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Supplement of

Seasonal and diurnal trends in concentrations and fluxes of volatile organic compounds in central London

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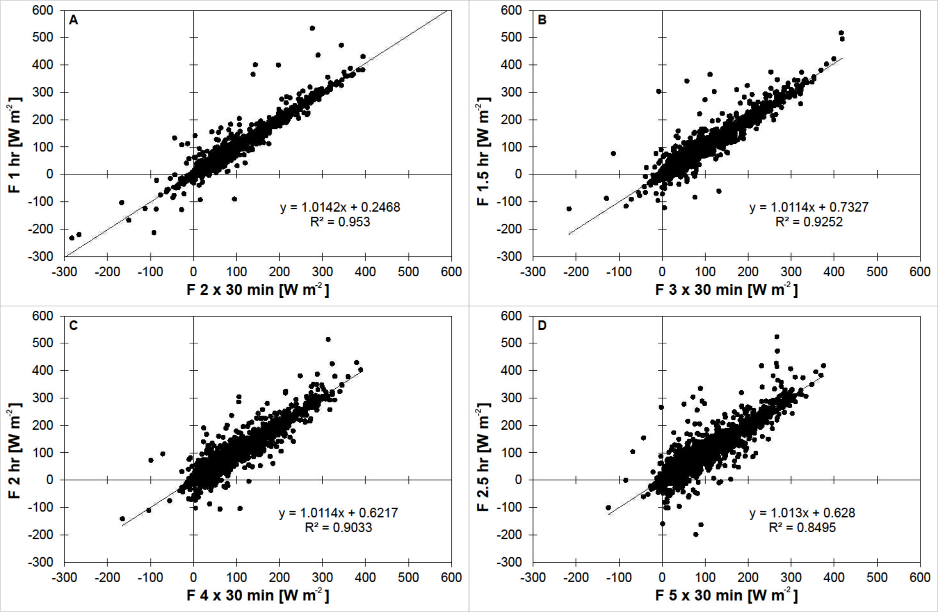
Supplementary information

A) Estimation of flux losses due to low frequency attenuation (from Section 2.3)

Attenuation from low frequency fluctuations for a 25 min flux period was investigated by re-analysing the sensible heat fluxes for longer averaging periods of 60, 90, 120 and 150 min. The coordinate rotation was applied to the joined files, which acted as a high pass filter to the three wind vectors, confirming that fluctuations of eddies with a longer time period than the averaging time did not contribute to the flux measurement. The fluxes were compared back to the 25 min average fluxes, which had the coordinate rotation applied before joining, again to ensure only turbulent fluctuations of ≤ 25 min contributed to the flux (Figure A1). Flux losses due to low frequency attenuation were estimated to be < 1.5 % and, therefore, no corrections were deemed necessary.

Figure A1. Sensible heat fluxes (W m^{-2}) measured from the roof tower of the King's College London Strand building calculated using 1 to 2.5 h averaging periods and compared with fluxes calculated using the same 25 min averaging period as used for VOC fluxes.

