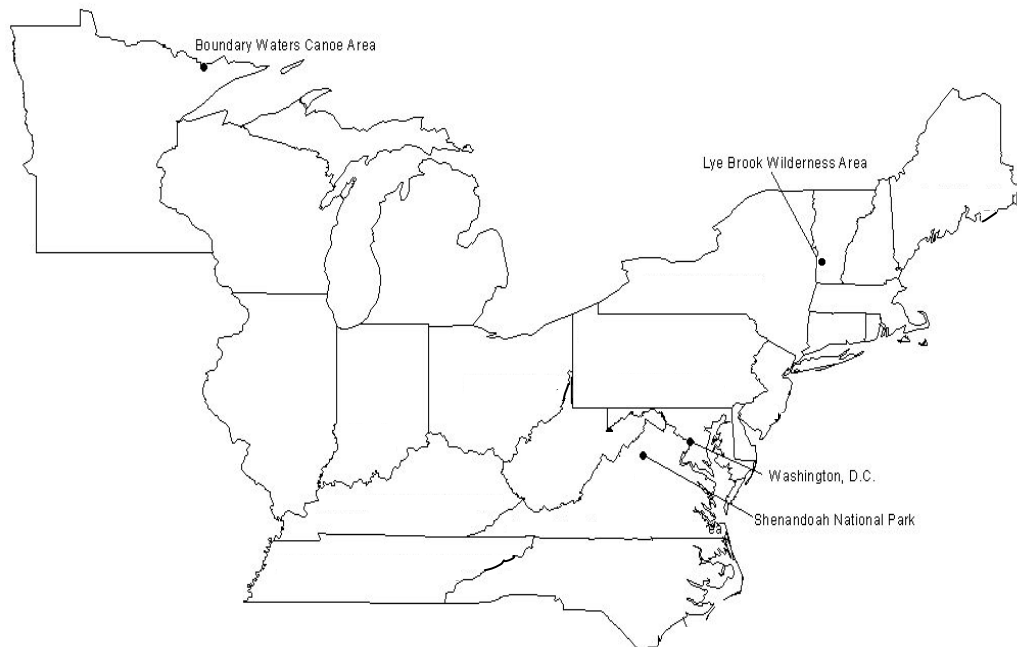


MANE-VU

Mid-Atlantic/Northeast Visibility Union

Source Apportionment Analysis of Air Quality Monitoring Data: Phase II



Final Report

APPENDICES 6.5 – 6.7

Comparison of Modeled and Measured Profiles, CMB Modeling, Conceptual Model

Prepared by
Desert Research Institute

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and
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6. RECEPTOR MODELING

6.5 Comparison of Modeled and Measured Profiles

As was demonstrated in sections 6.2 and 6.4, the PMF and UNMIX receptor models were able to distinguish several source types for each of the data sets and sub-sets. Of the 180 profiles originally modeled by PMF, 120 (Table 6.6-24) were assigned specific source type names, based on comparisons with similar measured profiles from the DRI's data base (Figure 6.5-1) and other published measured and modeled sources (Braaten and Cahil, 1986, Engelbrecht *et al.*, 2002, Huang *et al.*, 1999, 2001, Maykut *et al.*, 2001, Perry *et al.*, 1997, Poirot, *et al.*, 2001, Watson, *et al.*, 1994, Eugene Kim, personal communication).

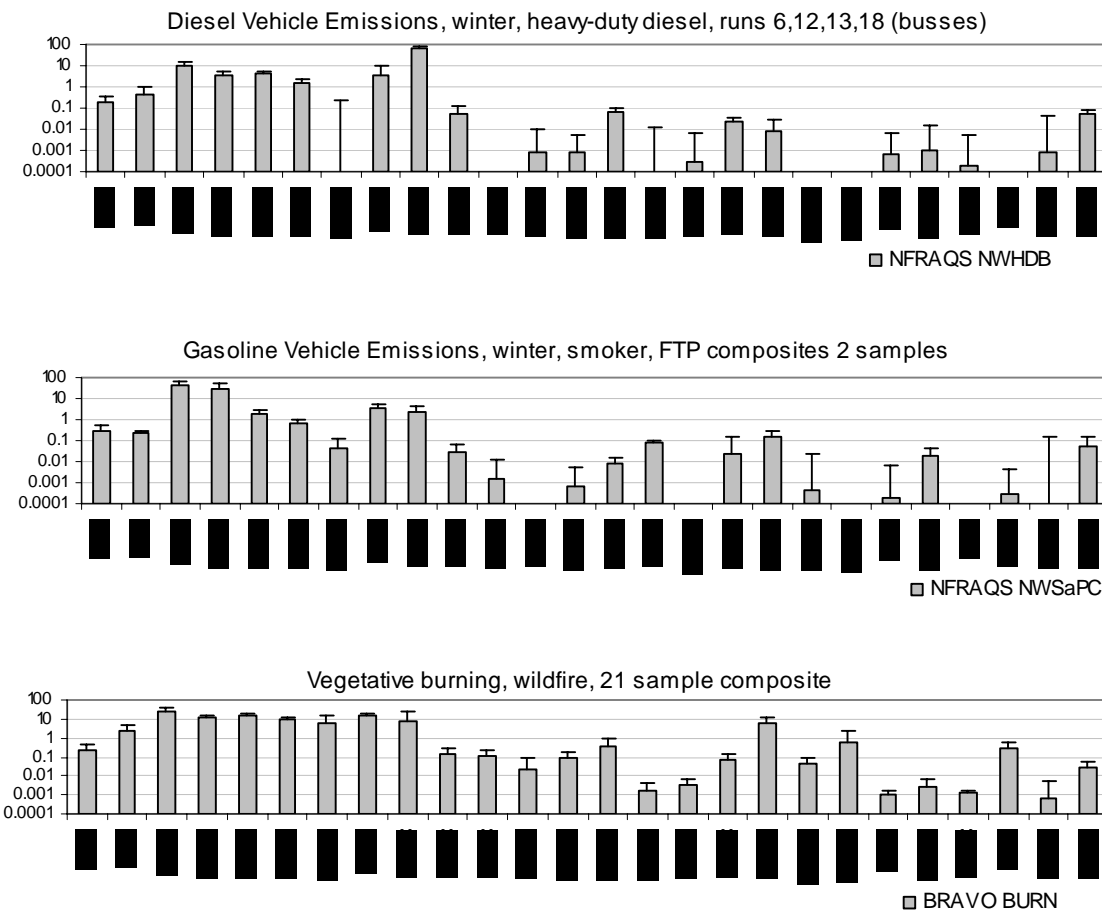


Figure 6.5-1a. Measured chemical source profiles from the DRI database

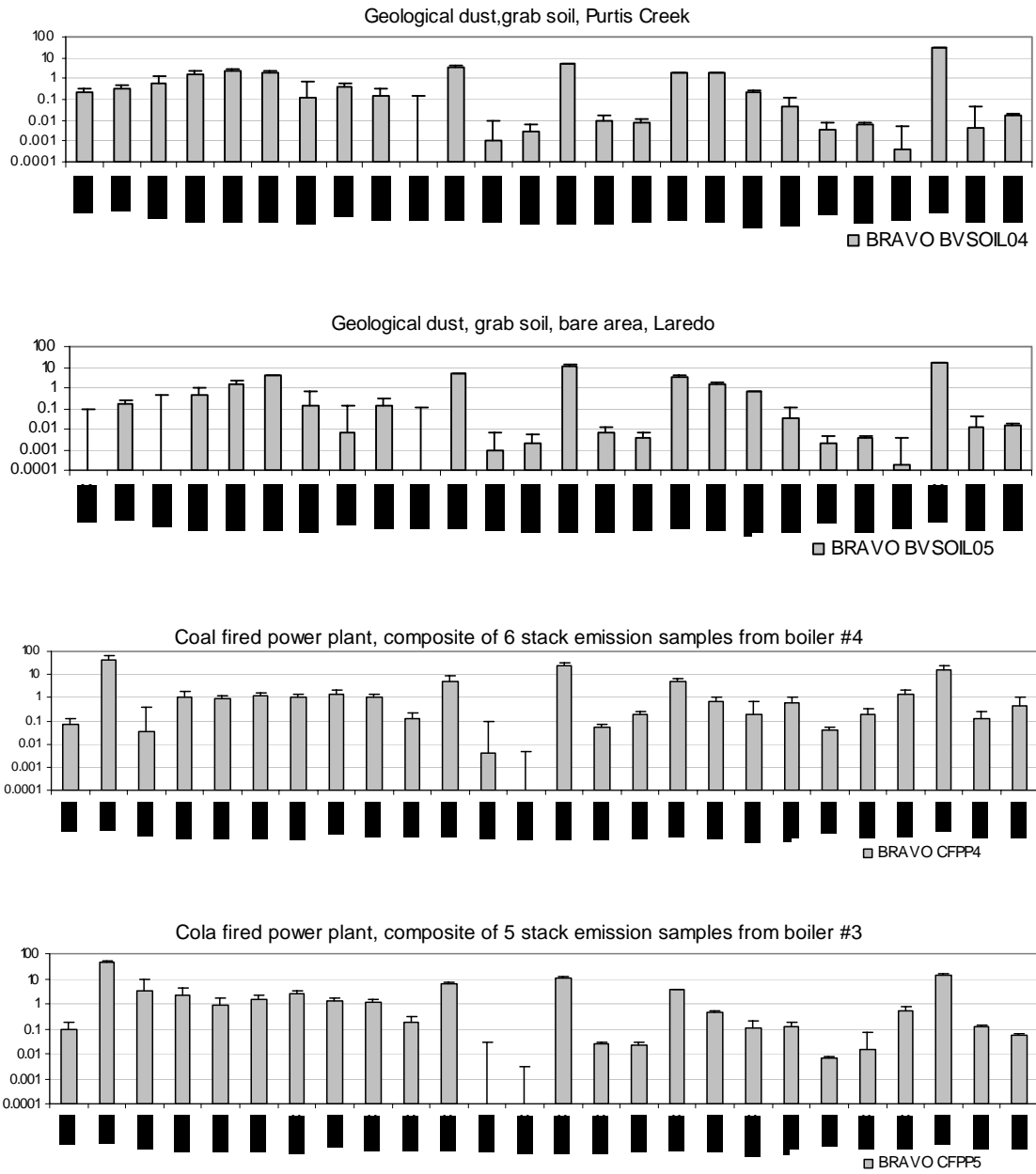


Figure 6.5-1b. Measured chemical source profiles from the DRI database

6.6 Chemical Mass Balance (CMB8) Receptor Modeling

The CMB receptor model (Friedlander, 1973; Cooper and Watson, 1980; Watson, 1984) consists of a solution to linear equations that express each receptor chemical concentration as a linear sum of products of source profile abundances and source contributions. The source profile abundances (i.e., the mass fraction of a chemical or other property in the emissions from each source type) and the receptor concentrations, with appropriate uncertainty estimates, serve as input data to the CMB model. The output consists of the amount contributed by each source type represented by a profile to the total mass and each chemical species. The CMB calculates values for the contributions from each source and the uncertainties of those values. The CMB is applicable to multi-species data sets, the most common of which are chemically characterized PM₁₀ (suspended particles with aerodynamic diameters less than 10 μm), PM_{2.5} (suspended particles with aerodynamic diameters less than 2.5 μm), and VOC (Volatile Organic Compounds).

The CMB modeling procedure requires: 1) identification of the contributing sources types; 2) selection of chemical species or other properties to be included in the calculation; 3) estimation of the fraction of each of the chemical species which is contained in each source type (source profiles); 4) estimation of the uncertainty in both ambient concentrations and source profiles; and 5) solution of the chemical mass balance equations.

CMB model assumptions are: 1) compositions of source emissions are constant over the period of ambient and source sampling; 2) chemical species do not react with each other (i.e., they add linearly); 3) all sources with a potential for contributing to the receptor have been identified and have had their emissions characterized; 4) the number of sources or source categories is less than or equal to the number of species; 5) the source profiles are linearly independent of each other; and 6) measurement uncertainties are random, uncorrelated, and normally distributed.

The CMB is intended to complement rather than replace other data analysis and modeling methods. It does not explicitly treat profiles that change between source and receptor. These models are often overly simplified, and require additional assumptions regarding chemical mechanisms, relative transformation and deposition rates, mixing volumes, and transport times. For this project, no appropriate measured source were available, and the PMF modeled profiles were used instead. These differ from measured profiles, in that they had aged, and had formed new secondary profiles by reactions in the ambient atmosphere.

The CMB model quantifies contributions from chemically distinct source-types rather than contributions from individual emitters. Sources with similar chemical and physical properties cannot be distinguished from each other by the CMB. The CMB model calculates source contribution estimates for each individual ambient sample. The combination of source profiles that best explains the ambient measurements may differ from one sample to the next owing to differences in emission rates (e.g., wild fires during the summer months), wind directions (e.g., a downwind point source would not be expected to be contributing at an upwind sampling site), and changes in emissions compositions (e.g., different gasoline characteristics and engine performance in winter and summer may result in different profiles).

Source contribution estimates are the main output of the CMB model. The sum of these concentrations approximates the total mass concentration. Negative source contribution

estimates are not physically meaningful, but they can occur when a source profile is collinear with another profile or when the source contribution is close to zero. Collinearity is usually identified in the eligible sources display. When the absolute value of a positive or negative source contribution estimate is less than its standard error, the source contribution is undetectable. Two or three times the standard error may be taken as an upper limit of the source contribution in this case.

The standard errors reflect the precisions of the ambient data, the source profiles, and the amount of co linearity among different profiles. Standard errors should be reported with every source contribution estimate. The standard error is a single standard deviation. There is about a 66% probability that the true source contribution is within one standard error and about a 95% probability that the true contribution is within two standard errors of the source contribution estimate.

The T-statistic (TSTAT) is the ratio of the source contribution estimate to the standard error. A TSTAT value less than 2.0 indicates that the source contribution estimate is at or below a detection limit. Low TSTAT values for several source contributions may be caused by collinear ties among their profiles; this will be indicated by the Similarity/Uncertainty Clusters.

The reduced chi square, degrees of freedom, R square, percent mass, and fit measure are performance measures for the least squares calculation.

The chi-square is the weighted sum of squares of the differences between the calculated and measured fitting species concentrations. The weighting is inversely proportional to the squares of the precisions in the source profiles and ambient data for each species. Ideally, there would be no difference between calculated and measured species concentrations and chi-square would equal zero. A value less than 1 indicates a very good fit to the data, while values between 1 and 2 are acceptable. Chi-square values greater than 4 indicate that one or more species concentrations are not well explained by the source contribution estimates. The degrees of freedom equal the number of fitting species minus the number of fitting sources. The degrees of freedom is needed when statistical significance tests are applied to the chi-square value.

The R-square is the fraction of the variance in the measured concentrations that is explained by the variance in the calculated species concentrations. It is determined by a linear regression of measured versus model-calculated values for the fitting species. R-square ranges from 0 to 1.0. The closer the value is to 1.0, the better the source contribution estimates explain the measured concentrations. When R-square is less than 0.8, the source contribution estimates do not explain the observations very well with the fitting source profiles and/or species.

Percent mass is the percent ratio of the sum of the model-calculated source contribution estimates to the measured mass concentration. This ratio should equal 100%, although values ranging from 80 to 120% are acceptable. If the measured mass is very low (< 5 to $10 \mu\text{g}/\text{m}^3$), percent mass may be outside of this range because the precision of the mass measurement is on the order of 1 to $2 \mu\text{g}/\text{m}^3$.

6.6.1 Ambient Sample Sets

Average ambient sample compositions were calculated for the seasonal sub-sets as well as for the total (annual) IMPROVE data sets, for each of the four sites, *i.e.* 20 ambient samples in total (Table 6.6-1).

Table 6.6-1a Average seasonal and annual sample sub-sets used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MBWI	MBSP	MBSU	MBFA	MBAL	MLWI	MLSP
Mass	4.6513 ± 0.2263	4.5564 ± 0.2204	6.0382 ± 0.2519	3.9135 ± 0.2075	4.7497 ± 0.2257	4.4531 ± 0.2178	5.6809 ± 0.2441
ammNitr	1.2909 ± 0.1320	0.4730 ± 0.0624	0.1172 ± 0.0277	0.5143 ± 0.0649	0.6108 ± 0.0729	0.7765 ± 0.0834	0.4712 ± 0.0582
ammSulf	1.8832 ± 0.0333	2.0662 ± 0.0363	1.8894 ± 0.0332	1.4158 ± 0.0252	1.8055 ± 0.0319	2.1260 ± 0.0370	2.7575 ± 0.0473
OC1	0.0781 ± 0.0560	0.0721 ± 0.0473	0.1508 ± 0.0739	0.0880 ± 0.0567	0.0959 ± 0.0581	0.0942 ± 0.0632	0.0830 ± 0.0494
OC2	0.1339 ± 0.0569	0.1534 ± 0.0537	0.3398 ± 0.0919	0.1694 ± 0.0610	0.1955 ± 0.0652	0.1299 ± 0.0585	0.1646 ± 0.0557
OC3	0.1749 ± 0.0570	0.1908 ± 0.0563	0.5477 ± 0.0984	0.3121 ± 0.0748	0.3011 ± 0.0711	0.1864 ± 0.0589	0.1900 ± 0.0550
OC4	0.1681 ± 0.0335	0.1599 ± 0.0325	0.2797 ± 0.0507	0.2083 ± 0.0421	0.2024 ± 0.0395	0.2030 ± 0.0376	0.1981 ± 0.0364
OPT	0.1581 ± 0.0463	0.1674 ± 0.0488	0.3356 ± 0.0967	0.1967 ± 0.0588	0.2115 ± 0.0619	0.1596 ± 0.0468	0.1910 ± 0.0551
EC1	0.2694 ± 0.0398	0.2455 ± 0.0369	0.4190 ± 0.0612	0.3036 ± 0.0479	0.3070 ± 0.0462	0.3181 ± 0.0461	0.3182 ± 0.0464
EC2	0.0548 ± 0.0236	0.0553 ± 0.0250	0.0839 ± 0.0354	0.0666 ± 0.0307	0.0648 ± 0.0286	0.0589 ± 0.0242	0.0721 ± 0.0294
EC3	0.0130 ± 0.0088	0.0137 ± 0.0097	0.0162 ± 0.0114	0.0154 ± 0.0110	0.0146 ± 0.0102	0.0131 ± 0.0089	0.0168 ± 0.0110
Al	0.0092 ± 0.0022	0.0276 ± 0.0032	0.0139 ± 0.0023	0.0093 ± 0.0019	0.0149 ± 0.0024	0.0104 ± 0.0026	0.0270 ± 0.0037
As	0.0010 ± 0.0001	0.0007 ± 0.0001	0.0011 ± 0.0006	0.0010 ± 0.0007	0.0010 ± 0.0004	0.0003 ± 0.0001	0.0003 ± 0.0001
Br	0.0015 ± 0.0001	0.0019 ± 0.0004	0.0009 ± 0.0006	0.0010 ± 0.0006	0.0013 ± 0.0004	0.0017 ± 0.0001	0.0022 ± 0.0002
Ca	0.0187 ± 0.0016	0.0251 ± 0.0019	0.0201 ± 0.0017	0.0227 ± 0.0019	0.0217 ± 0.0018	0.0127 ± 0.0014	0.0236 ± 0.0020
Cr	0.0009 ± 0.0003	0.0009 ± 0.0004	0.0009 ± 0.0004	0.0009 ± 0.0004	0.0009 ± 0.0004	0.0010 ± 0.0004	0.0012 ± 0.0005
Cu	0.0005 ± 0.0001	0.0007 ± 0.0005	0.0005 ± 0.0003	0.0006 ± 0.0003	0.0006 ± 0.0003	0.0008 ± 0.0001	0.0007 ± 0.0001
Fe	0.0322 ± 0.0017	0.0364 ± 0.0019	0.0320 ± 0.0017	0.0315 ± 0.0017	0.0330 ± 0.0017	0.0140 ± 0.0008	0.0249 ± 0.0014
K	0.0260 ± 0.0020	0.0271 ± 0.0020	0.0278 ± 0.0020	0.0342 ± 0.0024	0.0289 ± 0.0021	0.0228 ± 0.0019	0.0275 ± 0.0023
Mg	0.0132 ± 0.0038	0.0110 ± 0.0030	0.0072 ± 0.0027	0.0077 ± 0.0027	0.0098 ± 0.0031	0.0126 ± 0.0047	0.0105 ± 0.0037
Na	0.0751 ± 0.0131	0.0560 ± 0.0089	0.0376 ± 0.0066	0.0353 ± 0.0069	0.0511 ± 0.0089	0.0595 ± 0.0137	0.0643 ± 0.0111
Ni	0.0001 ± 0.0001	0.0001 ± 0.0002	0.0004 ± 0.0003	0.0006 ± 0.0002	0.0003 ± 0.0002	0.0006 ± 0.0001	0.0005 ± 0.0001
Pb	0.0015 ± 0.0002	0.0013 ± 0.0003	0.0009 ± 0.0006	0.0011 ± 0.0005	0.0012 ± 0.0004	0.0022 ± 0.0002	0.0022 ± 0.0002
Se	0.0002 ± 0.0001	0.0002 ± 0.0005	0.0003 ± 0.0002	0.0003 ± 0.0003	0.0003 ± 0.0003	0.0006 ± 0.0001	0.0004 ± 0.0008
Si	0.0377 ± 0.0035	0.0766 ± 0.0050	0.0625 ± 0.0044	0.0547 ± 0.0041	0.0576 ± 0.0042	0.0332 ± 0.0036	0.0761 ± 0.0056
V	0.0011 ± 0.0004	0.0011 ± 0.0005	0.0012 ± 0.0005	0.0013 ± 0.0005	0.0011 ± 0.0005	0.0018 ± 0.0006	0.0018 ± 0.0007
Zn	0.0037 ± 0.0002	0.0026 ± 0.0004	0.0024 ± 0.0005	0.0026 ± 0.0003	0.0029 ± 0.0004	0.0050 ± 0.0003	0.0042 ± 0.0003

MBWI Marama, Boundary Waters Canoe Area, winter mean ambient sample
 MBSP Marama, Boundary Waters Canoe Area, spring mean ambient sample
 MBSU Marama, Boundary Waters Canoe Area, summer mean ambient sample
 MBFA Marama, Boundary Waters Canoe Area, fall mean ambient sample
 MBAL Marama, Boundary Waters Canoe Area, annual mean ambient sample
 MLWI Marama, Lye Brook Wilderness Area, winter mean ambient sample
 MLSP Marama, Lye Brook Wilderness Area, spring mean ambient sample

Table 6.6-1b Average seasonal and annual sample sub-sets used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MLSU	MLFA	MLAL	MSWI	MSSP	MSSU
Mass	10.2242 ± 0.3597	5.6230 ± 0.2476	6.4667 ± 0.2667	5.8144 ± 0.2448	9.8709 ± 0.3446	18.8000 ± 0.5940
ammNitr	0.2480 ± 0.0342	0.4733 ± 0.0565	0.4916 ± 0.0581	1.0027 ± 0.1045	0.9027 ± 0.0988	0.3531 ± 0.0478
ammSulf	5.4312 ± 0.0906	2.9355 ± 0.0493	3.2996 ± 0.0558	3.0621 ± 0.0526	5.6186 ± 0.0950	11.6930 ± 0.1850
OC1	0.1477 ± 0.0735	0.1039 ± 0.0606	0.1070 ± 0.0616	0.0878 ± 0.0636	0.1353 ± 0.0671	0.2702 ± 0.1059
OC2	0.3130 ± 0.0873	0.1728 ± 0.0613	0.1943 ± 0.0656	0.1613 ± 0.0630	0.2865 ± 0.0738	0.5275 ± 0.1171
OC3	0.3610 ± 0.0762	0.2294 ± 0.0668	0.2412 ± 0.0643	0.2405 ± 0.0664	0.3041 ± 0.0688	0.3980 ± 0.0829
OC4	0.3137 ± 0.0530	0.2237 ± 0.0438	0.2342 ± 0.0427	0.2650 ± 0.0464	0.3626 ± 0.0580	0.5251 ± 0.0808
OPT	0.3443 ± 0.0984	0.1914 ± 0.0569	0.2206 ± 0.0640	0.2243 ± 0.0651	0.3166 ± 0.0898	0.6330 ± 0.1758
EC1	0.5130 ± 0.0733	0.3607 ± 0.0556	0.3768 ± 0.0553	0.4418 ± 0.0635	0.5660 ± 0.0792	0.8931 ± 0.1232
EC2	0.1025 ± 0.0411	0.0765 ± 0.0334	0.0775 ± 0.0320	0.0754 ± 0.0325	0.0965 ± 0.0382	0.1170 ± 0.0462
EC3	0.0193 ± 0.0126	0.0168 ± 0.0111	0.0165 ± 0.0109	0.0140 ± 0.0109	0.0175 ± 0.0126	0.0195 ± 0.0142
Al	0.0215 ± 0.0036	0.0109 ± 0.0026	0.0173 ± 0.0031	0.0138 ± 0.0028	0.0443 ± 0.0048	0.0487 ± 0.0058
As	0.0003 ± 0.0004	0.0002 ± 0.0002	0.0003 ± 0.0002	0.0003 ± 0.0001	0.0004 ± 0.0002	0.0003 ± 0.0003
Br	0.0014 ± 0.0004	0.0015 ± 0.0005	0.0017 ± 0.0003	0.0021 ± 0.0002	0.0028 ± 0.0002	0.0020 ± 0.0004
Ca	0.0179 ± 0.0020	0.0139 ± 0.0016	0.0170 ± 0.0018	0.0150 ± 0.0015	0.0313 ± 0.0025	0.0262 ± 0.0025
Cr	0.0013 ± 0.0006	0.0013 ± 0.0005	0.0012 ± 0.0005	0.0011 ± 0.0004	0.0012 ± 0.0005	0.0015 ± 0.0006
Cu	0.0007 ± 0.0006	0.0008 ± 0.0006	0.0007 ± 0.0003	0.0008 ± 0.0001	0.0010 ± 0.0001	0.0011 ± 0.0005
Fe	0.0219 ± 0.0012	0.0165 ± 0.0009	0.0193 ± 0.0011	0.0168 ± 0.0010	0.0383 ± 0.0020	0.0401 ± 0.0021
K	0.0254 ± 0.0024	0.0220 ± 0.0021	0.0243 ± 0.0022	0.0289 ± 0.0022	0.0400 ± 0.0028	0.0402 ± 0.0033
Mg	0.0117 ± 0.0046	0.0093 ± 0.0038	0.0110 ± 0.0042	0.0098 ± 0.0040	0.0117 ± 0.0041	0.0151 ± 0.0059
Na	0.0687 ± 0.0121	0.0559 ± 0.0102	0.0619 ± 0.0117	0.0519 ± 0.0118	0.0824 ± 0.0137	0.1146 ± 0.0195
Ni	0.0005 ± 0.0005	0.0006 ± 0.0005	0.0006 ± 0.0003	0.0002 ± 0.0001	0.0003 ± 0.0002	0.0005 ± 0.0004
Pb	0.0019 ± 0.0003	0.0020 ± 0.0004	0.0021 ± 0.0003	0.0022 ± 0.0002	0.0028 ± 0.0003	0.0025 ± 0.0004
Se	0.0006 ± 0.0004	0.0005 ± 0.0005	0.0005 ± 0.0004	0.0010 ± 0.0001	0.0009 ± 0.0005	0.0012 ± 0.0005
Si	0.0785 ± 0.0068	0.0486 ± 0.0046	0.0589 ± 0.0051	0.0448 ± 0.0041	0.1215 ± 0.0078	0.1452 ± 0.0103
V	0.0021 ± 0.0008	0.0023 ± 0.0008	0.0020 ± 0.0007	0.0014 ± 0.0005	0.0015 ± 0.0006	0.0018 ± 0.0008
Zn	0.0043 ± 0.0004	0.0045 ± 0.0004	0.0045 ± 0.0004	0.0055 ± 0.0005	0.0067 ± 0.0004	0.0063 ± 0.0005

MLSU Marama, Lye Brook Wilderness Area, summer mean ambient sample
 MLFA Marama, Lye Brook Wilderness Area, fall mean ambient sample
 MLAL Marama, Lye Brook Wilderness Area, annual mean ambient sample
 MSWI Marama, Shenandoah National Park, winter mean ambient sample
 MSSP Marama, Shenandoah National Park, spring mean ambient sample
 MSSU Marama, Shenandoah National Park, summer mean ambient sample

