.81	-0.19	46.12	43.88	0.48	0.51	0.54

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: FRRE1																		
EC	WIN	29	0.32	0.35	0.64	10.45	36.41	0.03	0.12	0.02	26.79	15.36	0.1	43.42	35.5	0.36	0.15	0.41
EC	SPR	28	0.24	0.2	0.53	-17.94	32.93	-0.04	0.08	0.01	-12.89	-21.64	-0.22	32.66	38.3	0.4	0.1	0.28
EC	SUM	28	0.3	0.22	0.45	-26.57	33.22	-0.08	0.1	0.01	-22.05	-29.85	-0.36	31.76	38.08	0.45	0.12	0.20
EC	FAL	30	0.26	0.23	0.65	-11.11	37.82	-0.03	0.1	0.01	10.23	-4.87	-0.13	45.25	39.56	0.43	0.12	0.42
EC	ALL	115	0.28	0.25	0.59	-10.38	35.19	-0.03	0.1	0.01	0.92	-9.93	-0.12	38.44	37.87	0.39	0.12	0.35
NO3	WIN	28	0.9	1.08	0.34	20.15	68.91	0.18	0.62	0.77	68.23	7.31	0.2	109.83	65.29	0.69	0.9	0.12
NO3	SPR	28	0.52	0.64	0.5	22.61	77.65	0.12	0.4	0.38	34.29	-3.42	0.23	84.42	72.57	0.78	0.63	0.25
NO3	SUM	15	0.13	0.11	0.16	-17.27	51.03	-0.02	0.07	0.01	-11.85	-30.69	-0.21	50.38	59.17	0.62	0.08	0.02
NO3	FAL	24	0.33	0.39	0.55	21.39	82.78	0.07	0.27	0.12	160.89	16.18	0.21	207.47	83.82	0.83	0.35	0.31
NO3	ALL	95	0.52	0.62	0.56	19.57	72.96	0.1	0.38	0.37	68.99	0.39	0.2	117.62	71.15	0.73	0.62	0.31
OC	WIN	29	1.15	1.12	0.65	-2.43	37.2	-0.03	0.43	0.32	12.76	1.62	-0.02	40.3	37.01	0.38	0.57	0.42
OC	SPR	28	0.93	0.73	0.66	-21.58	30.1	-0.2	0.28	0.11	-17.52	-26.04	-0.28	29.78	36.34	0.38	0.39	0.43
OC	SUM	28	1.66	1.22	0.48	-26.6	33.86	-0.44	0.56	0.56	-19.93	-30.58	-0.36	33.08	38.14	0.46	0.87	0.23
OC	FAL	30	0.81	0.81	0.66	-0.68	46.93	-0.01	0.38	0.39	5.84	-8.96	-0.01	46.28	42.93	0.47	0.63	0.43
OC	ALL	115	1.13	0.97	0.6	-14.58	36.41	-0.16	0.41	0.38	-4.38	-15.71	-0.17	37.54	38.67	0.43	0.64	0.35
PM-2.5	WIN	29	6.06	6.43	0.72	6.09	26.45	0.37	1.6	4.26	10.96	5.85	0.06	27.35	25.38	0.26	2.1	0.52
PM-2.5	SPR	28	5.68	5.2	0.63	-8.44	28.8	-0.48	1.63	4.27	-3.67	-11.88	-0.09	30.59	32.96	0.31	2.12	0.39
PM-2.5	SUM	28	11.89	7.58	0.71	-36.26	39.2	-4.31	4.66	15.99	-32.55	-42.28	-0.57	35.31	44.76	0.61	5.88	0.51
PM-2.5	FAL	30	5.46	4.96	0.92	-9.2	20.74	-0.5	1.13	2.14	-1.35	-9.87	-0.1	27.83	27.54	0.23	1.55	0.84
PM-2.5	ALL	115	7.23	6.03	0.74	-16.66	30.88	-1.2	2.23	9.8	-6.41	-14.29	-0.2	30.2	32.51	0.37	3.35	0.54
SO4	WIN	28	1.99	1.36	0.79	-31.58	34.23	-0.63	0.68	0.42	-27.81	-36.12	-0.46	30.94	39.03	0.5	0.9	0.62
SO4	SPR	28	1.88	1.68	0.76	-10.66	28.26	-0.2	0.53	0.4	-6.16	-14.93	-0.12	30.58	34.05	0.32	0.66	0.58
SO4	SUM	15	4.35	3.44	0.81	-20.83	32.14	-0.91	1.4	3.02	-15.74	-22.61	-0.26	30.58	34.55	0.41	1.96	0.66
SO4	FAL	24	1.85	1.66	0.92	-10.73	26.95	-0.2	0.5	0.47	1.23	-8.24	-0.12	34.1	33.03	0.3	0.71	0.84
SO4	ALL	95	2.3	1.86	0.85	-19.07	30.68	-0.44	0.7	0.91	-12.19	-20.7	-0.24	31.58	35.34	0.38	1.05	0.73

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: GRGU1																		
EC	WIN	28	0.12	0.22	0.88	86.07	86.07	0.1	0.1	0	112.56	64.9	0.86	112.56	64.9	0.86	0.12	0.78
EC	SPR	30	0.11	0.11	0.51	2.02	52.04	0	0.06	0.01	36.75	10.83	0.02	65.6	50.65	0.52	0.08	0.26
EC	SUM	22	0.21	0.1	0.6	-53.55	54.38	-0.11	0.11	0.01	-47.36	-67.37	-1.15	48.64	68.56	1.17	0.16	0.36
EC	FAL	26	0.16	0.13	0.73	-14.16	36.03	-0.02	0.06	0	-10.93	-21.13	-0.16	35.7	40.92	0.42	0.07	0.54
EC	ALL	106	0.14	0.14	0.43	-1.29	55.76	0	0.08	0.01	27.62	1.04	-0.01	67.15	55.75	0.56	0.11	0.19
NO3	WIN	28	0.25	0.86	0.55	248.82	264.99	0.61	0.65	0.53	367.33	95.57	2.49	373.89	103.38	2.65	0.95	0.30
NO3	SPR	30	0.1	0.28	0.2	186.88	203.38	0.18	0.2	0.07	328.95	52.2	1.87	354.75	93.06	2.03	0.32	0.04
NO3	SUM	22	0.04	0.03	0.2	-29.14	72.71	-0.01	0.03	0	-21.77	-58.69	-0.41	72.36	79.99	1.03	0.04	0.04
NO3	FAL	26	0.1	0.22	0.36	111.41	169.55	0.12	0.18	0.14	104.47	-3.7	1.11	166.25	90.16	1.7	0.39	0.13
NO3	ALL	106	0.13	0.37	0.61	189.48	219.78	0.24	0.28	0.25	211.24	26.93	1.89	254.96	92.36	2.2	0.55	0.37
OC	WIN	28	0.53	1.04	0.82	95.36	96.17	0.51	0.51	0.13	138.77	69.32	0.95	139.22	69.79	0.96	0.62	0.67
OC	SPR	30	0.58	0.59	0.88	0.23	37.71	0	0.22	0.13	24.33	11.66	0	45.19	38.44	0.38	0.36	0.78
OC	SUM	22	1.97	0.77	0.51	-61.04	61.04	-1.2	1.2	2.91	-50.18	-71.24	-1.57	50.18	71.24	1.57	2.09	0.26
OC	FAL	26	0.84	0.68	0.76	-18.36	32.43	-0.15	0.27	0.11	-12.21	-22.06	-0.22	34.03	39.64	0.4	0.37	0.58
OC	ALL	106	0.92	0.77	0.4	-16.62	55.83	-0.15	0.51	1.05	30.13	1.41	-0.2	68.33	53.82	0.67	1.04	0.16
PM-2.5	WIN	27	3.23	4.86	0.81	50.62	57.36	1.63	1.85	3.2	64.12	42.07	0.51	69.08	47.72	0.57	2.42	0.66
PM-2.5	SPR	30	3.07	3.63	0.88	18.59	25.98	0.57	0.8	0.98	30.4	18.97	0.19	36.98	26.09	0.26	1.14	0.78
PM-2.5	SUM	22	7.7	3.6	0.65	-53.23	54.32	-4.1	4.18	18.43	-44.62	-62.95	-1.14	47.11	65.14	1.16	5.93	0.42
PM-2.5	FAL	26	3.93	3.66	0.81	-6.94	30.57	-0.27	1.2	2.67	0.71	-10.47	-0.07	37.96	37.74	0.33	1.66	0.66
PM-2.5	ALL	105	4.29	3.95	0.53	-7.98	43.74	-0.34	1.88	9.82	16	0.45	-0.09	47.6	42.72	0.48	3.15	0.28
SO4	WIN	28	1.01	0.88	0.87	-13.44	30.06	-0.14	0.3	0.17	7.88	0.56	-0.16	32.37	31.28	0.35	0.43	0.75
SO4	SPR	30	0.96	1.34	0.8	38.99	46.49	0.37	0.45	0.32	103.61	32.79	0.39	110.81	40.68	0.46	0.68	0.64
SO4	SUM	22	1.47	1.38	0.89	-6.18	35.51	-0.09	0.52	0.5	28.97	8.67	-0.07	56.54	42.19	0.38	0.71	0.78
SO4	FAL	26	1.04	1.26	0.91	20.85	35.78	0.22	0.37	0.2	37.99	21.65	0.21	52.3	37.51	0.36	0.5	0.82
SO4	ALL	106	1.1	1.2	0.81	9.52	36.96	0.1	0.41	0.34	46.74	16.54	0.1	64.48	37.73	0.37	0.59	0.65

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: GRRI1																		
EC	WIN	29	0.22	0.47	0.47	118.67	118.67	0.26	0.26	0.03	133.82	73.24	1.19	133.82	73.24	1.19	0.3	0.22
EC	SPR	31	0.21	0.36	0.45	72.52	84.05	0.15	0.17	0.03	97.26	53.43	0.73	102.58	59.61	0.84	0.22	0.21
EC	SUM	31	0.25	0.28	0.64	11.87	23.67	0.03	0.06	0	20.67	14.68	0.12	29	24.28	0.24	0.08	0.40
EC	FAL	29	0.25	0.44	0.6	75.37	77.18	0.19	0.19	0.03	94.89	55.05	0.75	96.15	56.38	0.77	0.25	0.36
EC	ALL	120	0.23	0.39	0.43	66.65	73.1	0.15	0.17	0.03	85.74	48.6	0.67	89.57	53	0.73	0.23	0.19
NO3	WIN	29	3.36	3.24	0.68	-3.55	35.55	-0.12	1.19	3.09	17.05	3.98	-0.04	42.42	35.06	0.37	1.76	0.46
NO3	SPR	31	1.88	2.36	0.93	25.51	37.74	0.48	0.71	0.68	45.75	14.99	0.26	72.09	50.56	0.38	0.96	0.87
NO3	SUM	31	0.24	0.39	0.49	58.01	108.98	0.14	0.27	0.16	60.08	-2.79	0.58	112.14	72.32	1.09	0.43	0.24
NO3	FAL	24	1.21	1.8	0.94	48.88	54.87	0.59	0.66	0.89	95.88	28.54	0.49	114.32	54.34	0.55	1.11	0.88
NO3	ALL	115	1.67	1.93	0.86	15.6	42.03	0.26	0.7	1.27	52.84	10.25	0.16	84.22	53.3	0.42	1.16	0.75
OC	WIN	29	0.98	2.02	0.66	106.84	106.84	1.04	1.04	0.49	117.75	68.13	1.07	117.75	68.13	1.07	1.25	0.43
OC	SPR	31	0.96	1.39	0.44	44.67	66.15	0.43	0.64	0.54	76.81	37.38	0.45	89.64	52.69	0.66	0.85	0.19
OC	SUM	31	1.42	1.14	0.63	-19.58	32.63	-0.28	0.46	0.34	-10.04	-16.85	-0.24	30.88	34.09	0.41	0.64	0.40
OC	FAL	29	1.07	1.49	0.33	38.73	55.98	0.41	0.6	0.55	63.58	32.18	0.39	75.19	45.7	0.56	0.85	0.11
OC	ALL	120	1.11	1.5	0.3	35.22	61.32	0.39	0.68	0.69	61.07	29.54	0.35	77.76	49.93	0.61	0.92	0.09
PM-2.5	WIN	29	8.83	10.97	0.55	24.23	41.81	2.14	3.69	22.53	46.47	27.3	0.24	57.02	39.58	0.42	5.21	0.31
PM-2.5	SPR	31	6.17	8.82	0.86	42.86	45.87	2.65	2.83	6.89	58.35	37.34	0.43	62.34	41.85	0.46	3.73	0.73
PM-2.5	SUM	31	6.77	5.98	0.83	-11.68	23.92	-0.79	1.62	4.66	-3.97	-7.95	-0.13	22.56	23.55	0.27	2.3	0.68
PM-2.5	FAL	29	5.63	8.25	0.86	46.49	53.49	2.62	3.01	6.17	63.11	41.18	0.46	67.42	46.14	0.53	3.61	0.74
PM-2.5	ALL	120	6.84	8.47	0.73	23.82	40.51	1.63	2.77	12	40.53	24.14	0.24	52.01	37.61	0.41	3.83	0.53
SO4	WIN	29	1.47	1.24	0.53	-15.43	54.83	-0.23	0.81	1.74	-9.62	-24.73	-0.18	44.95	49.17	0.65	1.34	0.28
SO4	SPR	31	1.46	1.44	0.86	-1.05	27.83	-0.02	0.41	0.27	15.31	7.33	-0.01	34.31	29.77	0.28	0.52	0.74
SO4	SUM	31	1.71	1.48	0.87	-13.42	30.3	-0.23	0.52	0.66	4.48	-4.6	-0.16	33.94	31.52	0.35	0.85	0.75
SO4	FAL	24	1.15	1.16	0.84	1.1	35.45	0.01	0.41	0.31	30.75	15.33	0.01	51.41	40.18	0.35	0.55	0.70
SO4	ALL	115	1.46	1.34	0.73	-8.23	36.69	-0.12	0.54	0.77	9.33	-2.3	-0.09	40.46	37.31	0.4	0.88	0.53

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: GRSA1																		
EC	WIN	29	0.09	0.06	0	-31.34	79.31	-0.03	0.07	0.01	2.44	-46.38	-0.46	87.59	82.56	1.16	0.12	0.00
EC	SPR	28	0.05	0.04	0.13	-27.23	45.15	-0.01	0.02	0	34.88	-19.36	-0.37	85.42	49.35	0.62	0.03	0.02
EC	SUM	31	0.17	0.12	0.76	-32.56	45.88	-0.06	0.08	0.02	-24.84	-39.37	-0.48	43.24	54.29	0.68	0.16	0.58
EC	FAL	30	0.08	0.07	0.1	-3.82	55.89	0	0.04	0.01	4.78	-23.33	-0.04	56.16	49.8	0.58	0.08	0.01
EC	ALL	118	0.1	0.07	0.64	-26.13	55.34	-0.03	0.06	0.01	3.57	-32.26	-0.35	67.43	58.92	0.75	0.11	0.41
NO3	WIN	29	0.16	0.09	0.38	-44.74	76.2	-0.07	0.12	0.03	-40.26	-97.19	-0.81	84.11	118.02	1.38	0.18	0.15
NO3	SPR	16	0.11	0.03	0.27	-73.21	73.21	-0.08	0.08	0	-69.17	-112.07	-2.73	69.17	112.07	2.73	0.1	0.07
NO3	SUM	19	0.07	0.01	0.61	-87.1	87.1	-0.06	0.06	0	-84.5	-148.19	-6.75	84.5	148.19	6.75	0.08	0.37
NO3	FAL	30	0.08	0.05	0.85	-33.4	72.71	-0.03	0.06	0	-49.32	-101.57	-0.5	82.31	117.14	1.09	0.07	0.72
NO3	ALL	94	0.11	0.05	0.54	-52.81	76.35	-0.06	0.08	0.01	-57.01	-111.43	-1.12	81.07	122.82	1.62	0.12	0.29
OC	WIN	29	0.49	0.24	0.06	-49.6	80.81	-0.24	0.39	0.25	-34.08	-86.92	-0.98	84.35	100.47	1.6	0.56	0.00
OC	SPR	28	0.41	0.13	0.3	-67.18	67.18	-0.27	0.27	0.02	-63.83	-96.74	-2.05	63.83	96.74	2.05	0.31	0.09
OC	SUM	31	1.53	0.75	0.86	-50.54	51.34	-0.77	0.78	1.34	-42.64	-61.47	-1.02	44.83	63.45	1.04	1.39	0.74
OC	FAL	30	0.44	0.35	0.22	-21.05	53.38	-0.09	0.24	0.13	-15.17	-47.24	-0.27	60.03	64.03	0.68	0.37	0.05
OC	ALL	118	0.73	0.38	0.78	-48.05	58.58	-0.35	0.43	0.52	-38.58	-72.48	-0.93	62.92	80.6	1.13	0.8	0.61
PM-2.5	WIN	29	1.75	1.31	0.63	-25.04	44.11	-0.44	0.77	1.06	-21.6	-33.69	-0.33	37.06	46.18	0.59	1.12	0.39
PM-2.5	SPR	31	4.17	1.47	0.2	-64.69	66.19	-2.69	2.76	9.72	-53.45	-82.02	-1.83	57.88	85.79	1.87	4.12	0.04
PM-2.5	SUM	31	5.45	2.32	0.82	-57.4	57.4	-3.13	3.13	9.24	-54.93	-79.9	-1.35	54.93	79.9	1.35	4.36	0.67
PM-2.5	FAL	30	2.29	1.55	0.34	-32.38	48.53	-0.74	1.11	1.21	-28.45	-47.47	-0.48	48.51	61.11	0.72	1.33	0.12
PM-2.5	ALL	121	3.45	1.67	0.62	-51.61	57.04	-1.78	1.97	6.79	-40	-61.33	-1.07	49.81	68.67	1.18	3.16	0.39
SO4	WIN	29	0.25	0.39	0.53	53.4	76.13	0.14	0.19	0.03	89.07	50.45	0.53	97.8	61.53	0.76	0.22	0.28
SO4	SPR	16	0.36	0.41	0.35	15.08	43.91	0.05	0.16	0.05	30.25	15.35	0.15	49.48	40.51	0.44	0.22	0.13
SO4	SUM	19	0.56	0.33	0.54	-40.24	45.17	-0.22	0.25	0.06	-34.14	-49.27	-0.67	44.38	56.15	0.76	0.33	0.29
SO4	FAL	30	0.43	0.36	0.44	-15.66	32.98	-0.07	0.14	0.03	-8.09	-18.09	-0.19	33.03	37.7	0.39	0.2	0.20
SO4	ALL	94	0.39	0.37	0.34	-4.03	46.93	-0.02	0.18	0.06	23.15	2.45	-0.04	58.1	49.26	0.49	0.24	0.11

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: GRSM1																		
EC	WIN	29	0.22	0.39	0.87	73.3	74.16	0.16	0.17	0.02	90.84	53.47	0.73	91.5	54.16	0.74	0.21	0.76
EC	SPR	27	0.25	0.25	0.31	0.73	44.63	0	0.11	0.02	39.26	9.99	0.01	68.43	47.3	0.45	0.14	0.10
EC	SUM	31	0.32	0.25	0.41	-22.77	32.1	-0.07	0.1	0.01	-19.43	-26.58	-0.29	30.72	34.79	0.42	0.13	0.17
EC	FAL	29	0.26	0.28	0.44	11.1	43.95	0.03	0.11	0.02	40.94	17.83	0.11	61.49	44.14	0.44	0.14	0.19
EC	ALL	116	0.26	0.29	0.46	10.94	46.62	0.03	0.12	0.02	36.89	13.05	0.11	62.39	44.88	0.47	0.16	0.21
NO3	WIN	29	0.44	0.65	0.73	48.31	73.88	0.21	0.32	0.14	68.35	17.27	0.48	102.08	64.73	0.74	0.43	0.53
NO3	SPR	27	0.25	0.28	0.1	9.47	114.13	0.02	0.29	0.24	26.69	-51.12	0.09	120.63	99.39	1.14	0.49	0.01
NO3	SUM	31	0.11	0.04	0.33	-63.98	65.54	-0.07	0.07	0	-61.94	-94.13	-1.78	63.05	95.14	1.82	0.09	0.11
NO3	FAL	29	0.21	0.14	0.56	-32.66	65.42	-0.07	0.14	0.02	-29.2	-65.96	-0.48	71.61	89.06	0.97	0.17	0.32
NO3	ALL	116	0.25	0.27	0.66	9.22	80.61	0.02	0.2	0.11	-0.55	-49.23	0.09	88.35	87.01	0.81	0.33	0.43
OC	WIN	29	1.04	1.33	0.92	28.39	38.49	0.29	0.4	0.24	36.94	24.03	0.28	45.17	33.99	0.38	0.57	0.84
OC	SPR	27	1.44	1.14	0.76	-21.36	38.37	-0.31	0.55	0.62	12.38	-5.07	-0.27	50.54	43.11	0.49	0.84	0.58
OC	SUM	31	2.01	2.13	0.55	5.84	33.38	0.12	0.67	0.99	12.05	3.35	0.06	34.62	30.24	0.33	1	0.30
OC	FAL	29	1.22	1.18	0.8	-3.43	32.04	-0.04	0.39	0.28	8.82	-4.37	-0.04	41.26	35.54	0.33	0.53	0.63
OC	ALL	116	1.44	1.46	0.72	1.58	35.18	0.02	0.51	0.59	17.54	4.63	0.02	42.62	35.5	0.35	0.77	0.52
PM-2.5	WIN	28	5.21	6.28	0.86	20.69	31.72	1.08	1.65	3.16	30.72	20.73	0.21	39.82	30.92	0.32	2.08	0.73
PM-2.5	SPR	27	8.08	6.16	0.51	-23.72	39.79	-1.92	3.22	15.18	-0.89	-15.12	-0.31	43.51	42.93	0.52	4.34	0.26
PM-2.5	SUM	30	12	7.93	0.57	-33.91	36.89	-4.07	4.43	10.41	-32.42	-42.11	-0.51	35.44	44.72	0.56	5.19	0.32
PM-2.5	FAL	29	5.99	5.42	0.81	-9.52	26.11	-0.57	1.56	4.66	3.46	-3.99	-0.11	29.6	28.96	0.29	2.23	0.65
PM-2.5	ALL	114	7.87	6.47	0.67	-17.85	34.67	-1.41	2.73	11.92	-0.31	-10.59	-0.22	36.94	36.9	0.42	3.73	0.45
SO4	WIN	29	1.61	1.35	0.58	-16.28	33.78	-0.26	0.54	0.59	-4.5	-11.47	-0.19	30.55	32.99	0.4	0.81	0.34
SO4	SPR	27	2.36	2	0.56	-15.36	31.27	-0.36	0.74	0.81	-0.73	-11.4	-0.18	36.78	35.74	0.37	0.97	0.31
SO4	SUM	31	3.76	2.46	0.57	-34.46	38.27	-1.29	1.44	1.48	-31.8	-43.08	-0.53	36.51	47.35	0.58	1.78	0.32
SO4	FAL	29	1.68	1.58	0.72	-5.9	30.14	-0.1	0.51	0.71	3.68	-1.95	-0.06	25.77	26.58	0.32	0.85	0.52
SO4	ALL	116	2.38	1.86	0.7	-21.91	34.45	-0.52	0.82	1.14	-8.87	-17.52	-0.28	32.4	35.87	0.44	1.19	0.48

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: GUMO1																		
EC	WIN	28	0.09	0.08	0.24	-16.38	53.29	-0.01	0.05	0	68.17	-7.25	-0.2	111.83	52.07	0.64	0.07	0.06
EC	SPR	30	0.1	0.08	0.43	-21.45	52.24	-0.02	0.05	0.01	14.44	-5.84	-0.27	56.8	48.84	0.67	0.1	0.19
EC	SUM	30	0.11	0.07	0.25	-40.05	58.66	-0.04	0.06	0.01	-3.05	-38.34	-0.67	69.75	62.58	0.98	0.11	0.06
EC	FAL	24	0.14	0.08	0.58	-39.65	40.9	-0.06	0.06	0	-34.43	-49.2	-0.66	36.22	50.92	0.68	0.08	0.34
EC	ALL	112	0.11	0.08	0.36	-30.38	51.09	-0.03	0.06	0.01	12.72	-24.19	-0.44	69.62	53.77	0.73	0.09	0.13
NO3	WIN	27	0.36	0.13	0.03	-64.14	93	-0.23	0.33	0.16	-44.93	-129.93	-1.79	107.94	145.14	2.59	0.47	0.00
NO3	SPR	27	0.24	0.03	0.47	-87.17	87.17	-0.21	0.21	0.01	-85.81	-151.73	-6.79	85.81	151.73	6.79	0.23	0.22
NO3	SUM	31	0.22	0.01	0.61	-94.8	94.8	-0.21	0.21	0.02	-94.02	-178.13	-18.21	94.02	178.13	18.21	0.24	0.38
NO3	FAL	24	0.16	0.02	0.58	-86.39	86.39	-0.14	0.14	0.01	-85.73	-151.53	-6.35	85.73	151.53	6.35	0.18	0.34
NO3	ALL	109	0.25	0.05	0.15	-80.72	91.12	-0.2	0.22	0.05	-78	-153.8	-4.19	93.61	157.56	4.73	0.3	0.02
OC	WIN	27	0.32	0.23	0.16	-29.65	59.87	-0.1	0.19	0.05	34.75	-39.04	-0.42	111.08	66.04	0.85	0.25	0.03
OC	SPR	30	0.84	0.3	0.45	-64.69	69.15	-0.54	0.58	0.5	-50.68	-80.15	-1.83	61.05	87.44	1.96	0.89	0.20
OC	SUM	31	0.97	0.58	0.15	-40.16	57.75	-0.39	0.56	0.66	-26.87	-48.25	-0.67	50.97	67.05	0.97	0.9	0.02
OC	FAL	24	0.58	0.46	0.77	-20.43	41.71	-0.12	0.24	0.07	-25.4	-43.27	-0.26	46.33	59.81	0.52	0.3	0.59
OC	ALL	112	0.7	0.39	0.36	-43.41	58.81	-0.3	0.41	0.38	-18.07	-53.5	-0.77	67.17	70.72	1.04	0.69	0.13
PM-2.5	WIN	10	1.81	2.63	0.48	45.5	77.53	0.82	1.4	3.44	70.28	28.67	0.46	90.94	55.04	0.78	2.03	0.23
PM-2.5	SPR	7	8.06	2.8	0.49	-65.29	65.29	-5.27	5.27	9.18	-59.19	-90.11	-1.88	59.19	90.11	1.88	6.07	0.24
PM-2.5	SUM	31	7.09	2.33	0.26	-67.16	67.16	-4.76	4.76	7.92	-65.29	-101.98	-2.04	65.29	101.98	2.04	5.53	0.07
PM-2.5	FAL	22	4.73	2.26	0.56	-52.12	52.12	-2.46	2.46	4.93	-52.14	-75.93	-1.09	52.14	75.93	1.09	3.32	0.32
PM-2.5	ALL	70	5.69	2.4	0.29	-57.86	63.43	-3.29	3.61	10.44	-41.18	-73.94	-1.37	64.21	85.9	1.51	4.61	0.09
SO4	WIN	27	0.43	0.63	0.35	46.09	78.33	0.2	0.34	0.26	80.29	37.46	0.46	91.78	52.87	0.78	0.55	0.12
SO4	SPR	27	0.82	0.56	0.65	-31.86	35.1	-0.26	0.29	0.11	-24.39	-32.27	-0.47	29.55	36.95	0.52	0.43	0.42
SO4	SUM	31	1.36	0.75	0.56	-44.64	45.94	-0.61	0.62	0.16	-43.98	-62.52	-0.81	45.87	64.2	0.83	0.73	0.31
SO4	FAL	24	0.87	0.68	0.88	-21.57	27.47	-0.19	0.24	0.07	-18.03	-28.66	-0.28	32.33	40.38	0.35	0.32	0.78
SO4	ALL	109	0.89	0.66	0.54	-25.9	43.35	-0.23	0.38	0.24	-2.63	-22.81	-0.35	50.22	49.4	0.59	0.54	0.29

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: HEGL1																		
EC	WIN	28	0.32	0.5	0.66	57.48	69.34	0.18	0.22	0.06	57.34	32.02	0.57	68.45	45.43	0.69	0.3	0.43
EC	SPR	30	0.29	0.48	0.47	62.74	92.33	0.18	0.27	0.34	48.75	9.7	0.63	79.04	49.55	0.92	0.61	0.22
EC	SUM	26	0.26	0.23	0.52	-11.58	39.74	-0.03	0.1	0.02	10.82	-4.07	-0.13	48.65	43.64	0.45	0.13	0.27
EC	FAL	30	0.26	0.3	0.61	16.88	38.72	0.04	0.1	0.02	20.81	12.21	0.17	37.61	31.77	0.39	0.14	0.38
EC	ALL	114	0.28	0.38	0.47	34.67	62	0.1	0.18	0.12	34.86	12.7	0.35	58.61	42.51	0.62	0.36	0.22
NO3	WIN	27	2.47	1.88	0.8	-24.07	44.43	-0.59	1.1	2.05	13.89	-10.41	-0.32	61.94	54.98	0.59	1.55	0.65
NO3	SPR	30	0.63	0.68	0.47	7.61	76.94	0.05	0.48	0.61	7.09	-29.39	0.08	76.73	74.57	0.77	0.78	0.22
NO3	SUM	20	0.17	0.05	0.14	-67.64	67.64	-0.11	0.11	0.01	-61.85	-99.01	-2.09	61.85	99.01	2.09	0.15	0.02
NO3	FAL	30	0.46	0.52	0.8	12.31	60.26	0.06	0.28	0.18	50.74	-14.78	0.12	108.59	75.53	0.6	0.43	0.63
NO3	ALL	107	0.96	0.82	0.81	-14.78	53.31	-0.14	0.51	0.81	8.16	-33.52	-0.17	79.15	74.47	0.63	0.91	0.66
OC	WIN	28	1.43	1.97	0.68	38.24	59.5	0.55	0.85	0.96	39.39	19.61	0.38	59.83	45.01	0.59	1.12	0.46
OC	SPR	30	1.7	2.12	0.57	24.75	64.41	0.42	1.1	5.7	13.25	-9.94	0.25	54.59	46.1	0.64	2.42	0.32
OC	SUM	26	2.01	2.34	0.69	16.76	39.9	0.34	0.8	0.84	42.56	16.28	0.17	64.39	42.75	0.4	0.98	0.48
OC	FAL	30	1.21	1.29	0.68	7.01	39.69	0.08	0.48	0.58	14.55	3.37	0.07	39.34	35	0.4	0.77	0.46
OC	ALL	114	1.57	1.92	0.59	21.85	51.2	0.34	0.81	2.11	26.7	6.8	0.22	54.1	42.15	0.51	1.49	0.35
PM-2.5	WIN	28	7.64	9.29	0.76	21.55	39.32	1.65	3	10.15	30.61	17.17	0.22	48.42	38.38	0.39	3.59	0.58
PM-2.5	SPR	30	7.67	8.35	0.46	8.85	44.75	0.68	3.43	32.78	8.78	-6.58	0.09	45.34	39.22	0.45	5.77	0.21
PM-2.5	SUM	28	10.76	7.33	0.63	-31.87	38.07	-3.43	4.1	12.2	-25.95	-36.8	-0.47	37.46	46.54	0.56	4.9	0.40
PM-2.5	FAL	30	5.69	6.19	0.7	8.84	27.75	0.5	1.58	5.53	15.94	8.67	0.09	29.95	25.77	0.28	2.4	0.50
PM-2.5	ALL	116	7.9	7.77	0.53	-1.58	38.11	-0.12	3.01	18.97	7.52	-4.2	-0.02	40.2	37.31	0.39	4.36	0.28
SO4	WIN	27	1.75	1.38	0.76	-21.2	35.24	-0.37	0.62	0.7	-10.39	-19.59	-0.27	32.75	36.49	0.45	0.92	0.58
SO4	SPR	30	2.19	1.74	0.76	-20.83	29.08	-0.46	0.64	0.62	-16.96	-23.05	-0.26	26.76	31.76	0.37	0.91	0.58
SO4	SUM	20	2.49	1.66	0.81	-33.41	39.98	-0.83	0.99	0.57	-27.7	-39.29	-0.5	41.08	50.17	0.6	1.12	0.65
SO4	FAL	30	1.44	1.37	0.79	-5.17	30.94	-0.07	0.45	0.37	11.86	2.56	-0.05	34.42	30.11	0.33	0.62	0.62
SO4	ALL	107	1.93	1.53	0.77	-20.66	33.51	-0.4	0.65	0.63	-9.23	-18.03	-0.26	33.1	35.93	0.42	0.89	0.59

