Supplemental Information

Characteristics of PM2.5 Concentrations across Beijing during 2013-2015

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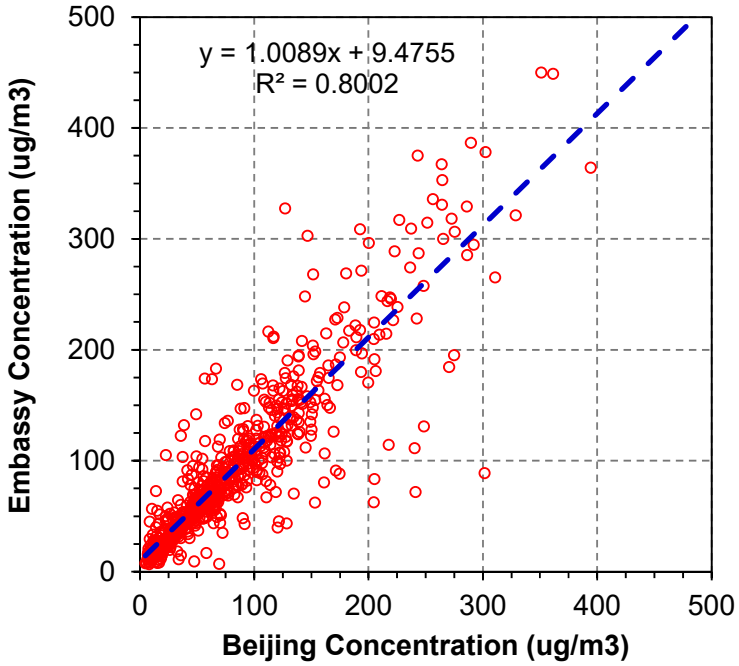
Supplemental Figure 1. Scatterplot contrasting daily $PM_{2.5}$ concentrations at US Embassy and Beijing-wide averages.