Table 6.6-1c Average seasonal and annual sample sub-sets used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MSFA	MSAL	MWWI	MWSP	MWSU	MWFA	MWAL
Mass	10.0164 ± 0.3535	11.1349 ± 0.3843	15.8216 ± 0.5073	14.7898 ± 0.4776	20.6870 ± 0.6480	14.6890 ± 0.4776	16.4575 ± 0.5265
ammNitr	0.6527 ± 0.0745	0.7273 ± 0.0814	2.9953 ± 0.2903	1.9939 ± 0.1979	0.9640 ± 0.0991	1.6680 ± 0.1659	1.9001 ± 0.1878
ammSulf	6.0046 ± 0.0992	6.6005 ± 0.1081	4.9520 ± 0.0862	6.7899 ± 0.1172	11.0070 ± 0.1894	6.4380 ± 0.1118	7.2850 ± 0.1260
OC1	0.1410 ± 0.0744	0.1586 ± 0.0777	0.5019 ± 0.1642	0.3229 ± 0.1133	0.3619 ± 0.1280	0.3800 ± 0.1340	0.3907 ± 0.1346
OC2	0.3147 ± 0.0820	0.3231 ± 0.0840	0.5498 ± 0.1133	0.5204 ± 0.1064	0.7367 ± 0.1468	0.6111 ± 0.1232	0.6040 ± 0.1224
OC3	0.3676 ± 0.0813	0.3284 ± 0.0749	1.0197 ± 0.1401	0.6708 ± 0.1023	0.7455 ± 0.1144	0.8859 ± 0.1303	0.8296 ± 0.1217
OC4	0.4083 ± 0.0666	0.3910 ± 0.0630	1.0006 ± 0.1394	0.7193 ± 0.1029	0.8118 ± 0.1169	0.8758 ± 0.1254	0.8508 ± 0.1210
OPT	0.3824 ± 0.1079	0.3892 ± 0.1097	0.2068 ± 0.0653	0.1666 ± 0.0527	0.3041 ± 0.0928	0.2380 ± 0.0754	0.2286 ± 0.0715
EC1	0.6607 ± 0.0937	0.6411 ± 0.0900	1.5252 ± 0.2054	1.1958 ± 0.1620	1.4080 ± 0.1909	1.5651 ± 0.2123	1.4235 ± 0.1927
EC2	0.1090 ± 0.0435	0.0997 ± 0.0402	0.0883 ± 0.0331	0.1143 ± 0.0409	0.1050 ± 0.0423	0.1091 ± 0.0422	0.1044 ± 0.0397
EC3	0.0202 ± 0.0142	0.0178 ± 0.0130	0.0178 ± 0.0114	0.0191 ± 0.0127	0.0193 ± 0.0135	0.0179 ± 0.0124	0.0185 ± 0.0125
Al	0.0211 ± 0.0034	0.0321 ± 0.0042	0.0304 ± 0.0052	0.0498 ± 0.0058	0.0606 ± 0.0072	0.0351 ± 0.0053	0.0439 ± 0.0059
As	0.0003 ± 0.0001	0.0003 ± 0.0002	0.0007 ± 0.0002	0.0006 ± 0.0002	0.0005 ± 0.0002	0.0006 ± 0.0002	0.0006 ± 0.0002
Br	0.0030 ± 0.0003	0.0025 ± 0.0003	0.0060 ± 0.0004	0.0047 ± 0.0004	0.0034 ± 0.0003	0.0047 ± 0.0004	0.0047 ± 0.0004
Ca	0.0235 ± 0.0022	0.0242 ± 0.0022	0.0379 ± 0.0032	0.0482 ± 0.0036	0.0429 ± 0.0036	0.0448 ± 0.0037	0.0435 ± 0.0035
Cr	0.0013 ± 0.0005	0.0012 ± 0.0005	0.0014 ± 0.0006	0.0015 ± 0.0006	0.0017 ± 0.0008	0.0016 ± 0.0007	0.0016 ± 0.0007
Cu	0.0010 ± 0.0004	0.0010 ± 0.0003	0.0046 ± 0.0004	0.0033 ± 0.0003	0.0033 ± 0.0003	0.0044 ± 0.0003	0.0039 ± 0.0003
Fe	0.0246 ± 0.0014	0.0301 ± 0.0016	0.1147 ± 0.0059	0.1088 ± 0.0056	0.1035 ± 0.0054	0.1241 ± 0.0064	0.1129 ± 0.0059
K	0.0360 ± 0.0028	0.0364 ± 0.0028	0.0714 ± 0.0046	0.0580 ± 0.0040	0.0754 ± 0.0051	0.0599 ± 0.0044	0.0660 ± 0.0045
Mg	0.0095 ± 0.0041	0.0115 ± 0.0045	0.0155 ± 0.0066	0.0146 ± 0.0053	0.0182 ± 0.0072	0.0141 ± 0.0056	0.0156 ± 0.0062
Na	0.0764 ± 0.0130	0.0815 ± 0.0145	0.1243 ± 0.0238	0.1284 ± 0.0190	0.1576 ± 0.0264	0.1238 ± 0.0201	0.1334 ± 0.0223
Ni	0.0007 ± 0.0004	0.0004 ± 0.0003	0.0023 ± 0.0002	0.0018 ± 0.0002	0.0012 ± 0.0004	0.0016 ± 0.0004	0.0017 ± 0.0003
Pb	0.0024 ± 0.0003	0.0025 ± 0.0003	0.0064 ± 0.0005	0.0059 ± 0.0005	0.0058 ± 0.0005	0.0071 ± 0.0005	0.0063 ± 0.0005
Se	0.0012 ± 0.0004	0.0011 ± 0.0004	0.0026 ± 0.0002	0.0017 ± 0.0004	0.0020 ± 0.0004	0.0022 ± 0.0004	0.0021 ± 0.0003
Si	0.0808 ± 0.0063	0.0986 ± 0.0071	0.0796 ± 0.0067	0.1421 ± 0.0093	0.1660 ± 0.0115	0.1180 ± 0.0090	0.1265 ± 0.0091
V	0.0016 ± 0.0007	0.0016 ± 0.0007	0.0062 ± 0.0012	0.0043 ± 0.0010	0.0034 ± 0.0011	0.0040 ± 0.0011	0.0045 ± 0.0011
Zn	0.0060 ± 0.0005	0.0061 ± 0.0005	0.0195 ± 0.0011	0.0150 ± 0.0009	0.0123 ± 0.0007	0.0161 ± 0.0009	0.0157 ± 0.0009

MSFA Marama, Shenandoah National Park, fall mean ambient sample
MSAL Marama, Shenandoah National Park, annual mean ambient sample
MWWI Marama, Washinton DC, winter mean ambient sample
MWSP Marama, Washington DC, spring mean ambient sample
MWSU Marama, Washington DC, summer mean ambient sample
MWFA Marama, Washington DC, fall mean ambient sample
MWAL Marama, Washington DC, annual mean ambient sample

6.6.2 Source Profiles Derived from PMF Modeled Profiles.

Of the 180 profiles originally modeled by PMF, 120 (Table 6.6-24) were assigned specific source type names, based on comparisons with similar measured profiles from the DRI's data base and other published measured and modeled sources (Braaten and Cahil, 1986, Engelbrecht *et al.*, 2002, Huang *et al.*, 1999, 2001, Perry *et al.*, 1997, Poirot, *et al.*, 2001, Watson, *et al.*, 1994, xxx personal communication). The PMF generated source profiles are expressed as relative mass abundances, and had to be recalculated to mass fractions, after adjusting for the ammonium sulfate, ammonium nitrate, sodium chloride (sea salt), oxides and hydrocarbons (component of OC), as is described below.

Separate calculations were performed on each of the sample subsets, by season and site, since the hydrocarbon correction factors. The latter was calculated from the average ambient samples (**Table 6.6-1**) by equating the sum of all species mass (measured and not measured) to the measured mass, for each sample subset (IMPROVE, 2002; Sisler and Malm, 2000; Solomon, *et al.*, 1989; Turpin and Lim, 2001; Zhang, *et al.*, 1990) are that all sulfate is ammonium sulfate, all nitrate is ammonium nitrate, all sodium is sodium chloride and all crustal species (Al, Ca, Fe, K, Mg and Si) are silicates or oxides, and that all hydrogen and organic oxygen are part of OC. The other trace species and EC are added in as elemental mass.

Σ Species (ammNitr, ammSulf, (Fac).OC, EC, Al₂O₃, As, Br, CaO, Cr, Cu, Fe₂O₃, K₂O, MgO, NaCl, Ni, Pb, Se, SiO₂, V, Zn) mass = Measured mass, where Fac = hydrocarbon correction factor.

The hydrocarbon correction factor (Fac) calculated for each sample subset is given in Table 6.6-2. For the three rural sites, the lowest hydrocarbon correction factors were calculated for the winter season, while the highest for all four sites, is the summer season. This is ascribed to the higher proportion of hydrocarbons from seasonal sources such as vegetative burning and biogenic emissions during the summer months. Washington DC differs from the other three sites by having the lowest correction factor not in winter, but fall. This anomalous pattern is ascribed to the contribution of motor vehicle emissions and perhaps other urban emissions.

Table 6.6-2 Hydrocarbon correction factors (Fac) applied to the PMF modeled source profiles to reconstruct mass

	Annual	Winter	Spring	Summer	Fall
Boundary Waters Canoe Area	1.73	1.23	1.83	2.10	1.50
Lye Brook Wilderness Area	2.00	1.26	2.10	2.54	1.72
Shenandoah National Park	1.76	1.10	1.60	2.33	1.48
Washington DC	1.68	1.68	1.57	2.11	1.38

These same hydrocarbon correction factors were applied to the 120 identified PMF modeled source profiles, in order to reconstruct mass. In each case the ammonium nitrate, ammonium sulfate and sodium (marine) were considered not to be part of the source profiles. Derived PMF modeled profiles include one biogenic emissions profile, 14 coal fired power plant profiles, two diesel vehicle emissions, two gasoline vehicle emissions, seven motor vehicle emissions profiles, 28 geological dust profiles, five iron and steel industry profiles, 10 oil combustion profiles, five road dust profiles, 11 secondary organics profiles, 15 smelter emissions profiles, and 20 vegetative burning profiles.

Separate secondary ammonium sulfate, secondary ammonium nitrate and marine salt were included in the CMB model.

Various combinations from the 120 PMF modeled source profiles were evaluated for the CMB modeling, based on the performance measures previously described. For the 20 ambient samples, the sub-set of 18 PMF modeled source profiles proved to be those that best fitted the 20 ambient samples. These include four power plant emission profiles, one diesel vehicle emissions profile, two geological dust profiles, one iron and steel industry profile, one motor vehicle emissions profile, two oil combustion profiles, one smelter profile, and six vegetative burning profiles, as listed in Table 6.6-3 and portrayed in Figure 6.6-1. The two geological dust profiles (MGIDst01, 02) represent the more aluminous and more calcium siliceous end members of the actual dust found in the sampled region. These same profiles were used as CMB input to all 20 ambient samples, but modeled in variable ratios. The secondary organic profiles were not modeled as potential sources, because they were considered to be reacted mixtures of primary organic sources such as vegetative burning and motor vehicle emissions.

Table 6.6-3a. PMF source profiles used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MCoIPP08	MCoIPP10	MCoIPP11	MCoIPP14	MDsEmi02	MGIDst01
ammNitr	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
ammSulf	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
OC1	0.114658 ± 0.098560	0.047819 ± 0.032816	0.019571 ± 0.012304	0.032448 ± 0.007886	0.090055 ± 0.077132	0.000530 ± 0.013305
OC2	0.103101 ± 0.108310	0.212777 ± 0.050410	0.204694 ± 0.023889	0.162563 ± 0.016062	0.000400 ± 0.017925	0.001689 ± 0.030062
OC3	0.000204 ± 0.009648	0.000097 ± 0.004183	0.000049 ± 0.002237	0.018980 ± 0.010324	0.000916 ± 0.038447	0.000253 ± 0.007009
OC4	0.000833 ± 0.035313	0.176943 ± 0.033229	0.017006 ± 0.012746	0.136603 ± 0.011289	0.000939 ± 0.036270	0.000165 ± 0.004553
OPT	0.000103 ± 0.004651	0.000144 ± 0.005563	0.109127 ± 0.011710	0.016577 ± 0.002612	0.001536 ± 0.021972	0.007380 ± 0.006675
EC1	0.000166 ± 0.007838	0.000100 ± 0.004309	0.260797 ± 0.017149	0.154422 ± 0.015348	0.373417 ± 0.094844	0.000250 ± 0.006503
EC2	0.276578 ± 0.050100	0.087178 ± 0.023645	0.017780 ± 0.008771	0.002737 ± 0.003350	0.353117 ± 0.046730	0.000646 ± 0.012036
EC3	0.000267 ± 0.009485	0.000054 ± 0.002142	0.004648 ± 0.002544	0.002300 ± 0.000838	0.036014 ± 0.011736	0.000321 ± 0.002741
Al	0.000011 ± 0.000528	0.013470 ± 0.002611	0.002231 ± 0.000690	0.000087 ± 0.000481	0.000107 ± 0.002644	0.304975 ± 0.002372
As	0.000595 ± 0.000138	0.000000 ± 0.000006	0.000004 ± 0.000017	0.000013 ± 0.000011	0.000341 ± 0.000070	0.000000 ± 0.000008
Br	0.000004 ± 0.000152	0.005931 ± 0.000151	0.000303 ± 0.000031	0.000783 ± 0.000031	0.000226 ± 0.000172	0.003846 ± 0.000079
Ca	0.000008 ± 0.000398	0.000008 ± 0.000324	0.000001 ± 0.000052	0.000017 ± 0.000321	0.019322 ± 0.002452	0.000020 ± 0.000527
Cr	0.000004 ± 0.000139	0.003019 ± 0.000279	0.000055 ± 0.000096	0.000205 ± 0.000047	0.000315 ± 0.000191	0.002102 ± 0.000173
Cu	0.000001 ± 0.000033	0.000001 ± 0.000029	0.000204 ± 0.000019	0.000102 ± 0.000029	0.000312 ± 0.000109	0.000370 ± 0.000030
Fe	0.021928 ± 0.001875	0.023526 ± 0.001293	0.000003 ± 0.000148	0.000002 ± 0.000071	0.000009 ± 0.000355	0.019835 ± 0.000689
K	0.016244 ± 0.004617	0.000008 ± 0.000340	0.000002 ± 0.000070	0.000002 ± 0.000113	0.039186 ± 0.003693	0.046382 ± 0.001723
Mg	0.035511 ± 0.005391	0.041057 ± 0.002821	0.001971 ± 0.001097	0.005999 ± 0.000729	0.010668 ± 0.004205	0.023266 ± 0.001720
Na	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
Ni	0.000272 ± 0.000118	0.000001 ± 0.000025	0.000030 ± 0.000016	0.000092 ± 0.000016	0.000043 ± 0.000074	0.000093 ± 0.000026
Pb	0.000003 ± 0.000133	0.002550 ± 0.000179	0.000001 ± 0.000026	0.000003 ± 0.000043	0.000002 ± 0.000078	0.000720 ± 0.000081
Se	0.004416 ± 0.000194	0.005705 ± 0.000077	0.001163 ± 0.000026	0.001089 ± 0.000019	0.000341 ± 0.000120	0.000000 ± 0.000002
Si	0.168167 ± 0.007404	0.025162 ± 0.004877	0.000017 ± 0.000599	0.032358 ± 0.001064	0.000041 ± 0.001787	0.131850 ± 0.003742
V	0.000006 ± 0.000223	0.002849 ± 0.000356	0.000019 ± 0.000120	0.000001 ± 0.000044	0.000421 ± 0.000238	0.000002 ± 0.000048
Zn	0.007036 ± 0.000737	0.011200 ± 0.000300	0.000054 ± 0.000087	0.000665 ± 0.000090	0.005865 ± 0.000548	0.000003 ± 0.000058

MSPWI8 -MCoIPP08 Marama, Coal Fired Power Plant Profile 05, Shenandoah National Park, winter
MSPSP8 -MCoIPP10 Marama, Coal Fired Power Plant Profile 10, Shenandoah National Park, spring
MSPSU1 -MCoIPP11 Marama, Coal Fired Power Plant Profile 11, Shenandoah National Park, summer
MWPSU9 -MCoIPP14 Marama, Coal Fired Power Plant Profile 14, Washington DC, summer
MSPFA3 -MDsEmi02 Marama, Diesel Vehicle Emissions Profile 02, Shenandoah National Park, fall
MBPAL1 -MGIDst01 Marama, Geological Dust Profile 01, Boundary Waters Canoe Area, annual

Table 6.6-3b. PMF source profiles used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MGIDst02	MIR&St03	MMvEmi07	MOilCo02	MOilCo03	MSmelt06
ammNitr	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
ammSulf	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
OC1	0.018116 ± 0.008663	0.000293 ± 0.010718	0.009248 ± 0.004049	0.042048 ± 0.181541	0.070248 ± 0.028485	0.000165 ± 0.008456
OC2	0.051846 ± 0.012748	0.069599 ± 0.019925	0.086002 ± 0.006610	0.000982 ± 0.050168	0.000187 ± 0.009627	0.000153 ± 0.006839
OC3	0.043950 ± 0.012151	0.090191 ± 0.022514	0.109680 ± 0.005342	0.591669 ± 0.179302	0.062741 ± 0.023382	0.000265 ± 0.010854
OC4	0.014336 ± 0.007466	0.080879 ± 0.013307	0.103380 ± 0.005136	0.002940 ± 0.108504	0.046677 ± 0.026954	0.004404 ± 0.042246
OPT	0.000044 ± 0.001068	0.147067 ± 0.018551	0.000007 ± 0.000335	0.000177 ± 0.009721	0.001308 ± 0.034596	0.000199 ± 0.010162
EC1	0.000026 ± 0.000713	0.205380 ± 0.016374	0.257761 ± 0.006868	0.002524 ± 0.103719	0.000117 ± 0.006321	0.546486 ± 0.106339
EC2	0.028106 ± 0.004722	0.018900 ± 0.008969	0.023680 ± 0.001895	0.000495 ± 0.025796	0.040204 ± 0.021794	0.000208 ± 0.010734
EC3	0.000005 ± 0.000139	0.005946 ± 0.002769	0.002294 ± 0.000395	0.034582 ± 0.022887	0.005768 ± 0.003662	0.006233 ± 0.010707
Al	0.000975 ± 0.000454	0.000085 ± 0.000892	0.000725 ± 0.000217	0.000829 ± 0.008350	0.000100 ± 0.000891	0.013465 ± 0.004293
As	0.000000 ± 0.000001	0.004646 ± 0.000063	0.000042 ± 0.000005	0.001309 ± 0.000210	0.000129 ± 0.000047	0.000001 ± 0.000006
Br	0.000197 ± 0.000028	0.000004 ± 0.000046	0.000384 ± 0.000014	0.000048 ± 0.000528	0.002299 ± 0.000262	0.019197 ± 0.000374
Ca	0.087521 ± 0.000531	0.000029 ± 0.000687	0.006895 ± 0.000171	0.000009 ± 0.000520	0.007550 ± 0.001265	0.002569 ± 0.003593
Cr	0.000001 ± 0.000021	0.000117 ± 0.000120	0.000116 ± 0.000025	0.000467 ± 0.000607	0.001337 ± 0.000299	0.000030 ± 0.000797
Cu	0.000000 ± 0.000001	0.000001 ± 0.000013	0.000998 ± 0.000017	0.017170 ± 0.000372	0.002340 ± 0.000197	0.006716 ± 0.000196
Fe	0.064117 ± 0.000341	0.123502 ± 0.001539	0.031858 ± 0.000317	0.052132 ± 0.002918	0.002495 ± 0.000344	0.145145 ± 0.002664
K	0.018551 ± 0.000679	0.006890 ± 0.000876	0.002244 ± 0.000205	0.000077 ± 0.003778	0.010521 ± 0.001531	0.066781 ± 0.005410
Mg	0.000006 ± 0.000170	0.008759 ± 0.001078	0.001612 ± 0.000283	0.000072 ± 0.003788	0.001674 ± 0.001660	0.000054 ± 0.002665
Na	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010
Ni	0.000020 ± 0.000010	0.000000 ± 0.000002	0.000000 ± 0.000003	0.024203 ± 0.000379	0.016294 ± 0.000257	0.000646 ± 0.000168
Pb	0.000694 ± 0.000030	0.000002 ± 0.000041	0.000000 ± 0.000007	0.002057 ± 0.000854	0.001589 ± 0.000096	0.033656 ± 0.000524
Se	0.000045 ± 0.000006	0.000127 ± 0.000011	0.000000 ± 0.000007	0.000006 ± 0.000189	0.000000 ± 0.000007	0.006530 ± 0.000171
Si	0.238300 ± 0.001428	0.000722 ± 0.002133	0.000001 ± 0.000049	0.000210 ± 0.008202	0.205000 ± 0.006460	0.000012 ± 0.000628
V	0.000111 ± 0.000044	0.000132 ± 0.000147	0.000207 ± 0.000030	0.028434 ± 0.001413	0.002338 ± 0.000402	0.002917 ± 0.001227
Zn	0.000535 ± 0.000044	0.000464 ± 0.000059	0.002004 ± 0.000043	0.008411 ± 0.001290	0.000001 ± 0.000071	0.051392 ± 0.000096

MBPAL2 - MGIDst02 Marama, Geological Dust Profile 02, Boundary Waters Canoe Area, annual
 MBPSP8 - MIR&St03 Marama, Iron and Steel Industry Profile 03, Boundary Waters Canoe Area, spring
 MWPSU5 - MMvEmi07 Marama, Motor Vehicle Emissions Profile 07, Washington DC, summer
 MLPWI7 - MOilCo02 Marama, Oil Combustion Profile 02, Lye Brook Wilderness Area, winter
 MLPSU7 - MOilCo03 Marama, Oil Combustion Profile 03, Lye Brook Wilderness Area, summer
 MLPFA2 - MSmelt06 Marama, Smelter 06, Lye Brook Wilderness Area, fall

Table 6.6-3c. PMF source profiles used as input to the CMB model ($\mu\text{g}/\text{m}^3$)

	MVgBrn08	MVgBrn10	MVgBrn12	MVgBrn15	MVgBrn19	MVgBrn20	
ammNitr	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ±	0.000010
ammSulf	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ±	0.000010
OC1	0.028461 ± 0.003195	0.036522 ± 0.005075	0.023497 ± 0.002242	0.028016 ± 0.001961	0.018655 ± 0.002981	0.013024 ±	0.004301
OC2	0.073778 ± 0.004192	0.068233 ± 0.006176	0.083815 ± 0.002925	0.086867 ± 0.002917	0.101510 ± 0.005668	0.134080 ±	0.005050
OC3	0.108946 ± 0.004191	0.137660 ± 0.006045	0.182034 ± 0.002677	0.081489 ± 0.001990	0.141069 ± 0.004273	0.186034 ±	0.005137
OC4	0.098942 ± 0.002993	0.060629 ± 0.003723	0.162461 ± 0.002467	0.095060 ± 0.001865	0.116555 ± 0.004255	0.174870 ±	0.004518
OPT	0.128362 ± 0.003805	0.083037 ± 0.006361	0.000003 ± 0.000058	0.108077 ± 0.002454	0.006273 ± 0.001122	0.000004 ±	0.000178
EC1	0.170304 ± 0.004009	0.069856 ± 0.004942	0.168280 ± 0.002792	0.169787 ± 0.002570	0.177794 ± 0.006199	0.286013 ±	0.004206
EC2	0.022373 ± 0.002195	0.004936 ± 0.002538	0.006367 ± 0.001076	0.000966 ± 0.000995	0.004649 ± 0.001213	0.000011 ±	0.000473
EC3	0.005084 ± 0.000583	0.003022 ± 0.000779	0.001060 ± 0.000288	0.001045 ± 0.000330	0.000793 ± 0.000324	0.001792 ±	0.000304
Al	0.000291 ± 0.000252	0.000230 ± 0.000205	0.000012 ± 0.000105	0.000171 ± 0.000090	0.000543 ± 0.000182	0.000737 ±	0.000146
As	0.000000 ± 0.000004	0.000000 ± 0.000003	0.000042 ± 0.000003	0.000000 ± 0.000000	0.000000 ± 0.000003	0.000000 ±	0.000002
Br	0.000260 ± 0.000014	0.000094 ± 0.000009	0.001204 ± 0.000008	0.000132 ± 0.000005	0.000452 ± 0.000011	0.000326 ±	0.000018
Ca	0.000001 ± 0.000040	0.001781 ± 0.000126	0.003766 ± 0.000074	0.000000 ± 0.000015	0.002049 ± 0.000131	0.000002 ±	0.000075
Cr	0.000212 ± 0.000033	0.000182 ± 0.000032	0.000000 ± 0.000003	0.000004 ± 0.000012	0.000131 ± 0.000019	0.000000 ±	0.000004
Cu	0.000000 ± 0.000001	0.000025 ± 0.000005	0.000002 ± 0.000004	0.000000 ± 0.000003	0.000000 ± 0.000006	0.000000 ±	0.000005
Fe	0.000002 ± 0.000080	0.000001 ± 0.000030	0.000023 ± 0.000051	0.000000 ± 0.000009	0.000020 ± 0.000147	0.000003 ±	0.000113
K	0.004440 ± 0.000223	0.005455 ± 0.000179	0.016128 ± 0.000123	0.003991 ± 0.000086	0.006139 ± 0.000153	0.007140 ±	0.000193
Mg	0.001213 ± 0.000320	0.001455 ± 0.000282	0.001270 ± 0.000130	0.000005 ± 0.000114	0.000044 ± 0.000232	0.000001 ±	0.000064
Na	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ± 0.000010	0.000001 ±	0.000010
Ni	0.000006 ± 0.000006	0.000000 ± 0.000004	0.000024 ± 0.000003	0.000000 ± 0.000001	0.000000 ± 0.000004	0.000000 ±	0.000002
Pb	0.000375 ± 0.000019	0.000000 ± 0.000003	0.000000 ± 0.000000	0.000001 ± 0.000006	0.000000 ± 0.000007	0.000000 ±	0.000009
Se	0.000008 ± 0.000004	0.000000 ± 0.000001	0.000153 ± 0.000003	0.000001 ± 0.000003	0.000283 ± 0.000007	0.000000 ±	0.000005
Si	0.000036 ± 0.000479	0.005608 ± 0.000338	0.000001 ± 0.000030	0.000011 ± 0.000166	0.000001 ± 0.000053	0.000001 ±	0.000057
V	0.000345 ± 0.000043	0.000358 ± 0.000045	0.000054 ± 0.000014	0.000012 ± 0.000016	0.000249 ± 0.000026	0.000186 ±	0.000036
Zn	0.000575 ± 0.000029	0.000000 ± 0.000006	0.000765 ± 0.000014	0.000108 ± 0.000012	0.000158 ± 0.000029	0.000612 ±	0.000047

MLPSP2 -MVgBrn08 Marama, Vegetative Burning, Profile 08, Lye Brook Winderness Area, spring
 MLPSU6 -MVgBrn10 Marama, Vegetative Burning, Profile 10, Lye Brook Winderness Area, summer
 MSPAL6 -MVgBrn12 Marama, Vegetative Burning, Profile 12, Shenandoah National Park, annual
 MSPSU6 -MVgBrn15 Marama, Vegetative Burning, Profile 15, Shenandoah National Park, summer
 MWPSU8 -MVgBrn19 Marama, Vegetative Burning, Profile 19, Washington DC, summer
 MWPFPA6 -MVgBrn20 Marama, Vegetative Burning, Profile 20, Washington DC, fall

