



Supplement of

Chemical characterization of fine organic aerosol for source apportionment at Monterrey, Mexico

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Table S1. Concentrations of organic compounds in MMA (PM_{2.5}) in ng m⁻³

| | Spring 2011 | | | | Fall 2011 | | | | Spring 2012 | | | | Fall 2012 | | | |
|-------------------------------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|-------------|--------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|
| | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | |
| | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD |
| <i>Triterpanes (hopanes)</i> | | | | | | | | | | | | | | | | |
| 17a,21b-29-hopane | 1.12 | 0.40 | 0.59 | 0.32 | 1.66 | 0.67 | 1.21 | 0.43 | 0.56 | 0.19 | 0.90 | 0.43 | 1.04 | 0.57 | 0.58 | 0.24 |
| 17a, 21b -hopane | 0.89 | 0.41 | 0.44 | 0.20 | 2.36 | 1.37 | 1.84 | 0.86 | 0.50 | 0.11 | 1.31 | 0.63 | 1.49 | 0.78 | 0.68 | 0.31 |
| 22S 17a,21b-30-homohopane | 0.25 | 0.16 | 0.11 | 0.09 | 0.78 | 0.36 | 0.53 | 0.14 | 0.18 | 0.06 | 0.31 | 0.15 | 0.63 | 0.33 | 0.28 | 0.14 |
| 22R 17a,21b-30-homohopane | 0.39 | 0.24 | 0.11 | 0.10 | 0.45 | 0.40 | 0.84 | 0.15 | 0.15 | 0.12 | 0.30 | 0.13 | 0.65 | 0.39 | 0.30 | 0.18 |
| 22S 17a,21b-30-bishomohopane | 0.10 | 0.10 | 0.05 | 0.02 | 0.35 | 0.07 | 0.28 | 0.04 | 0.13 | 0.06 | 0.15 | 0.08 | 0.40 | 0.19 | 0.16 | 0.09 |
| 22R 17a,21b-30-bishomohopane | 0.06 | 0.03 | 0.05 | 0.02 | 0.17 | 0.10 | 0.19 | 0.13 | 0.10 | 0.03 | 0.10 | 0.07 | 0.30 | 0.14 | 0.12 | 0.08 |
| 18a(H) 22,29,30 trisnorneohopane | 0.29 | 0.16 | 0.11 | 0.10 | 0.37 | 0.29 | 0.37 | 0.11 | 0.12 | 0.06 | 0.27 | 0.13 | 0.31 | 0.24 | 0.14 | 0.07 |
| 17a(H)-22,29,30-trisnorhopane | ND | | ND | | 0.60 | 0.34 | 0.53 | 0.20 | 0.16 | 0.07 | 0.36 | 0.16 | 0.37 | 0.23 | 0.21 | 0.09 |