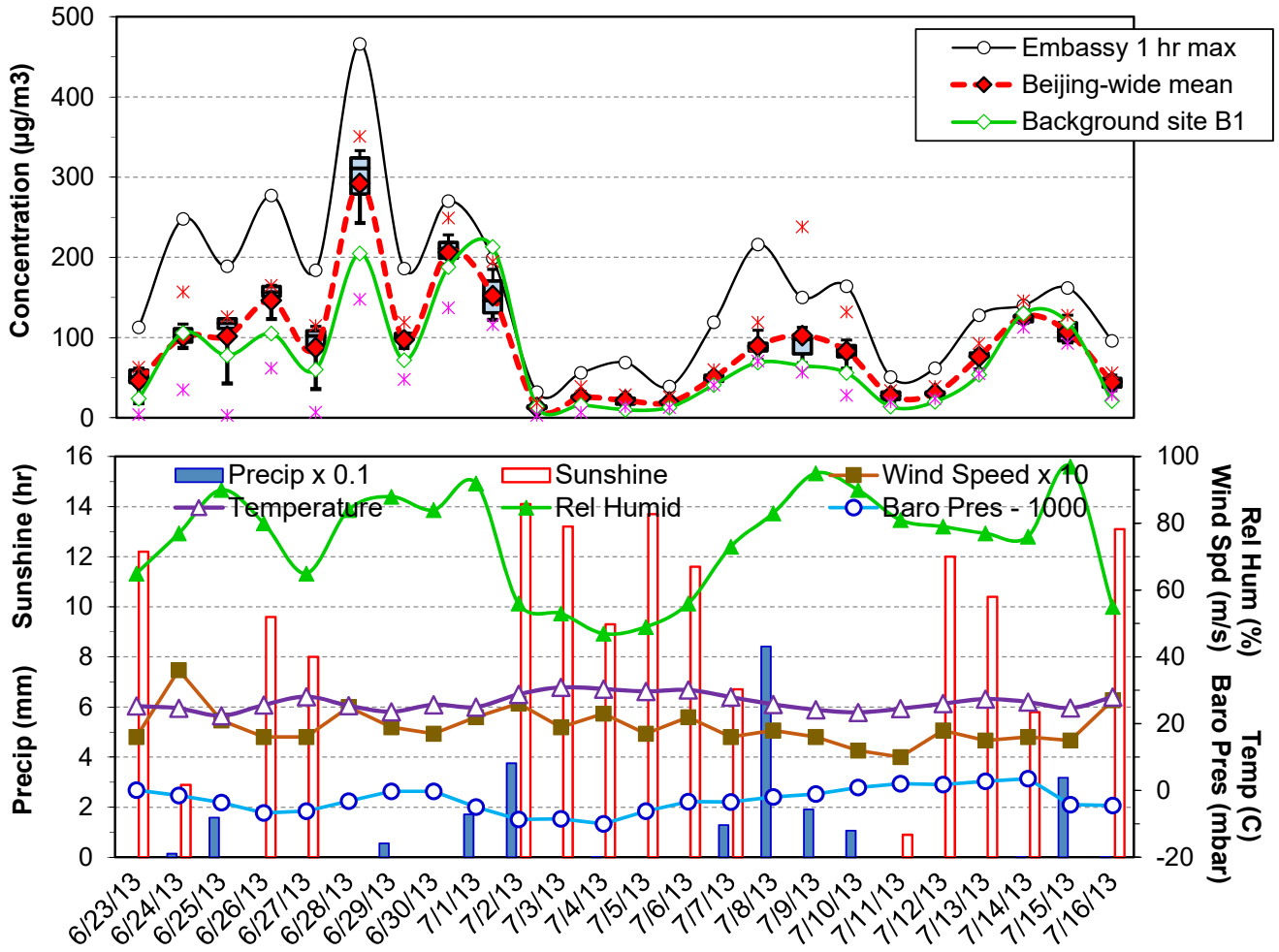


Hourly $PM_{2.5}$ data measured at the US Embassy in central Beijing were obtained and compared to the state-operated network data. Daily averages were calculated if at least 19 of the hourly observations were valid. The figure above shows that $PM_{2.5}$ concentrations at the US Embassy monitor were highly correlated to the Beijing-wide levels (r=0.895, n=689), although levels at the Embassy site averaged 9.5 $\mu g \cdot m^{-3}$ higher. The median absolute difference between the Beijing-wide and the US Embassy observations was 11 $\mu g \cdot m^{-3}$; the relative absolute difference was 18%. The regression model for daily $PM_{2.5}$ levels was Embassy $PM_{2.5}$ = 1.0089 × Beijing wide $PM_{2.5}$ + 9.4755).

Based on fits of regression model at each site, $PM_{2.5}$ levels at the US Embassy site were most similar to those at site B7 located about 5 km to the north (this site tended to have the highest concentration among the state-operated sites), although other monitors in the urban and capital core zones (3 and 4) had close agreement.

Many factors can cause differences among $PM_{2.5}$, including monitoring placement (both location and height), instrumentation type, and maintenance and calibration procedures, thus, analyses in this paper utilize only data from the state-operated sites.

669 Supplemental Figure 2A. Trends of $PM_{2.5}$ and meteorological variables over a pollution episode in June 2013.
670 Top: Shows daily Beijing-wide concentrations, including maximum, minimum, average, 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th}
671 percentiles; daily concentration at background site B1, and 1-hr maximum at the US Embassy site. Bottom:
672 Shows daily average of temperature, relative humidity, wind speed and barometric pressure, and daily sum of
673 sunshine hours and precipitation.