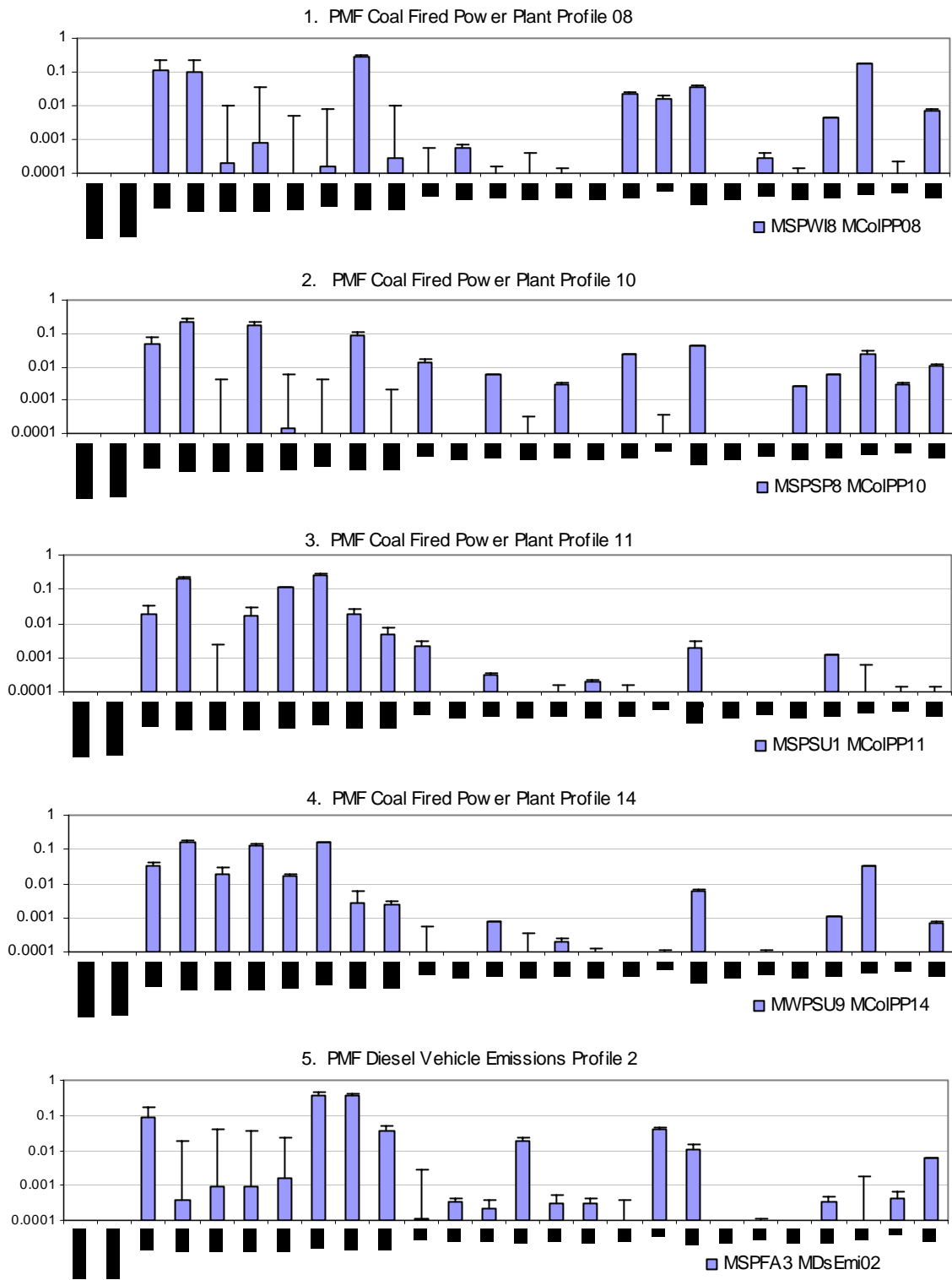


Figure 6.6-1a. PMF modeled source profiles used as input to the CMB model

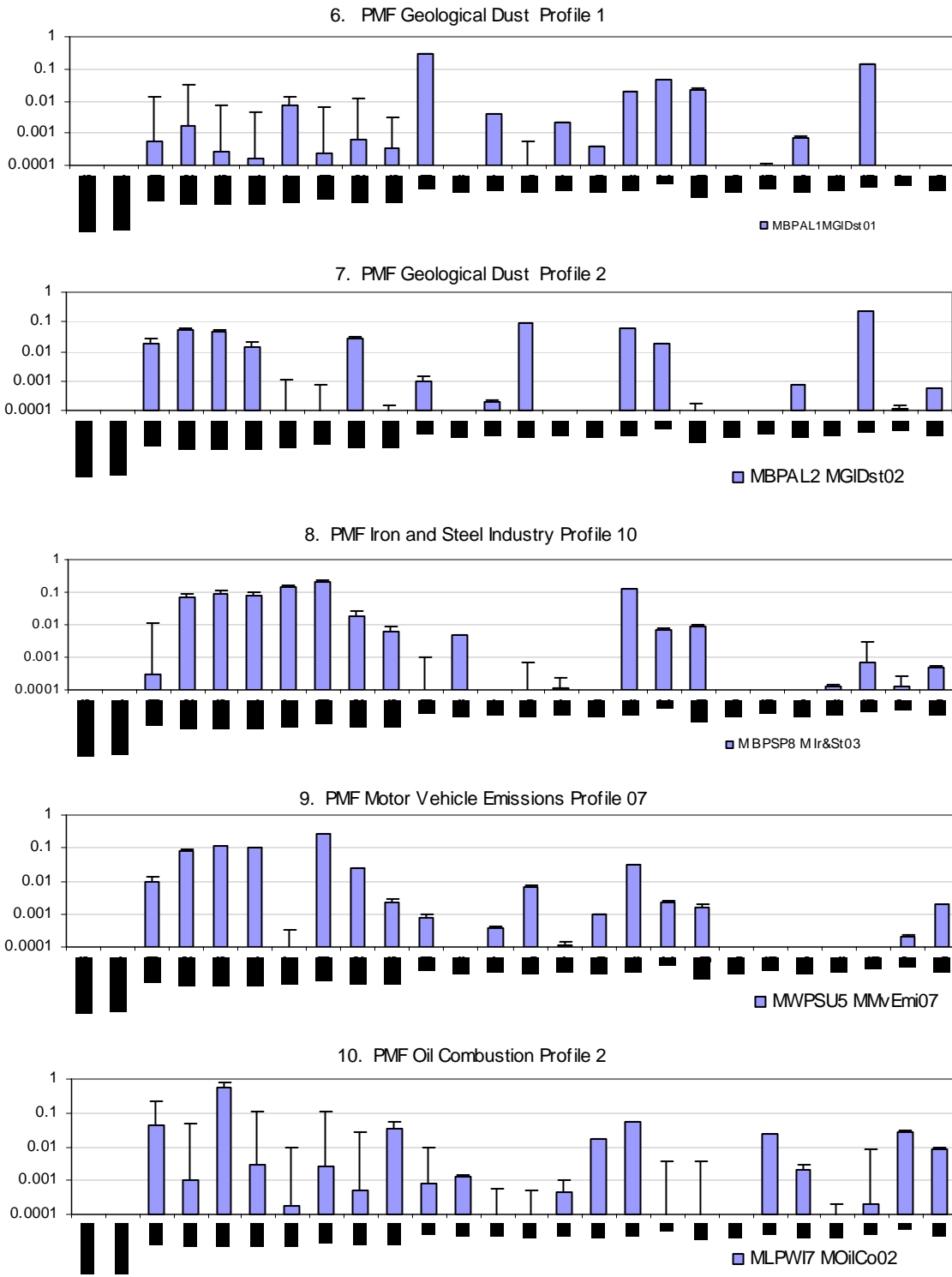


Figure 6.6-1b. PMFmodeled source profiles used as input to the CMB model

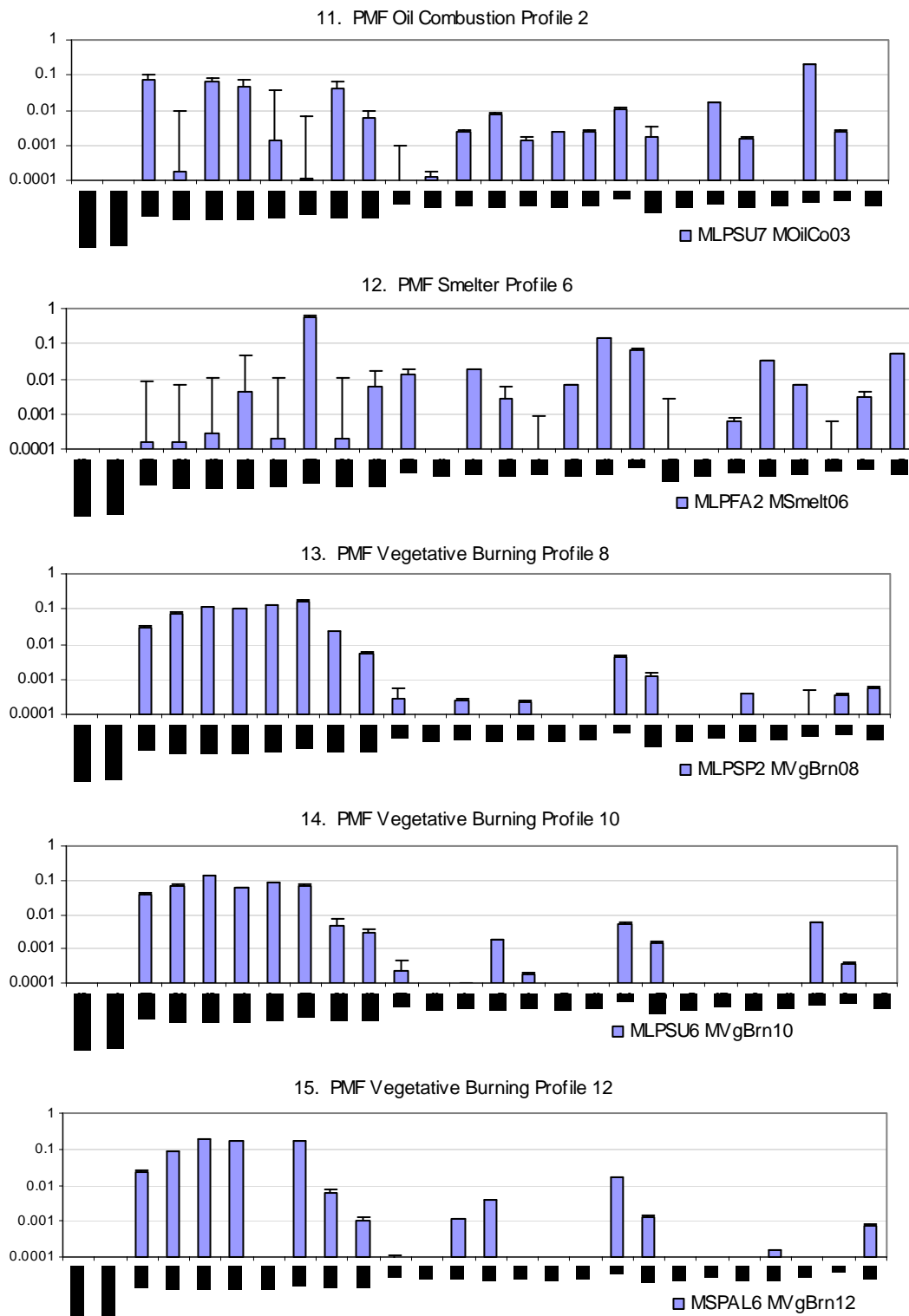


Figure 6.6-1c. PMF modeled source profiles used as input to the CMB model

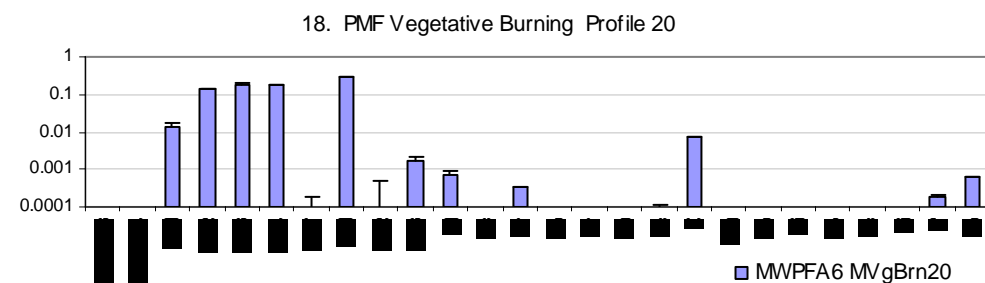
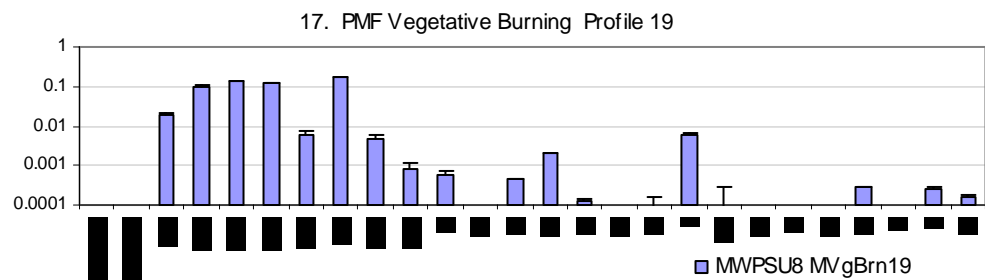
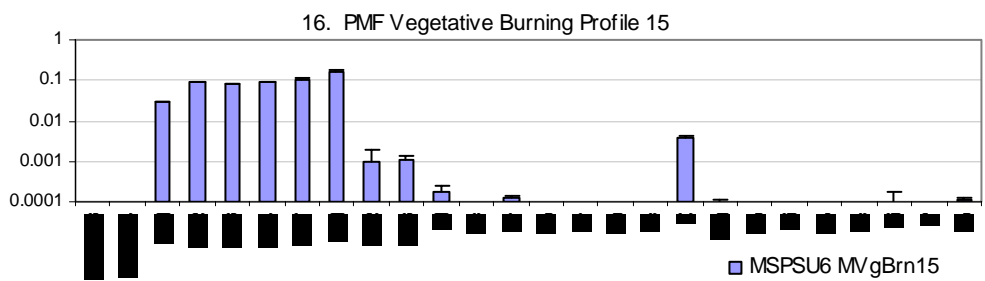


Table 6.6-1d. PMFmodeled source profiles used as input to the CMB model

6.6.3 Boundary Waters Canoe Area

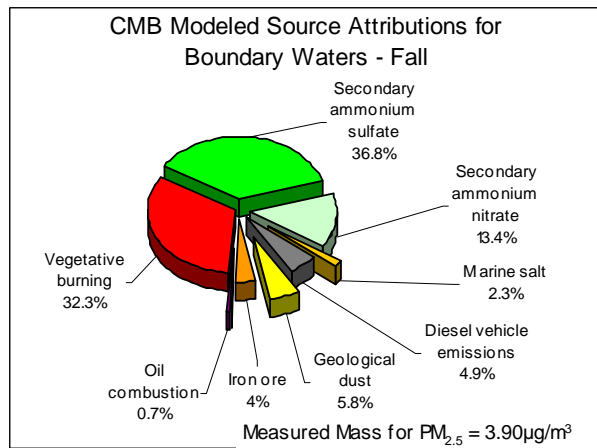
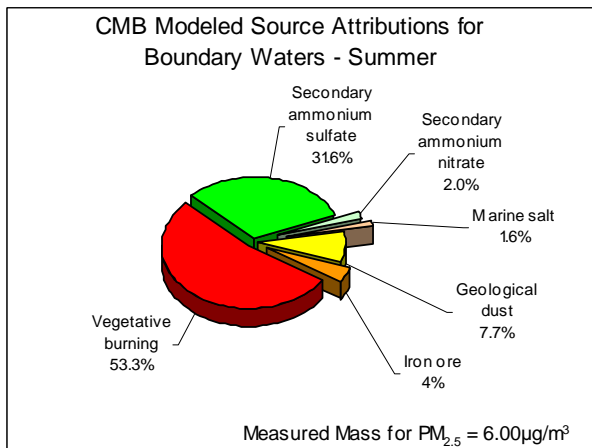
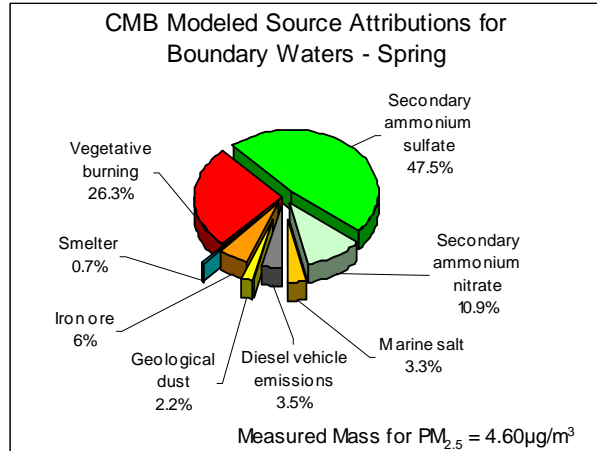
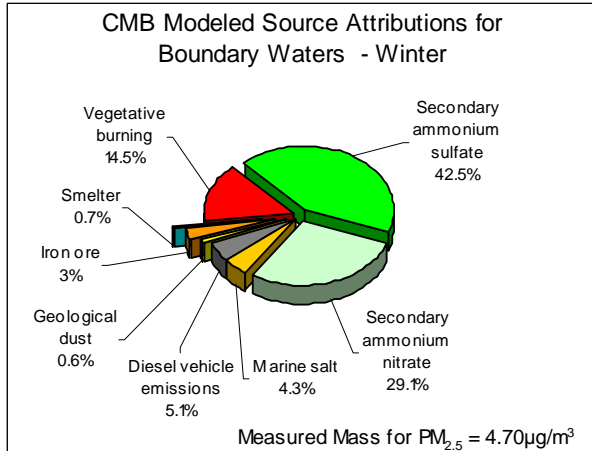
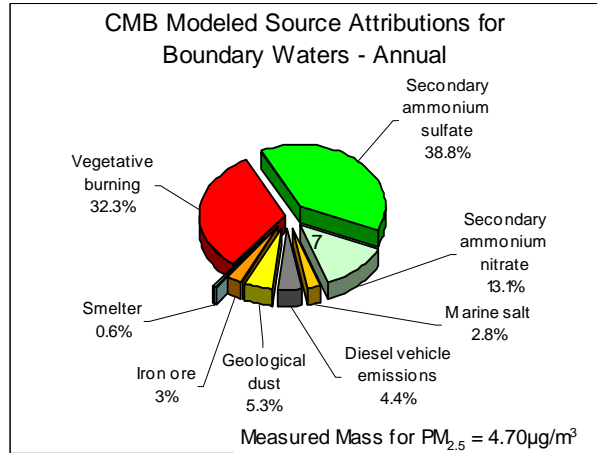


Figure 6.6-2 CMB modeled source attributions for annual and seasonal data subsets from Boundary Waters Canoe Area.

Table 6.6-4a CMB model output for Boundary Waters Canoe Area, winter

SOURCE CONTRIBUTION ESTIMATES - SITE: MBWIMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.7
 CHI SQUARE 2.49 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPFA3	MDsEmi02	0.22612	0.03447	6.55907
YES MBPAL1	MGlDst01	0.02879	0.00733	3.92604
YES MBPAL2	MGlDst02	0.13389	0.01207	11.09502
YES MBPSP8	MIR&St03	0.16269	0.01291	12.60391
YES MLPFA2	Msmelt06	0.03312	0.00377	8.78210
YES MSPAL6	MVgBrn12	0.64258	0.08406	7.64465
YES MAMSUL	AMSUL	1.88324	0.03826	49.22682
YES MAMNIT	AMNIT	1.29135	0.13263	9.73653
YES MNACL	NACL	0.19094	0.03839	4.97407

MEASURED CONCENTRATION FOR SIZE: PM2.5
 4.7+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 0.93026 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00287 0.00693 0.01021 0.01421 0.03235 0.03826 0.03839 0.08500
 0.13263

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MBPSP8	1.0000 MLPFA2
1.0000 MSPAL6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-4b CMB model output for Boundary Waters Canoe Area, winter

SPECIES CONCENTRATIONS - SITE: MBWIMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.7
 CHI SQUARE 2.49 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	4.65130+- 0.22630	4.59273+- 0.16317	0.99+- 0.06	-0.2
N3IC	N3IU	* 1.29090+- 0.13200	1.29136+- 0.01291	1.00+- 0.10	0.0
S4IC	S4IU	* 1.88320+- 0.03330	1.88324+- 0.01883	1.00+- 0.02	0.0
OC1C	OC1U	* 0.07810+- 0.05600	0.03796+- 0.01763	0.49+- 0.42	-0.7
OC2C	OC2U	* 0.13390+- 0.05690	0.07227+- 0.00585	0.54+- 0.23	-1.1
OC3C	OC3U	* 0.17490+- 0.05700	0.13776+- 0.00974	0.79+- 0.26	-0.6
OC4C	OC4U	* 0.16810+- 0.03350	0.11984+- 0.00880	0.71+- 0.15	-1.4
OPTC	OPTU	* 0.15810+- 0.04630	0.02450+- 0.00583	0.15+- 0.06	-2.9
EC1C	EC1U	* 0.26940+- 0.03980	0.24410+- 0.02197	0.91+- 0.16	-0.6
EC2C	EC2U	* 0.05480+- 0.02360	0.09081+- 0.01072	1.66+- 0.74	1.4
EC3C	EC3U	* 0.01300+- 0.00880	0.01001+- 0.00272	0.77+- 0.56	-0.3
ALXC	ALXU	* 0.00920+- 0.00220	0.00941+- 0.00064	1.02+- 0.25	0.1
ASXC	ASXU	* 0.00100+- 0.00010	0.00086+- 0.00003	0.86+- 0.09	-1.3
BRXC	BRXU	* 0.00150+- 0.00010	0.00160+- 0.00005	1.07+- 0.08	0.9
CAXC	CAXU	* 0.01870+- 0.00160	0.01860+- 0.00058	0.99+- 0.09	-0.1
CRXC	CRXU	* 0.00090+- 0.00030	0.00016+- 0.00006	0.17+- 0.09	-2.4
CUXC	CUXU	* 0.00050+- 0.00010	0.00031+- 0.00003	0.62+- 0.14	-1.8
FEXC	FEXU	* 0.03220+- 0.00170	0.03408+- 0.00028	1.06+- 0.06	1.1
KPXC	KPXU	* 0.02600+- 0.00200	0.02638+- 0.00088	1.01+- 0.09	0.2
MGXC	MGXU	* 0.01320+- 0.00380	0.00533+- 0.00098	0.40+- 0.14	-2.0
NAXC	NAXU	* 0.07510+- 0.01310	0.07512+- 0.00751	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00010+- 0.00010	0.00006+- 0.00003	0.55+- 0.62	-0.4
PBXC	PBXU	* 0.00150+- 0.00020	0.00123+- 0.00003	0.82+- 0.11	-1.3
SEXC	SEXU	* 0.00020+- 0.00010	0.00042+- 0.00004	2.11+- 1.07	2.1
SIXC	SIXU	* 0.03770+- 0.00350	0.03583+- 0.00058	0.95+- 0.09	-0.5
VAXC	VAXU	* 0.00110+- 0.00040	0.00027+- 0.00008	0.24+- 0.11	-2.0
ZNXC	ZNXU	* 0.00370+- 0.00020	0.00367+- 0.00013	0.99+- 0.06	-0.1

Table 6.6-5a CMB model output for Boundary Waters Canoe Area, spring

SOURCE CONTRIBUTION ESTIMATES - SITE: MBSPMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.2
 CHI SQUARE 1.49 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPFA3	MDsEmi02	0.15308	0.04189	3.65405
YES	MBPAL1	MGlDst01	0.09506	0.01024	9.28751
YES	MBPAL2	MGlDst02	0.24585	0.01543	15.92891
YES	MBPSP8	MIR&St03	0.12648	0.01433	8.82467
YES	MLPFA2	Msmelt06	0.02906	0.00603	4.81593
YES	MWPSU8	MVgBrn19	1.14513	0.16087	7.11843
YES	MAMSUL	AMSUL	2.06622	0.04177	49.46834
YES	MAMNIT	AMNIT	0.47305	0.06258	7.55931
YES	MNACL	NACL	0.14236	0.02673	5.32557

MEASURED CONCENTRATION FOR SIZE: PM2.5
 4.6+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 0.91128 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00504 0.00974 0.01245 0.01692 0.02673 0.03679 0.04177 0.06258
 0.16218

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MBPSP8	1.0000 MLPFA2
1.0000 MWPSU8	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-5b CMB model output for Boundnary Waters Canoe Area, spring

SPECIES CONCENTRATIONS - SITE: MBSPMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.2
 CHI SQUARE 1.49 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	4.55640+- 0.22040	4.47629+- 0.16536	0.98+- 0.06	-0.3
N3IC	N3IU	* 0.47300+- 0.06240	0.47306+- 0.00473	1.00+- 0.13	0.0
S4IC	S4IU	* 2.06620+- 0.03630	2.06623+- 0.02066	1.00+- 0.02	0.0
OC1C	OC1U	* 0.07210+- 0.04730	0.03970+- 0.01261	0.55+- 0.40	-0.7
OC2C	OC2U	* 0.15340+- 0.05370	0.13802+- 0.00860	0.90+- 0.32	-0.3
OC3C	OC3U	* 0.19080+- 0.05630	0.18393+- 0.00873	0.96+- 0.29	-0.1
OC4C	OC4U	* 0.15990+- 0.03250	0.14751+- 0.00790	0.92+- 0.19	-0.4
OPTC	OPTU	* 0.16740+- 0.04880	0.02674+- 0.00436	0.16+- 0.05	-2.9
EC1C	EC1U	* 0.24550+- 0.03690	0.30265+- 0.01660	1.23+- 0.20	1.4
EC2C	EC2U	* 0.05530+- 0.02500	0.06875+- 0.00756	1.24+- 0.58	0.5
EC3C	EC3U	* 0.01370+- 0.00970	0.00739+- 0.00191	0.54+- 0.41	-0.6
ALXC	ALXU	* 0.02760+- 0.00320	0.03027+- 0.00055	1.10+- 0.13	0.8
ASXC	ASXU	* 0.00070+- 0.00010	0.00064+- 0.00003	0.92+- 0.14	-0.6
BRXC	BRXU	* 0.00190+- 0.00040	0.00153+- 0.00004	0.80+- 0.17	-0.9
CAXC	CAXU	* 0.02510+- 0.00190	0.02690+- 0.00045	1.07+- 0.08	0.9
CRXC	CRXU	* 0.00090+- 0.00040	0.00042+- 0.00005	0.46+- 0.21	-1.2
CUXC	CUXU	* 0.00070+- 0.00050	0.00028+- 0.00003	0.40+- 0.29	-0.8
FEXC	FEXU	* 0.03640+- 0.00190	0.03751+- 0.00029	1.03+- 0.05	0.6
KPXC	KPXU	* 0.02710+- 0.00200	0.02481+- 0.00067	0.92+- 0.07	-1.1
MGXC	MGXU	* 0.01100+- 0.00300	0.00501+- 0.00073	0.46+- 0.14	-1.9
NAXC	NAXU	* 0.05600+- 0.00890	0.05600+- 0.00560	1.00+- 0.19	0.0
NIXC	NIXU	* 0.00010< 0.00020	0.00004< 0.00003	0.42< 0.87	-0.3
PBXC	PBXU	* 0.00130+- 0.00030	0.00122+- 0.00003	0.94+- 0.22	-0.3
SEXC	SEXU	* 0.00020< 0.00050	0.00060< 0.00003	2.98< 7.45	0.8
SIXC	SIXU	* 0.07660+- 0.00500	0.07122+- 0.00063	0.93+- 0.06	-1.1
VAXC	VAXU	* 0.00110+- 0.00050	0.00048+- 0.00007	0.44+- 0.21	-1.2
ZNXC	ZNXU	* 0.00260+- 0.00040	0.00277+- 0.00010	1.06+- 0.17	0.4

Table 6.6-6a CMB model output for Boundary Waters Canoe Area, summer

SOURCE CONTRIBUTION ESTIMATES - SITE: MBSUMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 94.4
 CHI SQUARE 1.52 DF 19
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MBPAL1	MGLDst01	0.04589	0.00785	5.84810
YES MBPAL2	MGLDst02	0.23687	0.01399	16.93118
YES MBPSP8	MIR&St03	0.13064	0.01564	8.35160
YES MLPSP2	MVgBrn08	3.18714	0.21297	14.96511
YES MAMSUL	AMSUL	1.88942	0.03820	49.46151
YES MAMNIT	AMNIT	0.11721	0.02772	4.22757
YES MNACL	NACL	0.09558	0.01931	4.94970

MEASURED CONCENTRATION FOR SIZE: PM2.5
 6.0+- 0.3

ELIGIBLE SPACE DIM. = 7 FOR MAX. UNC. = 1.20764 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

 0.00753 0.01109 0.01792 0.01931 0.02772 0.03820 0.21297

NUMBER ESTIMABLE SOURCES = 7 FOR MIN. PROJ. = 0.95
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE

 1.0000 MBPAL1 1.0000 MBPAL2 1.0000 MBPSP8 1.0000 MLPSP2 1.0000 MAMSUL
 1.0000 MAMNIT 1.0000 MNACL

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE STD ERR

Table 6.6-6b CMB model output for Boundnary Waters Canoe Area, summer

SPECIES CONCENTRATIONS - SITE: MBSUMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 94.4
 CHI SQUARE 1.52 DF 19

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	6.03820+- 0.25190	5.70275+- 0.21786	0.94+- 0.05	-1.0
N3IC	N3IU	* 0.11720+- 0.02770	0.11721+- 0.00117	1.00+- 0.24	0.0
S4IC	S4IU	* 1.88940+- 0.03320	1.88943+- 0.01889	1.00+- 0.02	0.0
OC1C	OC1U	* 0.15080+- 0.07390	0.09507+- 0.01050	0.63+- 0.32	-0.7
OC2C	OC2U	* 0.33980+- 0.09190	0.25659+- 0.01401	0.76+- 0.21	-0.9
OC3C	OC3U	* 0.54770+- 0.09840	0.36943+- 0.01398	0.67+- 0.12	-1.8
OC4C	OC4U	* 0.27970+- 0.05070	0.32931+- 0.00986	1.18+- 0.22	1.0
OPTC	OPTU	* 0.33560+- 0.09670	0.42867+- 0.01237	1.28+- 0.37	1.0
EC1C	EC1U	* 0.41900+- 0.06120	0.56963+- 0.01296	1.36+- 0.20	2.4
EC2C	EC2U	* 0.08390+- 0.03540	0.08046+- 0.00720	0.96+- 0.41	-0.1
EC3C	EC3U	* 0.01620+- 0.01140	0.01700+- 0.00190	1.05+- 0.75	0.1
ALXC	ALXU	* 0.01390+- 0.00230	0.01517+- 0.00083	1.09+- 0.19	0.5
ASXC	ASXU	* 0.00110+- 0.00060	0.00061+- 0.00002	0.55+- 0.30	-0.8
BRXC	BRXU	* 0.00090+- 0.00060	0.00105+- 0.00005	1.17+- 0.78	0.3
CAXC	CAXU	* 0.02010+- 0.00170	0.02074+- 0.00020	1.03+- 0.09	0.4
CRXC	CRXU	* 0.00090+- 0.00040	0.00079+- 0.00011	0.88+- 0.41	-0.3
CUXC	CUXU	* 0.00050+- 0.00030	0.00002+- 0.00002	0.04+- 0.05	-1.6
FEXC	FEXU	* 0.03200+- 0.00170	0.03224+- 0.00034	1.01+- 0.05	0.1
KPXC	KPXU	* 0.02780+- 0.00200	0.02158+- 0.00074	0.78+- 0.06	-2.9
MGXC	MGXU	* 0.00720+- 0.00270	0.00608+- 0.00103	0.84+- 0.35	-0.4
NAXC	NAXU	* 0.03760+- 0.00660	0.03760+- 0.00376	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00040+- 0.00030	0.00003+- 0.00003	0.08+- 0.09	-1.2
PBXC	PBXU	* 0.00090+- 0.00060	0.00139+- 0.00006	1.55+- 1.04	0.8
SEXC	SEXU	* 0.00030+- 0.00020	0.00005+- 0.00002	0.18+- 0.14	-1.2
SIXC	SIXU	* 0.06250+- 0.00440	0.06271+- 0.00160	1.00+- 0.08	0.0
VAXC	VAXU	* 0.00120+- 0.00050	0.00115+- 0.00014	0.95+- 0.41	-0.1
ZNXC	ZNXU	* 0.00240+- 0.00050	0.00202+- 0.00010	0.84+- 0.18	-0.7

Table 6.6-7a CMB model output for Boundary Waters Canoe Area, fall

SOURCE CONTRIBUTION ESTIMATES - SITE: MBFAMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.3
 CHI SQUARE 1.37 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPFA3	MDsEmi02	0.18951	0.04793	3.95367
YES	MBPAL1	MGlDst01	0.03166	0.00644	4.91461
YES	MBPAL2	MGlDst02	0.19328	0.01431	13.50914
YES	MBPSP8	MIR&St03	0.14057	0.01585	8.86769
YES	MLPWI7	MOilCo02	0.02755	0.00687	4.00884
YES	MSPAL6	MVgBrn12	1.24326	0.14840	8.37750
YES	MAMSUL	AMSUL	1.41580	0.02890	48.98151
YES	MAMNIT	AMNIT	0.51433	0.06510	7.90013
YES	MNACL	NACL	0.08973	0.01970	4.55422

MEASURED CONCENTRATION FOR SIZE: PM2.5
 3.9+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 0.78270 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00623 0.00663 0.01110 0.01787 0.01970 0.02890 0.03458 0.06510
 0.15213

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MBPSP8	1.0000 MLPWI7
1.0000 MSPAL6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-7b CMB model output for Boundary Waters Canoe Area, fall

SPECIES CONCENTRATIONS - SITE: MBFAMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.3
 CHI SQUARE 1.37 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	3.91350+- 0.20750	3.84568+- 0.14147	0.98+- 0.06	-0.3
N3IC	N3IU	* 0.51430+- 0.06490	0.51433+- 0.00514	1.00+- 0.13	0.0
S4IC	S4IU	* 1.41580+- 0.02520	1.41581+- 0.01416	1.00+- 0.02	0.0
OC1C	OC1U	* 0.08800+- 0.05670	0.05100+- 0.01587	0.58+- 0.41	-0.6
OC2C	OC2U	* 0.16940+- 0.06100	0.12417+- 0.00644	0.73+- 0.27	-0.7
OC3C	OC3U	* 0.31210+- 0.07480	0.26397+- 0.01021	0.85+- 0.21	-0.6
OC4C	OC4U	* 0.20830+- 0.04210	0.21639+- 0.00844	1.04+- 0.21	0.2
OPTC	OPTU	* 0.19670+- 0.05880	0.02122+- 0.00493	0.11+- 0.04	-3.0
EC1C	EC1U	* 0.30360+- 0.04790	0.30894+- 0.01867	1.02+- 0.17	0.1
EC2C	EC2U	* 0.06660+- 0.03070	0.08296+- 0.00913	1.25+- 0.59	0.5
EC3C	EC3U	* 0.01540+- 0.01100	0.00994+- 0.00237	0.65+- 0.49	-0.5
ALXC	ALXU	* 0.00930+- 0.00190	0.00992+- 0.00059	1.07+- 0.23	0.3
ASXC	ASXU	* 0.00100+- 0.00070	0.00081+- 0.00002	0.81+- 0.57	-0.3
BRXC	BRXU	* 0.00100+- 0.00060	0.00170+- 0.00004	1.70+- 1.02	1.2
CAXC	CAXU	* 0.02270+- 0.00190	0.02527+- 0.00049	1.11+- 0.10	1.3
CRXC	CRXU	* 0.00090+- 0.00040	0.00016+- 0.00005	0.18+- 0.09	-1.8
CUXC	CUXU	* 0.00060+- 0.00030	0.00055+- 0.00003	0.91+- 0.46	-0.2
FEXC	FEXU	* 0.03150+- 0.00170	0.03185+- 0.00026	1.01+- 0.06	0.2
KPXC	KPXU	* 0.03420+- 0.00240	0.03350+- 0.00075	0.98+- 0.07	-0.3
MGXC	MGXU	* 0.00770+- 0.00270	0.00557+- 0.00084	0.72+- 0.28	-0.8
NAXC	NAXU	* 0.03530+- 0.00690	0.03530+- 0.00353	1.00+- 0.22	0.0
NIXC	NIXU	* 0.00060+- 0.00020	0.00071+- 0.00002	1.19+- 0.40	0.6
PBXC	PBXU	* 0.00110+- 0.00050	0.00022+- 0.00003	0.20+- 0.09	-1.8
SEXC	SEXU	* 0.00030+- 0.00030	0.00028+- 0.00003	0.95+- 0.95	-0.1
SIXC	SIXU	* 0.05470+- 0.00410	0.05035+- 0.00059	0.92+- 0.07	-1.0
VAXC	VAXU	* 0.00130+- 0.00050	0.00097+- 0.00007	0.75+- 0.29	-0.6
ZNXC	ZNXU	* 0.00260+- 0.00030	0.00247+- 0.00011	0.95+- 0.12	-0.4