| 18a(H)-30-Norneohopane | ND | | ND | | 0.33 | 0.33 | 0.32 | 0.21 | 0.11 | 0.04 | 0.26 | 0.12 | 0.26 | 0.12 | 0.15 | 0.07 |
| Total | 3.10 | 1.49 | 1.47 | 0.86 | 7.08 | 3.95 | 6.11 | 2.29 | 2.00 | 0.74 | 3.95 | 1.91 | 5.45 | 2.98 | 2.63 | 1.27 |
| <i>Sugars and sterols</i> | | | | | | | | | | | | | | | | |
| Levoglucosan | 19.60 | 15.79 | 10.56 | 13.53 | 23.57 | 4.15 | 10.19 | 7.74 | 17.74 | 18.81 | 11.63 | 9.87 | 2.51 | 3.95 | 1.49 | 1.53 |
| Cholesterol | 0.49 | 0.37 | 0.35 | 0.48 | 0.50 | 0.06 | 0.78 | 0.03 | 1.14 | 0.90 | 0.67 | 0.85 | 0.24 | 0.02 | 0.30 | 0.07 |
| Stigmasterol | 0.04 | 0.08 | 0.05 | 0.09 | 0.53 | 0.63 | 0.50 | 0.43 | 0.27 | 0.24 | 0.10 | 0.09 | 0.07 | 0.02 | 0.13 | 0.05 |
| Total | 20.13 | 16.25 | 10.96 | 14.10 | 24.60 | 4.84 | 11.47 | 8.21 | 19.15 | 19.94 | 12.39 | 10.81 | 2.82 | 3.99 | 1.92 | 1.66 |
| <i>PAH</i> | | | | | | | | | | | | | | | | |
| fluoranthene | 0.05 | 0.08 | 0.01 | 0.01 | 0.08 | 0.02 | 0.07 | 0.07 | 0.03 | 0.01 | 0.02 | 0.01 | 0.18 | 0.12 | 0.19 | 0.22 |
| acephenanthrylene | 0.18 | 0.00 | 0.17 | 0.00 | 0.07 | 0.02 | 0.05 | 0.01 | 0.05 | 0.04 | 0.02 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 |
| pyrene | 0.05 | 0.08 | 0.02 | 0.03 | 0.07 | 0.03 | 0.04 | 0.03 | 0.02 | 0.02 | 0.00 | 0.00 | 0.11 | 0.06 | 0.09 | 0.10 |
| benz(a)anthracene | 0.01 | 0.01 | 0.03 | 0.02 | 1.65 | 0.30 | 0.56 | 0.96 | 0.02 | 0.01 | 0.15 | 0.30 | 0.36 | 0.21 | 0.37 | 0.44 |
| Chrysene | 0.06 | 0.07 | 0.02 | 0.02 | 1.70 | 0.44 | 1.95 | 0.44 | 2.07 | 0.44 | 1.48 | 0.52 | 0.66 | 0.35 | 0.72 | 0.97 |
| benzofluoranthenes | 0.18 | 0.20 | 0.05 | 0.02 | 1.04 | 0.35 | 0.54 | 0.09 | 0.35 | 0.15 | 0.11 | 0.05 | 1.37 | 0.69 | 0.99 | 1.13 |

