Cairo Air Improvement Project

Air Quality Monitoring Component

1999 Source Attribution Study

Final Report

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ABSTRACT

The greater Cairo area suffers from extreme levels of gas and particulate phase air pollutants. In order to reduce the levels of ambient pollution, the USAID and the Egyptian Environmental Affairs Agency (EEAA) have supported the Cairo Air Improvement Project (CAIP). As part of this project a source attribution study was performed to assess the contributions of specific pollutant source types to the observed particulate matter (PM) and volatile organic compound (VOC) levels in Cairo. Two intensive ambient monitoring studies were carried out during the period of February 21 to March 3 and October 27 to November 27, 1999. PM_{10}, $PM_{2.5}$, volatile organic VOCs, and polycyclic aromatic hydrocarbons (PAHs) were measured on a 24-hour basis at six sampling stations during each of the intensive periods. During the February/March study, samples were collected daily, while in the October/November study samples were collected every other day. The six intensive measurement sites represented background levels, mobile source impacts, industrial impacts, and residential exposure. Based on the results of earlier studies, particular emphasis was placed on characterizing the source contribution and ambient levels of lead (Pb) in the area. The results of this study demonstrate that lead smelting is the clear and dominant source of Pb throughout the greater Cairo area.

In addition to the primary goal of determining the sources of the observed high particulate and VOC levels in the greater Cairo area, the results provide a baseline against which future studies could assess the impact of regulatory initiatives and controls on pollutant levels. This report presents the results of the intensive monitoring studies and PM_{10}, $PM_{2.5}$, and VOC source contribution estimates.

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EXECUTIVE SUMMARY

Background and Objectives

Cairo, Egypt suffers from high ambient concentrations of atmospheric pollutants, including particulates (PM), carbon monoxide (CO), oxides of nitrogen (NO_x), ozone (O_3), and sulfur dioxide (SO_2), and volatile organic compounds (VOCs). In order to develop and implement a pollution-control strategy and to reduce the health impact of air pollution in Cairo the Cairo Air Improvement Project (CAIP) was established. As part of the CAIP, source attribution studies were performed to assess the impact of various sources (e.g., lead smelters, motor vehicles, oil combustion, vegetative burning, geological material, etc.) to ambient pollutant levels. Specific objectives of the source attribution studies included:

- Estimating the spatial and temporal distributions of PM_{10} (PM with aerodynamic diameter less than 10 μm), $PM_{2.5}$ (PM with aerodynamic diameter less than 2.5 μm), and VOCs.
- Attributing PM_{10}, $PM_{2.5}$, and VOC concentrations to specific source categories.
- Providing a baseline against which the impact of CAIP implemented strategies can be evaluated.

Particular emphasis was placed on determining the sources of airborne lead and PM observed in greater Cairo and the effectiveness of lead control strategies on ambient lead concentrations. In this report we present results of the winter (February/March) and fall (October/November) 1999 source attribution studies.

Sampling Sites and Methods

Six representative sampling sites for the source attribution task were chosen. Kaha, a delta site with significant agricultural activity, was chosen to represent the background levels. The Industrial/Residential sites were represented by Shobra Kheima and El Massara. The Shobra site is located in a heavily industrialized area and is downwind from numerous Pb smelters and other industrial sources. The El Massara site is near a number of cement plants. For the mobile sources dominated site, El Qualaly Square was chosen. This site is located downtown and it has high light- and heavy-duty (bus) traffic. Finally Helwan and Zamalek were chosen to represent the residential sites with limited nearby sources.

PM samples were collected on 47-mm filters appropriate for chemical analysis. Filters were analyzed for gravimetric mass, metals, ions and carbon analysis. Volatile organic compounds (C2-C12) were collected in pre-cleaned stainless steel canisters and

polyaromatic hydrocarbons (PAHs) were collected using absorbent cartridges. All samples were analyzed by the Desert Research Institute 9DRI).

Source Attribution Methods

The Chemical Mass Balance (CMB) receptor model was used to apportion PM and its chemical constituents and VOCs to their sources. The CMB consists of a set of linear equations which express the ambient concentrations of a chemical species as the sum of products of source contributions and source composition profiles. The current CMB software (EPA/DRI versions 7 and 8) applies the effective variance least-squares solution developed and tested by Watson et al. (1984) to solve these equations. This approach has two advantages: 1) it calculates uncertainties of source contributions from both the source and receptor uncertainties and 2) chemical species measured more precisely in both source and receptor samples are given greater influence in the solution than are less precisely measured species.

The CMB procedure requires several steps. First, the contributing sources must be identified and their chemical profiles must be entered. Then the chemical species to be included in the model must be selected. The next step is the estimation of the fractions of each chemical species contained in each source type and the estimation of the uncertainties in both the ambient concentrations and source contributions. The final step is the solution of the set of chemical mass balance equations.

Summary of Results

During the two intensive measurement periods, the average PM_{10} mass ranged from 265.1 $\mu g/m^3$ at Shobra, an industrial site to 88.1 $\mu g/m^3$ at Helwan, a residential location. The average $PM_{2.5}$ mass ranged from 216.1 $\mu g/m^3$ at Shobra to 29.4 $\mu g/m^3$ at Helwan.

Source profiles measured during the CAIP and from previous studies was were used with the CMB model to estimate source contributions to $PM_{2.5}$ and PM_{10} mass and to VOCs. The CAIP source samples were acquired to characterize current motor vehicle, vegetative and refuse burning, smelter, restaurant, and Mazut emissions in Cairo. These profiles, including PAHs, were used to determine the winter and fall source contributions to $PM_{2.5}$ and PM_{10} mass and lead.

The results of initial (using previously reported source profiles) and final (using CAIP source profiles) CMB analysis were quite similar. Depending on the sites, major contributors to PM_{10} included geological material, mobile source emissions, and

vegetative burning. $PM_{2.5}$ tended to be dominated by mobile source emissions, vegetative burning, and secondary species.

Two unusual features emerged. First, most sites had high levels of ammonium chloride (up to 19.2 $\mu g/m^3$). Ammonium chloride is formed by chemical reaction in the atmosphere. Based on investigations by CAIP personnel, sources are likely to include agricultural activity and bleaching operations north of Cairo. Second, considering both the preliminary and final CMB analysis, lead smelting at Shobra contributed 53 and 40-42% of $PM_{2.5}$ and PM_{10}, respectively during winter. During fall, lead smelter contributions fell to 16-17% of PM_{10} and 11-12% of $PM_{2.5}$. This is consistent with dramatically lower Pb concentrations at Shobra in fall (8.1 $\mu g/m^3$) than in winter (26.8 $\mu g/m^3$).

El Qualaly, a site chosen to represent mobile emissions, displayed the highest average NMHC concentrations of any site, by factors of 2 or more, in both winter (1849 ppb) and fall (2037 ppb). The major contributors to NMHC at all sites in both seasons were mobile emissions and lead smelting/LPG. We interpret the latter to represent industrial processes that may be fueled by LPG. Mobile evaporative contributions were higher in both absolute and relative terms at all sites during the fall season, when average temperatures were about 5˚ C higher than those in winter.

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1 INTRODUCTION

1.1 Background

Cairo, Egypt is generally classified as one of the world's "megacities", with an estimated population in excess of 20 million people in the greater Cairo/Giza area. It also suffers from high ambient concentrations of atmospheric pollutants, including particulates (PM), carbon monoxide (CO), oxides of nitrogen (NO_x), ozone (O_3), and sulfur dioxide (SO_2) (Nasralla, 1994; Sturchio et al., 1997).

Nasralla (1994) reported annual average SO_2 concentration in Cairo ranging from 40 $\mu g/m^3$ in suburban areas to 105 $\mu g/m^3$ in Helwan, the industrial area south of Cairo. Maximum twenty-four hour average SO_2 concentrations were greater than 300 $\mu g/m^3$. Concentrations for CO ranged from 7 to 19 ppm during one day in 1984, and NO_x levels ranged from 0.2 to 0.75 ppm in 1989. Particulate lead concentrations ranged from 0.5 $\mu g/m^3$ in a residential area to 3.0 $\mu g/m^3$ at the city center.

Sturchio et al. (1997) measured total suspended particulate (TSP) and lead concentrations at eleven sites in Cairo from December, 1995 through January, 1996 and during October, 1996. Lead concentrations ranged from 0.08 $\mu g/m^3$ at Helwan to over 3 $\mu g/m^3$ at the city center. TSP concentrations ranged from 25 $\mu g/m^3$ to over 1100 $\mu g/m^3$. Carbon concentrations (elemental plus organic) ranged from 53 $\mu g/m^3$ at Helwan to 176 $\mu g/m^3$ at the city center. In this study, the sources of lead were determined using stable isotopic ratios ($^{207}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$). Isotopic ratios in ambient aerosol samples were compared with those measured in local gasoline and lead ingots from a local smelter. The aerosol ratios compared well with those of the lead ingots. The ratios in gasoline were higher for three gasoline samples, but lower for one sample. It was concluded that the majority of atmospheric lead in Cairo was derived from local lead smelters. This result contradicts the suggestion by Nasralla (1994) that most of the atmospheric lead in Cairo comes from motor vehicle emissions; although it should be noted that Cairo began to phase out leaded gas in 1996.

Rodes et al. (1996) measured $PM_{2.5}$ (fine) and coarse (PM_{10}-$PM_{2.5}$) concentrations using dichotomous samplers during a source apportionment study in Cairo from December, 1994 through November, 1995. Fine and coarse concentrations averaged 73.3 and 204.2 $\mu g/m^3$, respectively at the city center, 25.4 and 63.0 $\mu g/m^3$, respectively at Ma'adi (a residential area), 54.4 and 173.9 $\mu g/m^3$, respectively at Helwan, 64.6 and 131.1 $\mu g/m^3$, respectively at Shobra El-Kheima (an industrial area) and 17.7 and 28.0 $\mu g/m^3$, respectively at a background site in northeast Cairo. PM_{10} mass was dominated by the

coarse fraction, suggesting a strong influence of fugitive dust sources. The annual average PM_{10} concentrations exceeded the 24-hour average U.S. standard of 150 $\mu g/m^3$ at all sites except Ma'adi and the background site. As part of this study, an attempt was made to attribute the high PM levels to specific sources using the Chemical Mass Balance (CMB) source apportionment model. The major contributors to the coarse fraction were paved road dust at the city center, paved road dust at Shobra El-Kheima, desert dust, unpaved road dust, and lime production at Ma'adi, desert dust at the background site, and desert dust and unpaved road dust at Helwan. Emissions from mobile sources, oil combustion, and vegetative/trash burning dominated the $PM_{2.5}$ apportionments.

It is difficult to determine whether the Rodes et al. (1996) apportionments are realistic because there is nothing with which to compare them. Some serious inconsistencies in the results raise questions as to their validity. Heavy duty diesel vehicle emissions were a significant contributor at the city center (38%) but nowhere else. On the other hand, vegetative/trash burning accounted for roughly the same percentage of $PM_{2.5}$ at the other 4 sites. Given the prevalence of diesel vehicles in this air shed, this seems unrealistic. A likely explanation is that the diesel and vegetative burning profiles were collinear, that is, they could not be distinguished by the CMB. This could mean that the estimated contributions of vegetative/trash burning could in part represent diesel emissions, and visa versa. In a complex air shed like Cairo, the issue of source-profile collinearity is a potentially important confounding influence on the source apportionment process.

Hindy (1991) studied the effects of air pollution from Cairo by measuring concentrations of trace and heavy metals (Cr, Mn, Fe, Co, Ni, Cu, Zn, Cd, and Pb) as a function of depth in alluvial soils south and southwest of Cairo. In all cases, metal concentrations were highest at the surface, indicating the effects of anthropogenic aerosol deposition. It was also suggested that windblown desert dust may have elevated surface soil concentrations of Fe, Cu, and Zn.

Hindy et al. (1990) investigated the impact of emissions from cement plants 20 km southeast of Cairo on the concentrations of vanadium (V) in plants, soil, water and air particulates. They found high V concentrations (99-204 ppm) in the raw material used in the plants as well as in fugitive dust collected at various locations around the factories (230-730 ppm). Concentrations in dustfall near the factories (340 ppm) were over three times higher than those in dustfall over northeast Cairo (104 ppm).

El-Shazly et al. (1990) studied the effects of an aluminum reduction plant at Nagi Hammady on total suspended particulate concentrations. TSP concentrations were highest near the plant, averaging 937 $\mu g/m^3$. Average TSP concentrations (540 $\mu g/m^3$) within 50 km of the plant were much higher than those found in residential neighborhoods (132 $\mu g/m^3$) but lower than those found in other industrial areas. Concentrations of trace elements (Fe, Pb, Cu, and Zn) in TSP were also much higher near the plant than in urban or residential areas. The concentration of fluoride in TSP, which is typically enriched in aluminum production emissions, was much higher near the plant (1.52 $\mu g/m^3$) than in urban (0.03-0.09 $\mu g/m^3$) or rural (0.05 $\mu g/m^3$) locations.

In order to develop and implement a pollution-control strategy and to reduce the health impact of air pollution in Cairo, USAID awarded Chemonics International, Inc. the Cairo Air Improvement Project (CAIP). One aspect of the CAIP includes routine monitoring of PM_{10}, $PM_{2.5}$ and Pb at sites throughout the greater Cairo area. Howes et al. (2000) reported baseline year monitoring results for the CAIP. Only 37 of the 1783 PM_{10} measurements recorded during period were below the Government of Egypt (GOE) 24-hr limit of 70 $\mu g/m^3$. The highest annual average PM_{10} Pb levels observed were 26.2 $\mu g/m^3$ at the Shobra Kheima site.

1.2 Objectives

These studies highlight the severe air pollution problems associated with the greater Cairo area. As part of the CAIP (Chemonics International, Inc., 1997), source attribution studies were performed by scientists from the Desert Research Institute (DRI) and the CAIP project team to assess the impact of various sources (e.g., lead smelters, motor vehicles, oil combustion, vegetative burning, geological material, etc.) to ambient pollutant levels. Specific objectives of the source attribution studies included:

- Estimating the spatial and temporal distributions of PM_{10}, $PM_{2.5}$, and VOCs.
- Apportioning PM_{10}, $PM_{2.5}$, and VOC concentrations to source emissions.
- Providing a baseline against which the impact of CAIP implemented strategies can be evaluated.

Particular emphasis was placed on determining the sources of airborne lead and PM observed in greater Cairo and the effectiveness of lead control strategies on ambient lead concentrations. In this report we present results of the winter (February/March) and fall (October/November) 1999 source attribution studies.

1.3 Guide to this Report

In this first section, we provide the background, motivation, and objectives of this study. Section 2 discusses the monitoring and modeling approach, while Section 3 presents the results of the ambient measurements. Section 4 contains the results of the initial source attribution modeling of the winter and fall measurements using source profiles from earlier studies. Section 5 contains the results of PM and Pb source apportionment using CAIP source profiles that include PAHs for the winter and source intensive measurement periods. Section 6 provides recommendations on how the results can be used to develop control strategies for the greater Cairo area. Section 7 summarizes the findings of this work and references are contained in Section 8. The Appendices contain all the inorganic and organic data, PM, VOC, and PAH source profiles, and the PM and VOC source attribution results.

2 EXPERIMENTAL METHODS

The rationale for the source attribution study was to improve on previous source apportionment results (Rodes et al., 1996). We have attempted to fit the source attribution requirements within the constraints of the CAIP. In order to accomplish this, samples were collected at existing sampling locations (Gertler et al., 1999). Particular emphasis was placed on characterizing the source contributions and ambient levels of Pb in the greater Cairo area.

2.1 Sampling Sites

Six sites were chosen for the intensive studies. We attempted to choose sites that were representative of upwind conditions, residential areas, and highly impacted locations. Sites included:

Background: Kaha, a Nile delta site with significant agricultural activity. During most of the year, the prevailing winds come from this direction.

Industrial/Residential: There are numerous potential sites. One constraint is available power. Shobra and El Massara were chosen. The Shobra site is located in a heavily industrialized area and is downwind from numerous Pb smelters and other industrial sources. This is one of the most highly polluted areas in the city. The El Massara site is near a number of cement plants and other industrial sources.

Traffic: El Qualaly Square, a site located downtown. The site is close to the road and has high light- and heavy-duty (bus) traffic.

Residential: Helwan and Zamalek were chosen. Helwan is impacted by emissions from nearby cement plants and has higher PM levels than some of the other residential areas. Zamalek is located on one of the islands in the Nile and represents a residential area with limited nearby sources.

2.2 Ambient Measurements

Ambient $PM_{2.5}$ (fine) and PM_{10} (total) samples were collected daily at the six sites from 18 February through March 5 and from October 29 through November 27, 1999 using the sampling protocol described by Watson et al. (1994). All samples were of 24-hour duration. Two medium volume samplers were used, one for $PM_{2.5}$ and the other for PM_{10}, with a flow rate of 20 lpm. In one channel, a pre-fired quartz filter collected particles for measurement of ions and carbon. This was followed by a sodium chloride-impregnated cellulose filter which collected gaseous nitrate. In the second channel, a

Teflon filter for measurement of particle mass and elemental concentration was followed by a pre-fired quartz filter which collected volatile organic carbon. Samples were collected daily. Particulate, semi-volatile, and gaseous polycyclic aromatic hydrocarbons (PAH) were collected independently using a Teflon-impregnated glass-fiber filter (TIGF) followed by a polyurethane plug (PUF) and XAD-4 resin. Forty-four winter and 39 fall fine and total sample pairs were selected for detailed chemical analysis. Sample days were chosen for detailed chemical analysis based on the occurrence of high mass concentrations at all or most of the six sites. Volatile organic compounds (C_2-C_{12}) were collected in pre-cleaned stainless steel canisters.

2.3 Source Measurements

Source emissions samples were collected using methods similar to those used in the ambient sampling program. Bulk soil and road dust samples were collected at each of the ambient-sampling sites. Emissions from various sources including brick manufacturing, cast iron foundry, copper foundry, lead smelting, refuse burning, Mazot oil combustion, refuse burning, and restaurants were sampled. Individual motor vehicle emissions were sampled from heavy- and light-duty diesel vehicles, spark ignition automobiles, and motorcycles.

2.4 Analytical Methods

Following collection, samples were shipped back to DRI in Reno, NV for chemical analysis as follows:

- Aerosol mass ($PM_{2.5}$ and PM_{10}) on the Teflon filters was determined gravimetrically on a Cahn C-31 microbalance. Filters were equilibrated to a low relative humidity (<30%) before weighing to avoid water uptake by hygroscopic species on the filter.
- A basic suite of elemental concentrations was determined on the Teflon filters by x-ray fluorescence (XRF) on a Kevex 0700/8000 XRF analyzer: Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Se, Br, Rb, Sr, Sn, Sb, Ba, and Pb.
- Sulfate, nitrate, and chloride on the front quartz filters were determined by ion chromatography (IC) on a Dionex DX 500 ion chromatograph with a Dionex AS4A column. Volatile nitrate on the sodium chloride-impregnated filter was also analyzed in this manner.
- Bulk organic and elemental carbon (OC and EC) on the front and backup quartz filters were determined by thermal/optical reflectance (TOR) (Chow et al. , 1993).

- Soluble Na and K were determined by atomic absorption (AA) spectroscopy on a Varian SpectraAA-880. Soluble K is helpful for distinguishing vegetative burning emissions. Sodium is a tracer for sea salt aerosol. It is not measured accurately by XRF.
- Ammonium was determined by automated colorimetry (AC) on a Technicon TRAACS 800 autoanalyzer using the indophenol method.
- In order to reduce the uncertainty in the source apportionments, samples were also analyzed for PAHs following the protocol described by Fujita et al. (1998).
- VOCs were analyzed by gas chromatography with flame ionization detection (GC/FID).

2.5 Receptor Modeling Methods

The Chemical Mass Balance (CMB) receptor model was used to apportion PM and its chemical constituents and VOCs to their sources (Watson et al., 1984). The CMB consists of a set of linear equations which express the ambient concentrations of a chemical species as the sum of products of source contributions and source composition profiles. The form of these equations is:

$$C_i = F_{i1}S_1 + F_{i2}S_2 + ... + F_{ij}S_j + ... + F_{iJ}S_J + e_i + e_{ij} \qquad i = 1,2,..I \quad j = 1,2,...,J \tag{1}$$

where C_i is the concentration of species i measured at a receptor site, F_{ij} is the fraction of species i in emissions from source j, S_j is the estimate of the contribution of source j, e_i and e_{ij} are the random measurement errors of the ith species in the ambient sample and in the jth source, respectively, I is the number of chemical species, and J is the number of source types.

The source contributions are the unknowns in these equations. The current CMB software (EPA/DRI versions 7 and 8) applies the effective variance least-squares solution developed and tested by Watson et al. (1984) to solve these equations. This approach has two advantages: 1) it calculates uncertainties of source contributions from both the source and receptor uncertainties and 2) chemical species measured more precisely in both source and receptor samples are given greater influence in the solution than are less precisely measured species.

The CMB procedure requires several steps. First, the contributing sources must be identified and their chemical profiles must be entered. Then the chemical species to be included in the model must be selected. The next step is the estimation of the fractions

of each chemical species contained in each source type and the estimation of the uncertainties in both the ambient concentrations and source contributions. The final step is the solution of the set of chemical mass balance equations. These procedures are described in detail in an application and validation protocol (Pace and Watson, 1987).

2.5.1 CMB Model Applicability

The requirements for CMB model applicability are as follows (Watson, 1979):

- Compositions of source emissions are constant over the period of ambient and source sampling. Chemical species do not react with each other.
- All sources with a potential for significantly contributing to the receptor have been identified and included in the model.
- The number of sources is less than or equal to the number of species.
- The source profiles are linearly independent of each other.
- Measurement uncertainties are random, uncorrelated and normally distributed.

Even though these assumptions are quite restrictive, the CMB model can tolerate reasonable deviations from these assumptions by increasing the calculated uncertainties of the source contribution estimates.

The PM and VOC measurements taken at each receptor for each sampling day were formatted for input to version 7.0 of the CMB model (Watson et al., 1990), as well as the source compositions that are specified in Section 4.

2.5.2 Model Outputs and Performance Measures

The model provides three primary outputs or variable values. These are the source contribution estimates (SCE), the standard error of the SCE (STDERR) and the calculated concentration for each species (CALC) (Pace and Watson, 1987).

<u>Source Contribution Estimate (SCE)</u> is the contribution of each source type to pollutant (particle mass of NMHC) being apportioned. The sum of these concentrations approximates the total measured mass or NMHC concentration. Negative SCEs may indicate collinearity among source profiles or values not significantly different from zero.

<u>Standard Error (STDERR</u>), the estimated uncertainty of the SCE, reflects the precision of the ambient data, the variability of the source profiles, and the degree of collinearity among the profiles. It is desirable to have this value be much smaller than the SCE.

Calculated concentration (CALC) is the calculated concentration and uncertainty determined by the model for all species, including those not used in the fit.

The CMB output also consists of statistics that can be used to evaluate how well the model's calculated species concentrations match the ambient measurements for these species. In addition, diagnostics provide information to help identify which species are responsible for a poor fit. Short descriptions of some of the statistics and diagnostics outputs are given below.

T-Statistic (TSTAT) is the ratio of the source contribution estimate to its standard error. A low TSTAT value (<2.0) indicates that a source contribution is not statistically significant.

R-Square and Chi-Square The R-square is the fraction of the total variance of the ambient concentration profile accounted for by the regression model. Its value ranges from 0 to 1.0. A value close to 1.0 indicates that the source contribution estimates explain the measured concentrations well. A low R-square (<0.8) indicates a bad fit which may be caused by unrepresentative source profiles or inaccurately or imprecisely measured species concentrations in the ambient sample or source profiles. The Chi-square is the mean of the weighted sum of squares of the difference between the calculated and the measured fitting species concentrations. A value less than 1 indicates a very good fit, where a value greater than 4 means that one or more of the calculated species concentrations differs from the measured concentrations by several uncertainty intervals.

Percent of Mass accounted for (PERCENT MASS) is the ratio of the sum of the source contributions to the measured mass concentration. The desirable value is 100%, but values between 80-120% are acceptable (Watson et al., 1990).

R/U is the ratio of the difference between the measured and calculated concentration divided by its uncertainty. The R/U is essentially the contribution of a particular species fit to the weighted sum of squares, which determines the CMB solution. An R/U less than 1 represents a good fit for that species.

Uncertainty/Similarity Clusters (U/S CLUSTERS) are caused by excessive similarity (collinearity) among the source profiles in the cluster or by high uncertainties in the individual source profiles. When source profiles are very similar in composition, the

CMB model cannot accurately apportion species to the source types. This can happen very often among geological sources, vegetative burning and motor vehicle profiles. The CMB 7.0 includes measures developed by Henry (1992) to evaluate the effects of collinearity among source contribution estimates based on singular value decomposition.

2.5.3 Applicability of the CMB Model to the CAIP Data

All of the requirements for applying the CMB model to the Cairo particulate matter data have been met. Ambient and source concentrations were determined using standard sampling and analytical techniques. This is also the case for PAH and VOC concentrations. Where necessary, representative source profiles have been assembled from recent source apportionment studies, particularly from those conducted previously in Cairo. Because particulate species are generally conservative, the CMB model is appropriate for determining sources of $PM_{2.5}$ and PM_{10} in Cairo. The application to PAH and VOCs is potentially more problematic. Volatile and semi-volatile VOC and PAH are subject to transformations through photochemical reactions which may occur between the source and receptor. Such transformations would violate the principle of conservation inherent in the CMB model. To obviate this concern, we have chosen a subset of the VOCs with comparable reactivity. Thus, the relative composition of the VOC source emissions is expected to be conserved between the sources and receptor.

3 AMBIENT MEASUREMENTS

3.1 Mass and Inorganic Chemical Species

$PM_{2.5}$ and PM_{10} and chemical concentrations are presented for winter samples in Appendices A1a and A1b, respectively and for fall samples in Appendices A1c and A1d, respectively. The corresponding $PM_{2.5}$ PAH concentrations for winter and fall are presented in Appendices A2a and A2b, respectively. The mass measurements for PM_{10} and $PM_{2.5}$ are presented as time series plots for winter and fall in Figures 3-1a to 3-1b and 3-1c to 3-1d, respectively. For winter, the time series plots show similar trends among the PM_{10} and $PM_{2.5}$ measurements with the highest concentrations of PM_{10} and $PM_{2.5}$ observed on March 2 at Shobra. PM_{10} levels were most similar at Shobra, El Qualaly, and El Massara. $PM_{2.5}$ levels were uniformly low at all sites except Shobra, where most of the PM_{10} was in the fine ($PM_{2.5}$) fraction. During fall, the temporal trends in both $PM_{2.5}$ and PM_{10} at the six sites were also similar. However, concentration levels at all sites (except for $PM_{2.5}$ at Shobra) were higher in fall than in winter.

The sum of measured species is plotted against the total gravimetric mass with all sites and size fractions combined for winter and fall samples in Figure 3-2a and 3-2b. The correlations between measured and reconstructed (sum of species) were very high during both seasons. This indicates that the data quality for the CAIP particulate measurements was quite good. The sum of the species consistently accounted for 70-80% of the measured mass. The difference is accounted for by the fact that the sum of species does not contain oxygen associated with geological species (e.g., Al, Fe, Si) or hydrogen, oxygen, nitrogen, and sulfur associated with organic carbon.

Table 3-1 compares average concentrations of mass and major chemical species for the PM_{10} and $PM_{2.5}$ size fractions during the winter and fall sampling periods. Averages for mass represent all days on which filter samples were collected. Mass concentrations in both size fractions were higher at all sites (except for $PM_{2.5}$ at Shobra) during the fall season. Shobra exhibited the highest average PM_{10} and $PM_{2.5}$ mass concentrations during the fall season (360.3±140.6 and 216.1±11.0 $\mu g/m^3$, respectively). During winter the second highest average $PM_{2.5}$ and PM_{10} concentrations were found at El Qualaly, the mobile source site (84.6±9.6 and 219.9±30.3 $\mu g/m^3$, respectively). During fall, the second highest average $PM_{2.5}$ concentration (135.1±51.7 $\mu g/m^3$) was found at El Qualaly, while the second highest average PM_{10} concentration (317.4±158.8 $\mu g/m^3$) was found at El Massara The lowest values in both size fractions were observed at Helwan, a residential location. The background site, Kaha, generally had the second lowest mass

levels. For all sites, the average PM_{10} concentrations in both seasons would have exceeded the US annual PM_{10} standard of 50 $\mu g/m^3$.

The $PM_{2.5}/PM_{10}$ ratio varied from 0.32 at El Massara to 0.82 at Shobra during winter and from 0.31 at El Massara to 0.54 at El Qualaly during fall. El Massara is an industrial location impacted by emissions from nearby cement plants. The ratio of 0.31-0.33 at El Massara is consistent with coarse particle emissions from those activities. Shobra is a highly industrialized site with a number of lead smelters in the vicinity. The ratio of 0.82 is likely due to the impact of fresh combustion emissions, although it is still unusually high. The situation at Shobra was clearly different in the fall, with lower $PM_{2.5}$ concentrations and $PM_{2.5}/PM_{10}$ ratio. One might have also expected very high ratios at El Qualaly, the mobile source site; however, the observed ratio was 0.39-0.54. This site also had high levels of crustal species in the PM_{10} fraction, likely due to resuspended road dust, leading to the reduced ratio.

Crustal components (Si, Ca, Fe, and Al) were significant at all sites. The majority of crustal material was in the coarse (PM_{10}-$PM_{2.5}$) fraction. The highest concentrations of PM_{10} crustal species, e.g., Si, were found at Shobra and El Massara during winter and fall, probably as a result of fugitive dust emissions from industrial operations at these sites.

Organic carbon (OC), and elemental carbon (EC) were major components of PM at all sites Potential sources include mobile emissions, vegetative burning, and fossil fuel combustion. The highest average PM_{10} OC levels were observed at El Qualaly and Shobra during both winter and fall.

Shobra exhibited the highest lead (Pb) concentrations during both seasons. The average PM_{10} and $PM_{2.5}$ ambient lead concentrations were 33.7±17.8 and 26.8±10.8 $\mu g/m^3$, respectively, during winter and 11.2±16.8 and 8.1±13.3 $\mu g/m^3$, respectively, during fall. Note that while the average winter Pb concentrations at Shobra were three times higher than those in fall, the fall concentrations were highly variable. Because other mass and species concentrations were generally higher during fall, we suspect that industrial lead operations may have been shut down or diminished at Shobra during the fall period. Lead concentrations at Shobra and Cairo in general are in excess of PM_{10} and $PM_{2.5}$ mass concentrations observed in many cities in the US. High Pb concentrations were also observed at El Qualaly and El Zamalek. It should be noted

that leaded fuel was phased out in 1996 and so most of this Pb probably comes from other sources.

Figures 3-3a and 3-3b show the relationship between the observed values for K (total potassium) and K^+ (soluble potassium) in the fine ($PM_{2.5}$) fraction. Potassium is enriched in geological material, which is found mainly in the coarse fraction. The ratio of soluble to total K in geological dust is typically about 0.1. The ratio of K^+/K in the fine fraction can be indicative of vegetative or refuse burning because these fine-particle emissions are enriched in K^+. The average fine K^+/K ratios during winter and fall over all sites were 0.92 and 0.84, respectively, indicating a high level of these emissions in the greater Cairo area.

One unusual feature of the PM chemical composition was the high levels of Cl relative to Na throughout the network. Rodes et al. (1996) observed similarly high levels. The Cl/Na ratio in sea salt aerosols is 1.8. In Cairo, the average ratios of Cl/Na during winter and fall were 9.6 and 21.2, respectively. There is clearly an additional source(s) of Cl in Cairo. The nature of this source is unknown but it is likely due to industrial/processing activities to the north of Kaha due to the general increase in Cl concentration from Helwan (south) to Kaha (north).

Recognition of this non-sea salt source of Cl helps us understand the acidity of the Cairo aerosol. Nitrate can exist as ammonium nitrate or in association with sea salt or mineral aerosols. Sulfate can be completely neutralized by ammonia as ammonium sulfate, partially neutralized as ammonium bisulfate, or completely acidic, as sulfuric acid. To determine the degree of ammonia neutralization, we create an “ammonium balance” by assuming that all of the sulfate was completely neutralized as ammonium sulfate and that all of the nitrate was present as ammonium nitrate. We then compare the “predicted” and measured ammonium. If they are equivalent, we have accurately described the aerosol acidity. Ammonium balances for winter and fall are shown in Figures 3-4a to 3-4b and 3-4c to 3-4d, respectively. In the top panels, we predicted ammonium assuming that only ammonium sulfate and ammonium nitrate were present. This clearly underestimates the measured ammonium. In the bottom panels, we assume that all of the Cl was present as ammonium chloride. While this over-predicts the measured ammonium, it implies that a significant amount of ammonium chloride is present in the Cairo atmosphere. Because there is also Na in the aerosol, some of the chlorine must also be associated with sea salt derived aerosols.

3.2 Polycyclic Aromatic Hydrocarbons

Winter and fall sample PAH concentrations are presented in Appendices A2a and A2b, respectively. A statistical summary of PAH concentrations is presented in Table 3-2. In Table 3-2, most of the compounds are either volatile or semi-volatile. Only compounds including and after cetene in Table 3-2 are found completely in the particulate phase. Some of these particulate compounds, for example, benzo(a)pyrene (BaP) are carcinogens. In general, the PAH concentrations increased during the fall season, following the pattern displayed by the aerosol concentrations. Note that the PAH concentrations in Table 3-2 (ng/m^3) are very low. Even including the gas-phase compounds, the PAH are a small fraction of particle mass and organic carbon. While their concentrations are low, they were measured to aid in discriminating different combustion source emissions using the CMB model.

3.3 Volatile Organic Compounds

Winter and fall ambient VOC concentrations are presented in Appendices A3a and A3b, respectively. Figures 3-5a and 3-5b present time series plots of daily non-methane hydrocarbon (NMHC) concentrations at the six sites during winter and fall. Table 3-3 presents a statistical summary of selected VOC concentrations at the six sites during winter and fall. Fall NMHC concentrations were generally higher than those observed in winter. Table 3-3 indicates that the highest average NMHC concentrations were found at El Qualaly during both fall (2037±1369 ppb) and winter (1849±298 ppb). This is consistent with the high volume of mobile source emissions expected at this site. The next highest NMHC concentrations were found at Al Zamalek (winter NMHC = 1282±965 ppb; fall NMHC = 879±213 ppb) and at Shobra (fall NMHC = 1149±822 ppb; winter NMHC = 914±171 ppb). The lowest NMHC concentrations were found at El Massara, Helwan, and Kaha.

The temporal variations of NMHC were consistent and largely invariant among the six sites during winter. All sites seemed to experience a minimum in NMHC concentrations at the end of February, 1999. During fall, all sites experienced NMHC maxima on 11/22/99 and elevated concentrations on the two days leading up to it. Again, the lowest concentrations in fall were found at El Massara, Helwan, and Kaha.

Table 3-3 shows that the most abundant VOCs were isopentane and n-pentane, which are associated with evaporative emissions from motor vehicles, C2 compounds (e.g., ethane, ethene), propane, isobutane, and n-butane, which come from CNG (natural gas) and LPG (liquefied petroleum gas). MTBE (methyl tertiary-butyl ether), a gasoline additive, toluene, and benzene were also abundant compounds.

3.4 Meteorology

Atmospheric concentrations were generally higher in fall than in winter. We examined surface meteorological data to try to explain these seasonal differences. We received daily average surface wind speed, wind direction, and temperature data from four sites in Cairo (BLB, CAI, KFC, and LSA) from Dr. Mounir Labib. We calculated the seasonal average temperature and vector-averaged wind speed and direction at the four sites. The average winter temperature ranged from 13.7 to 15.4 ^{o}C while the average fall temperature ranged from 19.4 to 20.6 ^{o}C. Thus, the seasonal variation was approximately 5 ^{o}C. The vector-averaged wind direction ranged from 312 to 6 degrees, i.e., from the north, in both seasons at the four measurement locations. The seasonal variation in concentration was thus unrelated to wind direction. The seasonal vector-averaged wind speed ranged from 1.2 to 2.8 mph in winter and from 0.72 to 1.86 mph in fall. The average ratio of winter to fall wind speed is 1.8±0.8. The lower wind speeds during fall may explain the higher concentrations during that season because lower ventilation associated with low wind speeds may allow for buildup of pollutants in the vicinity of the sources in Cairo.

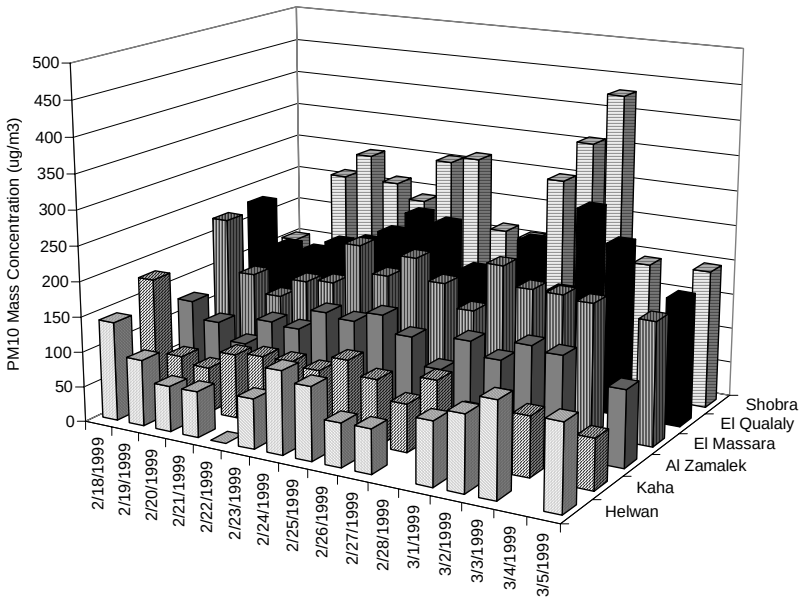


Figure 3-1a. PM_{10} mass ($\mu g/m^3$) for the February/March intensive measurement period.

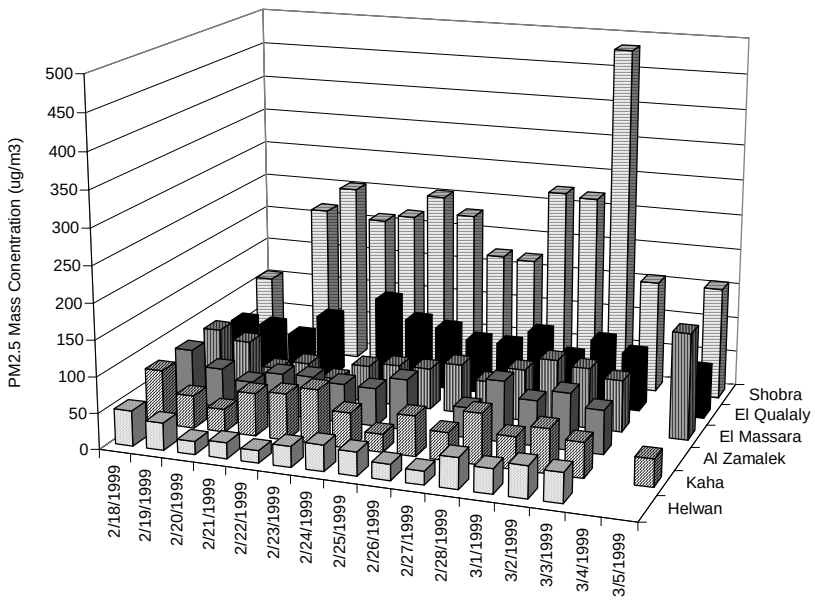


Figure 3-1b. $PM_{2.5}$ mass ($\mu g/m^3$) for the February/March intensive measurement period.

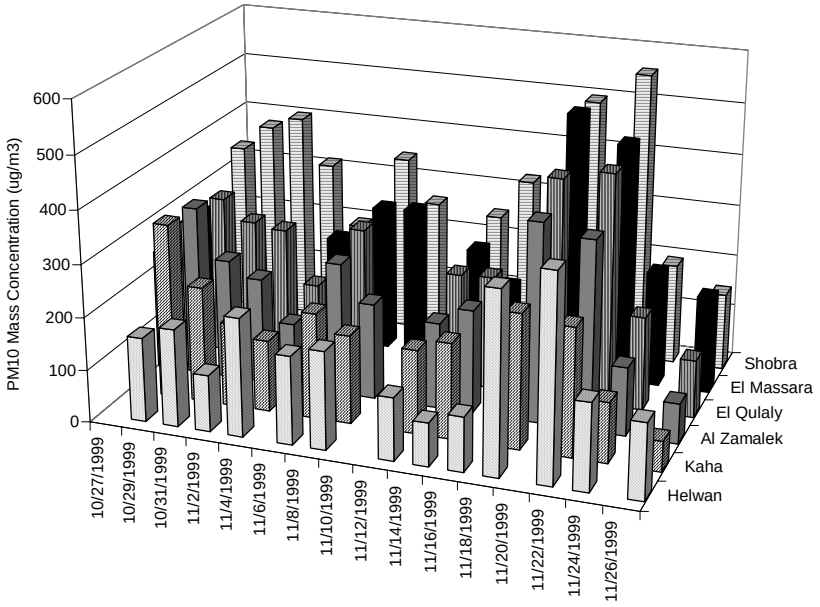


Figure 3-1c. PM_{10} mass ($\mu g/m^3$) for the October/November intensive measurement period.

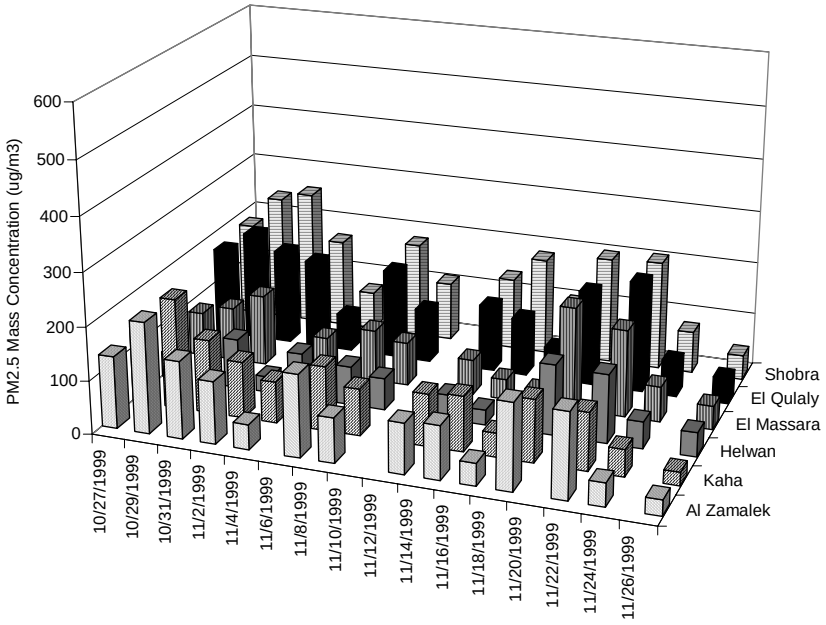
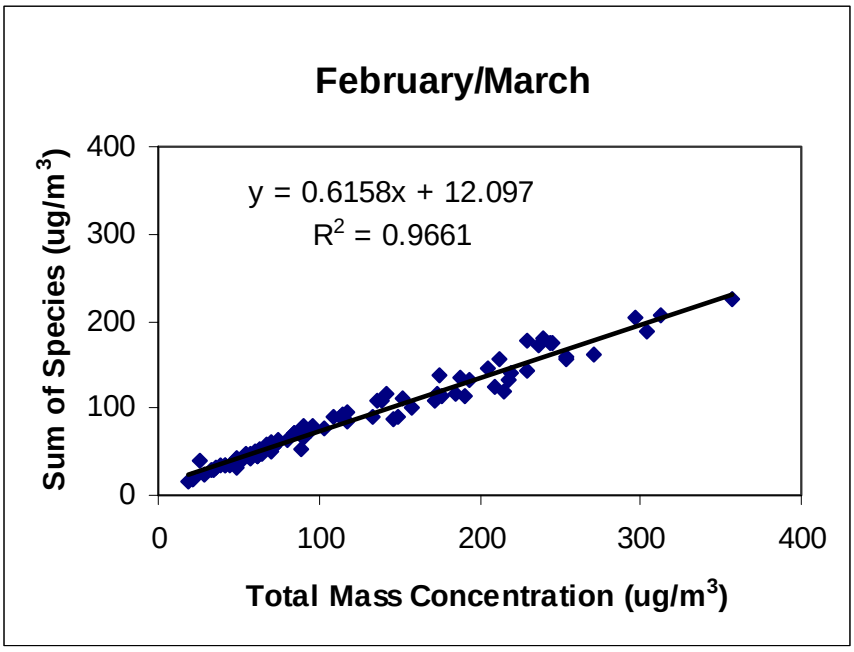
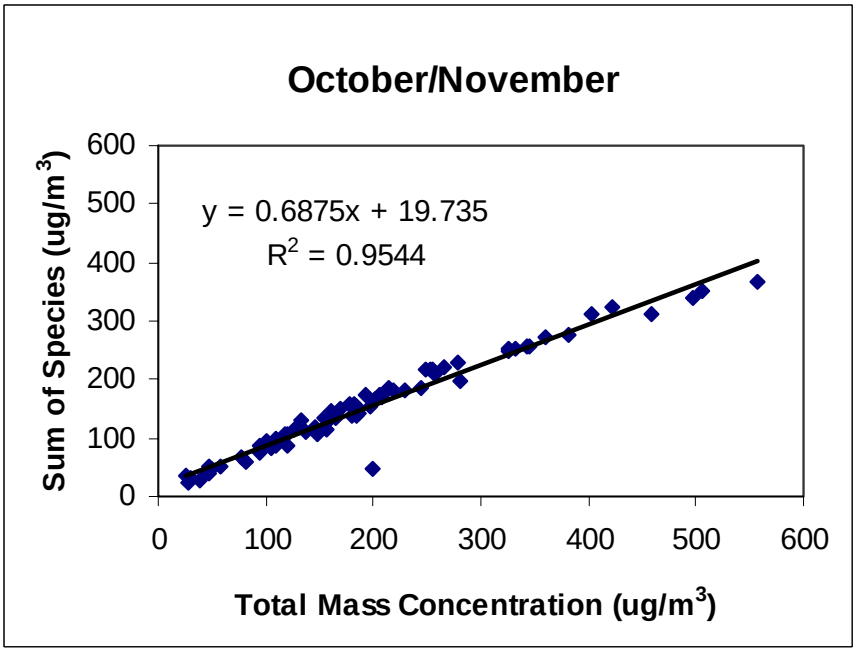
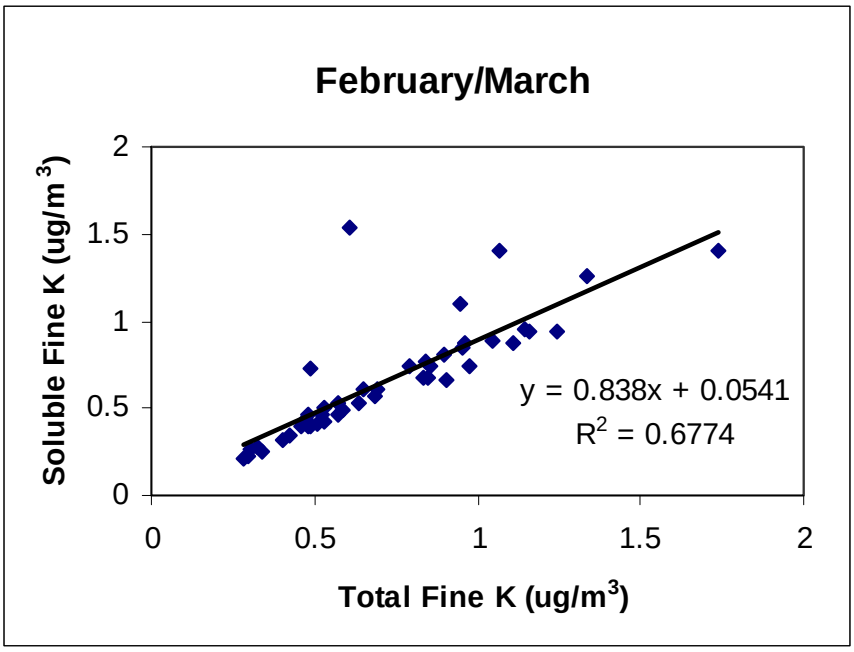


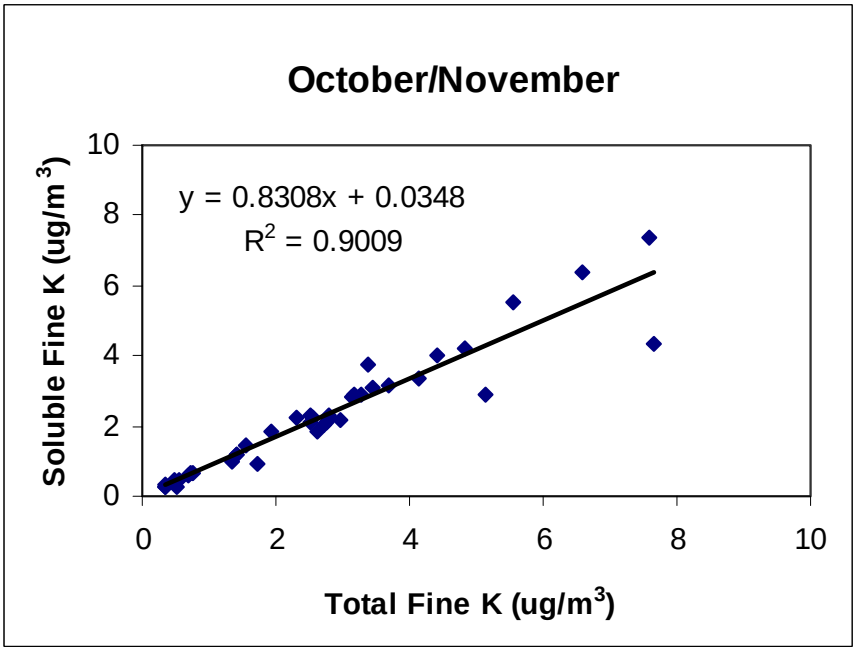
Figure 3-1d. $PM_{2.5}$ mass ($\mu g/m^3$) for the October/November intensive measurement period.



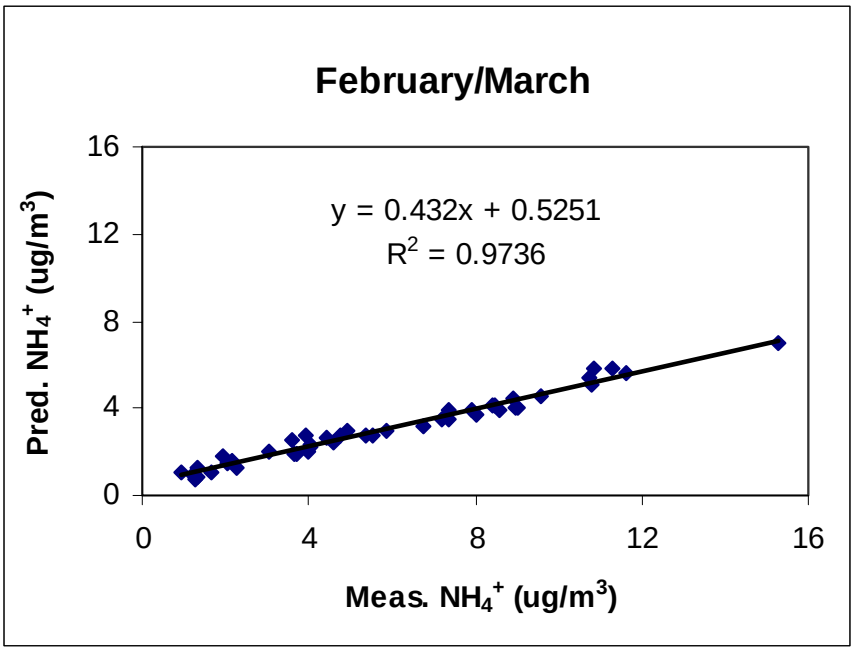


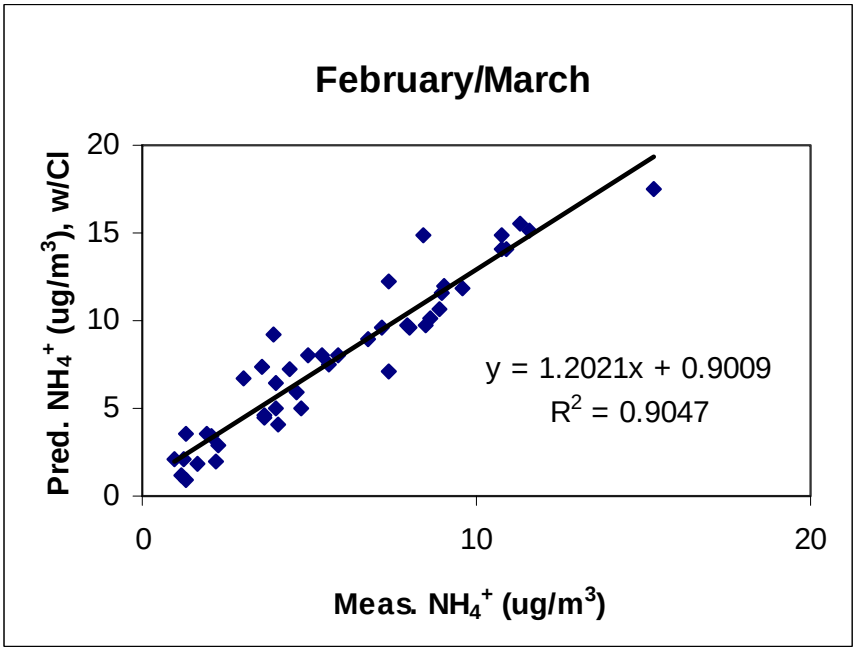
Figures 3-2a and 3-2b. Sum of the measured species vs. total gravimetric mass.



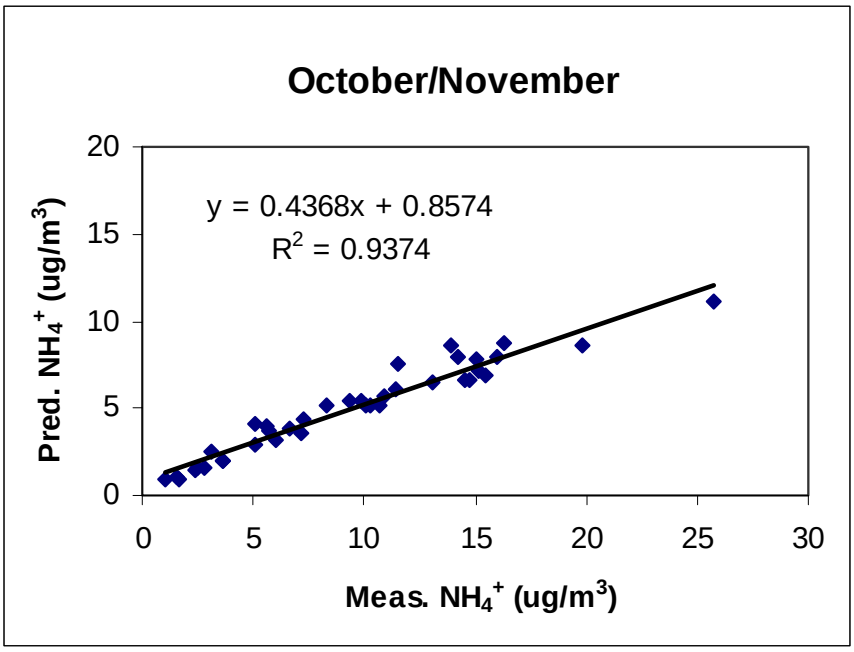


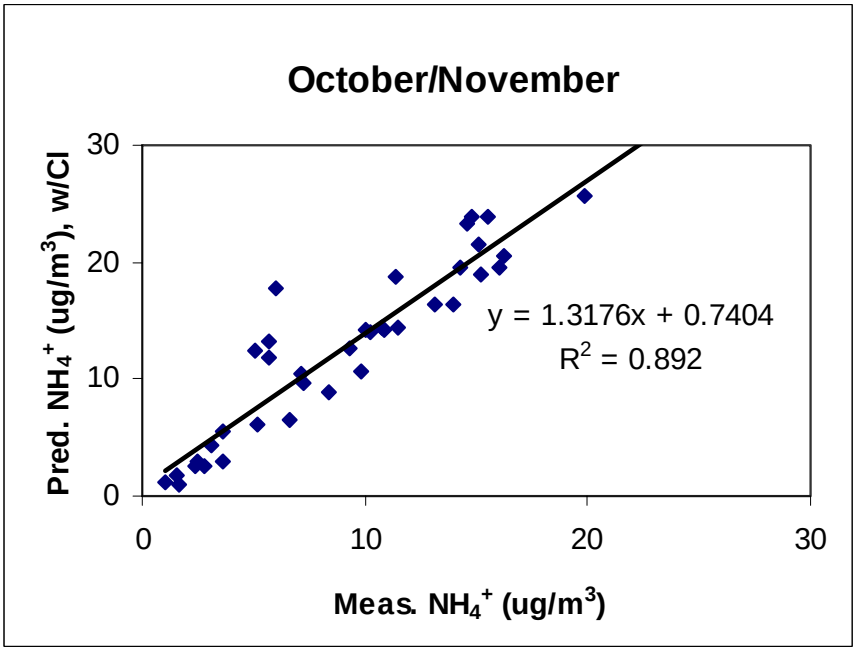
Figures 3-3a and 3-3b. Relationship between total potassium (K) and soluble potassium (K^+) in the $PM_{2.5}$ fraction.





Figures 3-4a and 3-4b. Ammonium balances for the winter intensive sampling period.





Figures 3-4c and 3-4d. Ammonium balances for the fall intensive sampling period.

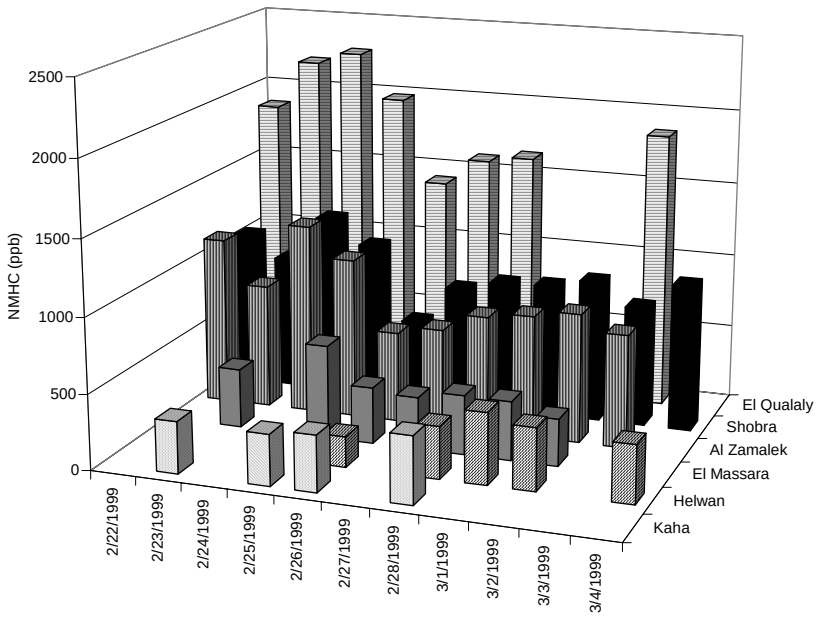


Figure 3-5a. NMHC (ppb) for the February/March intensive measurement period

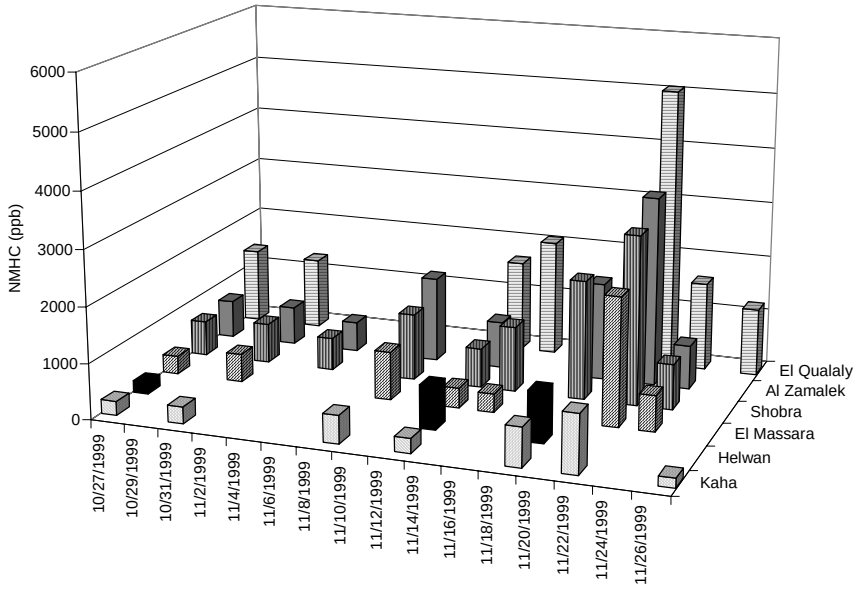


Figure 3-5b. NMHC (ppb) for the October/November intensive measurement period

Table 3-1. Statistical summary of $PM_{2.5}$ and PM_{10} mass and selected chemical species for the six intensive sites during the winter and fall, 1999 (average ± standard deviation, $\mu g/m^3$).

Species	Size	Season	Al Zamalek	El Qualaly	Helwan	Kaha	El Massara	Shobra
Mass	PM2.5	Winter	61.9 ± 13.5	84.6 ± 9.6	29.4 ± 8.0	49.7 ± 14.7	60.9 ± 15.2	216.1 ± 43.4
	PM2.5	Fall	131.8 ± 54.9	135.1 ± 51.7	99.9 ± 68.6	111.4 ± 53.1	107.5 ± 69.8	173.5 ± 66.4
	PM10	Winter	127.2 ± 21.4	219.9 ± 30.3	88.1 ± 27.8	93.0 ± 15.2	186.1 ± 27.9	265.1 ± 60.3
	PM10	Fall	248.5 ± 103.7	251.6 ± 102.6	146.3 ± 129.3	204.7 ± 86.3	317.4 ± 158.8	360.3 ± 140.6
Chlorine	PM2.5	Winter	12.6535 ± 5.2	10.2 ± 4.5	2.4 ± 2.0	11.1 ± 4.4	6.5 ± 3.3	15.1 ± 4.4
	PM2.5	Fall	17.3042 ± 9.6	16.7 ± 11.3	9.3 ± 13.7	13.8 ± 8.0	13.8 ± 18.3	19.9 ± 9.6
	PM10	Winter	22.1241 ± 7.8	19.7 ± 7.6	7.6 ± 4.3	21.5 ± 7.0	13.3 ± 5.5	22.2 ± 6.2
	PM10	Fall	30.6782 ± 14.751	30.2 ± 17.4	20.0 ± 19.7	25.8 ± 12.8	25.8 ± 24.7	34.1 ± 13.5
Nitrate	PM2.5	Winter	2.72 ± 0.74	2.96 ± 0.47	1.65 ± 0.48	3.21 ± 0.75	2.79 ± 0.66	4.46 ± 1.01
	PM2.5	Fall	5.51 ± 2.90	4.62 ± 2.39	2.92 ± 1.42	5.53 ± 1.97	4.02 ± 2.31	5.73 ± 3.22
	PM10	Winter	4.55 ± 0.76	5.63 ± 0.42	3.63 ± 0.72	4.90 ± 0.53	4.91 ± 1.07	5.38 ± 0.86
	PM10	Fall	9.49 ± 3.81	9.26 ± 3.85	6.63 ± 2.47	9.22 ± 4.15	9.83 ± 4.70	10.21 ± 4.80
Sulfate	PM2.5	Winter	6.04 ± 0.79	6.66 ± 0.42	4.01 ± 0.87	4.80 ± 1.02	5.94 ± 1.04	9.11 ± 1.81
	PM2.5	Fall	12.86 ± 4.79	11.72 ± 3.02	8.76 ± 2.62	8.65 ± 2.31	10.66 ± 2.70	15.14 ± 4.70
	PM10	Winter	8.69 ± 1.15	13.01 ± 1.85	6.12 ± 1.59	5.88 ± 0.99	10.36 ± 2.43	10.59 ± 2.06
	PM10	Fall	17.17 ± 5.81	18.40 ± 6.16	13.81 ± 5.21	13.00 ± 4.27	20.52 ± 6.50	22.08 ± 4.97
Ammonium	PM2.5	Winter	8.74 ± 3.39	6.80 ± 2.35	2.15 ± 1.01	7.90 ± 2.49	2.95 ± 1.66	7.58 ± 3.26
	PM2.5	Fall	10.66 ± 3.91	9.39 ± 5.18	6.13 ± 7.72	9.06 ± 5.12	8.94 ± 9.65	10.34 ± 4.80
	PM10	Winter	9.33 ± 3.38	7.70 ± 4.08	1.77 ± 0.99	9.39 ± 2.93	1.45 ± 1.38	7.70 ± 3.02
	PM10	Fall	8.63 ± 4.09	9.61 ± 5.39	3.07 ± 3.96	9.19 ± 5.35	4.00 ± 4.27	8.23 ± 4.30
Org. Carbon	PM2.5	Winter	11.06 ± 2.83	23.22 ± 5.05	7.27 ± 2.63	10.21 ± 3.07	9.44 ± 2.38	32.65 ± 7.79
	PM2.5	Fall	44.33 ± 19.79	44.26 ± 16.03	22.42 ± 14.24	45.63 ± 30.18	37.17 ± 25.07	61.08 ± 26.84
	PM10	Winter	16.15 ± 2.96	48.53 ± 10.04	15.02 ± 4.46	14.57 ± 4.42	22.43 ± 7.30	42.20 ± 10.57
	PM10	Fall	63.01 ± 25.57	73.08 ± 24.54	39.95 ± 23.81	55.53 ± 30.26	68.70 ± 34.44	91.84 ± 33.49
Ele. Carbon	PM2.5	Winter	7.92 ± 3.21	13.02 ± 2.20	5.87 ± 1.90	5.90 ± 1.35	7.55 ± 2.84	12.35 ± 4.34
	PM2.5	Fall	14.67 ± 5.25	22.08 ± 4.66	5.59 ± 1.75	8.52 ± 4.10	6.67 ± 4.01	15.43 ± 9.39
	PM10	Winter	16.71 ± 2.90	20.32 ± 5.43	6.92 ± 3.14	7.87 ± 2.12	7.51 ± 1.69	9.98 ± 2.25
	PM10	Fall	14.20 ± 3.58	18.25 ± 2.63	7.80 ± 2.41	9.60 ± 3.21	8.26 ± 4.61	13.78 ± 2.65
Aluminum	PM2.5	Winter	0.07 ± 0.02	0.13 ± 0.04	0.05 ± 0.02	0.05 ± 0.02	0.24 ± 0.13	0.87 ± 0.17
	PM2.5	Fall	0.36 ± 0.25	0.31 ± 0.21	0.24 ± 0.17	0.34 ± 0.21	0.45 ± 0.35	0.49 ± 0.24
	PM10	Winter	1.84 ± 0.25	2.99 ± 0.53	1.48 ± 0.44	1.56 ± 0.43	2.83 ± 0.22	3.30 ± 0.39
	PM10	Fall	5.62 ± 2.82	4.70 ± 2.41	3.38 ± 1.66	5.85 ± 2.55	6.74 ± 3.54	7.87 ± 3.06
Silicon	PM2.5	Winter	0.25 ± 0.10	0.53 ± 0.21	0.17 ± 0.06	0.10 ± 0.04	0.91 ± 0.47	5.45 ± 1.21
	PM2.5	Fall	1.23 ± 0.73	1.06 ± 0.59	0.71 ± 0.44	1.18 ± 0.71	1.61 ± 1.15	3.12 ± 1.97
	PM10	Winter	5.50 ± 0.62	9.57 ± 1.71	4.91 ± 1.39	4.17 ± 1.17	9.21 ± 0.80	13.64 ± 1.80
	PM10	Fall	16.01 ± 7.65	13.52 ± 6.27	10.39 ± 4.88	16.77 ± 7.59	21.21 ± 10.19	26.30 ± 10.81
Calcium	PM2.5	Winter	0.20 ± 0.08	0.79 ± 0.29	0.33 ± 0.13	0.07 ± 0.04	3.93 ± 2.23	5.49 ± 1.74
	PM2.5	Fall	1.02 ± 1.16	0.89 ± 1.20	1.03 ± 1.13	0.52 ± 0.49	3.58 ± 2.18	1.41 ± 1.32
	PM10	Winter	6.98 ± 1.05	18.65 ± 4.90	9.80 ± 3.89	2.47 ± 1.18	30.10 ± 6.04	10.42 ± 2.87
	PM10	Fall	13.03 ± 10.76	13.43 ± 12.09	15.79 ± 12.41	6.40 ± 4.59	41.49 ± 16.55	20.07 ± 15.02
Iron	PM2.5	Winter	0.20 ± 0.10	0.48 ± 0.23	0.13 ± 0.03	0.06 ± 0.03	0.55 ± 0.29	4.16 ± 0.98
	PM2.5	Fall	0.71 ± 0.42	0.65 ± 0.36	0.56 ± 0.58	0.46 ± 0.30	0.94 ± 0.78	1.46 ± 0.85
	PM10	Winter	2.06 ± 0.33	4.29 ± 0.85	1.56 ± 0.51	1.16 ± 0.31	2.99 ± 0.41	6.00 ± 1.46
	PM10	Fall	4.44 ± 2.42	4.24 ± 2.30	3.58 ± 3.44	3.98 ± 1.87	6.60 ± 4.19	7.92 ± 3.60
Lead	PM2.5	Winter	0.74 ± 0.61	1.64 ± 0.69	0.10 ± 0.13	0.05 ± 0.03	0.43 ± 0.36	26.81 ± 10.81
	PM2.5	Fall	0.75 ± 0.73	1.37 ± 1.51	0.22 ± 0.30	0.06 ± 0.06	0.36 ± 0.34	8.11 ± 13.29
	PM10	Winter	1.65 ± 1.12	4.76 ± 2.56	0.21 ± 0.33	0.07 ± 0.03	0.72 ± 0.59	33.72 ± 17.78
	PM10	Fall	0.99 ± 1.01	1.78 ± 1.82	0.27 ± 0.33	0.07 ± 0.07	0.43 ± 0.39	11.18 ± 16.75

Table 3-2. Statistical summary of PAH concentrations at the six intensive sites during the winter and fall, 1999 (average ± standard deviation, ng/m^3).

Species	Season	Al Zamalek	El Qualaly	Helwan	Kaha	El Massara	Shobra
Naphthalene	Winter	128.76 ± 58.88	297.34 ± 128.33	49.48 ± 22.56	61.43 ± 14.12	53.08 ± 21.41	192.08 ± 95.42
	Fall	126.28 ± 38.56	189.09 ± 98.94	82.75 ± 72.46	61.08 ± 23.73	111.80 ± 108.65	163.07 ± 148.39
2-methylnaphthalene	Winter	32.34 ± 11.18	116.93 ± 63.35	16.49 ± 6.42	17.95 ± 6.13	17.24 ± 7.86	54.81 ± 25.69
	Fall	42.60 ± 11.85	98.92 ± 64.16	22.67 ± 8.93	22.75 ± 8.35	42.16 ± 47.28	76.65 ± 91.45
1-methylnaphthalene	Winter	32.96 ± 11.75	121.97 ± 62.47	18.34 ± 6.87	19.28 ± 6.54	19.33 ± 8.89	60.29 ± 29.18
	Fall	41.72 ± 12.15	97.45 ± 61.43	23.13 ± 8.60	23.06 ± 8.18	44.43 ± 49.92	77.47 ± 90.28
Biphenyl	Winter	5.85 ± 1.82	14.58 ± 4.10	4.06 ± 1.52	4.31 ± 1.05	4.90 ± 1.75	13.83 ± 7.13
	Fall	9.64 ± 2.86	16.87 ± 9.04	6.43 ± 2.63	9.41 ± 4.25	11.62 ± 10.54	21.02 ± 18.75
1+2-ethylnaphthalene	Winter	7.03 ± 2.27	29.43 ± 9.65	4.11 ± 1.63	3.95 ± 1.37	4.72 ± 1.85	13.34 ± 6.24
	Fall	9.77 ± 2.70	26.22 ± 15.92	5.69 ± 2.07	5.76 ± 2.05	11.25 ± 12.38	19.27 ± 21.22
2,6+2,7-dimethylnaphthalene	Winter	11.68 ± 3.70	49.29 ± 16.86	6.80 ± 2.66	6.63 ± 1.91	7.68 ± 2.95	21.21 ± 9.39
	Fall	19.13 ± 4.91	54.23 ± 33.81	11.04 ± 4.11	11.15 ± 4.06	21.06 ± 23.17	38.45 ± 44.24
1,3+1,6+1,7-dimethylnaphthalene	Winter	28.66 ± 8.96	77.08 ± 24.42	15.80 ± 4.95	14.96 ± 5.32	19.31 ± 7.45	49.10 ± 23.10
	Fall	40.28 ± 10.44	117.32 ± 72.31	23.65 ± 8.59	23.89 ± 8.69	46.55 ± 51.22	82.84 ± 94.04
1,4+1,5+2,3-dimethylnaphthalene	Winter	6.90 ± 2.15	30.35 ± 9.54	4.30 ± 1.62	3.88 ± 1.06	4.67 ± 1.77	12.74 ± 6.28
	Fall	10.36 ± 2.63	31.19 ± 18.33	6.27 ± 2.29	6.15 ± 2.21	12.16 ± 13.42	21.23 ± 23.41
1,2-dimethylnaphthalene	Winter	2.75 ± 0.74	13.95 ± 4.89	1.72 ± 0.61	1.50 ± 0.39	1.79 ± 0.69	5.98 ± 3.02
	Fall	4.40 ± 1.17	14.53 ± 10.43	2.45 ± 0.94	2.42 ± 0.87	4.63 ± 4.92	9.40 ± 10.45
2-methylbiphenyl	Winter	1.61 ± 0.44	4.84 ± 1.38	1.18 ± 0.54	0.95 ± 0.51	1.32 ± 0.76	2.90 ± 1.39
	Fall	2.52 ± 0.58	4.91 ± 1.44	3.55 ± 1.89	2.53 ± 0.50	3.24 ± 2.36	4.76 ± 3.53
3-methylbiphenyl	Winter	1.82 ± 0.52	6.61 ± 1.57	1.36 ± 0.51	1.03 ± 0.25	1.37 ± 0.60	3.58 ± 2.25
	Fall	5.86 ± 0.99	13.14 ± 4.62	4.52 ± 1.29	4.30 ± 0.98	6.37 ± 5.13	10.07 ± 7.40
4-methylbiphenyl	Winter	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
	Fall	2.72 ± 0.55	6.48 ± 2.40	2.05 ± 0.61	1.95 ± 0.53	2.70 ± 2.62	4.76 ± 3.46
Bibenzyl	Winter	1.68 ± 1.64	7.47 ± 3.63	1.73 ± 0.98	1.18 ± 0.70	1.26 ± 1.05	4.32 ± 3.77
	Fall	70.76 ± 27.60	43.60 ± 26.55	58.10 ± 48.09	49.78 ± 22.77	63.26 ± 46.46	55.02 ± 42.43
A-trimethylnaphthalene	Winter	6.37 ± 1.90	27.23 ± 6.55	4.98 ± 2.07	4.02 ± 1.09	4.74 ± 1.91	13.94 ± 7.73
	Fall	5.98 ± 1.48	16.43 ± 5.47	4.33 ± 1.43	3.51 ± 1.03	6.87 ± 6.44	10.85 ± 8.50
1-ethyl-2-methylnaphth	Winter	1.07 ± 0.31	4.31 ± 0.85	1.14 ± 0.83	0.75 ± 0.18	1.49 ± 1.28	2.31 ± 1.35
	Fall	1.37 ± 0.42	3.37 ± 1.16	0.90 ± 0.29	0.93 ± 0.39	1.38 ± 1.09	2.44 ± 1.65
B-trimethylnaphthalene	Winter	8.31 ± 2.55	37.02 ± 9.77	6.32 ± 2.62	5.45 ± 1.67	5.67 ± 2.29	18.34 ± 10.18
	Fall	8.34 ± 2.32	24.23 ± 9.39	5.89 ± 2.08	5.07 ± 1.64	9.58 ± 9.50	15.84 ± 13.38
C-trimethylnaphthalene	Winter	6.98 ± 2.05	31.53 ± 7.64	5.59 ± 2.20	4.92 ± 1.24	5.05 ± 2.00	16.17 ± 8.88
	Fall	12.72 ± 3.54	32.22 ± 10.39	8.40 ± 2.73	7.56 ± 2.34	13.11 ± 12.02	22.46 ± 16.09
2-ethyl-1-methylnaphth	Winter	5.54 ± 4.02	1.13 ± 0.30	2.06 ± 2.95	0.68 ± 1.34	2.36 ± 2.43	3.37 ± 5.39
	Fall	0.24 ± 0.14	0.80 ± 0.34	0.21 ± 0.10	0.15 ± 0.11	0.31 ± 0.33	0.46 ± 0.49
E-trimethylnaphthalene	Winter	4.65 ± 1.28	22.36 ± 5.83	3.74 ± 1.48	3.40 ± 0.95	3.37 ± 1.32	11.24 ± 6.44
	Fall	1.08 ± 0.26	3.09 ± 0.74	0.71 ± 0.24	0.62 ± 0.22	1.13 ± 1.01	2.00 ± 1.45
F-trimethylnaphthalene	Winter	3.94 ± 1.20	16.15 ± 3.38	3.01 ± 1.19	2.69 ± 0.65	2.60 ± 1.13	8.55 ± 4.65
	Fall	3.78 ± 0.90	11.22 ± 3.80	2.76 ± 0.84	2.69 ± 0.87	4.18 ± 3.76	7.36 ± 5.71
2,3,5+I-trimethylnapht	Winter	5.61 ± 1.51	25.51 ± 5.58	4.54 ± 1.83	4.16 ± 1.00	3.84 ± 1.49	12.84 ± 7.60
	Fall	6.89 ± 1.56	20.45 ± 6.54	5.14 ± 1.50	4.51 ± 1.36	7.64 ± 6.86	12.84 ± 9.75
2,4,5-trimethylnaphtha	Winter	0.60 ± 0.17	3.01 ± 0.92	0.40 ± 0.15	0.37 ± 0.15	0.40 ± 0.16	1.39 ± 0.95
	Fall	0.47 ± 0.47	1.60 ± 1.13	0.37 ± 0.39	0.23 ± 0.31	0.22 ± 0.24	1.31 ± 1.33
J-trimethylnaphthalene	Winter	2.56 ± 0.68	11.22 ± 2.20	2.08 ± 0.85	2.25 ± 0.52	1.80 ± 0.67	6.30 ± 3.44
	Fall	2.61 ± 0.61	7.64 ± 2.57	1.91 ± 0.56	1.86 ± 0.59	2.86 ± 2.55	5.02 ± 3.87
1,4,5-trimethylnaphtha	Winter	0.22 ± 0.13	0.64 ± 0.19	0.14 ± 0.06	0.12 ± 0.06	0.15 ± 0.08	0.39 ± 0.19
	Fall	0.37 ± 0.11	0.93 ± 0.22	0.25 ± 0.06	0.25 ± 0.09	0.37 ± 0.23	0.66 ± 0.34
1,2,8-trimethylnaphtha	Winter	0.31 ± 0.14	1.71 ± 0.37	0.23 ± 0.11	0.15 ± 0.10	0.20 ± 0.10	0.78 ± 0.51
	Fall	0.49 ± 0.32	0.69 ± 0.44	0.17 ± 0.13	0.69 ± 0.39	0.29 ± 0.21	0.77 ± 0.51
Acenaphthylene	Winter	2.32 ± 0.35	10.08 ± 2.81	0.90 ± 0.34	0.95 ± 0.55	0.93 ± 0.47	12.43 ± 14.17
	Fall	4.36 ± 1.96	7.43 ± 4.17	1.31 ± 1.15	1.97 ± 1.07	1.61 ± 1.38	7.36 ± 3.04
Acenaphthene	Winter	3.38 ± 1.08	4.35 ± 1.12	1.87 ± 0.77	2.06 ± 0.62	1.65 ± 0.71	3.02 ± 1.63
	Fall	3.89 ± 0.92	5.60 ± 2.93	2.60 ± 1.09	2.63 ± 1.15	3.23 ± 2.36	4.48 ± 3.15
Fluorene	Winter	4.90 ± 1.16	10.35 ± 1.77	3.41 ± 1.39	3.48 ± 0.72	2.96 ± 1.00	11.06 ± 8.14
	Fall	6.61 ± 2.29	8.58 ± 2.29	4.34 ± 2.28	5.24 ± 2.47	5.25 ± 2.85	9.07 ± 3.60
Phenanthrene	Winter	7.13 ± 0.79	18.33 ± 5.72	4.74 ± 2.14	5.04 ± 1.66	4.53 ± 1.53	22.22 ± 15.05
	Fall	10.56 ± 3.25	16.07 ± 5.27	6.41 ± 4.06	7.60 ± 3.50	7.31 ± 3.95	17.15 ± 5.13
A-methylfluorene	Winter	1.08 ± 0.17	3.93 ± 0.96	0.75 ± 0.27	0.72 ± 0.24	0.64 ± 0.20	1.91 ± 1.02
	Fall	2.64 ± 1.30	5.26 ± 1.71	1.25 ± 0.55	2.06 ± 1.35	1.93 ± 1.15	4.11 ± 2.05
1-methylfluorene	Winter	1.12 ± 0.14	5.30 ± 1.54	0.89 ± 0.31	0.78 ± 0.23	0.73 ± 0.31	2.56 ± 1.60
	Fall	1.95 ± 0.60	4.63 ± 1.50	1.08 ± 0.36	1.68 ± 0.94	1.74 ± 1.16	3.71 ± 2.03
B-methylfluorene	Winter	0.32 ± 0.07	1.38 ± 0.31	0.27 ± 0.09	0.26 ± 0.07	0.25 ± 0.12	0.88 ± 0.75
	Fall	0.65 ± 0.36	1.19 ± 0.44	0.28 ± 0.15	0.51 ± 0.37	0.45 ± 0.28	1.00 ± 0.51
9-fluorenone	Winter	1.69 ± 0.21	3.02 ± 0.81	1.34 ± 0.51	1.30 ± 0.42	1.31 ± 0.46	4.47 ± 2.95
	Fall	3.29 ± 1.38	3.66 ± 1.30	1.79 ± 0.68	2.88 ± 1.67	2.45 ± 1.07	5.52 ± 2.11
Xanthone	Winter	0.30 ± 0.05	1.45 ± 0.50	0.24 ± 0.10	0.20 ± 0.07	0.18 ± 0.08	0.83 ± 0.59
	Fall	0.69 ± 0.35	1.25 ± 0.52	0.32 ± 0.14	0.59 ± 0.45	0.36 ± 0.18	1.27 ± 0.67
Acenaphthenequinone	Winter	0.16 ± 0.13	0.42 ± 0.19	0.08 ± 0.07	0.07 ± 0.05	0.05 ± 0.06	0.39 ± 0.35
	Fall	0.51 ± 0.82	0.36 ± 0.95	0.00 ± 0.00	0.48 ± 0.71	0.18 ± 0.30	0.59 ± 0.99
Perinaphthenone	Winter	0.34 ± 0.17	1.37 ± 0.40	0.21 ± 0.12	0.31 ± 0.11	0.17 ± 0.05	1.68 ± 1.38
	Fall	1.28 ± 0.71	1.96 ± 0.75	0.47 ± 0.24	0.82 ± 0.53	0.58 ± 0.31	2.05 ± 0.97

Table 3-2 (cont.). Statistical summary of PAH concentrations at the six intensive sites during the winter and fall, 1999 (average ± standard deviation, ng/m^3).

Species	Season	Al Zamalek	El Qualaly	Helwan	Kaha	El Massara	Shobra
A-methylfluorene	Winter	1.08 ± 0.17	3.93 ± 0.96	0.75 ± 0.27	0.72 ± 0.24	0.64 ± 0.20	1.91 ± 1.02
	Fall	2.64 ± 1.30	5.26 ± 1.71	1.25 ± 0.55	2.06 ± 1.35	1.93 ± 1.15	4.11 ± 2.05
1-methylfluorene	Winter	1.12 ± 0.14	5.30 ± 1.54	0.89 ± 0.31	0.78 ± 0.23	0.73 ± 0.31	2.56 ± 1.60
	Fall	1.95 ± 0.60	4.63 ± 1.50	1.08 ± 0.36	1.68 ± 0.94	1.74 ± 1.16	3.71 ± 2.03
B-methylfluorene	Winter	0.32 ± 0.07	1.38 ± 0.31	0.27 ± 0.09	0.26 ± 0.07	0.25 ± 0.12	0.88 ± 0.75
	Fall	0.65 ± 0.36	1.19 ± 0.44	0.28 ± 0.15	0.51 ± 0.37	0.45 ± 0.28	1.00 ± 0.51
9-fluorenone	Winter	1.69 ± 0.21	3.02 ± 0.81	1.34 ± 0.51	1.30 ± 0.42	1.31 ± 0.46	4.47 ± 2.95
	Fall	3.29 ± 1.38	3.66 ± 1.30	1.79 ± 0.68	2.88 ± 1.67	2.45 ± 1.07	5.52 ± 2.11
Xanthone	Winter	0.30 ± 0.05	1.45 ± 0.50	0.24 ± 0.10	0.20 ± 0.07	0.18 ± 0.08	0.83 ± 0.59
	Fall	0.69 ± 0.35	1.25 ± 0.52	0.32 ± 0.14	0.59 ± 0.45	0.36 ± 0.18	1.27 ± 0.67
Acenaphthenequinone	Winter	0.16 ± 0.13	0.42 ± 0.19	0.08 ± 0.07	0.07 ± 0.05	0.05 ± 0.06	0.39 ± 0.35
	Fall	0.51 ± 0.82	0.36 ± 0.95	0.00 ± 0.00	0.48 ± 0.71	0.18 ± 0.30	0.59 ± 0.99
Perinaphthenone	Winter	0.34 ± 0.17	1.37 ± 0.40	0.21 ± 0.12	0.31 ± 0.11	0.17 ± 0.05	1.68 ± 1.38
	Fall	1.28 ± 0.71	1.96 ± 0.75	0.47 ± 0.24	0.82 ± 0.53	0.58 ± 0.31	2.05 ± 0.97
A-methylphenanthrene	Winter	0.96 ± 0.14	3.79 ± 1.24	0.53 ± 0.23	0.41 ± 0.12	0.45 ± 0.16	2.20 ± 1.68
	Fall	1.32 ± 0.46	3.28 ± 1.10	0.66 ± 0.28	0.89 ± 0.53	0.75 ± 0.32	2.22 ± 0.80
2-methylphenanthrene	Winter	1.13 ± 0.15	4.84 ± 1.55	0.73 ± 0.28	0.60 ± 0.18	0.63 ± 0.21	2.90 ± 2.33
	Fall	1.92 ± 0.78	4.20 ± 1.49	0.94 ± 0.41	1.32 ± 0.84	1.09 ± 0.46	3.11 ± 1.22
C-methylphenanthrene	Winter	0.82 ± 0.14	3.89 ± 1.30	0.59 ± 0.26	0.47 ± 0.18	0.44 ± 0.20	2.36 ± 1.88
	Fall	1.35 ± 0.50	3.68 ± 1.08	0.81 ± 0.32	1.03 ± 0.60	0.86 ± 0.35	2.46 ± 0.87
1-methylphenanthrene	Winter	0.74 ± 0.09	3.19 ± 0.97	0.48 ± 0.19	0.44 ± 0.14	0.41 ± 0.15	2.17 ± 1.78
	Fall	1.39 ± 0.57	2.97 ± 1.14	0.69 ± 0.26	1.06 ± 0.67	0.80 ± 0.37	2.53 ± 1.02
Anthraquinone	Winter	0.43 ± 0.14	0.63 ± 0.13	0.26 ± 0.10	0.31 ± 0.08	0.27 ± 0.13	1.11 ± 0.88
	Fall	0.69 ± 0.30	0.70 ± 0.24	0.41 ± 0.28	0.56 ± 0.27	0.47 ± 0.30	1.02 ± 0.33
3,6-dimethylphenanthre	Winter	0.30 ± 0.07	1.28 ± 0.52	0.14 ± 0.07	0.10 ± 0.06	0.11 ± 0.06	0.63 ± 0.56
	Fall	0.43 ± 0.14	1.09 ± 0.39	0.24 ± 0.05	0.28 ± 0.17	0.25 ± 0.10	0.67 ± 0.26
A-dimethylphenanthrene	Winter	0.28 ± 0.08	1.21 ± 0.42	0.13 ± 0.09	0.09 ± 0.06	0.10 ± 0.05	0.53 ± 0.47
	Fall	0.40 ± 0.14	1.09 ± 0.34	0.20 ± 0.07	0.21 ± 0.13	0.20 ± 0.08	0.60 ± 0.22
B-dimethylphenanthrene	Winter	0.12 ± 0.05	0.61 ± 0.16	0.07 ± 0.05	0.05 ± 0.03	0.05 ± 0.02	0.29 ± 0.27
	Fall	0.24 ± 0.08	0.62 ± 0.20	0.13 ± 0.05	0.16 ± 0.09	0.12 ± 0.04	0.38 ± 0.13
C-dimethylphenanthrene	Winter	0.69 ± 0.19	3.66 ± 1.38	0.46 ± 0.17	0.35 ± 0.14	0.34 ± 0.10	1.81 ± 1.49
	Fall	1.10 ± 0.33	3.39 ± 1.15	0.63 ± 0.20	0.67 ± 0.33	0.61 ± 0.23	1.83 ± 0.57
1,7-dimethylphenanthre	Winter	0.33 ± 0.07	1.65 ± 0.62	0.20 ± 0.07	0.17 ± 0.06	0.16 ± 0.05	0.83 ± 0.66
	Fall	12.55 ± 4.09	36.31 ± 11.72	6.95 ± 1.91	9.01 ± 5.10	6.87 ± 2.58	22.65 ± 8.58
D-dimethylphenanthrene	Winter	0.24 ± 0.05	1.15 ± 0.37	0.16 ± 0.08	0.18 ± 0.06	0.14 ± 0.04	0.81 ± 0.64
	Fall	12.62 ± 4.63	31.75 ± 10.66	7.37 ± 2.39	10.45 ± 6.24	8.49 ± 3.76	25.97 ± 10.87
E-dimethylphenanthrene	Winter	0.23 ± 0.04	1.00 ± 0.36	0.13 ± 0.06	0.10 ± 0.05	0.10 ± 0.03	0.50 ± 0.43
	Fall	8.14 ± 2.10	23.54 ± 8.11	4.56 ± 1.22	5.02 ± 2.25	4.63 ± 1.65	14.49 ± 4.92
Anthracene	Winter	0.54 ± 0.17	1.80 ± 0.62	0.32 ± 0.12	0.24 ± 0.14	0.25 ± 0.13	2.69 ± 2.23
	Fall	0.95 ± 0.42	1.63 ± 0.55	0.35 ± 0.20	0.68 ± 0.49	0.46 ± 0.25	2.03 ± 0.74
9-methylanthracene	Winter	0.01 ± 0.01	0.07 ± 0.05	0.01 ± 0.01	0.00 ± 0.00	0.01 ± 0.01	0.06 ± 0.05
	Fall	0.03 ± 0.05	0.04 ± 0.03	0.01 ± 0.01	0.01 ± 0.02	0.00 ± 0.00	0.04 ± 0.04
Fluoranthene	Winter	2.50 ± 0.35	5.22 ± 1.59	1.56 ± 0.70	1.66 ± 0.57	1.35 ± 0.39	8.01 ± 5.26
	Fall	3.13 ± 0.99	4.12 ± 1.49	2.16 ± 1.91	1.97 ± 0.93	1.93 ± 1.34	5.01 ± 1.54
Pyrene	Winter	2.12 ± 0.32	5.20 ± 1.43	1.18 ± 0.51	1.17 ± 0.36	0.93 ± 0.29	6.64 ± 4.69
	Fall	2.51 ± 0.70	3.96 ± 1.10	1.38 ± 1.06	1.28 ± 0.57	1.23 ± 0.73	3.96 ± 1.11
9-anthraldehyde	Winter	0.33 ± 0.16	1.69 ± 0.46	0.19 ± 0.14	0.16 ± 0.11	0.17 ± 0.09	1.02 ± 0.90
	Fall	0.55 ± 0.16	1.49 ± 0.50	0.36 ± 0.12	0.45 ± 0.28	0.41 ± 0.21	1.18 ± 0.51
Retene	Winter	0.35 ± 0.10	0.84 ± 0.48	0.30 ± 0.11	0.27 ± 0.11	0.33 ± 0.09	1.63 ± 1.35
	Fall	0.35 ± 0.12	0.52 ± 0.20	0.31 ± 0.16	0.61 ± 0.56	0.60 ± 0.58	1.94 ± 1.89
Benzonaphthothiophene	Winter	0.13 ± 0.02	0.25 ± 0.05	0.09 ± 0.06	0.10 ± 0.04	0.07 ± 0.04	0.44 ± 0.30
	Fall	0.22 ± 0.08	0.27 ± 0.08	0.15 ± 0.15	0.11 ± 0.06	0.17 ± 0.15	0.44 ± 0.16
1-MeFl+C-MePy/Fl	Winter	0.09 ± 0.03	0.12 ± 0.02	0.09 ± 0.04	0.10 ± 0.02	0.07 ± 0.05	0.15 ± 0.14
	Fall	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
A-methylpyrene	Winter	0.02 ± 0.02	0.09 ± 0.09	0.00 ± 0.00	0.03 ± 0.07	0.00 ± 0.00	0.20 ± 0.23
	Fall	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
B-MePy/MeFl	Winter	0.20 ± 0.03	0.56 ± 0.22	0.16 ± 0.08	0.21 ± 0.09	0.13 ± 0.09	0.95 ± 0.70
	Fall	0.53 ± 0.43	0.71 ± 0.48	0.24 ± 0.21	0.54 ± 0.43	0.34 ± 0.22	0.90 ± 0.25
C-methylpyrene/methyl fluoranthene	Winter	0.13 ± 0.02	0.26 ± 0.06	0.09 ± 0.03	0.10 ± 0.04	0.06 ± 0.02	0.57 ± 0.50
	Fall	0.27 ± 0.14	0.32 ± 0.17	0.16 ± 0.16	0.21 ± 0.15	0.16 ± 0.13	0.45 ± 0.18

Table 3-2 (cont.). Statistical summary of PAH concentrations at the six intensive sites during the winter and fall, 1999 (average ± standard deviation, ng/m^3).

Species	Season	Al Zamalek	El Qualaly	Helwan	Kaha	El Massara	Shobra
4-methylpyrene	Winter	0.11 ± 0.01	0.32 ± 0.06	0.08 ± 0.02	0.09 ± 0.04	0.07 ± 0.02	0.34 ± 0.26
	Fall	0.24 ± 0.14	0.33 ± 0.16	0.11 ± 0.05	0.20 ± 0.17	0.12 ± 0.06	0.37 ± 0.16
1-methylpyrene	Winter	0.09 ± 0.02	0.26 ± 0.04	0.07 ± 0.04	0.07 ± 0.03	0.06 ± 0.02	0.33 ± 0.26
	Fall	0.18 ± 0.10	0.24 ± 0.13	0.09 ± 0.04	0.14 ± 0.10	0.10 ± 0.05	0.28 ± 0.10
benzo(c)phenanthrene	Winter	0.09 ± 0.02	0.18 ± 0.04	0.10 ± 0.05	0.11 ± 0.03	0.08 ± 0.03	0.39 ± 0.24
	Fall	0.19 ± 0.08	0.17 ± 0.08	0.10 ± 0.07	0.12 ± 0.05	0.12 ± 0.06	0.29 ± 0.09
Benz(a)anthracene	Winter	0.15 ± 0.03	0.42 ± 0.11	0.16 ± 0.13	0.18 ± 0.09	0.13 ± 0.05	0.76 ± 0.53
	Fall	0.29 ± 0.14	0.30 ± 0.16	0.15 ± 0.15	0.16 ± 0.11	0.17 ± 0.14	0.42 ± 0.14
7-methylbenz(a)anthracene	Winter	0.06 ± 0.07	0.10 ± 0.05	0.05 ± 0.06	0.06 ± 0.03	0.04 ± 0.03	0.19 ± 0.20
	Fall	0.01 ± 0.01	0.01 ± 0.01	0.00 ± 0.00	0.00 ± 0.01	0.00 ± 0.00	0.02 ± 0.02
Chrysene	Winter	0.46 ± 0.15	0.62 ± 0.08	0.28 ± 0.11	0.35 ± 0.12	0.32 ± 0.09	1.10 ± 0.64
	Fall	0.61 ± 0.26	0.61 ± 0.26	0.39 ± 0.31	0.42 ± 0.20	0.43 ± 0.29	0.87 ± 0.30
Benz(a)anthracene-7,12-dione	Winter	0.08 ± 0.03	0.21 ± 0.06	0.15 ± 0.15	0.12 ± 0.06	0.09 ± 0.06	0.33 ± 0.24
	Fall	0.09 ± 0.05	0.10 ± 0.06	0.05 ± 0.05	0.07 ± 0.03	0.09 ± 0.08	0.13 ± 0.06
5+6-methylchrysene	Winter	0.03 ± 0.03	0.10 ± 0.08	0.07 ± 0.13	0.05 ± 0.07	0.06 ± 0.05	0.27 ± 0.35
	Fall	0.06 ± 0.05	0.07 ± 0.05	0.01 ± 0.01	0.03 ± 0.02	0.04 ± 0.02	0.08 ± 0.04
Benzo(b+j+k)fluoranthe	Winter	0.39 ± 0.15	0.50 ± 0.06	0.17 ± 0.18	0.20 ± 0.13	0.26 ± 0.11	1.01 ± 0.55
	Fall	0.88 ± 0.44	1.00 ± 0.57	0.43 ± 0.48	0.53 ± 0.31	0.72 ± 0.73	1.41 ± 0.62
7-methylbenzo(a)pyrene	Winter	0.02 ± 0.02	0.01 ± 0.02	0.01 ± 0.03	0.00 ± 0.01	0.01 ± 0.01	0.03 ± 0.06
	Fall	0.03 ± 0.02	0.03 ± 0.02	0.01 ± 0.01	0.03 ± 0.01	0.02 ± 0.01	0.05 ± 0.03
BeP	Winter	0.15 ± 0.04	0.07 ± 0.01	0.04 ± 0.04	0.02 ± 0.02	0.12 ± 0.05	0.11 ± 0.09
	Fall	0.39 ± 0.19	0.47 ± 0.23	0.17 ± 0.16	0.25 ± 0.13	0.29 ± 0.26	0.58 ± 0.23
Perylene	Winter	0.04 ± 0.02	0.04 ± 0.00	0.02 ± 0.02	0.01 ± 0.01	0.02 ± 0.01	0.05 ± 0.05
	Fall	0.08 ± 0.03	0.12 ± 0.05	0.00 ± 0.00	0.04 ± 0.03	0.03 ± 0.05	0.10 ± 0.04
BaP	Winter	0.12 ± 0.05	0.02 ± 0.01	0.01 ± 0.01	0.00 ± 0.00	0.06 ± 0.05	0.04 ± 0.05
	Fall	0.52 ± 0.32	0.51 ± 0.20	0.11 ± 0.08	0.24 ± 0.15	0.24 ± 0.19	0.63 ± 0.33
Indeno[123-cd]pyrene	Winter	0.28 ± 0.07	0.33 ± 0.05	0.15 ± 0.09	0.14 ± 0.04	0.19 ± 0.05	0.50 ± 0.30
	Fall	0.49 ± 0.19	0.61 ± 0.28	0.23 ± 0.24	0.29 ± 0.13	0.42 ± 0.41	0.81 ± 0.35
Benzo(ghi)perylene	Winter	0.38 ± 0.10	0.44 ± 0.07	0.17 ± 0.08	0.16 ± 0.03	0.25 ± 0.06	0.50 ± 0.24
	Fall	0.62 ± 0.24	0.96 ± 0.42	0.27 ± 0.25	0.29 ± 0.13	0.43 ± 0.46	0.91 ± 0.60
Dibenz(ah+ac)anthracene	Winter	0.08 ± 0.02	0.09 ± 0.05	0.07 ± 0.08	0.03 ± 0.02	0.06 ± 0.03	0.19 ± 0.15
	Fall	0.06 ± 0.06	0.05 ± 0.08	0.01 ± 0.01	0.03 ± 0.03	0.04 ± 0.04	0.09 ± 0.08
Benzo(b)chrysene	Winter	0.09 ± 0.03	0.14 ± 0.03	0.08 ± 0.10	0.07 ± 0.04	0.07 ± 0.03	0.23 ± 0.21
	Fall	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Coronene	Winter	0.08 ± 0.03	0.19 ± 0.06	0.07 ± 0.09	0.07 ± 0.06	0.05 ± 0.04	0.29 ± 0.18
	Fall	0.29 ± 0.11	0.47 ± 0.19	0.14 ± 0.12	0.12 ± 0.06	0.17 ± 0.15	0.41 ± 0.28

Table 3-3. Statistical summary of VOC concentrations at the six intensive sites during the winter and fall, 1999 (average ± standard deviation, ppb).