Table 6.7-8a CMB model output for Boundnary Waters Canoe Area, annual

SOURCE CONTRIBUTION ESTIMATES - SITE: MBALMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.0
 CHI SQUARE 1.74 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPFA3	MDsEmi02	0.20372	0.04815	4.23144
YES MBPAL1	MGlDst01	0.04930	0.00798	6.18002
YES MBPAL2	MGlDst02	0.19517	0.01453	13.43490
YES MBPSP8	MIR&St03	0.13098	0.01784	7.34018
YES MLPFA2	Msmelt06	0.02621	0.00719	3.64557
YES MWPSU8	MVgBrn19	1.50233	0.19344	7.76625
YES MAMSUL	AMSUL	1.80552	0.03666	49.25683
YES MAMNIT	AMNIT	0.61087	0.07316	8.35024
YES MNACL	NACL	0.12990	0.02609	4.97911

MEASURED CONCENTRATION FOR SIZE: PM2.5
 4.7+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 0.94994 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00526 0.00777 0.01210 0.01836 0.02609 0.03666 0.04239 0.07316
 0.19497

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MBPSP8	1.0000 MLPFA2
1.0000 MWPSU8	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.7-8b CMB model output for Boundnary Waters Canoe Area, annual

SPECIES CONCENTRATIONS - SITE: MBALMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.0
 CHI SQUARE 1.74 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	4.74970+- 0.22570	4.65399+- 0.19401	0.98+- 0.06	-0.3
N3IC	N3IU	* 0.61080+- 0.07290	0.61087+- 0.00611	1.00+- 0.12	0.0
S4IC	S4IU	* 1.80550+- 0.03190	1.80552+- 0.01806	1.00+- 0.02	0.0
OC1C	OC1U	* 0.09590+- 0.05810	0.04998+- 0.01650	0.52+- 0.36	-0.8
OC2C	OC2U	* 0.19550+- 0.06520	0.17191+- 0.01005	0.88+- 0.30	-0.4
OC3C	OC3U	* 0.30110+- 0.07110	0.23253+- 0.01082	0.77+- 0.19	-1.0
OC4C	OC4U	* 0.20240+- 0.03950	0.18881+- 0.01009	0.93+- 0.19	-0.3
OPTC	OPTU	* 0.21150+- 0.06190	0.02938+- 0.00539	0.14+- 0.05	-2.9
EC1C	EC1U	* 0.30700+- 0.04620	0.38442+- 0.02174	1.25+- 0.20	1.5
EC2C	EC2U	* 0.06480+- 0.02860	0.08692+- 0.00983	1.34+- 0.61	0.7
EC3C	EC3U	* 0.01460+- 0.01020	0.00949+- 0.00249	0.65+- 0.48	-0.5
ALXC	ALXU	* 0.01490+- 0.00240	0.01643+- 0.00064	1.10+- 0.18	0.6
ASXC	ASXU	* 0.00100+- 0.00040	0.00068+- 0.00003	0.68+- 0.27	-0.8
BRXC	BRXU	* 0.00130+- 0.00040	0.00146+- 0.00005	1.12+- 0.35	0.4
CAXC	CAXU	* 0.02170+- 0.00180	0.02417+- 0.00056	1.11+- 0.10	1.3
CRXC	CRXU	* 0.00090+- 0.00040	0.00038+- 0.00006	0.43+- 0.20	-1.3
CUXC	CUXU	* 0.00060+- 0.00030	0.00026+- 0.00003	0.43+- 0.22	-1.1
FEXC	FEXU	* 0.03300+- 0.00170	0.03351+- 0.00032	1.02+- 0.05	0.3
KPXC	KPXU	* 0.02890+- 0.00210	0.02577+- 0.00082	0.89+- 0.07	-1.4
MGXC	MGXU	* 0.00980+- 0.00310	0.00454+- 0.00094	0.46+- 0.18	-1.6
NAXC	NAXU	* 0.05110+- 0.00890	0.05110+- 0.00511	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00030+- 0.00020	0.00004+- 0.00003	0.12+- 0.12	-1.3
PBXC	PBXU	* 0.00120+- 0.00040	0.00106+- 0.00003	0.88+- 0.29	-0.4
SEXC	SEXU	* 0.00030+- 0.00030	0.00069+- 0.00003	2.31+- 2.32	1.3
SIXC	SIXU	* 0.05760+- 0.00420	0.05312+- 0.00057	0.92+- 0.07	-1.1
VAXC	VAXU	* 0.00110+- 0.00050	0.00058+- 0.00008	0.53+- 0.25	-1.0
ZNXC	ZNXU	* 0.00290+- 0.00040	0.00295+- 0.00012	1.02+- 0.15	0.1

6.6.4 Lye Brook Wilderness Area

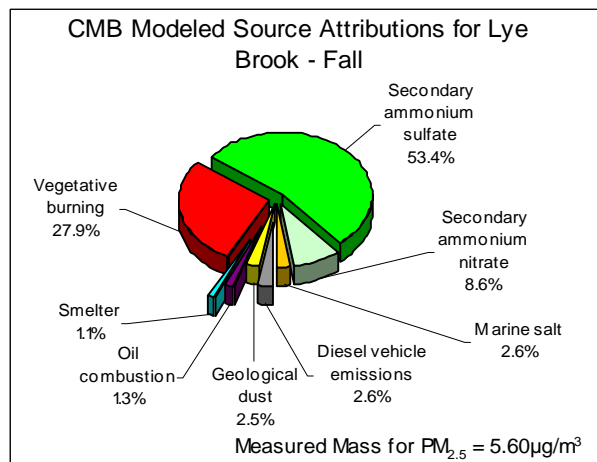
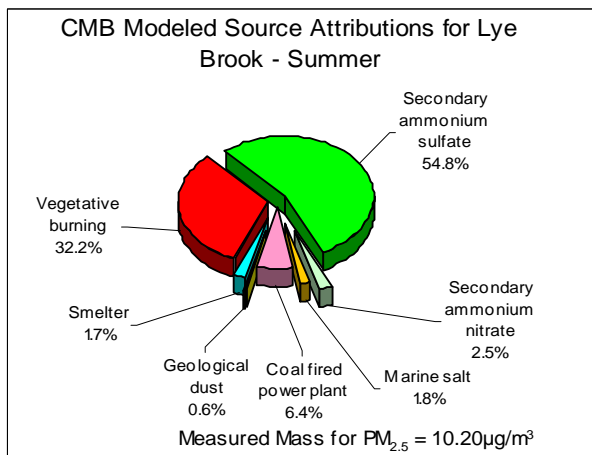
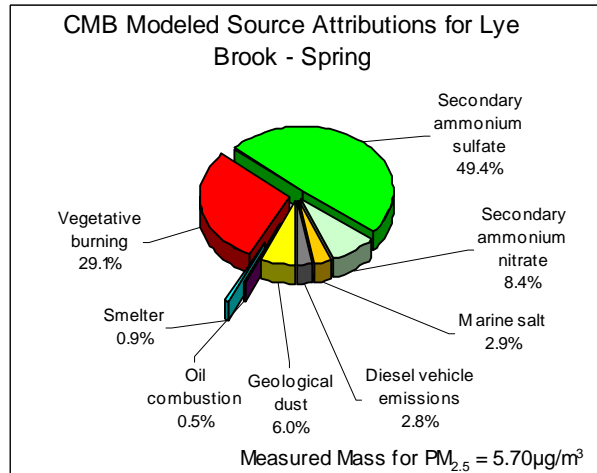
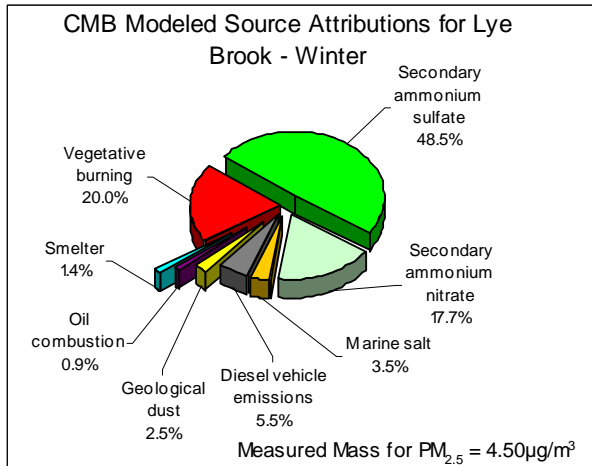
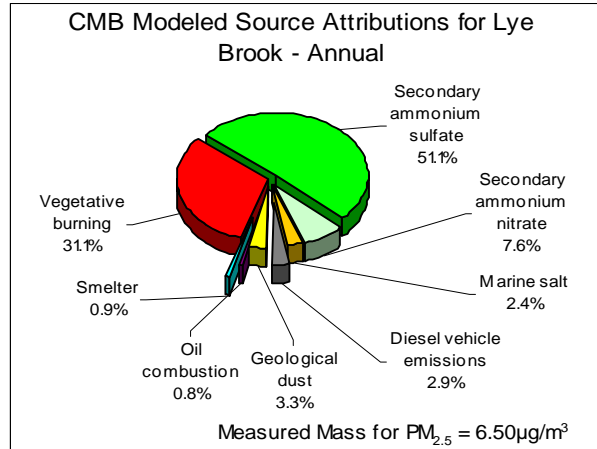


Figure 6.6-3. CMB modeled source attributions for annual and seasonal data subsets from Lye Brook Wilderness Area

Table 6.6-9a CMB model output for Lye Brook Wilderness area, winter

SOURCE CONTRIBUTION ESTIMATES - SITE: MLWIMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.4
 CHI SQUARE 2.30 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPFA3	MDsEmi02	0.24051	0.03594	6.69209
YES	MBPAL1	MGlDst01	0.03070	0.00842	3.64413
YES	MBPAL2	MGlDst02	0.08074	0.00982	8.21912
YES	MLPSU7	MOilCo03	0.03727	0.00613	6.08306
YES	MLPFA2	MSmelt06	0.06032	0.00339	17.82012
YES	MWPFA6	MVgBrn20	0.87768	0.12292	7.14037
YES	MAMSUL	AMSUL	2.12609	0.04267	49.82224
YES	MAMNIT	AMNIT	0.77684	0.08376	9.27452
YES	MNACL	NACL	0.15132	0.03797	3.98491

MEASURED CONCENTRATION FOR SIZE: PM2.5
 4.5+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 0.89062 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00286 0.00591 0.00802 0.01013 0.03259 0.03797 0.04267 0.08376
 0.12387

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPSU7	1.0000 MLPFA2
1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE STD ERR

Table 6.6-9b CMB model output for Lye Brook Wilderness area, winter

SPECIES CONCENTRATIONS - SITE: MLWIMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.4
 CHI SQUARE 2.30 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	4.45310+- 0.21780	4.38146+- 0.15173	0.98+- 0.06	-0.3
N3IC	N3IU	* 0.77650+- 0.08340	0.77685+- 0.00777	1.00+- 0.11	0.0
S4IC	S4IU	* 2.12600+- 0.03700	2.12609+- 0.02126	1.00+- 0.02	0.0
OC1C	OC1U	* 0.09420+- 0.06320	0.03720+- 0.01898	0.39+- 0.33	-0.9
OC2C	OC2U	* 0.12990+- 0.05850	0.12203+- 0.00636	0.94+- 0.43	-0.1
OC3C	OC3U	* 0.18640+- 0.05890	0.16941+- 0.01039	0.91+- 0.29	-0.3
OC4C	OC4U	* 0.20300+- 0.03760	0.15688+- 0.00999	0.77+- 0.15	-1.2
OPTC	OPTU	* 0.15960+- 0.04680	0.00067+- 0.00548	0.00+- 0.03	-3.4
EC1C	EC1U	* 0.31810+- 0.04610	0.37382+- 0.02398	1.18+- 0.19	1.1
EC2C	EC2U	* 0.05890+- 0.02420	0.08874+- 0.01131	1.51+- 0.65	1.1
EC3C	EC3U	* 0.01310+- 0.00890	0.01084+- 0.00291	0.83+- 0.60	-0.2
ALXC	ALXU	* 0.01040+- 0.00260	0.01093+- 0.00070	1.05+- 0.27	0.2
ASXC	ASXU	* 0.00030+- 0.00010	0.00009+- 0.00003	0.30+- 0.14	-2.0
BRXC	BRXU	* 0.00170+- 0.00010	0.00172+- 0.00006	1.01+- 0.07	0.2
CAXC	CAXU	* 0.01270+- 0.00140	0.01215+- 0.00064	0.96+- 0.12	-0.4
CRXC	CRXU	* 0.00100+- 0.00040	0.00020+- 0.00007	0.20+- 0.11	-2.0
CUXC	CUXU	* 0.00080+- 0.00010	0.00058+- 0.00004	0.73+- 0.10	-2.0
FEXC	FEXU	* 0.01400+- 0.00080	0.01464+- 0.00021	1.05+- 0.06	0.8
KPXC	KPXU	* 0.02280+- 0.00190	0.02304+- 0.00097	1.01+- 0.09	0.1
MGXC	MGXU	* 0.01260+- 0.00470	0.00335+- 0.00103	0.27+- 0.13	-1.9
NAXC	NAXU	* 0.05950+- 0.01370	0.05953+- 0.00595	1.00+- 0.25	0.0
NIXC	NIXU	* 0.00060+- 0.00010	0.00066+- 0.00003	1.11+- 0.19	0.6
PBXC	PBXU	* 0.00220+- 0.00020	0.00217+- 0.00004	0.99+- 0.09	-0.1
SEXC	SEXU	* 0.00060+- 0.00010	0.00048+- 0.00004	0.80+- 0.15	-1.1
SIXC	SIXU	* 0.03320+- 0.00360	0.03094+- 0.00052	0.93+- 0.10	-0.6
VAXC	VAXU	* 0.00180+- 0.00060	0.00054+- 0.00010	0.30+- 0.12	-2.1
ZNXC	ZNXU	* 0.00500+- 0.00030	0.00509+- 0.00015	1.02+- 0.07	0.3

Table 6.6-10a CMB model output for Lye Brook Wilderness Area, spring

SOURCE CONTRIBUTION ESTIMATES - SITE: MLSPMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.3
 CHI SQUARE 1.43 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT	---
YES MSPFA3	MDsEmi02	0.15580	0.04101	3.79858	
YES MBPAL1	MGlDst01	0.09401	0.01165	8.06727	
YES MBPAL2	MGlDst02	0.24173	0.01454	16.61958	
YES MLPSU7	MOilCo03	0.02961	0.00632	4.68570	
YES MLPFA2	Msmelt06	0.04750	0.00434	10.95614	
YES MLPSP2	MVgBrn08	1.62536	0.18759	8.66444	
YES MAMSUL	AMSUL	2.75762	0.05475	50.36615	
YES MAMNIT	AMNIT	0.47134	0.05839	8.07213	
YES MNACL	NACL	0.16349	0.03261	5.01324	

MEASURED CONCENTRATION FOR SIZE: PM2.5
 5.7+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 1.13618 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00358 0.00626 0.01101 0.01478 0.03261 0.03729 0.05475 0.05839
 0.18840

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPSU7	1.0000 MLPFA2
1.0000 MLPSP2	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-10b CMB model output for Lye Brook Wilderness Area, spring

SPECIES CONCENTRATIONS - SITE: MLSPMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.3
 CHI SQUARE 1.43 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	5.68090+- 0.24410	5.58646+- 0.19500	0.98+- 0.05	-0.3
N3IC	N3IU	* 0.47120+- 0.05820	0.47134+- 0.00471	1.00+- 0.12	0.0
S4IC	S4IU	* 2.75750+- 0.04730	2.75762+- 0.02758	1.00+- 0.02	0.0
OC1C	OC1U	* 0.08300+- 0.04940	0.06681+- 0.01335	0.80+- 0.51	-0.3
OC2C	OC2U	* 0.16460+- 0.05570	0.13269+- 0.00848	0.81+- 0.28	-0.6
OC3C	OC3U	* 0.19000+- 0.05500	0.18974+- 0.00960	1.00+- 0.29	0.0
OC4C	OC4U	* 0.19810+- 0.03640	0.16604+- 0.00798	0.84+- 0.16	-0.9
OPTC	OPTU	* 0.19100+- 0.05510	0.20963+- 0.00719	1.10+- 0.32	0.3
EC1C	EC1U	* 0.31820+- 0.04640	0.36098+- 0.01693	1.13+- 0.17	0.9
EC2C	EC2U	* 0.07210+- 0.02940	0.09944+- 0.00831	1.38+- 0.57	0.9
EC3C	EC3U	* 0.01680+- 0.01100	0.01438+- 0.00214	0.86+- 0.57	-0.2
ALXC	ALXU	* 0.02700+- 0.00370	0.03004+- 0.00067	1.11+- 0.15	0.8
ASXC	ASXU	* 0.00030+- 0.00010	0.00006+- 0.00003	0.20+- 0.12	-2.3
BRXC	BRXU	* 0.00220+- 0.00020	0.00185+- 0.00005	0.84+- 0.08	-1.7
CAXC	CAXU	* 0.02360+- 0.00200	0.02452+- 0.00045	1.04+- 0.09	0.4
CRXC	CRXU	* 0.00120+- 0.00050	0.00064+- 0.00008	0.53+- 0.23	-1.1
CUXC	CUXU	* 0.00070+- 0.00010	0.00048+- 0.00003	0.68+- 0.11	-2.1
FEXC	FEXU	* 0.02490+- 0.00140	0.02434+- 0.00022	0.98+- 0.06	-0.4
KPXC	KPXU	* 0.02750+- 0.00230	0.02565+- 0.00076	0.93+- 0.08	-0.8
MGXC	MGXU	* 0.01050+- 0.00370	0.00588+- 0.00086	0.56+- 0.21	-1.2
NAXC	NAXU	* 0.06430+- 0.01110	0.06432+- 0.00643	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00050+- 0.00010	0.00055+- 0.00003	1.09+- 0.23	0.4
PBXC	PBXU	* 0.00220+- 0.00020	0.00249+- 0.00005	1.13+- 0.11	1.4
SEXC	SEXU	* 0.00040< 0.00080	0.00039< 0.00004	0.98< 1.96	0.0
SIXC	SIXU	* 0.07610+- 0.00560	0.07614+- 0.00098	1.00+- 0.07	0.0
VAXC	VAXU	* 0.00180+- 0.00070	0.00086+- 0.00010	0.48+- 0.20	-1.3
ZNXC	ZNXU	* 0.00420+- 0.00030	0.00442+- 0.00011	1.05+- 0.08	0.7

Table 6.6-11a CMB model output for Lye Brook Wilderness Area, summer

SOURCE CONTRIBUTION ESTIMATES - SITE: MLSUMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.6
 CHI SQUARE 1.65 DF 18
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSU1	MCo1PP11	0.63654	0.20561	3.09585
YES	MBPAL1	MGlDst01	0.06113	0.01181	5.17504
YES	MBPAL2	MGlDst02	0.17131	0.01551	11.04175
YES	MLPFA2	MSmelt06	0.06507	0.00529	12.30021
YES	MLPSU6	MVgBrn10	3.19484	0.31161	10.25273
YES	MAMSUL	AMSUL	5.43118	0.10563	51.41600
YES	MAMNIT	AMNIT	0.24799	0.03429	7.23212
YES	MNAACL	NACL	0.17462	0.03537	4.93673

MEASURED CONCENTRATION FOR SIZE: PM2.5
 10.2+- 0.4

ELIGIBLE SPACE DIM. = 8 FOR MAX. UNC. = 2.04484 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00464	0.01125	0.01528	0.03429	0.03537	0.10563	0.18413	0.32481
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NUMBER ESTIMABLE SOURCES = 8 FOR MIN. PROJ. = 0.95
 PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE PROJ. SOURCE
 1.0000 MSPSU1 1.0000 MBPAL1 1.0000 MBPAL2 1.0000 MLPFA2 1.0000 MLPSU6
 1.0000 MAMSUL 1.0000 MAMNIT 1.0000 MNAACL

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES
 COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE COEFF. SOURCE SCE STD ERR

Table 6.6-11b CMB model output for Lye Brook Wilderness Area, summer

SPECIES CONCENTRATIONS - SITE: MLSUMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.6
 CHI SQUARE 1.65 DF 18

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	10.22420+- 0.35970	9.98266+- 0.32288	0.98+- 0.05	-0.5
N3IC	N3IU	* 0.24800+- 0.03420	0.24800+- 0.00248	1.00+- 0.14	0.0
S4IC	S4IU	* 5.43120+- 0.09060	5.43118+- 0.05431	1.00+- 0.02	0.0
OC1C	OC1U	* 0.14770+- 0.07350	0.13229+- 0.01809	0.90+- 0.46	-0.2
OC2C	OC2U	* 0.31300+- 0.08730	0.35729+- 0.02508	1.14+- 0.33	0.5
OC3C	OC3U	* 0.36100+- 0.07620	0.44740+- 0.01949	1.24+- 0.27	1.1
OC4C	OC4U	* 0.31370+- 0.05300	0.20728+- 0.01472	0.66+- 0.12	-1.9
OPTC	OPTU	* 0.34430+- 0.09840	0.33523+- 0.02166	0.97+- 0.29	-0.1
EC1C	EC1U	* 0.51300+- 0.07330	0.42477+- 0.02041	0.83+- 0.12	-1.2
EC2C	EC2U	* 0.10250+- 0.04110	0.03196+- 0.00993	0.31+- 0.16	-1.7
EC3C	EC3U	* 0.01930+- 0.01260	0.01305+- 0.00306	0.68+- 0.47	-0.5
ALXC	ALXU	* 0.02150+- 0.00360	0.02185+- 0.00085	1.02+- 0.17	0.1
ASXC	ASXU	* 0.00030< 0.00040	0.00001< 0.00006	0.03< 0.19	-0.7
BRXC	BRXU	* 0.00140+- 0.00040	0.00202+- 0.00007	1.44+- 0.41	1.5
CAXC	CAXU	* 0.01790+- 0.00200	0.02086+- 0.00048	1.17+- 0.13	1.4
CRXC	CRXU	* 0.00130+- 0.00060	0.00075+- 0.00014	0.58+- 0.29	-0.9
CUXC	CUXU	* 0.00070+- 0.00060	0.00068+- 0.00006	0.96+- 0.83	0.0
FEXC	FEXU	* 0.02190+- 0.00120	0.02165+- 0.00024	0.99+- 0.06	-0.2
KPXC	KPXU	* 0.02540+- 0.00240	0.02779+- 0.00069	1.09+- 0.11	1.0
MGXC	MGXU	* 0.01170+- 0.00460	0.00734+- 0.00116	0.63+- 0.27	-0.9
NAXC	NAXU	* 0.06870+- 0.01210	0.06870+- 0.00687	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00050+- 0.00050	0.00008+- 0.00006	0.15+- 0.19	-0.8
PBXC	PBXU	* 0.00190+- 0.00030	0.00236+- 0.00007	1.24+- 0.20	1.5
SEXC	SEXU	* 0.00060+- 0.00040	0.00118+- 0.00006	1.96+- 1.31	1.4
SIXC	SIXU	* 0.07850+- 0.00680	0.06682+- 0.00120	0.85+- 0.08	-1.7
VAXC	VAXU	* 0.00210+- 0.00080	0.00137+- 0.00019	0.65+- 0.26	-0.9
ZNXC	ZNXU	* 0.00430+- 0.00040	0.00348+- 0.00010	0.81+- 0.08	-2.0

Table 6.6-12a CMB model output for Lye Brook Wilderness Area, fall

SOURCE CONTRIBUTION ESTIMATES - SITE: MLFAMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.8
 CHI SQUARE 1.78 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPFA3	MDsEmi02	0.14554	0.04475	3.25218
YES MBPAL1	MGlDst01	0.03198	0.00856	3.73450
YES MBPAL2	MGlDst02	0.10512	0.01350	7.78417
YES MLPSU7	MOilCo03	0.07272	0.02106	3.45338
YES MLPFA2	MSmelt06	0.05973	0.00561	10.63964
YES MWPSU8	MVgBrn19	1.53416	0.20664	7.42423
YES MAMSUL	AMSUL	2.93551	0.05738	51.16103
YES MAMNIT	AMNIT	0.47330	0.05670	8.34783
YES MNACL	NACL	0.14209	0.02957	4.80566

MEASURED CONCENTRATION FOR SIZE: PM2.5
 5.6+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 1.12460 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00436 0.00822 0.01152 0.02251 0.02957 0.03777 0.05670 0.05738
 0.20804

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPSU7	1.0000 MLPFA2
1.0000 MWPSU8	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-12b CMB model output for Lye Brook Wilderness Area, fall

SPECIES CONCENTRATIONS - SITE: MLFAMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.8
 CHI SQUARE 1.78 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	5.62300+- 0.24760	5.50015+- 0.20518	0.98+- 0.06	-0.4
N3IC	N3IU	* 0.47330+- 0.05650	0.47331+- 0.00473	1.00+- 0.12	0.0
S4IC	S4IU	* 2.93550+- 0.04930	2.93551+- 0.02936	1.00+- 0.02	0.0
OC1C	OC1U	* 0.10390+- 0.06060	0.04877+- 0.01235	0.47+- 0.30	-0.9
OC2C	OC2U	* 0.17280+- 0.06130	0.16132+- 0.00926	0.93+- 0.34	-0.2
OC3C	OC3U	* 0.22940+- 0.06680	0.22577+- 0.00890	0.98+- 0.29	-0.1
OC4C	OC4U	* 0.22370+- 0.04380	0.18412+- 0.00902	0.82+- 0.17	-0.9
OPTC	OPTU	* 0.19140+- 0.05690	0.01020+- 0.00447	0.05+- 0.03	-3.2
EC1C	EC1U	* 0.36070+- 0.05560	0.35977+- 0.01793	1.00+- 0.16	0.0
EC2C	EC2U	* 0.07650+- 0.03340	0.06444+- 0.00728	0.84+- 0.38	-0.4
EC3C	EC3U	* 0.01680+- 0.01110	0.00726+- 0.00191	0.43+- 0.31	-0.8
ALXC	ALXU	* 0.01090+- 0.00260	0.01152+- 0.00055	1.06+- 0.26	0.2
ASXC	ASXU	* 0.00020+- 0.00020	0.00006+- 0.00003	0.31+- 0.35	-0.7
BRXC	BRXU	* 0.00150+- 0.00050	0.00219+- 0.00005	1.46+- 0.49	1.4
CAXC	CAXU	* 0.01390+- 0.00160	0.01586+- 0.00048	1.14+- 0.14	1.2
CRXC	CRXU	* 0.00130+- 0.00050	0.00042+- 0.00007	0.32+- 0.14	-1.7
CUXC	CUXU	* 0.00080+- 0.00060	0.00063+- 0.00004	0.79+- 0.59	-0.3
FEXC	FEXU	* 0.01650+- 0.00090	0.01626+- 0.00029	0.99+- 0.06	-0.3
KPXC	KPXU	* 0.02200+- 0.00210	0.02331+- 0.00069	1.06+- 0.11	0.6
MGXC	MGXU	* 0.00930+- 0.00380	0.00249+- 0.00074	0.27+- 0.14	-1.8
NAXC	NAXU	* 0.05590+- 0.01020	0.05590+- 0.00559	1.00+- 0.21	0.0
NIXC	NIXU	* 0.00060+- 0.00050	0.00124+- 0.00004	2.06+- 1.72	1.3
PBXC	PBXU	* 0.00200+- 0.00040	0.00223+- 0.00005	1.11+- 0.22	0.6
SEXC	SEXU	* 0.00050+- 0.00050	0.00088+- 0.00004	1.76+- 1.77	0.8
SIXC	SIXU	* 0.04860+- 0.00460	0.04419+- 0.00058	0.91+- 0.09	-1.0
VAXC	VAXU	* 0.00230+- 0.00080	0.00080+- 0.00010	0.35+- 0.13	-1.9
ZNXC	ZNXU	* 0.00450+- 0.00040	0.00423+- 0.00011	0.94+- 0.09	-0.7

Table 6.6-13a CMB model output for Lye Brook Wilderness Area, annual

SOURCE CONTRIBUTION ESTIMATES - SITE: MLALMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.9
 CHI SQUARE 1.11 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPFA3	MDsEmi02	0.18872	0.04290	4.39894
YES MBPAL1	MGlDst01	0.05512	0.01004	5.49155
YES MBPAL2	MGlDst02	0.15749	0.01374	11.46462
YES MLPSU7	MOilCo03	0.04888	0.01581	3.09264
YES MLPFA2	MSmelt06	0.05653	0.00521	10.85684
YES MSPSU6	MVgBrn15	2.00752	0.23031	8.71655
YES MAMSUL	AMSUL	3.29964	0.06483	50.90010
YES MAMNIT	AMNIT	0.49163	0.05831	8.43170
YES MNACL	NACL	0.15735	0.03365	4.67636

MEASURED CONCENTRATION FOR SIZE: PM2.5
 6.5+- 0.3

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 1.29334 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00437 0.00942 0.01242 0.01723 0.03365 0.03955 0.05831 0.06483
 0.23093

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPSU7	1.0000 MLPFA2
1.0000 MSPSU6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-13b CMB model output for Lye Brook Wilderness Area, annual

SPECIES CONCENTRATIONS - SITE: MLALMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.9
 CHI SQUARE 1.11 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	6.46670+- 0.26670	6.46290+- 0.23674	1.00+- 0.06	0.0
N3IC	N3IU	* 0.49160+- 0.05810	0.49164+- 0.00492	1.00+- 0.12	0.0
S4IC	S4IU	* 3.29960+- 0.05580	3.29965+- 0.03300	1.00+- 0.02	0.0
OC1C	OC1U	* 0.10700+- 0.06160	0.07957+- 0.01523	0.74+- 0.45	-0.4
OC2C	OC2U	* 0.19430+- 0.06560	0.18274+- 0.00727	0.94+- 0.32	-0.2
OC3C	OC3U	* 0.24120+- 0.06430	0.17379+- 0.00861	0.72+- 0.20	-1.0
OC4C	OC4U	* 0.23420+- 0.04270	0.19581+- 0.00835	0.84+- 0.16	-0.9
OPTC	OPTU	* 0.22060+- 0.06400	0.21775+- 0.00669	0.99+- 0.29	0.0
EC1C	EC1U	* 0.37680+- 0.05530	0.44224+- 0.01958	1.17+- 0.18	1.1
EC2C	EC2U	* 0.07750+- 0.03200	0.07502+- 0.00918	0.97+- 0.42	-0.1
EC3C	EC3U	* 0.01650+- 0.01090	0.00955+- 0.00240	0.58+- 0.41	-0.6
ALXC	ALXU	* 0.01730+- 0.00310	0.01810+- 0.00060	1.05+- 0.19	0.3
ASXC	ASXU	* 0.00030+- 0.00020	0.00007+- 0.00004	0.25+- 0.20	-1.1
BRXC	BRXU	* 0.00170+- 0.00030	0.00175+- 0.00005	1.03+- 0.18	0.2
CAXC	CAXU	* 0.01700+- 0.00180	0.01795+- 0.00052	1.06+- 0.12	0.5
CRXC	CRXU	* 0.00120+- 0.00050	0.00025+- 0.00007	0.21+- 0.11	-1.9
CUXC	CUXU	* 0.00070+- 0.00030	0.00058+- 0.00004	0.82+- 0.36	-0.4
FEXC	FEXU	* 0.01930+- 0.00110	0.01952+- 0.00018	1.01+- 0.06	0.2
KPXC	KPXU	* 0.02430+- 0.00220	0.02518+- 0.00080	1.04+- 0.10	0.4
MGXC	MGXU	* 0.01100+- 0.00420	0.00340+- 0.00085	0.31+- 0.14	-1.8
NAXC	NAXU	* 0.06190+- 0.01170	0.06191+- 0.00619	1.00+- 0.21	0.0
NIXC	NIXU	* 0.00060+- 0.00030	0.00085+- 0.00004	1.42+- 0.71	0.8
PBXC	PBXU	* 0.00210+- 0.00030	0.00214+- 0.00005	1.02+- 0.15	0.1
SEXC	SEXU	* 0.00050+- 0.00040	0.00045+- 0.00004	0.89+- 0.72	-0.1
SIXC	SIXU	* 0.05890+- 0.00510	0.05485+- 0.00065	0.93+- 0.08	-0.8
VAXC	VAXU	* 0.00200+- 0.00070	0.00040+- 0.00010	0.20+- 0.09	-2.3
ZNXC	ZNXU	* 0.00450+- 0.00040	0.00432+- 0.00012	0.96+- 0.09	-0.4

