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Supplement of

Source apportionment of ambient particle number concentrations in central Los Angeles using positive matrix factorization (PMF)

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Signal-to-noise ratio calculation in PMF 5.0

In the previous versions of the PMF model, S/N ratio was basically calculated by dividing the sum of concentration values by sum of uncertainty values, using the following equation (Paatero et al., 2014):

$$\left(\frac{S}{N}_j\right) = \sqrt{\frac{\sum_{i=1}^{n}\left(x_{ij} - s_{ij}\right)^2}{\sum_{i=1}^{n} s_{ij}^2}} \qquad (8)$$

The major disadvantage associated with this method of S/N calculation was that it would have resulted in artificially high S/N values for a species having a number of very high concentration data points. In such cases, the S/N ratios might have even exceeded that of a species having consistently lower signals. Additionally, a few missing values for a species would also have led to very low S/N ratios. In the current version, to resolve these issues, the model only includes concentration values for the signal portion that exceed the uncertainty value. If the concentration is below the uncertainty value, it is considered to have no signal (Paatero et al., 2014):

$$d_{ij} = 0 \qquad if \;\; x_{ij} \le S_{ij} \qquad (9)$$

where, d_{ij} is the difference between the concentration and the uncertainty value.

However, if the concentration exceeds the uncertainty value, the model uses the difference between the concentration and the uncertainty value as the signal:

$$d_{ij} = \left(\frac{x_{ij} - S_{ij}}{S_{ij}}\right) \qquad if \;\; x_{ij} > S_{ij} \qquad (10)$$

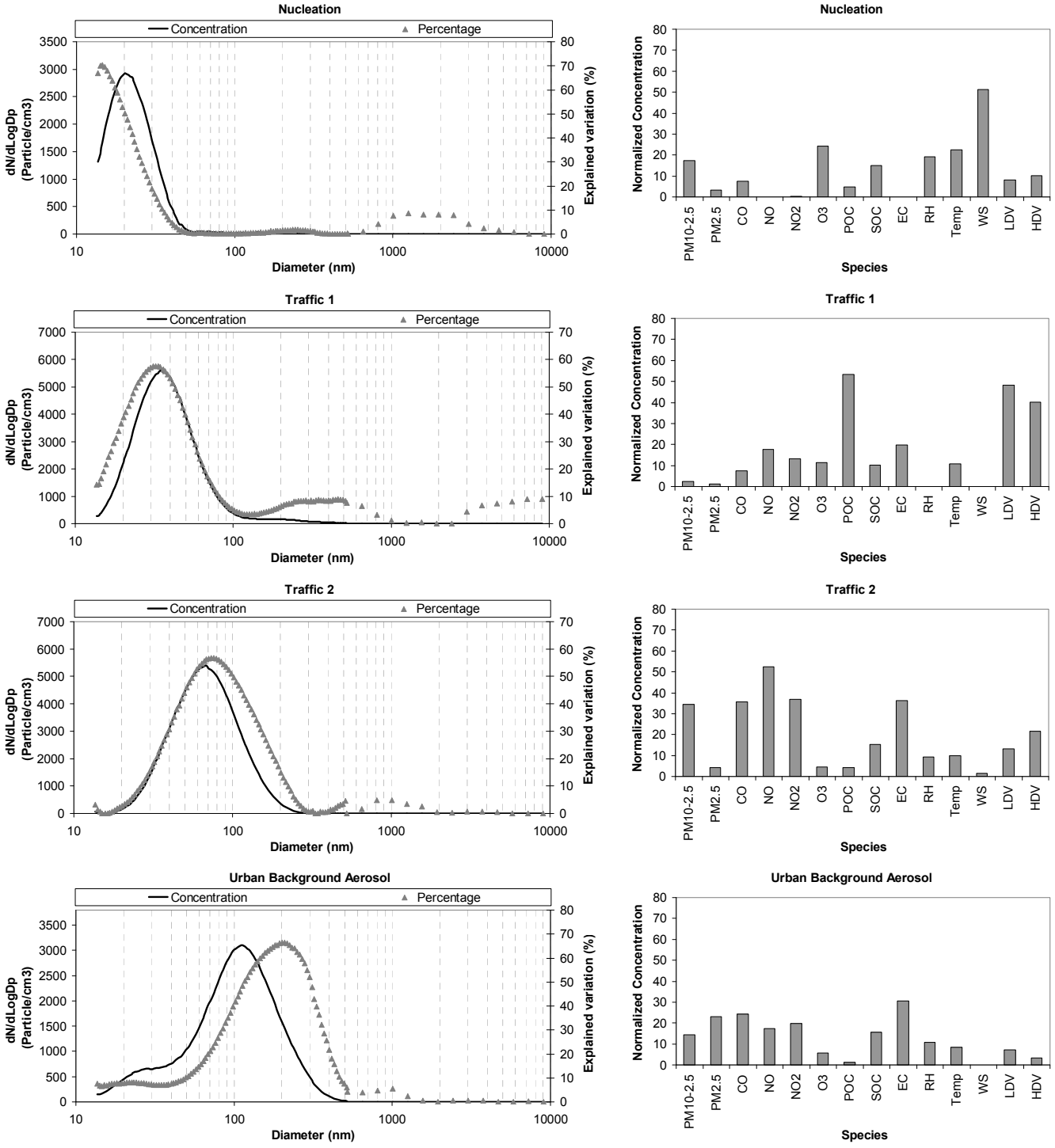
Then, the S/N ratio is calculated using the following equation:

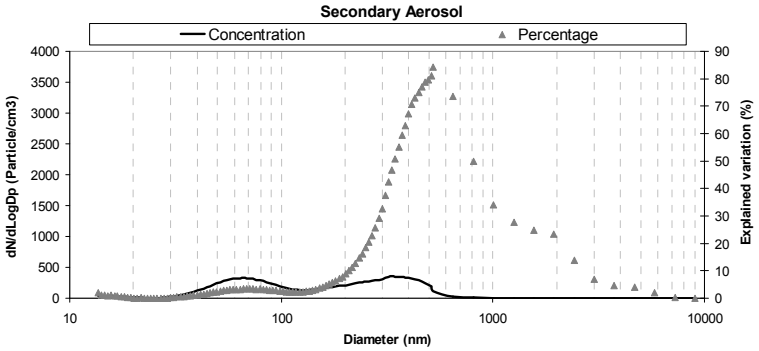
$$\left(\frac{S}{N}\right)_j = 1/n \sum_{i=1}^{n} d_{ij} \qquad (11)$$

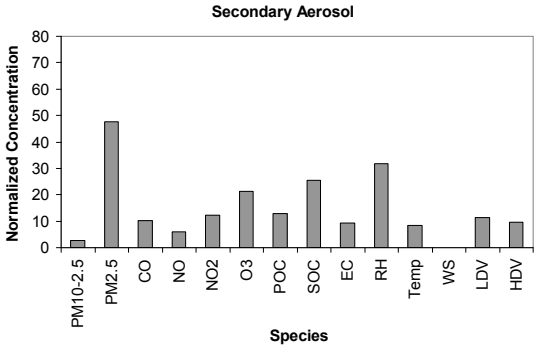
Table S1. Contribution (#/cm^3) of each of the PMF-resolved factors in different months of the study period.

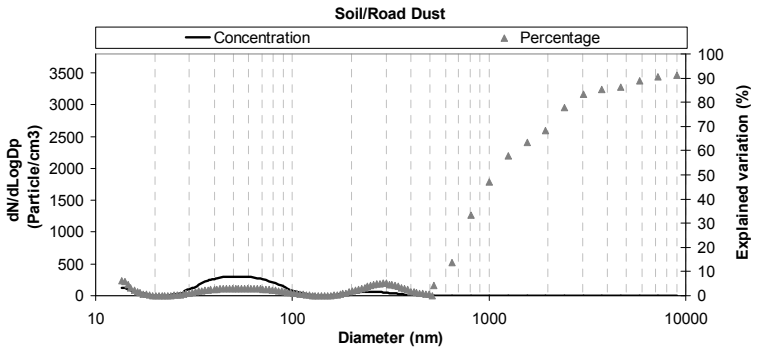
Year/ Month	Statistics	Nucleation	Traffic 1	Traffic 2	Urban Background Aerosol	Secondary Aerosol	Soil/road dust
Aug 2014	Geometric Mean	1477.65	525.74	440.87	116.47	176.46	293.48
	Standard Error	55.24	148.05	56.54	12.42	7.73	9.27
Sep 2014	Geometric Mean	1257.41	700.42	741.34	109.79	85.57	318.03
	Standard Error	55.89	79.27	35.01	8.67	8.62	5.64
Oct 2014	Geometric Mean	949.96	1836.26	1546.09	866.6	143.52	247.52
	Standard Error	43.06	104.47	75.18	55.18	12.98	4.39
Nov 2014	Geometric Mean	591.92	3249.86	1741.39	840.13	61.65	5.66
	Standard Error	65.64	119.02	102.43	38.39	7.92	0.95
Dec 2014	Geometric Mean	512.78	3148.09	1903.79	1645.71	131.36	4.72
	Standard Error	42.72	114.19	115.44	99.55	17.77	0.28
Jan 2015	Geometric Mean	508.66	4169.93	2604.66	1985.96	175.25	18.71
	Standard Error	55.11	193.48	138.3	124.64	36.35	3.58
Feb 2015	Geometric Mean	733.69	2648.81	1314.48	1008.57	146.59	121.1
	Standard Error	43.84	121.45	100.14	64.7	28.79	3.75
Mar 2015	Geometric Mean	768	4256.31	2101.16	599.71	16.39	71.29
	Standard Error	80.46	200.86	182.77	58.37	3.43	8.99
Aug 2015	Geometric Mean	1030.21	1074.72	1062.54	216.07	147.89	273.64
	Standard Error	99.28	146.11	115.31	28.42	11.75	8.91

