Supplement materials of

Quantifying Black Carbon emissions from Traffic and Construction in central London using Eddy Covariance

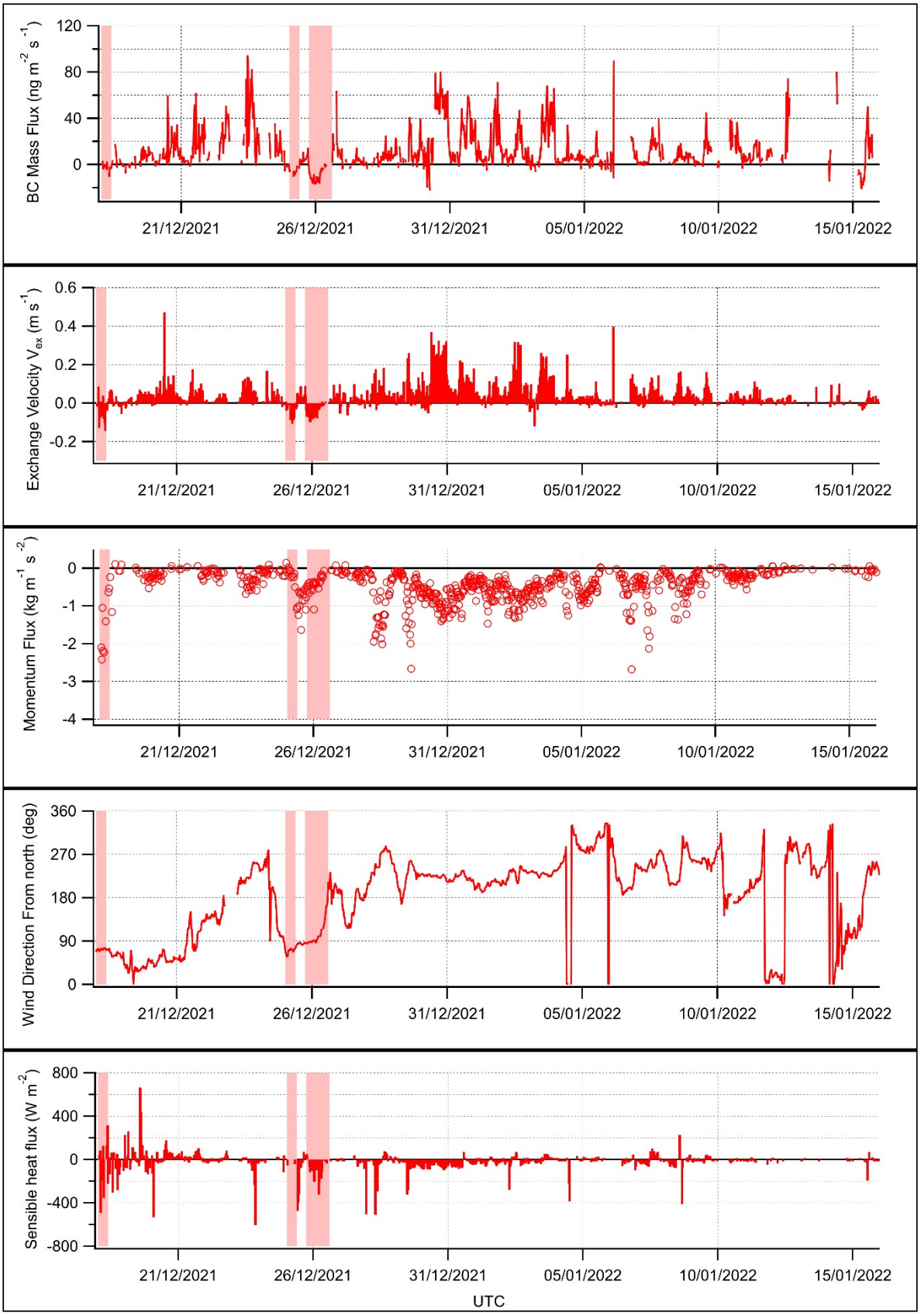


Figure S1: Time series of BC mass flux, exchange velocity, momentum flux, wind direction, sensible heat flux for winter campaign with negative fluxes periods included and highlighted with red shaded.