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ISLE1																		
EC	WIN	27	0.08	0.14	0.97	74.54	74.54	0.06	0.06	0	145.85	71.05	0.75	145.85	71.05	0.75	0.08	0.94
EC	SPR	31	0.09	0.09	0.69	-4.94	37.68	0	0.03	0	15.77	1	-0.05	47.94	43.67	0.4	0.05	0.48
EC	SUM	31	0.14	0.07	0.63	-48.36	49.42	-0.07	0.07	0.01	-44.48	-64.67	-0.94	45.63	65.77	0.96	0.1	0.40
EC	FAL	27	0.18	0.17	0.8	-2.19	46.47	0	0.08	0.02	44.35	5.03	-0.02	77.73	50.33	0.48	0.16	0.64
EC	ALL	116	0.12	0.12	0.74	-4.85	50.01	-0.01	0.06	0.01	36.6	0.69	-0.05	77.05	57.5	0.53	0.1	0.54
NO3	WIN	26	0.64	0.92	0.79	44.63	78.42	0.28	0.5	1.18	81.5	3.87	0.45	132.17	89.2	0.78	1.12	0.62
NO3	SPR	31	0.41	0.27	0.98	-33.23	44.22	-0.14	0.18	0.17	-21.32	-70.31	-0.5	79.91	95.12	0.66	0.43	0.96
NO3	SUM	31	0.05	0.06	0.71	24.36	98.86	0.01	0.05	0.02	-28.3	-70.89	0.24	75	91.5	0.99	0.14	0.50
NO3	FAL	30	0.27	0.35	0.94	28.78	47.42	0.08	0.13	0.05	37.44	-16.12	0.29	99.08	82.23	0.47	0.23	0.89
NO3	ALL	118	0.33	0.38	0.8	15.08	61.61	0.05	0.2	0.34	14.44	-40.34	0.15	95.01	89.59	0.62	0.59	0.64
OC	WIN	27	0.36	0.72	0.94	101.79	102.57	0.37	0.37	0.11	318.06	83.87	1.02	318.81	84.66	1.03	0.49	0.88
OC	SPR	31	0.52	0.53	0.64	2.14	39.34	0.01	0.2	0.09	18.42	5.16	0.02	44	36.78	0.39	0.3	0.41
OC	SUM	31	1.55	0.78	0.41	-49.82	53.98	-0.77	0.84	0.91	-45.11	-65.37	-0.99	48.61	68.59	1.08	1.23	0.16
OC	FAL	27	1.21	0.85	0.8	-29.54	58.68	-0.36	0.71	3.22	33.58	1.85	-0.42	71.6	52.04	0.83	1.83	0.63
OC	ALL	116	0.92	0.72	0.62	-21.97	57.64	-0.2	0.53	1.22	74.72	3.86	-0.28	115.62	59.98	0.74	1.12	0.38
PM-2.5	WIN	29	3.02	3.94	0.89	30.49	44	0.92	1.33	8.24	29.03	17.34	0.3	43.02	34.34	0.44	3.01	0.79
PM-2.5	SPR	31	3.69	3.28	0.91	-11.03	21.38	-0.41	0.79	0.91	-6.94	-11.18	-0.12	23.18	24.63	0.24	1.04	0.82
PM-2.5	SUM	31	5.48	3.29	0.72	-39.93	46.2	-2.19	2.53	5.88	-41.2	-58.26	-0.66	45.36	61.87	0.77	3.27	0.52
PM-2.5	FAL	30	4.15	3.74	0.68	-10.01	46.04	-0.42	1.91	15.4	24.31	7.79	-0.11	51.78	43.37	0.51	3.95	0.46
PM-2.5	ALL	121	4.1	3.55	0.66	-13.34	40.05	-0.55	1.64	8.75	0.65	-11.7	-0.15	40.71	41.14	0.46	3.01	0.44
SO4	WIN	26	0.84	0.83	0.76	-0.63	45.49	-0.01	0.38	0.67	1.58	-5.77	-0.01	31.24	31.53	0.46	0.82	0.57
SO4	SPR	31	1.09	1.21	0.85	11.78	27.28	0.13	0.3	0.13	22.16	13.04	0.12	34.37	27.3	0.27	0.39	0.72
SO4	SUM	31	0.85	1.08	0.89	27.03	46.9	0.23	0.4	0.36	45.45	27.52	0.27	58.26	42.66	0.47	0.64	0.80
SO4	FAL	30	0.81	0.94	0.83	16.35	42.36	0.13	0.34	0.18	101.71	33.84	0.16	117.64	52.32	0.42	0.45	0.70
SO4	ALL	118	0.9	1.03	0.83	14.07	39.35	0.13	0.35	0.33	43.97	17.99	0.14	61.13	38.63	0.39	0.59	0.69

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: JARI1																		
EC	WIN	29	0.59	0.46	0.73	-22.02	36.29	-0.13	0.21	0.06	-2.99	-13.92	-0.28	39.61	39.29	0.47	0.27	0.54
EC	SPR	31	0.33	0.3	0.44	-9.58	34.97	-0.03	0.12	0.02	3.69	-4.9	-0.11	35.09	34.33	0.39	0.15	0.19
EC	SUM	31	0.45	0.3	0.53	-33.03	34.41	-0.15	0.15	0.02	-27.82	-35.82	-0.49	29.34	37.24	0.51	0.21	0.28
EC	FAL	25	0.43	0.36	0.59	-15.88	33.54	-0.07	0.14	0.04	-3.59	-11.63	-0.19	32.44	33.45	0.4	0.21	0.35
EC	ALL	116	0.45	0.35	0.65	-21.22	34.96	-0.09	0.16	0.04	-7.97	-16.87	-0.27	34.11	36.16	0.44	0.21	0.43
NO3	WIN	29	0.9	0.64	0.25	-28.75	63.58	-0.26	0.57	1.11	20.68	-11.63	-0.4	69.65	63.95	0.89	1.09	0.06
NO3	SPR	31	0.49	0.27	0.23	-44.5	77.43	-0.22	0.38	0.48	36.28	-40.52	-0.8	116.71	84.06	1.4	0.73	0.05
NO3	SUM	31	0.15	0.04	0.11	-70.77	70.77	-0.11	0.11	0.01	-64.86	-104.41	-2.42	64.86	104.41	2.42	0.15	0.01
NO3	FAL	25	0.25	0.22	0.64	-11.89	57.37	-0.03	0.14	0.03	12.65	-28.55	-0.13	77.23	70.65	0.65	0.18	0.42
NO3	ALL	116	0.45	0.29	0.43	-35.17	67.53	-0.16	0.3	0.43	0.26	-47.79	-0.54	82.58	81.58	1.04	0.67	0.18
OC	WIN	29	2.23	1.23	0.55	-44.99	51.6	-1	1.15	1.13	-32.44	-50.06	-0.82	48.09	61.31	0.94	1.46	0.30
OC	SPR	31	1.43	0.95	0.7	-33.85	39.31	-0.48	0.56	0.42	-28.54	-40.63	-0.51	37.06	47.16	0.59	0.81	0.48
OC	SUM	31	2.14	1.42	0.4	-33.56	38.48	-0.72	0.82	1.94	-26.02	-36.41	-0.51	32.89	42.28	0.58	1.57	0.16
OC	FAL	25	1.46	1.06	0.56	-26.96	43.91	-0.39	0.64	0.8	-23.86	-34.8	-0.37	34.79	43.76	0.6	0.98	0.32
OC	ALL	116	1.82	1.17	0.52	-35.98	43.6	-0.66	0.8	1.14	-27.83	-40.6	-0.56	38.21	48.66	0.68	1.25	0.28
PM-2.5	WIN	29	8.13	5.82	0.68	-28.36	33.66	-2.3	2.74	7.24	-21.66	-29.63	-0.4	30.9	37.04	0.47	3.54	0.47
PM-2.5	SPR	31	6.98	5.24	0.65	-24.98	31.99	-1.75	2.23	6.63	-16.08	-24.87	-0.33	30.78	35.88	0.43	3.11	0.42
PM-2.5	SUM	31	11.88	6.83	0.47	-42.5	44.76	-5.05	5.32	17.88	-39.09	-52.91	-0.74	41.98	55.45	0.78	6.59	0.22
PM-2.5	FAL	25	6.6	5	0.84	-24.2	29.32	-1.6	1.94	4.01	-17.51	-23.79	-0.32	26.88	32	0.39	2.56	0.70
PM-2.5	ALL	116	8.5	5.76	0.66	-32.2	36.71	-2.74	3.12	11.24	-23.93	-33.32	-0.48	32.96	40.57	0.54	4.33	0.44
SO4	WIN	29	1.86	1.2	0.73	-35.57	36.57	-0.66	0.68	0.37	-28.61	-38.17	-0.55	34.02	42.18	0.57	0.9	0.54
SO4	SPR	31	2	1.68	0.71	-16.33	27.99	-0.33	0.56	0.51	-8.04	-16.89	-0.2	31.69	34.44	0.33	0.79	0.51
SO4	SUM	31	3.73	2.61	0.39	-30.07	42.73	-1.12	1.59	3.1	-20.79	-35.58	-0.43	43.94	49.58	0.61	2.09	0.15
SO4	FAL	25	1.73	1.45	0.85	-15.89	29.99	-0.27	0.52	0.45	7.54	-9.62	-0.19	44.15	35.5	0.36	0.72	0.73
SO4	ALL	116	2.37	1.76	0.67	-25.82	36.19	-0.61	0.86	1.27	-13.23	-25.64	-0.35	38.23	40.65	0.49	1.28	0.45

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: LASU2																		
EC	WIN	29	0.26	0.3	0.54	16.56	37.95	0.04	0.1	0.01	25.87	14.76	0.17	42.09	35.46	0.38	0.12	0.29
EC	SPR	31	0.29	0.4	0.63	39.7	65.23	0.11	0.19	0.13	34.51	6.68	0.4	60.62	38.54	0.65	0.38	0.40
EC	SUM	29	0.32	0.27	0.72	-15.24	24.41	-0.05	0.08	0.01	-6.01	-10.32	-0.18	22.64	24.24	0.29	0.12	0.52
EC	FAL	27	0.27	0.26	0.68	-3.29	26.94	-0.01	0.07	0.01	-1.58	-6.75	-0.03	25.42	25.21	0.28	0.1	0.46
EC	ALL	116	0.28	0.31	0.52	9.54	39.13	0.03	0.11	0.05	13.82	1.32	0.1	38.3	31.09	0.39	0.22	0.27
NO3	WIN	28	3.68	3.16	0.77	-14.23	35.7	-0.52	1.31	2.61	15.09	-6.48	-0.17	53.41	43.24	0.42	1.7	0.59
NO3	SPR	30	1.61	2.17	0.89	34.78	48.61	0.56	0.78	0.8	53.71	21.8	0.35	74.35	50.06	0.49	1.06	0.79
NO3	SUM	31	0.28	0.25	0.53	-10.57	60.58	-0.03	0.17	0.06	-0.66	-23.58	-0.12	59.47	63.14	0.68	0.24	0.28
NO3	FAL	27	0.8	1.42	0.89	77.33	93.15	0.62	0.75	1.6	85.67	26.05	0.77	117.29	67.2	0.93	1.41	0.80
NO3	ALL	116	1.57	1.72	0.82	9.89	47.18	0.15	0.74	1.44	37.3	3.84	0.1	75.31	55.9	0.47	1.21	0.67
OC	WIN	29	1.01	1.06	0.68	4.8	29.32	0.05	0.3	0.11	7.9	0.05	0.05	32.91	32.81	0.29	0.34	0.46
OC	SPR	31	1.32	1.6	0.67	21.08	58.22	0.28	0.77	2.1	15.27	-12.01	0.21	59.38	44.46	0.58	1.48	0.45
OC	SUM	29	1.7	1.45	0.81	-14.65	29.14	-0.25	0.5	0.37	-14.64	-21.67	-0.17	28.97	33.89	0.34	0.65	0.66
OC	FAL	27	1.06	0.91	0.61	-14.66	40.7	-0.16	0.43	0.32	-14.33	-27.03	-0.17	39.69	45.52	0.48	0.58	0.37
OC	ALL	116	1.28	1.27	0.67	-0.94	39.45	-0.01	0.5	0.8	-0.94	-14.91	-0.01	40.58	39.15	0.4	0.89	0.46
PM-2.5	WIN	29	10.1	8.9	0.71	-11.86	29.89	-1.2	3.02	14.68	1.77	-7.58	-0.13	35.55	32.98	0.34	4.01	0.50
PM-2.5	SPR	31	8.37	9.89	0.64	18.22	42.01	1.52	3.51	21.87	32.54	9.37	0.18	57.58	39.72	0.42	4.92	0.41
PM-2.5	SUM	31	8.98	6.93	0.87	-22.84	28.34	-2.05	2.54	5.1	-17.32	-22.82	-0.3	28.65	32.15	0.37	3.05	0.76
PM-2.5	FAL	27	6.21	6.62	0.75	6.67	28.99	0.41	1.8	9.06	8.69	2.47	0.07	25.83	23.15	0.29	3.04	0.56
PM-2.5	ALL	118	8.46	8.12	0.67	-3.99	32.46	-0.34	2.75	14.76	6.42	-4.83	-0.04	37.3	32.28	0.34	3.86	0.44
SO4	WIN	28	1.78	1.19	0.51	-33.4	52.06	-0.59	0.93	1.25	-21.67	-37.99	-0.5	46.32	56.99	0.78	1.27	0.26
SO4	SPR	30	1.84	1.85	0.71	0.33	31.97	0.01	0.59	0.75	11.03	1.35	0	33.44	29.05	0.32	0.87	0.51
SO4	SUM	31	2.36	1.75	0.81	-25.81	35.63	-0.61	0.84	0.98	-11.58	-20.24	-0.35	33.82	37.32	0.48	1.16	0.65
SO4	FAL	27	1.41	1.21	0.89	-13.97	30.98	-0.2	0.44	0.33	11.22	2.54	-0.16	36.87	34.53	0.36	0.6	0.79
SO4	ALL	116	1.87	1.51	0.69	-18.8	37.66	-0.35	0.7	0.91	-2.86	-13.64	-0.23	37.45	39.28	0.46	1.01	0.48

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: LIGO1																		
EC	WIN	29	0.22	0.26	0.72	20.19	47.83	0.04	0.11	0.02	57.52	29.3	0.2	74.24	50.47	0.48	0.13	0.52
EC	SPR	30	0.26	0.22	0.43	-16.78	44.98	-0.04	0.12	0.02	3.31	-10.38	-0.2	46.58	45.84	0.54	0.16	0.18
EC	SUM	22	0.31	0.16	0.4	-46.68	47.3	-0.14	0.15	0.01	-43.81	-59.93	-0.88	44.82	60.91	0.89	0.17	0.16
EC	FAL	30	0.23	0.2	0.54	-14.06	37.42	-0.03	0.09	0.01	3.54	-11.78	-0.16	44.91	41.9	0.44	0.11	0.29
EC	ALL	111	0.25	0.21	0.48	-14.88	44.34	-0.04	0.11	0.02	8.19	-10.21	-0.17	53.01	48.97	0.52	0.14	0.23
NO3	WIN	29	0.25	0.42	0.4	66.58	117.87	0.17	0.29	0.19	123.07	19.67	0.67	162.99	80.78	1.18	0.46	0.16
NO3	SPR	30	0.2	0.18	0.41	-9.17	70.66	-0.02	0.14	0.04	50.98	-25.64	-0.1	116.79	74.31	0.78	0.2	0.17
NO3	SUM	22	0.07	0.05	0.15	-31.84	81.17	-0.02	0.06	0.01	-30.81	-70.91	-0.47	73.37	86.89	1.19	0.09	0.02
NO3	FAL	30	0.14	0.17	0.45	21.35	76.29	0.03	0.11	0.02	85.53	-20.33	0.21	149.66	81.83	0.76	0.15	0.20
NO3	ALL	111	0.17	0.21	0.48	24.61	90.73	0.04	0.16	0.07	62.94	-21.34	0.25	129.14	80.53	0.91	0.27	0.23
OC	WIN	29	1.14	0.93	0.77	-18.19	42.56	-0.21	0.48	0.42	2.79	-10.13	-0.22	41.27	43.09	0.52	0.68	0.59
OC	SPR	30	1.43	1.09	0.76	-23.99	36.58	-0.34	0.52	0.34	-13.58	-23.29	-0.32	37.08	41.51	0.48	0.68	0.58
OC	SUM	22	1.93	1.66	0.5	-13.79	37.06	-0.27	0.71	0.7	-7.26	-19.3	-0.16	38.68	42.06	0.43	0.88	0.25
OC	FAL	30	1.16	0.98	0.57	-15.36	52.59	-0.18	0.61	0.61	-6.04	-26.38	-0.18	53.42	56.53	0.62	0.8	0.32
OC	ALL	111	1.38	1.13	0.67	-17.96	41.63	-0.25	0.57	0.51	-6.01	-19.9	-0.22	42.91	46.09	0.51	0.76	0.45
PM-2.5	WIN	29	4.41	4.62	0.8	4.84	33.58	0.21	1.48	3.22	22.27	8.85	0.05	44.44	35.26	0.34	1.81	0.64
PM-2.5	SPR	30	6.82	5.68	0.74	-16.65	31.72	-1.13	2.16	6.81	-1.77	-11.52	-0.2	36.35	36.25	0.38	2.85	0.55
PM-2.5	SUM	22	11.27	7.38	0.61	-34.53	36.53	-3.89	4.12	6.09	-34.38	-45.43	-0.53	36.79	47.56	0.56	4.61	0.37
PM-2.5	FAL	30	5.33	4.78	0.83	-10.37	30.37	-0.55	1.62	3.85	-2.9	-11.84	-0.12	33.77	35.64	0.34	2.04	0.70
PM-2.5	ALL	111	6.67	5.5	0.77	-17.57	33.36	-1.17	2.22	7	-2.26	-13.01	-0.21	37.85	38.07	0.4	2.89	0.60
SO4	WIN	29	1.16	1.19	0.73	2.73	36.29	0.03	0.42	0.25	33.01	13.59	0.03	56.01	40.89	0.36	0.5	0.53
SO4	SPR	30	1.9	1.96	0.68	3.1	31.42	0.06	0.6	0.68	21.51	5.77	0.03	43.73	33.62	0.31	0.83	0.46
SO4	SUM	22	3.31	2.86	0.42	-13.82	30.08	-0.46	1	1.33	-8.77	-15.79	-0.16	30.49	33.57	0.35	1.24	0.18
SO4	FAL	30	1.35	1.58	0.78	16.52	38.16	0.22	0.52	0.55	42.85	16.63	0.17	59.42	37.32	0.38	0.77	0.61
SO4	ALL	111	1.84	1.83	0.76	-0.33	33.08	-0.01	0.61	0.72	24.28	6.47	0	48.56	36.51	0.33	0.85	0.57

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: LOST1																		
EC	WIN	29	0.15	0.09	0.56	-35.74	39.89	-0.05	0.06	0	-27.72	-38.3	-0.56	34.96	44.92	0.62	0.08	0.31
EC	SPR	19	0.16	0.11	0.58	-31.61	44.75	-0.05	0.07	0.01	5.37	-14.33	-0.46	50.5	47.02	0.65	0.13	0.34
EC	SUM	29	0.21	0.14	0.24	-36.18	44.69	-0.08	0.09	0.01	-27.57	-41.74	-0.57	40.54	52.09	0.7	0.12	0.06
EC	FAL	29	0.29	0.23	0.28	-21.74	56.62	-0.06	0.17	0.05	-17.43	-39.35	-0.28	53.97	62.33	0.72	0.23	0.08
EC	ALL	106	0.21	0.15	0.43	-29.86	48.39	-0.06	0.1	0.02	-18.93	-35.23	-0.43	44.47	52.02	0.69	0.15	0.18
NO3	WIN	29	0.98	2.11	0.4	115.72	143.03	1.13	1.4	3.58	180.08	54.77	1.16	198.77	79.92	1.43	2.2	0.16
NO3	SPR	19	1.2	1.58	0.55	31.87	76.88	0.38	0.92	1.36	161.99	35.04	0.32	191.31	76.26	0.77	1.23	0.30
NO3	SUM	29	0.31	0.08	0.72	-72.6	72.6	-0.22	0.22	0.07	-67.68	-108.27	-2.65	67.68	108.27	2.65	0.35	0.52
NO3	FAL	26	0.42	1.21	0.61	187.51	193.61	0.79	0.81	0.83	284.18	75.35	1.88	295.83	90.91	1.94	1.2	0.37
NO3	ALL	103	0.69	1.21	0.53	76.12	120.73	0.52	0.83	1.77	133.26	10.42	0.76	184.99	90	1.21	1.43	0.28
OC	WIN	29	0.35	0.25	0.58	-30.2	35.4	-0.11	0.13	0.02	-21.02	-29.83	-0.43	31.86	38.31	0.51	0.17	0.33
OC	SPR	19	0.48	0.27	0.61	-42.72	49.35	-0.2	0.24	0.05	-20.41	-37.91	-0.75	48.4	57.94	0.86	0.3	0.37
OC	SUM	29	1.03	0.52	0.17	-49.23	56.32	-0.51	0.58	0.24	-43.67	-66.33	-0.97	52.34	73.2	1.11	0.7	0.03
OC	FAL	29	0.9	0.95	0.35	5.64	65.21	0.05	0.59	0.9	22.14	-3.56	0.06	63.69	56.08	0.65	0.95	0.12
OC	ALL	106	0.71	0.52	0.42	-26.88	55.71	-0.19	0.4	0.37	-15.3	-34.08	-0.37	49.14	56.23	0.76	0.64	0.18
PM-2.5	WIN	29	3.29	4.21	0.46	27.92	65.04	0.92	2.14	7.36	37.62	15.39	0.28	66.11	52.16	0.65	2.86	0.21
PM-2.5	SPR	19	4.23	4.42	0.55	4.59	43.93	0.19	1.86	5.69	26.01	10.01	0.05	51.81	42.46	0.44	2.39	0.30
PM-2.5	SUM	28	5.67	3.18	0.75	-43.89	43.89	-2.49	2.49	1.44	-43.51	-58.44	-0.78	43.51	58.44	0.78	2.76	0.56
PM-2.5	FAL	29	4.65	5.28	0.45	13.51	53.23	0.63	2.48	9.81	43.15	14.77	0.14	70.46	51.23	0.53	3.19	0.20
PM-2.5	ALL	105	4.47	4.27	0.39	-4.51	50.88	-0.2	2.27	8.12	15.41	-5.44	-0.05	58.7	51.82	0.53	2.86	0.15
SO4	WIN	29	0.86	0.56	0.59	-35.23	43.77	-0.3	0.38	0.29	-13.05	-25.57	-0.54	38.59	43.76	0.68	0.62	0.35
SO4	SPR	19	0.97	1.03	0.48	6.46	45.96	0.06	0.45	0.49	26.06	10.38	0.06	47.97	38.02	0.46	0.7	0.23
SO4	SUM	29	1.1	0.96	0.74	-12.48	38.84	-0.14	0.43	0.27	4.62	-8.84	-0.14	45.72	43.96	0.44	0.53	0.55
SO4	FAL	26	0.57	0.74	0.45	29.85	57.83	0.17	0.33	0.15	61.5	32.58	0.3	75.23	48.88	0.58	0.42	0.20
SO4	ALL	103	0.88	0.81	0.58	-7.9	44.8	-0.07	0.39	0.32	17.95	0.45	-0.09	51.58	44.05	0.49	0.57	0.33

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: LYBR1																		
EC	WIN	21	0.11	0.32	0.6	199.61	200.41	0.22	0.22	0.02	345.38	103.11	2	345.83	103.56	2	0.26	0.36
EC	SPR	28	0.1	0.17	0.62	63.97	81.24	0.07	0.08	0.01	138.55	57.28	0.64	146.9	67.83	0.81	0.11	0.38
EC	SUM	22	0.18	0.15	0.72	-16.52	40.36	-0.03	0.07	0.01	2.97	-11.09	-0.2	45.39	41.97	0.48	0.09	0.52
EC	FAL	30	0.17	0.22	0.8	29.55	45.26	0.05	0.08	0.01	125.68	40.6	0.3	133.29	50.16	0.45	0.09	0.63
EC	ALL	101	0.14	0.21	0.5	51.43	76.44	0.07	0.11	0.02	148.2	46.96	0.51	162.11	64.38	0.76	0.15	0.25
NO3	WIN	22	0.45	1.18	0.67	161.87	171.74	0.73	0.77	0.71	251.33	84.77	1.62	258.21	92.81	1.72	1.11	0.45
NO3	SPR	27	0.25	0.36	0.31	43.38	116.14	0.11	0.29	0.25	101.11	-18.69	0.43	171.56	91.32	1.16	0.51	0.10
NO3	SUM	23	0.19	0.06	0.11	-70.12	81.7	-0.14	0.16	0.06	-46.25	-93.58	-2.35	78.09	111.38	2.73	0.27	0.01
NO3	FAL	30	0.27	0.24	0.72	-10.03	51.58	-0.03	0.14	0.03	16.63	-31.87	-0.11	89.27	75.28	0.57	0.17	0.52
NO3	ALL	102	0.29	0.43	0.58	51.37	111.8	0.15	0.32	0.34	75.43	-17.14	0.51	144.97	91.45	1.12	0.6	0.33
OC	WIN	20	0.48	1.72	0.6	256.98	256.98	1.24	1.24	0.67	351.67	111.68	2.57	351.67	111.68	2.57	1.48	0.36
OC	SPR	27	0.51	0.9	0.6	77.31	94.73	0.39	0.48	0.24	232.7	69.89	0.77	241.04	79.74	0.95	0.63	0.36
OC	SUM	22	1.25	0.82	0.67	-34.17	45.75	-0.43	0.57	1.1	3.43	-15.42	-0.52	52.07	48.36	0.69	1.13	0.45
OC	FAL	29	0.67	0.98	0.76	45.78	58.76	0.31	0.4	0.15	167.79	47.39	0.46	175.7	56.32	0.59	0.49	0.57
OC	ALL	98	0.72	1.07	0.32	49.63	87.84	0.36	0.63	0.79	186.3	52.61	0.5	201.86	72.28	0.88	0.96	0.10
PM-2.5	WIN	22	2.61	6.53	0.78	150.19	150.19	3.92	3.92	8.53	177.61	85.56	1.5	177.61	85.56	1.5	4.89	0.61
PM-2.5	SPR	28	3.18	4.5	0.62	41.39	55.29	1.32	1.76	4.5	72.43	35.83	0.41	81.13	46.57	0.55	2.5	0.38
PM-2.5	SUM	23	6.09	4.08	0.65	-32.95	44.6	-2.01	2.72	12.82	-7.56	-28.59	-0.49	51.86	53.63	0.67	4.1	0.42
PM-2.5	FAL	30	3.93	4.49	0.92	14.27	30.57	0.56	1.2	1.79	78.86	29.16	0.14	90.8	43.23	0.31	1.45	0.84
PM-2.5	ALL	103	3.93	4.84	0.51	23.19	57.85	0.91	2.27	10.34	78.91	30.12	0.23	98.02	55.5	0.58	3.34	0.26
SO4	WIN	22	0.85	0.87	0.82	2.77	28.1	0.02	0.24	0.09	15.51	7.23	0.03	34.64	30.02	0.28	0.31	0.68
SO4	SPR	27	0.93	1.29	0.84	38.24	43.86	0.36	0.41	0.22	66.77	36.6	0.38	70.68	40.94	0.44	0.59	0.70
SO4	SUM	23	1.64	1.49	0.61	-9.11	59.09	-0.15	0.97	1.69	85.07	3.76	-0.1	129.86	66.9	0.65	1.31	0.37
SO4	FAL	30	1.27	1.33	0.96	4.45	22.98	0.06	0.29	0.14	62.79	24.49	0.04	73.61	36.36	0.23	0.38	0.93
SO4	ALL	102	1.17	1.25	0.78	7.01	39.56	0.08	0.46	0.53	58.67	19.3	0.07	77.11	43.09	0.4	0.73	0.61

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MACA1																		
EC	WIN	29	0.34	0.52	0.74	52.12	56.6	0.18	0.19	0.03	54.27	37.47	0.52	58.87	42.52	0.57	0.25	0.55
EC	SPR	31	0.29	0.31	0.66	5.95	29.4	0.02	0.09	0.01	16.94	8.95	0.06	35.14	30.6	0.29	0.1	0.43
EC	SUM	31	0.34	0.33	0.43	-1.01	26.76	0	0.09	0.01	4.95	-0.78	-0.01	28.82	27.02	0.27	0.11	0.19
EC	FAL	30	0.31	0.36	0.73	16.04	27.12	0.05	0.09	0.01	26.65	18.62	0.16	33.75	26.74	0.27	0.11	0.53
EC	ALL	121	0.32	0.38	0.6	18.35	35.1	0.06	0.11	0.02	25.22	15.69	0.18	38.86	31.59	0.35	0.15	0.36
NO3	WIN	28	2.08	2.02	0.58	-2.61	39.99	-0.05	0.83	1.22	34.34	10.89	-0.03	62.34	47.06	0.41	1.11	0.33
NO3	SPR	31	0.68	1.22	0.2	80.79	141.48	0.55	0.96	2.89	147.23	26.44	0.81	179.85	71.9	1.41	1.78	0.04
NO3	SUM	26	0.2	0.12	0	-40.05	58.79	-0.08	0.12	0.01	-32.42	-62.9	-0.67	59.59	79.85	0.98	0.14	0.00
NO3	FAL	30	0.39	0.55	0.57	41.51	79.74	0.16	0.31	0.15	62.4	10.75	0.42	103.1	69.61	0.8	0.42	0.33
NO3	ALL	115	0.83	0.99	0.57	18.97	68.03	0.16	0.57	1.18	57	-1.64	0.19	104.03	67.05	0.68	1.1	0.32
OC	WIN	29	1.46	1.7	0.81	16.41	33.15	0.24	0.48	0.31	18.98	11.04	0.16	35.58	31.91	0.33	0.6	0.66
OC	SPR	31	1.44	1.04	0.82	-28.33	37.67	-0.41	0.54	0.37	-17.58	-27.05	-0.4	33.93	40.3	0.53	0.73	0.67
OC	SUM	31	2.26	1.72	0.77	-23.89	31.69	-0.54	0.72	0.43	-24.26	-32.17	-0.31	31.61	38.22	0.42	0.85	0.59
OC	FAL	30	1.3	1.12	0.82	-13.71	30.71	-0.18	0.4	0.23	-14.53	-20.83	-0.16	28.94	33.32	0.36	0.51	0.68
OC	ALL	121	1.62	1.39	0.74	-14.19	33.18	-0.23	0.54	0.42	-9.77	-17.69	-0.17	32.49	36.03	0.39	0.69	0.55
PM-2.5	WIN	29	7.68	9.36	0.67	21.83	31.35	1.68	2.41	6.5	29.44	19.69	0.22	37.93	29.5	0.31	3.05	0.45
PM-2.5	SPR	31	8.34	7.24	0.41	-13.2	36.93	-1.1	3.08	13.97	-2.71	-14.41	-0.15	39.14	38.44	0.43	3.9	0.17
PM-2.5	SUM	31	11.69	7.66	0.74	-34.46	35.57	-4.03	4.16	8.05	-32.8	-42.22	-0.53	34.41	43.72	0.54	4.93	0.54
PM-2.5	FAL	30	6.49	6.44	0.86	-0.76	19.68	-0.05	1.28	2.42	2.76	-0.72	-0.01	21.88	21.67	0.2	1.56	0.74
PM-2.5	ALL	121	8.58	7.66	0.56	-10.77	32.02	-0.92	2.75	12.09	-1.36	-9.97	-0.12	33.36	33.49	0.36	3.6	0.31
SO4	WIN	28	2.11	1.5	0.8	-28.91	33.84	-0.61	0.71	0.43	-22.02	-29.92	-0.41	33.35	39.5	0.48	0.89	0.64
SO4	SPR	31	2.74	1.84	0.78	-32.73	36.58	-0.9	1	0.84	-23.06	-31.95	-0.49	34.37	41.12	0.54	1.28	0.61
SO4	SUM	26	3.32	2.1	0.73	-36.94	40.31	-1.23	1.34	0.97	-33.7	-45.53	-0.59	38.01	49.43	0.64	1.57	0.53
SO4	FAL	30	1.85	1.67	0.72	-9.67	31.65	-0.18	0.59	0.6	-2.36	-9.15	-0.11	29.93	32.07	0.35	0.8	0.53
SO4	ALL	115	2.49	1.77	0.74	-28.73	36.18	-0.71	0.9	0.85	-19.81	-28.58	-0.4	33.79	40.25	0.51	1.17	0.55