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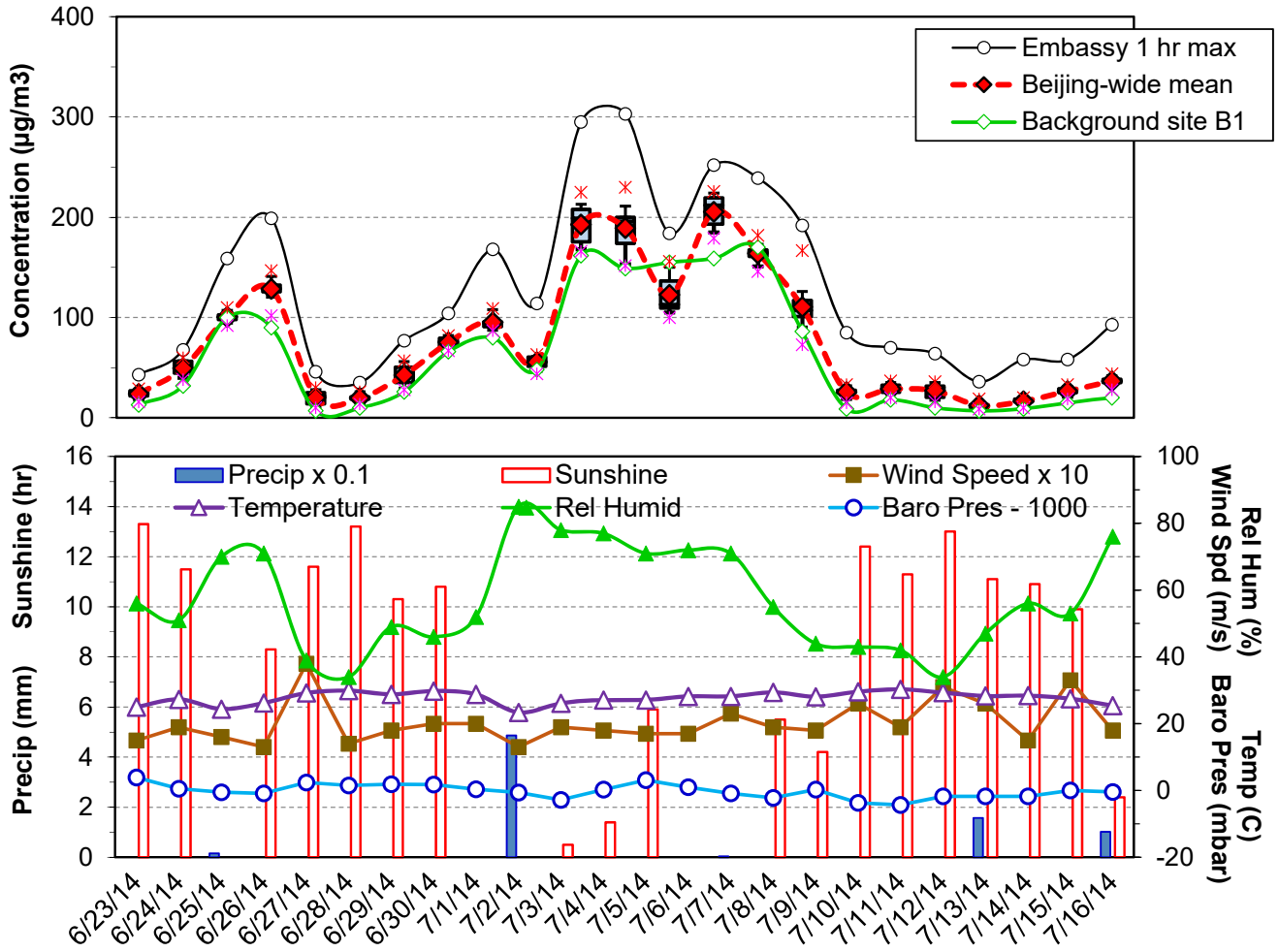
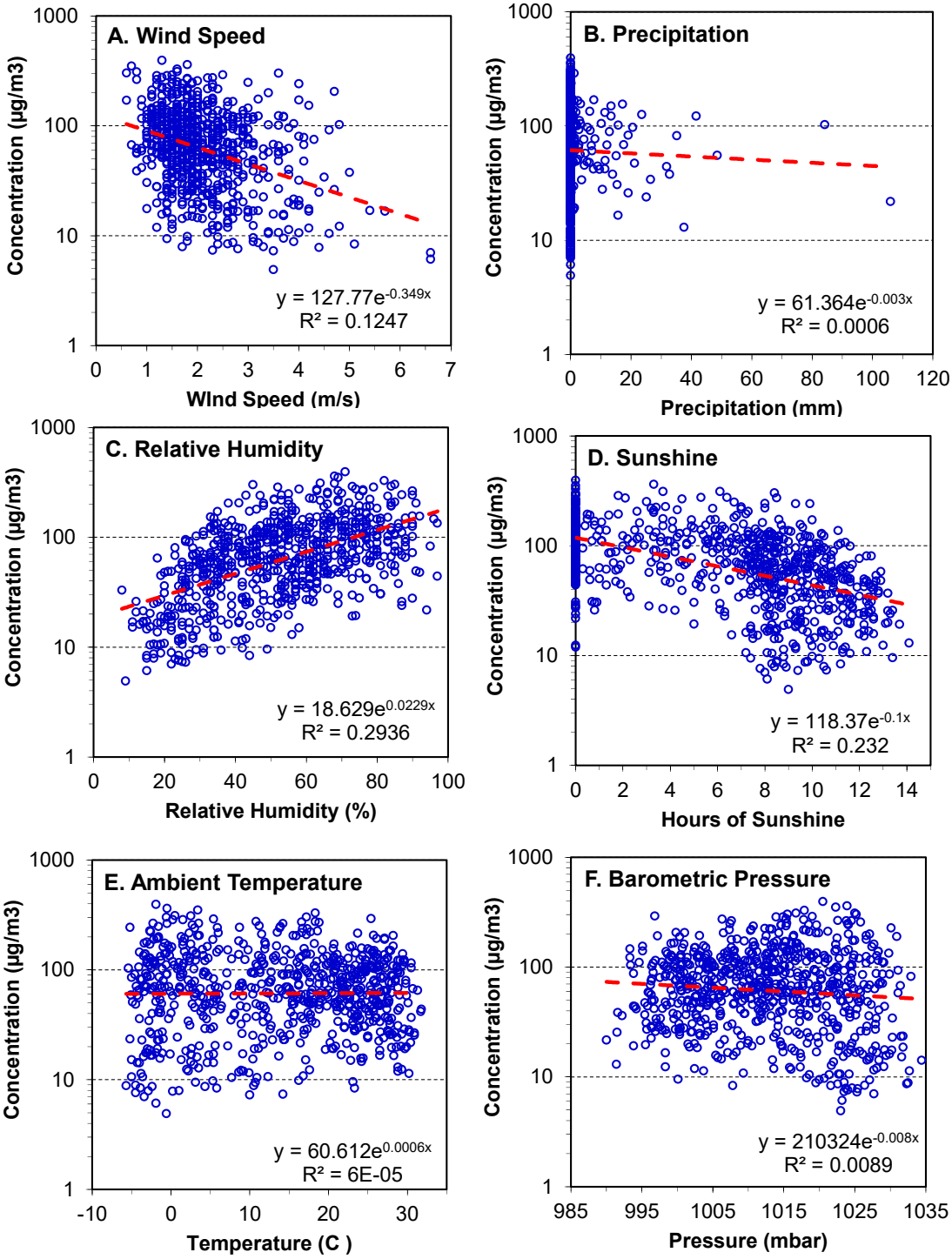
Supplemental Figure 2B. Trends of $PM_{2.5}$ and meteorological variables over a pollution episode in June 2014. Top: Shows daily Beijing-wide concentrations, including maximum, minimum, average, 10^{th}, 25^{th}, 50^{th}, 75^{th}, 90^{th} percentiles; daily concentration at background site B1, and 1-hr maximum at the US Embassy site. Bottom: Shows daily average of temperature, relative humidity, wind speed and barometric pressure, and daily sum of sunshine hours and precipitation.