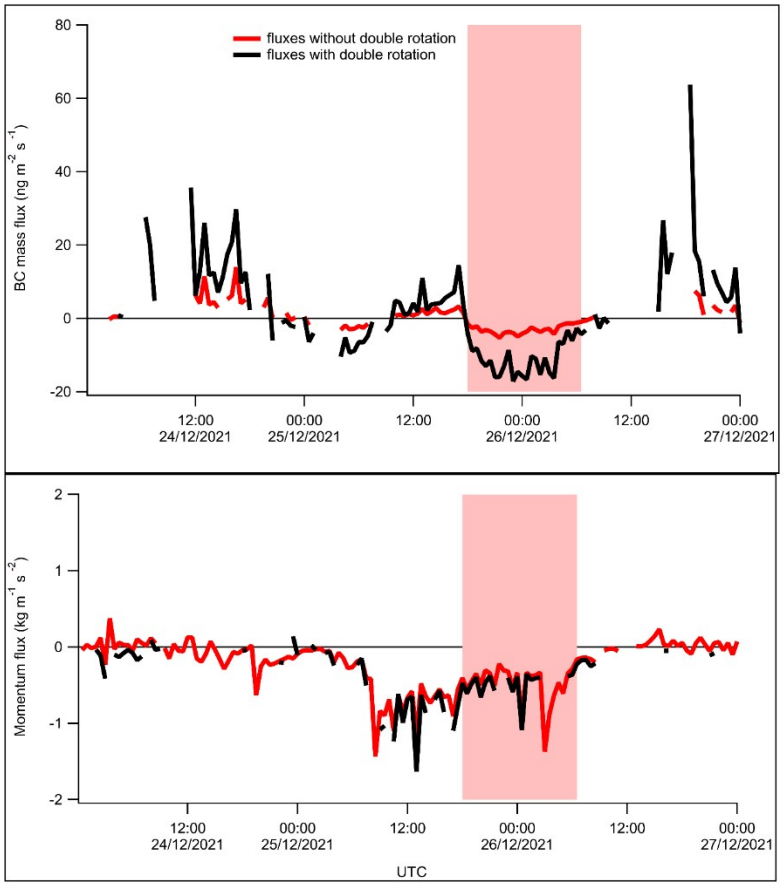


Figure S2: BC fluxes and momentum fluxes including negative flux period (2024/12/24 00:00 – 2024 12/27 00:00) with double rotations applied (black) and not applied (red).