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MAVI1																		
EC	WIN	28	0.17	0.34	0.79	96.69	97.29	0.17	0.17	0.02	114.61	65.42	0.97	115.01	65.83	0.97	0.21	0.62
EC	SPR	31	0.1	0.21	0.4	100.15	120.09	0.1	0.12	0.01	184.54	74.48	1	192.1	84.99	1.2	0.15	0.16
EC	SUM	28	0.21	0.24	0.74	15.38	42.62	0.03	0.09	0.01	50.14	21.42	0.15	69.49	45.1	0.43	0.12	0.54
EC	FAL	28	0.16	0.25	0.86	54.97	67.86	0.09	0.11	0.02	98.41	51.63	0.55	103.71	57.59	0.68	0.17	0.74
EC	ALL	115	0.16	0.26	0.74	61.04	76.49	0.1	0.12	0.02	113.82	53.79	0.61	121.96	63.94	0.76	0.17	0.55
NO3	WIN	23	0.68	1.23	0.82	81.88	93.53	0.55	0.63	0.65	94.93	35.75	0.82	118.41	71.19	0.94	0.98	0.68
NO3	SPR	31	0.41	0.92	0.51	123.33	140.61	0.51	0.58	0.8	140.88	36.22	1.23	164.8	72.56	1.41	1.03	0.26
NO3	SUM	27	0.35	0.53	0.84	53.32	94.59	0.19	0.33	0.25	31.05	-14.65	0.53	92.07	81.35	0.95	0.54	0.70
NO3	FAL	19	0.42	0.8	0.72	90.45	118.28	0.38	0.5	0.74	41.26	-7.5	0.9	94.87	73.2	1.18	0.94	0.52
NO3	ALL	100	0.46	0.86	0.72	89.02	111.18	0.41	0.51	0.63	81.73	14.07	0.89	121.2	74.74	1.11	0.89	0.52
OC	WIN	28	0.89	1.39	0.72	56.99	61.01	0.5	0.54	0.41	60.28	37.64	0.57	65.4	43.9	0.61	0.82	0.52
OC	SPR	31	0.59	0.84	0.38	43.45	76.17	0.25	0.45	0.32	73.28	38.17	0.43	86.69	55.19	0.76	0.62	0.15
OC	SUM	28	1.33	0.99	0.74	-25.37	40.39	-0.34	0.54	0.38	-18.76	-34.93	-0.34	44.06	51.73	0.54	0.7	0.54
OC	FAL	28	1.21	0.81	0.76	-33.41	46.11	-0.4	0.56	0.38	-40.09	-59.52	-0.5	47.49	65.65	0.69	0.74	0.58
OC	ALL	115	0.99	1	0.57	1.11	52.27	0.01	0.52	0.52	20.1	-3.54	0.01	61.58	54.14	0.52	0.72	0.32
PM-2.5	WIN	27	5.19	6.62	0.85	27.57	37.79	1.43	1.96	5.64	28.47	18.43	0.28	38.7	30.51	0.38	2.77	0.72
PM-2.5	SPR	30	5.59	6.37	0.54	13.8	37.51	0.77	2.1	9.2	19.34	9.65	0.14	37.3	31.14	0.38	3.13	0.29
PM-2.5	SUM	30	8.44	6.14	0.76	-27.25	38.76	-2.3	3.27	12.49	-19.5	-31.02	-0.37	36.83	44.87	0.53	4.22	0.58
PM-2.5	FAL	28	6.16	5.13	0.64	-16.66	39.51	-1.03	2.43	27.99	-4.3	-13.79	-0.2	32.05	36.99	0.47	5.39	0.41
PM-2.5	ALL	115	6.38	6.07	0.61	-4.89	38.47	-0.31	2.45	15.97	5.6	-4.61	-0.05	36.23	36	0.4	4.01	0.37
SO4	WIN	23	1.32	0.93	0.68	-29.21	35.42	-0.38	0.47	0.36	-16.67	-25.2	-0.41	32.31	37.42	0.5	0.71	0.47
SO4	SPR	31	1.49	1.82	0.64	22.34	38.73	0.33	0.58	0.93	29.95	16.09	0.22	44.73	33.09	0.39	1.02	0.41
SO4	SUM	27	2.36	2.29	0.52	-2.88	54.01	-0.07	1.28	3.54	36.82	4	-0.03	72.77	52.31	0.56	1.88	0.27
SO4	FAL	19	1.19	1.08	0.86	-9.28	27.79	-0.11	0.33	0.14	4.76	-6.75	-0.1	38.94	39.27	0.31	0.39	0.74
SO4	ALL	100	1.63	1.6	0.6	-1.51	42.58	-0.02	0.69	1.43	16.3	-1.01	-0.02	48.34	40.45	0.43	1.19	0.35

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MELA1																		
EC	WIN	27	0.07	0.09	0.65	30.88	46.75	0.02	0.03	0	51.56	30.64	0.31	63.11	44.48	0.47	0.04	0.43
EC	SPR	31	0.1	0.11	0.43	5.67	52.44	0.01	0.05	0	48.86	8.2	0.06	85.11	57.39	0.52	0.07	0.18
EC	SUM	29	0.13	0.14	0.54	4.79	31.29	0.01	0.04	0	22.47	10.68	0.05	38.57	30.66	0.31	0.07	0.29
EC	FAL	27	0.17	0.21	0.51	27.37	63	0.05	0.11	0.03	33.38	14.07	0.27	57.54	44.05	0.63	0.17	0.26
EC	ALL	114	0.12	0.14	0.57	16.34	49.06	0.02	0.06	0.01	39.12	15.54	0.16	61.53	44.38	0.49	0.1	0.33
NO3	WIN	27	0.62	1.94	0.6	210.87	220.82	1.32	1.38	3.07	258.48	82.39	2.11	266.04	92.55	2.21	2.19	0.36
NO3	SPR	31	0.8	1.22	0.77	52.15	78.88	0.42	0.63	0.81	98.92	25.93	0.52	132.07	80.95	0.79	1	0.60
NO3	SUM	30	0.17	0.11	0.59	-32.01	67.26	-0.05	0.11	0.02	-44.58	-82.5	-0.47	68.51	98.44	0.99	0.15	0.35
NO3	FAL	27	0.28	0.72	0.72	157.5	173.26	0.44	0.48	0.52	248.1	40.22	1.58	281.82	92.32	1.73	0.84	0.51
NO3	ALL	115	0.47	0.98	0.66	108.36	135.02	0.51	0.64	1.31	133.97	14.26	1.08	182.1	90.9	1.35	1.25	0.44
OC	WIN	27	0.33	0.26	0.67	-22.39	32.05	-0.07	0.11	0.01	-15.68	-22.19	-0.29	28.51	32.86	0.41	0.14	0.44
OC	SPR	31	0.38	0.27	0.06	-29.45	56.35	-0.11	0.21	0.07	-7.31	-33.59	-0.42	59.57	63.11	0.8	0.28	0.00
OC	SUM	29	0.93	0.44	0.35	-52.32	55.41	-0.49	0.51	0.19	-50.56	-73.89	-1.1	53.18	76.09	1.16	0.65	0.12
OC	FAL	27	0.78	0.88	0.46	13.39	67.13	0.1	0.52	0.61	21.87	-1.28	0.13	62.32	54.35	0.67	0.79	0.21
OC	ALL	114	0.6	0.46	0.46	-24.35	56.1	-0.15	0.34	0.26	-13.38	-33.49	-0.32	51.24	57.18	0.74	0.53	0.21
PM-2.5	WIN	27	2.06	3.88	0.64	88.09	99.81	1.82	2.06	5.53	100.19	48.87	0.88	109.5	59.79	1	2.97	0.41
PM-2.5	SPR	31	3.63	3.82	0.75	5.42	41.06	0.2	1.49	3.03	24.61	2.84	0.05	57.74	50.05	0.41	1.75	0.56
PM-2.5	SUM	30	4.5	2.51	0.59	-44.27	45.61	-1.99	2.05	1.76	-41.97	-56.58	-0.79	43.33	57.81	0.82	2.39	0.35
PM-2.5	FAL	27	4.04	4.35	0.68	7.56	41.57	0.31	1.68	4.9	22.42	6.07	0.08	51.02	44.09	0.42	2.24	0.46
PM-2.5	ALL	115	3.58	3.62	0.51	0.91	50.63	0.03	1.81	5.57	24.47	-1.09	0.01	64.56	52.96	0.51	2.36	0.26
SO4	WIN	27	0.6	0.47	0.57	-21.77	44.67	-0.13	0.27	0.11	10.54	-8.33	-0.28	54.33	48.94	0.57	0.35	0.32
SO4	SPR	31	1.15	0.89	0.75	-22.73	41.2	-0.26	0.48	0.37	-1.83	-16.74	-0.29	45	47.89	0.53	0.66	0.56
SO4	SUM	30	0.8	0.64	0.43	-19.94	36.53	-0.16	0.29	0.13	-11.48	-22.06	-0.25	36.6	38.82	0.46	0.39	0.18
SO4	FAL	27	0.52	0.68	0.51	31.14	55.29	0.16	0.28	0.11	57.12	32.95	0.31	68.56	47.09	0.55	0.37	0.26
SO4	ALL	115	0.78	0.68	0.67	-13.46	42.76	-0.11	0.33	0.21	12.4	-4.49	-0.16	50.53	45.58	0.49	0.47	0.45

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MING1																		
EC	WIN	27	0.44	0.45	0.52	2.69	35.56	0.01	0.16	0.05	16.7	5.86	0.03	38.25	32.9	0.36	0.22	0.27
EC	SPR	29	0.32	0.27	0.76	-14.81	26.49	-0.05	0.08	0.01	-10.43	-15.84	-0.17	27.56	30.44	0.31	0.1	0.57
EC	SUM	18	0.43	0.39	0.74	-9.94	26.13	-0.04	0.11	0.02	-3.86	-9.28	-0.11	26.19	27.02	0.29	0.15	0.54
EC	FAL	30	0.34	0.4	0.85	17.58	30.82	0.06	0.11	0.02	21.38	13.84	0.18	34.56	28.9	0.31	0.14	0.71
EC	ALL	104	0.38	0.38	0.68	-0.05	30.31	0	0.11	0.03	6.93	-0.51	0	32.12	30.04	0.3	0.16	0.47
NO3	WIN	21	2.13	2.75	0.56	28.93	62.54	0.62	1.33	2.86	107.29	38.16	0.29	124.61	59.71	0.63	1.8	0.31
NO3	SPR	29	0.96	1.94	0.79	102.29	113.09	0.98	1.09	2.23	203.78	54.1	1.02	218.5	77.39	1.13	1.79	0.63
NO3	SUM	18	0.36	0.35	0.73	-2.79	63.18	-0.01	0.23	0.09	17.47	-24.44	-0.03	82.05	74.46	0.65	0.31	0.53
NO3	FAL	24	0.42	1.39	0.77	229.28	235.4	0.97	0.99	1.58	299.6	78.45	2.29	313.14	96.07	2.35	1.59	0.59
NO3	ALL	92	0.97	1.67	0.68	72.28	97.99	0.7	0.95	1.93	170.3	41.45	0.72	195.06	77.65	0.98	1.56	0.46
OC	WIN	27	2.03	1.6	0.4	-21.31	42.69	-0.43	0.87	1.23	-7.71	-18.15	-0.27	37.56	42.2	0.54	1.19	0.16
OC	SPR	29	1.52	0.93	0.77	-38.88	40.09	-0.59	0.61	0.25	-36.94	-49.83	-0.64	38.49	51.27	0.66	0.78	0.59
OC	SUM	18	2.65	2.31	0.82	-12.85	24.74	-0.34	0.65	0.52	-12.41	-19.16	-0.15	28.71	32.25	0.28	0.8	0.67
OC	FAL	30	1.62	1.5	0.76	-7.28	36.8	-0.12	0.6	0.69	-9	-18.53	-0.08	36.71	39.19	0.4	0.84	0.58
OC	ALL	104	1.88	1.51	0.7	-19.73	36.26	-0.37	0.68	0.71	-17.04	-27.27	-0.25	36.04	42.14	0.45	0.92	0.49
PM-2.5	WIN	27	8.92	10.79	0.58	20.97	35.18	1.87	3.14	16.63	28.01	15.68	0.21	40.99	30.3	0.35	4.49	0.33
PM-2.5	SPR	27	8.62	8.63	0.5	0.03	39.58	0	3.41	19.27	7.17	-6.05	0	41.82	39.01	0.4	4.39	0.25
PM-2.5	SUM	18	12.65	9.71	0.8	-23.25	30.05	-2.94	3.8	10.47	-20.94	-28.63	-0.3	31.56	37.85	0.39	4.37	0.64
PM-2.5	FAL	30	7.55	8.72	0.81	15.5	27.69	1.17	2.09	9.53	16.9	9.88	0.16	28.91	23.64	0.28	3.3	0.66
PM-2.5	ALL	102	9.1	9.42	0.63	3.53	33.2	0.32	3.02	16.91	10.59	0.4	0.04	35.99	31.98	0.33	4.12	0.40
SO4	WIN	21	1.88	1.43	0.92	-23.71	26.74	-0.45	0.5	0.2	-19.15	-25.18	-0.31	26.1	31.55	0.35	0.63	0.84
SO4	SPR	29	2.45	1.86	0.66	-24.35	34.36	-0.6	0.84	1.12	-15.99	-24.55	-0.32	31.79	37.85	0.45	1.21	0.44
SO4	SUM	18	2.98	1.93	0.75	-35.39	38.85	-1.06	1.16	0.97	-33.7	-46.26	-0.55	37.29	49.5	0.6	1.44	0.57
SO4	FAL	24	1.71	1.59	0.89	-6.82	24.35	-0.12	0.42	0.36	12	3.22	-0.07	33.37	29.08	0.26	0.61	0.80
SO4	ALL	92	2.23	1.7	0.79	-23.61	32.07	-0.53	0.72	0.78	-12.88	-21.7	-0.31	31.98	36.4	0.42	1.03	0.62

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MOMO1																		
EC	WIN	29	0.21	0.47	0.92	128.32	128.32	0.27	0.27	0.03	138.71	77.03	1.28	138.71	77.03	1.28	0.32	0.84
EC	SPR	31	0.16	0.24	0.71	49.48	58.81	0.08	0.1	0.01	80.14	45.72	0.49	84.04	50.33	0.59	0.13	0.50
EC	SUM	29	0.25	0.24	0.9	-2.31	21.16	-0.01	0.05	0.01	1.45	-1.55	-0.02	19.79	20.04	0.22	0.07	0.82
EC	FAL	26	0.28	0.36	0.8	29.72	41.36	0.08	0.11	0.02	53.2	34.07	0.3	59.72	41.97	0.41	0.15	0.63
EC	ALL	115	0.22	0.33	0.72	47.95	59.71	0.11	0.13	0.03	68.97	39.06	0.48	76.12	47.53	0.6	0.19	0.51
NO3	WIN	29	0.73	1.54	0.69	109.64	112.87	0.81	0.83	0.47	187.02	66.88	1.1	194.21	80.58	1.13	1.06	0.48
NO3	SPR	31	0.4	0.64	0.56	61.17	102.75	0.24	0.41	0.34	112.07	33.49	0.61	142.64	77.14	1.03	0.63	0.32
NO3	SUM	29	0.21	0.1	0.55	-53.04	63.46	-0.11	0.14	0.03	-51.33	-86.57	-1.13	61.54	94.43	1.35	0.2	0.31
NO3	FAL	26	0.43	0.49	0.38	14.27	80.42	0.06	0.34	0.21	82.58	0.56	0.14	133.02	75.93	0.8	0.46	0.14
NO3	ALL	115	0.44	0.7	0.67	57.39	97.36	0.25	0.43	0.38	83.1	4.19	0.57	133.02	82.09	0.97	0.67	0.45
OC	WIN	29	0.88	2.11	0.85	138.71	139.36	1.22	1.23	0.51	162.76	81.98	1.39	163.8	83.1	1.39	1.42	0.72
OC	SPR	31	0.74	0.98	0.65	32.68	54.93	0.24	0.4	0.27	68.79	36.12	0.33	78.46	47.63	0.55	0.57	0.42
OC	SUM	29	1.54	1.02	0.76	-33.8	37.75	-0.52	0.58	0.47	-28.59	-38.66	-0.51	34.91	44.27	0.57	0.86	0.58
OC	FAL	26	0.95	1.1	0.87	15.61	26.15	0.15	0.25	0.1	29.25	18.64	0.16	37.93	28.56	0.26	0.35	0.75
OC	ALL	115	1.02	1.3	0.5	26.97	60.74	0.28	0.62	0.73	58.99	24.87	0.27	79.84	51.42	0.61	0.9	0.25
PM-2.5	WIN	29	4.46	8.34	0.85	87.17	89.02	3.88	3.97	7.57	93.57	57.36	0.87	96.18	60.58	0.89	4.76	0.73
PM-2.5	SPR	31	4.25	5.41	0.74	27.33	39.59	1.16	1.68	4.5	51.34	27.9	0.27	58.35	35.72	0.4	2.42	0.55
PM-2.5	SUM	29	7.54	4.73	0.87	-37.17	39.44	-2.8	2.97	6.69	-33.11	-43.96	-0.59	37.44	47.84	0.63	3.81	0.76
PM-2.5	FAL	26	5.03	5.52	0.88	9.73	27.65	0.49	1.39	3.04	29.97	18.43	0.1	42.41	33.33	0.28	1.81	0.77
PM-2.5	ALL	115	5.31	6	0.59	13.13	47.44	0.7	2.52	11.21	35.86	15.07	0.13	59.01	44.5	0.47	3.42	0.35
SO4	WIN	29	1.38	1.07	0.79	-22.87	28.86	-0.32	0.4	0.23	-17.89	-24.28	-0.3	28.39	32.9	0.37	0.57	0.63
SO4	SPR	31	1.32	1.54	0.84	16.53	30.3	0.22	0.4	0.31	91.19	17.09	0.17	103.62	31.8	0.3	0.6	0.71
SO4	SUM	29	1.95	1.56	0.8	-19.91	36.79	-0.39	0.72	0.86	-1.47	-17.14	-0.25	45.16	42.66	0.46	1	0.64
SO4	FAL	26	1.52	1.47	0.84	-3.08	33.43	-0.05	0.51	0.5	28.78	9.04	-0.03	53.38	40.02	0.34	0.71	0.71
SO4	ALL	115	1.54	1.41	0.78	-8.41	32.74	-0.13	0.5	0.53	26.21	-3.79	-0.09	58.55	36.67	0.36	0.74	0.62

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MOOS1																		
EC	WIN	29	0.18	0.18	0.04	-1.24	64.59	0	0.12	0.03	49.61	17.68	-0.01	77.65	58.91	0.65	0.19	0.00
EC	SPR	25	0.08	0.1	0.46	22.05	50.01	0.02	0.04	0	66.59	28.13	0.22	82.28	47.9	0.5	0.06	0.22
EC	SUM	27	0.13	0.12	0.66	-6.61	35.32	-0.01	0.04	0	0.69	-7.31	-0.07	35.83	34.65	0.38	0.06	0.43
EC	FAL	30	0.13	0.15	0.67	13.53	44.01	0.02	0.06	0.01	47.84	7.92	0.14	75.3	41.3	0.44	0.08	0.45
EC	ALL	111	0.13	0.14	0.37	4.79	50.19	0.01	0.07	0.01	41.06	11.32	0.05	67.89	45.77	0.5	0.11	0.14
NO3	WIN	28	0.25	0.73	0.76	187.07	194.39	0.47	0.49	0.29	249.66	71.84	1.87	261.14	88.99	1.94	0.72	0.58
NO3	SPR	28	0.12	0.19	0.18	58.61	129.36	0.07	0.16	0.05	201.55	10.98	0.59	256.51	98.87	1.29	0.23	0.03
NO3	SUM	28	0.09	0.03	0.5	-71.03	74.69	-0.07	0.07	0	-54.22	-97.81	-2.45	72.13	105.76	2.58	0.1	0.25
NO3	FAL	30	0.18	0.41	0.77	129.85	164.39	0.23	0.29	0.26	318.71	10.12	1.3	368.9	88.76	1.64	0.55	0.59
NO3	ALL	114	0.16	0.34	0.75	109.74	156.52	0.18	0.25	0.19	181.38	-1.02	1.1	241.94	95.48	1.57	0.47	0.56
OC	WIN	29	0.72	0.81	0.33	12.32	47.49	0.09	0.34	0.26	33.17	16.64	0.12	51.6	41.57	0.47	0.51	0.11
OC	SPR	25	0.49	0.51	0.78	4.78	25.86	0.02	0.13	0.03	13.87	6.9	0.05	31.12	26.82	0.26	0.16	0.60
OC	SUM	27	1.1	0.72	0.86	-34.81	36.26	-0.38	0.4	0.1	-34.9	-45.41	-0.53	37.27	47.55	0.56	0.5	0.74
OC	FAL	30	0.83	0.68	0.82	-17.6	28.57	-0.15	0.24	0.07	-13.95	-21.68	-0.21	31.2	34.26	0.35	0.29	0.67
OC	ALL	111	0.79	0.69	0.67	-13.21	35.33	-0.1	0.28	0.15	-0.47	-11.01	-0.15	37.99	37.73	0.41	0.4	0.45
PM-2.5	WIN	29	3.25	4.18	0.71	28.79	42.74	0.94	1.39	2.45	37.96	24.1	0.29	48.66	37.77	0.43	1.82	0.51
PM-2.5	SPR	25	2.91	4.05	0.55	39.11	50.09	1.14	1.46	3.85	59.27	29.13	0.39	68.8	40.04	0.5	2.27	0.30
PM-2.5	SUM	28	4.77	3.83	0.67	-19.85	33.56	-0.95	1.6	3.52	-10.83	-19.22	-0.25	33.09	35.82	0.42	2.1	0.45
PM-2.5	FAL	30	3.79	4.01	0.79	5.7	30.53	0.22	1.16	2.65	19.86	6.18	0.06	40.86	30.57	0.31	1.64	0.62
PM-2.5	ALL	112	3.7	4.02	0.62	8.57	37.72	0.32	1.4	3.74	25.67	9.59	0.09	47.18	35.86	0.38	1.96	0.39
SO4	WIN	28	1.01	0.87	0.75	-13.36	31.36	-0.13	0.32	0.16	-1.67	-9.11	-0.15	32.12	31.65	0.36	0.42	0.57
SO4	SPR	28	0.84	1.81	0.41	114.99	122.79	0.97	1.03	2.36	168.67	55.53	1.15	174.93	62.57	1.23	1.82	0.17
SO4	SUM	28	0.99	1.67	0.48	68.37	88	0.68	0.87	1.35	134.09	52.77	0.68	144.1	65.37	0.88	1.34	0.24
SO4	FAL	30	0.94	1.29	0.82	37.33	48.82	0.35	0.46	0.28	97.36	35.18	0.37	105.38	44.41	0.49	0.63	0.67
SO4	ALL	114	0.94	1.41	0.46	49.05	70.54	0.46	0.67	1.19	99.57	33.62	0.49	113.98	50.88	0.71	1.18	0.22

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: MOZI1																		
EC	WIN	25	0.02	0.08	0.29	259.44	259.44	0.06	0.06	0	350.85	101.83	2.59	350.85	101.83	2.59	0.09	0.09
EC	SPR	26	0.03	0.04	0.52	29.1	58.62	0.01	0.02	0	95.05	42.82	0.29	106.36	57.22	0.59	0.02	0.27
EC	SUM	26	0.06	0.08	0.89	26.75	39.51	0.02	0.03	0	18.59	10.71	0.27	29.62	24.58	0.4	0.07	0.79
EC	FAL	27	0.06	0.08	0.4	32.58	65.44	0.02	0.04	0	60.53	26.67	0.33	83.32	56.65	0.65	0.05	0.16
EC	ALL	104	0.05	0.07	0.52	58.16	79.19	0.03	0.04	0	128.46	44.79	0.58	139.96	59.64	0.79	0.06	0.27
NO3	WIN	27	0.1	0.17	0.21	66.18	133.85	0.07	0.13	0.04	228.09	19.83	0.66	269.71	84.93	1.34	0.21	0.05
NO3	SPR	28	0.13	0.07	0.45	-50.89	71.22	-0.07	0.09	0.01	-16.37	-61.54	-1.04	81.96	94.42	1.45	0.13	0.20
NO3	SUM	25	0.07	0.01	0.57	-82.2	82.2	-0.06	0.06	0	-80.26	-135.96	-4.62	80.26	135.96	4.62	0.07	0.32
NO3	FAL	27	0.08	0.07	0.27	-7.31	96.58	-0.01	0.08	0.02	-0.56	-56.98	-0.08	93.86	90.65	1.04	0.14	0.07
NO3	ALL	107	0.1	0.08	0.24	-16.41	94.82	-0.02	0.09	0.02	34.38	-57.25	-0.2	131.94	100.78	1.13	0.15	0.06
OC	WIN	26	0.11	0.29	0.25	169.21	174.91	0.18	0.19	0.08	283.92	72.49	1.69	288.31	77.43	1.75	0.34	0.06
OC	SPR	28	0.16	0.14	0.59	-15.48	42.49	-0.03	0.07	0.01	14.81	-1.6	-0.18	49.91	44.68	0.5	0.1	0.35
OC	SUM	26	0.59	0.55	0.91	-5.39	29.37	-0.03	0.17	0.05	-4.89	-11.54	-0.06	30.15	31.44	0.31	0.22	0.82
OC	FAL	27	0.33	0.34	0.36	3.49	54.68	0.01	0.18	0.06	37.43	6.75	0.03	72.31	53.18	0.55	0.25	0.13
OC	ALL	107	0.29	0.33	0.73	11.23	51.36	0.03	0.15	0.06	81.12	16.09	0.11	108.69	51.56	0.51	0.24	0.54
PM-2.5	WIN	27	0.79	1.62	0.38	105.52	111.93	0.83	0.88	0.72	146.64	65.08	1.06	149.72	68.85	1.12	1.19	0.15
PM-2.5	SPR	27	1.91	1.41	0.56	-26.56	45.22	-0.51	0.87	2.17	18.61	-6.2	-0.36	53.38	42.39	0.62	1.56	0.31
PM-2.5	SUM	26	2.64	1.87	0.88	-29.18	32.6	-0.77	0.86	0.34	-30.08	-38.58	-0.41	33.72	41.58	0.46	0.97	0.77
PM-2.5	FAL	27	1.81	1.63	0.29	-9.97	42.32	-0.18	0.77	0.9	3.6	-9.46	-0.11	45.45	44.82	0.47	0.96	0.09
PM-2.5	ALL	107	1.78	1.63	0.47	-8.52	47.36	-0.15	0.84	1.41	35.3	3.1	-0.09	70.91	49.48	0.52	1.2	0.22
SO4	WIN	27	0.22	0.45	0.33	101.25	115.02	0.23	0.26	0.03	153.31	72.32	1.01	158.58	78.78	1.15	0.29	0.11
SO4	SPR	28	0.41	0.48	0.54	15.76	47.93	0.06	0.2	0.1	53.81	27.71	0.16	66.32	43.8	0.48	0.32	0.29
SO4	SUM	25	0.46	0.35	0.54	-23.61	28.21	-0.11	0.13	0.01	-22.31	-28.94	-0.31	26.97	32.73	0.37	0.16	0.29
SO4	FAL	27	0.38	0.4	0.39	3.89	35.03	0.01	0.13	0.03	19.2	6.22	0.04	43.19	35.62	0.35	0.17	0.15
SO4	ALL	107	0.37	0.42	0.37	14.18	49.03	0.05	0.18	0.06	52.4	20.31	0.14	74.57	47.97	0.49	0.25	0.13

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: NEBR1																		
EC	WIN	28	0.08	0.17	0.34	106.17	110.51	0.09	0.09	0.02	183.07	68.72	1.06	185.03	70.84	1.11	0.15	0.12
EC	SPR	29	0.13	0.24	0.91	86.8	92.18	0.11	0.12	0.04	90.94	55.77	0.87	93.9	58.99	0.92	0.23	0.83
EC	SUM	29	0.14	0.19	0.73	33.54	41.86	0.05	0.06	0	41.55	26.41	0.34	51.63	38.26	0.42	0.08	0.53
EC	FAL	27	0.11	0.2	0.62	85.48	85.48	0.09	0.09	0	110.72	62.33	0.85	110.72	62.33	0.85	0.12	0.39
EC	ALL	113	0.12	0.2	0.77	73.49	78.4	0.09	0.09	0.02	105.82	53.01	0.73	109.65	57.41	0.78	0.16	0.59
NO3	WIN	29	1.08	0.96	0.58	-10.39	65.61	-0.11	0.71	2.66	110.87	28.3	-0.12	141.61	70.16	0.73	1.64	0.33
NO3	SPR	29	1.13	1.71	0.76	51.44	69.48	0.58	0.78	2.6	47.37	15.86	0.51	76.16	55.98	0.69	1.71	0.58
NO3	SUM	29	0.26	0.31	0.54	20.8	93.05	0.05	0.24	0.1	64.44	-41.51	0.21	151.48	102.19	0.93	0.32	0.29
NO3	FAL	27	0.22	0.23	0.8	8.35	56.85	0.02	0.12	0.04	-0.39	-25.51	0.08	58.97	60.18	0.57	0.21	0.64
NO3	ALL	114	0.68	0.81	0.61	20.22	69.23	0.14	0.47	1.45	56.55	-5.37	0.2	107.9	72.34	0.69	1.21	0.38
OC	WIN	28	0.37	0.4	0.18	7.08	77.66	0.03	0.29	0.28	50.28	-16.66	0.07	108.33	60.98	0.78	0.53	0.03
OC	SPR	29	0.83	0.79	0.87	-5.36	52.97	-0.04	0.44	0.69	-25.07	-38.72	-0.06	42.61	51.59	0.56	0.83	0.76
OC	SUM	29	1.08	0.84	0.3	-22.17	50.88	-0.24	0.55	0.35	-19.49	-43.39	-0.28	55.56	66.34	0.65	0.63	0.09
OC	FAL	27	0.61	0.5	0.59	-17.42	41.86	-0.11	0.25	0.09	-1.05	-16.3	-0.21	47.21	48.46	0.51	0.32	0.35
OC	ALL	113	0.73	0.64	0.74	-12.59	53.09	-0.09	0.39	0.37	0.77	-29.09	-0.14	63.32	56.95	0.61	0.61	0.54
PM-2.5	WIN	29	3.38	3.27	0.6	-3.09	50.21	-0.1	1.7	7.72	40.75	14.3	-0.03	66.15	46.62	0.52	2.78	0.36
PM-2.5	SPR	29	5.44	6.33	0.73	16.22	40.21	0.88	2.19	30.5	11.32	-1.23	0.16	40.79	34.91	0.4	5.59	0.53
PM-2.5	SUM	29	5.58	4.43	0.27	-20.67	50.7	-1.15	2.83	9.54	-15.18	-39.8	-0.26	57.15	63.86	0.64	3.3	0.07
PM-2.5	FAL	27	3.37	3	0.7	-11.04	26.23	-0.37	0.88	1.4	-4.47	-10.56	-0.12	26.9	28.28	0.29	1.24	0.50
PM-2.5	ALL	114	4.46	4.28	0.64	-4.11	42.97	-0.18	1.92	13.02	8.33	-9.3	-0.04	48.11	43.68	0.45	3.61	0.41
SO4	WIN	29	0.92	0.56	0.37	-39.63	58.74	-0.37	0.54	0.84	11.99	-12.31	-0.66	56.08	52.83	0.97	0.99	0.14
SO4	SPR	29	1.2	1.28	0.63	6.77	43.61	0.08	0.52	1.33	2.52	-10.07	0.07	39.1	36.93	0.44	1.16	0.40
SO4	SUM	29	1.24	1.1	0.23	-11.23	55.29	-0.14	0.68	0.85	-2.74	-28.75	-0.13	58.3	57.53	0.62	0.93	0.05
SO4	FAL	27	0.63	0.66	0.76	5.26	27.16	0.03	0.17	0.07	17.43	7.89	0.05	35.31	30.17	0.27	0.26	0.58
SO4	ALL	114	1	0.9	0.44	-9.95	48.37	-0.1	0.49	0.82	7.12	-11.14	-0.11	47.41	44.61	0.54	0.91	0.20

