Supporting Information

**Spatial Variability of Fine Particle Mass, Components, and Source Contributions During the Regional Air Pollution Study in St. Louis**

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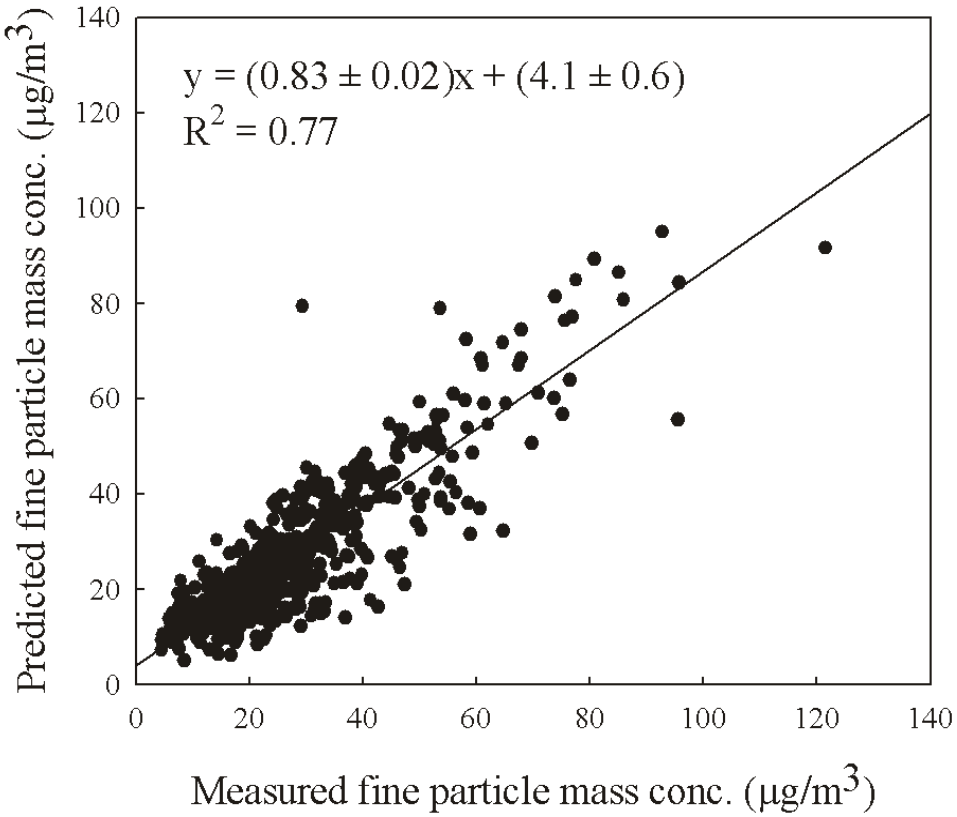


Figure S1 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 103.

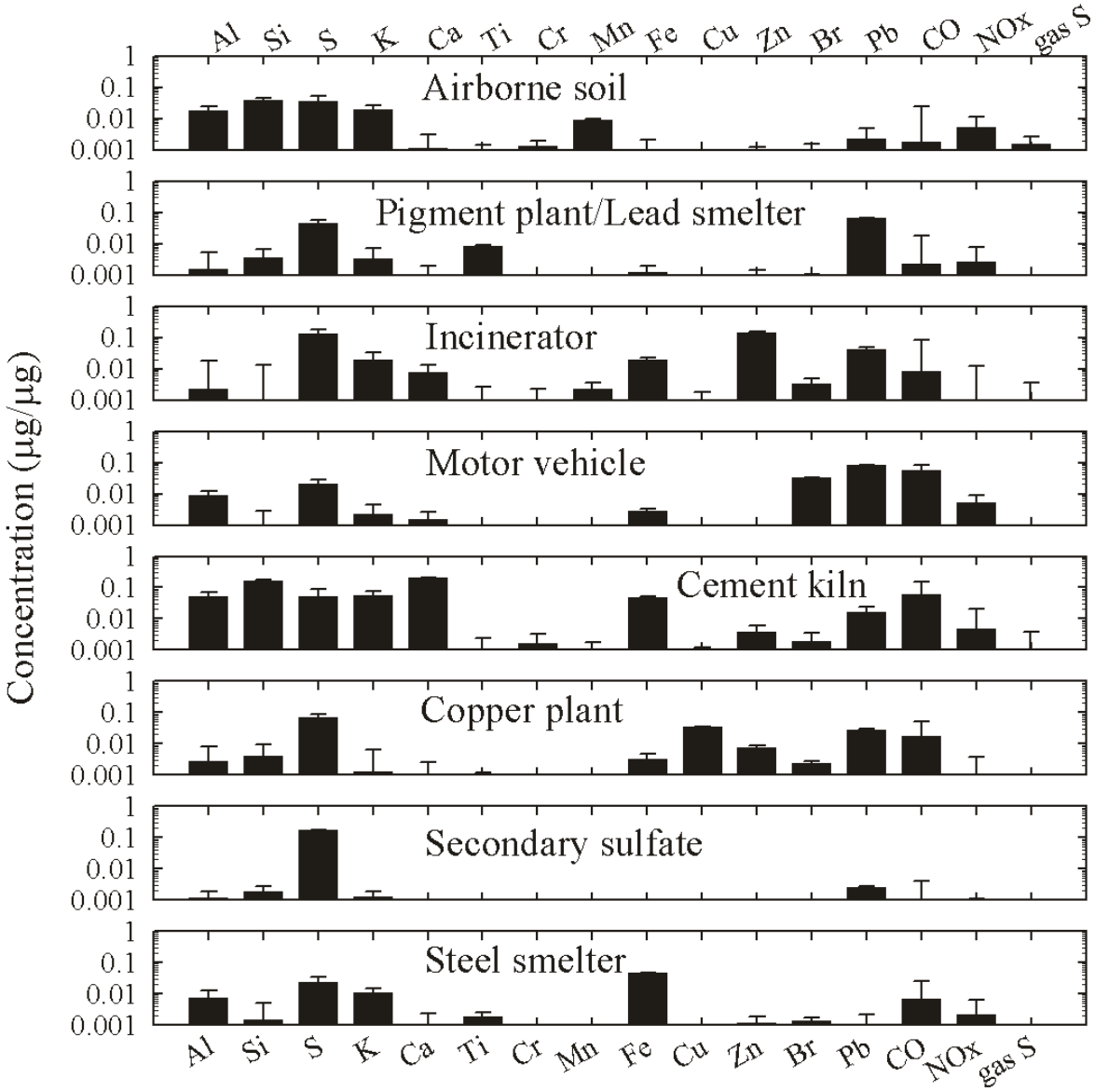


Figure S1 (b). Source profiles (prediction ± standard deviation) at Site 103.

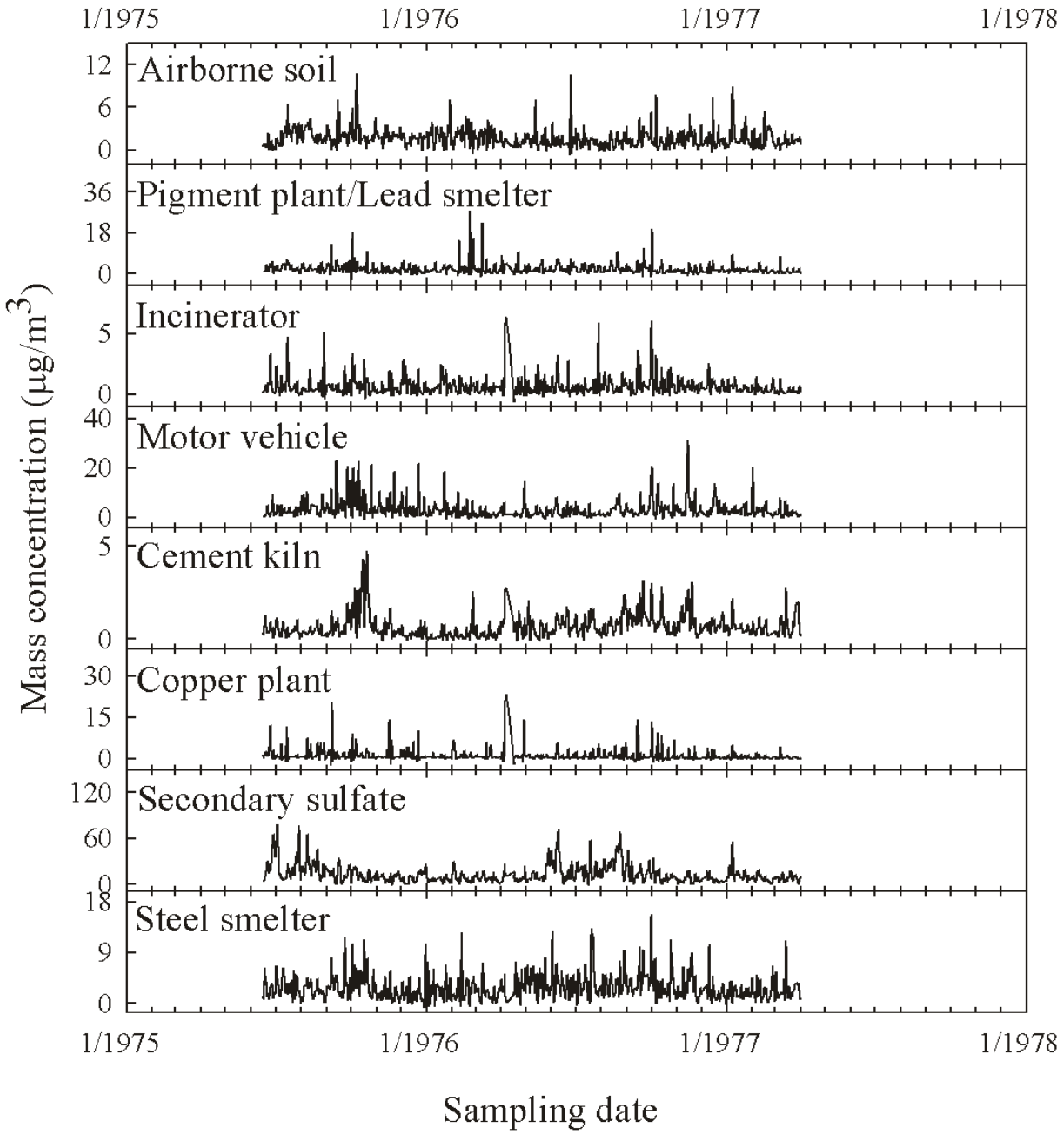


Figure S1 (c). Time series plot of source contributions to Site 103.

Table S1. Summary of $PM_{2.5}$ and species mass concentrations at Site 103.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 27705.93 | 10.5 | 0.0 |
| Al | 294.46 | 14.9 | 1.9 |
| Si | 293.67 | 8.3 | 2.7 |
| Si | 2964.20 | 0.0 | 0.7 |
| K | 177.40 | 0.0 | 0.9 |
| Ca | 168.63 | 19.1 | 7.6 |
| Ti | 27.02 | 74.3 | 31.1 |
| Cr | 8.40 | 92.7 | 29.7 |
| Mn | 17.71 | 54.4 | 15.6 |
| Fe | 203.29 | 0.2 | 0.7 |
| Cu | 55.87 | 15.7 | 25.8 |
| Zn | 122.33 | 0.3 | 1.0 |
| Br | 135.80 | 0.0 | 0.3 |
| Pb | 548.39 | 0.0 | 0.5 |
| CO (ppm) | 0.46 | | 9.3 |
| NOx (ppm) | 0.05 | | 24.2 |
| $SO_2$ (ppm) | 0.02 | | 13.1 |

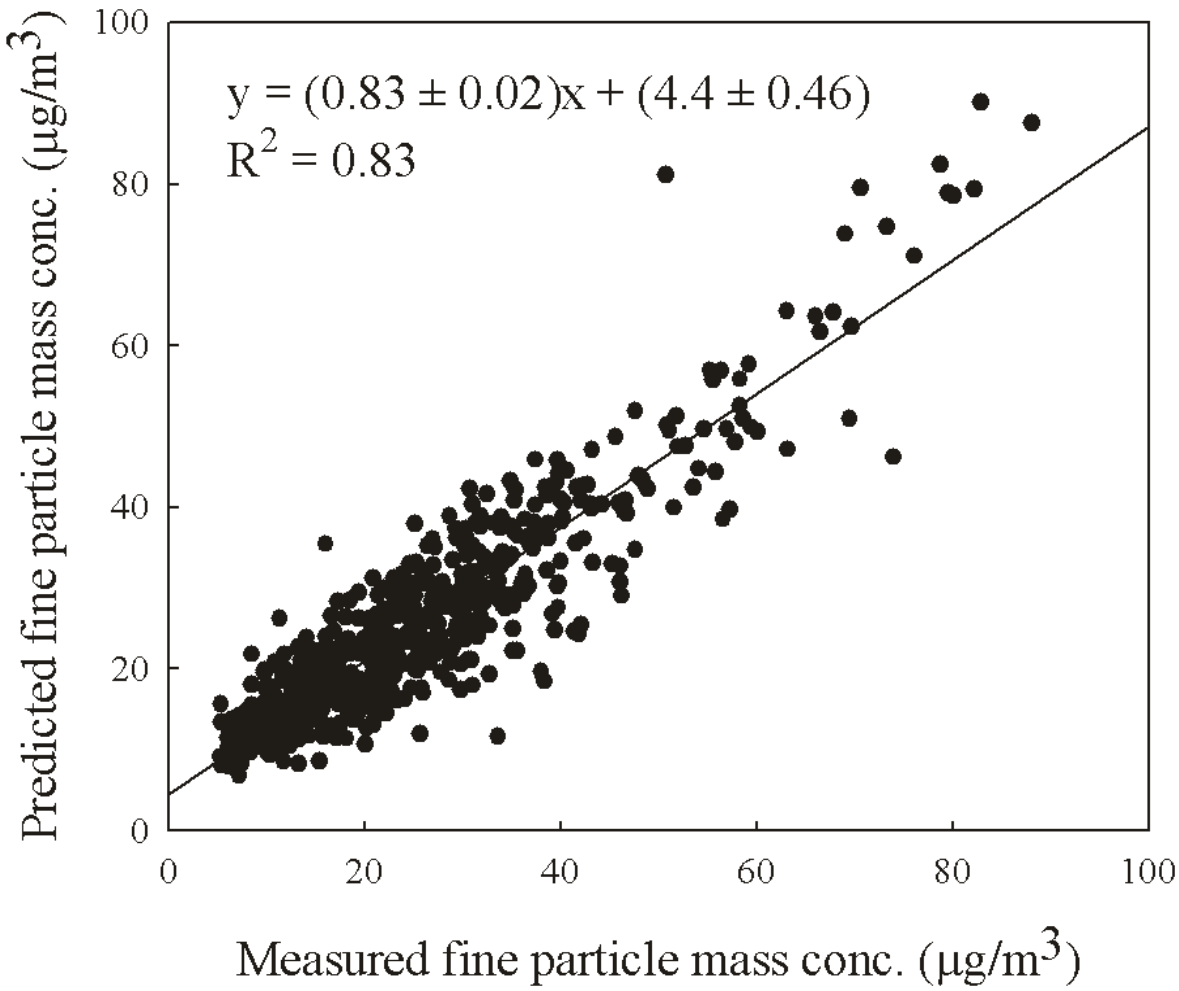


Figure S2 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 105.