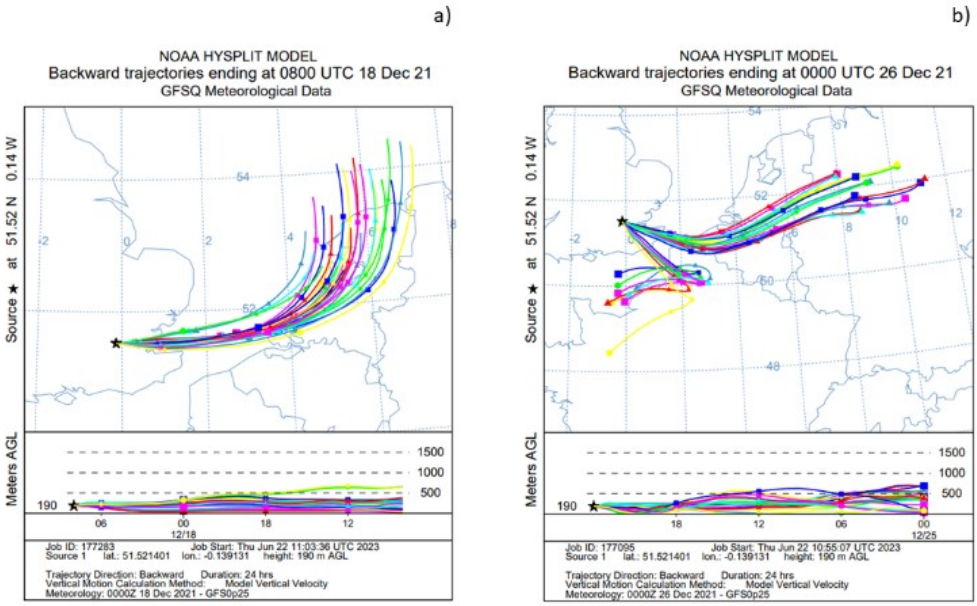


Figure S3: NOAA HYSPLIT historic back trajectories (generated from website version) in negative flux periods. a) first negative fluxes period (2021/12/18 0:30 - 2021/12/18 9:00) and b) second and third negative fluxes periods (2021/12/24 18:00 – 2021/12/25 8:00 and 2021/12/25 18:00 - 2021/12/26 7:00)