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: NOCH1																		
EC	WIN	26	0.04	0.06	0.61	47.55	75.6	0.02	0.03	0	210.74	64.36	0.48	218.44	73.95	0.76	0.04	0.37
EC	SPR	31	0.05	0.05	0.61	7.78	48.18	0	0.02	0	25.2	2.79	0.08	60.47	51.76	0.48	0.03	0.37
EC	SUM	29	0.17	0.51	0.32	198.74	226.61	0.34	0.39	1.44	213.27	0.68	1.99	250.59	50.24	2.27	1.25	0.10
EC	FAL	21	0.1	0.25	0.04	157.72	182.28	0.15	0.18	0.28	319.37	41.76	1.58	330.3	54.82	1.82	0.55	0.00
EC	ALL	107	0.09	0.22	0.35	144.36	173.44	0.13	0.15	0.46	178.99	24.83	1.44	203.34	57.34	1.73	0.69	0.12
NO3	WIN	26	0.19	0.5	0.69	162.43	176.66	0.31	0.33	0.34	174.07	41.67	1.62	200.46	78.09	1.77	0.66	0.48
NO3	SPR	31	0.21	0.4	0.73	89.22	127.81	0.19	0.27	0.25	143.43	8.15	0.89	192.25	78.88	1.28	0.53	0.53
NO3	SUM	28	0.08	0.03	0.4	-58.9	70.74	-0.05	0.06	0.01	-33.29	-65.24	-1.43	61.54	77.01	1.72	0.13	0.16
NO3	FAL	21	0.06	0.06	0.3	17.38	94.51	0.01	0.05	0.01	103.84	-22.99	0.17	166.28	61.59	0.95	0.11	0.09
NO3	ALL	106	0.14	0.26	0.69	84.55	132.36	0.12	0.19	0.18	96.42	-9.18	0.85	154.59	74.77	1.32	0.44	0.48
OC	WIN	26	0.2	0.18	0.35	-11.41	53.97	-0.02	0.11	0.02	66.11	5.27	-0.13	106.43	58.23	0.61	0.14	0.13
OC	SPR	31	0.21	0.16	0.39	-23.49	50.6	-0.05	0.11	0.02	19.83	-22.94	-0.31	78.23	60.03	0.66	0.15	0.15
OC	SUM	29	1.47	2.58	0.35	75.69	140.99	1.11	2.07	33.35	75.07	-49	0.76	163.96	79.32	1.41	5.88	0.12
OC	FAL	21	0.79	1.16	0.04	46.57	122.17	0.37	0.97	6.27	563.21	10.4	0.47	599.04	58.9	1.22	2.53	0.00
OC	ALL	107	0.66	1.02	0.39	53.31	121.84	0.35	0.81	10.52	152.69	-16.6	0.53	210.53	64.6	1.22	3.26	0.15
PM-2.5	WIN	25	1.73	1.92	0.82	10.89	33.05	0.19	0.57	0.6	27.88	13.61	0.11	43.19	31.34	0.33	0.8	0.67
PM-2.5	SPR	31	2.32	2.27	0.54	-2.13	46.81	-0.05	1.08	4.37	24.06	2.52	-0.02	55.89	45.07	0.48	2.09	0.29
PM-2.5	SUM	28	4.78	6.87	0.35	43.56	103.22	2.08	4.94	162.55	36.37	-34.04	0.44	107.62	60.29	1.03	12.92	0.12
PM-2.5	FAL	21	3.03	3.79	0.02	25.19	74.76	0.76	2.26	30.12	133.62	15.93	0.25	156.87	46.22	0.75	5.54	0.00
PM-2.5	ALL	105	2.98	3.72	0.37	24.8	74.75	0.74	2.23	51.54	50.16	-1.91	0.25	86.86	46.09	0.75	7.22	0.14
SO4	WIN	26	0.51	0.45	0.67	-13.08	49.44	-0.07	0.25	0.14	43.49	15.36	-0.15	72.69	53.95	0.57	0.38	0.45
SO4	SPR	31	0.62	0.66	0.59	5.36	53.31	0.03	0.33	0.28	62.51	16.51	0.05	90.63	52.49	0.53	0.53	0.35
SO4	SUM	28	0.53	0.49	0.51	-6.68	27.99	-0.04	0.15	0.04	-2.3	-8.92	-0.07	28.11	27.48	0.3	0.21	0.26
SO4	FAL	21	0.41	0.52	0.59	25.88	40.49	0.11	0.17	0.04	46.8	25.98	0.26	56.87	37.07	0.4	0.22	0.35
SO4	ALL	106	0.53	0.54	0.58	0.98	43.72	0.01	0.23	0.14	37.61	11.39	0.01	63.03	43.19	0.44	0.37	0.34

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: OKEF1																		
EC	WIN	29	0.37	0.51	0.61	36.51	60.49	0.14	0.23	0.15	36.15	18.88	0.37	52.43	39.46	0.6	0.41	0.37
EC	SPR	31	0.75	0.43	0.2	-42.2	70.68	-0.32	0.53	1.76	6.31	-13.42	-0.73	48.6	47.11	1.22	1.36	0.04
EC	SUM	28	0.28	0.31	0.44	8.38	54.94	0.02	0.15	0.04	156.4	2.28	0.08	199.48	57.75	0.55	0.21	0.19
EC	FAL	30	0.33	0.22	0.47	-32.36	45.43	-0.11	0.15	0.06	-13.91	-24.96	-0.48	36.5	42	0.67	0.27	0.23
EC	ALL	118	0.44	0.37	0.23	-16.25	61.36	-0.07	0.27	0.55	44.12	-4.69	-0.19	82.27	46.46	0.73	0.75	0.05
NO3	WIN	29	0.34	0.57	0.52	67.7	108.99	0.23	0.37	0.28	67.62	6.33	0.68	113.91	78.36	1.09	0.57	0.27
NO3	SPR	31	0.34	0.22	0.12	-34.99	75.89	-0.12	0.26	0.11	-16.1	-57.12	-0.54	77.19	95.64	1.17	0.35	0.01
NO3	SUM	28	0.18	0.13	0.34	-27.21	74.81	-0.05	0.13	0.03	-29.82	-79.07	-0.37	80.68	104.79	1.03	0.18	0.12
NO3	FAL	29	0.24	0.23	0.46	-2.79	85.67	-0.01	0.2	0.08	-10.28	-52.84	-0.03	79.52	91.26	0.88	0.29	0.21
NO3	ALL	117	0.28	0.29	0.39	4.56	87.95	0.01	0.24	0.14	2.81	-45.59	0.05	87.7	92.46	0.88	0.38	0.15
OC	WIN	29	1.84	2.19	0.43	19.18	59.56	0.35	1.1	3.95	19.8	1.87	0.19	47.9	39.98	0.6	2.02	0.18
OC	SPR	31	5.5	2.28	0.19	-58.45	72.13	-3.21	3.97	133.26	-18.55	-36.14	-1.41	42.36	52.07	1.74	11.98	0.03
OC	SUM	28	3	2.46	0.46	-18.14	56.72	-0.54	1.7	6.03	8.2	-19.55	-0.22	68.55	63.31	0.69	2.51	0.22
OC	FAL	30	3.25	1.21	0.65	-62.64	66.85	-2.04	2.17	35.59	-28.71	-46.17	-1.68	43.54	58.27	1.79	6.3	0.42
OC	ALL	118	3.44	2.03	0.23	-40.88	66.01	-1.4	2.27	48.35	-5.36	-25.41	-0.69	50.23	53.34	1.12	7.09	0.05
PM-2.5	WIN	29	7.1	8.35	0.48	17.64	43.82	1.25	3.11	23.3	18.92	7.43	0.18	40	33.09	0.44	4.99	0.23
PM-2.5	SPR	29	9.84	7.81	0.48	-20.62	37.14	-2.03	3.66	33.06	-14.98	-23.72	-0.26	29.34	34.55	0.47	6.1	0.23
PM-2.5	SUM	28	10.95	7.31	0.53	-33.18	41.21	-3.63	4.51	24.5	-24.96	-40.6	-0.5	41.7	53.14	0.62	6.14	0.28
PM-2.5	FAL	29	7.34	5.24	0.85	-28.57	33.85	-2.1	2.48	10.53	-18.72	-25.35	-0.4	27.33	32.85	0.47	3.86	0.72
PM-2.5	ALL	115	8.79	7.18	0.48	-18.31	39.04	-1.61	3.43	26	-9.81	-20.38	-0.22	34.53	38.28	0.48	5.35	0.23
SO4	WIN	29	1.9	1.7	0.62	-10.31	27.22	-0.2	0.52	0.46	0.62	-6.06	-0.11	28.25	28.1	0.3	0.71	0.38
SO4	SPR	31	2.4	1.72	0.52	-28.29	35.56	-0.68	0.85	1.02	-18.24	-28.1	-0.39	33.89	40.29	0.5	1.22	0.27
SO4	SUM	28	2.36	1.35	0.68	-42.69	46.96	-1.01	1.11	0.81	-43.71	-65.67	-0.74	47.95	69.19	0.82	1.35	0.46
SO4	FAL	29	1.82	1.49	0.79	-17.96	31.44	-0.33	0.57	0.47	-13.9	-22.52	-0.22	31.27	37.91	0.38	0.76	0.62
SO4	ALL	117	2.12	1.57	0.62	-25.94	35.87	-0.55	0.76	0.79	-18.58	-30.25	-0.35	35.21	43.59	0.48	1.05	0.39

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: PACK1																		
EC	WIN	29	0.15	0.44	0.84	188.99	188.99	0.29	0.29	0.03	217.99	97.53	1.89	217.99	97.53	1.89	0.33	0.71
EC	SPR	31	0.1	0.23	0.58	130.83	133.44	0.13	0.13	0.01	205.5	81.27	1.31	206.46	82.31	1.33	0.18	0.34
EC	SUM	30	0.17	0.2	0.67	22.11	36.62	0.04	0.06	0.01	69.11	25.13	0.22	79.38	36.83	0.37	0.08	0.45
EC	FAL	29	0.19	0.31	0.74	59.28	62.87	0.11	0.12	0.01	93.87	52.58	0.59	95.68	54.48	0.63	0.17	0.55
EC	ALL	119	0.15	0.29	0.62	92.98	98.53	0.14	0.15	0.02	146.95	64.09	0.93	150.23	67.77	0.99	0.21	0.38
NO3	WIN	28	0.42	1.22	0.65	191.48	197.14	0.8	0.83	0.52	247.53	88.07	1.91	254.92	100.73	1.97	1.08	0.42
NO3	SPR	28	0.16	0.34	0.65	108.01	154.71	0.17	0.25	0.15	509.68	25.31	1.08	549.74	82.99	1.55	0.43	0.42
NO3	SUM	21	0.1	0.06	0.15	-37.49	98.2	-0.04	0.1	0.03	616.82	-85.74	-0.6	737.29	104.52	1.57	0.17	0.02
NO3	FAL	27	0.22	0.35	0.22	59.15	115.74	0.13	0.25	0.28	255.53	10.33	0.59	301.09	78.16	1.16	0.55	0.05
NO3	ALL	104	0.23	0.52	0.65	124.1	160.92	0.29	0.38	0.36	394.76	15.9	1.24	443.68	90.86	1.61	0.67	0.42
OC	WIN	29	0.69	2.27	0.79	228.37	228.37	1.58	1.58	0.71	259.91	105.34	2.28	259.91	105.34	2.28	1.79	0.63
OC	SPR	30	0.54	1.11	0.49	105.13	112.12	0.57	0.6	0.42	165.57	73.08	1.05	168.35	76.15	1.12	0.86	0.24
OC	SUM	29	1.34	1.12	0.68	-16.61	32.2	-0.22	0.43	0.48	-3.73	-12.01	-0.2	33.11	33.78	0.39	0.73	0.47
OC	FAL	29	0.79	1.28	0.65	61.35	68.79	0.49	0.55	0.28	114.64	52.73	0.61	118.37	56.91	0.69	0.72	0.42
OC	ALL	117	0.84	1.44	0.37	71.72	93.97	0.6	0.79	0.88	134.37	54.94	0.72	145.13	68.11	0.94	1.11	0.13
PM-2.5	WIN	29	3.44	8	0.85	132.43	133.71	4.56	4.6	7.62	153.01	78.25	1.32	154.38	79.77	1.34	5.33	0.72
PM-2.5	SPR	31	3.05	5.25	0.56	72.17	75.66	2.2	2.31	6.03	262.53	53.18	0.72	264.44	55.31	0.76	3.3	0.31
PM-2.5	SUM	30	5.75	4.6	0.66	-19.91	37.56	-1.14	2.16	7.39	37.97	-17.09	-0.25	86.13	44.44	0.47	2.95	0.44
PM-2.5	FAL	29	4.17	5.36	0.73	28.56	40.54	1.19	1.69	5.15	76.92	37.06	0.29	83.3	44.09	0.41	2.56	0.54
PM-2.5	ALL	119	4.1	5.78	0.49	41.15	65.38	1.69	2.68	10.71	134	37.65	0.41	148.52	55.79	0.65	3.68	0.24
SO4	WIN	28	1	1.01	0.87	0.77	23.5	0.01	0.24	0.09	11.9	5.04	0.01	30.48	27.34	0.24	0.3	0.76
SO4	SPR	29	0.92	1.55	0.65	67.4	70.13	0.62	0.65	0.68	1081.17	48.36	0.67	1083.93	51.32	0.7	1.03	0.42
SO4	SUM	21	1.44	1.5	0.73	3.69	35.5	0.05	0.51	0.55	141.3	5.13	0.04	170.16	42.59	0.35	0.75	0.53
SO4	FAL	27	1.23	1.37	0.85	11.2	34.28	0.14	0.42	0.34	69.19	29.58	0.11	82.65	44.86	0.34	0.6	0.73
SO4	ALL	105	1.13	1.35	0.72	19.53	40.16	0.22	0.45	0.47	347.84	23.33	0.2	362.78	41.52	0.4	0.72	0.52

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: PENO1																		
EC	WIN	28	0.47	0.37	0.82	-20.61	32.6	-0.1	0.15	0.06	7.98	-5.33	-0.26	39.03	34	0.41	0.26	0.67
EC	SPR	28	0.22	0.2	0.68	-11.11	45.35	-0.02	0.1	0.04	23.75	8.49	-0.12	46.93	39.1	0.51	0.2	0.46
EC	SUM	30	0.2	0.19	0.49	-7.96	31.85	-0.02	0.07	0.01	-0.17	-8.65	-0.09	30.87	31.97	0.35	0.12	0.24
EC	FAL	25	0.32	0.25	0.64	-24.12	36.58	-0.08	0.12	0.05	-15.47	-24.17	-0.32	30.61	37.11	0.48	0.23	0.41
EC	ALL	111	0.3	0.25	0.75	-17.36	35.81	-0.05	0.11	0.04	4.47	-6.99	-0.21	36.92	35.44	0.43	0.21	0.56
NO3	WIN	28	0.49	1.18	0.8	142.74	144.09	0.69	0.7	0.54	174.25	72.12	1.43	178.6	77.27	1.44	1.01	0.64
NO3	SPR	25	0.18	0.3	0.37	65.4	120.91	0.12	0.22	0.09	117.6	5.49	0.65	171.57	92.33	1.21	0.33	0.14
NO3	SUM	27	0.11	0.04	0.38	-69.06	76.74	-0.08	0.09	0.01	-62.28	-113.19	-2.23	75	122.18	2.48	0.12	0.14
NO3	FAL	25	0.25	0.43	0.89	72.68	97.94	0.18	0.25	0.15	45.14	-13.16	0.73	108.13	88.99	0.98	0.42	0.78
NO3	ALL	105	0.26	0.5	0.83	90.26	122.18	0.24	0.32	0.29	69.2	-11.7	0.9	133.51	95.19	1.22	0.59	0.68
OC	WIN	28	1.68	1.69	0.85	0.83	26.03	0.01	0.44	0.38	16.31	8.96	0.01	31.71	27.27	0.26	0.62	0.72
OC	SPR	28	0.92	0.83	0.82	-8.8	34.13	-0.08	0.31	0.22	7.08	-2.37	-0.1	37.38	35.01	0.37	0.47	0.67
OC	SUM	30	1.27	0.83	0.76	-34.45	40.93	-0.44	0.52	0.22	-34.51	-49.83	-0.53	42.67	55.69	0.62	0.64	0.58
OC	FAL	25	1.33	0.93	0.86	-30.47	34.57	-0.41	0.46	0.34	-26.33	-34.99	-0.44	32.49	40.37	0.5	0.71	0.74
OC	ALL	111	1.3	1.07	0.81	-17.45	33.39	-0.23	0.43	0.33	-9.36	-19.69	-0.21	36.28	39.86	0.4	0.61	0.66
PM-2.5	WIN	28	6.21	6.66	0.79	7.2	32.38	0.45	2.01	6.53	15.81	8.77	0.07	33.99	30.39	0.32	2.59	0.62
PM-2.5	SPR	27	3.88	4.51	0.66	16.21	36.54	0.63	1.42	4.32	28.64	14.69	0.16	42.13	30.49	0.37	2.17	0.44
PM-2.5	SUM	30	5.34	3.8	0.75	-28.99	38.96	-1.55	2.08	3.42	-25.57	-37.7	-0.41	39.98	48.55	0.55	2.41	0.57
PM-2.5	FAL	24	4.87	4.46	0.9	-8.53	23.52	-0.42	1.15	2.47	-3.52	-11.53	-0.09	29.63	30.45	0.26	1.63	0.81
PM-2.5	ALL	109	5.1	4.85	0.77	-4.85	33.2	-0.25	1.69	5.02	3.35	-7.03	-0.05	36.7	35.42	0.35	2.25	0.59
SO4	WIN	28	1.34	0.9	0.72	-32.76	34.82	-0.44	0.47	0.34	-23.74	-32.09	-0.49	29.56	37.22	0.52	0.73	0.52
SO4	SPR	25	1.03	1.55	0.45	51.3	70.66	0.53	0.72	1.29	65.89	29.28	0.51	79.68	45.86	0.71	1.25	0.20
SO4	SUM	27	1.07	1.42	0.71	32.86	57.81	0.35	0.62	0.9	63.33	23.09	0.33	85.33	51.97	0.58	1.01	0.51
SO4	FAL	25	1.06	1.13	0.71	6.78	38.76	0.07	0.41	0.37	34.41	10.77	0.07	58.19	41.28	0.39	0.62	0.51
SO4	ALL	105	1.13	1.24	0.53	10.28	49.07	0.12	0.55	0.86	33.84	6.92	0.1	62.65	44.03	0.49	0.93	0.28

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: PMRF1																		
EC	WIN	29	0.21	0.38	0.79	81.19	85.18	0.17	0.18	0.02	113.73	58.25	0.81	117.28	62.33	0.85	0.22	0.62
EC	SPR	31	0.11	0.15	0.44	35.75	58.25	0.04	0.07	0.01	69.52	26.17	0.36	87.66	48.32	0.58	0.09	0.19
EC	SUM	30	0.19	0.14	0.83	-28.71	30.73	-0.05	0.06	0	-22.07	-28.34	-0.4	25.86	31.81	0.43	0.09	0.69
EC	FAL	24	0.19	0.24	0.62	26.68	45.52	0.05	0.09	0.01	41.53	23.16	0.27	55.74	40.66	0.46	0.11	0.38
EC	ALL	114	0.17	0.22	0.64	28.9	55.55	0.05	0.1	0.02	50.77	19.35	0.29	72.21	45.93	0.56	0.14	0.41
NO3	WIN	29	0.93	1.54	0.86	65.3	83.26	0.61	0.78	0.63	176.73	67.21	0.65	185.9	78.1	0.83	1	0.73
NO3	SPR	31	0.18	0.48	0.64	165.78	185.61	0.3	0.34	0.18	185.45	41.9	1.66	212.32	85.65	1.86	0.52	0.41
NO3	SUM	27	0.06	0.04	0.12	-22.8	65.86	-0.01	0.04	0	12.99	-42.6	-0.3	95.98	77.35	0.85	0.05	0.02
NO3	FAL	24	0.25	0.46	0.45	84.02	106.92	0.21	0.27	0.21	174.45	38.32	0.84	192.2	60.63	1.07	0.51	0.20
NO3	ALL	111	0.36	0.65	0.84	78.84	100.46	0.29	0.36	0.31	138.84	27.18	0.79	172.77	76.25	1	0.63	0.70
OC	WIN	29	0.99	1.96	0.82	96.81	99.3	0.96	0.99	0.47	131.04	66.7	0.97	133.68	69.62	0.99	1.18	0.68
OC	SPR	31	0.59	0.8	0.52	35.15	54.71	0.21	0.32	0.19	45.95	24.43	0.35	61.11	42.87	0.55	0.48	0.27
OC	SUM	30	1.59	0.83	0.62	-48.24	48.24	-0.77	0.77	0.83	-43.69	-59.89	-0.93	43.69	59.89	0.93	1.19	0.39
OC	FAL	24	0.9	1.07	0.55	18.49	41.68	0.17	0.38	0.23	35.75	17.7	0.18	53.02	38.39	0.42	0.51	0.30
OC	ALL	114	1.02	1.16	0.41	13.11	60.65	0.13	0.62	0.83	41.86	11.58	0.13	73.28	53.21	0.61	0.92	0.17
PM-2.5	WIN	29	4.99	7.75	0.87	55.26	61.09	2.76	3.05	6.04	83.73	48.6	0.55	87.96	53.43	0.61	3.69	0.76
PM-2.5	SPR	31	3.01	4.24	0.69	40.83	47.48	1.23	1.43	2.26	46.06	28.64	0.41	53.59	38.53	0.47	1.94	0.48
PM-2.5	SUM	30	6.5	3.86	0.77	-40.55	44.9	-2.64	2.92	7.81	-36.1	-51.59	-0.68	44.49	58.08	0.76	3.84	0.59
PM-2.5	FAL	24	4.14	5.05	0.61	21.78	41.23	0.9	1.71	4.81	46.26	24.49	0.22	58.96	39.62	0.41	2.37	0.37
PM-2.5	ALL	114	4.67	5.2	0.66	11.39	49.07	0.53	2.29	9.28	34.06	11.73	0.11	61.07	47.69	0.49	3.09	0.43
SO4	WIN	29	1.21	0.93	0.92	-23.18	27.15	-0.28	0.33	0.16	-12.51	-18.39	-0.3	26.42	29.2	0.35	0.49	0.85
SO4	SPR	31	0.92	1.19	0.77	29.29	42.99	0.27	0.4	0.22	39.31	20.15	0.29	53.97	37.95	0.43	0.54	0.60
SO4	SUM	27	1.51	1.2	0.89	-20.61	36.88	-0.31	0.56	0.64	-0.58	-20.1	-0.26	47.85	44.45	0.46	0.86	0.79
SO4	FAL	24	1.19	1.2	0.83	0.73	33.85	0.01	0.4	0.3	34.93	14.37	0.01	55.47	38.65	0.34	0.55	0.68
SO4	ALL	111	1.2	1.13	0.82	-5.96	34.98	-0.07	0.42	0.38	15.12	-0.96	-0.06	45.61	37.4	0.37	0.62	0.67

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: PRIS1																		
EC	WIN	29	0.26	0.2	0.75	-23.36	29.72	-0.06	0.08	0.01	-7.51	-15.36	-0.3	28.51	31	0.39	0.13	0.56
EC	SPR	31	0.14	0.11	0.71	-23.12	38.42	-0.03	0.05	0	-6.09	-16.81	-0.3	38.86	41.69	0.5	0.08	0.51
EC	SUM	31	0.18	0.11	0.59	-37.67	40.43	-0.07	0.07	0	-30.13	-42.55	-0.6	38.83	49.53	0.65	0.09	0.35
EC	FAL	30	0.22	0.17	0.72	-25.24	34.07	-0.06	0.08	0.01	-20.94	-29.47	-0.34	32.56	39.22	0.46	0.1	0.52
EC	ALL	121	0.2	0.15	0.75	-27.16	34.96	-0.05	0.07	0.01	-16.27	-26.2	-0.37	34.81	40.53	0.48	0.1	0.56
NO3	WIN	29	0.36	0.79	0.74	116.29	121.8	0.42	0.44	0.24	126.82	55.77	1.16	136.44	69.5	1.22	0.64	0.54
NO3	SPR	31	0.16	0.3	0.42	88.1	112.14	0.14	0.18	0.05	187.19	53.07	0.88	204.97	77.6	1.12	0.26	0.18
NO3	SUM	31	0.06	0.05	0.16	-23.06	77.58	-0.01	0.05	0	4.5	-42.19	-0.3	86.4	88.36	1.01	0.07	0.02
NO3	FAL	30	0.14	0.4	0.5	184.17	205.58	0.26	0.29	0.29	310.35	17.11	1.84	355.31	85.9	2.06	0.59	0.25
NO3	ALL	121	0.18	0.37	0.7	110.95	132.06	0.2	0.23	0.17	156.45	20.4	1.11	195.44	80.47	1.32	0.45	0.48
OC	WIN	29	1.01	0.96	0.79	-4.91	22.81	-0.05	0.23	0.11	6.2	0.61	-0.05	26.11	23.88	0.24	0.33	0.62
OC	SPR	31	0.6	0.52	0.68	-13.58	30.89	-0.08	0.19	0.07	-0.12	-8.26	-0.16	31.42	32.65	0.36	0.27	0.46
OC	SUM	31	1.47	0.77	0.6	-47.41	49.13	-0.7	0.72	0.58	-43.93	-61.8	-0.9	45.64	63.41	0.93	1.03	0.36
OC	FAL	30	1.07	0.8	0.77	-24.58	32.46	-0.26	0.35	0.13	-21.27	-29.06	-0.33	30.93	36.67	0.43	0.45	0.60
OC	ALL	121	1.04	0.76	0.65	-26.62	36.01	-0.28	0.37	0.29	-15.07	-25.01	-0.36	33.67	39.42	0.49	0.61	0.43
PM-2.5	WIN	29	4.37	4.33	0.81	-0.85	21.63	-0.04	0.95	1.79	0.62	-3.45	-0.01	21.16	22.38	0.22	1.34	0.65
PM-2.5	SPR	31	3.39	3.22	0.61	-5.03	28.22	-0.17	0.96	1.69	7.42	-1.43	-0.05	34.14	30.38	0.3	1.31	0.38
PM-2.5	SUM	31	5.04	3.21	0.7	-36.34	37.61	-1.83	1.9	3.98	-31.84	-43.44	-0.57	34.97	46.28	0.59	2.71	0.50
PM-2.5	FAL	30	4.17	4.03	0.65	-3.36	35.3	-0.14	1.47	4.43	1.27	-9.48	-0.03	37.84	35.59	0.37	2.11	0.43
PM-2.5	ALL	121	4.24	3.69	0.64	-13.12	31.18	-0.56	1.32	3.54	-5.79	-14.67	-0.15	32.16	33.83	0.36	1.96	0.41
SO4	WIN	29	1.05	0.78	0.87	-26.09	29.68	-0.27	0.31	0.07	-25.03	-31.51	-0.35	28.68	34.63	0.4	0.38	0.76
SO4	SPR	31	0.86	1.13	0.05	31.86	57.47	0.27	0.49	0.35	59.29	26.71	0.32	76.24	47.94	0.57	0.65	0.00
SO4	SUM	31	0.82	0.98	0.67	20.4	50.54	0.17	0.41	0.34	49.94	22.72	0.2	67.64	46.6	0.51	0.61	0.45
SO4	FAL	30	0.93	1.08	0.66	16.86	44.97	0.16	0.42	0.34	38.33	19.51	0.17	56.92	41.41	0.45	0.61	0.43
SO4	ALL	121	0.91	1	0.57	9.4	45.03	0.09	0.41	0.32	31.49	9.95	0.09	57.85	42.79	0.45	0.57	0.33

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: QUCI1																		
EC	WIN	29	0.36	0.56	0.87	54.16	56.03	0.2	0.2	0.04	58.41	40.05	0.54	59.65	41.39	0.56	0.28	0.76
EC	SPR	30	0.29	0.27	0.52	-6.43	34.99	-0.02	0.1	0.02	5.86	-2.36	-0.07	33.8	32.78	0.37	0.14	0.27
EC	SUM	31	0.35	0.26	0.65	-25.8	28.96	-0.09	0.1	0.01	-21.9	-27.85	-0.35	26.51	32.04	0.39	0.13	0.43
EC	FAL	28	0.3	0.38	0.41	26.26	45.95	0.08	0.14	0.03	37.84	20.57	0.26	54.03	39.8	0.46	0.19	0.17
EC	ALL	118	0.33	0.36	0.59	11.76	41.42	0.04	0.13	0.03	19.07	6.81	0.12	43.04	36.37	0.41	0.19	0.35
NO3	WIN	23	1.33	1.82	0.57	36.48	70.58	0.49	0.94	1.29	124.85	31.07	0.36	153.03	69.45	0.71	1.23	0.33
NO3	SPR	31	0.65	0.91	0.38	38.6	92.74	0.25	0.61	1.08	116.99	2.34	0.39	164.46	70.74	0.93	1.07	0.15
NO3	SUM	28	0.18	0.15	0.71	-13.63	45.72	-0.02	0.08	0.01	-14.79	-28.6	-0.16	41.59	50.15	0.53	0.1	0.51
NO3	FAL	27	0.35	0.52	0.67	50.6	87.69	0.18	0.3	0.16	77.18	28.29	0.51	104.98	67.16	0.88	0.44	0.45
NO3	ALL	109	0.6	0.81	0.65	35.35	78.03	0.21	0.47	0.65	74.93	6.88	0.35	115.75	64.29	0.78	0.84	0.43
OC	WIN	29	1.36	2.43	0.9	78.36	78.36	1.07	1.07	0.67	86.78	54.99	0.78	86.78	54.99	0.78	1.34	0.82
OC	SPR	30	1.05	1.23	0.6	17.1	47.95	0.18	0.5	0.36	28.87	13.82	0.17	52.94	42.95	0.48	0.62	0.36
OC	SUM	31	1.5	1.42	0.52	-5.45	35.25	-0.08	0.53	0.47	0.8	-11.81	-0.06	40.67	38.46	0.37	0.69	0.27
OC	FAL	28	0.99	1.61	0.81	63.59	73.45	0.63	0.72	0.74	59.78	35.23	0.64	70.01	48.52	0.73	1.06	0.65
OC	ALL	118	1.23	1.66	0.68	35.4	57.01	0.44	0.7	0.75	43.06	22.29	0.35	62.08	46.05	0.57	0.97	0.46
PM-2.5	WIN	27	7.91	10.83	0.84	36.94	39.61	2.92	3.13	8.55	44.09	31.05	0.37	47.14	34.31	0.4	4.13	0.71
PM-2.5	SPR	31	7.37	7.09	0.58	-3.82	34.63	-0.28	2.55	11.26	6.23	-1.19	-0.04	33.01	32.17	0.36	3.37	0.34
PM-2.5	SUM	31	12.22	8.41	0.83	-31.19	31.42	-3.81	3.84	9.84	-28.83	-36.19	-0.45	29.68	36.99	0.46	4.94	0.69
PM-2.5	FAL	28	6.46	7.68	0.81	18.88	35.05	1.22	2.26	6.48	28.38	16.18	0.19	45.22	37.25	0.35	2.82	0.65
PM-2.5	ALL	117	8.56	8.44	0.65	-1.39	34.56	-0.12	2.96	15.29	10.98	1.13	-0.01	38.31	35.16	0.35	3.91	0.43
SO4	WIN	23	2.46	1.65	0.83	-32.83	35.11	-0.81	0.86	0.73	-29.18	-37.55	-0.49	31.43	39.7	0.52	1.18	0.68
SO4	SPR	31	2.68	1.94	0.76	-27.56	34.78	-0.74	0.93	1.27	-22.96	-31.14	-0.38	30.11	37.42	0.48	1.35	0.57
SO4	SUM	28	4.83	3.48	0.85	-27.97	30.03	-1.35	1.45	2.77	-21.16	-27.86	-0.39	26.34	32.56	0.42	2.14	0.73
SO4	FAL	27	2.14	2.06	0.9	-4.03	24.61	-0.09	0.53	0.49	-2.42	-9.83	-0.04	30.27	32.09	0.26	0.71	0.81
SO4	ALL	109	3.05	2.3	0.85	-24.53	31.14	-0.75	0.95	1.55	-18.72	-26.37	-0.33	29.46	35.33	0.41	1.45	0.72