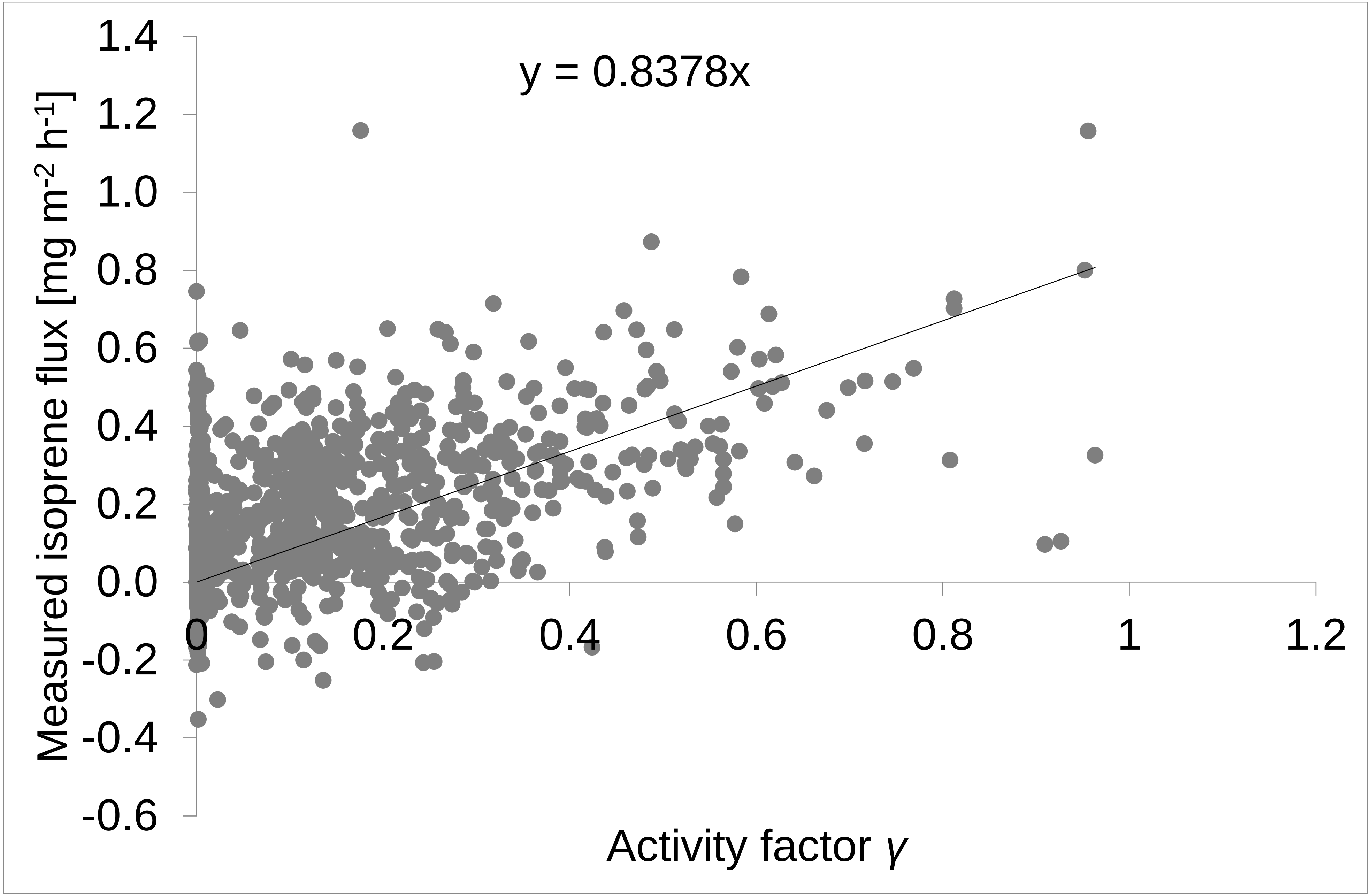


A
F 1 hr [W m^-2]
F 2 x 30 min [W m^-2]
y = 1.0142x + 0.2468
R² = 0.953
B
F 1.5 hr [W m^-2]
F 3 x 30 min [W m^-2]
y = 1.0114x + 0.7327
R² = 0.9252
C
F 2 hr [W m^-2]
F 4 x 30 min [W m^-2]
y = 1.0114x + 0.6217
R² = 0.9033
D
F 2.5 hr [W m^-2]
F 5 x 30 min [W m^-2]
y = 1.013x + 0.628
R² = 0.8495

B) Modelling the biogenic isoprene contribution in summer using the Guenther et al. (1995) algorithm

The base emission rate was determined from the slope of the linear regression of the measured total isoprene flux and activity adjustment factor for light and temperature (*γ*) (Figure B1). This provided a base emission rate of 0.838 mg m^{-2} h^{-1}, which was then divided by the estimated foliar density (*D*) and converted to produce an emission rate in units of μg g h^{-1}. The foliar density was calculated from the estimated leaf dry weight divided by the tree leaf area for trees located in the maximum flux footprint contribution area identified from visible satellite imagery. Using a foliar density of 0.129 kg dry matter m^{-2}, the final base emission rate of 6.5 μg g h^{-1} was calculated, which compared well with the estimate of 5 μg g h^{-1} for urban areas in a cold climate presented in Guenther et al., (1995).

Figure B1. The scatterplot of measured isoprene fluxes to the activity adjustment factor *γ* with the linear regression used to determine the base emission rate in mg m^{-2} h^{-1}.



y = 0.8378x
Measured isoprene flux [mg m-2 h-1]
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
0
0.2
0.4
0.6
0.8
1
1.2
Activity factor γ