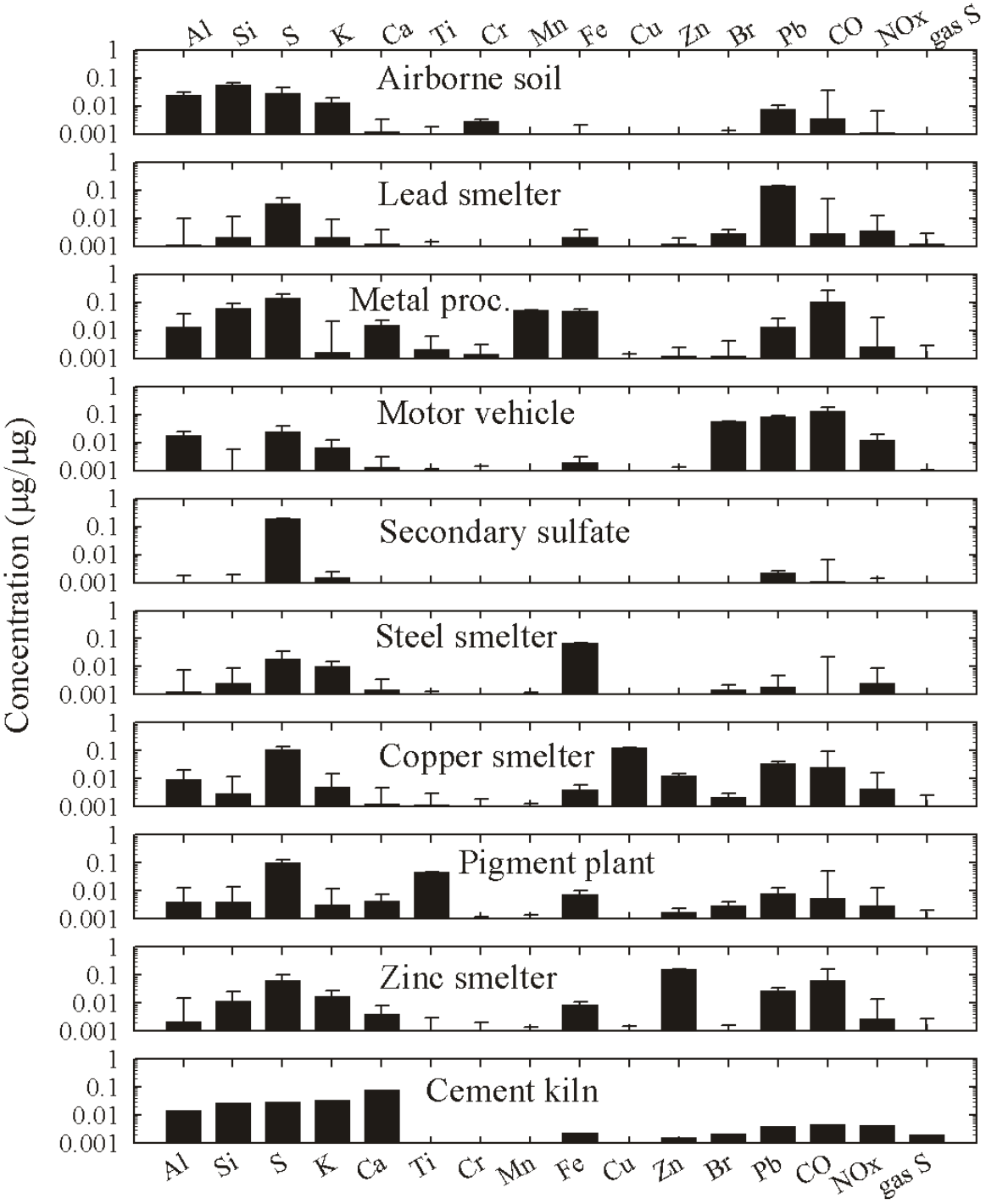


Figure S2 (b). Source profiles (prediction ± standard deviation) at Site 105.

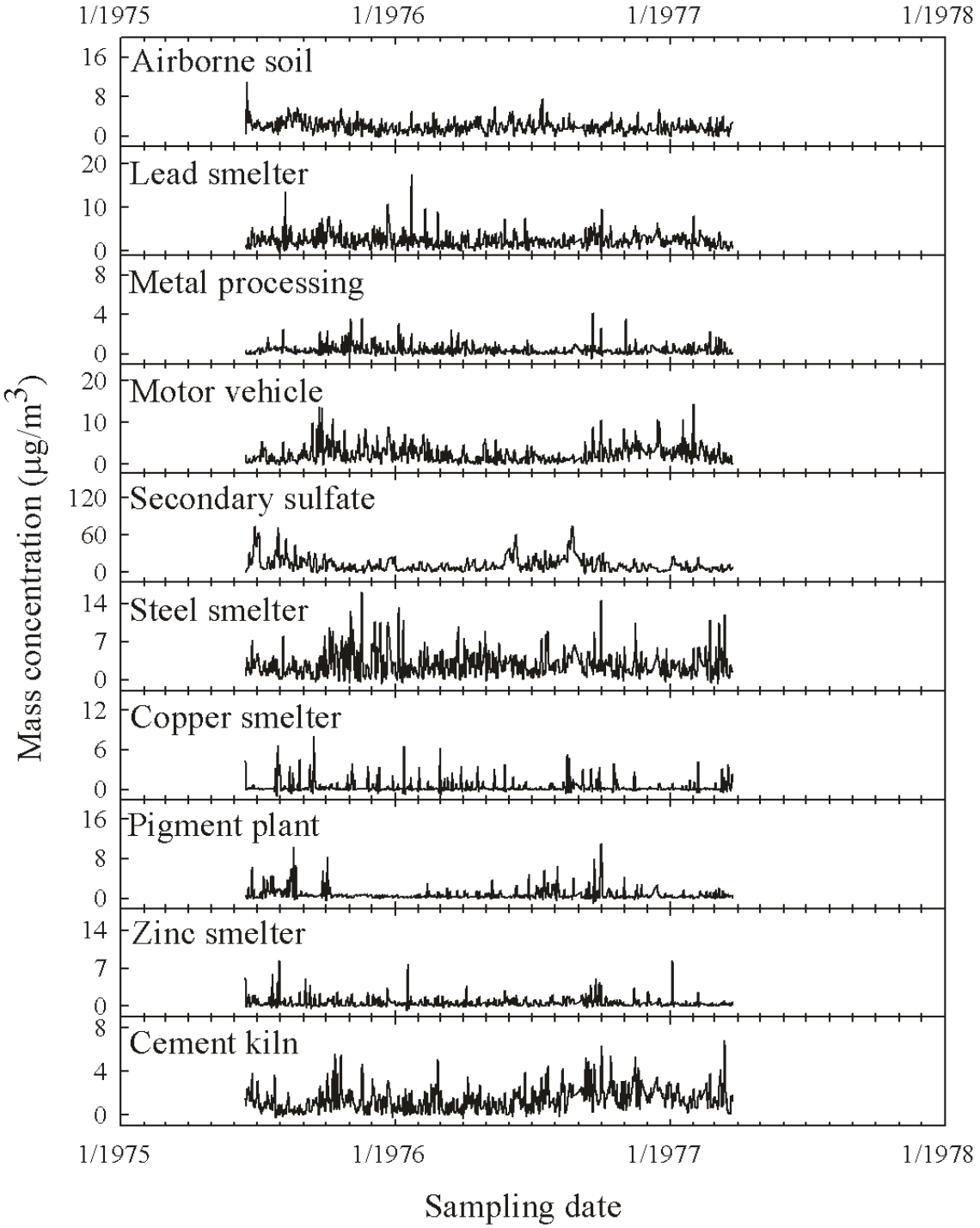


Figure S2 (c). Time series plot of source contributions to Site 105.

Table S2. Summary of $PM_{2.5}$ and species mass concentrations at Site 105.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 25610.42 | 12.3 | 0.0 |
| Al | 168.09 | 80.9 | 5.7 |
| Si | 259.07 | 6.7 | 5.1 |
| Si | 2899.11 | 0.0 | 0.2 |
| K | 171.50 | 0.2 | 0.5 |
| Ca | 146.42 | 20.6 | 8.4 |
| Ti | 45.18 | 66.9 | 19.1 |
| Cr | 9.21 | 90.4 | 19.1 |
| Mn | 28.28 | 41.3 | 4.0 |
| Fe | 248.33 | 0.0 | 0.5 |
| Cu | 69.43 | 27.5 | 18.5 |
| Zn | 128.73 | 0.3 | 0.7 |
| Br | 154.58 | 0.0 | 0.5 |
| Pb | 644.40 | 0.0 | 0.7 |
| CO (ppm) | 0.66 | | 11.1 |
| NOx (ppm) | 0.05 | | 11.0 |
| $SO_2$ (ppm) | 0.02 | | 14.3 |

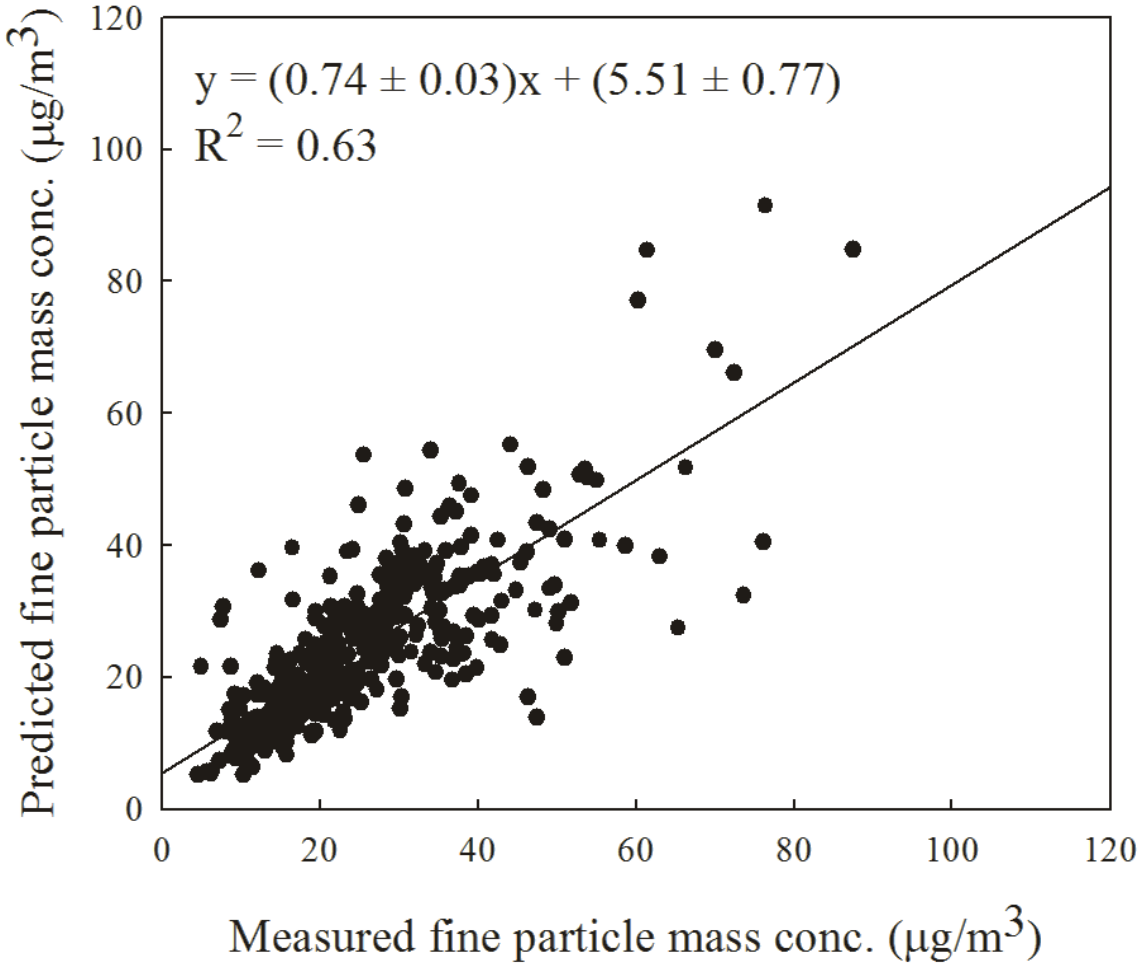


Figure S3 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 106.

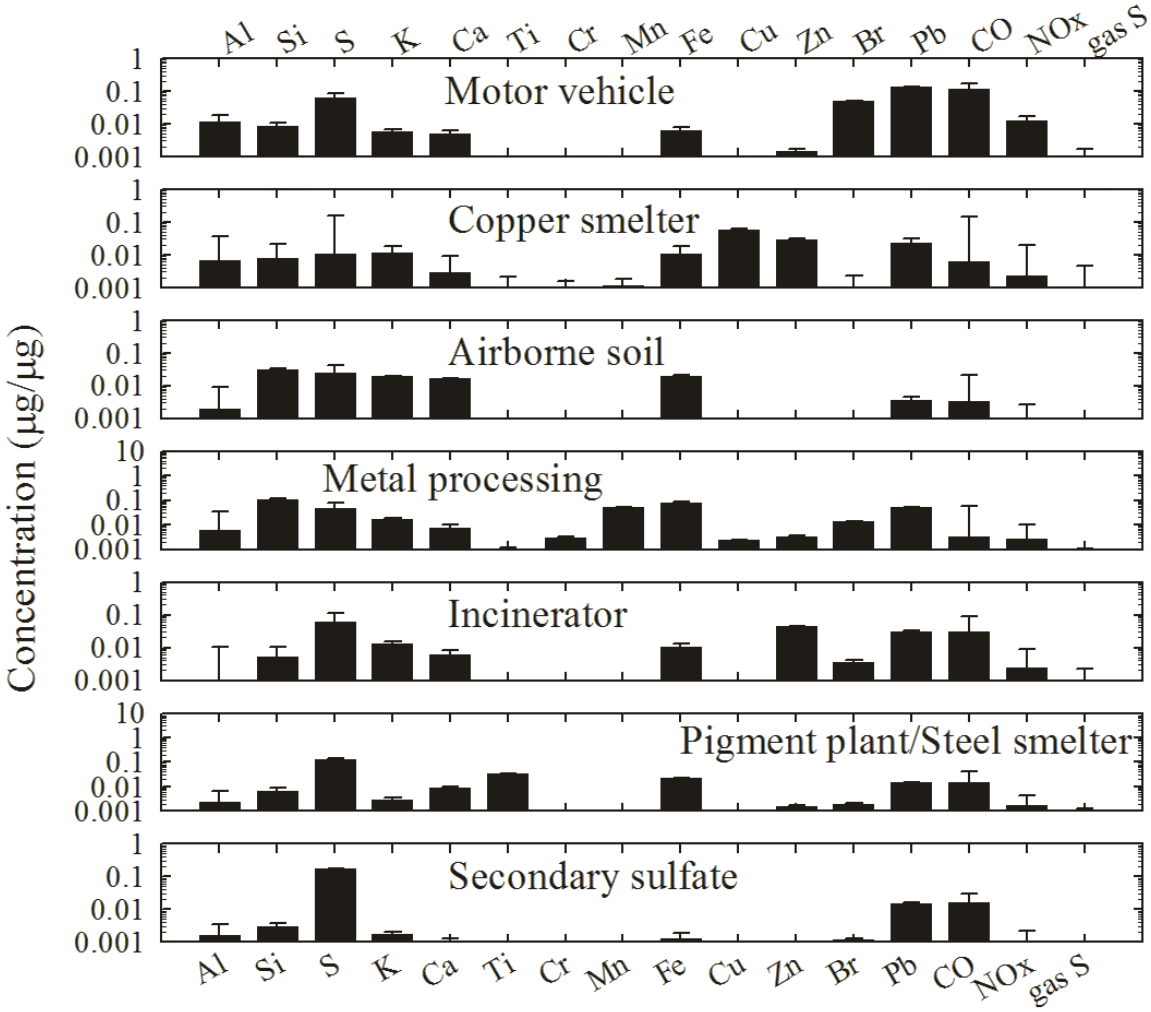


Figure S3 (b). Source profiles (prediction ± standard deviation) at Site 106.