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: QURE1																		
EC	WIN	28	0.29	0.69	0.9	135.22	135.22	0.4	0.4	0.05	161.88	83.84	1.35	161.88	83.84	1.35	0.46	0.81
EC	SPR	31	0.17	0.3	0.51	78.33	88.36	0.13	0.15	0.02	109	56.39	0.78	114.44	62.52	0.88	0.19	0.26
EC	SUM	31	0.25	0.3	0.74	18.62	34.36	0.05	0.09	0.01	46.81	27.24	0.19	55	37.04	0.34	0.11	0.55
EC	FAL	29	0.31	0.41	0.79	33.33	43.73	0.1	0.13	0.02	55.05	34.01	0.33	61.87	42.16	0.44	0.17	0.63
EC	ALL	119	0.25	0.42	0.71	65.17	74.05	0.17	0.19	0.04	92.09	49.8	0.65	97.31	55.94	0.74	0.26	0.51
NO3	WIN	28	0.69	1.88	0.78	170.8	173.53	1.18	1.2	0.83	267.93	91.6	1.71	273.49	100.7	1.74	1.49	0.62
NO3	SPR	31	0.33	0.67	0.48	105.31	144.05	0.34	0.47	0.55	137.69	32.99	1.05	169.95	79.15	1.44	0.82	0.23
NO3	SUM	31	0.14	0.12	0.32	-14.57	76.24	-0.02	0.11	0.03	1.69	-46.89	-0.17	86.08	75	0.89	0.17	0.10
NO3	FAL	29	0.3	0.55	0.66	84.62	106.45	0.25	0.32	0.16	97.6	31.6	0.85	124.48	69.14	1.06	0.47	0.44
NO3	ALL	119	0.36	0.78	0.78	118.58	142.85	0.42	0.51	0.58	123.14	25.63	1.19	161.38	80.7	1.43	0.87	0.61
OC	WIN	28	1.12	3.43	0.84	205.51	205.51	2.31	2.31	1.87	227.42	99.79	2.06	227.42	99.79	2.06	2.68	0.70
OC	SPR	31	0.77	1.34	0.41	74.27	92.52	0.57	0.71	0.61	113.97	53.43	0.74	123.52	64.32	0.93	0.97	0.17
OC	SUM	31	1.58	1.26	0.68	-20.27	32.54	-0.32	0.51	0.6	-12.99	-21.41	-0.25	32.5	35.96	0.41	0.84	0.46
OC	FAL	29	1.15	1.51	0.77	30.52	45.37	0.35	0.52	0.31	39.89	25.1	0.31	52.42	39.67	0.45	0.66	0.60
OC	ALL	119	1.16	1.85	0.43	60.05	85.57	0.69	0.99	1.74	89.54	37.94	0.6	106.93	59.27	0.86	1.49	0.18
PM-2.5	WIN	28	4.73	11.55	0.92	144.12	144.24	6.82	6.82	14.85	149.76	82.02	1.44	149.92	82.17	1.44	7.83	0.85
PM-2.5	SPR	31	4.27	6.3	0.6	47.47	60.58	2.03	2.59	7.54	66.48	39.49	0.47	73.26	47	0.61	3.41	0.36
PM-2.5	SUM	31	6.48	5.24	0.79	-19.11	31.02	-1.24	2.01	5.21	-9.26	-18.39	-0.24	34.2	36.38	0.38	2.6	0.62
PM-2.5	FAL	29	4.96	6.49	0.8	30.89	43.54	1.53	2.16	4.55	47.2	30.3	0.31	56.95	42	0.44	2.62	0.64
PM-2.5	ALL	119	5.12	7.3	0.54	42.61	64.99	2.18	3.33	16.13	61.65	32.18	0.43	77.15	51.29	0.65	4.57	0.30
SO4	WIN	28	1.2	1.03	0.83	-14.4	23.21	-0.17	0.28	0.13	-8.6	-12.53	-0.17	21.01	23.36	0.27	0.4	0.69
SO4	SPR	31	1.33	1.56	0.82	17.73	28.04	0.24	0.37	0.33	34.63	15.99	0.18	44.12	26.42	0.28	0.62	0.67
SO4	SUM	31	1.59	1.41	0.74	-11.17	35.78	-0.18	0.57	0.65	11.67	-6.58	-0.13	47.81	41.96	0.4	0.82	0.54
SO4	FAL	29	1.35	1.38	0.87	2.14	26.78	0.03	0.36	0.26	23.62	9.81	0.02	44.23	35.07	0.27	0.51	0.76
SO4	ALL	119	1.37	1.35	0.79	-1.36	29.08	-0.02	0.4	0.38	15.79	1.89	-0.01	39.67	31.86	0.29	0.62	0.62

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: RICR1																		
EC	WIN	5	0.02	0.03	0.08	41.16	61.41	0.01	0.01	0	76.71	41.98	0.41	88.97	56.46	0.61	0.02	0.01
EC	SPR	13	0.03	0.03	0.43	-12.33	52.7	0	0.02	0	30.05	8.76	-0.14	60.71	49.1	0.6	0.03	0.18
EC	SUM	20	0.07	0.08	0.75	22.12	69.38	0.01	0.05	0.01	11.85	-4.55	0.22	48.82	43.01	0.69	0.11	0.57
EC	FAL	6	0.07	0.07	0.55	4.5	41.33	0	0.03	0	27.63	3.25	0.05	63.52	47.43	0.41	0.03	0.31
EC	ALL	44	0.05	0.06	0.69	13.17	60.69	0.01	0.03	0.01	26.75	5.73	0.13	58.9	46.94	0.61	0.08	0.47
NO3	WIN	6	0.1	0.03	0.53	-69.63	69.63	-0.07	0.07	0	-64.76	-99.81	-2.29	64.76	99.81	2.29	0.09	0.28
NO3	SPR	13	0.14	0.05	0.67	-61.28	64.77	-0.09	0.09	0.01	-51.38	-86.99	-1.58	59.49	94.16	1.67	0.13	0.45
NO3	SUM	20	0.07	0.01	0.81	-83.03	83.03	-0.06	0.06	0	-83.58	-144.65	-4.89	83.58	144.65	4.89	0.07	0.65
NO3	FAL	6	0.05	0.01	0.59	-71.77	71.77	-0.04	0.04	0	-72.42	-115.41	-2.54	72.42	115.41	2.54	0.04	0.35
NO3	ALL	45	0.09	0.03	0.73	-70.61	72.17	-0.06	0.07	0	-70.28	-118.12	-2.4	72.62	120.19	2.46	0.09	0.54
OC	WIN	6	0.12	0.09	0.43	-21.34	48.32	-0.03	0.06	0.01	189.02	8.07	-0.27	230.88	63.65	0.61	0.08	0.18
OC	SPR	13	0.19	0.11	0.53	-39.6	50.1	-0.08	0.1	0.01	-14.02	-30.05	-0.66	45.84	52.91	0.83	0.14	0.28
OC	SUM	20	0.6	0.56	0.85	-6.35	35.28	-0.04	0.21	0.15	-9.81	-16.22	-0.07	27.12	30.33	0.38	0.39	0.73
OC	FAL	6	0.5	0.47	0.55	-7.25	32.11	-0.04	0.16	0.03	-4.49	-10.31	-0.08	30.26	31.61	0.35	0.19	0.30
OC	ALL	45	0.4	0.36	0.85	-11.6	37.27	-0.05	0.15	0.08	16.19	-16.19	-0.13	60.11	41.47	0.42	0.28	0.73
PM-2.5	WIN	6	1	0.94	0.1	-6.52	27.39	-0.07	0.27	0.11	1.63	-4.17	-0.07	28.21	28.48	0.29	0.34	0.01
PM-2.5	SPR	13	2.91	1.37	0.75	-52.83	55.96	-1.54	1.63	4.02	-33.16	-49.56	-1.12	43.34	57.2	1.19	2.53	0.57
PM-2.5	SUM	20	3.17	1.84	0.79	-42.07	46.74	-1.33	1.48	1.04	-45.08	-61.08	-0.73	47.1	62.92	0.81	1.68	0.62
PM-2.5	FAL	6	2.92	1.85	0.75	-36.66	36.66	-1.07	1.07	0.18	-36.07	-45.19	-0.58	36.07	45.19	0.58	1.15	0.57
PM-2.5	ALL	45	2.77	1.58	0.65	-42.86	47.19	-1.19	1.31	1.88	-34.21	-48.04	-0.75	42.02	54.31	0.83	1.81	0.42
SO4	WIN	6	0.21	0.37	0.01	81.03	81.03	0.17	0.17	0.01	108.6	59.53	0.81	108.6	59.53	0.81	0.21	0.00
SO4	SPR	13	0.51	0.42	0.61	-18.77	47.92	-0.1	0.25	0.17	10.93	-4.43	-0.23	47.39	43.61	0.59	0.42	0.37
SO4	SUM	20	0.51	0.35	0.74	-32.18	32.24	-0.16	0.16	0.01	-30.47	-38.3	-0.47	30.53	38.37	0.48	0.2	0.55
SO4	FAL	6	0.4	0.43	0.88	5.84	9.02	0.02	0.04	0	5.73	5.2	0.06	8.54	8.14	0.09	0.04	0.78
SO4	ALL	45	0.46	0.38	0.55	-16.55	37.54	-0.08	0.17	0.07	4.86	-9.67	-0.2	42.88	38.67	0.45	0.27	0.30

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ROMA1																		
EC	WIN	29	0.34	0.4	0.75	19.08	39.94	0.06	0.13	0.04	31.17	20.66	0.19	43.16	36.96	0.4	0.21	0.57
EC	SPR	31	0.31	0.3	0.89	-1.71	31.69	-0.01	0.1	0.02	5.86	-7.56	-0.02	42.64	41.09	0.32	0.14	0.80
EC	SUM	30	0.24	0.17	0.64	-29.04	45.97	-0.07	0.11	0.02	-8.13	-20.87	-0.41	44.09	48.8	0.65	0.17	0.42
EC	FAL	30	0.2	0.22	0.79	11.67	36.29	0.02	0.07	0.01	39.79	18.15	0.12	57.5	39.43	0.36	0.1	0.62
EC	ALL	120	0.27	0.27	0.78	0.83	38.22	0	0.1	0.03	16.96	2.36	0.01	46.84	41.6	0.38	0.16	0.61
NO3	WIN	29	0.47	0.55	0.16	16.72	74.22	0.08	0.35	0.23	42.37	-5.68	0.17	92.86	66.74	0.74	0.49	0.02
NO3	SPR	15	0.36	0.35	0.19	-4.98	70.6	-0.02	0.26	0.1	7.58	-28.89	-0.05	76.52	81.44	0.74	0.32	0.03
NO3	SUM	31	0.25	0.15	0.11	-40.99	81.71	-0.1	0.21	0.06	-36.22	-90.27	-0.69	87.31	109.86	1.38	0.27	0.01
NO3	FAL	30	0.22	0.22	0.61	-0.78	71.58	0	0.16	0.04	-3.46	-41.55	-0.01	77	84.31	0.72	0.21	0.38
NO3	ALL	105	0.32	0.31	0.39	-3.76	74.86	-0.01	0.24	0.11	1.11	-44.22	-0.04	84.35	86.59	0.78	0.34	0.16
OC	WIN	29	1.47	1.43	0.9	-2.61	25.26	-0.04	0.37	0.39	-7.57	-12.87	-0.03	23.94	26.34	0.26	0.63	0.80
OC	SPR	31	1.85	1.38	0.87	-25.38	35.85	-0.47	0.66	0.94	-28.29	-41.01	-0.34	37.78	48.74	0.48	1.08	0.75
OC	SUM	31	2.7	1.33	0.33	-50.54	57.97	-1.36	1.56	10.59	-32.92	-54.39	-1.02	46.94	64.69	1.17	3.53	0.11
OC	FAL	30	1.05	0.94	0.75	-10.45	40.74	-0.11	0.43	0.29	-15.95	-29.64	-0.12	42.02	49.81	0.45	0.55	0.57
OC	ALL	121	1.78	1.27	0.51	-28.46	43.07	-0.51	0.77	3.4	-21.45	-34.87	-0.4	37.86	47.72	0.6	1.91	0.26
PM-2.5	WIN	28	6.68	6.9	0.82	3.18	18.38	0.21	1.23	3.16	5.68	2.28	0.03	20.44	19.57	0.18	1.79	0.68
PM-2.5	SPR	14	8.84	6.15	0.64	-30.49	36.62	-2.7	3.24	12.01	-23.53	-34.26	-0.44	34.97	44.25	0.53	4.39	0.41
PM-2.5	SUM	30	12.88	5.86	0.38	-54.48	55.79	-7.02	7.19	49.2	-49.92	-73.28	-1.2	51.83	75.05	1.23	9.92	0.14
PM-2.5	FAL	30	5.78	5.04	0.82	-12.71	23.03	-0.73	1.33	2.92	-13.52	-20.6	-0.15	24.69	30.13	0.26	1.86	0.68
PM-2.5	ALL	102	8.54	5.94	0.43	-30.36	38.5	-2.59	3.29	26.78	-20.33	-31.69	-0.44	32.92	42.38	0.55	5.79	0.18
SO4	WIN	29	1.79	1.49	0.75	-16.81	24.26	-0.3	0.43	0.31	-9.09	-13.61	-0.2	23.01	24.38	0.29	0.63	0.57
SO4	SPR	15	2.39	1.71	0.6	-28.34	33.47	-0.68	0.8	0.94	-19.22	-28.02	-0.4	29.93	36.63	0.47	1.18	0.36
SO4	SUM	31	3.2	1.83	0.8	-42.85	45.52	-1.37	1.46	0.97	-46	-67.75	-0.75	48.5	69.96	0.8	1.69	0.64
SO4	FAL	30	1.66	1.57	0.86	-5.56	23.54	-0.09	0.39	0.33	-6.63	-12.41	-0.06	23.44	26.95	0.25	0.58	0.74
SO4	ALL	105	2.25	1.64	0.72	-27.12	34.42	-0.61	0.78	0.87	-20.73	-31.31	-0.37	31.65	40.32	0.47	1.12	0.52

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ROMO1																		
EC	WIN	26	0.05	0.8	0.33	1643.97	1643.97	0.75	0.75	1.95	2990.03	115.15	16.44	2990.03	115.15	16.44	1.59	0.11
EC	SPR	30	0.04	0.08	0.38	84.93	113.74	0.04	0.05	0.01	150.31	40.36	0.85	168.03	62.69	1.14	0.11	0.14
EC	SUM	31	0.13	0.11	0.9	-18.87	31.36	-0.03	0.04	0	-6.16	-23.97	-0.23	43.29	41.35	0.39	0.06	0.81
EC	FAL	30	0.07	0.23	0.16	229.23	252.74	0.16	0.18	0.14	327.45	51.16	2.29	343.8	71.54	2.53	0.41	0.02
EC	ALL	117	0.08	0.29	0.11	282.57	316.24	0.21	0.24	0.56	785.32	42.71	2.83	807.16	70.96	3.16	0.78	0.01
NO3	WIN	25	0.15	0.37	0.4	139.67	172.96	0.21	0.26	0.15	1198.06	49.53	1.4	1230.45	95.37	1.73	0.44	0.16
NO3	SPR	31	0.21	0.18	0.7	-17.15	96.56	-0.04	0.21	0.13	-34.79	-94.04	-0.21	89.54	113.59	1.17	0.36	0.49
NO3	SUM	31	0.1	0.02	0.35	-78.36	78.36	-0.08	0.08	0.01	-77.01	-132.12	-3.62	77.01	132.12	3.62	0.12	0.12
NO3	FAL	30	0.11	0.14	0.32	27.36	138.82	0.03	0.16	0.08	82.82	-46.68	0.27	179.32	107.68	1.39	0.29	0.10
NO3	ALL	117	0.14	0.17	0.5	15.85	118.87	0.02	0.17	0.1	247.61	-61.31	0.16	353.02	113.09	1.19	0.32	0.25
OC	WIN	26	0.23	3.43	0.3	1421.92	1421.92	3.21	3.21	37	4087.62	92.49	14.22	4087.62	92.49	14.22	6.88	0.09
OC	SPR	31	0.24	0.31	0.23	26.84	86.26	0.07	0.21	0.19	71.29	-7.24	0.27	117.87	56.36	0.86	0.44	0.05
OC	SUM	31	0.95	0.58	0.91	-38.71	43.06	-0.37	0.41	0.23	-33.29	-46.91	-0.63	39.29	51.44	0.7	0.61	0.84
OC	FAL	30	0.38	1.01	0.13	163.71	211.69	0.63	0.81	2.71	313.07	29.36	1.64	348.55	77.11	2.12	1.76	0.02
OC	ALL	118	0.46	1.25	0.07	170.35	233.08	0.79	1.08	10.74	990.24	13.62	1.7	1030.56	68.3	2.33	3.37	0.00
PM-2.5	WIN	26	1.39	8.31	0.32	497.69	501.52	6.92	6.97	162.49	788.89	71.7	4.98	793.21	77.14	5.02	14.5	0.10
PM-2.5	SPR	31	2.37	1.94	0.15	-18.14	64.92	-0.43	1.54	6.05	40.45	-16.89	-0.22	91.39	53.54	0.79	2.5	0.02
PM-2.5	SUM	31	3.87	2.05	0.9	-47.04	48.26	-1.82	1.87	1.33	-47.61	-66.28	-0.89	49.17	67.67	0.91	2.16	0.80
PM-2.5	FAL	28	1.98	3.2	0.12	61.44	108.18	1.22	2.14	16.22	85.8	5.28	0.61	127.1	59.45	1.08	4.21	0.01
PM-2.5	ALL	116	2.46	3.7	0.09	50.57	121.67	1.24	2.99	52.79	195.62	-4.88	0.51	246.03	64.03	1.22	7.37	0.01
SO4	WIN	25	0.31	0.44	0.27	40.51	106.74	0.13	0.34	0.24	163.35	68.43	0.41	175.44	85.87	1.07	0.51	0.07
SO4	SPR	31	0.44	0.48	0.37	9.46	49.55	0.04	0.22	0.13	46.6	12.39	0.09	70.24	42.37	0.5	0.37	0.14
SO4	SUM	31	0.6	0.38	0.74	-36.14	37.74	-0.22	0.23	0.02	-36.26	-48.23	-0.57	37.85	49.69	0.59	0.26	0.54
SO4	FAL	30	0.41	0.41	0.54	-0.32	34.24	0	0.14	0.03	12.24	1.29	0	40.64	36.16	0.34	0.18	0.29
SO4	ALL	117	0.45	0.43	0.33	-4.31	50.41	-0.02	0.22	0.12	40.78	5.46	-0.05	76.55	52.01	0.53	0.34	0.11

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SACR1																		
EC	WIN	26	0.15	0.18	0.57	24.78	41.33	0.04	0.06	0.01	36.42	20.37	0.25	47.23	32.52	0.41	0.11	0.32
EC	SPR	30	0.12	0.19	0.08	52.08	93.63	0.06	0.11	0.05	350.68	42.42	0.52	366.36	62.5	0.94	0.23	0.01
EC	SUM	30	0.14	0.13	0.72	-2.54	32.51	0	0.04	0.01	3.08	-8.1	-0.03	38	33.82	0.33	0.08	0.52
EC	FAL	26	0.15	0.17	0.71	18.08	31.42	0.03	0.05	0.01	22.77	13.13	0.18	35.24	27.1	0.31	0.09	0.50
EC	ALL	112	0.14	0.17	0.35	22.31	48.98	0.03	0.07	0.02	108.5	16.97	0.22	127.46	39.64	0.49	0.14	0.12
NO3	WIN	26	0.96	0.55	0.81	-42.94	47.02	-0.41	0.45	0.44	-23.2	-35.49	-0.75	36.36	46.53	0.82	0.78	0.65
NO3	SPR	28	0.32	0.15	0.49	-53.33	55.41	-0.17	0.18	0.03	-38.51	-57.29	-1.14	46.11	63.65	1.19	0.24	0.24
NO3	SUM	30	0.29	0.09	0.52	-69.4	70.06	-0.2	0.2	0.04	-56.18	-88.82	-2.27	57.97	90.4	2.29	0.28	0.27
NO3	FAL	26	0.3	0.17	0.17	-41.99	60.38	-0.12	0.18	0.04	-4.78	-36.25	-0.72	67.91	70.93	1.04	0.24	0.03
NO3	ALL	110	0.46	0.23	0.81	-49.24	54.56	-0.23	0.25	0.14	-31.74	-55.76	-0.97	52.19	68.62	1.07	0.44	0.66
OC	WIN	26	0.53	0.81	0.64	52.88	68.47	0.28	0.36	0.23	57.76	34.15	0.53	70.07	49.19	0.68	0.56	0.41
OC	SPR	30	1	0.86	0.33	-14.48	55.75	-0.15	0.56	1.08	-4.62	-19.11	-0.17	42.59	43.25	0.65	1.05	0.11
OC	SUM	30	1.1	1.1	0.55	-0.44	45.08	0	0.5	0.37	7.06	-7.68	0	48.95	48.2	0.45	0.6	0.30
OC	FAL	26	0.69	0.9	0.84	30.55	42.45	0.21	0.29	0.18	32.64	20.65	0.31	43.67	32.98	0.42	0.48	0.71
OC	ALL	112	0.85	0.92	0.46	8.67	51.37	0.07	0.44	0.51	21.64	5.55	0.09	50.93	43.57	0.51	0.72	0.22
PM-2.5	WIN	26	4.48	8.03	0.4	79.19	95.77	3.55	4.29	10.06	132.98	62.58	0.79	141.2	73.25	0.96	4.76	0.16
PM-2.5	SPR	28	10.25	6.84	0.45	-33.25	45.77	-3.41	4.69	38.18	-12.91	-25.59	-0.5	39.57	46.81	0.69	7.06	0.20
PM-2.5	SUM	30	7.99	5.97	0.21	-25.28	32.53	-2.02	2.6	9.14	-21.23	-29.71	-0.34	30.12	37.37	0.44	3.63	0.04
PM-2.5	FAL	26	5.08	6.89	0.56	35.71	48.17	1.81	2.45	5.58	51.11	30.7	0.36	60.79	41.72	0.48	2.98	0.31
PM-2.5	ALL	110	7.05	6.9	0.22	-2.13	49.61	-0.15	3.5	23.71	34.44	7.43	-0.02	66.03	49.28	0.51	4.87	0.05
SO4	WIN	26	0.81	0.62	0.74	-23.29	43.26	-0.19	0.35	0.51	14.21	1.2	-0.3	43.91	40.59	0.56	0.74	0.55
SO4	SPR	28	1.57	0.65	0.11	-58.5	59.37	-0.92	0.93	1.4	-44.45	-66.34	-1.41	46.25	67.97	1.43	1.5	0.01
SO4	SUM	30	1.64	0.84	0.49	-48.83	48.83	-0.8	0.8	0.2	-47.84	-66.88	-0.95	47.84	66.88	0.95	0.92	0.24
SO4	FAL	26	1.01	0.72	0.74	-28.7	33.14	-0.29	0.34	0.15	-17.75	-27.78	-0.4	31.88	38.53	0.46	0.49	0.55
SO4	ALL	110	1.28	0.71	0.48	-44.23	48.34	-0.56	0.62	0.67	-25.2	-41.41	-0.79	42.73	54.24	0.87	0.99	0.23

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SAFO1																		
EC	WIN	14	0.22	0.31	0.75	41.92	43.63	0.09	0.1	0.01	50.28	35.32	0.42	52.02	37.16	0.44	0.12	0.56
EC	SPR	31	0.31	0.39	0.68	25.98	49.86	0.08	0.16	0.09	20.07	7.34	0.26	41.13	32.59	0.5	0.32	0.46
EC	SUM	9	0.31	0.27	0.78	-12.64	20.21	-0.04	0.06	0	-8.5	-11.06	-0.14	17.73	19.6	0.23	0.08	0.60
EC	ALL	54	0.29	0.35	0.65	22.2	43.33	0.06	0.12	0.06	23.14	11.53	0.22	40.05	31.61	0.43	0.25	0.43
NO3	WIN	14	2.85	2.92	0.8	2.46	32.25	0.07	0.92	1.24	17.38	3.33	0.02	44.98	37.31	0.32	1.12	0.63
NO3	SPR	31	1.82	1.83	0.94	0.12	33.26	0	0.61	0.67	0.45	-18.81	0	51.38	54.03	0.33	0.82	0.88
NO3	SUM	9	0.45	0.29	0.76	-35.44	43.76	-0.16	0.2	0.06	-37.33	-55.26	-0.55	43.78	61.26	0.68	0.29	0.58
NO3	ALL	54	1.86	1.85	0.92	-0.37	33.28	-0.01	0.62	0.72	-1.46	-19.14	0	48.46	50.9	0.33	0.85	0.85
OC	WIN	14	0.91	0.93	0.76	3.01	26.26	0.03	0.24	0.08	4.14	-0.06	0.03	26.63	25.73	0.26	0.28	0.58
OC	SPR	31	1.6	1.34	0.62	-16.27	59.11	-0.26	0.95	2.02	-22.82	-40.51	-0.19	49.68	58.83	0.71	1.44	0.38
OC	SUM	9	1.9	1.58	0.91	-16.57	26.9	-0.31	0.51	0.29	-23.17	-30.38	-0.2	29.01	35.55	0.32	0.62	0.82
OC	ALL	54	1.47	1.27	0.65	-13.26	46.92	-0.19	0.69	1.25	-15.89	-28.34	-0.15	40.26	46.37	0.54	1.13	0.43
PM-2.5	WIN	14	7.61	8	0.72	5.11	28.76	0.39	2.19	7.06	17	7.49	0.05	37.43	32.89	0.29	2.69	0.52
PM-2.5	SPR	31	9.03	8.7	0.74	-3.73	37.14	-0.34	3.35	22.71	1.18	-8.02	-0.04	36.37	35.36	0.39	4.78	0.54
PM-2.5	SUM	9	9.76	7.28	0.96	-25.42	25.42	-2.48	2.48	1.28	-28.14	-34.04	-0.34	28.14	34.04	0.34	2.73	0.92
PM-2.5	ALL	54	8.78	8.28	0.74	-5.76	33.09	-0.51	2.91	15.96	0.4	-8.34	-0.06	35.27	34.5	0.35	4.03	0.55
SO4	WIN	14	1.32	1.02	0.65	-23.15	44.53	-0.31	0.59	0.56	-14.74	-27.6	-0.3	39.97	46.87	0.58	0.81	0.42
SO4	SPR	31	2.07	1.59	0.71	-23.43	36.68	-0.49	0.76	1.03	-13.53	-21.85	-0.31	30.17	34.96	0.48	1.13	0.50
SO4	SUM	9	2.54	1.78	0.93	-29.63	29.63	-0.75	0.75	0.23	-32.09	-40.55	-0.42	32.09	40.55	0.42	0.89	0.87
SO4	ALL	54	1.95	1.47	0.75	-24.72	36.53	-0.48	0.71	0.79	-16.94	-26.46	-0.33	33.03	38.98	0.49	1.01	0.56

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SAMA1																		
EC	WIN	26	0.37	0.67	0.81	83.76	96.36	0.31	0.35	0.16	76.59	40.91	0.84	88.89	56.41	0.96	0.51	0.65
EC	SPR	29	0.32	0.3	0.7	-7.81	43.66	-0.03	0.14	0.04	-0.62	-15.76	-0.08	46.86	45.38	0.47	0.21	0.49
EC	SUM	28	0.18	0.13	0.73	-26.22	42.39	-0.05	0.08	0.01	9.93	-19.53	-0.36	63.49	54.99	0.57	0.11	0.54
EC	FAL	30	0.23	0.22	0.79	-4.17	26.88	-0.01	0.06	0.01	6	-2.59	-0.04	31.96	28.64	0.28	0.09	0.62
EC	ALL	113	0.27	0.32	0.68	18.36	55.95	0.05	0.15	0.07	21.52	-0.16	0.18	56.7	45.86	0.56	0.27	0.46
NO3	WIN	21	0.37	0.82	0.19	119.48	161.34	0.45	0.6	0.56	160.22	36.52	1.19	190.96	84.31	1.61	0.87	0.03
NO3	SPR	28	0.29	0.26	0.58	-9.98	92.14	-0.03	0.27	0.15	-24.65	-69.23	-0.11	77.26	99.31	1.02	0.39	0.34
NO3	SUM	27	0.2	0.1	0.09	-50.91	88.9	-0.1	0.18	0.03	-32.82	-93.91	-1.04	92.25	123.01	1.81	0.21	0.01
NO3	FAL	23	0.19	0.27	0.62	41.43	117.83	0.08	0.22	0.13	19.49	-36.32	0.41	100.69	93.54	1.18	0.37	0.38
NO3	ALL	99	0.26	0.34	0.44	29.65	116.88	0.08	0.3	0.24	22.59	-45.88	0.3	110.91	101.25	1.17	0.5	0.20
OC	WIN	26	1.63	3.03	0.73	85.82	100.35	1.4	1.64	4.56	76.32	35.61	0.86	90.62	53.43	1	2.55	0.53
OC	SPR	29	2.16	1.57	0.42	-27.24	58.49	-0.59	1.26	5.92	-2.33	-24.83	-0.37	54.11	55.4	0.8	2.5	0.17
OC	SUM	28	1.85	1.22	0.68	-34.08	47.64	-0.63	0.88	1.19	-22.71	-38.66	-0.52	45.72	54.88	0.72	1.26	0.46
OC	FAL	30	1.31	1.26	0.65	-3.97	45.85	-0.05	0.6	0.74	-4.59	-18.82	-0.04	44	46.01	0.48	0.86	0.42
OC	ALL	113	1.74	1.74	0.39	0.03	62.13	0	1.08	3.7	10.12	-12.75	0	57.74	52.32	0.62	1.92	0.16
PM-2.5	WIN	26	6.98	10.69	0.73	53.25	70.14	3.71	4.89	38.97	47.77	24.43	0.53	65.16	44.85	0.7	7.26	0.54
PM-2.5	SPR	29	9.45	6.94	0.43	-26.58	42.72	-2.51	4.04	24.24	-19.08	-32.15	-0.36	41.18	48.65	0.58	5.53	0.18
PM-2.5	SUM	28	9.29	4.41	0.81	-52.54	52.54	-4.88	4.88	6.91	-55.17	-81.63	-1.11	55.17	81.63	1.11	5.54	0.66
PM-2.5	FAL	30	5.85	5.72	0.8	-2.27	27.98	-0.13	1.64	4.27	-0.46	-7.32	-0.02	29.56	32.21	0.29	2.07	0.64
PM-2.5	ALL	113	7.89	6.85	0.43	-13.12	48.26	-1.03	3.81	27.67	-7.7	-24.8	-0.15	47.08	51.58	0.56	5.36	0.19
SO4	WIN	21	2.1	2.23	0.48	6.47	46.83	0.14	0.98	2.2	9.29	-3.67	0.06	41.72	36.85	0.47	1.49	0.23
SO4	SPR	28	2.43	1.99	0.32	-18.07	39.44	-0.44	0.96	1.19	-10.83	-22.83	-0.22	39.68	44.43	0.48	1.18	0.10
SO4	SUM	27	2.37	1.17	0.8	-50.69	51.35	-1.2	1.22	0.62	-53.18	-79.68	-1.03	53.96	80.43	1.04	1.44	0.64
SO4	FAL	23	1.64	1.58	0.73	-3.25	37.75	-0.05	0.62	0.61	7	-7.41	-0.03	44.14	46.28	0.39	0.78	0.54
SO4	ALL	99	2.16	1.72	0.5	-20.17	44.24	-0.44	0.95	1.38	-13.97	-30.69	-0.25	45.04	53.07	0.55	1.25	0.25