Species	Interval	Al Zamalek	El Qualaly	Helwan	Kaha	El Massara	Shobra
non-methane hydrocarbons	Winter	879.22 ± 213.10	1848.94 ± 297.69	365.28 ± 101.85	375.05 ± 48.74	406.51 ± 100.54	913.66 ± 170.99
	Fall	1281.36 ± 964.57	2036.57 ± 1368.77	628.37 ± 367.04	461.74 ± 314.90	763.04 ± 704.11	1149.15 ± 822.04
C2 compounds	Winter	78.48 ± 14.30	139.03 ± 21.82	23.81 ± 11.49	33.57 ± 3.81	23.82 ± 10.12	67.70 ± 19.40
	Fall	109.33 ± 73.06	179.91 ± 90.24	52.45 ± 35.13	44.67 ± 21.00	60.82 ± 49.93	80.25 ± 48.53
propane	Winter	51.21 ± 12.31	82.28 ± 18.05	18.24 ± 9.41	33.52 ± 5.84	40.29 ± 22.86	57.16 ± 16.85
	Fall	86.61 ± 71.47	108.32 ± 106.03	40.54 ± 25.83	48.63 ± 35.55	87.41 ± 77.53	104.39 ± 71.72
isobutane	Winter	32.75 ± 6.98	52.82 ± 12.16	9.92 ± 5.42	23.46 ± 5.31	23.36 ± 11.77	35.61 ± 7.87
	Fall	54.43 ± 45.85	72.29 ± 70.01	21.97 ± 12.46	31.13 ± 23.10	50.20 ± 46.33	67.78 ± 48.29
n-butane	Winter	95.66 ± 21.19	174.26 ± 38.89	33.16 ± 18.49	70.86 ± 17.79	82.95 ± 41.91	120.09 ± 25.20
	Fall	149.77 ± 137.24	218.74 ± 223.33	68.34 ± 42.36	87.26 ± 74.13	158.02 ± 140.50	211.42 ± 168.42
isopentane	Winter	53.73 ± 12.67	98.85 ± 17.41	12.50 ± 4.07	9.56 ± 2.07	12.89 ± 6.45	33.94 ± 9.33
	Fall	107.96 ± 75.75	169.27 ± 101.20	39.06 ± 33.52	18.29 ± 15.91	37.60 ± 36.69	73.07 ± 59.40
n-pentane	Winter	44.78 ± 13.80	89.68 ± 20.83	11.93 ± 3.12	7.89 ± 1.34	10.94 ± 4.74	27.24 ± 11.32
	Fall	50.06 ± 37.86	86.66 ± 52.15	17.51 ± 15.46	9.39 ± 7.87	19.12 ± 19.73	38.56 ± 31.52
2,2-dimethylbutane	Winter	5.23 ± 2.09	8.57 ± 3.14	1.78 ± 0.90	0.65 ± 0.19	1.11 ± 0.53	2.93 ± 1.24
	Fall	19.52 ± 12.87	30.09 ± 17.07	7.37 ± 6.00	3.05 ± 2.72	5.98 ± 6.37	11.03 ± 8.78
cyclopentane	Winter	4.21 ± 1.15	8.70 ± 1.73	1.15 ± 0.32	0.77 ± 0.15	0.96 ± 0.37	2.60 ± 0.87
	Fall	5.41 ± 3.97	9.31 ± 5.47	2.06 ± 1.57	0.97 ± 0.85	1.92 ± 2.07	3.82 ± 3.04
2,3-dimethylbutane	Winter	4.33 ± 0.86	8.45 ± 1.27	1.23 ± 0.43	0.88 ± 0.31	0.92 ± 0.36	2.59 ± 0.75
	Fall	5.05 ± 3.15	8.40 ± 4.69	3.78 ± 3.02	1.23 ± 1.00	2.12 ± 2.02	3.67 ± 2.43
MTBE	Winter	33.93 ± 9.70	57.82 ± 15.01	6.52 ± 2.17	0.04 ± 0.02	3.89 ± 2.49	12.56 ± 4.73
	Fall	64.95 ± 45.01	101.25 ± 57.69	22.07 ± 20.52	5.19 ± 5.88	17.11 ± 19.67	33.84 ± 30.07
2-methylpentane	Winter	26.05 ± 5.65	50.61 ± 8.34	8.68 ± 2.13	6.43 ± 2.21	7.06 ± 2.15	16.29 ± 4.39
	Fall	36.56 ± 25.78	59.23 ± 33.87	25.90 ± 22.54	7.26 ± 6.27	14.00 ± 15.17	25.17 ± 17.56
3-methylpentane	Winter	16.65 ± 3.75	33.52 ± 5.99	6.83 ± 1.50	4.40 ± 1.07	4.69 ± 1.30	11.46 ± 3.08
	Fall	23.05 ± 16.01	38.01 ± 21.97	22.26 ± 23.67	4.49 ± 3.64	8.68 ± 9.53	16.18 ± 11.56
n-hexane	Winter	25.85 ± 6.93	103.04 ± 46.20	9.22 ± 2.71	9.22 ± 2.78	6.87 ± 2.39	22.41 ± 11.77
	Fall	31.34 ± 22.21	52.04 ± 30.69	42.18 ± 53.26	6.90 ± 5.64	13.28 ± 15.20	24.46 ± 17.10
methylcyclopentane	Winter	11.16 ± 3.03	23.70 ± 5.01	3.52 ± 0.94	3.15 ± 0.86	2.80 ± 0.94	7.89 ± 2.67
	Fall	14.05 ± 9.85	23.62 ± 13.52	17.69 ± 21.74	2.98 ± 2.50	5.57 ± 6.16	10.76 ± 7.53
2,4-dimethylpentane	Winter	1.64 ± 0.40	3.47 ± 0.77	0.49 ± 0.20	0.28 ± 0.07	0.34 ± 0.11	1.28 ± 0.46
	Fall	2.34 ± 1.76	4.15 ± 2.45	1.00 ± 0.64	0.44 ± 0.37	0.84 ± 0.94	1.50 ± 1.19
2,2,3-trimethylbutane	Winter	0.00 ± 0.00	0.16 ± 0.10	0.00 ± 0.00	0.00 ± 0.00	0.01 ± 0.01	0.28 ± 0.16
	Fall	0.05 ± 0.02	0.07 ± 0.03	0.06 ± 0.03	0.04 ± 0.03	0.04 ± 0.02	0.07 ± 0.06
benzene	Winter	34.02 ± 32.91	42.78 ± 7.25	9.79 ± 4.05	8.03 ± 1.00	8.07 ± 3.16	18.23 ± 4.88
	Fall	31.47 ± 21.47	49.17 ± 27.82	17.81 ± 18.26	12.07 ± 6.29	13.13 ± 11.86	23.22 ± 15.21
3,3-dimethylpentane	Winter	1.10 ± 0.27	2.61 ± 1.55	0.32 ± 0.08	0.25 ± 0.06	0.26 ± 0.08	1.18 ± 0.92
	Fall	0.18 ± 0.16	0.29 ± 0.16	0.07 ± 0.09	0.13 ± 0.06	0.18 ± 0.11	0.18 ± 0.10
cyclohexane	Winter	5.23 ± 1.09	10.28 ± 1.64	1.66 ± 0.55	1.31 ± 0.22	1.30 ± 0.41	3.75 ± 1.08
	Fall	8.96 ± 5.94	14.86 ± 8.11	4.88 ± 3.38	1.85 ± 1.61	3.27 ± 3.35	6.41 ± 4.52
2-methylhexane	Winter	7.89 ± 1.89	16.36 ± 3.07	2.32 ± 0.62	1.47 ± 0.29	1.68 ± 0.54	4.72 ± 1.28
	Fall	11.87 ± 9.55	21.77 ± 12.70	4.47 ± 3.17	2.48 ± 2.07	4.38 ± 4.74	7.78 ± 6.11
2,3-dimethylpentane	Winter	3.08 ± 0.72	6.61 ± 1.20	1.17 ± 0.45	0.55 ± 0.09	0.72 ± 0.22	2.65 ± 0.70
	Fall	4.59 ± 3.42	8.33 ± 4.79	1.78 ± 1.20	0.89 ± 0.68	1.67 ± 1.71	3.07 ± 2.38
1,3-dimethylcyclopentane	Winter	1.00 ± 0.28	2.04 ± 0.31	0.30 ± 0.10	0.32 ± 0.07	0.28 ± 0.07	0.75 ± 0.28
	Fall	1.56 ± 1.14	2.94 ± 1.56	0.56 ± 0.44	0.36 ± 0.30	0.64 ± 0.67	1.26 ± 0.94
3-ethylpentane	Winter	1.86 ± 0.46	3.86 ± 0.66	0.59 ± 0.18	0.46 ± 0.07	0.50 ± 0.13	1.14 ± 0.42
	Fall	2.94 ± 2.23	5.40 ± 3.06	1.06 ± 0.84	0.54 ± 0.43	0.95 ± 1.12	2.16 ± 1.67
2,2,4-trimethylpentane	Winter	2.23 ± 0.66	4.15 ± 2.11	1.24 ± 0.28	1.43 ± 0.65	0.95 ± 0.32	1.53 ± 0.81
	Fall	0.27 ± 0.21	0.45 ± 0.25	0.19 ± 0.06	0.13 ± 0.08	0.17 ± 0.12	0.23 ± 0.13
n-heptane	Winter	10.02 ± 2.33	21.31 ± 3.39	3.37 ± 0.86	2.81 ± 0.45	2.84 ± 0.78	7.59 ± 1.89
	Fall	14.97 ± 12.33	28.51 ± 16.37	5.69 ± 4.73	3.21 ± 2.59	6.00 ± 6.49	11.07 ± 8.66
toluene	Winter	54.52 ± 13.62	110.50 ± 26.57	18.68 ± 4.65	18.85 ± 3.40	17.37 ± 5.63	43.38 ± 13.33
	Fall	85.81 ± 60.97	131.49 ± 81.30	48.07 ± 35.91	16.12 ± 10.90	30.75 ± 31.89	57.99 ± 42.34
n-octane	Winter	6.19 ± 1.38	13.67 ± 1.89	2.31 ± 0.53	2.47 ± 0.40	2.40 ± 0.51	5.68 ± 1.49
	Fall	8.17 ± 7.47	15.36 ± 9.40	3.25 ± 3.11	2.37 ± 2.00	4.19 ± 4.42	6.95 ± 6.00
ethylbenzene	Winter	10.08 ± 2.59	21.61 ± 4.26	3.54 ± 0.93	2.28 ± 0.48	2.94 ± 0.77	7.21 ± 2.09
	Fall	14.54 ± 11.33	25.23 ± 15.16	5.53 ± 3.83	3.38 ± 1.99	6.64 ± 6.30	10.48 ± 8.46

Table 3-3 (cont.). Statistical summary of VOC concentrations at the six intensive sites during the winter and fall, 1999 (average ± standard deviation, ppb).

Species	Interval	Al Zamalek		El Qualaly		Helwan		Kaha		El Massara		Shobra	
m,p-xylene	Winter	36.98 ±	9.41	78.65 ±	15.35	12.09 ±	3.10	7.83 ±	1.95	9.58 ±	2.70	25.04 ±	7.86
	Fall	48.29 ±	37.82	85.14 ±	52.14	16.87 ±	12.75	8.73 ±	6.25	19.11 ±	19.96	32.48 ±	26.38
o-xylene	Winter	13.54 ±	3.49	28.78 ±	5.62	4.67 ±	1.11	2.92 ±	0.61	3.57 ±	0.98	9.04 ±	2.71
	Fall	17.88 ±	13.75	31.55 ±	18.80	6.27 ±	4.61	3.37 ±	2.39	7.10 ±	7.38	11.87 ±	9.70
n-nonane	Winter	6.37 ±	1.67	12.46 ±	2.28	2.24 ±	0.56	3.05 ±	0.39	3.23 ±	0.74	7.35 ±	2.23
	Fall	8.70 ±	8.72	13.93 ±	10.25	3.54 ±	3.31	3.14 ±	2.71	5.36 ±	5.71	9.08 ±	7.89
n-propylbenzene	Winter	3.09 ±	0.80	6.82 ±	1.12	1.18 ±	0.24	0.98 ±	0.11	0.93 ±	0.22	2.42 ±	0.64
	Fall	3.86 ±	3.29	6.95 ±	4.31	1.58 ±	1.09	0.99 ±	0.70	1.74 ±	1.85	2.93 ±	2.54
m-ethyltoluene	Winter	9.05 ±	2.45	21.78 ±	3.53	2.94 ±	0.67	2.71 ±	0.25	2.45 ±	0.64	8.23 ±	2.59
	Fall	11.25 ±	9.11	20.32 ±	12.70	4.22 ±	2.95	2.60 ±	1.79	4.55 ±	4.95	8.12 ±	6.69
p-ethyltoluene	Winter	4.07 ±	1.10	9.12 ±	1.69	1.43 ±	0.34	1.26 ±	0.09	1.15 ±	0.30	3.61 ±	1.92
	Fall	5.39 ±	4.42	9.57 ±	6.04	2.07 ±	1.42	1.34 ±	0.86	2.31 ±	2.43	3.98 ±	3.27
o-ethyltoluene	Winter	3.29 ±	0.88	7.25 ±	1.27	1.11 ±	0.25	1.19 ±	0.09	0.92 ±	0.22	2.37 ±	0.72
	Fall	4.17 ±	3.38	7.65 ±	4.76	1.66 ±	1.14	1.08 ±	0.75	1.77 ±	1.97	2.98 ±	2.51
n-decane	Winter	8.62 ±	3.22	16.48 ±	5.14	2.85 ±	0.68	3.95 ±	0.51	4.26 ±	1.05	13.68 ±	4.21
	Fall	10.75 ±	11.30	16.10 ±	13.36	4.67 ±	4.32	3.94 ±	3.48	6.88 ±	7.59	11.78 ±	10.98
n-undecane	Winter	7.03 ±	2.90	14.89 ±	4.47	2.87 ±	0.53	3.61 ±	0.31	4.00 ±	1.04	9.24 ±	2.49
	Fall	9.00 ±	9.64	15.46 ±	12.58	4.64 ±	3.96	3.53 ±	3.00	6.73 ±	6.94	9.91 ±	9.95
n-dodecane	Winter	3.04 ±	1.36	9.58 ±	5.03	2.95 ±	1.72	1.80 ±	0.26	2.48 ±	0.61	3.54 ±	2.48
	Fall	4.20 ±	4.85	9.47 ±	7.75	2.21 ±	1.85	2.08 ±	1.66	4.04 ±	4.07	4.77 ±	5.00

4 INITIAL SOURCE ATTRIBUTION RESULTS

4.1 Source Profiles

Fine and PM_{10} particulate source data for individual source samples collected during the CAIP study are presented in Appendices A4a and A4b respectively. The corresponding $PM_{2.5}$ PAH profiles are presented in Appendix A5. Volatile organic compound (VOC) source sample profiles are presented in Appendix A6.

Descriptions of the particulate source profiles used in the initial CMB modeling are presented in Table 4-1. The actual profiles used for the $PM_{2.5}$ and PM_{10} source apportionment are presented in Tables 4-2 and 4-3, respectively. These profiles were compiled from the CAIP source data and from previous studies. Tests were done to determine which profiles best explained the ambient data. Geological CAIP profiles were used in all cases. These included soil (SOIL), unpaved road dust (UPRD), and paved road dust (PVRD) collected at the six sites. We relied on the AUTO and DIESEL profiles determined during the Rodes et al. (1996) study. These profiles fit the data better than did the CAIP motor vehicle profiles, probably because the OC/total carbon ratio in most of the CAIP motor vehicle profiles was greater than 90% while this ratio in the ambient fine samples averaged only 60%. Because the AUTO and DIESEL profiles were collinear in most cases, the DIESEL profile was mainly used to represent mobile sources. The high OC content of the CAIP profiles may be due to absorption of volatile OC by the quartz filters. This may have been caused by a lack of cooling of the vehicle emissions prior to sampling.

The CAIP copper foundry and lead smelter profiles were needed to account for Zn and Pb, respectively. However, the brick, cement, iron foundry, and Mazot power plant profiles were frequently collinear with combustion and secondary profiles and could not be used routinely, although we used the Rodes et al. (1996) cement profile for Helwan samples. We found that samples in both size fractions at El Massara were enriched in calcium which could not be explained by the geological profiles. In the U.S., we usually associate this with construction activities. To account for the excess calcium in Cairo, we used a pure $CaCO_3$ (LIME – limestone) profile. We assumed that this was associated with cement production and report it as such. However, it is possible that the limestone contribution represents construction activities or other geological source contributions.

The restaurant and gas power plant profiles were essentially pure OC. The concentration of OC in the gas power plant profile exceeded that of total particle mass by over a factor of two. The cast iron profile contained 37% OC, 4% EC, and 10%

sulfate. It was collinear with vegetative burning and mobile source profiles. The cast iron profile was determined from stack sampling and probably mainly represents emissions from fuel combustion. While ambient samples were frequently enriched in Fe and Mn over what could be accounted for by geological sources, these species could not be accounted for by the cast iron profile. Since fugitive dust is often associated with industrial operations, it would probably be useful to sample fugitive emissions from these sources. The Mazut power plant profile was enriched in vanadium (1.8%) and nickel (1.2%), which distinguishes oil combustion emissions. It was also enriched in sulfate (42%) and OC (15%), which made it collinear with vehicle and vegetative burning as well as secondary sulfate profiles. The addition of PAHs to the CMB may help resolve this profile from other combustion profiles. For these preliminary apportionments, we used a profile taken from the EPA source profile library (OFPP - #11501) and the oil profile (OIL) from Rodes et al. (1996). The latter profile was frequently collinear with the vehicle and/or vegetative burning profiles.

Soluble potassium (K^+) accounted for over 90%, on average, of the fine potassium in the ambient samples. This is consistent with emissions from refuse and vegetative burning, which are prevalent in Cairo. While soluble K^+ is enriched in vegetative burning emissions, it was essentially absent in all of the CAIP refuse burning profiles. For this reason, we used a vegetative burning profile (VEGB1) from a U.S. study. Despite the utility of soluble K^+ for distinguishing vegetative burning contributions, there was still collinearity between the vegetative burning and mobile source (DIESEL) profiles. Secondary ammonium sulfate (AMSUL), ammonium bisulfate (AMBSUL), sulfuric acid (H2SO4), and ammonium chloride (AMCL) profiles were needed to account for particulate sulfate, ammonium, and chloride. Pure sea salt profiles, needed to account for soluble sodium in the ambient samples, were used to account for marine derived aerosols. The ammonium chloride profile was used to account for high chlorine concentrations in excess of the marine contribution.

Initial tests with the CAIP VOC profiles produced results which were inadequate with respect to CMB model statistics. We therefore examined the VOC profiles measured in Cairo by Doskey et al. (1999). These data contained a roadway profile that represented far more vehicles than those sampled in this study. The Doskey “on-road” profile also represents a comprehensive mixture of different types of vehicles. These profiles are presented in Table 4-4. In addition to the roadway profile (ROAD), profiles representing evaporative head space losses (REGHD, HIGHD – regular and high test gasoline), whole gasoline (REGWL, HIGWHL – regular and high test gasoline), bus hot soak (BUSHSK), bus cold start (BUSCST), motorcycle (MOTO), oil refinery (OILREF), lead

smelter (PB), iron foundry (FE), liquid petroleum gas (LPG), and natural gas (CNG) were also measured by Doskey et al.(1999). We assumed an uncertainty for these profiles of 20%.

4.2 PM CMB Results

The initial CMB results for winter, 1999 are presented in Figures 4-1 to 4-6. For each site and size fraction, the results are presented as averages in pie charts and for individual sample days in stacked bars. Source apportionment results for individual samples in from winter and fall are also presented in Appendix A7. In the pie charts, average source contributions are expressed as percentages of the total predicted particle mass. The CMB model diagnostics were quite good. The percent of mass accounted for, Chi-squared, and R^2 averaged 98%, 1.75, and 0.99, respectively, for the fine fraction and 98%, 1.93, and 0.98, respectively, for the PM_{10} fraction (a chi-square less than 2 is considered acceptable.) Comparisons of measured and predicted $PM_{2.5}$ and PM_{10} mass are shown in Figure 4-7. In Figures 4-1 to 4-6, all geological sources including paved and unpaved road dust, and agricultural dust are grouped as "geological". The results for the six sites are summarized as follows:

Al Zamalek (Figure 4-1): The major sources of PM_{10} were geological material (36%), Mazut oil (8%), mobile sources (12%), vegetative burning (10%), and ammonium chloride (16%). Most of the secondary sulfate, ammonium chloride, and combustion (motor vehicle, vegetative burning, and oil) were in the fine fraction. $PM_{2.5}$ was dominated by ammonium chloride (29%), mobile sources (28%), and vegetative burning (15%). Lead and copper smelter contributions were small at this site. Mobile contributions to $PM_{2.5}$ ranged from 10.0 µg/m^3 on 2/28/99 to 29.6 µg/m^3 on 2/21/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 6.4 µg/m^3 on 2/21/99 to 12.4 µg/m^3 on 2/25/99. Geological contributions to PM_{10} ranged from 59.6 µg/m^3 on 2/28/99 to 29.6 µg/m^3 on 2/21/99.

El Qualaly (Figure 4-2): This site was dominated by mobile source emissions. PM_{10} was dominated by geological (32%), mobile source (40%), vegetative burning (9%), and secondary ammonium chloride (8%). About half of the mobile and vegetative burning emissions was in the $PM_{2.5}$ fraction, which was dominated by mobile emissions (49%), vegetative burning (15%), and secondary ammonium chloride (16%). The lead and copper smelter contributions to PM_{10} were 6 and 2 µg/m^3, or about 3 and 1%, respectively. Mobile contributions to $PM_{2.5}$ ranged from 24.0 µg/m^3 on 2/26/99 to 54.1 µg/m^3 on 2/27/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 5.6 µg/m^3 on

2/27/99 to 18.5 μg/m^3 on 2/24/99. Geological contributions to PM_{10} ranged from 34.2 μg/m^3 on 2/27/99 to 59.6 μg/m^3 on 2/28/99.

Helwan (Figure 4-3): PM_{10} at this site was dominated by geological material (61%). Contributions from vegetative burning, mobile, and marine sources accounted for 11, 6, and 6%, respectively. While the marine contribution was almost entirely in the coarse (PM_{10}-$PM_{2.5}$) fraction, mobile, Mazut, and vegetative burning contributions at this site were almost entirely in the fine fraction. Copper smelter contributions were detected at low levels (1-2%) in both size fractions. Mobile contributions to $PM_{2.5}$ ranged from 2.0 μg/m^3 on 2/27/99 to 10.7 μg/m^3 on 2/25/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 5.3 μg/m^3 on 3/1/99 to 15.2 μg/m^3 on 2/24/99. Geological contributions to PM_{10} ranged from 34.8 μg/m^3 on 2/21/99 to 105.0 μg/m^3 on 3/3/99.

Kaha (Figure 4-4): The largest contributors to PM_{10} were vegetative burning (31%), secondary ammonium chloride (22%), and geological dust (21%). Mobile source and Mazut oil contributions were small compared with other sites. $PM_{2.5}$ was dominated by vegetative burning (40%) and secondary ammonium chloride (32%). Seventy-five and 82% of the PM_{10} contributions from these two sources, respectively, were in the $PM_{2.5}$ fraction. Mobile contributions to $PM_{2.5}$ ranged from 0 to 4.4 μg/m^3 on 2/24/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 5.3 μg/m^3 on 3/1/99 to 15.2 μg/m^3 on 2/24/99. Geological contributions to PM_{10} ranged from 13.3 μg/m^3 on 2/21/99 to 24.8 μg/m^3 on 2/25/99.

El Massara (Figure 4-5): The PM_{10} fraction was dominated by geological material (41%), cement (21%), mobile sources (12%), and vegetative burning (12%). The fine fraction was dominated by vegetative burning (24%), mobile emissions (18%), secondary ammonium chloride (11%), and geological material (10%). Eighty, 54, and 37% of the cement, mobile source, and vegetative burning contributions were in the coarse fraction. The lead and copper smelter contributions were 0.6 μg/m^3 or less and were found almost entirely in the fine fraction. Mobile contributions to $PM_{2.5}$ ranged from 6.1 μg/m^3 on 2/21/99 to 16.0 μg/m^3 on 3/3/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 11.7 μg/m^3 on 2/21/99 to 20.2 μg/m^3 on 2/25/99. Geological contributions to PM_{10} ranged from 56.4 μg/m^3 on 2/21/99 to 97.1 μg/m^3 on 2/23/99.

Shobra (Figure 4-6): The most unusual aspect of this location is the high PM Pb level. Lead from sources other than road dust and mobile emissions accounted for an additional 19% of the PM_{10} and 21% of the $PM_{2.5}$. Eighty-six percent of the lead contribution was in the $PM_{2.5}$ fraction. Most of this Pb is in the form of fresh emissions

from secondary Pb smelters in the vicinity. Other contributors to PM_{10} included geological material (31%) and mobile source emissions (22%). The $PM_{2.5}$ apportionment shows a similar distribution of source contributions, which is consistent with dominance of fine particles at this site ($PM_{2.5}/PM_{10}$ = 0.8). Mobile contributions to $PM_{2.5}$ ranged from 35.5 µg/m^3 on 3/3/99 to 80.6 µg/m^3 on 2/24/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 12.8 µg/m^3 on 2/26/99 to 21.2 µg/m^3 on 2/24/99. Geological contributions to PM_{10} ranged from 55.8 µg/m^3 on 2/26/99 to 107.2 µg/m^3 on 2/24/99. The lead smelter contribution to PM_{10} ranged from 14.3 µg/m^3 on 3/3/99 to 106.2 µg/m^3 on 3/1/99.

Figures 4-1 through 4-6 indicate that the temporal variation of $PM_{2.5}$ and PM_{10} was small at all sites. The coefficient of variation of particle mass concentration ranged from about 10 to 30%. These figures also suggest that this was also true for the major source contributions estimated with CMB.

Because our data included soluble K^+ concentrations, our estimates for mobile and vegetative burning source contributions appear to be more consistent than those of Rodes et al. (1996). The relative magnitudes of these contributions should be compared with expected emissions from these source types at the six sites. Including PAHs in the CMB should also improve our ability to resolve these sources.

The initial CMB results for fall, 1999 are presented in Figures 4-8 to 4-13 and in Appendix A7. The percent of mass accounted for, Chi-squared, and R^2 averaged 109%, 1.19, and 0.99,respectively, for the fine fraction and 104%, 1.58, and 0.98, respectively, for the PM_{10} fraction. Comparisons of measured and predicted $PM_{2.5}$ and PM_{10} mass are shown in Figure 4-14. As in the winter CMB results, geological sources including paved and unpaved road dust, and agricultural dust are grouped as “geological”. The results for the six sites are summarized as follows:

Al Zamalek (Figure 4-8): The major sources of PM_{10} were geological material (45%), vegetative burning (24%), and mobile sources (14%). Most of the secondary sulfate, ammonium chloride, and combustion (motor vehicle, vegetative burning, and oil) were in the fine fraction. $PM_{2.5}$ was dominated by vegetative burning (40%), mobile sources (26%), and ammonium chloride (14%). Lead and copper smelter contributions were between 0 and 1%. Mobile contributions to $PM_{2.5}$ ranged from 9.2 µg/m^3 on 11/19/99 to 90.8 µg/m^3 on 11/22/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 8.4 µg/m^3 on 11/27/99 to 130.5 µg/m^3 on 10/29/99. Geological contributions to PM_{10} ranged from 40.8 µg/m^3 on 11/27/99 to 130.4 µg/m^3 on 10/29/99.

El Qualaly (Figure 4-9): PM_{10} was dominated by geological (35%), mobile source (21%), vegetative burning (25%), and secondary ammonium chloride (8%). About 60 and 90% of the mobile and vegetative burning emissions, respectively, were in the $PM_{2.5}$ fraction, which was dominated by mobile emissions (25%), vegetative burning (42%), and secondary ammonium chloride (14%). The lead and copper smelter contributions to PM_{10} were 2.0 and 2.4 $\mu g/m^3$, or about 1 and 1%, respectively. Mobile contributions to $PM_{2.5}$ ranged from 7.5 $\mu g/m^3$ on 11/27/99 to 54.8 $\mu g/m^3$ on 11/15/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 24.4 $\mu g/m^3$ on 11/27/99 to 120.1 $\mu g/m^3$ on 10/31/99. Geological contributions to PM_{10} ranged from 51.5 $\mu g/m^3$ on 11/27/99 to 230.7 $\mu g/m^3$ on 11/19/99.

Helwan (Figure 4-10): PM_{10} at this site was dominated by geological material (46%). Contributions from vegetative burning, secondary sulfate, and secondary nitrate accounted for 33, 7, and 5%, respectively. Most of the vegetative burning and mobile contriibutions at this site were in the fine fraction. Copper smelter contributions were detected at low levels (1-3%) in the fine and PM_{10} fractions. Mobile contributions to $PM_{2.5}$ ranged from 0 to 27.0 $\mu g/m^3$ on 11/27/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 8.0 $\mu g/m^3$ on 11/27/99 to 74.7 $\mu g/m^3$ on 11/19/99. Geological contributions to PM_{10} ranged from 39.6 $\mu g/m^3$ on 11/15/99 to 81.6 $\mu g/m^3$ on 11/19/99.

Kaha (Figure 4-11): The largest contributors to PM_{10} were geological dust (42%), vegetative burning (35%), and secondary ammonium chloride (9%). Mobile source contributions were small compared with other sites although vegetative burning contributions were similar. $PM_{2.5}$ was dominated by vegetative burning (65%) and secondary ammonium chloride (14%). Nearly all of the PM_{10} contributions from these two sources were in the $PM_{2.5}$ fraction. Mobile contributions to $PM_{2.5}$ ranged from 0 to 4.4 $\mu g/m^3$ on 11/22/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 26.1 $\mu g/m^3$ on 11/27/99 to 196.5 $\mu g/m^3$ on 10/29/99. Geological contributions to PM_{10} ranged from 30.9 $\mu g/m^3$ on 11/27/99 to 170.7 $\mu g/m^3$ on 11/19/99.

El Massara (Figure 4-12): The PM_{10} fraction was dominated by geological material (51%), vegetative burning (21%), cement (8%), and mobile sources (7%). The fine fraction was dominated by vegetative burning (39%), mobile emissions (16%), secondary ammonium chloride (15%), and geological material (11%). The lead and copper smelter contributions, 0.26 and 1.02 $\mu g/m^3$, respectively, were found entirely in the $PM_{2.5}$ fraction. Mobile contributions to $PM_{2.5}$ ranged from 0 to 80.2 $\mu g/m^3$ on 11/22/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 13.7 $\mu g/m^3$ on 11/27/99

to 90.4 µg/m^3 on 11/19/99. Geological contributions to PM_{10} ranged from 68.5 µg/m^3 on 11/27/99 to 109.3 µg/m^3 on 11/7/99.

Shobra (Figure 4-13): The major contributors to PM_{10} were geological material (34%), vegetative burning (25%), and mobile source emissions (23%). Lead smelters accounted for 5%. The fine fraction was dominated by vegetative burning (36%), mobile sources (24%), geological material (11%), secondary ammonium sulfate (11%) and lead smelter emissions (5%). Mobile contributions to $PM_{2.5}$ ranged from 0 to 101.3 µg/m^3 on 11/22/99. Vegetative burning contributions to $PM_{2.5}$ ranged from 7.8 µg/m^3 on 11/27/99 to 168.5 µg/m^3 on 10/29/99. Geological contributions to PM_{10} ranged from 66.5 µg/m^3 on 11/27/99 to 215.0 µg/m^3 on 11/22/99. The lead smelter contribution to PM_{10} ranged from 0 to 76.6 µg/m^3 on 10/31/99.

The temporal variation was larger than that observed in winter, especially 11/26/99, which exhibited low concentrations at all sites except Helwan in both size fractions. Although concentrations were much higher in the fall, the pie charts for the $PM_{2.5}$ apportionments indicate that the relative contributions from refuse burning were consistently higher all sites during the fall season.

The CMB model allows us to apportion lead concentrations to sources. During winter, industrial sources (lead smelter, copper foundry) contributed 83, 85, 72, 28, 53, and 98% of the total estimated PM_{10} lead concentrations at Al Zamalek, El Qualaly, Helwan, Kaha, El Massara, and Shobra, respectively. The mobile contribution to PM_{10} lead ranged from 1% at Shobra to 45% at Kaha. During the fall period, the industrial sources contributed 64, 73, 74, 36, 36, and 93% of the total estimated PM_{10} lead concentrations at Al Zamalek, El Qualaly, Helwan, Kaha, El Massara, and Shobra, respectively. The mobile contribution to PM_{10} lead ranged from 6% at Shobra to 38% at El Massara. We consider the mobile source estimates to represent upper limits. The Rodes et al. (1996) AUTO profile used in these apportionments contained 8.7% lead. However, leaded gasoline has presumably been phased out in Cairo since 1996. Therefore, the AUTO profile may not be representative of current on-road lead emissions.

4.3 VOC CMB Results

Initial CMB analysis of VOC samples indicated that to adequately fit the data, it was necessary to include evaporative, on-road, industrial, and natural gas profiles in the model. Because some source profiles were too similar, i.e., collinear, it was not possible to include both the Doskey on-road and the CAIP vegetative burning profile in the same CMB. Neither was it usually possible to include both the LNG and CNG or the lead

smelter and iron foundry profiles together. In general, the VOC data were fit well with evaporative (head space), on-road, lead smelter, and natural gas profiles.

The CMB results are presented for each winter and fall sample in Appendix A8. Results for winter and fall samples are presented in Figures 4-15 to 4-26. For winter samples, the percent of total non-methane hydrocarbons (NMHC) accounted for, Chi-squared, and R^2 averaged 99.5%, 2.8, and 0.95, respectively. For fall samples, the percent of NMHC accounted for, Chi-squared, and R^2 averaged 103.0%, 2.6, and 0.95, respectively. While the Chi-squares were higher than those obtained in the particulate source apportionments, the VOC fits were remarkably good.

The VOC apportionments were also consistent spatially and temporally. On-road mobile and industrial (lead smelter/LPG) emissions dominated contributions to NMHC at all sites during both seasons. Further, evaporative contributions were relatively higher during the fall season. This may be related to the observation that average temperatures were about 5 ^{o}C higher during the fall season. The results for the six sites during both seasons are summarized below. We refer to evaporative, mobile, lead smelter plus LPG, and natural gas contributions as EVAP, MV, PB, and CNG, respectively.

Al Zamalek (Figures 4-15, 4-16): Average relative contributions of EVAP, MV, PB, and CNG sources to NHMC were 14.3, 45.8, 31.0, and 9.0%, respectively, in winter, and 19.1, 38.9, 31.3, and 10.7%, respectively in fall. While the absolute contributions varied somewhat from day to day, mainly as a function of NMHC concentration, the relative source contributions were quite stable during both seasons. For example, the largest day- to-day variation of any relative (%) source contribution was 36% (coefficient of variation) for PB during fall.

El Qualaly (Figures 4-17, 4-18): The relative source contributions were similar during both seasons. Average relative contributions of EVAP, MV, PB, and CNG sources to NHMC were 11.4, 52.2, 29.9, and 6.4%, respectively, in winter, and 16.5, 46.7, 28.5, and 8.3%, respectively in fall. This site had the highest NMHC concentrations during both seasons. Absolute contributions of MV plus EVAP sources were a factor of two higher at this site, which is dominated by mobile emissions. The temporal variation of the relative source contributions was quite low during both seasons, e.g., 21% for EVAP during winter and 21% for PB during fall.

Helwan (Figures 4-19, 4-20): Average relative contributions of EVAP, MV, PB, and CNG sources to NHMC were 5.8, 52.3, 33.6, and 8.3%, respectively, in winter, and 15.4, 36.9,

34.2, and 13.5%, respectively in fall. The absolute average EVAP and CNG contributions were 4 and 3 times higher, respectively, in fall. The MV contribution in fall (210 ppb) was only somewhat higher than the MV contribution in winter (174 ppb). In relative terms, the temporal variation of the major source contributions was less than 45% during both seasons.

Kaha (Figures 4-21, 4-22): Average relative contributions of EVAP, MV, PB, and CNG sources to NHMC were 4.3, 25.4, 55.0, and 15.2%, respectively, in winter, and 7.1, 20.6, 50.1, and 22.2%, respectively in fall. The most dramatic seasonal changes in source contributions were for EVAP and CNG, which increased from 16 to 32 ppb and 56 to 100 ppb from winter to fall. Again, the relative source contributions didn't vary much at this site. Except for EVAP (85% and 44% in fall, and winter, respectively), the temporal variation of the other sources varied by less than 24%. The industrial contributions at this "background" site were 203 and 226 ppb during winter and fall, respectively. In light of the similarity between $PM_{2.5}$ concentrations at Kaha and the other sites (except Shobra), relatively high VOC concentrations and source contributions at Kaha don't appear to be unusual.

El Massara (Figures 4-23, 4-24): Average relative source contributions were similar in both seasons. EVAP, MV, PB, and CNG sources to NHMC were 6.9, 24.2, 54.4, and 14.5%, respectively, in winter, and 10.0, 23.0, 48.9, and 18.2%, respectively in fall. While their relative mix was similar, absolute source contributions were about 2 times higher in fall than in winter, following a similar increase in NMHC concentrations.

Shobra (Figures 4-25, 4-26): Average relative contributions of EVAP, MV, PB, and CNG sources to NHMC were 7.4, 36.4, 45.0, and 11.1%, respectively, in winter, and 12.9, 28.7, 42.4, and 16.0%, respectively in fall. While the EVAP contribution in fall (162 ppb) was nearly 3 times larger than that in winter (62 ppb), differences between fall and winter MV (362 and 304 ppb, respectively) and PB (534 and 375 ppb), respectively) were less pronounced.

Table 4-1. Source Profiles used in CMB Source Apportionment

No.	Source ID	Reference
1	BSSOIL - British School soil	CAIP
2	HESOIL – Helwan soil	CAIP
3	KASOIL - Kaha soil	CAIP
4	ELMAUPRD – Massara unpaved road	CAIP
5	QUAPVRD – El Qualaly paved road	CAIP
6	SHOBUPRD – Shobra unpaved road	CAIP
7	KAHAUPRD – Kaha unpaved road	CAIP
8	BRICK - brick foundry	CAIP
9	CASTFE – cast iron foundry	CAIP
10	CEMENT1 – cement plant	CAIP
11	CUFOUNDR – copper foundry	CAIP
12	GASPP – gas power plant	CAIP
13	HDDBUS – heavy duty diesel bus	CAIP
14	LDDMBUS – light duty diesel microbus	CAIP
15	LDSI1_3 – light duty spark ignition	CAIP
16	LDSI4_5 – light duty spark ignition	CAIP
17	LDSILATE – late model light duty spark ignition	CAIP
18	MAZUTPP – Mazut oil power plant	CAIP
19	MOTO – motorcycle	CAIP
20	PBSMELT – lead smelter	CAIP
21	REFUSEBA – refuse burning Basatin	CAIP
22	REFUSED1 – refuse burning desert	CAIP
23	REFUSED2 – refuse burning desert	CAIP
24	REST – restaurant	CAIP
25	AMSUL – secondary ammonium sulfate	DRI PURE COMPOUND
26	AMBSUL – secondary ammonium bisulfate	DRI PURE COMPOUND
27	H2SO4 – secondary sulfuric acid	DRI PURE COMPOUND
28	AMNIT – secondary ammonium nitrate	DRI PURE COMPOUND
29	NH4CL – secondary ammonium chloride	DRI PURE COMPOUND
30	MAR100 – pure sea salt	DRI - Watson et al. (1994)
31	MAR75 – sea salt 25% nitrate replacement	DRI - Watson et al. (1994)
32	MAR50 – sea salt 50% nitrate replacement	DRI - Watson et al. (1994)
33	MAR25 – sea salt 75% nitrate replacement	DRI - Watson et al. (1994)
34	MAR0 – sea salt 100% nitrate replacement	DRI - Watson et al. (1994)
35	AUTO – light duty spark ignition	Rodes et al. (1996)
36	CEMENT – cement plant	Rodes et al. (1996)
37	DIESEL – heavy duty diesel	Rodes et al. (1996)
38	OIL – Mazut oil	Rodes et al. (1996)
39	LEAD – lead smelter	Rodes et al. (1996)
40	VEGB1 – vegetative burning	DRI Chow et al. (1999)
41	OFPP – oil fired power plant	Kuykendal (1990)
42	LIME – limestone	PURE CACO3

Table 4-2. Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling (percent of mass followed by uncertainty).

Species	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD	BRICK	CASTFE
Cl^-	0.493	1.450	0.565	0.784	0.894	0.622	0.386	8.060	0.050
	0.099	0.244	0.247	0.241	0.126	0.107	0.071	0.860	0.020
NO_3^-	0.314	0.363	0.565	0.392	0.515	0.291	0.179	0.820	0.040
	0.078	0.154	0.238	0.219	0.059	0.072	0.051	0.200	0.020
$SO_4^=$	2.642	3.351	2.814	2.349	3.360	2.905	1.846	32.570	9.730
	0.280	0.377	0.379	0.328	0.344	0.304	0.194	3.010	0.900
NH_4^+	0.220	0.079	0.240	0.080	0.031	0.071	0.069	15.970	2.000
	0.077	0.151	0.236	0.218	0.045	0.069	0.051	1.170	0.150
Na^+	0.487	1.106	0.452	0.596	0.696	0.474	0.371	0.360	0.350
	0.035	0.082	0.038	0.047	0.050	0.034	0.026	0.030	0.030
K^+	0.432	0.466	0.297	0.389	0.359	0.288	0.506	0.170	0.360
	0.033	0.038	0.033	0.037	0.027	0.022	0.037	0.020	0.030
OC	17.889	24.817	17.690	17.130	11.569	6.583	10.554	20.170	36.610
	1.998	2.922	2.619	2.488	1.282	0.870	1.188	1.710	2.730
EC	1.060	0.604	1.878	1.217	0.759	0.249	0.248	2.670	4.260
	0.706	0.486	1.275	0.875	0.500	0.208	0.179	0.300	0.350
TC	18.949	25.421	19.615	18.303	12.328	6.832	10.802	22.850	40.870
	2.092	2.996	2.935	2.720	1.344	0.926	1.206	1.910	2.980
Al	4.839	2.668	3.290	3.439	2.224	4.160	5.577	0.530	0.030
	0.350	0.207	0.265	0.273	0.161	0.301	0.399	0.060	0.010
Si	17.242	9.400	11.271	11.078	7.427	11.994	15.955	2.160	4.000
	1.230	0.689	0.860	0.837	0.528	0.855	1.132	0.160	0.280
S	1.488	1.584	1.238	1.250	1.323	1.103	0.696	10.740	2.760
	0.107	0.119	0.096	0.096	0.095	0.080	0.050	0.770	0.200
Cl	0.473	1.510	0.513	0.544	0.829	0.421	0.385	10.020	0.000
	0.045	0.121	0.059	0.058	0.073	0.042	0.034	0.720	0.060
K	1.882	1.101	0.946	1.151	0.726	0.780	1.554	0.210	0.390
	0.139	0.089	0.085	0.099	0.073	0.064	0.112	0.020	0.030
Ca	11.301	12.476	15.328	12.312	21.905	12.040	7.020	0.690	0.080
	0.806	0.912	1.163	0.927	1.554	0.858	0.498	0.050	0.010
Ti	0.394	0.263	0.254	0.328	0.239	0.435	0.636	0.050	0.000
	0.039	0.054	0.081	0.071	0.025	0.044	0.048	0.120	0.020
V	0.014	0.029	0.000	0.025	0.013	0.000	0.001	0.140	0.330
	0.035	0.062	0.146	0.083	0.024	0.057	0.030	0.020	0.020
Cr	0.009	0.007	0.009	0.022	0.004	0.000	0.006	0.000	0.010
	0.004	0.014	0.047	0.006	0.007	0.018	0.010	0.010	0.010
Mn	0.043	0.043	0.052	0.044	0.038	0.088	0.120	0.010	0.000
	0.004	0.005	0.010	0.006	0.004	0.008	0.009	0.010	0.000
Fe	3.108	2.515	3.252	2.741	2.793	5.362	6.621	0.760	1.080
	0.222	0.184	0.247	0.206	0.198	0.382	0.470	0.050	0.080
Ni	0.006	0.002	0.014	0.014	0.003	0.001	0.006	0.170	0.210
	0.001	0.007	0.005	0.003	0.001	0.004	0.002	0.010	0.010
Cu	0.019	0.014	0.024	0.033	0.012	0.011	0.013	0.000	0.070
	0.002	0.003	0.005	0.003	0.001	0.001	0.002	0.010	0.010
Zn	0.119	0.081	0.075	0.088	0.072	0.086	0.066	0.240	1.000
	0.008	0.006	0.006	0.007	0.005	0.007	0.004	0.020	0.070
Se	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.020	0.000
	0.005	0.007	0.009	0.008	0.003	0.004	0.003	0.000	0.000
Br	0.000	0.000	0.000	0.000	0.003	0.003	0.001	1.050	0.000
	0.005	0.007	0.009	0.011	0.003	0.004	0.003	0.080	0.000
Rb	0.002	0.002	0.000	0.000	0.003	0.003	0.006	0.000	0.000
	0.004	0.005	0.009	0.008	0.001	0.004	0.002	0.040	0.000
Sr	0.058	0.081	0.094	0.069	0.135	0.072	0.042	0.010	0.000
	0.005	0.006	0.007	0.007	0.010	0.005	0.004	0.000	0.000
Zr	0.014	0.014	0.019	0.008	0.009	0.016	0.022	0.000	0.000
	0.002	0.003	0.005	0.014	0.002	0.003	0.002	0.010	0.000
Sn	0.023	0.029	0.042	0.097	0.000	0.044	0.022	0.000	0.060
	0.049	0.093	0.141	0.124	0.035	0.050	0.030	0.080	0.010
Sb	0.006	0.043	0.000	0.000	0.000	0.000	0.012	0.050	0.010
	0.056	0.110	0.165	0.146	0.042	0.059	0.036	0.090	0.010
Ba	0.154	0.000	0.184	0.017	0.056	0.134	0.092	0.030	0.030
	0.194	0.380	0.551	0.500	0.136	0.204	0.117	0.290	0.040
Pb	0.048	0.038	0.033	0.072	0.025	0.103	0.036	0.030	0.570
	0.005	0.007	0.010	0.012	0.003	0.009	0.003	0.010	0.040

Table 4-2 (cont.). Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling (percent of mass followed by uncertainty).

Species	CEMENT	CUFOUNDR	GASPP	HDDBUS	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP
Cl^-	44.900	0.870	4.010	0.800	0.490	0.340	0.000	0.530	0.070
	3.490	0.080	1.970	0.220	0.220	0.160	0.040	0.280	0.020
NO_3^-	0.230	0.280	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.050	0.070	1.760	0.210	0.200	0.140	0.040	0.260	0.020
$SO_4^=$	3.720	2.400	5.480	0.800	0.460	0.350	0.100	0.000	41.090
	0.360	0.220	1.910	0.230	0.210	0.140	0.040	0.260	3.810
NH_4^+	0.250	0.040	2.060	0.310	0.330	0.100	0.020	0.140	1.160
	0.020	0.040	1.800	0.220	0.200	0.140	0.040	0.270	0.090
Na^+	7.360	0.110	0.880	0.310	0.070	0.090	0.000	0.040	0.810
	0.540	0.010	0.150	0.030	0.010	0.010	0.000	0.020	0.060
K^+	40.210	0.100	0.820	0.110	0.080	0.050	0.010	0.060	0.020
	3.560	0.010	0.210	0.020	0.020	0.010	0.000	0.030	0.000
OC	4.140	10.680	306.050	74.480	57.190	77.640	75.190	92.570	15.440
	0.320	0.840	40.500	5.790	4.500	5.880	5.610	7.240	1.160
EC	0.130	15.700	28.110	24.840	70.840	5.240	2.700	6.490	0.460
	0.020	1.300	4.500	2.100	5.930	0.480	0.230	0.670	0.050
TC	4.270	26.370	334.510	99.320	128.030	82.880	77.880	99.060	15.900
	0.330	1.950	44.090	7.510	9.570	6.160	5.680	7.620	1.170
Al	0.240	0.000	0.500	0.020	0.110	0.060	0.030	0.000	0.020
	0.030	0.020	0.590	0.070	0.030	0.020	0.010	0.080	0.020
Si	0.080	0.290	6.580	0.430	4.260	0.300	0.160	0.530	0.150
	0.020	0.020	0.850	0.040	0.310	0.030	0.010	0.050	0.010
S	0.540	0.730	1.910	0.850	0.830	0.600	0.560	0.620	10.580
	0.040	0.080	0.250	0.060	0.060	0.040	0.040	0.050	0.750
Cl	25.870	1.010	0.660	0.070	0.120	0.100	0.020	0.050	0.000
	1.830	0.070	0.140	0.020	0.020	0.010	0.010	0.050	0.240
K	21.680	0.080	0.370	0.030	0.060	0.030	0.010	0.020	0.020
	1.530	0.010	0.460	0.040	0.010	0.010	0.010	0.040	0.000
Ca	0.560	0.040	2.230	0.180	0.180	0.370	0.120	0.290	0.070
	0.110	0.010	0.310	0.020	0.020	0.030	0.010	0.030	0.010
Ti	0.010	0.000	0.000	0.000	0.070	0.010	0.000	0.000	0.000
	0.040	0.040	1.610	0.220	0.170	0.120	0.030	0.220	0.020
V	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	1.770
	0.020	0.020	0.990	0.130	0.070	0.050	0.010	0.090	0.130
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.050	0.300	0.040	0.020	0.010	0.000	0.020	0.050
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.050	0.140	0.020	0.010	0.010	0.000	0.020	0.010
Fe	0.070	0.000	1.190	0.050	0.350	0.160	0.020	0.100	0.230
	0.010	0.010	0.160	0.010	0.030	0.010	0.000	0.010	0.020
Ni	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.150
	0.000	0.030	0.060	0.010	0.010	0.010	0.000	0.010	0.080
Cu	0.010	0.850	0.010	0.000	0.010	0.010	0.000	0.000	0.000
	0.000	0.060	0.070	0.010	0.010	0.000	0.000	0.010	0.010
Zn	0.020	55.830	0.370	0.090	0.050	0.260	0.040	0.040	0.280
	0.000	3.950	0.050	0.010	0.010	0.020	0.000	0.010	0.020
Se	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000
	0.000	0.010	0.070	0.010	0.010	0.010	0.000	0.010	0.000
Br	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.020	0.060	0.010	0.010	0.010	0.000	0.010	0.000
Rb	0.310	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	0.020	0.000	0.060	0.010	0.010	0.010	0.000	0.010	0.000
Sr	0.010	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.060	0.010	0.010	0.010	0.000	0.010	0.000
Zr	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.090	0.010	0.010	0.010	0.000	0.010	0.000
Sn	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.040	0.010	0.910	0.130	0.110	0.080	0.020	0.140	0.010
Sb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.040	0.040	1.060	0.150	0.120	0.090	0.020	0.160	0.010
Ba	0.000	0.030	2.790	0.130	0.000	0.000	0.000	0.230	0.050
	0.130	0.090	3.620	0.490	0.430	0.310	0.080	0.550	0.010
Pb	0.410	2.820	0.210	0.020	0.030	0.050	0.000	0.000	0.110
	0.030	0.200	0.070	0.030	0.010	0.010	0.000	0.030	0.010

Table 4-2 (cont.). Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling (percent of mass followed by uncertainty).

Species	MOTO	PBSMELT	REFUSEBA	REFUSED1	REFUSED2	REST	AMSUL	AMBSUL	H2SO4
Cl^-	0.010	5.300	0.230	0.230	1.960	0.500	0.000	0.000	0.000
	0.000	0.430	0.040	0.020	0.150	0.060	0.000	0.000	0.000
NO_3^-	0.010	0.210	0.070	0.000	0.060	0.700	0.000	0.000	0.000
	0.000	0.040	0.040	0.010	0.010	0.140	0.000	0.000	0.000
$SO_4^=$	0.010	0.130	0.230	0.080	0.060	0.160	72.700	83.450	97.945
	0.000	0.010	0.040	0.020	0.010	0.050	7.270	8.345	0.000
NH_4^+	0.000	0.000	0.160	0.130	0.970	0.020	27.300	16.550	0.000
	0.000	0.000	0.040	0.020	0.070	0.050	2.730	1.655	0.000
Na^+	0.000	0.050	0.030	0.020	0.010	0.180	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000
K^+	0.000	0.170	0.020	0.020	0.020	0.850	0.000	0.000	0.000
	0.000	0.010	0.000	0.000	0.000	0.080	0.000	0.000	0.000
OC	68.570	2.630	93.270	115.280	62.380	80.590	0.000	0.000	0.000
	5.110	0.200	6.990	8.590	4.640	6.010	0.000	0.000	0.000
EC	3.590	0.010	2.070	1.690	6.580	0.960	0.000	0.000	0.000
	0.300	0.010	0.180	0.140	0.540	0.110	0.000	0.000	0.000
TC	72.160	2.640	95.340	116.970	68.970	81.550	0.000	0.000	0.000
	5.260	0.190	6.990	8.530	5.020	5.950	0.000	0.000	0.000
Al	0.000	0.040	0.040	0.010	0.030	0.030	0.000	0.000	0.000
	0.000	0.210	0.040	0.020	0.010	0.010	0.000	0.000	0.000
Si	0.030	0.000	0.140	0.100	0.200	0.540	0.000	0.000	0.000
	0.000	0.600	0.010	0.010	0.010	0.040	0.000	0.000	0.000
S	0.570	0.000	0.480	0.190	0.130	0.220	24.233	27.817	32.648
	0.040	5.080	0.040	0.010	0.010	0.020	2.427	2.782	0.000
Cl	0.010	0.230	1.510	1.320	7.620	0.800	0.000	0.000	0.000
	0.010	0.850	0.110	0.100	0.540	0.060	0.000	0.000	0.000
K	0.000	0.000	0.070	0.050	0.050	0.960	0.000	0.000	0.000
	0.000	0.090	0.010	0.010	0.000	0.070	0.000	0.000	0.000
Ca	0.050	0.000	0.160	0.050	0.020	0.080	0.000	0.000	0.000
	0.000	0.210	0.020	0.010	0.000	0.010	0.000	0.000	0.000
Ti	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.030	0.120	0.040	0.020	0.040	0.000	0.000	0.000
V	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.020	0.050	0.020	0.010	0.020	0.000	0.000	0.000
Cr	0.000	0.010	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.000	0.180	0.030	0.010	0.010	0.030	0.000	0.000	0.000
	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ni	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Cu	0.000	0.030	0.000	0.000	0.050	0.000	0.000	0.000	0.000
	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Zn	0.030	0.400	0.040	0.000	0.090	0.000	0.000	0.000	0.000
	0.000	0.030	0.000	0.000	0.010	0.000	0.000	0.000	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.270	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Br	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.000	0.000
	0.000	0.450	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.050	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.040	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Sn	0.000	0.000	0.000	0.000	0.010	0.000	0.000	0.000	0.000
	0.000	0.070	0.070	0.030	0.010	0.020	0.000	0.000	0.000
Sb	0.000	3.400	0.000	0.000	0.010	0.000	0.000	0.000	0.000
	0.000	0.240	0.080	0.030	0.010	0.030	0.000	0.000	0.000
Ba	0.010	0.000	0.110	0.070	0.000	0.000	0.000	0.000	0.000
	0.010	0.090	0.290	0.110	0.040	0.100	0.000	0.000	0.000
Pb	0.000	65.370	0.020	0.020	0.220	0.000	0.000	0.000	0.000
	0.000	4.630	0.020	0.000	0.020	0.010	0.000	0.000	0.000

Table 4-2 (cont.). Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling (percent of mass followed by uncertainty).

Species	AMNIT	NH4CL	MAR100	MAR75	MAR50	MAR25	MAR0	AUTO	CEMENT
Cl^-	0.000	66.280	57.372	38.743	23.488	10.769	0.000	0.000	9.070
	0.000	0.000	6.880	4.402	2.680	1.274	0.000	0.100	0.640
NO_3^-	77.500	0.000	0.004	22.880	41.611	57.230	70.453	0.000	0.000
	7.750	0.000	0.000	2.599	4.747	6.773	8.768	0.000	0.000
$SO_4^=$	0.000	0.000	7.996	7.199	6.547	6.003	5.543	0.290	8.110
	0.000	0.000	0.959	0.818	0.747	0.710	0.690	2.130	0.580
NH_4^+	22.550	33.720	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.255	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na^+	0.000	0.000	31.982	28.796	26.187	24.012	22.170	0.000	0.000
	0.000	0.000	3.835	3.272	2.987	2.842	2.759	0.000	0.000
K^+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.530	0.870
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.780	0.070
EC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.450	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.130	0.030
TC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	17.980	0.870
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.790	0.080
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150	0.100
Si	0.000	0.000	0.009	0.008	0.007	0.007	0.006	0.000	0.000
	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.100	0.190
S	0.000	0.000	2.665	2.400	2.182	2.001	1.848	0.100	2.700
	0.000	0.000	0.320	0.273	0.249	0.237	0.230	0.710	0.190
Cl	0.000	66.280	57.372	38.743	23.488	10.769	0.000	0.000	9.070
	0.000	0.000	6.880	4.402	2.680	1.274	0.000	0.100	0.640
K	0.000	0.000	1.185	1.067	0.970	0.889	0.821	0.030	8.260
	0.000	0.000	0.142	0.121	0.111	0.105	0.102	0.000	0.410
Ca	0.000	0.000	1.220	1.099	0.999	0.916	0.846	0.280	2.240
	0.000	0.000	0.146	0.125	0.114	0.108	0.105	0.020	0.160
Ti	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000
V	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150	0.270
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.020
Ni	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Zn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.020
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000
Br	0.000	0.000	0.198	0.179	0.163	0.149	0.138	5.030	0.060
	0.000	0.000	0.024	0.020	0.019	0.018	0.017	0.360	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.170	0.020
Sr	0.000	0.000	0.023	0.021	0.019	0.018	0.016	0.000	0.020
	0.000	0.000	0.003	0.002	0.002	0.002	0.002	0.010	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
Sn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.010
Sb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.010
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.020
Pb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.720	0.060
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.630	0.000

Table 4-2 (cont.). Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling (percent of mass followed by uncertainty).

Species	DIESEL	OIL	LEAD	VEGB1	OFPP	LIME
Cl^-	0.520	0.000	5.580	1.950	0.000	0.000
	0.050	0.040	0.490	0.560	0.130	0.000
NO_3^-	0.000	0.000	0.000	0.490	0.000	0.000
	0.000	0.000	0.000	0.190	0.010	0.000
$SO_4^=$	5.870	6.290	0.000	1.470	0.000	0.000
	0.490	0.450	46.130	0.510	0.010	0.000
NH_4^+	0.000	0.000	0.000	0.080	0.000	0.000
	0.000	0.000	0.000	0.060	0.000	0.000
Na^+	0.000	0.000	0.000	0.150	0.000	0.000
	0.000	0.000	0.000	0.070	0.000	0.000
K^+	0.000	0.000	0.000	4.090	0.000	0.000
	0.000	0.000	0.000	1.270	0.000	0.000
OC	38.790	2.540	0.080	44.730	0.000	0.000
	2.450	0.270	0.010	7.980	0.010	0.000
EC	12.590	143.690	0.000	23.870	0.000	0.000
	1.150	7.330	0.000	11.050	0.010	0.000
TC	51.380	146.230	0.080	68.600	0.000	0.000
	2.710	7.330	0.010	13.630	0.010	0.000
Al	0.070	0.020	0.000	0.010	1.470	0.000
	0.070	0.010	1.020	0.030	0.070	0.000
Si	0.450	0.120	0.000	0.000	2.510	0.000
	0.040	0.010	2.330	0.020	0.120	0.000
S	1.960	2.100	0.000	0.540	11.030	0.000
	0.160	0.150	15.380	0.200	0.510	0.000
Cl	0.520	0.000	5.580	1.950	0.000	0.000
	0.050	0.040	0.490	0.560	0.130	0.000
K	0.720	0.020	0.000	4.090	0.220	0.000
	0.040	0.000	0.170	1.270	0.010	0.000
Ca	0.570	0.030	0.000	0.100	2.350	40.000
	0.050	0.000	0.470	0.060	0.110	0.000
Ti	0.000	0.000	0.000	0.000	0.130	0.000
	0.090	0.020	0.000	0.020	0.130	0.000
V	0.000	0.080	0.000	0.000	1.500	0.000
	0.040	0.010	0.000	0.010	0.070	0.000
Cr	0.000	0.000	0.000	0.000	0.050	0.000
	0.010	0.000	0.000	0.000	0.090	0.000
Mn	0.020	0.000	0.030	0.000	0.040	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.910	0.090	0.670	0.000	2.040	0.000
	0.080	0.010	0.050	0.000	0.090	0.000
Ni	0.010	0.040	0.000	0.000	2.040	0.000
	0.000	0.000	0.000	0.000	0.090	0.000
Cu	0.030	0.020	0.040	0.000	0.000	0.000
	0.030	0.000	0.000	0.000	0.010	0.000
Zn	0.850	0.110	0.160	0.090	1.100	0.000
	0.070	0.010	0.010	0.040	0.050	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.170	0.000	0.000	0.000
Br	0.080	0.000	0.000	0.010	0.000	0.000
	0.010	0.000	0.300	0.000	0.000	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.050	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.030	0.000
	0.000	0.000	0.030	0.000	0.000	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.030	0.000	0.000	0.000
Sn	0.010	0.110	0.000	0.000	0.020	0.000
	0.060	0.010	0.000	0.010	0.010	0.000
Sb	0.090	0.010	0.000	0.000	0.070	0.000
	0.030	0.010	0.000	0.010	0.010	0.000
Ba	0.120	0.000	0.000	0.010	0.220	0.000
	0.260	0.050	0.000	0.050	0.030	0.000
Pb	0.770	0.040	57.340	0.000	1.420	0.000
	0.060	0.000	4.080	0.000	0.070	0.000

Table 4-3. Source profiles used in CAIP PM_{10} source apportionment modeling (percent of mass followed by uncertainty).

Species	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD	BRICK	CASTFE
Cl^-	0.568	1.331	0.582	0.550	1.875	0.581	0.376	7.140	0.060
	0.086	0.181	0.103	0.105	0.248	0.082	0.056	0.750	0.020
NO_3^-	0.258	0.163	0.249	0.000	0.513	0.194	0.121	0.700	0.060
	0.047	0.047	0.071	0.000	0.043	0.033	0.027	0.170	0.020
$SO_4^=$	2.607	3.449	2.368	1.465	3.951	3.117	1.490	25.030	8.720
	0.268	0.353	0.250	0.168	0.401	0.317	0.153	2.330	0.800
NH_4^+	0.138	0.034	0.064	0.049	0.012	0.051	0.052	11.360	1.790
	0.045	0.046	0.069	0.076	0.021	0.030	0.026	0.830	0.130
Na^+	0.518	1.041	0.422	0.384	1.166	0.466	0.283	0.440	0.330
	0.037	0.074	0.031	0.028	0.083	0.033	0.020	0.030	0.020
K^+	0.328	0.381	0.181	0.226	0.314	0.196	0.377	0.260	0.340
	0.024	0.028	0.015	0.019	0.023	0.015	0.028	0.030	0.030
OC	14.591	17.917	13.156	9.230	11.402	7.971	8.579	16.550	41.450
	1.586	1.940	1.503	1.138	1.224	0.880	0.932	1.430	3.090
EC	0.834	0.615	1.468	0.122	0.204	0.223	0.195	1.650	5.400
	0.545	0.410	0.961	0.153	0.138	0.153	0.136	0.210	0.450
TC	15.435	18.532	14.624	9.352	11.607	8.194	8.775	18.200	46.850
	1.652	1.975	1.644	1.182	1.225	0.894	0.941	1.550	3.420
Al	6.970	4.745	7.321	4.967	3.564	8.794	10.084	2.390	0.010
	2.100	1.431	2.207	1.500	1.074	2.649	3.037	0.730	0.050
Si	23.195	16.891	23.853	16.596	11.707	22.030	24.878	8.370	7.660
	7.432	5.413	7.646	5.319	3.751	7.059	7.971	2.680	2.450
S	1.261	1.288	1.065	1.155	0.926	0.872	0.453	8.670	2.560
	0.090	0.092	0.077	0.083	0.066	0.062	0.032	0.620	0.180
Cl	0.868	2.016	0.669	0.837	1.989	0.691	0.349	13.470	0.000
	0.259	0.595	0.203	0.251	0.588	0.206	0.105	3.970	0.000
K	1.449	1.179	1.078	1.105	0.803	0.989	1.670	0.430	0.470
	0.300	0.246	0.226	0.231	0.175	0.206	0.343	0.090	0.100
Ca	15.966	17.660	19.107	17.758	25.036	14.313	7.781	3.260	0.270
	2.801	3.099	3.353	3.118	4.391	2.511	1.365	0.570	0.050
Tli	0.366	0.293	0.486	0.327	0.264	0.569	0.687	0.120	0.000
	0.031	0.027	0.042	0.033	0.021	0.042	0.050	0.040	0.000
V	0.014	0.000	0.005	0.006	0.006	0.002	0.000	0.140	0.310
	0.023	0.000	0.033	0.030	0.014	0.027	0.000	0.030	0.020
Cr	0.009	0.003	0.017	0.010	0.005	0.003	0.001	0.000	0.000
	0.002	0.009	0.003	0.003	0.001	0.009	0.009	0.000	0.000
Mn	0.047	0.036	0.069	0.057	0.040	0.097	0.118	0.010	0.000
	0.004	0.003	0.006	0.005	0.003	0.008	0.009	0.000	0.000
Fe	3.193	2.888	4.195	3.402	2.772	5.773	6.465	1.740	1.150
	0.226	0.205	0.298	0.242	0.196	0.409	0.458	0.120	0.080
Ni	0.005	0.004	0.008	0.006	0.005	0.004	0.003	0.220	0.200
	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.020	0.010
Cu	0.018	0.015	0.017	0.033	0.014	0.015	0.012	0.010	0.070
	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.010
Zn	0.132	0.076	0.069	0.141	0.061	0.074	0.037	0.170	0.960
	0.010	0.006	0.005	0.010	0.004	0.005	0.003	0.010	0.070
Se	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Br	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.900	0.000
	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.060	0.000
Rb	0.003	0.000	0.000	0.000	0.002	0.003	0.004	0.000	0.000
	0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
Sr	0.071	0.094	0.095	0.090	0.124	0.075	0.037	0.030	0.000
	0.005	0.007	0.007	0.006	0.009	0.006	0.003	0.000	0.000
Zr	0.011	0.009	0.014	0.010	0.008	0.017	0.020	0.010	0.000
	0.002	0.001	0.003	0.002	0.002	0.002	0.002	0.010	0.000
Sn	0.025	0.017	0.022	0.073	0.012	0.001	0.005	0.000	0.050
	0.029	0.027	0.042	0.015	0.016	0.019	0.017	0.000	0.010
Sb	0.017	0.000	0.009	0.000	0.000	0.002	0.000	0.030	0.010
	0.032	0.000	0.048	0.000	0.000	0.022	0.000	0.080	0.010
Ba	0.000	0.125	0.123	0.148	0.068	0.094	0.075	0.040	0.050
	0.000	0.035	0.162	0.160	0.020	0.024	0.022	0.250	0.010
Pb	0.050	0.034	0.034	0.068	0.021	0.116	0.030	0.020	0.560
	0.004	0.003	0.004	0.006	0.002	0.008	0.002	0.010	0.040

Table 4-3 (cont.). Source profiles used in CAIP PM_{10} source apportionment modeling (percent of mass followed by uncertainty).

Species	CEMENT	CUFOUNDR	GASPP	HDDBUS	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP
Cl^-	35.200	0.810	2.060	0.000	0.380	0.290	0.100	0.000	0.060
	2.610	0.070	1.160	0.000	0.200	0.140	0.050	0.000	0.020
NO_3^-	0.480	0.280	1.290	0.000	0.000	0.000	0.000	0.000	0.000
	0.110	0.070	1.110	0.000	0.000	0.000	0.000	0.000	0.000
$SO_4^=$	2.440	2.070	4.580	0.520	0.440	0.430	0.120	0.000	37.460
	0.230	0.190	1.190	0.220	0.190	0.140	0.040	0.000	3.480
NH_4^+	0.150	0.050	1.260	0.230	0.620	0.080	0.010	0.170	1.200
	0.010	0.040	1.100	0.220	0.200	0.130	0.040	0.260	0.090
Na^+	2.900	0.110	0.590	0.040	0.050	0.100	0.010	0.030	0.770
	0.210	0.010	0.090	0.010	0.010	0.010	0.000	0.020	0.060
K^+	32.450	0.110	0.690	0.080	0.070	0.070	0.010	0.080	0.020
	2.880	0.010	0.130	0.020	0.020	0.010	0.000	0.030	0.000
OC	2.750	20.250	220.490	82.070	49.480	36.150	82.060	92.460	15.900
	0.210	1.530	22.850	6.360	3.920	2.830	6.120	7.220	1.190
EC	0.240	5.720	18.930	24.270	60.560	2.890	3.010	7.850	0.790
	0.020	0.480	2.500	2.050	5.060	0.310	0.260	0.770	0.070
TC	2.990	25.970	239.420	106.340	110.000	39.040	85.060	100.310	16.690
	0.220	1.920	24.620	8.010	8.230	3.010	6.210	7.700	1.220
Al	0.230	0.150	1.640	0.190	0.720	0.010	0.000	0.190	0.080
	0.080	0.050	0.610	0.080	0.230	0.120	0.000	0.240	0.030
Si	0.200	2.110	12.690	0.960	10.830	1.870	0.230	4.080	0.280
	0.070	0.680	4.160	0.310	3.470	0.600	0.070	1.310	0.090
S	0.370	0.720	1.230	0.930	0.780	0.390	0.520	0.600	11.340
	0.030	0.080	0.130	0.070	0.060	0.030	0.040	0.050	0.800
Cl	30.340	1.360	0.610	0.140	0.170	0.100	0.040	0.120	0.000
	8.930	0.400	0.210	0.050	0.050	0.030	0.010	0.040	0.000
K	22.820	0.150	0.740	0.030	0.140	0.030	0.010	0.040	0.010
	4.680	0.030	0.180	0.040	0.030	0.010	0.010	0.050	0.000
Ca	1.470	0.230	3.870	0.380	0.250	0.480	0.150	0.120	0.140
	0.280	0.040	0.740	0.070	0.050	0.090	0.030	0.030	0.020
Tli	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
V	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.920
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.140
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060
Mn	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.070	0.000	0.000	0.000	0.000	0.000	0.010
Fe	0.140	0.080	1.610	0.090	0.400	0.250	0.010	0.200	0.250
	0.010	0.010	0.160	0.010	0.030	0.020	0.000	0.020	0.020
Ni	0.000	0.000	0.020	0.000	0.000	0.010	0.000	0.000	1.280
	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.090
Cu	0.010	0.850	0.010	0.010	0.000	0.010	0.000	0.000	0.000
	0.000	0.060	0.040	0.010	0.000	0.000	0.000	0.000	0.000
Zn	0.020	56.510	0.280	0.090	0.060	0.250	0.040	0.050	0.290
	0.000	4.000	0.030	0.010	0.010	0.020	0.000	0.010	0.020
Se	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Br	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rb	0.190	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sr	0.010	0.000	0.030	0.000	0.000	0.000	0.000	0.010	0.010
	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.010	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sn	0.010	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.020	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.050	0.010	1.130	0.310	0.000	0.140	0.050	0.440	0.080
	0.060	0.100	2.240	0.420	0.000	0.250	0.090	0.560	0.020
Pb	0.300	2.700	0.170	0.030	0.040	0.070	0.000	0.010	0.110
	0.020	0.190	0.050	0.010	0.010	0.010	0.000	0.030	0.010

Table 4-3 (cont.). Source profiles used in CAIP PM_{10} source apportionment modeling (percent of mass followed by uncertainty).

Species	MOTO	PBSMELT	REFUSEBA	REFUSED1	REFUSED2	REST	AMSUL	AMBSUL	H2SO4
Cl^-	0.010	4.520	0.280	0.280	0.610	0.460	0.000	0.000	0.000
	0.000	0.360	0.040	0.020	0.050	0.050	0.000	0.000	0.000
NO_3^-	0.010	0.460	0.100	0.040	0.040	0.720	0.000	0.000	0.000
	0.000	0.090	0.030	0.010	0.010	0.140	0.000	0.000	0.000
$SO_4^=$	0.010	0.150	0.240	0.080	0.050	0.210	72.700	83.450	97.945
	0.000	0.010	0.040	0.010	0.010	0.050	7.270	8.345	0.000
NH_4^+	0.000	0.000	0.140	0.140	0.320	0.020	27.300	16.550	0.000
	0.000	0.000	0.030	0.020	0.020	0.040	2.730	1.655	0.000
Na^+	0.000	0.070	0.060	0.020	0.010	0.190	0.000	0.000	0.000
	0.000	0.010	0.000	0.000	0.000	0.010	0.000	0.000	0.000
K^+	0.000	0.170	0.030	0.020	0.010	0.800	0.000	0.000	0.000
	0.000	0.020	0.000	0.000	0.000	0.070	0.000	0.000	0.000
OC	58.680	2.330	112.690	122.800	45.590	75.750	0.000	0.000	0.000
	4.370	0.170	8.420	9.150	3.390	5.650	0.000	0.000	0.000
EC	3.340	0.030	2.590	2.140	3.700	0.660	0.000	0.000	0.000
	0.280	0.010	0.220	0.180	0.310	0.080	0.000	0.000	0.000
TC	62.020	2.360	115.280	124.940	49.290	76.410	0.000	0.000	0.000
	4.520	0.170	8.430	9.100	3.590	5.580	0.000	0.000	0.000
Al	0.010	0.030	0.280	0.100	0.060	0.090	0.000	0.000	0.000
	0.010	0.480	0.090	0.030	0.020	0.030	0.000	0.000	0.000
Si	0.100	0.000	0.720	0.250	0.210	0.420	0.000	0.000	0.000
	0.030	0.000	0.230	0.080	0.070	0.130	0.000	0.000	0.000
S	0.580	0.000	0.450	0.210	0.190	0.230	24.233	27.817	32.648
	0.040	0.000	0.030	0.020	0.010	0.020	2.427	2.782	0.000
Cl	0.010	0.000	2.090	2.150	5.310	1.100	0.000	0.000	0.000
	0.020	0.000	0.620	0.630	1.560	0.320	0.000	0.000	0.000
K	0.000	0.000	0.130	0.080	0.070	1.210	0.000	0.000	0.000
	0.000	0.000	0.030	0.020	0.020	0.250	0.000	0.000	0.000
Ca	0.070	0.000	1.240	0.440	0.090	0.340	0.000	0.000	0.000
	0.010	0.000	0.220	0.080	0.020	0.060	0.000	0.000	0.000
TIi	0.000	0.010	0.000	0.010	0.020	0.000	0.000	0.000	0.000
	0.000	0.030	0.000	0.030	0.000	0.000	0.000	0.000	0.000
V	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cr	0.000	0.010	0.050	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.000	0.210	0.160	0.030	0.010	0.030	0.000	0.000	0.000
	0.000	0.020	0.010	0.000	0.000	0.000	0.000	0.000	0.000
Ni	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cu	0.000	0.020	0.010	0.000	0.020	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Zn	0.030	0.380	0.050	0.000	0.050	0.000	0.000	0.000	0.000
	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Br	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sr	0.000	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sb	0.000	3.260	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.230	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ba	0.010	0.010	0.000	0.010	0.010	0.040	0.000	0.000	0.000
	0.010	0.080	0.000	0.070	0.030	0.100	0.000	0.000	0.000
Pb	0.000	62.450	0.020	0.020	0.060	0.000	0.000	0.000	0.000
	0.000	4.420	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Table 4-3 (cont.). Source profiles used in CAIP PM_{10} source apportionment modeling (percent of mass followed by uncertainty).

Species	AMNIT	NH4CL	MAR100	MAR75	MAR50	MAR25	MAR0	AUTO	CEMENT
Cl^-	0.000	66.280	57.372	38.743	23.488	10.769	0.000	0.000	9.070
	0.000	0.000	6.880	4.402	2.680	1.274	0.000	0.100	0.640
NO_3^-	77.500	0.000	0.004	22.880	41.611	57.230	70.453	0.000	0.000
	7.750	0.000	0.000	2.599	4.747	6.773	8.768	0.000	0.000
$SO_4^=$	0.000	0.000	7.996	7.199	6.547	6.003	5.543	0.290	8.110
	0.000	0.000	0.959	0.818	0.747	0.710	0.690	2.130	0.580
NH_4^+	22.550	33.720	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	2.255	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Na^+	0.000	0.000	31.982	28.796	26.187	24.012	22.170	0.000	0.000
	0.000	0.000	3.835	3.272	2.987	2.842	2.759	0.000	0.000
K^+	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	15.530	0.870
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.780	0.070
EC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.450	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.130	0.030
TC	0.000	0.000	0.000	0.000	0.000	0.000	0.000	17.980	0.870
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.790	0.080
Al	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.860	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150	0.100
Si	0.000	0.000	0.009	0.008	0.007	0.007	0.006	0.000	0.000
	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.100	0.190
S	0.000	0.000	2.665	2.400	2.182	2.001	1.848	0.100	2.700
	0.000	0.000	0.320	0.273	0.249	0.237	0.230	0.710	0.190
Cl	0.000	66.280	57.372	38.743	23.488	10.769	0.000	0.000	9.070
	0.000	0.000	6.880	4.402	2.680	1.274	0.000	0.100	0.640
K	0.000	0.000	1.185	1.067	0.970	0.889	0.821	0.030	8.260
	0.000	0.000	0.142	0.121	0.111	0.105	0.102	0.000	0.410
Ca	0.000	0.000	1.220	1.099	0.999	0.916	0.846	0.280	2.240
	0.000	0.000	0.146	0.125	0.114	0.108	0.105	0.020	0.160
Tli	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000
V	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010
Cr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.150	0.270
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.020
Ni	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Cu	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Zn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.200	0.020
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000
Br	0.000	0.000	0.198	0.179	0.163	0.149	0.138	5.030	0.060
	0.000	0.000	0.024	0.020	0.019	0.018	0.017	0.360	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.210
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.170	0.020
Sr	0.000	0.000	0.023	0.021	0.019	0.018	0.016	0.000	0.020
	0.000	0.000	0.003	0.002	0.002	0.002	0.002	0.010	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010	0.000
Sn	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.010
Sb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.010
Ba	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.010
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.060	0.020
Pb	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.720	0.060
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.630	0.000

Table 4-3 (cont.). Source profiles used in CAIP PM_{10} source apportionment modeling (percent of mass followed by uncertainty).

Species	DIESEL	OIL	LEAD	VEGB1	OFPP	LIME
Cl^-	0.520	0.000	5.580	1.950	0.000	0.000
	0.050	0.040	0.490	0.560	0.130	0.000
NO_3^-	0.000	0.000	0.000	0.490	0.000	0.000
	0.000	0.000	0.000	0.190	0.010	0.000
$SO_4^=$	5.870	6.290	0.000	1.470	0.000	0.000
	0.490	0.450	46.130	0.510	0.010	0.000
NH_4^+	0.000	0.000	0.000	0.080	0.000	0.000
	0.000	0.000	0.000	0.060	0.000	0.000
Na^+	0.000	0.000	0.000	0.150	0.000	0.000
	0.000	0.000	0.000	0.070	0.000	0.000
K^+	0.000	0.000	0.000	4.090	0.000	0.000
	0.000	0.000	0.000	1.270	0.000	0.000
OC	38.790	2.540	0.080	44.730	0.000	0.000
	2.450	0.270	0.010	7.980	0.010	0.000
EC	12.590	143.690	0.000	23.870	0.000	0.000
	1.150	7.330	0.000	11.050	0.010	0.000
TC	51.380	146.230	0.080	68.600	0.000	0.000
	2.710	7.330	0.010	13.630	0.010	0.000
Al	0.070	0.020	0.000	0.010	1.470	0.000
	0.070	0.010	1.020	0.030	0.070	0.000
Si	0.450	0.120	0.000	0.000	2.510	0.000
	0.040	0.010	2.330	0.020	0.120	0.000
S	1.960	2.100	0.000	0.540	11.030	0.000
	0.160	0.150	15.380	0.200	0.510	0.000
Cl	0.520	0.000	5.580	1.950	0.000	0.000
	0.050	0.040	0.490	0.560	0.130	0.000
K	0.720	0.020	0.000	4.090	0.220	0.000
	0.040	0.000	0.170	1.270	0.010	0.000
Ca	0.570	0.030	0.000	0.100	2.350	40.000
	0.050	0.000	0.470	0.060	0.110	0.000
Tli	0.000	0.000	0.000	0.000	0.130	0.000
	0.090	0.020	0.000	0.020	0.130	0.000
V	0.000	0.080	0.000	0.000	1.500	0.000
	0.040	0.010	0.000	0.010	0.070	0.000
Cr	0.000	0.000	0.000	0.000	0.050	0.000
	0.010	0.000	0.000	0.000	0.090	0.000
Mn	0.020	0.000	0.030	0.000	0.040	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
Fe	0.910	0.090	0.670	0.000	2.040	0.000
	0.080	0.010	0.050	0.000	0.090	0.000
Ni	0.010	0.040	0.000	0.000	2.040	0.000
	0.000	0.000	0.000	0.000	0.090	0.000
Cu	0.030	0.020	0.040	0.000	0.000	0.000
	0.030	0.000	0.000	0.000	0.010	0.000
Zn	0.850	0.110	0.160	0.090	1.100	0.000
	0.070	0.010	0.010	0.040	0.050	0.000
Se	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.170	0.000	0.000	0.000
Br	0.080	0.000	0.000	0.010	0.000	0.000
	0.010	0.000	0.300	0.000	0.000	0.000
Rb	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.050	0.000	0.000	0.000
Sr	0.000	0.000	0.000	0.000	0.030	0.000
	0.000	0.000	0.030	0.000	0.000	0.000
Zr	0.000	0.000	0.000	0.000	0.000	0.000
	0.010	0.000	0.030	0.000	0.000	0.000
Sn	0.010	0.110	0.000	0.000	0.020	0.000
	0.060	0.010	0.000	0.010	0.010	0.000
Sb	0.090	0.010	0.000	0.000	0.070	0.000
	0.030	0.010	0.000	0.010	0.010	0.000
Ba	0.120	0.000	0.000	0.010	0.220	0.000
	0.260	0.050	0.000	0.050	0.030	0.000
Pb	0.770	0.040	57.340	0.000	1.420	0.000
	0.060	0.000	4.080	0.000	0.070	0.000

Table 4-4. VOC source profiles used in VOC source apportionments from Doskey et al. (1999), values in percent NMHC.

Compound	REGHD	HIGHD	REGWL	HIGWHL	ROAD	BUSHSK	BUSCST	MOTO	OILREF	PB	FE	LPG	CNG
C2 compounds	0.19	0.00	0.00	0.10	10.71	2.65	6.05	6.83	7.13	0.38	0.78	0.06	61.98
propane	0.33	1.51	0.00	0.06	0.32	0.48	1.26	0.13	10.24	4.98	0.73	4.67	26.15
isobutane	1.40	1.49	0.04	0.08	0.22	0.28	0.87	0.16	6.97	8.88	5.20	20.07	3.35
n-butane	6.81	6.80	0.53	0.51	0.94	0.85	2.89	0.81	36.85	25.60	18.07	69.59	3.29
isopentane	28.33	22.60	6.13	4.20	5.53	2.49	5.53	8.41	3.18	1.30	1.93	2.38	1.93
n-pentane	22.42	18.24	8.98	4.91	5.48	2.26	5.55	8.55	3.24	0.83	1.53	0.21	1.26
2,2-dimethylbutane	0.50	0.71	0.17	0.26	0.24	0.08	0.18	0.29	0.09	0.03	0.09	0.00	0.06
cyclopentane	0.00	0.12	0.00	0.00	0.03	0.01	0.09	0.00	0.00	0.03	0.02	0.00	0.00
2,3-dimethylbutane	0.00	0.00	0.00	0.00	0.43	0.23	0.00	0.37	0.09	0.00	0.00	0.01	0.00
MTBE	3.38	9.46	1.37	4.85	3.71	0.78	2.97	2.05	0.00	0.40	0.72	0.00	0.00
2-methylpentane	6.90	8.21	4.30	4.08	2.82	0.92	2.53	4.12	1.59	0.42	0.00	0.00	0.33
3-methylpentane	3.22	3.96	2.26	2.50	1.95	0.63	1.65	2.77	1.09	0.29	0.52	0.00	0.16
n-hexane	5.37	5.05	4.60	3.98	3.23	1.06	2.89	5.01	2.30	0.54	0.88	0.00	0.27
methylcyclopentane	2.28	1.51	2.19	1.30	1.19	0.43	1.20	2.04	1.25	0.23	0.38	0.00	0.15
2,4-dimethylpentane	0.32	0.36	0.42	0.43	0.29	0.09	0.21	0.40	0.11	0.04	0.15	0.00	0.03
benzene	1.88	3.03	1.93	3.20	3.63	1.04	2.16	2.77	0.37	0.68	3.61	0.00	0.08
cyclohexane	0.98	0.43	1.17	0.45	0.47	0.22	0.55	0.89	0.84	0.34	0.25	0.00	0.09
2,3-dimethylpentane	0.49	0.54	0.90	0.82	0.55	0.18	0.46	0.76	0.27	0.07	0.18	0.00	0.02
2,2,4-trimethylpentane	0.43	0.12	0.79	0.35	0.35	0.18	0.46	0.62	0.53	0.13	0.21	0.00	0.00
n-heptane	1.55	1.09	4.01	2.64	2.00	0.75	1.60	2.94	1.76	0.42	0.66	0.00	0.07
toluene	2.77	3.74	10.03	13.50	9.46	2.68	4.95	9.06	1.46	3.74	3.52	0.00	0.00
n-octane	0.26	0.13	2.42	1.37	0.98	1.29	0.94	1.43	1.44	0.70	0.89	0.00	0.00
ethylbenzene	0.18	0.18	2.55	3.15	1.94	0.88	1.05	1.81	0.50	0.40	0.68	0.00	0.00
m,p-xylene	0.58	0.69	9.37	12.82	6.89	2.87	3.53	6.24	1.64	1.48	2.00	0.00	0.00
o-xylene	0.11	0.17	3.17	4.39	2.33	1.11	1.20	2.04	0.52	0.47	0.56	0.00	0.00
n-nonane	0.00	0.00	0.49	0.46	0.34	3.19	0.77	0.36	0.64	2.28	1.83	0.00	0.00
n-propylbenzene	0.00	0.00	0.43	0.77	0.46	0.61	0.31	0.30	0.09	0.35	0.23	0.00	0.00
m-ethyltoluene	0.00	0.00	1.25	2.24	1.55	1.24	0.80	0.82	0.22	0.81	0.68	0.00	0.00
p-ethyltoluene	0.00	0.00	0.82	1.45	0.71	0.62	0.39	0.50	0.10	0.32	0.25	0.00	0.00
n-undecane	0.00	0.00	0.00	0.00	0.11	3.45	1.16	0.00	0.11	2.17	2.28	0.00	0.00
n-dodecane	0.00	0.00	0.01	0.00	0.13	2.99	1.34	0.00	0.06	0.98	1.63	0.00	0.00

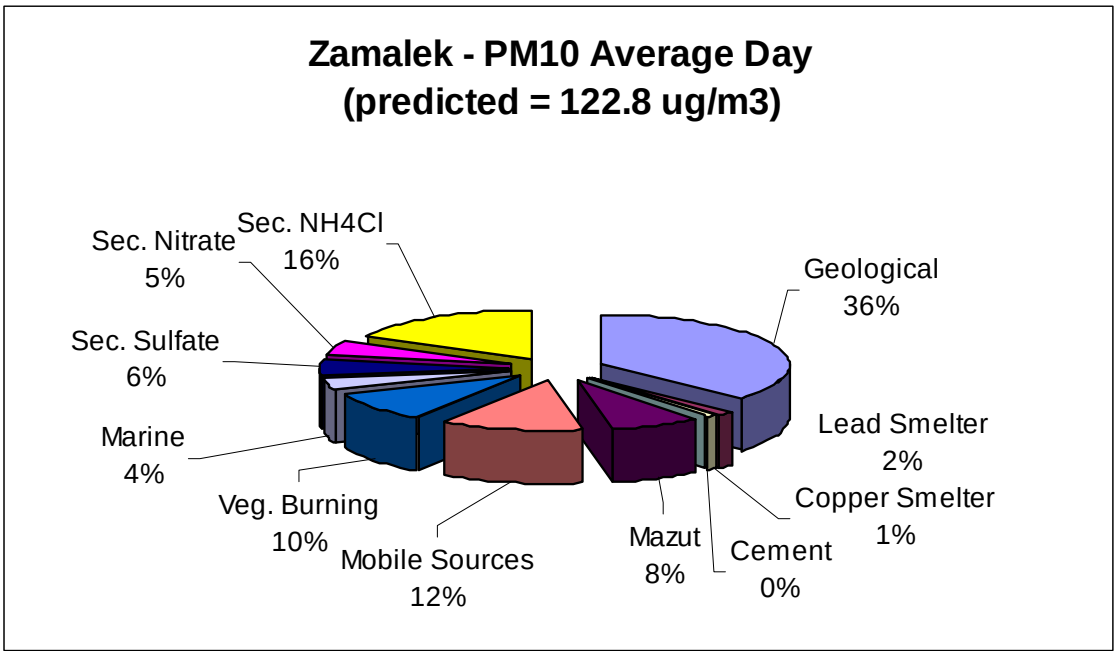


Figure 4-1a. Zamalek PM_{10} source apportionment, average day for the winter 1999 intensive study.

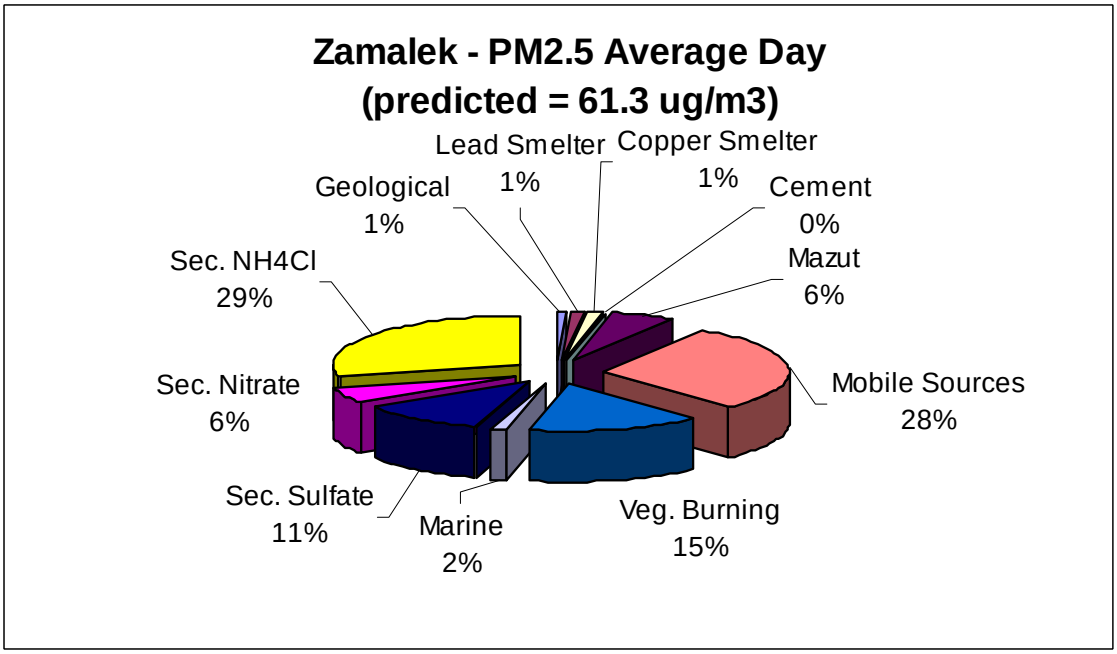


Figure 4-1b. Zamalek $PM_{2.5}$ source apportionment, average day for the winter intensive study.

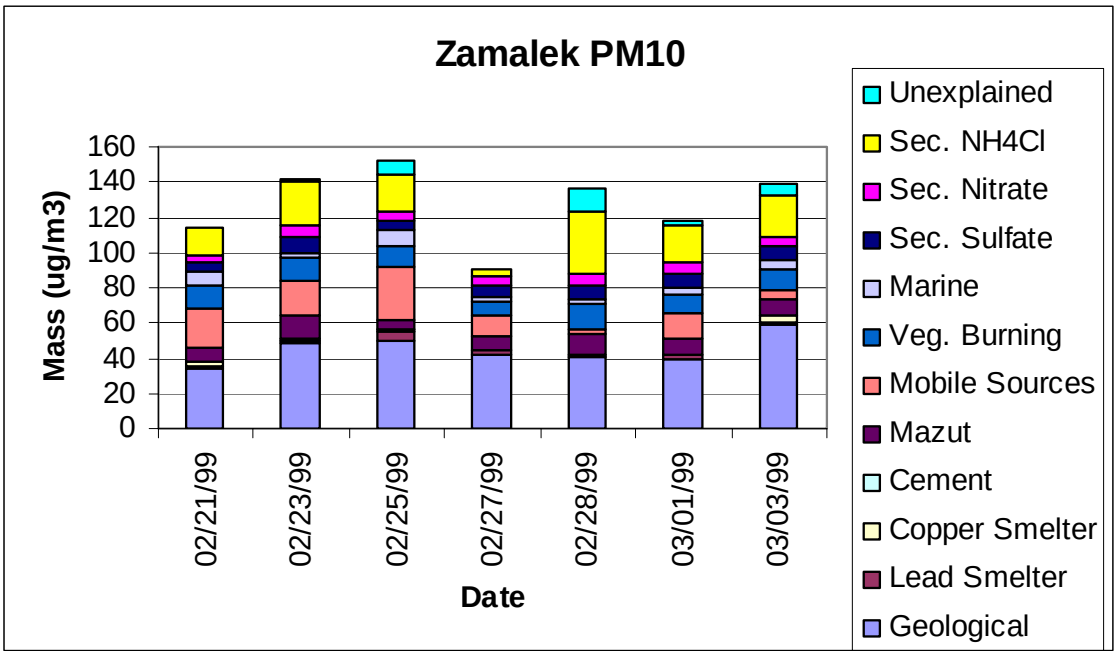


Figure 4-1c. Zamalek PM_{10} source apportionment, by day for the winter 1999 intensive study.

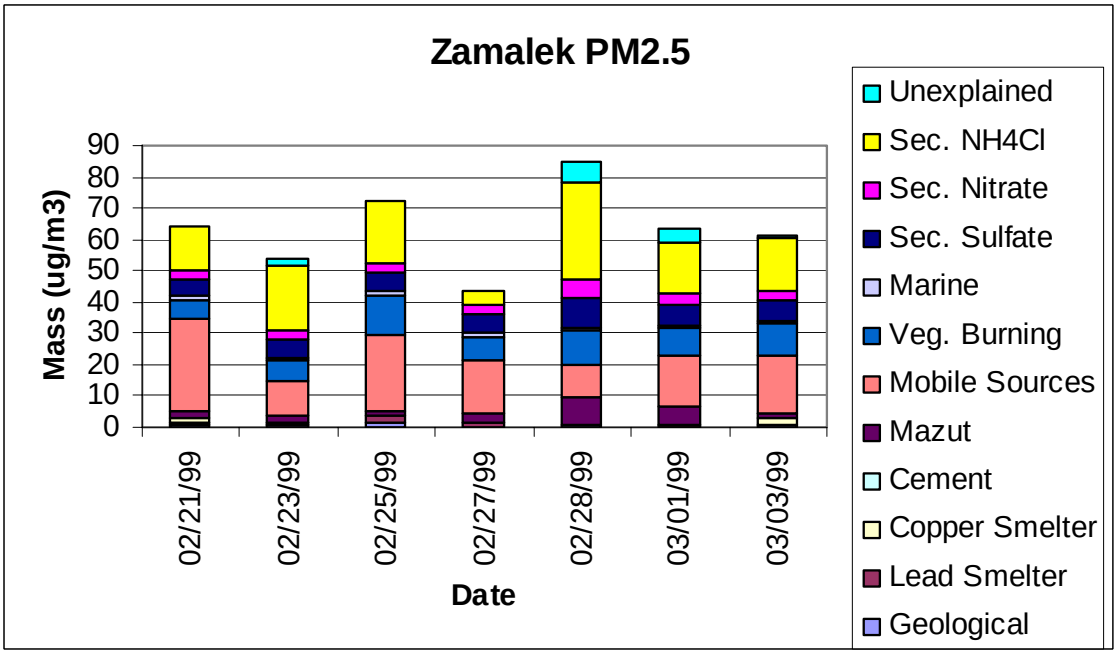


Figure 4-1d. Zamalek $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study.

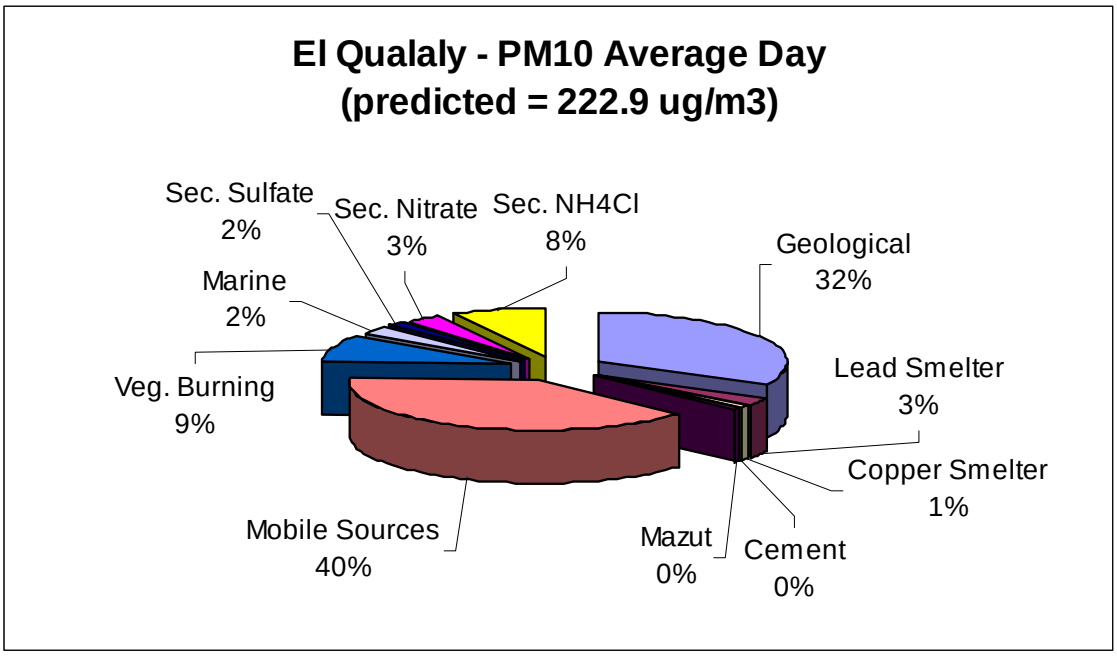


Figure 4-2a. El Qualaly PM_{10} source apportionment, average day for the winter 1999 intensive study.