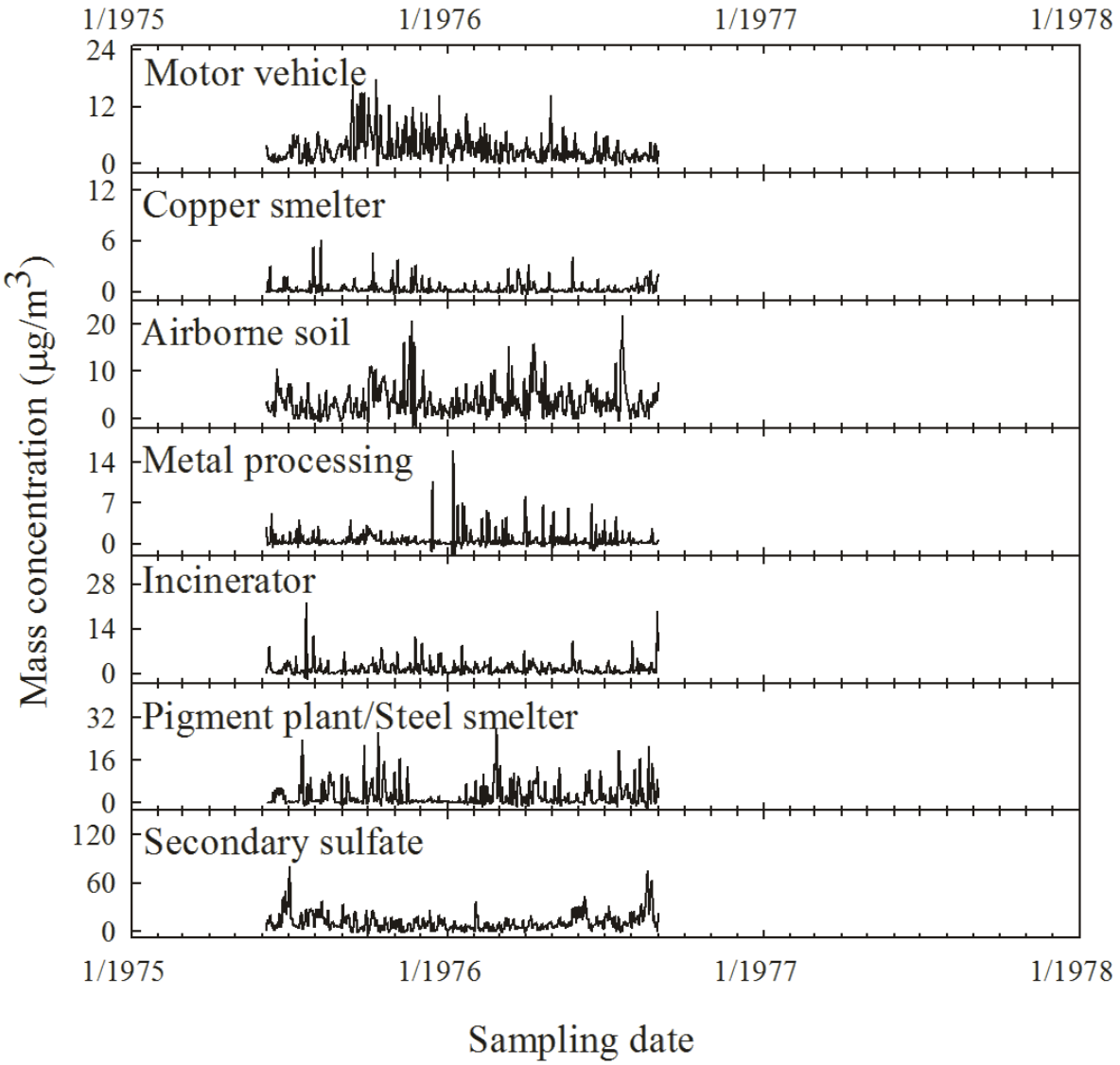


Figure S3 (c). Time series plot of source contributions to Site 106.

Table S3. Summary of $PM_{2.5}$ and species mass concentrations at Site 106.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 24711.32 | 1.9 | 0.0 |
| Al | 107.99 | 53.7 | 1.7 |
| Si | 331.12 | 0.2 | 2.4 |
| Si | 3146.38 | 0.0 | 0.0 |
| K | 165.14 | 0.0 | 0.7 |
| Ca | 128.79 | 6.8 | 1.9 |
| Ti | 96.62 | 36.0 | 3.8 |
| Cr | 9.69 | 55.9 | 2.8 |
| Mn | 45.84 | 18.8 | 1.9 |
| Fe | 275.46 | 0.0 | 0.5 |
| Cu | 28.83 | 11.8 | 5.9 |
| Zn | 103.03 | 0.0 | 0.0 |
| Br | 190.29 | 0.0 | 0.2 |
| Pb | 744.05 | 0.0 | 0.2 |
| CO (ppm) | 0.76 | | 11.1 |
| NOx (ppm) | 0.05 | | 10.2 |
| $SO_2$ (ppm) | 0.03 | | 46.0 |

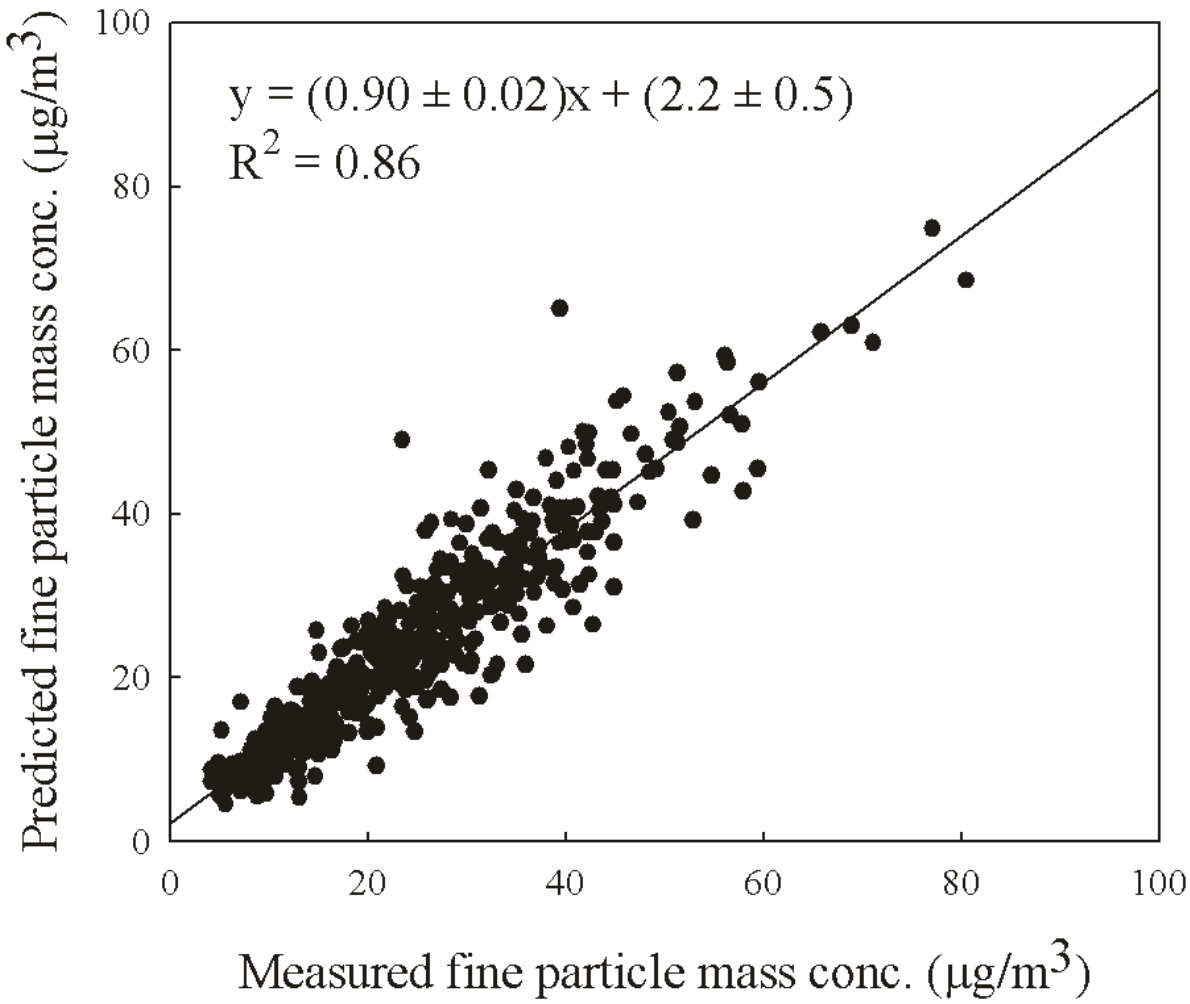


Figure S4 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 108.

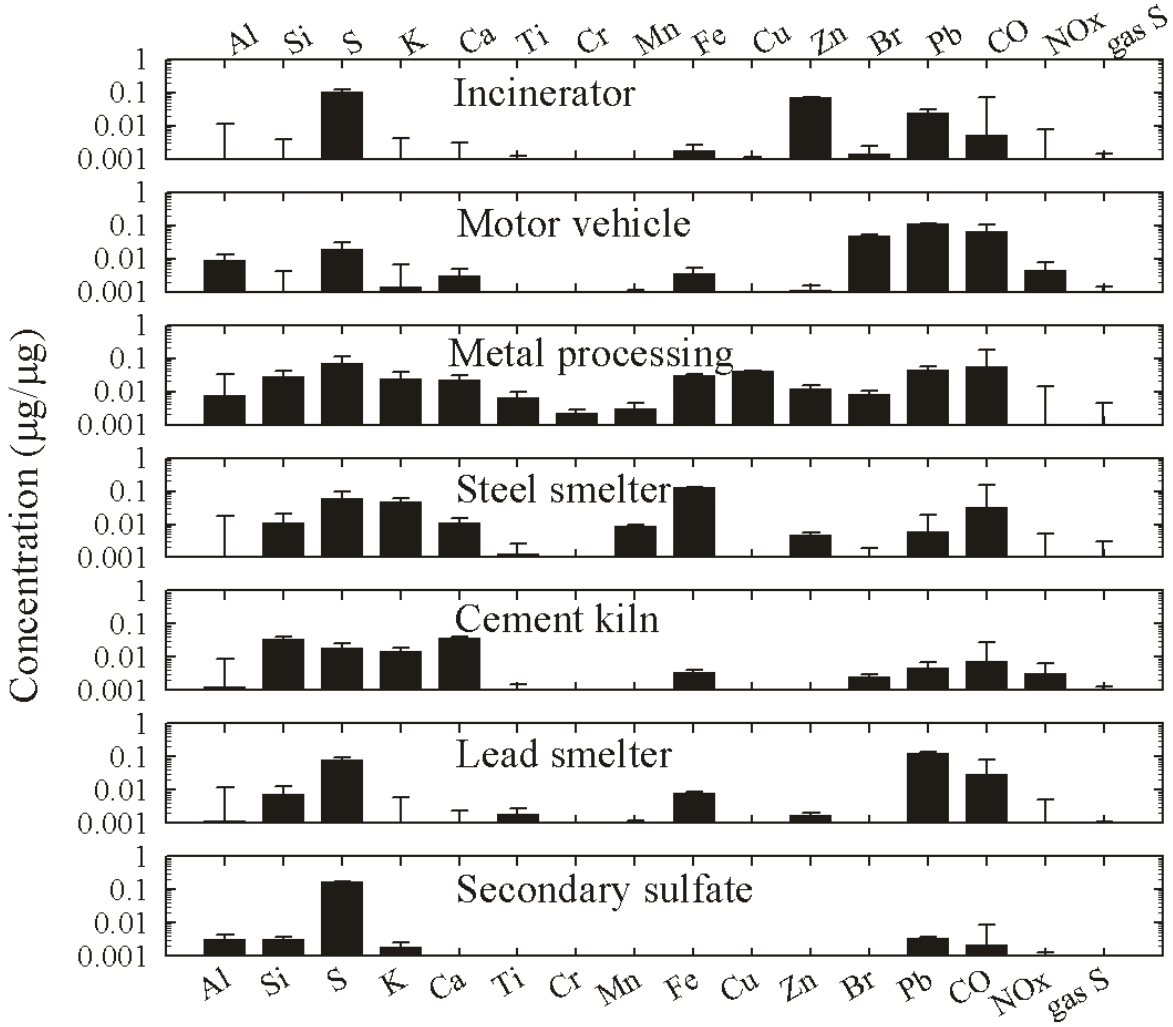


Figure S4 (b). Source profiles (prediction ± standard deviation) at Site 108.

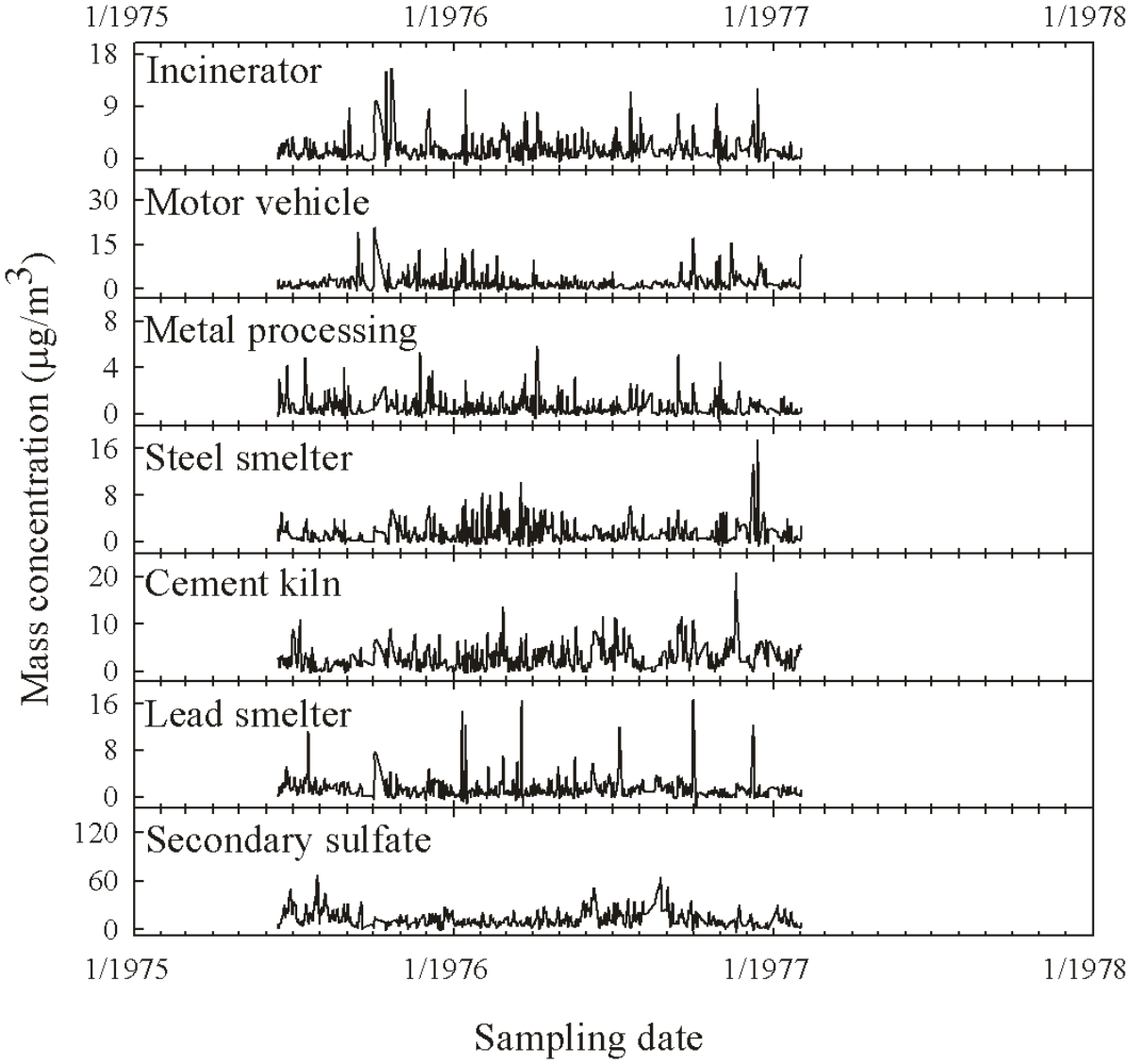


Figure S4 (c). Time series plot of source contributions to Site 108.