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SAPE1																		
EC	WIN	28	0.03	0.05	0.82	44.23	52.28	0.01	0.02	0	94.82	49.06	0.44	100.12	54.91	0.52	0.02	0.67
EC	SPR	30	0.05	0.05	0.69	-4.86	44.7	0	0.02	0	24.19	7.95	-0.05	51.34	42.36	0.47	0.03	0.47
EC	SUM	30	0.29	0.19	0.81	-34.03	50.11	-0.1	0.14	0.11	2.31	-24.15	-0.52	58.45	50.16	0.76	0.34	0.66
EC	FAL	27	0.06	0.05	0.49	-12.37	50.12	-0.01	0.03	0	23.7	-1.17	-0.14	63.82	52.85	0.57	0.04	0.24
EC	ALL	115	0.11	0.09	0.84	-22.3	49.59	-0.02	0.05	0.03	35.56	7.45	-0.29	68	49.91	0.64	0.18	0.70
NO3	WIN	21	0.1	0.04	0.29	-60.83	78.42	-0.06	0.08	0.01	-30.5	-80.94	-1.55	83.27	108.97	2	0.13	0.08
NO3	SPR	24	0.18	0.03	0.67	-80.62	80.62	-0.14	0.14	0.01	-78.55	-131.44	-4.16	78.55	131.44	4.16	0.18	0.45
NO3	SUM	30	0.14	0.02	0.76	-85.74	85.74	-0.12	0.12	0.02	-77.34	-132.15	-6.01	77.34	132.15	6.01	0.17	0.57
NO3	FAL	23	0.06	0.02	0.3	-72.04	74.13	-0.04	0.05	0	-55.86	-94.01	-2.58	67.41	102.59	2.65	0.06	0.09
NO3	ALL	98	0.12	0.03	0.37	-78.03	81.29	-0.1	0.1	0.01	-62.56	-112.05	-3.55	76.58	120.07	3.7	0.15	0.13
OC	WIN	27	0.16	0.14	0.62	-12.88	38.3	-0.02	0.06	0.01	29.46	-0.93	-0.15	65.26	45.79	0.44	0.09	0.39
OC	SPR	30	0.35	0.18	0.66	-49.09	55.03	-0.17	0.19	0.09	-30.72	-46.93	-0.96	43.29	56.5	1.08	0.35	0.44
OC	SUM	30	2.07	1.17	0.84	-43.51	51.39	-0.9	1.06	4.54	-18.45	-36.31	-0.77	45.99	53.4	0.91	2.31	0.70
OC	FAL	27	0.3	0.28	0.69	-6.5	48.87	-0.02	0.15	0.03	186.03	-0.53	-0.07	231.97	63.01	0.52	0.18	0.48
OC	ALL	114	0.75	0.45	0.86	-39.1	50.93	-0.29	0.38	1.36	38.1	-22.25	-0.64	93.89	54.69	0.84	1.2	0.74
PM-2.5	WIN	27	1.16	1.22	0.85	5.73	24.7	0.07	0.29	0.12	14.72	8.74	0.06	29.12	24.76	0.25	0.35	0.72
PM-2.5	SPR	30	3.51	1.8	0.55	-48.77	52.36	-1.71	1.84	3.74	-35.85	-52.35	-0.95	44.15	59.4	1.02	2.58	0.31
PM-2.5	SUM	30	6.33	3.45	0.83	-45.55	47.14	-2.88	2.99	17.27	-38.46	-55.67	-0.84	42.98	59.25	0.87	5.06	0.69
PM-2.5	FAL	24	2.23	1.4	0.43	-37.18	38.23	-0.83	0.85	1	-30.45	-40.85	-0.59	32.28	42.59	0.61	1.3	0.18
PM-2.5	ALL	111	3.42	2.02	0.84	-41.05	45.49	-1.41	1.56	7.14	-23.09	-35.9	-0.7	37.61	47.3	0.77	3.02	0.70
SO4	WIN	22	0.23	0.44	0.83	95.56	95.56	0.22	0.22	0.01	130.61	71.39	0.96	130.61	71.39	0.96	0.24	0.69
SO4	SPR	24	0.55	0.47	0.63	-14.43	33.38	-0.08	0.18	0.11	1.3	-5	-0.17	28.29	28.84	0.39	0.34	0.40
SO4	SUM	30	0.68	0.47	0.67	-30.54	34.66	-0.21	0.24	0.06	-29.61	-39.63	-0.44	34.27	43.75	0.5	0.31	0.45
SO4	FAL	23	0.42	0.41	0.63	-2.99	28.86	-0.01	0.12	0.03	6.67	-0.81	-0.03	32.07	30.55	0.3	0.16	0.40
SO4	ALL	99	0.49	0.45	0.59	-7.52	39.44	-0.04	0.19	0.07	21.92	2.46	-0.08	53.72	43.21	0.43	0.28	0.35

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SENE1																		
EC	WIN	26	0.11	0.18	0.92	63.65	66.59	0.07	0.07	0	171.99	66.61	0.64	173.38	68.13	0.67	0.08	0.85
EC	SPR	30	0.1	0.12	0.82	18.1	41	0.02	0.04	0	29.18	15.18	0.18	50.76	42.47	0.41	0.05	0.68
EC	SUM	31	0.16	0.1	0.84	-39.7	43.98	-0.06	0.07	0	-28.35	-48.06	-0.66	48.76	58.4	0.73	0.09	0.71
EC	FAL	30	0.15	0.17	0.94	16.72	32.15	0.02	0.05	0	28.04	13.12	0.17	50.4	43.37	0.32	0.07	0.88
EC	ALL	117	0.13	0.14	0.81	7.55	44.11	0.01	0.06	0.01	45.38	9.32	0.08	77.38	52.62	0.44	0.08	0.65
NO3	WIN	29	1.08	1	0.73	-7.3	57.2	-0.08	0.62	1.19	50.07	-18.84	-0.08	110.46	72.45	0.62	1.09	0.53
NO3	SPR	31	0.4	0.42	0.79	5.43	61.35	0.02	0.24	0.28	38.25	-54.13	0.05	127.51	92.01	0.61	0.53	0.62
NO3	SUM	31	0.08	0.1	0.85	30.74	88.64	0.02	0.07	0.02	-33.98	-79.9	0.31	78.27	102.03	0.89	0.15	0.72
NO3	FAL	30	0.36	0.45	0.89	25.58	53.27	0.09	0.19	0.12	24.31	-30.73	0.26	92.16	82.19	0.53	0.36	0.80
NO3	ALL	121	0.47	0.49	0.79	3.33	58.7	0.02	0.28	0.4	19.12	-46.47	0.03	102.04	87.46	0.59	0.63	0.62
OC	WIN	26	0.53	0.9	0.84	68.94	74.17	0.37	0.39	0.07	146.9	66.33	0.69	149.14	68.96	0.74	0.45	0.71
OC	SPR	31	0.59	0.66	0.84	12.33	29.62	0.07	0.17	0.04	30.78	16.49	0.12	46.37	35.11	0.3	0.22	0.70
OC	SUM	31	1.54	0.82	0.76	-46.93	47.34	-0.72	0.73	0.36	-44.6	-61.86	-0.88	45.07	62.32	0.89	0.94	0.58
OC	FAL	30	0.79	0.86	0.93	8.89	28.74	0.07	0.23	0.07	155.91	22.96	0.09	173.09	43.79	0.29	0.28	0.87
OC	ALL	118	0.88	0.8	0.7	-8.2	43.55	-0.07	0.38	0.3	68.37	8.53	-0.09	100.89	51.92	0.47	0.56	0.49
PM-2.5	WIN	28	3.79	4.49	0.85	18.55	40.37	0.7	1.53	5.16	37.7	22.68	0.19	51.35	38.49	0.4	2.38	0.72
PM-2.5	SPR	31	3.53	3.95	0.83	11.87	29.09	0.42	1.03	2.34	19.32	8.01	0.12	36.08	27.15	0.29	1.59	0.70
PM-2.5	SUM	30	6.01	3.65	0.9	-39.32	42.08	-2.36	2.53	4.03	-40.7	-55.08	-0.65	43.71	57.53	0.69	3.1	0.82
PM-2.5	FAL	30	3.65	4.12	0.94	12.84	26.23	0.47	0.96	1.37	26	14.75	0.13	39.9	31.73	0.26	1.26	0.88
PM-2.5	ALL	119	4.25	4.05	0.8	-4.78	35.47	-0.2	1.51	4.77	10.2	-2.75	-0.05	42.56	38.63	0.37	2.19	0.64
SO4	WIN	29	0.99	0.77	0.76	-21.85	41.08	-0.22	0.41	0.29	-13.95	-22.96	-0.28	34.06	40.12	0.53	0.58	0.58
SO4	SPR	31	1.16	1.29	0.8	10.62	33.44	0.12	0.39	0.32	21.26	7.94	0.11	41.36	32.31	0.33	0.58	0.63
SO4	SUM	31	1.3	1.12	0.93	-13.81	28.99	-0.18	0.38	0.54	23.61	3.69	-0.16	52.6	39.93	0.34	0.75	0.87
SO4	FAL	30	0.97	1.02	0.92	4.9	35.14	0.05	0.34	0.18	64.32	27.44	0.05	81.24	47.51	0.35	0.43	0.84
SO4	ALL	121	1.11	1.06	0.84	-4.9	34.11	-0.05	0.38	0.35	24.1	4.28	-0.05	52.38	39.9	0.36	0.6	0.71

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SHEN1																		
EC	WIN	27	0.16	0.35	0.53	122.22	122.22	0.19	0.19	0.02	179.77	78.61	1.22	179.77	78.61	1.22	0.23	0.28
EC	SPR	31	0.18	0.2	0.38	8.6	52.43	0.02	0.1	0.01	365.47	22.47	0.09	389.84	53.89	0.52	0.12	0.14
EC	SUM	31	0.29	0.21	0.64	-26.09	31.92	-0.08	0.09	0.01	-18.82	-25.76	-0.35	28.94	34.06	0.43	0.12	0.41
EC	FAL	30	0.2	0.26	0.58	29.42	50.07	0.06	0.1	0.01	136.48	35.44	0.29	147.7	48.8	0.5	0.12	0.34
EC	ALL	119	0.21	0.25	0.3	20.31	56.28	0.04	0.12	0.02	165.5	25.91	0.2	187.11	53.05	0.56	0.15	0.09
NO3	WIN	27	0.7	1.45	0.31	105.99	111.11	0.75	0.78	0.65	333.27	71.15	1.06	337.16	75.76	1.11	1.1	0.09
NO3	SPR	31	0.48	0.78	0.37	62.66	109.63	0.3	0.53	0.48	168.2	16.43	0.63	211.94	82.24	1.1	0.76	0.13
NO3	SUM	31	0.19	0.35	0.13	87.36	122.22	0.16	0.23	0.06	154.46	42.55	0.87	179.34	79.63	1.22	0.3	0.02
NO3	FAL	30	0.33	0.98	0.27	192.9	193.57	0.64	0.65	0.42	334.41	93.52	1.93	335.01	94.16	1.94	0.91	0.08
NO3	ALL	119	0.42	0.87	0.45	108.32	128.55	0.45	0.54	0.45	243.98	55.08	1.08	262.89	83.09	1.29	0.81	0.20
OC	WIN	27	0.69	1.26	0.45	82.66	93.91	0.57	0.65	0.41	140.7	63.63	0.83	143.02	66.32	0.94	0.86	0.21
OC	SPR	31	0.93	0.81	0.7	-12.54	42.85	-0.12	0.4	0.33	27.98	3.51	-0.14	63.29	50.12	0.49	0.58	0.49
OC	SUM	31	1.57	1.37	0.52	-12.91	34.36	-0.2	0.54	0.62	2.02	-11.44	-0.15	39.14	34.9	0.39	0.81	0.27
OC	FAL	29	0.92	0.95	0.44	3.23	48.86	0.03	0.45	0.5	35.23	15.21	0.03	56	43.8	0.49	0.71	0.19
OC	ALL	118	1.04	1.1	0.52	5.2	48.54	0.05	0.51	0.55	48.73	16.21	0.05	73.4	48.27	0.49	0.75	0.27
PM-2.5	WIN	27	4.32	6.75	0.36	56.11	63.95	2.42	2.76	6.36	95.29	48.49	0.56	98.8	52.32	0.64	3.5	0.13
PM-2.5	SPR	31	5.48	5.41	0.6	-1.25	40.66	-0.07	2.23	7.61	47.6	8.5	-0.01	78.26	48.1	0.41	2.76	0.36
PM-2.5	SUM	31	11.52	7.98	0.8	-30.74	32.69	-3.54	3.77	6.81	-30.81	-38.42	-0.44	32.43	39.86	0.47	4.4	0.64
PM-2.5	FAL	30	5.29	5.84	0.68	10.37	43.16	0.55	2.28	9.2	54.33	24.3	0.1	70.48	44.41	0.43	3.08	0.46
PM-2.5	ALL	119	6.74	6.49	0.67	-3.74	40.99	-0.25	2.76	12.14	39.69	9.34	-0.04	69.02	45.98	0.43	3.49	0.44
SO4	WIN	27	1.33	1.12	0.28	-15.91	38.65	-0.21	0.51	0.42	6.18	-11.1	-0.19	48.02	40.72	0.46	0.68	0.08
SO4	SPR	31	1.65	1.53	0.79	-7.38	29.26	-0.12	0.48	0.31	20.77	-0.18	-0.08	51.15	38.04	0.32	0.57	0.62
SO4	SUM	31	3.83	3	0.85	-21.6	25.73	-0.83	0.99	0.99	-20.13	-25.39	-0.28	25.48	30.13	0.33	1.29	0.73
SO4	FAL	30	1.44	1.49	0.69	3.03	42.64	0.04	0.62	0.99	60.71	19.43	0.03	81.07	45.44	0.43	0.99	0.48
SO4	ALL	119	2.09	1.81	0.85	-13.57	31.25	-0.28	0.65	0.79	16.87	-4.28	-0.16	51.29	38.45	0.36	0.93	0.72

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SHRO1																		
EC	WIN	19	0.09	0.21	0.67	132	132	0.12	0.12	0.01	194.95	82.48	1.32	194.95	82.48	1.32	0.14	0.45
EC	SPR	21	0.18	0.22	0.59	21.71	48.87	0.04	0.09	0.01	70.69	30.83	0.22	88.56	53.76	0.49	0.11	0.35
EC	SUM	27	0.2	0.15	0.56	-23.2	31.91	-0.05	0.06	0	-17.92	-25.85	-0.3	30.51	36.69	0.42	0.08	0.31
EC	FAL	27	0.16	0.19	0.77	25.5	35.26	0.04	0.05	0	74.99	31.85	0.25	81.56	39.21	0.35	0.08	0.59
EC	ALL	94	0.16	0.19	0.49	19.47	48.61	0.03	0.08	0.01	71.59	25.28	0.19	91.38	50.48	0.49	0.1	0.24
NO3	WIN	19	0.21	0.31	0.23	49.59	105.33	0.1	0.22	0.07	137.84	5.89	0.5	189.54	84.37	1.05	0.28	0.05
NO3	SPR	21	0.23	0.23	0.29	-2.02	69.19	0	0.16	0.05	358.17	-11.82	-0.02	415.34	78.76	0.71	0.23	0.08
NO3	SUM	27	0.16	0.05	0.33	-68.01	74.9	-0.11	0.12	0.01	-67.58	-115.88	-2.13	73.73	120.54	2.34	0.14	0.11
NO3	FAL	23	0.2	0.16	0.36	-20.85	75.96	-0.04	0.15	0.05	35.06	-48.15	-0.26	121.62	87.77	0.96	0.22	0.13
NO3	ALL	90	0.2	0.17	0.32	-11.34	80.33	-0.02	0.16	0.05	101.36	-48.58	-0.13	190.13	94.78	0.91	0.22	0.10
OC	WIN	19	0.49	0.74	0.6	52.06	59.38	0.25	0.29	0.14	61.89	37.69	0.52	67.4	43.95	0.59	0.45	0.36
OC	SPR	21	1.11	1.05	0.86	-4.89	30.43	-0.05	0.34	0.17	35.34	10.85	-0.05	62.29	43.6	0.32	0.41	0.74
OC	SUM	27	1.9	1.61	0.76	-15.44	30.38	-0.29	0.58	0.42	-12.39	-19.59	-0.18	31.19	35.18	0.36	0.71	0.58
OC	FAL	26	0.87	1.06	0.78	21.6	52.2	0.19	0.45	0.5	18.78	0.92	0.22	51.15	41.44	0.52	0.73	0.61
OC	ALL	93	1.15	1.15	0.74	0.59	37.54	0.01	0.43	0.38	22.28	4.72	0.01	51.19	40.62	0.38	0.61	0.55
PM-2.5	WIN	19	2.29	3.89	0.54	70.16	73.65	1.6	1.68	1.86	116.66	52.39	0.7	118.51	54.41	0.74	2.1	0.29
PM-2.5	SPR	21	5.23	5.52	0.69	5.47	39.52	0.29	2.07	6.9	68.35	24.16	0.05	86.57	47.76	0.4	2.64	0.47
PM-2.5	SUM	27	9.94	6.81	0.73	-31.47	33.56	-3.13	3.34	8.28	-29.1	-38.1	-0.46	31.57	40.44	0.49	4.25	0.53
PM-2.5	FAL	22	4.26	5.28	0.93	23.77	29.59	1.01	1.26	1.83	74.54	32.76	0.24	79.84	38.8	0.3	1.69	0.86
PM-2.5	ALL	89	5.79	5.5	0.76	-4.99	37.48	-0.29	2.17	8.7	50.63	13.42	-0.05	75.04	44.74	0.39	2.96	0.58
SO4	WIN	19	0.71	1.09	0.25	53.79	59.65	0.38	0.42	0.19	127.9	45.06	0.54	131.27	48.65	0.6	0.58	0.06
SO4	SPR	21	1.5	1.89	0.45	25.32	55.22	0.38	0.83	0.87	91.38	35.56	0.25	106.92	55.3	0.55	1.01	0.20
SO4	SUM	27	3.04	2.45	0.64	-19.51	28.83	-0.59	0.88	0.96	-15.94	-23.22	-0.24	28.02	33.72	0.36	1.15	0.41
SO4	FAL	23	1.35	1.87	0.81	38.74	47.82	0.52	0.64	0.55	182.16	45.05	0.39	185.25	48.43	0.48	0.91	0.66
SO4	ALL	90	1.76	1.88	0.72	7.09	40.44	0.12	0.71	0.9	90.09	22.36	0.07	108.41	45.66	0.4	0.96	0.52

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SIPS1																		
EC	WIN	23	0.33	0.6	0.57	79.65	79.65	0.27	0.27	0.15	84.13	47.1	0.8	84.13	47.1	0.8	0.47	0.32
EC	SPR	26	0.4	0.42	0.23	2.95	61.81	0.01	0.25	0.19	13.37	-8.42	0.03	55.3	46.98	0.62	0.44	0.05
EC	SUM	27	0.37	0.26	0.61	-30.55	37.32	-0.11	0.14	0.02	-23.23	-32.41	-0.44	33.98	41.07	0.54	0.18	0.37
EC	FAL	19	0.37	0.5	0.58	34.35	53.44	0.13	0.2	0.09	32.84	17.57	0.34	48.87	35.8	0.53	0.32	0.34
EC	ALL	95	0.37	0.43	0.33	16.3	57.01	0.06	0.21	0.13	23.99	3.4	0.16	54.94	43.09	0.57	0.37	0.11
NO3	WIN	23	0.88	1.16	0.22	31.62	66.41	0.28	0.59	0.45	95.05	33.41	0.32	115.73	60.11	0.66	0.72	0.05
NO3	SPR	26	0.48	0.87	0.35	82.48	144.89	0.39	0.69	2.19	57.5	-18.39	0.82	121.19	79.23	1.45	1.53	0.12
NO3	SUM	27	0.16	0.09	0.03	-41.85	55.04	-0.07	0.09	0.01	-28.66	-55.66	-0.72	52.28	71.53	0.95	0.12	0.00
NO3	FAL	19	0.25	0.55	0.34	123.9	165.95	0.31	0.41	0.5	186.08	26.5	1.24	222.3	78.96	1.66	0.77	0.12
NO3	ALL	95	0.44	0.66	0.42	49.45	99.7	0.22	0.44	0.84	67.82	-7.46	0.49	120.5	72.36	1	0.94	0.17
OC	WIN	23	1.55	2.42	0.63	56.38	58.72	0.87	0.91	3	62.8	31.55	0.56	66.52	35.55	0.59	1.94	0.39
OC	SPR	26	2.24	2.1	0.2	-6.49	59.02	-0.15	1.32	7.14	16.78	-1.95	-0.07	50.31	43.78	0.63	2.68	0.04
OC	SUM	27	2.4	3.17	0.67	32.01	40.58	0.77	0.98	1.5	29.85	17.56	0.32	41.62	33.54	0.41	1.45	0.45
OC	FAL	19	1.85	2.84	0.85	53.24	63.69	0.99	1.18	2.14	40.49	25.34	0.53	54.22	42.12	0.64	1.76	0.73
OC	ALL	95	2.04	2.63	0.43	28.77	53.64	0.59	1.1	3.74	36.38	17.16	0.29	52.54	38.55	0.54	2.02	0.18
PM-2.5	WIN	23	6.44	9.91	0.58	54.02	57.08	3.48	3.67	20.68	60.94	36.48	0.54	64.41	40.37	0.57	5.72	0.34
PM-2.5	SPR	26	10.32	9.73	0.16	-5.7	47.84	-0.59	4.94	53.48	5.5	-10.18	-0.06	46.2	42.77	0.51	7.34	0.03
PM-2.5	SUM	27	11.98	10.48	0.77	-12.49	22.58	-1.5	2.71	9.43	-12.73	-18.21	-0.14	23.87	27.63	0.26	3.42	0.59
PM-2.5	FAL	19	7.95	10.57	0.79	32.98	39.89	2.62	3.17	13.88	32.06	22.08	0.33	40.71	31.97	0.4	4.56	0.62
PM-2.5	ALL	95	9.38	10.16	0.45	8.31	38.85	0.78	3.64	29.52	19.05	5.28	0.08	43.16	35.73	0.39	5.49	0.20
SO4	WIN	23	1.7	1.55	0.66	-9.04	28.86	-0.15	0.49	0.34	1.22	-6.85	-0.1	33.55	33.26	0.32	0.6	0.44
SO4	SPR	26	3.11	2.4	0.55	-22.62	39.18	-0.7	1.22	2.14	-11.92	-21.43	-0.29	36.21	41.09	0.51	1.62	0.31
SO4	SUM	27	3.61	2.41	0.8	-33.11	36.67	-1.2	1.32	1.05	-31.53	-44.05	-0.49	37.56	49.06	0.55	1.57	0.64
SO4	FAL	19	2.11	2.05	0.81	-2.94	22.71	-0.06	0.48	0.5	6.04	1.25	-0.03	24.94	24.58	0.23	0.71	0.66
SO4	ALL	95	2.71	2.13	0.73	-21.46	34.1	-0.58	0.92	1.28	-10.72	-19.79	-0.27	33.7	38.16	0.43	1.27	0.53

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: STIL1																		
EC	WIN	29	0.41	0.59	0.48	45.13	68.28	0.18	0.28	0.2	42.01	15.25	0.45	64.5	42.68	0.68	0.49	0.23
EC	SPR	28	0.38	0.6	0.72	56.85	77.99	0.22	0.3	0.26	40.86	13.89	0.57	64.67	42.02	0.78	0.56	0.52
EC	SUM	26	0.31	0.3	0.21	-0.95	36.88	0	0.11	0.02	8.95	-2.33	-0.01	38.34	34.75	0.37	0.16	0.04
EC	FAL	27	0.33	0.36	0.51	7.74	33.82	0.03	0.11	0.02	11.35	4.98	0.08	31.71	29.63	0.34	0.14	0.26
EC	ALL	110	0.36	0.47	0.59	30.55	56.77	0.11	0.2	0.14	26.37	8.23	0.31	50.31	37.43	0.57	0.39	0.34
NO3	WIN	29	2.45	2.32	0.76	-5.42	37.92	-0.13	0.93	1.57	33.59	1.34	-0.06	67.46	46.78	0.4	1.26	0.58
NO3	SPR	29	0.88	0.95	0.71	8.27	71.94	0.07	0.63	0.72	14.17	-23.24	0.08	81.51	79.52	0.72	0.85	0.50
NO3	SUM	26	0.2	0.06	0.13	-71.67	71.67	-0.15	0.15	0.01	-67.51	-106.19	-2.53	67.51	106.19	2.53	0.18	0.02
NO3	FAL	29	0.66	0.68	0.88	3.19	54.45	0.02	0.36	0.31	7.31	-23.27	0.03	67.53	64.74	0.54	0.56	0.78
NO3	ALL	113	1.07	1.03	0.84	-4.1	49.17	-0.04	0.53	0.68	-1.4	-36.02	-0.04	71.1	73.46	0.51	0.83	0.70
OC	WIN	29	2.01	2.21	0.25	9.87	72.29	0.2	1.45	5.09	22.26	-13.35	0.1	76.72	59.32	0.72	2.27	0.06
OC	SPR	28	2.46	2.63	0.64	6.95	53.72	0.17	1.32	4.69	-0.94	-18.83	0.07	51.19	47.09	0.54	2.17	0.41
OC	SUM	26	2.3	2.84	0.56	23.24	38.47	0.54	0.89	1.1	27.69	15.64	0.23	43.11	33.53	0.38	1.18	0.32
OC	FAL	27	1.51	1.53	0.5	1.4	38.75	0.02	0.58	0.88	8.01	-6.94	0.01	40.91	34.1	0.39	0.94	0.25
OC	ALL	110	2.07	2.3	0.53	10.99	51.78	0.23	1.07	3.04	14.14	-6.32	0.11	53.49	43.92	0.52	1.76	0.28
PM-2.5	WIN	29	9.33	10.92	0.45	17.13	44.69	1.6	4.17	38.1	31.8	8.64	0.17	54.02	36.91	0.45	6.38	0.20
PM-2.5	SPR	29	10.19	10.61	0.55	4.17	41.54	0.42	4.23	35.46	10.65	-2.51	0.04	44.53	38.51	0.42	5.97	0.30
PM-2.5	SUM	26	11.08	8.59	0.71	-22.47	25.5	-2.49	2.83	6.28	-21.48	-27.49	-0.29	25.03	30.81	0.33	3.53	0.50
PM-2.5	FAL	30	6.66	7.07	0.61	6.22	27	0.41	1.8	8.34	12.26	4.71	0.06	28.74	24.71	0.27	2.92	0.37
PM-2.5	ALL	114	9.24	9.3	0.54	0.6	35.21	0.06	3.25	24.49	9.13	-3.47	0.01	38.34	32.72	0.35	4.95	0.29
SO4	WIN	29	1.8	1.41	0.72	-21.73	33.76	-0.39	0.61	0.82	-10.7	-20.04	-0.28	29.7	34.44	0.43	0.99	0.52
SO4	SPR	29	2.61	2.21	0.85	-15.14	25.03	-0.4	0.65	0.63	-5.76	-11.01	-0.18	25.58	27.72	0.29	0.89	0.73
SO4	SUM	26	2.65	1.44	0.67	-45.52	45.94	-1.2	1.22	0.59	-42.82	-59.43	-0.84	43.59	60.18	0.84	1.43	0.44
SO4	FAL	29	1.46	1.42	0.56	-2.41	32.37	-0.04	0.47	0.7	15.68	-0.55	-0.02	41.05	30.64	0.33	0.84	0.31
SO4	ALL	113	2.11	1.63	0.71	-23.07	34.26	-0.49	0.72	0.86	-10.05	-21.78	-0.3	34.75	37.66	0.45	1.05	0.50

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: SWAN1																		
EC	WIN	27	0.2	0.26	0.84	29.72	37.87	0.06	0.08	0.01	54.4	29.87	0.3	62.6	39.03	0.38	0.1	0.71
EC	SPR	29	0.18	0.19	0.81	6.85	45.18	0.01	0.08	0.01	16.46	-0.52	0.07	51.57	47.31	0.45	0.12	0.66
EC	SUM	27	0.37	0.13	0.79	-65.32	66.08	-0.24	0.24	0.19	-20.37	-60.28	-1.88	73.42	78.25	1.91	0.49	0.62
EC	FAL	27	0.13	0.12	0.9	-9.99	30.23	-0.01	0.04	0	40.39	6.02	-0.11	70.57	42.72	0.34	0.05	0.82
EC	ALL	110	0.22	0.18	0.44	-20.17	49.88	-0.04	0.11	0.06	22.6	-6.12	-0.25	64.3	51.75	0.62	0.26	0.20
NO3	WIN	27	0.55	0.6	0.42	7.77	72.77	0.04	0.4	0.29	47.34	-7.16	0.08	102.02	73.88	0.73	0.54	0.18
NO3	SPR	29	0.39	0.52	0.3	34.39	96.15	0.13	0.37	0.36	39.52	-25.87	0.34	106.21	84.57	0.96	0.62	0.09
NO3	SUM	27	0.3	0.13	0.18	-56.59	76.72	-0.17	0.23	0.05	-49.96	-101.4	-1.3	76.68	118.37	1.77	0.28	0.03
NO3	FAL	27	0.18	0.23	0.05	26.55	89.01	0.05	0.16	0.06	56.59	-6.21	0.27	112	78.07	0.89	0.24	0.00
NO3	ALL	110	0.36	0.37	0.41	4.64	82.35	0.02	0.29	0.21	23.67	-34.99	0.05	99.35	88.65	0.82	0.45	0.17
OC	WIN	27	0.96	0.94	0.76	-2.18	33.58	-0.02	0.32	0.21	4.68	-3.03	-0.02	33.4	31.88	0.34	0.46	0.58
OC	SPR	29	1.25	0.91	0.6	-27.47	43.09	-0.34	0.54	1.27	-16.73	-30.69	-0.38	41.37	49.58	0.59	1.18	0.36
OC	SUM	27	5	1.16	0.4	-76.8	77.5	-3.84	3.87	39.19	-52.58	-86.51	-3.31	57.19	90.26	3.34	7.34	0.16
OC	FAL	27	0.81	0.6	0.82	-25.69	40.83	-0.21	0.33	0.15	-31.6	-49.55	-0.35	44.01	59.64	0.55	0.44	0.67
OC	ALL	110	1.99	0.9	0.37	-54.69	62.94	-1.09	1.25	12.52	-23.92	-42.23	-1.21	43.94	57.69	1.39	3.7	0.14
PM-2.5	WIN	27	4.66	5.06	0.76	8.47	26.73	0.39	1.25	2.67	17.52	8.71	0.08	32.93	26.36	0.27	1.68	0.58
PM-2.5	SPR	29	7.3	5.8	0.67	-20.54	31.61	-1.5	2.31	8.46	-18.22	-27.35	-0.26	29.73	36.77	0.4	3.27	0.44
PM-2.5	SUM	26	13.58	5.2	0.48	-61.72	61.72	-8.38	8.38	46.07	-55.98	-83.7	-1.61	55.99	83.72	1.61	10.78	0.23
PM-2.5	FAL	27	4.43	3.7	0.79	-16.6	33.64	-0.74	1.49	3.3	-11.41	-23.62	-0.2	37.09	43.65	0.4	1.96	0.63
PM-2.5	ALL	109	7.43	4.95	0.48	-33.39	44.27	-2.48	3.29	26.08	-16.69	-30.94	-0.5	38.61	47.1	0.66	5.68	0.23
SO4	WIN	27	1.42	1.23	0.72	-13.96	27.55	-0.2	0.39	0.24	-0.57	-9.39	-0.16	31.98	30.44	0.32	0.53	0.51
SO4	SPR	29	2.25	1.9	0.78	-15.51	25.32	-0.35	0.57	0.51	-15.46	-22.19	-0.18	24.43	30.08	0.3	0.79	0.62
SO4	SUM	27	2.98	1.85	0.65	-37.8	41.28	-1.12	1.23	1.04	-35.32	-55	-0.61	44.44	62.26	0.66	1.52	0.43
SO4	FAL	27	1.28	1.19	0.81	-7.09	32.92	-0.09	0.42	0.35	-8.48	-25.11	-0.08	39.34	47.63	0.35	0.6	0.65
SO4	ALL	110	1.99	1.55	0.73	-22.1	32.78	-0.44	0.65	0.7	-14.97	-27.82	-0.28	34.86	42.37	0.42	0.94	0.54