6.6.5 Shenandoah National Park

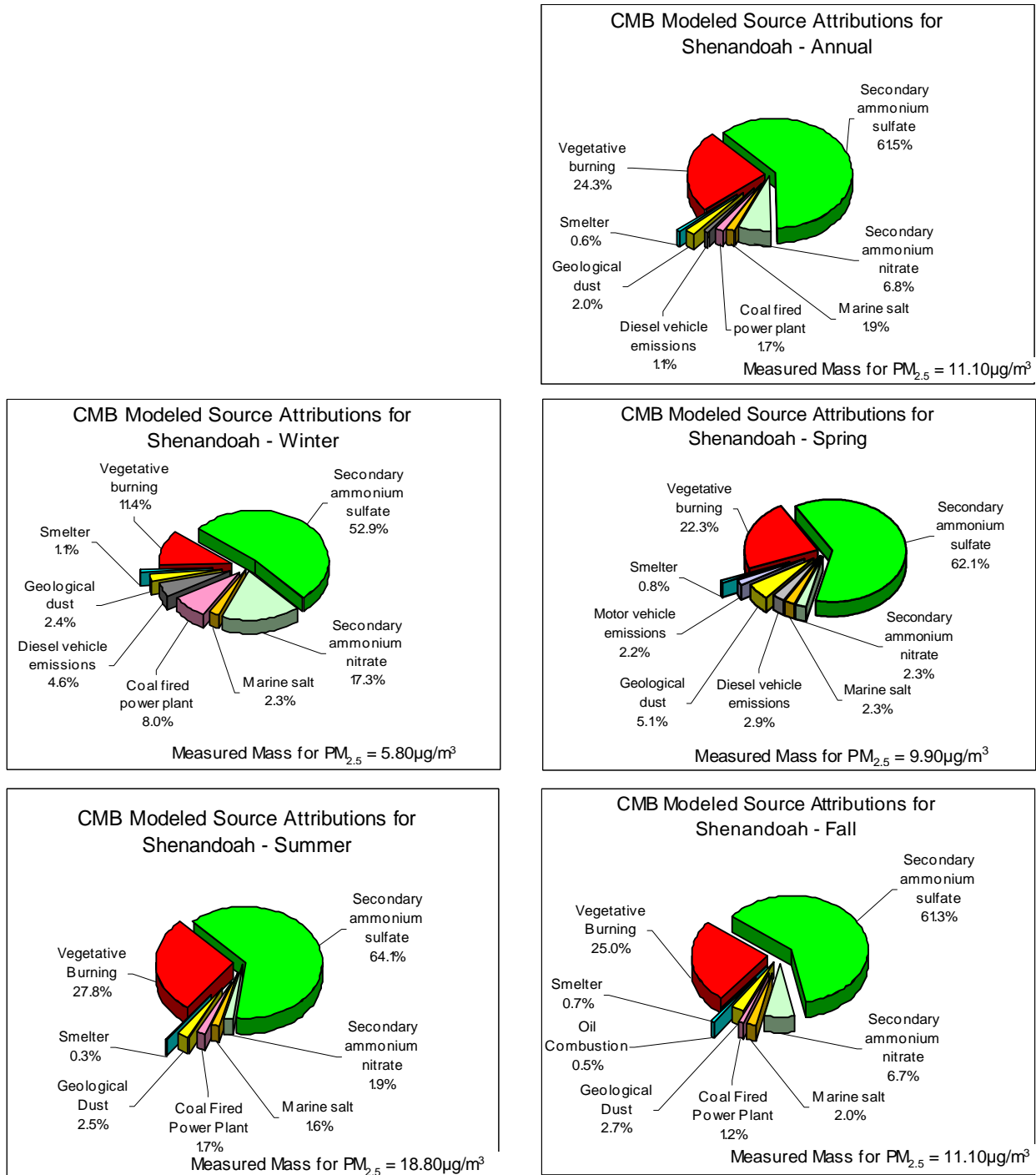


Figure 6.6-4 CMB modeled source attributions for mean annual and seasonal data subsets from Shenandoah National Park

Table 6.6-14a CMB model output for Shenandoah National Park, winter

SOURCE CONTRIBUTION ESTIMATES - SITE: MSWIMean1 DATE: 2/25/200 CMB8
 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.6
 CHI SQUARE 2.67 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MWPSU9	MColPP14	0.46165	0.08220	5.61633
YES	MSPFA3	MDsEmi02	0.26900	0.05099	5.27572
YES	MBPAL1	MGlDst01	0.04170	0.00927	4.50004
YES	MBPAL2	MGlDst02	0.09960	0.01165	8.54639
YES	MLPFA2	MSmelt06	0.06121	0.00422	14.50120
YES	MSPAL6	MVgBrn12	0.65936	0.13330	4.94638
YES	MAMSUL	AMSUL	3.06222	0.06086	50.31211
YES	MAMNIT	AMNIT	1.00305	0.10498	9.55462
YES	MNAACL	NAACL	0.13195	0.03277	4.02657

MEASURED CONCENTRATION FOR SIZE: PM2.5
 5.8+- 0.2

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 1.16288 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

 0.00365 0.00863 0.01153 0.03277 0.03919 0.06086 0.07593
 0.10498
 0.14087

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MWPSU9	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPFA2
1.0000 MSPAL6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNAACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-14b CMB model output for Shenandoah National Park, winter

SPECIES CONCENTRATIONS - SITE: MSWIMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.6
 CHI SQUARE 2.67 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO			
R/U								
TMAC	TMAU	5.81440+-	0.24480	5.78974+-	0.16758	1.00+-	0.05	-0.1
N3IC	N3IU	* 1.00270+-	0.10450	1.00305+-	0.01003	1.00+-	0.10	0.0
S4IC	S4IU	* 3.06210+-	0.05260	3.06222+-	0.03062	1.00+-	0.02	0.0
OC1C	OC1U	* 0.08780+-	0.06360	0.05654+-	0.02115	0.64+-	0.52	-0.5
OC2C	OC2U	* 0.16130+-	0.06300	0.13567+-	0.00924	0.84+-	0.33	-0.4
OC3C	OC3U	* 0.24050+-	0.06640	0.13344+-	0.01161	0.55+-	0.16	-1.6
OC4C	OC4U	* 0.26500+-	0.04640	0.17214+-	0.01150	0.65+-	0.12	-1.9
OPTC	OPTU	* 0.22430+-	0.06510	0.00840+-	0.00607	0.04+-	0.03	-3.3
EC1C	EC1U	* 0.44180+-	0.06350	0.31616+-	0.02733	0.72+-	0.12	-1.8
EC2C	EC2U	* 0.07540+-	0.03250	0.10329+-	0.01272	1.37+-	0.61	0.8
EC3C	EC3U	* 0.01400+-	0.01090	0.01185+-	0.00326	0.85+-	0.70	-0.2
ALXC	ALXU	* 0.01380+-	0.00280	0.01372+-	0.00080	0.99+-	0.21	0.0
ASXC	ASXU	* 0.00030+-	0.00010	0.00013+-	0.00004	0.43+-	0.19	-1.6
BRXC	BRXU	* 0.00210+-	0.00020	0.00258+-	0.00006	1.23+-	0.12	2.3
CAXC	CAXU	* 0.01500+-	0.00150	0.01657+-	0.00072	1.10+-	0.12	0.9
CRXC	CRXU	* 0.00110+-	0.00040	0.00027+-	0.00008	0.25+-	0.12	-2.0
CUXC	CUXU	* 0.00080+-	0.00010	0.00056+-	0.00005	0.70+-	0.11	-2.1
FEXC	FEXU	* 0.01680+-	0.00100	0.01612+-	0.00020	0.96+-	0.06	-0.7
KPXC	KPXU	* 0.02890+-	0.00220	0.02905+-	0.00106	1.01+-	0.08	0.1
MGXC	MGXU	* 0.00980+-	0.00400	0.00745+-	0.00120	0.76+-	0.33	-0.6
NAXC	NAXU	* 0.05190+-	0.01180	0.05191+-	0.00519	1.00+-	0.25	0.0
NIXC	NIXU	* 0.00020+-	0.00010	0.00012+-	0.00004	0.60+-	0.36	-0.7
PBXC	PBXU	* 0.00220+-	0.00020	0.00217+-	0.00005	0.98+-	0.09	-0.2
SEXC	SEXU	* 0.00100+-	0.00010	0.00110+-	0.00005	1.10+-	0.12	0.9
SIXC	SIXU	* 0.04480+-	0.00410	0.04419+-	0.00072	0.99+-	0.09	-0.1
VAXC	VAXU	* 0.00140+-	0.00050	0.00034+-	0.00011	0.25+-	0.12	-2.1
ZNXC	ZNXU	* 0.00550+-	0.00050	0.00559+-	0.00017	1.02+-	0.10	0.2

Table 6.6-15a CMB model output for Shenandoah National Park, spring

SOURCE CONTRIBUTION ESTIMATES - SITE: MSSPMean1 DATE: 2/25/200 CMB8
 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.6
 CHI SQUARE 2.82 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPFA3	MDsEmi02	0.26305	0.05380	4.88910
YES	MBPAL1	MGlDst01	0.14702	0.01522	9.66076
YES	MBPAL2	MGlDst02	0.31017	0.02284	13.58242
YES	MWPSU5	MMvEmi07	0.19459	0.07754	2.50944
YES	MLPFA2	MSmelt06	0.07436	0.00662	11.22776
YES	MWPSU8	MVgBrn19	2.01545	0.23452	8.59378
YES	MAMSUL	AMSUL	5.61884	0.11037	50.90791
YES	MAMNIT	AMNIT	0.90289	0.09921	9.10064
YES	MNAACL	NAACL	0.20948	0.04064	5.15426

MEASURED CONCENTRATION FOR SIZE: PM2.5
 9.9+- 0.3

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 1.97418 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

 0.00482 0.01434 0.01929 0.04064 0.04982 0.07824 0.09921
 0.11037
 0.23559

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5	1.0000 MLPFA2
1.0000 MWPSU8	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNAACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-15b CMB model output for Shenandoah National Park, spring

SPECIES CONCENTRATIONS - SITE: MSSPMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.6
 CHI SQUARE 2.82 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO			
R/U								
TMAC	TMAU	9.87090+-	0.34460	9.73585+-	0.26900	0.99+-	0.04	-0.3
N3IC	N3IU	* 0.90270+-	0.09880	0.90290+-	0.00903	1.00+-	0.11	0.0
S4IC	S4IU	* 5.61860+-	0.09500	5.61885+-	0.05619	1.00+-	0.02	0.0
OC1C	OC1U	* 0.13530+-	0.06710	0.06880+-	0.02144	0.51+-	0.30	-0.9
OC2C	OC2U	* 0.28650+-	0.07380	0.23778+-	0.01378	0.83+-	0.22	-0.6
OC3C	OC3U	* 0.30410+-	0.06880	0.31960+-	0.01391	1.05+-	0.24	0.2
OC4C	OC4U	* 0.36260+-	0.05800	0.26008+-	0.01346	0.72+-	0.12	-1.7
OPTC	OPTU	* 0.31660+-	0.08980	0.01417+-	0.00634	0.04+-	0.02	-3.4
EC1C	EC1U	* 0.56600+-	0.07920	0.54741+-	0.02905	0.97+-	0.14	-0.2
EC2C	EC2U	* 0.09650+-	0.03820	0.11570+-	0.01277	1.20+-	0.49	0.5
EC3C	EC3U	* 0.01750+-	0.01260	0.01204+-	0.00328	0.69+-	0.53	-0.4
ALXC	ALXU	* 0.04430+-	0.00480	0.04741+-	0.00093	1.07+-	0.12	0.6
ASXC	ASXU	* 0.00040+-	0.00020	0.00010+-	0.00006	0.26+-	0.20	-1.4
BRXC	BRXU	* 0.00280+-	0.00020	0.00311+-	0.00008	1.11+-	0.08	1.4
CAXC	CAXU	* 0.03130+-	0.00250	0.03790+-	0.00077	1.21+-	0.10	2.5
CRXC	CRXU	* 0.00120+-	0.00050	0.00069+-	0.00011	0.57+-	0.25	-1.0
CUXC	CUXU	* 0.00100+-	0.00010	0.00084+-	0.00007	0.84+-	0.11	-1.4
FEXC	FEXU	* 0.03830+-	0.00200	0.03985+-	0.00041	1.04+-	0.06	0.8
KPXC	KPXU	* 0.04000+-	0.00280	0.04066+-	0.00115	1.02+-	0.08	0.2
MGXC	MGXU	* 0.01170+-	0.00410	0.00664+-	0.00125	0.57+-	0.23	-1.2
NAXC	NAXU	* 0.08240+-	0.01370	0.08241+-	0.00824	1.00+-	0.19	0.0
NIXC	NIXU	* 0.00030+-	0.00020	0.00009+-	0.00006	0.29+-	0.28	-1.0
PBXC	PBXU	* 0.00280+-	0.00030	0.00283+-	0.00007	1.01+-	0.11	0.1
SEXC	SEXU	* 0.00090+-	0.00050	0.00117+-	0.00007	1.30+-	0.72	0.5
SIXC	SIXU	* 0.12150+-	0.00780	0.09332+-	0.00086	0.77+-	0.05	-3.6
VAXC	VAXU	* 0.00150+-	0.00060	0.00091+-	0.00014	0.61+-	0.26	-1.0
ZNXC	ZNXU	* 0.00670+-	0.00040	0.00625+-	0.00018	0.93+-	0.06	-1.0

Table 6.6-16a CMB model output for Shenandoah National Park, summer

SOURCE CONTRIBUTION ESTIMATES - SITE: MSSUMean1 DATE: 2/25/200 CMB8
 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 1.00 PERCENT MASS 97.0
 CHI SQUARE 0.84 DF 18
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPWI8	MColPP08	0.30988	0.05102	6.07398
YES MBPAL1	MGlDst01	0.15066	0.01836	8.20445
YES MBPAL2	MGlDst02	0.30858	0.02320	13.30325
YES MLPFA2	Msmelt06	0.06367	0.00800	7.95735
YES MSPSU6	MVgBrn15	5.07401	0.40168	12.63187
YES MAMSUL	AMSUL	11.69326	0.21886	53.42900
YES MAMNIT	AMNIT	0.35310	0.04793	7.36683
YES MNAACL	NAACL	0.29130	0.05750	5.06629

MEASURED CONCENTRATION FOR SIZE: PM2.5
 18.8+- 0.6

ELIGIBLE SPACE DIM. = 8 FOR MAX. UNC. = 3.76000 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00670 0.01729 0.02142 0.04793 0.05225 0.05750 0.21886
 0.40169

NUMBER ESTIMABLE SOURCES = 8 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPWI8	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPFA2	1.0000 MSPSU6
1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNAACL		

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-16b CMB model output for Shenandoah National Park, summer

SPECIES CONCENTRATIONS - SITE: MSSUMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 1.00 PERCENT MASS 97.0
 CHI SQUARE 0.84 DF 18

SPECIES	I	MEAS	CALC	RATIO	C/M	RATIO
R/U						
TMAC	TMAU	18.80000+-	0.59400	18.24445+-	0.46188	0.97+- 0.04 -0.7
N3IC	N3IU	* 0.35310+-	0.04780	0.35311+-	0.00353	1.00+- 0.14 0.0
S4IC	S4IU	* 11.69300+-	0.18500	11.69327+-	0.11693	1.00+- 0.02 0.0
OC1C	OC1U	* 0.27020+-	0.10590	0.18338+-	0.03230	0.68+- 0.29 -0.8
OC2C	OC2U	* 0.52750+-	0.11710	0.48899+-	0.03717	0.93+- 0.22 -0.3
OC3C	OC3U	* 0.39800+-	0.08290	0.42717+-	0.01125	1.07+- 0.23 0.3
OC4C	OC4U	* 0.52510+-	0.08080	0.48733+-	0.01491	0.93+- 0.15 -0.5
OPTC	OPTU	* 0.63300+-	0.17580	0.54957+-	0.01260	0.87+- 0.24 -0.5
EC1C	EC1U	* 0.89310+-	0.12320	0.89640+-	0.01493	1.00+- 0.14 0.0
EC2C	EC2U	* 0.11700+-	0.04620	0.09940+-	0.01650	0.85+- 0.36 -0.4
EC3C	EC3U	* 0.01950+-	0.01420	0.00584+-	0.00348	0.30+- 0.28 -0.9
ALXC	ALXU	* 0.04870+-	0.00580	0.04799+-	0.00069	0.99+- 0.12 -0.1
ASXC	ASXU	* 0.00030+-	0.00030	0.00020+-	0.00012	0.66+- 0.78 -0.3
BRXC	BRXU	* 0.00200+-	0.00040	0.00255+-	0.00013	1.27+- 0.26 1.3
CAXC	CAXU	* 0.02620+-	0.00250	0.02719+-	0.00035	1.04+- 0.10 0.4
CRXC	CRXU	* 0.00150+-	0.00060	0.00035+-	0.00015	0.24+- 0.14 -1.9
CUXC	CUXU	* 0.00110+-	0.00050	0.00050+-	0.00012	0.45+- 0.23 -1.2
FEXC	FEXU	* 0.04010+-	0.00210	0.03882+-	0.00064	0.97+- 0.05 -0.6
KPXC	KPXU	* 0.04020+-	0.00330	0.04226+-	0.00158	1.05+- 0.09 0.6
MGXC	MGXU	* 0.01510+-	0.00590	0.01455+-	0.00180	0.96+- 0.39 -0.1
NAXC	NAXU	* 0.11460+-	0.01950	0.11461+-	0.01146	1.00+- 0.20 0.0
NIXC	NIXU	* 0.00050+-	0.00040	0.00016+-	0.00012	0.32+- 0.35 -0.8
PBXC	PBXU	* 0.00250+-	0.00040	0.00248+-	0.00013	0.99+- 0.17 0.0
SEXC	SEXU	* 0.00120+-	0.00050	0.00182+-	0.00013	1.51+- 0.64 1.2
SIXC	SIXU	* 0.14520+-	0.01030	0.14558+-	0.00255	1.00+- 0.07 0.0
VAXC	VAXU	* 0.00180+-	0.00080	0.00030+-	0.00018	0.16+- 0.12 -1.8
ZNXC	ZNXU	* 0.00630+-	0.00050	0.00618+-	0.00027	0.98+- 0.09 -0.2

Table 6.6-17a CMB model output for Shenandoah National Park, fall

SOURCE CONTRIBUTION ESTIMATES - SITE: MSFAMean1 DATE: 2/25/200 CMB8
 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.8
 CHI SQUARE 2.68 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPWI8	MColPP08	0.11868	0.03916	3.03095
YES MBPAL1	MGlDst01	0.06258	0.01105	5.66115
YES MBPAL2	MGlDst02	0.20528	0.01923	10.67687
YES MLPSU7	MOilCo03	0.04531	0.02172	2.08641
YES MLPFA2	MSmelt06	0.06682	0.00606	11.03243
YES MWPFA6	MVgBrn20	2.44501	0.18355	13.32071
YES MAMSUL	AMSUL	6.00500	0.11596	51.78527
YES MAMNIT	AMNIT	0.65286	0.07479	8.72973
YES MNACL	NACL	0.19424	0.03833	5.06704

MEASURED CONCENTRATION FOR SIZE: PM2.5
 10.0+- 0.4

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 2.00328 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

 0.00515 0.01053 0.01436 0.02214 0.03833 0.04105 0.07479
 0.11596
 0.18359

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPWI8	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPSU7	1.0000 MLPFA2
1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-17b CMB model output for Shenandoah National Park, fall

SPECIES CONCENTRATIONS - SITE: MSFAMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.8
 CHI SQUARE 2.68 DF 17

SPECIES	I	MEAS	CALC	RATIO	C/M	RATIO
R/U						
TMAC	TMAU	10.01640+-	0.35350	9.79576+-	0.23180	0.98+- 0.04 -0.5
N3IC	N3IU	* 0.65270+-	0.07450	0.65287+-	0.00653	1.00+- 0.11 0.0
S4IC	S4IU	* 6.00460+-	0.09920	6.00500+-	0.06005	1.00+- 0.02 0.0
OC1C	OC1U	* 0.14100+-	0.07440	0.05240+-	0.01591	0.37+- 0.23 -1.2
OC2C	OC2U	* 0.31470+-	0.08200	0.35084+-	0.01812	1.11+- 0.30 0.4
OC3C	OC3U	* 0.36760+-	0.08130	0.46678+-	0.01293	1.27+- 0.28 1.2
OC4C	OC4U	* 0.40830+-	0.06660	0.43303+-	0.01231	1.06+- 0.18 0.4
OPTC	OPTU	* 0.38240+-	0.10790	0.00057+-	0.00191	0.00+- 0.01 -3.5
EC1C	EC1U	* 0.66070+-	0.09370	0.73587+-	0.01255	1.11+- 0.16 0.8
EC2C	EC2U	* 0.10900+-	0.04350	0.04050+-	0.00630	0.37+- 0.16 -1.6
EC3C	EC3U	* 0.02020+-	0.01420	0.00512+-	0.00155	0.25+- 0.19 -1.1
ALXC	ALXU	* 0.02110+-	0.00340	0.02200+-	0.00050	1.04+- 0.17 0.3
ASXC	ASXU	* 0.00030+-	0.00010	0.00008+-	0.00006	0.28+- 0.23 -1.8
BRXC	BRXU	* 0.00300+-	0.00030	0.00247+-	0.00008	0.82+- 0.09 -1.7
CAXC	CAXU	* 0.02350+-	0.00220	0.01849+-	0.00034	0.79+- 0.08 -2.2
CRXC	CRXU	* 0.00130+-	0.00050	0.00020+-	0.00008	0.16+- 0.09 -2.2
CUXC	CUXU	* 0.00100+-	0.00040	0.00058+-	0.00006	0.58+- 0.24 -1.0
FEXC	FEXU	* 0.02460+-	0.00140	0.02683+-	0.00041	1.09+- 0.06 1.5
KPXC	KPXU	* 0.03600+-	0.00280	0.03104+-	0.00083	0.86+- 0.07 -1.7
MGXC	MGXU	* 0.00950+-	0.00410	0.00576+-	0.00070	0.61+- 0.27 -0.9
NAXC	NAXU	* 0.07640+-	0.01300	0.07642+-	0.00764	1.00+- 0.20 0.0
NIXC	NIXU	* 0.00070+-	0.00040	0.00083+-	0.00006	1.19+- 0.68 0.3
PBXC	PBXU	* 0.00240+-	0.00030	0.00252+-	0.00008	1.05+- 0.13 0.4
SEXC	SEXU	* 0.00120+-	0.00040	0.00098+-	0.00007	0.81+- 0.28 -0.6
SIXC	SIXU	* 0.08080+-	0.00630	0.08642+-	0.00101	1.07+- 0.08 0.9
VAXC	VAXU	* 0.00160+-	0.00070	0.00079+-	0.00014	0.49+- 0.23 -1.1
ZNXC	ZNXU	* 0.00600+-	0.00050	0.00588+-	0.00017	0.98+- 0.09 -0.2

Table 6.6-18a CMB model output for Shenandoah National Park, annual

SOURCE CONTRIBUTION ESTIMATES - SITE: MSALMean1 DATE: 2/25/200 CMB8
 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.3
 CHI SQUARE 1.82 DF 17
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES MSPWI8	MColPP08	0.18780	0.04098	4.58234
YES MSPFA3	MDsEmi02	0.12008	0.05910	2.03176
YES MBPAL1	MGlDst01	0.09818	0.01356	7.24012
YES MBPAL2	MGlDst02	0.21040	0.02003	10.50491
YES MLPFA2	MSmelt06	0.06650	0.00629	10.56456
YES MWPSU8	MVgBrn19	2.61191	0.26569	9.83060
YES MAMSUL	AMSUL	6.60059	0.12666	52.11330
YES MAMNIT	AMNIT	0.72733	0.08172	8.89976
YES MNAACL	NAACL	0.20716	0.04228	4.89940

MEASURED CONCENTRATION FOR SIZE: PM2.5
 11.1+- 0.4

ELIGIBLE SPACE DIM. = 9 FOR MAX. UNC. = 2.22698 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

 0.00540 0.01276 0.01686 0.04019 0.04228 0.05378 0.08172
 0.12666
 0.26722

NUMBER ESTIMABLE SOURCES = 9 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPWI8	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MLPFA2
1.0000 MWPSU8	1.0000 MAMSUL	1.0000 MAMNIT	1.0000 MNAACL	

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR

Table 6.6-18b CMB model output for Shenandoah National Park, annual

SPECIES CONCENTRATIONS - SITE: MSALMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.3
 CHI SQUARE 1.82 DF 17

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO			
R/U								
TMAC	TMAU	11.13490+-	0.38430	10.82995+-	0.29086	0.97+-	0.04	-0.6
N3IC	N3IU	* 0.72730+-	0.08140	0.72734+-	0.00727	1.00+-	0.11	0.0
S4IC	S4IU	* 6.60050+-	0.10810	6.60059+-	0.06601	1.00+-	0.02	0.0
OC1C	OC1U	* 0.15860+-	0.07770	0.08495+-	0.02223	0.54+-	0.30	-0.9
OC2C	OC2U	* 0.32310+-	0.08400	0.29564+-	0.02557	0.92+-	0.25	-0.3
OC3C	OC3U	* 0.32840+-	0.07490	0.37791+-	0.01252	1.15+-	0.27	0.7
OC4C	OC4U	* 0.39100+-	0.06300	0.30803+-	0.01404	0.79+-	0.13	-1.3
OPTC	OPTU	* 0.38920+-	0.10970	0.01734+-	0.00415	0.04+-	0.02	-3.4
EC1C	EC1U	* 0.64110+-	0.09000	0.54563+-	0.02108	0.85+-	0.12	-1.0
EC2C	EC2U	* 0.09970+-	0.04020	0.11249+-	0.01153	1.13+-	0.47	0.3
EC3C	EC3U	* 0.01780+-	0.01300	0.00690+-	0.00254	0.39+-	0.32	-0.8
ALXC	ALXU	* 0.03210+-	0.00420	0.03248+-	0.00070	1.01+-	0.13	0.1
ASXC	ASXU	* 0.00030+-	0.00020	0.00016+-	0.00007	0.53+-	0.43	-0.7
BRXC	BRXU	* 0.00250+-	0.00030	0.00291+-	0.00008	1.16+-	0.14	1.3
CAXC	CAXU	* 0.02420+-	0.00220	0.02627+-	0.00053	1.09+-	0.10	0.9
CRXC	CRXU	* 0.00120+-	0.00050	0.00060+-	0.00011	0.50+-	0.23	-1.2
CUXC	CUXU	* 0.00100+-	0.00030	0.00053+-	0.00007	0.53+-	0.17	-1.5
FEXC	FEXU	* 0.03010+-	0.00160	0.02927+-	0.00056	0.97+-	0.05	-0.5
KPXC	KPXU	* 0.03640+-	0.00280	0.03670+-	0.00114	1.01+-	0.08	0.1
MGXC	MGXU	* 0.01150+-	0.00450	0.01036+-	0.00131	0.90+-	0.37	-0.2
NAXC	NAXU	* 0.08150+-	0.01450	0.08150+-	0.00815	1.00+-	0.20	0.0
NIXC	NIXU	* 0.00040+-	0.00030	0.00012+-	0.00007	0.30+-	0.29	-0.9
PBXC	PBXU	* 0.00250+-	0.00030	0.00246+-	0.00008	0.99+-	0.12	-0.1
SEXC	SEXU	* 0.00110+-	0.00040	0.00206+-	0.00008	1.87+-	0.69	2.4
SIXC	SIXU	* 0.09860+-	0.00710	0.09468+-	0.00149	0.96+-	0.07	-0.5
VAXC	VAXU	* 0.00160+-	0.00070	0.00093+-	0.00014	0.58+-	0.27	-0.9
ZNXC	ZNXU	* 0.00610+-	0.00050	0.00598+-	0.00019	0.98+-	0.09	-0.2