Table S4. Summary of $PM_{2.5}$ and species mass concentrations at Site 108.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 24608.52 | 0.4 | 0.0 |
| Al | 103.92 | 39.5 | 2.0 |
| Si | 252.28 | 1.4 | 1.2 |
| Si | 3008.14 | 0.0 | 0.2 |
| K | 218.28 | 0.0 | 0.0 |
| Ca | 155.74 | 8.0 | 2.5 |
| Ti | 21.59 | 47.9 | 6.1 |
| Cr | 7.17 | 64.3 | 6.5 |
| Mn | 23.36 | 19.7 | 2.7 |
| Fe | 256.97 | 0.0 | 0.0 |
| Cu | 30.66 | 9.3 | 11.9 |
| Zn | 135.54 | 0.4 | 0.2 |
| Br | 141.47 | 0.0 | 0.2 |
| Pb | 589.27 | 0.0 | 0.6 |
| CO (ppm) | 0.50 | | 5.5 |
| NOx (ppm) | 0.04 | | 6.1 |
| $SO_2$ (ppm) | 0.02 | | 13.3 |

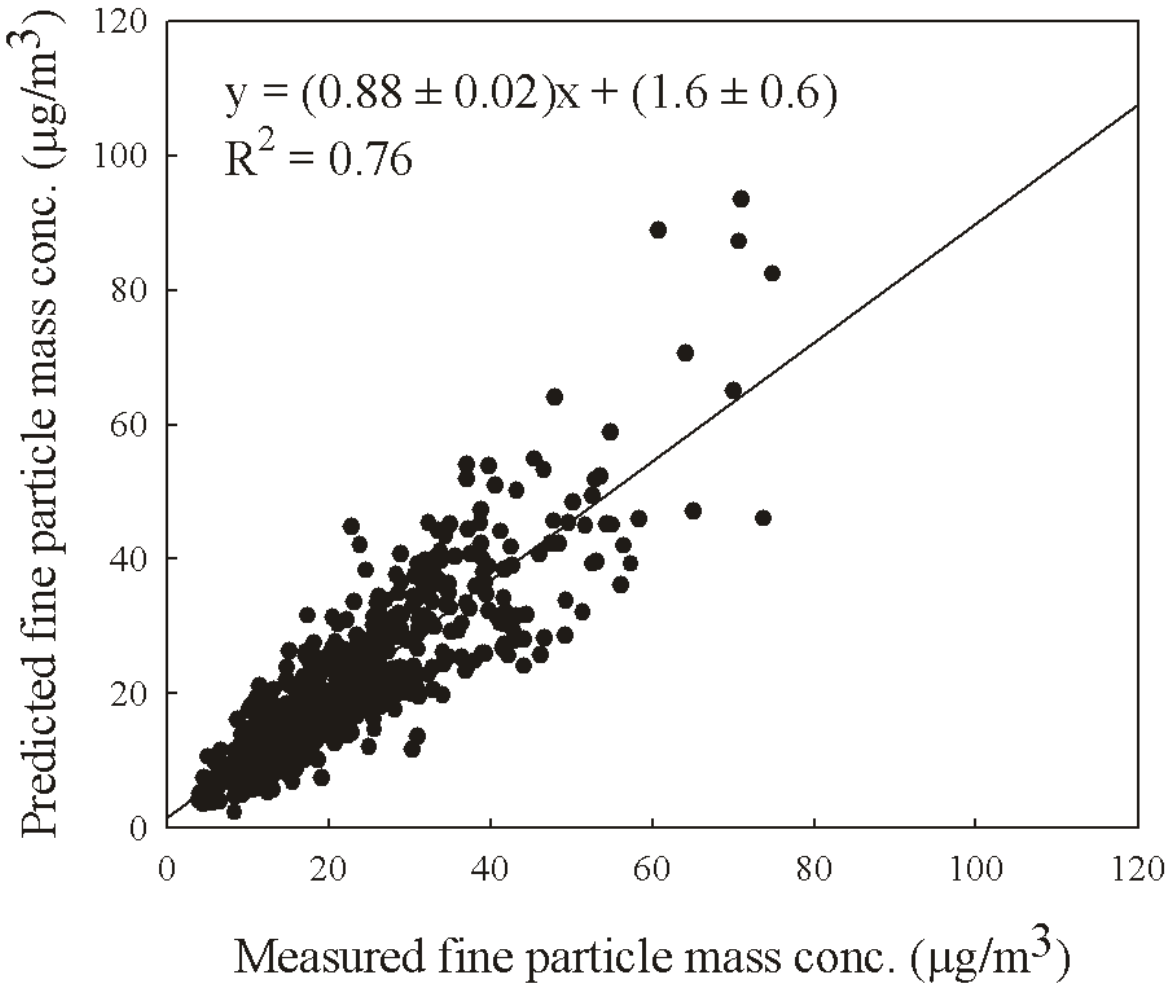


Figure S5 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 112.

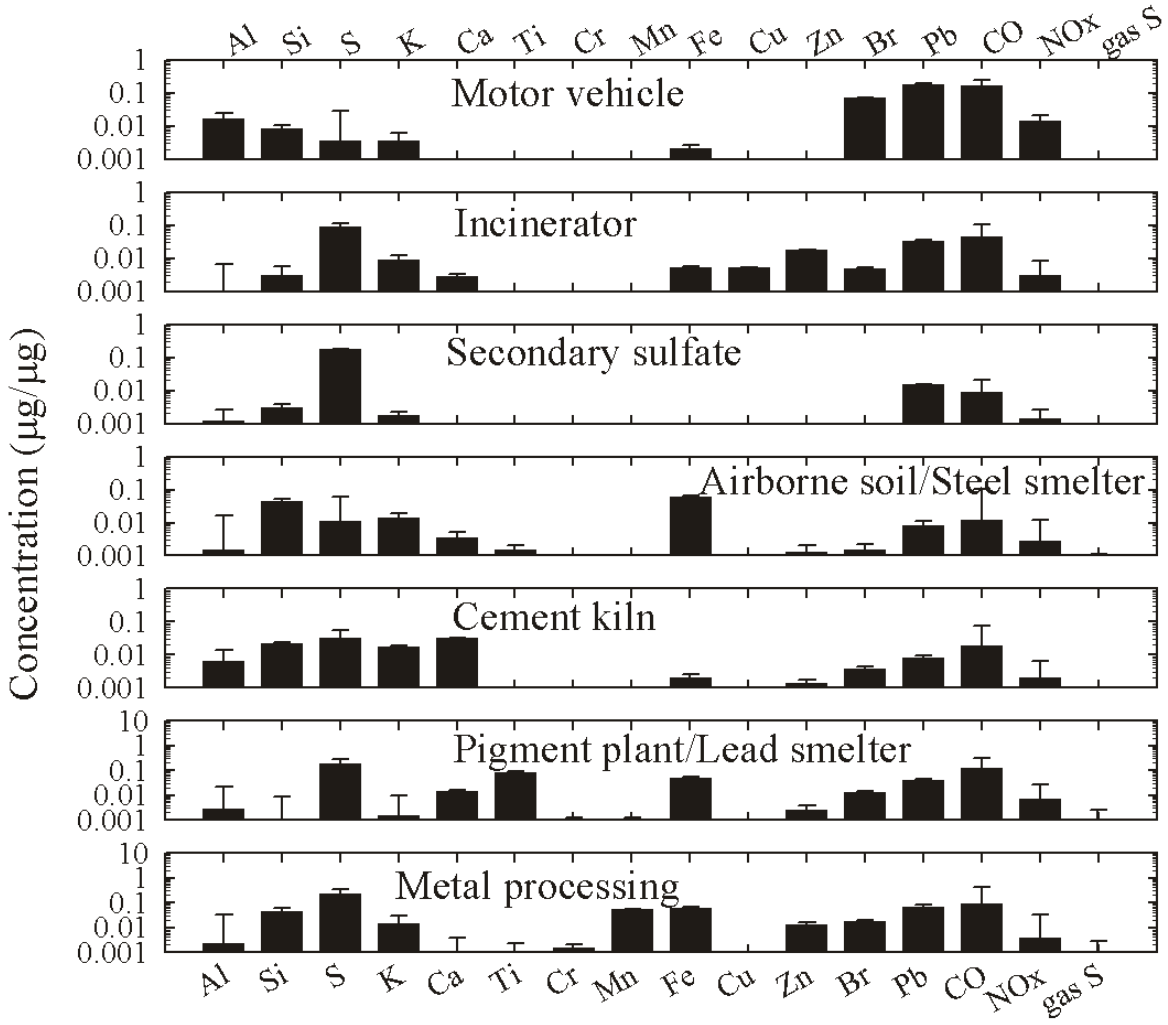


Figure S5 (b). Source profiles (prediction ± standard deviation) at Site 112.

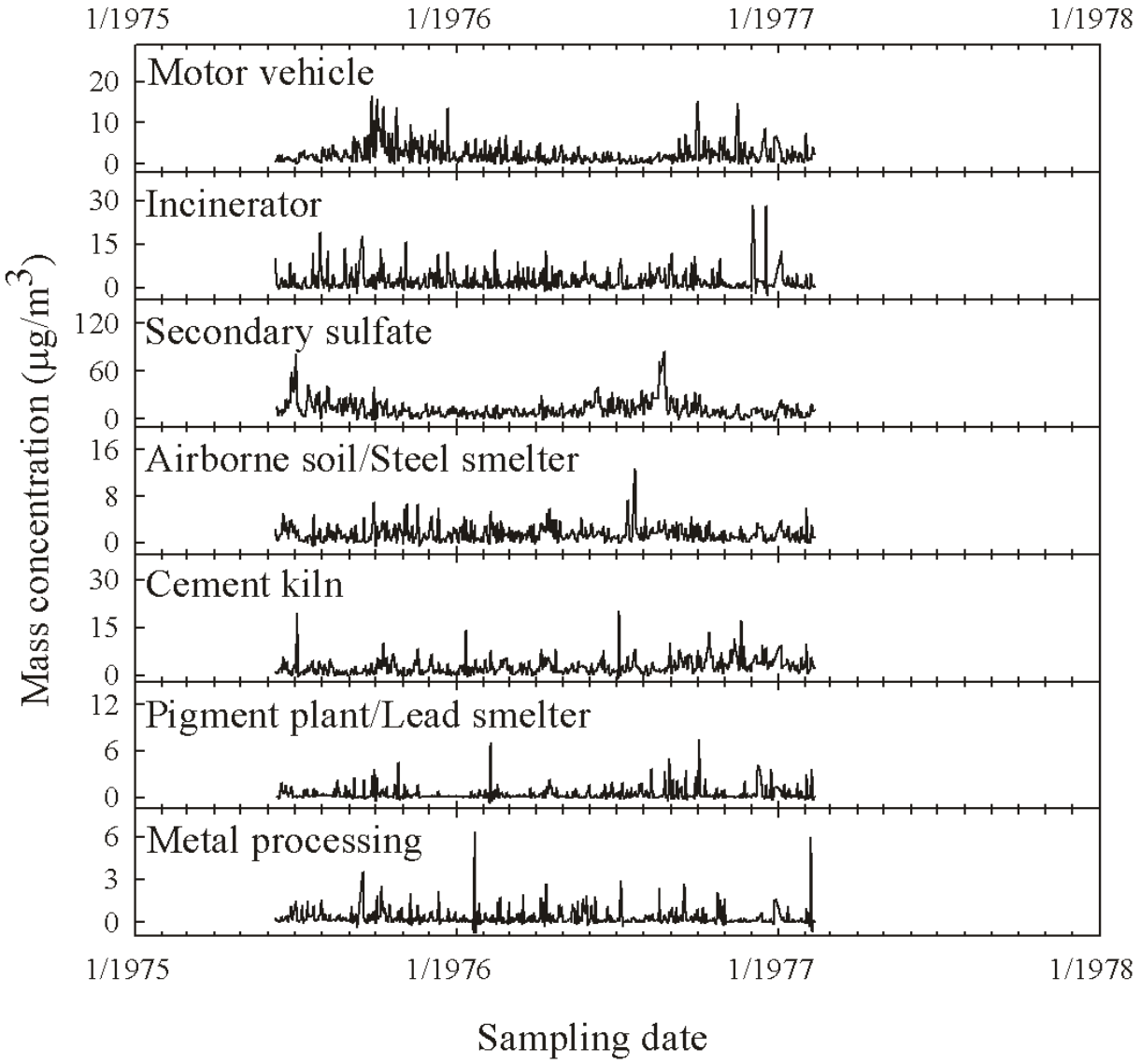


Figure S5 (c). Time series plot of source contributions to Site 112.