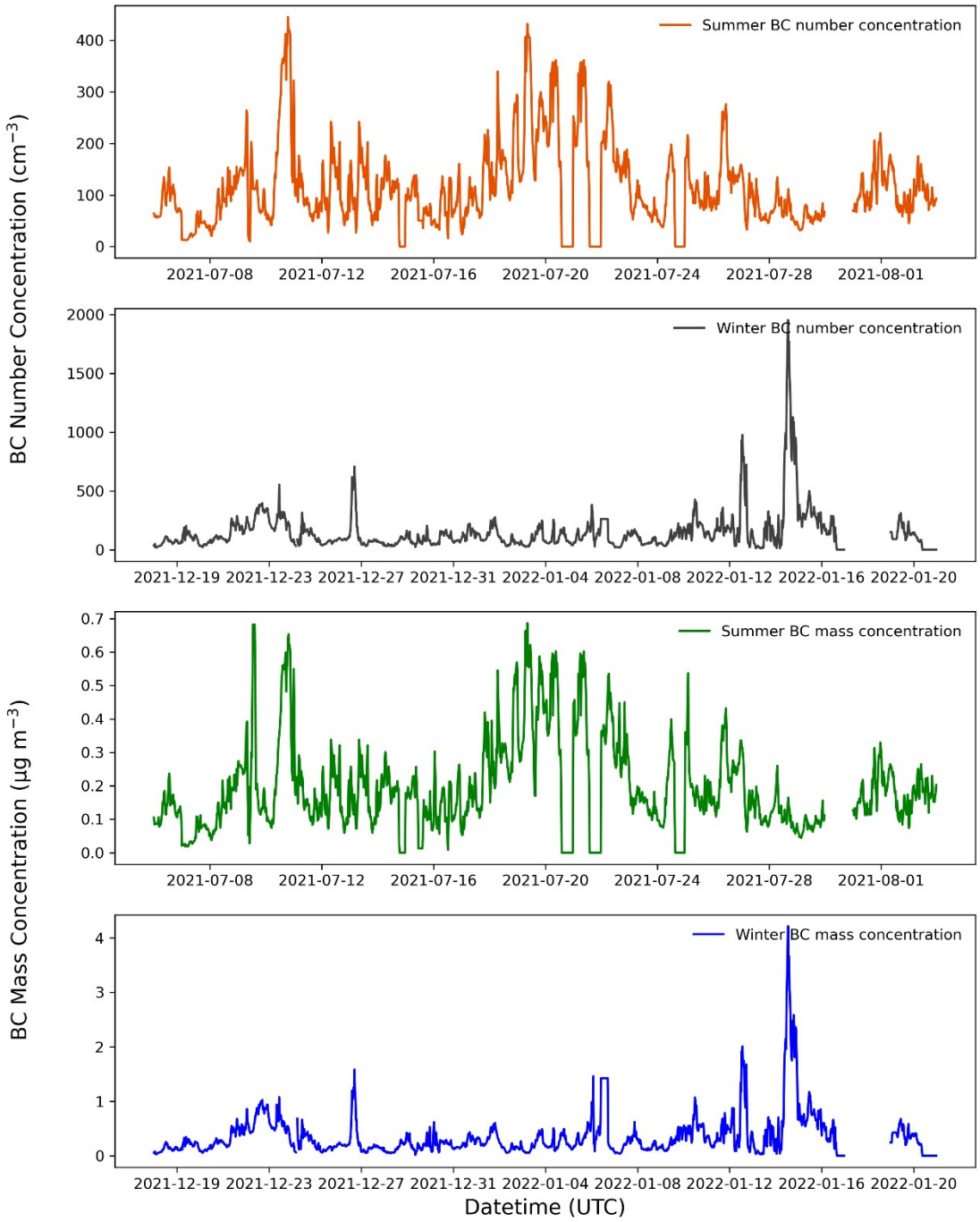


Figure S4: Time series for BC mass and number concentrations in winter and summer.

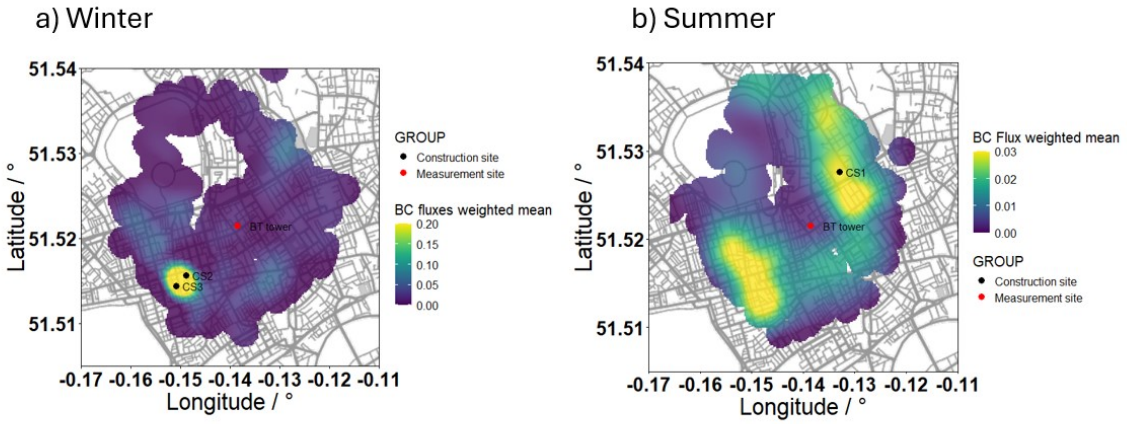


Figure S5: Spatial map for BC fluxes weighted mean for a) winter and b) summer. Here, weighted mean can provide the indication of flux × frequency of occurrence, which highlights the flux footprint distance and direction that dominate the overall mean.