6.6.6 Washington DC

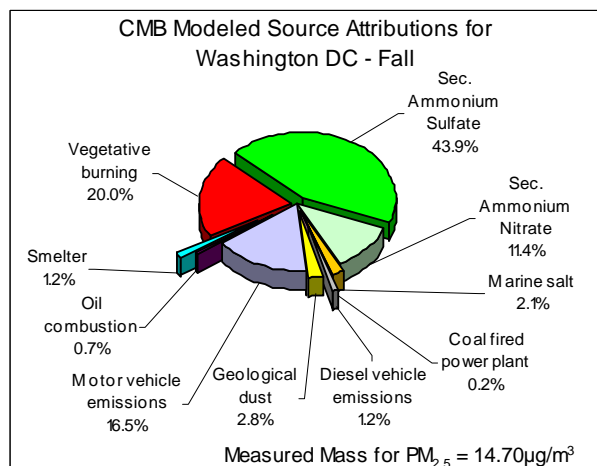
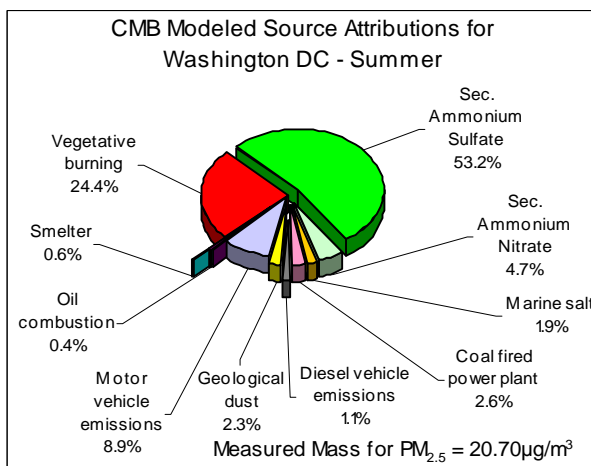
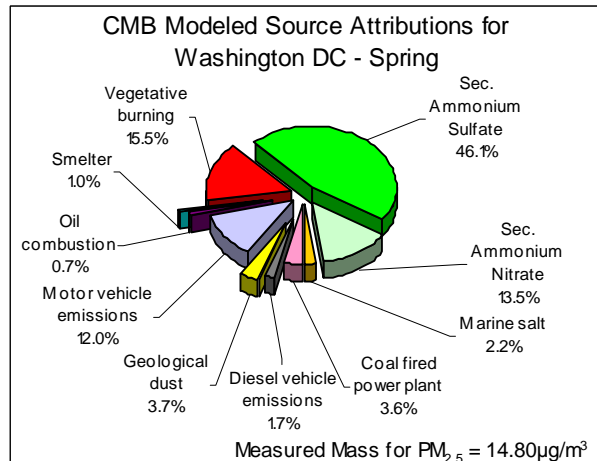
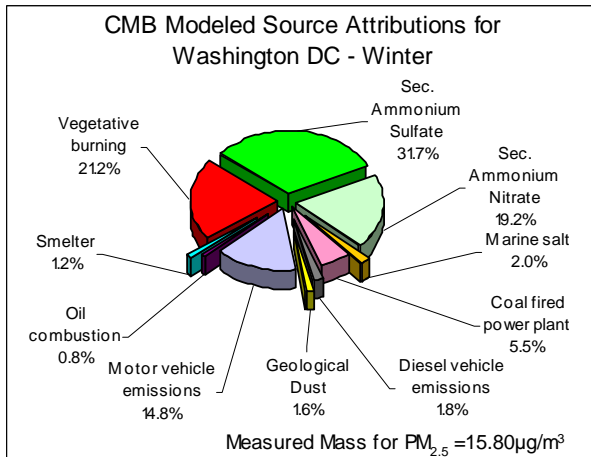
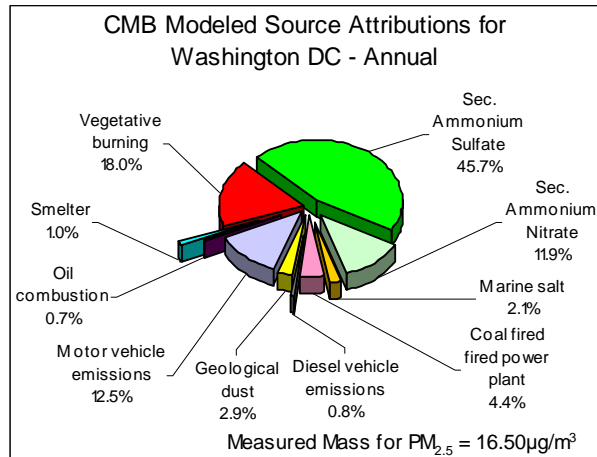


Figure 6.6-5 CMB modeled source attributions for mean annual and seasonal data subsets from Washington DC

Table 6.6-19a CMB model output for Washington DC, winter

SOURCE CONTRIBUTION ESTIMATES - SITE: MWWIMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.7
 CHI SQUARE 3.70 DF 15
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSU1	MCo1PP11	0.87355	0.17639	4.95235
YES	MSPFA3	MDsEmi02	0.28566	0.07539	3.78901
YES	MBPAL1	MGlDst01	0.07472	0.01729	4.32120
YES	MBPAL2	MGlDst02	0.17857	0.02688	6.64216
YES	MWPSU5	MMvEmi07	2.31658	0.18429	12.57019
YES	MLPSU7	MOilCo03	0.13153	0.01295	10.15493
YES	MLPFA2	MSmelt06	0.19148	0.01176	16.28795
YES	MWPFA6	MVgBrn20	3.30333	0.37266	8.86427
YES	MAMSUL	AMSUL	4.95217	0.09941	49.81433
YES	MAMNIT	AMNIT	2.99680	0.29184	10.26854
YES	MNAACL	NACL	0.31603	0.06826	4.62982

MEASURED CONCENTRATION FOR SIZE: PM2.5
 15.8+- 0.5

ELIGIBLE SPACE DIM. = 11 FOR MAX. UNC. = 3.16432 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00963	0.01205	0.01654	0.02490	0.06826	0.07035	0.09941	0.17346
0.18039	0.29184	0.37716					

NUMBER ESTIMABLE SOURCES = 11 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPSU1	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5
1.0000 MLPSU7	1.0000 MLPFA2	1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT
1.0000 MNAACL				

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-19b CMB model output for Washington DC, winter

SPECIES CONCENTRATIONS - SITE: MWWIMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 98.7
 CHI SQUARE 3.70 DF 15

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	15.82160+- 0.50730	15.62041+- 0.48894	0.99+- 0.04	-0.3
N3IC	N3IU	* 2.99530+- 0.29030	2.99681+- 0.02997	1.00+- 0.10	0.0
S4IC	S4IU	* 4.95200+- 0.08620	4.95218+- 0.04952	1.00+- 0.02	0.0
OC1C	OC1U	* 0.50190+- 0.16420	0.11982+- 0.03018	0.24+- 0.10	-2.3
OC2C	OC2U	* 0.54980+- 0.11330	0.83051+- 0.03143	1.51+- 0.32	2.4
OC3C	OC3U	* 1.01970+- 0.14010	0.88510+- 0.02417	0.87+- 0.12	-0.9
OC4C	OC4U	* 1.00060+- 0.13940	0.84183+- 0.02599	0.84+- 0.12	-1.1
OPTC	OPTU	* 0.20680+- 0.06530	0.09657+- 0.01303	0.47+- 0.16	-1.7
EC1C	EC1U	* 1.52520+- 0.20540	1.98110+- 0.04266	1.30+- 0.18	2.2
EC2C	EC2U	* 0.08830+- 0.03310	0.18170+- 0.01651	2.06+- 0.79	2.5
EC3C	EC3U	* 0.01780+- 0.01140	0.02757+- 0.00474	1.55+- 1.03	0.8
ALXC	ALXU	* 0.03040+- 0.00520	0.03165+- 0.00147	1.04+- 0.18	0.2
ASXC	ASXU	* 0.00070+- 0.00020	0.00022+- 0.00006	0.32+- 0.13	-2.3
BRXC	BRXU	* 0.00600+- 0.00040	0.00660+- 0.00013	1.10+- 0.08	1.4
CAXC	CAXU	* 0.03790+- 0.00320	0.03862+- 0.00111	1.02+- 0.09	0.2
CRXC	CRXU	* 0.00140+- 0.00060	0.00075+- 0.00020	0.54+- 0.27	-1.0
CUXC	CUXU	* 0.00460+- 0.00040	0.00421+- 0.00009	0.91+- 0.08	-1.0
FEXC	FEXU	* 0.11470+- 0.00590	0.11488+- 0.00099	1.00+- 0.05	0.0
KPXC	KPXU	* 0.07140+- 0.00460	0.06094+- 0.00170	0.85+- 0.06	-2.1
MGXC	MGXU	* 0.01550+- 0.00660	0.01049+- 0.00178	0.68+- 0.31	-0.7
NAXC	NAXU	* 0.12430+- 0.02380	0.12433+- 0.01243	1.00+- 0.22	0.0
NIXC	NIXU	* 0.00230+- 0.00020	0.00232+- 0.00008	1.01+- 0.09	0.1
PBXC	PBXU	* 0.00640+- 0.00050	0.00684+- 0.00013	1.07+- 0.09	0.9
SEXC	SEXU	* 0.00260+- 0.00020	0.00238+- 0.00008	0.92+- 0.08	-1.0
SIXC	SIXU	* 0.07960+- 0.00670	0.07941+- 0.00121	1.00+- 0.09	0.0
VAXC	VAXU	* 0.00620+- 0.00120	0.00213+- 0.00031	0.34+- 0.08	-3.3
ZNXC	ZNXU	* 0.01950+- 0.00110	0.01833+- 0.00032	0.94+- 0.06	-1.0

Table 6.6-20a CMB model output for Washington DC, spring

SOURCE CONTRIBUTION ESTIMATES - SITE: MWSPMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.6
 CHI SQUARE 2.09 DF 15
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSU1	MCo1PP11	0.52347	0.24382	2.14690
YES	MSPFA3	MDsEmi02	0.24434	0.07673	3.18458
YES	MBPAL1	MGlDst01	0.14595	0.01882	7.75423
YES	MBPAL2	MGlDst02	0.39399	0.03252	12.11578
YES	MWPSU5	MMvEmi07	1.76143	0.17461	10.08770
YES	MLPSU7	MOilCo03	0.10445	0.01306	7.99529
YES	MLPFA2	MSmelt06	0.15237	0.01141	13.35121
YES	MWPFA6	MVgBrn20	2.28669	0.31627	7.23024
YES	MAMSUL	AMSUL	6.79007	0.13545	50.13024
YES	MAMNIT	AMNIT	1.99428	0.19890	10.02642
YES	MNAACL	NACL	0.32640	0.05830	5.59913

MEASURED CONCENTRATION FOR SIZE: PM2.5
 14.8+- 0.5

ELIGIBLE SPACE DIM. = 11 FOR MAX. UNC. = 2.95796 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00933	0.01271	0.01818	0.02884	0.05830	0.07155	0.13545	0.16384
0.19890	0.23221	0.33207					

NUMBER ESTIMABLE SOURCES = 11 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPSU1	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5
1.0000 MLPSU7	1.0000 MLPFA2	1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT
1.0000 MNAACL				

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-20b CMB model output for Washington DC, spring

SPECIES CONCENTRATIONS - SITE: MWSPMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.6
 CHI SQUARE 2.09 DF 15

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	14.78980+-	0.47760 14.72344+-	0.40470 1.00+-	0.04 -0.1
N3IC	N3IU	* 1.99390+-	0.19790 1.99429+-	0.01994 1.00+-	0.10 0.0
S4IC	S4IU	* 6.78990+-	0.11720 6.79008+-	0.06790 1.00+-	0.02 0.0
OC1C	OC1U	* 0.32290+-	0.11330 0.09291+-	0.02388 0.29+-	0.13 -2.0
OC2C	OC2U	* 0.52040+-	0.10640 0.58606+-	0.02216 1.13+-	0.23 0.6
OC3C	OC3U	* 0.67080+-	0.10230 0.64280+-	0.01868 0.96+-	0.15 -0.3
OC4C	OC4U	* 0.71930+-	0.10290 0.60233+-	0.01924 0.84+-	0.12 -1.1
OPTC	OPTU	* 0.16660+-	0.05270 0.05879+-	0.00914 0.35+-	0.12 -2.0
EC1C	EC1U	* 1.19580+-	0.16200 1.41915+-	0.03347 1.19+-	0.16 1.4
EC2C	EC2U	* 0.11430+-	0.04090 0.15273+-	0.01335 1.34+-	0.49 0.9
EC3C	EC3U	* 0.01910+-	0.01270 0.02098+-	0.00373 1.10+-	0.76 0.1
ALXC	ALXU	* 0.04980+-	0.00580 0.05112+-	0.00118 1.03+-	0.12 0.2
ASXC	ASXU	* 0.00060+-	0.00020 0.00018+-	0.00007 0.30+-	0.16 -2.0
BRXC	BRXU	* 0.00470+-	0.00040 0.00545+-	0.00012 1.16+-	0.10 1.8
CAXC	CAXU	* 0.04820+-	0.00360 0.05255+-	0.00092 1.09+-	0.08 1.2
CRXC	CRXU	* 0.00150+-	0.00060 0.00077+-	0.00017 0.51+-	0.23 -1.2
CUXC	CUXU	* 0.00330+-	0.00030 0.00327+-	0.00009 0.99+-	0.09 -0.1
FEXC	FEXU	* 0.10880+-	0.00560 0.10667+-	0.00077 0.98+-	0.05 -0.4
KPXC	KPXU	* 0.05800+-	0.00400 0.05522+-	0.00141 0.95+-	0.07 -0.7
MGXC	MGXU	* 0.01460+-	0.00530 0.01007+-	0.00139 0.69+-	0.27 -0.8
NAXC	NAXU	* 0.12840+-	0.01900 0.12841+-	0.01284 1.00+-	0.18 0.0
NIXC	NIXU	* 0.00180+-	0.00020 0.00186+-	0.00008 1.03+-	0.12 0.3
PBXC	PBXU	* 0.00590+-	0.00050 0.00568+-	0.00011 0.96+-	0.08 -0.4
SEXC	SEXU	* 0.00170+-	0.00040 0.00171+-	0.00008 1.01+-	0.24 0.0
SIXC	SIXU	* 0.14210+-	0.00930 0.13458+-	0.00118 0.95+-	0.06 -0.8
VAXC	VAXU	* 0.00430+-	0.00100 0.00164+-	0.00024 0.38+-	0.11 -2.6
ZNXC	ZNXU	* 0.01500+-	0.00090 0.01444+-	0.00025 0.96+-	0.06 -0.6

Table 6.6-21a CMB model output for Washington DC, summer

SOURCE CONTRIBUTION ESTIMATES - SITE: MWSUMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 100.0
 CHI SQUARE 4.07 DF 15
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSU1	MCo1PP11	0.52801	0.29278	1.80342
YES	MSPFA3	MDsEmi02	0.21801	0.08267	2.63701
YES	MBPAL1	MGlDst01	0.18072	0.02310	7.82199
YES	MBPAL2	MGlDst02	0.29805	0.03781	7.88240
YES	MWPSU5	MMvEmi07	1.83832	0.17394	10.56867
YES	MLPSU7	MOilCo03	0.07689	0.02416	3.18272
YES	MLPFA2	MSmelt06	0.12833	0.01101	11.65760
YES	MLPSU6	MVgBrn10	5.05338	0.56896	8.88177
YES	MAMSUL	AMSUL	11.00700	0.21906	50.24630
YES	MAMNIT	AMNIT	0.96398	0.09957	9.68168
YES	MNACL	NACL	0.40059	0.07816	5.12529

MEASURED CONCENTRATION FOR SIZE: PM2.5
 20.7+- 0.6

ELIGIBLE SPACE DIM. = 11 FOR MAX. UNC. = 4.13740 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00837	0.02057	0.02417	0.03268	0.07816	0.07820	0.09957	0.17309
0.21906	0.27659	0.57834					

NUMBER ESTIMABLE SOURCES = 11 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPSU1	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5
1.0000 MLPSU7	1.0000 MLPFA2	1.0000 MLPSU6	1.0000 MAMSUL	1.0000 MAMNIT
1.0000 MNACL				

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-21b CMB model output for Washington DC, summer

SPECIES CONCENTRATIONS - SITE: MWSUMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 100.0
 CHI SQUARE 4.07 DF 15

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	20.68700+- 0.64800	20.69329+- 0.58823	1.00+- 0.04	0.0
N3IC	N3IU	* 0.96400+- 0.09910	0.96400+- 0.00964	1.00+- 0.10	0.0
S4IC	S4IU	* 11.00700+- 0.18940	11.00701+- 0.11007	1.00+- 0.02	0.0
OC1C	OC1U	* 0.36190+- 0.12800	0.24246+- 0.03250	0.67+- 0.25	-0.9
OC2C	OC2U	* 0.73670+- 0.14680	0.62688+- 0.03662	0.85+- 0.18	-0.7
OC3C	OC3U	* 0.74550+- 0.11440	0.91552+- 0.03348	1.23+- 0.19	1.4
OC4C	OC4U	* 0.81180+- 0.11690	0.51408+- 0.02430	0.63+- 0.10	-2.5
OPTC	OPTU	* 0.30410+- 0.09280	0.47907+- 0.03324	1.58+- 0.49	1.8
EC1C	EC1U	* 1.40800+- 0.19090	1.11617+- 0.03848	0.79+- 0.11	-1.5
EC2C	EC2U	* 0.10500+- 0.04230	0.16647+- 0.01770	1.59+- 0.66	1.3
EC3C	EC3U	* 0.01930+- 0.01350	0.03111+- 0.00516	1.61+- 1.16	0.8
ALXC	ALXU	* 0.06060+- 0.00720	0.06085+- 0.00149	1.00+- 0.12	0.0
ASXC	ASXU	* 0.00050+- 0.00020	0.00018+- 0.00011	0.35+- 0.27	-1.4
BRXC	BRXU	* 0.00340+- 0.00030	0.00480+- 0.00014	1.41+- 0.13	4.2
CAXC	CAXU	* 0.04290+- 0.00360	0.05290+- 0.00103	1.23+- 0.11	2.7
CRXC	CRXU	* 0.00170+- 0.00080	0.00173+- 0.00024	1.02+- 0.50	0.0
CUXC	CUXU	* 0.00330+- 0.00030	0.00326+- 0.00012	0.99+- 0.10	-0.1
FEXC	FEXU	* 0.10350+- 0.00540	0.10010+- 0.00073	0.97+- 0.05	-0.6
KPXC	KPXU	* 0.07540+- 0.00510	0.06354+- 0.00150	0.84+- 0.06	-2.2
MGXC	MGXU	* 0.01820+- 0.00720	0.01804+- 0.00193	0.99+- 0.41	0.0
NAXC	NAXU	* 0.15760+- 0.02640	0.15760+- 0.01576	1.00+- 0.20	0.0
NIXC	NIXU	* 0.00120+- 0.00040	0.00140+- 0.00012	1.16+- 0.40	0.5
PBXC	PBXU	* 0.00580+- 0.00050	0.00479+- 0.00013	0.83+- 0.07	-1.9
SEXC	SEXU	* 0.00200+- 0.00040	0.00155+- 0.00012	0.78+- 0.17	-1.1
SIXC	SIXU	* 0.16600+- 0.01150	0.13899+- 0.00202	0.84+- 0.06	-2.3
VAXC	VAXU	* 0.00340+- 0.00110	0.00289+- 0.00032	0.85+- 0.29	-0.4
ZNXC	ZNXU	* 0.01230+- 0.00070	0.01176+- 0.00023	0.96+- 0.06	-0.7

Table 6.6-22a CMB model output for Washington DC, fall

SOURCE CONTRIBUTION ESTIMATES - SITE: MWFAMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.8
 CHI SQUARE 3.21 DF 15
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSP8	MCo1PP10	0.02979	0.05699	0.52264
YES	MSPFA3	MDsEmi02	0.17574	0.08058	2.18111
YES	MBPAL1	MGLDst01	0.09318	0.01765	5.27889
YES	MBPAL2	MGLDst02	0.31692	0.03369	9.40699
YES	MWPSU5	MMvEmi07	2.41460	0.18797	12.84571
YES	MLPSU7	MOilCo03	0.10642	0.02337	4.55340
YES	MLPFA2	MSmelt06	0.16921	0.01509	11.21369
YES	MWPFA6	MVgBrn20	2.93393	0.36214	8.10173
YES	MAMSUL	AMSUL	6.43826	0.12901	49.90396
YES	MAMNIT	AMNIT	1.66843	0.16674	10.00638
YES	MNAACL	NACL	0.31473	0.06001	5.24450

MEASURED CONCENTRATION FOR SIZE: PM2.5
 14.7+- 0.5

ELIGIBLE SPACE DIM. = 11 FOR MAX. UNC. = 2.93780 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00933	0.01641	0.02091	0.03187	0.05722	0.06001	0.07546	0.12901
0.16674	0.18338	0.36610					

NUMBER ESTIMABLE SOURCES = 11 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPSP8	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5
1.0000 MLPSU7	1.0000 MLPFA2	1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT
1.0000 MNAACL				

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-22b CMB model output for Washington DC, fall

SPECIES CONCENTRATIONS - SITE: MWFAMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 99.8
 CHI SQUARE 3.21 DF 15

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	14.68900+- 0.47760	14.66121+- 0.40787	1.00+- 0.04	0.0
N3IC	N3IU	* 1.66800+- 0.16590	1.66845+- 0.01668	1.00+- 0.10	0.0
S4IC	S4IU	* 6.43800+- 0.11180	6.43827+- 0.06438	1.00+- 0.02	0.0
OC1C	OC1U	* 0.38000+- 0.13400	0.09110+- 0.02144	0.24+- 0.10	-2.1
OC2C	OC2U	* 0.61110+- 0.12320	0.62409+- 0.02265	1.02+- 0.21	0.1
OC3C	OC3U	* 0.88590+- 0.13030	0.83149+- 0.02154	0.94+- 0.14	-0.4
OC4C	OC4U	* 0.87580+- 0.12540	0.77839+- 0.02089	0.89+- 0.13	-0.8
OPTC	OPTU	* 0.23800+- 0.07540	0.00119+- 0.00573	0.00+- 0.02	-3.1
EC1C	EC1U	* 1.56510+- 0.21230	1.61968+- 0.03209	1.03+- 0.14	0.3
EC2C	EC2U	* 0.10910+- 0.04220	0.13515+- 0.01015	1.24+- 0.49	0.6
EC3C	EC3U	* 0.01790+- 0.01240	0.01884+- 0.00308	1.05+- 0.75	0.1
ALXC	ALXU	* 0.03510+- 0.00530	0.03536+- 0.00114	1.01+- 0.16	0.0
ASXC	ASXU	* 0.00060+- 0.00020	0.00018+- 0.00007	0.31+- 0.15	-2.0
BRXC	BRXU	* 0.00470+- 0.00040	0.00602+- 0.00012	1.28+- 0.11	3.2
CAXC	CAXU	* 0.04480+- 0.00370	0.04904+- 0.00091	1.09+- 0.09	1.1
CRXC	CRXU	* 0.00160+- 0.00070	0.00078+- 0.00017	0.49+- 0.24	-1.1
CUXC	CUXU	* 0.00440+- 0.00030	0.00389+- 0.00009	0.88+- 0.06	-1.6
FEXC	FEXU	* 0.12410+- 0.00640	0.12464+- 0.00096	1.00+- 0.05	0.1
KPXC	KPXU	* 0.05990+- 0.00440	0.05588+- 0.00139	0.93+- 0.07	-0.9
MGXC	MGXU	* 0.01410+- 0.00560	0.00936+- 0.00115	0.66+- 0.28	-0.8
NAXC	NAXU	* 0.12380+- 0.02010	0.12382+- 0.01238	1.00+- 0.19	0.0
NIXC	NIXU	* 0.00160+- 0.00040	0.00187+- 0.00008	1.17+- 0.30	0.7
PBXC	PBXU	* 0.00710+- 0.00050	0.00624+- 0.00012	0.88+- 0.06	-1.7
SEXC	SEXU	* 0.00220+- 0.00040	0.00136+- 0.00008	0.62+- 0.12	-2.1
SIXC	SIXU	* 0.11800+- 0.00900	0.11040+- 0.00099	0.94+- 0.07	-0.8
VAXC	VAXU	* 0.00400+- 0.00110	0.00199+- 0.00026	0.50+- 0.15	-1.8
ZNXC	ZNXU	* 0.01610+- 0.00090	0.01687+- 0.00027	1.05+- 0.06	0.8

Table 6.6-23a CMB model output for Washington DC, annual

SOURCE CONTRIBUTION ESTIMATES - SITE: MWALMean1 DATE: 2/25/200 CMB8 (97350)
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.6
 CHI SQUARE 2.74 DF 15
 B and L: No SRC ELIM: No
 WEIGHTS: CHISQR 1.000 R SQR 1.000 PCMASS 1.000 FRCEST 1.000

SOURCE	EST CODE	NAME	SCE(UG/M3)	STD ERR	TSTAT
YES	MSPSU1	MCo1PP11	0.70974	0.22836	3.10807
YES	MSPFA3	MDsEmi02	0.23609	0.07915	2.98282
YES	MBPAL1	MGlDst01	0.12498	0.01922	6.50117
YES	MBPAL2	MGlDst02	0.33393	0.03267	10.22273
YES	MWPSU5	MMvEmi07	1.99798	0.17998	11.10111
YES	MLPSU7	MOilCo03	0.10426	0.01842	5.66027
YES	MLPFA2	MSmelt06	0.15948	0.01153	13.83131
YES	MWPFA6	MVgBrn20	2.87873	0.35476	8.11453
YES	MAMSUL	AMSUL	7.28522	0.14555	50.05473
YES	MAMNIT	AMNIT	1.90048	0.18876	10.06826
YES	MNAACL	NACL	0.33912	0.06606	5.13371

MEASURED CONCENTRATION FOR SIZE: PM2.5
 16.5+- 0.5

ELIGIBLE SPACE DIM. = 11 FOR MAX. UNC. = 3.29150 (20.% OF TOTAL MEAS. MASS)

1 / SINGULAR VALUE

0.00940	0.01648	0.01932	0.02942	0.06606	0.07402	0.14555	0.17393
0.18876	0.22309	0.36259					

NUMBER ESTIMABLE SOURCES = 11 FOR MIN. PROJ. = 0.95

PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE	PROJ. SOURCE
1.0000 MSPSU1	1.0000 MSPFA3	1.0000 MBPAL1	1.0000 MBPAL2	1.0000 MWPSU5
1.0000 MLPSU7	1.0000 MLPFA2	1.0000 MWPFA6	1.0000 MAMSUL	1.0000 MAMNIT
1.0000 MNAACL				

ESTIMABLE LINEAR COMBINATIONS OF INESTIMABLE SOURCES

COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	COEFF. SOURCE	SCE	STD ERR
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Table 6.6-23b CMB model output for Washington DC, annual

SPECIES CONCENTRATIONS - SITE: MWALMean1 DATE: 2/25/200 CMB 8.0
 SAMPLE DURATION 24 START HOUR 0 SIZE: PM2.5
 R SQUARE 0.99 PERCENT MASS 97.6
 CHI SQUARE 2.74 DF 15

SPECIES	I	MEAS	CALC	RATIO C/M	RATIO R/U
TMAC	TMAU	16.45750+- 0.52650	16.07001+- 0.43767	0.98+- 0.04	-0.6
N3IC	N3IU	* 1.90010+- 0.18780	1.90049+- 0.01900	1.00+- 0.10	0.0
S4IC	S4IU	* 7.28500+- 0.12600	7.28523+- 0.07285	1.00+- 0.02	0.0
OC1C	OC1U	* 0.39070+- 0.13460	0.10460+- 0.02546	0.27+- 0.11	-2.1
OC2C	OC2U	* 0.60400+- 0.12240	0.72076+- 0.02694	1.19+- 0.25	0.9
OC3C	OC3U	* 0.82960+- 0.12170	0.77623+- 0.02106	0.94+- 0.14	-0.4
OC4C	OC4U	* 0.85080+- 0.12100	0.73263+- 0.02212	0.86+- 0.13	-1.0
OPTC	OPTU	* 0.22860+- 0.07150	0.07896+- 0.01064	0.35+- 0.12	-2.1
EC1C	EC1U	* 1.42350+- 0.19270	1.69883+- 0.03568	1.19+- 0.16	1.4
EC2C	EC2U	* 0.10440+- 0.03970	0.15703+- 0.01377	1.50+- 0.59	1.3
EC3C	EC3U	* 0.01850+- 0.01250	0.02319+- 0.00394	1.25+- 0.87	0.4
ALXC	ALXU	* 0.04390+- 0.00590	0.04579+- 0.00126	1.04+- 0.14	0.3
ASXC	ASXU	* 0.00060+- 0.00020	0.00019+- 0.00008	0.32+- 0.17	-1.9
BRXC	BRXU	* 0.00470+- 0.00040	0.00583+- 0.00013	1.24+- 0.11	2.7
CAXC	CAXU	* 0.04350+- 0.00350	0.04878+- 0.00094	1.12+- 0.09	1.5
CRXC	CRXU	* 0.00160+- 0.00070	0.00076+- 0.00018	0.48+- 0.24	-1.2
CUXC	CUXU	* 0.00390+- 0.00030	0.00358+- 0.00010	0.92+- 0.07	-1.0
FEXC	FEXU	* 0.11290+- 0.00590	0.11097+- 0.00086	0.98+- 0.05	-0.3
KPXC	KPXU	* 0.06600+- 0.00450	0.05804+- 0.00145	0.88+- 0.06	-1.7
MGXC	MGXU	* 0.01560+- 0.00620	0.01024+- 0.00149	0.66+- 0.28	-0.8
NAXC	NAXU	* 0.13340+- 0.02230	0.13342+- 0.01334	1.00+- 0.19	0.0
NIXC	NIXU	* 0.00170+- 0.00030	0.00186+- 0.00009	1.09+- 0.20	0.5
PBXC	PBXU	* 0.00630+- 0.00050	0.00587+- 0.00012	0.93+- 0.08	-0.8
SEXC	SEXU	* 0.00210+- 0.00030	0.00197+- 0.00009	0.94+- 0.14	-0.4
SIXC	SIXU	* 0.12650+- 0.00910	0.11746+- 0.00114	0.93+- 0.07	-1.0
VAXC	VAXU	* 0.00450+- 0.00110	0.00182+- 0.00027	0.40+- 0.12	-2.4
ZNXC	ZNXU	* 0.01570+- 0.00090	0.01557+- 0.00028	0.99+- 0.06	-0.1

6.7 Conceptual Model

The conceptual model of the sources influencing the four receptor sites is assembled from the analyses of emissions inventories, back trajectories, and receptor modeling. It examines the weight of evidence from several assessment projects, including those undertaken as part of this study and those previously published. The integrated analysis increases confidence in findings that are corroborated by multiple analysis methods and highlight gaps in our knowledge when results are not consistent.

Although each site is analyzed individually in the subsections below, some observations are applicable for all sites. The three secondary profiles, ammonium sulfate, ammonium nitrate and secondary organics, in variable proportions, make up close to three quarters of all ambient sample sets. The extent to which secondary sources evolve is very much a seasonal phenomenon. All four monitoring sites show increases in summertime sulfate concentrations due to increased sunlight and more efficient photochemical conversion of SO₂ to SO₄. This effect is also observed with the secondary organic component of the aerosol mass. Conversely, ammonium nitrate forms reversibly from the combination of nitric acid gas and ammonia. This reaction is favored by colder temperatures and less prevailing sunlight, consequently ammonium nitrate forms predominantly during the colder winter months.

6.7.1 Boundary Waters Canoe Area.

The Boundary Waters Canoe Area site is located in a remote area of northern Minnesota on the US/Canadian border. The closest urban areas to the site are Duluth (pop 87,000) ~200 km to the south and the twin cities Minneapolis-St. Paul (pop 700,000) ~400 km to the south. Nearby PM point sources include iron ore mining and steel processing operations within 100 km to the south west. With respect to the more eastern visibility protected areas, there are few sulfur dioxide sources within 200 km of the site. The proximity to the Canadian wilderness region, and the prevailing wind direction, makes this site susceptible to smoke from forest wild fires, more so during the summer and fall.

Based on the above observations, the following trends are expected to be observed at the site:

- Secondary sulfate should originate from warmer southerly areas where SO₂ and NH₃ sources are more plentiful and photochemical conversion is more efficient. This was confirmed by the back trajectory analysis.
- Secondary nitrate should form during colder winter period, perhaps when air arrives from the Arctic, with shorter daylight hours. This was confirmed by the back trajectory analysis.
- Secondary organics should originate during dry warmer periods, when primary organic sources such as forest fires are more prevalent and photochemical conversion is more efficient. PMF modeling showed this to be more evident at Boundary Waters Canoe Area and Washington DC
- Smoke from vegetative burning in the densely forested areas of Canada (to the northwest of the site) in the late summer when conditions are dry, and lightning could ignite fires. Time series plots, historic data on events and back trajectory analysis confirmed this.