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: TALL1																		
EC	WIN	28	0.22	0.34	0.56	57.92	63.75	0.13	0.14	0.02	72.22	43.39	0.58	75.81	47.34	0.64	0.19	0.32
EC	SPR	28	0.4	0.59	0.79	47.73	74.39	0.19	0.3	0.45	35.93	14.71	0.48	59.78	44.85	0.74	0.7	0.62
EC	SUM	31	0.22	0.26	0.52	14.85	30	0.03	0.07	0.01	22.46	14.94	0.15	33.34	27.2	0.3	0.09	0.27
EC	FAL	30	0.21	0.27	0.43	32.3	44.04	0.07	0.09	0.01	42.82	26.87	0.32	48.54	33.98	0.44	0.14	0.19
EC	ALL	117	0.26	0.36	0.77	39.15	55.98	0.1	0.15	0.12	42.81	24.75	0.39	53.73	37.98	0.56	0.36	0.60
NO3	WIN	28	2.83	2.15	0.78	-24.04	37.06	-0.68	1.05	1.5	-13.29	-26.03	-0.32	40.78	44.85	0.49	1.4	0.60
NO3	SPR	28	1.83	1.66	0.95	-9.48	30.61	-0.17	0.56	0.51	-19.71	-37.92	-0.1	45.56	58.35	0.34	0.74	0.90
NO3	SUM	31	0.28	0.08	0.62	-70.13	70.13	-0.19	0.19	0.02	-65.02	-104.3	-2.35	65.02	104.3	2.35	0.24	0.38
NO3	FAL	29	0.49	0.58	0.8	18.69	58.19	0.09	0.28	0.19	33.36	-8.58	0.19	85.52	65.62	0.58	0.45	0.64
NO3	ALL	116	1.32	1.09	0.9	-17.82	38.71	-0.24	0.51	0.61	-17	-45.45	-0.22	59.6	69.19	0.47	0.82	0.81
OC	WIN	28	0.89	1.06	0.65	19.58	41.33	0.17	0.37	0.26	23.68	11.14	0.2	43	34.96	0.41	0.54	0.42
OC	SPR	28	2.15	2.27	0.75	5.55	67.56	0.12	1.45	8.86	-14.08	-36.7	0.06	56.06	62.72	0.68	2.98	0.56
OC	SUM	31	1.59	1.37	0.76	-13.94	30.43	-0.22	0.48	0.31	-15.05	-24.17	-0.16	32.16	38.29	0.35	0.6	0.58
OC	FAL	30	0.97	0.81	0.65	-16.51	34.74	-0.16	0.34	0.26	-11.53	-21.39	-0.2	33.58	34.13	0.42	0.53	0.43
OC	ALL	117	1.4	1.37	0.74	-2.13	46.53	-0.03	0.65	2.36	-4.65	-18	-0.02	40.84	42.27	0.48	1.54	0.55
PM-2.5	WIN	28	7.28	7.48	0.75	2.75	32.45	0.2	2.36	7.68	17.9	8.45	0.03	40.31	34.97	0.32	2.78	0.56
PM-2.5	SPR	28	10.34	9.99	0.75	-3.3	41.81	-0.34	4.32	52.35	-3.85	-16.31	-0.03	40.3	41.07	0.43	7.24	0.56
PM-2.5	SUM	31	8.42	5.71	0.71	-32.2	33.95	-2.71	2.86	4.48	-30.57	-40.66	-0.48	32.89	42.84	0.5	3.44	0.51
PM-2.5	FAL	30	4.83	5.25	0.67	8.71	32.23	0.42	1.56	4.62	19.6	11.13	0.09	35.78	29.54	0.32	2.19	0.44
PM-2.5	ALL	117	7.69	7.04	0.73	-8.38	35.86	-0.64	2.76	18.36	0.29	-9.8	-0.09	37.18	37.12	0.39	4.33	0.53
SO4	WIN	28	1.33	0.93	0.7	-29.69	42.8	-0.39	0.57	0.45	-20.22	-32.63	-0.42	38.29	47.73	0.61	0.78	0.49
SO4	SPR	28	2.17	1.42	0.79	-34.49	40.22	-0.75	0.87	1.25	-23.87	-33.24	-0.53	32.76	40.95	0.61	1.34	0.62
SO4	SUM	31	2.09	1.26	0.73	-39.89	41.92	-0.83	0.88	0.36	-36.43	-51.33	-0.66	42.6	56.15	0.7	1.03	0.53
SO4	FAL	29	1.01	0.96	0.81	-5.31	29.67	-0.05	0.3	0.18	10.63	2.61	-0.06	33.32	31.62	0.31	0.42	0.65
SO4	ALL	116	1.66	1.15	0.74	-30.92	39.68	-0.51	0.66	0.65	-17.72	-28.96	-0.45	36.87	44.32	0.57	0.95	0.54

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: THBA1																		
EC	WIN	15	0.12	0.08	0.5	-27.35	42.27	-0.03	0.05	0	14.24	-12.77	-0.38	60	46.92	0.58	0.07	0.25
EC	SPR	25	0.06	0.05	0.77	-15.37	34.72	-0.01	0.02	0	-3.41	-15.72	-0.18	41.01	43.01	0.41	0.03	0.59
EC	SUM	27	0.13	0.35	0.68	165.24	197.58	0.22	0.26	0.56	94.61	15.85	1.65	124.78	54.56	1.98	0.78	0.46
EC	FAL	24	0.16	0.19	0.39	13.77	53.48	0.02	0.09	0.02	26.69	3.89	0.14	56.13	43.09	0.53	0.14	0.15
EC	ALL	91	0.12	0.18	0.43	52.93	96.5	0.06	0.11	0.18	36.52	-0.69	0.53	72.98	47.1	0.97	0.43	0.19
NO3	WIN	15	0.21	0.29	0.61	41.11	90.4	0.09	0.19	0.06	115.38	56.92	0.41	127.48	72.66	0.9	0.26	0.37
NO3	SPR	25	0.28	0.38	0.78	34.98	74.12	0.1	0.21	0.12	89.16	10.35	0.35	127.6	65.71	0.74	0.36	0.61
NO3	SUM	27	0.07	0.06	0.46	-18.37	59.96	-0.01	0.04	0.01	-25.24	-46.35	-0.23	49.77	56.41	0.73	0.08	0.21
NO3	FAL	24	0.11	0.14	0.69	25.09	70.78	0.03	0.08	0.02	59.62	-21.33	0.25	122.55	69.02	0.71	0.14	0.47
NO3	ALL	91	0.16	0.2	0.76	27.55	75.14	0.04	0.12	0.05	51.75	-7.15	0.28	103.15	64.97	0.75	0.23	0.57
OC	WIN	15	0.31	0.21	0.33	-32.95	36.08	-0.1	0.11	0.01	-30.3	-39.55	-0.49	33.68	42.55	0.54	0.14	0.11
OC	SPR	25	0.35	0.15	0.33	-56.75	59.06	-0.2	0.21	0.04	-48.54	-73.68	-1.31	51.89	76.6	1.37	0.28	0.11
OC	SUM	27	1.1	1.76	0.65	60.45	126.23	0.66	1.38	13.36	18.61	-33.11	0.6	93.37	70.64	1.26	3.72	0.42
OC	FAL	24	0.86	0.79	0.49	-8.64	57.29	-0.07	0.49	0.51	25.67	-18.43	-0.09	82.22	60.48	0.63	0.72	0.24
OC	ALL	91	0.7	0.81	0.46	15.06	87.99	0.11	0.62	4.24	-6.04	-41.45	0.15	69.19	64.97	0.88	2.06	0.22
PM-2.5	WIN	15	1.77	2.09	0.61	18.05	33.39	0.32	0.59	0.44	31.03	20.62	0.18	41.39	32.7	0.33	0.73	0.37
PM-2.5	SPR	25	2.25	2.15	0.74	-4.33	35.05	-0.1	0.79	1.02	-2.44	-13.66	-0.05	38.03	41.79	0.37	1.01	0.55
PM-2.5	SUM	27	4.62	5.17	0.38	11.78	79.81	0.54	3.69	69.17	0.44	-32.67	0.12	70.44	59.41	0.8	8.33	0.14
PM-2.5	FAL	24	4.07	3.6	0.49	-11.56	42.97	-0.47	1.75	4.18	7.48	-14.48	-0.13	57.19	50.6	0.49	2.1	0.24
PM-2.5	ALL	91	3.35	3.42	0.38	1.89	55.75	0.06	1.87	22.14	6.55	-13.86	0.02	53.25	47.84	0.56	4.71	0.14
SO4	WIN	15	0.4	0.39	0.67	-1.29	48.5	-0.01	0.19	0.13	44.23	25.09	-0.01	58.7	44.82	0.49	0.36	0.45
SO4	SPR	25	0.62	0.59	0.61	-5.12	40.23	-0.03	0.25	0.12	5.62	-10.12	-0.05	46.22	43.51	0.42	0.35	0.37
SO4	SUM	27	0.58	0.49	0.46	-14.6	27.3	-0.08	0.16	0.03	-11.25	-16.06	-0.17	25.11	27.82	0.32	0.2	0.22
SO4	FAL	24	0.45	0.51	0.59	13.11	29.75	0.06	0.14	0.03	23.32	13.09	0.13	38.34	29.75	0.3	0.18	0.35
SO4	ALL	91	0.53	0.51	0.56	-3.6	34.67	-0.02	0.18	0.08	11.64	0.04	-0.04	39.94	35.44	0.36	0.28	0.32

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: THRO1																		
EC	WIN	29	0.09	0.12	0.75	30.01	43.24	0.03	0.04	0	51.21	29.75	0.3	61.02	41.48	0.43	0.05	0.56
EC	SPR	30	0.1	0.11	0.54	9.91	41.59	0.01	0.04	0	42.08	17.75	0.1	62.52	43.26	0.42	0.05	0.29
EC	SUM	31	0.18	0.21	0.2	15.29	50.98	0.03	0.09	0.05	15.79	-4.76	0.15	46.06	32.74	0.51	0.22	0.04
EC	FAL	28	0.19	0.21	0.39	11.76	48.21	0.02	0.09	0.03	20.22	5.12	0.12	44.88	37.18	0.48	0.17	0.15
EC	ALL	118	0.14	0.16	0.41	15.53	47.11	0.02	0.07	0.02	32.23	11.79	0.16	53.64	38.62	0.47	0.14	0.17
NO3	WIN	28	0.47	1.44	0.79	208.16	212.95	0.97	0.99	2.12	216.99	82.93	2.08	224.1	94.42	2.13	1.75	0.62
NO3	SPR	30	0.7	0.94	0.63	34.95	79.45	0.24	0.55	0.63	102.16	26.38	0.35	135.27	74.82	0.79	0.83	0.40
NO3	SUM	31	0.21	0.1	0.74	-53.71	60.51	-0.12	0.13	0.02	-38.82	-69.48	-1.16	62.98	85.41	1.31	0.19	0.55
NO3	FAL	30	0.16	0.51	0.83	213.18	223.87	0.34	0.36	0.18	240.87	61.67	2.13	268.46	99.75	2.24	0.55	0.69
NO3	ALL	119	0.38	0.73	0.64	90.73	130.42	0.35	0.5	0.86	127.42	23.61	0.91	170.92	88.47	1.3	0.99	0.41
OC	WIN	29	0.34	0.26	0.58	-22.66	39.01	-0.08	0.13	0.03	-6.27	-24.11	-0.29	45.47	42.37	0.5	0.18	0.34
OC	SPR	30	0.36	0.25	0.5	-30.35	41.23	-0.11	0.15	0.03	-16.98	-30.47	-0.44	40.55	47.5	0.59	0.2	0.25
OC	SUM	31	1.03	0.78	0.3	-24.43	70.5	-0.25	0.73	1.15	-26.57	-55.6	-0.32	64.02	75.74	0.93	1.1	0.09
OC	FAL	28	0.77	0.74	0.31	-4.35	61.08	-0.03	0.47	0.68	8.64	-19.4	-0.05	62.02	55.27	0.64	0.83	0.09
OC	ALL	118	0.63	0.51	0.42	-19.18	59.37	-0.12	0.37	0.49	-10.79	-32.88	-0.24	53.02	55.5	0.73	0.71	0.18
PM-2.5	WIN	29	2.35	3.4	0.85	44.39	54.19	1.04	1.28	2.84	44.68	26.7	0.44	55.14	38.76	0.54	1.98	0.72
PM-2.5	SPR	30	3.77	3.31	0.57	-12.31	34.81	-0.46	1.31	4.2	5.47	-6.66	-0.14	39.6	38.76	0.4	2.1	0.33
PM-2.5	SUM	31	4.64	3.2	0.54	-30.95	46.87	-1.44	2.17	4.94	-32.83	-48.46	-0.45	45.65	57.18	0.68	2.65	0.29
PM-2.5	FAL	30	3.83	3.75	0.78	-2.17	34.39	-0.08	1.32	2.64	4.94	-5.08	-0.02	39.16	38.43	0.35	1.63	0.61
PM-2.5	ALL	120	3.67	3.41	0.59	-6.96	41.64	-0.26	1.53	4.46	4.92	-9	-0.07	44.81	43.44	0.45	2.13	0.35
SO4	WIN	28	0.62	0.46	0.54	-25.98	46.66	-0.16	0.29	0.15	13.87	-6.97	-0.35	54.6	48.08	0.63	0.42	0.29
SO4	SPR	30	1.08	0.82	0.36	-23.84	47.57	-0.26	0.51	0.69	6.7	-8.04	-0.31	46.05	46.98	0.62	0.87	0.13
SO4	SUM	31	0.8	0.67	0.82	-16.33	33.02	-0.13	0.26	0.15	-5.11	-15	-0.2	36.08	36.6	0.39	0.41	0.68
SO4	FAL	30	0.54	0.63	0.76	17.04	38.7	0.09	0.21	0.06	36.97	24.28	0.17	48.04	37.04	0.39	0.27	0.58
SO4	ALL	119	0.76	0.65	0.59	-14.92	41.84	-0.11	0.32	0.28	12.94	-1.45	-0.18	45.97	42.03	0.49	0.54	0.35

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: ULBE1																		
EC	WIN	27	0.05	0.06	0.83	1.75	42.47	0	0.02	0	819.83	23.9	0.02	841.44	50.38	0.42	0.03	0.69
EC	SPR	31	0.05	0.05	0.41	-0.88	49.03	0	0.02	0	31.29	0.03	-0.01	66.93	55.46	0.49	0.03	0.17
EC	SUM	26	0.09	0.1	0.28	15.2	75.26	0.01	0.07	0.02	49.1	1.07	0.15	87.56	53.56	0.75	0.13	0.08
EC	FAL	28	0.11	0.13	0.63	11.24	51.54	0.01	0.06	0.01	79.82	25.09	0.11	101.35	52.89	0.52	0.08	0.39
EC	ALL	112	0.08	0.08	0.5	8.43	55.92	0.01	0.04	0.01	237.65	12.29	0.08	267.04	53.15	0.56	0.08	0.25
NO3	WIN	29	0.31	0.95	0.64	209	219.21	0.64	0.67	1.7	275.98	58.92	2.09	292.5	79.71	2.19	1.45	0.41
NO3	SPR	31	0.27	0.6	0.75	120.16	133.05	0.33	0.36	0.55	144.13	10.42	1.2	187.65	77.23	1.33	0.81	0.56
NO3	SUM	26	0.03	0.01	0.26	-58.66	58.66	-0.02	0.02	0	-55.39	-81.59	-1.42	55.39	81.59	1.42	0.02	0.07
NO3	FAL	28	0.14	0.21	0.99	55.7	79.19	0.08	0.11	0.07	22.9	-22.35	0.56	89.77	77.67	0.79	0.27	0.98
NO3	ALL	114	0.19	0.46	0.73	137.57	155.49	0.27	0.3	0.66	102.39	-6.27	1.38	160.12	78.96	1.55	0.86	0.53
OC	WIN	29	0.29	0.19	0.49	-32.62	52.78	-0.09	0.15	0.05	11.05	-11.85	-0.48	59.12	53.61	0.78	0.24	0.24
OC	SPR	31	0.29	0.17	0.28	-40.16	51.13	-0.12	0.15	0.03	-27.72	-46.81	-0.67	43.5	59.57	0.85	0.21	0.08
OC	SUM	26	0.86	0.55	0.48	-36.44	61.35	-0.31	0.53	0.46	-38.63	-64.85	-0.57	56.86	73.98	0.97	0.75	0.23
OC	FAL	28	0.72	0.61	0.53	-14.66	42.03	-0.11	0.3	0.24	18.09	-6.54	-0.17	60.37	51.1	0.49	0.51	0.28
OC	ALL	114	0.52	0.37	0.57	-29.14	52.13	-0.15	0.27	0.19	-9.09	-32.14	-0.41	54.66	59.26	0.74	0.46	0.32
PM-2.5	WIN	29	2	2.35	0.74	17.1	49.11	0.34	0.98	2.21	28.56	13.07	0.17	50.7	40.67	0.49	1.53	0.54
PM-2.5	SPR	31	2.51	2.35	0.8	-6.06	33.37	-0.15	0.84	1.39	-11.05	-24.05	-0.06	35.5	43.49	0.36	1.19	0.64
PM-2.5	SUM	26	3.07	1.94	0.52	-36.72	48.41	-1.13	1.48	2.28	-35.2	-51.12	-0.58	44.64	57.1	0.76	1.88	0.27
PM-2.5	FAL	28	3.2	2.56	0.7	-20.14	34.72	-0.65	1.11	2.38	-4.12	-14.92	-0.25	37.06	38.08	0.43	1.67	0.49
PM-2.5	ALL	114	2.68	2.31	0.65	-13.8	40.69	-0.37	1.09	2.34	-4.78	-18.54	-0.16	41.84	44.55	0.47	1.57	0.42
SO4	WIN	29	0.57	0.44	0.44	-22.48	61.72	-0.13	0.35	0.29	64.75	15.94	-0.29	100.17	66.29	0.8	0.56	0.19
SO4	SPR	31	0.75	0.66	0.63	-11.44	39.9	-0.09	0.3	0.22	-1.81	-15.13	-0.13	39.85	44.1	0.45	0.47	0.40
SO4	SUM	26	0.42	0.37	0.55	-11.43	28.37	-0.05	0.12	0.02	-4	-12.23	-0.13	31.48	32.66	0.32	0.16	0.30
SO4	FAL	28	0.43	0.51	0.41	20.6	54.19	0.09	0.23	0.13	47.38	24.51	0.21	61.02	41.16	0.54	0.37	0.17
SO4	ALL	114	0.55	0.5	0.53	-8.23	46.34	-0.05	0.25	0.18	26.7	3.17	-0.09	58.48	46.41	0.5	0.42	0.28

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: UPBU1																		
EC	WIN	28	0.25	0.37	0.72	45.94	57.63	0.12	0.14	0.02	60.07	30.93	0.46	72.73	46.11	0.58	0.19	0.51
EC	SPR	30	0.28	0.32	0.39	14.21	64.91	0.04	0.18	0.12	14.99	-14.74	0.14	63.03	47.62	0.65	0.34	0.16
EC	SUM	28	0.28	0.21	0.32	-24.59	45.2	-0.07	0.13	0.03	-13.77	-30.39	-0.33	43.27	44.56	0.6	0.19	0.11
EC	FAL	29	0.23	0.28	0.63	19.94	42.42	0.05	0.1	0.02	32.88	12.63	0.2	51.14	35.42	0.42	0.15	0.40
EC	ALL	115	0.26	0.29	0.44	12.9	53.08	0.03	0.14	0.05	23.48	-0.53	0.13	57.58	43.43	0.53	0.23	0.19
NO3	WIN	28	1.69	1.53	0.62	-9.36	52.23	-0.16	0.88	1.17	100.03	-4.09	-0.1	149.96	64.98	0.58	1.09	0.38
NO3	SPR	25	0.62	0.36	0.5	-41.87	68.13	-0.26	0.42	0.28	-23.42	-64.16	-0.72	77.75	94.89	1.17	0.59	0.25
NO3	SUM	28	0.23	0.04	0.18	-82.18	82.18	-0.19	0.19	0.02	-78.22	-133.45	-4.61	78.22	133.45	4.61	0.23	0.03
NO3	FAL	29	0.41	0.41	0.59	0.66	73.38	0	0.3	0.23	-14.01	-59.78	0.01	82.25	91.46	0.73	0.48	0.35
NO3	ALL	110	0.74	0.59	0.74	-19.92	60.77	-0.15	0.45	0.44	-3.46	-65.35	-0.25	97.44	96.19	0.76	0.68	0.55
OC	WIN	28	1.15	1.45	0.61	25.48	52.32	0.29	0.6	0.59	61.8	16.7	0.25	87.58	47.41	0.52	0.82	0.37
OC	SPR	30	1.62	1.53	0.43	-5.73	55.43	-0.09	0.9	2.34	6.01	-24.38	-0.06	59.99	47.69	0.59	1.53	0.19
OC	SUM	28	2.35	2.53	0.66	7.7	38.13	0.18	0.9	1.19	15.84	2.55	0.08	45.53	39.4	0.38	1.11	0.44
OC	FAL	29	1.15	1.33	0.82	16.06	40.34	0.18	0.46	0.41	18.9	3.98	0.16	46.52	38.6	0.4	0.67	0.67
OC	ALL	115	1.56	1.7	0.64	8.81	45.75	0.14	0.72	1.17	25.24	-0.67	0.09	59.79	43.31	0.46	1.09	0.41
PM-2.5	WIN	28	6.28	7.64	0.74	21.64	35.88	1.36	2.25	6.91	41.91	18.34	0.22	56.87	36.91	0.36	2.96	0.55
PM-2.5	SPR	30	8.28	7.09	0.4	-14.41	42.89	-1.19	3.55	20.13	-6.25	-22.54	-0.17	44.82	45.4	0.5	4.64	0.16
PM-2.5	SUM	28	11.53	7.45	0.64	-35.39	38.65	-4.08	4.46	12.16	-32.36	-44.95	-0.55	37.68	49.37	0.6	5.37	0.41
PM-2.5	FAL	29	5.96	5.98	0.7	0.28	26.13	0.02	1.56	5.45	13.62	-1.44	0	38.46	28.15	0.26	2.33	0.50
PM-2.5	ALL	115	8	7.03	0.53	-12.12	36.91	-0.97	2.95	15.21	4.13	-12.72	-0.14	44.41	39.95	0.42	4.02	0.29
SO4	WIN	28	1.43	1.4	0.83	-1.76	31.46	-0.03	0.45	0.44	33.92	-4.33	-0.02	65.48	35.37	0.32	0.66	0.68
SO4	SPR	25	2.21	1.84	0.79	-16.86	30.1	-0.37	0.67	0.68	-8.27	-15.41	-0.2	29.53	33.53	0.36	0.9	0.62
SO4	SUM	28	2.76	1.42	0.62	-48.72	49.48	-1.35	1.37	0.68	-46.61	-65.5	-0.95	47.51	66.34	0.96	1.58	0.39
SO4	FAL	29	1.45	1.4	0.77	-3.67	30.78	-0.05	0.45	0.37	17.13	1.74	-0.04	42.91	32.36	0.32	0.61	0.59
SO4	ALL	110	1.95	1.5	0.68	-22.95	37.47	-0.45	0.73	0.83	-0.59	-20.82	-0.3	46.79	42.04	0.49	1.02	0.46

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: VILA1																		
EC	WIN	28	0.21	0.33	0.35	53.84	68.36	0.12	0.15	0.03	73.63	41.37	0.54	82.09	51.67	0.68	0.2	0.12
EC	SPR	28	0.26	0.29	0.69	10.22	34.88	0.03	0.09	0.02	17.34	5.93	0.1	40.31	35.36	0.35	0.13	0.48
EC	SUM	29	0.31	0.31	0.56	-0.3	33.14	0	0.1	0.02	17.68	7.12	0	39.11	33.23	0.33	0.14	0.31
EC	FAL	30	0.29	0.31	0.65	6.96	27.54	0.02	0.08	0.01	12.07	5.66	0.07	28.21	24.92	0.28	0.12	0.43
EC	ALL	115	0.27	0.31	0.51	14.66	38.75	0.04	0.11	0.02	29.75	14.79	0.15	47.02	36.07	0.39	0.15	0.26
NO3	WIN	28	3.23	2.7	0.7	-16.61	30.54	-0.54	0.99	1.53	-7.16	-16.74	-0.2	32.94	35.64	0.37	1.35	0.49
NO3	SPR	30	2.05	2.17	0.9	5.89	35.51	0.12	0.73	1.08	5.56	-12.81	0.06	50.22	50.68	0.36	1.05	0.80
NO3	SUM	25	0.34	0.29	0.61	-16.63	49.84	-0.06	0.17	0.06	-11.34	-29.27	-0.2	50.94	59.09	0.6	0.26	0.37
NO3	FAL	30	0.88	1.42	0.97	60.96	65.69	0.54	0.58	0.42	78.68	37.88	0.61	93.36	56.68	0.66	0.84	0.94
NO3	ALL	113	1.66	1.69	0.87	1.76	38.03	0.03	0.63	0.94	18.08	-3.97	0.02	57.55	50.4	0.38	0.97	0.76
OC	WIN	28	0.81	0.95	0.33	18.13	43.8	0.15	0.35	0.39	20.5	6.23	0.18	42.9	34.66	0.44	0.64	0.11
OC	SPR	28	1.19	0.9	0.63	-24.17	41.78	-0.29	0.5	0.39	-18.68	-31.72	-0.32	38.52	47.76	0.55	0.69	0.39
OC	SUM	29	1.42	1.35	0.86	-4.65	26.97	-0.07	0.38	0.2	-5.48	-12.63	-0.05	30.09	33.36	0.28	0.46	0.74
OC	FAL	30	1.07	0.9	0.86	-15.35	27.19	-0.16	0.29	0.1	-17.58	-24.91	-0.18	29.84	35.15	0.32	0.35	0.74
OC	ALL	115	1.12	1.03	0.7	-8.34	33.8	-0.09	0.38	0.29	-5.53	-15.89	-0.09	35.2	37.65	0.37	0.55	0.50
PM-2.5	WIN	28	8.45	7.81	0.59	-7.53	28.83	-0.64	2.44	9.37	-0.67	-7.31	-0.08	29.17	28.52	0.31	3.13	0.35
PM-2.5	SPR	31	8.37	8.15	0.79	-2.59	29.71	-0.22	2.49	12.03	0.1	-6.96	-0.03	30.71	30.74	0.31	3.48	0.63
PM-2.5	SUM	29	8.33	6.83	0.88	-17.99	24.78	-1.5	2.06	3.71	-13.25	-18.34	-0.22	26.69	29.58	0.3	2.44	0.77
PM-2.5	FAL	30	6.33	6.88	0.9	8.62	23.4	0.55	1.48	3.52	11.98	6.03	0.09	27.89	24.14	0.23	1.95	0.81
PM-2.5	ALL	118	7.86	7.42	0.79	-5.57	26.91	-0.44	2.12	7.74	-0.34	-6.54	-0.06	28.64	28.25	0.28	2.82	0.62
SO4	WIN	28	1.42	0.95	0.48	-33.18	48.1	-0.47	0.68	0.6	-24.82	-39.25	-0.5	40.64	51.41	0.72	0.91	0.23
SO4	SPR	30	1.89	1.63	0.74	-14.06	31.47	-0.27	0.6	0.84	-11.47	-18	-0.16	26.47	30.19	0.37	0.95	0.55
SO4	SUM	25	1.97	1.53	0.78	-22.56	31.74	-0.44	0.63	0.51	-5.26	-19.47	-0.29	40.21	39.39	0.41	0.84	0.61
SO4	FAL	30	1.2	1.06	0.84	-11.93	32.04	-0.14	0.39	0.42	17.19	6.45	-0.14	39.28	33.74	0.36	0.67	0.71
SO4	ALL	113	1.61	1.29	0.72	-20.12	35.29	-0.32	0.57	0.61	-5.79	-17.1	-0.25	36.42	38.42	0.44	0.85	0.52

