# Supplementary material: Source apportionment of the carbonaceous aerosol in Norway – Quantitative estimates based on $^{14}C$, thermal optical and organic tracer analysis

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Table S1: Concentrations of sugars and sugar-alcohols in $PM_{10}$ (ng $m^{-3}$)

| $PM_{10}$ | Arabitol | Mannitol | Trehalose | Inositol | Erytritol | Sucrose | Fructose | Glucose | Ribose |
|---|---|---|---|---|---|---|---|---|---|
| Summer | | | | | | | | | |
| Oslo day | 20 ± 10 | 24 ± 8 | 10 ± 3 | 2.0 ± 0.6 | 3.3 ± 2.5 | 5.7 ± 3.0 | 4.7 ± 1.4 | 20 ± 7 | 1.5 ± 0.5 |
| Oslo night | 20 ± 9 | 26 ± 6 | 11 ± 5 | 1.6 ± 0.6 | 1.9 ± 1.9 | 3.6 ± 1.9 | 3.4 ± 1.4 | 17 ± 8 | 2.4 ± 1.1 |
| Oslo 24 hour | 20 ± 9 | 25 ± 8 | 10 ± 4 | 1.8 ± 0.7 | 2.5 ± 2.3 | 4.6 ± 2.7 | 4.0 ± 1.5 | 19 ± 8 | 1.9 ± 0.9 |
| | | | | | | | | | |
| Hurdal day | 25 ± 7 | 28 ± 10 | 18 ± 7 | 2.3 ± 0.9 | 3.2 ± 1.6 | 24 ± 22 | 5.2 ± 1.4 | 32 ± 18 | 0.6 ± 0.7 |
| Hurdal night | 40 ± 14 | 64 ± 21 | 32 ± 12 | 1.8 ± 0.7 | 8.2 ± 6.6 | 2.0 ± 0.6 | 4.5 ± 1.3 | 25 ± 9 | 2.8 ± 1.6 |
| Hurdal 24 hour | 32 ± 13 | 45 ± 24 | 25 ± 12 | 2.0 ± 0.6 | 5.6 ± 5.3 | 13 ± 19 | 4.9 ± 1.4 | 29 ± 15 | 1.7 ± 1.6 |
| | | | | | | | | | |
| Winter | | | | | | | | | |
| Oslo day | 2.7 ± 1.1 | 3.2 ± 0.8 | 6.0 ± 2.9 | 1.0 ± 0.7 | n.d. | 2.8 ± 1.1 | 3.5 ± 2.2 | 7.0 ± 2.4 | 1.4 ± 0.4 |
| Oslo night | 2.7 ± 1.0 | 2.6 ± 1.9 | 3.7 ± 2.1 | 0.6 ± 0.6 | n.d. | 2.8 ± 1.0 | 2.3 ± 1.0 | 6.1 ± 1.9 | 0.9 ± 0.4 |
| Oslo 24 hour | 2.7 ± 1.0 | 2.9 ± 1.4 | 4.9 ± 2.7 | 0.8 ± 0.6 | n.d. | 2.8 ± 1.0 | 2.9 ± 1.7 | 6.6 ± 2.1 | 1.2 ± 0.5 |
| | | | | | | | | | |
| Hurdal day | 0.77 ± 0.48 | 0.78 ± 0.42 | 1.73 ± 0.92 | n.d. | n.d. | 1.52 ± 0.97 | 1.02 ± 0.79 | 1.70 ± 0.99 | 0.25 ± 0.05 |
| Hurdal night | 0.71 ± 0.45 | 0.53 ± 0.38 | 1.11 ± 0.52 | n.d. | n.d. | 0.89 ± 0.64 | 0.53 ± 0.21 | 1.26 ± 0.50 | 0.60 ± 0.44 |
| Hurdal 24 hour | 0.74 ± 0.45 | 0.65 ± 0.40 | 1.42 ± 0.79 | n.d. | n.d. | 1.20 ± 0.85 | 0.78 ± 0.61 | 1.48 ± 0.79 | 0.43 ± 0.35 |

Table S2: Calculated contributions to total carbon ($\mu g\ C\ m^{-3}$) from LHS analysis, $PM_{10}$, Summer. B.E. is best estimate (50th percentile), range is 10th-90th percentiles of LHS results.