Table S5. Summary of $PM_{2.5}$ and species mass concentrations at Site 112.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 22912.06 | 5.1 | 0.0 |
| Al | 155.14 | 37.7 | 4.8 |
| Si | 254.14 | 2.9 | 2.7 |
| Si | 2810.40 | 0.0 | 0.0 |
| K | 140.79 | 0.5 | 0.4 |
| Ca | 111.32 | 11.6 | 5.3 |
| Ti | 47.14 | 43.4 | 13.6 |
| Cr | 6.06 | 71.7 | 17.5 |
| Mn | 23.27 | 32.3 | 5.3 |
| Fe | 164.25 | 0.4 | 0.4 |
| Cu | 17.60 | 18.1 | 12.0 |
| Zn | 72.61 | 0.2 | 1.1 |
| Br | 210.91 | 0.0 | 0.4 |
| Pb | 794.71 | 0.0 | 0.0 |
| CO (ppm) | 0.95 | | 13.3 |
| NOx (ppm) | 0.06 | | 16.6 |
| $SO_2$ (ppm) | 0.01 | | 13.3 |

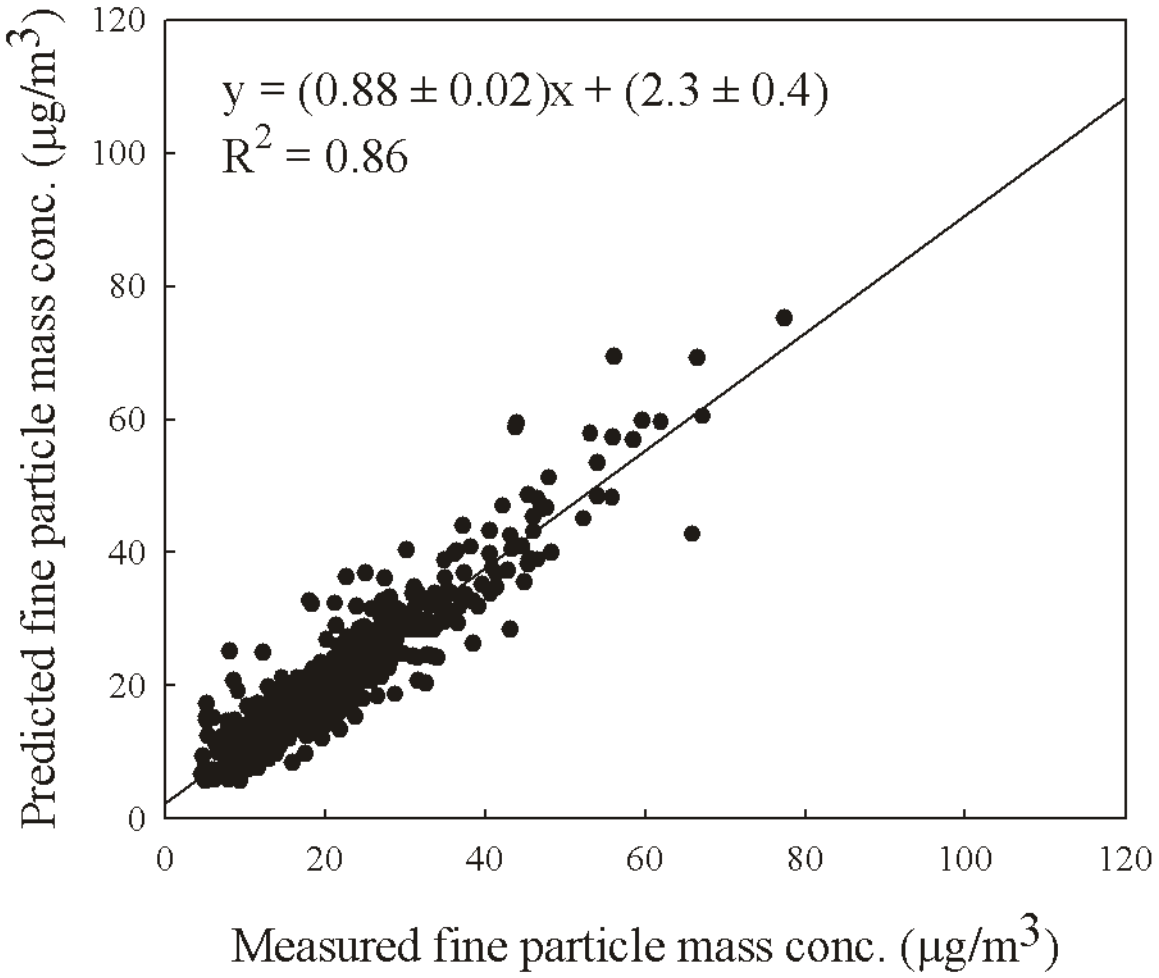


Figure S6 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 115.

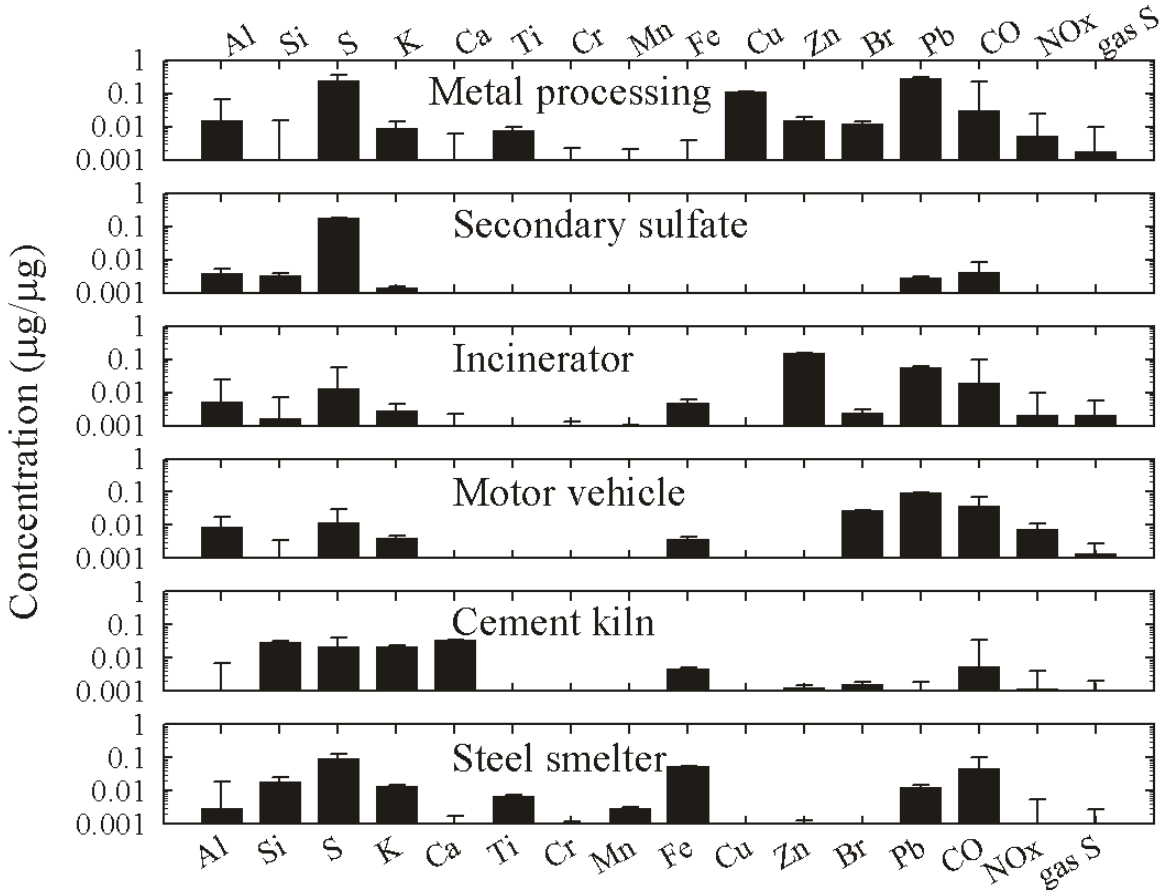


Figure S6 (b). Source profiles (prediction ± standard deviation) at Site 115.

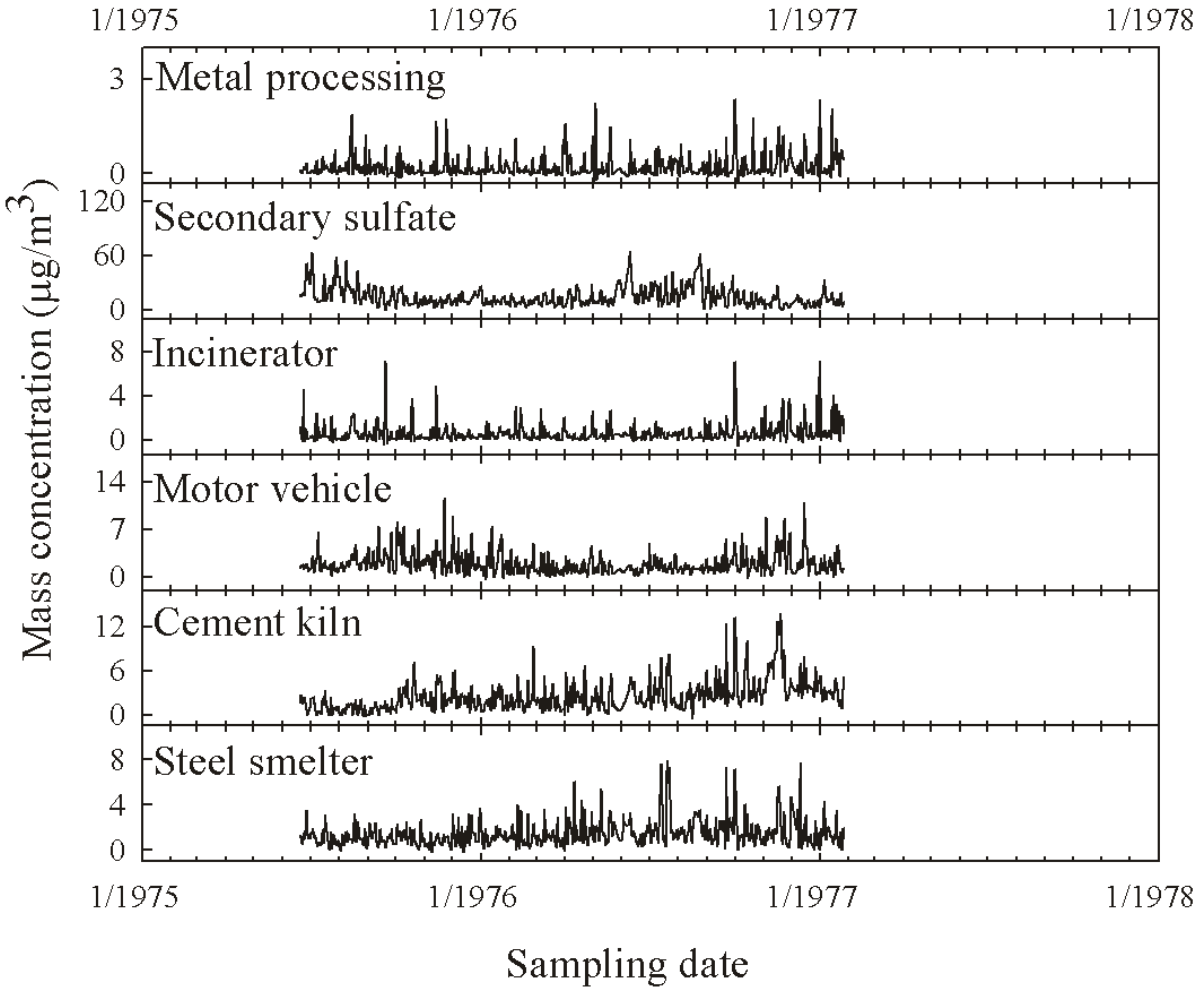


Figure S6 (c). Time series plot of source contributions to Site 115.

Table S7. Summary of $PM_{2.5}$ and species mass concentrations at Site 115.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 21101.98 | 1.1 | 0.0 |
| Al | 108.29 | 27.2 | 2.8 |
| Si | 207.41 | 1.7 | 1.3 |
| Si | 2860.72 | 0.2 | 0.2 |
| K | 118.58 | 0.0 | 0.4 |
| Ca | 93.63 | 20.9 | 3.9 |
| Ti | 14.53 | 67.8 | 16.3 |
| Cr | 4.99 | 83.3 | 20.2 |
| Mn | 9.06 | 49.1 | 6.9 |
| Fe | 110.65 | 0.0 | 0.9 |
| Cu | 31.57 | 19.2 | 15.2 |
| Zn | 112.25 | 0.2 | 0.6 |
| Br | 64.76 | 0.0 | 0.6 |
| Pb | 361.44 | 0.0 | 0.4 |
| CO (ppm) | 0.30 | | 7.9 |
| NOx (ppm) | 0.02 | | 4.3 |
| $SO_2$ (ppm) | 0.02 | | 46.6 |

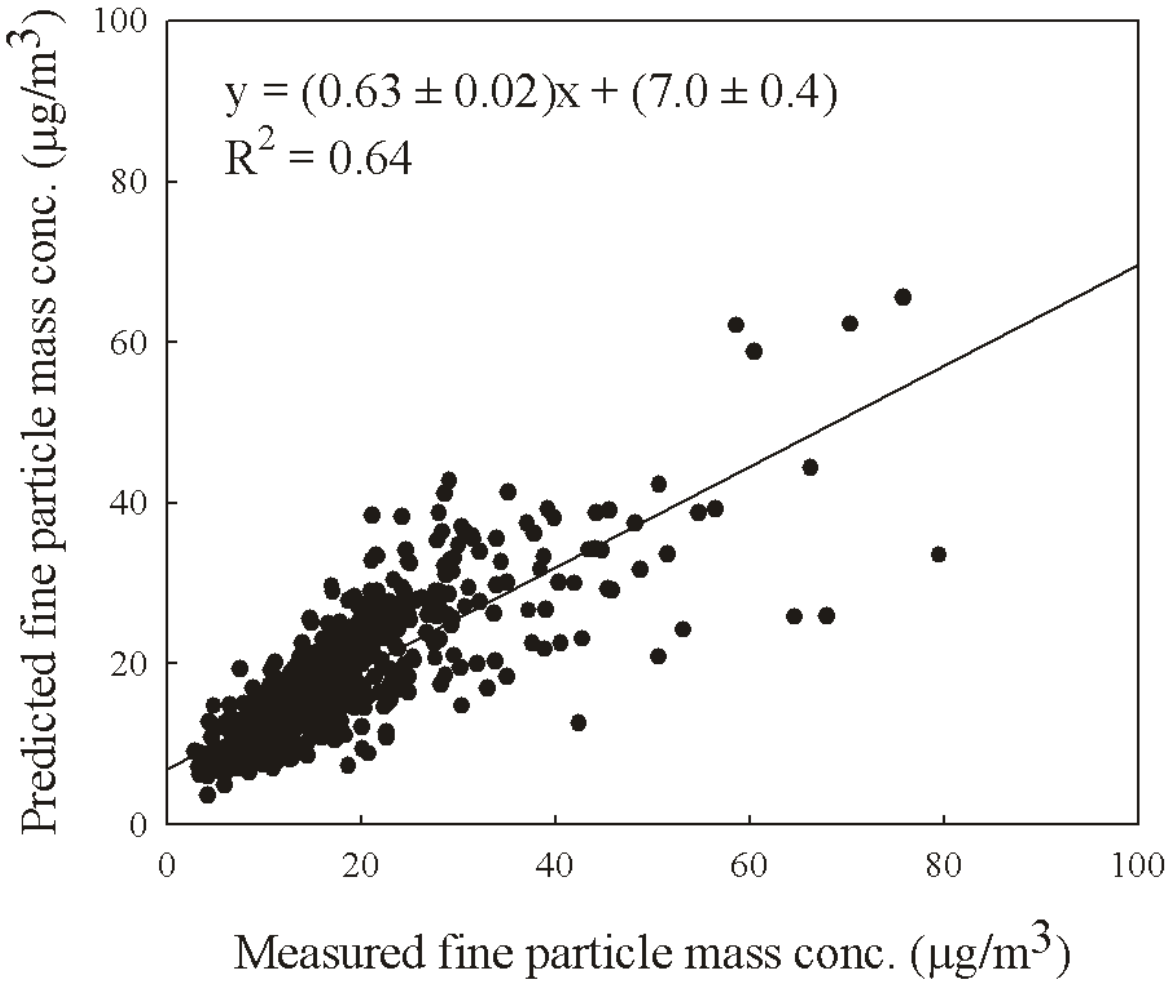


Figure S7 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 118.