Table S1 (continued)

| | Spring 2011 | | | | Fall 2011 | | | | Spring 2012 | | | | Fall 2012 | | | | |
|----------------------|--------------|-------------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|--------------|-------------|--|
| | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | | |
| | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | |
| BaP + BeP | 0.06 | 0.09 | 0.01 | 0.01 | 1.12 | 0.38 | 0.70 | 0.14 | 0.85 | 0.39 | 0.48 | 0.16 | 1.31 | 0.78 | 0.82 | 0.70 | |
| perylene | 0.03 | 0.02 | 0.01 | 0.01 | 0.08 | 0.03 | 0.08 | 0.03 | 0.08 | 0.03 | 0.43 | 0.27 | 0.05 | 0.02 | 0.05 | 0.04 | |
| indeno(123cd)pyrene | 0.20 | 0.03 | 0.17 | 0.02 | 0.24 | 0.10 | 0.23 | 0.06 | 0.11 | 0.06 | 0.02 | 0.02 | 0.36 | 0.21 | 0.23 | 0.19 | |
| Benzo(ghi)perylene | 0.29 | 0.04 | 0.20 | 0.02 | 0.41 | 0.02 | 0.26 | 0.17 | 0.20 | 0.08 | 0.04 | 0.02 | 0.68 | 0.30 | 0.40 | 0.30 | |
| dibenz(ah)anthracene | 0.06 | 0.02 | 0.04 | 0.02 | 0.08 | 0.04 | 0.09 | 0.02 | 0.03 | 0.02 | 0.01 | 0.01 | 0.07 | 0.06 | 0.05 | 0.04 | |
| Coronene | NA | | NA | | 0.34 | 0.03 | 0.26 | 0.02 | 0.17 | 0.08 | 0.09 | 0.01 | 0.22 | 0.11 | 0.11 | 0.07 | |
| Total | 1.17 | 0.64 | 0.73 | 0.08 | 6.87 | 1.75 | 4.83 | 2.05 | 3.95 | 1.30 | 2.85 | 1.40 | 5.40 | 2.92 | 4.03 | 4.20 | |
| <i>n-alkanes</i> | | | | | | | | | | | | | | | | | |
| C17 | ND | | ND | | 0.79 | 1.37 | 0.64 | 1.10 | ND | | 1.14 | 1.79 | ND | | ND | | |
| C18 | ND | | ND | | 1.27 | 2.19 | 1.26 | 1.10 | ND | | 0.60 | 0.85 | ND | | ND | | |
| C19 | ND | | ND | | 0.71 | 0.68 | 1.34 | 0.52 | ND | | 0.58 | 0.37 | 0.35 | 0.26 | 0.33 | 0.11 | |
| C20 | ND | | ND | | 1.18 | 1.41 | 1.45 | 0.63 | ND | | 0.30 | 0.18 | 0.14 | 0.08 | 0.19 | 0.08 | |
| C21 | 0.19 | 0.15 | 0.50 | 0.27 | 0.93 | 0.64 | 1.57 | 0.48 | 0.09 | 0.14 | 0.37 | 0.14 | 0.14 | 0.10 | 0.18 | 0.09 | |