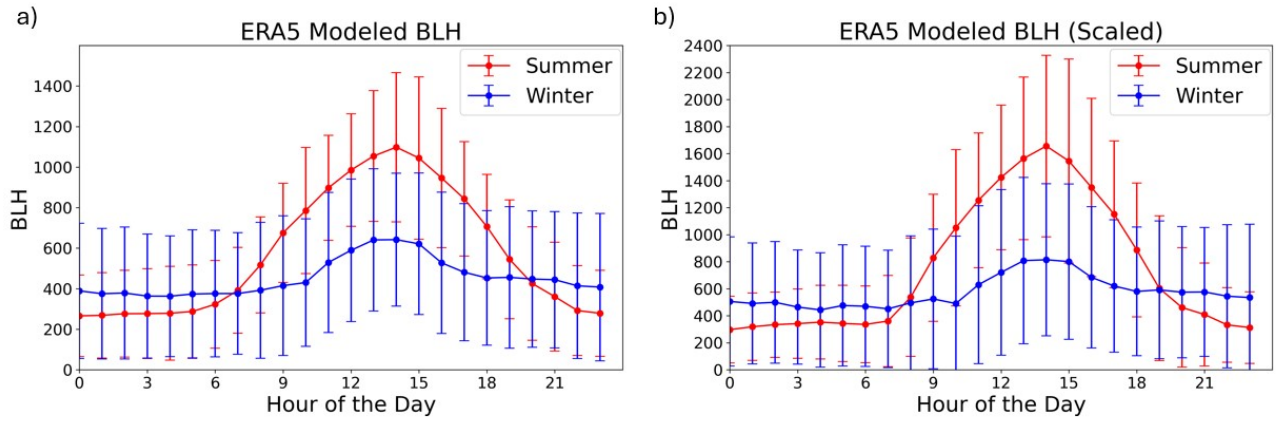
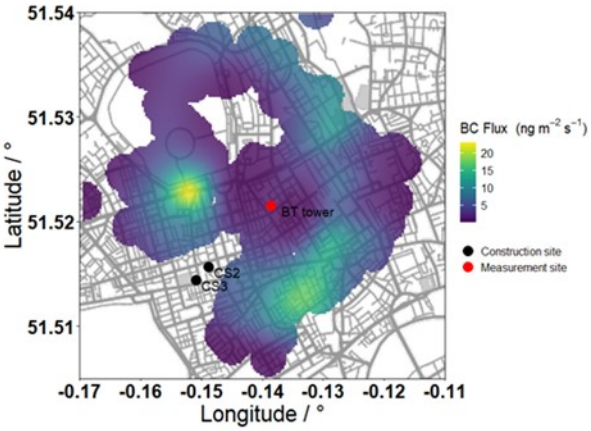


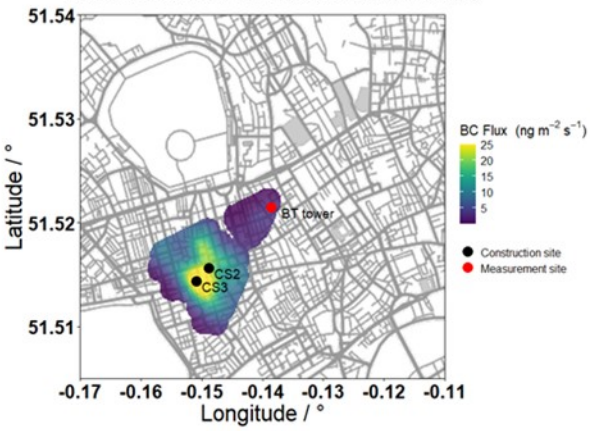
Figure S6: Boundary layer height (BLH) diurnal profiles during both BT tower campaign calculated from ERA5 (a) and applied correction factor [1](b).