- Iron oxides and crustal species should originate from iron ore mining and processing to the southwest. This should have a greater impact at this site during the dry summer months. PMF modeling of the Boundary Waters Canoe Area showed this profile.
- Motor vehicle exhaust, road dust including road salt contributions to aerosol mass should be present during southerly flow from the population centers of the twin cities and beyond. This was picked up with the PMF modeling but better time resolved CMB modeling needs to be done.
- Road dust and road salt from road de-icing was identified from PMF modeling and compared to measured source profiles.
- Geological dust from remote sources, such as Saharan and Asian dust could impact on the site, especially during the dry summer months. Comparing the modeled profiles with published chemical profiles and with back trajectories confirmed this hypothesis.
- Smelter emissions from Canadian sources could impact on this site, should this be favored by northwesterly winds. The PMF modeling from Boundary Waters, but also from the other three sites could confirm this.
- If local sources (i.e., within 200 km of the site) control the abundance of secondary sulfate and organics, there should be less sulfate and nitrate at Boundary Waters Canoe Area than at the other sites. Comparative ammonium sulfate seasonal plots for each of the sites clearly showed this difference.

6.7.2 Lye Brook Wilderness Area

The Lye Brook site is located in the south western corner of the state of Vermont. The closest population centers to the site are Boston (pop 590,000) 200 km to the southeast, Montreal (pop 1,000,000) 250 km to the north, and Toronto (pop 2,500,000) and Buffalo (pop 1,100,000) ~350 km to the west. Nearby point sources include a large cement kiln 100 km to the south west and several smaller coal fired power plants to the west, south, and east. The site is located ~200 km west of the coast of New Hampshire.

Based on this information, the following hypotheses are constructed about the aerosol trends at the site.

- Marine influence should occur under westerly flow from the Atlantic Ocean and after winter snowstorms when salt was applied as a road de-icer. Marine salt was modeled consistently at each of the sites and all seasons, and it is not possible to distinguish sea salt from road salt.
- The influence of the cement kiln (increase in calcium) should be observed when trajectories are from the southwest. This profile could not be modeled, and may be masked by calcium which commonly occurs in the geological dust profiles.
- Aside from the cement kiln influence, the lack of large nearby point sources should generate an ambient aerosol that has the properties of well mixed, aged urban emissions (*i.e.* road dust with motor vehicle emissions). In general the Lye

Brook Wilderness Area data are more difficult to model and profiles are not as clearly resolved by the PMF model. This anomalous situation is ascribed to the fact that the site is at a high elevation and not able to clearly detect the local sources.

- Summertime vegetative burning signatures should be observed during northwesterly wind flows from Canada. Back trajectory analysis and recorded dates of wild fires confirmed this
- There are only a few large coal fired power plants close by. If sulfate aerosol is a local issue, there should be substantially less sulfate at Lye Brook Wilderness Area than at either the Shenandoah National Park or Washington DC sites. Comparative seasonal plots of ammonium nitrate confirmed that this is the case.

6.7.3 Shenandoah National Park and Washington DC.

The Shenandoah National Park IMPROVE site is located in northern Virginia, approximately 150 km west-southwest of the urban Washington D.C. IMPROVE site. The Shenandoah site is located in a forested area while the Washington D.C. site is in an urban center. There are substantially more sources of SO₂ (coal fired power plants) in the vicinity of these two sites than at the other two sites. Several iron and steel blast furnaces, and smelters are in the region surrounding these two sites.

The following trends are expected for the Shenandoah National Park and Washington D.C. sites.

- Contributions from local motor vehicle emissions such as organics and nitrogen oxides, as well as road dust should dominate at both sites, being greater at Washington D.C. than at Shenandoah National Park. PMF modeling did show this to be the case.
- Contributions from forest fires should be less at these two sites than at the two more northerly sites. CMB modeling shows that this is true, being more evident for the summer months. However, the vegetative burning profiles at Washington DC and Shenandoah National Park are not well resolved and may contain some vegetative burning components.
- Secondary sulfate and primary emissions from coal fired power plants should originate from distant (>300 km away) facilities in Pennsylvania and Ohio. The ammonium sulfate contributions are highest at Shenandoah National Park.
- The Washington D.C. site should have greater secondary organic aerosol because it is closer to urban sources such as motor vehicle emissions.
- Marine salt from the Atlantic ocean should be more at these sites than at the more inland sites in Vermont and Minnesota. CMB modeling showed that marine salt at Washington DC was similar to the other sites.
- Contributions from iron and steel blast furnaces as well as aluminum smelters may not have a strong directional bias since several smaller facilities are located

in all directions. The iron and steel plant emissions were not detected at Washington DC or Shenandoah National Park.

- The urban site will have larger contributions of trace metals from poorly characterized sources such as motor vehicle brake and clutch wear, foundries and plating operations. This was can be seen in the PMF modeled road dust profiles from Washington DC.

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Profile Description	OC1	OC2	OC3	OC4
1	MWSPS1	MBiEmi01	Biogenic emissions, PMF modeled profile, Marama, Washington DC, spring	0.058844	0.338893	0.000072	0.000335
2	MBPW18	MColPP01	Coal fired power plant, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	0.000264	0.093261	0.110291	0.135247
3	MBPSU8	MColPP02	Coal fired power plant, PMF modeled profile, Marama, Boundary Waters Canoe Area, summer	0.111074	0.000364	0.109781	0.000428
5	MLPAL6	MVgBrn24	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, annual	0.022505	0.067941	0.142444	0.152791
6	MLPW16	MColPP05	Coal fired power plant, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	0.000194	0.119245	0.176025	0.214970
7	MLPSU5	MColPP06	Coal fired power plant, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.023604	0.140830	0.008558	0.115440
8	MSPW15	MColPP07	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, winter	0.028940	0.142984	0.233484	0.280774
9	MSPW18	MColPP08	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, winter	0.114658	0.103101	0.000204	0.000833
10	MSPSP4	MColPP09	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, spring	0.000528	0.000244	0.000134	0.000560
11	MSPSP8	MColPP10	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, spring	0.047819	0.212777	0.000097	0.176943
12	MSPSU1	MColPP11	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, summer	0.019571	0.204694	0.000049	0.017006
13	MSPSU2	MColPP12	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, summer	0.019428	0.158063	0.036501	0.000557
14	MWSPS2	MColPP13	Coal fired power plant, PMF modeled profile, Marama, Washington DC, spring	0.138766	0.109967	0.028695	0.234290
15	MWPSU9	MColPP14	Coal fired power plant, PMF modeled profile, Marama, Washington DC, summer	0.032448	0.162563	0.018980	0.136603
17	MSPFA3	MDsEmi02	Diesel vehicle emissions, PMF modeled profile, Marama, Shenandoah National Park, fall	0.090055	0.000400	0.000916	0.000939
18	MSPSU5	MGaEmi01	Motor vehicle emissions, PMF modeled profile, Marama, Shenandoah National Park, summer	0.034979	0.106693	0.073984	0.201197
20	MBPAL1	MGIDst01	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.000530	0.001689	0.000253	0.000165
21	MBPAL2	MGIDst02	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.018116	0.051846	0.043950	0.014336
22	MBPW14	MGIDst03	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	0.034631	0.004819	0.226729	0.136153
23	MBPSP6	MVgBrn26	Vegetative burning, PMF modeled profile, Marama, Boundary Waters Canoe Area, spring	0.8583	4.6640	9.6791	5.5179
24	MBPSP9	MGIDst05	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, spring	0.002853	0.014667	0.003510	0.000155
25	MBPSU4	MGIDst06	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, summer	0.000709	0.020017	0.000102	0.014802
26	MBPFA5	MGIDst07	Geological dust, PMF modeled profile, Marama, Boundary Waters Canoe Area, fall	0.000452	0.072086	0.143432	0.070046
27	MLPAL9	MGIDst08	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, annual	0.001115	0.000267	0.000757	0.001084
29	MLPW12	MGIDst10	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, spring	0.000167	0.000069	0.000091	0.000078
30	MLPSP1	MGIDst11	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, spring	0.000295	0.000190	0.000067	0.000071
31	MLPSP3	MGIDst12	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, spring	0.010314	0.008497	0.027054	0.024296
32	MLPSU2	MGIDst13	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.000062	0.000264	0.013468	0.007168
33	MLPSU9	MGIDst14	Geological dust, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.000046	0.000748	0.000007	0.000051
34	MSPAL3	MGIDst15	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, annual	0.009035	0.000771	0.000103	0.000064
35	MSPAL9	MGIDst16	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, annual	0.000353	0.005618	0.000142	0.001377
36	MSPW14	MGIDst17	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, winter	0.000478	0.002683	0.000320	0.000194
37	MSPSP2	MGIDst18	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, spring	0.030162	0.000428	0.000321	0.000141
38	MSPSP9	MGIDst19	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, spring	0.000495	0.000306	0.067882	0.001631
39	MSPSU3	MGIDst20	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, summer	0.044631	0.001436	0.000058	0.000237
40	MSPSU9	MGIDst21	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, summer	0.000041	0.008825	0.000026	0.000238
41	MSPFA5	MGIDst22	Geological dust, PMF modeled profile, Marama, Shenandoah National Park, fall	0.039080	0.000149	0.000640	0.019439
42	MWPAL3	MGIDst23	Geological dust, PMF modeled profile, Marama, Washington DC, annual	0.000711	0.000065	0.000111	0.000026
43	MWPW14	MGIDst24	Geological dust, PMF modeled profile, Marama, Washington DC, winter	0.030702	0.015968	0.000144	0.009306
44	MWPW19	MGIDst25	Geological dust, PMF modeled profile, Marama, Washington DC, winter	0.137275	0.146930	0.001444	0.000734

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Profile Description	OC1	OC2	OC3	OC4
45	MWPS6	MGIDst26	Geological dust, PMF modeled profile, Marama, Washington DC, spring	0.000125	0.036249	0.000589	0.000115
46	MWPSU2	MGIDst27	Geological dust, PMF modeled profile, Marama, Washington DC, summer	0.100652	0.000142	0.059767	0.000180
47	MWPFA4	MGIDst28	Geological dust, PMF modeled profile, Marama, Washington DC, fall	0.126129	0.000687	0.000051	0.000052
48	MBPAL7	Mir&St01	Iron and steel industry, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.004481	0.002414	0.004622	0.011933
49	MBPW16	Mir&St02	Iron and steel industry, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	0.087262	0.144723	0.025758	0.000764
50	MBPSP8	Mir&St03	Iron and steel industry, PMF modeled profile, Marama, Boundary Waters Canoe Area, spring	0.000293	0.069599	0.090191	0.080879
51	MBPSU6	Mir&St04	Iron and steel industry, PMF modeled profile, Marama, Boundary Waters Canoe Area, summer	0.000665	0.032640	0.000626	0.000657
52	MBPFA8	Mir&St05	Iron and steel industry, PMF modeled profile, Marama, Boundary Waters Canoe Area, fall	0.059241	0.015974	0.003458	0.049126
55	MLPFA9	MsecOr19	Secondary organics, PMF modeled profile, Marama, Lye Brook Wilderness Area, fall	1.888600	1.941100	5.101100	1.734000
56	MWPAL4	MVgBrn21	Vegetative burning, PMF modeled profile, Marama, Washington DC, annual	5.108000	11.39400	21.62200	21.26100
57	MWPS3	MVgBrn23	Vegetative burning, PMF modeled profile, Marama, Washington DC, spring	2.960000	20.74200	27.16800	27.77000
58	MWPS9	MmvEmi06	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, spring	0.071022	0.000467	0.201983	0.308498
59	MWPSU5	MmvEmi07	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, summer	0.009248	0.086002	0.109680	0.103380
60	MLPAL5	MoilCo01	Oil combustion, PMF modeled profile, Marama, Lye Brook Wilderness Area, annual	0.000585	0.000560	0.028590	0.009879
61	MLPW17	MoilCo02	Oil combustion, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	0.042048	0.000982	0.591669	0.002940
62	MLPSU7	MoilCo03	Oil combustion, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.070248	0.000187	0.062741	0.046677
63	MLPFA6	MsecOr15	Secondary organics, PMF modeled profile, Marama, Lye Brook Wilderness Area, fall	4.635300	1.697700	4.099200	1.436300
64	MSPAL1	MdvEmi05	Diesel vehicle emissions, PMF modeled profile, Marama, Shenandoah National Park, annual	1.504800	1.772700	1.570800	2.208600
65	MWPAL8	MoilCo06	Oil combustion, PMF modeled profile, Marama, Washington DC, annual	0.392832	0.000336	0.001914	0.000544
66	MWPW12	MoilCo07	Oil combustion, PMF modeled profile, Marama, Washington DC, winter	0.189839	0.000795	0.153286	0.085822
67	MWPS8	MoilCo08	Oil combustion, PMF modeled profile, Marama, Washington DC, spring	0.261354	0.001120	0.002702	0.078461
68	MWPSU6	MoilCo09	Oil combustion, PMF modeled profile, Marama, Washington DC, summer	0.167807	0.002047	0.000621	0.215921
69	MWPFA8	MoilCo10	Oil combustion, PMF modeled profile, Marama, Washington DC, fall	0.110129	0.000663	0.001594	0.000737
72	MBPW12	MoilCo11	Oil combustion, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	1.401300	0.361400	0.457200	1.011000
75	MBPAL9	MsecOr01	Secondary organics, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.024186	0.125234	0.136104	0.093897
76	MBPW11	MsecOr02	Secondary organics, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	0.014706	0.086052	0.165945	0.178685
77	MBPSU1	MsecOr03	Secondary organics, PMF modeled profile, Marama, Boundary Waters Canoe Area, summer	0.014671	0.097943	0.159424	0.082599
78	MBPFA1	MsecOr04	Secondary organics, PMF modeled profile, Marama, Boundary Waters Canoe Area, fall	0.039237	0.128811	0.112406	0.104234
79	MLPAL3	MsecOr05	Secondary organics, PMF modeled profile, Marama, Lye Brook Wilderness Area, annual	0.043768	0.072906	0.128452	0.083031
80	MLPSU1	MsecOr06	Secondary organics, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.023388	0.055610	0.033132	0.065673
81	MSPAL4	MsecOr07	Secondary organics, PMF modeled profile, Marama, Shenandoah National Park, annual	0.037199	0.136974	0.075414	0.121199
82	MSPW19	MdvEmi05	Diesel vehicle emissions, PMF modeled profile, Marama, Shenandoah National Park, winter	1.990000	4.624100	0.442500	3.274400
83	MSPSP7	MsecOr09	Secondary organics, PMF modeled profile, Marama, Shenandoah National Park, spring	0.036534	0.119311	0.080363	0.123884
84	MSPFA1	MsecOr10	Secondary organics, PMF modeled profile, Marama, Shenandoah National Park, fall	0.051721	0.112201	0.075724	0.103122
85	MWPW11	MVgBrn22	Vegetative burning, PMF modeled profile, Marama, Washington DC, winter	9.58230	15.00100	29.59100	24.89900
86	MBPAL8	Msmelt01	Smelter, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.077369	0.054803	0.001141	0.104426
87	MBPW17	MVgBrn25	Vegetative burning, PMF modeled profile, Marama, Boundary Waters Canoe Area, winter	1.071500	1.585900	0.748600	0.001900
88	MBPSU2	Msmelt03	Smelter, PMF modeled profile, Marama, Boundary Waters Canoe Area, summer	0.142916	0.170008	0.000559	0.082646
89	MLPAL2	Msmelt04	Smelter, PMF modeled profile, Marama, Lye Brook Wilderness Area, annual	0.000550	0.000344	0.000922	0.008889
91	MLPFA2	Msmelt06	Smelter, PMF modeled profile, Marama, Lye Brook Wilderness Area, fall	0.000165	0.000153	0.000265	0.004404
92	MLPFA8	Msmelt07	Smelter, PMF modeled profile, Marama, Lye Brook Wilderness Area, fall	0.112856	0.017381	0.135951	0.099242
93	MSPW12	Msmelt08	Smelter, PMF modeled profile, Marama, Shenandoah National Park, winter	0.012226	0.000778	0.002138	0.001850

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Profile Description	OC1	OC2	OC3	OC4
94	MSPSU7	MSmelt09	Smelter, PMF modeled profile, Marama, Shenandoah National Park, summer	0.058575	0.000669	0.000263	0.198224
95	MSPFA4	MSmelt10	Smelter, PMF modeled profile, Marama, Shenandoah National Park, fall	0.140921	0.000370	0.004149	0.002023
96	MWPAL1	MSmelt11	Smelter, PMF modeled profile, Marama, Washington DC, annual	0.063398	0.000263	0.056202	0.000105
97	MWPAL5	MSmelt12	Smelter, PMF modeled profile, Marama, Washington DC, annual	0.104567	0.000231	0.000227	0.000128
98	MWPWI3	MDvEmi07	Diesel vehicle emissions, PMF modeled profile, Marama, Washington DC, winter	0.55317	5.37470	1.22790	0.89352
99	MWPSP4	MSmelt14	Smelter, PMF modeled profile, Marama, Washington DC, spring	0.141972	0.031493	0.000278	0.000141
100	MWPFA5	MSmelt15	Smelter, PMF modeled profile, Marama, Washington DC, fall	0.032805	0.000270	0.000156	0.000143
101	MBPAL5	MVgBrn01	Vegetative burning, PMF modeled profile, Marama, Boundary Waters Canoe Area, annual	0.019971	0.057589	0.223824	0.150508
102	MBPSP1	MVgBrn02	Vegetative burning, PMF modeled profile, Marama, Boundary Waters Canoe Area, spring	0.011993	0.098727	0.222530	0.126012
103	MBPSP7	MSecOr12	Secondary organics, PMF modeled profile, Marama, Boundary Waters Canoe Area, spring	0.8206	5.2013	1.7970	3.1523
104	MBPFA2	MVgBrn04	Vegetative burning, PMF modeled profile, Marama, Boundary Waters Canoe Area, fall	0.027207	0.083972	0.269803	0.151603
105	MLPWI4	MVgBrn05	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	0.038615	0.088697	0.125540	0.154698
106	MLPWI5	MSecOr13	Secondary organics, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	1.5954	4.0273	0.7027	2.3620
107	MLPWI8	MVgBrn07	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	0.021662	0.122357	0.223754	0.235049
108	MLPSP2	MVgBrn08	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, spring	0.028461	0.073778	0.108946	0.098942
109	MLPSU3	MVgBrn09	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.012781	0.087968	0.146263	0.099102
110	MLPSU6	MVgBrn10	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	5.4472	10.1770	20.5320	9.0428
111	MLPFA5	MVgBrn11	Vegetative burning, PMF modeled profile, Marama, Lye Brook Wilderness Area, fall	0.002380	0.080636	0.173574	0.130004
112	MSPAL6	MVgBrn12	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, annual	0.023497	0.083815	0.182034	0.162461
113	MSPWI6	MVgBrn13	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, winter	0.032750	0.100654	0.266387	0.204895
114	MSPSP1	MVgBrn14	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, spring	0.029984	0.090164	0.145763	0.158499
115	MSPSU6	MVgBrn15	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, summer	0.028016	0.086867	0.081489	0.095060
116	MSPFA2	MVgBrn16	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, fall	0.020969	0.113542	0.215656	0.197525
117	MWPAL6	MVgBrn17	Vegetative burning, PMF modeled profile, Marama, Washington DC, annual	0.028817	0.091056	0.120957	0.113482
118	MWPWI7	MGvEmi04	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, winter	3.75930	7.26680	25.30800	25.99600
119	MWPSU8	MVgBrn19	Vegetative burning, PMF modeled profile, Marama, Washington DC, summer	0.018655	0.101510	0.141069	0.116555
120	MWPFA6	MVgBrn20	Vegetative burning, PMF modeled profile, Marama, Washington DC, fall	0.013024	0.134080	0.186034	0.174870
121	MLPSP9	MDvEmi03	Diesel vehicle emissions, PMF modeled profile, Marama, Lye Brook Wilderness Area, spring	0.0082	0.0006	0.0004	0.0007
122	MLPSU8	MDvEmi04	Diesel vehicle emissions, PMF modeled profile, Marama, Lye Brook Wilderness Area, summer	0.0360	0.0037	0.0398	0.0038
123	MLPWI9	MColPP16	Coal fired power plant, PMF modeled profile, Marama, Lye Brook Wilderness Area, winter	5.4139	4.5302	5.8169	4.9737
124	MSPAL8	MColPP15	Coal fired power plant, PMF modeled profile, Marama, Shenandoah National Park, annual	0.0093	3.9784	0.0118	3.0760
125	MSPFA6	MSecOr18	Secondary organics, PMF modeled profile, Marama, Shenandoah National Park, fall	0.1555	2.4262	5.0271	4.6220
126	MWPFA2	MGvEmi07	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, fall	4.9196	1.5154	4.4172	3.7694
127	MWPSP7	MGvEmi05	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, spring	0.809	2.359	4.287	3.595
128	MWPSU3	MGvEmi06	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, summer	2.051	0.760	1.887	0.017
129	MWPWI6	MGvEmi03	Motor vehicle emissions, PMF modeled profile, Marama, Washington DC, winter	8.48570	6.09100	7.36780	5.91500
130	MSPWI1	MVgBrn27	Vegetative burning, PMF modeled profile, Marama, Shenandoah National Park, winter	1.3104	2.3893	2.8011	3.0833
131	MSPWI3	MGvEmi09	Motor vehicle emissions, PMF modeled profile, Marama, Shenandoah National Park, winter	0.0956	0.8807	1.6581	2.0935

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	OPT	EC1	EC2	EC3	Al	As	Br	Ca	Cr	Cu	Fe	K
1	MWPSP1	MbiEmi01	0.000010	0.000717	0.000184	0.000061	0.007175	0.000526	0.001009	0.000412	0.000855	0.000001	0.000011	0.000007
2	MBPW18	McolPP01	0.244292	0.344733	0.038793	0.006972	0.002542	0.008564	0.000002	0.002932	0.000818	0.000395	0.036074	0.000025
3	MBPSU8	McolPP02	0.000115	0.000174	0.079181	0.005781	0.001740	0.044970	0.000001	0.000069	0.001479	0.000226	0.000238	0.046051
5	MLPAL6	MVgBrn24	0.001629	0.000013	0.181805	0.017472	0.000001	0.000027	0.000564	0.002632	0.000000	0.000000	0.004285	0.010049
6	MLPW16	McolPP05	0.000019	0.224941	0.000287	0.000027	0.011270	0.000000	0.005194	0.000002	0.000001	0.000000	0.014337	0.020137
7	MLPSU5	McolPP06	0.023992	0.199664	0.018046	0.000471	0.001108	0.000002	0.000286	0.000000	0.000000	0.000000	0.005480	0.000002
8	MSPWI5	McolPP07	0.000036	0.191749	0.000083	0.000099	0.000004	0.000016	0.003135	0.000002	0.000036	0.000000	0.006913	0.017839
9	MSPWI8	McolPP08	0.000103	0.000166	0.276578	0.000267	0.000011	0.000595	0.000004	0.000008	0.000004	0.000001	0.021928	0.016244
10	MSPSP4	McolPP09	0.001098	0.639530	0.092629	0.049208	0.000175	0.000000	0.002949	0.013485	0.000008	0.005962	0.082570	0.000029
11	MSPSP8	McolPP10	0.000144	0.000100	0.087178	0.000054	0.013470	0.000000	0.005931	0.000008	0.003019	0.000001	0.023526	0.000008
12	MSPSU1	McolPP11	0.109127	0.260797	0.017780	0.004648	0.002231	0.000004	0.000303	0.000001	0.000055	0.000204	0.000003	0.000002
13	MSPSU2	McolPP12	0.000013	0.000112	0.171492	0.012911	0.001882	0.000000	0.006060	0.096482	0.004848	0.000000	0.029887	0.052736
14	MWPSP2	McolPP13	0.003833	0.000120	0.074562	0.004984	0.004693	0.000000	0.009710	0.002669	0.002733	0.002573	0.000012	0.031852
15	MWPSP9	McolPP14	0.016577	0.154422	0.002737	0.002300	0.000087	0.000013	0.000783	0.000017	0.000205	0.000102	0.000002	0.000002
17	MSPFA3	MdsEmi02	0.001536	0.373417	0.353117	0.036014	0.000107	0.000341	0.000226	0.019322	0.000315	0.000312	0.000009	0.039186
18	MSPSU5	MgaEmi01	0.000078	0.000179	0.000069	0.003312	0.003672	0.000000	0.000313	0.000001	0.000189	0.000000	0.000329	0.000011
20	MBPAL1	MGIDst01	0.007380	0.000250	0.000646	0.000321	0.304975	0.000000	0.003846	0.000020	0.002102	0.000370	0.019835	0.046382
21	MBPAL2	MGIDst02	0.000044	0.000026	0.028106	0.000005	0.000975	0.000000	0.000197	0.087521	0.000001	0.000000	0.064117	0.018551
22	MBPW14	MGIDst03	0.000018	0.000292	0.040370	0.004611	0.001660	0.000001	0.000021	0.065085	0.000000	0.000000	0.000090	0.046524
23	MBPSP6	MVgBrn26	0.0031	3.0955	1.8337	0.0004	0.0028	0.0000	0.0271	2.0327	0.0114	0.0000	1.8101	1.3126
24	MBPSP9	MGIDst05	0.198799	0.162740	0.006020	0.003699	0.175318	0.000000	0.000003	0.020815	0.000259	0.000133	0.024566	0.014419
25	MBPSU4	MGIDst06	0.000026	0.000031	0.000760	0.000016	0.001667	0.000003	0.000626	0.115150	0.000846	0.000001	0.044236	0.027812
26	MBPFA5	MGIDst07	0.000029	0.057380	0.044585	0.000019	0.001694	0.000000	0.000292	0.069178	0.000188	0.000002	0.009033	0.009099
27	MLPAL9	MGIDst08	0.000013	0.000084	0.000076	0.002932	0.033934	0.000011	0.002471	0.080585	0.000204	0.000000	0.088188	0.044809
29	MLPW12	MGIDst10	0.000226	0.121207	0.000083	0.000036	0.016131	0.000000	0.000382	0.096406	0.000001	0.000390	0.106533	0.029375
30	MLPSP1	MGIDst11	0.000204	0.000831	0.080707	0.014616	0.398050	0.000004	0.000001	0.000025	0.001085	0.000969	0.009121	0.033433
31	MLPSP3	MGIDst12	0.000045	0.000058	0.025573	0.000005	0.007944	0.000135	0.001874	0.074742	0.000195	0.000000	0.075209	0.040787
32	MLPSU2	MGIDst13	0.001162	0.000216	0.000081	0.001435	0.169104	0.000000	0.000217	0.022341	0.000001	0.000014	0.066235	0.018589
33	MLPSU9	MGIDst14	0.002448	0.001752	0.009238	0.000011	0.000010	0.000062	0.001535	0.055487	0.002030	0.000000	0.032865	0.034263
34	MSPAL3	MGIDst15	0.000009	0.000017	0.029877	0.000006	0.000083	0.000060	0.000362	0.065241	0.000429	0.000000	0.064722	0.039351
35	MSPAL9	MGIDst16	0.000044	0.000044	0.000355	0.005185	0.445939	0.000000	0.000000	0.000009	0.000000	0.000001	0.052262	0.010675
36	MSPWI4	MGIDst17	0.010150	0.000597	0.059478	0.036791	0.329364	0.000003	0.001252	0.014370	0.008760	0.005207	0.030048	0.000037
37	MSPSP2	MGIDst18	0.002310	0.000093	0.043467	0.016942	0.435595	0.000000	0.000002	0.000027	0.000003	0.000873	0.020759	0.020583
38	MSPSP9	MGIDst19	0.000035	0.000021	0.014966	0.000004	0.000609	0.000039	0.000756	0.073216	0.000234	0.000000	0.072594	0.043482
39	MSPSU3	MGIDst20	0.000025	0.000743	0.061777	0.002352	0.000006	0.000104	0.000089	0.029296	0.000067	0.000000	0.048931	0.015777
40	MSPSU9	MGIDst21	0.005444	0.002114	0.003588	0.000169	0.173796	0.000005	0.000048	0.020760	0.000082	0.000000	0.056883	0.024164
41	MSPFA5	MGIDst22	0.000067	0.036748	0.046041	0.002146	0.007576	0.000095	0.000627	0.080005	0.000421	0.000000	0.055546	0.045109
42	MWPAL3	MGIDst23	0.000004	0.000026	0.007205	0.000006	0.200258	0.000030	0.000278	0.041537	0.000001	0.000002	0.060671	0.029754
43	MWPWI4	MGIDst24	0.000565	0.000170	0.002175	0.000090	0.010117	0.000000	0.000000	0.097468	0.000000	0.001128	0.123985	0.046010
44	MWPWI9	MGIDst25	0.000098	0.000271	0.000046	0.000289	0.205530	0.000000	0.011751	0.000076	0.002937	0.000010	0.032170	0.014562