683 Supplemental Figure 3. Beijing-wide daily $PM_{2.5}$ concentrations versus meteorological factors. Plots use log
684 scale and show regression line.



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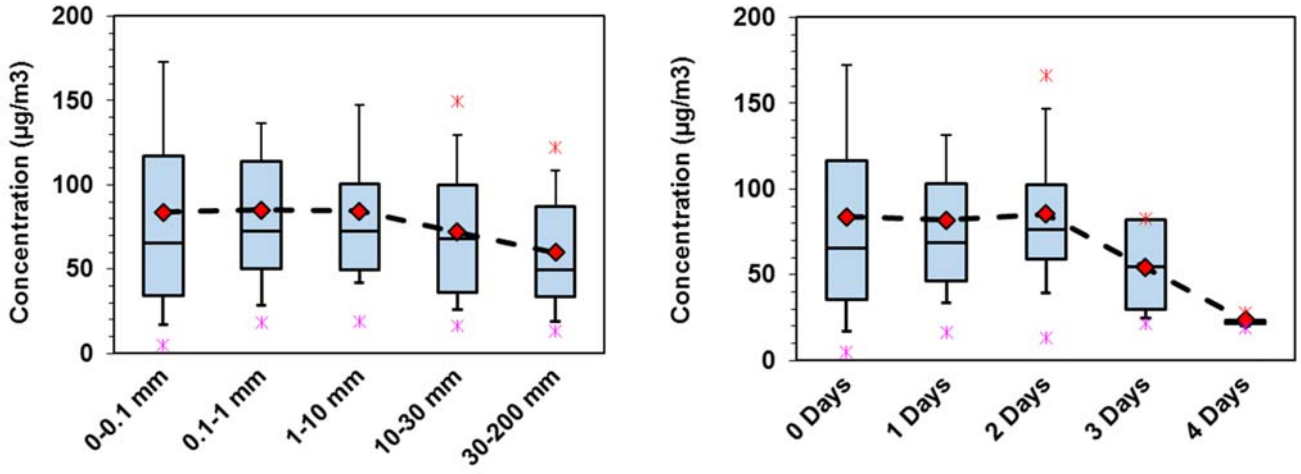
687 Supplemental Figure 4. Left: Beijing-wide daily $PM_{2.5}$ levels versus same day daily precipitation amount.
688 (620, 34, 45, 23 and 8 days in the five categories in the plot.) Right: Beijing-wide daily $PM_{2.5}$ levels versus
689 days of preceding and consecutive days of precipitation, defined as days with precipitation exceeding 1 mm/day.
690 Box and whisker plots show monthly 90th, 75th, 50th, 25th and 10th percentiles; maximum and minimum indicated
691 as points; line (diamond symbol) shows average.



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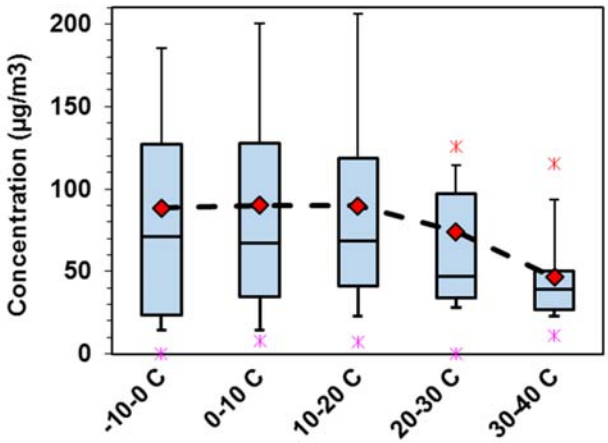
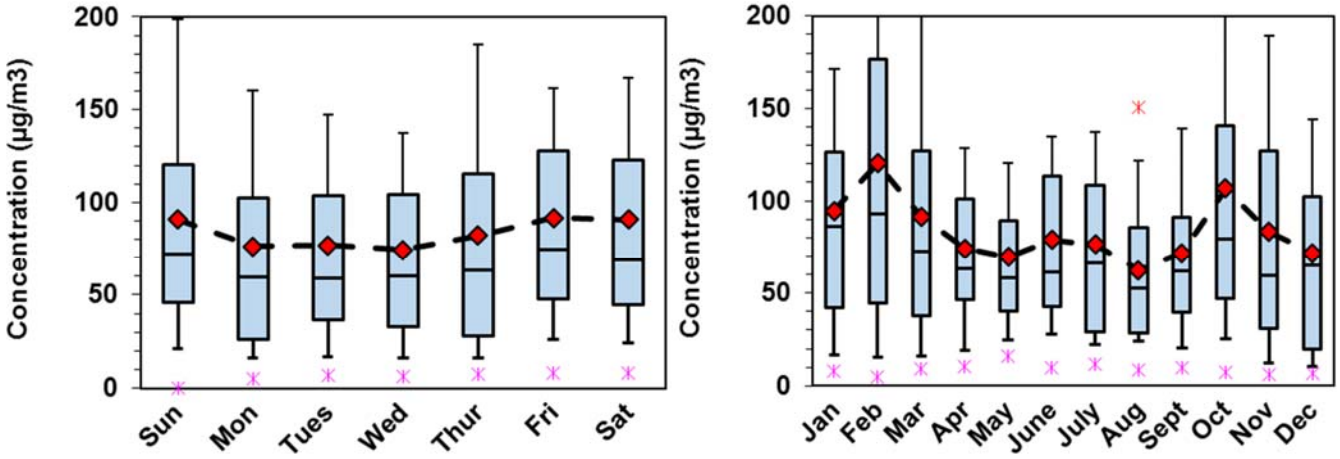
Supplemental Figure 6. Daily Beijing-wide $PM_{2.5}$ levels versus daily temperature average. (125, 151, 178, 262 and 14 days in the temperature ranges shown.) Box and whisker plots show monthly 90th, 75th, 50th, 25th and 10th percentiles; maximum and minimum indicated as points; line (diamond symbol) shows average.