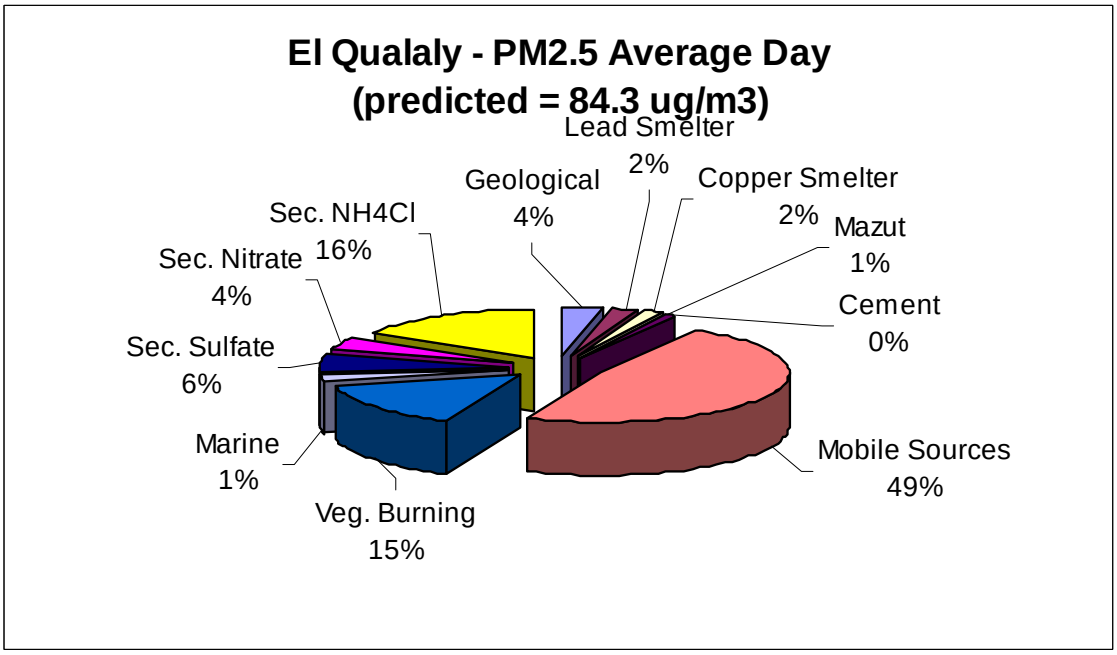


Figure 4-2b. El Qualaly $PM_{2.5}$ source apportionment, average day for the winter intensive study.

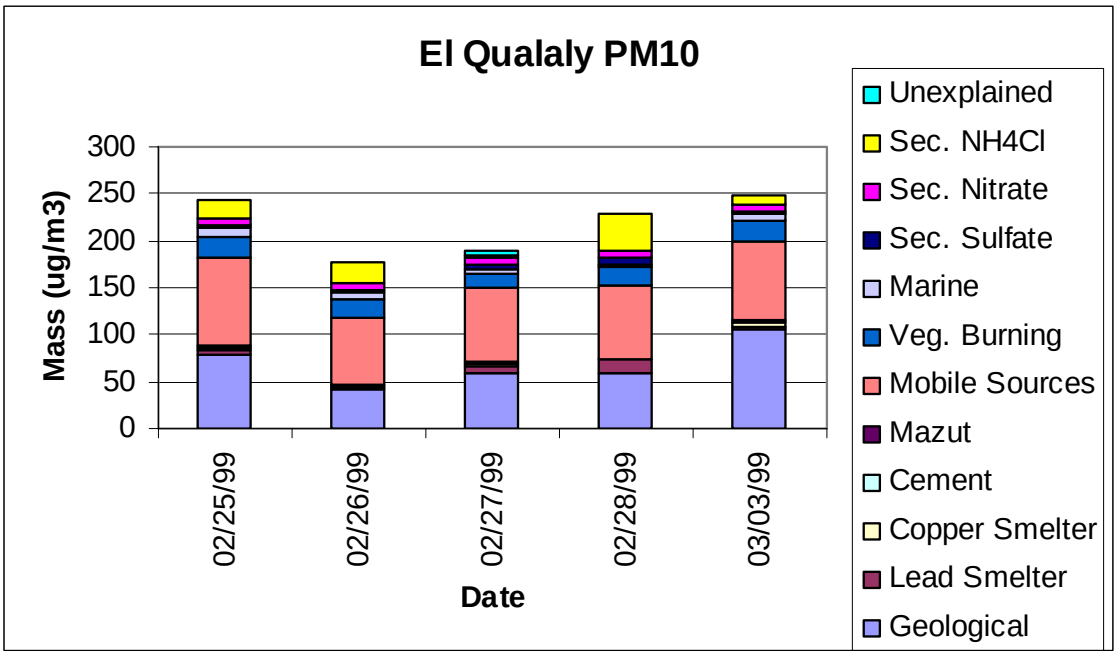


Figure 4-2c. El Qualaly PM_{10} source apportionment, by day for the winter 1999 intensive study.

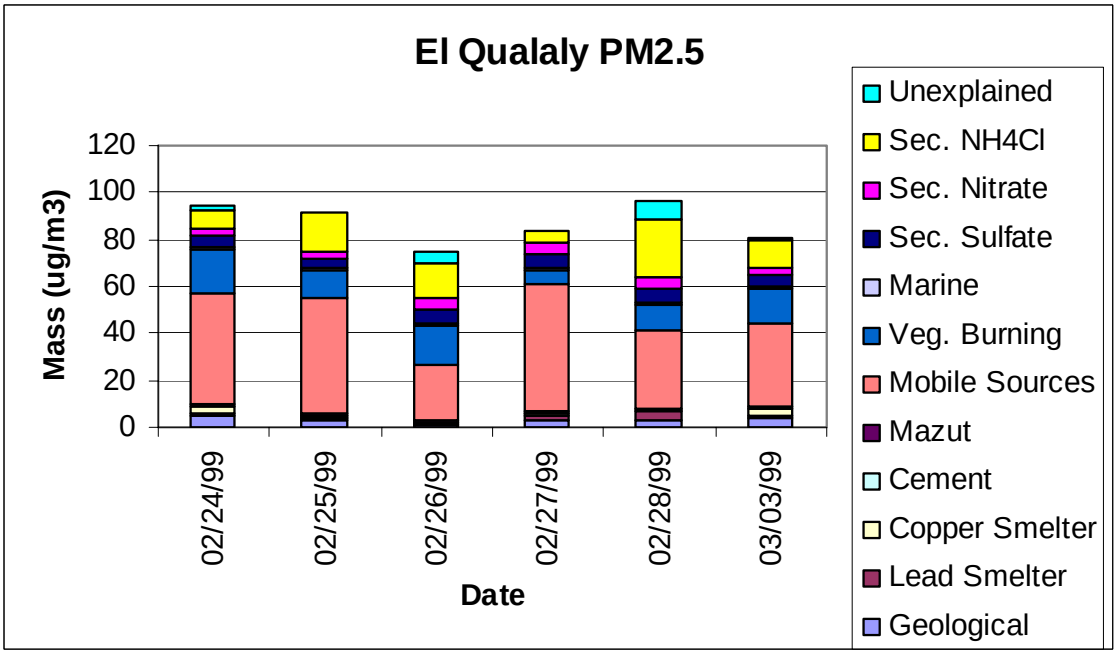


Figure 4-2d. El Qualaly PM_{10} source apportionment, by day for the winter 1999 intensive study.

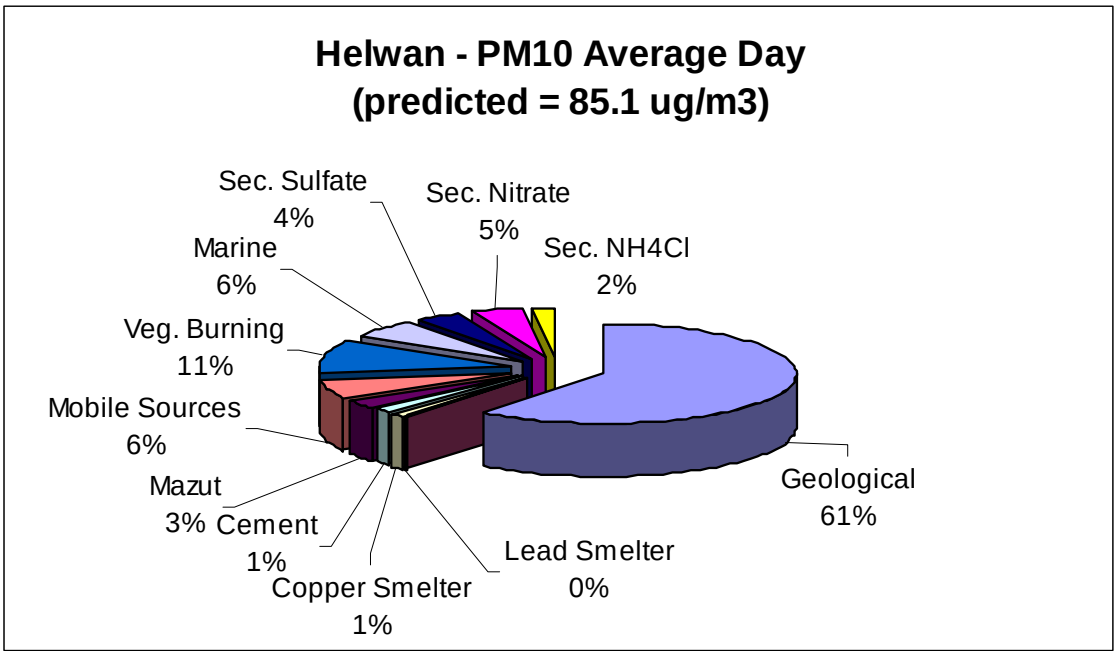


Figure 4-3a. Helwan PM_{10} source apportionment, average day for the winter 1999 intensive study.

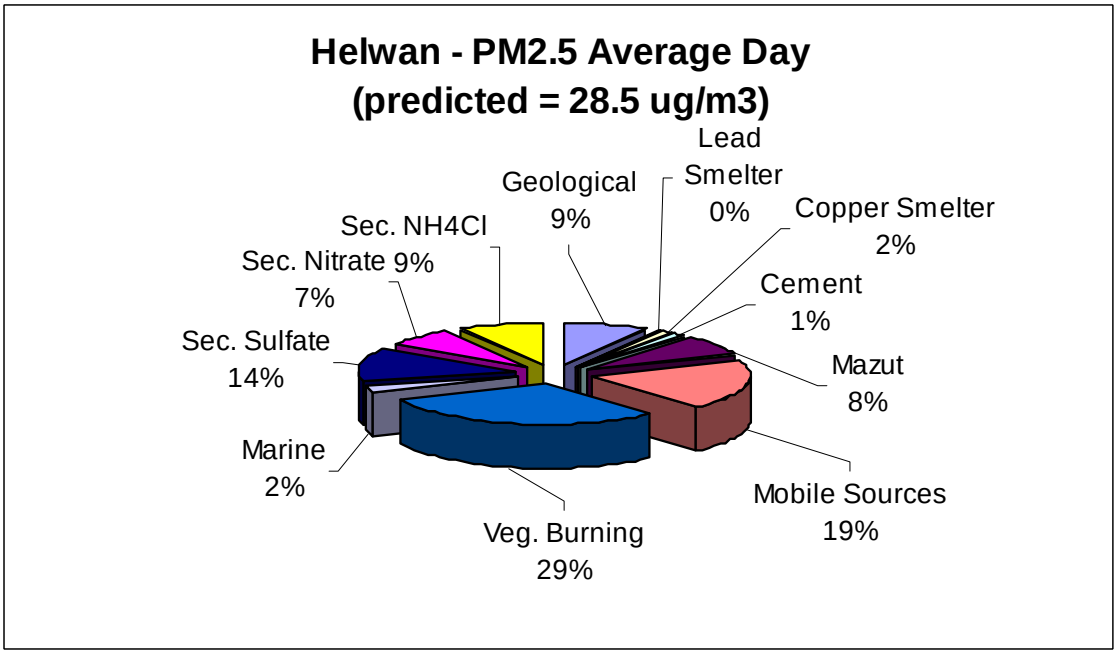


Figure 4-3b. Helwan $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study.

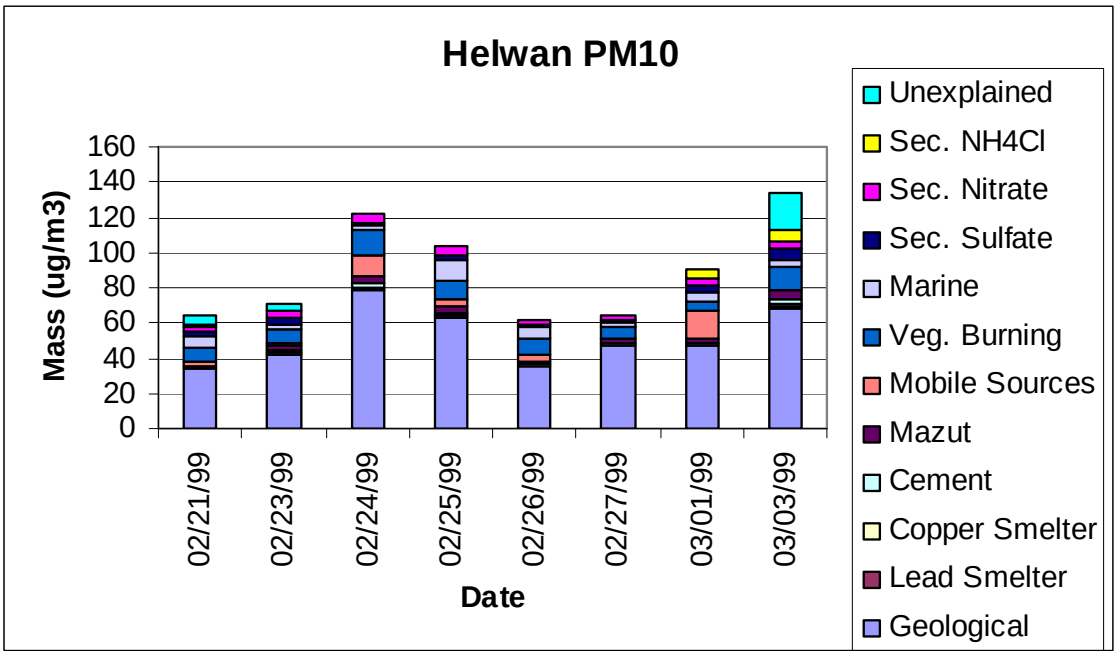


Figure 4-3c. Helwan PM_{10} source apportionment, by day for the winter 1999 intensive study.

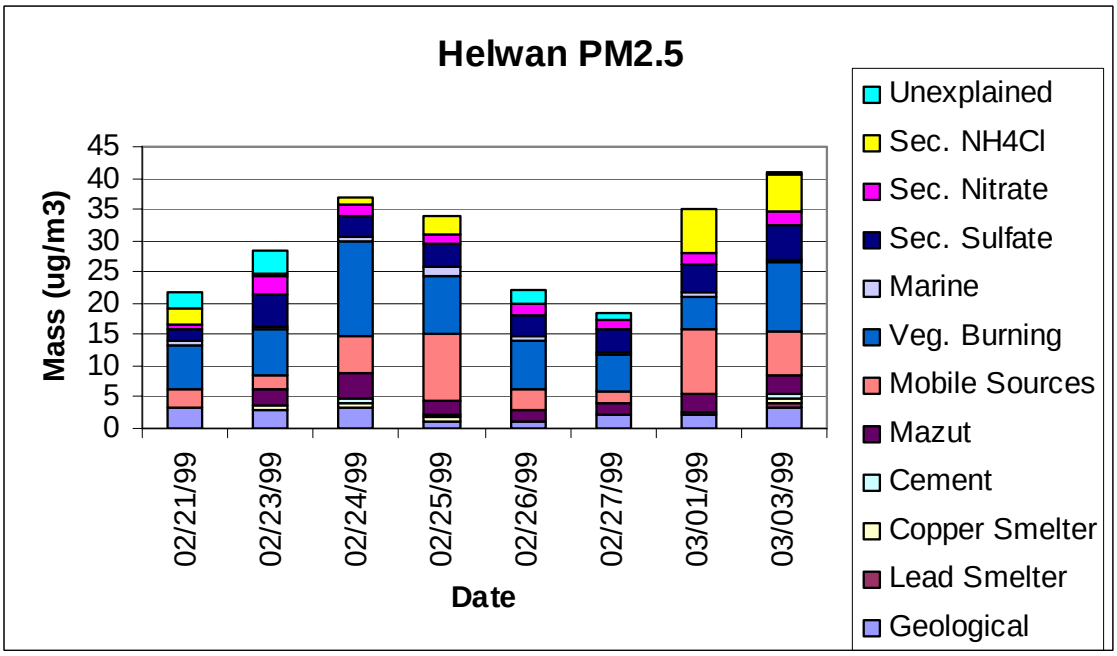


Figure 4-3d. Helwan $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study.

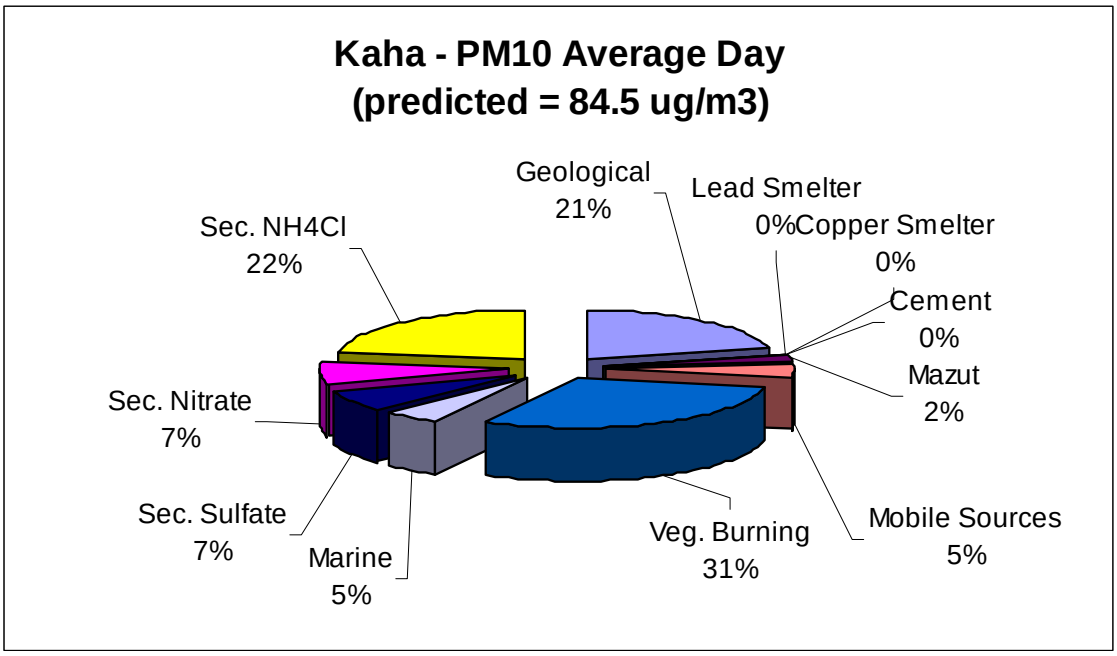


Figure 4-4a. Kaha PM_{10} source apportionment, average day for the winter 1999 intensive study.

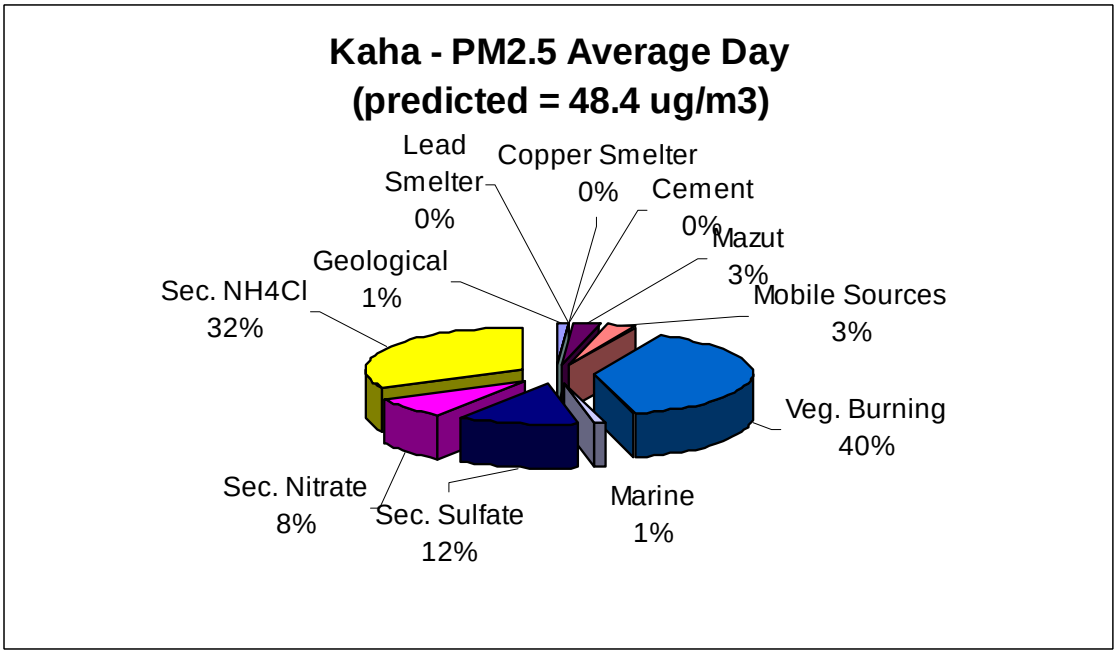


Figure 4-4b. Kaha $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study.

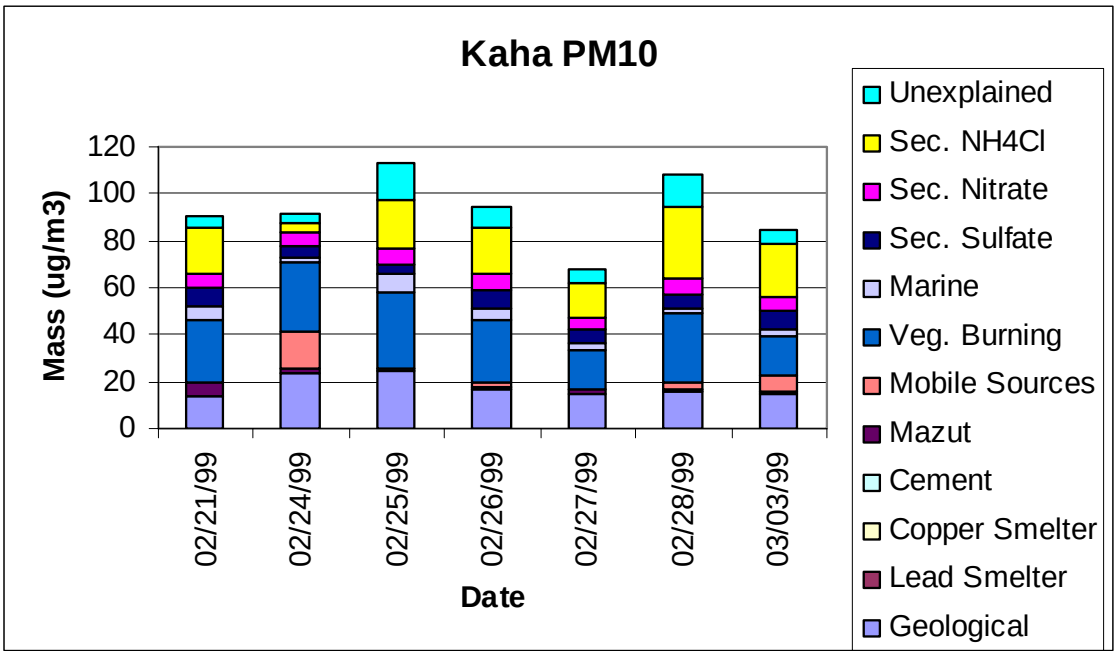


Figure 4-4c. Kaha PM_{10} source apportionment, by day for the winter 1999 intensive study.

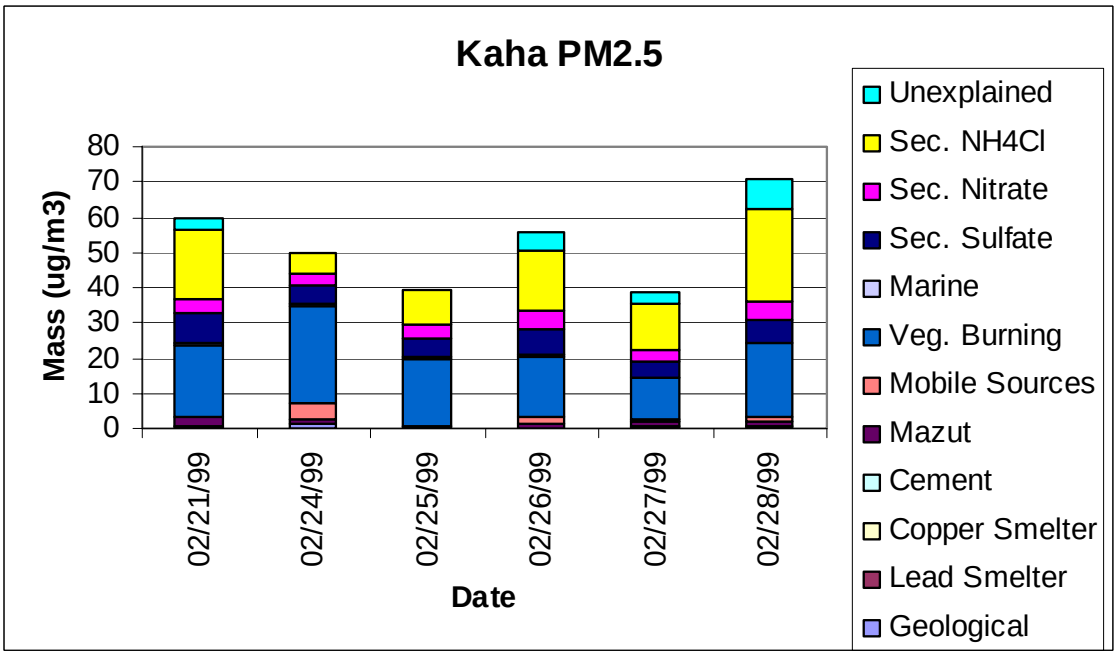


Figure 4-4d. Kaha $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study.

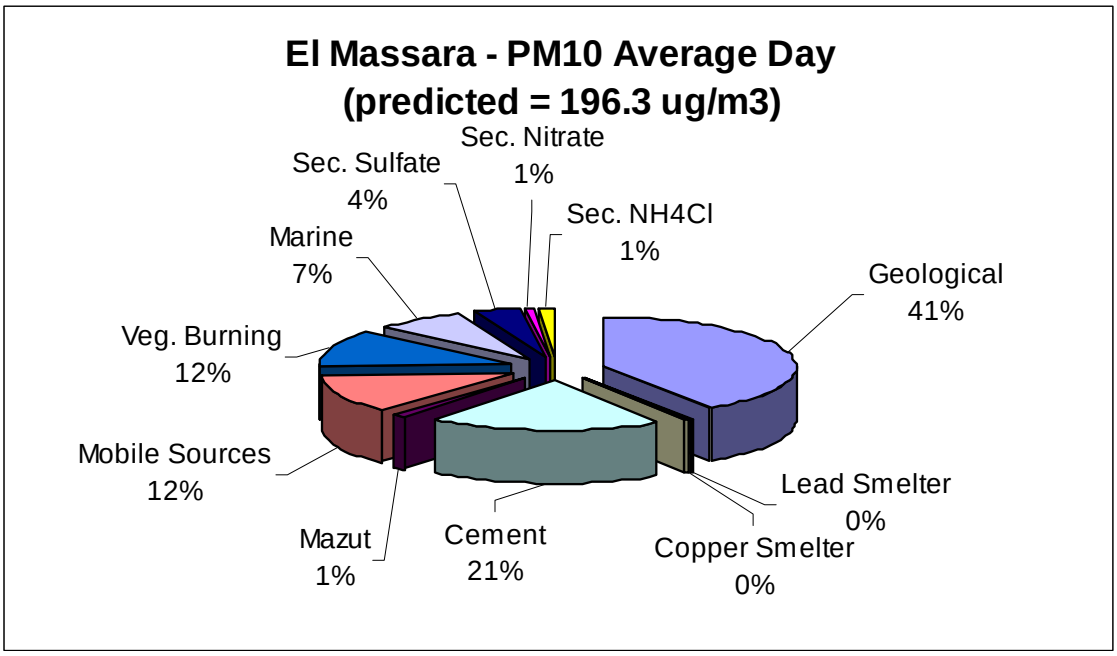


Figure 4-5a. El Massara PM_{10} source apportionment, average day for the winter 1999 intensive study.

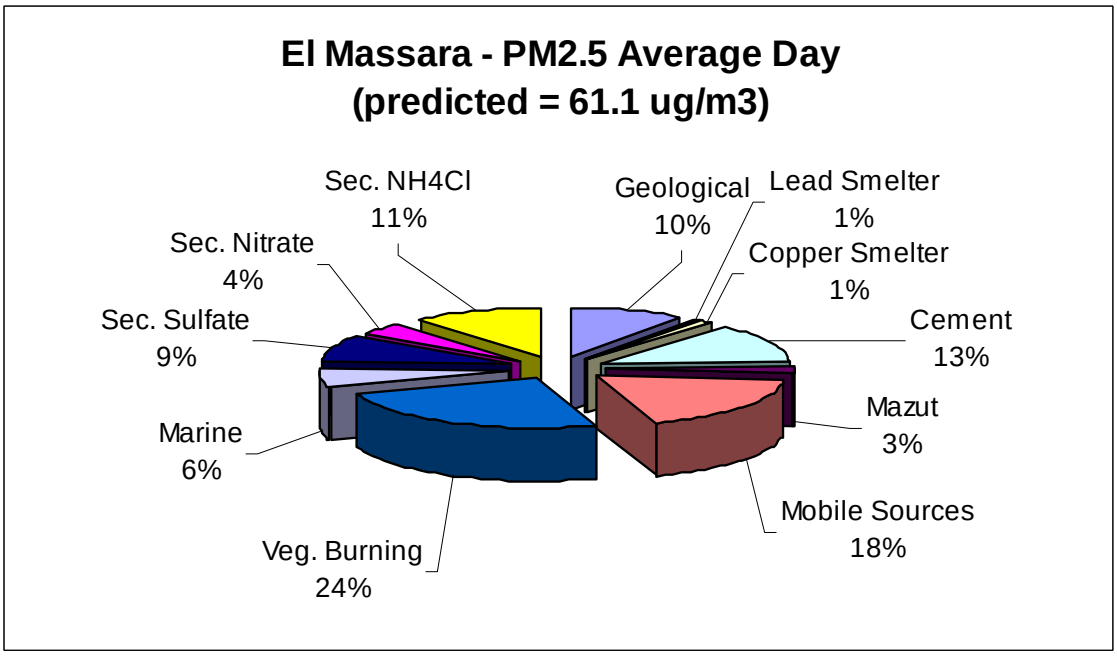


Figure 4-5b. El Massara $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study.

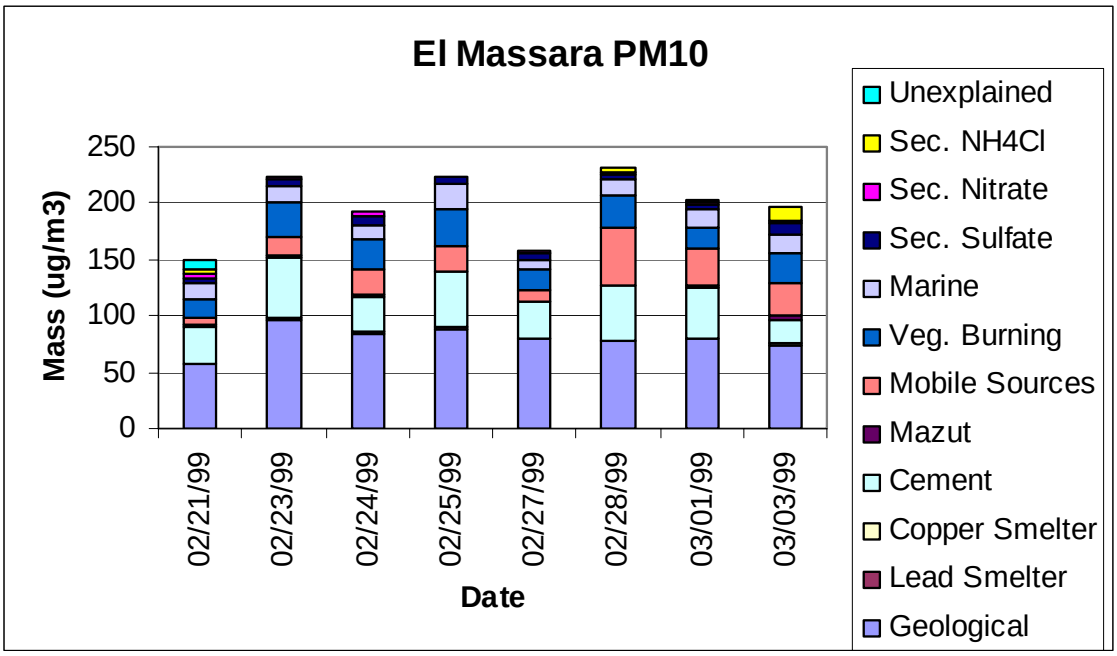


Figure 4-5c. El Massara PM_{10} source apportionment, by day for the winter 1999 intensive study.

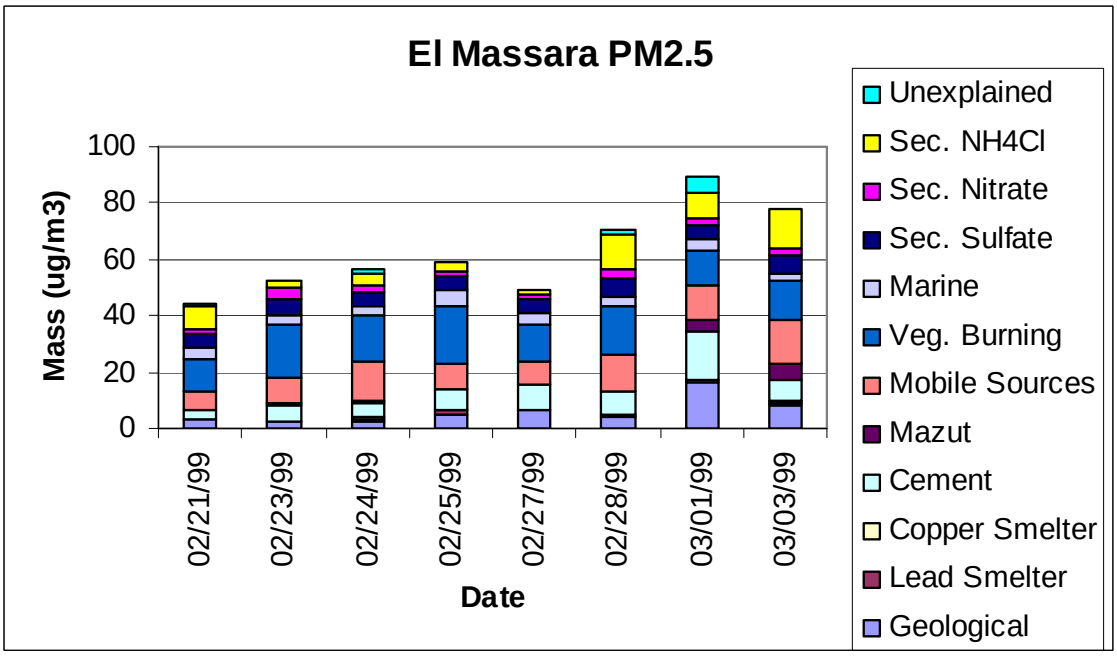


Figure 4-5d. El Massara $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study.

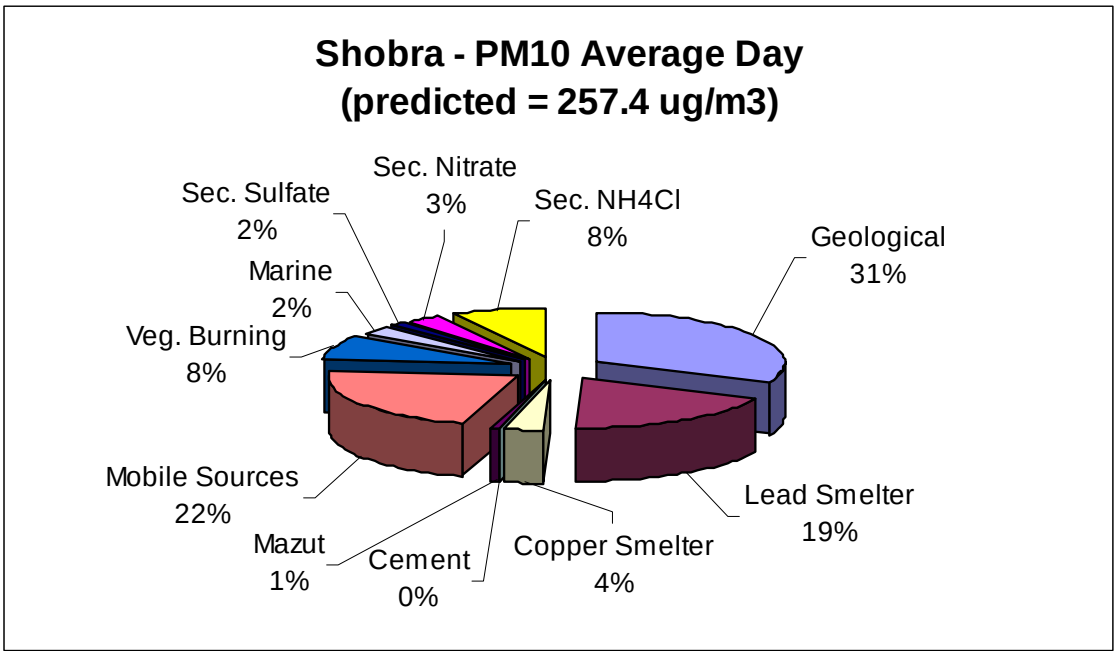


Figure 4-6a. Shobra PM_{10} source apportionment, average day for the winter 1999 intensive study.

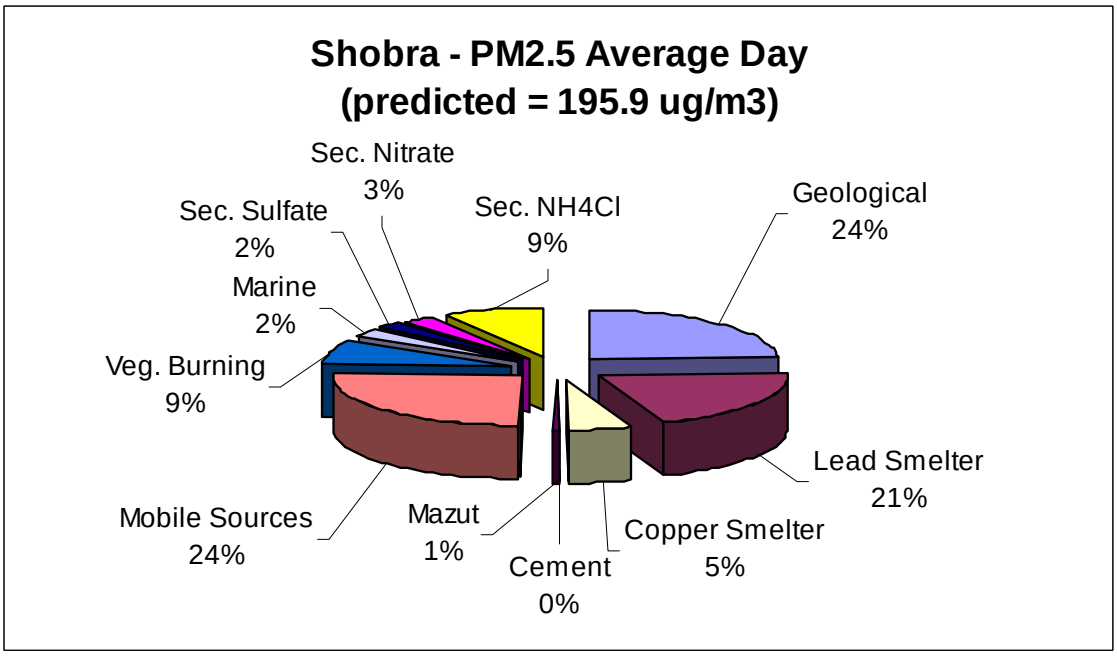


Figure 4-6b. Shobra $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study.

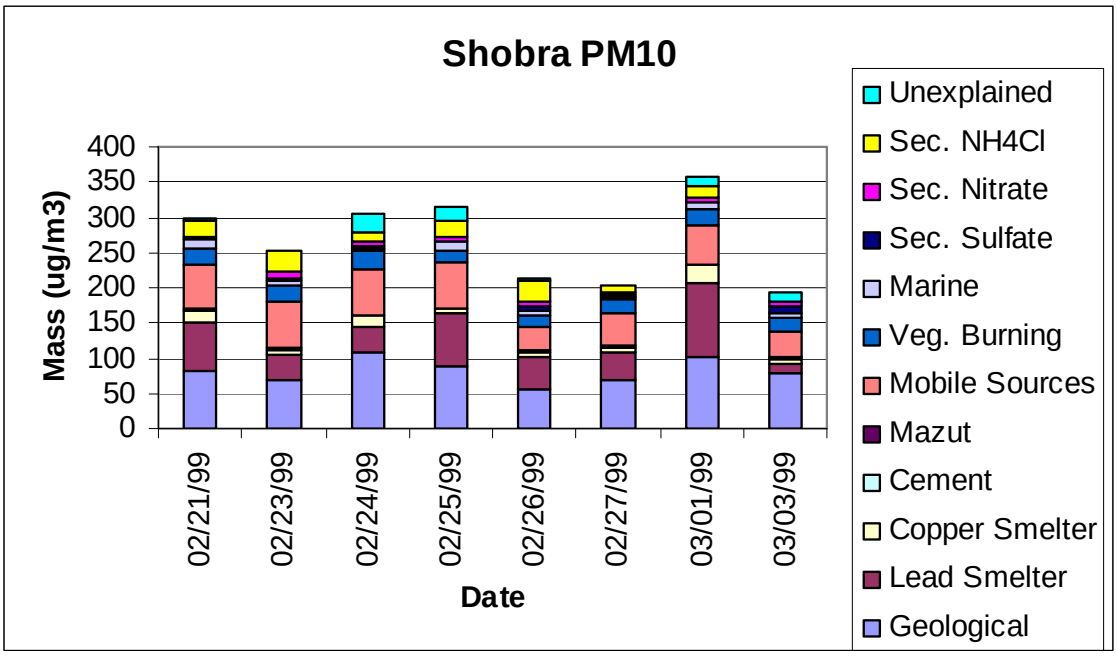


Figure 4-6c. Shobra PM_{10} source apportionment, by day for the winter 1999 intensive study.

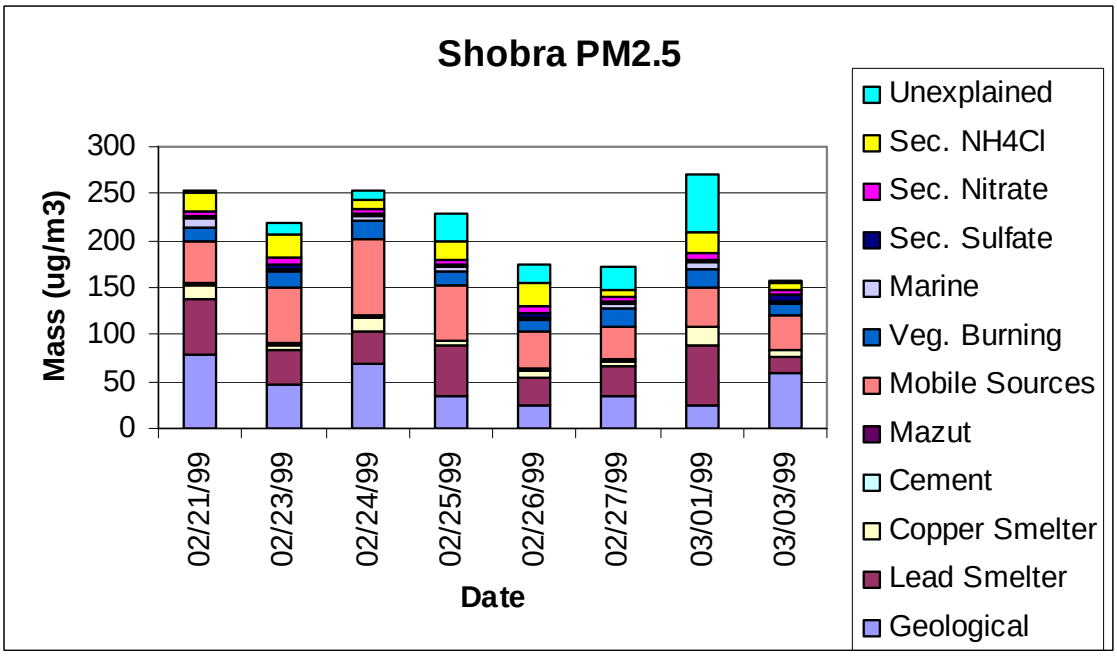


Figure 4-6d. Shobra $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study.

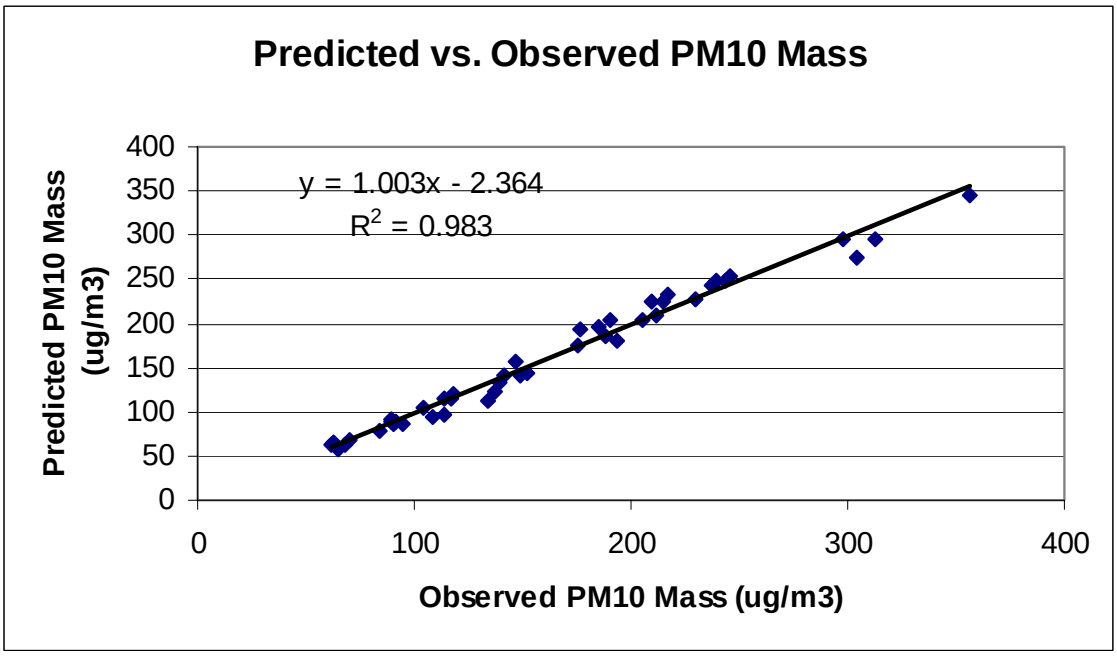


Figure 4-7a. Comparison of predicted vs. measured PM_{10} mass of the winter intensive samples and CMB apportionments.

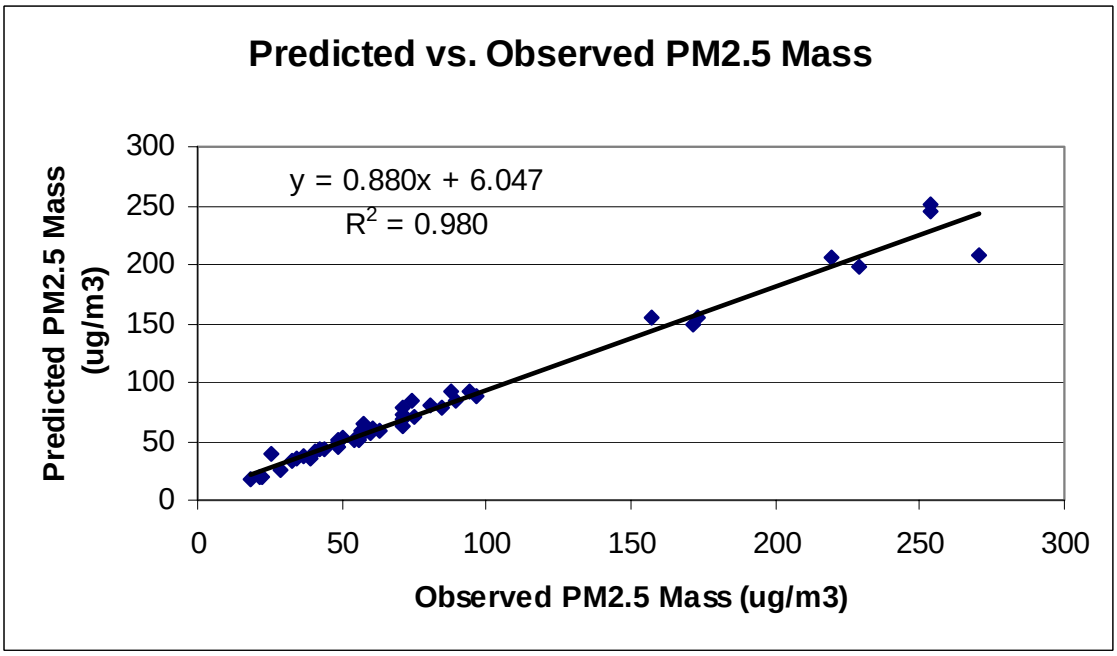


Figure 4-7b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the winter intensive samples and CMB apportionments.

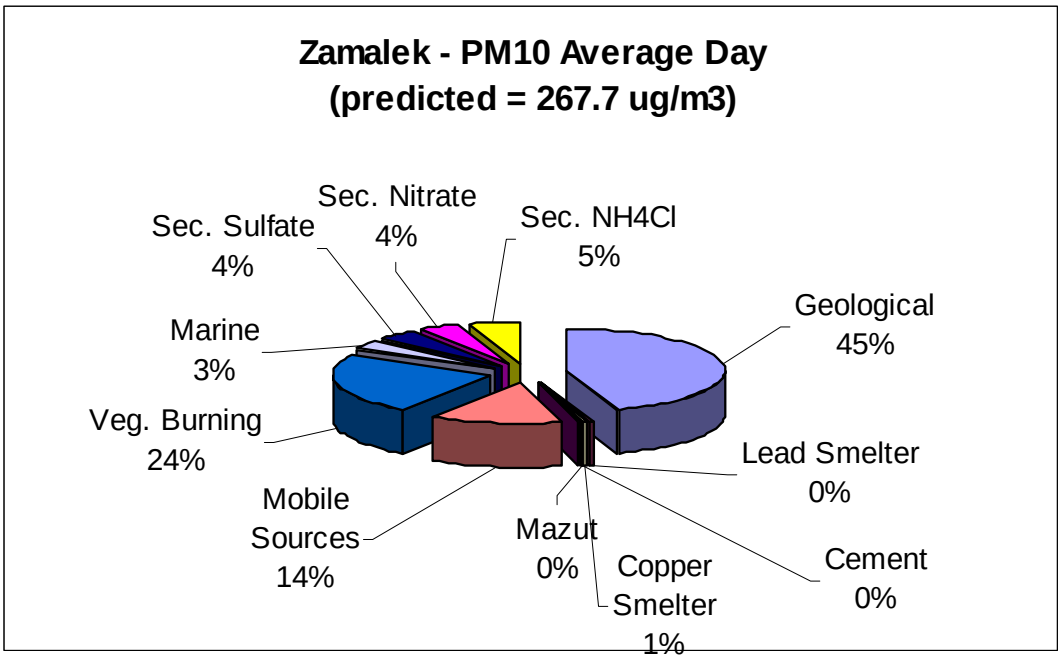


Figure 4-8a. Zamalek PM_{10} source apportionment, average day for the fall 1999 intensive study.

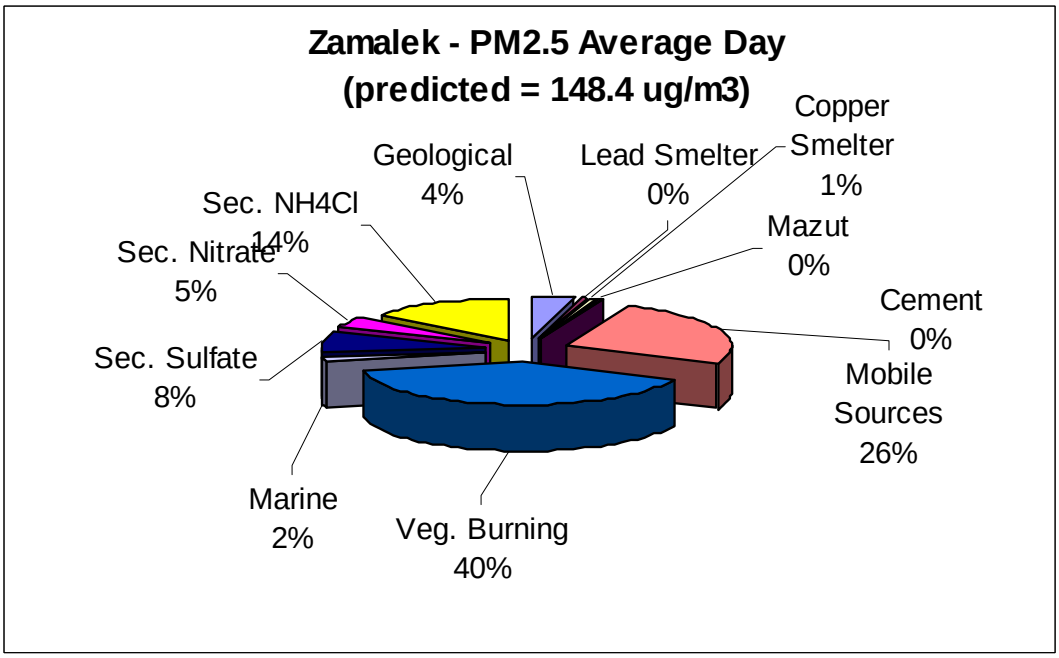


Figure 4-8b. Zamalek $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

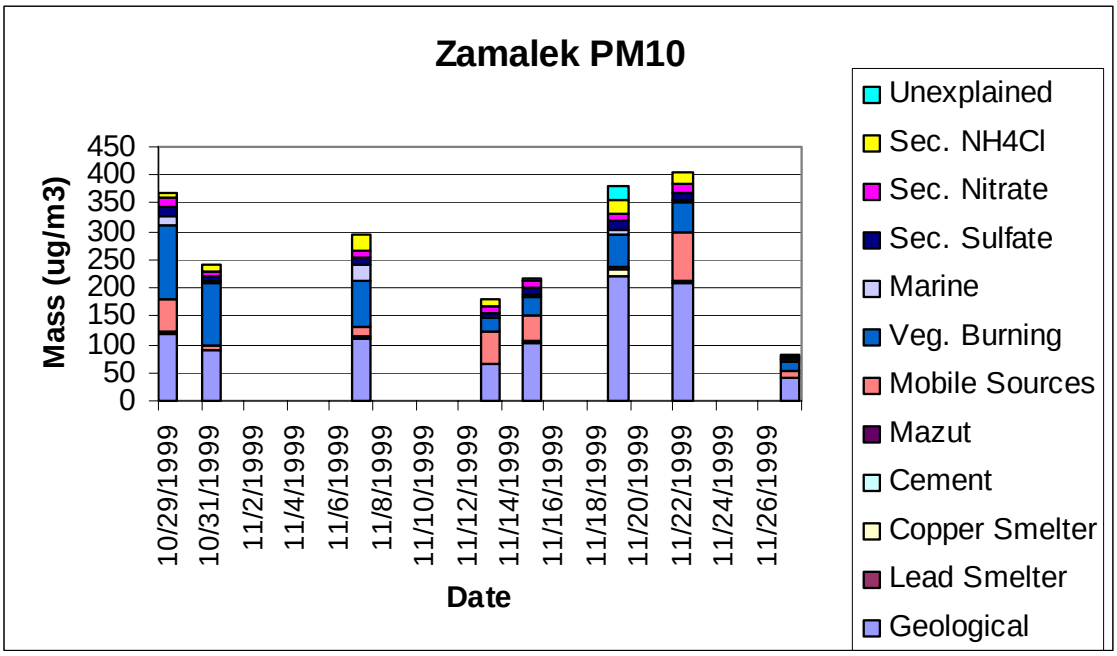


Figure 4-8c. Zamalek PM_{10} source apportionment, by day for the fall 1999 intensive study.

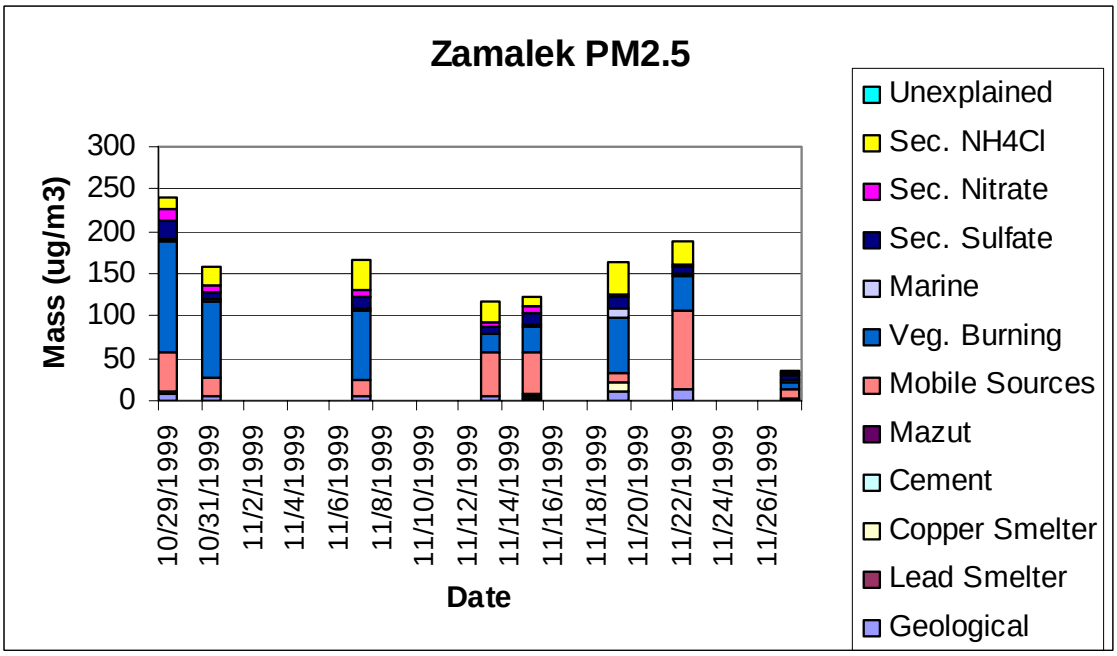


Figure 4-8d. Zamalek $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

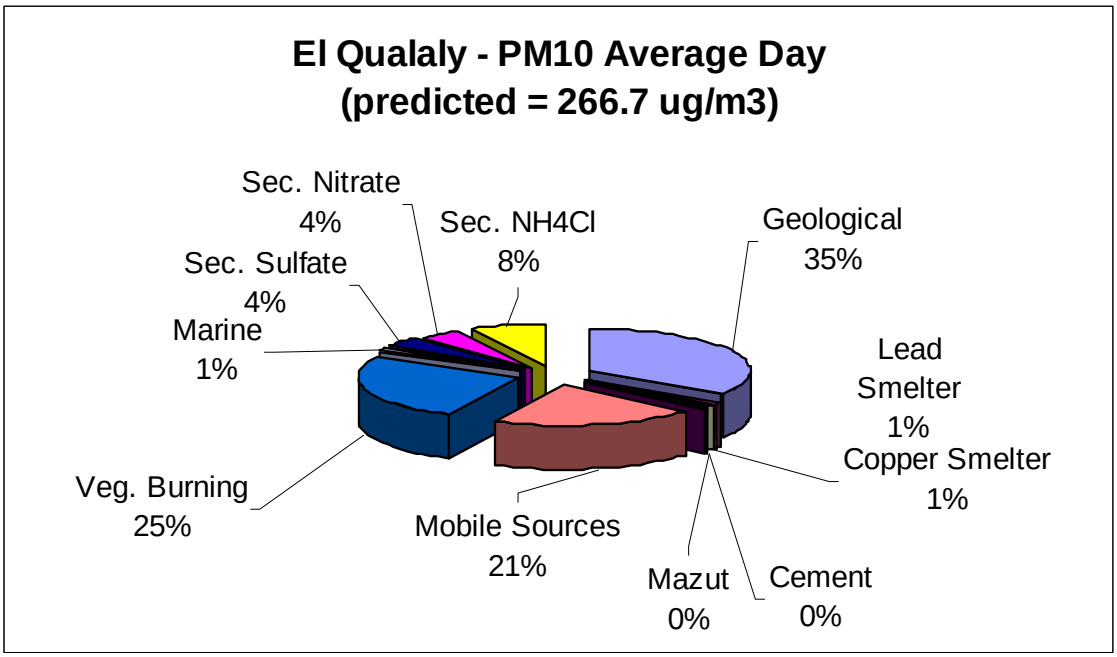


Figure 4-9a. El Qulaly PM_{10} source apportionment, average day for the fall 1999 intensive study.

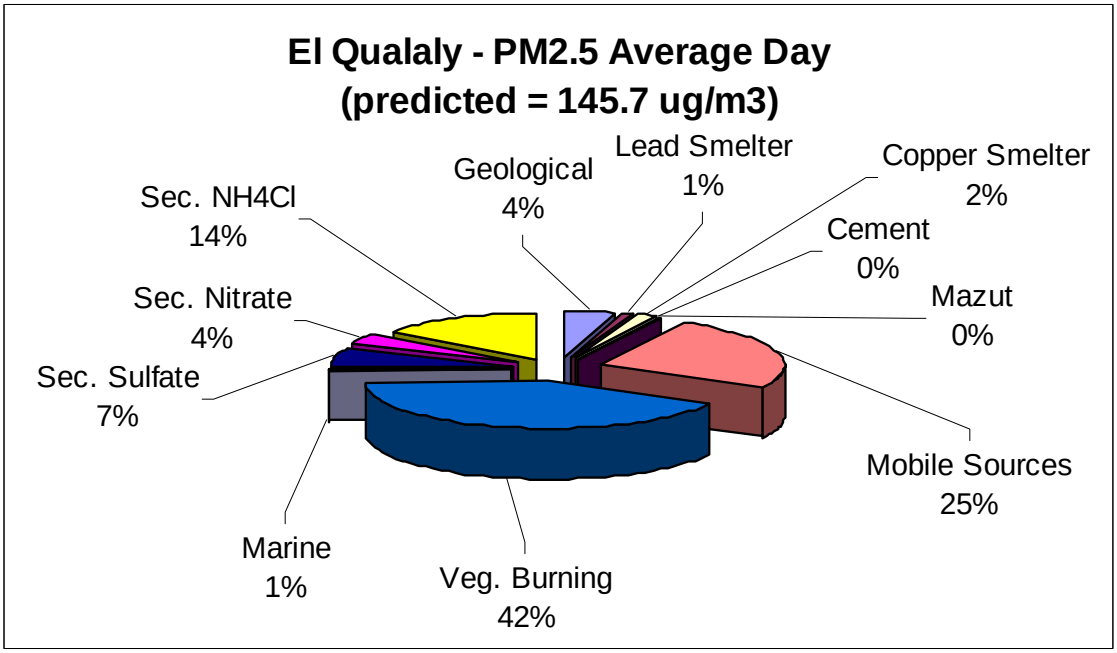


Figure 4-9b. El Qualaly $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

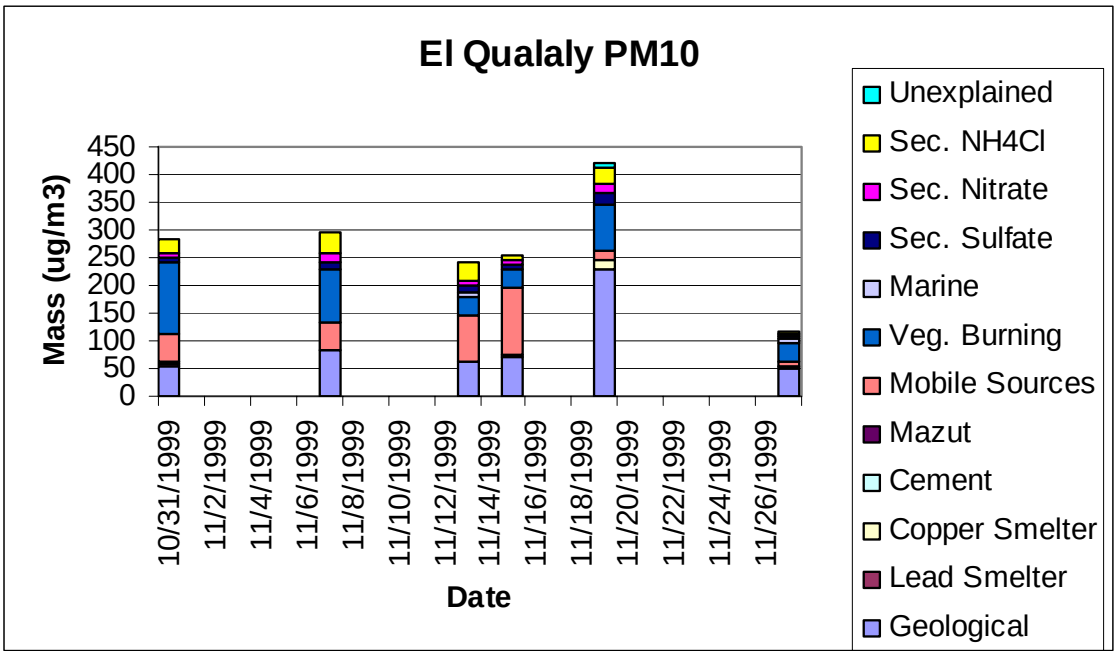


Figure 4-9c. El Qualaly PM_{10} source apportionment, by day for the fall 1999 intensive study.

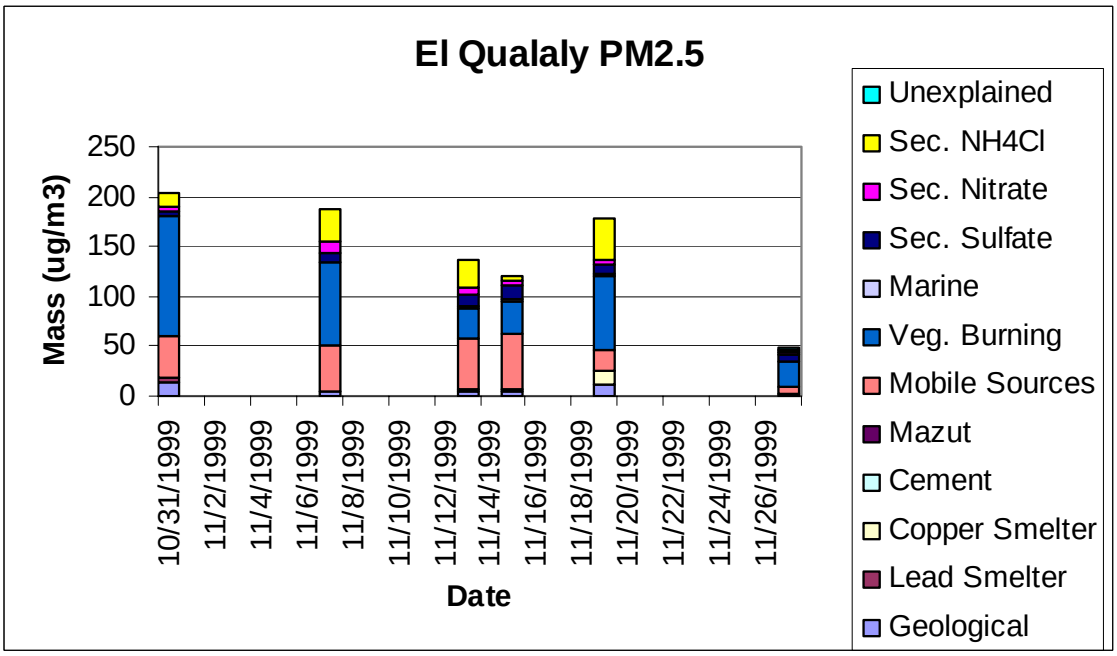


Figure 4-9d. El Qualaly $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

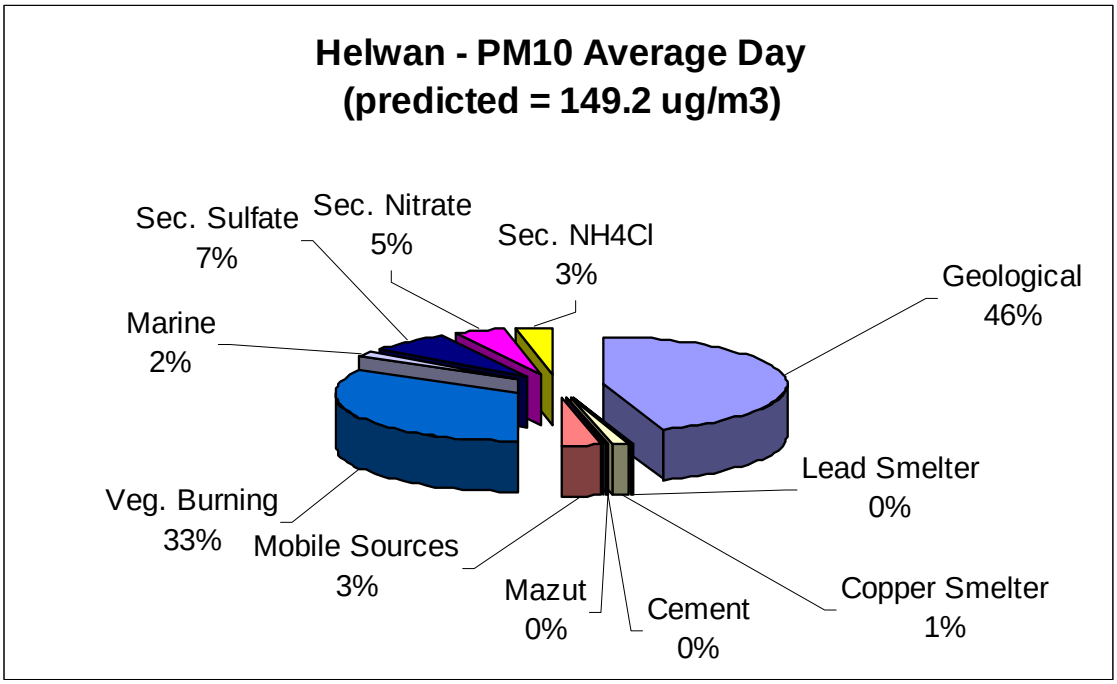


Figure 4-10a. Helwan PM_{10} source apportionment, average day for the fall 1999 intensive study.

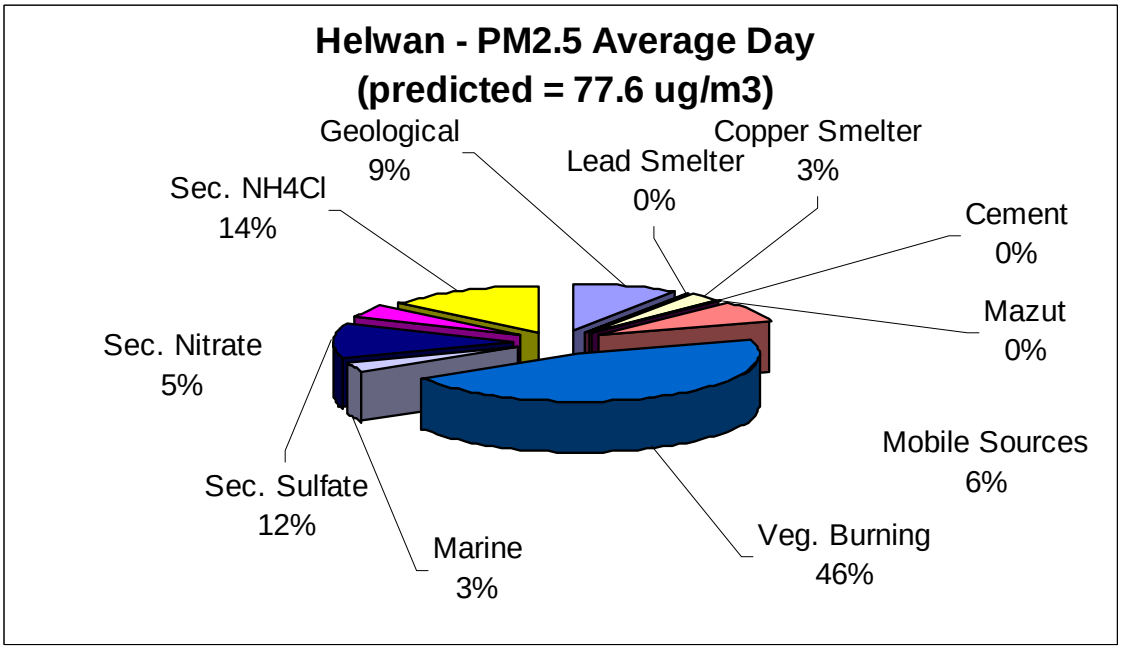


Figure 4-10b. Helwan $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

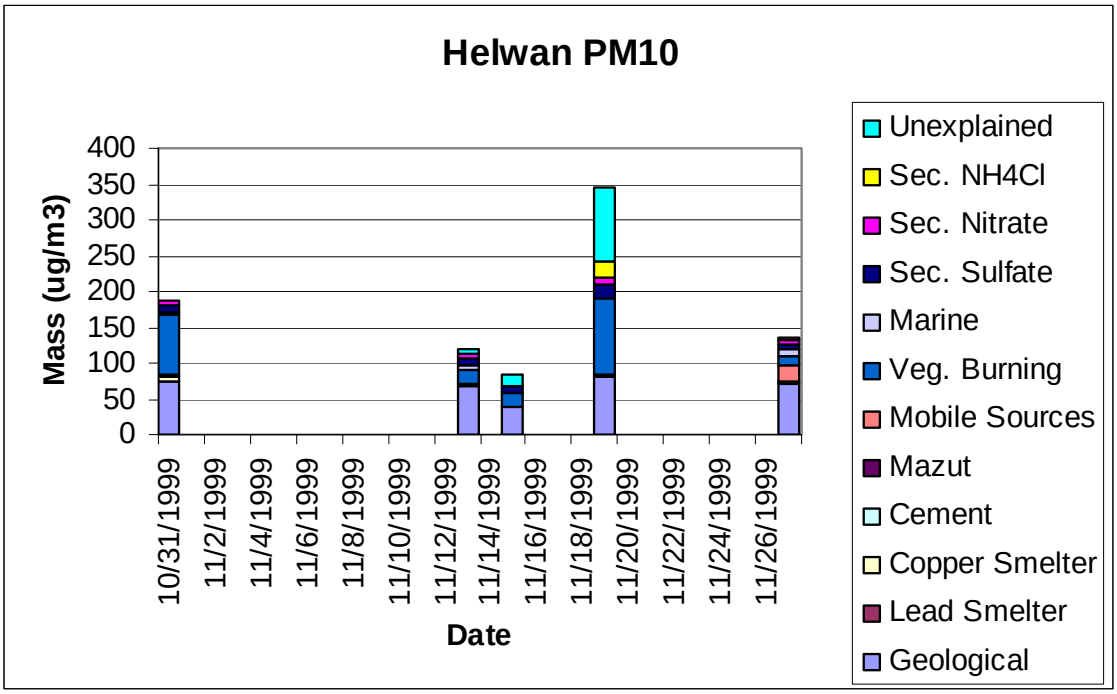


Figure 4-10c. Helwan PM_{10} source apportionment, by day for the fall 1999 intensive study.

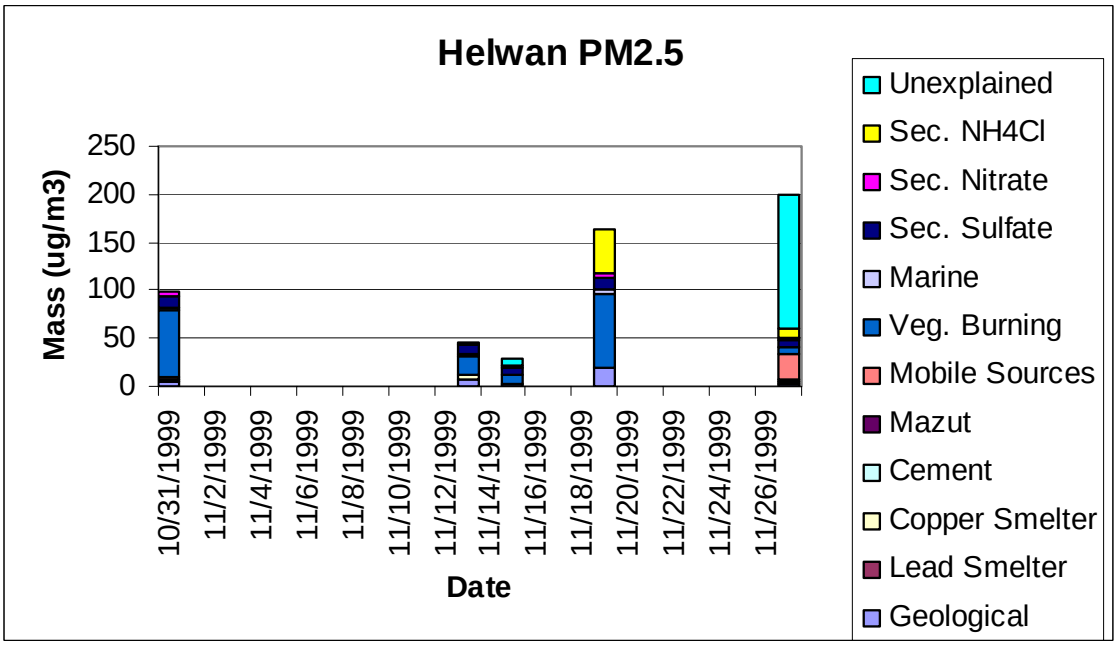


Figure 4-10d. Helwan $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

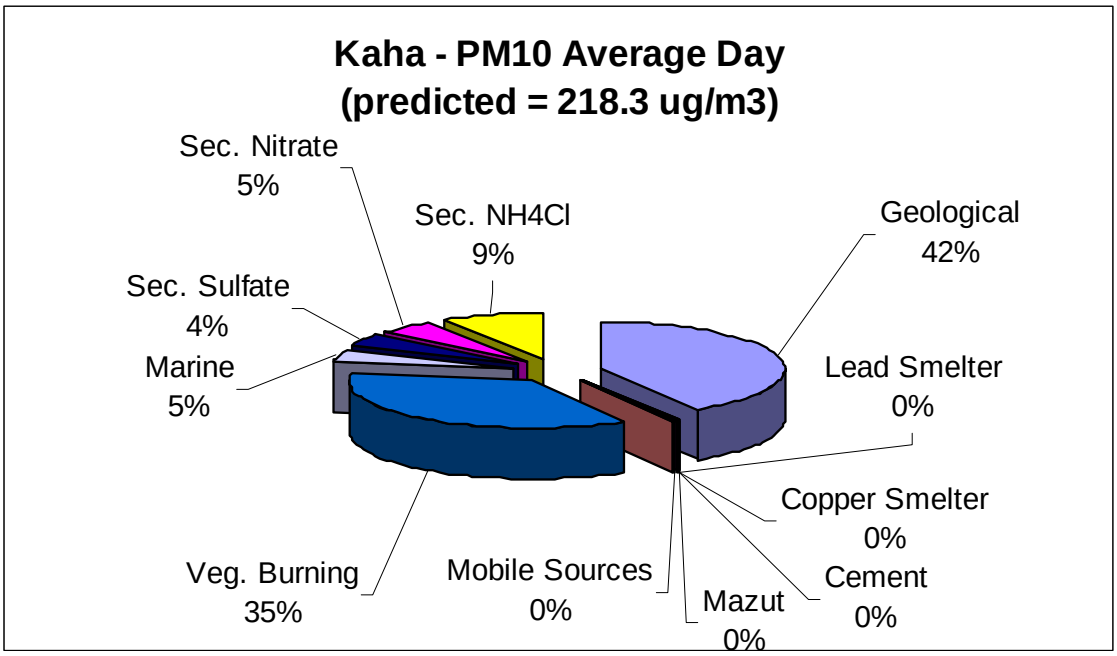


Figure 4-11a. Kaha PM_{10} source apportionment, average day for the fall 1999 intensive study.

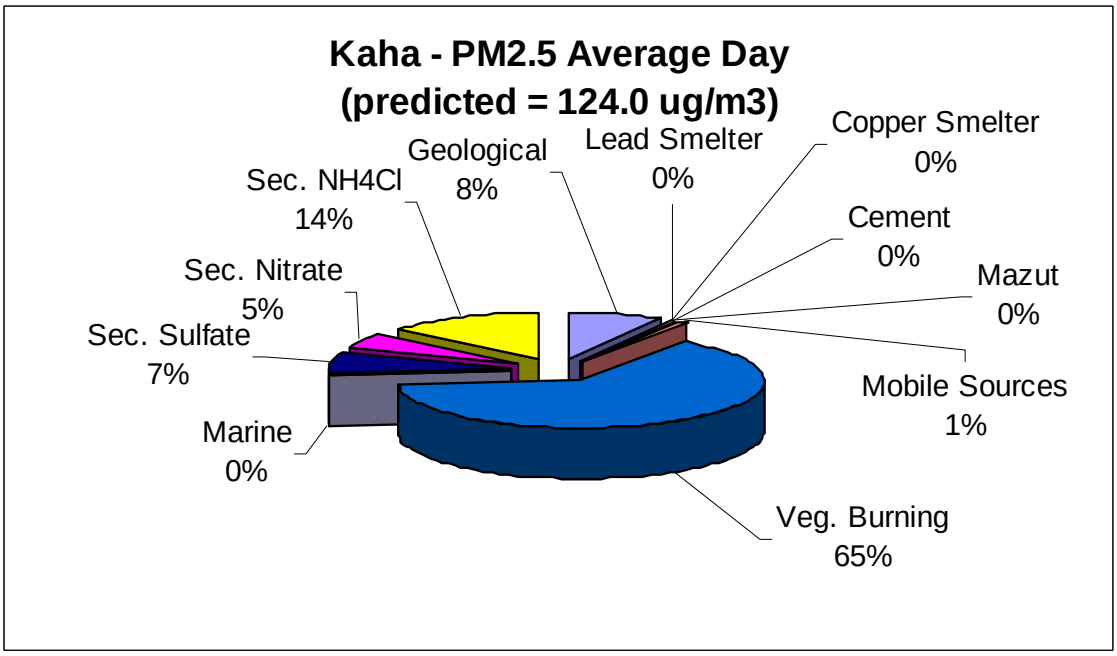


Figure 4-11b. Kaha $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

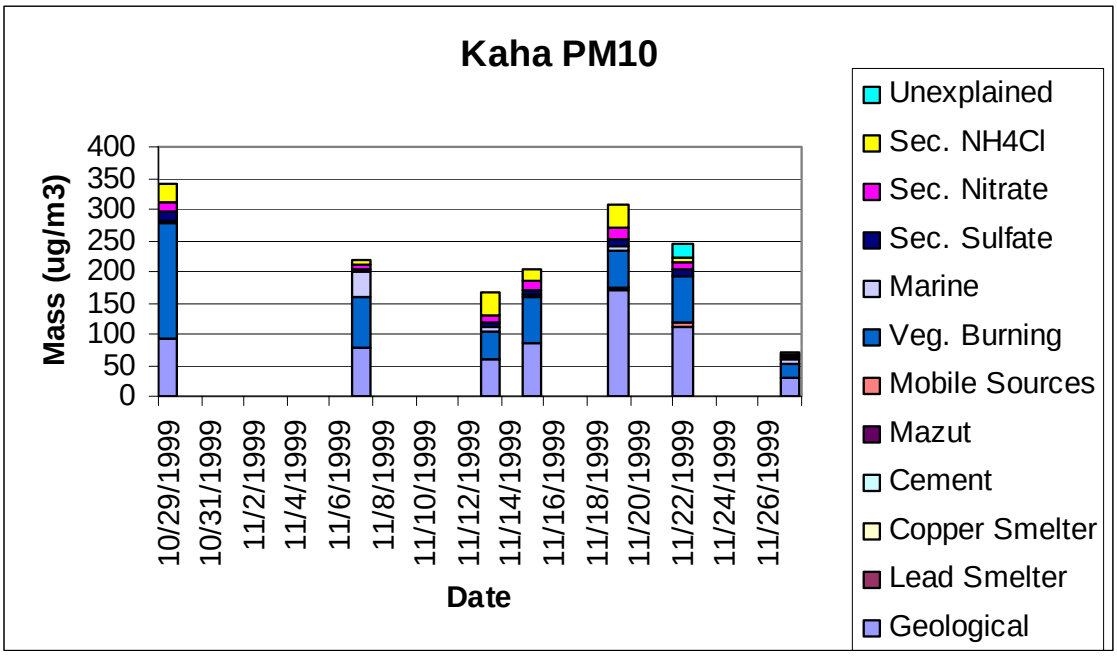


Figure 4-11c. Kaha PM_{10} source apportionment, by day for the fall 1999 intensive study.

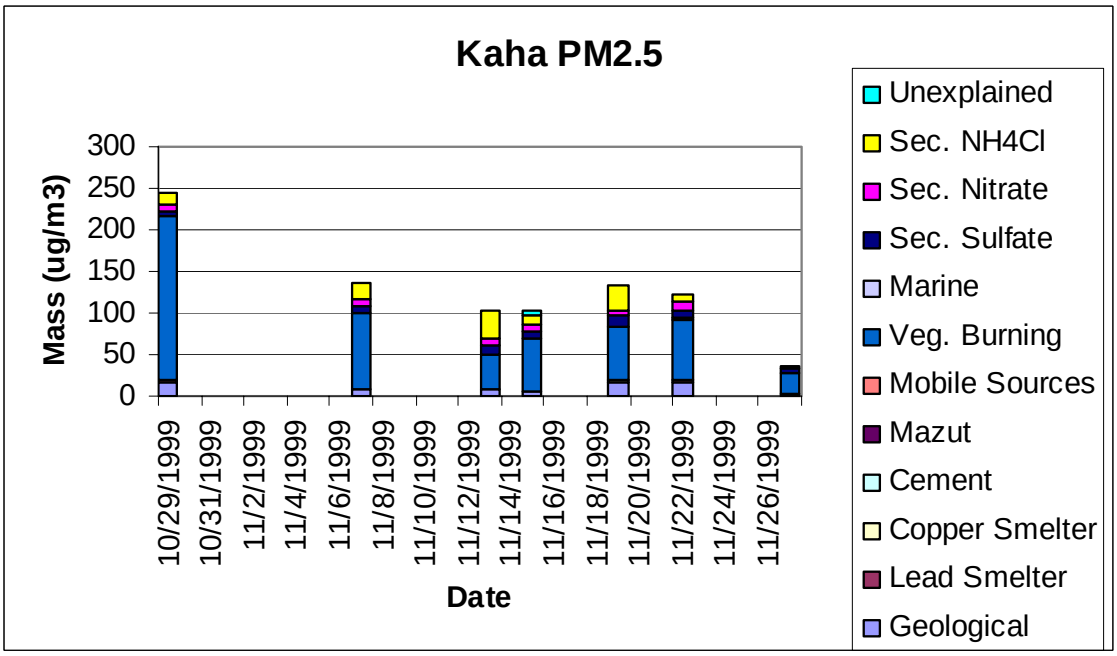


Figure 4-11d. Kaha $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

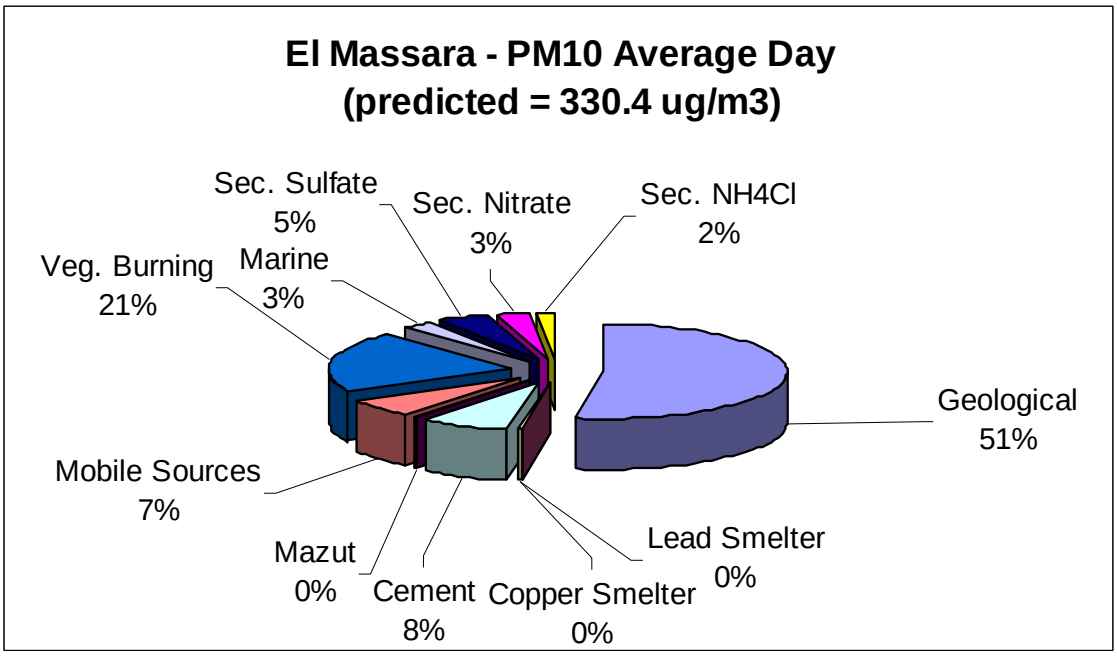


Figure 4-12a. El Massara PM_{10} source apportionment, average day for the fall 1999 intensive study.

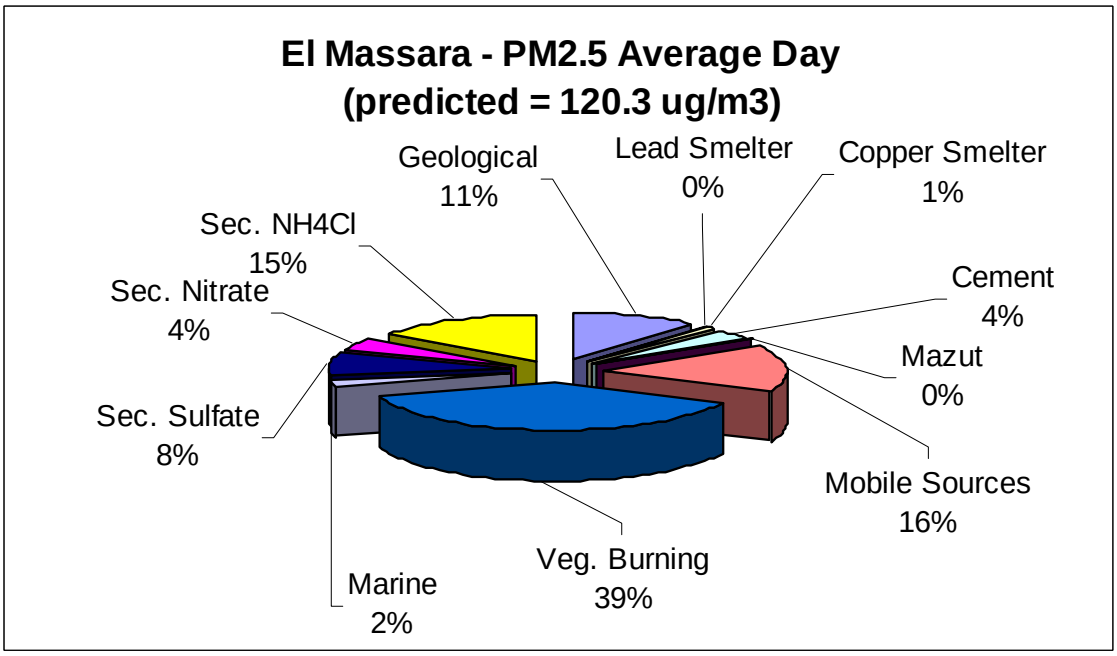


Figure 4-12b. El Massara $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

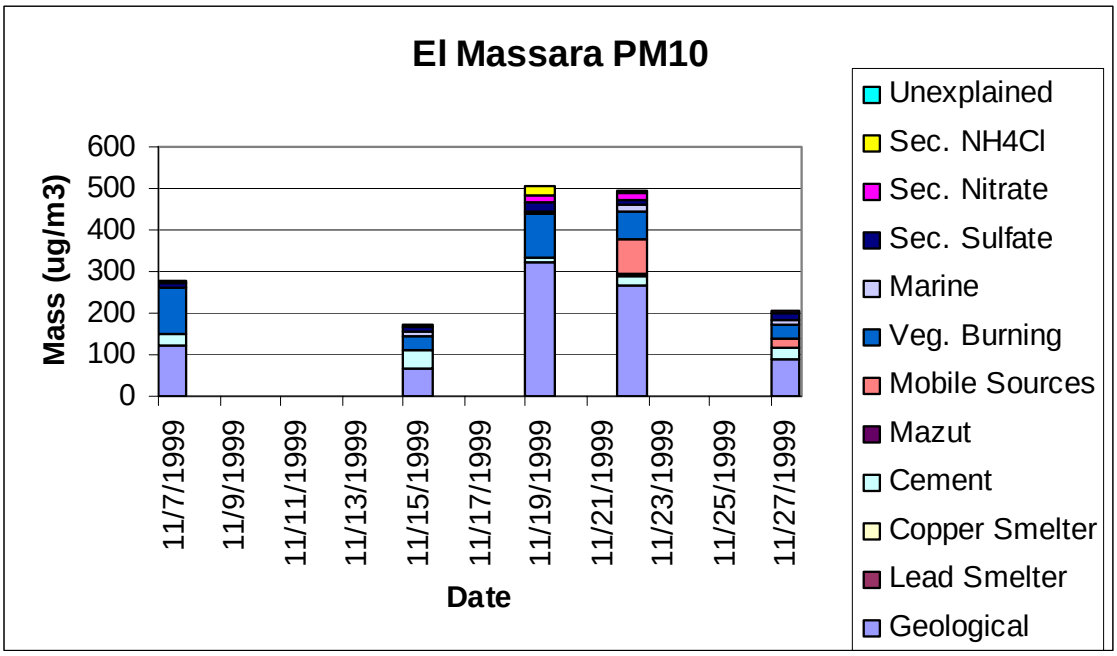


Figure 4-12c. El Massara PM_{10} source apportionment, by day for the fall 1999 intensive study.

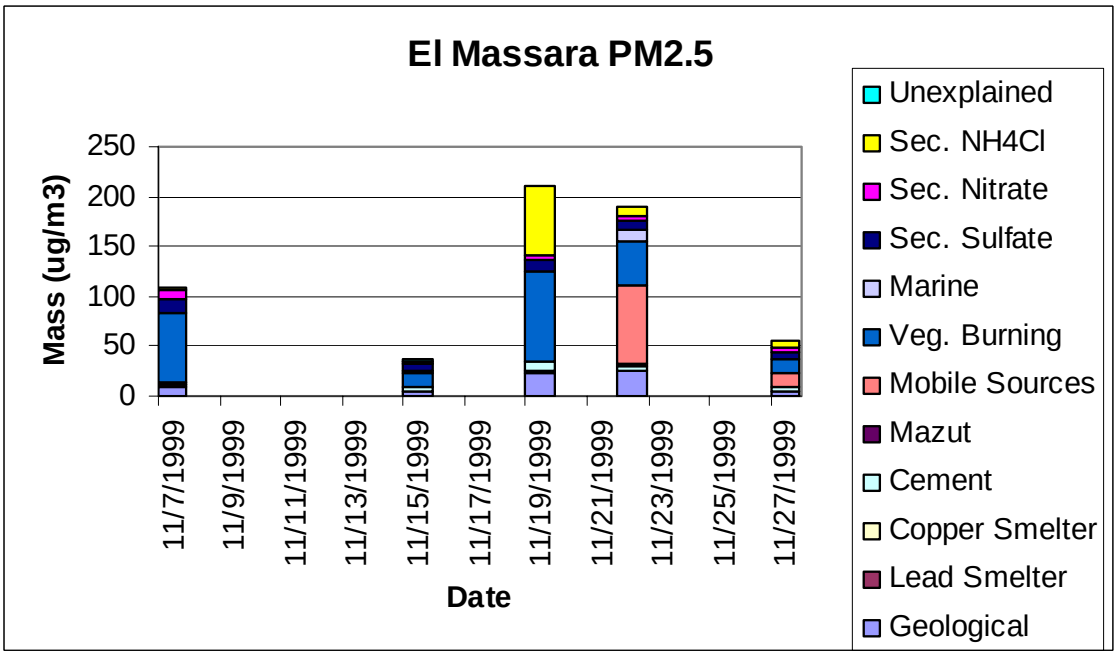


Figure 4-12d. El Massara $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

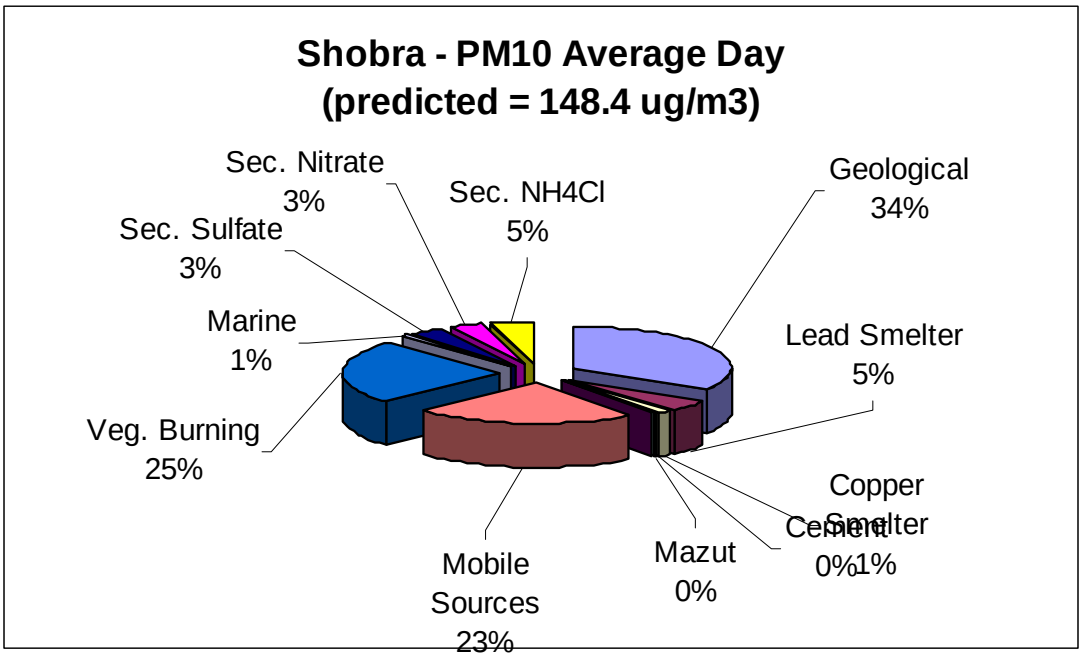


Figure 4-13a. Shobra PM_{10} source apportionment, average day for the fall 1999 intensive study.