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	OPT	EC1	EC2	EC3	Al	As	Br	Ca	Cr	Cu	Fe	0.026647
45	MWPSP6	MGIDst26	0.000006	0.000107	0.000045	0.000012	0.265719	0.000061	0.001805	0.030173	0.000529	0.000002	0.039664	0.053404
46	MWPSP2	MGIDst27	0.000008	0.000042	0.018787	0.000518	0.000095	0.000000	0.000314	0.041051	0.000222	0.000361	0.067436	0.037846
47	MWPFA4	MGIDst28	0.001814	0.000118	0.060035	0.001212	0.000003	0.000055	0.000249	0.082640	0.000617	0.000000	0.088159	0.021197
48	MBPAL7	Mlr&St01	0.000087	0.000153	0.000154	0.004591	0.000127	0.021000	0.000006	0.000020	0.001219	0.000000	0.573705	0.030810
49	MBPW16	Mlr&St02	0.000049	0.000220	0.005428	0.000106	0.000036	0.001662	0.000108	0.000057	0.000392	0.000000	0.440041	0.006890
50	MBPSP8	Mlr&St03	0.147067	0.205380	0.018900	0.005946	0.000085	0.004646	0.000004	0.000029	0.000117	0.000001	0.123502	0.000057
51	MBPSU6	Mlr&St04	0.000053	0.000099	0.000073	0.000113	0.008272	0.000239	0.000869	0.001516	0.000311	0.000002	0.617345	0.012293
52	MBPFA8	Mlr&St05	0.000080	0.165399	0.024182	0.009419	0.000052	0.000671	0.000762	0.000020	0.000334	0.000009	0.369541	0.2693
55	MLPFA9	MSecOr19	11.5870	5.4680	3.2779	0.6002	0.4354	0.0143	0.0000	0.0002	0.0001	0.0594	0.0461	1.155
56	MWPAL4	MVgBrn21	0.104	32.811	0.832	0.277	0.088	0.000	0.160	0.101	0.017	0.035	0.000	0.476
57	MWPSP3	MVgBrn23	0.301	56.101	1.731	0.409	0.001	0.000	0.042	0.361	0.000	0.000	1.156	0.0238093
58	MWPSP9	MMvEmi06	4.941E-06	0.0001481	2.005E-05	5.899E-06	0.0013654	0.0002653	0.0019727	0.0011097	6.701E-05	6.793E-07	0.0269563	0.0022437
59	MWPSP5	MMvEmi07	7.224E-06	0.2577614	0.0236804	0.002294	0.0007253	4.178E-05	0.0003839	0.0068946	0.0001158	0.0009977	0.0318578	0.031306
60	MLPAL5	MOilCo01	0.000065	0.000245	0.000258	0.211560	0.000012	0.001142	0.012394	0.000049	0.005247	0.008517	0.000011	0.000077
61	MLPW17	MOilCo02	0.000177	0.002524	0.000495	0.034582	0.000829	0.001309	0.000048	0.000009	0.000467	0.017170	0.052132	0.010521
62	MLPSU7	MOilCo03	0.001308	0.000117	0.040204	0.005768	0.000100	0.000129	0.002299	0.007550	0.001337	0.002340	0.002495	0.9996
63	MLPFA6	MSecOr15	12.4830	6.7657	4.0925	0.8387	0.2749	0.0015	0.0221	0.5245	0.0959	0.0000	0.0000	0.2166
64	MSPAL1	MDvEmi05	13.1550	16.7490	1.8170	0.5544	0.0007	0.0000	0.0088	0.0000	0.0217	0.0611	0.3989	0.066628
65	MWPAL8	MOilCo06	0.001106	0.002175	0.000272	0.003209	0.002490	0.000201	0.006538	0.036323	0.002470	0.005884	0.000129	0.025355
66	MWPWI2	MOilCo07	0.006279	0.000490	0.000110	0.008227	0.000019	0.000311	0.003780	0.014985	0.000454	0.002645	0.000091	0.025714
67	MWPSP8	MOilCo08	0.000214	0.001634	0.000518	0.000150	0.008269	0.000530	0.006339	0.031513	0.000012	0.015621	0.002474	0.034690
68	MWPSP6	MOilCo09	0.000149	0.000959	0.001537	0.000058	0.000068	0.001616	0.000284	0.000050	0.000012	0.001403	0.000228	0.125557
69	MWPFA8	MOilCo10	0.010193	0.000756	0.000542	0.002317	0.000126	0.000530	0.005687	0.153399	0.000473	0.003414	0.000083	0.4411
72	MBPW12	MOilCo11	1.2558	2.3834	0.4286	0.3477	0.2929	0.0000	0.0002	0.3706	0.0742	0.0021	0.0023	0.001005
75	MBPAL9	MSecOr01	0.179822	0.176610	0.021383	0.005016	0.000505	0.000013	0.000000	0.000002	0.000204	0.000033	0.000000	0.020153
76	MBPW11	MSecOr02	0.189977	0.317288	0.020925	0.004699	0.004523	0.000000	0.000160	0.000002	0.000000	0.000096	0.000016	0.001398
77	MBPSU1	MSecOr03	0.102210	0.121826	0.012988	0.003200	0.000157	0.000000	0.000080	0.000000	0.000044	0.000000	0.000003	0.000006
78	MBPFA1	MSecOr04	0.233684	0.231002	0.042233	0.009623	0.003760	0.000000	0.000433	0.000000	0.000338	0.000002	0.000008	0.006782
79	MLPAL3	MSecOr05	0.006830	0.144206	0.133331	0.030735	0.000001	0.000015	0.000028	0.001971	0.000602	0.000000	0.000000	0.007364
80	MLPSU1	MSecOr06	0.175556	0.214156	0.034348	0.008994	0.000075	0.000000	0.000430	0.000001	0.000514	0.000000	0.000104	0.002289
81	MSPAL4	MSecOr07	0.140827	0.214558	0.012247	0.002010	0.000011	0.000024	0.000000	0.000000	0.000027	0.000037	0.000874	0.1999
82	MSPWI9	MDvEmi05	20.5390	21.1740	1.9973	0.4303	0.0001	0.0035	0.0000	0.0000	0.0056	0.0222	0.0352	0.002977
83	MSPSP7	MSecOr09	0.177731	0.245585	0.015515	0.003940	0.000013	0.000000	0.000000	0.001832	0.000029	0.000000	0.003941	0.005409
84	MSPFA1	MSecOr10	0.235589	0.285598	0.021259	0.007161	0.001120	0.000000	0.000000	0.000747	0.000179	0.000000	0.000000	1.73560
85	MWPWI1	MVgBrn22	0.04929	52.93700	0.80929	0.15344	0.12957	0.01615	0.04527	0.09783	0.00958	0.03492	0.00127	0.000010
86	MBPAL8	MSmelt01	0.042232	0.026884	0.082562	0.011428	0.002022	0.000002	0.000006	0.009587	0.000723	0.037808	0.000006	0.3469
87	MBPW17	MVgBrn25	0.0012	0.8007	0.8568	0.1561	0.0001	0.0000	0.0058	0.1887	0.0000	0.0482	0.0004	0.000115
88	MBPSU2	MSmelt03	0.033455	0.003376	0.061134	0.014816	0.001262	0.000202	0.000325	0.002687	0.000031	0.022829	0.000157	0.075653
89	MLPAL2	MSmelt04	0.009586	0.000413	0.643928	0.000983	0.000008	0.000000	0.010804	0.000008	0.000405	0.010696	0.058691	0.066781
91	MLPFA2	MSmelt06	0.000199	0.546486	0.000208	0.006233	0.013465	0.000000	0.019197	0.002569	0.000030	0.006716	0.145145	0.020061

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	OPT	EC1	EC2	EC3	Al	As	Br	Ca	Cr	Cu	Fe	0.026647
92	MLPFA8	Msmelt07	0.000158	0.245719	0.049100	0.014523	0.000006	0.000000	0.000003	0.007835	0.000714	0.000000	0.003297	0.106811
93	MSPWI2	Msmelt08	0.000326	0.000435	0.000588	0.031534	0.000033	0.000001	0.017158	0.064704	0.001315	0.008679	0.339468	0.000008
94	MSPSU7	Msmelt09	0.000076	0.001097	0.000388	0.013158	0.010736	0.000000	0.001455	0.000576	0.000370	0.006576	0.162261	0.037501
95	MSPFA4	Msmelt10	0.000388	0.001536	0.175528	0.019034	0.001839	0.000001	0.030501	0.030660	0.012598	0.000002	0.117124	0.000011
96	MWPAL1	Msmelt11	0.000008	0.000047	0.057401	0.000014	0.000013	0.000241	0.001100	0.043084	0.000119	0.015205	0.432106	0.092684
97	MWPAL5	Msmelt12	0.043006	0.367609	0.000475	0.031019	0.000065	0.000000	0.008720	0.018531	0.000716	0.009109	0.000898	0.87376
98	MWPWI3	MdvEmi07	0.29183	40.53900	0.57553	0.20859	0.00021	0.00000	0.05305	0.11077	0.01747	0.02738	0.00197	0.000018
99	MWPSP4	Msmelt14	0.000005	0.000242	0.099829	0.000011	0.005184	0.000355	0.002741	0.031493	0.001817	0.010196	0.299426	0.080989
100	MWPFA5	Msmelt15	0.015004	0.410065	0.033179	0.025919	0.000015	0.000000	0.003142	0.005702	0.000002	0.010972	0.144366	0.032530
101	MBPAL5	MVgBrn01	0.003419	0.150869	0.013646	0.003297	0.000587	0.000026	0.000565	0.002445	0.000000	0.000000	0.000000	0.007746
102	MBPSP1	MVgBrn02	0.000333	0.069189	0.002286	0.036876	0.008090	0.000285	0.000003	0.002833	0.000003	0.007488	0.000003	0.0055
103	MBPSP7	MsecOr12	0.6477	5.2104	0.7788	0.1237	0.0015	0.0000	0.0000	0.0001	0.0098	0.0000	0.0002	0.046695
104	MBPFA2	MVgBrn04	0.000012	0.133956	0.000341	0.003342	0.001170	0.000000	0.000435	0.000001	0.000260	0.000001	0.000014	0.019341
105	MLPWI4	MVgBrn05	0.227890	0.331659	0.043393	0.009290	0.001736	0.000000	0.000119	0.000001	0.000216	0.001091	0.002745	0.1173
106	MLPWI5	MsecOr13	8.7643	11.9430	2.2173	0.2194	0.0000	0.0043	0.0001	0.0000	0.0000	0.0000	0.0909	0.009181
107	MLPWI8	MVgBrn07	0.000008	0.195745	0.018580	0.000021	0.000002	0.000073	0.000000	0.000006	0.000000	0.000104	0.005946	0.004440
108	MLPSP2	MVgBrn08	0.128362	0.170304	0.022373	0.005084	0.000291	0.000000	0.000260	0.000001	0.000212	0.000000	0.000002	0.003545
109	MLPSU3	MVgBrn09	0.000009	0.093496	0.000545	0.000382	0.000003	0.000020	0.000584	0.007370	0.000000	0.000003	0.007148	0.8136
110	MLPSU6	MVgBrn10	12.3850	10.4190	0.7362	0.4507	0.0343	0.0001	0.0139	0.2656	0.0271	0.0037	0.0001	0.015574
111	MLPFA5	MVgBrn11	0.000032	0.131110	0.000031	0.000003	0.002224	0.000045	0.000334	0.019826	0.000114	0.000000	0.020476	0.016128
112	MSPAL6	MVgBrn12	0.000003	0.168280	0.006367	0.001060	0.000012	0.000042	0.001204	0.003766	0.000000	0.000002	0.000023	0.015658
113	MSPWI6	MVgBrn13	0.004153	0.302920	0.003845	0.002160	0.000001	0.000130	0.000487	0.000002	0.000015	0.000297	0.000002	0.013022
114	MSPSP1	MVgBrn14	0.076896	0.235313	0.012340	0.001592	0.000900	0.000047	0.001042	0.002503	0.000200	0.000000	0.000009	0.003991
115	MSPSU6	MVgBrn15	0.108077	0.169787	0.000966	0.001045	0.000171	0.000000	0.000132	0.000000	0.000004	0.000000	0.000000	0.014914
116	MSPFA2	MVgBrn16	0.000010	0.164896	0.000015	0.000532	0.000002	0.000064	0.001137	0.000820	0.000144	0.000002	0.000698	0.011096
117	MWPAL6	MVgBrn17	0.001162	0.280341	0.011964	0.001625	0.000001	0.000023	0.000239	0.010890	0.000112	0.000000	0.012173	1.21020
118	MWPWI7	MgvEmi04	0.00021	0.00323	0.35236	0.15015	0.00005	0.00001	0.16916	0.00479	0.00001	0.03128	0.00551	0.006139
119	MWPSU8	MVgBrn19	0.006273	0.177794	0.004649	0.000793	0.000543	0.000000	0.000452	0.002049	0.000131	0.000000	0.000020	0.007140
120	MWPFA6	MVgBrn20	0.000004	0.286013	0.000011	0.001792	0.000737	0.000000	0.000326	0.000002	0.000000	0.000000	0.000003	1.0202
121	MLPSP9	MdvEmi03	0.0023	0.6030	1.6547	0.0730	0.0010	0.0000	0.1472	0.3358	0.0608	0.0313	0.0001	0.5292
122	MLPSU8	MdvEmi04	9.6321	7.0640	5.1054	0.4232	0.0612	0.0247	0.0037	0.0801	0.0316	0.0128	0.0001	0.9654
123	MLPWI9	McolPP16	0.4387	0.2006	1.8066	0.5334	0.1857	0.0118	0.0275	0.4808	0.1063	0.0000	0.0000	0.0001
124	MSPAL8	McolPP15	0.0008	0.4281	0.3428	0.0006	0.0008	0.0003	0.0000	0.0000	0.0000	0.0038	0.1793	0.3793
125	MSPFA6	MsecOr18	9.8414	19.5120	1.7576	0.2538	0.0137	0.0000	0.0000	0.0070	0.0000	0.0752	0.5937	0.4769
126	MWPFA2	MgvEmi07	0.0004	0.0014	0.0011	0.0027	0.0024	0.0000	0.1519	0.0001	0.0381	0.0405	0.0014	2.801
127	MWPSP7	MgvEmi05	0.000	0.045	0.247	0.000	0.029	0.003	0.008	3.085	0.006	0.009	2.300	0.152
128	MWPSU3	MgvEmi06	0.000	0.007	0.001	0.046	0.003	0.000	0.026	0.000	0.000	0.046	0.172	0.00019
129	MWPWI6	MgvEmi03	0.00027	0.02709	0.65273	0.00267	0.00024	0.00012	0.00002	0.43863	0.00055	0.21053	5.85760	1.0993
130	MSPWI1	MVgBrn27	0.4290	4.6504	1.7595	0.2125	0.1243	0.0009	0.0381	1.3183	0.0000	0.0000	0.7938	0.4848
131	MSPWI3	MgvEmi09	0.0010	0.0045	0.0012	0.0004	0.0002	0.0004	0.0652	0.2038	0.0000	0.0000	0.0275	K

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Mg	Ni	Pb	Se	Si	V	Zn
1	MWPSP1	MBiEmi01	0.014255	0.000265	0.000012	0.001503	0.154228	0.000001	0.001718
2	MBPW18	MCoIPP01	0.001432	0.000004	0.000000	0.000190	0.029146	0.000962	0.000001
3	MBPSU8	MCoIPP02	0.005152	0.000002	0.000610	0.000014	0.155113	0.002074	0.000002
5	MLPAL6	MVgBrn24	0.001613	0.000001	0.000036	0.000411	0.000002	0.000000	0.002080
6	MLPW16	MCoIPP05	0.000011	0.000001	0.003461	0.003448	0.020312	0.000420	0.009477
7	MLPSU5	MCoIPP06	0.000527	0.000018	0.000000	0.000290	0.000003	0.000000	0.000839
8	MSPW15	MCoIPP07	0.005812	0.000044	0.000003	0.002294	0.000740	0.000118	0.005004
9	MSPW18	MCoIPP08	0.035511	0.000272	0.000003	0.004416	0.168167	0.000006	0.007036
10	MSPSP4	MCoIPP09	0.000016	0.001534	0.024316	0.002074	0.000087	0.000494	0.040727
11	MSPSP8	MCoIPP10	0.041057	0.000001	0.002550	0.005705	0.025162	0.002849	0.011200
12	MSPSU1	MCoIPP11	0.001971	0.000030	0.000001	0.001163	0.000017	0.000019	0.000054
13	MSPSU2	MCoIPP12	0.027526	0.000000	0.000013	0.002947	0.000046	0.005215	0.005942
14	MWPSP2	MCoIPP13	0.020281	0.000001	0.000002	0.005322	0.000107	0.003614	0.005937
15	MWPSU9	MCoIPP14	0.005999	0.000092	0.000003	0.001089	0.032358	0.000001	0.000665
17	MSPFA3	MDsEmi02	0.010668	0.000043	0.000002	0.000341	0.000041	0.000421	0.005865
18	MSPSU5	MGaEmi01	0.003689	0.000001	0.000413	0.000350	0.004438	0.000255	0.000505
20	MBPAL1	MGIDst01	0.023266	0.000093	0.000720	0.000000	0.131850	0.000002	0.000003
21	MBPAL2	MGIDst02	0.000006	0.000020	0.000694	0.000045	0.238300	0.000111	0.000535
22	MBPW14	MGIDst03	0.000010	0.000000	0.001309	0.000000	0.142843	0.000001	0.002283
23	MBPSP6	MVgBrn26	0.0002	0.0019	0.0000	0.0024	6.7757	0.0103	0.0432
24	MBPSP9	MGIDst05	0.007880	0.000000	0.000944	0.000000	0.091476	0.000440	0.000001
25	MBPSU4	MGIDst06	0.002359	0.000063	0.000000	0.000000	0.306443	0.000284	0.001416
26	MBPFA5	MGIDst07	0.002715	0.000002	0.000136	0.000000	0.158628	0.000311	0.000027
27	MLPAL9	MGIDst08	0.004147	0.000087	0.001438	0.000000	0.289416	0.000366	0.002255
29	MLPW12	MGIDst10	0.000658	0.000004	0.000782	0.000079	0.241939	0.000001	0.004178
30	MLPSP1	MGIDst11	0.025408	0.000001	0.003972	0.000000	0.018365	0.000003	0.008994
31	MLPSP3	MGIDst12	0.000440	0.000089	0.000002	0.000001	0.255454	0.000650	0.000000
32	MLPSU2	MGIDst13	0.001226	0.000001	0.000001	0.000050	0.220764	0.000001	0.000120
33	MLPSU9	MGIDst14	0.021539	0.000284	0.002855	0.001593	0.357281	0.002728	0.005282
34	MSPAL3	MGIDst15	0.003170	0.000007	0.000000	0.000000	0.333480	0.000482	0.000446
35	MSPAL9	MGIDst16	0.001936	0.000000	0.000112	0.000088	0.022021	0.000002	0.000001
36	MSPW14	MGIDst17	0.021736	0.000305	0.000002	0.002481	0.064975	0.012065	0.007074
37	MSPSP2	MGIDst18	0.000087	0.000000	0.003115	0.000000	0.000581	0.000007	0.005074
38	MSPSP9	MGIDst19	0.002390	0.000034	0.000073	0.000000	0.283392	0.000398	0.000360
39	MSPSU3	MGIDst20	0.001951	0.000116	0.000179	0.000000	0.323753	0.000025	0.000001
40	MSPSU9	MGIDst21	0.003193	0.000000	0.000013	0.000025	0.229752	0.000110	0.000000
41	MSPFA5	MGIDst22	0.004811	0.000009	0.000000	0.000006	0.258998	0.000355	0.003135
42	MWPAL3	MGIDst23	0.002354	0.000002	0.000053	0.000179	0.199630	0.000001	0.000005
43	MWPW14	MGIDst24	0.002732	0.000032	0.003000	0.000131	0.234488	0.000001	0.003709
44	MWPW19	MGIDst25	0.000043	0.000449	0.000005	0.000187	0.004097	0.008666	0.033154

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Mg	Ni	Pb	Se	Si	V	Zn
45	MWPSP6	MGISt26	0.003362	0.000001	0.000001	0.000138	0.139984	0.000001	0.000401
46	MWPSP2	MGISt27	0.003717	0.000016	0.000005	0.000000	0.194061	0.000442	0.000001
47	MWPFA4	MGISt28	0.006213	0.000000	0.000001	0.000170	0.216221	0.000168	0.000926
48	MBPAL7	Mir&St01	0.009282	0.000001	0.000530	0.000545	0.030301	0.001252	0.003129
49	MBPWI6	Mir&St02	0.000024	0.000130	0.001753	0.000037	0.000061	0.000006	0.005216
50	MBPSP8	Mir&St03	0.008759	0.000000	0.000002	0.000127	0.000722	0.000132	0.000464
51	MBPSU6	Mir&St04	0.013339	0.000035	0.000004	0.000525	0.000135	0.000857	0.000763
52	MBPFA8	Mir&St05	0.001233	0.000006	0.001262	0.000264	0.026576	0.000465	0.002927
55	MLPFA9	MsecOr19	0.0673	0.0068	0.0209	0.0000	0.0001	0.0000	0.1382
56	MWPAL4	MVgBrn21	0.175	0.000	0.000	0.090	0.000	0.064	0.081
57	MWPSP3	MVgBrn23	0.047	0.000	0.000	0.000	0.000	0.007	0.085
58	MWPSP9	MmvEmi06	1.625E-05	1.024E-06	0.0012233	0.0005092	1.107E-05	0.0019609	0.0086962
59	MWPSP5	MmvEmi07	0.0016121	6.529E-08	1.453E-07	3.942E-07	1.035E-06	0.0002074	0.0020041
60	MLPAL5	MoilCo01	0.028012	0.049542	0.000374	0.001701	0.235431	0.041301	0.000011
61	MLPWI7	MoilCo02	0.000072	0.024203	0.002057	0.000006	0.000210	0.028434	0.008411
62	MLPSU7	MoilCo03	0.001674	0.016294	0.001589	0.000000	0.205000	0.002338	0.000001
63	MLPFA6	MsecOr15	0.4897	0.0009	0.0781	0.0000	1.8736	0.1554	0.0131
64	MSPAL1	MdvEmi05	0.0001	0.0098	0.1319	0.0000	0.0002	0.0290	0.2264
65	MWPAL8	MoilCo06	0.000044	0.067779	0.000151	0.000001	0.000035	0.087797	0.022005
66	MWPWI2	MoilCo07	0.000013	0.026042	0.004520	0.000001	0.055070	0.042514	0.015052
67	MWPSP8	MoilCo08	0.000062	0.138831	0.006819	0.001351	0.000185	0.148913	0.044923
68	MWPSP6	MoilCo09	0.000026	0.033772	0.005304	0.004045	0.028354	0.026334	0.006139
69	MWPFA8	MoilCo10	0.039625	0.055001	0.000035	0.000001	0.117906	0.067293	0.019605
72	MBPWI2	MoilCo11	0.1745	0.0041	0.0000	0.0008	0.1063	0.0864	0.0000
75	MBPAL9	MsecOr01	0.000858	0.000006	0.000000	0.000023	0.002928	0.000302	0.000000
76	MBPWI1	MsecOr02	0.000027	0.000020	0.000000	0.000204	0.013975	0.000032	0.002227
77	MBPSU1	MsecOr03	0.000461	0.000005	0.000000	0.000006	0.000868	0.000073	0.000000
78	MBPFA1	MsecOr04	0.003845	0.000001	0.000001	0.000057	0.003753	0.000332	0.000562
79	MLPAL3	MsecOr05	0.002816	0.000005	0.000023	0.000000	0.005400	0.000684	0.000062
80	MLPSU1	MsecOr06	0.004614	0.000009	0.001470	0.000102	0.000011	0.000863	0.000298
81	MSPAL4	MsecOr07	0.000867	0.000000	0.000000	0.000000	0.002724	0.000012	0.000174
82	MSPWI9	MdvEmi05	0.0002	0.0022	0.0447	0.0000	0.5327	0.0087	0.0001
83	MSPSP7	MsecOr09	0.000411	0.000015	0.000166	0.000000	0.018295	0.000001	0.000298
84	MSPFA1	MsecOr10	0.002183	0.000000	0.000224	0.000000	0.024135	0.000220	0.000000
85	MWPWI1	MVgBrn22	0.02502	0.00010	0.00002	0.00129	0.00161	0.00002	0.00014
86	MBPAL8	Msmelt01	0.002580	0.002858	0.108987	0.011599	0.028509	0.000744	0.192268
87	MBPWI7	MVgBrn25	0.1324	0.0028	0.1550	0.0026	0.0002	0.0007	0.2221
88	MBPSU2	Msmelt03	0.003398	0.000098	0.000849	0.000000	0.000032	0.000355	0.015103
89	MLPAL2	Msmelt04	0.000127	0.000007	0.049398	0.001837	0.000012	0.001527	0.073633
91	MLPFA2	Msmelt06	0.000054	0.000646	0.033656	0.006530	0.000012	0.002917	0.051392

Table 6.6-24a PMF modeled chemical source profiles (Mass fractions)

	PNO	SID	Mg	Ni	Pb	Se	Si	V	Zn
92	MLPFA8	Msmelt07	0.007344	0.000310	0.000670	0.000085	0.000004	0.002642	0.005538
93	MSPW12	Msmelt08	0.000019	0.002010	0.075527	0.000008	0.000059	0.000024	0.138944
94	MSPSU7	Msmelt09	0.000070	0.001491	0.047247	0.001830	0.000126	0.000015	0.072128
95	MSPFA4	Msmelt10	0.060335	0.001235	0.053087	0.027181	0.000148	0.016237	0.085152
96	MWPAL1	Msmelt11	0.014550	0.000001	0.000002	0.000002	0.000009	0.003997	0.017697
97	MWPAL5	Msmelt12	0.000011	0.000009	0.097317	0.000001	0.000019	0.000002	0.140069
98	MWPW13	MDvEmi07	0.00006	0.00614	0.35077	0.02128	0.00461	0.00007	0.54409
99	MWPSP4	Msmelt14	0.019378	0.000001	0.000002	0.000886	0.036388	0.003519	0.015113
100	MWPFA5	Msmelt15	0.000011	0.000981	0.059673	0.000010	0.000050	0.001083	0.090976
101	MBPAL5	MVgBrn01	0.001944	0.000020	0.000001	0.000000	0.000005	0.000000	0.001262
102	MBPSP1	MVgBrn02	0.005816	0.000077	0.000005	0.000085	0.000125	0.000106	0.004364
103	MBPSP7	MSecOr12	0.0488	0.0014	0.0000	0.0060	0.9381	0.0102	0.0180
104	MBPFA2	MVgBrn04	0.001070	0.000002	0.000000	0.000000	0.000828	0.000431	0.000309
105	MLPW14	MVgBrn05	0.000522	0.000000	0.004636	0.000000	0.000002	0.000000	0.005449
106	MLPW15	MSecOr13	0.1518	0.0018	0.0000	0.0022	0.0459	0.0001	0.0216
107	MLPW18	MVgBrn07	0.001362	0.000000	0.000631	0.000405	0.000003	0.000000	0.003038
108	MLPSP2	MVgBrn08	0.001213	0.000006	0.000375	0.000008	0.000036	0.000345	0.000575
109	MLPSU3	MVgBrn09	0.000009	0.000000	0.000000	0.000033	0.000013	0.000011	0.000931
110	MLPSU6	MVgBrn10	0.2170	0.0000	0.0000	0.0000	0.8364	0.0534	0.0000
111	MLPFA5	MVgBrn11	0.000243	0.000000	0.000000	0.000019	0.056693	0.000002	0.001589
112	MSPAL6	MVgBrn12	0.001270	0.000024	0.000000	0.000153	0.000001	0.000054	0.000765
113	MSPW16	MVgBrn13	0.000910	0.000120	0.000000	0.000000	0.001261	0.000097	0.001275
114	MSPSP1	MVgBrn14	0.001402	0.000003	0.000000	0.000079	0.000007	0.000258	0.000688
115	MSPSU6	MVgBrn15	0.000005	0.000000	0.000001	0.000001	0.000011	0.000012	0.000108
116	MSPFA2	MVgBrn16	0.001033	0.000015	0.000000	0.000190	0.000001	0.000191	0.000392
117	MWPAL6	MVgBrn17	0.000505	0.000000	0.000000	0.000000	0.029331	0.000000	0.000001
118	MWPW17	MGvEmi04	0.33444	0.00000	0.00004	0.12341	0.00062	0.00006	0.04811
119	MWPSU8	MVgBrn19	0.000044	0.000000	0.000000	0.000283	0.000001	0.000249	0.000158
120	MWPFA6	MVgBrn20	0.000001	0.000000	0.000000	0.000000	0.000001	0.000186	0.000612
121	MLPSP9	MDvEmi03	0.4876	0.0001	0.1331	0.0016	0.3461	0.0749	0.1154
122	MLPSU8	MDvEmi04	0.1807	0.0021	0.0000	0.0000	0.2089	0.0113	0.0489
123	MLPW19	MColPP16	0.5520	0.0094	0.0049	0.0000	2.0596	0.1382	0.0001
124	MSPAL8	MColPP15	0.0425	0.0006	0.0000	0.0173	0.1453	0.0000	0.0197
125	MSPFA6	MSecOr18	0.0001	0.0090	0.0954	0.0010	0.0002	0.0000	0.2138
126	MWPFA2	MGvEmi07	0.0923	0.0000	0.0369	0.1123	0.0020	0.0347	0.0001
127	MWPSP7	MGvEmi05	0.008	0.007	0.063	0.001	9.791	0.000	0.000
128	MWPSU3	MGvEmi06	0.000	0.000	0.374	0.000	0.000	0.000	0.405
129	MWPW16	MGvEmi03	0.09499	0.00002	0.00002	0.00330	0.50552	0.07081	0.22534
130	MSPW11	MVgBrn27	0.0004	0.0000	0.0236	0.0000	3.6344	0.0000	0.0448
131	MSPW13	MGvEmi09	0.1987	0.0003	0.0000	0.0000	0.0001	0.0000	0.0155

9. REFERENCES

- Braaten, D.A. and Cahill, T.A. (1986). Size and composition of Asian dust transported to Hawaii. *Atmospheric Environment*, **20**, 1105-1109.
- Cooper, J.A. and Watson, J.G. (1980). Receptor oriented methods of air particulate source apportionment. *JAPCA* **30**, 1116-25.
- Engelbrecht, J.P., Swanepoel, L., Chow, J.C. and Watson, R.E. (2002). The comparison of source contributions from residential coal and low-smoke fuels, using CMB modeling, in South Africa. *Environ Sci.Pol.*, **5**, 2169-2185.
- Friedlander, S.K. (1973). Chemical element balances and identification of air pollution sources. *Environ.Sci.Technol.* **7**:235-40.
- Huang, S., Arimoto, R. and Rahn, K.A. (2001). Sources and source variations for aerosol at Mace Head, Ireland. *Atmospheric Environment*, **35**, 1421-1437.
- Huang, S., Rahn, K.A. and Arimoto, R. (1999). Testing and optimizing two factor-analysis techniques on aerosol at Narragansett, Rhode Island. *Atmospheric Environment*, **33**, 2169-2185.
- IMPROVE, 2002. Interagency Monitoring of Protected Visual Environments-Data resources. National Park Service, Ft. Collins, CO. <http://vista.cira.colostate.edu/IMPROVE>.
- Maykut, N.N., Lewtas, J. And Larson, T.V. (2001). Source apportionment of PM_{2.5} and carbon in Seattle using Chemical Mass Balance and Positive Matrix Factorization. *Regional Haze and Global Radiation Balance – Aerosol Measurements and Models: Closure, Reconciliation and Evaluation, Speciality Conference, Bend, Oregon*
- Perry, K.D., Cahill, T.A., Eldred, R.A., Dutcher, D.D. and Gill, T.E. (1997). Long-range transport of Nort African dust to the easter United States. *J. Geophys. Res.*, **102, No. D10**, 11,225-11,238.
- Poirot, R.L., Wishinski, P.R., Hopke, P.K. and Polissar, (2001). Comparative application of multiple receptor methods to identify aerosol sources in northern Vermont. *Environ.Sci.Technol.***35**, 4622-4636.
- Sisler, J.F. and Malm, W.C., 2000. Interpretation of trends of PM_{2.5} and reconstructed visibility from the IMPROVE network. *J.A.W.M.A.*, **50**, 775-789
- Solomon, P.A., Fall, T., Salmon, L.G, Cass, G.R., Gray, H.A. and Davidson, A., 1989. Chemical characteristics of PM₁₀ aerosols collected in the Los Angeles Area. *J.Air Pollution Control Assoc.*, **39 (2)**, 154-163.
- Turpin, B.J. and Lim, H.J., (2001). Species Contributions to PM_{2.5} mass concentrations: revisiting common assumptions for estimating organic mass. *Aerosol Sci. Technol.* **35**, 602-610.

Zhang, X.Q., Turpin, B.J., McMurry, P.H., Hering, S.V. and Stolzenburg, M.R.. (1994). Mie theory evaluation of species contributions to 1990 wintertime visibility reduction in the Grand Canyon. *J.A.W.M.A.* **44(2)**, 153-162.

Watson, J.G. (1984). Overview of receptor model principles. *JAPCA* **34**, 619-23.

Watson, J.G., Chow, J.C., Lowenthal, D.H., Pritchett, L.C., Frazier, C.A., Neuroth, G.R. and Robbins, R. (1994). Differences in carbon composition of source profiles for diesel- and gasoline-powered vehicles. *Atmospheric Environment*, **28**, 2493-2505.

Watson, J.G., Robinson, N.F., Lewis, C. and Coulter, T. (1997). Chemical mass balance receptor model version 8 (CMB8) users manual. *Desert Research Institute Document No. 1808.1D1*.