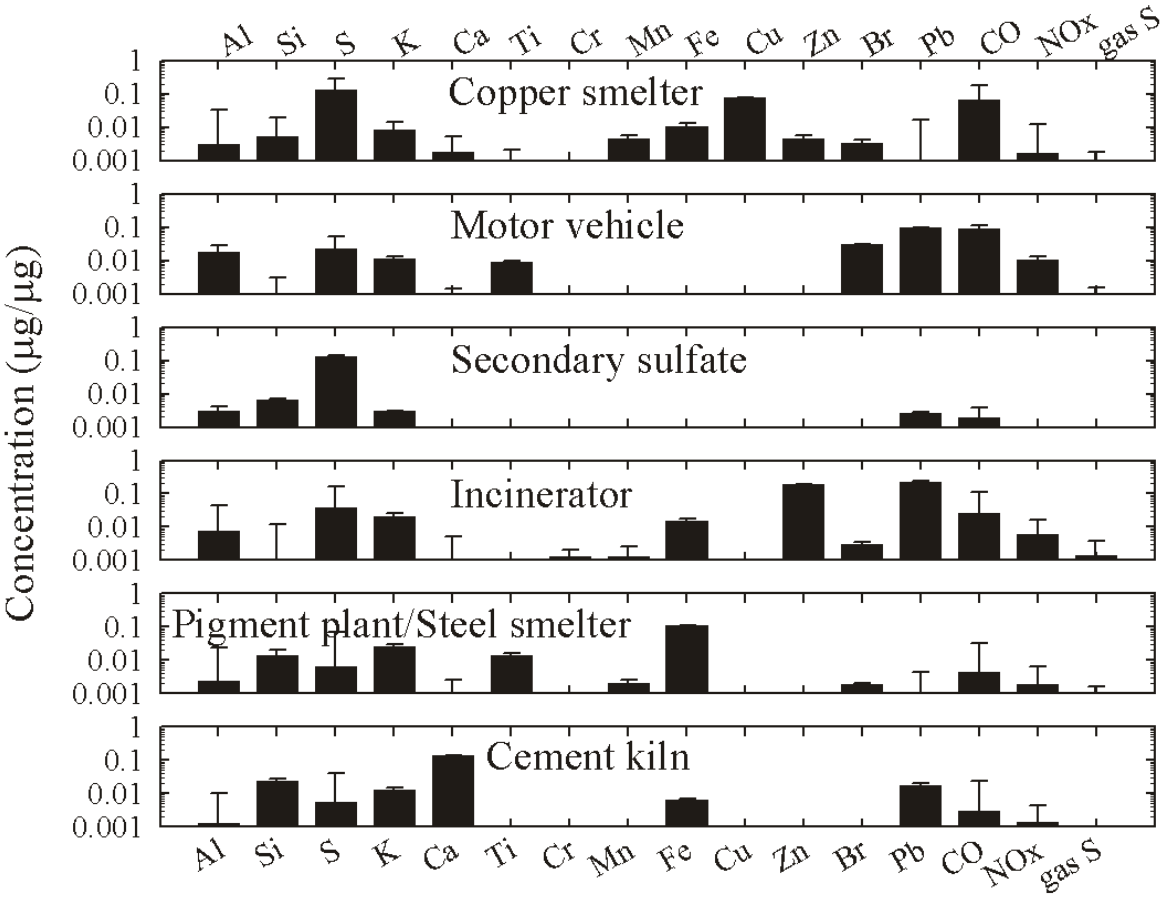


Figure S7 (b). Source profiles (prediction ± standard deviation) at Site 118..

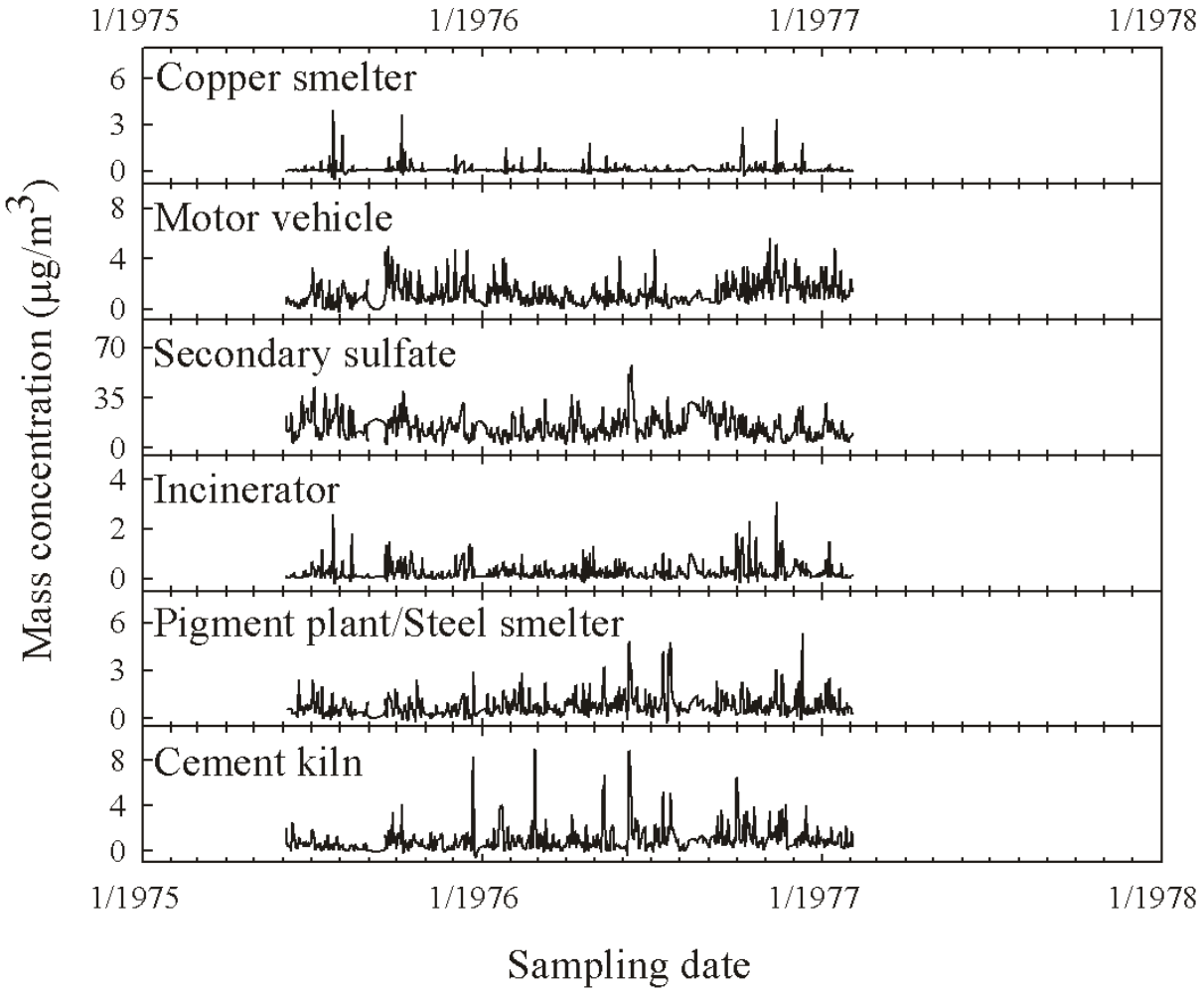


Figure S7 (c). Time series plot of source contributions to Site 118.

Table S7. Summary of $PM_{2.5}$ and species mass concentrations at Site 118.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 18433.35 | 2.3 | 0.0 |
| Al | 100.58 | 23.2 | 4.9 |
| Si | 188.68 | 0.8 | 1.8 |
| Si | 2483.76 | 0.0 | 0.2 |
| K | 116.51 | 0.0 | 0.6 |
| Ca | 150.56 | 8.0 | 1.9 |
| Ti | 36.87 | 50.5 | 18.5 |
| Cr | 4.12 | 89.2 | 27.5 |
| Mn | 8.77 | 54.0 | 12.3 |
| Fe | 111.43 | 0.0 | 0.8 |
| Cu | 14.47 | 31.2 | 22.6 |
| Zn | 55.80 | 0.6 | 1.2 |
| Br | 44.69 | 0.0 | 0.8 |
| Pb | 282.68 | 0.0 | 0.2 |
| CO (ppm) | 0.22 | | 4.9 |
| NOx (ppm) | 0.02 | | 9.4 |
| $SO_2$ (ppm) | 0.01 | | 8.8 |

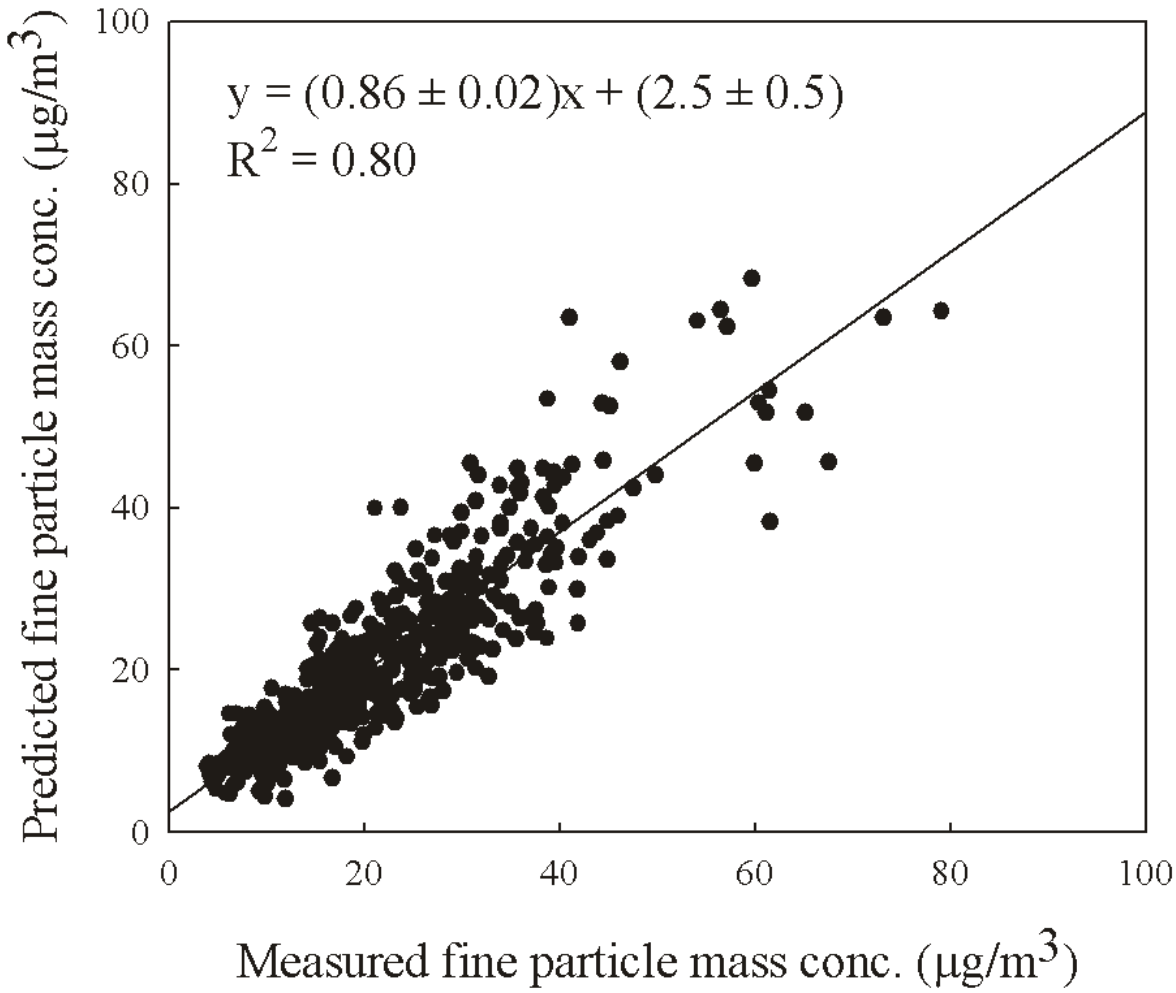


Figure S8 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 120.

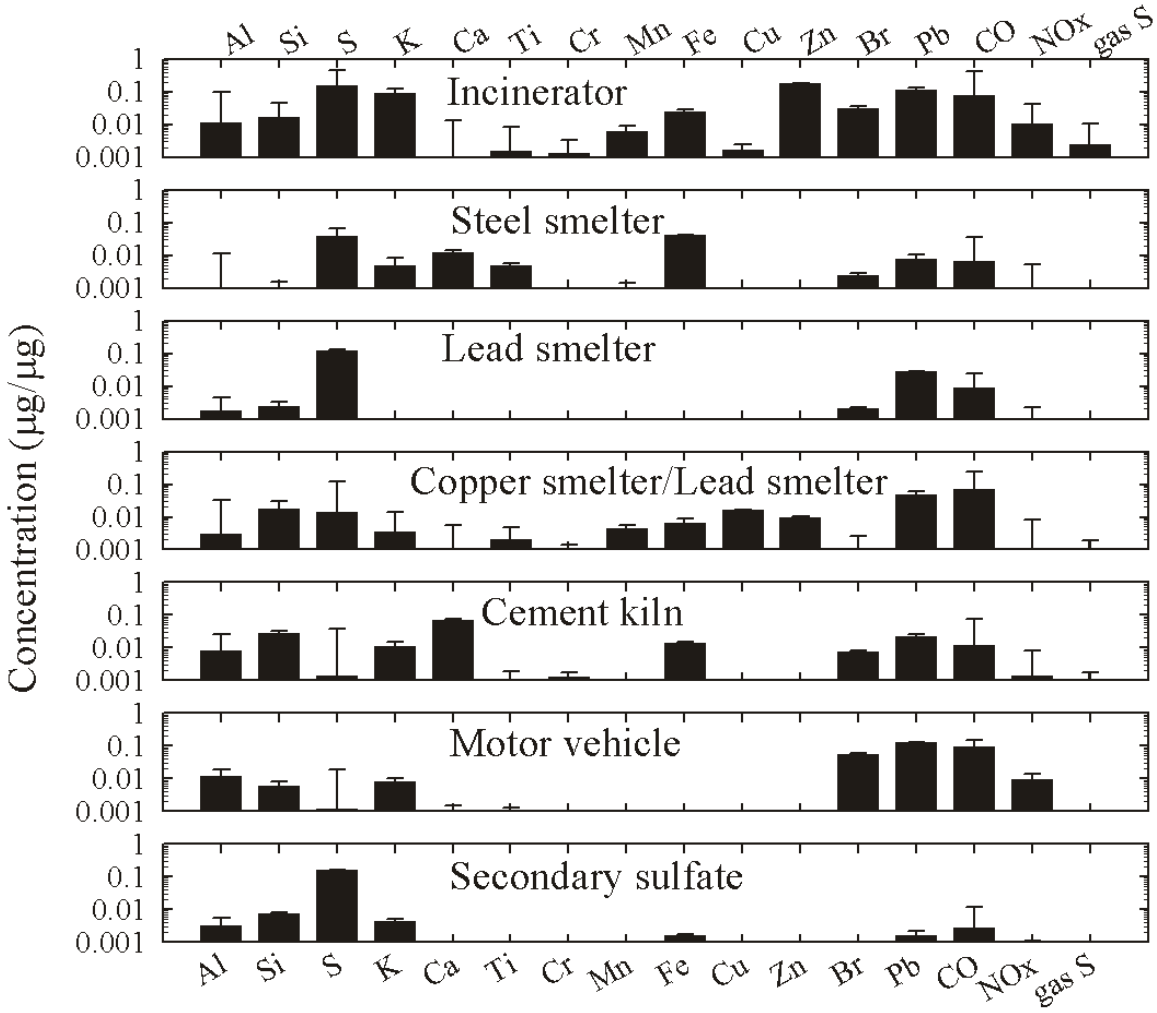


Figure S8 (b). Source profiles (prediction ± standard deviation) at Site 120.