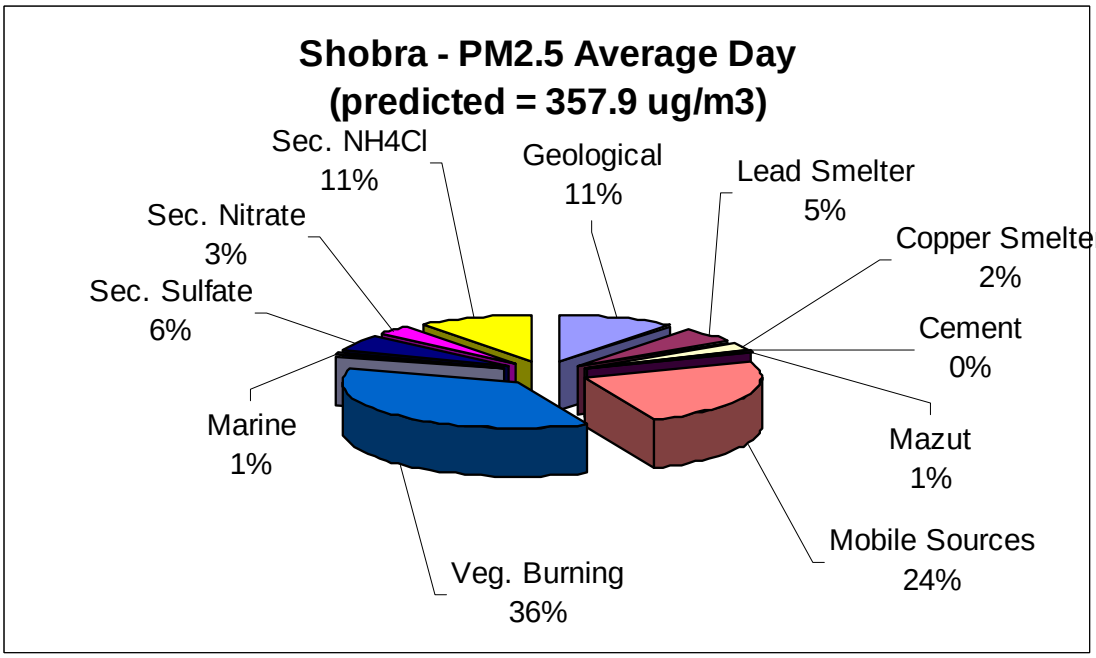


Figure 4-13b. Shobra $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study.

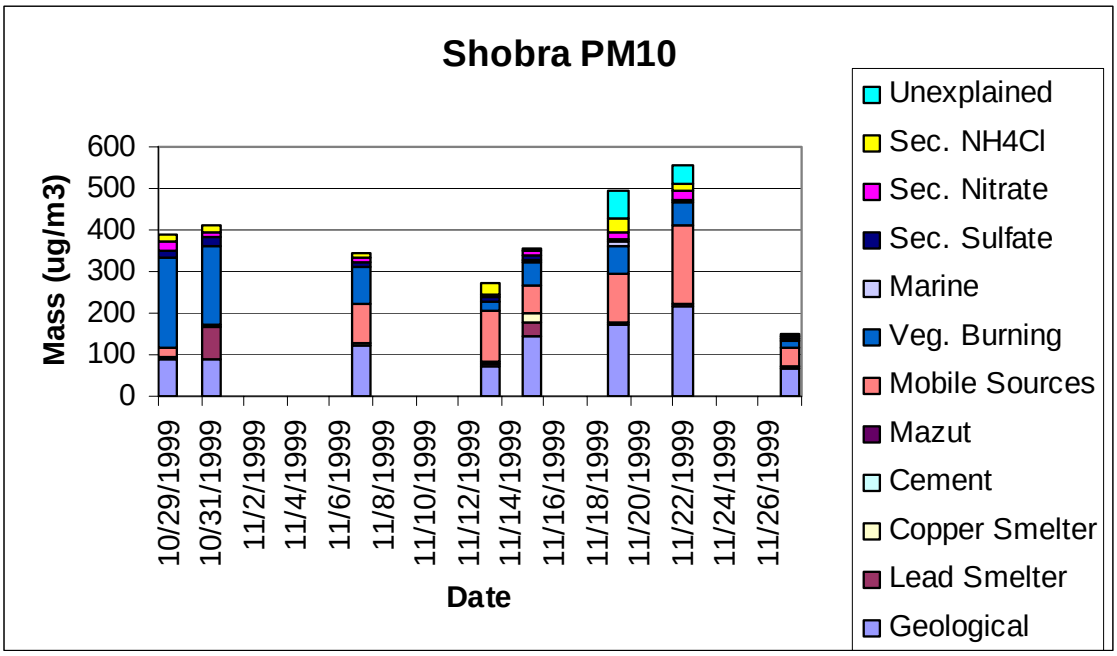


Figure 4-13c. Shobra PM_{10} source apportionment, by day for the fall 1999 intensive study.

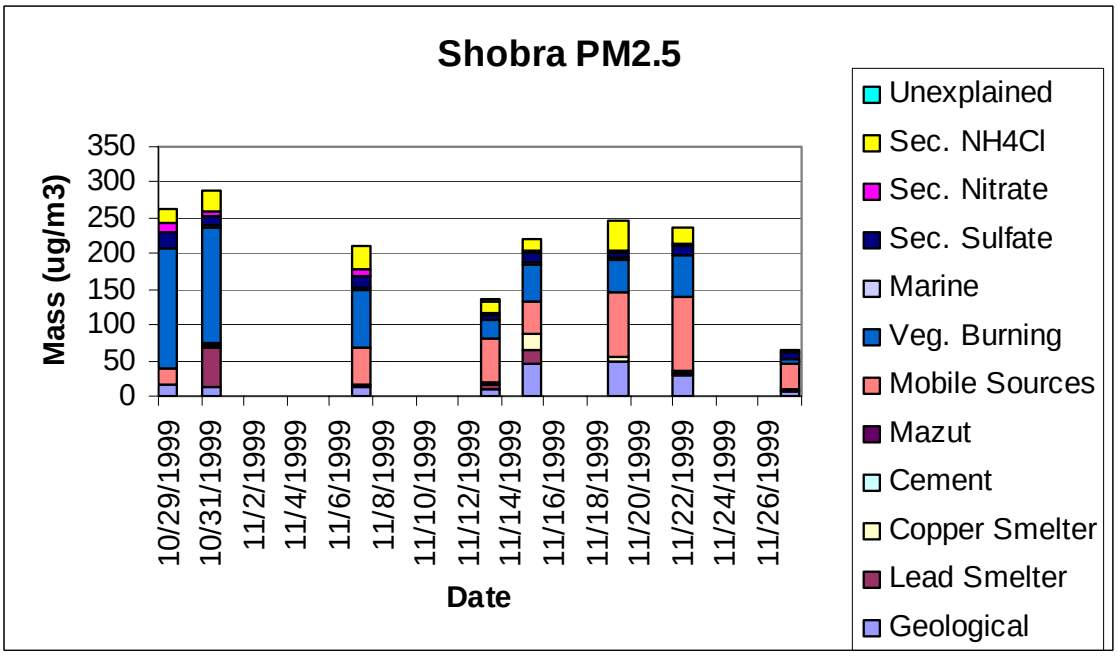


Figure 4-13d. Shobra $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study.

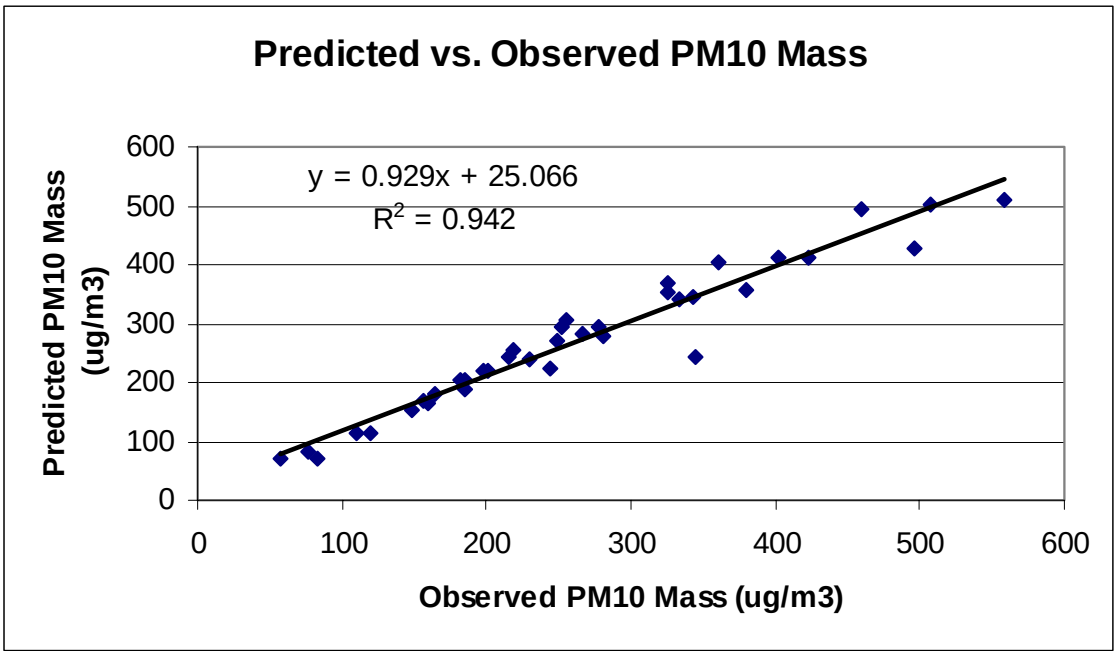


Figure 4-14a. Comparison of predicted vs. measured PM_{10} mass of the fall intensive samples and CMB apportionments.

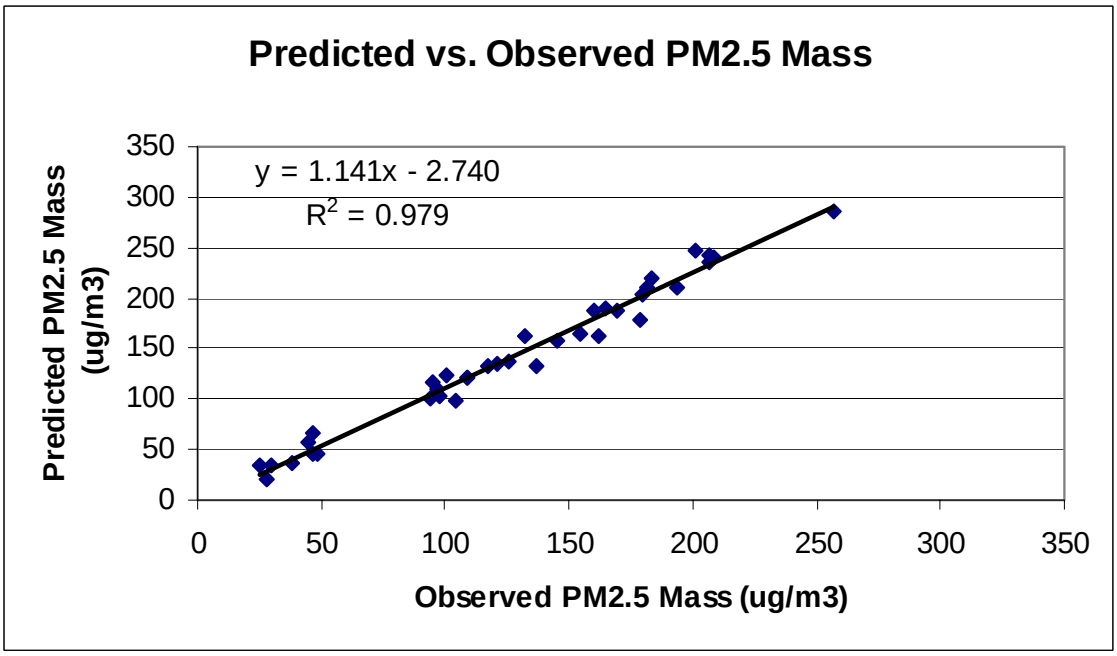


Figure 4-14b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the fall intensive samples and CMB apportionments.

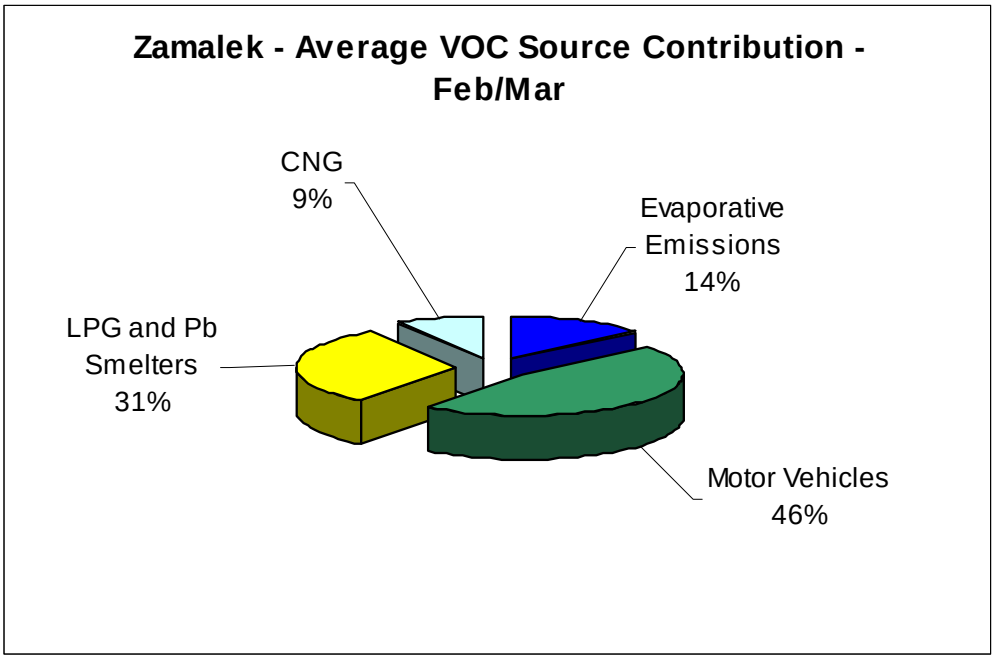


Figure 4-15a. Zamalek VOC source apportionment, average day for the winter 1999 intensive study.

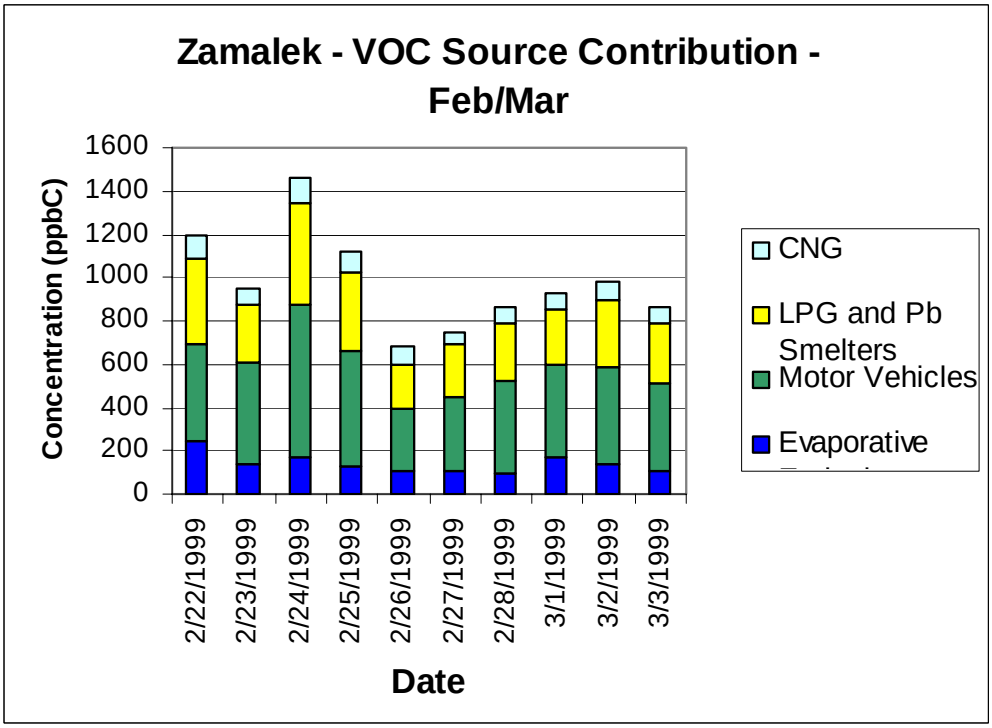


Figure 4-15b. Zamalek VOC source apportionment, by day for the winter 1999 intensive study.

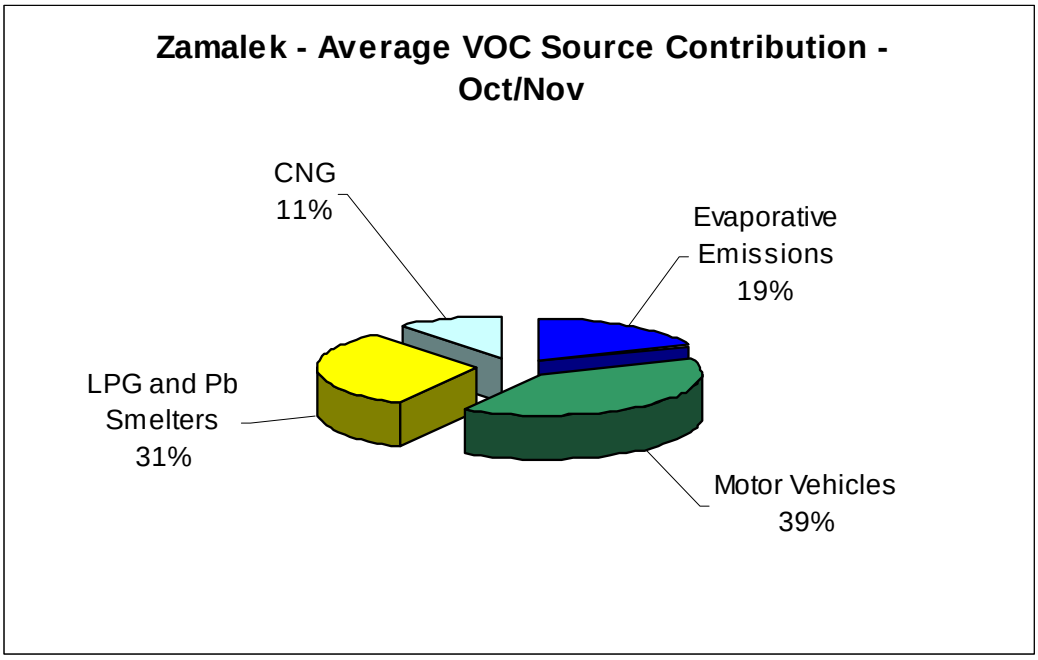


Figure 4-16a. Zamalek VOC source apportionment, average day for the fall 1999 intensive study.

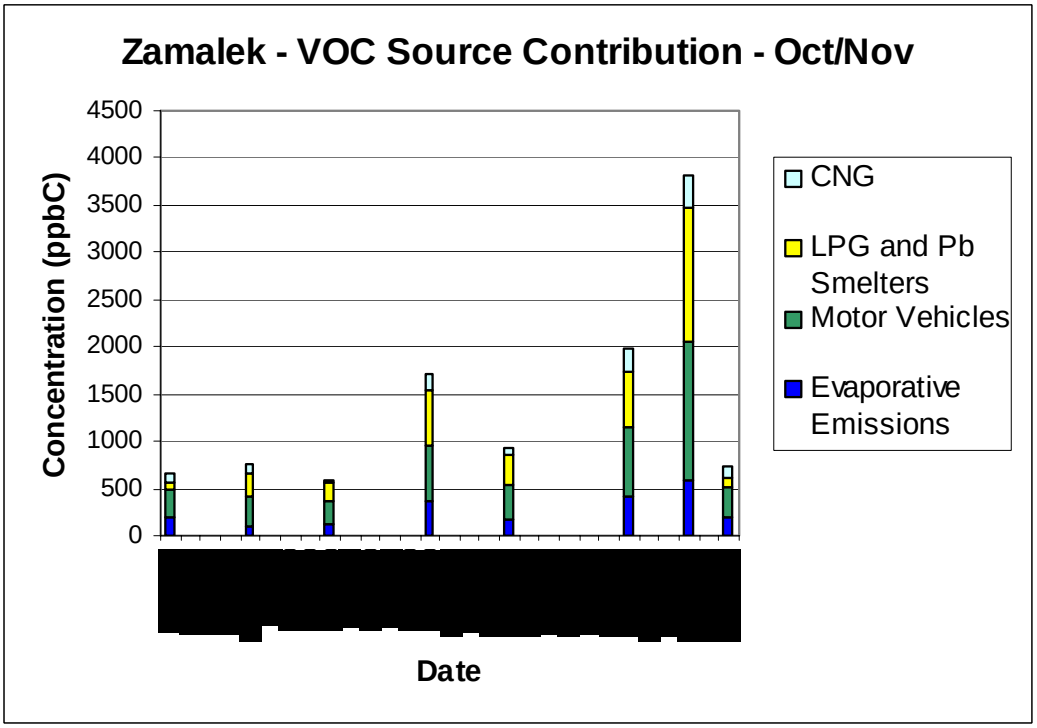


Figure 4-16b. Zamalek VOC source apportionment, by day for the fall 1999 intensive study.

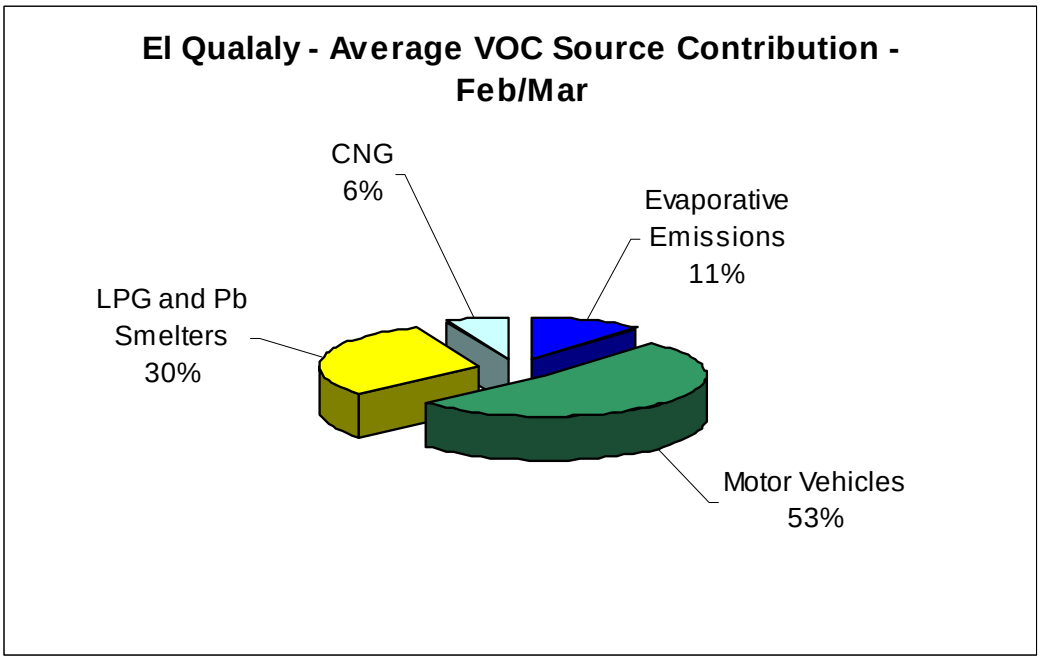


Figure 4-17a. El Qualaly VOC source apportionment, average day for the winter 1999 intensive study.

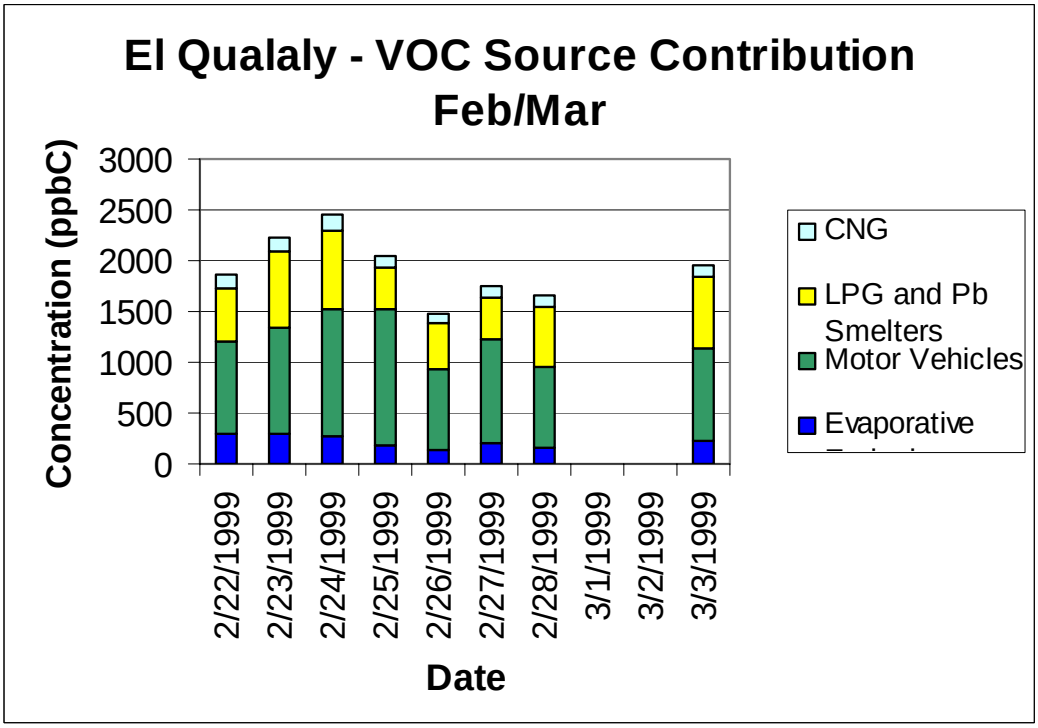


Figure 4-17b. El Qualaly VOC source apportionment, by day for the winter 1999 intensive study.

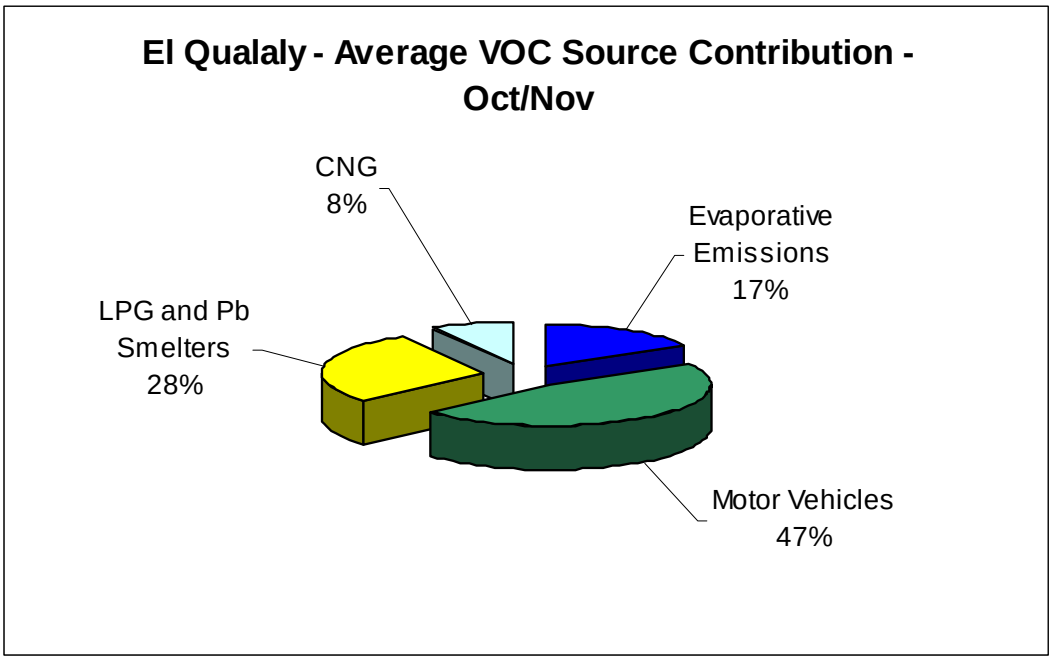


Figure 4-18a. El Qualaly VOC source apportionment, average day for the fall 1999 intensive study.

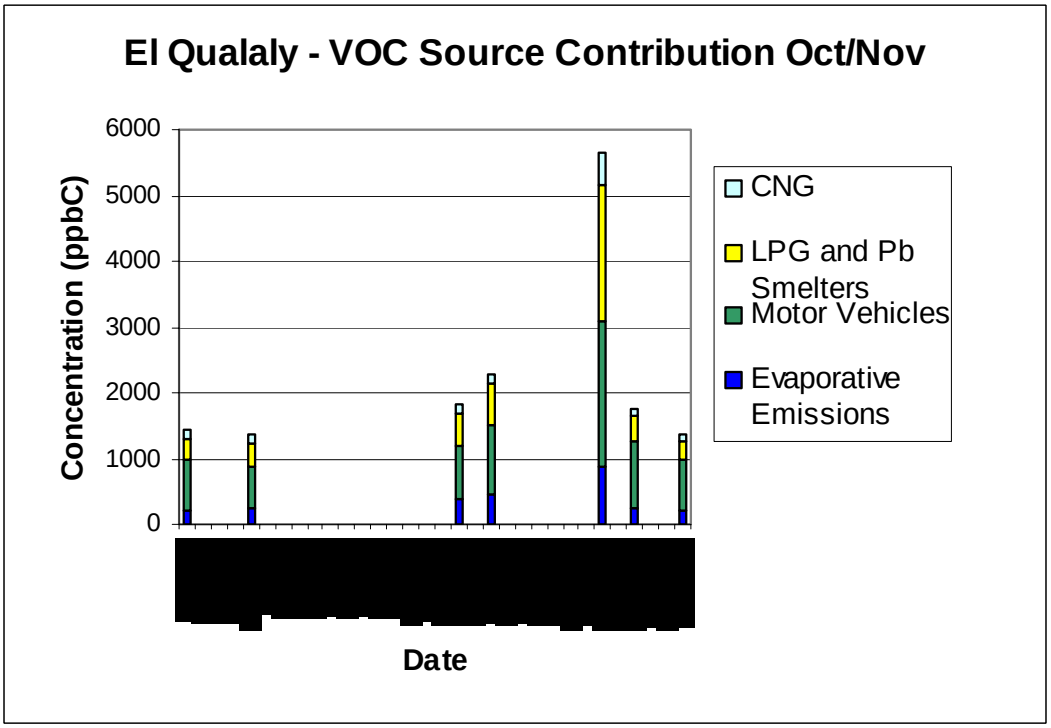


Figure 4-18b. El Qualaly VOC source apportionment, by day for the fall 1999 intensive study.

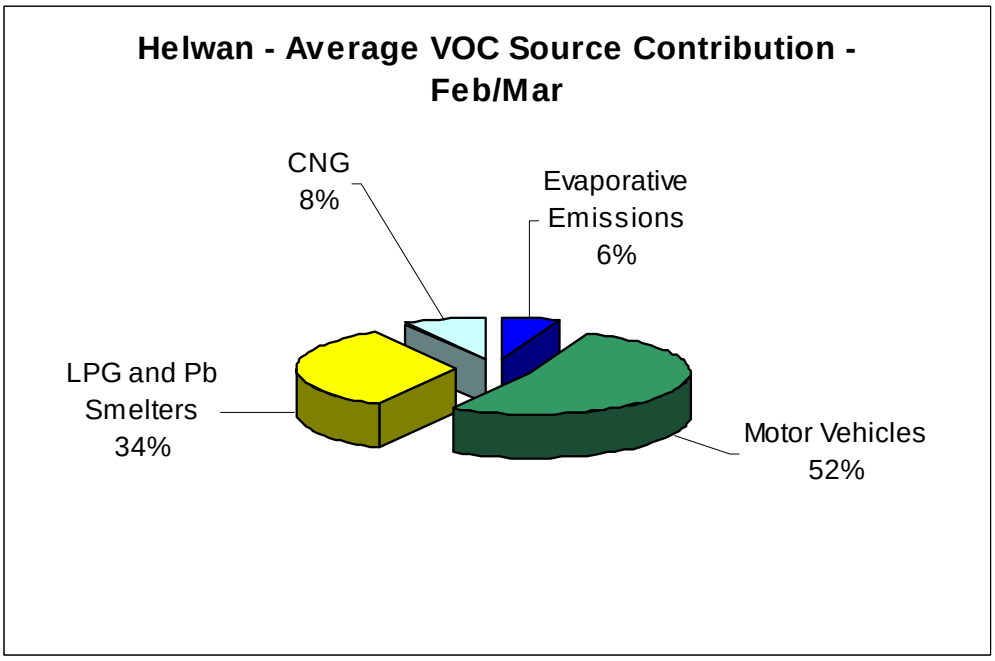


Figure 4-19a. Helwan VOC source apportionment, average day for the winter 1999 intensive study.

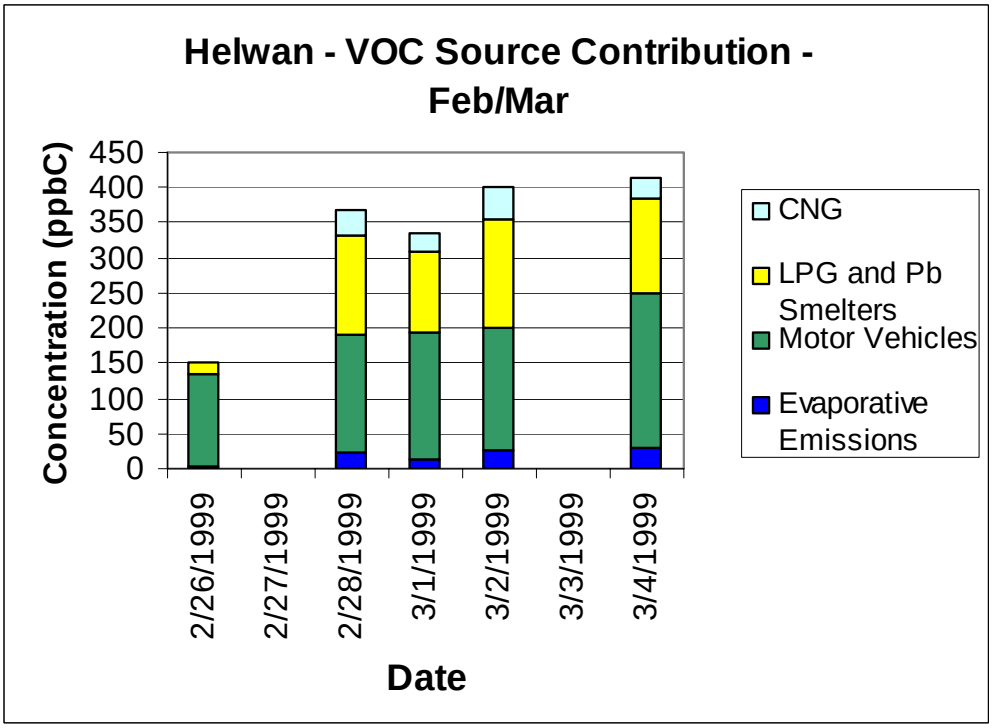


Figure 4-19b. Helwan VOC source apportionment, by day for the winter 1999 intensive study.

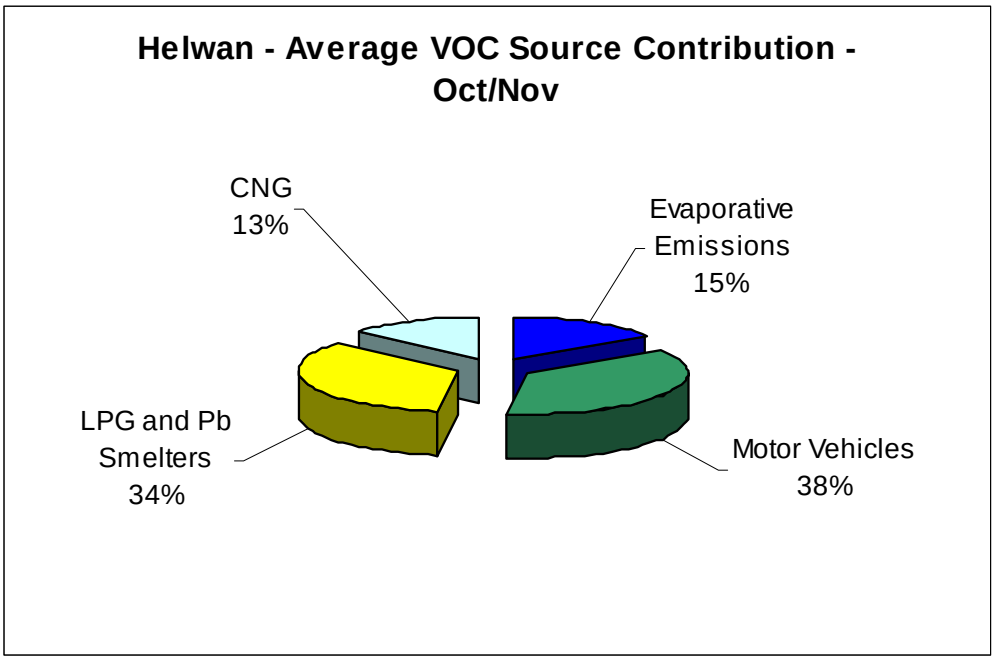


Figure 4-20a. Helwan VOC source apportionment, average day for the fall 1999 intensive study.

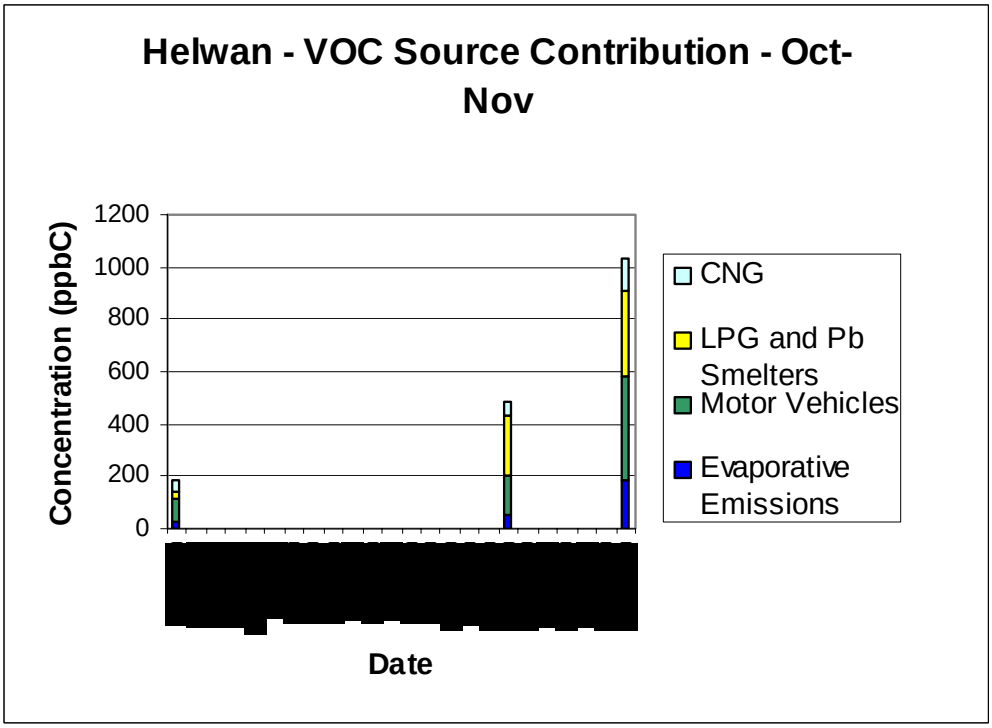


Figure 4-20b. Helwan VOC source apportionment, by day for the fall 1999 intensive study.

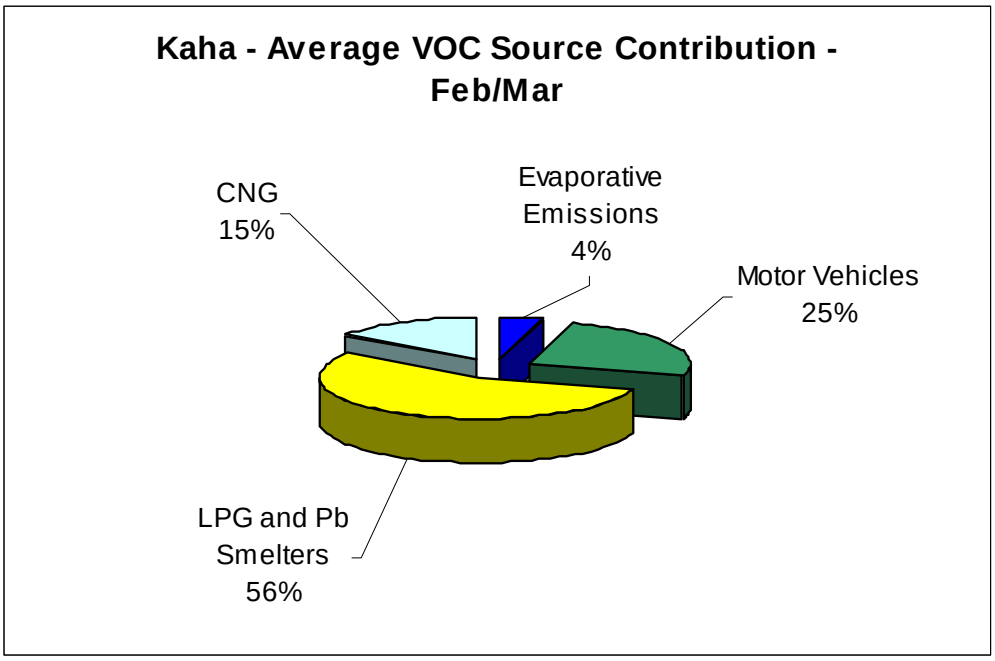


Figure 4-21a. Kaha VOC source apportionment, average day for the winter 1999 intensive study.

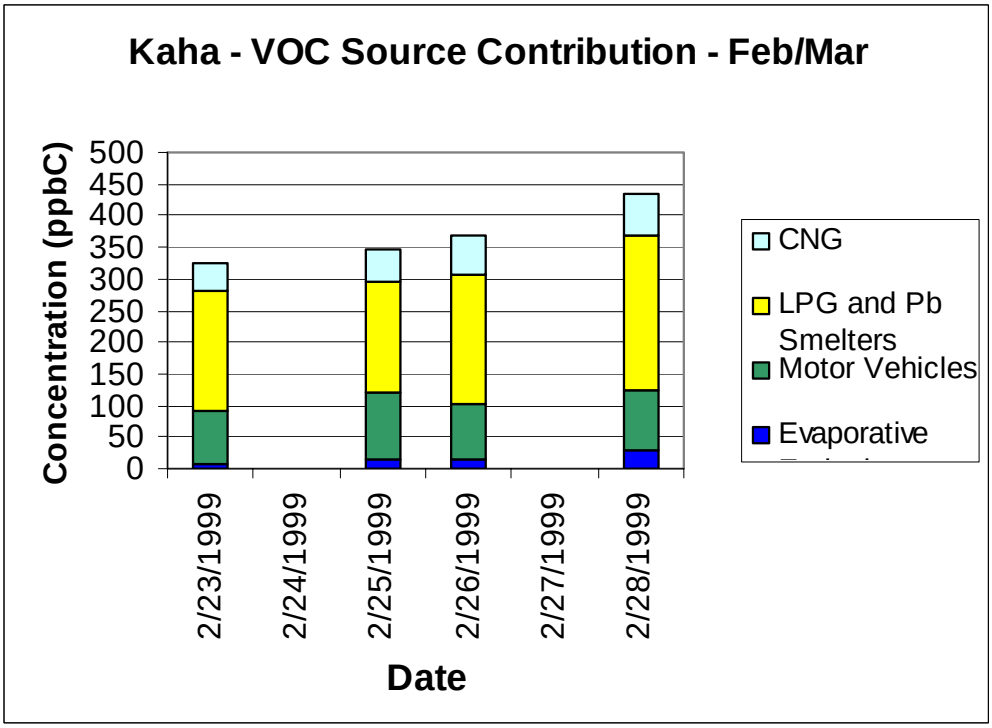


Figure 4-21b. Kaha VOC source apportionment, by day for the winter 1999 intensive study.

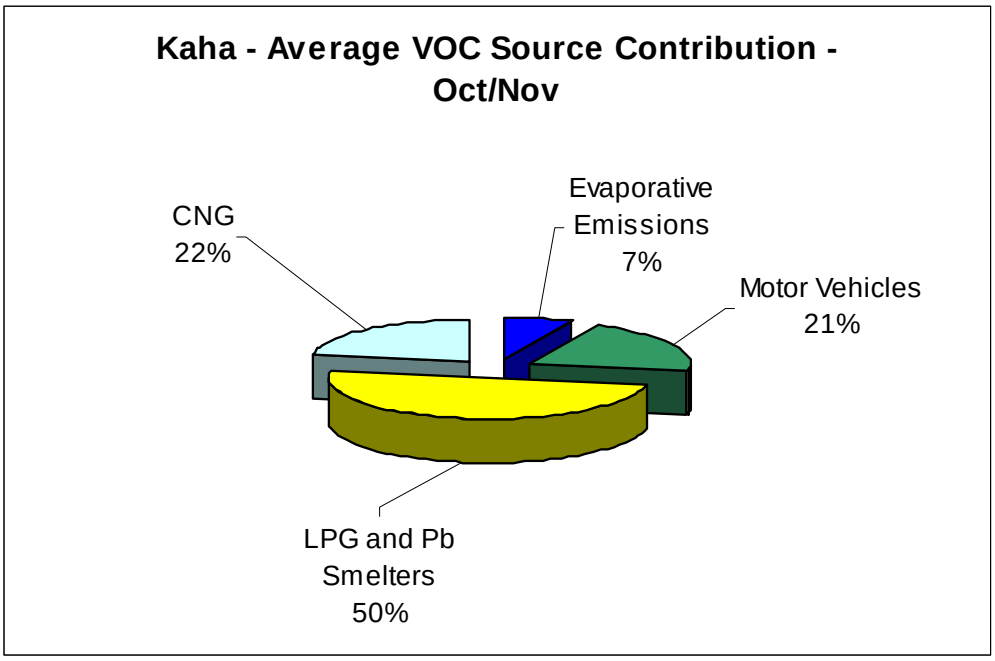


Figure 4-22a. Kaha VOC source apportionment, average day for the fall 1999 intensive study.

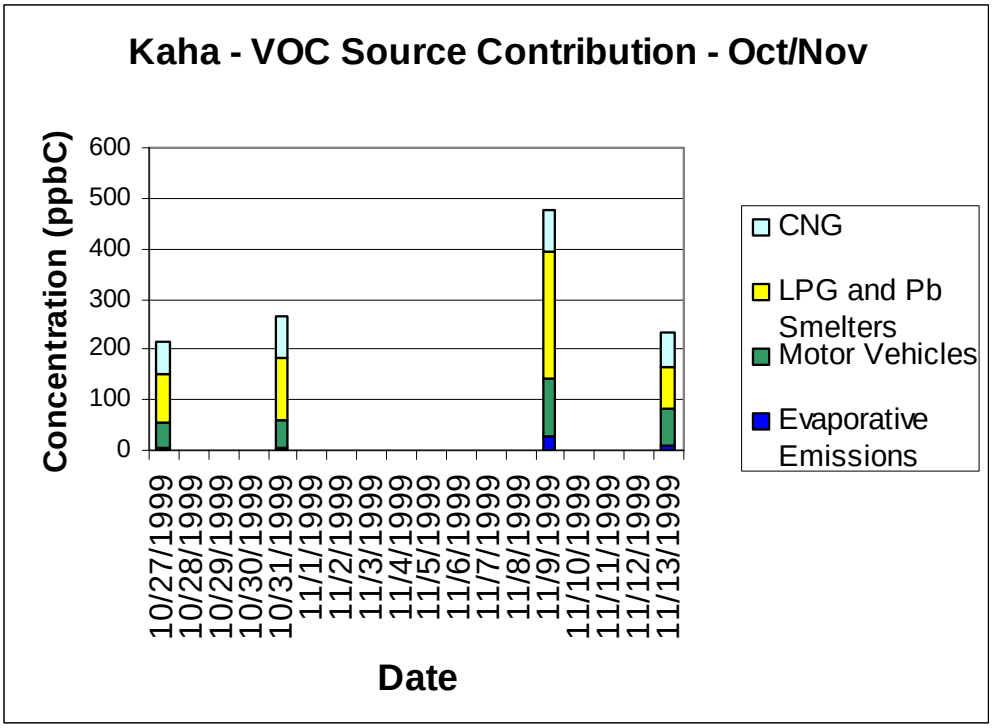


Figure 4-22b. Kaha VOC source apportionment, by day for the fall 1999 intensive study.

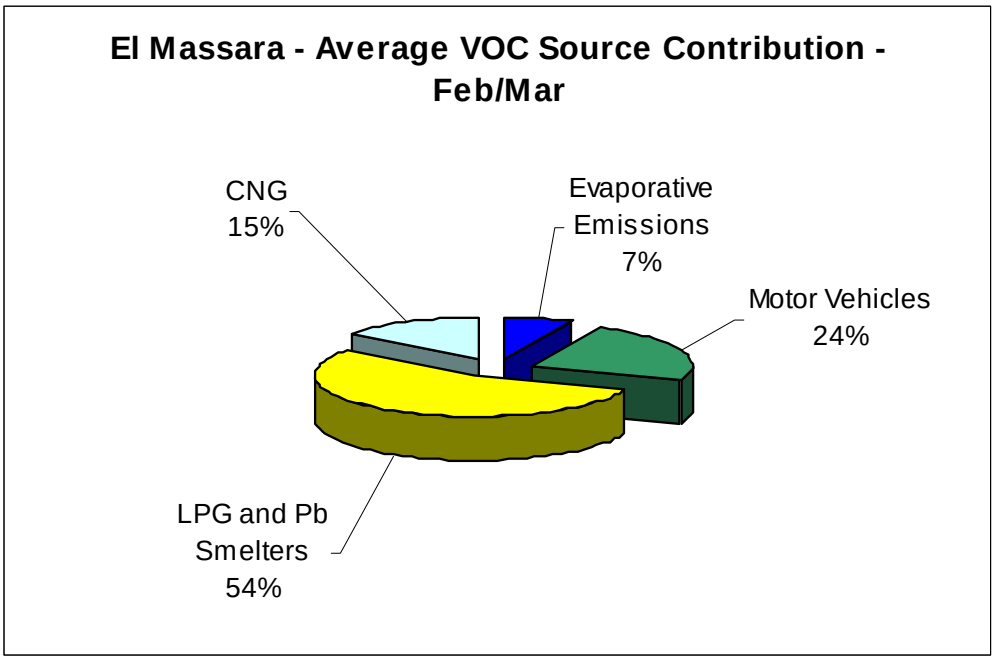


Figure 4-23a. El Massara VOC source apportionment, average day for the winter 1999 intensive study.

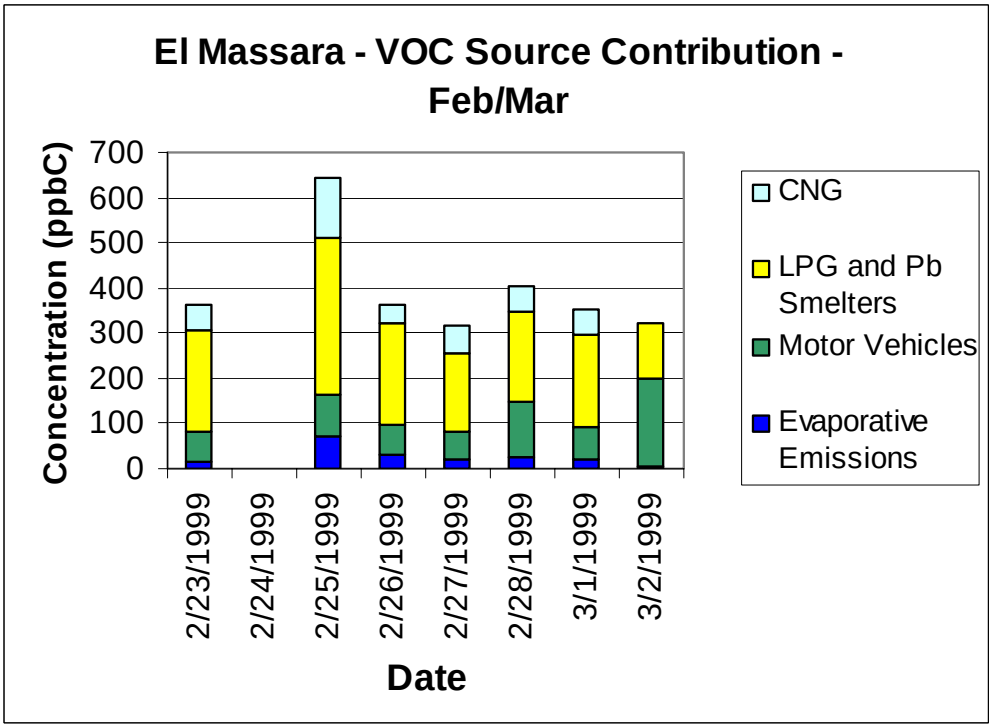


Figure 4-23b. El Massara VOC source apportionment, by day for the winter 1999 intensive study.

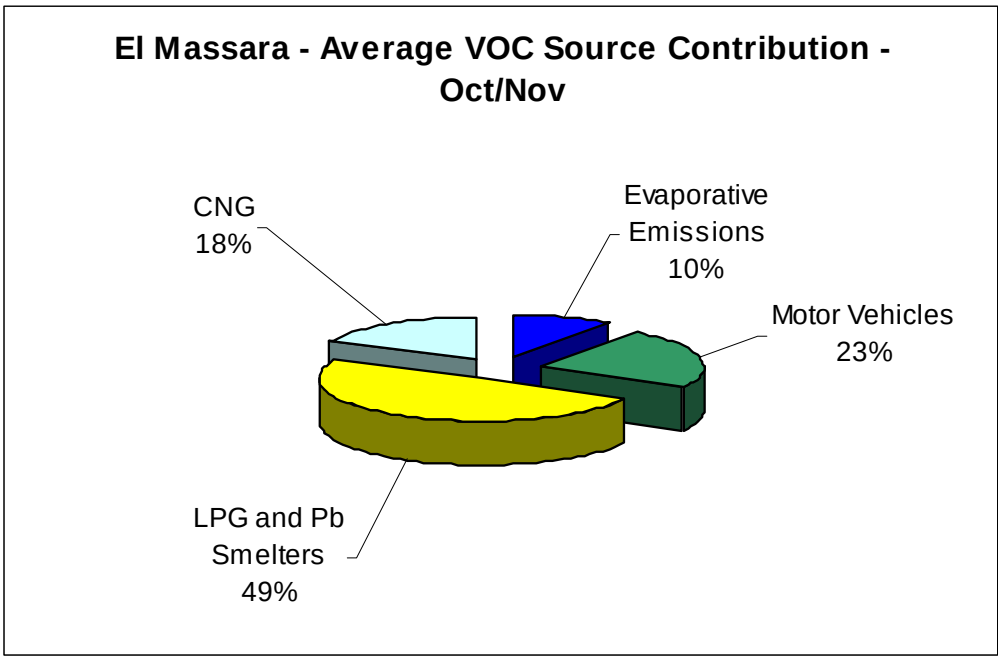


Figure 4-24a. El Massara VOC source apportionment, average day for the fall 1999 intensive study.

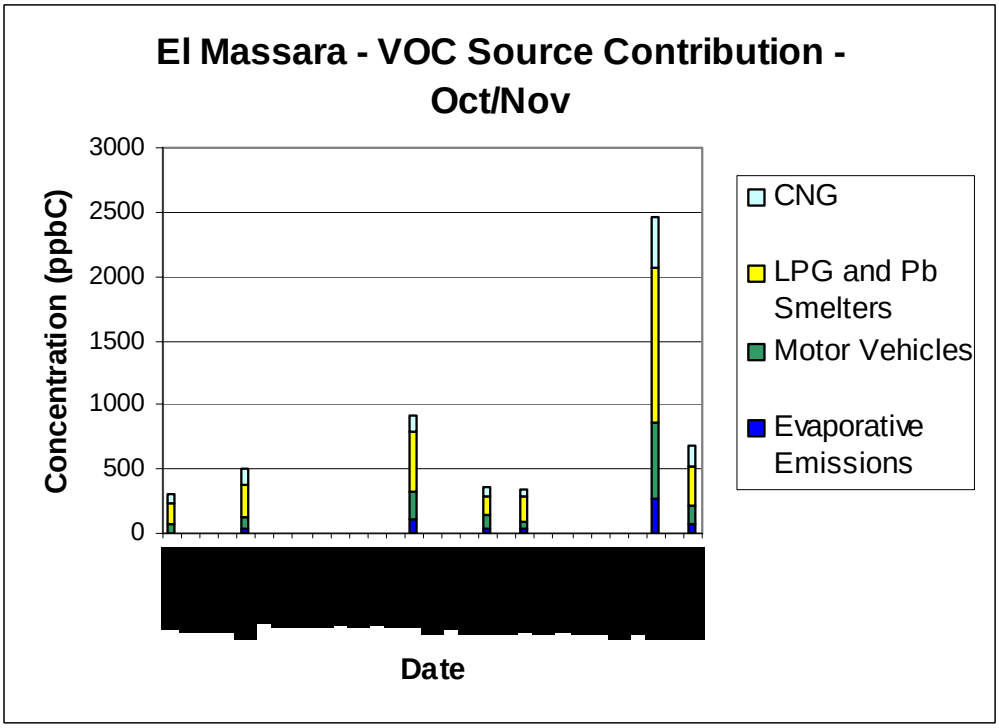


Figure 4-24b. El Massara VOC source apportionment, by day for the fall 1999 intensive study.

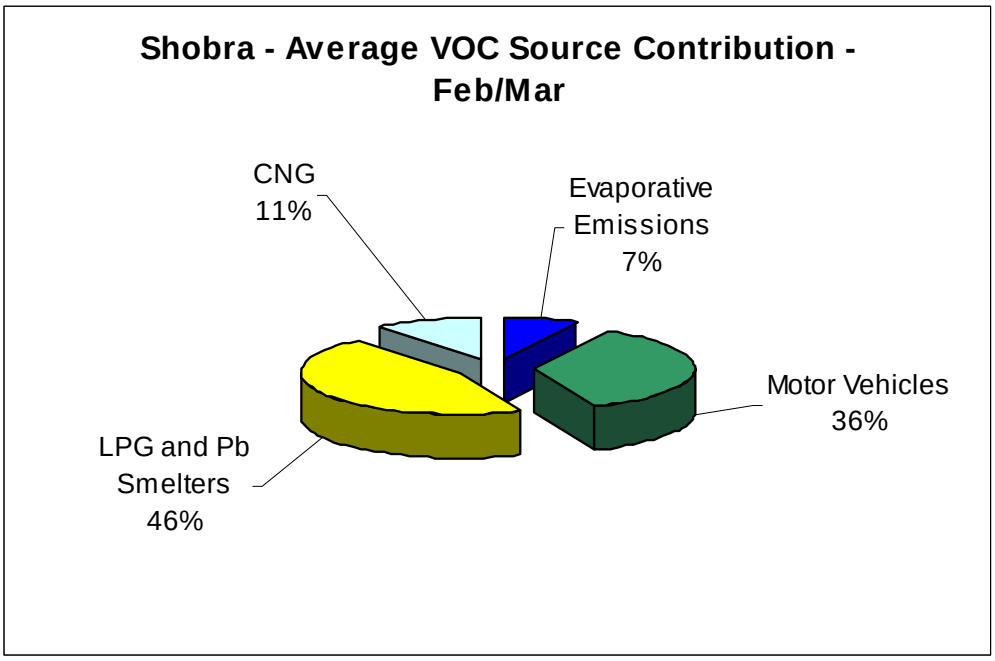


Figure 4-25a. Shobra VOC source apportionment, average day for the winter 1999 intensive study.

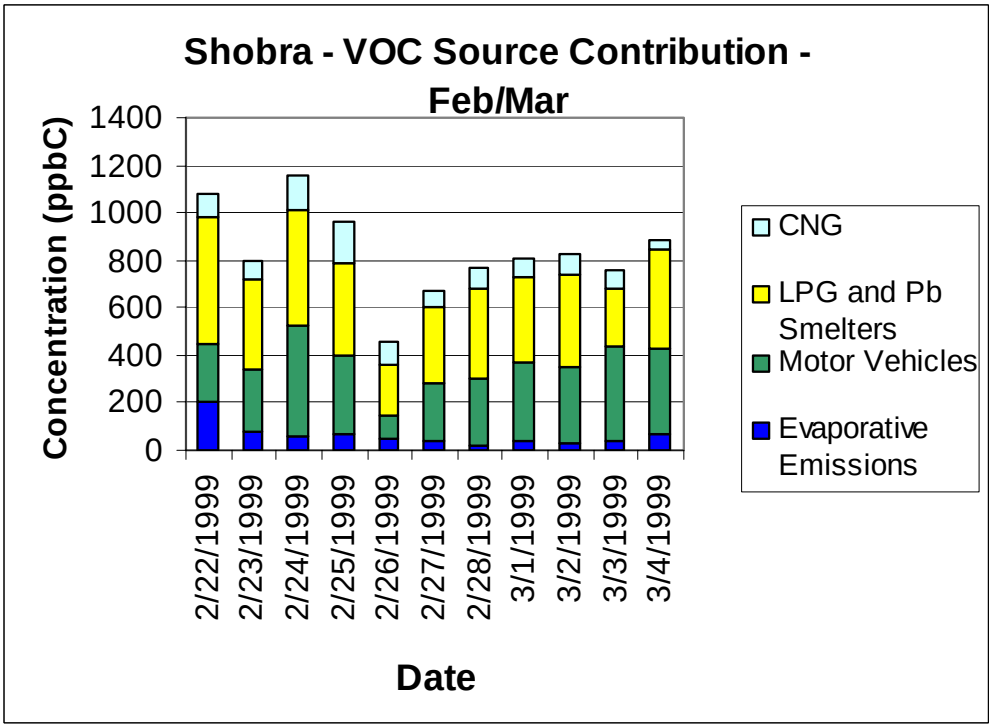


Figure 4-25b. Shobra VOC source apportionment, by day for the winter 1999 intensive study.

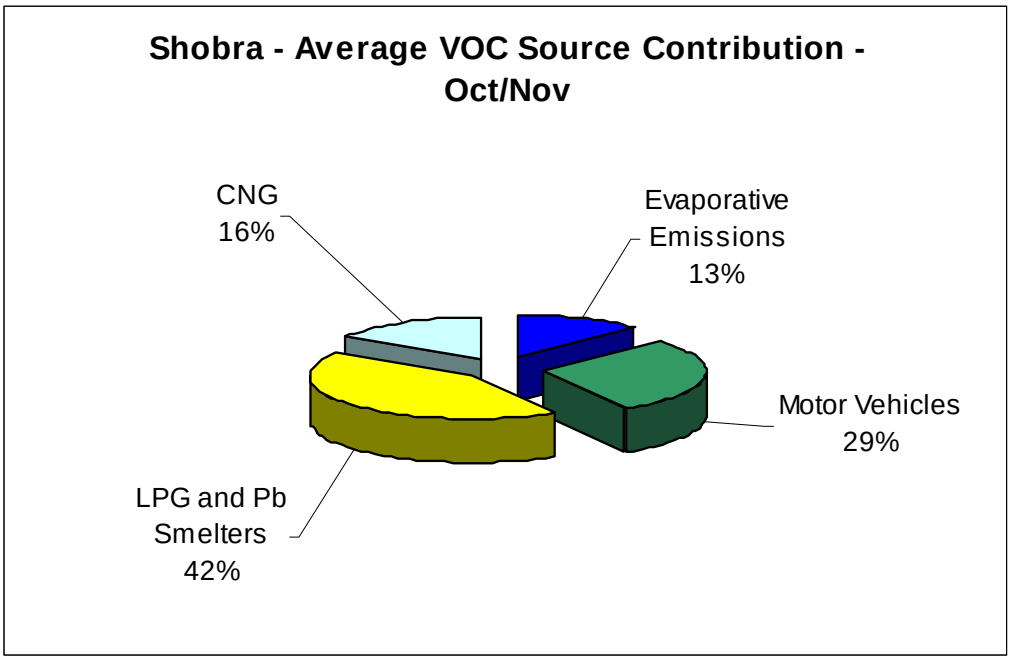


Figure 4-26a. Shobra VOC source apportionment, average day for the fall 1999 intensive study.

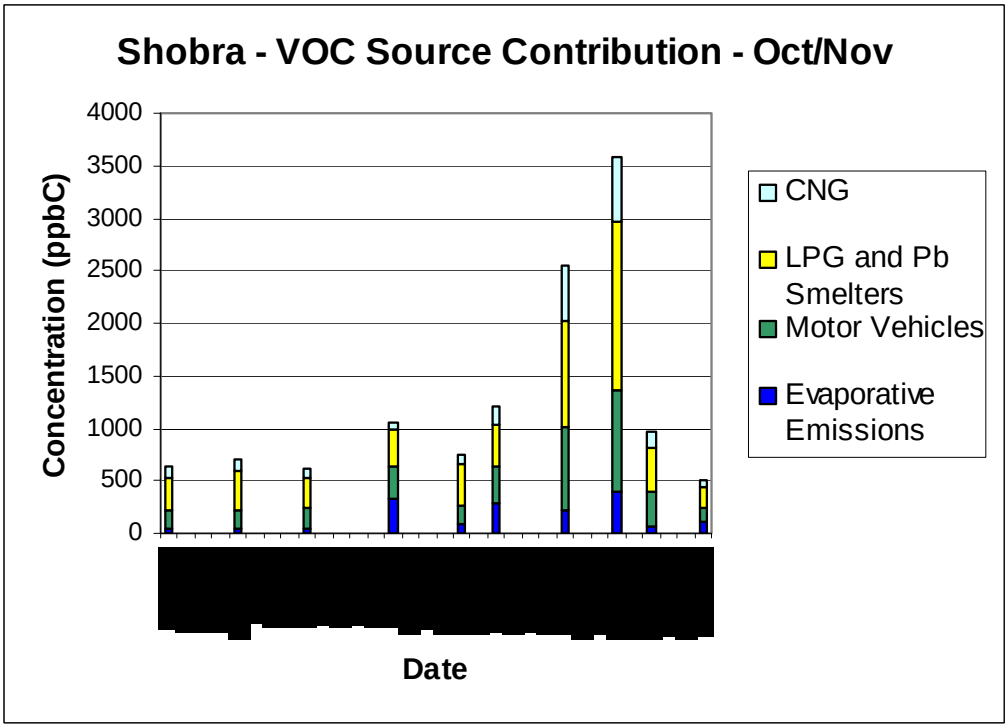


Figure 4-26b. Shobra VOC source apportionment, by day for the winter 1999 intensive study.

5 PM AND LEAD CMB RESULTS USING CAIP SOURCE PROFILES

In November 2000, CAIP personnel sampled additional source emissions in Cairo for the purpose of producing source profiles for the CMB source apportionment. The source types sampled were: 1) gasoline and diesel motor vehicles; 2) agricultural burning of maze and rice; 3) restaurants; 4) lead smelter; 5) Mazut oil combustion; 6) refuse burning; and 7) ammonia and chlorine sources. These samples were all analyzed for mass, elements, ions, organic and elemental carbon, and PAHs. The goal of this effort was to produce a suite of source profiles determined specifically for the Cairo air shed and apply these profiles in CMB modeling to the winter and fall, 1999 ambient sample data. It was also hoped that by including the PAHs in this analysis, better source resolution could be obtained, particularly with respect to the combustion sources.

Upwind and downwind samples were collected for Mazut, lead smelter, and restaurant sources. It was found that the upwind samples did not adequately represent the effective background for the downwind samples. Therefore, only the downwind samples were used to construct source profiles for these sources. We combined the new source profiles with the previously determined CAIP source profiles shown in Table 4-1. The new set of source profiles is described in Table 5-1. The $PM_{2.5}$ and PM_{10} profiles, including PAH, are shown in Tables 5-2 and 5-3, respectively. Only non-reactive PAH are included in these tables. The reactive PAHs must be excluded from the CMB analysis because their compositions will not be conserved between the source and ambient receptor locations.

Preliminary CMB tests with the new source profiles showed that the model performed well when only particulate PAH, i.e., those heavier than and including retene, were used. The lighter PAHs are semi-volatile, that is they appear in both particle and gas phases. Gases and particles may have different residence times, which could lead to lack of conservation of source profile composition. Conservation of source profile composition is a primary requirement for applying the CMB model.

The new gasoline and diesel vehicle profiles are not sufficiently different, even considering the PAH, to distinguish their contributions to ambient PM. As shown in the Figure 5-1, a log-log plot of the new diesel versus the new gasoline profile, the two are highly correlated. This is apparent from the EC and OC (elemental and organic carbon) compositions of the two profiles: 26 and 63% in the diesel profile versus 25 and 63% in the gasoline profile (see Tables 5-2 and 5-3). We attempted to resolve gasoline and diesel vehicle contributions by creating averages of the new diesel (DIESAVE) and

gasoline vehicle (MVGASAVE) profiles using different proportions of each. Thus, MV7525 is 75% diesel and 25% gasoline, MV5050 is 50% diesel and 50% gasoline, and MV2575 is 25% diesel and 75% gasoline. The combination which produced the best fit (according to the R/U statistic) to both EC and OC in the ambient samples was used. Unfortunately, the differences in the fit obtained with the different diesel/gasoline vehicle combinations were smaller than the uncertainties in the profiles and ambient measurements. That is to say, the goodness of fit was not affected by which profile was used. Therefore, the final results are presented as a combination of all motor vehicle (diesel plus gasoline vehicle) contributions.

As noted previously, the high concentrations of soluble potassium (K^+) in Cairo suggests a significant contribution by the burning of vegetative material. However, most of the CAIP refuse and agricultural source profiles are not sufficiently enriched in K^+ to explain its high ambient concentrations. In the initial source apportionments, we used a U.S. vegetative burning profile (VEGB1) with a K^+ composition of 4%. By contrast, the CAIP rice burning profile contained only 0.5% K^+. The maze burning profile contains 2% K^+ but maze burning is not expected to contribute significantly during the periods of the intensive ambient sampling periods.

An equally important problem is the fact that the relative abundances of EC and OC in the CAIP refuse and vegetative burning profiles don't match those in the ambient samples. For example, during winter, the average ambient EC/OC ratio was 0.66±0.25% (it was 0.31±0.16% in fall). The EC/OC ratios in the new CAIP diesel and gasoline vehicle profiles are both about 0.40. However, the EC/OC ratios in the new CAIP refuse, vegetative burning, and restaurant profiles are less than 0.08. Using these profiles results in an overprediction of OC and underprediction of EC. Furthermore, the motor vehicle and vegetative burning profiles are also collinear, mainly because the soluble potassium compositions in the vegetative burning profiles are not high enough. There is clearly a deficit of EC (elemental carbon soot) and soluble potassium in the CAIP maze and rice burning profiles. To solve this problem, we created a new profile (RICE2) by replacing the VEGB1 EC, OC, and K^+ source compositions into the CAIP rice burning profile.

It should be noted that the previously determined CAIP cement plant profile was mainly potassium chloride. This is an incongruous result because we expect cement to be composed mainly of limestone ($CaCO_3$). While we have assumed that the high levels of soluble K in the ambient PM come from vegetative burning emissions, we strongly

recommend that the composition of fugitive emissions from cement and brick production be examined.

The new CAIP lead smelter profile and the previously determined copper foundry profile were used to represent these sources. The previously determined CAIP Mazut power plant profile was needed to fit the ambient V and Ni. These elements are both enriched in heavy oil combustion emissions. Neither element was enriched in the new CAIP Mazut profile.

As in the previous CMB modeling, secondary profiles were used to fit residual ammonium, sulfate, nitrate, and chlorine concentrations. The pure sea salt profile (MAR100) was used to explain ambient sodium (Na) concentrations. Because there was a large excess of chlorine over what would be expected from either sea salt or pure NaCl, the marine contribution can be interpreted either as transported sea salt aerosol or salt from more local geological sources, possibly desert dust. However, the Na in the ambient air is not associated with resuspended road dust.

We observed that the ambient manganese (Mn) concentrations could not be explained without the steel production profile determined by Rodes et al. (1996). However, this profile could not be used in the final CAIP CMB analysis because PAH were not measured by Rodes et al. Therefore Mn was excluded from the CMB analysis. However, if we assume that all of the Mn not associated with geological material (excess Mn) came from activities related to steel or ferrous metal production, we can make an estimate of the contribution of these activities based solely on the ambient excess Mn concentration and the composition of Mn (0.051) in the Rodes et al. STEEL profile (Table 4-1). According to equation 1 (Section 2) the steel source contribution estimate would be the total ambient Mn minus Mn from geological sources divided by 0.051. This is clearly a crude estimate. The STEEL profile of Rodes et al. (1996) was determined in Helwan. However, fine-particle Mn concentrations at Shobra were between five and greater than ten times higher than those found at any of the other sites. Clearly, more work needs to be done to determine the composition of steel-production-related emissions at Shobra. Finally, the following CMB analysis was done using CAIP site-specific road dust profiles.

The final CMB results are given in Figures 5-2 to 5-15 for $PM_{2.5}$ and PM_{10} mass and in Figure 5-16 to 5-31 for $PM_{2.5}$ and PM_{10} lead sources. Results for all individual samples at each site and the average results for each site are also presented in Appendix 9 for PM mass and in Appendix 10 for lead. It is important that the uncertainties of the

average source contribution estimates (SCEs) be considered when comparing the final and initial CMB results. If final and initial SCEs overlap to within twice their uncertainties, then they may be considered to be statistically identical. This is generally the case here. It should be noted that in some cases, the final CMB road dust contributions were higher and the motor vehicle contributions were lower than in the initial CMB apportionments. There are two major reasons for this. First, the EC and OC compositions of the Rodes et al. (1996) DIESEL profile used previously were 13 and 39%, respectively. In the new CAIP gasoline and diesel profiles, the EC and OC compositions are ~26 and 63%, respectively. Because EC and OC are both key combustion emission markers, the higher EC and OC carbon compositions in the new CAIP profiles will tend to produce lower SCEs for motor vehicles, as observed. There are also significant levels of EC and OC in the road dust profiles. With less carbon available in the new CAIP motor vehicle profiles, the dust contribution is larger in many cases than in the preliminary CMB results. Second, there is significant collinearity between the motor vehicle and vegetative burning profiles (both old and new CAIP profiles). This increases the variance of the CMB results for these sources. Given these problems, it is the case that the sense of the results of the previous CMB is preserved in the final apportionments. For example, the lead smelter contributions to PM_{10} at Shobra were essentially identical for the old and final CMB analysis even though the new CAIP downwind smelter profile was used for the final analysis while a profile based on stack sampling was used in the initial CMB.

We believe that using the new CAIP motor vehicle profiles makes the apportionment of lead more credible because the older Rodes et al. profiles were determined when leaded gasoline was still used in Cairo. Thus, during winter, 95, 97, 76, 81, 90, and 99% of PM_{10} lead at Zamalek, El Qualaly, Helwan, Kaha, Massara, and Shobra came from lead smelters. During fall, the respective lead smelter contributions at the six sites were 85, 92, 59, 46, 67, and 96%, respectively. At Helwan during winter, 13% of the PM_{10} lead came from copper foundry operations. During fall, 24% of PM_{10} lead at Helwan came from these sources. The road dust contribution to PM_{10} lead was less than 8% at all sites during winter but as high as 26% at Kaha, 25% at Massara, and 15% at Helwan during fall.

Table 5-1 Source Profiles used in CMB Source Apportionment using CAIP Profiles

No.	Source ID	Reference
1	BSSOIL - British School road dust	CAIP
2	HESOIL - Helwan road dust	CAIP
3	KASOIL - Kaha soil	CAIP
4	ELMAUPRD - El Massara road dust	CAIP
5	QUAPVRD - El Qualaly road dust	CAIP
6	SHOBUPRD - Shobra road dust	CAIP
7	KAHAUPRD - Kaha road dust	CAIP
8	LIME - Limestone (construction)	CAIP
9	DIESAVE - Diesel vehicle composite	CAIP
10	MVGASAVE - Gasline vehicle composite	CAIP
11	GARBAGE - Refuse burning	CAIP
12	MAZEAVE - Maze burning	CAIP
13	RICEAVE - Rice burning	CAIP
14	RESTD2 - Restaurant downwind	CAIP
15	MAZOTAVE - Mazut oil combustion	CAIP
16	LEADAVE - Lead smelter	CAIP
17	CUFOUNDR - Copper foundry	CAIP
18	AMSUL - Secondary ammonium sulfate	DRI Pure Compound
19	AMBSUL - Secondary ammonium bisulfate	DRI Pure Compound
20	H2SO4 - Secondary sulfuric acid	DRI Pure Compound
21	AMNIT - Secondary ammonium nitrate	DRI Pure Compound
22	NH4CL - Secondary ammonium chloride	DRI Pure Compound
23	MAR100 - Pure sea salt	DRI - Watson et al. (1994)
24	BRICK - Brick foundry	CAIP
25	CASTFE - Cast iron foundry	CAIP
26	CEMENT - Cement plant	CAIP
27	GASPP - Gas power plant	CAIP
28	HDDBUS - Heavy duty diesel bus	CAIP
29	LDDMBUS - Light duty diesel microbus	CAIP
30	LDSI1_3 - Light duty spark ignition	CAIP
31	LDSI4_5 - Light duty spark ignition	CAIP
32	LDSILATE - Late model light duty spark ignition	CAIP
33	MAZUTPP - Mazut oil power plant	CAIP
34	MOTO - Motorcycle	CAIP
35	REFUSEBA - Refuse burning Basatin	CAIP
36	REFUSED1 - Refuse burning desert	CAIP
37	REFUSED2 - Refuse burning desert	CAIP
38	REST - Restaurant	CAIP
39	MV7525 - Diesel 75%, Gasoline 25%	CAIP - from DIESAVE and MVGASAVE
40	MV5050 - Diesel 50%, Gasoline 50%	CAIP - from DIESAVE and MVGASAVE
41	MV2575 - Diesel 25%, Gasoline 75%	CAIP - from DIESAVE and MVGASAVE
42	RICE2 - Modified rice burning	RICE with OC, EC, Sol. K from VEGB1(Table 4-1)

Table 5-2. Source profiles used in CAIP $PM_{2.5}$ source apportionment modeling with PAH (percent mass followed by uncertainty).

Species	Source	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD
Cl^-		0.004928	0.014500	0.005647	0.007838	0.008941	0.006222	0.003864
		0.000990	0.002441	0.002468	0.002414	0.001262	0.001068	0.000705
NO_3^-		0.003141	0.003631	0.005647	0.003919	0.005149	0.002910	0.001788
		0.000776	0.001541	0.002375	0.002191	0.000586	0.000721	0.000513
$SO_4^=$		0.026424	0.033514	0.028143	0.023486	0.033597	0.029046	0.018455
		0.002795	0.003766	0.003789	0.003283	0.003440	0.003037	0.001938
NH_4^+		0.002195	0.000788	0.002400	0.000800	0.000314	0.000705	0.000692
		0.000767	0.001505	0.002357	0.002181	0.000452	0.000694	0.000506
Na^+		0.004869	0.011060	0.004518	0.005961	0.006963	0.004736	0.003705
		0.000348	0.000820	0.000381	0.000470	0.000496	0.000339	0.000264
K^+		0.004320	0.004658	0.002965	0.003891	0.003592	0.002884	0.005061
		0.000329	0.000378	0.000329	0.000374	0.000268	0.000219	0.000374
OC		0.178886	0.248167	0.176902	0.171303	0.115693	0.065825	0.105538
		0.019976	0.029217	0.026190	0.024881	0.012815	0.008700	0.011878
EC		0.010602	0.006044	0.018777	0.012171	0.007587	0.002494	0.002480
		0.007062	0.004860	0.012751	0.008748	0.004996	0.002082	0.001792
TC		0.189489	0.254210	0.196150	0.183033	0.123280	0.068319	0.108018
		0.020918	0.029958	0.029348	0.027198	0.013439	0.009261	0.012062
Al		0.048388	0.026682	0.032896	0.034388	0.022239	0.041604	0.055768
		0.003503	0.002066	0.002651	0.002726	0.001614	0.003013	0.003992
Si		0.172417	0.093997	0.112711	0.110780	0.074267	0.119937	0.159547
		0.012304	0.006888	0.008596	0.008373	0.005280	0.008552	0.011321
S		0.014876	0.015837	0.012377	0.012502	0.013229	0.011034	0.006964
		0.001070	0.001185	0.000963	0.000963	0.000946	0.000796	0.000503
Cl		0.004729	0.015097	0.005130	0.005437	0.008285	0.004207	0.003850
		0.000454	0.001210	0.000594	0.000582	0.000733	0.000423	0.000335
K		0.018823	0.011012	0.009459	0.011509	0.007263	0.007797	0.015542
		0.001386	0.000888	0.000850	0.000985	0.000733	0.000640	0.001124
Ca		0.113007	0.124764	0.153278	0.123116	0.219046	0.120403	0.070200
		0.008059	0.009124	0.011630	0.009273	0.015541	0.008577	0.004984
Ti		0.003935	0.002628	0.002541	0.003284	0.002385	0.004346	0.006358
		0.000393	0.000544	0.000813	0.000714	0.000251	0.000437	0.000482
V		0.000140	0.000287	0.000000	0.000248	0.000130	0.000000	0.000014
		0.000350	0.000621	0.001459	0.000828	0.000242	0.000567	0.000303
Cr		0.000093	0.000072	0.000094	0.000221	0.000042	0.000000	0.000058
		0.000035	0.000143	0.000471	0.000057	0.000068	0.000176	0.000101
Mn		0.000432	0.000430	0.000518	0.000442	0.000379	0.000882	0.001197
		0.000041	0.000053	0.000099	0.000060	0.000036	0.000077	0.000094
Fe		0.031083	0.025153	0.032519	0.027405	0.027930	0.053620	0.066206
		0.002222	0.001839	0.002474	0.002063	0.001984	0.003817	0.004699
Ni		0.000058	0.000024	0.000141	0.000138	0.000033	0.000013	0.000058
		0.000012	0.000072	0.000048	0.000029	0.000009	0.000038	0.000015
Cu		0.000187	0.000143	0.000235	0.000331	0.000123	0.000113	0.000130
		0.000015	0.000025	0.000049	0.000033	0.000013	0.000014	0.000016
Zn		0.001191	0.000812	0.000753	0.000883	0.000724	0.000857	0.000663
		0.000084	0.000064	0.000064	0.000074	0.000054	0.000066	0.000044
Se		0.000000	0.000000	0.000047	0.000000	0.000002	0.000000	0.000000
		0.000047	0.000072	0.000094	0.000083	0.000026	0.000038	0.000029
Br		0.000000	0.000000	0.000000	0.000000	0.000026	0.000025	0.000014
		0.000047	0.000072	0.000094	0.000110	0.000028	0.000038	0.000029
Rb		0.000023	0.000024	0.000000	0.000000	0.000026	0.000025	0.000058
		0.000035	0.000048	0.000094	0.000083	0.000007	0.000038	0.000015
Sr		0.000584	0.000812	0.000941	0.000690	0.001345	0.000718	0.000418
		0.000046	0.000064	0.000071	0.000067	0.000097	0.000052	0.000036
Zr		0.000140	0.000143	0.000188	0.000083	0.000088	0.000164	0.000216
		0.000024	0.000025	0.000048	0.000138	0.000024	0.000027	0.000018
Sn		0.000234	0.000287	0.000424	0.000966	0.000000	0.000441	0.000216
		0.000491	0.000932	0.001412	0.001243	0.000349	0.000504	0.000303
Sb		0.000058	0.000430	0.000000	0.000000	0.000000	0.000000	0.000115
		0.000560	0.001099	0.001647	0.001463	0.000416	0.000592	0.000360
Ba		0.001541	0.000000	0.001835	0.000166	0.000558	0.001335	0.000923
		0.001940	0.003798	0.005507	0.004995	0.001364	0.002042	0.001169
Pb		0.000479	0.000382	0.000329	0.000718	0.000249	0.001033	0.000360
		0.000053	0.000074	0.000096	0.000117	0.000031	0.000092	0.000034

Table 5-2 cont.

Species	Source	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD
Fluorene		0.00245210	0.00262762	0.00564733	0.00469173	0.00025592	0.00138553	0.00187431
		0.00297501	0.00540681	0.01065332	0.00664039	0.00052658	0.00285090	0.00326366
Phenanthrene		0.00408683	0.00812173	0.01553014	0.00551968	0.00081428	0.00428255	0.00706469
		0.00117432	0.00240352	0.00474122	0.00236199	0.00023391	0.00126557	0.00147077
A-methylfluorene		0.00361976	0.00477749	0.00800038	0.01021140	0.00172162	0.00377872	0.03546764
		0.00166149	0.00338765	0.00667084	0.00394455	0.00040422	0.00179153	0.00501739
1-methylfluorene		0.00221856	0.00238874	0.00611794	0.00303582	0.00034898	0.00062979	0.00158595
		0.00181990	0.00338054	0.00666442	0.00390666	0.00032948	0.00178157	0.00204052
B-methylfluorene		0.00151797	0.00000000	0.00000000	0.00027598	0.00011633	0.00025192	0.00000000
		0.00247817	0.00337816	0.00665537	0.00390300	0.00036196	0.00178133	0.00203896
9-fluorenone		0.00303593	0.00812173	0.01176526	0.01297124	0.00118652	0.00264510	0.01931977
		0.00198762	0.00441278	0.00735121	0.00589925	0.00049712	0.00196396	0.00659669
Xanthone		0.00035030	0.00143325	0.00282366	0.00027598	0.00002327	0.00037787	0.00129760
		0.00165141	0.00371671	0.00732257	0.00390300	0.00032902	0.00178139	0.00244771
Acenaphthenequinone		0.15471562	0.48754270	0.44190315	0.51967765	0.01919372	0.00000000	0.24365980
		0.02177530	0.06888391	0.06310094	0.07387308	0.00271110	0.00178129	0.03427702
Perinaphthenone		0.00081737	0.00047775	0.00047061	0.00165590	0.00004653	0.00062979	0.00028836
		0.00165183	0.00337826	0.00665543	0.00390406	0.00032902	0.00178157	0.00203901
A-methylphenanthrene		0.00058383	0.00167212	0.00329427	0.00331181	0.00000000	0.00100766	0.00173013
		0.00165158	0.00337933	0.00665800	0.00390736	0.00032902	0.00178202	0.00204081
2-methylphenanthrene		0.00105090	0.00238874	0.00376488	0.00441574	0.00000000	0.00151149	0.00216266
		0.00165217	0.00338054	0.00665880	0.00391077	0.00032902	0.00178293	0.00204186
C-methylphenanthrene		0.00046707	0.00238874	0.00423549	0.00193189	0.00020939	0.00125957	0.00230684
		0.00165148	0.00338054	0.00665971	0.00390446	0.00032918	0.00178243	0.00204225
1-methylphenanthrene		0.00058383	0.00238874	0.00329427	0.00082795	0.00016286	0.00075574	0.00173013
		0.00181666	0.00405592	0.00732320	0.00390324	0.00036201	0.00195977	0.00265213
Anthraquinone		0.00105090	0.00214987	0.00282366	0.00137992	0.00006980	0.00100766	0.00086506
		0.00181720	0.00371768	0.00665730	0.00390373	0.00032903	0.00196006	0.00203942
3,6-dimethylphenanthre		0.00140120	0.00119437	0.00329427	0.00110394	0.00011633	0.00125957	0.00086506
		0.00165284	0.00337876	0.00665800	0.00390345	0.00032907	0.00178243	0.00203942
A-dimethylphenanthrene		0.00140120	0.00238874	0.00564733	0.00137992	0.00018612	0.00214127	0.00187431
		0.00165284	0.00338054	0.00666309	0.00390373	0.00032915	0.00178458	0.00204113
B-dimethylphenanthrene		0.00035030	0.00143325	0.00376488	0.00055197	0.00018612	0.00125957	0.00129760
		0.00165141	0.00337902	0.00665880	0.00390309	0.00032915	0.00178243	0.00204000
C-dimethylphenanthrene		0.00210180	0.00501636	0.00894160	0.00248386	0.00034898	0.00289702	0.00374861
		0.00165475	0.00338862	0.00667469	0.00390544	0.00032948	0.00178732	0.00204765
D-dimethylphenanthrene		0.00151797	0.00286649	0.00423549	0.00165590	0.00027918	0.00151149	0.00201848
		0.00198314	0.00405679	0.00732476	0.00390406	0.00039508	0.00213899	0.00244894
Fluoranthene		0.00128443	0.00310537	0.00423549	0.00055197	0.00048857	0.00176340	0.00144177
		0.00313819	0.00642067	0.01264759	0.00741575	0.00062562	0.00338565	0.00387473
Pyrene		0.00245210	0.00406087	0.00564733	0.00358779	0.00044204	0.00365276	0.00389279
		0.00182068	0.00372217	0.00732783	0.00429789	0.00036259	0.00196810	0.00225135
9-anthraldehyde		0.00245210	0.00334424	0.01223587	0.00220787	0.00044204	0.00226723	0.00389279
		0.00165599	0.00338281	0.00669151	0.00390492	0.00032977	0.00178498	0.00204833
Retene		0.00035030	0.00095550	0.00188244	0.00055197	0.00004653	0.00088170	0.00043253
		0.00231193	0.00472975	0.00931823	0.00546429	0.00046063	0.00249423	0.00285465
Benzonaphthothiophene		0.00011677	0.00023887	0.00047061	0.00000000	0.00002327	0.00025192	0.00028836
		0.00330263	0.00675634	0.01331077	0.00780593	0.00065803	0.00356260	0.00407794
B-MePy/MeFl		0.00046707	0.00167212	0.00329427	0.00220787	0.00013959	0.00075574	0.00086506
		0.00165148	0.00337933	0.00665800	0.00390492	0.00032909	0.00178170	0.00203942
C-methylpyrene/methyl fluoranthene		0.00023353	0.00047775	0.00047061	0.00082795	0.00004653	0.00050383	0.00028836
		0.00165135	0.00337826	0.00665543	0.00390324	0.00032902	0.00178147	0.00203901
4-methylpyrene		0.00035030	0.00071662	0.00188244	0.00027598	0.00006980	0.00062979	0.00129760
		0.00165141	0.00337838	0.00665623	0.00390300	0.00032903	0.00178157	0.00204000
1-methylpyrene		0.00000000	0.00071662	0.00282366	0.00027598	0.00002327	0.00075574	0.00057671
		0.00165131	0.00337838	0.00798834	0.00390300	0.00032902	0.00213796	0.00224301
benzo(c)phenanthrene		0.00000000	0.00071662	0.00047061	0.00000000	0.00004653	0.00000000	0.00000000
		0.00165131	0.00371613	0.00665543	0.00390296	0.00032902	0.00178129	0.00203896
Chrysene		0.00000000	0.00095550	0.00094122	0.00000000	0.00013959	0.00037787	0.00014418
		0.00247697	0.00506750	0.00998320	0.00585445	0.00052647	0.00267200	0.00305844
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
5+6-methylchrysene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(b+j+k)fluoranthe		0.00268563	0.00310537	0.00800038	0.00413976	0.00041877	0.00138553	0.00302773
		0.00314047	0.00574538	0.01198846	0.00702926	0.00059261	0.00302908	0.00387704
BeP		0.00046707	0.00071662	0.00282366	0.00027598	0.00002327	0.00075574	0.00057671
		0.00165148	0.00337838	0.00732257	0.00390300	0.00032902	0.00195977	0.00203916
Perylene		0.00023353	0.00047775	0.00141183	0.00027598	0.00004653	0.00050383	0.00043253
		0.00165135	0.00337826	0.00665585	0.00390300	0.00032902	0.00178147	0.00203907
Indeno[123-cd]pyrene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00445861	0.00912118	0.01796979	0.01053817	0.00088836	0.00480955	0.00550527
Benzo(ghi)perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00577959	0.01182357	0.02329380	0.01366037	0.00115155	0.00623451	0.00713635
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00644014	0.01317488	0.02595605	0.01522162	0.00128316	0.00694705	0.00795196
Coronene		0.00093413	0.00214987	0.00329427	0.00386377	0.00020939	0.00100766	0.00129760
		0.00181704	0.00371768	0.00665800	0.00429864	0.00036207	0.00196006	0.00224377

Table 5-2 cont.

Species	Source	LIME	DIESAVE	MVGASAVE	GARBAGE	MAZEAVE	RICEAVE	RESTD2
Cl^-		0.000000	0.008221	0.019628	0.035886	0.042003	0.017306	0.000946
		0.000000	0.005595	0.027757	0.002927	0.028933	0.004235	0.000391
NO_3^-		0.000000	0.017079	0.024252	0.002072	0.001608	0.001443	0.000946
		0.000000	0.006888	0.012642	0.000195	0.001053	0.000581	0.000390
$SO_4^=$		0.000000	0.087591	0.135362	0.006895	0.004274	0.011429	0.007592
		0.000000	0.037067	0.014110	0.000507	0.003219	0.001711	0.000661
NH_4^+		0.000000	0.028192	0.048140	0.012400	0.008108	0.003534	0.001408
		0.000000	0.012364	0.008005	0.001331	0.008534	0.000428	0.000413
Na^+		0.000000	0.013129	0.017273	0.000807	0.000303	0.000896	0.001311
		0.000000	0.010931	0.006219	0.000058	0.000194	0.000198	0.000096
K^+		0.000000	0.008651	0.012858	0.002017	0.018228	0.004723	0.001867
		0.000000	0.005745	0.002893	0.000150	0.010513	0.000781	0.000143
OC		0.000000	0.631287	0.634297	0.653039	0.435468	0.520180	0.185385
		0.000000	0.070424	0.074326	0.053297	0.210104	0.079460	0.015281
EC		0.000000	0.261834	0.253978	0.034489	0.026353	0.032385	0.014462
		0.000000	0.030426	0.172623	0.003350	0.014242	0.014119	0.001485
TC		0.000000	0.892729	0.888276	0.687529	0.461820	0.552581	0.199769
		0.000000	0.098449	0.160948	0.059188	0.224347	0.093557	0.017400
Al		0.000000	0.002189	0.002743	0.000154	0.000330	0.000268	0.000000
		0.000000	0.001700	0.003879	0.000158	0.000056	0.000288	0.000221
Si		0.000000	0.004271	0.006909	0.000319	0.000771	0.000456	0.000396
		0.000000	0.002609	0.002686	0.000035	0.000318	0.000255	0.000051
S		0.000000	0.039108	0.050804	0.004354	0.001940	0.006263	0.002693
		0.000000	0.008134	0.004933	0.000312	0.000444	0.000446	0.000194
Cl		0.000000	0.000014	0.000845	0.032410	0.041306	0.018032	0.000209
		0.000000	0.000987	0.001194	0.002317	0.002912	0.001386	0.000032
K		0.000000	0.005491	0.008884	0.001949	0.020275	0.005251	0.001225
		0.000000	0.002368	0.000916	0.000141	0.002116	0.000665	0.000091
Ca		0.400000	0.002860	0.003558	0.000077	0.000291	0.000060	0.000743
		0.000000	0.001452	0.000463	0.000016	0.000346	0.000077	0.000059
Ti		0.000000	0.000224	0.000377	0.000000	0.000008	0.000002	0.000000
		0.000000	0.004256	0.004917	0.000178	0.000120	0.000222	0.000407
V		0.000000	0.000125	0.000262	0.000000	0.000002	0.000000	0.000000
		0.000000	0.001834	0.002068	0.000108	0.000069	0.000121	0.000248
Cr		0.000000	0.000067	0.000106	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000296	0.000298	0.000030	0.000019	0.000031	0.000069
Mn		0.000000	0.000191	0.000225	0.000000	0.000003	0.000000	0.000000
		0.000000	0.000185	0.000236	0.000012	0.000007	0.000013	0.000027
Fe		0.000000	0.003164	0.005914	0.000078	0.000196	0.000077	0.000236
		0.000000	0.002167	0.004349	0.000007	0.000081	0.000047	0.000020
Ni		0.000000	0.000035	0.000040	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000101	0.000122	0.000004	0.000003	0.000006	0.000009
Cu		0.000000	0.000223	0.000140	0.000022	0.000003	0.000050	0.000015
		0.000000	0.000091	0.000098	0.000002	0.000004	0.000068	0.000004
Zn		0.000000	0.001802	0.001793	0.000122	0.000007	0.000004	0.000033
		0.000000	0.000533	0.001146	0.000009	0.000001	0.000005	0.000004
Se		0.000000	0.000015	0.000012	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000106	0.000126	0.000004	0.000003	0.000006	0.000010
Br		0.000000	0.000062	0.000081	0.000088	0.000166	0.000099	0.000016
		0.000000	0.000104	0.000137	0.000007	0.000013	0.000008	0.000003
Rb		0.000000	0.000010	0.000000	0.000000	0.000017	0.000000	0.000000
		0.000000	0.000134	0.000153	0.000007	0.000003	0.000009	0.000012
Sr		0.000000	0.000021	0.000010	0.000000	0.000000	0.000001	0.000005
		0.000000	0.000174	0.000199	0.000007	0.000005	0.000009	0.000016
Zr		0.000000	0.000058	0.000000	0.000000	0.000000	0.000005	0.000000
		0.000000	0.000251	0.000286	0.000010	0.000007	0.000013	0.000023
Sn		0.000000	0.000138	0.000046	0.000035	0.000024	0.000000	0.000000
		0.000000	0.001893	0.002009	0.000070	0.000051	0.000085	0.000150
Sb		0.000000	0.000020	0.000000	0.000000	0.000000	0.000003	0.000000
		0.000000	0.002174	0.002394	0.000082	0.000053	0.000104	0.000184
Ba		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.010174	0.011865	0.000393	0.000262	0.000509	0.000890
Pb		0.000000	0.000810	0.001426	0.000162	0.000001	0.000009	0.000032
		0.000000	0.000556	0.001155	0.000013	0.000011	0.000020	0.000036

Table 5-2 cont.