| | Hur-19June-15July-24h | | Osl-19June-15July-24h | | Osl-19June-15July-Day | | Osl-19June-15July-Night | |
|---|---|---|---|---|---|---|---|---|
| | B.E. | Range | B.E. | Range | B.E. | Range | B.E. | Range |
| $EC_{bb}$ | 0.04 | (0.00–0.08) | 0.13 | (0.04–0.18) | 0.09 | (0.00–0.14) | 0.17 | (0.04–0.26) |
| $EC_{ff}$ | 0.37 | (0.25–0.46) | 0.64 | (0.36–0.86) | 0.65 | (0.38–0.85) | 0.62 | (0.34–0.86) |
| $OC_{bb}$ | 0.15 | (0.08–0.17) | 0.53 | (0.32–0.68) | 0.39 | (0.24–0.47) | 0.70 | (0.43–0.86) |
| $OC_{ff}$ | 0.29 | (0.17–0.38) | 0.90 | (0.63–1.13) | 0.93 | (0.66–1.18) | 0.91 | (0.60–1.16) |
| $OC_{BSOA}$ | 2.33 | (2.00–2.58) | 1.61 | (1.26–1.89) | 1.91 | (1.56–2.17) | 1.27 | (0.95–1.59) |
| $OC_{PBAP}$ | 0.99 | (0.71–1.21) | 0.71 | (0.50–0.90) | 0.75 | (0.52–0.99) | 0.63 | (0.43–0.77) |
| $OC_{pbs}$ | 0.75 | (0.50–0.92) | 0.34 | (0.23–0.41) | 0.28 | (0.19–0.33) | 0.40 | (0.26–0.47) |
| $OC_{pbc}$ | 0.23 | (0.12–0.38) | 0.38 | (0.18–0.59) | 0.47 | (0.24–0.76) | 0.23 | (0.09–0.34) |

Table S3: Calculated contributions to total carbon ($\mu g\ C\ m^{-3}$) from LHS analysis, $PM_{10}$, Winter. B.E. is best estimate (50th percentile), range is 10th-90th percentiles of LHS results.

| | Hur-1Mar-8March-24h | | Osl-1Mar-8March-24h | | Osl-1Mar-8March-Day | | Osl-1Mar-8March-Night | |
|---|---|---|---|---|---|---|---|---|
| | B.E. | Range | B.E. | Range | B.E. | Range | B.E. | Range |
| $EC_{bb}$ | 0.13 | (0.05–0.21) | 0.29 | (0.11–0.45) | 0.30 | (0.08–0.50) | 0.28 | (0.10–0.42) |
| $EC_{ff}$ | 0.24 | (0.08–0.36) | 0.67 | (0.30–1.00) | 0.74 | (0.33–1.08) | 0.58 | (0.23–0.88) |
| $OC_{bb}$ | 0.56 | (0.43–0.69) | 1.22 | (0.93–1.48) | 1.28 | (0.92–1.63) | 1.16 | (0.94–1.36) |
| $OC_{ff}$ | 0.42 | (0.28–0.56) | 1.06 | (0.70–1.41) | 1.27 | (0.88–1.67) | 0.88 | (0.55–1.20) |
| $OC_{bb}+OC_{BSOA}$ | 0.72 | (0.61–0.82) | 1.59 | (1.37–1.78) | 1.76 | (1.50–1.96) | 1.40 | (1.20–1.59) |
| $OC_{BSOA}$ | 0.15 | (0.02–0.29) | 0.38 | (0.04–0.67) | 0.48 | (0.04–0.92) | 0.24 | (0.03–0.45) |
| $OC_{PBAP}$ | 0.13 | (0.07–0.20) | 0.10 | (0.04–0.11) | 0.10 | (0.04–0.12) | 0.09 | (0.03–0.13) |
| $OC_{pbs}$ | 0.01 | (0.00–0.03) | 0.02 | (0.00–0.07) | 0.03 | (0.00–0.08) | 0.02 | (0.00–0.07) |
| $OC_{pbc}$ | 0.12 | (0.07–0.18) | 0.07 | (0.00–0.07) | 0.06 | (0.00–0.08) | 0.07 | (0.03–0.10) |