| C22 | 0.74 | 0.16 | 0.78 | 0.17 | 1.65 | 0.88 | 2.22 | 0.65 | 0.27 | 0.27 | 0.62 | 0.18 | 0.20 | 0.10 | 0.26 | 0.10 | |
| C23 | 1.40 | 0.28 | 1.63 | 0.24 | 2.00 | 0.52 | 3.01 | 0.80 | 1.17 | 0.47 | 1.39 | 0.28 | 0.52 | 0.24 | 0.54 | 0.19 | |
| C24 | 2.30 | 0.62 | 1.92 | 0.40 | 3.36 | 1.98 | 5.12 | 4.41 | 2.63 | 1.25 | 2.56 | 0.45 | 1.09 | 0.61 | 0.94 | 0.40 | |
| C25 | 2.47 | 0.74 | 1.95 | 0.35 | 2.35 | 0.61 | 3.38 | 0.53 | 3.25 | 1.52 | 3.77 | 0.64 | 1.34 | 0.57 | 1.22 | 0.49 | |
| C26 | 1.54 | 0.36 | 1.25 | 0.27 | 3.39 | 0.28 | 3.90 | 0.60 | 2.95 | 0.93 | 3.31 | 1.08 | 1.89 | 0.95 | 1.42 | 0.72 | |
| C27 | 2.79 | 1.14 | 2.28 | 1.16 | 3.02 | 0.42 | 4.19 | 0.42 | 3.23 | 0.78 | 3.79 | 1.19 | 2.50 | 1.17 | 1.94 | 0.90 | |
| C28 | 2.13 | 1.40 | 2.06 | 1.59 | 4.01 | 1.56 | 4.50 | 1.87 | 6.63 | 1.71 | 3.52 | 1.14 | 3.25 | 2.23 | 2.09 | 0.88 | |
| C29 | 3.22 | 2.00 | 2.59 | 1.27 | 2.68 | 1.05 | 3.23 | 1.58 | 3.43 | 0.40 | 4.05 | 0.67 | 3.15 | 1.76 | 2.92 | 1.58 | |
| C30 | 1.11 | 0.56 | 0.89 | 0.37 | 2.01 | 0.87 | 2.44 | 1.39 | 2.76 | 0.36 | 3.43 | 0.79 | 1.87 | 0.81 | 1.43 | 0.63 | |
| C31 | 1.99 | 1.33 | 1.74 | 1.02 | 2.42 | 0.96 | 2.77 | 1.82 | 2.99 | 0.25 | 3.64 | 0.43 | 2.73 | 1.52 | 2.53 | 1.17 | |
| C32 | 0.41 | 0.35 | 0.52 | 0.29 | 1.11 | 0.59 | 1.55 | 1.03 | 1.79 | 0.11 | 2.24 | 0.50 | 1.31 | 0.60 | 1.10 | 0.60 | |
| C33 | 0.57 | 0.52 | 0.57 | 0.39 | 0.45 | 0.77 | 1.03 | 1.29 | 1.29 | 0.22 | 1.60 | 0.45 | 1.30 | 0.71 | 1.16 | 0.51 | |
| Total | 20.86 | 9.60 | 18.67 | 7.80 | 33.32 | 16.80 | 43.61 | 20.23 | 32.49 | 8.41 | 36.90 | 11.13 | 21.79 | 11.70 | 18.24 | 8.45 | |
| CPI | 1.5 | 0.3 | 1.7 | 0.5 | 0.9 | 0.1 | 1.0 | 0.3 | 0.9 | 0.1 | 1.2 | 0.1 | 1.3 | 0.1 | 1.5 | 0.2 | |