Species	Source	LIME	DIESAVE	MVGASAVE	GARBAGE	MAZEAVE	RICEAVE	RESTD2
Fluorene		0.00000000	0.03818813	0.05350928	0.00421292	0.00292624	0.00327820	0.00280429
		0.00000000	0.00861484	0.01009881	0.00057110	0.00093203	0.00169614	0.00038012
Phenanthrene		0.00000000	0.02864265	0.02835936	0.00450601	0.00316935	0.00233055	0.00249089
		0.00000000	0.00985591	0.00584876	0.00057271	0.00074518	0.00105360	0.00031642
A-methylfluorene		0.00000000	0.01362591	0.01084998	0.00053779	0.00092444	0.00083963	0.00058771
		0.00000000	0.00581671	0.00319249	0.00011970	0.00031226	0.00043595	0.00013295
1-methylfluorene		0.00000000	0.01045699	0.00817446	0.00191603	0.00026840	0.00042480	0.00041367
		0.00000000	0.00417545	0.00160551	0.00034808	0.00013430	0.00019436	0.00007647
B-methylfluorene		0.00000000	0.00344333	0.00259196	0.00028947	0.00016240	0.00021312	0.00010983
		0.00000000	0.00259788	0.00097489	0.00010148	0.00005872	0.00007644	0.00004130
9-fluorenone		0.00000000	0.00380601	0.00446008	0.00056347	0.00031235	0.00106211	0.00056266
		0.00000000	0.00275833	0.00133124	0.00012669	0.00013484	0.00089959	0.00012899
Xanthone		0.00000000	0.00362182	0.00170765	0.00002692	0.00000498	0.00008785	0.00015030
		0.00000000	0.00327448	0.00048849	0.00000765	0.00000704	0.00010541	0.00003912
Acenaphthenequinone		0.00000000	0.00126105	0.00058438	0.00038892	0.00001634	0.00004193	0.00010598
		0.00000000	0.00061626	0.00024054	0.00012910	0.00000601	0.00003673	0.00003600
Perinaphthenone		0.00000000	0.00202264	0.00139451	0.00015757	0.00008084	0.00017504	0.00000000
		0.00000000	0.00158879	0.00030404	0.00002832	0.00008091	0.00010453	0.00000910
A-methylphenanthrene		0.00000000	0.01073592	0.00633766	0.00023814	0.00027999	0.00014120	0.00033783
		0.00000000	0.00623487	0.00182442	0.00003115	0.00003883	0.00007099	0.00004486
2-methylphenanthrene		0.00000000	0.01111609	0.00744064	0.00028077	0.00035942	0.00026013	0.00039117
		0.00000000	0.00544265	0.00132293	0.00003688	0.00007851	0.00015939	0.00005194
C-methylphenanthrene		0.00000000	0.01318971	0.00698697	0.00040717	0.00024739	0.00019302	0.00040273
		0.00000000	0.00757106	0.00192762	0.00005721	0.00003480	0.00009877	0.00005725
1-methylphenanthrene		0.00000000	0.00654604	0.00408647	0.00030410	0.00037466	0.00015793	0.00129042
		0.00000000	0.00346412	0.00097900	0.00006887	0.00008962	0.00010630	0.00029108
Anthraquinone		0.00000000	0.00047843	0.00057475	0.00001972	0.00001066	0.00008060	0.00002312
		0.00000000	0.00062850	0.00075275	0.00002323	0.00001323	0.00011958	0.00003370
3,6-dimethylphenanthre		0.00000000	0.00671385	0.00470524	0.00010731	0.00015129	0.00005971	0.00029613
		0.00000000	0.00538352	0.00088148	0.00001864	0.00005765	0.00003559	0.00005196
A-dimethylphenanthrene		0.00000000	0.00496439	0.00460445	0.00002736	0.00005271	0.00006909	0.00012779
		0.00000000	0.00239234	0.00129977	0.00000611	0.00001032	0.00009770	0.00002608
B-dimethylphenanthrene		0.00000000	0.00278765	0.00239217	0.00005515	0.00004545	0.00000674	0.00008671
		0.00000000	0.00163678	0.00041798	0.00000904	0.00000993	0.00000953	0.00001654
C-dimethylphenanthrene		0.00000000	0.01426014	0.00809158	0.00017623	0.00015317	0.00009151	0.00043356
		0.00000000	0.00804190	0.00116520	0.00002259	0.00001966	0.00003345	0.00005589
D-dimethylphenanthrene		0.00000000	0.00267732	0.00125850	0.00011472	0.00005500	0.00003738	0.00011431
		0.00000000	0.00153465	0.00047125	0.00003043	0.00001494	0.00002577	0.00003227
Fluoranthene		0.00000000	0.00498114	0.00943697	0.00040399	0.00072339	0.00033859	0.00088769
		0.00000000	0.00184661	0.00149836	0.00005763	0.00010262	0.00013151	0.00012742
Pyrene		0.00000000	0.00429173	0.00797077	0.00022796	0.00045944	0.00021631	0.00081447
		0.00000000	0.00105568	0.00251722	0.00003043	0.00006098	0.00007258	0.00010856
9-anthraldehyde		0.00000000	0.00593926	0.00290446	0.00020804	0.00012923	0.00004487	0.00016379
		0.00000000	0.00345075	0.00131709	0.00002727	0.00001701	0.00002246	0.00002331
Retene		0.00000000	0.00056130	0.00041817	0.00080586	0.00001169	0.00001179	0.00002829
		0.00000000	0.00024706	0.00022999	0.00028212	0.00000530	0.00000914	0.00001579
Benzonaphthothiophene		0.00000000	0.00028822	0.00016519	0.00002588	0.00000141	0.00002292	0.00000578
		0.00000000	0.00023518	0.00025352	0.00001069	0.00000461	0.00002601	0.00001819
B-MePy/MeFl		0.00000000	0.00078074	0.00092365	0.00013042	0.00017425	0.00008426	0.00007130
		0.00000000	0.00020097	0.00023765	0.00002688	0.00009038	0.00002961	0.00001695
C-methylpyrene/methyl fluoranthene		0.00000000	0.00026379	0.00042285	0.00006298	0.00007563	0.00003601	0.00002698
		0.00000000	0.00012155	0.00016001	0.00001428	0.00003768	0.00001141	0.00001049
4-methylpyrene		0.00000000	0.00076703	0.00052272	0.00004072	0.00006961	0.00003395	0.00003407
		0.00000000	0.00040326	0.00021171	0.00001327	0.00005367	0.00001378	0.00001428
1-methylpyrene		0.00000000	0.00051934	0.00037005	0.00004326	0.00007763	0.00003906	0.00002759
		0.00000000	0.00026563	0.00013972	0.00000716	0.00005246	0.00001834	0.00000966
benzo(c)phenanthrene		0.00000000	0.00009243	0.00009155	0.00005599	0.00005244	0.00003674	0.00001989
		0.00000000	0.00013480	0.00014261	0.00004137	0.00004903	0.00002855	0.00001745
Chrysene		0.00000000	0.00067660	0.00068376	0.00056093	0.00037108	0.00034906	0.00004879
		0.00000000	0.00022745	0.00024203	0.00012678	0.00029761	0.00010269	0.00001744
Benz(a)anthracene-7,12-dione		0.00000000	0.00003045	0.00003451	0.00001718	0.00000300	0.00001453	0.00000000
		0.00000000	0.00011103	0.00012344	0.00000925	0.00000424	0.00000898	0.00000910
5+6-methylchrysene		0.00000000	0.00002409	0.00000000	0.00006744	0.00003176	0.00003870	0.00000000
		0.00000000	0.00010617	0.00012341	0.00002482	0.00002439	0.00001824	0.00000910
Benzo(b+j+k)fluoranthe		0.00000000	0.00036774	0.00057967	0.00036009	0.00031694	0.00031132	0.00001287
		0.00000000	0.00038579	0.00043521	0.00016239	0.00014233	0.00014095	0.00003091
BeP		0.00000000	0.00006617	0.00023053	0.00018025	0.00011521	0.00009643	0.00002698
		0.00000000	0.00016128	0.00025549	0.00009761	0.00006518	0.00005603	0.00002116
Perylene		0.00000000	0.00000000	0.00000000	0.00001463	0.00001842	0.00001161	0.00000000
		0.00000000	0.00011095	0.00012341	0.00001094	0.00001264	0.00001346	0.00001002
Indeno[123-cd]pyrene		0.00000000	0.00018214	0.00030955	0.00008991	0.00011573	0.00010353	0.00002952
		0.00000000	0.00036193	0.00042748	0.00005422	0.00007041	0.00006479	0.00003379
Benzo(ghi)perylene		0.00000000	0.00047468	0.00129355	0.00010116	0.00008709	0.00008914	0.00012201
		0.00000000	0.00040359	0.00055699	0.00002780	0.00002383	0.00002831	0.00004436
Dibenz(ah+ac)anthracene		0.00000000	0.00005437	0.00000891	0.00004135	0.00002212	0.00003272	0.00000000
		0.00000000	0.00041180	0.00048107	0.00001498	0.00001811	0.00003574	0.00003546
Coronene		0.00000000	0.00024077	0.00100987	0.00004581	0.00004019	0.00004640	0.00007962
		0.00000000	0.00027898	0.00065016	0.00001163	0.00001002	0.00002083	0.00002309

Table 5-2 cont.

Species	Source	MAZOTAVE	LEADAVE	CUFOUNDR	AMSUL	AMBSUL	H2SO4	AMNIT
Cl^-		0.123565	0.097617	0.008700	0.000000	0.000000	0.000000	0.000000
		0.025371	0.007535	0.000800	0.000000	0.000000	0.000000	0.000000
NO_3^-		0.020310	0.000544	0.002800	0.000000	0.000000	0.000000	0.775000
		0.005445	0.000242	0.000700	0.000000	0.000000	0.000000	0.077500
$SO_4^=$		0.094035	0.020054	0.024000	0.727000	0.834500	0.979446	0.000000
		0.017196	0.001865	0.002200	0.072700	0.083450	0.000000	0.000000
NH_4^+		0.045321	0.000905	0.000400	0.273000	0.165500	0.000000	0.225500
		0.007731	0.000258	0.000400	0.027300	0.016550	0.000000	0.022550
Na^+		0.017285	0.002518	0.001100	0.000000	0.000000	0.000000	0.000000
		0.003791	0.000179	0.000100	0.000000	0.000000	0.000000	0.000000
K^+		0.016042	0.003746	0.001000	0.000000	0.000000	0.000000	0.000000
		0.004272	0.000277	0.000100	0.000000	0.000000	0.000000	0.000000
OC		0.395412	0.104085	0.106800	0.000000	0.000000	0.000000	0.000000
		0.124130	0.008609	0.008400	0.000000	0.000000	0.000000	0.000000
EC		0.233342	0.000499	0.157000	0.000000	0.000000	0.000000	0.000000
		0.044207	0.000384	0.013000	0.000000	0.000000	0.000000	0.000000
TC		0.629102	0.104610	0.263700	0.000000	0.000000	0.000000	0.000000
		0.167846	0.009141	0.019500	0.000000	0.000000	0.000000	0.000000
Al		0.002181	0.000151	0.000000	0.000000	0.000000	0.000000	0.000000
		0.002763	0.007578	0.000200	0.000000	0.000000	0.000000	0.000000
Si		0.012812	0.000000	0.002900	0.000000	0.000000	0.000000	0.000000
		0.001259	0.005754	0.000200	0.000000	0.000000	0.000000	0.000000
S		0.036464	0.000000	0.007300	0.242333	0.278167	0.326482	0.000000
		0.003259	0.057906	0.000800	0.024270	0.027820	0.000000	0.000000
Cl		0.082007	0.035374	0.010100	0.000000	0.000000	0.000000	0.000000
		0.007168	0.009116	0.000700	0.000000	0.000000	0.000000	0.000000
K		0.015845	0.000233	0.000800	0.000000	0.000000	0.000000	0.000000
		0.003015	0.000674	0.000100	0.000000	0.000000	0.000000	0.000000
Ca		0.052230	0.000000	0.000400	0.000000	0.000000	0.000000	0.000000
		0.004528	0.002256	0.000100	0.000000	0.000000	0.000000	0.000000
Ti		0.000390	0.000065	0.000000	0.000000	0.000000	0.000000	0.000000
		0.003920	0.000302	0.000400	0.000000	0.000000	0.000000	0.000000
V		0.000142	0.000142	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001956	0.000041	0.000200	0.000000	0.000000	0.000000	0.000000
Cr		0.000010	0.000057	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000444	0.000008	0.000500	0.000000	0.000000	0.000000	0.000000
Mn		0.000188	0.000083	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000171	0.000008	0.000500	0.000000	0.000000	0.000000	0.000000
Fe		0.008252	0.001821	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000724	0.000344	0.000100	0.000000	0.000000	0.000000	0.000000
Ni		0.000043	0.000075	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000091	0.000006	0.000300	0.000000	0.000000	0.000000	0.000000
Cu		0.000133	0.000133	0.008500	0.000000	0.000000	0.000000	0.000000
		0.000036	0.000010	0.000600	0.000000	0.000000	0.000000	0.000000
Zn		0.001855	0.004007	0.558300	0.000000	0.000000	0.000000	0.000000
		0.000521	0.000284	0.039500	0.000000	0.000000	0.000000	0.000000
Se		0.000006	0.000000	0.000100	0.000000	0.000000	0.000000	0.000000
		0.000109	0.001231	0.000100	0.000000	0.000000	0.000000	0.000000
Br		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000253	0.007033	0.000200	0.000000	0.000000	0.000000	0.000000
Rb		0.000063	0.000089	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000123	0.001308	0.000000	0.000000	0.000000	0.000000	0.000000
Sr		0.000191	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000054	0.000388	0.000000	0.000000	0.000000	0.000000	0.000000
Zr		0.000063	0.000174	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000213	0.000361	0.000000	0.000000	0.000000	0.000000	0.000000
Sn		0.000390	0.000000	0.000500	0.000000	0.000000	0.000000	0.000000
		0.001626	0.000435	0.000100	0.000000	0.000000	0.000000	0.000000
Sb		0.000000	0.025829	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001730	0.001846	0.000400	0.000000	0.000000	0.000000	0.000000
Ba		0.000000	0.000162	0.000300	0.000000	0.000000	0.000000	0.000000
		0.008922	0.000673	0.000900	0.000000	0.000000	0.000000	0.000000
Pb		0.019988	0.626146	0.028200	0.000000	0.000000	0.000000	0.000000
		0.001751	0.044230	0.002000	0.000000	0.000000	0.000000	0.000000

Table 5-2 cont.

Species	Source	MAZOTAVE	LEADAVE	CUFOUNDR	AMSUL	AMBSUL	H2SO4	AMNIT
Fluorene		0.02522819	0.00281987	0.00019153	0.00000000	0.00000000	0.00000000	0.00000000
		0.00364741	0.00038338	0.00008177	0.00000000	0.00000000	0.00000000	0.00000000
Phenanthrene		0.03162224	0.01059442	0.00056102	0.00000000	0.00000000	0.00000000	0.00000000
		0.00453932	0.00134934	0.00009751	0.00000000	0.00000000	0.00000000	0.00000000
A-methylfluorene		0.00137257	0.00020864	0.00009803	0.00000000	0.00000000	0.00000000	0.00000000
		0.00047289	0.00004879	0.00002590	0.00000000	0.00000000	0.00000000	0.00000000
1-methylfluorene		0.00142438	0.00014606	0.00010557	0.00000000	0.00000000	0.00000000	0.00000000
		0.00051957	0.00002839	0.00004016	0.00000000	0.00000000	0.00000000	0.00000000
B-methylfluorene		0.00032637	0.00004333	0.00000302	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016335	0.00001782	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000
9-fluorenone		0.00105176	0.00070145	0.00002715	0.00000000	0.00000000	0.00000000	0.00000000
		0.00044628	0.00020508	0.00002577	0.00000000	0.00000000	0.00000000	0.00000000
Xanthone		0.00022907	0.00001725	0.00001056	0.00000000	0.00000000	0.00000000	0.00000000
		0.00011108	0.00000732	0.00002136	0.00000000	0.00000000	0.00000000	0.00000000
Acenaphthenequinone		0.00025085	0.00002074	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012962	0.00000885	0.00002773	0.00000000	0.00000000	0.00000000	0.00000000
Perinaphthenone		0.00073433	0.00001986	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00068361	0.00001187	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000
A-methylphenanthrene		0.00093524	0.00025679	0.00003016	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016095	0.00003388	0.00002159	0.00000000	0.00000000	0.00000000	0.00000000
2-methylphenanthrene		0.00112071	0.00028941	0.00001810	0.00000000	0.00000000	0.00000000	0.00000000
		0.00018281	0.00003839	0.00003631	0.00000000	0.00000000	0.00000000	0.00000000
C-methylphenanthrene		0.00158434	0.00036715	0.00000452	0.00000000	0.00000000	0.00000000	0.00000000
		0.00025575	0.00005183	0.00004053	0.00000000	0.00000000	0.00000000	0.00000000
1-methylphenanthrene		0.00079474	0.00020450	0.00005580	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021124	0.00004700	0.00007491	0.00000000	0.00000000	0.00000000	0.00000000
Anthraquinone		0.00001109	0.00000084	0.00002564	0.00000000	0.00000000	0.00000000	0.00000000
		0.00013197	0.00000794	0.00003212	0.00000000	0.00000000	0.00000000	0.00000000
3,6-dimethylphenanthre		0.00034501	0.00009394	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00011303	0.00003816	0.00002346	0.00000000	0.00000000	0.00000000	0.00000000
A-dimethylphenanthrene		0.00080544	0.00014859	0.00001207	0.00000000	0.00000000	0.00000000	0.00000000
		0.00018574	0.00003970	0.00002989	0.00000000	0.00000000	0.00000000	0.00000000
B-dimethylphenanthrene		0.00026033	0.00004414	0.00000754	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010358	0.00000912	0.00002348	0.00000000	0.00000000	0.00000000	0.00000000
C-dimethylphenanthrene		0.00137627	0.00018542	0.00001207	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021135	0.00002424	0.00002137	0.00000000	0.00000000	0.00000000	0.00000000
D-dimethylphenanthrene		0.00027334	0.00004425	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012567	0.00001347	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000
Fluoranthene		0.01066771	0.00572180	0.00018701	0.00000000	0.00000000	0.00000000	0.00000000
		0.00161823	0.00084644	0.00005332	0.00000000	0.00000000	0.00000000	0.00000000
Pyrene		0.00826371	0.00418986	0.00017947	0.00000000	0.00000000	0.00000000	0.00000000
		0.00127829	0.00055713	0.00003777	0.00000000	0.00000000	0.00000000	0.00000000
9-anthraldehyde		0.00075480	0.00007662	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00014354	0.00001159	0.00002346	0.00000000	0.00000000	0.00000000	0.00000000
Retene		0.00046252	0.00002711	0.00001508	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021265	0.00001249	0.00002991	0.00000000	0.00000000	0.00000000	0.00000000
Benzonaphthothiophene		0.00023975	0.00037788	0.00001207	0.00000000	0.00000000	0.00000000	0.00000000
		0.00020903	0.00012585	0.00004481	0.00000000	0.00000000	0.00000000	0.00000000
B-MePy/MeFl		0.00038103	0.00020865	0.00000905	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012369	0.00004337	0.00002988	0.00000000	0.00000000	0.00000000	0.00000000
C-methylpyrene/methyl fluoranthene		0.00018319	0.00011112	0.00003167	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010631	0.00002504	0.00002162	0.00000000	0.00000000	0.00000000	0.00000000
4-methylpyrene		0.00023969	0.00006514	0.00001207	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012455	0.00002114	0.00002137	0.00000000	0.00000000	0.00000000	0.00000000
1-methylpyrene		0.00018475	0.00007480	0.00000603	0.00000000	0.00000000	0.00000000	0.00000000
		0.00009694	0.00001265	0.00002134	0.00000000	0.00000000	0.00000000	0.00000000
benzo(c)phenanthrene		0.00016698	0.00015816	0.00001508	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016071	0.00011754	0.00002565	0.00000000	0.00000000	0.00000000	0.00000000
Chrysene		0.00091874	0.00063800	0.00002413	0.00000000	0.00000000	0.00000000	0.00000000
		0.00037231	0.00014532	0.00003636	0.00000000	0.00000000	0.00000000	0.00000000
Benz(a)anthracene-7,12-dione		0.00009222	0.00003112	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00013042	0.00001666	0.00002773	0.00000000	0.00000000	0.00000000	0.00000000
5+6-methylchrysene		0.00004079	0.00001245	0.00000452	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010017	0.00000772	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(b+j+k)fluoranthe		0.00169371	0.00134810	0.00004524	0.00000000	0.00000000	0.00000000	0.00000000
		0.00111599	0.00059782	0.00004084	0.00000000	0.00000000	0.00000000	0.00000000
BeP		0.00064426	0.00046232	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00046830	0.00025331	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000
Perylene		0.00000000	0.00005882	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010007	0.00003830	0.00002346	0.00000000	0.00000000	0.00000000	0.00000000
Indeno[123-cd]pyrene		0.00100350	0.00066177	0.00001810	0.00000000	0.00000000	0.00000000	0.00000000
		0.00072161	0.00039175	0.00006828	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(ghi)perylene		0.00141453	0.00056602	0.00004826	0.00000000	0.00000000	0.00000000	0.00000000
		0.00054897	0.00014659	0.00008335	0.00000000	0.00000000	0.00000000	0.00000000
Dibenz(ah+ac)anthracene		0.00007358	0.00007585	0.00003016	0.00000000	0.00000000	0.00000000	0.00000000
		0.00036668	0.00002824	0.00009177	0.00000000	0.00000000	0.00000000	0.00000000
Coronene		0.00079614	0.00034693	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00030618	0.00008741	0.00002133	0.00000000	0.00000000	0.00000000	0.00000000

Table 5-2 cont.

Species	Source	NH4CL	MAR100	BRICK	CASTFE	CEMENT	GASPP	HDDBUS
Cl^-		0.662800	0.573724	0.080600	0.000500	0.449000	0.040100	0.008000
		0.000000	0.068802	0.008600	0.000200	0.034900	0.019700	0.002200
NO_3^-		0.000000	0.000037	0.008200	0.000400	0.002300	0.000000	0.000000
		0.000000	0.000004	0.002000	0.000200	0.000500	0.017600	0.002100
$SO_4^=$		0.000000	0.079955	0.325700	0.097300	0.037200	0.054800	0.008000
		0.000000	0.009588	0.030100	0.009000	0.003600	0.019100	0.002300
NH_4^+		0.337200	0.000000	0.159700	0.020000	0.002500	0.020600	0.003100
		0.000000	0.000000	0.011700	0.001500	0.000200	0.018000	0.002200
Na^+		0.000000	0.319822	0.003600	0.003500	0.073600	0.008800	0.003100
		0.000000	0.038354	0.000300	0.000300	0.005400	0.001500	0.000300
K^+		0.000000	0.000000	0.001700	0.003600	0.402100	0.008200	0.001100
		0.000000	0.000000	0.000200	0.000300	0.035600	0.002100	0.000200
OC		0.000000	0.000000	0.201700	0.366100	0.041400	3.060500	0.744800
		0.000000	0.000000	0.017100	0.027300	0.003200	0.405000	0.057900
EC		0.000000	0.000000	0.026700	0.042600	0.001300	0.281100	0.248400
		0.000000	0.000000	0.003000	0.003500	0.000200	0.045000	0.021000
TC		0.000000	0.000000	0.228500	0.408700	0.042700	3.345100	0.993200
		0.000000	0.000000	0.019100	0.029800	0.003300	0.440900	0.075100
Al		0.000000	0.000000	0.005300	0.000300	0.002400	0.005000	0.000200
		0.000000	0.000000	0.000600	0.000100	0.000300	0.005900	0.000700
Si		0.000000	0.000089	0.021600	0.040000	0.000800	0.065800	0.004300
		0.000000	0.000011	0.001600	0.002800	0.000200	0.008500	0.000400
S		0.000000	0.026652	0.107400	0.027600	0.005400	0.019100	0.008500
		0.000000	0.003196	0.007700	0.002000	0.000400	0.002500	0.000600
Cl		0.662800	0.573724	0.100200	0.000000	0.258700	0.006600	0.000700
		0.000000	0.068802	0.007200	0.000600	0.018300	0.001400	0.000200
K		0.000000	0.011845	0.002100	0.003900	0.216800	0.003700	0.000300
		0.000000	0.001421	0.000200	0.000300	0.015300	0.004600	0.000400
Ca		0.000000	0.012201	0.006900	0.000800	0.005600	0.022300	0.001800
		0.000000	0.001463	0.000500	0.000100	0.001100	0.003100	0.000200
Ti		0.000000	0.000000	0.000500	0.000000	0.000100	0.000000	0.000000
		0.000000	0.000000	0.001200	0.000200	0.000400	0.016100	0.002200
V		0.000000	0.000000	0.001400	0.003300	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000200	0.000200	0.000200	0.009900	0.001300
Cr		0.000000	0.000000	0.000000	0.000100	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000100	0.000100	0.000000	0.003000	0.000400
Mn		0.000000	0.000000	0.000100	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000100	0.000000	0.000000	0.001400	0.000200
Fe		0.000000	0.000000	0.007600	0.010800	0.000700	0.011900	0.000500
		0.000000	0.000000	0.000500	0.000800	0.000100	0.001600	0.000100
Ni		0.000000	0.000000	0.001700	0.002100	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000100	0.000100	0.000000	0.000600	0.000100
Cu		0.000000	0.000000	0.000000	0.000700	0.000100	0.000100	0.000000
		0.000000	0.000000	0.000100	0.000100	0.000000	0.000700	0.000100
Zn		0.000000	0.000000	0.002400	0.010000	0.000200	0.003700	0.000900
		0.000000	0.000000	0.000200	0.000700	0.000000	0.000500	0.000100
Se		0.000000	0.000000	0.000200	0.000000	0.000000	0.000000	0.000100
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000700	0.000100
Br		0.000000	0.001984	0.010500	0.000000	0.000800	0.000000	0.000000
		0.000000	0.000238	0.000800	0.000000	0.000100	0.000600	0.000100
Rb		0.000000	0.000000	0.000000	0.000000	0.003100	0.000100	0.000000
		0.000000	0.000000	0.000400	0.000000	0.000200	0.000600	0.000100
Sr		0.000000	0.000234	0.000100	0.000000	0.000100	0.000200	0.000000
		0.000000	0.000028	0.000000	0.000000	0.000000	0.000600	0.000100
Zr		0.000000	0.000000	0.000000	0.000000	0.000000	0.000100	0.000000
		0.000000	0.000000	0.000100	0.000000	0.000000	0.000900	0.000100
Sn		0.000000	0.000000	0.000000	0.000600	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000800	0.000100	0.000400	0.009100	0.001300
Sb		0.000000	0.000000	0.000500	0.000100	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000900	0.000100	0.000400	0.010600	0.001500
Ba		0.000000	0.000001	0.000300	0.000300	0.000000	0.027900	0.001300
		0.000000	0.000000	0.002900	0.000400	0.001300	0.036200	0.004900
Pb		0.000000	0.000000	0.000300	0.005700	0.004100	0.002100	0.000200
		0.000000	0.000000	0.000100	0.000400	0.000300	0.000700	0.000300

Table 5-2 cont.

Species	Source	NH4CL	MAR100	BRICK	CASTFE	CEMENT	GASPP	HDDBUS
Fluorene		0.00000000	0.00000000	0.00003452	0.00142687	0.00113205	0.00000000	0.00094485
		0.00000000	0.00000000	0.00006771	0.00045437	0.00035990	0.00333064	0.00035489
Phenanthrene		0.00000000	0.00000000	0.00054702	0.00046692	0.00233808	0.00264955	0.00118854
		0.00000000	0.00000000	0.00010289	0.00007666	0.00037231	0.00171336	0.00021104
A-methylfluorene		0.00000000	0.00000000	0.00012481	0.00023764	0.00036877	0.01854687	0.00063702
		0.00000000	0.00000000	0.00004361	0.00003656	0.00005534	0.00405488	0.00011560
1-methylfluorene		0.00000000	0.00000000	0.00009560	0.00081215	0.00032417	0.01884126	0.00055152
		0.00000000	0.00000000	0.00005366	0.00020445	0.00008226	0.00612351	0.00016901
B-methylfluorene		0.00000000	0.00000000	0.00000000	0.00018541	0.00013525	0.00088318	0.00008978
		0.00000000	0.00000000	0.00003755	0.00004107	0.00002977	0.00208603	0.00006727
9-fluorenone		0.00000000	0.00000000	0.00034786	0.00332275	0.00066393	0.00000000	0.00009833
		0.00000000	0.00000000	0.00008798	0.00063427	0.00012785	0.00208167	0.00007340
Xanthone		0.00000000	0.00000000	0.00000000	0.00166712	0.00009138	0.00117758	0.00008551
		0.00000000	0.00000000	0.00003755	0.00049374	0.00002808	0.00208941	0.00006720
Acenaphthenequinone		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00004131	0.00003176	0.00001641	0.00228980	0.00007256
Perinaphthenone		0.00000000	0.00000000	0.00000000	0.00005588	0.00003807	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003755	0.00004476	0.00003055	0.00208167	0.00008465
A-methylphenanthrene		0.00000000	0.00000000	0.00002921	0.00006790	0.00042896	0.00412153	0.00039761
		0.00000000	0.00000000	0.00003770	0.00001343	0.00007021	0.00217397	0.00009044
2-methylphenanthrene		0.00000000	0.00000000	0.00000000	0.00008670	0.00055515	0.00441592	0.00037623
		0.00000000	0.00000000	0.00004882	0.00004681	0.00025833	0.00462864	0.00023957
C-methylphenanthrene		0.00000000	0.00000000	0.00006108	0.00000000	0.00044891	0.00103038	0.00032493
		0.00000000	0.00000000	0.00012037	0.00000739	0.00045048	0.00458245	0.00041277
1-methylphenanthrene		0.00000000	0.00000000	0.00004780	0.00074895	0.00042715	0.01383655	0.00026935
		0.00000000	0.00000000	0.00009029	0.00066122	0.00037840	0.01451675	0.00030383
Anthraquinone		0.00000000	0.00000000	0.00013012	0.00009767	0.00004641	0.00206076	0.00011116
		0.00000000	0.00000000	0.00011360	0.00007613	0.00003678	0.00293109	0.00010955
3,6-dimethylphenanthre		0.00000000	0.00000000	0.00000000	0.00010028	0.00006309	0.00029440	0.00002565
		0.00000000	0.00000000	0.00004507	0.00007179	0.00004567	0.00312283	0.00009678
A-dimethylphenanthrene		0.00000000	0.00000000	0.00000531	0.00005327	0.00008956	0.00367993	0.00010261
		0.00000000	0.00000000	0.00004131	0.00005718	0.00009336	0.00502725	0.00013954
B-dimethylphenanthrene		0.00000000	0.00000000	0.00000000	0.00000783	0.00004750	0.00323834	0.00005986
		0.00000000	0.00000000	0.00003755	0.00000891	0.00002318	0.00295567	0.00007287
C-dimethylphenanthrene		0.00000000	0.00000000	0.00004514	0.00014624	0.00030495	0.00706547	0.00031638
		0.00000000	0.00000000	0.00003789	0.00002579	0.00005101	0.00252922	0.00008082
D-dimethylphenanthrene		0.00000000	0.00000000	0.00000000	0.00013214	0.00011241	0.00426872	0.00009833
		0.00000000	0.00000000	0.00003755	0.00004672	0.00003949	0.00298569	0.00007938
Fluoranthene		0.00000000	0.00000000	0.00013277	0.00004022	0.00022228	0.00942063	0.00025225
		0.00000000	0.00000000	0.00007657	0.00001615	0.00003995	0.00440273	0.00012421
Pyrene		0.00000000	0.00000000	0.00006639	0.00006059	0.00012655	0.01442534	0.00039333
		0.00000000	0.00000000	0.00004197	0.00001299	0.00002090	0.00364725	0.00009552
9-anthraldehyde		0.00000000	0.00000000	0.00000000	0.00003604	0.00004605	0.00029440	0.00000000
		0.00000000	0.00000000	0.00004507	0.00004671	0.00004746	0.00603710	0.00012697
Retene		0.00000000	0.00000000	0.00009294	0.00003082	0.00001052	0.00132478	0.00003420
		0.00000000	0.00000000	0.00005360	0.00001090	0.00000728	0.00292125	0.00008473
Benzonaphthothiophene		0.00000000	0.00000000	0.00004249	0.00001410	0.00003372	0.00264955	0.00011116
		0.00000000	0.00000000	0.00008650	0.00002001	0.00003202	0.00480483	0.00015770
B-MePy/MeFl		0.00000000	0.00000000	0.00002921	0.00002611	0.00003807	0.00014720	0.00000000
		0.00000000	0.00000000	0.00006017	0.00002822	0.00003717	0.00249814	0.00006046
C-methylpyrene/methyl fluoranthene		0.00000000	0.00000000	0.00004514	0.00002194	0.00001849	0.00471032	0.00002993
		0.00000000	0.00000000	0.00003789	0.00000849	0.00000601	0.00239918	0.00006055
4-methylpyrene		0.00000000	0.00000000	0.00004249	0.00001254	0.00001668	0.00206076	0.00004703
		0.00000000	0.00000000	0.00004158	0.00000897	0.00000792	0.00231115	0.00006069
1-methylpyrene		0.00000000	0.00000000	0.00005842	0.00003290	0.00001305	0.00132478	0.00002993
		0.00000000	0.00000000	0.00003812	0.00000892	0.00000533	0.00209144	0.00006055
benzo(c)phenanthrene		0.00000000	0.00000000	0.00002655	0.00002037	0.00001487	0.00117758	0.00007268
		0.00000000	0.00000000	0.00004516	0.00001934	0.00001395	0.00250437	0.00009106
Chrysene		0.00000000	0.00000000	0.00007170	0.00003029	0.00009065	0.00220796	0.00010261
		0.00000000	0.00000000	0.00007180	0.00002023	0.00004475	0.00355469	0.00011546
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00004131	0.00000813	0.00000615	0.00208167	0.00006046
5+6-methylchrysene		0.00000000	0.00000000	0.00000000	0.00000575	0.00000435	0.00117758	0.00010261
		0.00000000	0.00000000	0.00003755	0.00000741	0.00000515	0.00208941	0.00006155
Benzo(b+j+k)fluoranthe		0.00000000	0.00000000	0.00009560	0.00013423	0.00006019	0.00147197	0.00006841
		0.00000000	0.00000000	0.00007587	0.00006025	0.00002800	0.00354587	0.00010308
BeP		0.00000000	0.00000000	0.00000000	0.00000000	0.00001704	0.00000000	0.00005130
		0.00000000	0.00000000	0.00003755	0.00000739	0.00000644	0.00208167	0.00006676
Perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000580	0.00073599	0.00000000
		0.00000000	0.00000000	0.00003755	0.00000739	0.00000925	0.00270857	0.00006046
Indeno[123-cd]pyrene		0.00000000	0.00000000	0.00000000	0.00002194	0.00001487	0.00000000	0.00002993
		0.00000000	0.00000000	0.00010515	0.00003554	0.00002467	0.00582872	0.00018142
Benzo(ghi)perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000399	0.00323834	0.00000000
		0.00000000	0.00000000	0.00013519	0.00002585	0.00001898	0.00792569	0.00021162
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00001859	0.00000209	0.00000363	0.00000000	0.00006413
		0.00000000	0.00000000	0.00015398	0.00002955	0.00002103	0.00811852	0.00025405
Coronene		0.00000000	0.00000000	0.00000000	0.00000052	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003755	0.00000813	0.00000513	0.00208167	0.00006651

Table 5-2 cont.

Species	Source	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP	MOTO	REFUSEBA
Cl^-		0.004900	0.003400	0.000000	0.005300	0.000700	0.000100	0.002300
		0.002200	0.001600	0.000400	0.002800	0.000200	0.000000	0.000400
NO_3^-		0.000000	0.000000	0.000000	0.000000	0.000000	0.000100	0.000700
		0.002000	0.001400	0.000400	0.002600	0.000200	0.000000	0.000400
$SO_4^=$		0.004600	0.003500	0.001000	0.000000	0.410900	0.000100	0.002300
		0.002100	0.001400	0.000400	0.002600	0.038100	0.000000	0.000400
NH_4^+		0.003300	0.001000	0.000200	0.001400	0.011600	0.000000	0.001600
		0.002000	0.001400	0.000400	0.002700	0.000900	0.000000	0.000400
Na^+		0.000700	0.000900	0.000000	0.000400	0.008100	0.000000	0.000300
		0.000100	0.000100	0.000000	0.000200	0.000600	0.000000	0.000000
K^+		0.000800	0.000500	0.000100	0.000600	0.000200	0.000000	0.000200
		0.000200	0.000100	0.000000	0.000300	0.000000	0.000000	0.000000
OC		0.571900	0.776400	0.751900	0.925700	0.154400	0.685700	0.932700
		0.045000	0.058800	0.056100	0.072400	0.011600	0.051100	0.069900
EC		0.708400	0.052400	0.027000	0.064900	0.004600	0.035900	0.020700
		0.059300	0.004800	0.002300	0.006700	0.000500	0.003000	0.001800
TC		1.280300	0.828800	0.778800	0.990600	0.159000	0.721600	0.953400
		0.095700	0.061600	0.056800	0.076200	0.011700	0.052600	0.069900
Al		0.001100	0.000600	0.000300	0.000000	0.000200	0.000000	0.000400
		0.000300	0.000200	0.000100	0.000800	0.000200	0.000000	0.000400
Si		0.042600	0.003000	0.001600	0.005300	0.001500	0.000300	0.001400
		0.003100	0.000300	0.000100	0.000500	0.000100	0.000000	0.000100
S		0.008300	0.006000	0.005600	0.006200	0.105800	0.005700	0.004800
		0.000600	0.000400	0.000400	0.000500	0.007500	0.000400	0.000400
Cl		0.001200	0.001000	0.000200	0.000500	0.000000	0.000100	0.015100
		0.000200	0.000100	0.000100	0.000500	0.002400	0.000100	0.001100
K		0.000600	0.000300	0.000100	0.000200	0.000200	0.000000	0.000700
		0.000100	0.000100	0.000100	0.000400	0.000000	0.000000	0.000100
Ca		0.001800	0.003700	0.001200	0.002900	0.000700	0.000500	0.001600
		0.000200	0.000300	0.000100	0.000300	0.000100	0.000000	0.000200
Ti		0.000700	0.000100	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001700	0.001200	0.000300	0.002200	0.000200	0.000100	0.001200
V		0.000000	0.000100	0.000000	0.000000	0.017700	0.000000	0.000000
		0.000700	0.000500	0.000100	0.000900	0.001300	0.000000	0.000500
Cr		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000100
		0.000200	0.000100	0.000000	0.000200	0.000500	0.000000	0.000100
Mn		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000200	0.000100	0.000000	0.000100
Fe		0.003500	0.001600	0.000200	0.001000	0.002300	0.000000	0.000300
		0.000300	0.000100	0.000000	0.000100	0.000200	0.000000	0.000000
Ni		0.000000	0.000000	0.000000	0.000000	0.011500	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000800	0.000000	0.000100
Cu		0.000100	0.000100	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000000	0.000000	0.000100	0.000100	0.000000	0.000100
Zn		0.000500	0.002600	0.000400	0.000400	0.002800	0.000300	0.000400
		0.000100	0.000200	0.000000	0.000100	0.000200	0.000000	0.000000
Se		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000000	0.000000	0.000100
Br		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000000	0.000000	0.000000
Rb		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000000	0.000000	0.000000
Sr		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000000	0.000000	0.000100
Zr		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000100	0.000100	0.000000	0.000100	0.000000	0.000000	0.000100
Sn		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001100	0.000800	0.000200	0.001400	0.000100	0.000000	0.000700
Sb		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001200	0.000900	0.000200	0.001600	0.000100	0.000000	0.000800
Ba		0.000000	0.000000	0.000000	0.002300	0.000500	0.000100	0.001100
		0.004300	0.003100	0.000800	0.005500	0.000100	0.000100	0.002900
Pb		0.000300	0.000500	0.000000	0.000000	0.001100	0.000000	0.000200
		0.000100	0.000100	0.000000	0.000300	0.000100	0.000000	0.000200

Table 5-2 cont.

Species	Source	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP	MOTO	REFUSEBA
Fluorene		0.00206024	0.00187167	0.00056131	0.00372251	0.00000000	0.00005592	0.00246156
		0.00069838	0.00062286	0.00018650	0.00122914	0.00001942	0.00001865	0.00080170
Phenanthrene		0.00209639	0.00133091	0.00040152	0.00172251	0.00000000	0.00015002	0.00442325
		0.00035189	0.00022649	0.00006746	0.00030083	0.00000906	0.00002420	0.00070537
A-methylfluorene		0.00098795	0.00061362	0.00026161	0.00129843	0.00007325	0.00004110	0.00095114
		0.00016299	0.00010199	0.00004138	0.00021369	0.00001757	0.00000636	0.00015175
1-methylfluorene		0.00122892	0.00052396	0.00017634	0.00114660	0.00008149	0.00002841	0.00251324
		0.00033122	0.00015062	0.00004974	0.00032322	0.00002868	0.00000760	0.00063629
B-methylfluorene		0.00018072	0.00014010	0.00006706	0.00025131	0.00000000	0.00000808	0.00021059
		0.00007112	0.00005386	0.00001910	0.00009327	0.00001295	0.00000220	0.00005447
9-fluorenone		0.00044578	0.00017932	0.00004719	0.00004712	0.00000000	0.00000364	0.00490306
		0.00011898	0.00006275	0.00001722	0.00008162	0.00001295	0.00000168	0.00093372
Xanthone		0.00016868	0.00010647	0.00002235	0.00008377	0.00000000	0.00000870	0.00061713
		0.00008175	0.00005288	0.00001427	0.00008199	0.00001295	0.00000293	0.00018269
Acenaphthenequinone		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00042273
		0.00012495	0.00004359	0.00002459	0.00011847	0.00001424	0.00000226	0.00019988
Perinaphthenone		0.00004016	0.00000000	0.00000000	0.00000000	0.00000000	0.00001234	0.00017511
		0.00011936	0.00004755	0.00001288	0.00007404	0.00001295	0.00000927	0.00010441
A-methylphenanthrene		0.00065864	0.00026618	0.00015316	0.00054974	0.00000183	0.00004909	0.00026459
		0.00012169	0.00005953	0.00002808	0.00012082	0.00001295	0.00000815	0.00004921
2-methylphenanthrene		0.00081526	0.00022695	0.00018048	0.00043456	0.00000183	0.00005655	0.00044279
		0.00043017	0.00014490	0.00009467	0.00027832	0.00001813	0.00002699	0.00022482
C-methylphenanthrene		0.00065060	0.00022135	0.00010597	0.00020419	0.00003937	0.00002681	0.00062715
		0.00072501	0.00027848	0.00012234	0.00031922	0.00005844	0.00002828	0.00063121
1-methylphenanthrene		0.00056627	0.00018493	0.00014405	0.00040838	0.00003754	0.00002503	0.00099280
		0.00055458	0.00020709	0.00013793	0.00043928	0.00004809	0.00002314	0.00088522
Anthraquinone		0.00009237	0.00004763	0.00001242	0.00007853	0.00000916	0.00000293	0.00020597
		0.00009711	0.00005968	0.00001645	0.00010404	0.00001557	0.00000278	0.00015986
3,6-dimethylphenanthre		0.00015663	0.00000000	0.00004139	0.00006283	0.00000000	0.00001793	0.00008486
		0.00016565	0.00005548	0.00004008	0.00013347	0.00001295	0.00001284	0.00006075
A-dimethylphenanthrene		0.00024498	0.00002522	0.00006706	0.00016230	0.00000641	0.00002841	0.00001697
		0.00027401	0.00005555	0.00007414	0.00020813	0.00001685	0.00002955	0.00005022
B-dimethylphenanthrene		0.00017269	0.00000841	0.00003063	0.00004712	0.00001007	0.00001332	0.00007714
		0.00010965	0.00004360	0.00002020	0.00008162	0.00001558	0.00000645	0.00003915
C-dimethylphenanthrene		0.00080321	0.00016251	0.00016392	0.00034031	0.00000641	0.00004580	0.00012960
		0.00014512	0.00004724	0.00002974	0.00009680	0.00001297	0.00000772	0.00002621
D-dimethylphenanthrene		0.00025301	0.00005043	0.00006706	0.00009948	0.00000000	0.00001198	0.00030548
		0.00011710	0.00004789	0.00002795	0.00008956	0.00001295	0.00000459	0.00010811
Fluoranthene		0.00040562	0.00015411	0.00011839	0.00051833	0.00000824	0.00009347	0.00019054
		0.00013302	0.00008111	0.00003106	0.00017309	0.00002462	0.00001643	0.00004375
Pyrene		0.00072691	0.00029420	0.00016475	0.00069634	0.00001099	0.00017656	0.00013577
		0.00013538	0.00006798	0.00002980	0.00014218	0.00001430	0.00002781	0.00002842
9-anthraldehyde		0.00010843	0.00001681	0.00003312	0.00000000	0.00000000	0.00002494	0.00000309
		0.00023885	0.00012285	0.00005632	0.00014068	0.00001295	0.00002165	0.00001092
Retene		0.00004016	0.00005324	0.00000414	0.00004712	0.00001099	0.00000417	0.00057393
		0.00007964	0.00005580	0.00001640	0.00010379	0.00001817	0.00000182	0.00007120
Benzonaphthothiophene		0.00010442	0.00005884	0.00001739	0.00000524	0.00001923	0.00000479	0.00004937
		0.00014813	0.00009533	0.00002817	0.00014808	0.00003115	0.00000505	0.00006243
B-MePy/MeFl		0.00005623	0.00003643	0.00000911	0.00004189	0.00001465	0.00001713	0.00002931
		0.00009676	0.00006749	0.00001876	0.00011116	0.00002466	0.00001593	0.00003506
C-methylpyrene/methyl fluoranthene		0.00000000	0.00000000	0.00002318	0.00008901	0.00002014	0.00001411	0.00002083
		0.00005680	0.00003963	0.00001199	0.00007472	0.00001314	0.00000286	0.00001223
4-methylpyrene		0.00014458	0.00004483	0.00001821	0.00007330	0.00001648	0.00001172	0.00002854
		0.00008116	0.00004388	0.00001420	0.00008187	0.00001436	0.00000447	0.00001667
1-methylpyrene		0.00004819	0.00000841	0.00001490	0.00009424	0.00000366	0.00001261	0.00004166
		0.00005705	0.00003964	0.00001183	0.00007480	0.00001296	0.00000225	0.00001288
benzo(c)phenanthrene		0.00008835	0.00007005	0.00000994	0.00004189	0.00000733	0.00000453	0.00003317
		0.00009706	0.00007570	0.00001526	0.00008898	0.00001556	0.00000405	0.00002969
Chrysene		0.00012450	0.00010367	0.00005050	0.00004712	0.00000183	0.00001678	0.00028002
		0.00011445	0.00008795	0.00003327	0.00011859	0.00002072	0.00000850	0.00013462
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00002546
		0.00005680	0.00004359	0.00001405	0.00007404	0.00001295	0.00000138	0.00001876
5+6-methylchrysene		0.00002410	0.00003643	0.00000662	0.00004189	0.00000183	0.00000169	0.00003394
		0.00005686	0.00003984	0.00001173	0.00007420	0.00001295	0.00000127	0.00001259
Benzo(b+j+k)fluoranthe		0.00003213	0.00011768	0.00003477	0.00009424	0.00000000	0.00003098	0.00007637
		0.00009662	0.00008425	0.00002489	0.00013370	0.00002072	0.00001363	0.00006601
BeP		0.00000000	0.00003082	0.00000745	0.00003665	0.00000000	0.00002619	0.00010337
		0.00005680	0.00004372	0.00001174	0.00007416	0.00001295	0.00000560	0.00002764
Perylene		0.00000000	0.00000280	0.00001821	0.00000000	0.00000000	0.00001314	0.00000926
		0.00005680	0.00004755	0.00002467	0.00008145	0.00001424	0.00001164	0.00001313
Indeno[123-cd]pyrene		0.00002410	0.00000560	0.00001904	0.00021990	0.00000824	0.00002929	0.00000000
		0.00017041	0.00011492	0.00004337	0.00035627	0.00004015	0.00003205	0.00006546
Benzo(ghi)perylene		0.00003213	0.00004483	0.00005712	0.00047644	0.00000000	0.00007572	0.00000000
		0.00021018	0.00014670	0.00005191	0.00035213	0.00004662	0.00002865	0.00004473
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00022150	0.00015454	0.00004566	0.00028876	0.00005180	0.00000490	0.00004473
Coronene		0.00000000	0.00002522	0.00003891	0.00020419	0.00000000	0.00004359	0.00000694
		0.00005680	0.00004368	0.00001583	0.00009179	0.00001295	0.00000765	0.00001420

Table 5-2 cont.

Species	Source	REFUSED1	REFUSED2	REST	MV7525	MV5050	MV2575	RICE2
Cl^-		0.002300	0.019600	0.005000	0.011073	0.013925	0.016776	0.017306
		0.000200	0.001500	0.000600	0.014700	0.020022	0.024201	0.004235
NO_3^-		0.000000	0.000600	0.007000	0.018872	0.020666	0.022459	0.001443
		0.000100	0.000100	0.001400	0.008691	0.010180	0.011477	0.000581
$SO_4^=$		0.000800	0.000600	0.001600	0.099534	0.111477	0.123419	0.011429
		0.000200	0.000100	0.000500	0.032867	0.028045	0.022199	0.001711
NH_4^+		0.001300	0.009700	0.000200	0.033179	0.038166	0.043153	0.003534
		0.000200	0.000700	0.000500	0.011431	0.010415	0.009289	0.000428
Na^+		0.000200	0.000100	0.001800	0.014165	0.015201	0.016237	0.000896
		0.000000	0.000000	0.000100	0.009964	0.008893	0.007673	0.000198
K^+		0.000200	0.000200	0.008500	0.009703	0.010755	0.011806	0.040900
		0.000000	0.000000	0.000800	0.005181	0.004548	0.003812	0.012700
OC		1.152800	0.623800	0.805900	0.632040	0.632792	0.633545	0.447300
		0.085900	0.046400	0.060100	0.071419	0.072401	0.073370	0.079800
EC		0.016900	0.065800	0.009600	0.259870	0.257906	0.255942	0.238700
		0.001400	0.005400	0.001100	0.090244	0.123944	0.150268	0.110500
TC		1.169700	0.689700	0.815500	0.891616	0.890503	0.889389	0.552581
		0.085300	0.050200	0.059500	0.117240	0.133410	0.147822	0.093557
Al		0.000100	0.000300	0.000300	0.002328	0.002466	0.002605	0.000268
		0.000200	0.000100	0.000100	0.002435	0.002995	0.003465	0.000288
Si		0.001000	0.002000	0.005400	0.004931	0.005590	0.006250	0.000456
		0.000100	0.000100	0.000400	0.002628	0.002648	0.002667	0.000255
S		0.001900	0.001300	0.002200	0.042032	0.044956	0.047880	0.006263
		0.000100	0.000100	0.000200	0.007464	0.006727	0.005898	0.000446
Cl		0.013200	0.076200	0.008000	0.000222	0.000430	0.000637	0.018032
		0.001000	0.005400	0.000600	0.001043	0.001095	0.001146	0.001386
K		0.000500	0.000500	0.009600	0.006339	0.007188	0.008036	0.040900
		0.000100	0.000000	0.000700	0.002101	0.001795	0.001425	0.012700
Ca		0.000500	0.000200	0.000800	0.003035	0.003209	0.003384	0.000060
		0.000100	0.000000	0.000100	0.001279	0.001078	0.000829	0.000077
Ti		0.000000	0.000000	0.000000	0.000262	0.000301	0.000339	0.000002
		0.000400	0.000200	0.000400	0.004431	0.004598	0.004760	0.000222
V		0.000000	0.000000	0.000000	0.000159	0.000194	0.000228	0.000000
		0.000200	0.000100	0.000200	0.001895	0.001955	0.002012	0.000121
Cr		0.000000	0.000000	0.000000	0.000077	0.000087	0.000096	0.000000
		0.000000	0.000000	0.000000	0.000297	0.000297	0.000298	0.000031
Mn		0.000000	0.000000	0.000000	0.000200	0.000208	0.000217	0.000000
		0.000000	0.000000	0.000000	0.000199	0.000212	0.000224	0.000013
Fe		0.000100	0.000100	0.000300	0.003852	0.004539	0.005227	0.000077
		0.000000	0.000000	0.000000	0.002872	0.003436	0.003919	0.000047
Ni		0.000000	0.000000	0.000000	0.000036	0.000038	0.000039	0.000000
		0.000000	0.000000	0.000000	0.000107	0.000112	0.000117	0.000006
Cu		0.000000	0.000500	0.000000	0.000202	0.000182	0.000161	0.000050
		0.000000	0.000000	0.000000	0.000093	0.000095	0.000096	0.000068
Zn		0.000000	0.000900	0.000000	0.001800	0.001798	0.001795	0.000004
		0.000000	0.000100	0.000000	0.000736	0.000894	0.001028	0.000005
Se		0.000000	0.000000	0.000000	0.000014	0.000014	0.000013	0.000000
		0.000000	0.000000	0.000000	0.000111	0.000116	0.000121	0.000006
Br		0.000000	0.000500	0.000000	0.000067	0.000072	0.000076	0.000099
		0.000000	0.000000	0.000000	0.000113	0.000122	0.000130	0.000008
Rb		0.000000	0.000000	0.000000	0.000008	0.000005	0.000003	0.000000
		0.000000	0.000000	0.000000	0.000139	0.000144	0.000148	0.000009
Sr		0.000000	0.000000	0.000000	0.000018	0.000016	0.000013	0.000001
		0.000000	0.000000	0.000000	0.000181	0.000187	0.000193	0.000009
Zr		0.000000	0.000000	0.000000	0.000044	0.000029	0.000015	0.000005
		0.000000	0.000000	0.000000	0.000260	0.000269	0.000278	0.000013
Sn		0.000000	0.000100	0.000000	0.000115	0.000092	0.000069	0.000000
		0.000300	0.000100	0.000200	0.001923	0.001952	0.001981	0.000085
Sb		0.000000	0.000100	0.000000	0.000015	0.000010	0.000005	0.000003
		0.000300	0.000100	0.000300	0.002231	0.002287	0.002341	0.000104
Ba		0.000700	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001100	0.000400	0.001000	0.010622	0.011052	0.011466	0.000509
Pb		0.000200	0.002200	0.000000	0.000964	0.001118	0.001272	0.000009
		0.000000	0.000200	0.000100	0.000752	0.000906	0.001038	0.000020

Table 5-2 cont.

Species	Source	REFUSED1	REFUSED2	REST	MV7525	MV5050	MV2575	RICE2
Fluorene		0.00269719	0.00043436	-99.00000000	0.04201842	0.04584871	0.04967899	0.00327820
		0.00085762	0.00013839	-99.00000000	0.00900878	0.00938620	0.00974902	0.00169614
Phenanthrene		0.00460295	0.00073089	-99.00000000	0.02857183	0.02850101	0.02843018	0.00233055
		0.00073081	0.00011607	-99.00000000	0.00902254	0.00810392	0.00706688	0.00105360
A-methylfluorene		0.00047565	0.00018789	-99.00000000	0.01293193	0.01223795	0.01154396	0.00083963
		0.00007417	0.00002857	-99.00000000	0.00528428	0.00469181	0.00401279	0.00043595
1-methylfluorene		0.00341501	0.00049122	-99.00000000	0.00988636	0.00931573	0.00874509	0.00042480
		0.00085128	0.00012265	-99.00000000	0.00370408	0.00316323	0.00250835	0.00019436
B-methylfluorene		0.00022823	0.00003168	-99.00000000	0.00323049	0.00301765	0.00280480	0.00021312
		0.00005141	0.00000732	-99.00000000	0.00230203	0.00196206	0.00154921	0.00007644
9-fluorenone		0.00362614	0.00059689	-99.00000000	0.00396953	0.00413305	0.00429656	0.00106211
		0.00068992	0.00011357	-99.00000000	0.00247979	0.00216571	0.00179757	0.00089959
Xanthone		0.00038993	0.00006390	-99.00000000	0.00314328	0.00266474	0.00218619	0.00008785
		0.00011529	0.00001889	-99.00000000	0.00284628	0.00234103	0.00169101	0.00010541
Acenaphthenequinone		0.00018143	0.00004611	-99.00000000	0.00109188	0.00092272	0.00075355	0.00004193
		0.00008573	0.00002180	-99.00000000	0.00054708	0.00046778	0.00037194	0.00003673
Perinaphthenone		0.00022586	0.00006109	-99.00000000	0.00186561	0.00170858	0.00155154	0.00017504
		0.00013367	0.00003618	-99.00000000	0.00138431	0.00114383	0.00083690	0.00010453
A-methylphenanthrene		0.00020404	0.00003641	-99.00000000	0.00963636	0.00853679	0.00743723	0.00014120
		0.00003518	0.00000625	-99.00000000	0.00547607	0.00459359	0.00349497	0.00007099
2-methylphenanthrene		0.00022139	0.00004705	-99.00000000	0.01019723	0.00927837	0.00835950	0.00026013
		0.00010847	0.00002291	-99.00000000	0.00475966	0.00396059	0.00295266	0.00015939
C-methylphenanthrene		0.00041570	0.00008552	-99.00000000	0.01163903	0.01008834	0.00853766	0.00019302
		0.00041462	0.00008519	-99.00000000	0.00662719	0.00552434	0.00413727	0.00009877
1-methylphenanthrene		0.00052929	0.00010543	-99.00000000	0.00593115	0.00531626	0.00470136	0.00015793
		0.00046856	0.00009320	-99.00000000	0.00303969	0.00254544	0.00192844	0.00010630
Anthraquinone		0.00014199	0.00002532	-99.00000000	0.00050251	0.00052659	0.00055067	0.00008060
		0.00010937	0.00001951	-99.00000000	0.00066175	0.00069341	0.00072369	0.00011958
3,6-dimethylphenanthre		0.00001867	0.00000892	-99.00000000	0.00621170	0.00570955	0.00520739	0.00005971
		0.00001428	0.00000614	-99.00000000	0.00468305	0.00385741	0.00279791	0.00003559
A-dimethylphenanthrene		0.00002629	0.00000000	-99.00000000	0.00487441	0.00478442	0.00469444	0.00006909
		0.00003767	0.00000146	-99.00000000	0.00217136	0.00192519	0.00164252	0.00009770
B-dimethylphenanthrene		0.00007993	0.00001222	-99.00000000	0.00268878	0.00258991	0.00249104	0.00000674
		0.00003716	0.00000574	-99.00000000	0.00143282	0.00119452	0.00089487	0.00000953
C-dimethylphenanthrene		0.00004338	0.00000951	-99.00000000	0.01271800	0.01117586	0.00963372	0.00009151
		0.00000888	0.00000187	-99.00000000	0.00698882	0.00574586	0.00414564	0.00003345
D-dimethylphenanthrene		0.00043121	0.00005557	-99.00000000	0.00232262	0.00196791	0.00161321	0.00003738
		0.00014649	0.00001902	-99.00000000	0.00134977	0.00113517	0.00086911	0.00002577
Fluoranthene		0.00018116	0.00003912	-99.00000000	0.00609510	0.00720906	0.00832301	0.00033859
		0.00003387	0.00000720	-99.00000000	0.00176600	0.00168152	0.00159258	0.00013151
Pyrene		0.00019142	0.00003458	-99.00000000	0.00521149	0.00613125	0.00705101	0.00021631
		0.00003174	0.00000575	-99.00000000	0.00155562	0.00193014	0.00224297	0.00007258
9-anthraldehyde		0.00022271	0.00002764	-99.00000000	0.00518056	0.00442186	0.00366316	0.00004487
		0.00016293	0.00002023	-99.00000000	0.00306014	0.00261174	0.00206832	0.00002246
Retene		0.00145771	0.00018834	-99.00000000	0.00052552	0.00048974	0.00045395	0.00001179
		0.00017540	0.00002268	-99.00000000	0.00024290	0.00023868	0.00023437	0.00000914
Benzonaphthothiophene		0.00005785	0.00001237	-99.00000000	0.00025746	0.00022671	0.00019595	0.00002292
		0.00005726	0.00001206	-99.00000000	0.00023990	0.00024452	0.00024906	0.00002601
B-MePy/MeFl		0.00015040	0.00001892	-99.00000000	0.00081647	0.00085220	0.00088792	0.00008426
		0.00013602	0.00001727	-99.00000000	0.00021074	0.00022008	0.00022903	0.00002961
C-methylpyrene/methyl fluoranthene		0.00011885	0.00001350	-99.00000000	0.00030356	0.00034332	0.00038309	0.00003601
		0.00002166	0.00000252	-99.00000000	0.00013222	0.00014209	0.00015131	0.00001141
4-methylpyrene		0.00014383	0.00001503	-99.00000000	0.00070595	0.00064488	0.00058380	0.00003395
		0.00005307	0.00000562	-99.00000000	0.00036492	0.00032206	0.00027253	0.00001378
1-methylpyrene		0.00016802	0.00002054	-99.00000000	0.00048202	0.00044470	0.00040737	0.00003906
		0.00002467	0.00000306	-99.00000000	0.00024042	0.00021223	0.00017967	0.00001834
benzo(c)phenanthrene		0.00010281	0.00001488	-99.00000000	0.00009221	0.00009199	0.00009177	0.00003674
		0.00008482	0.00001231	-99.00000000	0.00013679	0.00013876	0.00014070	0.00002855
Chrysene		0.00080274	0.00011843	-99.00000000	0.00067839	0.00068018	0.00068197	0.00034906
		0.00037711	0.00005566	-99.00000000	0.00023118	0.00023485	0.00023847	0.00010269
Benz(a)anthracene-7,12-dione		0.00005574	0.00000985	-99.00000000	0.00003147	0.00003248	0.00003350	0.00001453
		0.00003331	0.00000589	-99.00000000	0.00011426	0.00011740	0.00012046	0.00000898
5+6-methylchrysene		0.00011780	0.00000729	-99.00000000	0.00001807	0.00001205	0.00000602	0.00003870
		0.00001656	0.00000127	-99.00000000	0.00011073	0.00011511	0.00011933	0.00001824
Benzo(b+j+k)fluoranthe		0.00031710	0.00004050	-99.00000000	0.00042072	0.00047371	0.00052669	0.00031132
		0.00014605	0.00001928	-99.00000000	0.00039872	0.00041124	0.00042340	0.00014095
BeP		0.00019747	0.00003192	-99.00000000	0.00010726	0.00014835	0.00018944	0.00009643
		0.00004135	0.00000674	-99.00000000	0.00018928	0.00021364	0.00023550	0.00005603
Perylene		0.00007967	0.00000956	-99.00000000	0.00000000	0.00000000	0.00000000	0.00001161
		0.00006605	0.00000795	-99.00000000	0.00011419	0.00011735	0.00012042	0.00001346
Indeno[123-cd]pyrene		0.00000000	0.00000567	-99.00000000	0.00021399	0.00024585	0.00027770	0.00010353
		0.00001562	0.00001075	-99.00000000	0.00037938	0.00039606	0.00041207	0.00006479
Benzo(ghi)perylene		0.00000000	0.00000000	-99.00000000	0.00067940	0.00088412	0.00108883	0.00008914
		0.00001376	0.00000397	-99.00000000	0.00044690	0.00048638	0.00052288	0.00002831
Dibenz(ah+ac)anthracene		0.00001104	0.00000374	-99.00000000	0.00004301	0.00003164	0.00002028	0.00003272
		0.00002049	0.00000462	-99.00000000	0.00043016	0.00044778	0.00046472	0.00003574
Coronene		0.00004707	0.00000365	-99.00000000	0.00043305	0.00062532	0.00081760	0.00004640
		0.00001068	0.00000125	-99.00000000	0.00040503	0.00050027	0.00058008	0.00002083

Table 5-3. Source profiles used in CAIP PM_{10} source apportionment modeling with PAH (percent mass followed by uncertainty).

Species	Source	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD
Cl^-		0.005679	0.013311	0.005816	0.005495	0.018754	0.005812	0.003763
		0.000863	0.001809	0.001029	0.001051	0.002479	0.000818	0.000556
NO_3^-		0.002581	0.001627	0.002493	0.000000	0.005126	0.001939	0.001206
		0.000470	0.000469	0.000712	0.000000	0.000426	0.000325	0.000266
$SO_4^=$		0.026067	0.034490	0.023679	0.014648	0.039508	0.031168	0.014901
		0.002678	0.003528	0.002498	0.001675	0.004011	0.003174	0.001531
NH_4^+		0.001382	0.000341	0.000636	0.000489	0.000121	0.000510	0.000518
		0.000447	0.000456	0.000689	0.000761	0.000209	0.000296	0.000256
Na^+		0.005180	0.010405	0.004219	0.003839	0.011660	0.004662	0.002826
		0.000368	0.000739	0.000307	0.000278	0.000826	0.000331	0.000200
K^+		0.003284	0.003810	0.001805	0.002263	0.003139	0.001964	0.003768
		0.000244	0.000282	0.000148	0.000185	0.000231	0.000148	0.000277
OC		0.145912	0.179168	0.131561	0.092298	0.114023	0.079707	0.085794
		0.015863	0.019399	0.015033	0.011384	0.012243	0.008798	0.009322
EC		0.008344	0.006153	0.014683	0.001222	0.002042	0.002229	0.001954
		0.005452	0.004096	0.009609	0.001531	0.001383	0.001533	0.001360
TC		0.154345	0.185321	0.146244	0.093521	0.116065	0.081941	0.087748
		0.016515	0.019751	0.016444	0.011815	0.012245	0.008943	0.009414
Al		0.069700	0.047447	0.073206	0.049666	0.035636	0.087938	0.100841
		0.021003	0.014308	0.022069	0.014996	0.010739	0.026490	0.030370
Si		0.231950	0.168910	0.238534	0.165956	0.117069	0.220296	0.248777
		0.074322	0.054128	0.076457	0.053193	0.037512	0.070590	0.079712
S		0.012608	0.012883	0.010645	0.011552	0.009255	0.008715	0.004531
		0.000897	0.000917	0.000765	0.000829	0.000657	0.000620	0.000324
Cl		0.008676	0.020161	0.006686	0.008365	0.019890	0.006906	0.003485
		0.002586	0.005952	0.002027	0.002507	0.005880	0.002063	0.001046
K		0.014489	0.011785	0.010775	0.011045	0.008031	0.009885	0.016695
		0.002997	0.002456	0.002260	0.002314	0.001752	0.002059	0.003428
Ca		0.159664	0.176597	0.191071	0.177580	0.250364	0.143133	0.077806
		0.028008	0.030985	0.033533	0.031178	0.043914	0.025107	0.013650
Ti		0.003663	0.002926	0.004855	0.003268	0.002638	0.005692	0.006871
		0.000306	0.000265	0.000417	0.000326	0.000206	0.000421	0.000500
V		0.000136	0.000000	0.000052	0.000063	0.000056	0.000015	0.000000
		0.000233	0.000000	0.000325	0.000299	0.000138	0.000270	0.000000
Cr		0.000091	0.000027	0.000169	0.000100	0.000051	0.000030	0.000009
		0.000021	0.000094	0.000027	0.000028	0.000014	0.000090	0.000094
Mn		0.000468	0.000355	0.000688	0.000570	0.000396	0.000974	0.001182
		0.000041	0.000032	0.000062	0.000054	0.000033	0.000077	0.000092
Fe		0.031934	0.028879	0.041945	0.034022	0.027723	0.057729	0.064653
		0.002261	0.002048	0.002983	0.002420	0.001962	0.004087	0.004576
Ni		0.000050	0.000040	0.000078	0.000063	0.000054	0.000040	0.000028
		0.000008	0.000007	0.000014	0.000010	0.000007	0.000010	0.000010
Cu		0.000178	0.000147	0.000169	0.000326	0.000135	0.000150	0.000118
		0.000016	0.000015	0.000016	0.000024	0.000011	0.000013	0.000011
Zn		0.001317	0.000757	0.000688	0.001412	0.000610	0.000735	0.000372
		0.000095	0.000055	0.000052	0.000102	0.000044	0.000054	0.000026
Se		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Br		0.000000	0.000000	0.000000	0.000000	0.000003	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000015	0.000000	0.000000
Rb		0.000029	0.000000	0.000000	0.000000	0.000018	0.000030	0.000038
		0.000008	0.000000	0.000000	0.000000	0.000004	0.000005	0.000005
Sr		0.000705	0.000944	0.000948	0.000896	0.001239	0.000750	0.000367
		0.000051	0.000067	0.000071	0.000064	0.000088	0.000055	0.000026
Zr		0.000107	0.000087	0.000143	0.000100	0.000075	0.000165	0.000198
		0.000017	0.000014	0.000027	0.000019	0.000018	0.000017	0.000017
Sn		0.000251	0.000174	0.000221	0.000733	0.000122	0.000010	0.000052
		0.000285	0.000268	0.000416	0.000150	0.000161	0.000185	0.000170
Sb		0.000167	0.000000	0.000091	0.000000	0.000000	0.000020	0.000000
		0.000324	0.000000	0.000480	0.000000	0.000000	0.000215	0.000000
Ba		0.000000	0.001252	0.001233	0.001476	0.000679	0.000944	0.000749
		0.000000	0.000354	0.001624	0.001595	0.000201	0.000240	0.000215
Pb		0.000502	0.000341	0.000338	0.000679	0.000212	0.001159	0.000297
		0.000042	0.000032	0.000043	0.000057	0.000019	0.000083	0.000024

Table 5-3 cont.

Species	Source	BSSOIL	HESOIL	KASOIL	ELMAUPRD	QUAPVRD	SHOBUPRD	KAHAUPRD
Fluorene		0.00054861	0.00073655	0.00155786	0.00153906	0.00011039	0.00054970	0.00061224
		0.00066559	0.00151552	0.00293852	0.00217798	0.00022714	0.00113108	0.00106607
Phenanthrene		0.00091435	0.00227659	0.00428410	0.00181066	0.00035124	0.00169908	0.00230767
		0.00026263	0.00067260	0.00130315	0.00077361	0.00010088	0.00050195	0.00048029
A-methylfluorene		0.00080985	0.00133917	0.00220696	0.00334972	0.00074262	0.00149919	0.01158547
		0.00037167	0.00094931	0.00183931	0.00129147	0.00017432	0.00071070	0.00163794
1-methylfluorene		0.00049636	0.00066959	0.00168768	0.00099586	0.00015053	0.00024987	0.00051805
		0.00040715	0.00094753	0.00183791	0.00128131	0.00014212	0.00070683	0.00066653
B-methylfluorene		0.00033962	0.00000000	0.00000000	0.00009053	0.00005018	0.00009995	0.00000000
		0.00055444	0.00094693	0.00183593	0.00128033	0.00015613	0.00070674	0.00066602
9-fluorenone		0.00067923	0.00227659	0.00324553	0.00425505	0.00051181	0.00104943	0.00631078
		0.00044466	0.00123633	0.00202613	0.00193249	0.00021442	0.00077916	0.00215458
Xanthone		0.00007837	0.00040175	0.00077893	0.00009053	0.00001004	0.00014992	0.00042386
		0.00036947	0.00104180	0.00201988	0.00128033	0.00014192	0.00070676	0.00079954
Acenaphthenequinone		0.03461473	0.13666252	0.12190214	0.17047358	0.00827920	0.00000000	0.07959121
		0.00486347	0.01916690	0.01711580	0.02388656	0.00116870	0.00070672	0.01118972
Perinaphthenone		0.00018287	0.00013392	0.00012982	0.00054320	0.00002007	0.00024987	0.00009419
		0.00036956	0.00094695	0.00183594	0.00128061	0.00014192	0.00070683	0.00066604
A-methylphenanthrene		0.00013062	0.00046871	0.00090875	0.00108640	0.00000000	0.00039978	0.00056515
		0.00036951	0.00094722	0.00183650	0.00128150	0.00014192	0.00070700	0.00066662
2-methylphenanthrene		0.00023512	0.00066959	0.00103857	0.00144853	0.00000000	0.00059968	0.00070643
		0.00036964	0.00094753	0.00183668	0.00128241	0.00014192	0.00070736	0.00066696
C-methylphenanthrene		0.00010450	0.00066959	0.00116839	0.00063373	0.00009032	0.00049973	0.00075353
		0.00036949	0.00094753	0.00183688	0.00128072	0.00014199	0.00070716	0.00066709
1-methylphenanthrene		0.00013062	0.00066959	0.00090875	0.00027160	0.00007025	0.00029984	0.00056515
		0.00040644	0.00113685	0.00202002	0.00128039	0.00015615	0.00077753	0.00086631
Anthraquinone		0.00023512	0.00060263	0.00077893	0.00045267	0.00003011	0.00039978	0.00028257
		0.00040656	0.00104205	0.00183635	0.00128052	0.00014193	0.00077764	0.00066617
3,6-dimethylphenanthre		0.00031349	0.00033479	0.00090875	0.00036213	0.00005018	0.00049973	0.00028257
		0.00036978	0.00094708	0.00183650	0.00128045	0.00014194	0.00070716	0.00066617
A-dimethylphenanthrene		0.00031349	0.00066959	0.00155786	0.00045267	0.00008028	0.00084954	0.00061224
		0.00036978	0.00094753	0.00183761	0.00128052	0.00014198	0.00070800	0.00066673
B-dimethylphenanthrene		0.00007837	0.00040175	0.00103857	0.00018107	0.00008028	0.00049973	0.00042386
		0.00036947	0.00094714	0.00183668	0.00128035	0.00014198	0.00070716	0.00066636
C-dimethylphenanthrene		0.00047024	0.00140613	0.00246660	0.00081480	0.00015053	0.00114938	0.00122448
		0.00037020	0.00094956	0.00184014	0.00128098	0.00014212	0.00070906	0.00066884
D-dimethylphenanthrene		0.00033962	0.00080350	0.00116839	0.00054320	0.00012043	0.00059968	0.00065934
		0.00044368	0.00113707	0.00202036	0.00128061	0.00017042	0.00084862	0.00079994
Fluoranthene		0.00028737	0.00087046	0.00116839	0.00018107	0.00021074	0.00069962	0.00047095
		0.00070211	0.00179971	0.00348880	0.00243264	0.00026986	0.00134323	0.00126567
Pyrene		0.00054861	0.00113830	0.00155786	0.00117693	0.00019067	0.00144922	0.00127158
		0.00040732	0.00104317	0.00202103	0.00140959	0.00015640	0.00078076	0.00073538
9-anthraldehyde		0.00054861	0.00093742	0.00337535	0.00072426	0.00019067	0.00089951	0.00127158
		0.00037047	0.00094810	0.00184381	0.00128084	0.00014224	0.00070815	0.00066906
Retene		0.00007837	0.00026783	0.00051929	0.00018107	0.00002007	0.00034981	0.00014129
		0.00051725	0.00132578	0.00257046	0.00179249	0.00019869	0.00098957	0.00093247
Benzonaphthothiophene		0.00002612	0.00006696	0.00012982	0.00000000	0.00001004	0.00009995	0.00009419
		0.00073890	0.00189386	0.00367187	0.00256063	0.00028384	0.00141345	0.00133205
B-MePy/MeFl		0.00010450	0.00046871	0.00090875	0.00072426	0.00006021	0.00029984	0.00028257
		0.00036949	0.00094722	0.00183650	0.00128084	0.00014195	0.00070688	0.00066617
C-methylpyrene/methyl fluoranthene		0.00005225	0.00013392	0.00012982	0.00027160	0.00002007	0.00019989	0.00009419
		0.00036946	0.00094695	0.00183594	0.00128039	0.00014192	0.00070679	0.00066604
4-methylpyrene		0.00007837	0.00020088	0.00051929	0.00009053	0.00003011	0.00024987	0.00042386
		0.00036947	0.00094698	0.00183612	0.00128033	0.00014193	0.00070683	0.00066636
1-methylpyrene		0.00000000	0.00020088	0.00077893	0.00009053	0.00001004	0.00029984	0.00018838
		0.00036945	0.00094698	0.00220355	0.00128033	0.00014192	0.00084823	0.00073268
benzo(c)phenanthrene		0.00000000	0.00020088	0.00012982	0.00000000	0.00002007	0.00000000	0.00000000
		0.00036945	0.00104166	0.00183594	0.00128032	0.00014192	0.00070672	0.00066602
Chrysene		0.00000000	0.00026783	0.00025964	0.00000000	0.00006021	0.00014992	0.00004710
		0.00055418	0.00142046	0.00275393	0.00192048	0.00022709	0.00106010	0.00099904
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
5+6-methylchrysene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(b+j+k)fluoranthe		0.00060086	0.00087046	0.00220696	0.00135800	0.00018064	0.00054970	0.00098900
		0.00070261	0.00161041	0.00330660	0.00230563	0.00025562	0.00120177	0.00126642
BeP		0.00010450	0.00020088	0.00077893	0.00009053	0.00001004	0.00029984	0.00018838
		0.00036949	0.00094698	0.00201988	0.00128033	0.00014192	0.00077753	0.00066609
Perylene		0.00005225	0.00013392	0.00038946	0.00009053	0.00002007	0.00019989	0.00014129
		0.00036946	0.00094695	0.00183604	0.00128033	0.00014192	0.00070679	0.00066606
Indeno[123-cd]pyrene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00099753	0.00255675	0.00495709	0.00345691	0.00038319	0.00190817	0.00179829
Benzo(ghi)perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00129308	0.00331425	0.00642576	0.00448111	0.00049672	0.00247351	0.00233108
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00144086	0.00369304	0.00716016	0.00499326	0.00055349	0.00275621	0.00259750
Coronene		0.00020900	0.00060263	0.00090875	0.00126746	0.00009032	0.00039978	0.00042386
		0.00040653	0.00104205	0.00183650	0.00140979	0.00015618	0.00077764	0.00073292

Table 5-3 cont.

Species	Source	LIME	DIESAVE	MVGASAVE	GARBAGE	MAZEAVE	RICEAVE	RESTD2
Cl^-		0.000000	0.008221	0.019628	0.035886	0.042003	0.017306	0.000946
		0.000000	0.005595	0.027757	0.002927	0.028933	0.004235	0.000391
NO_3^-		0.000000	0.017079	0.024252	0.002072	0.001608	0.001443	0.000946
		0.000000	0.006888	0.012642	0.000195	0.001053	0.000581	0.000390
$SO_4^=$		0.000000	0.087591	0.135362	0.006895	0.004274	0.011429	0.007592
		0.000000	0.037067	0.014110	0.000507	0.003219	0.001711	0.000661
NH_4^+		0.000000	0.028192	0.048140	0.012400	0.008108	0.003534	0.001408
		0.000000	0.012364	0.008005	0.001331	0.008534	0.000428	0.000413
Na^+		0.000000	0.013129	0.017273	0.000807	0.000303	0.000896	0.001311
		0.000000	0.010931	0.006219	0.000058	0.000194	0.000198	0.000096
K^+		0.000000	0.008651	0.012858	0.002017	0.018228	0.004723	0.001867
		0.000000	0.005745	0.002893	0.000150	0.010513	0.000781	0.000143
OC		0.000000	0.631287	0.634297	0.653039	0.435468	0.520180	0.185385
		0.000000	0.070424	0.074326	0.053297	0.210104	0.079460	0.015281
EC		0.000000	0.261834	0.253978	0.034489	0.026353	0.032385	0.014462
		0.000000	0.030426	0.172623	0.003350	0.014242	0.014119	0.001485
TC		0.000000	0.892729	0.888276	0.687529	0.461820	0.552581	0.199769
		0.000000	0.098449	0.160948	0.059188	0.224347	0.093557	0.017400
Al		0.000000	0.002189	0.002743	0.000154	0.000330	0.000268	0.000000
		0.000000	0.001700	0.003879	0.000158	0.000056	0.000288	0.000221
Si		0.000000	0.004271	0.006909	0.000319	0.000771	0.000456	0.000396
		0.000000	0.002609	0.002686	0.000035	0.000318	0.000255	0.000051
S		0.000000	0.039108	0.050804	0.004354	0.001940	0.006263	0.002693
		0.000000	0.008134	0.004933	0.000312	0.000444	0.000446	0.000194
Cl		0.000000	0.000014	0.000845	0.032410	0.041306	0.018032	0.000209
		0.000000	0.000987	0.001194	0.002317	0.002912	0.001386	0.000032
K		0.000000	0.005491	0.008884	0.001949	0.020275	0.005251	0.001225
		0.000000	0.002368	0.000916	0.000141	0.002116	0.000665	0.000091
Ca		0.400000	0.002860	0.003558	0.000077	0.000291	0.000060	0.000743
		0.000000	0.001452	0.000463	0.000016	0.000346	0.000077	0.000059
Ti		0.000000	0.000224	0.000377	0.000000	0.000008	0.000002	0.000000
		0.000000	0.004256	0.004917	0.000178	0.000120	0.000222	0.000407
V		0.000000	0.000125	0.000262	0.000000	0.000002	0.000000	0.000000
		0.000000	0.001834	0.002068	0.000108	0.000069	0.000121	0.000248
Cr		0.000000	0.000067	0.000106	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000296	0.000298	0.000030	0.000019	0.000031	0.000069
Mn		0.000000	0.000191	0.000225	0.000000	0.000003	0.000000	0.000000
		0.000000	0.000185	0.000236	0.000012	0.000007	0.000013	0.000027
Fe		0.000000	0.003164	0.005914	0.000078	0.000196	0.000077	0.000236
		0.000000	0.002167	0.004349	0.000007	0.000081	0.000047	0.000020
Ni		0.000000	0.000035	0.000040	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000101	0.000122	0.000004	0.000003	0.000006	0.000009
Cu		0.000000	0.000223	0.000140	0.000022	0.000003	0.000050	0.000015
		0.000000	0.000091	0.000098	0.000002	0.000004	0.000068	0.000004
Zn		0.000000	0.001802	0.001793	0.000122	0.000007	0.000004	0.000033
		0.000000	0.000533	0.001146	0.000009	0.000001	0.000005	0.000004
Se		0.000000	0.000015	0.000012	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000106	0.000126	0.000004	0.000003	0.000006	0.000010
Br		0.000000	0.000062	0.000081	0.000088	0.000166	0.000099	0.000016
		0.000000	0.000104	0.000137	0.000007	0.000013	0.000008	0.000003
Rb		0.000000	0.000010	0.000000	0.000000	0.000017	0.000000	0.000000
		0.000000	0.000134	0.000153	0.000007	0.000003	0.000009	0.000012
Sr		0.000000	0.000021	0.000010	0.000000	0.000000	0.000001	0.000005
		0.000000	0.000174	0.000199	0.000007	0.000005	0.000009	0.000016
Zr		0.000000	0.000058	0.000000	0.000000	0.000000	0.000005	0.000000
		0.000000	0.000251	0.000286	0.000010	0.000007	0.000013	0.000023
Sn		0.000000	0.000138	0.000046	0.000035	0.000024	0.000000	0.000000
		0.000000	0.001893	0.002009	0.000070	0.000051	0.000085	0.000150
Sb		0.000000	0.000020	0.000000	0.000000	0.000000	0.000003	0.000000
		0.000000	0.002174	0.002394	0.000082	0.000053	0.000104	0.000184
Ba		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.010174	0.011865	0.000393	0.000262	0.000509	0.000890
Pb		0.000000	0.000810	0.001426	0.000162	0.000001	0.000009	0.000032
		0.000000	0.000556	0.001155	0.000013	0.000011	0.000020	0.000036

Table 5-3 cont.

Species	Source	LIME	DIESAVE	MVGASAVE	GARBAGE	MAZEAVE	RICEAVE	RESTD2
Fluorene		0.00000000	0.03818813	0.05350928	0.00421292	0.00292624	0.00327820	0.00280429
		0.00000000	0.00861484	0.01009881	0.00057110	0.00093203	0.00169614	0.00038012
Phenanthrene		0.00000000	0.02864265	0.02835936	0.00450601	0.00316935	0.00233055	0.00249089
		0.00000000	0.00985591	0.00584876	0.00057271	0.00074518	0.00105360	0.00031642
A-methylfluorene		0.00000000	0.01362591	0.01084998	0.00053779	0.00092444	0.00083963	0.00058771
		0.00000000	0.00581671	0.00319249	0.00011970	0.00031226	0.00043595	0.00013295
1-methylfluorene		0.00000000	0.01045699	0.00817446	0.00191603	0.00026840	0.00042480	0.00041367
		0.00000000	0.00417545	0.00160551	0.00034808	0.00013430	0.00019436	0.00007647
B-methylfluorene		0.00000000	0.00344333	0.00259196	0.00028947	0.00016240	0.00021312	0.00010983
		0.00000000	0.00259788	0.00097489	0.00010148	0.00005872	0.00007644	0.00004130
9-fluorenone		0.00000000	0.00380601	0.00446008	0.00056347	0.00031235	0.00106211	0.00056266
		0.00000000	0.00275833	0.00133124	0.00012669	0.00013484	0.00089959	0.00012899
Xanthone		0.00000000	0.00362182	0.00170765	0.00002692	0.00000498	0.00008785	0.00015030
		0.00000000	0.00327448	0.00048849	0.00000765	0.00000704	0.00010541	0.00003912
Acenaphthenequinone		0.00000000	0.00126105	0.00058438	0.00038892	0.00001634	0.00004193	0.00010598
		0.00000000	0.00061626	0.00024054	0.00012910	0.00000601	0.00003673	0.00003600
Perinaphthenone		0.00000000	0.00202264	0.00139451	0.00015757	0.00008084	0.00017504	0.00000000
		0.00000000	0.00158879	0.00030404	0.00002832	0.00008091	0.00010453	0.00000910
A-methylphenanthrene		0.00000000	0.01073592	0.00633766	0.00023814	0.00027999	0.00014120	0.00033783
		0.00000000	0.00623487	0.00182442	0.00003115	0.00003883	0.00007099	0.00004486
2-methylphenanthrene		0.00000000	0.01111609	0.00744064	0.00028077	0.00035942	0.00026013	0.00039117
		0.00000000	0.00544265	0.00132293	0.00003688	0.00007851	0.00015939	0.00005194
C-methylphenanthrene		0.00000000	0.01318971	0.00698697	0.00040717	0.00024739	0.00019302	0.00040273
		0.00000000	0.00757106	0.00192762	0.00005721	0.00003480	0.00009877	0.00005725
1-methylphenanthrene		0.00000000	0.00654604	0.00408647	0.00030410	0.00037466	0.00015793	0.00129042
		0.00000000	0.00346412	0.00097900	0.00006887	0.00008962	0.00010630	0.00029108
Anthraquinone		0.00000000	0.00047843	0.00057475	0.00001972	0.00001066	0.00008060	0.00002312
		0.00000000	0.00062850	0.00075275	0.00002323	0.00001323	0.00011958	0.00003370
3,6-dimethylphenanthre		0.00000000	0.00671385	0.00470524	0.00010731	0.00015129	0.00005971	0.00029613
		0.00000000	0.00538352	0.00088148	0.00001864	0.00005765	0.00003559	0.00005196
A-dimethylphenanthrene		0.00000000	0.00496439	0.00460445	0.00002736	0.00005271	0.00006909	0.00012779
		0.00000000	0.00239234	0.00129977	0.00000611	0.00001032	0.00009770	0.00002608
B-dimethylphenanthrene		0.00000000	0.00278765	0.00239217	0.00005515	0.00004545	0.00000674	0.00008671
		0.00000000	0.00163678	0.00041798	0.00000904	0.00000993	0.00000953	0.00001654
C-dimethylphenanthrene		0.00000000	0.01426014	0.00809158	0.00017623	0.00015317	0.00009151	0.00043356
		0.00000000	0.00804190	0.00116520	0.00002259	0.00001966	0.00003345	0.00005589
D-dimethylphenanthrene		0.00000000	0.00267732	0.00125850	0.00011472	0.00005500	0.00003738	0.00011431
		0.00000000	0.00153465	0.00047125	0.00003043	0.00001494	0.00002577	0.00003227
Fluoranthene		0.00000000	0.00498114	0.00943697	0.00040399	0.00072339	0.00033859	0.00088769
		0.00000000	0.00184661	0.00149836	0.00005763	0.00010262	0.00013151	0.00012742
Pyrene		0.00000000	0.00429173	0.00797077	0.00022796	0.00045944	0.00021631	0.00081447
		0.00000000	0.00105568	0.00251722	0.00003043	0.00006098	0.00007258	0.00010856
9-anthraldehyde		0.00000000	0.00593926	0.00290446	0.00020804	0.00012923	0.00004487	0.00016379
		0.00000000	0.00345075	0.00131709	0.00002727	0.00001701	0.00002246	0.00002331
Retene		0.00000000	0.00056130	0.00041817	0.00080586	0.00001169	0.00001179	0.00002829
		0.00000000	0.00024706	0.00022999	0.00028212	0.00000530	0.00000914	0.00001579
Benzonaphthothiophene		0.00000000	0.00028822	0.00016519	0.00002588	0.00000141	0.00002292	0.00000578
		0.00000000	0.00023518	0.00025352	0.00001069	0.00000461	0.00002601	0.00001819
B-MePy/MeFl		0.00000000	0.00078074	0.00092365	0.00013042	0.00017425	0.00008426	0.00007130
		0.00000000	0.00020097	0.00023765	0.00002688	0.00009038	0.00002961	0.00001695
C-methylpyrene/methyl fluoranthene		0.00000000	0.00026379	0.00042285	0.00006298	0.00007563	0.00003601	0.00002698
		0.00000000	0.00012155	0.00016001	0.00001428	0.00003768	0.00001141	0.00001049
4-methylpyrene		0.00000000	0.00076703	0.00052272	0.00004072	0.00006961	0.00003395	0.00003407
		0.00000000	0.00040326	0.00021171	0.00001327	0.00005367	0.00001378	0.00001428
1-methylpyrene		0.00000000	0.00051934	0.00037005	0.00004326	0.00007763	0.00003906	0.00002759
		0.00000000	0.00026563	0.00013972	0.00000716	0.00005246	0.00001834	0.00000966
benzo(c)phenanthrene		0.00000000	0.00009243	0.00009155	0.00005599	0.00005244	0.00003674	0.00001989
		0.00000000	0.00013480	0.00014261	0.00004137	0.00004903	0.00002855	0.00001745
Chrysene		0.00000000	0.00067660	0.00068376	0.00056093	0.00037108	0.00034906	0.00004879
		0.00000000	0.00022745	0.00024203	0.00012678	0.00029761	0.00010269	0.00001744
Benz(a)anthracene-7,12-dione		0.00000000	0.00003045	0.00003451	0.00001718	0.00000300	0.00001453	0.00000000
		0.00000000	0.00011103	0.00012344	0.00000925	0.00000424	0.00000898	0.00000910
5+6-methylchrysene		0.00000000	0.00002409	0.00000000	0.00006744	0.00003176	0.00003870	0.00000000
		0.00000000	0.00010617	0.00012341	0.00002482	0.00002439	0.00001824	0.00000910
Benzo(b+j+k)fluoranthe		0.00000000	0.00036774	0.00057967	0.00036009	0.00031694	0.00031132	0.00001287
		0.00000000	0.00038579	0.00043521	0.00016239	0.00014233	0.00014095	0.00003091
BeP		0.00000000	0.00006617	0.00023053	0.00018025	0.00011521	0.00009643	0.00002698
		0.00000000	0.00016128	0.00025549	0.00009761	0.00006518	0.00005603	0.00002116
Perylene		0.00000000	0.00000000	0.00000000	0.00001463	0.00001842	0.00001161	0.00000000
		0.00000000	0.00011095	0.00012341	0.00001094	0.00001264	0.00001346	0.00001002
Indeno[123-cd]pyrene		0.00000000	0.00018214	0.00030955	0.00008991	0.00011573	0.00010353	0.00002952
		0.00000000	0.00036193	0.00042748	0.00005422	0.00007041	0.00006479	0.00003379
Benzo(ghi)perylene		0.00000000	0.00047468	0.00129355	0.00010116	0.00008709	0.00008914	0.00012201
		0.00000000	0.00040359	0.00055699	0.00002780	0.00002383	0.00002831	0.00004436
Dibenz(ah+ac)anthracene		0.00000000	0.00005437	0.00000891	0.00004135	0.00002212	0.00003272	0.00000000
		0.00000000	0.00041180	0.00048107	0.00001498	0.00001811	0.00003574	0.00003546
Coronene		0.00000000	0.00024077	0.00100987	0.00004581	0.00004019	0.00004640	0.00007962
		0.00000000	0.00027898	0.00065016	0.00001163	0.00001002	0.00002083	0.00002309

Table 5-3 cont.

Species	Source	MAZOTAVE	LEADAVE	CUFOUNDR	AMSUL	AMBSUL	H2SO4	AMNIT
Cl^-		0.123565	0.097617	0.008100	0.000000	0.000000	0.000000	0.000000
		0.025371	0.007535	0.000700	0.000000	0.000000	0.000000	0.000000
NO_3^-		0.020310	0.000544	0.002800	0.000000	0.000000	0.000000	0.775000
		0.005445	0.000242	0.000700	0.000000	0.000000	0.000000	0.077500
$SO_4^=$		0.094035	0.020054	0.020700	0.727000	0.834500	0.979446	0.000000
		0.017196	0.001865	0.001900	0.072700	0.083450	0.000000	0.000000
NH_4^+		0.045321	0.000905	0.000500	0.273000	0.165500	0.000000	0.225500
		0.007731	0.000258	0.000400	0.027300	0.016550	0.000000	0.022550
Na^+		0.017285	0.002518	0.001100	0.000000	0.000000	0.000000	0.000000
		0.003791	0.000179	0.000100	0.000000	0.000000	0.000000	0.000000
K^+		0.016042	0.003746	0.001100	0.000000	0.000000	0.000000	0.000000
		0.004272	0.000277	0.000100	0.000000	0.000000	0.000000	0.000000
OC		0.395412	0.104085	0.202500	0.000000	0.000000	0.000000	0.000000
		0.124130	0.008609	0.015300	0.000000	0.000000	0.000000	0.000000
EC		0.233342	0.000499	0.057200	0.000000	0.000000	0.000000	0.000000
		0.044207	0.000384	0.004800	0.000000	0.000000	0.000000	0.000000
TC		0.629102	0.104610	0.259700	0.000000	0.000000	0.000000	0.000000
		0.167846	0.009141	0.019200	0.000000	0.000000	0.000000	0.000000
Al		0.002181	0.000151	0.001500	0.000000	0.000000	0.000000	0.000000
		0.002763	0.007578	0.000500	0.000000	0.000000	0.000000	0.000000
Si		0.012812	0.000000	0.021100	0.000000	0.000000	0.000000	0.000000
		0.001259	0.005754	0.006800	0.000000	0.000000	0.000000	0.000000
S		0.036464	0.000000	0.007200	0.242333	0.278167	0.326482	0.000000
		0.003259	0.057906	0.000800	0.024270	0.027820	0.000000	0.000000
Cl		0.082007	0.035374	0.013600	0.000000	0.000000	0.000000	0.000000
		0.007168	0.009116	0.004000	0.000000	0.000000	0.000000	0.000000
K		0.015845	0.000233	0.001500	0.000000	0.000000	0.000000	0.000000
		0.003015	0.000674	0.000300	0.000000	0.000000	0.000000	0.000000
Ca		0.052230	0.000000	0.002300	0.000000	0.000000	0.000000	0.000000
		0.004528	0.002256	0.000400	0.000000	0.000000	0.000000	0.000000
Ti		0.000390	0.000065	0.000000	0.000000	0.000000	0.000000	0.000000
		0.003920	0.000302	0.000000	0.000000	0.000000	0.000000	0.000000
V		0.000142	0.000142	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001956	0.000041	0.000000	0.000000	0.000000	0.000000	0.000000
Cr		0.000010	0.000057	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000444	0.000008	0.000000	0.000000	0.000000	0.000000	0.000000
Mn		0.000188	0.000083	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000171	0.000008	0.000000	0.000000	0.000000	0.000000	0.000000
Fe		0.008252	0.001821	0.000800	0.000000	0.000000	0.000000	0.000000
		0.000724	0.000344	0.000100	0.000000	0.000000	0.000000	0.000000
Ni		0.000043	0.000075	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000091	0.000006	0.000000	0.000000	0.000000	0.000000	0.000000
Cu		0.000133	0.000133	0.008500	0.000000	0.000000	0.000000	0.000000
		0.000036	0.000010	0.000600	0.000000	0.000000	0.000000	0.000000
Zn		0.001855	0.004007	0.565100	0.000000	0.000000	0.000000	0.000000
		0.000521	0.000284	0.040000	0.000000	0.000000	0.000000	0.000000
Se		0.000006	0.000000	0.000100	0.000000	0.000000	0.000000	0.000000
		0.000109	0.001231	0.000000	0.000000	0.000000	0.000000	0.000000
Br		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000253	0.007033	0.000000	0.000000	0.000000	0.000000	0.000000
Rb		0.000063	0.000089	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000123	0.001308	0.000000	0.000000	0.000000	0.000000	0.000000
Sr		0.000191	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000054	0.000388	0.000000	0.000000	0.000000	0.000000	0.000000
Zr		0.000063	0.000174	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000213	0.000361	0.000000	0.000000	0.000000	0.000000	0.000000
Sn		0.000390	0.000000	0.000700	0.000000	0.000000	0.000000	0.000000
		0.001626	0.000435	0.000100	0.000000	0.000000	0.000000	0.000000
Sb		0.000000	0.025829	0.000000	0.000000	0.000000	0.000000	0.000000
		0.001730	0.001846	0.000000	0.000000	0.000000	0.000000	0.000000
Ba		0.000000	0.000162	0.000100	0.000000	0.000000	0.000000	0.000000
		0.008922	0.000673	0.001000	0.000000	0.000000	0.000000	0.000000
Pb		0.019988	0.626146	0.027000	0.000000	0.000000	0.000000	0.000000
		0.001751	0.044230	0.001900	0.000000	0.000000	0.000000	0.000000

Table 5-3 cont.

Species	Source	MAZOTAVE	LEADAVE	CUFOUNDR	AMSUL	AMBSUL	H2SO4	AMNIT
Fluorene		0.02522819	0.00281987	0.00020967	0.00000000	0.00000000	0.00000000	0.00000000
		0.00364741	0.00038338	0.00008951	0.00000000	0.00000000	0.00000000	0.00000000
Phenanthrene		0.03162224	0.01059442	0.00061414	0.00000000	0.00000000	0.00000000	0.00000000
		0.00453932	0.00134934	0.00010675	0.00000000	0.00000000	0.00000000	0.00000000
A-methylfluorene		0.00137257	0.00020864	0.00010731	0.00000000	0.00000000	0.00000000	0.00000000
		0.00047289	0.00004879	0.00002835	0.00000000	0.00000000	0.00000000	0.00000000
1-methylfluorene		0.00142438	0.00014606	0.00011556	0.00000000	0.00000000	0.00000000	0.00000000
		0.00051957	0.00002839	0.00004397	0.00000000	0.00000000	0.00000000	0.00000000
B-methylfluorene		0.00032637	0.00004333	0.00000330	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016335	0.00001782	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000
9-fluorenone		0.00105176	0.00070145	0.00002972	0.00000000	0.00000000	0.00000000	0.00000000
		0.00044628	0.00020508	0.00002821	0.00000000	0.00000000	0.00000000	0.00000000
Xanthone		0.00022907	0.00001725	0.00001156	0.00000000	0.00000000	0.00000000	0.00000000
		0.00011108	0.00000732	0.00002338	0.00000000	0.00000000	0.00000000	0.00000000
Acenaphthenequinone		0.00025085	0.00002074	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012962	0.00000885	0.00003035	0.00000000	0.00000000	0.00000000	0.00000000
Perinaphthenone		0.00073433	0.00001986	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00068361	0.00001187	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000
A-methylphenanthrene		0.00093524	0.00025679	0.00003302	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016095	0.00003388	0.00002364	0.00000000	0.00000000	0.00000000	0.00000000
2-methylphenanthrene		0.00112071	0.00028941	0.00001981	0.00000000	0.00000000	0.00000000	0.00000000
		0.00018281	0.00003839	0.00003975	0.00000000	0.00000000	0.00000000	0.00000000
C-methylphenanthrene		0.00158434	0.00036715	0.00000495	0.00000000	0.00000000	0.00000000	0.00000000
		0.00025575	0.00005183	0.00004436	0.00000000	0.00000000	0.00000000	0.00000000
1-methylphenanthrene		0.00079474	0.00020450	0.00006108	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021124	0.00004700	0.00008200	0.00000000	0.00000000	0.00000000	0.00000000
Anthraquinone		0.00001109	0.00000084	0.00002807	0.00000000	0.00000000	0.00000000	0.00000000
		0.00013197	0.00000794	0.00003516	0.00000000	0.00000000	0.00000000	0.00000000
3,6-dimethylphenanthre		0.00034501	0.00009394	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00011303	0.00003816	0.00002568	0.00000000	0.00000000	0.00000000	0.00000000
A-dimethylphenanthrene		0.00080544	0.00014859	0.00001321	0.00000000	0.00000000	0.00000000	0.00000000
		0.00018574	0.00003970	0.00003272	0.00000000	0.00000000	0.00000000	0.00000000
B-dimethylphenanthrene		0.00026033	0.00004414	0.00000826	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010358	0.00000912	0.00002570	0.00000000	0.00000000	0.00000000	0.00000000
C-dimethylphenanthrene		0.00137627	0.00018542	0.00001321	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021135	0.00002424	0.00002339	0.00000000	0.00000000	0.00000000	0.00000000
D-dimethylphenanthrene		0.00027334	0.00004425	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012567	0.00001347	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000
Fluoranthene		0.01066771	0.00572180	0.00020471	0.00000000	0.00000000	0.00000000	0.00000000
		0.00161823	0.00084644	0.00005838	0.00000000	0.00000000	0.00000000	0.00000000
Pyrene		0.00826371	0.00418986	0.00019646	0.00000000	0.00000000	0.00000000	0.00000000
		0.00127829	0.00055713	0.00004134	0.00000000	0.00000000	0.00000000	0.00000000
9-anthraldehyde		0.00075480	0.00007662	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00014354	0.00001159	0.00002568	0.00000000	0.00000000	0.00000000	0.00000000
Retene		0.00046252	0.00002711	0.00001651	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021265	0.00001249	0.00003274	0.00000000	0.00000000	0.00000000	0.00000000
Benzonaphthothiophene		0.00023975	0.00037788	0.00001321	0.00000000	0.00000000	0.00000000	0.00000000
		0.00020903	0.00012585	0.00004905	0.00000000	0.00000000	0.00000000	0.00000000
B-MePy/MeFl		0.00038103	0.00020865	0.00000991	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012369	0.00004337	0.00003271	0.00000000	0.00000000	0.00000000	0.00000000
C-methylpyrene/methyl fluoranthene		0.00018319	0.00011112	0.00003467	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010631	0.00002504	0.00002367	0.00000000	0.00000000	0.00000000	0.00000000
4-methylpyrene		0.00023969	0.00006514	0.00001321	0.00000000	0.00000000	0.00000000	0.00000000
		0.00012455	0.00002114	0.00002339	0.00000000	0.00000000	0.00000000	0.00000000
1-methylpyrene		0.00018475	0.00007480	0.00000660	0.00000000	0.00000000	0.00000000	0.00000000
		0.00009694	0.00001265	0.00002336	0.00000000	0.00000000	0.00000000	0.00000000
benzo(c)phenanthrene		0.00016698	0.00015816	0.00001651	0.00000000	0.00000000	0.00000000	0.00000000
		0.00016071	0.00011754	0.00002808	0.00000000	0.00000000	0.00000000	0.00000000
Chrysene		0.00091874	0.00063800	0.00002642	0.00000000	0.00000000	0.00000000	0.00000000
		0.00037231	0.00014532	0.00003980	0.00000000	0.00000000	0.00000000	0.00000000
Benz(a)anthracene-7,12-dione		0.00009222	0.00003112	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00013042	0.00001666	0.00003035	0.00000000	0.00000000	0.00000000	0.00000000
5+6-methylchrysene		0.00004079	0.00001245	0.00000495	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010017	0.00000772	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(b+j+k)fluoranthe		0.00169371	0.00134810	0.00004953	0.00000000	0.00000000	0.00000000	0.00000000
		0.00111599	0.00059782	0.00004471	0.00000000	0.00000000	0.00000000	0.00000000
BeP		0.00064426	0.00046232	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00046830	0.00025331	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000
Perylene		0.00000000	0.00005882	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00010007	0.00003830	0.00002568	0.00000000	0.00000000	0.00000000	0.00000000
Indeno[123-cd]pyrene		0.00100350	0.00066177	0.00001981	0.00000000	0.00000000	0.00000000	0.00000000
		0.00072161	0.00039175	0.00007475	0.00000000	0.00000000	0.00000000	0.00000000
Benzo(ghi)perylene		0.00141453	0.00056602	0.00005283	0.00000000	0.00000000	0.00000000	0.00000000
		0.00054897	0.00014659	0.00009125	0.00000000	0.00000000	0.00000000	0.00000000
Dibenz(ah+ac)anthracene		0.00007358	0.00007585	0.00003302	0.00000000	0.00000000	0.00000000	0.00000000
		0.00036668	0.00002824	0.00010046	0.00000000	0.00000000	0.00000000	0.00000000
Coronene		0.00079614	0.00034693	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00030618	0.00008741	0.00002335	0.00000000	0.00000000	0.00000000	0.00000000

Table 5-3 cont.