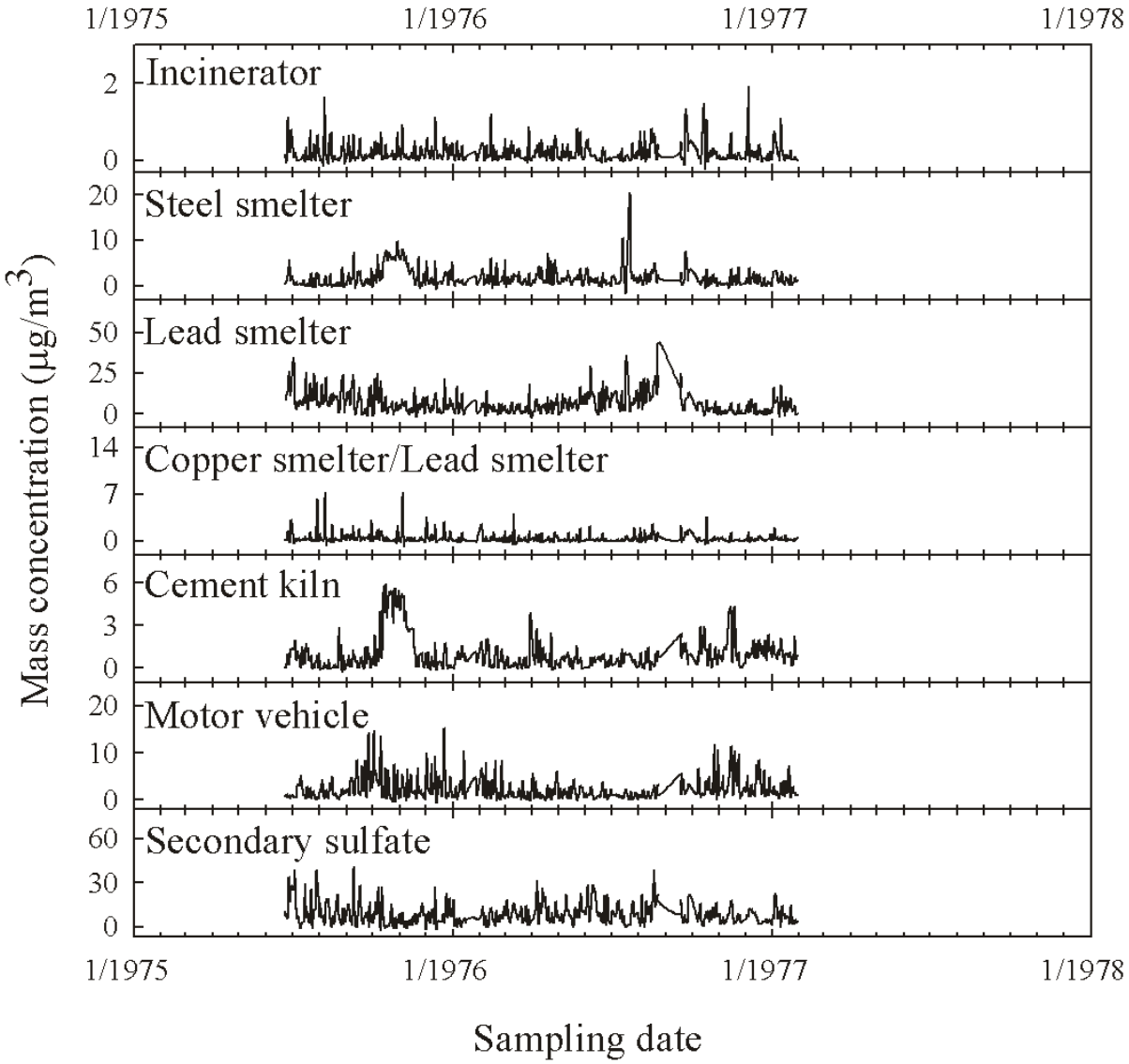


Figure S8 (c). Time series plot of source contributions to Site 120.

Table S8. Summary of $PM_{2.5}$ and species mass concentrations at Site 120.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 21965.29 | 1.6 | 0.0 |
| Al | 106.20 | 20.0 | 4.7 |
| Si | 178.40 | 1.6 | 1.0 |
| Si | 2543.05 | 0.0 | 0.2 |
| K | 116.40 | 0.0 | 0.6 |
| Ca | 99.22 | 15.4 | 7.1 |
| Ti | 22.62 | 56.3 | 22.2 |
| Cr | 5.55 | 79.7 | 26.3 |
| Mn | 10.69 | 51.6 | 12.0 |
| Fe | 116.55 | 0.2 | 1.4 |
| Cu | 9.97 | 27.2 | 22.8 |
| Zn | 48.77 | 0.8 | 2.4 |
| Br | 169.20 | 0.0 | 0.0 |
| Pb | 603.14 | 0.0 | 0.2 |
| CO (ppm) | 0.54 | | 11.0 |
| NOx (ppm) | 0.03 | | 7.9 |
| $SO_2$ (ppm) | 0.01 | | 18.1 |

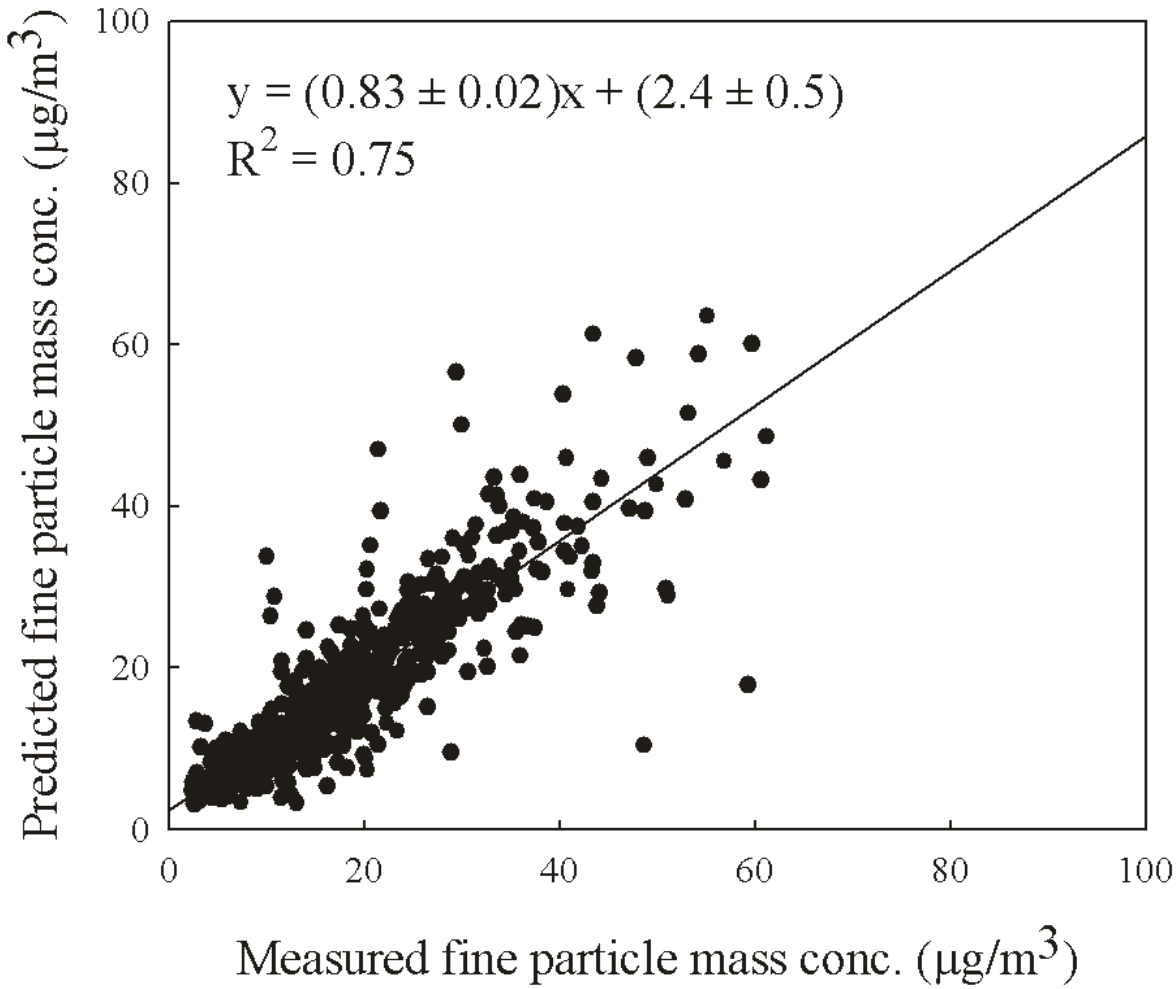


Figure S9 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 122.

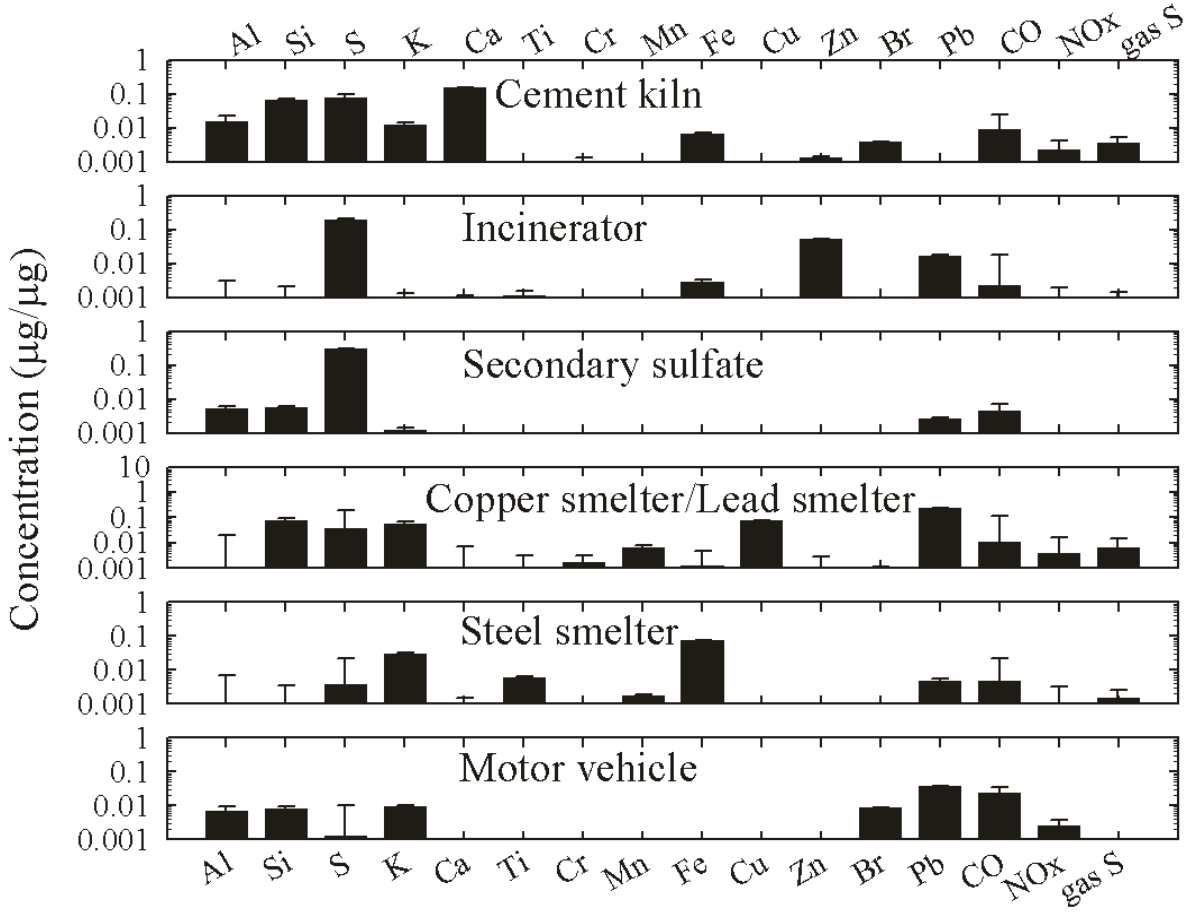


Figure S9 (b). Source profiles (prediction ± standard deviation) at Site 122.

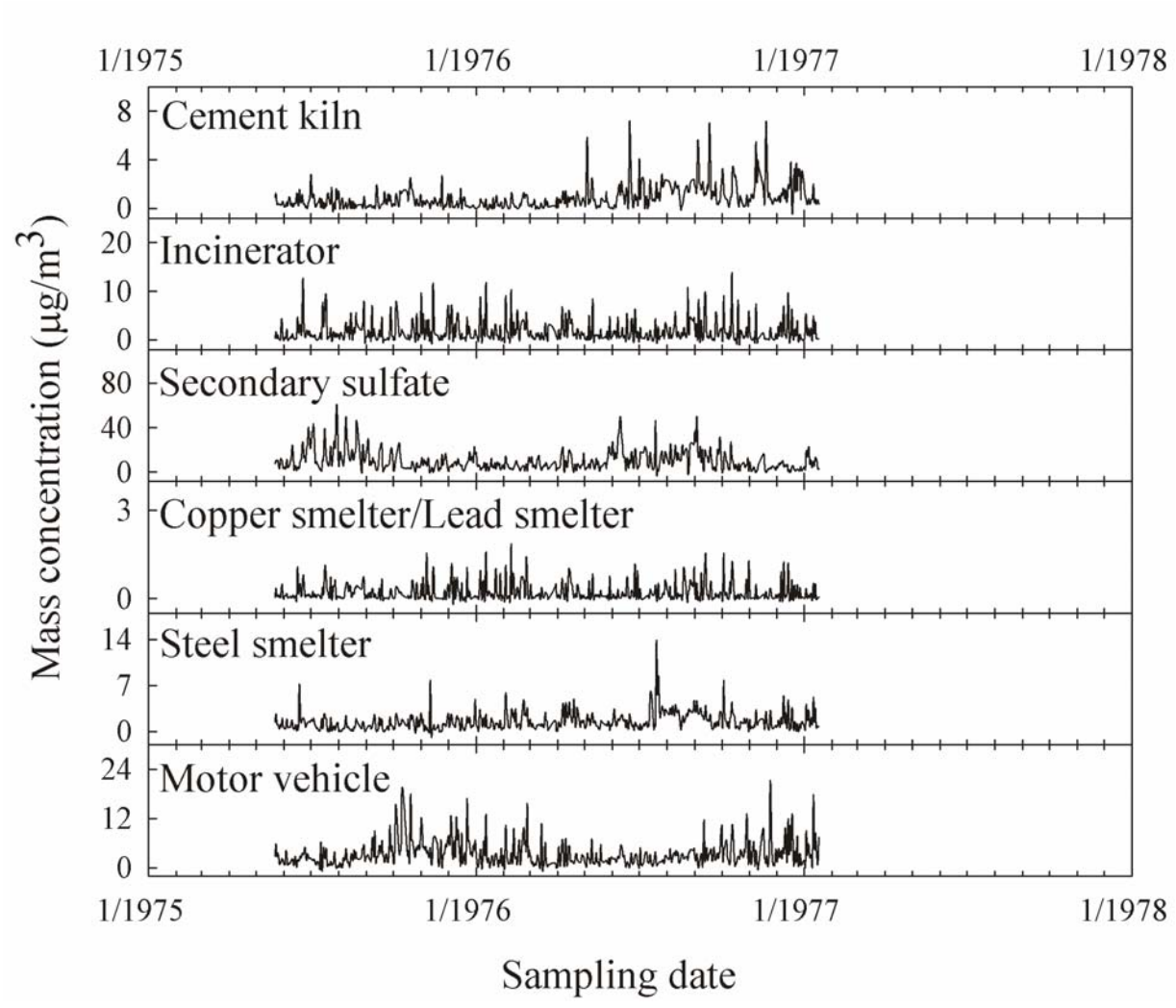


Figure S9 (c). Time series plot of source contributions to Site 122.