Table S1 (continued)

| | Spring 2011 | | | | Fall 2011 | | | | Spring 2012 | | | | Fall 2012 | | | |
|-------------------------|-------------|----|-----------|----|------------|--------------|------------|------------|-------------|------------|------------|--------------|------------|--------------|------------|--------------|
| | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | |
| | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD |
| <i>n-Alkanoic acids</i> | | | | | | | | | | | | | | | | |
| C10 | NA | | NA | | 3.39 | 0.77 | 8.98 | 6.31 | 3.60 | 1.65 | 3.66 | 1.29 | 0.66 | 0.35 | 1.12 | 0.74 |
| C11 | NA | | NA | | 1.53 | 0.32 | 4.04 | 3.11 | 4.87 | 7.91 | 3.64 | 4.32 | 5.38 | 4.37 | 3.82 | 4.14 |
| C12 | NA | | NA | | 23.44 | 7.01 | 31.74 | 10.25 | 7.08 | 2.77 | 18.00 | 8.28 | 3.15 | 2.21 | 4.55 | 2.32 |
| C13 | NA | | NA | | 13.29 | 15.61 | 3.90 | 1.58 | 2.69 | 1.14 | 3.44 | 1.70 | 1.14 | 0.60 | 1.30 | 0.34 |
| C14 | NA | | NA | | 28.26 | 13.17 | 25.16 | 11.95 | 26.99 | 17.84 | 33.27 | 11.62 | 11.77 | 6.34 | 14.03 | 3.38 |
| C15 | NA | | NA | | 7.76 | 2.84 | 6.98 | 3.09 | 17.89 | 9.74 | 11.68 | 5.47 | 6.09 | 2.33 | 5.59 | 1.49 |
| C16 | NA | | NA | | 37.79 | 4.02 | 34.35 | 11.16 | 57.78 | 4.83 | 36.68 | 5.94 | 40.07 | 13.38 | 30.16 | 9.28 |
| C17 | NA | | NA | | 3.62 | 0.58 | 4.90 | 4.17 | 11.98 | 9.00 | 5.02 | 1.08 | 2.84 | 0.93 | 2.73 | 0.69 |
| C18 | NA | | NA | | 33.90 | 3.76 | 31.32 | 8.51 | 48.95 | 7.43 | 29.51 | 4.16 | 23.87 | 6.27 | 17.99 | 4.78 |
| C19 | NA | | NA | | 0.10 | 0.03 | 0.18 | 0.17 | 0.50 | 0.22 | 0.40 | 0.11 | 0.13 | 0.09 | 0.06 | 0.03 |
| C20 | NA | | NA | | 3.59 | 0.46 | 4.49 | 3.32 | 13.32 | 6.58 | 8.23 | 1.66 | 2.99 | 1.39 | 2.36 | 1.24 |
| C21 | NA | | NA | | 5.47 | 2.75 | 5.83 | 2.84 | 10.28 | 2.62 | 5.71 | 1.47 | 3.87 | 1.22 | 2.94 | 1.11 |
| C22 | NA | | NA | | 16.98 | 3.13 | 19.48 | 4.33 | 21.04 | 5.09 | 14.18 | 2.98 | 11.80 | 3.24 | 10.11 | 3.79 |
| C23 | NA | | NA | | 8.85 | 2.75 | 9.91 | 3.45 | 10.29 | 2.65 | 8.31 | 2.27 | 4.53 | 1.20 | 3.99 | 1.37 |
| C24 | NA | | NA | | 23.78 | 4.84 | 32.50 | 8.91 | 30.82 | 6.50 | 25.03 | 5.33 | 15.73 | 6.63 | 14.94 | 4.29 |
| C25 | NA | | NA | | 8.44 | 1.61 | 9.60 | 2.35 | 12.07 | 3.30 | 7.08 | 2.02 | 4.48 | 1.64 | 3.54 | 1.00 |
| C26 | NA | | NA | | 23.58 | 4.67 | 33.53 | 7.89 | 32.08 | 16.83 | 27.34 | 5.06 | 13.54 | 6.11 | 13.73 | 4.75 |
| C27 | NA | | NA | | 4.81 | 1.68 | 6.80 | 2.32 | 6.78 | 1.17 | 5.64 | 1.98 | 2.81 | 0.61 | 2.41 | 0.93 |
| C28 | NA | | NA | | 22.21 | 5.28 | 27.49 | 0.85 | 24.20 | 6.51 | 27.92 | 5.79 | 16.75 | 7.31 | 18.60 | 8.40 |
| C29 | NA | | NA | | 4.33 | 1.03 | 5.11 | 1.61 | 6.77 | 1.56 | 5.57 | 2.03 | 2.37 | 1.20 | 2.27 | 0.74 |
| C30 | NA | | NA | | 20.33 | 6.00 | 26.18 | 2.01 | 19.50 | 4.63 | 30.51 | 10.54 | 15.90 | 9.73 | 15.42 | 6.86 |
| C31 | NA | | NA | | 2.22 | 0.83 | 2.44 | 0.58 | 4.09 | 1.87 | 3.48 | 1.74 | 1.11 | 0.57 | 1.00 | 0.91 |
| C32 | NA | | NA | | 11.56 | 4.36 | 17.39 | 5.53 | 20.71 | 12.37 | 20.93 | 12.76 | 6.79 | 3.91 | 5.64 | 2.79 |
| Total | | | | | 309 | 87.49 | 352 | 106 | 394 | 134 | 335 | 99.62 | 198 | 81.63 | 178 | 65.34 |
| CPI | | | | | 4.3 | 1.0 | 5.0 | 0.4 | 3.6 | 0.6 | 4.7 | 0.8 | 4.7 | 0.3 | 5.3 | 1.1 |