Species	Source	NH4CL	MAR100	BRICK	CASTFE	CEMENT	GASPP	HDDBUS
Cl^-		0.662800	0.573724	0.071400	0.000600	0.352000	0.020600	0.000000
		0.000000	0.068802	0.007500	0.000200	0.026100	0.011600	0.000000
NO_3^-		0.000000	0.000037	0.007000	0.000600	0.004800	0.012900	0.000000
		0.000000	0.000004	0.001700	0.000200	0.001100	0.011100	0.000000
$SO_4^=$		0.000000	0.079955	0.250300	0.087200	0.024400	0.045800	0.005200
		0.000000	0.009588	0.023300	0.008000	0.002300	0.011900	0.002200
NH_4^+		0.337200	0.000000	0.113600	0.017900	0.001500	0.012600	0.002300
		0.000000	0.000000	0.008300	0.001300	0.000100	0.011000	0.002200
Na^+		0.000000	0.319822	0.004400	0.003300	0.029000	0.005900	0.000400
		0.000000	0.038354	0.000300	0.000200	0.002100	0.000900	0.000100
K^+		0.000000	0.000000	0.002600	0.003400	0.324500	0.006900	0.000800
		0.000000	0.000000	0.000300	0.000300	0.028800	0.001300	0.000200
OC		0.000000	0.000000	0.165500	0.414500	0.027500	2.204900	0.820700
		0.000000	0.000000	0.014300	0.030900	0.002100	0.228500	0.063600
EC		0.000000	0.000000	0.016500	0.054000	0.002400	0.189300	0.242700
		0.000000	0.000000	0.002100	0.004500	0.000200	0.025000	0.020500
TC		0.000000	0.000000	0.182000	0.468500	0.029900	2.394200	1.063400
		0.000000	0.000000	0.015500	0.034200	0.002200	0.246200	0.080100
Al		0.000000	0.000000	0.023900	0.000100	0.002300	0.016400	0.001900
		0.000000	0.000000	0.007300	0.000500	0.000800	0.006100	0.000800
Si		0.000000	0.000089	0.083700	0.076600	0.002000	0.126900	0.009600
		0.000000	0.000011	0.026800	0.024500	0.000700	0.041600	0.003100
S		0.000000	0.026652	0.086700	0.025600	0.003700	0.012300	0.009300
		0.000000	0.003196	0.006200	0.001800	0.000300	0.001300	0.000700
Cl		0.662800	0.573724	0.134700	0.000000	0.303400	0.006100	0.001400
		0.000000	0.068802	0.039700	0.000000	0.089300	0.002100	0.000500
K		0.000000	0.011845	0.004300	0.004700	0.228200	0.007400	0.000300
		0.000000	0.001421	0.000900	0.001000	0.046800	0.001800	0.000400
Ca		0.000000	0.012201	0.032600	0.002700	0.014700	0.038700	0.003800
		0.000000	0.001463	0.005700	0.000500	0.002800	0.007400	0.000700
Ti		0.000000	0.000000	0.001200	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000400	0.000000	0.000000	0.000000	0.000000
V		0.000000	0.000000	0.001400	0.003100	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000300	0.000200	0.000000	0.000000	0.000000
Cr		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Mn		0.000000	0.000000	0.000100	0.000000	0.000000	0.000500	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000700	0.000000
Fe		0.000000	0.000000	0.017400	0.011500	0.001400	0.016100	0.000900
		0.000000	0.000000	0.001200	0.000800	0.000100	0.001600	0.000100
Ni		0.000000	0.000000	0.002200	0.002000	0.000000	0.000200	0.000000
		0.000000	0.000000	0.000200	0.000100	0.000000	0.000400	0.000000
Cu		0.000000	0.000000	0.000100	0.000700	0.000100	0.000100	0.000100
		0.000000	0.000000	0.000000	0.000100	0.000000	0.000400	0.000100
Zn		0.000000	0.000000	0.001700	0.009600	0.000200	0.002800	0.000900
		0.000000	0.000000	0.000100	0.000700	0.000000	0.000300	0.000100
Se		0.000000	0.000000	0.000200	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Br		0.000000	0.001984	0.009000	0.000000	0.000500	0.000000	0.000000
		0.000000	0.000238	0.000600	0.000000	0.000000	0.000000	0.000000
Rb		0.000000	0.000000	0.000000	0.000000	0.001900	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000000
Sr		0.000000	0.000234	0.000300	0.000000	0.000100	0.000300	0.000000
		0.000000	0.000028	0.000000	0.000000	0.000000	0.000400	0.000000
Zr		0.000000	0.000000	0.000100	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000100	0.000000	0.000000	0.000000	0.000000
Sn		0.000000	0.000000	0.000000	0.000500	0.000100	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000100	0.000200	0.000000	0.000000
Sb		0.000000	0.000000	0.000300	0.000100	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000800	0.000100	0.000000	0.000000	0.000000
Ba		0.000000	0.000001	0.000400	0.000500	0.000500	0.011300	0.003100
		0.000000	0.000000	0.002500	0.000100	0.000600	0.022400	0.004200
Pb		0.000000	0.000000	0.000200	0.005600	0.003000	0.001700	0.000300
		0.000000	0.000000	0.000100	0.000400	0.000200	0.000500	0.000100

Table 5-3 cont.

Species	Source	NH4CL	MAR100	BRICK	CASTFE	CEMENT	GASPP	HDDBUS
Fluorene		0.00000000	0.00000000	0.00002903	0.00134813	0.00052258	0.00000000	0.00095259
		0.00000000	0.00000000	0.00005695	0.00042930	0.00016614	0.00225582	0.00035780
Phenanthrene		0.00000000	0.00000000	0.00046008	0.00044115	0.00107932	0.00179453	0.00119828
		0.00000000	0.00000000	0.00008652	0.00007243	0.00017188	0.00115155	0.00021278
A-methylfluorene		0.00000000	0.00000000	0.00010497	0.00022452	0.00017023	0.01256169	0.00064224
		0.00000000	0.00000000	0.00003668	0.00003454	0.00002555	0.00255617	0.00011655
1-methylfluorene		0.00000000	0.00000000	0.00008040	0.00076733	0.00014965	0.01276108	0.00055603
		0.00000000	0.00000000	0.00004513	0.00019317	0.00003797	0.00402000	0.00017040
B-methylfluorene		0.00000000	0.00000000	0.00000000	0.00017518	0.00006244	0.00059818	0.00009052
		0.00000000	0.00000000	0.00003159	0.00003880	0.00001374	0.00141205	0.00006782
9-fluorenone		0.00000000	0.00000000	0.00029258	0.00313939	0.00030649	0.00000000	0.00009914
		0.00000000	0.00000000	0.00007399	0.00059926	0.00005902	0.00140990	0.00007400
Xanthone		0.00000000	0.00000000	0.00000000	0.00157513	0.00004218	0.00079757	0.00008621
		0.00000000	0.00000000	0.00003159	0.00046649	0.00001296	0.00141371	0.00006775
Acenaphthenequinone		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003474	0.00003001	0.00000758	0.00155087	0.00007315
Perinaphthenone		0.00000000	0.00000000	0.00000000	0.00005280	0.00001758	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003159	0.00004229	0.00001410	0.00140990	0.00008534
A-methylphenanthrene		0.00000000	0.00000000	0.00002457	0.00006415	0.00019802	0.00279149	0.00040086
		0.00000000	0.00000000	0.00003171	0.00001269	0.00003241	0.00145541	0.00009119
2-methylphenanthrene		0.00000000	0.00000000	0.00000000	0.00008191	0.00025627	0.00299088	0.00037931
		0.00000000	0.00000000	0.00004106	0.00004423	0.00011925	0.00312582	0.00024154
C-methylphenanthrene		0.00000000	0.00000000	0.00005137	0.00000000	0.00020723	0.00069787	0.00032759
		0.00000000	0.00000000	0.00010124	0.00000698	0.00020795	0.00310316	0.00041615
1-methylphenanthrene		0.00000000	0.00000000	0.00004020	0.00070762	0.00019718	0.00937142	0.00027155
		0.00000000	0.00000000	0.00007594	0.00062473	0.00017468	0.00980353	0.00030632
Anthraquinone		0.00000000	0.00000000	0.00010944	0.00009228	0.00002143	0.00139574	0.00011207
		0.00000000	0.00000000	0.00009555	0.00007193	0.00001698	0.00198207	0.00011045
3,6-dimethylphenanthre		0.00000000	0.00000000	0.00000000	0.00009474	0.00002913	0.00019939	0.00002586
		0.00000000	0.00000000	0.00003790	0.00006783	0.00002108	0.00211501	0.00009757
A-dimethylphenanthrene		0.00000000	0.00000000	0.00000447	0.00005033	0.00004135	0.00249240	0.00010345
		0.00000000	0.00000000	0.00003475	0.00005403	0.00004310	0.00339910	0.00014068
B-dimethylphenanthrene		0.00000000	0.00000000	0.00000000	0.00000740	0.00002193	0.00219331	0.00006035
		0.00000000	0.00000000	0.00003159	0.00000842	0.00001070	0.00199416	0.00007346
C-dimethylphenanthrene		0.00000000	0.00000000	0.00003797	0.00013817	0.00014077	0.00478541	0.00031897
		0.00000000	0.00000000	0.00003187	0.00002437	0.00002355	0.00166977	0.00008148
D-dimethylphenanthrene		0.00000000	0.00000000	0.00000000	0.00012485	0.00005189	0.00289118	0.00009914
		0.00000000	0.00000000	0.00003159	0.00004414	0.00001823	0.00200894	0.00008003
Fluoranthene		0.00000000	0.00000000	0.00011167	0.00003800	0.00010261	0.00638054	0.00025431
		0.00000000	0.00000000	0.00006440	0.00001526	0.00001844	0.00293800	0.00012523
Pyrene		0.00000000	0.00000000	0.00005584	0.00005724	0.00005842	0.00977020	0.00039655
		0.00000000	0.00000000	0.00003530	0.00001227	0.00000965	0.00234354	0.00009631
9-anthraldehyde		0.00000000	0.00000000	0.00000000	0.00003405	0.00002126	0.00019939	0.00000000
		0.00000000	0.00000000	0.00003790	0.00004413	0.00002191	0.00408886	0.00012801
Retene		0.00000000	0.00000000	0.00007817	0.00002911	0.00000485	0.00089726	0.00003448
		0.00000000	0.00000000	0.00004508	0.00001030	0.00000336	0.00197724	0.00008543
Benzonaphthothiophene		0.00000000	0.00000000	0.00003574	0.00001332	0.00001557	0.00179453	0.00011207
		0.00000000	0.00000000	0.00007276	0.00001890	0.00001478	0.00325112	0.00015899
B-MePy/MeFl		0.00000000	0.00000000	0.00002457	0.00002467	0.00001758	0.00009970	0.00000000
		0.00000000	0.00000000	0.00005061	0.00002666	0.00001716	0.00169196	0.00006096
C-methylpyrene/methyl fluoranthene		0.00000000	0.00000000	0.00003797	0.00002073	0.00000854	0.00319027	0.00003017
		0.00000000	0.00000000	0.00003187	0.00000802	0.00000277	0.00160482	0.00006105
4-methylpyrene		0.00000000	0.00000000	0.00003574	0.00001184	0.00000770	0.00139574	0.00004741
		0.00000000	0.00000000	0.00003497	0.00000848	0.00000365	0.00156135	0.00006119
1-methylpyrene		0.00000000	0.00000000	0.00004914	0.00003109	0.00000603	0.00089726	0.00003017
		0.00000000	0.00000000	0.00003206	0.00000843	0.00000246	0.00141470	0.00006105
benzo(c)phenanthrene		0.00000000	0.00000000	0.00002233	0.00001925	0.00000686	0.00079757	0.00007328
		0.00000000	0.00000000	0.00003799	0.00001827	0.00000644	0.00169500	0.00009181
Chrysene		0.00000000	0.00000000	0.00006030	0.00002862	0.00004185	0.00149544	0.00010345
		0.00000000	0.00000000	0.00006039	0.00001911	0.00002066	0.00240460	0.00011640
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003474	0.00000768	0.00000284	0.00140990	0.00006096
5+6-methylchrysene		0.00000000	0.00000000	0.00000000	0.00000543	0.00000201	0.00079757	0.00010345
		0.00000000	0.00000000	0.00003159	0.00000701	0.00000238	0.00141371	0.00006206
Benzo(b+j+k)fluoranthe		0.00000000	0.00000000	0.00008040	0.00012682	0.00002779	0.00099696	0.00006897
		0.00000000	0.00000000	0.00006381	0.00005693	0.00001293	0.00240028	0.00010392
BeP		0.00000000	0.00000000	0.00000000	0.00000000	0.00000787	0.00000000	0.00005172
		0.00000000	0.00000000	0.00003159	0.00000698	0.00000297	0.00140990	0.00006731
Perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000268	0.00049848	0.00000000
		0.00000000	0.00000000	0.00003159	0.00000698	0.00000427	0.00183406	0.00006096
Indeno[123-cd]pyrene		0.00000000	0.00000000	0.00000000	0.00002073	0.00000686	0.00000000	0.00003017
		0.00000000	0.00000000	0.00008844	0.00003358	0.00001139	0.00394776	0.00018290
Benzo(ghi)perylene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000184	0.00219331	0.00000000
		0.00000000	0.00000000	0.00011371	0.00002443	0.00000876	0.00536516	0.00021335
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00001563	0.00000197	0.00000167	0.00000000	0.00006466
		0.00000000	0.00000000	0.00012951	0.00002792	0.00000971	0.00549863	0.00025613
Coronene		0.00000000	0.00000000	0.00000000	0.00000049	0.00000000	0.00000000	0.00000000
		0.00000000	0.00000000	0.00003159	0.00000768	0.00000237	0.00140990	0.00006705

Table 5-3 cont.

Species	Source	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP	MOTO	REFUSEBA
Cl^-		0.003800	0.002900	0.001000	0.000000	0.000600	0.000100	0.002800
		0.002000	0.001400	0.000500	0.000000	0.000200	0.000000	0.000400
NO_3^-		0.000000	0.000000	0.000000	0.000000	0.000000	0.000100	0.001000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000300
$SO_4^=$		0.004400	0.004300	0.001200	0.000000	0.374600	0.000100	0.002400
		0.001900	0.001400	0.000400	0.000000	0.034800	0.000000	0.000400
NH_4^+		0.006200	0.000800	0.000100	0.001700	0.012000	0.000000	0.001400
		0.002000	0.001300	0.000400	0.002600	0.000900	0.000000	0.000300
Na^+		0.000500	0.001000	0.000100	0.000300	0.007700	0.000000	0.000600
		0.000100	0.000100	0.000000	0.000200	0.000600	0.000000	0.000000
K^+		0.000700	0.000700	0.000100	0.000800	0.000200	0.000000	0.000300
		0.000200	0.000100	0.000000	0.000300	0.000000	0.000000	0.000000
OC		0.494800	0.361500	0.820600	0.924600	0.159000	0.586800	1.126900
		0.039200	0.028300	0.061200	0.072200	0.011900	0.043700	0.084200
EC		0.605600	0.028900	0.030100	0.078500	0.007900	0.033400	0.025900
		0.050600	0.003100	0.002600	0.007700	0.000700	0.002800	0.002200
TC		1.100000	0.390400	0.850600	1.003100	0.166900	0.620200	1.152800
		0.082300	0.030100	0.062100	0.077000	0.012200	0.045200	0.084300
Al		0.007200	0.000100	0.000000	0.001900	0.000800	0.000100	0.002800
		0.002300	0.001200	0.000000	0.002400	0.000300	0.000100	0.000900
Si		0.108300	0.018700	0.002300	0.040800	0.002800	0.001000	0.007200
		0.034700	0.006000	0.000700	0.013100	0.000900	0.000300	0.002300
S		0.007800	0.003900	0.005200	0.006000	0.113400	0.005800	0.004500
		0.000600	0.000300	0.000400	0.000500	0.008000	0.000400	0.000300
Cl		0.001700	0.001000	0.000400	0.001200	0.000000	0.000100	0.020900
		0.000500	0.000300	0.000100	0.000400	0.000000	0.000200	0.006200
K		0.001400	0.000300	0.000100	0.000400	0.000100	0.000000	0.001300
		0.000300	0.000100	0.000100	0.000500	0.000000	0.000000	0.000300
Ca		0.002500	0.004800	0.001500	0.001200	0.001400	0.000700	0.012400
		0.000500	0.000900	0.000300	0.000300	0.000200	0.000100	0.002200
Ti		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
V		0.000000	0.000000	0.000000	0.000000	0.019200	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.001400	0.000000	0.000000
Cr		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000500
		0.000000	0.000000	0.000000	0.000000	0.000600	0.000000	0.000100
Mn		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000100	0.000000	0.000000
Fe		0.004000	0.002500	0.000100	0.002000	0.002500	0.000000	0.001600
		0.000300	0.000200	0.000000	0.000200	0.000200	0.000000	0.000100
Ni		0.000000	0.000100	0.000000	0.000000	0.012800	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000900	0.000000	0.000000
Cu		0.000000	0.000100	0.000000	0.000000	0.000000	0.000000	0.000100
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Zn		0.000600	0.002500	0.000400	0.000500	0.002900	0.000300	0.000500
		0.000100	0.000200	0.000000	0.000100	0.000200	0.000000	0.000000
Se		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Br		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Rb		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sr		0.000000	0.000000	0.000000	0.000100	0.000100	0.000000	0.000100
		0.000000	0.000000	0.000000	0.000100	0.000000	0.000000	0.000000
Zr		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sn		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sb		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
		0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Ba		0.000000	0.001400	0.000500	0.004400	0.000800	0.000100	0.000000
		0.000000	0.002500	0.000900	0.005600	0.000200	0.000100	0.000000
Pb		0.000400	0.000700	0.000000	0.000100	0.001100	0.000000	0.000200
		0.000100	0.000100	0.000000	0.000300	0.000100	0.000000	0.000000

Table 5-3 cont.

Species	Source	LDDMBUS	LDSI1_3	LDSI4_5	LDSILATE	MAZOTPP	MOTO	REFUSEBA
Fluorene		0.00195876	0.00172610	0.00056038	0.00364803	0.00000000	0.00005134	0.00185164
		0.00066394	0.00057439	0.00018619	0.00120449	0.00001941	0.00001713	0.00060299
Phenanthrene		0.00199313	0.00122739	0.00040086	0.00168805	0.00000000	0.00013773	0.00332727
		0.00033447	0.00020884	0.00006735	0.00029476	0.00000906	0.00002222	0.00053033
A-methylfluorene		0.00093929	0.00056589	0.00026118	0.00127245	0.00007319	0.00003773	0.00071547
		0.00015493	0.00009404	0.00004132	0.00020938	0.00001755	0.00000584	0.00011409
1-methylfluorene		0.00116839	0.00048320	0.00017605	0.00112365	0.00008142	0.00002608	0.00189052
		0.00031488	0.00013889	0.00004966	0.00031674	0.00002865	0.00000698	0.00047854
B-methylfluorene		0.00017182	0.00012920	0.00006695	0.00024628	0.00000000	0.00000742	0.00015841
		0.00006761	0.00004967	0.00001907	0.00009140	0.00001294	0.00000202	0.00004097
9-fluorenone		0.00042383	0.00016538	0.00004711	0.00004618	0.00000000	0.00000334	0.00368820
		0.00011311	0.00005786	0.00001719	0.00007999	0.00001294	0.00000154	0.00070212
Xanthone		0.00016037	0.00009819	0.00002232	0.00008209	0.00000000	0.00000799	0.00046422
		0.00007772	0.00004876	0.00001425	0.00008035	0.00001294	0.00000269	0.00013740
Acenaphthenequinone		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00031799
		0.00011880	0.00004020	0.00002455	0.00011610	0.00001423	0.00000208	0.00015035
Perinaphthenone		0.00003818	0.00000000	0.00000000	0.00000000	0.00000000	0.00001133	0.00013172
		0.00011348	0.00004385	0.00001286	0.00007256	0.00001294	0.00000851	0.00007854
A-methylphenanthrene		0.00062619	0.00024548	0.00015291	0.00053874	0.00000183	0.00004507	0.00019903
		0.00011567	0.00005490	0.00002803	0.00011839	0.00001294	0.00000748	0.00003700
2-methylphenanthrene		0.00077511	0.00020930	0.00018018	0.00042586	0.00000183	0.00005191	0.00033308
		0.00040897	0.00013363	0.00009451	0.00027274	0.00001811	0.00002478	0.00016911
C-methylphenanthrene		0.00061856	0.00020413	0.00010579	0.00020010	0.00003934	0.00002461	0.00047176
		0.00068929	0.00025682	0.00012214	0.00031283	0.00005839	0.00002596	0.00047481
1-methylphenanthrene		0.00053837	0.00017054	0.00014381	0.00040021	0.00003751	0.00002298	0.00074681
		0.00052726	0.00019098	0.00013770	0.00043048	0.00004805	0.00002125	0.00066588
Anthraquinone		0.00008782	0.00004393	0.00001240	0.00007696	0.00000915	0.00000269	0.00015493
		0.00009233	0.00005504	0.00001642	0.00010196	0.00001556	0.00000255	0.00012025
3,6-dimethylphenanthre		0.00014891	0.00000000	0.00004133	0.00006157	0.00000000	0.00001646	0.00006383
		0.00015749	0.00005116	0.00004001	0.00013079	0.00001294	0.00001179	0.00004570
A-dimethylphenanthrene		0.00023291	0.00002326	0.00006695	0.00015906	0.00000640	0.00002608	0.00001277
		0.00026051	0.00005123	0.00007402	0.00020396	0.00001683	0.00002713	0.00003778
B-dimethylphenanthrene		0.00016419	0.00000775	0.00003058	0.00004618	0.00001006	0.00001223	0.00005803
		0.00010424	0.00004021	0.00002016	0.00007999	0.00001557	0.00000592	0.00002945
C-dimethylphenanthrene		0.00076365	0.00014987	0.00016365	0.00033350	0.00000640	0.00004205	0.00009749
		0.00013794	0.00004356	0.00002969	0.00009486	0.00001296	0.00000709	0.00001971
D-dimethylphenanthrene		0.00024055	0.00004651	0.00006695	0.00009749	0.00000000	0.00001100	0.00022979
		0.00011133	0.00004416	0.00002791	0.00008777	0.00001294	0.00000422	0.00008132
Fluoranthene		0.00038564	0.00014212	0.00011819	0.00050795	0.00000823	0.00008582	0.00014333
		0.00012646	0.00007480	0.00003101	0.00016962	0.00002460	0.00001509	0.00003290
Pyrene		0.00069110	0.00027132	0.00016448	0.00068240	0.00001098	0.00016210	0.00010213
		0.00012868	0.00006268	0.00002975	0.00013932	0.00001429	0.00002553	0.00002137
9-anthraldehyde		0.00010309	0.00001550	0.00003306	0.00000000	0.00000000	0.00002290	0.00000232
		0.00022709	0.00011330	0.00005623	0.00013787	0.00001294	0.00001987	0.00000821
Retene		0.00003818	0.00004910	0.00000413	0.00004618	0.00001098	0.00000383	0.00043172
		0.00007572	0.00005146	0.00001637	0.00010172	0.00001815	0.00000167	0.00005352
Benzonaphthothiophene		0.00009928	0.00005426	0.00001736	0.00000513	0.00001921	0.00000440	0.00003714
		0.00014084	0.00008791	0.00002812	0.00014512	0.00003113	0.00000464	0.00004696
B-MePy/MeFl		0.00005346	0.00003359	0.00000909	0.00004105	0.00001464	0.00001573	0.00002205
		0.00009199	0.00006224	0.00001873	0.00010894	0.00002464	0.00001463	0.00002638
C-methylpyrene/methyl fluoranthene		0.00000000	0.00000000	0.00002314	0.00008722	0.00002013	0.00001296	0.00001567
		0.00005400	0.00003654	0.00001197	0.00007323	0.00001313	0.00000263	0.00000920
4-methylpyrene		0.00013746	0.00004134	0.00001818	0.00007183	0.00001647	0.00001076	0.00002147
		0.00007716	0.00004046	0.00001417	0.00008023	0.00001435	0.00000410	0.00001254
1-methylpyrene		0.00004582	0.00000775	0.00001488	0.00009236	0.00000366	0.00001157	0.00003134
		0.00005424	0.00003655	0.00001181	0.00007330	0.00001294	0.00000207	0.00000969
benzo(c)phenanthrene		0.00008400	0.00006460	0.00000992	0.00004105	0.00000732	0.00000416	0.00002495
		0.00009228	0.00006981	0.00001524	0.00008719	0.00001555	0.00000372	0.00002233
Chrysene		0.00011837	0.00009561	0.00005042	0.00004618	0.00000183	0.00001540	0.00021064
		0.00010881	0.00008111	0.00003321	0.00011621	0.00002070	0.00000780	0.00010126
Benz(a)anthracene-7,12-dione		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00001915
		0.00005400	0.00004020	0.00001403	0.00007256	0.00001294	0.00000127	0.00001411
5+6-methylchrysene		0.00002291	0.00003359	0.00000661	0.00004105	0.00000183	0.00000155	0.00002553
		0.00005406	0.00003674	0.00001171	0.00007271	0.00001294	0.00000117	0.00000947
Benzo(b+j+k)fluoranthe		0.00003055	0.00010853	0.00003471	0.00009236	0.00000000	0.00002844	0.00005745
		0.00009186	0.00007770	0.00002485	0.00013102	0.00002070	0.00001251	0.00004966
BeP		0.00000000	0.00002842	0.00000744	0.00003592	0.00000000	0.00002404	0.00007776
		0.00005400	0.00004032	0.00001172	0.00007267	0.00001294	0.00000514	0.00002079
Perylene		0.00000000	0.00000258	0.00001818	0.00000000	0.00000000	0.00001206	0.00000696
		0.00005400	0.00004385	0.00002463	0.00007982	0.00001423	0.00001069	0.00000988
Indeno[123-cd]pyrene		0.00002291	0.00000517	0.00001901	0.00021550	0.00000823	0.00002689	0.00000000
		0.00016202	0.00010598	0.00004330	0.00034914	0.00004012	0.00002943	0.00004924
Benzo(ghi)perylene		0.00003055	0.00004134	0.00005703	0.00046691	0.00000000	0.00006952	0.00000000
		0.00019982	0.00013529	0.00005182	0.00034508	0.00004658	0.00002630	0.00003365
Dibenz(ah+ac)anthracene		0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000	0.00000000
		0.00021059	0.00014252	0.00004559	0.00028299	0.00005175	0.00000450	0.00003365
Coronene		0.00000000	0.00002326	0.00003885	0.00020010	0.00000000	0.00004002	0.00000522
		0.00005400	0.00004028	0.00001580	0.00008995	0.00001294	0.00000703	0.00001068

Table 5-3 cont.

Species	Source	REFUSED1	REFUSED2	REST	MV7525	MV5050	MV2575	RICE2
Cl^-		0.002800	0.006100	0.004600	0.011073	0.013925	0.016776	0.017306
		0.000200	0.000500	0.000500	0.014700	0.020022	0.024201	0.004235
NO_3^-		0.000400	0.000400	0.007200	0.018872	0.020666	0.022459	0.001443
		0.000100	0.000100	0.001400	0.008691	0.010180	0.011477	0.000581
$SO_4^=$		0.000800	0.000500	0.002100	0.099534	0.111477	0.123419	0.011429
		0.000100	0.000100	0.000500	0.032867	0.028045	0.022199	0.001711
NH_4^+		0.001400	0.003200	0.000200	0.033179	0.038166	0.043153	0.003534
		0.000200	0.000200	0.000400	0.011431	0.010415	0.009289	0.000428
Na^+		0.000200	0.000100	0.001900	0.014165	0.015201	0.016237	0.000896
		0.000000	0.000000	0.000100	0.009964	0.008893	0.007673	0.000198
K^+		0.000200	0.000100	0.008000	0.009703	0.010755	0.011806	0.040900
		0.000000	0.000000	0.000700	0.005181	0.004548	0.003812	0.012700
OC		1.228000	0.455900	0.757500	0.632040	0.632792	0.633545	0.447300
		0.091500	0.033900	0.056500	0.071419	0.072401	0.073370	0.079800
EC		0.021400	0.037000	0.006600	0.259870	0.257906	0.255942	0.238700
		0.001800	0.003100	0.000800	0.090244	0.123944	0.150268	0.110500
TC		1.249400	0.492900	0.764100	0.891616	0.890503	0.889389	0.686000
		0.091000	0.035900	0.055800	0.117240	0.133410	0.147822	0.136302
Al		0.001000	0.000600	0.000900	0.002328	0.002466	0.002605	0.000268
		0.000300	0.000200	0.000300	0.002435	0.002995	0.003465	0.000288
Si		0.002500	0.002100	0.004200	0.004931	0.005590	0.006250	0.000456
		0.000800	0.000700	0.001300	0.002628	0.002648	0.002667	0.000255
S		0.002100	0.001900	0.002300	0.042032	0.044956	0.047880	0.006263
		0.000200	0.000100	0.000200	0.007464	0.006727	0.005898	0.000446
Cl		0.021500	0.053100	0.011000	0.000222	0.000430	0.000637	0.018032
		0.006300	0.015600	0.003200	0.001043	0.001095	0.001146	0.001386
K		0.000800	0.000700	0.012100	0.006339	0.007188	0.008036	0.040090
		0.000200	0.000200	0.002500	0.002101	0.001795	0.001425	0.012700
Ca		0.004400	0.000900	0.003400	0.003035	0.003209	0.003384	0.000060
		0.000800	0.000200	0.000600	0.001279	0.001078	0.000829	0.000077
Ti		0.000100	0.000200	0.000000	0.000262	0.000301	0.000339	0.000002
		0.000300	0.000000	0.000000	0.004431	0.004598	0.004760	0.000222
V		0.000000	0.000000	0.000000	0.000159	0.000194	0.000228	0.000000
		0.000000	0.000000	0.000000	0.001895	0.001955	0.002012	0.000121
Cr		0.000000	0.000000	0.000000	0.000077	0.000087	0.000096	0.000000
		0.000000	0.000000	0.000000	0.000297	0.000297	0.000298	0.000031
Mn		0.000000	0.000000	0.000000	0.000200	0.000208	0.000217	0.000000
		0.000000	0.000000	0.000000	0.000199	0.000212	0.000224	0.000013
Fe		0.000300	0.000100	0.000300	0.003852	0.004539	0.005227	0.000077
		0.000000	0.000000	0.000000	0.002872	0.003436	0.003919	0.000047
Ni		0.000000	0.000000	0.000000	0.000036	0.000038	0.000039	0.000000
		0.000000	0.000000	0.000000	0.000107	0.000112	0.000117	0.000006
Cu		0.000000	0.000200	0.000000	0.000202	0.000182	0.000161	0.000050
		0.000000	0.000000	0.000000	0.000093	0.000095	0.000096	0.000068
Zn		0.000000	0.000500	0.000000	0.001800	0.001798	0.001795	0.000004
		0.000000	0.000000	0.000000	0.000736	0.000894	0.001028	0.000005
Se		0.000000	0.000000	0.000000	0.000014	0.000014	0.000013	0.000000
		0.000000	0.000000	0.000000	0.000111	0.000116	0.000121	0.000006
Br		0.000000	0.000200	0.000000	0.000067	0.000072	0.000076	0.000099
		0.000000	0.000000	0.000000	0.000113	0.000122	0.000130	0.000008
Rb		0.000000	0.000000	0.000000	0.000008	0.000005	0.000003	0.000000
		0.000000	0.000000	0.000000	0.000139	0.000144	0.000148	0.000009
Sr		0.000000	0.000000	0.000000	0.000018	0.000016	0.000013	0.000001
		0.000000	0.000000	0.000000	0.000181	0.000187	0.000193	0.000009
Zr		0.000000	0.000000	0.000000	0.000044	0.000029	0.000015	0.000005
		0.000000	0.000000	0.000000	0.000260	0.000269	0.000278	0.000013
Sn		0.000000	0.000000	0.000000	0.000115	0.000092	0.000069	0.000000
		0.000000	0.000000	0.000000	0.001923	0.001952	0.001981	0.000085
Sb		0.000000	0.000000	0.000000	0.000015	0.000010	0.000005	0.000003
		0.000000	0.000000	0.000000	0.002231	0.002287	0.002341	0.000104
Ba		0.000100	0.000100	0.000400	0.000000	0.000000	0.000000	0.000000
		0.000700	0.000300	0.001000	0.010622	0.011052	0.011466	0.000509
Pb		0.000200	0.000600	0.000000	0.000964	0.001118	0.001272	0.000009
		0.000000	0.000000	0.000000	0.000752	0.000906	0.001038	0.000020

Table 5-3 cont.

Species	Source	REFUSED1	REFUSED2	REST	MV7525	MV5050	MV2575	RICE2
Fluorene		0.00204590	0.00031426	-99.00000000	0.04201842	0.04584871	0.04967899	0.00327820
		0.00065052	0.00010012	-99.00000000	0.00900878	0.00938620	0.00974902	0.00169614
Phenanthrene		0.00349147	0.00052879	-99.00000000	0.02857183	0.02850101	0.02843018	0.00233055
		0.00055430	0.00008397	-99.00000000	0.00902254	0.00810392	0.00706688	0.00105360
A-methylfluorene		0.00036080	0.00013594	-99.00000000	0.01293193	0.01223795	0.01154396	0.00083963
		0.00005626	0.00002067	-99.00000000	0.00528428	0.00469181	0.00401279	0.00043595
1-methylfluorene		0.00259038	0.00035539	-99.00000000	0.00988636	0.00931573	0.00874509	0.00042480
		0.00064571	0.00008873	-99.00000000	0.00370408	0.00316323	0.00250835	0.00019436
B-methylfluorene		0.00017312	0.00002292	-99.00000000	0.00323049	0.00301765	0.00280480	0.00021312
		0.00003899	0.00000530	-99.00000000	0.00230203	0.00196206	0.00154921	0.00007644
9-fluorenone		0.00275054	0.00043184	-99.00000000	0.00396953	0.00413305	0.00429656	0.00106211
		0.00052330	0.00008217	-99.00000000	0.00247979	0.00216571	0.00179757	0.00089959
Xanthone		0.00029578	0.00004623	-99.00000000	0.00314328	0.00266474	0.00218619	0.00008785
		0.00008745	0.00001367	-99.00000000	0.00284628	0.00234103	0.00169101	0.00010541
Acenaphthenequinone		0.00013762	0.00003336	-99.00000000	0.00109188	0.00092272	0.00075355	0.00004193
		0.00006503	0.00001577	-99.00000000	0.00054708	0.00046778	0.00037194	0.00003673
Perinaphthenone		0.00017132	0.00004420	-99.00000000	0.00186561	0.00170858	0.00155154	0.00017504
		0.00010139	0.00002618	-99.00000000	0.00138431	0.00114383	0.00083690	0.00010453
A-methylphenanthrene		0.00015477	0.00002634	-99.00000000	0.00963636	0.00853679	0.00743723	0.00014120
		0.00002668	0.00000452	-99.00000000	0.00547607	0.00459359	0.00349497	0.00007099
2-methylphenanthrene		0.00016793	0.00003404	-99.00000000	0.01019723	0.00927837	0.00835950	0.00026013
		0.00008228	0.00001657	-99.00000000	0.00475966	0.00396059	0.00295266	0.00015939
C-methylphenanthrene		0.00031532	0.00006188	-99.00000000	0.01163903	0.01008834	0.00853766	0.00019302
		0.00031450	0.00006163	-99.00000000	0.00662719	0.00552434	0.00413727	0.00009877
1-methylphenanthrene		0.00040148	0.00007627	-99.00000000	0.00593115	0.00531626	0.00470136	0.00015793
		0.00035542	0.00006743	-99.00000000	0.00303969	0.00254544	0.00192844	0.00010630
Anthraquinone		0.00010770	0.00001832	-99.00000000	0.00050251	0.00052659	0.00055067	0.00008060
		0.00008296	0.00001411	-99.00000000	0.00066175	0.00069341	0.00072369	0.00011958
3,6-dimethylphenanthre		0.00001416	0.00000645	-99.00000000	0.00621170	0.00570955	0.00520739	0.00005971
		0.00001083	0.00000444	-99.00000000	0.00468305	0.00385741	0.00279791	0.00003559
A-dimethylphenanthrene		0.00001994	0.00000000	-99.00000000	0.00487441	0.00478442	0.00469444	0.00006909
		0.00002858	0.00000106	-99.00000000	0.00217136	0.00192519	0.00164252	0.00009770
B-dimethylphenanthrene		0.00006063	0.00000884	-99.00000000	0.00268878	0.00258991	0.00249104	0.00000674
		0.00002819	0.00000415	-99.00000000	0.00143282	0.00119452	0.00089487	0.00000953
C-dimethylphenanthrene		0.00003291	0.00000688	-99.00000000	0.01271800	0.01117586	0.00963372	0.00009151
		0.00000674	0.00000135	-99.00000000	0.00698882	0.00574586	0.00414564	0.00003345
D-dimethylphenanthrene		0.00032709	0.00004020	-99.00000000	0.00232262	0.00196791	0.00161321	0.00003738
		0.00011112	0.00001376	-99.00000000	0.00134977	0.00113517	0.00086911	0.00002577
Fluoranthene		0.00013742	0.00002830	-99.00000000	0.00609510	0.00720906	0.00832301	0.00033859
		0.00002569	0.00000521	-99.00000000	0.00176600	0.00168152	0.00159258	0.00013151
Pyrene		0.00014520	0.00002502	-99.00000000	0.00521149	0.00613125	0.00705101	0.00021631
		0.00002407	0.00000416	-99.00000000	0.00155562	0.00193014	0.00224297	0.00007258
9-anthraldehyde		0.00016893	0.00002000	-99.00000000	0.00518056	0.00442186	0.00366316	0.00004487
		0.00012358	0.00001464	-99.00000000	0.00306014	0.00261174	0.00206832	0.00002246
Retene		0.00110572	0.00013626	-99.00000000	0.00052552	0.00048974	0.00045395	0.00001179
		0.00013303	0.00001641	-99.00000000	0.00024290	0.00023868	0.00023437	0.00000914
Benzonaphthothiophene		0.00004388	0.00000895	-99.00000000	0.00025746	0.00022671	0.00019595	0.00002292
		0.00004343	0.00000873	-99.00000000	0.00023990	0.00024452	0.00024906	0.00002601
B-MePy/MeFl		0.00011408	0.00001369	-99.00000000	0.00081647	0.00085220	0.00088792	0.00008426
		0.00010318	0.00001249	-99.00000000	0.00021074	0.00022008	0.00022903	0.00002961
C-methylpyrene/methyl fluoranthene		0.00009015	0.00000977	-99.00000000	0.00030356	0.00034332	0.00038309	0.00003601
		0.00001643	0.00000183	-99.00000000	0.00013222	0.00014209	0.00015131	0.00001141
4-methylpyrene		0.00010910	0.00001087	-99.00000000	0.00070595	0.00064488	0.00058380	0.00003395
		0.00004025	0.00000407	-99.00000000	0.00036492	0.00032206	0.00027253	0.00001378
1-methylpyrene		0.00012745	0.00001486	-99.00000000	0.00048202	0.00044470	0.00040737	0.00003906
		0.00001871	0.00000221	-99.00000000	0.00024042	0.00021223	0.00017967	0.00001834
benzo(c)phenanthrene		0.00007798	0.00001076	-99.00000000	0.00009221	0.00009199	0.00009177	0.00003674
		0.00006434	0.00000890	-99.00000000	0.00013679	0.00013876	0.00014070	0.00002855
Chrysene		0.00060890	0.00008568	-99.00000000	0.00067839	0.00068018	0.00068197	0.00034906
		0.00028605	0.00004027	-99.00000000	0.00023118	0.00023485	0.00023847	0.00010269
Benz(a)anthracene-7,12-dione		0.00004228	0.00000713	-99.00000000	0.00003147	0.00003248	0.00003350	0.00001453
		0.00002527	0.00000426	-99.00000000	0.00011426	0.00011740	0.00012046	0.00000898
5+6-methylchrysene		0.00008935	0.00000528	-99.00000000	0.00001807	0.00001205	0.00000602	0.00003870
		0.00001256	0.00000092	-99.00000000	0.00011073	0.00011511	0.00011933	0.00001824
Benzo(b+j+k)fluoranthe		0.00024053	0.00002930	-99.00000000	0.00042072	0.00047371	0.00052669	0.00031132
		0.00011078	0.00001395	-99.00000000	0.00039872	0.00041124	0.00042340	0.00014095
BeP		0.00014978	0.00002310	-99.00000000	0.00010726	0.00014835	0.00018944	0.00009643
		0.00003136	0.00000487	-99.00000000	0.00018928	0.00021364	0.00023550	0.00005603
Perylene		0.00006043	0.00000692	-99.00000000	0.00000000	0.00000000	0.00000000	0.00001161
		0.00005010	0.00000575	-99.00000000	0.00011419	0.00011735	0.00012042	0.00001346
Indeno[123-cd]pyrene		0.00000000	0.00000410	-99.00000000	0.00021399	0.00024585	0.00027770	0.00010353
		0.00001185	0.00000778	-99.00000000	0.00037938	0.00039606	0.00041207	0.00006479
Benzo(ghi)perylene		0.00000000	0.00000000	-99.00000000	0.00067940	0.00088412	0.00108883	0.00008914
		0.00001044	0.00000287	-99.00000000	0.00044690	0.00048638	0.00052288	0.00002831
Dibenz(ah+ac)anthracene		0.00000838	0.00000271	-99.00000000	0.00004301	0.00003164	0.00002028	0.00003272
		0.00001554	0.00000334	-99.00000000	0.00043016	0.00044778	0.00046472	0.00003574
Coronene		0.00003570	0.00000264	-99.00000000	0.00043305	0.00062532	0.00081760	0.00004640
		0.00000810	0.00000091	-99.00000000	0.00040503	0.00050027	0.00058008	0.00002083

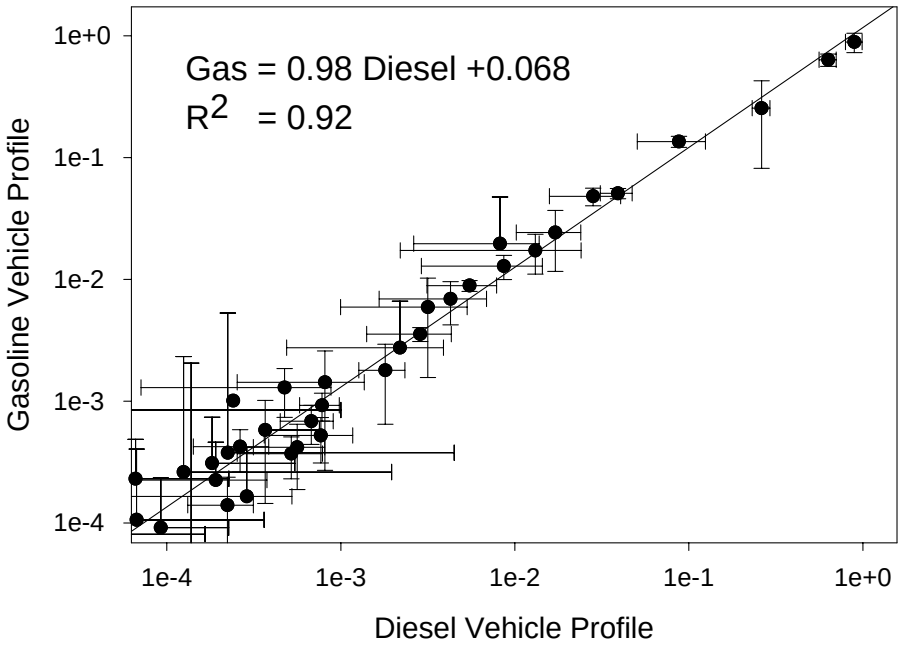


Figure 5-1. Comparison of CAIP gasoline vs. diesel vehicle profiles. Profiles are collinear with each other.

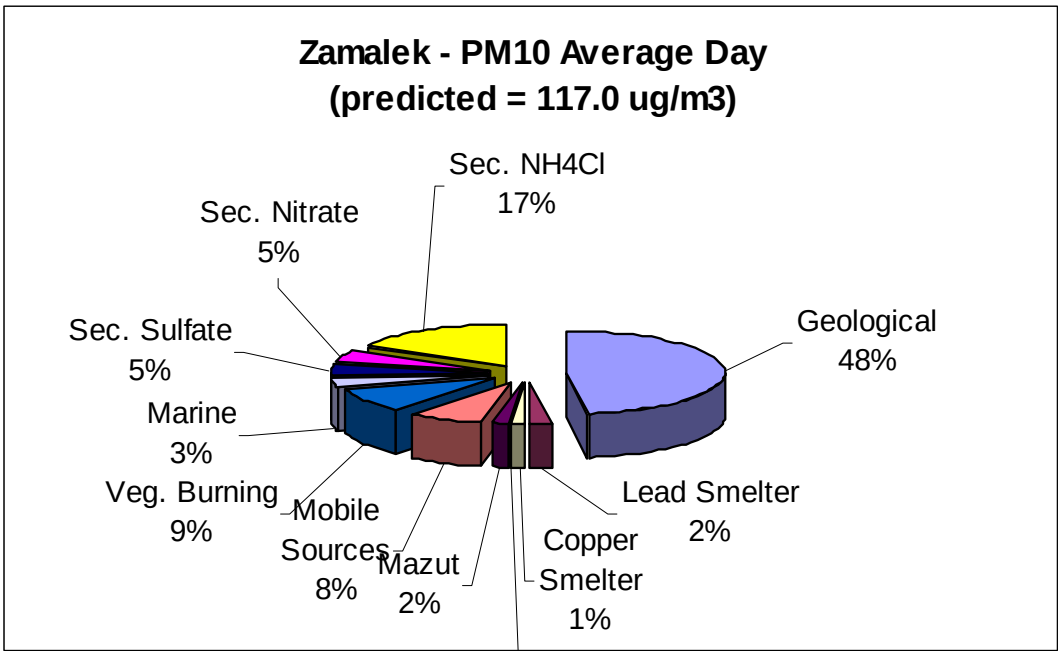


Figure 5-2a. Zamalek PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

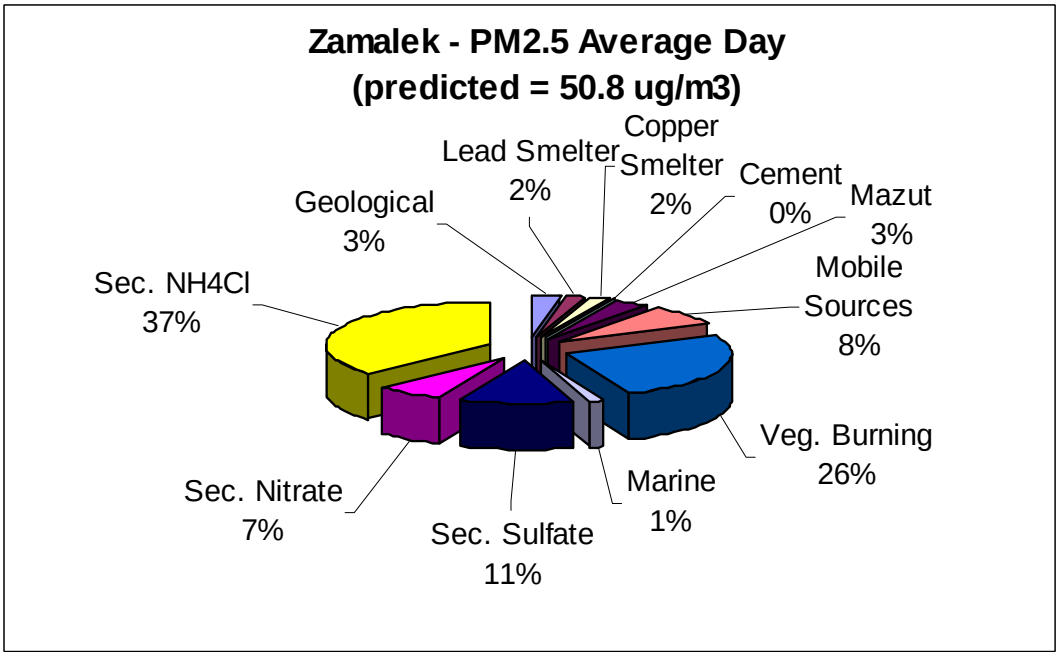


Figure 5-2b. Zamalek $PM_{2.5}$ source apportionment, average day for the winter intensive study using enhanced profiles (ions, metals, and PAHs).

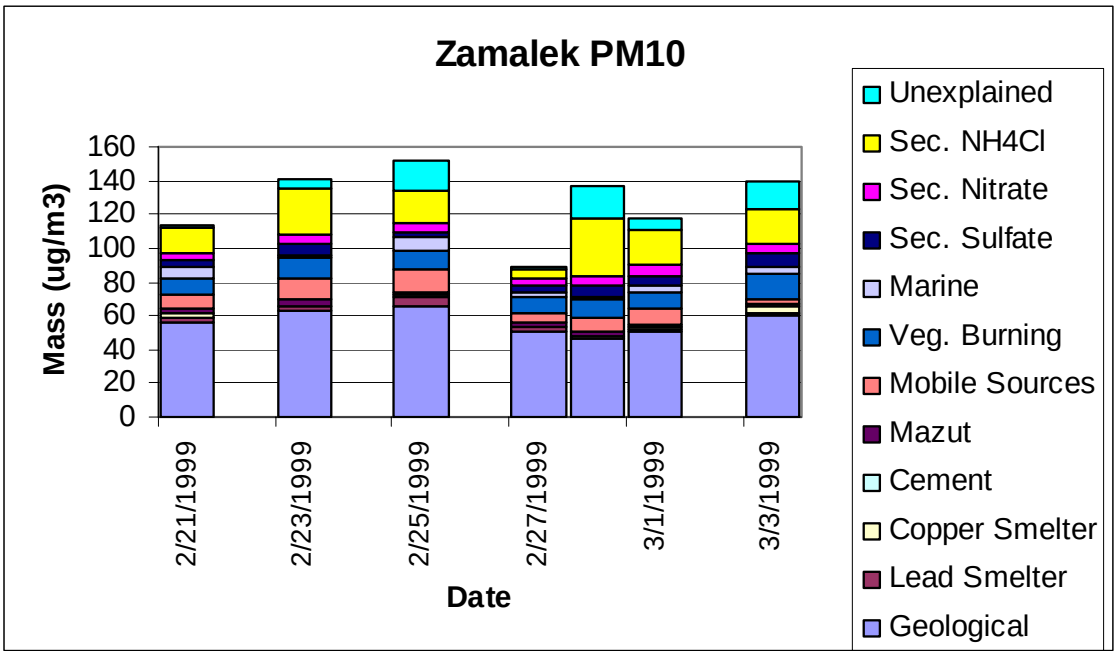


Figure 5-2c. Zamalek PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

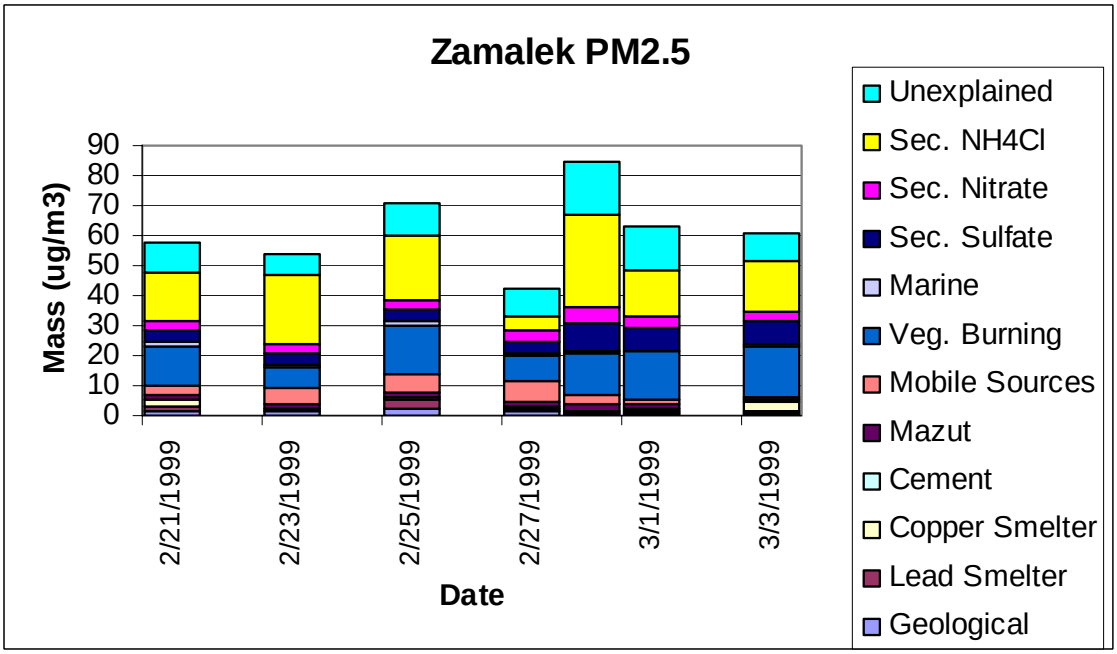


Figure 5-2d. Zamalek $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

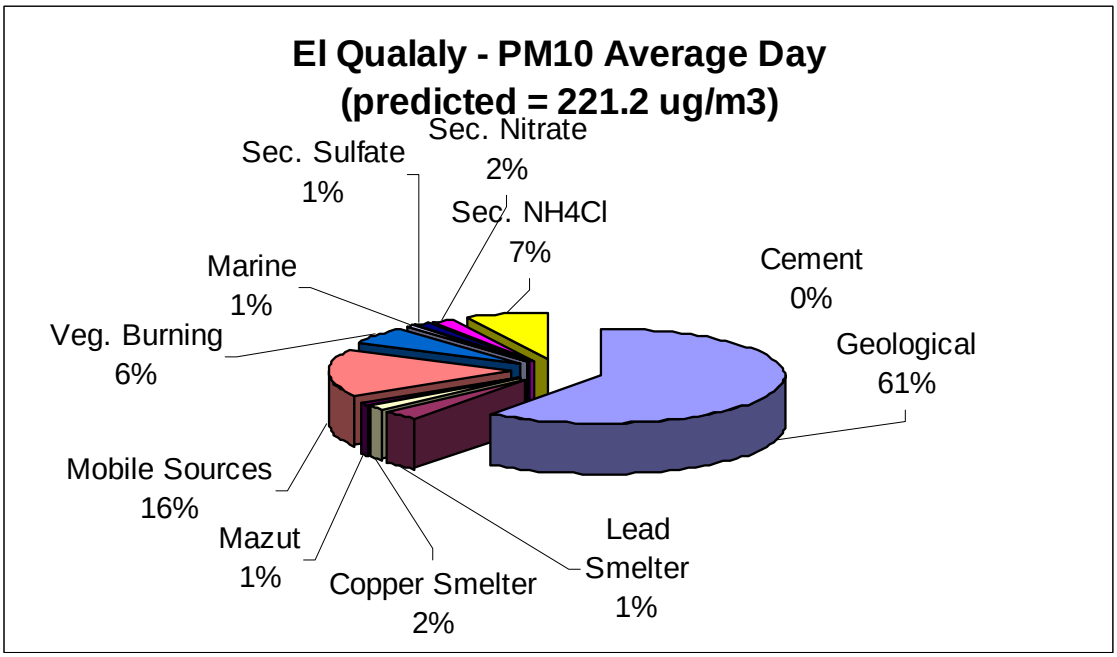


Figure 5-3a. El Qualaly PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

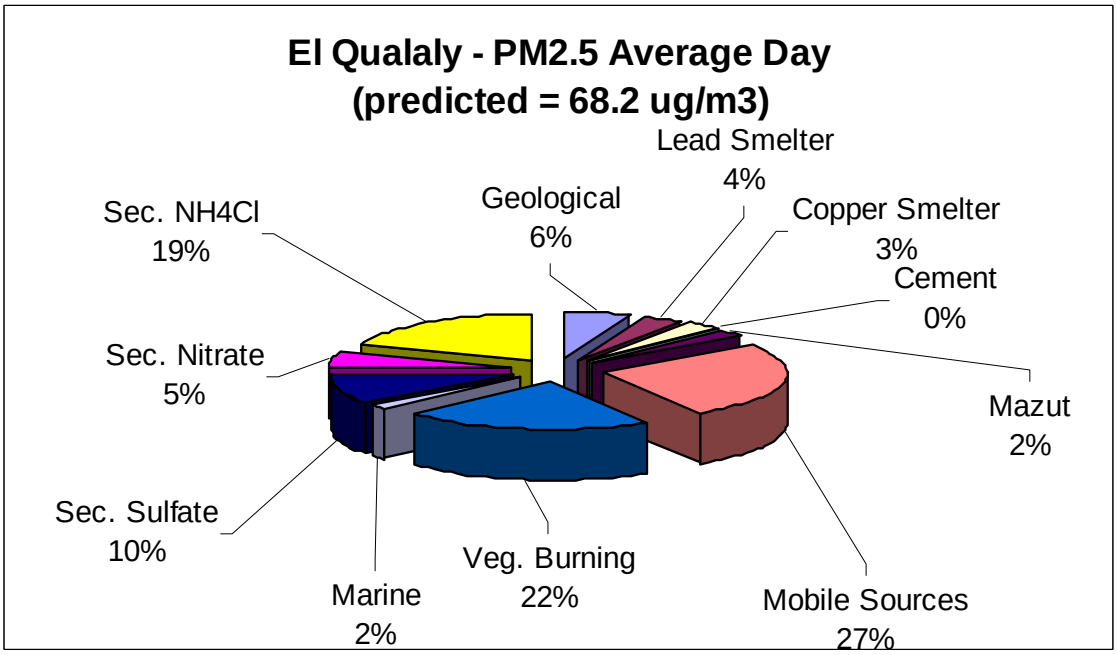


Figure 5-3b. El Qualaly $PM_{2.5}$ source apportionment, average day for the winter intensive study using enhanced profiles (ions, metals, and PAHs).

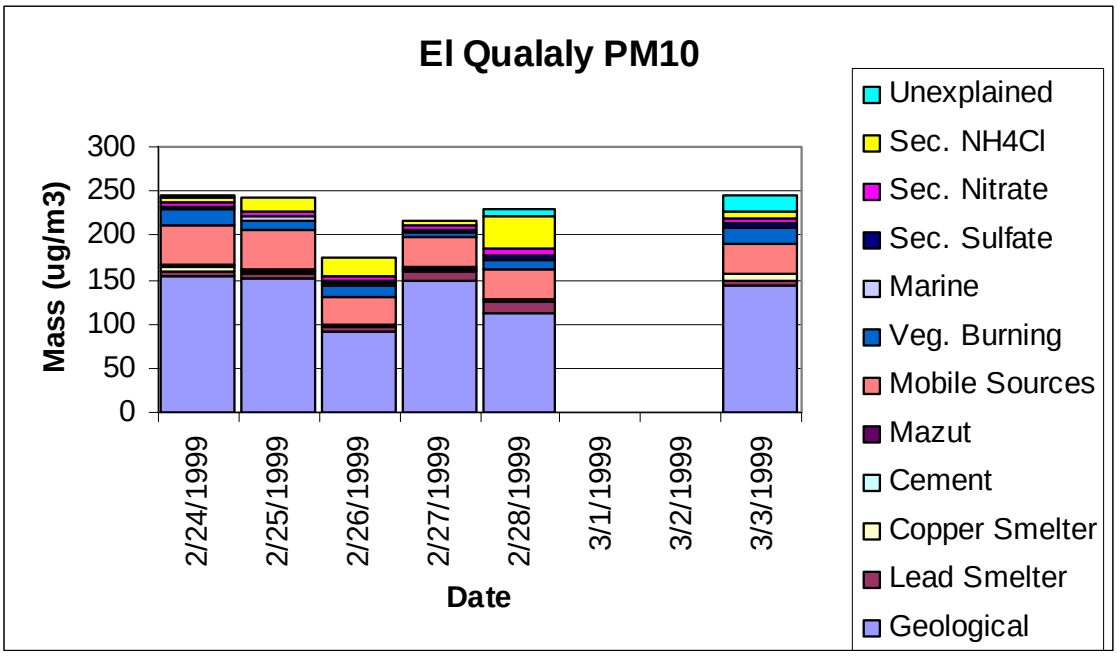


Figure 5-3c. El Qualaly PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

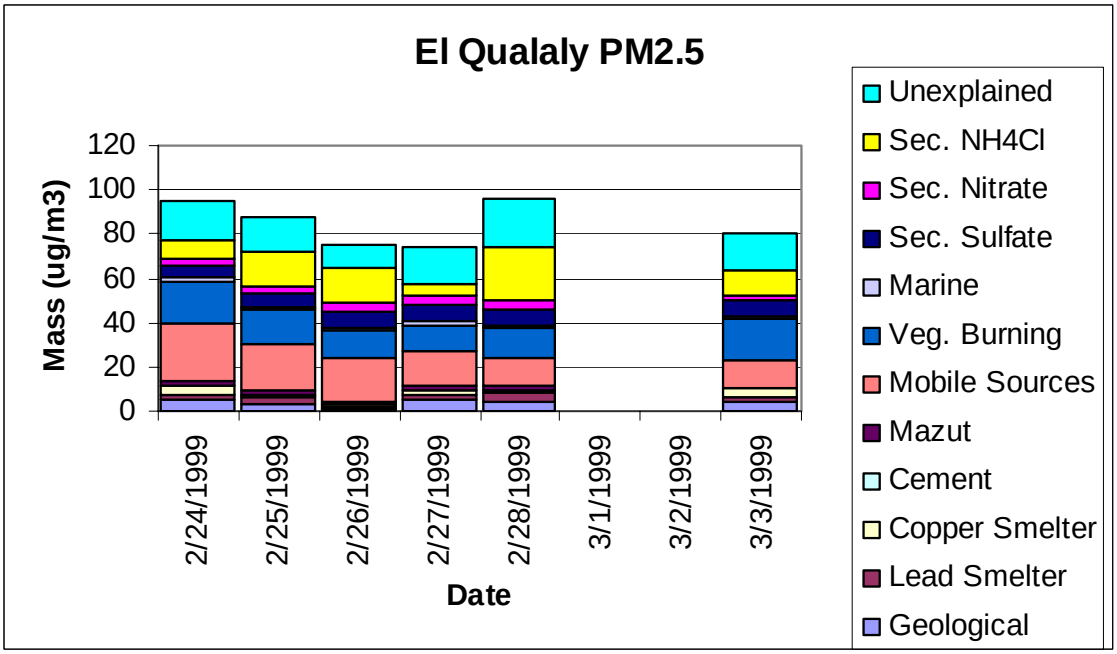


Figure 5-3d. El Qualaly $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

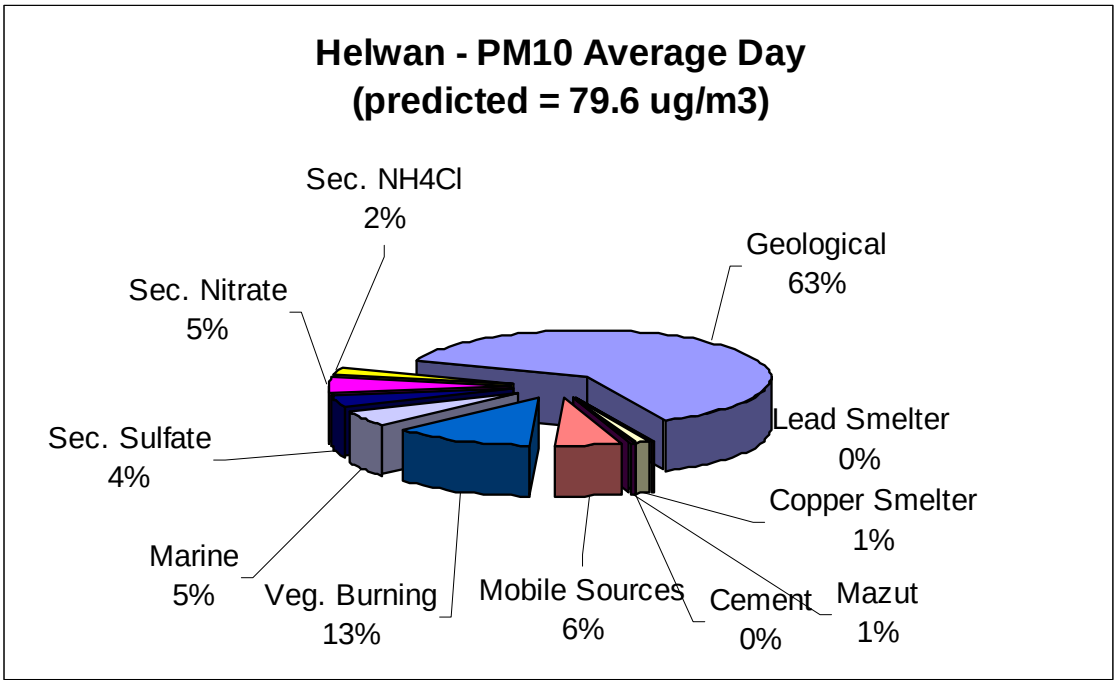


Figure 5-4a. Helwan PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

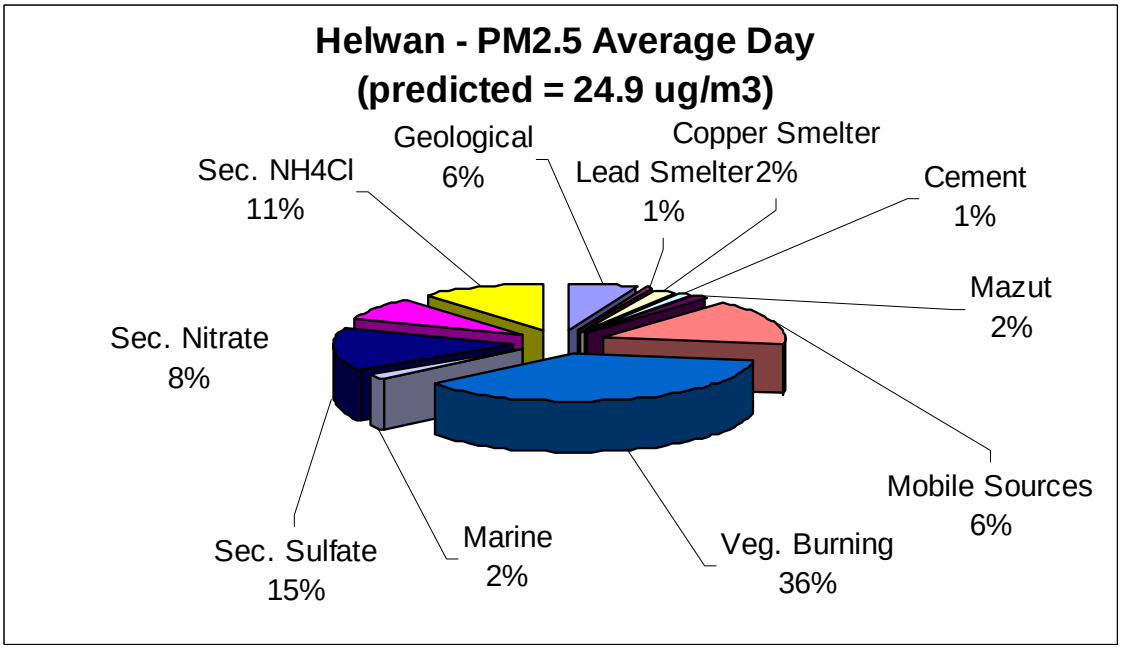


Figure 5-4b. Helwan $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

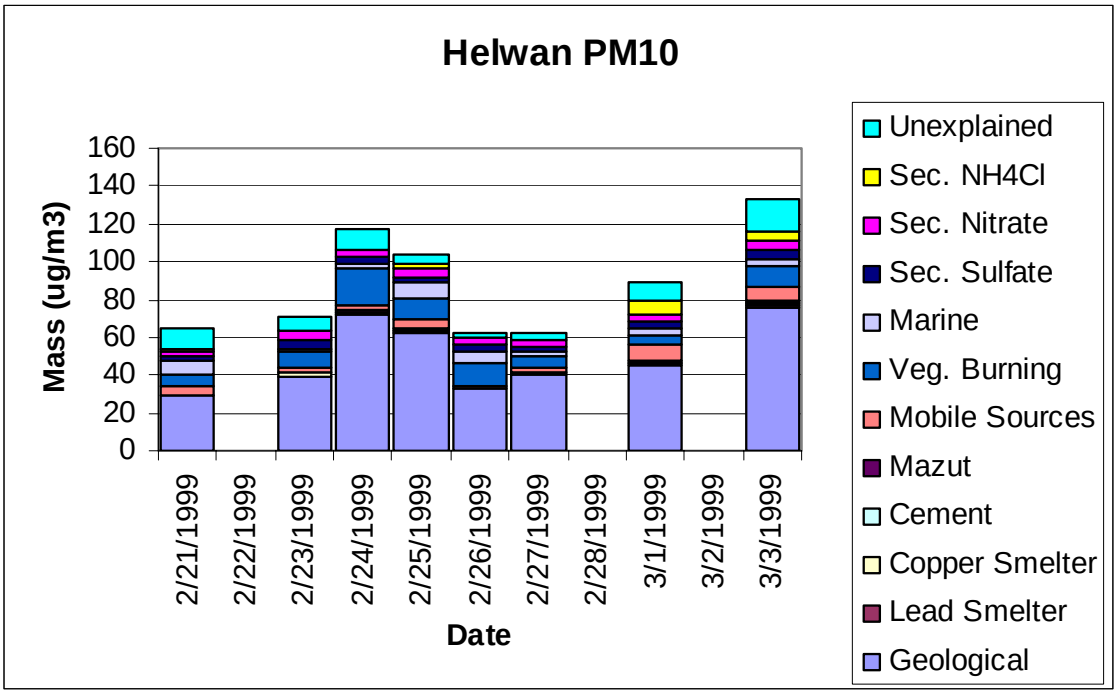


Figure 5-4c. Helwan PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

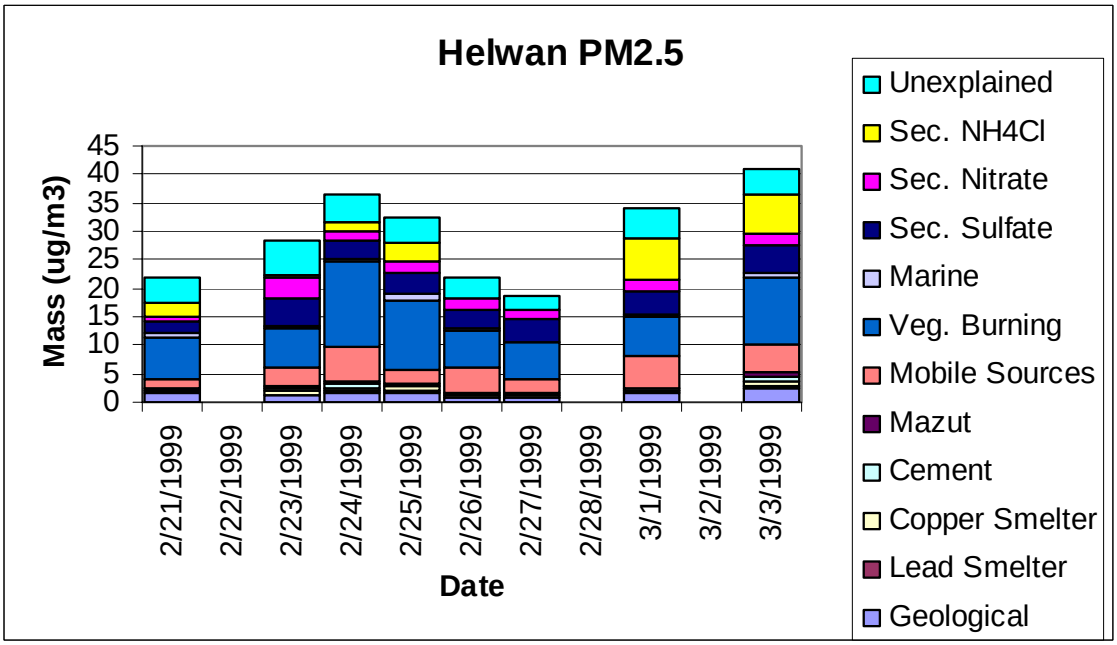


Figure 5-4d. Helwan $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

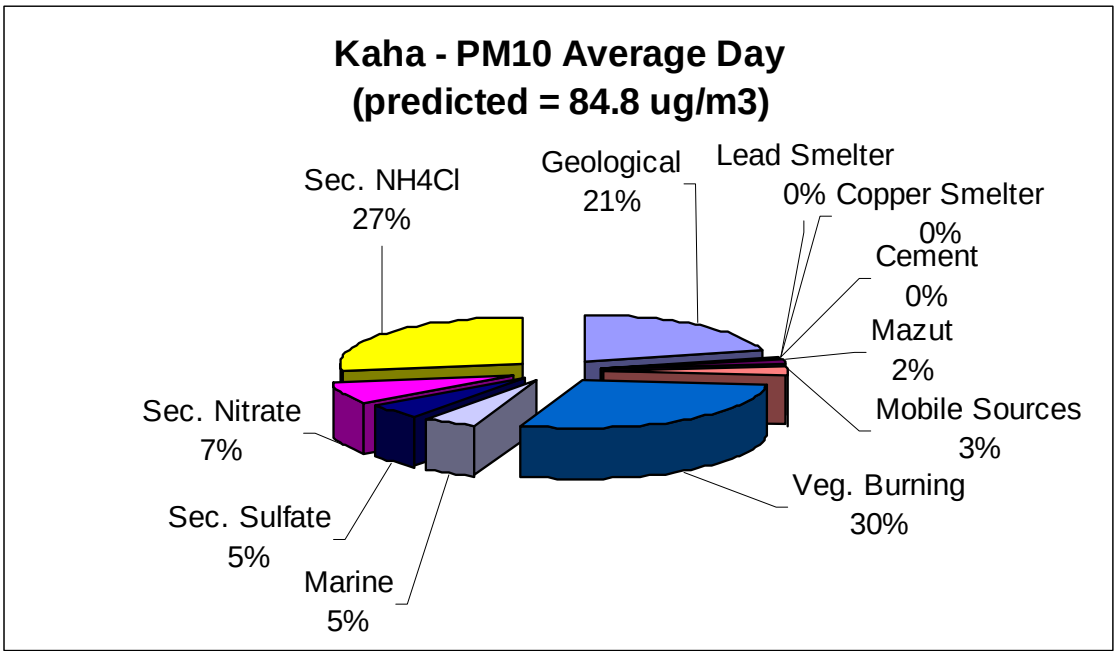


Figure 5-5a. Kaha PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

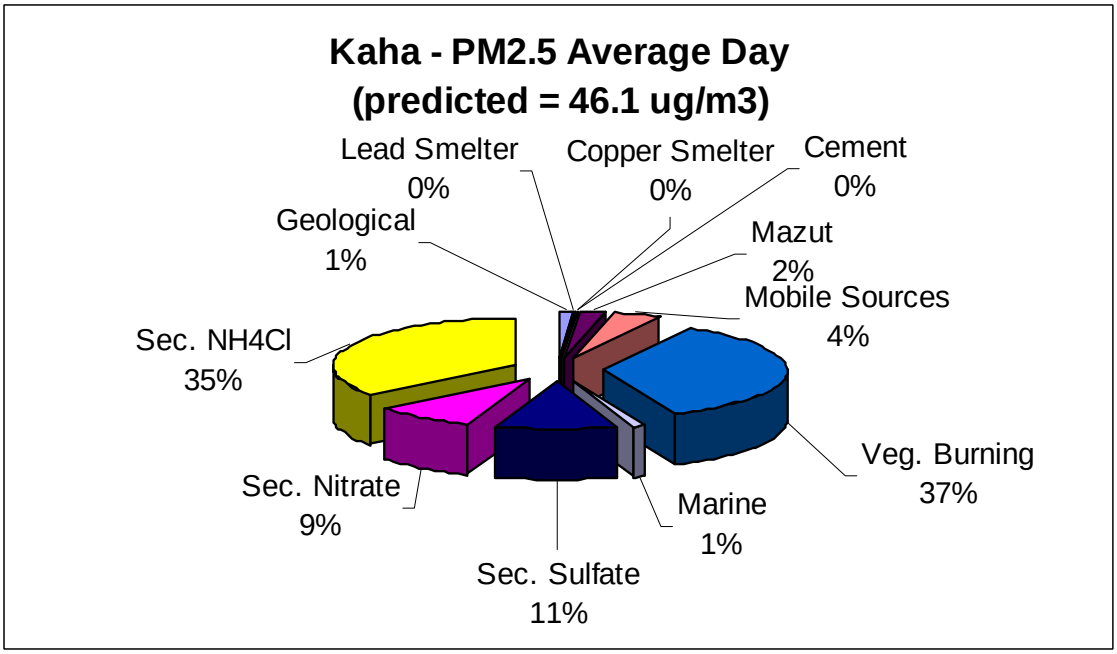


Figure 5-5b. Kaha $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

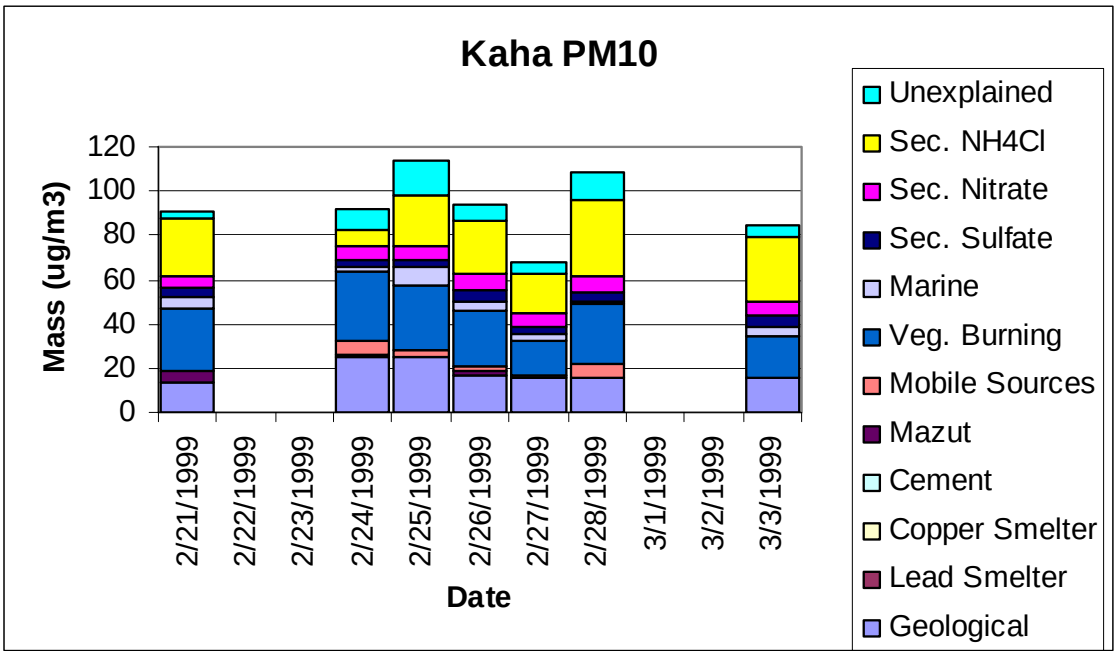


Figure 5-5c. Kaha PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

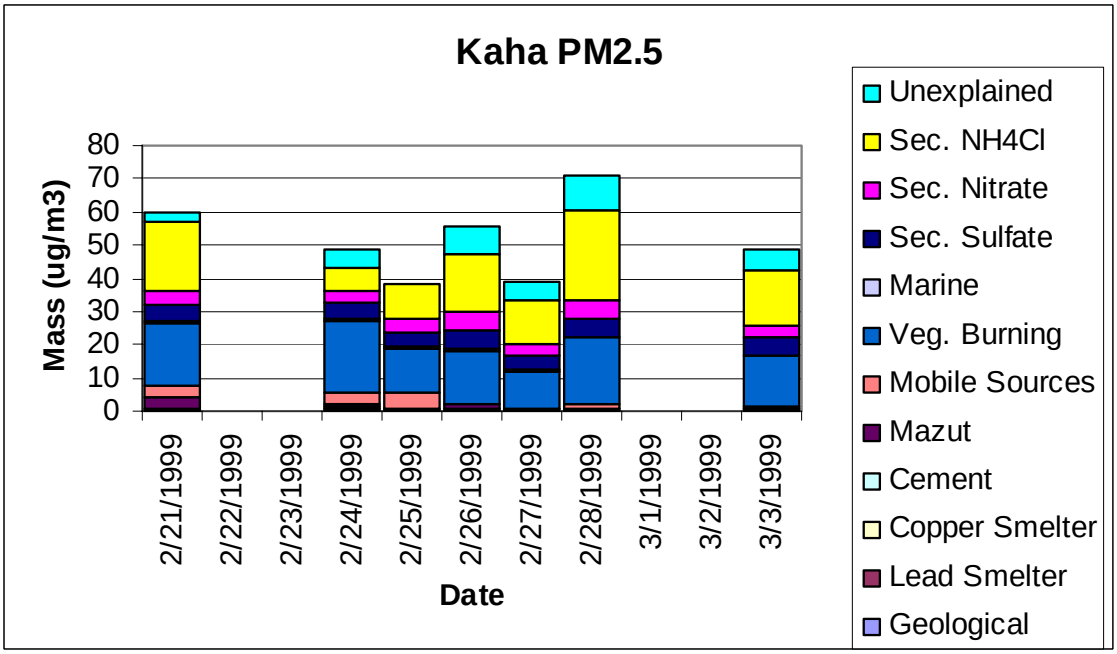


Figure 5-5d. Kaha $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

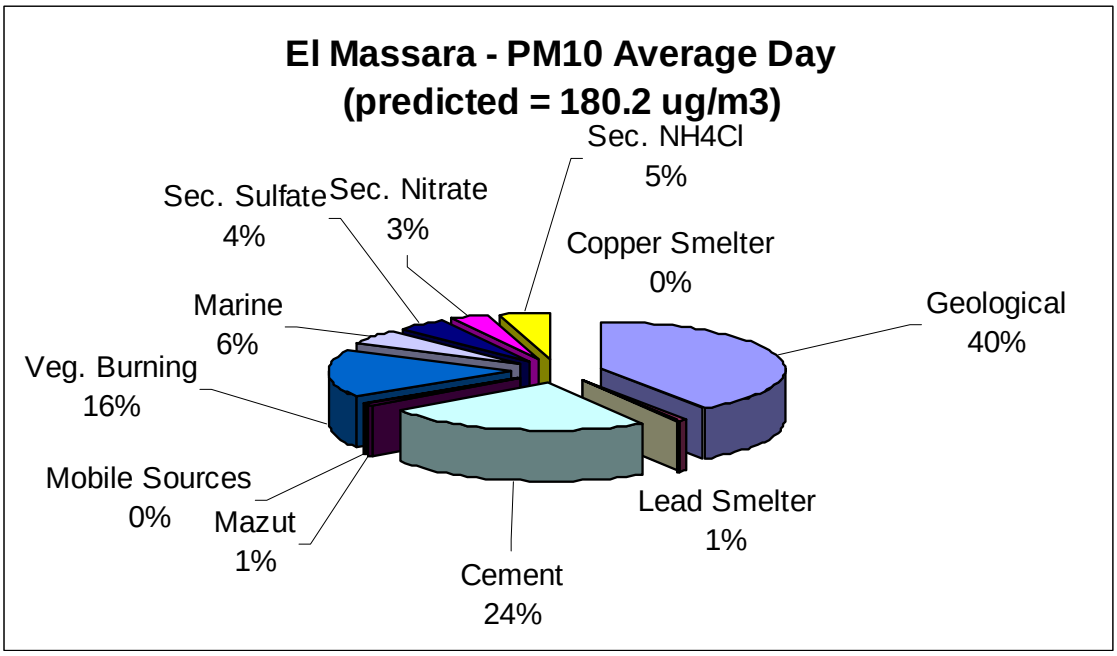


Figure 5-6a. El Massara PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

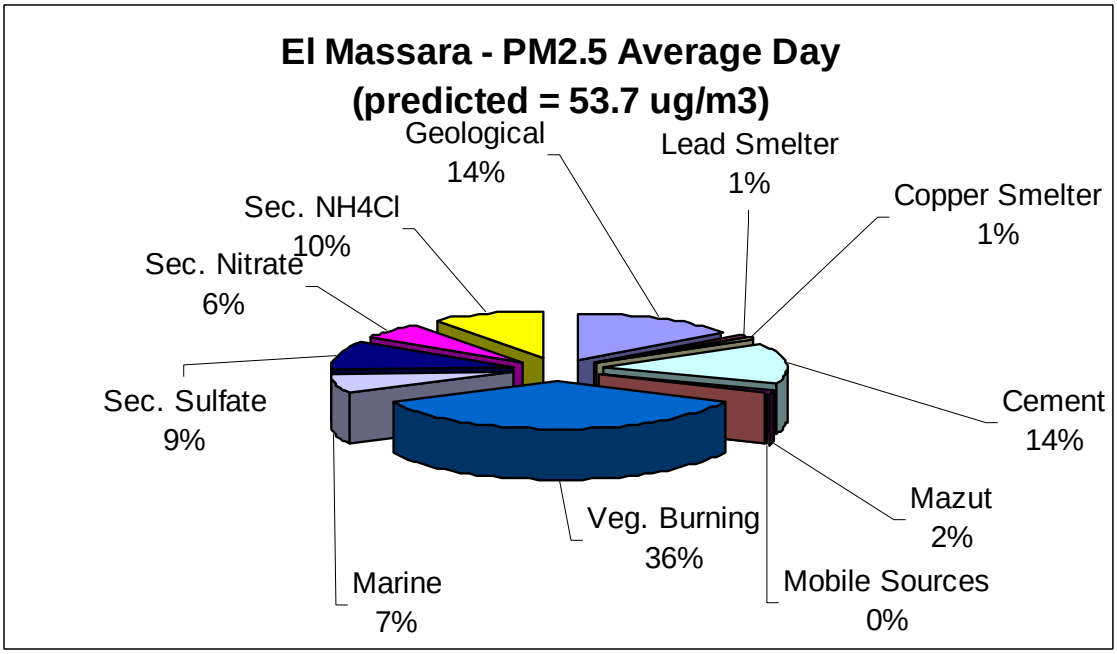


Figure 5-6b. El Massara $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

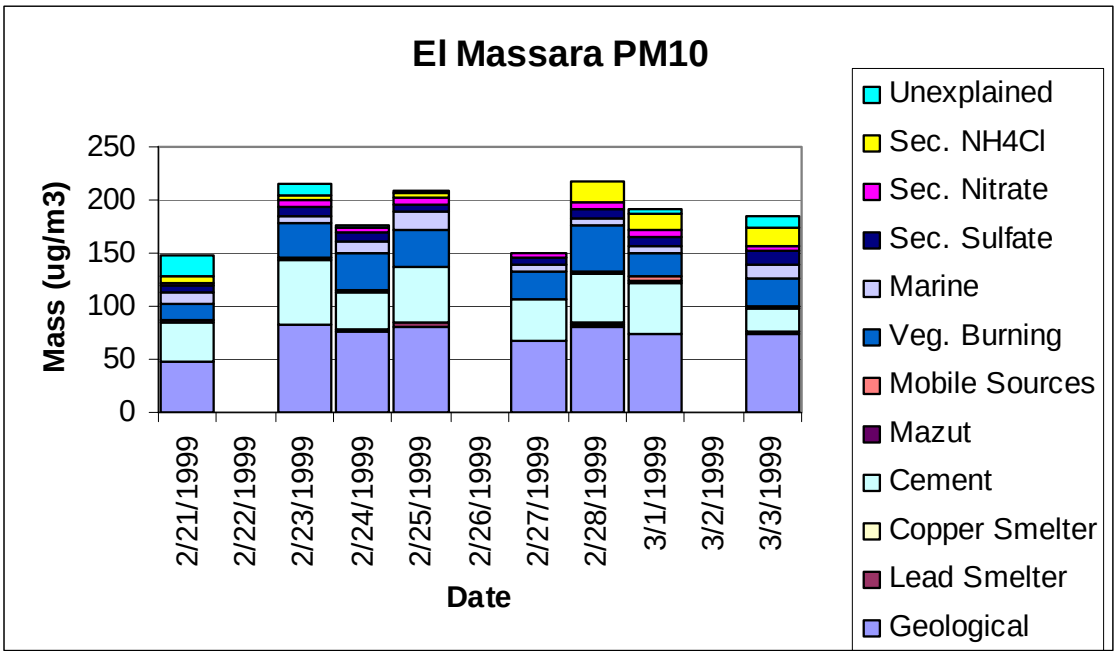


Figure 5-6c. El Massara PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

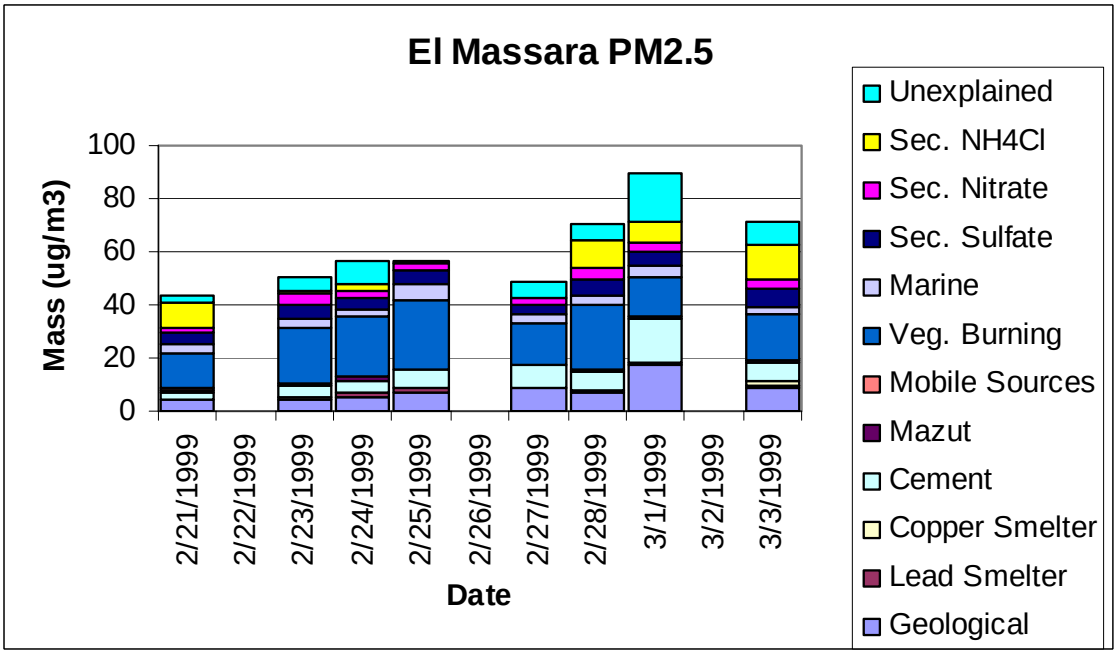


Figure 5-6d. El Massara $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

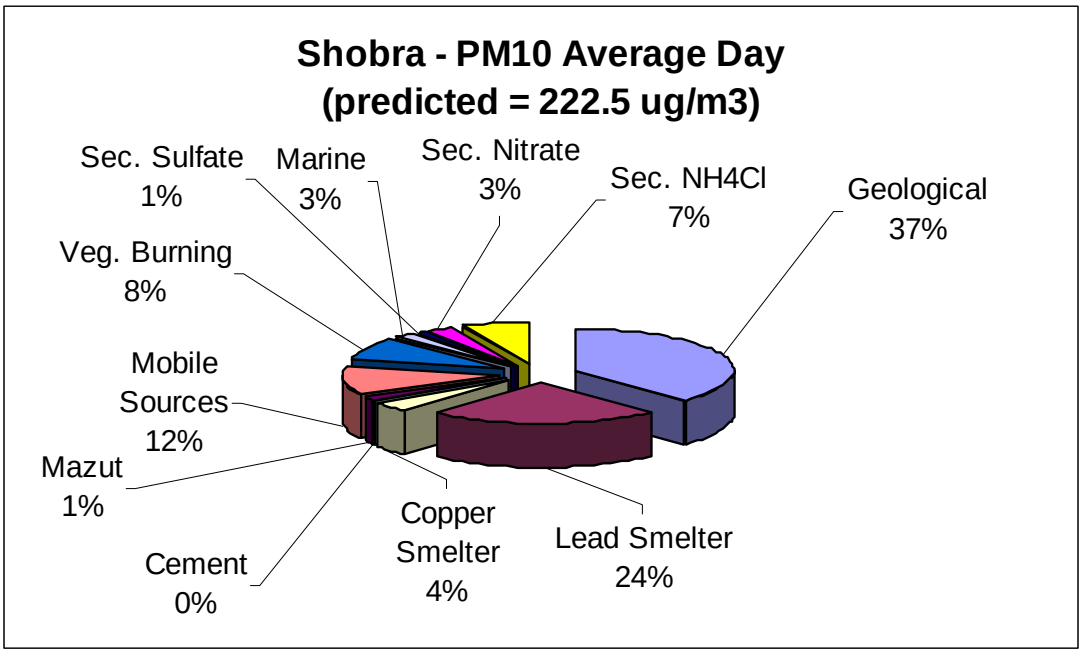


Figure 5-7a. Shobra PM_{10} source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

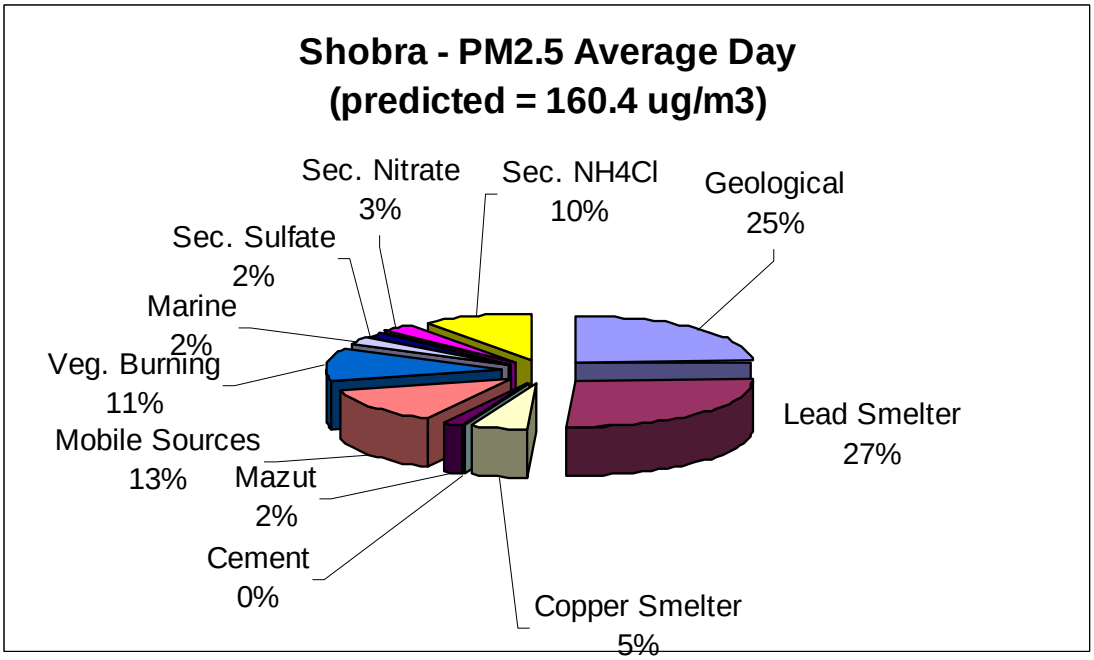


Figure 5-7b. Shobra $PM_{2.5}$ source apportionment, average day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

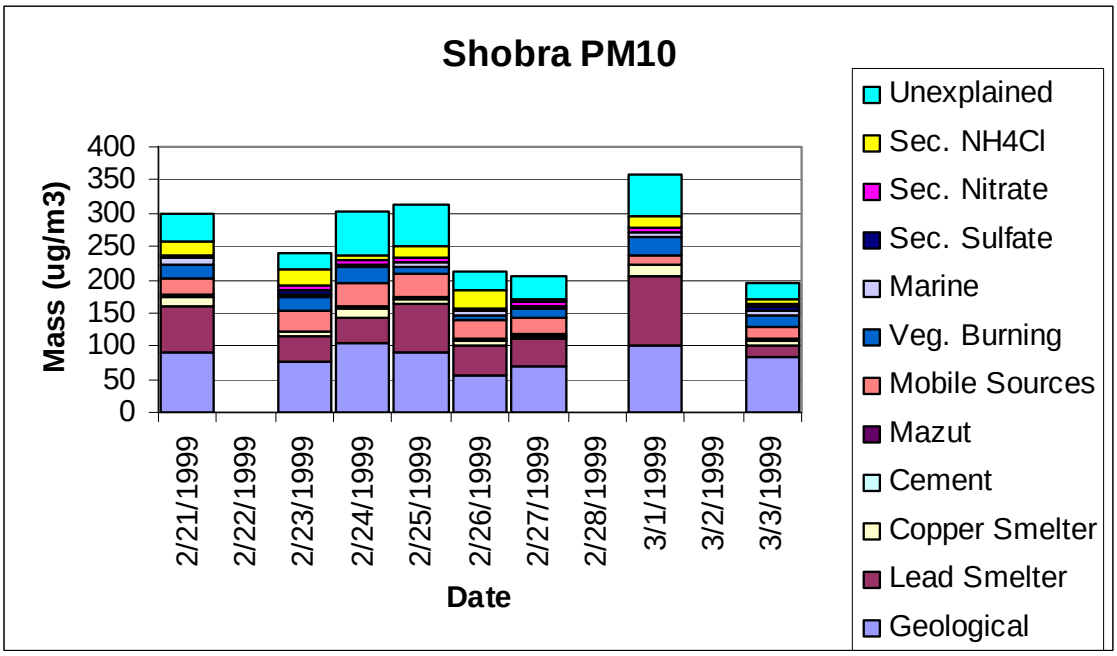


Figure 5-7c. Shobra PM_{10} source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

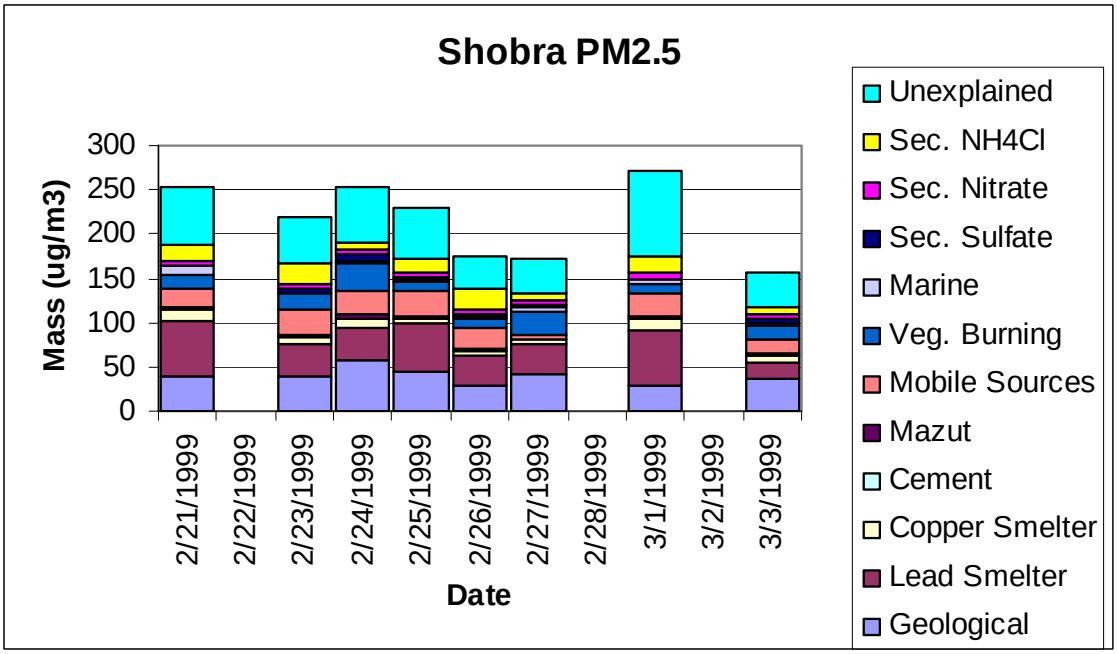


Figure 5-7d. Shobra $PM_{2.5}$ source apportionment, by day for the winter 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

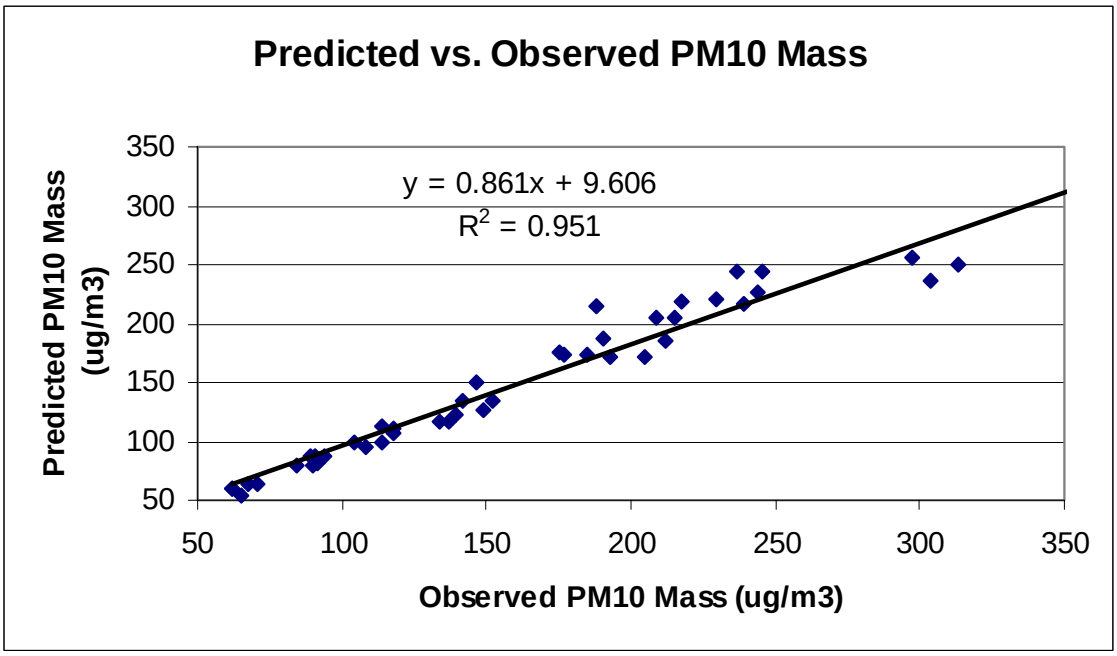


Figure 5-8a. Comparison of predicted vs. measured PM_{10} mass of the winter intensive samples and CMB apportionments.