Supplemental Figure 7. Left: Left: Beijing-wide daily $PM_{2.5}$ versus day of week. (104 or 105 days in each day category.) Right: Beijing-wide daily $PM_{2.5}$ versus month. (56 to 62 days in each month group.) Box and whisker plots show monthly 90th, 75th, 50th, 25th and 10th percentiles; maximum and minimum indicated as points; line (diamond symbol) shows monthly average.



Supplemental Table 1. Three models predicting Beijing-wide daily $PM_{2.5}$ concentrations based on step-wise regression selection of variables. Left: Full model which considers all variables. Center: Model without AR (autoregressive) terms; Right: Model without sunshine variable. Models scaled to fit data.

	Full Model			Model without AR terms			Model without Sunshine		
	Coef.	Std.Err.	p-value	Coef.	Std.Err.	p-value	Coef.	Std.Err.	p-value
CONSTANT	1247.90	208.30	0.000	1054.03	240.37	0.003	1134.13	224.23	0.001
PRECIP_STORM_TOTAL	-1.08	0.34	0.002	-1.16	0.50	0.021	-1.15	0.38	0.003
BP	-2.08	0.51	0.000	-2.40	0.75	0.001	-2.05	0.58	0.000
SUNSHINE	-7.62	0.97	0.000	-13.89	1.42	0.000			
RH	3.08	0.21	0.000	5.27	0.34	0.000	3.72	0.23	0.000
TEMP_MIN	2.12	1.35	0.116				3.39	1.52	0.026
TEMPS_AVE	5.66	1.00	0.000				1.80	0.99	0.068
TEMPS_MIN	-11.32	1.42	0.000	-12.57	1.83	0.000	-9.09	1.57	0.000
PRECIP_SCAV	-65.20	10.29	0.000	-107.10	15.30	0.000	-58.15	11.59	0.000
PRECIP_SCAV_L1	-14.99	8.86	0.091	-30.74	12.95	0.018	-29.53	9.76	0.003
WD1	-24.92	10.09	0.014				-50.93	13.17	0.000
WD5	32.26	12.74	0.012	37.98	18.98	0.046	38.05	14.79	0.010
WD10	15.51	6.97	0.026				16.70	7.89	0.035
PM_L1	0.73	0.05	0.000				0.81	0.05	0.000
PM_L2	-0.21	0.05	0.000				-0.19	0.05	0.000
WD_MWS							-1.18	0.73	0.106
PM_L5							0.06	0.04	0.167
WS				15.66	5.27	0.003			
TEMP_AVE				5.05	2.32	0.030			
TEMPS_MAX				3.17	0.73	0.000			
WD11				-18.01	10.33	0.082			
WD12				-35.50	21.87	0.105			
WD16				28.38	14.69	0.054			
N / R2 / Adj R2	676	0.631	0.623	701	0.495	0.485	654	0.6	0.591