Table S9. Summary of $PM_{2.5}$ and species mass concentrations at Site 122.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 18731.65 | 3.7 | 0.0 |
| Al | 99.09 | 24.8 | 8.6 |
| Si | 179.51 | 3.5 | 4.6 |
| Si | 2607.55 | 0.0 | 0.0 |
| K | 104.68 | 0.0 | 0.2 |
| Ca | 96.98 | 19.3 | 10.6 |
| Ti | 11.83 | 69.7 | 35.3 |
| Cr | 3.64 | 88.0 | 35.9 |
| Mn | 8.34 | 54.0 | 18.3 |
| Fe | 100.57 | 0.6 | 2.7 |
| Cu | 14.00 | 18.6 | 29.1 |
| Zn | 65.84 | 2.1 | 3.7 |
| Br | 27.20 | 0.2 | 3.1 |
| Pb | 187.46 | 0.0 | 0.2 |
| CO (ppm) | 0.16 | | 7.5 |
| NOx (ppm) | 0.01 | | 6.2 |
| $SO_2$ (ppm) | 0.02 | | 20.7 |

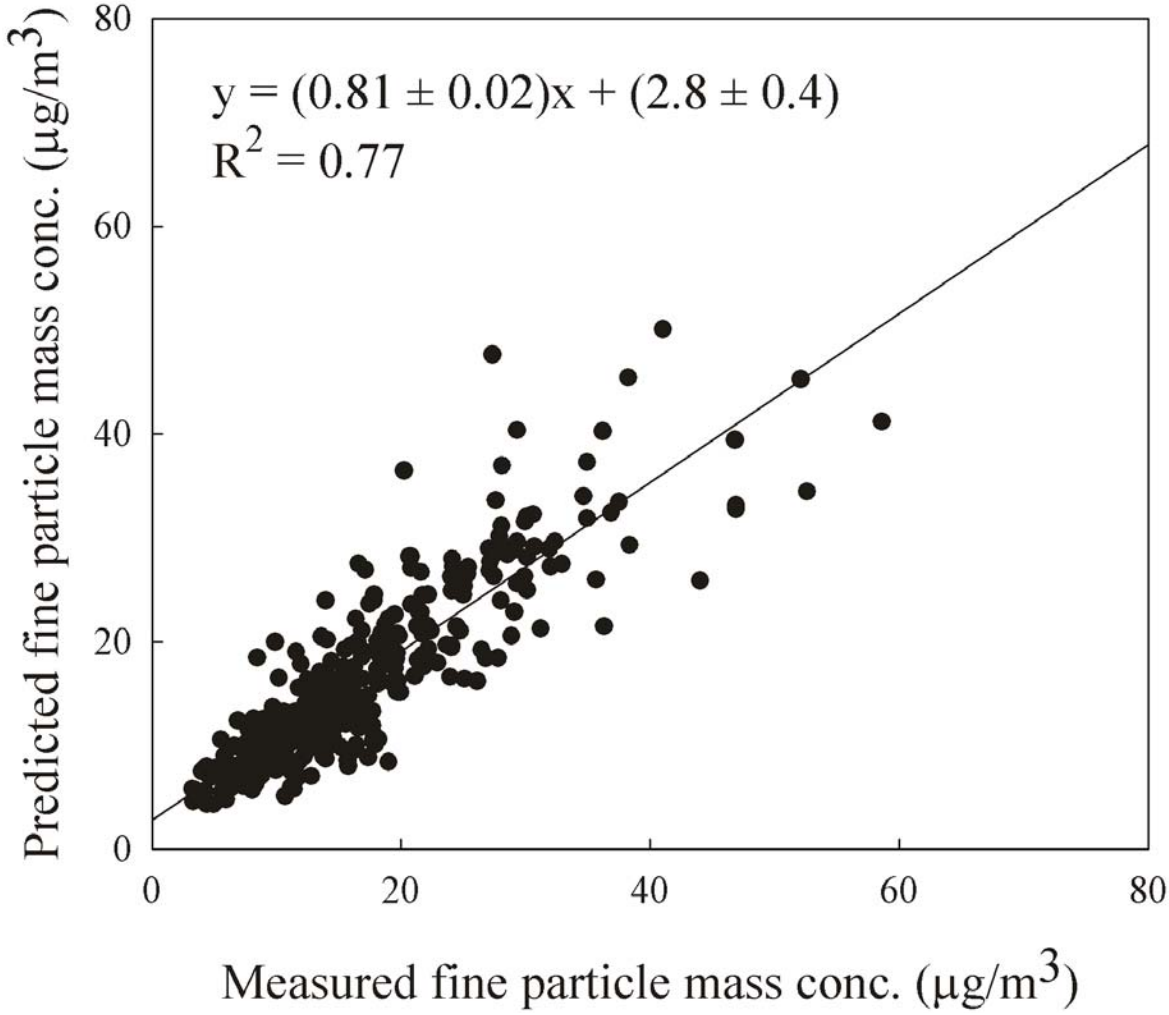


Figure S10 (a). Measure versus predicted $PM_{2.5}$ mass concentration at Site 124.

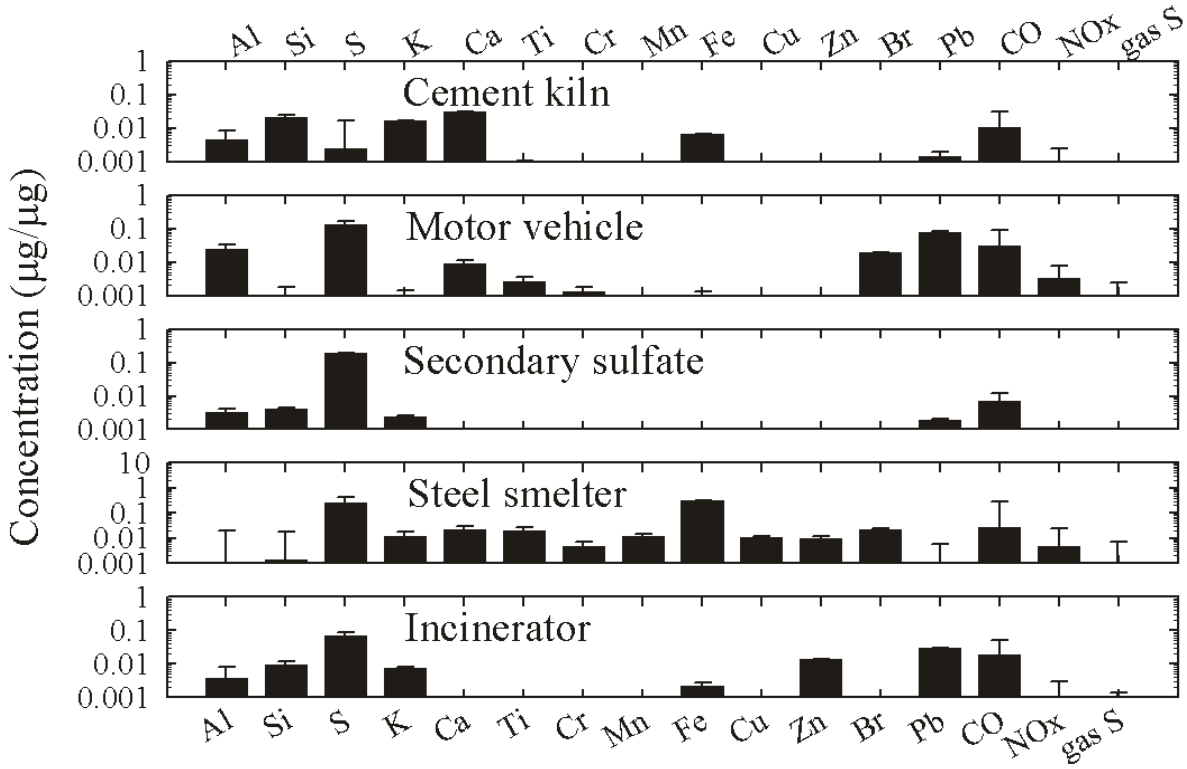


Figure S10 (b). Source profiles (prediction ± standard deviation) at Site 124.

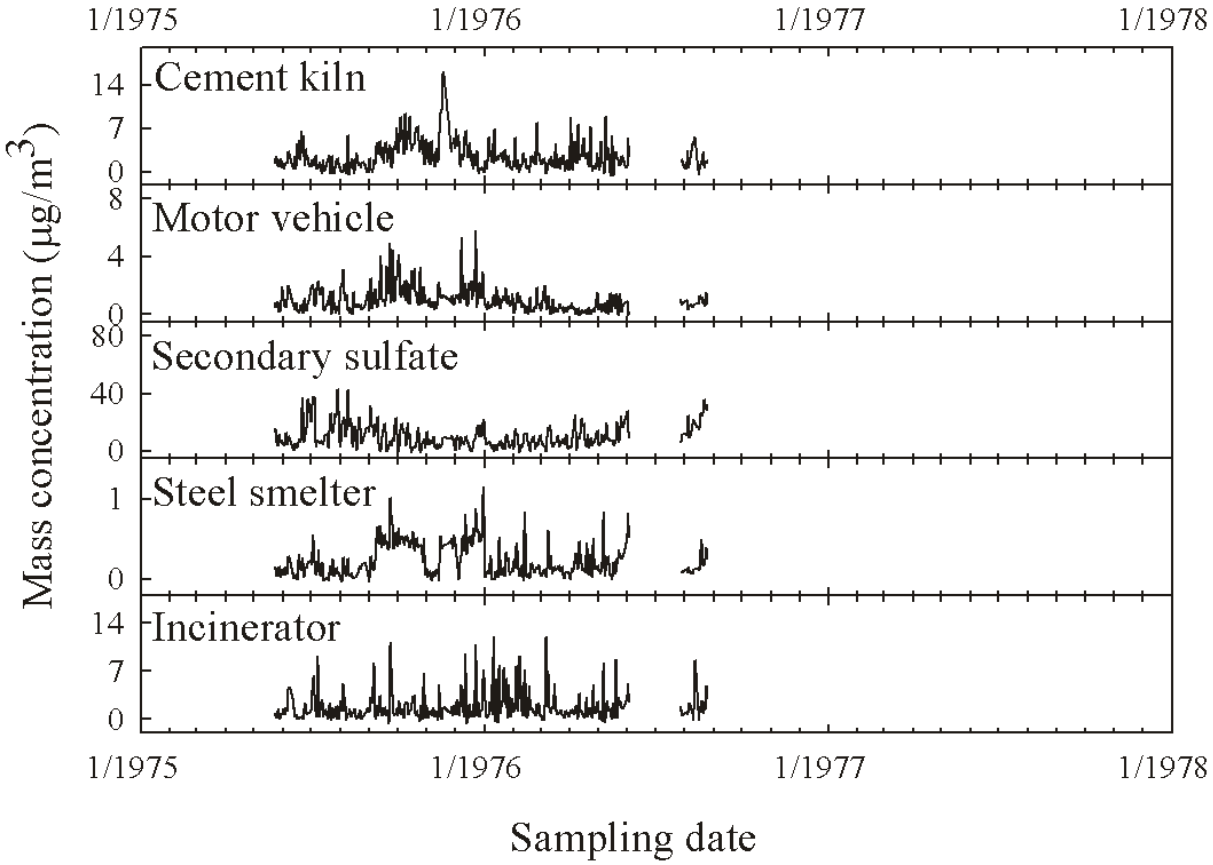


Figure S10 (c). Time series plot of source contributions to Site 124.

Table S10. Summary of $PM_{2.5}$ and species mass concentrations at Site 124.

| Species | Arithmetic mean ($ng/m^3$) | % Below detection limit values | % Missing values |
|---|---|---|---|
| $PM_{2.5}$ | 16441.00 | 4.4 | 0.0 |
| Al | 109.35 | 23.4 | 1.4 |
| Si | 166.20 | 3.6 | 1.9 |
| Si | 2505.48 | 0.0 | 0.3 |
| K | 91.62 | 0.0 | 0.5 |
| Ca | 107.19 | 6.1 | 5.8 |
| Ti | 11.10 | 84.2 | 21.7 |
| Cr | 5.25 | 91.5 | 25.8 |
| Mn | 7.39 | 65.7 | 12.6 |
| Fe | 97.40 | 0.6 | 0.3 |
| Cu | 5.94 | 42.4 | 45.6 |
| Zn | 30.61 | 1.4 | 4.1 |
| Br | 26.45 | 0.0 | 1.6 |
| Pb | 163.97 | 0.0 | 0.8 |
| CO (ppm) | 0.20 | | 14.6 |
| NOx (ppm) | 0.01 | | 10.7 |
| $SO_2$ (ppm) | 0.01 | | 8.8 |

Table S11. Summary of previous study of Alpert and Hopke (1981). Site: 112, July 1976 - August 1976. Method: Target transformation factor analysis.

| Sources | % contribution |
|---|---|
| Secondary sulfate aerosol | 65 |
| Motor vehicle | 15 |
| Soil/Fly ash | 11 |
| Refuse | 4 |
| Point | 4 |
| Unknown | 4 |

Table S12. Summary of previous study of Liu et al. (1982). Site: 108, July 1976 - August 1976. Method: Target transformation factor analysis.

| Sources | % contribution |
|---|---|
| Secondary sulfate aerosol | 61.0 |
| Motor vehicle | 17.0 |
| Soil/Fly ash | 9.1 |
| Smelter | 2.2 |
| Unidentified | 10.0 |

Table S13. Summary of previous study of Chang and Hopke (1982). Site: 105, 106, 112, 118, and 120, May 1975 - April 1977. Method: Target transformation factor analysis.

| Sources | % contribution |
|---|---|
| Secondary sulfate aerosol | 68.3 |
| Motor vehicle | 10.5 |
| Soil/Fly ash | 7.2 |
| Copper plant | 14.0 |

Table S14. Summary of previous study of Chang et al. (1988). Site: 105 and 106, May 1975 - April 1977. Method: Target transformation factor analysis.

| Sources | % contribution |
|---|---|
| Secondary sulfate aerosol | 66.7 |
| Iron/Steel complex | 10.0 |
| Motor vehicle | 9.1 |
| Pigmant plant | 7.6 |
| Incinerator | 3.9 |
| Soil/Fly ash | 2.7 |