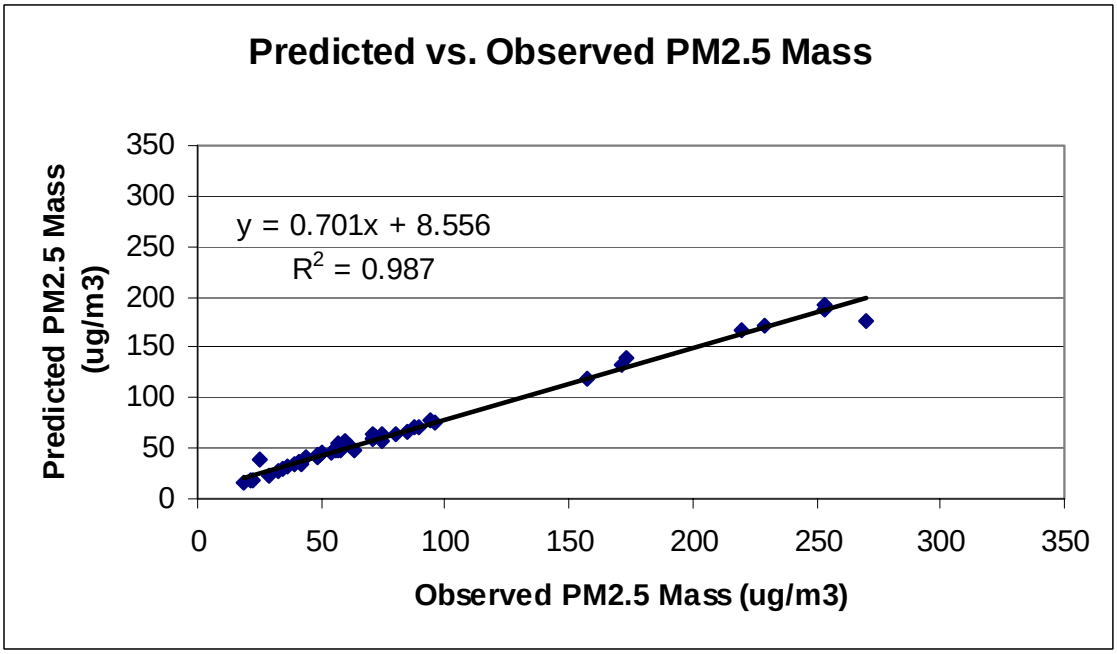


Figure 5-8b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the winter intensive samples and CMB apportionments.

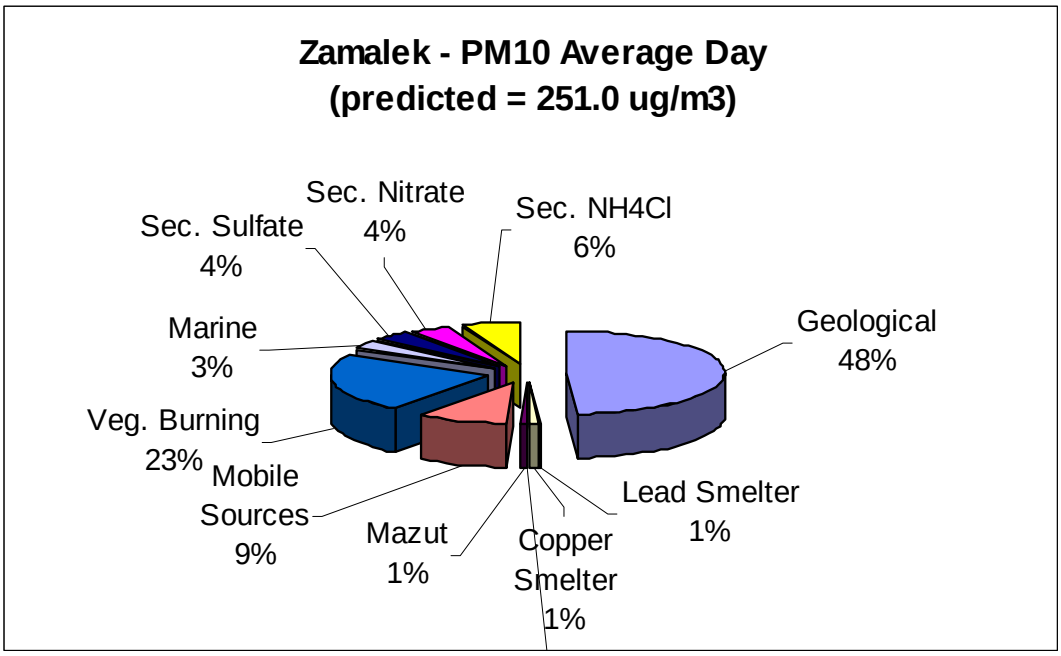


Figure 5-9a. Zamalek PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

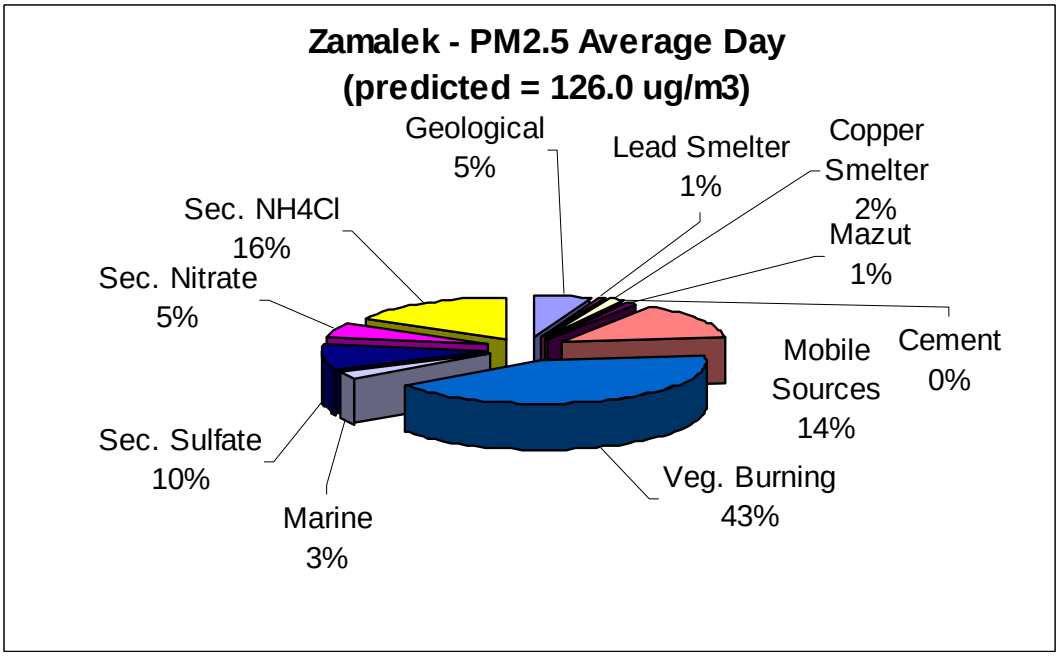


Figure 5-9b. Zamalek $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

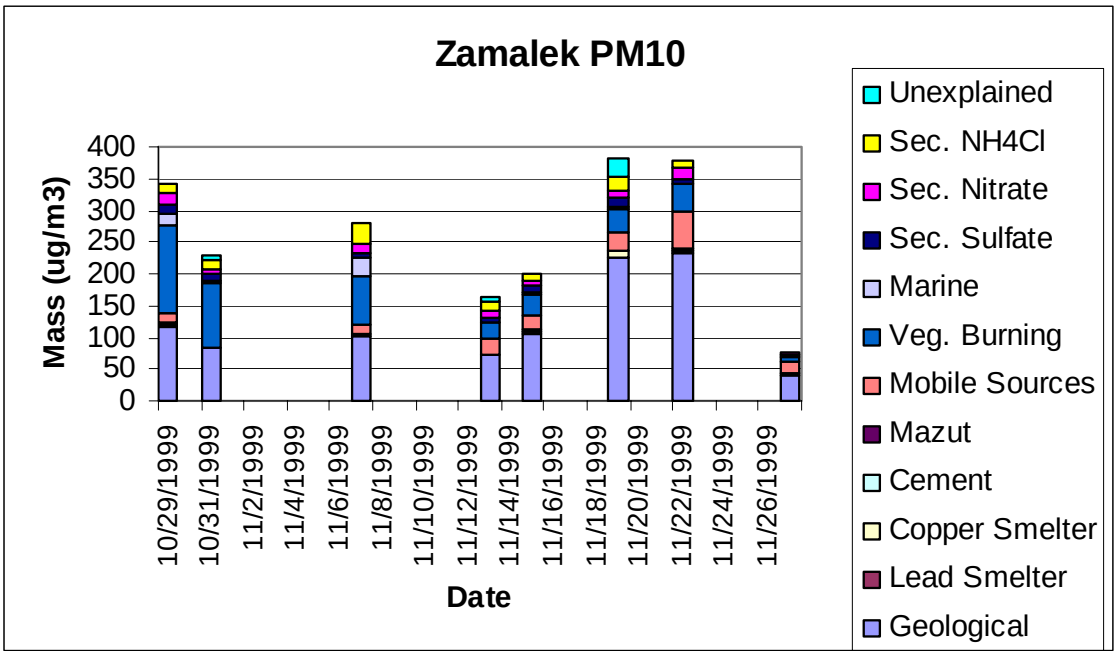


Figure 5-9c. Zamalek PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

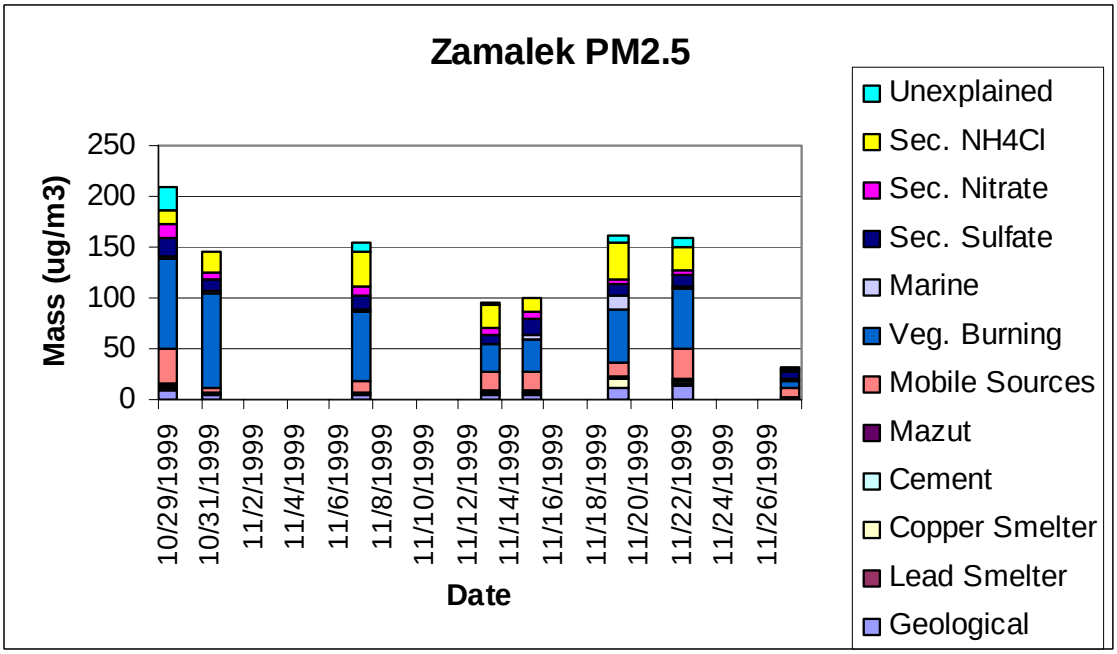


Figure 5-9d. Zamalek $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

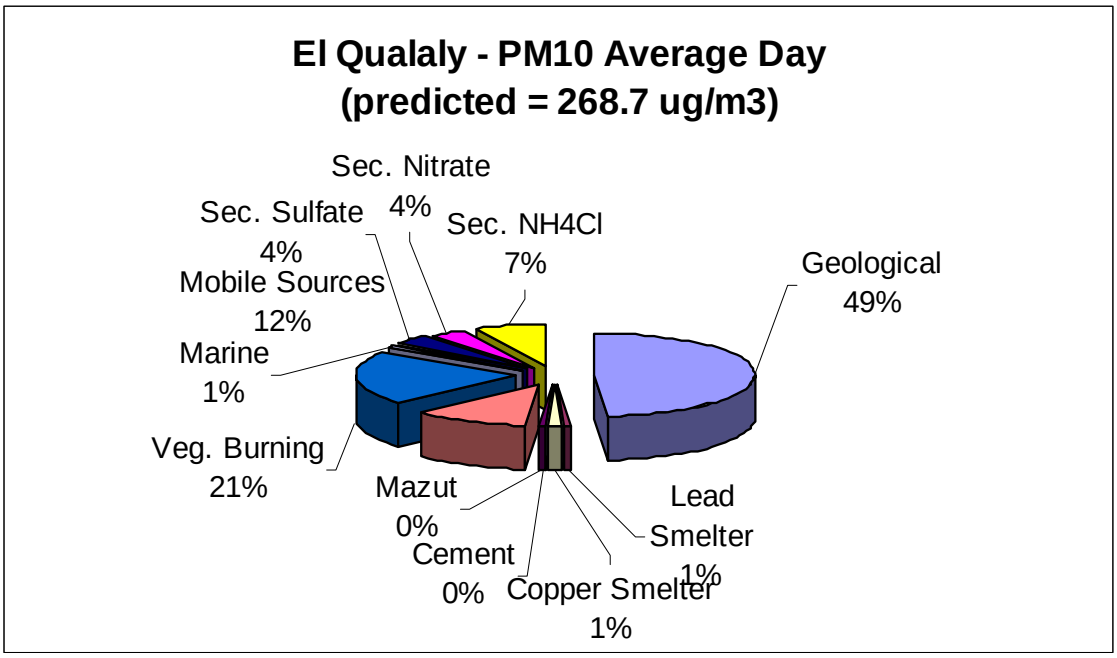


Figure 5-10a. El Qulaly PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

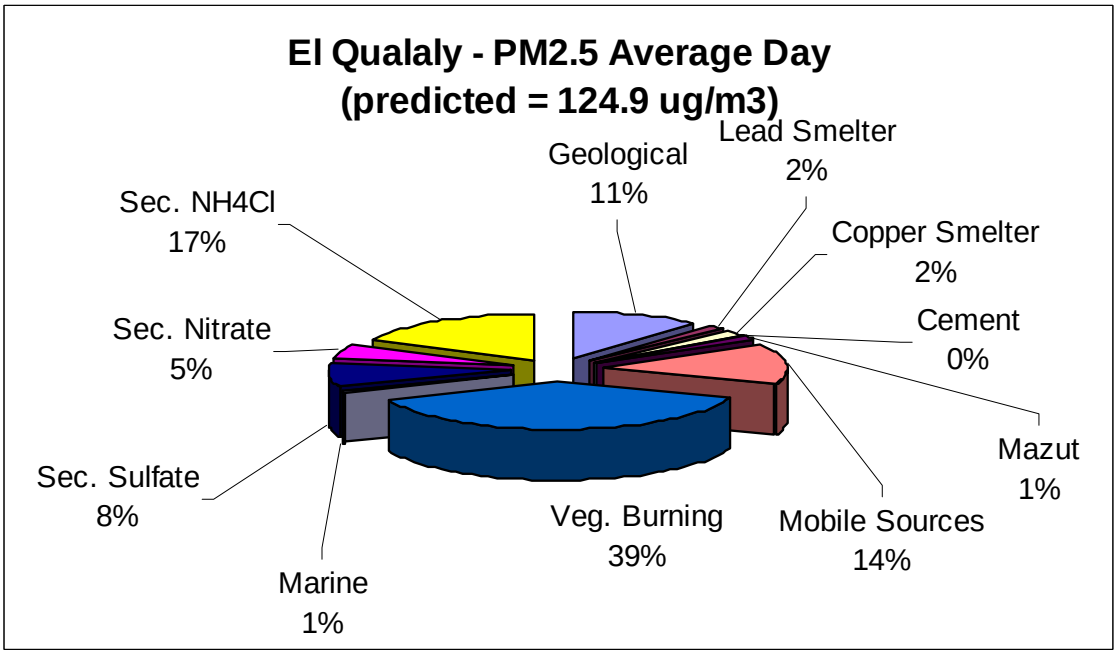


Figure 5-10b. El Qualaly $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

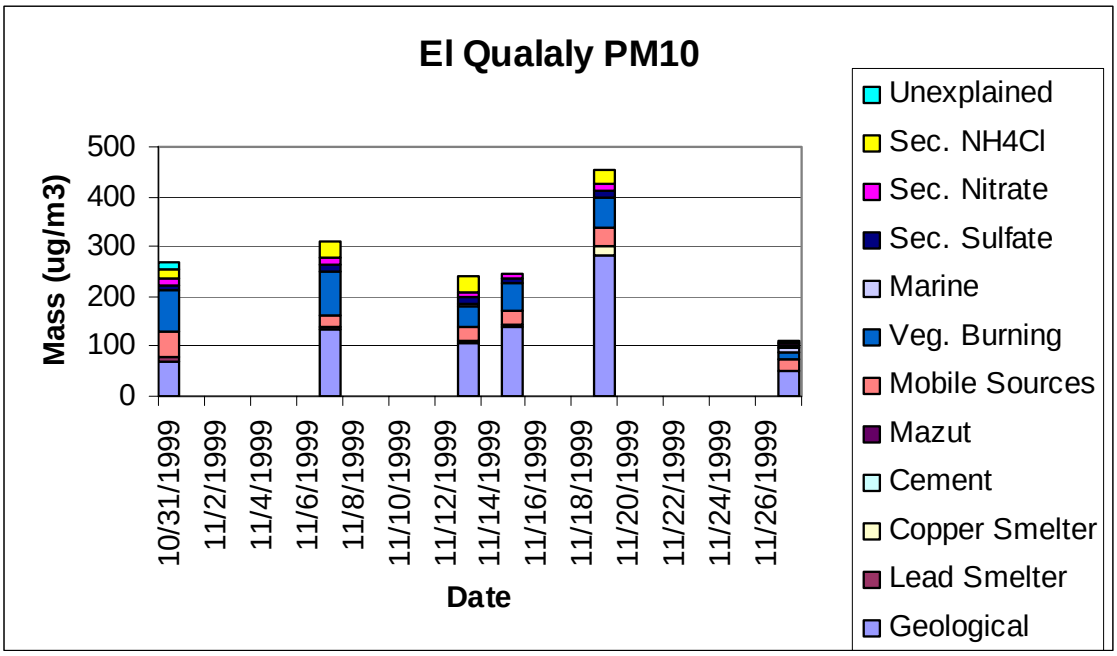


Figure 5-10c. El Qualaly PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

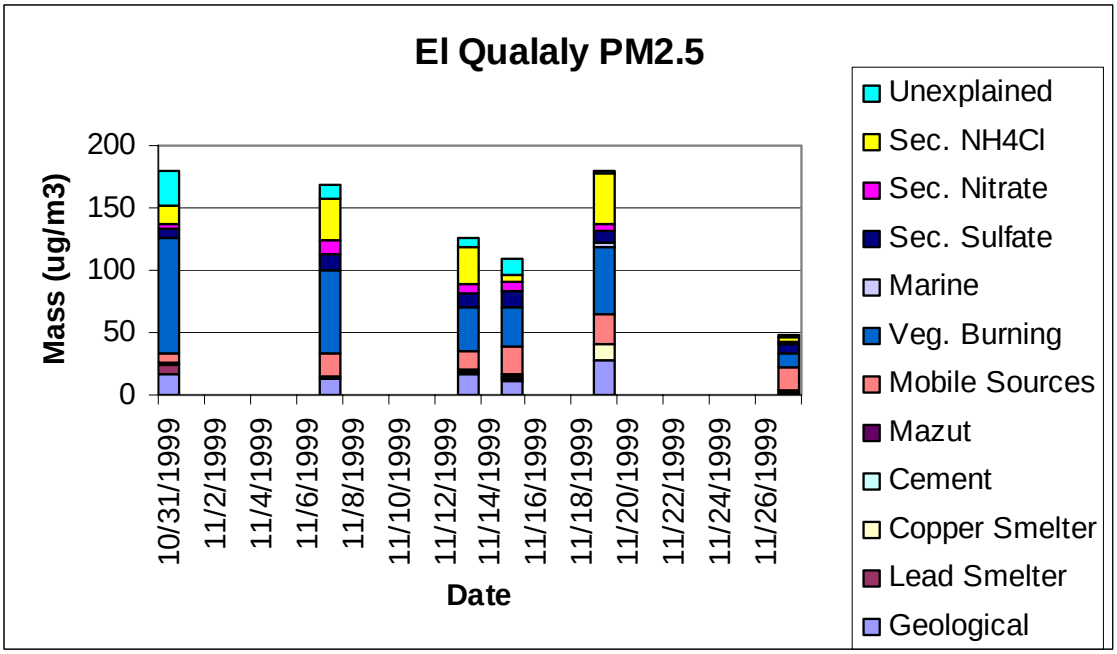


Figure 5-10d. El Qualaly $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

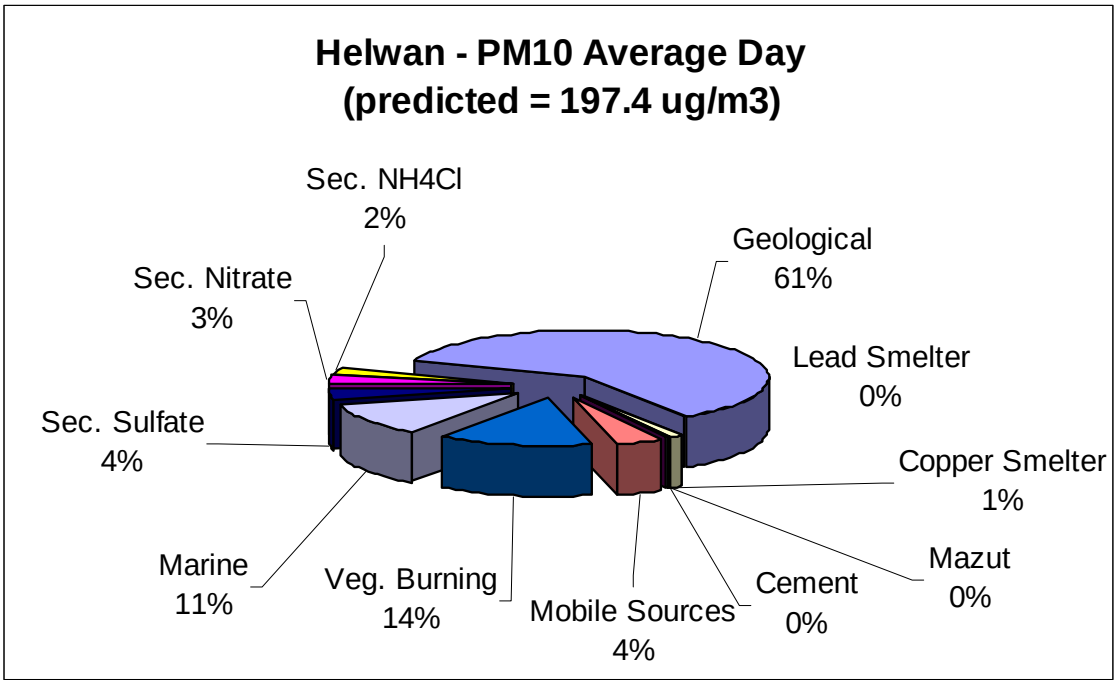


Figure 5-11a. Helwan PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

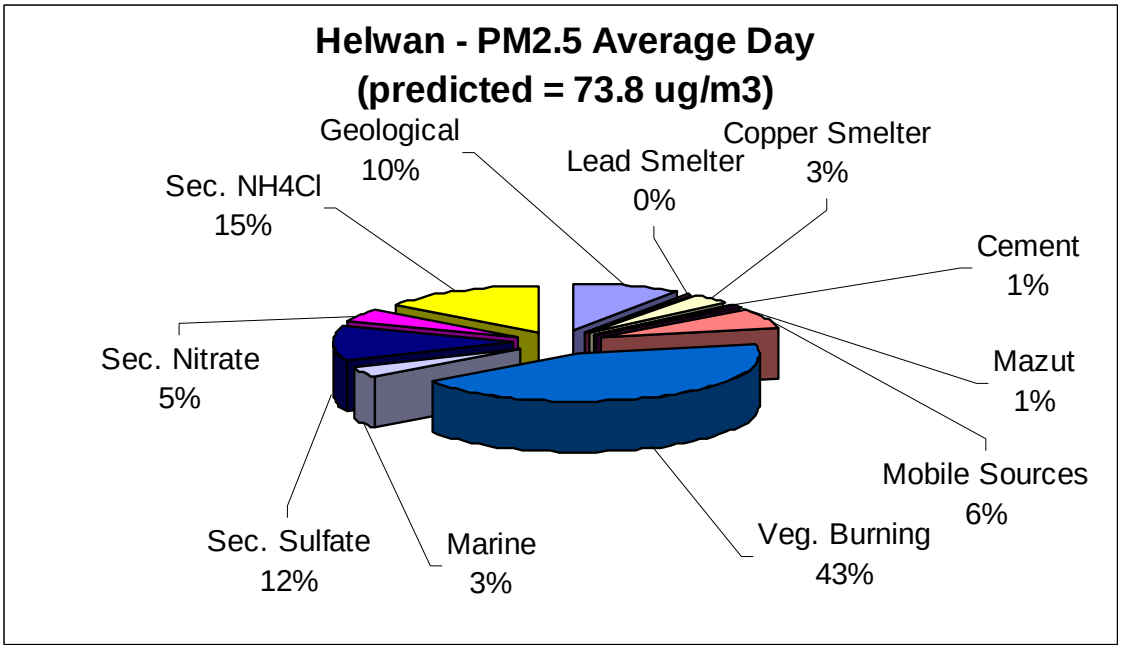


Figure 5-11b. Helwan $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

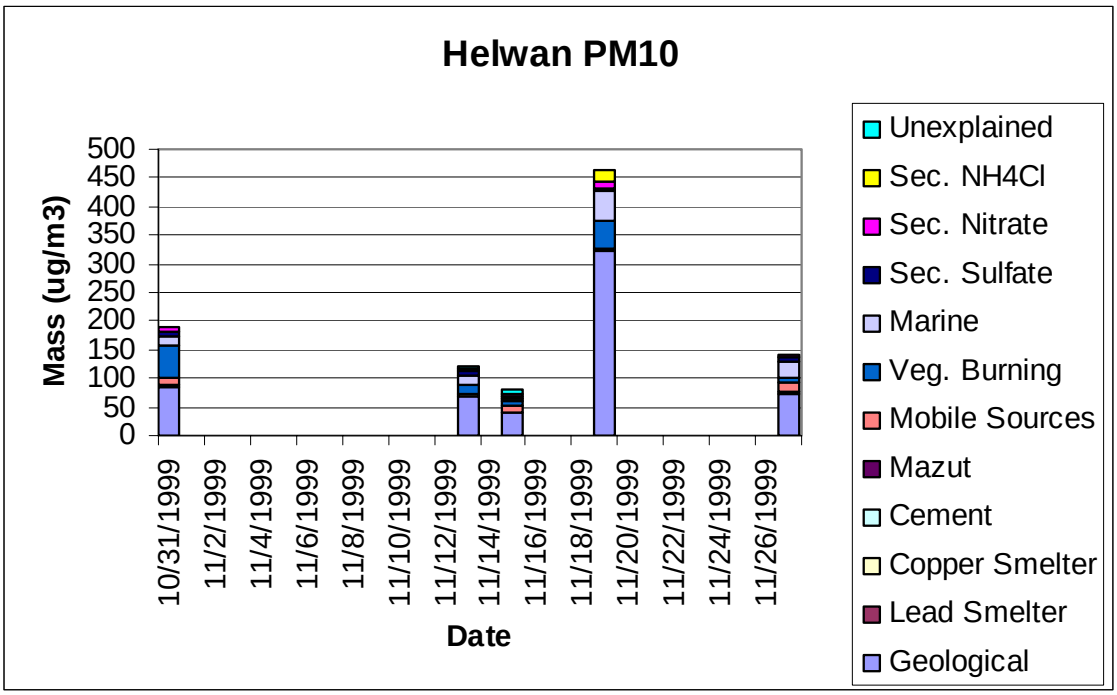


Figure 5-11c. Helwan PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

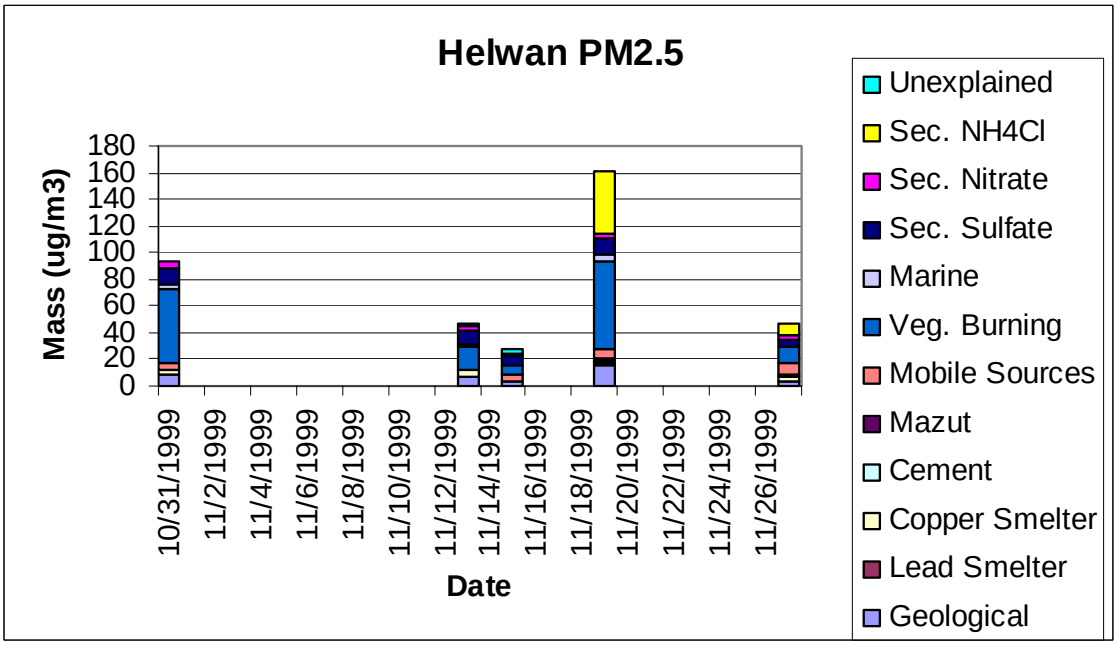


Figure 5-11d. Helwan $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

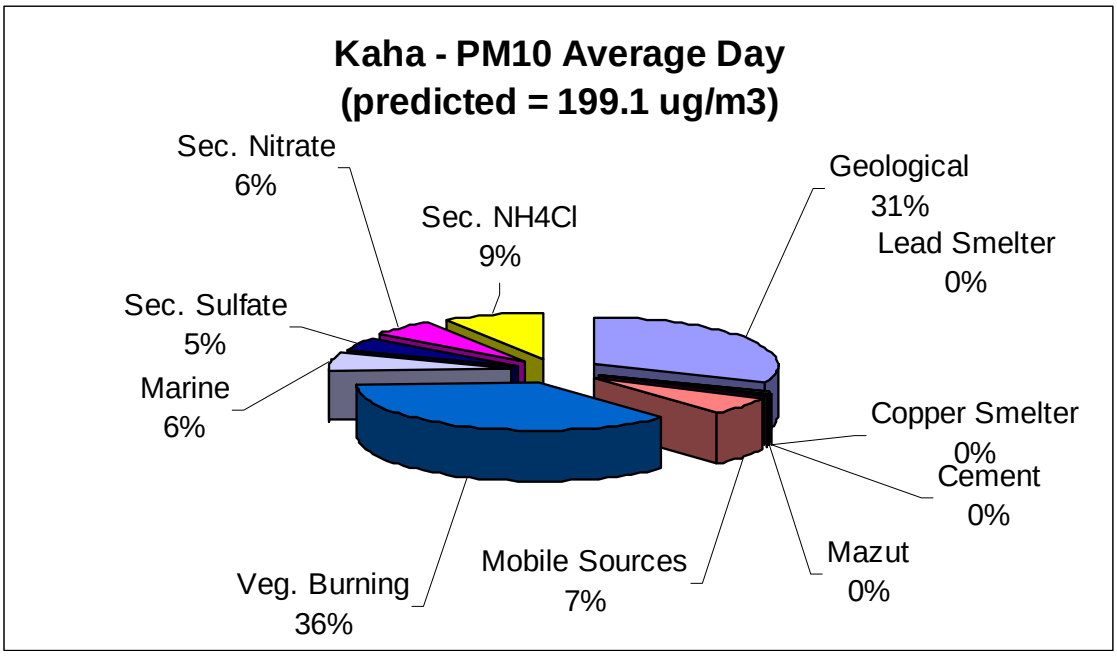


Figure 5-12a. Kaha PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

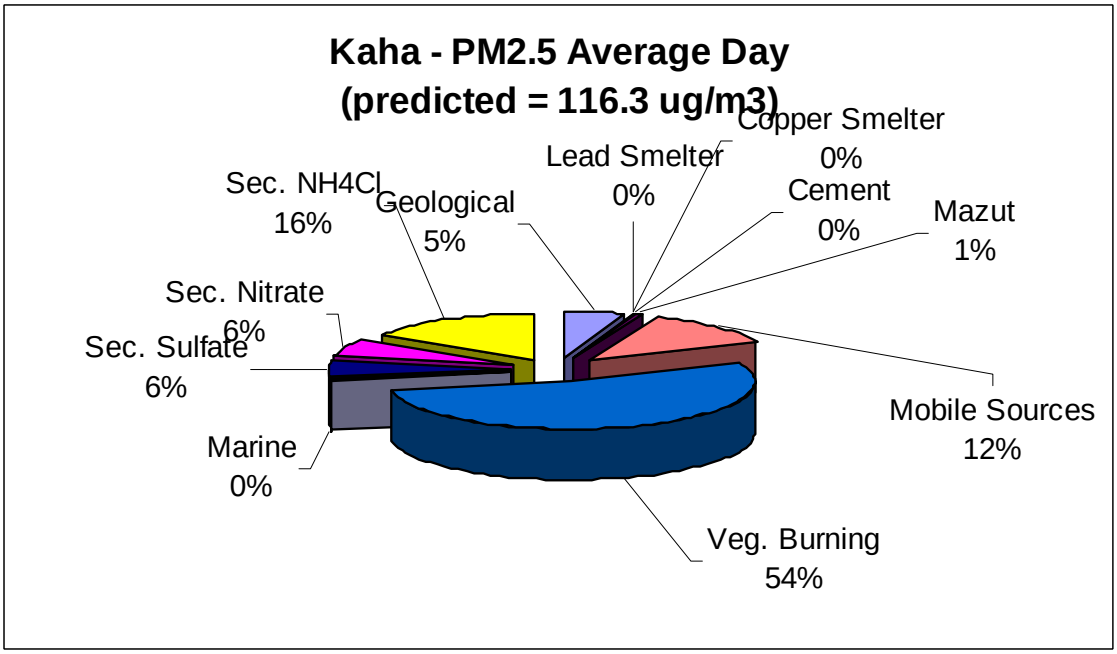


Figure 5-12b. Kaha $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

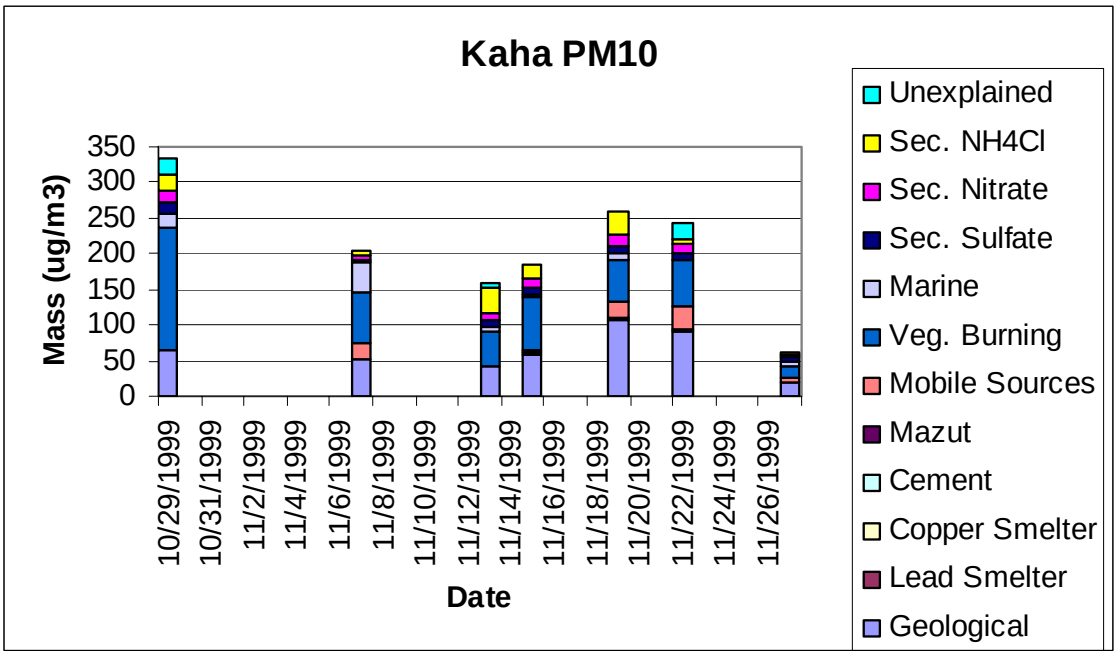


Figure 5-12c. Kaha PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

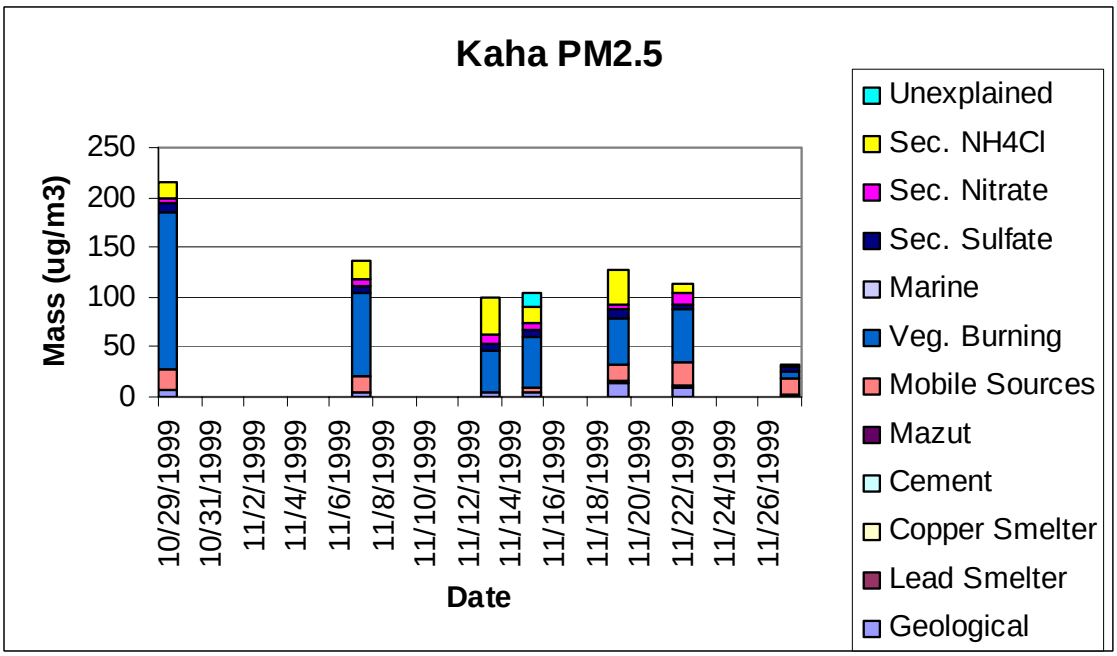


Figure 5-12d. Kaha $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

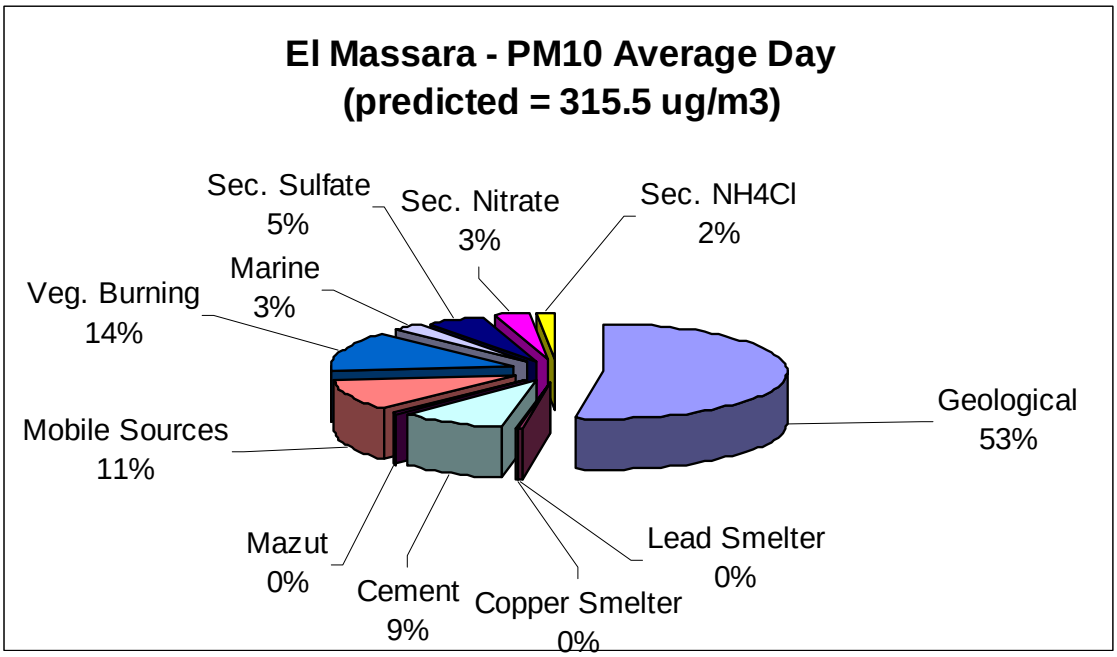


Figure 5-13a. El Massara PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

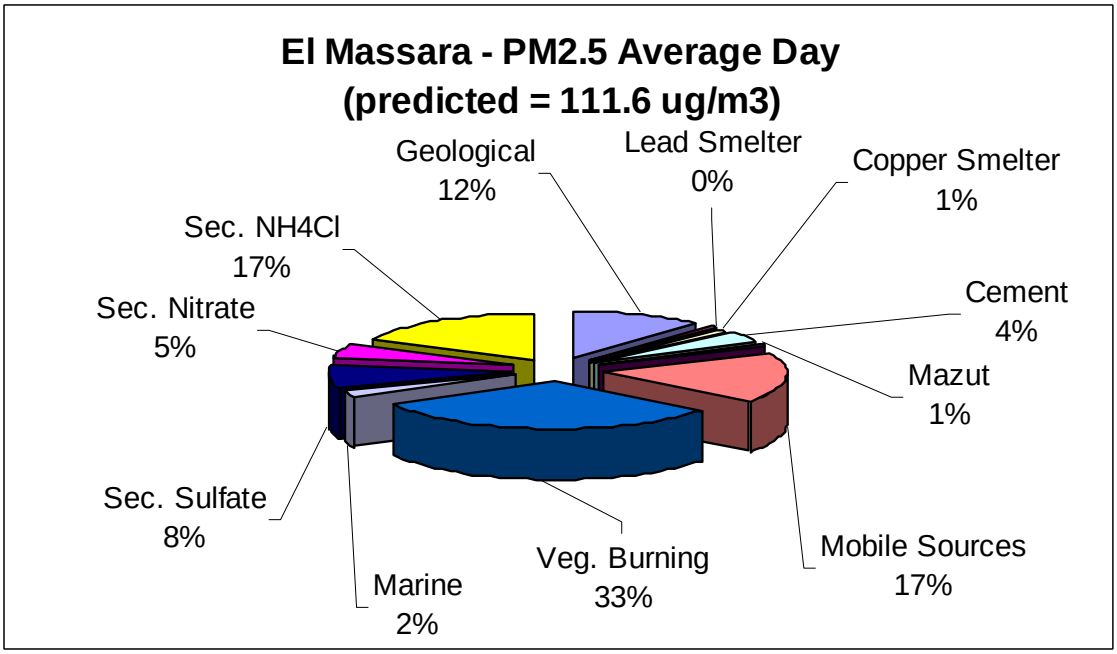


Figure 5-13b. El Massara $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

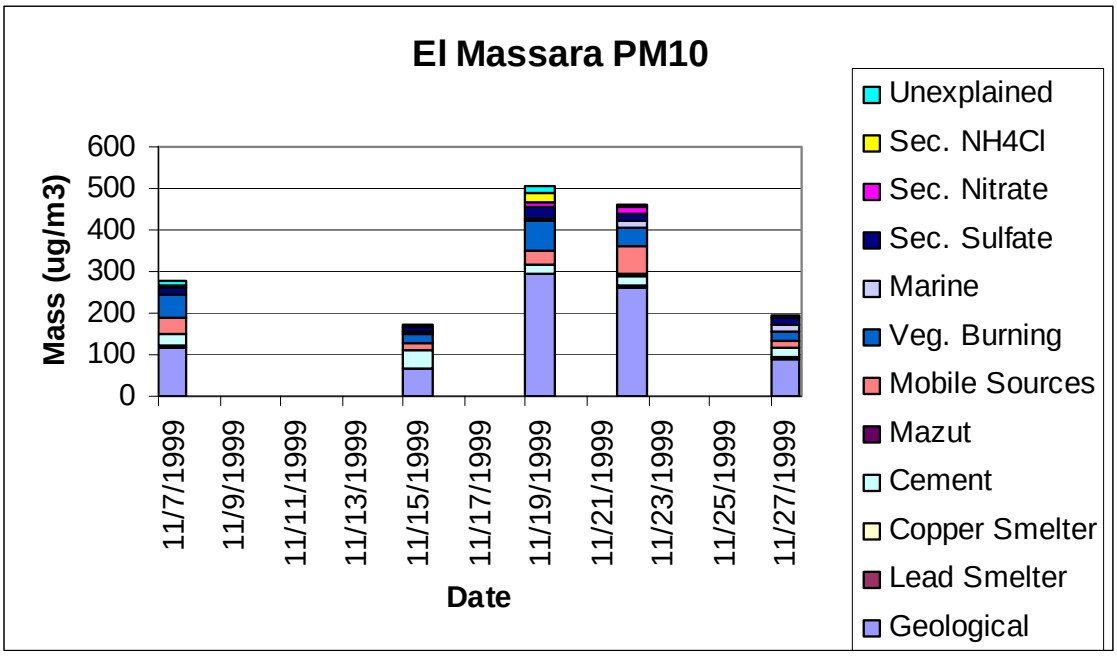


Figure 5-13c. El Massara PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

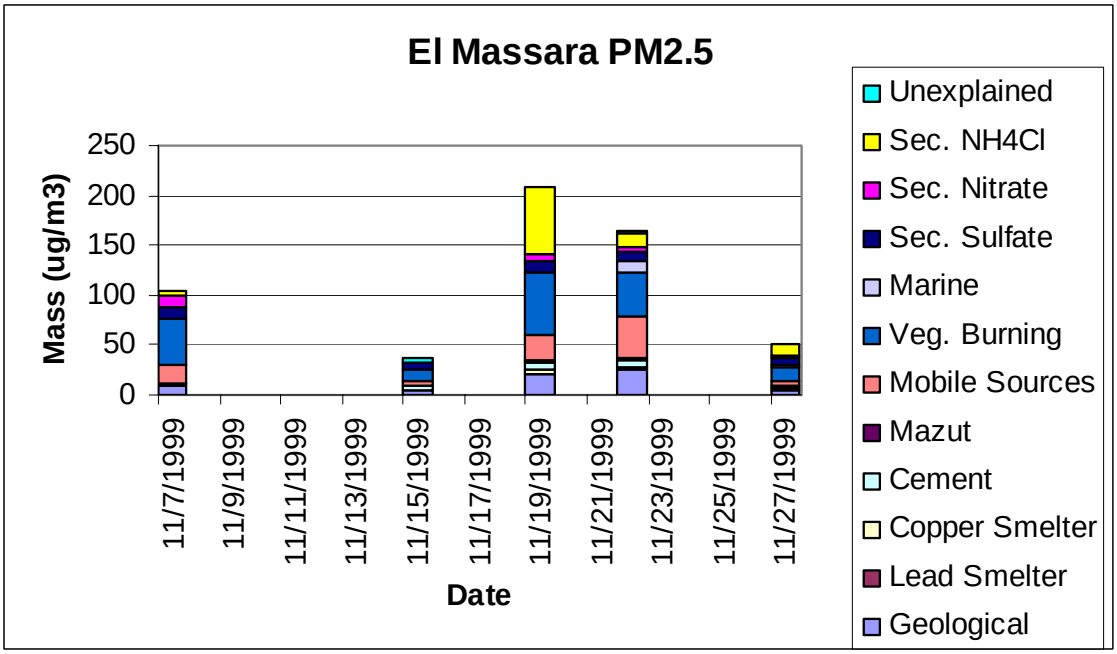


Figure 5-13d. El Massara $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

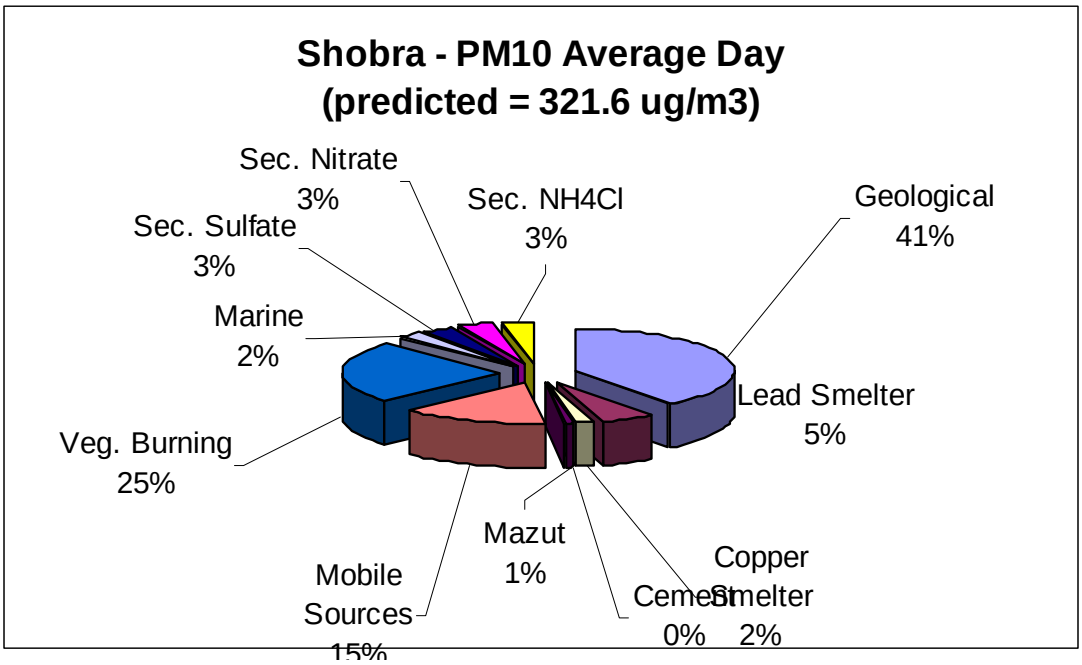


Figure 5-14a. Shobra PM_{10} source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

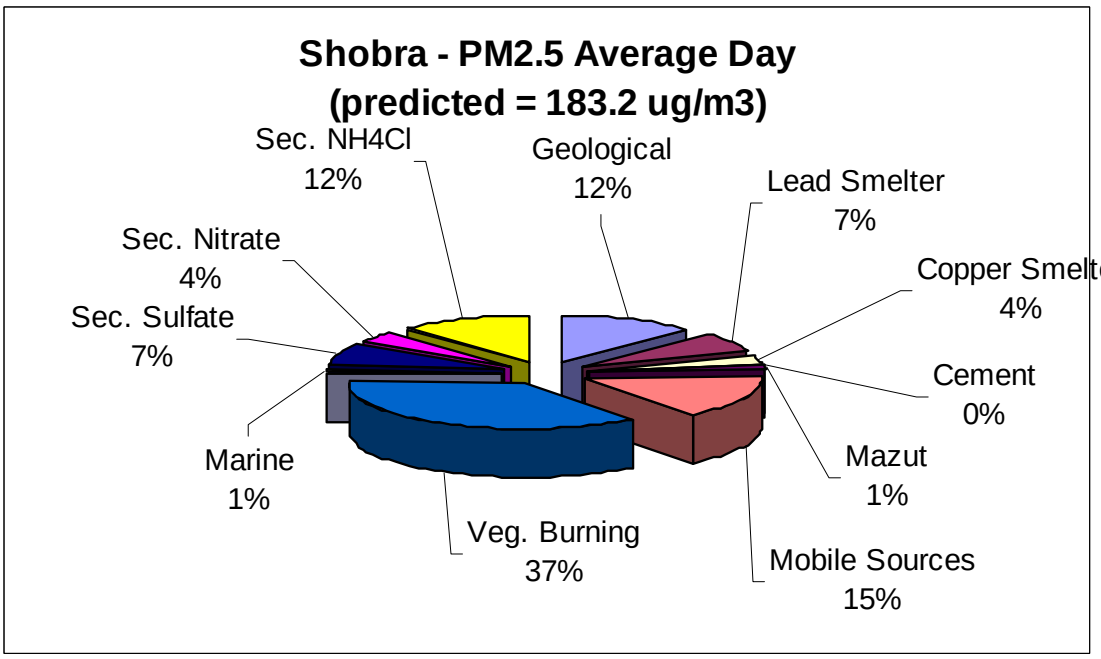


Figure 5-14b. Shobra $PM_{2.5}$ source apportionment, average day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

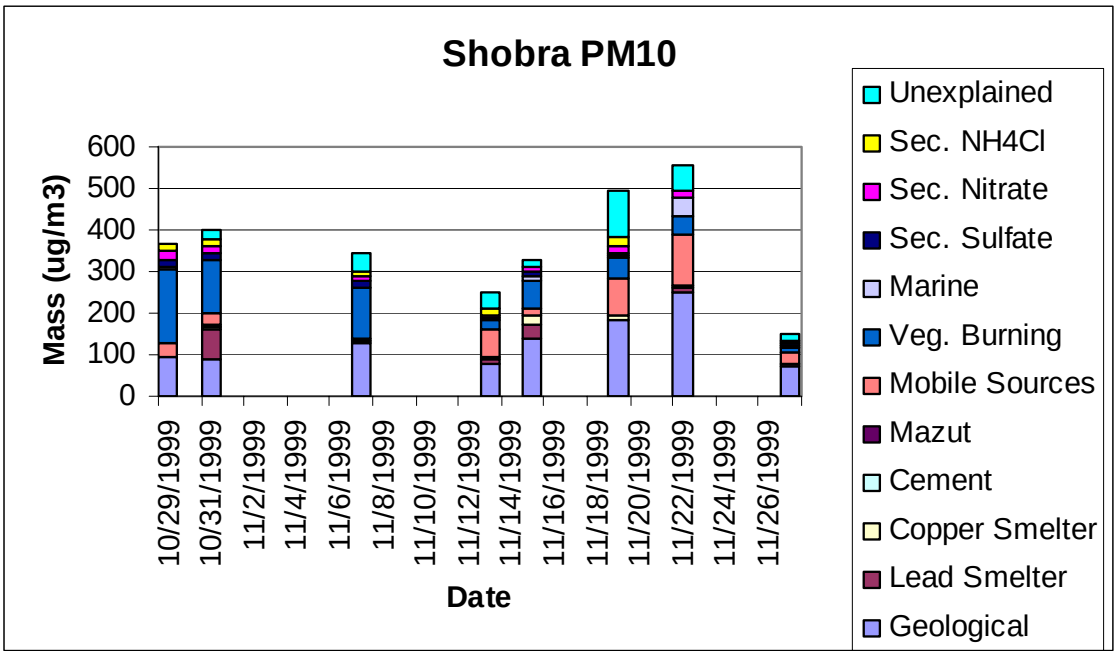


Figure 5-14c. Shobra PM_{10} source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

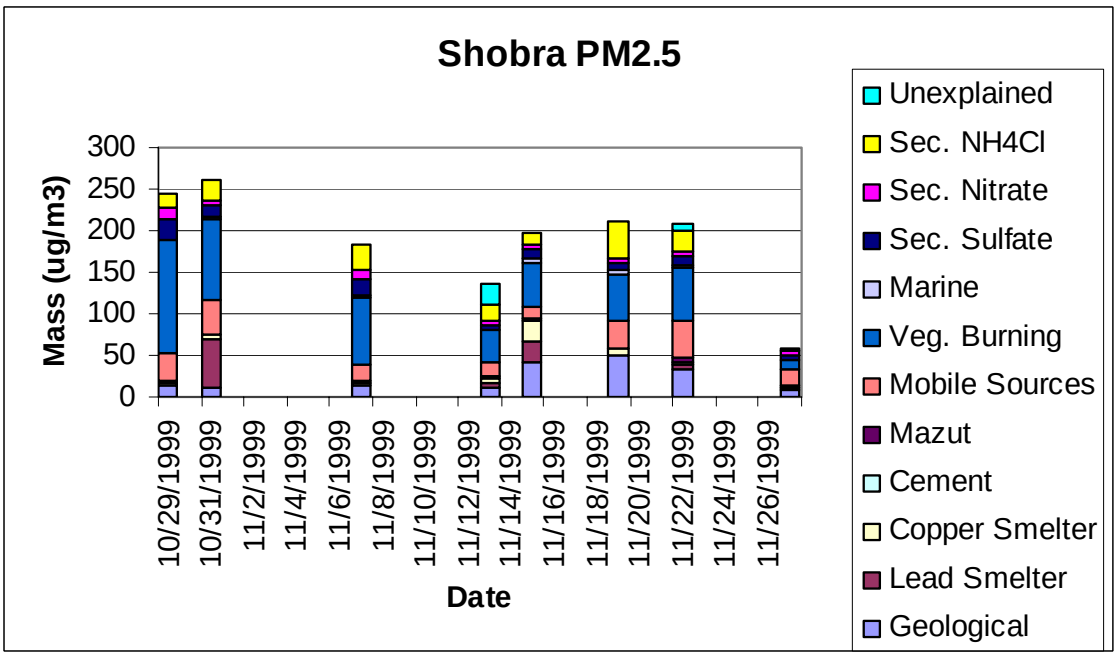


Figure 5-14d. Shobra $PM_{2.5}$ source apportionment, by day for the fall 1999 intensive study using enhanced profiles (ions, metals, and PAHs).

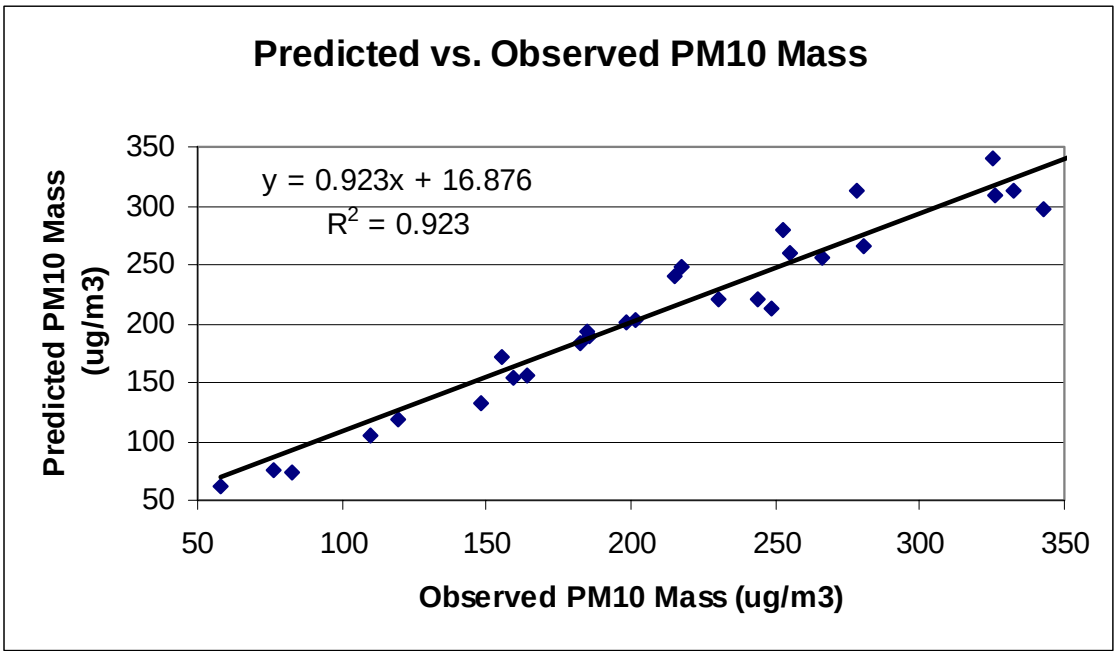


Figure 5-15a. Comparison of predicted vs. measured PM_{10} mass of the fall intensive samples and CMB apportionments.

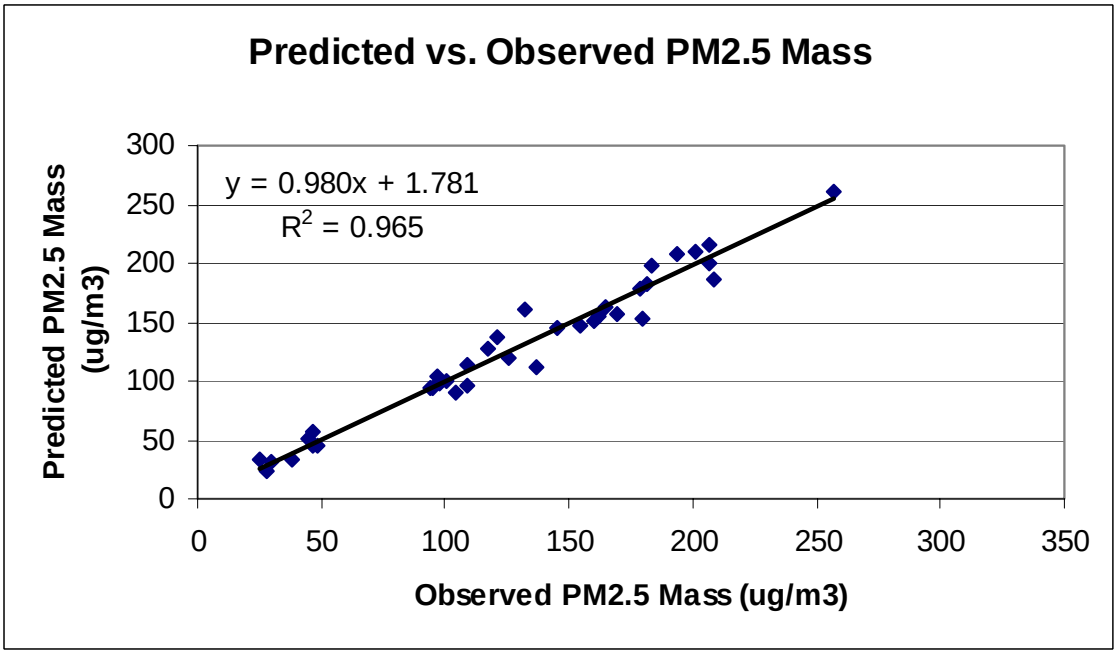


Figure 5-15b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the fall intensive samples and CMB apportionments.

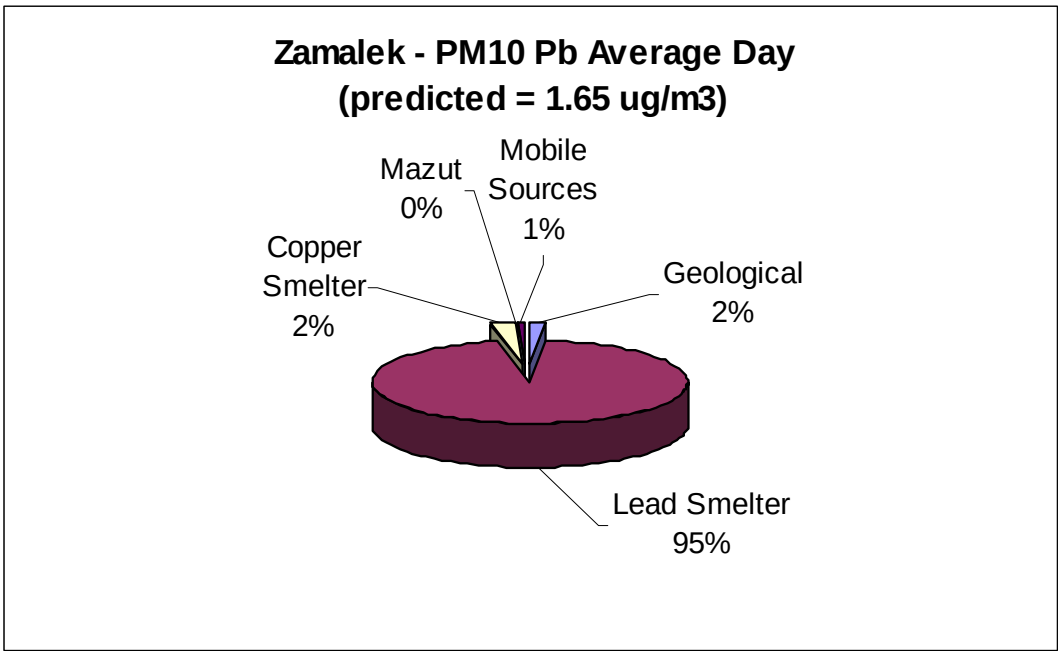


Figure 5-16a. Zamalek PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

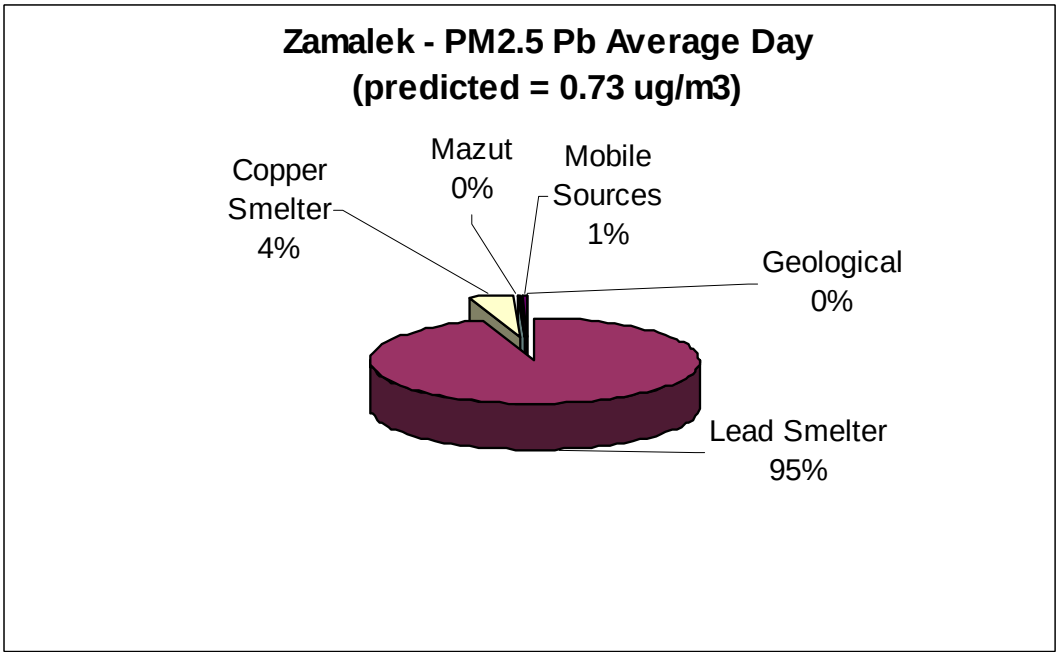


Figure 5-16b. Zamalek $PM_{2.5}$ Pb source apportionment, average day for the winter intensive study.

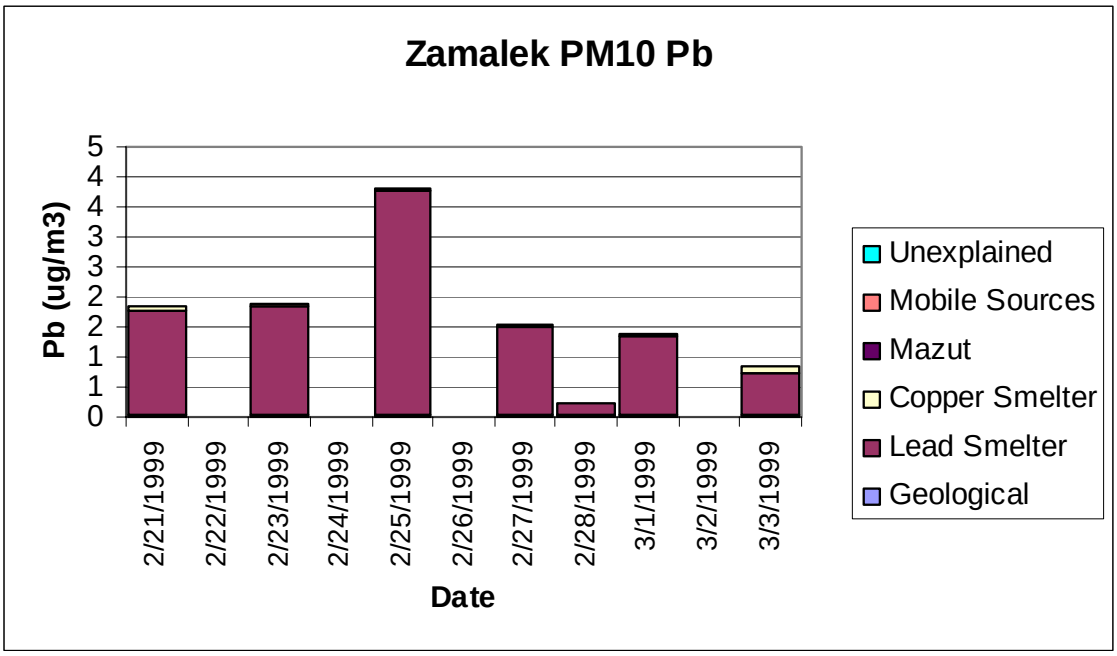


Figure 5-16c. Zamalek PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

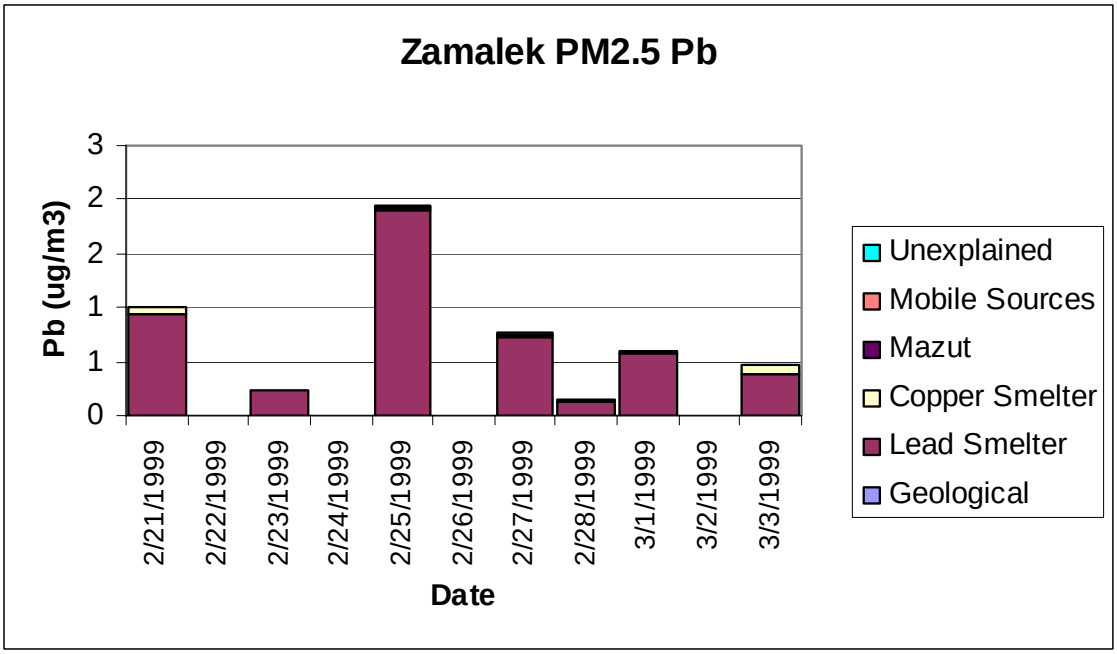


Figure 5-16d. Zamalek $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

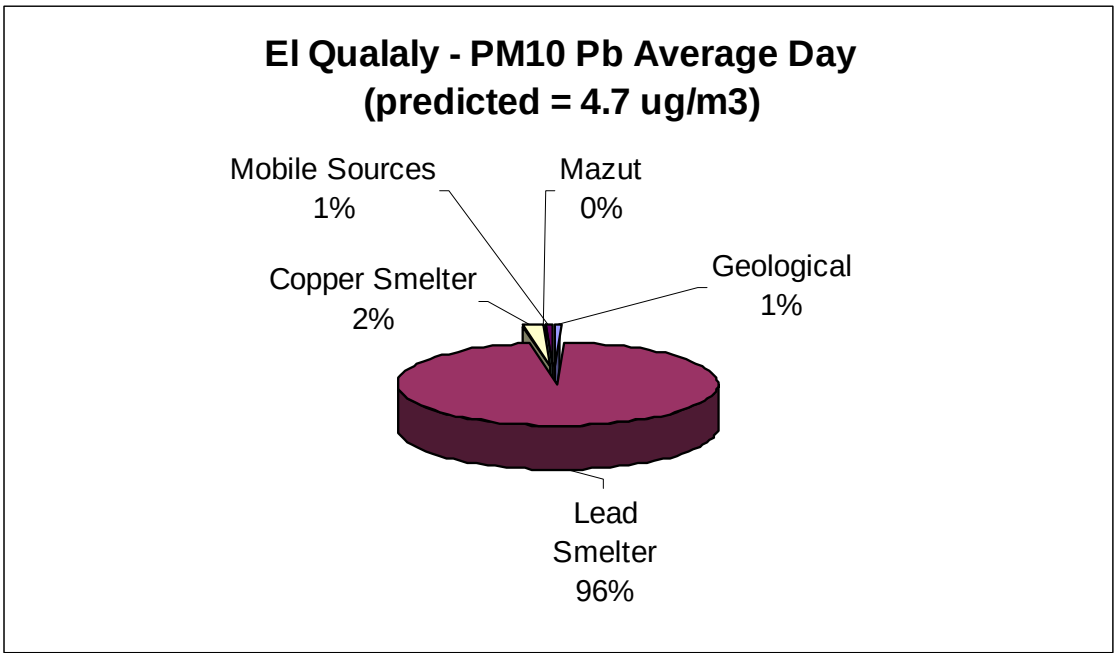


Figure 5-17a. El Qualaly PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

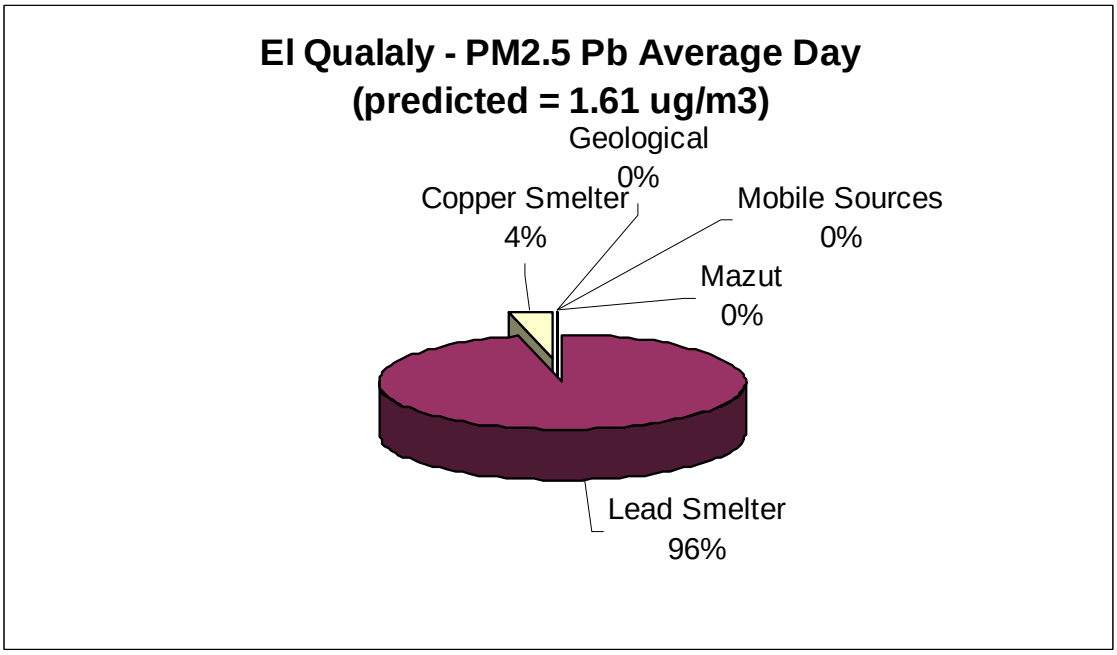


Figure 5-17b. El Qualaly $PM_{2.5}$ Pb source apportionment, average day for the winter intensive study.

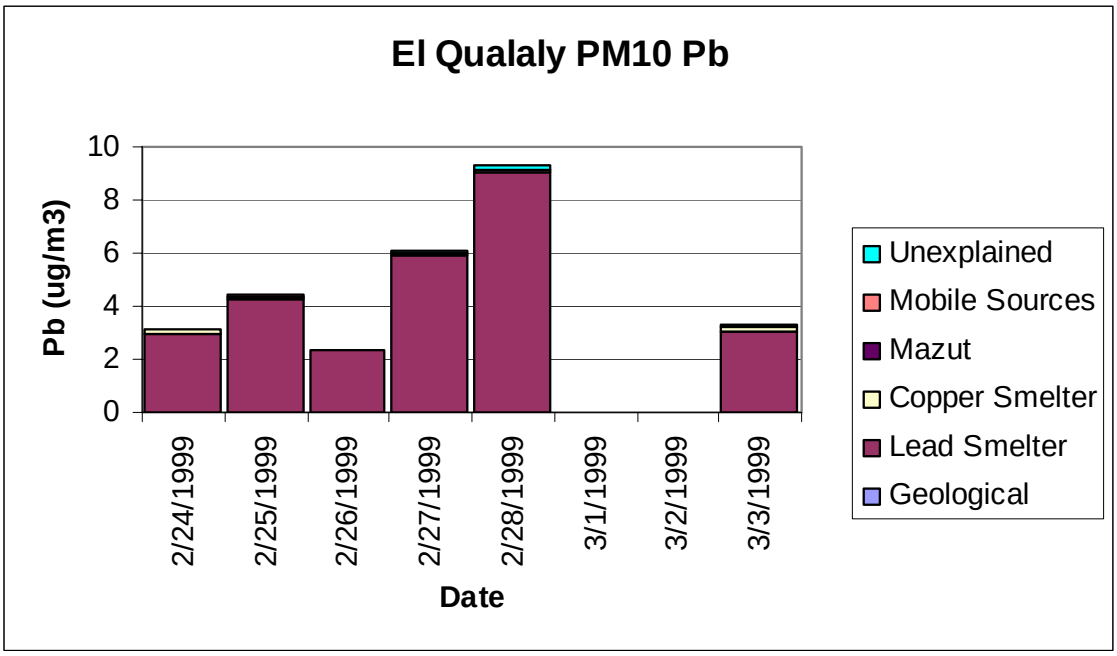


Figure 5-17c. El Qualaly PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

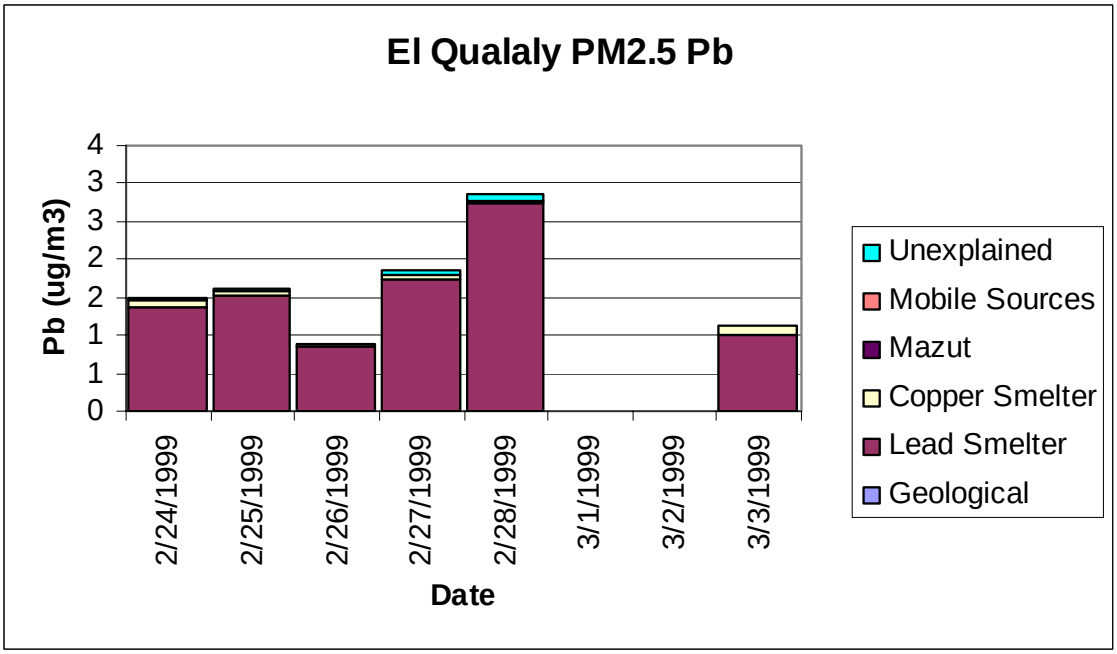


Figure 5-17d. El Qualaly $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

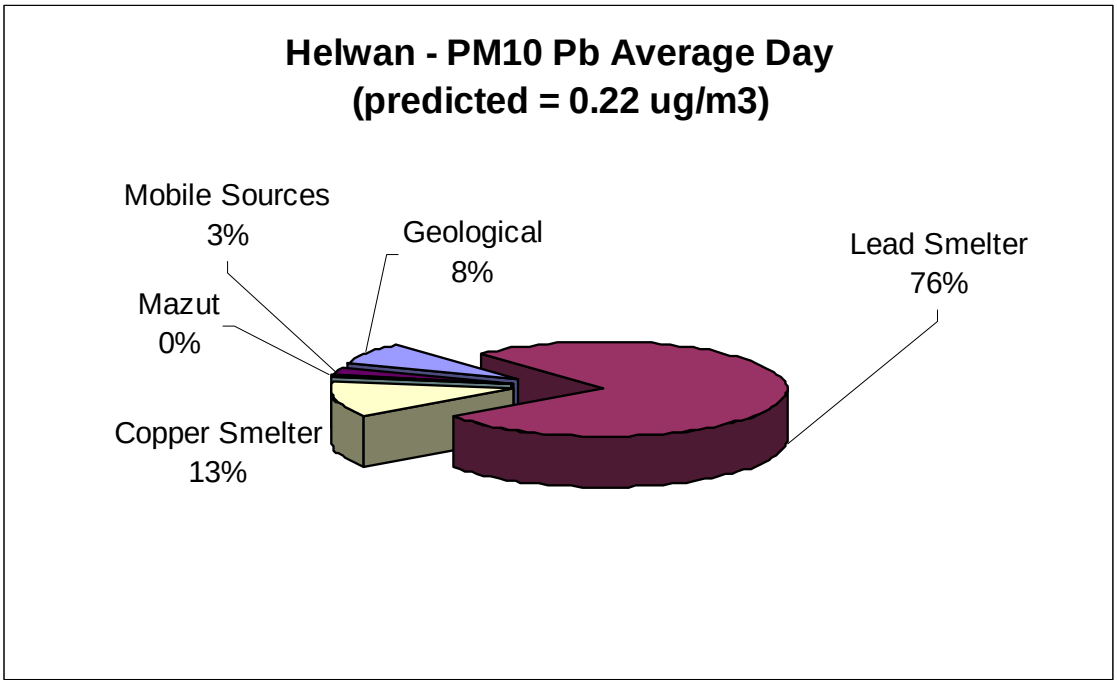


Figure 5-18a. Helwan PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

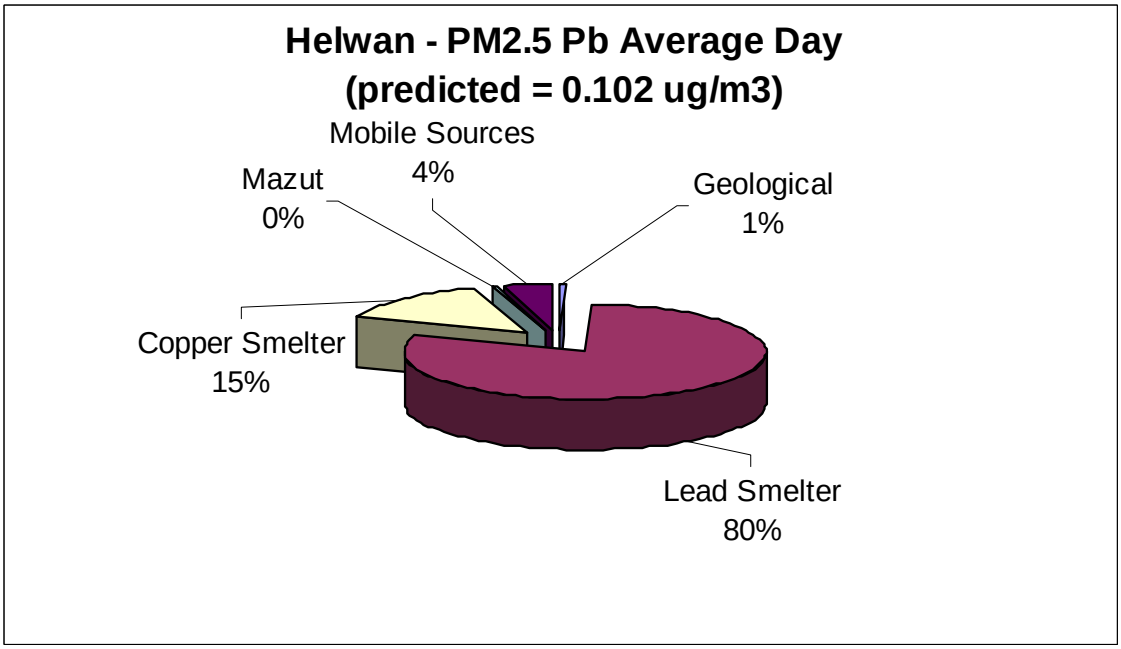


Figure 5-19b. Helwan $PM_{2.5}$ Pb source apportionment, average day for the winter 1999 intensive study.

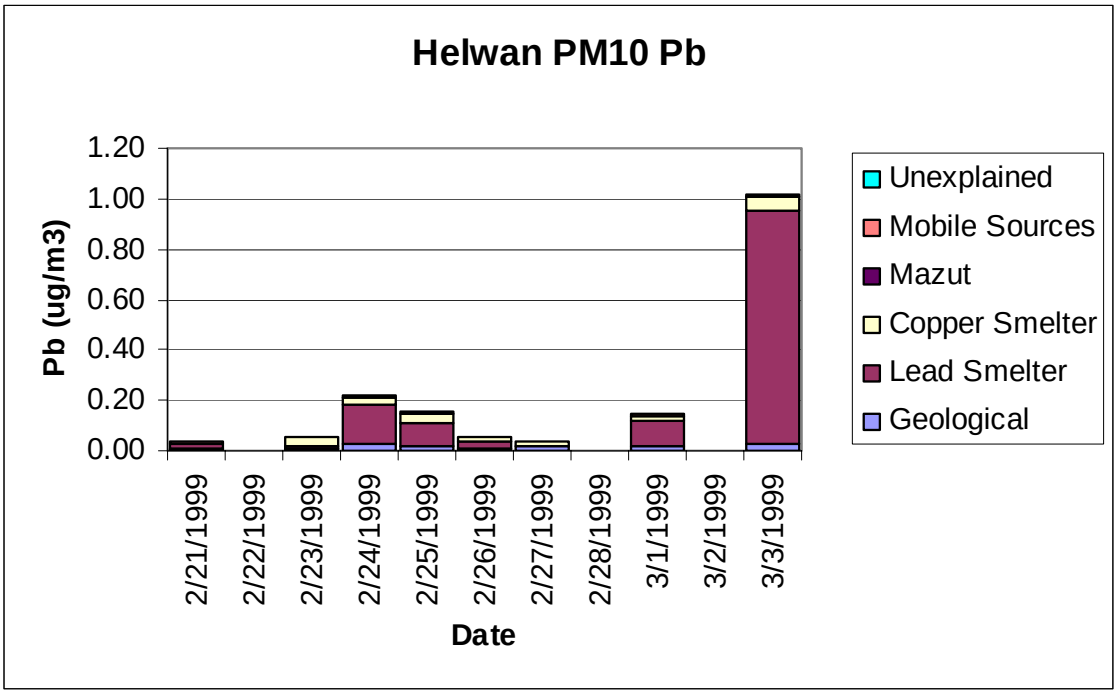


Figure 5-19c. Helwan PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

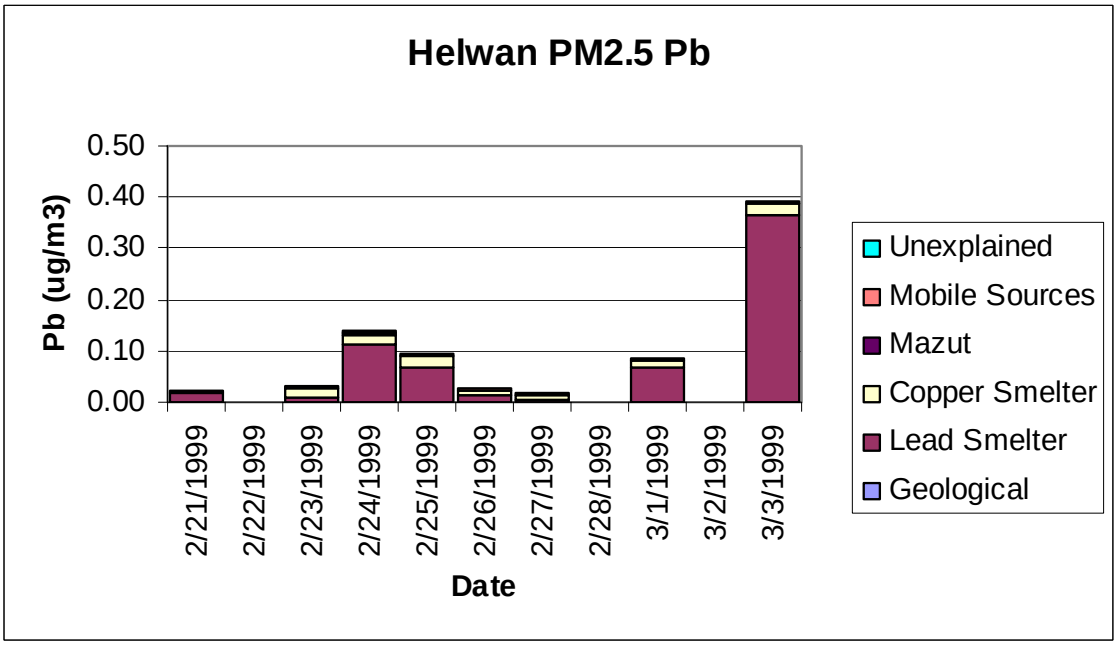


Figure 5-19d. Helwan $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

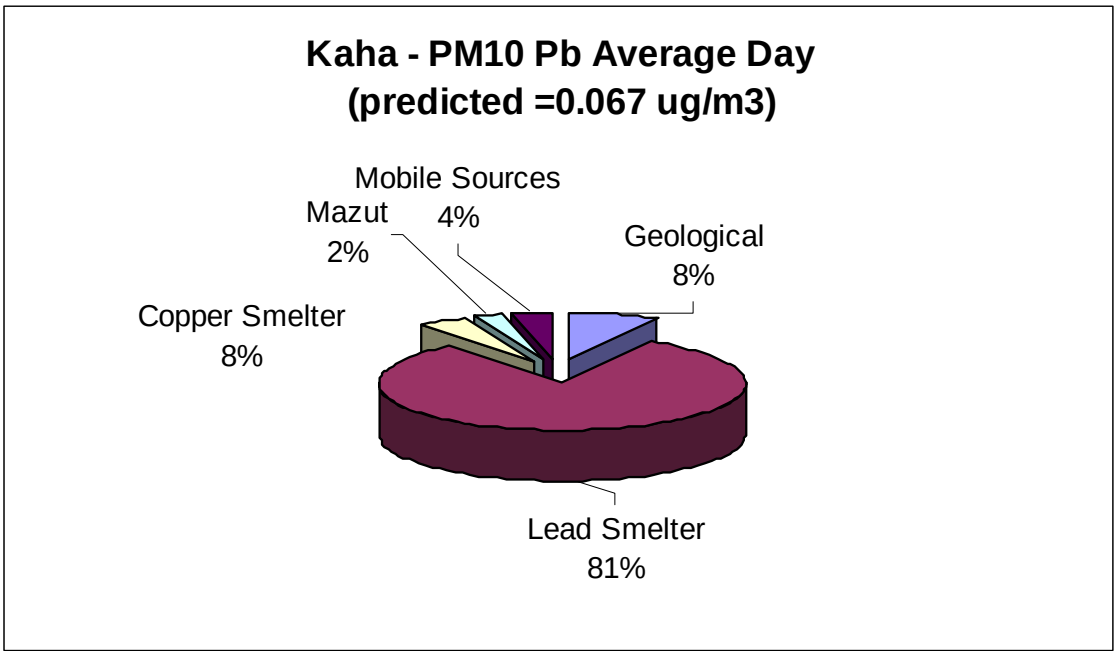


Figure 5-20a. Kaha PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

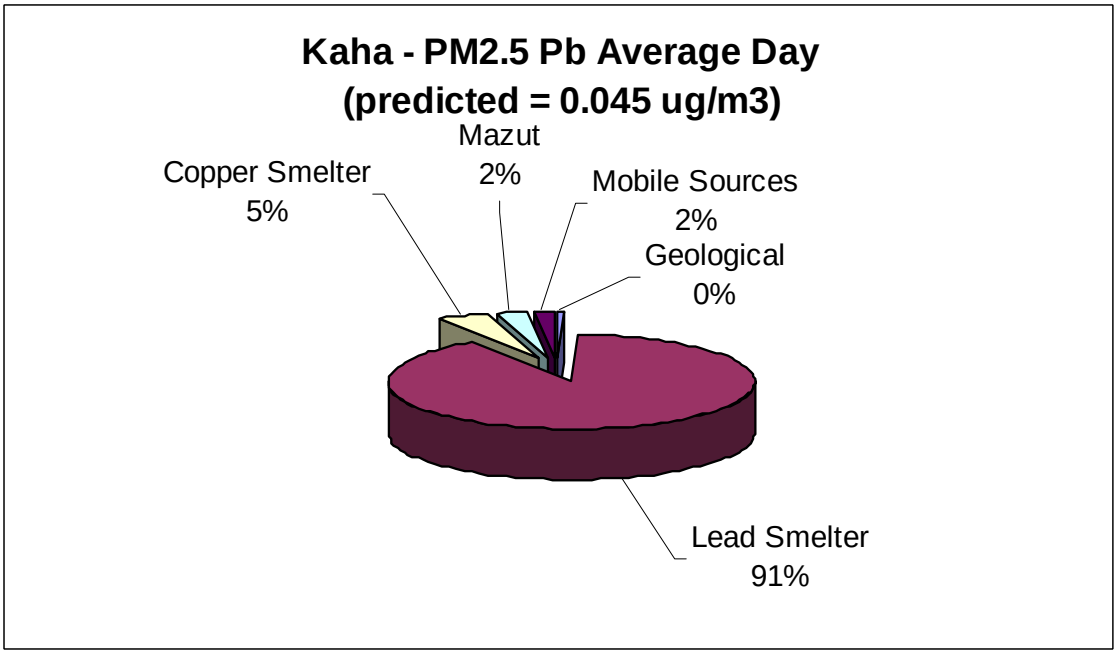


Figure 5-20b. Kaha $PM_{2.5}$ Pb source apportionment, average day for the winter 1999 intensive study.