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: VOYA2																		
EC	WIN	29	0.1	0.21	0.63	108	113	0.11	0.11	0.06	235.75	54.32	1.08	241.95	62.2	1.13	0.27	0.39
EC	SPR	31	0.09	0.09	0.62	8.34	47.73	0.01	0.04	0	17.65	-0.54	0.08	51.3	44.85	0.48	0.06	0.39
EC	SUM	23	0.13	0.11	0.63	-14.23	32.46	-0.02	0.04	0	12.48	-14.5	-0.17	52.62	38.83	0.38	0.06	0.40
EC	FAL	29	0.16	0.23	0.57	48.18	68.75	0.08	0.11	0.06	53.8	26.35	0.48	66.05	42.08	0.69	0.26	0.32
EC	ALL	112	0.12	0.16	0.55	39.57	66.31	0.05	0.08	0.04	82.42	17.76	0.4	104.76	47.39	0.66	0.2	0.31
NO3	WIN	19	0.84	1.34	0.94	60.42	61.32	0.51	0.51	0.2	263.15	50.89	0.6	271	61.83	0.61	0.68	0.89
NO3	SPR	5	0.86	0.51	0.96	-40.3	40.45	-0.35	0.35	0.21	-33.58	-54.05	-0.67	42.23	61.86	0.68	0.58	0.91
NO3	SUM	19	0.05	0.06	0.81	33.36	95.3	0.02	0.04	0.01	-18.46	-53.72	0.33	70.22	78.59	0.95	0.11	0.66
NO3	FAL	29	0.32	0.7	0.96	121.28	126.08	0.39	0.4	0.4	155.42	45.46	1.21	180.29	81.77	1.26	0.74	0.92
NO3	ALL	72	0.42	0.69	0.9	63.88	79.05	0.27	0.33	0.3	124.84	13.81	0.64	165.59	74.29	0.79	0.61	0.80
OC	WIN	29	0.49	0.98	0.54	98.7	100.23	0.49	0.5	1.27	126.44	48.35	0.99	128.41	50.59	1	1.23	0.29
OC	SPR	31	0.51	0.45	0.48	-11.33	41.36	-0.06	0.21	0.09	5.19	-8.65	-0.13	43.71	40.85	0.47	0.31	0.23
OC	SUM	23	1.22	0.81	0.44	-33.87	42.29	-0.41	0.52	0.56	-26.64	-37.74	-0.51	35.97	45.8	0.64	0.85	0.20
OC	FAL	29	0.91	1.04	0.22	13.89	61.93	0.13	0.56	1.68	42.38	10.58	0.14	66.56	44.81	0.62	1.3	0.05
OC	ALL	112	0.76	0.81	0.27	7.66	58.03	0.06	0.44	1	39.68	5.11	0.08	69.97	45.42	0.58	1	0.07
PM-2.5	WIN	29	3.39	5.32	0.77	56.87	61.97	1.93	2.1	12.43	64.21	33.42	0.57	71.64	42.26	0.62	4.02	0.59
PM-2.5	SPR	31	3.27	3.24	0.75	-0.67	31.87	-0.02	1.04	2.25	6	-2.93	-0.01	33.55	31.73	0.32	1.5	0.57
PM-2.5	SUM	23	4.47	3.2	0.76	-28.36	28.51	-1.27	1.27	2.17	-26.53	-33.42	-0.4	26.6	33.49	0.4	1.94	0.57
PM-2.5	FAL	30	3.77	4.73	0.65	25.44	53.23	0.96	2.01	12.89	58.07	25.6	0.25	75.62	49.39	0.53	3.72	0.42
PM-2.5	ALL	113	3.68	4.16	0.66	13.2	43.97	0.49	1.62	8.96	28.14	7.77	0.13	53.08	39.48	0.44	3.03	0.43
SO4	WIN	19	0.86	0.64	0.74	-25.86	34.97	-0.22	0.3	0.26	-12.16	-19.19	-0.35	25.94	30.96	0.47	0.56	0.55
SO4	SPR	5	0.75	0.7	0.88	-6.81	42.52	-0.05	0.32	0.21	252.07	22.89	-0.07	276	54.1	0.46	0.46	0.77
SO4	SUM	19	0.89	0.95	0.88	6.34	37.36	0.06	0.33	0.21	43.88	22.07	0.06	59.7	41.78	0.37	0.46	0.77
SO4	FAL	30	0.72	0.9	0.79	25.36	44.11	0.18	0.32	0.15	124.84	33.07	0.25	138.35	49.48	0.44	0.43	0.63
SO4	ALL	73	0.8	0.83	0.77	3.47	39.5	0.03	0.32	0.22	76.82	15.91	0.03	98.05	42.97	0.39	0.47	0.59

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WASH1																		
EC	WIN	27	0.88	2.05	0.69	132.77	132.77	1.17	1.17	0.42	142.45	76.48	1.33	142.45	76.48	1.33	1.33	0.48
EC	SPR	24	0.77	1.1	0.29	41.63	47.68	0.32	0.37	0.15	58.08	34.99	0.42	62.33	39.49	0.48	0.5	0.08
EC	SUM	26	1.01	1.21	0.44	19.15	40.14	0.19	0.41	0.2	31.76	20.57	0.19	44.99	36.52	0.4	0.49	0.19
EC	FAL	23	0.77	1.62	0.83	110.84	110.84	0.85	0.85	0.27	137.95	73.95	1.11	137.95	73.95	1.11	0.99	0.68
EC	ALL	100	0.86	1.5	0.5	73.96	81.68	0.64	0.7	0.42	92.39	51.4	0.74	96.85	56.63	0.82	0.91	0.25
NO3	WIN	27	1.83	2.81	0.63	53.84	63.69	0.98	1.16	1.43	98.35	44.19	0.54	107.62	58.83	0.64	1.55	0.39
NO3	SPR	24	0.72	0.95	0.65	31.48	56	0.23	0.4	0.41	51.98	9.1	0.31	82.28	52.01	0.56	0.68	0.42
NO3	SUM	26	0.37	0.14	0.33	-60.48	70.99	-0.22	0.26	0.06	-53.22	-90.2	-1.53	67.35	99.76	1.8	0.32	0.11
NO3	FAL	23	0.63	1.23	0.88	97.28	103.75	0.61	0.65	1.05	74.56	40.88	0.97	81.96	49.36	1.04	1.19	0.77
NO3	ALL	100	0.91	1.31	0.76	44.42	69.35	0.4	0.63	0.95	42.34	0.07	0.44	85.17	65.66	0.69	1.05	0.58
OC	WIN	27	1.81	5.89	0.55	224.52	224.52	4.07	4.07	4.36	265.75	106.85	2.25	265.75	106.85	2.25	4.58	0.30
OC	SPR	24	1.51	2.17	0.11	44.17	66.78	0.67	1.01	1.65	76.23	32.77	0.44	89.66	48.9	0.67	1.45	0.01
OC	SUM	26	2.3	2.23	0.8	-3.05	22.47	-0.07	0.52	0.36	1.26	-3.25	-0.03	25.69	24.77	0.23	0.6	0.65
OC	FAL	23	1.67	2.86	0.65	70.88	78.47	1.19	1.31	2.32	88.31	48.79	0.71	92.97	54.17	0.78	1.93	0.42
OC	ALL	100	1.83	3.35	0.36	82.58	96.94	1.51	1.78	4.82	110.69	47.09	0.83	121.33	59.49	0.97	2.67	0.13
PM-2.5	WIN	27	8.78	20.3	0.83	131.28	131.28	11.52	11.52	22.5	140.89	79.47	1.31	140.89	79.47	1.31	12.46	0.68
PM-2.5	SPR	24	8.44	10.21	0.16	20.98	46.12	1.77	3.89	22.48	37.44	19.45	0.21	53.95	39.96	0.46	5.06	0.02
PM-2.5	SUM	25	12.06	10.07	0.86	-16.51	19.68	-1.99	2.37	5.45	-14.66	-17.78	-0.2	18.83	21.66	0.24	3.07	0.74
PM-2.5	FAL	23	7.24	12.01	0.66	65.85	66.93	4.77	4.85	27.63	74.61	46.27	0.66	75.49	47.18	0.67	7.1	0.44
PM-2.5	ALL	99	9.17	13.34	0.39	45.56	63.39	4.18	5.81	45.2	61.14	32.65	0.46	73.8	47.79	0.63	7.91	0.15
SO4	WIN	27	1.69	1.59	0.38	-5.59	35.52	-0.09	0.6	0.54	-2.7	-10.41	-0.06	34.12	34.04	0.38	0.74	0.14
SO4	SPR	24	2.26	1.88	0.49	-16.94	31.48	-0.38	0.71	0.76	-11.5	-19.27	-0.2	30.19	33.64	0.38	0.95	0.24
SO4	SUM	26	3.35	2.61	0.81	-22.18	29.39	-0.74	0.98	1.33	-16.36	-23.07	-0.29	27.33	32.6	0.38	1.37	0.66
SO4	FAL	23	1.55	1.51	0.78	-2.55	24.12	-0.04	0.37	0.22	5.94	1.09	-0.03	26.71	26.01	0.25	0.47	0.62
SO4	ALL	100	2.22	1.9	0.76	-14.37	30.31	-0.32	0.67	0.81	-6.38	-13.18	-0.17	29.71	31.72	0.35	0.95	0.57

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WHIT1																		
EC	WIN	26	0.05	0.07	0.44	41.11	70.05	0.02	0.04	0	169.46	46.95	0.41	179.66	59.39	0.7	0.06	0.19
EC	SPR	27	0.06	0.23	0.1	279.4	317.98	0.17	0.19	0.65	889.47	42.9	2.79	908.59	66.3	3.18	0.82	0.01
EC	SUM	25	0.18	0.23	0.92	25.78	71.86	0.05	0.13	0.07	43.04	-12.68	0.26	95.77	57.48	0.72	0.27	0.85
EC	FAL	27	0.09	0.08	0.66	-8.83	36.88	-0.01	0.03	0	94.68	-6.98	-0.1	130.96	40.65	0.4	0.04	0.43
EC	ALL	105	0.1	0.15	0.44	60.74	103.19	0.06	0.1	0.19	305.27	17.84	0.61	334.6	55.89	1.03	0.44	0.19
NO3	WIN	26	0.18	0.13	0.19	-28.68	99.72	-0.05	0.18	0.13	-25.16	-84.06	-0.4	90.91	101.38	1.4	0.37	0.04
NO3	SPR	28	0.2	0.04	0.52	-80.96	80.96	-0.16	0.16	0.01	-74.26	-123.32	-4.25	74.26	123.32	4.25	0.2	0.27
NO3	SUM	25	0.17	0.03	0.82	-84.34	84.34	-0.14	0.14	0.01	-82.69	-142.87	-5.39	82.69	142.87	5.39	0.18	0.66
NO3	FAL	27	0.1	0.03	0.91	-66.83	66.83	-0.07	0.07	0.01	-59.12	-89.06	-2.01	59.12	89.06	2.01	0.12	0.82
NO3	ALL	106	0.16	0.06	0.22	-65.33	84.6	-0.11	0.14	0.04	-60.35	-109.57	-1.88	76.48	113.82	2.44	0.24	0.05
OC	WIN	26	0.25	0.26	0.2	3.38	62.34	0.01	0.16	0.06	160.31	8.92	0.03	195.84	56.7	0.62	0.25	0.04
OC	SPR	28	0.59	1.02	0.06	71.63	169.35	0.42	1	13.94	173.43	-49.17	0.72	255.73	66.2	1.69	3.76	0.00
OC	SUM	25	1.39	1.43	0.79	2.64	69.15	0.04	0.96	2.46	9.99	-19.19	0.03	68.06	64.37	0.69	1.57	0.63
OC	FAL	27	0.42	0.46	0.74	10.46	42.75	0.04	0.18	0.06	11.31	-3.46	0.1	46.73	44.35	0.43	0.26	0.55
OC	ALL	106	0.65	0.79	0.41	20.48	88.15	0.13	0.58	4.32	90.37	-16.21	0.2	143.54	57.87	0.88	2.08	0.17
PM-2.5	WIN	26	2.4	1.94	0.02	-19.08	63.86	-0.46	1.53	10.71	43.56	9.75	-0.24	69.11	47.61	0.79	3.3	0.00
PM-2.5	SPR	28	8.33	3.88	0.06	-53.42	85.65	-4.45	7.13	94.69	-36.86	-80.4	-1.15	77.15	96.28	1.84	10.7	0.00
PM-2.5	SUM	24	6.7	4.42	0.79	-33.99	47.64	-2.28	3.19	11.86	-39.47	-58.17	-0.51	45.92	63.52	0.72	4.13	0.62
PM-2.5	FAL	27	3.38	2.43	0.49	-28.05	39.26	-0.95	1.33	2.51	-23.81	-35.09	-0.39	37.79	46.31	0.55	1.85	0.24
PM-2.5	ALL	105	5.22	3.15	0.29	-39.57	64.27	-2.06	3.35	33.74	-14.19	-41.34	-0.65	57.9	63.89	1.06	6.16	0.08
SO4	WIN	26	0.7	0.48	0.24	-31.41	78.81	-0.22	0.55	1.53	74.43	26.37	-0.46	101.12	65.9	1.15	1.26	0.06
SO4	SPR	28	1.8	0.54	0.33	-69.73	70.18	-1.25	1.26	1.68	-51.89	-80.71	-2.3	53.75	82.41	2.32	1.8	0.11
SO4	SUM	25	1.12	0.65	0.61	-41.67	44.9	-0.47	0.5	0.07	-42.84	-60.73	-0.71	46.83	63.92	0.77	0.54	0.38
SO4	FAL	27	0.73	0.58	0.52	-20.52	42.7	-0.15	0.31	0.19	-6.39	-21.64	-0.26	43.39	45.51	0.54	0.47	0.27
SO4	ALL	106	1.1	0.56	0.25	-48.62	60.78	-0.53	0.67	1.09	-7.18	-34.69	-0.95	61.1	64.6	1.18	1.17	0.06

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WHPE1																		
EC	WIN	20	0.03	0.04	0.47	32	55.94	0.01	0.02	0	80.3	37.29	0.32	93.91	54.52	0.56	0.02	0.22
EC	SPR	28	0.06	0.04	0.42	-33.73	60.21	-0.02	0.04	0.01	28.72	-0.29	-0.51	66.73	52.72	0.91	0.09	0.18
EC	SUM	31	0.12	0.13	0.64	5.35	70.5	0.01	0.09	0.02	20.23	-11.52	0.05	69.52	54.43	0.7	0.15	0.41
EC	FAL	21	0.06	0.05	0.29	-20.67	39.31	-0.01	0.02	0	-4.99	-16.53	-0.26	37.51	40.54	0.5	0.03	0.08
EC	ALL	100	0.07	0.07	0.61	-5.75	61.62	0	0.05	0.01	29.32	0.34	-0.06	66.89	51.05	0.65	0.1	0.37
NO3	WIN	20	0.09	0.06	0.7	-33.27	52.89	-0.03	0.05	0	-44.03	-72.84	-0.5	55.73	81.84	0.79	0.07	0.49
NO3	SPR	28	0.16	0.04	0.6	-71.77	71.77	-0.11	0.11	0.01	-71.38	-117.25	-2.54	71.38	117.25	2.54	0.13	0.36
NO3	SUM	31	0.14	0.03	0.7	-79.87	79.87	-0.11	0.11	0.01	-78.63	-133.78	-3.97	78.63	133.78	3.97	0.14	0.49
NO3	FAL	21	0.07	0.03	0.26	-57.37	76.98	-0.04	0.06	0	-48.08	-89.45	-1.35	68.34	102.72	1.81	0.07	0.07
NO3	ALL	100	0.12	0.04	0.52	-67.44	72.74	-0.08	0.09	0.01	-63.27	-107.65	-2.07	69.86	112.24	2.23	0.12	0.27
OC	WIN	19	0.11	0.15	0.53	36.34	62.77	0.04	0.07	0	421.81	49.84	0.36	436.44	68.91	0.63	0.08	0.28
OC	SPR	28	0.24	0.16	0.52	-36.41	49.99	-0.09	0.12	0.02	59.73	-29.2	-0.57	123.49	58.06	0.79	0.16	0.27
OC	SUM	31	1.14	0.85	0.67	-25.64	43.7	-0.29	0.5	1.07	-10.38	-22.22	-0.34	35.84	42.88	0.59	1.08	0.45
OC	FAL	21	0.29	0.25	0.46	-13.82	57.24	-0.04	0.17	0.06	22.27	-2.55	-0.16	64.95	56.35	0.66	0.25	0.21
OC	ALL	99	0.51	0.39	0.74	-23.07	47	-0.12	0.24	0.37	99.32	-6.19	-0.3	143.69	55.03	0.61	0.62	0.55
PM-2.5	WIN	20	1.08	1.24	0.86	15.21	27.47	0.16	0.3	0.09	22.01	15.87	0.15	31.96	27.34	0.27	0.34	0.74
PM-2.5	SPR	28	2.8	1.76	0.71	-37.35	42.32	-1.05	1.19	1.58	-26.98	-37.82	-0.6	38.44	46.96	0.68	1.64	0.50
PM-2.5	SUM	31	4.29	2.75	0.78	-35.89	37.34	-1.54	1.6	4.41	-34.36	-47.02	-0.56	36.51	49.05	0.58	2.6	0.60
PM-2.5	FAL	21	1.9	1.45	0.42	-23.46	40.98	-0.45	0.78	1.17	-5.07	-18.14	-0.31	41.61	43.89	0.54	1.17	0.18
PM-2.5	ALL	100	2.73	1.9	0.78	-30.44	38.53	-0.83	1.05	2.47	-14.87	-25.8	-0.44	37.21	43.04	0.55	1.78	0.60
SO4	WIN	20	0.22	0.42	0.66	96.3	103.43	0.21	0.22	0.02	141.47	72.31	0.96	144.38	75.63	1.03	0.24	0.44
SO4	SPR	28	0.48	0.47	0.51	-2.62	38.44	-0.01	0.18	0.07	18.99	6.72	-0.03	42.95	36.16	0.39	0.27	0.26
SO4	SUM	31	0.61	0.43	0.77	-29.24	32.43	-0.18	0.2	0.04	-28.64	-38.59	-0.41	33.04	42.62	0.46	0.26	0.59
SO4	FAL	21	0.44	0.38	0.55	-15.08	32.48	-0.07	0.14	0.04	0.36	-9.89	-0.18	35.54	36.06	0.38	0.21	0.30
SO4	ALL	100	0.46	0.43	0.56	-6.9	40.82	-0.03	0.19	0.06	24.81	2.31	-0.07	58.61	46.03	0.44	0.25	0.32

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WHRI1																		
EC	WIN	29	0.03	0.05	0.35	56.23	80.45	0.02	0.03	0	121.3	47.77	0.56	135.55	65.19	0.8	0.04	0.12
EC	SPR	30	0.05	0.04	0.13	-14.19	55.58	-0.01	0.03	0	22.45	-2.01	-0.17	61.39	50.95	0.65	0.04	0.02
EC	SUM	28	0.09	0.07	0.96	-21.39	30.45	-0.02	0.03	0	-8.61	-17.45	-0.27	32.41	35.26	0.39	0.04	0.92
EC	FAL	27	0.07	0.07	0.28	3.2	65.6	0	0.04	0.01	23.74	-4.07	0.03	65.66	53.24	0.66	0.08	0.08
EC	ALL	114	0.06	0.06	0.68	-1.48	52.89	0	0.03	0	40.27	6.37	-0.02	74.15	51.26	0.54	0.05	0.46
NO3	WIN	29	0.08	0.07	0.66	-11.59	62.91	-0.01	0.05	0.01	-9.23	-55.89	-0.13	79.03	81.28	0.71	0.07	0.44
NO3	SPR	31	0.15	0.04	0.42	-75.39	77.55	-0.11	0.11	0.01	-71.86	-121.7	-3.06	74.44	123.85	3.15	0.15	0.18
NO3	SUM	28	0.1	0.01	0.63	-90.44	90.44	-0.09	0.09	0	-89.18	-162.26	-9.46	89.18	162.26	9.46	0.1	0.39
NO3	FAL	30	0.06	0.05	0.33	-12.43	112.75	-0.01	0.07	0.02	-23.22	-94.06	-0.14	102.59	121.12	1.29	0.14	0.11
NO3	ALL	118	0.1	0.04	0.23	-56.65	83.53	-0.05	0.08	0.01	-48.21	-108.12	-1.31	86.22	121.81	1.93	0.12	0.05
OC	WIN	23	0.11	0.19	0.42	77.04	101.41	0.08	0.11	0.02	2948.58	55.96	0.77	2962.18	74.06	1.01	0.16	0.17
OC	SPR	29	0.16	0.15	0.15	-2.16	63.11	0	0.1	0.02	59.71	9.52	-0.02	98.65	62.12	0.64	0.15	0.02
OC	SUM	28	0.63	0.48	0.9	-23.97	38.18	-0.15	0.24	0.1	-8.04	-19.22	-0.32	38.25	40.65	0.5	0.36	0.80
OC	FAL	27	0.24	0.34	0.53	42.81	76.22	0.1	0.18	0.08	100.66	28.99	0.43	127.32	63.76	0.76	0.3	0.28
OC	ALL	107	0.29	0.29	0.77	1.2	54.81	0	0.16	0.07	673.29	16.89	0.01	705.6	59.48	0.55	0.26	0.60
PM-2.5	WIN	29	0.89	1.09	0.9	22.53	32.37	0.2	0.29	0.07	40.49	25.82	0.23	49.37	36.21	0.32	0.34	0.81
PM-2.5	SPR	31	2.65	1.3	0.61	-50.75	52.55	-1.34	1.39	3.63	-35.29	-50.66	-1.03	39.02	54.07	1.07	2.33	0.37
PM-2.5	SUM	24	3.22	1.63	0.87	-49.33	50.27	-1.59	1.62	1.29	-44.95	-63.01	-0.97	47.27	65.23	0.99	1.95	0.76
PM-2.5	FAL	30	1.58	1.39	0.43	-11.63	43.38	-0.18	0.68	1	0.78	-18.49	-0.13	49.46	47.08	0.49	1.02	0.18
PM-2.5	ALL	114	2.04	1.34	0.6	-34.2	47.69	-0.7	0.97	2.1	-8.55	-25.34	-0.52	46.14	50.03	0.72	1.61	0.36
SO4	WIN	29	0.17	0.37	0.36	112.41	128.67	0.19	0.22	0.03	168.02	78.19	1.12	173.28	84.62	1.29	0.25	0.13
SO4	SPR	31	0.38	0.4	0.48	4.9	48.24	0.02	0.18	0.09	36.16	14.89	0.05	57.87	42.16	0.48	0.31	0.23
SO4	SUM	28	0.48	0.31	0.59	-35.66	39.95	-0.17	0.19	0.02	-27.29	-40.88	-0.55	41.87	50.9	0.62	0.22	0.35
SO4	FAL	30	0.33	0.35	0.51	4.92	37.24	0.02	0.12	0.02	23.01	5.73	0.05	49.51	40.84	0.37	0.16	0.26
SO4	ALL	118	0.34	0.36	0.37	4.83	52.8	0.02	0.18	0.06	50.17	14.88	0.05	80.31	54.33	0.53	0.24	0.14

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O (µg/m^3)	MEAN_P (µg/m^3)	r unitless	NMB (%)	NME (%)	MB (µg/m^3)	ME (µg/m^3)	VAR (µg/m^3)^2	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WICA1																		
EC	WIN	26	0.08	0.36	0.27	354.49	380.38	0.28	0.3	0.34	340.73	60.57	3.54	359.06	83.7	3.8	0.65	0.07
EC	SPR	31	0.06	0.1	0.3	61.91	93.79	0.04	0.06	0.03	68.13	7.77	0.62	97.35	45.87	0.94	0.19	0.09
EC	SUM	31	0.13	0.18	0.89	40.27	73	0.05	0.1	0.04	18.51	-3.37	0.4	53.61	41.65	0.73	0.21	0.78
EC	FAL	21	0.1	0.21	0.01	107.96	136.28	0.11	0.14	0.14	234.41	27.97	1.08	255.83	56.04	1.36	0.39	0.00
EC	ALL	109	0.09	0.21	0.3	121.81	152.07	0.12	0.14	0.14	151.08	21.09	1.22	177.87	55.65	1.52	0.39	0.09
NO3	WIN	26	0.23	0.46	0.56	105.48	144.25	0.24	0.33	0.16	187.16	41.19	1.05	225.57	96.55	1.44	0.46	0.31
NO3	SPR	31	0.44	0.53	0.72	19.42	62.32	0.09	0.28	0.2	121.44	3.72	0.19	165.51	70.77	0.62	0.45	0.51
NO3	SUM	31	0.11	0.06	0.56	-47.68	68.06	-0.05	0.07	0.01	-51.93	-94.01	-0.91	72.13	104.81	1.3	0.09	0.31
NO3	FAL	21	0.17	0.21	0.7	20.19	95.05	0.03	0.16	0.07	55.93	-36.58	0.2	143.78	96.71	0.95	0.27	0.49
NO3	ALL	109	0.24	0.32	0.7	30.28	85.62	0.07	0.21	0.12	75.19	-22.9	0.3	149.09	91.6	0.86	0.35	0.48
OC	WIN	26	0.33	1.52	0.21	356.98	400.86	1.19	1.33	6.48	382.64	57.37	3.57	404.84	87.16	4.01	2.81	0.05
OC	SPR	31	0.37	0.4	0.33	8	79.78	0.03	0.3	0.63	22.82	-29.39	0.08	89.72	61.33	0.8	0.79	0.11
OC	SUM	31	1.11	1.03	0.86	-7.68	54.33	-0.09	0.6	0.84	-21.87	-38.86	-0.08	47.72	57.06	0.59	0.92	0.74
OC	FAL	21	0.57	0.94	0.01	64.43	120.87	0.37	0.69	3.05	433.51	9.07	0.64	475.95	67.95	1.21	1.79	0.00
OC	ALL	109	0.61	0.95	0.28	55.29	115.64	0.34	0.71	2.8	175.06	-3.98	0.55	227.35	67.55	1.16	1.71	0.08
PM-2.5	WIN	26	1.83	4.65	0.2	154.65	173.64	2.83	3.17	31.62	192.18	52.39	1.55	203.25	65.43	1.74	6.29	0.04
PM-2.5	SPR	31	2.89	2.87	0.55	-0.58	46.41	-0.02	1.34	5.06	11.82	-12.12	-0.01	57.22	47.34	0.47	2.25	0.31
PM-2.5	SUM	27	4.22	3.26	0.65	-22.88	44.82	-0.97	1.89	5.28	-26.65	-40.15	-0.3	41.52	50.58	0.58	2.49	0.43
PM-2.5	FAL	19	2.46	3.57	0.04	45.12	79.43	1.11	1.95	18.45	86.81	11.8	0.45	116.35	48.96	0.79	4.44	0.00
PM-2.5	ALL	103	2.89	3.55	0.23	22.83	71.29	0.66	2.06	16.34	61.1	1.23	0.23	100.88	53.05	0.71	4.1	0.05
SO4	WIN	26	0.56	0.47	0.43	-15.15	51.86	-0.08	0.29	0.2	33.91	12.2	-0.18	62.29	51.73	0.61	0.46	0.19
SO4	SPR	31	0.72	0.67	0.66	-6.84	36.04	-0.05	0.26	0.14	24.93	0.93	-0.07	55.41	39.78	0.39	0.38	0.43
SO4	SUM	31	0.71	0.55	0.6	-22.71	26.94	-0.16	0.19	0.03	-18.27	-23.18	-0.29	25.14	29.06	0.35	0.24	0.36
SO4	FAL	21	0.5	0.54	0.78	7.48	27.4	0.04	0.14	0.03	18.05	9.51	0.07	33.87	28.14	0.27	0.18	0.61
SO4	ALL	109	0.64	0.56	0.59	-11.46	35.15	-0.07	0.22	0.11	13.46	-1.59	-0.13	44.29	37.34	0.4	0.34	0.35

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

Table A3. 2011 Model Performance Results by Pollutant and Season - IMPROVE Sites

Pollutant	Quarter	N	MEAN_O ($\mu g/m^3$)	MEAN_P ($\mu g/m^3$)	r unitless	NMB (%)	NME (%)	MB ($\mu g/m^3$)	ME ($\mu g/m^3$)	VAR $(\mu g/m^3)^2$	MNB (%)	MFB (%)	NMFB unitless	MNGE (%)	MFE (%)	NMFE unitless	RMSE unitless	RSQR (%)
IMPROVE Monitoring Station: WIMO1																		
EC	WIN	27	0.22	0.22	0.7	-0.69	31.46	0	0.07	0.01	17.98	1.86	-0.01	44.84	34.44	0.32	0.09	0.49
EC	SPR	28	0.28	0.32	0.66	11.05	52.33	0.03	0.15	0.07	10.04	-6.24	0.11	47.32	42.32	0.52	0.26	0.43
EC	SUM	30	0.17	0.15	0.65	-9.06	35.9	-0.02	0.06	0.01	7.33	-2.62	-0.1	38.75	36.11	0.39	0.08	0.42
EC	FAL	29	0.25	0.4	0.56	62.08	85.44	0.15	0.21	0.39	34.19	2.46	0.62	61.73	37.77	0.85	0.65	0.32
EC	ALL	114	0.23	0.27	0.54	18.36	53.36	0.04	0.12	0.12	17.35	-1.15	0.18	48.14	37.66	0.53	0.36	0.30
NO3	WIN	27	1.94	1	0.54	-48.18	61.62	-0.93	1.19	2.52	-20.98	-47.95	-0.93	59.16	67.03	1.19	1.84	0.29
NO3	SPR	28	0.89	0.59	0.89	-33.69	52.64	-0.3	0.47	0.33	-55.02	-94.41	-0.51	61.82	100.06	0.79	0.64	0.79
NO3	SUM	31	0.3	0.03	0.26	-88.48	88.48	-0.27	0.27	0.03	-84.25	-148.54	-7.68	84.25	148.54	7.68	0.31	0.07
NO3	FAL	29	0.42	0.2	0.67	-52.97	64.49	-0.22	0.27	0.25	-49.96	-80.91	-1.13	57.59	87.48	1.37	0.55	0.45
NO3	ALL	115	0.86	0.44	0.68	-48.94	62.25	-0.42	0.53	0.82	-53.63	-94.69	-0.96	66.17	102.2	1.22	1	0.47
OC	WIN	27	0.87	0.72	0.52	-18.06	42.7	-0.16	0.37	0.19	-3.87	-21.45	-0.22	48.47	47.29	0.52	0.46	0.27
OC	SPR	28	1.81	1.3	0.54	-28.08	56.98	-0.51	1.03	1.72	-25.46	-48.04	-0.39	54.35	65.22	0.79	1.41	0.29
OC	SUM	31	1.47	1.28	0.67	-12.63	35.67	-0.19	0.52	0.42	-8.09	-18.6	-0.14	37.29	39.74	0.41	0.67	0.45
OC	FAL	29	1.2	1.65	0.73	38.08	71.33	0.46	0.85	6.7	3.3	-21.06	0.38	52.26	49.03	0.71	2.63	0.54
OC	ALL	115	1.34	1.25	0.63	-7.13	51.74	-0.1	0.7	2.39	-8.45	-27.06	-0.08	47.84	50.06	0.56	1.55	0.40
PM-2.5	WIN	27	6.42	5.48	0.86	-14.73	34.28	-0.95	2.2	8.9	14.86	-0.66	-0.17	45.1	36.22	0.4	3.13	0.73
PM-2.5	SPR	28	9.27	6.6	0.51	-28.8	45.3	-2.67	4.2	22.19	-19.99	-36.51	-0.4	44.97	55.11	0.64	5.41	0.26
PM-2.5	SUM	31	8.56	4.85	0.65	-43.35	44.26	-3.71	3.79	4.98	-42.62	-58.99	-0.77	44.42	60.67	0.78	4.33	0.43
PM-2.5	FAL	29	5.35	6.43	0.57	20.36	51.52	1.09	2.75	41.72	15.42	-6.72	0.2	52.55	41.79	0.52	6.55	0.33
PM-2.5	ALL	115	7.42	5.82	0.48	-21.53	43.87	-1.6	3.26	22.76	-8.98	-26.64	-0.27	46.76	48.82	0.56	5.03	0.23
SO4	WIN	27	1.57	1.05	0.71	-33.16	39.66	-0.52	0.62	0.84	-13.64	-25.83	-0.5	36.82	44.2	0.59	1.05	0.50
SO4	SPR	28	2.1	1.42	0.72	-32.48	38.51	-0.68	0.81	0.83	-21.03	-31.46	-0.48	33.81	40.9	0.57	1.14	0.52
SO4	SUM	31	1.98	1.09	0.75	-45.07	46.28	-0.89	0.92	0.22	-44.97	-63.26	-0.82	47.77	65.61	0.84	1.01	0.56
SO4	FAL	29	1.12	1.04	0.84	-7.2	25.97	-0.08	0.29	0.14	3.12	-6.65	-0.08	34.41	33.22	0.28	0.38	0.70
SO4	ALL	115	1.7	1.15	0.72	-32.38	39.12	-0.55	0.66	0.59	-19.66	-32.45	-0.48	38.43	46.4	0.58	0.94	0.52

N: Number of observations
MEAN_O: Average of the observed values
MEAN_P: Average of the modeled values
r: Pearson correlation coefficient
NMB: Normalized Mean Bias
NME: Normalized Mean Error
MB: Mean Bias
ME: Mean Error
VAR: Variance
MNB: Mean Normalized Bias
MFB: Mean Fractional Bias
NMBF: Normalized Mean Bias Fraction
MNGE: Mean Normalized Gross Factor
MFE: Mean Fractional Error
NMEF: Normalized Mean Error Fraction
RMSE: Root Mean Squared Error
RSQR: r-squared

WIN = Winter; SPR = Spring; SUM = Summer; FAL = Fall; ALL = all days

This page is intentionally left blank.