Figure S1. The number size distributions as well as the auxiliary variables profiles for each of the factors resolved by the PMF for the scenario including POC-SOC data.




Secondary Aerosol
Concentration
Percentage
dN/dLogDp (Particle/cm3)
Explained variation (%)
Diameter (nm)


Secondary Aerosol
Normalized Concentration
PM10-2.5
PM2.5
CO
NO
NO2
O3
POC
SOC
EC
RH
Temp
WS
LDV
HDV
Species


Soil/Road Dust
Concentration
Percentage
dN/dLogDp (Particle/cm3)
Explained variation (%)
Diameter (nm)

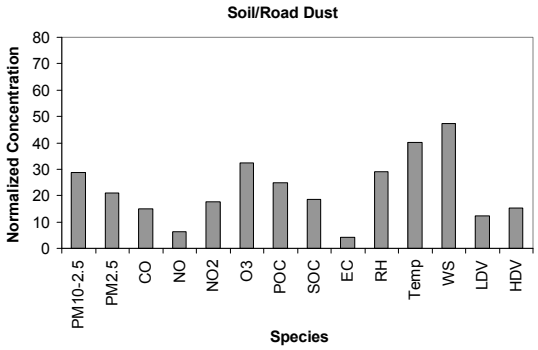
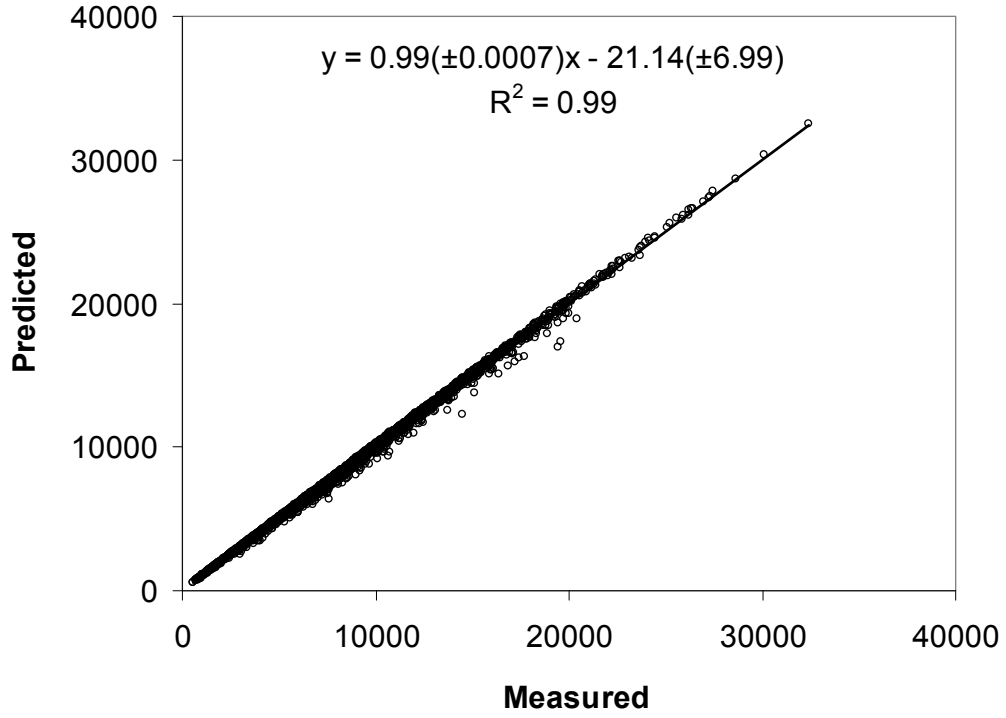

Soil/Road Dust
Normalized Concentration
PM10-2.5
PM2.5
CO
NO
NO2
O3
POC
SOC
EC
RH
Temp
WS
LDV
HDV
Species

Figure S2. Correlation between the measured vs. PMF-predicted total number concentrations (particles/cm^3) for the entire sampling period.



References

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