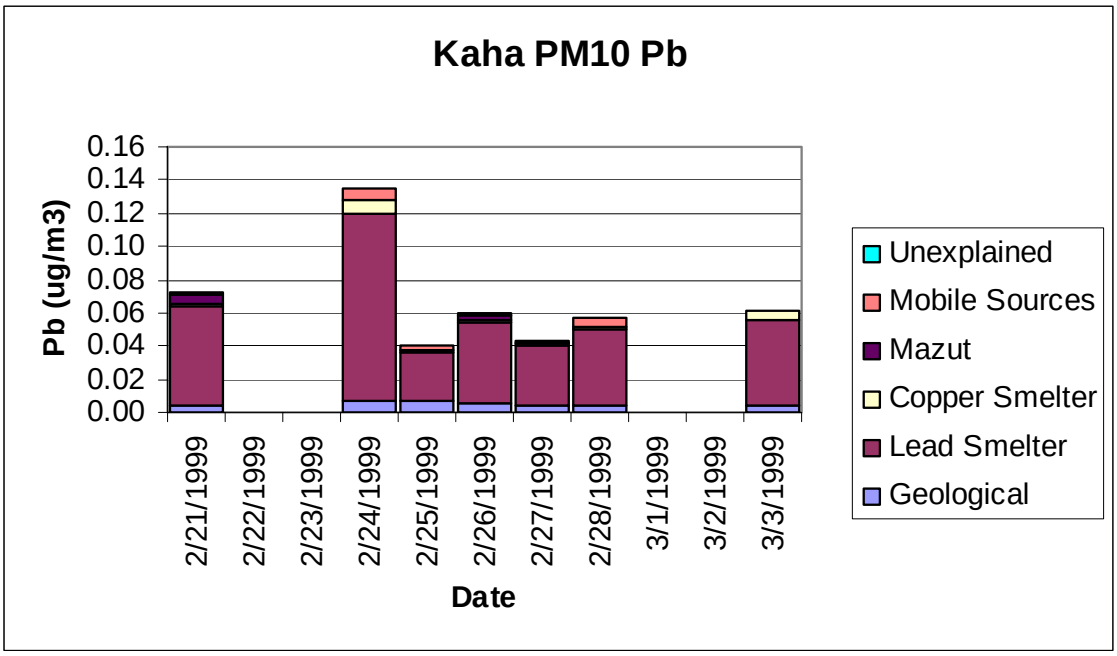


Figure 5-20c. Kaha PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

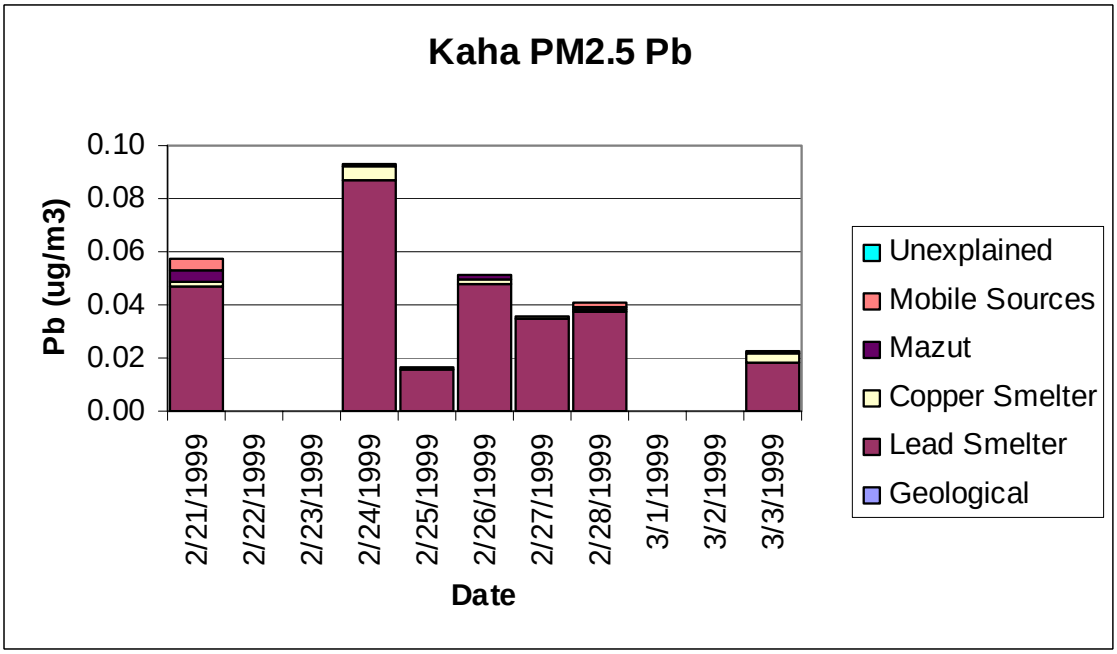


Figure 5-20d. Kaha $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

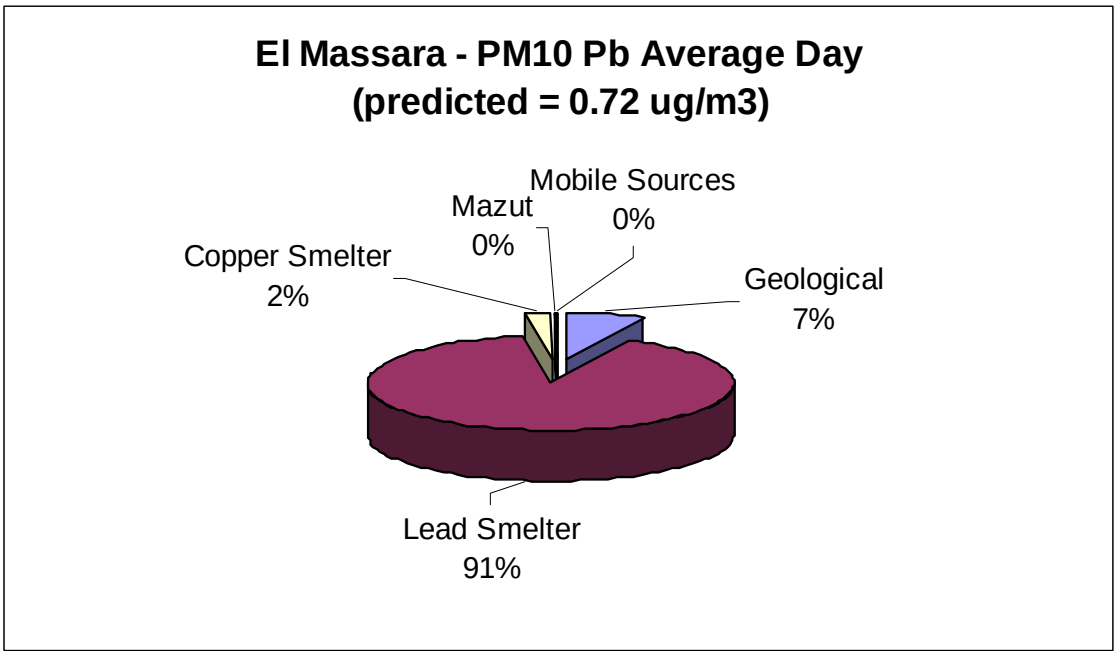


Figure 5-21a. El Massara PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

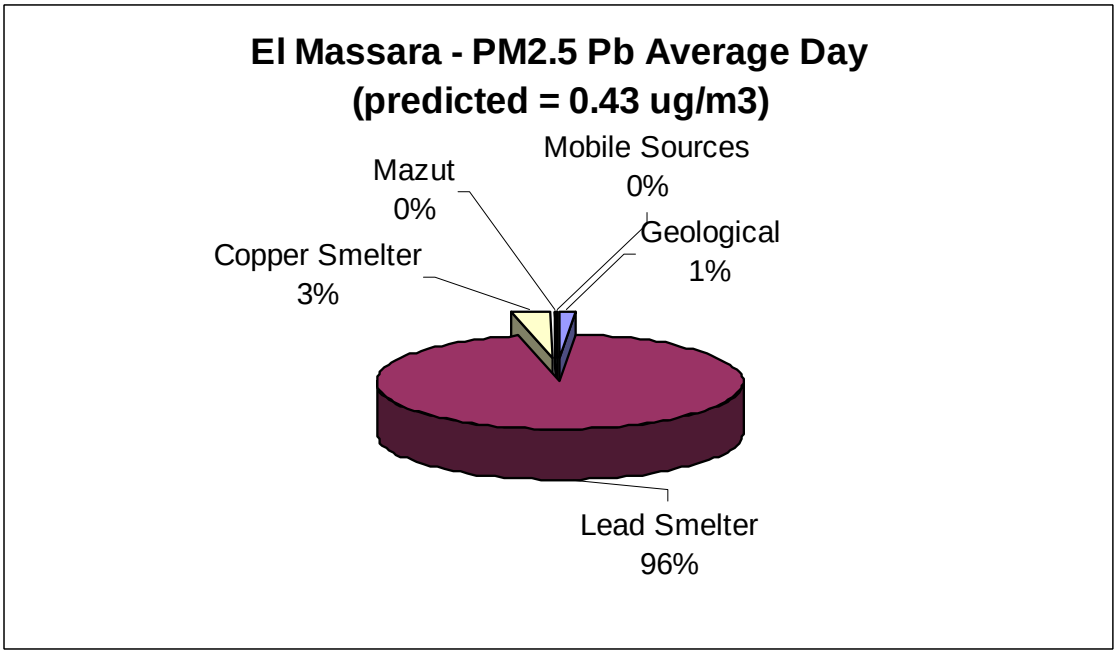


Figure 5-21b. El Massara $PM_{2.5}$ Pb source apportionment, average day for the winter 1999 intensive study.

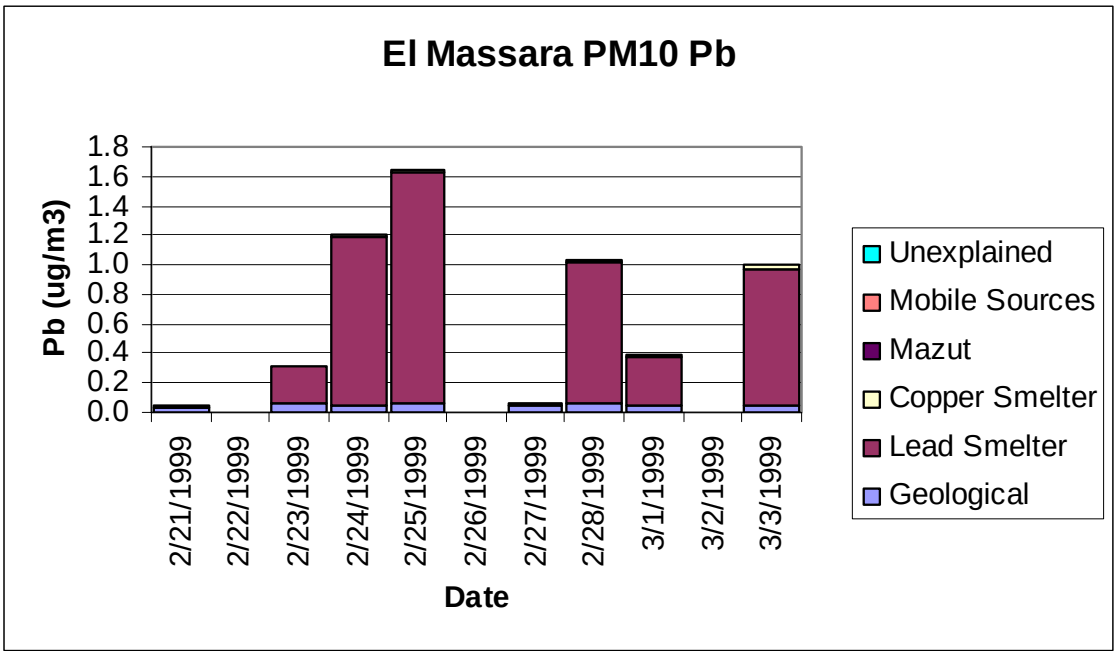


Figure 5-21c. El Massara PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

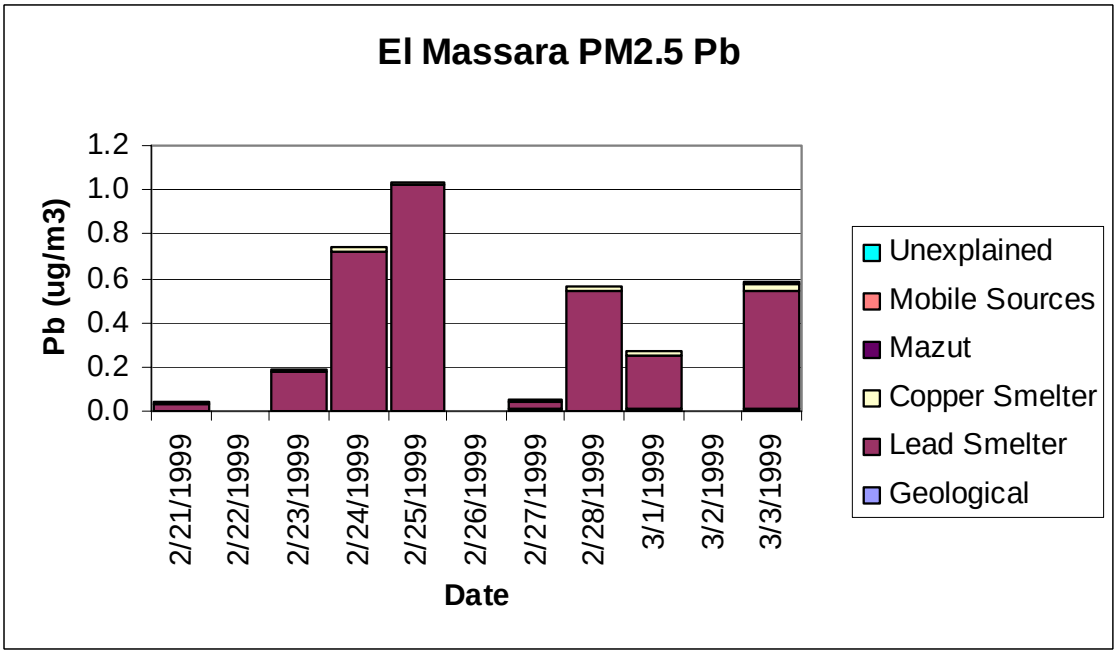


Figure 5-21d. El Massara $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

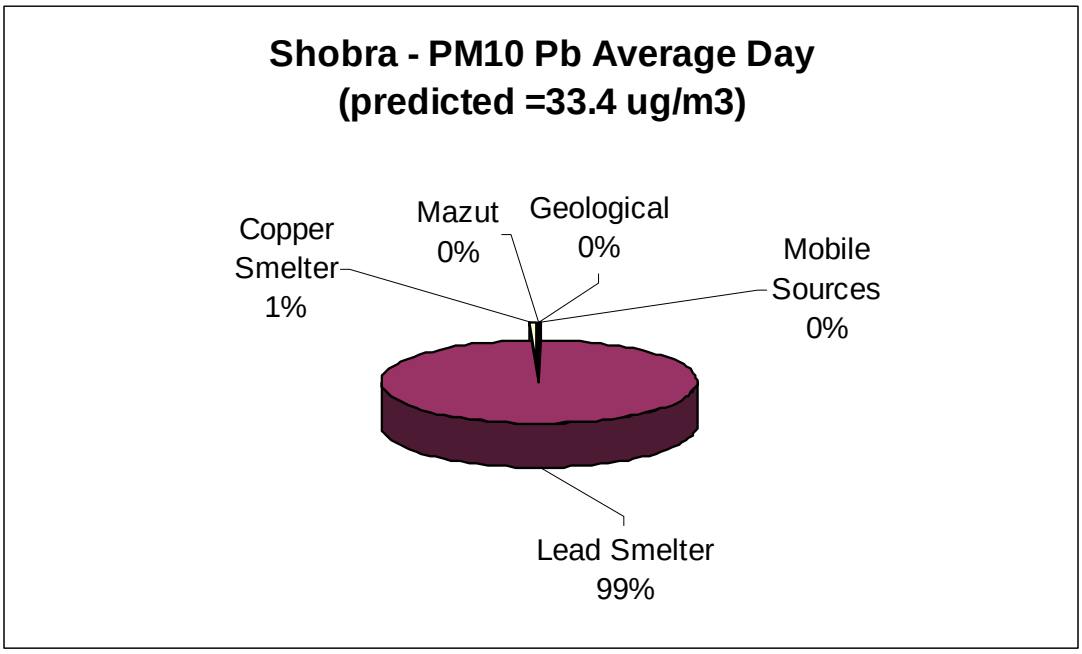


Figure 5-22a. Shobra PM_{10} Pb source apportionment, average day for the winter 1999 intensive study.

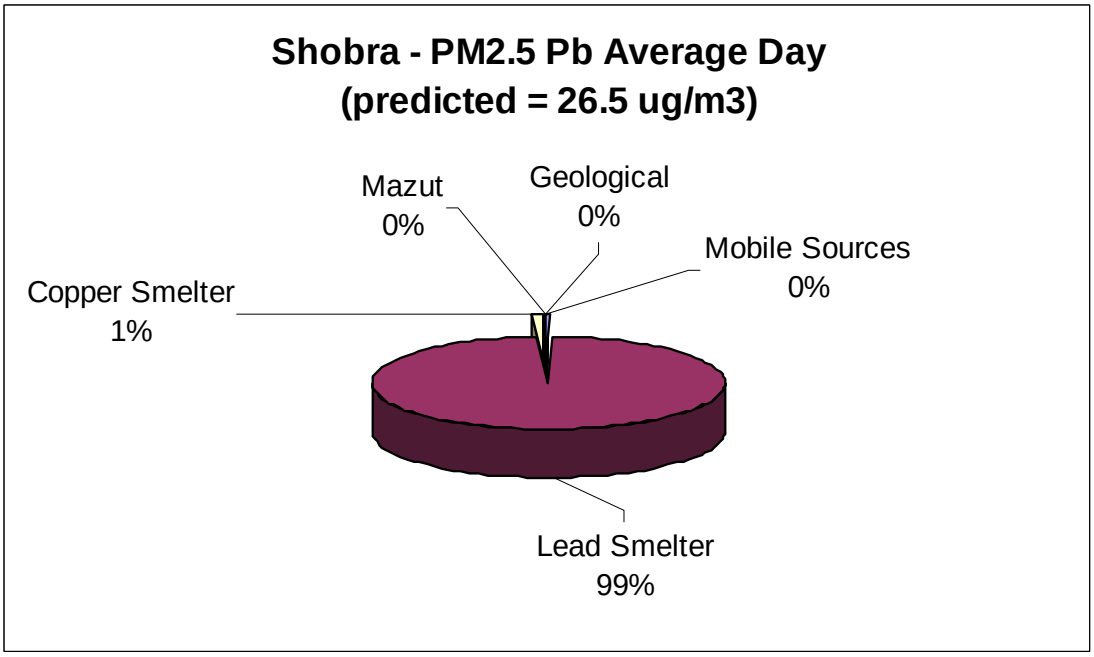


Figure 5-22b. Shobra $PM_{2.5}$ Pb source apportionment, average day for the winter 1999 intensive study.

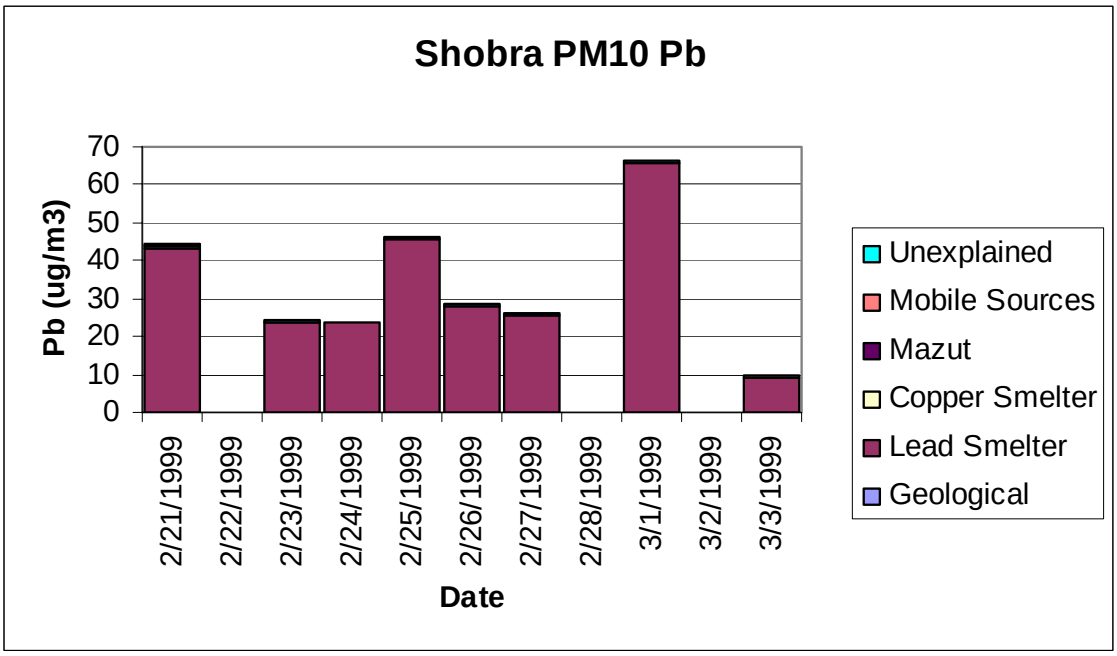


Figure 5-22c. Shobra PM_{10} Pb source apportionment, by day for the winter 1999 intensive study.

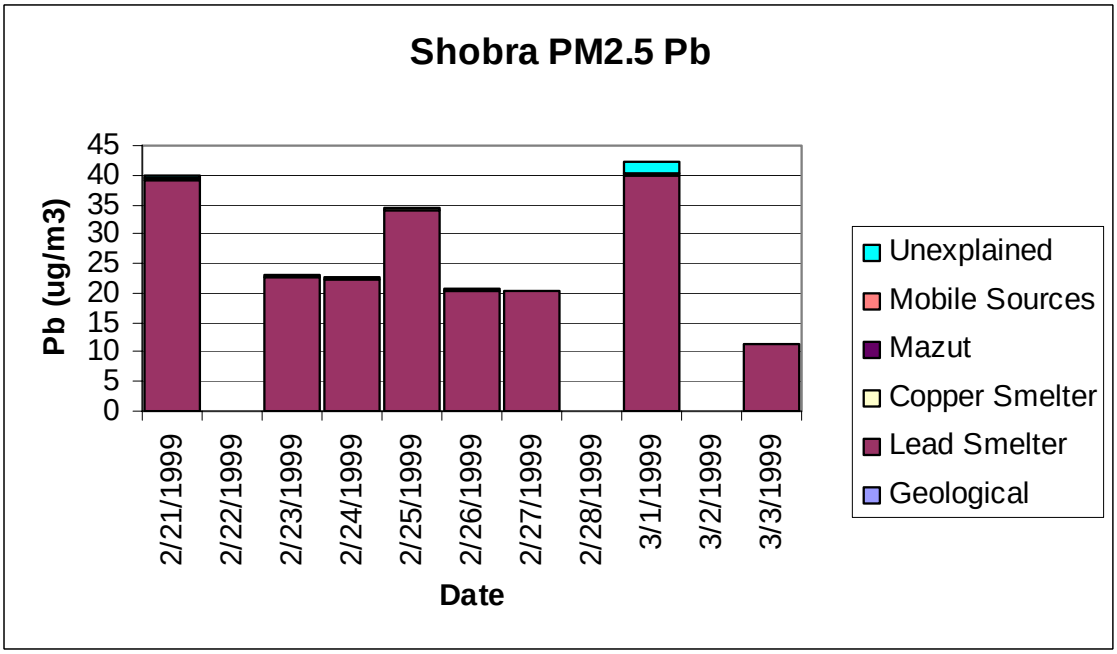


Figure 5-22d. Shobra $PM_{2.5}$ Pb source apportionment, by day for the winter 1999 intensive study.

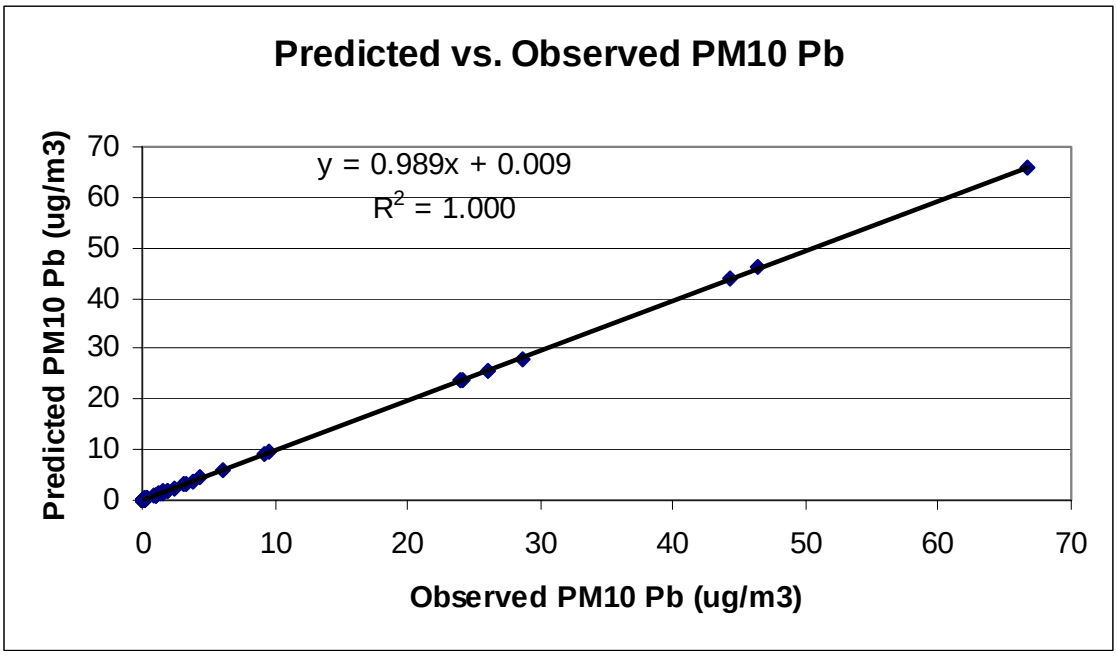


Figure 5-23a. Comparison of predicted vs. measured PM_{10} mass of the winter intensive samples and CMB apportionments.

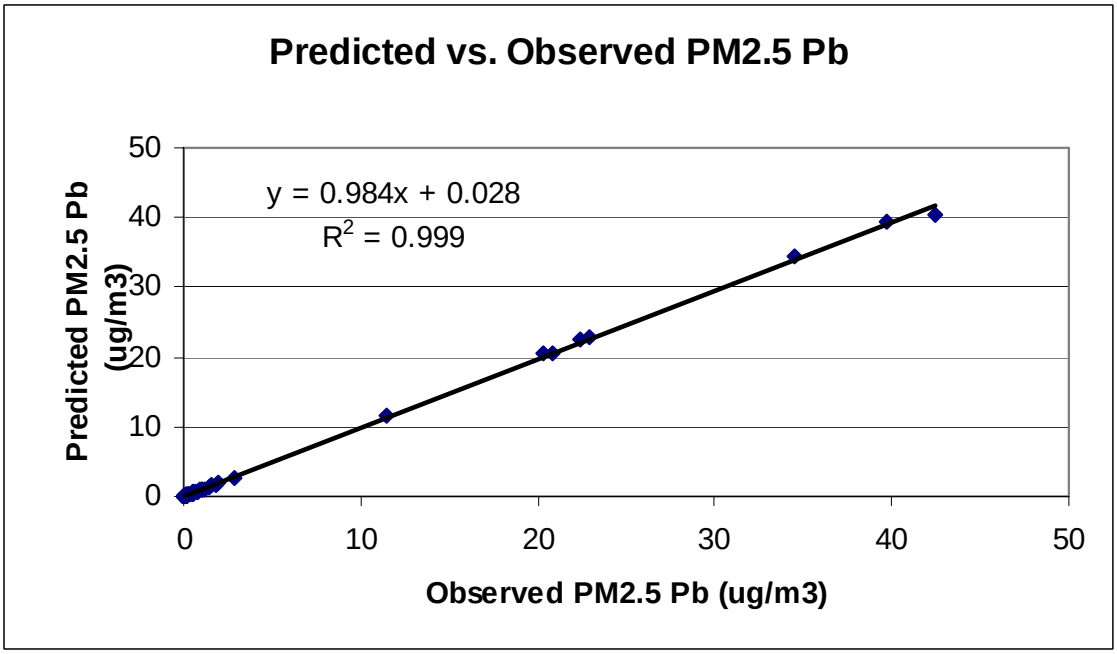


Figure 5-23b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the winter intensive samples and CMB apportionments.

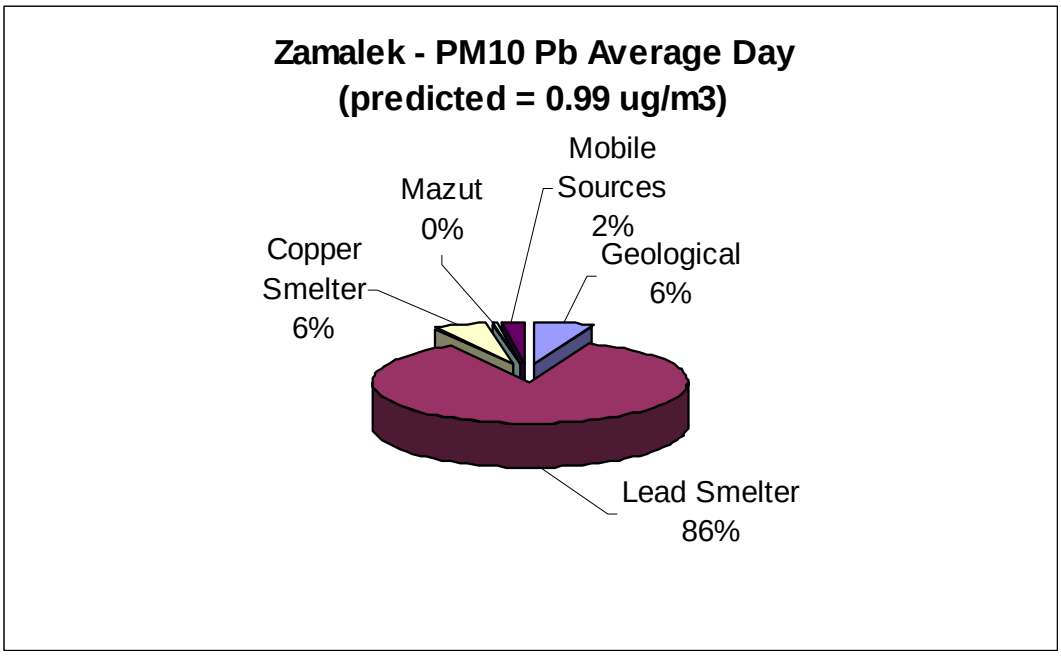


Figure 5-23a. Zamalek PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

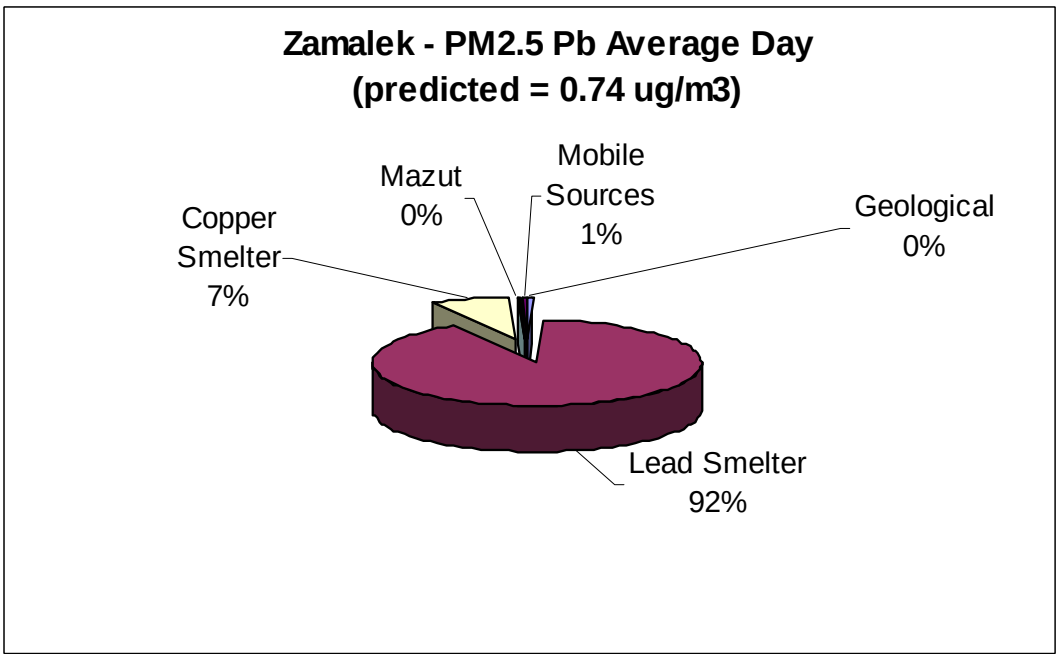


Figure 5-23b. Zamalek $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

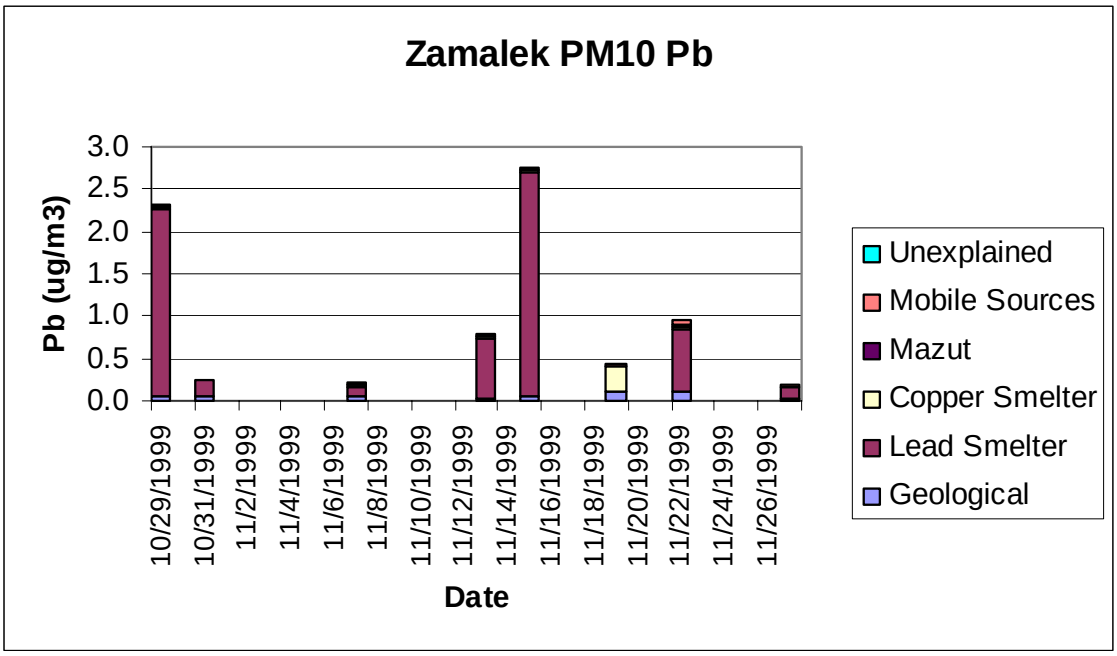


Figure 5-24c. Zamalek PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

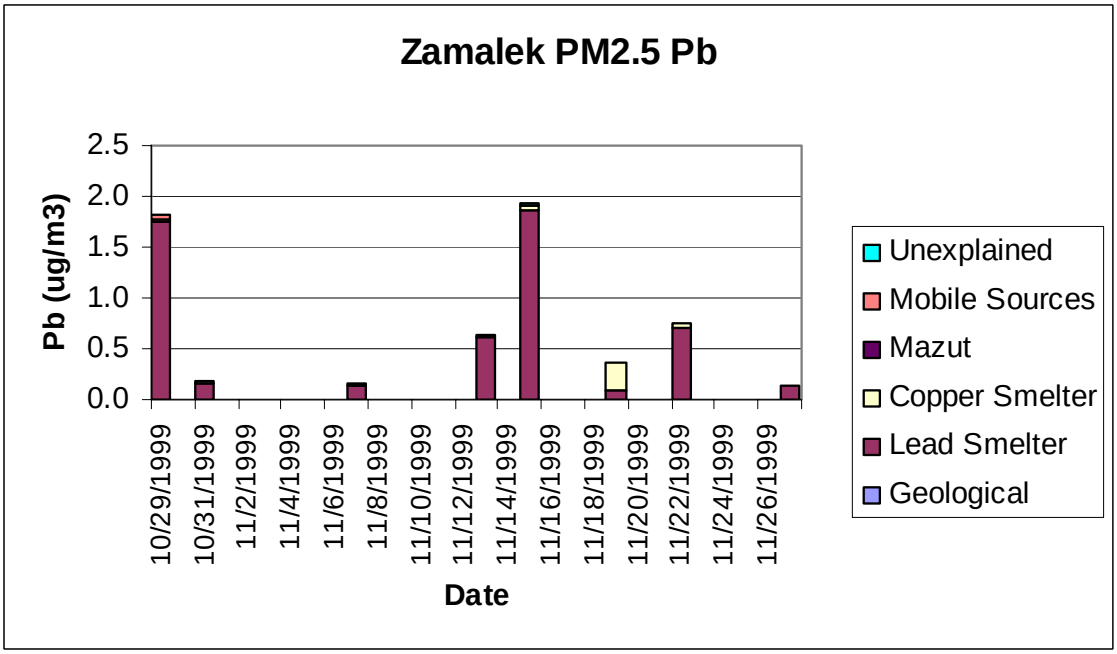


Figure 5-24d. Zamalek $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

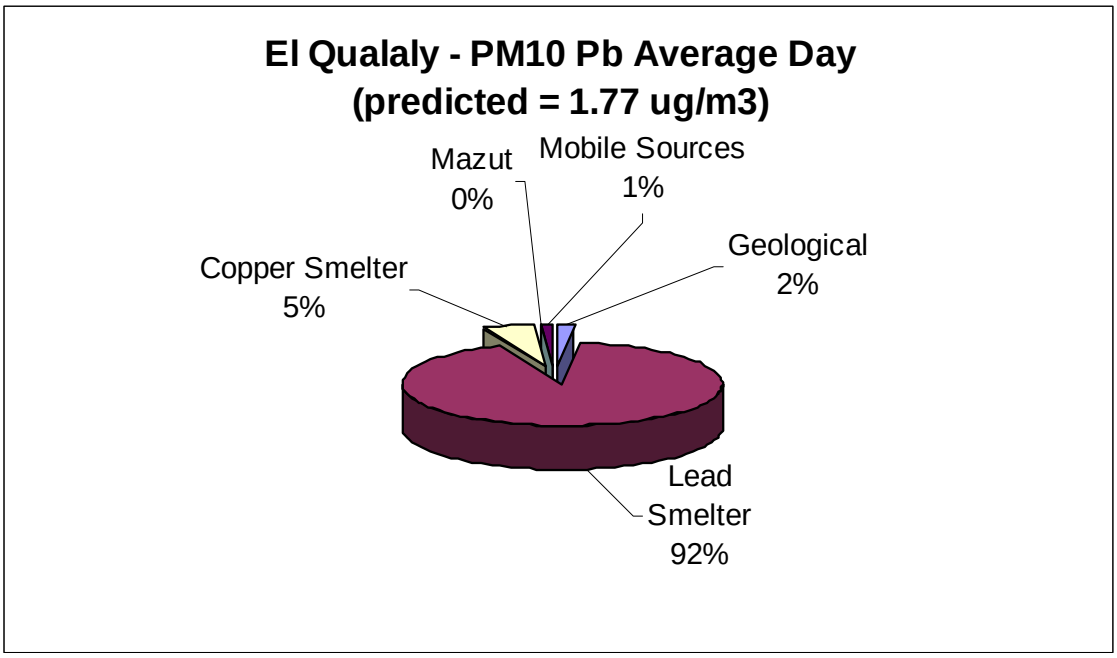


Figure 5-25a. El Qulaly PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

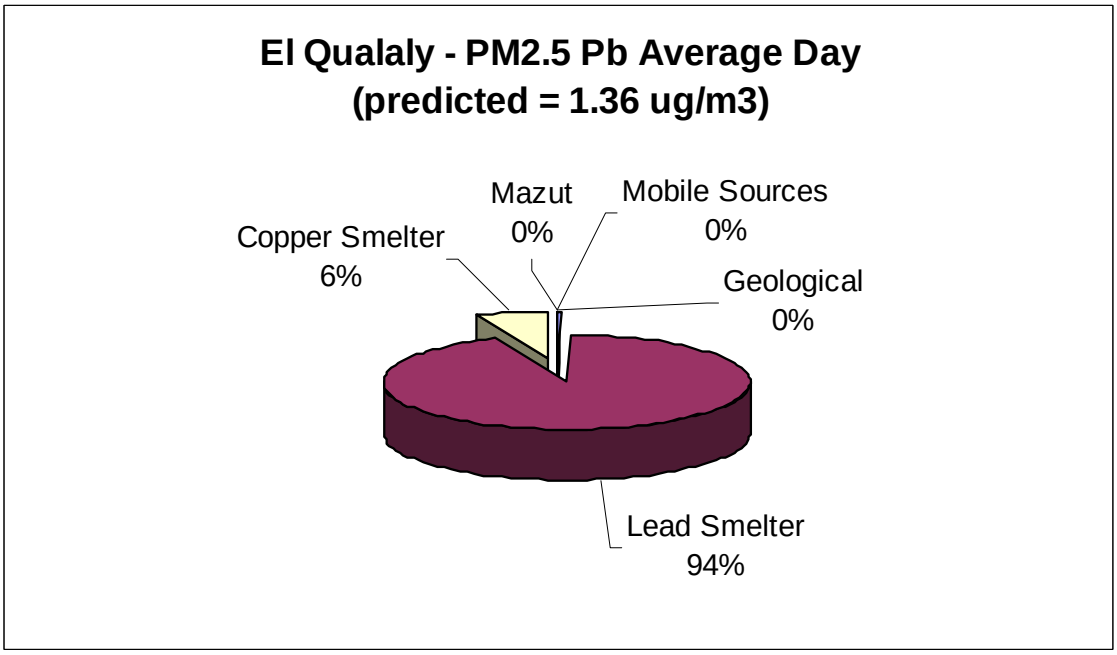


Figure 5-25b. El Qualaly $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

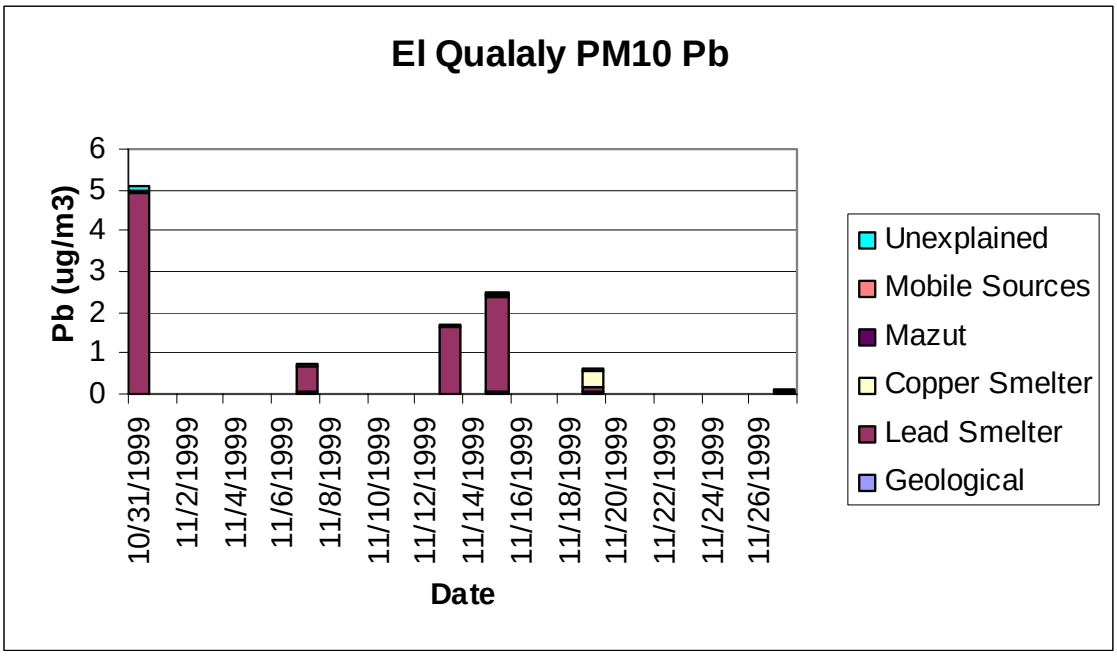


Figure 5-25c. El Qualaly PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

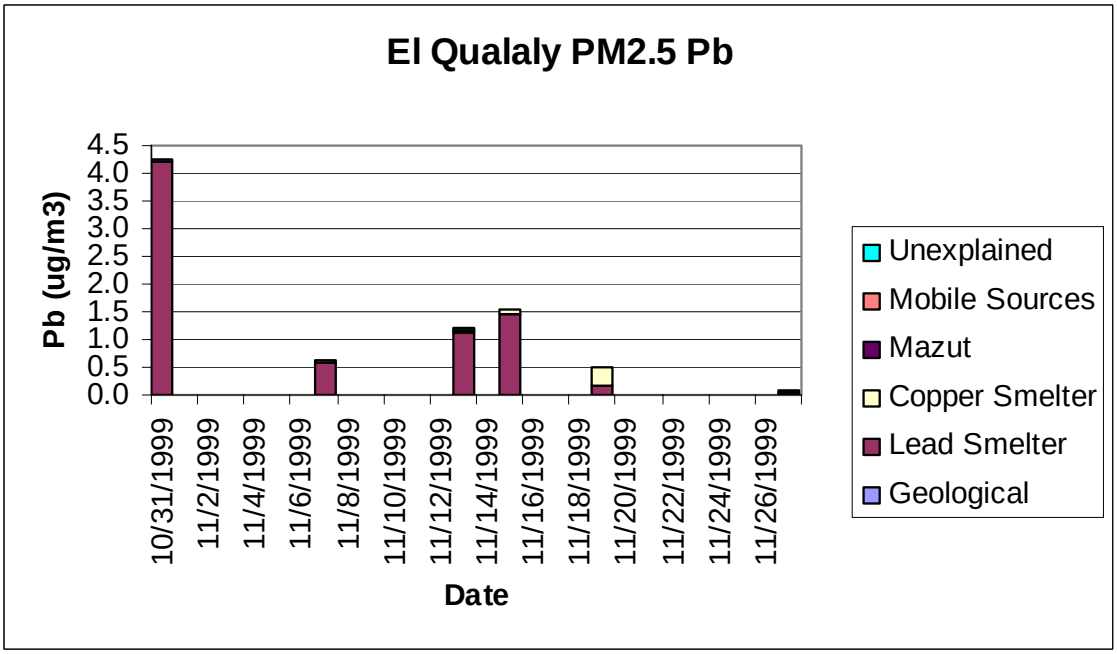


Figure 5-25d. El Qualaly $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

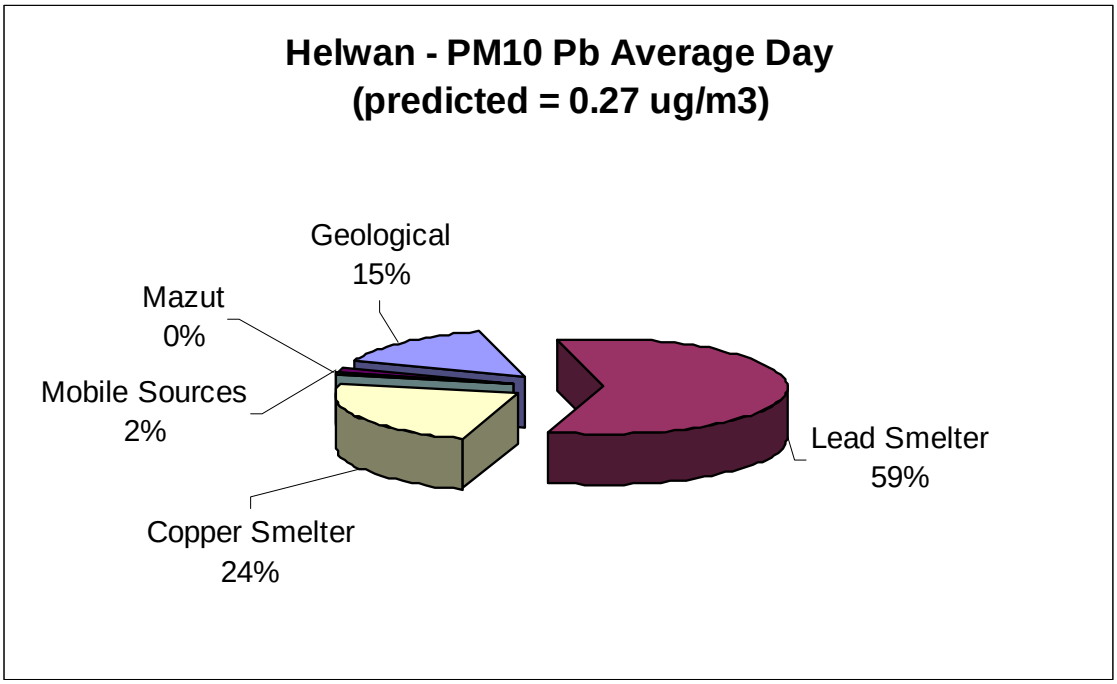


Figure 5-26a. Helwan PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

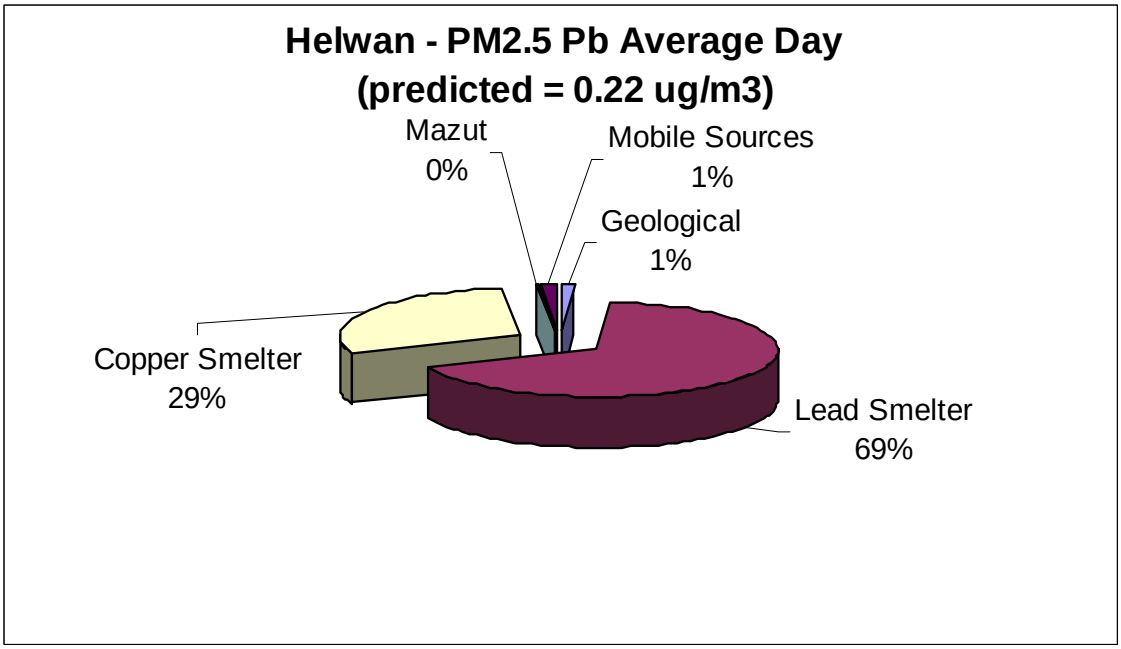


Figure 5-26b. Helwan $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

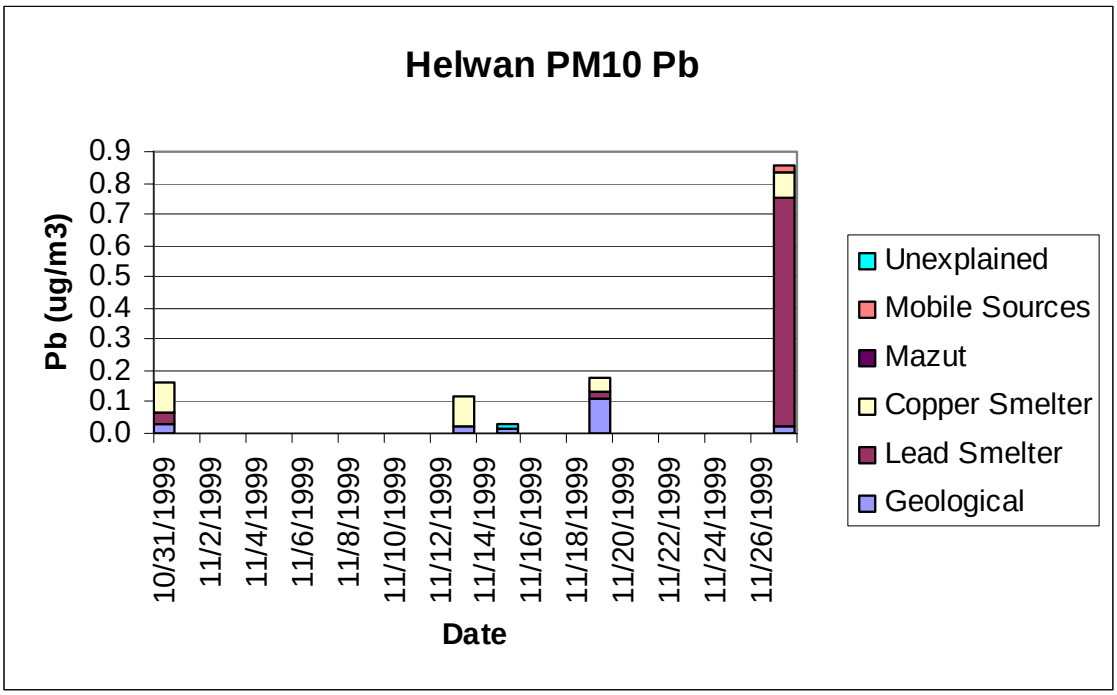


Figure 5-26c. Helwan PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

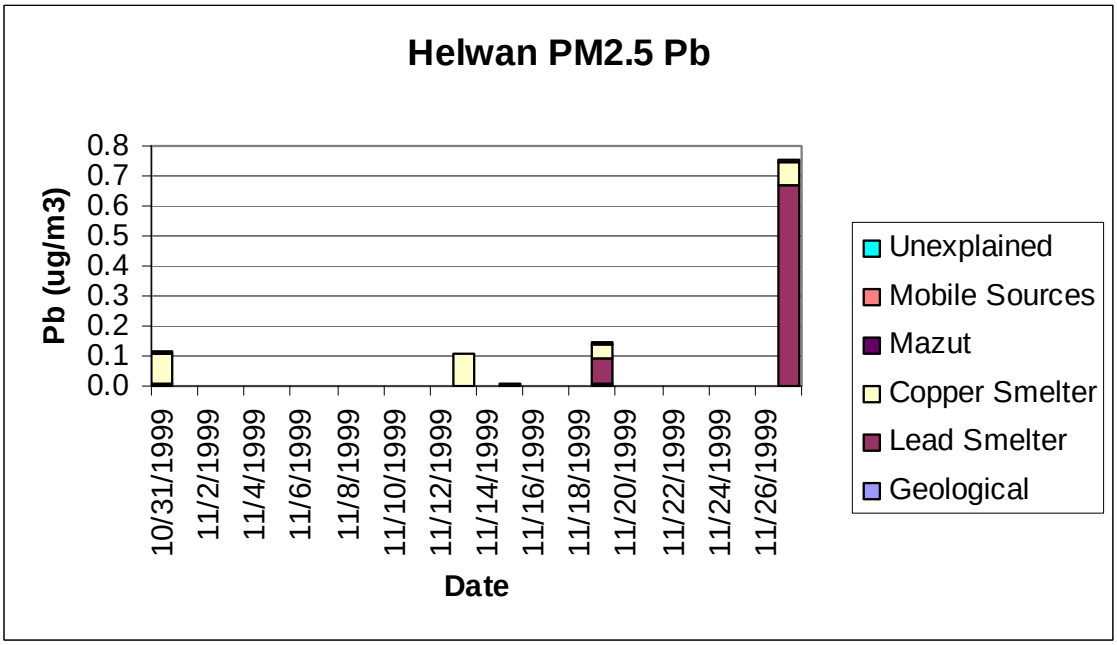


Figure 5-26d. Helwan $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

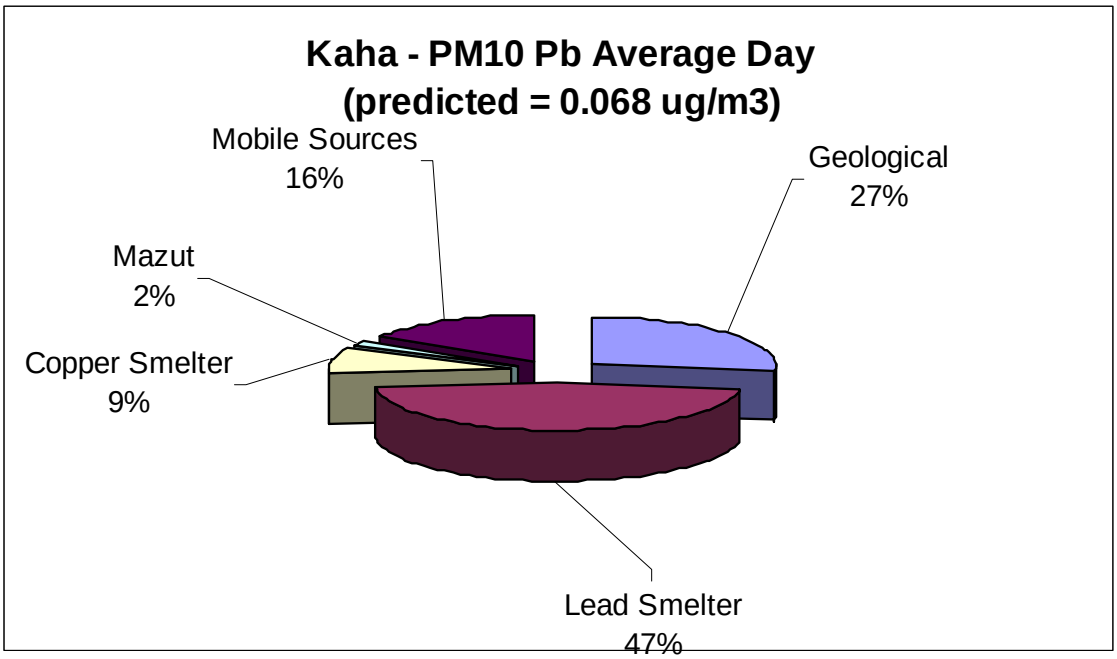


Figure 5-27a. Kaha PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

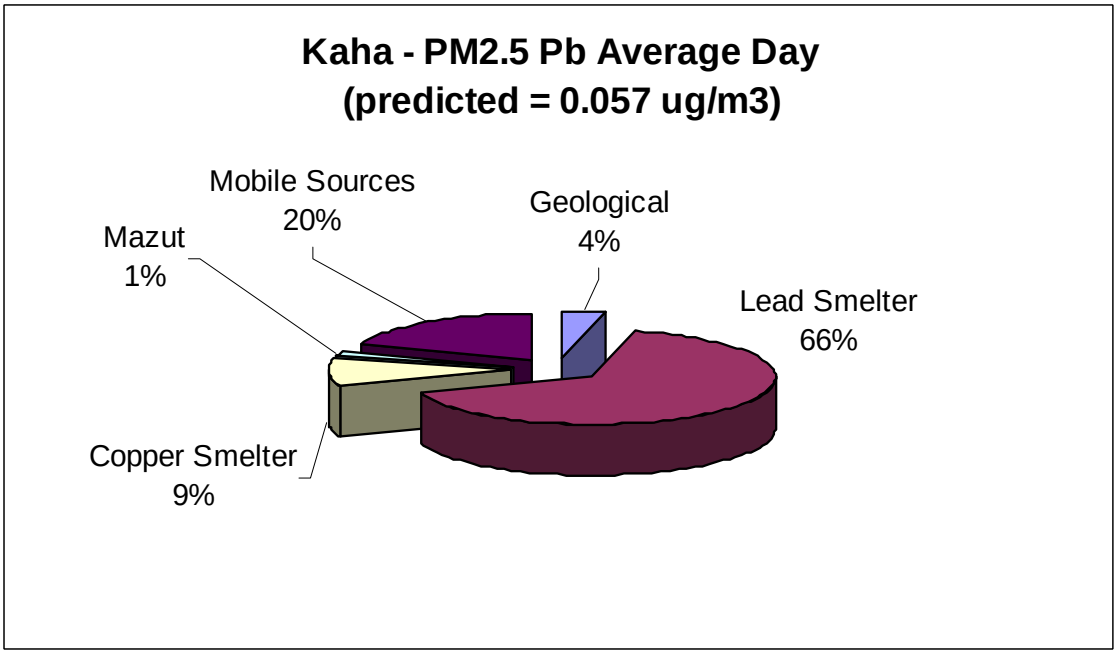


Figure 5-27b. Kaha $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

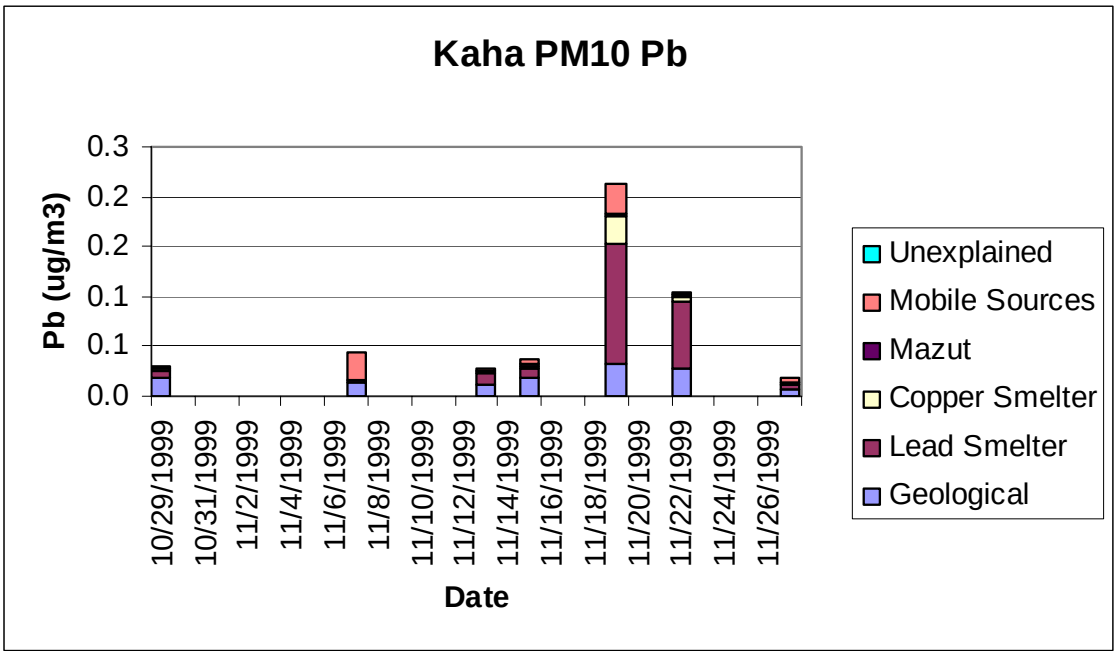


Figure 5-27c. Kaha PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

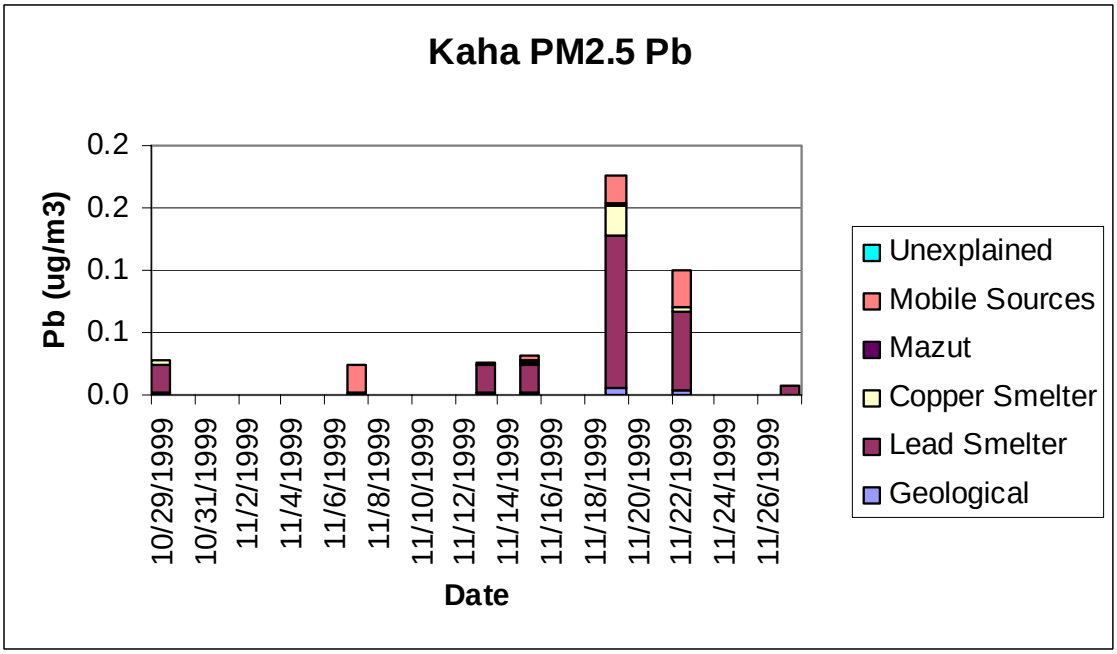


Figure 5-27d. Kaha $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

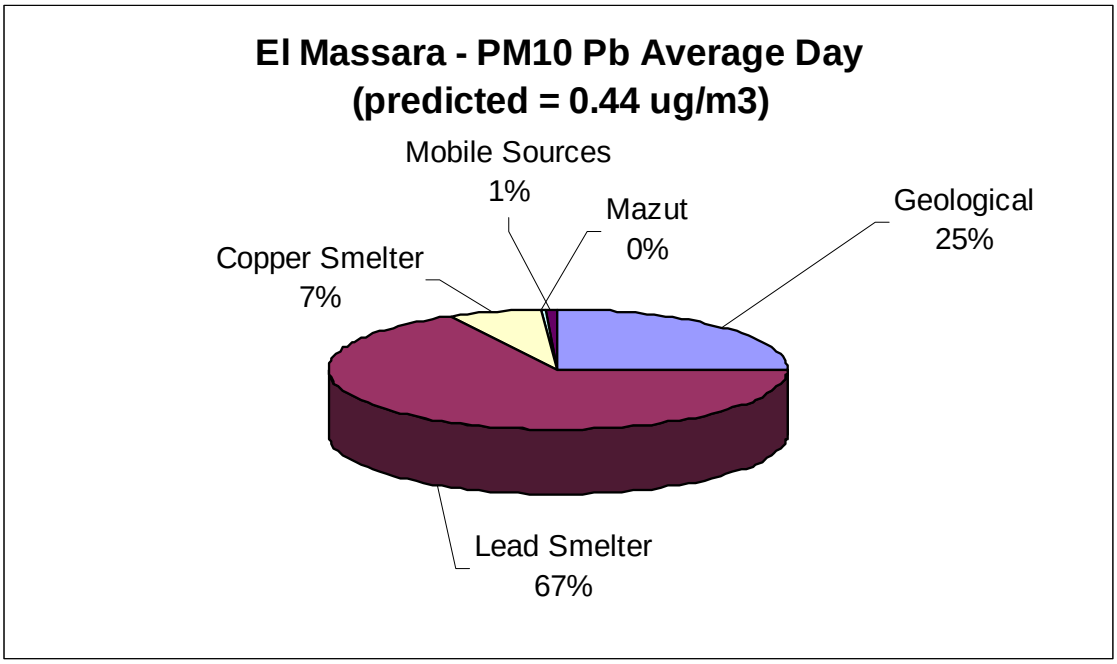


Figure 5-28a. El Massara PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

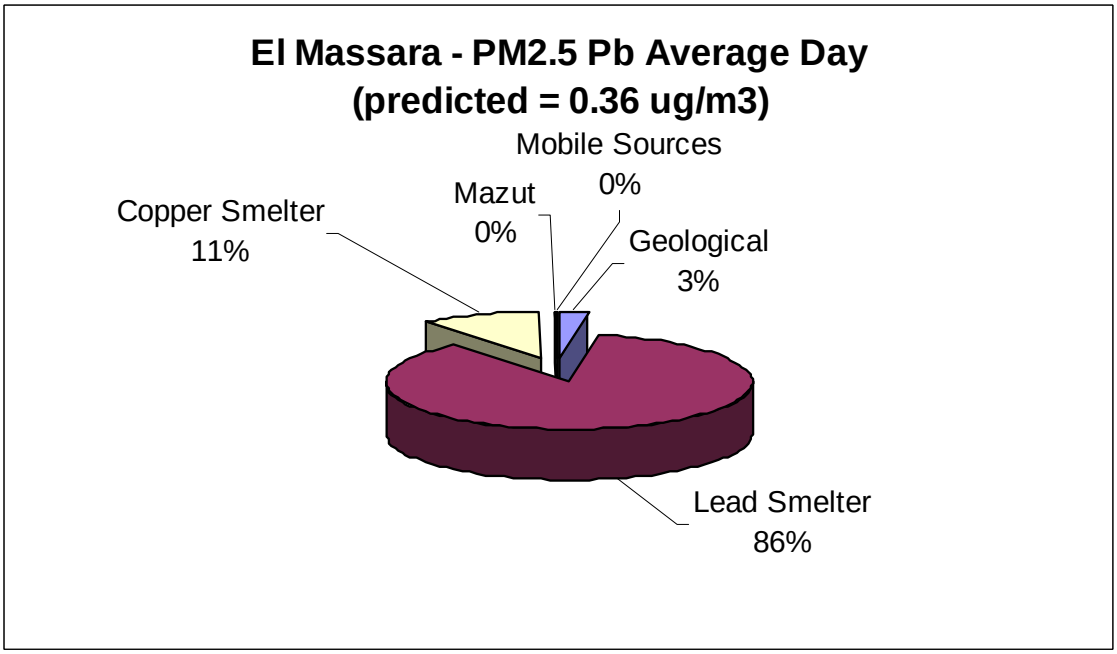


Figure 5-28b. El Massara $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

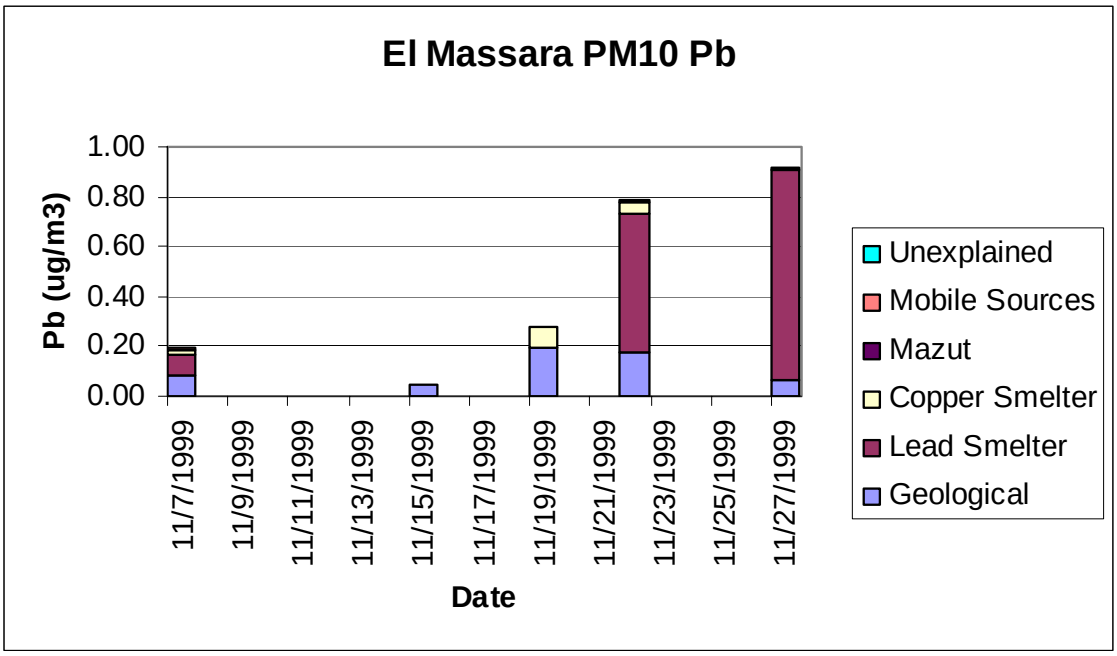


Figure 5-28c. El Massara PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

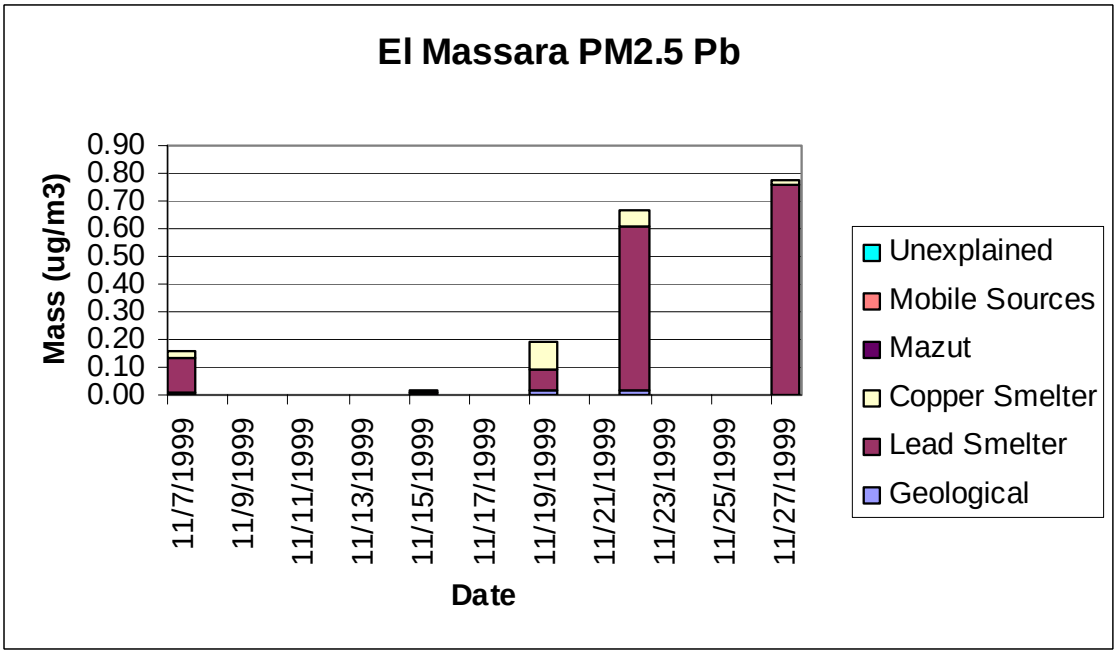


Figure 5-28d. El Massara $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

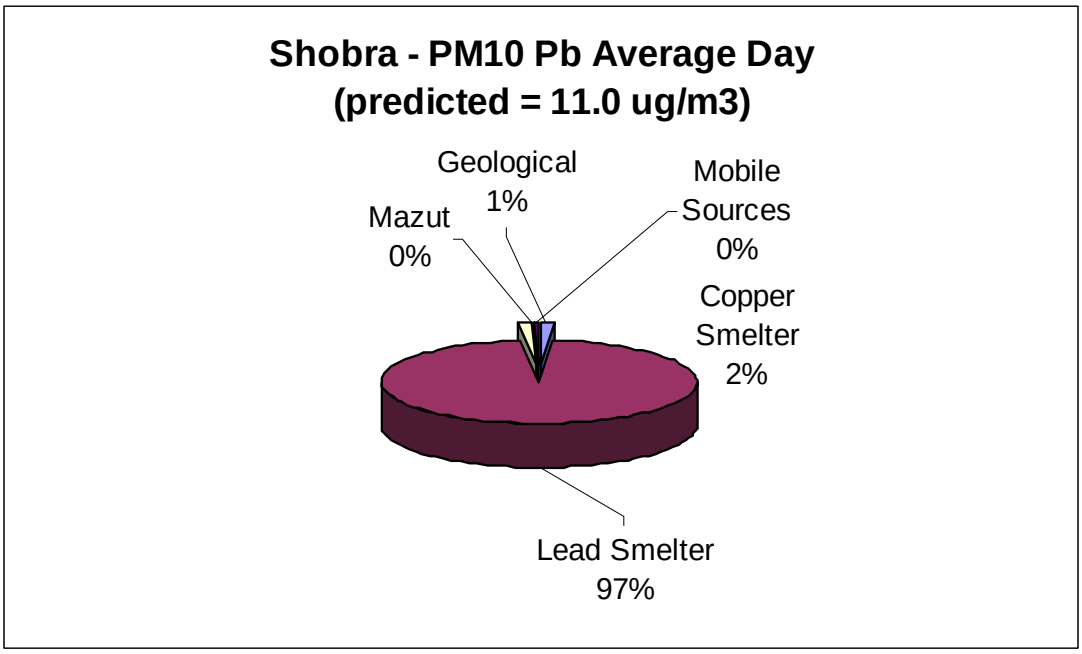


Figure 5-29a. Shobra PM_{10} Pb source apportionment, average day for the fall 1999 intensive study.

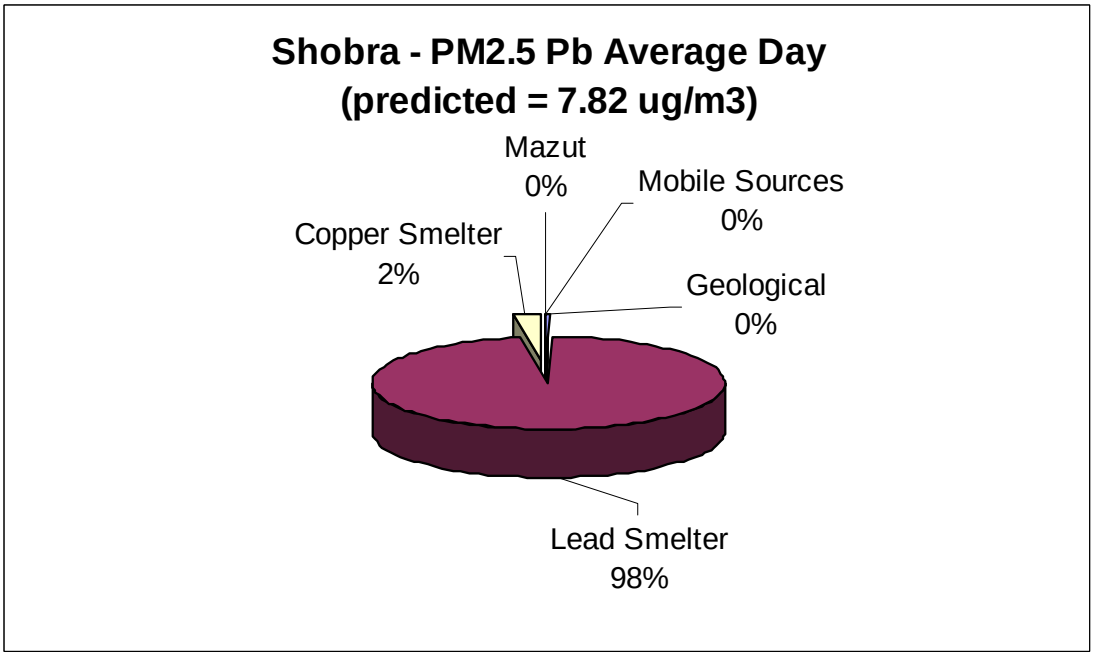


Figure 5-29b. Shobra $PM_{2.5}$ Pb source apportionment, average day for the fall 1999 intensive study.

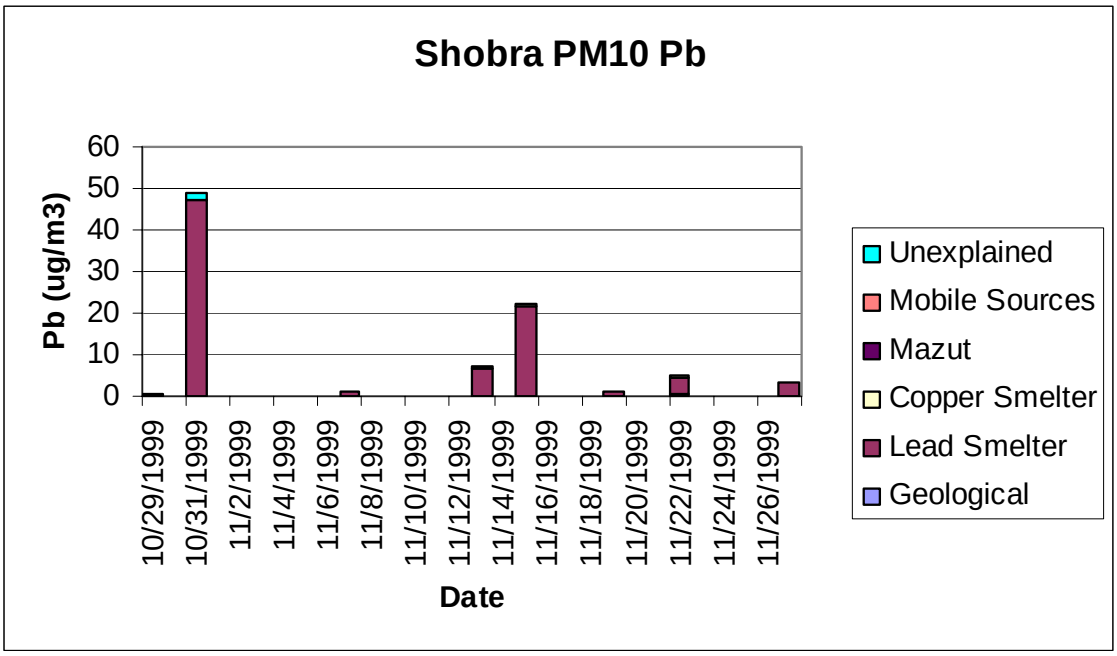


Figure 5-29c. Shobra PM_{10} Pb source apportionment, by day for the fall 1999 intensive study.

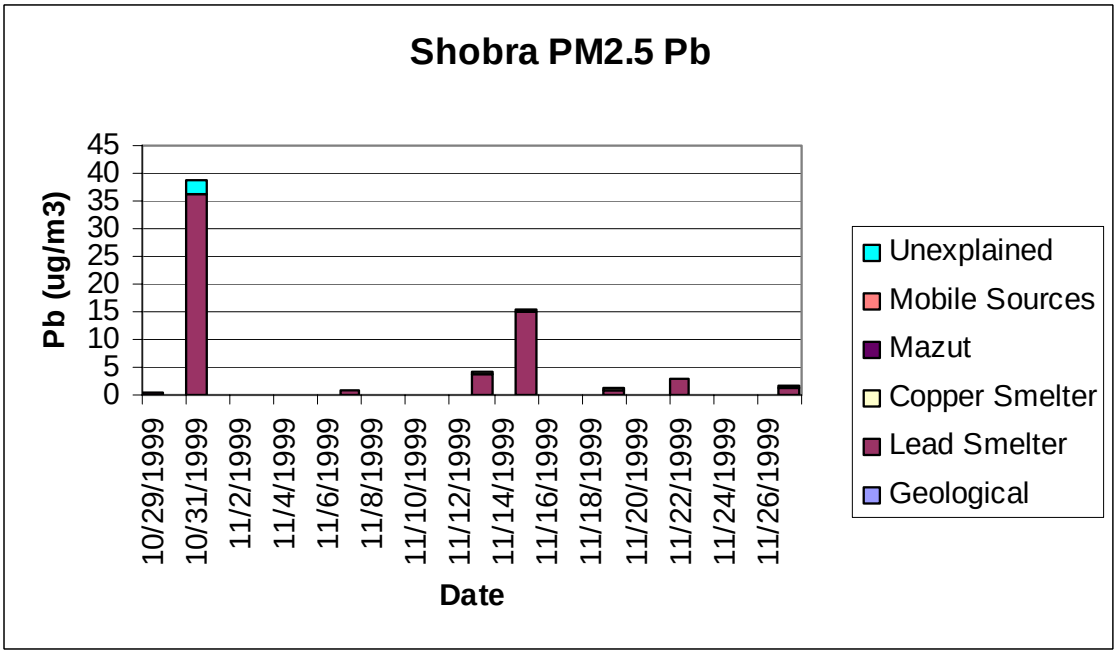


Figure 5-30d. Shobra $PM_{2.5}$ Pb source apportionment, by day for the fall 1999 intensive study.

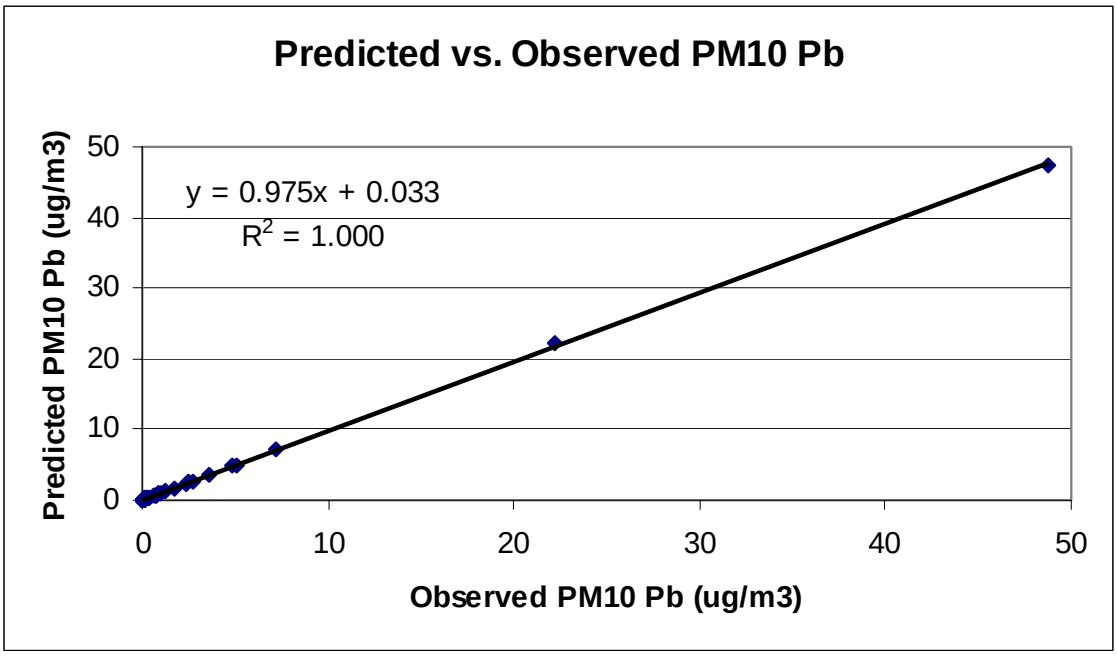


Figure 5-31a. Comparison of predicted vs. measured PM_{10} mass of the fall intensive samples and CMB apportionments.

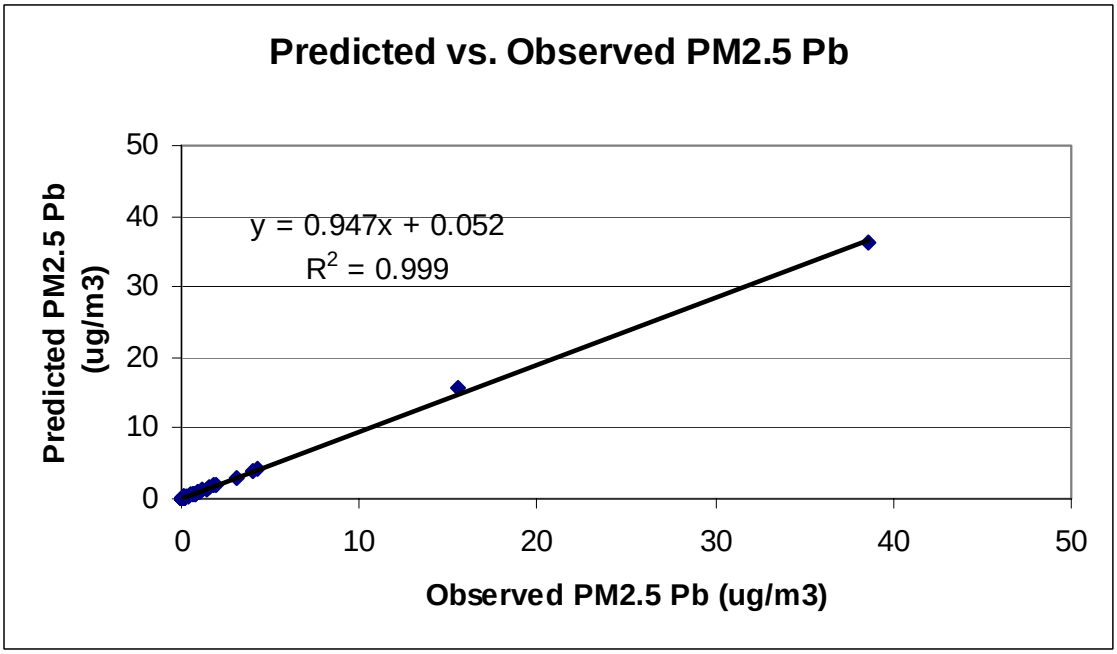


Figure 5-31b. Comparison of predicted vs. measured $PM_{2.5}$ mass of the fall intensive samples and CMB apportionments.

6 RECOMMENDATIONS

The 1999 Source Attribution Study provides a picture of the sources types contributing to high levels of $PM_{2.5}$, PM_{10}, and VOCs in the greater Cairo area. It also enables us to develop a plan to target specific source categories in order to effectively reduce the levels of ambient pollution and provides a baseline against which the impact of control measures can be evaluated.

Based on the source attribution estimates presented in Sections 4 and 5, we can present recommendations to reduce $PM_{2.5}$, PM_{10}, and VOC levels. These recommendations do not take into account the cost of implementing controls. Rather they are based on targeting sources that contribute significantly throughout the region. Given this caveat, the following recommendations are put forth:

<u>$PM_{2.5}$ reduction:</u> One surprising result of this study was the high level of secondary NH_4Cl observed at all sites. This compound accounted for 10 to 34% of the predicted mass. Based on work performed by CAIP personnel, it is likely the sources of the precursors for NH_4Cl originate north of Cairo. Reduction of NH_3 used in agricultural operations and chlorine used in bleaching industries should lead to a reduction of this pollutant. Another major source of $PM_{2.5}$ at all sites is vegetative burning. This source includes cooking, agricultural burning, and refuse burning. Procedures could be implemented to reduce cooking emissions but this may prove difficult. A more effective strategy may be to reduce or eliminate open burning of refuse and limit agricultural burning to periods when the meteorological conditions would rapidly disperse the smoke. As discussed in Section 5, use of the CAIP derived mobile source profiles resulted in a reduced estimate of the mobile source contribution to $PM_{2.5}$. Based on this result, reduction of mobile source PM emissions would reduce $PM_{2.5}$ but would not result in as large a reduction as could be achieved by controlling other sources.

<u>PM_{10} reduction:</u> The major source of PM_{10} is geological material. Methods commonly used in the US such as watering of construction zones and re-vegetation are not practical in Cairo. Reducing the amount of road dust that is resuspended may be a possibility but the use of motorized street sweepers in Cairo may not be possible. Development of methods to reduce the resuspension of geological material needs to be investigated. Given the high $PM_{2.5}/PM_{10}$ ratio observed in this study, reducing $PM_{2.5}$ would have a significant impact on reducing PM_{10}. Thus reducing vegetative burning and the sources of secondary NH_4Cl would also be an effective strategy to reduce PM_{10}.

VOC reduction: The major sources of VOCs are evaporative emissions and mobile source emissions. Other significant sources include LPG and industrial activities and CNG. Reduction in evaporative emissions during refueling and improved vehicle technologies to reduce evaporative and tailpipe emissions would effectively reduce VOC levels. Reduction in mobile source emissions can be accomplished by requiring new vehicles to be sold with evaporative control systems and other technologies to reduce tailpipe emissions. Fleet turnover would eventually lead to reduced emissions but this strategy would be slow to implement. Reducing fuel volatility (RVP, Reid Vapor Pressure) may aid in reducing evaporative emissions. Another approach would be to require gasoline stations and other fuel dispensing facilities to replace fuel pumps with newer designs that minimize evaporative losses. Similarly, industrial facilities could be required to install control technologies designed to reduce emissions. Given the dominance of the evaporative and mobile source contributions, it is likely that focusing on these sources may prove to be most effective in reducing VOC levels.

7 SUMMARY

An intensive PM_{10} and $PM_{2.5}$ sampling program was carried out at six sites in the greater Cairo area during a winter period from February 18 to March 4, 1999 and during a fall period from October 29 to November 27, 1999. Medium volume samplers were used to collect $PM_{2.5}$, PM_{10}, and PAH samples for subsequent chemical analysis and source apportionment modeling. Ambient volatile organic compound (VOC) samples were collected in stainless steel canisters and used to apportion non-methane hydrocarbon compound (NMHC) concentrations to sources.

The average PM_{10} mass ranged from 265.1 $\mu g/m^3$ at Shobra, an industrial site to 88.1 $\mu g/m^3$ at Helwan, a residential location. The average $PM_{2.5}$ mass ranged from 216.1 $\mu g/m^3$ at Shobra to 29.4 $\mu g/m^3$ at Helwan. The CMB receptor model coupled with source profiles measured during the CAIP and from previous studies was used to estimate source contributions to $PM_{2.5}$ and PM_{10} mass and to VOC. During fall, 2000, additional samples were acquired to characterize current motor vehicle, vegetative and refuse burning, smelter, restaurant, and Mazut emissions in Cairo. These profiles, including PAHs, were used to determine the winter and fall source contributions to $PM_{2.5}$ and PM_{10} mass and lead. The results of initial and final (using CAIP source profiles) CMB analysis were quite similar. Depending on the sites, major contributors to PM_{10} included geological material, mobile source emissions, and vegetative burning. $PM_{2.5}$ tended to be dominated by mobile source emissions, vegetative burning, and secondary species. In relative terms, the vegetative burning contribution was higher at all sites during fall, the warmer season. This is the case in the final and preliminary CMB analysis. Aside from the extremely high mass levels, two unusual features emerged. First, most sites had high levels of ammonium chloride (up to 19.2 $\mu g/m^3$). Second, considering both the preliminary and final CMB analysis, lead smelting at Shobra contributed 53 and 40-42% of $PM_{2.5}$ and PM_{10}, respectively during winter. During fall, lead smelter contributions fell to 16-17% of PM_{10} and 11-12% of $PM_{2.5}$. This is consistent with dramatically lower Pb concentrations at Shobra in fall (8.1 $\mu g/m^3$) than in winter (26.8 $\mu g/m^3$).

The results of the final CMB are even more dramatic for lead. During winter, 95, 97, 76, 81, 90, and 99% of PM_{10} lead at Zamalek, El Qualaly, Helwan, Kaha, Massara, and Shobra came from lead smelters. During fall, the respective lead smelter contributions at the six sites were 85, 92, 59, 46, 67, and 96%, respectively. Thus, reduction of emissions from lead production activities should dramatically reduce ambient lead concentrations in Cairo.

VOC concentrations were generally higher in fall than in winter although the seasonal differences were generally not as pronounced as those involving particulate concentrations. El Qualaly, the site chosen to represent mobile emissions displayed the highest average NMHC concentrations of any site, by factors of 2 or more, in both winter (1849 ppb) and fall (2037 ppb). The major contributors to NMHC at all sites in both seasons were mobile emissions and lead smelting/LPG. We interpret the latter to represent industrial processes that may be fueled by LPG. Mobile evaporative contributions were higher in both absolute and relative terms at all sites during the fall season, when average temperatures were about 5° C higher than those in winter.

There are two issues which must be resolved to better understand the sources of PM in Cairo. First, there is clearly industrial Mn and Fe in the Cairo aerosol which cannot be explained by the iron foundry profiles determined thus far during CAIP. Nonetheless, we suspect that steel production or related activities involving steel are significant contributors to PM in Cairo. It will be necessary to characterize these sources in future work. Second, highly enriched soluble potassium in ambient PM in Cairo suggests a strong influence of vegetative burning sources. Most of the refuse and vegetative burning emissions measured thus far during CAIP have not contained high levels of soluble potassium. However, a cement manufacturing profile determined during CAIP contained high levels of potassium chloride. It is possible that this source, rather than vegetative burning, accounts for ambient soluble potassium in Cairo. Because cement should be composed mainly of limestone rather than potassium chloride, this possibility seems remote. To resolve this issue, the composition of cement-related emissions in Cairo must be examined further in future work during CAIP.

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