Table S1 (continued)

| | Spring 2011 | | | | Fall 2011 | | | | Spring 2012 | | | | Fall 2012 | | | |
|-----------------------------------|--------------|--------------|--------------|--------------|--------------|-------------|--------------|-------------|--------------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|
| | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | | Daytime | | Nighttime | |
| | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD | Avg | SD |
| <i>n-Alkenoic acids</i> | | | | | | | | | | | | | | | | |
| Oleic acid | NA | | NA | | 3.83 | 1.83 | 4.77 | 3.52 | 15.38 | 8.44 | 8.50 | 2.72 | 1.22 | 1.83 | 0.94 | 0.39 |
| Elaidic acid | NA | | NA | | 7.57 | 2.85 | 8.81 | 2.76 | 12.74 | 7.51 | 13.35 | 4.97 | 2.11 | 2.04 | 2.45 | 0.87 |
| Total | | | | | 11.40 | 4.67 | 13.57 | 6.28 | 28.12 | 15.95 | 21.85 | 7.69 | 3.33 | 3.87 | 3.40 | 1.27 |
| C18:0/C18:1 | | | | | 10.6 | 5.9 | 8.2 | 3.6 | 5.0 | 3.4 | 3.8 | 1.3 | 20.3 | 17.1 | 21.0 | 6.7 |
| <i>Biomass burning tracers</i> | | | | | | | | | | | | | | | | |
| Abietic acid | NA | | NA | | 5.19 | 2.54 | 6.20 | 2.87 | 13.60 | 6.60 | 9.86 | 2.17 | 5.17 | 1.41 | 3.23 | 0.92 |
| Dehydroabietic acid | NA | | NA | | 2.89 | 1.82 | 3.69 | 0.99 | 1.94 | 0.63 | 4.39 | 0.74 | 2.02 | 1.10 | 1.95 | 0.74 |
| 7-Oxo-dehydroabietic acid | NA | | NA | | 0.28 | 0.11 | 0.31 | 0.15 | 0.41 | 0.35 | 0.25 | 0.13 | 0.35 | 0.16 | 0.32 | 0.20 |
| Pimaric acid | NA | | NA | | 0.23 | 0.05 | 0.35 | 0.13 | 0.00 | 0.00 | 0.09 | 0.13 | 0.15 | 0.09 | 0.26 | 0.23 |
| Isopimaric acid | NA | | NA | | 0.08 | 0.03 | 0.12 | 0.05 | 0.00 | 0.00 | 0.03 | 0.06 | 0.07 | 0.03 | 0.06 | 0.02 |
| 9,10-Epoxyoctadecanoic acid | NA | | NA | | 1.25 | 1.35 | 1.78 | 1.54 | 4.96 | 2.16 | 1.19 | 0.72 | 1.59 | 0.85 | 1.31 | 0.81 |
| Guaiacol | NA | | NA | | ND | | ND | | ND | | ND | | 3.04 | 2.59 | 4.61 | 4.42 |
| Vanillin | NA | | NA | | ND | | ND | | ND | | ND | | 18.58 | 19.13 | 9.41 | 3.18 |
| Retene | NA | | NA | | ND | | ND | | ND | | ND | | 0.01 | 0.01 | 0.01 | 0.01 |
| Total | | | | | 9.92 | 5.90 | 12.46 | 5.74 | 21.36 | 9.75 | 15.80 | 3.95 | 30.97 | 25.37 | 21.15 | 10.54 |
| <i>Secondary biogenic tracers</i> | | | | | | | | | | | | | | | | |
| Pinic acid | NA | | NA | | 0.00 | 0.00 | 0.00 | 0.00 | 4.61 | 7.31 | 1.90 | 4.25 | 0.49 | 0.75 | 0.30 | 0.10 |
| cis-Pinonic acid | NA | | NA | | 5.13 | 1.23 | 2.28 | 0.62 | 6.83 | 2.09 | 5.53 | 1.54 | 2.35 | 1.30 | 2.29 | 1.59 |
| Total | | | | | 5.13 | 1.23 | 2.28 | 0.62 | 11.44 | 9.40 | 7.43 | 5.79 | 2.84 | 2.05 | 2.59 | 1.69 |
| Identified OC | 45.27 | 27.98 | 31.83 | 22.83 | 408 | 127 | 447 | 152 | 512 | 200 | 436 | 142 | 270 | 135 | 232 | 94.42 |
| OC | 9200 | 800 | 7300 | 700 | 8800 | 500 | 5800 | 300 | 6700 | 400 | 4000 | 300 | 10200 | 600 | 7100 | 400 |
| EC | 1300 | 400 | 600 | 300 | 900 | 100 | 700 | 100 | 500 | 100 | 10 | 100 | 900 | 100 | 700 | 100 |
| PM _{2.5} | 21300 | 3400 | 27900 | 3300 | 19400 | 2800 | 14000 | 1400 | 15800 | 2200 | 13700 | 1800 | 20100 | 3000 | 16000 | 1800 |

ND: Not Detected; NA: Not Available.