Table S4: Calculated contributions to total carbon ($\mu g\ C\ m^{-3}$) from LHS analysis, $PM_1$, Summer. B.E. is best estimate (50th percentile), range is 10th-90th percentiles of LHS results.

| | Hur-19June-15July-24h | | Osl-19June-15July-24h | | Osl-19June-15July-Day | | Osl-19June-15July-Night | |
|---|---|---|---|---|---|---|---|---|
| | B.E. | Range | B.E. | Range | B.E. | Range | B.E. | Range |
| $EC_{bb}$ | 0.04 | (0.00–0.06) | 0.11 | (0.03–0.18) | 0.08 | (0.03–0.12) | 0.15 | (0.03–0.23) |
| $EC_{ff}$ | 0.33 | (0.20–0.43) | 0.43 | (0.24–0.59) | 0.34 | (0.18–0.45) | 0.50 | (0.26–0.70) |
| $OC_{bb}$ | 0.15 | (0.09–0.17) | 0.48 | (0.33–0.59) | 0.36 | (0.24–0.42) | 0.60 | (0.44–0.76) |
| $OC_{ff}$ | 0.34 | (0.20–0.46) | 0.79 | (0.59–0.98) | 0.89 | (0.72–1.02) | 0.70 | (0.47–0.90) |
| $OC_{BSOA}$ | 1.96 | (1.89–2.01) | 1.12 | (0.98–1.27) | 1.30 | (1.17–1.42) | 0.95 | (0.76–1.14) |
| $OC_{PBAP}$ | 0.05 | (0.03–0.09) | 0.02 | (0.00–0.06) | 0.04 | (0.00–0.06) | 0.01 | (0.00–0.06) |
| $OC_{pbs}$ | 0.03 | (0.00–0.06) | 0.01 | (0.00–0.06) | 0.01 | (0.00–0.06) | 0.01 | (0.00–0.06) |
| $OC_{pbc}$ | 0.02 | (0.00–0.06) | 0.01 | (0.00–0.06) | 0.02 | (0.00–0.06) | 0.01 | (0.00–0.06) |

Table S5: Calculated contributions to total carbon ($\mu g\ C\ m^{-3}$) from LHS analysis, $PM_1$, Winter. B.E. is best estimate (50th percentile), range is 10th-90th percentiles of LHS results.

| | Hur-1Mar-8March-24h | | Osl-1Mar-8March-24h | | Osl-1Mar-8March-Day | | Osl-1Mar-8March-Night | |
|---|---|---|---|---|---|---|---|---|
| | B.E. | Range | B.E. | Range | B.E. | Range | B.E. | Range |
| $EC_{bb}$ | 0.14 | (0.05–0.22) | 0.26 | (0.09–0.41) | 0.25 | (0.09–0.38) | 0.30 | (0.11–0.45) |
| $EC_{ff}$ | 0.21 | (0.06–0.33) | 0.51 | (0.21–0.77) | 0.56 | (0.22–0.85) | 0.44 | (0.17–0.67) |
| $OC_{bb}$ | 0.61 | (0.46–0.75) | 1.10 | (0.86–1.30) | 1.05 | (0.79–1.29) | 1.16 | (0.92–1.37) |
| $OC_{ff}$ | 0.41 | (0.27–0.54) | 0.80 | (0.50–1.10) | 0.96 | (0.66–1.26) | 0.66 | (0.39–0.92) |
| $OC_{BSOA}$ | 0.17 | (0.02–0.32) | 0.27 | (0.03–0.47) | 0.29 | (0.03–0.53) | 0.23 | (0.03–0.42) |
| $OC_{PBAP}$ | 0.05 | (0.03–0.06) | 0.02 | (0.00–0.06) | 0.04 | (0.00–0.06) | 0.01 | (0.00–0.06) |
| $OC_{pbs}$ | 0.02 | (0.00–0.03) | 0.01 | (0.00–0.06) | 0.02 | (0.00–0.06) | 0.01 | (0.00–0.06) |
| $OC_{pbc}$ | 0.03 | (0.02–0.05) | 0.01 | (0.00–0.06) | 0.03 | (0.00–0.06) | 0.01 | (0.00–0.06) |