a) Winter



Averaged BC mass flux: 9.60 ng m^{-2} s^{-1}

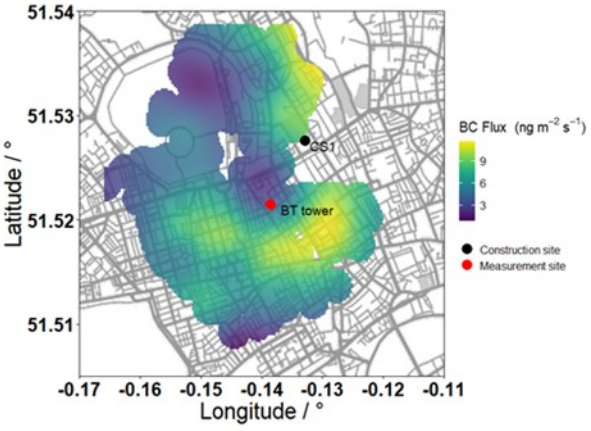
Contribution to total flux: 56.5%



Averaged BC mass flux: 18.1 ng m^{-2} s^{-1}

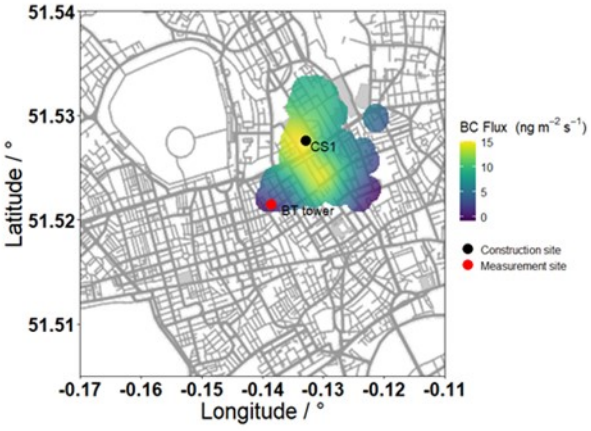
$$\frac{BC_{sw}}{BC_{Other}} \approx \frac{Construction}{Traffic} = 1.89$$

b) Summer



Averaged BC mass flux: 6.53 ng m^{-2} s^{-1}

Contribution to total flux: 29.8 %



Averaged BC mass flux: 10.2 ng m^{-2} s^{-1}

$$\frac{BC_{sw}}{BC_{Other}} \approx \frac{Construction}{Traffic} = 1.56$$

Figure S7 BC flux footprint separated non-hotspot area and hotspot area in winter (a) and summer (b). In winter there is another hotspot area to the west of BT tower with BC flux larger than 20 ng m^{-2} s^{-1} which is also identified as construction site but not document is found in West minster city council.

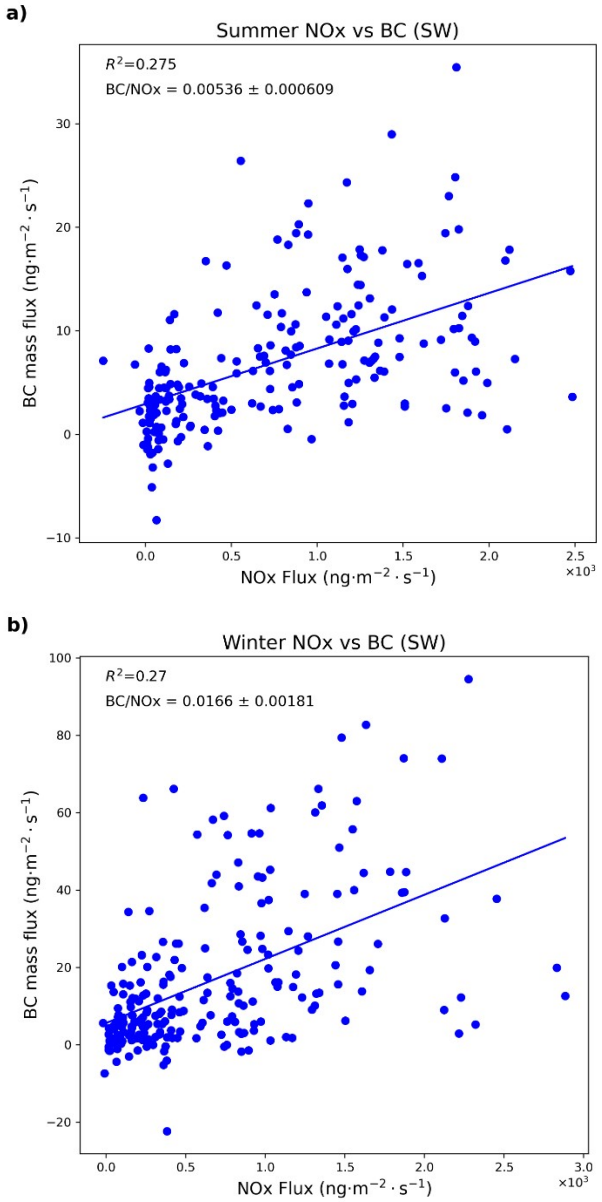


Figure S8 Scatter plots for NOx vs BC to Southwest BT tower in summer (a) and winter (b)

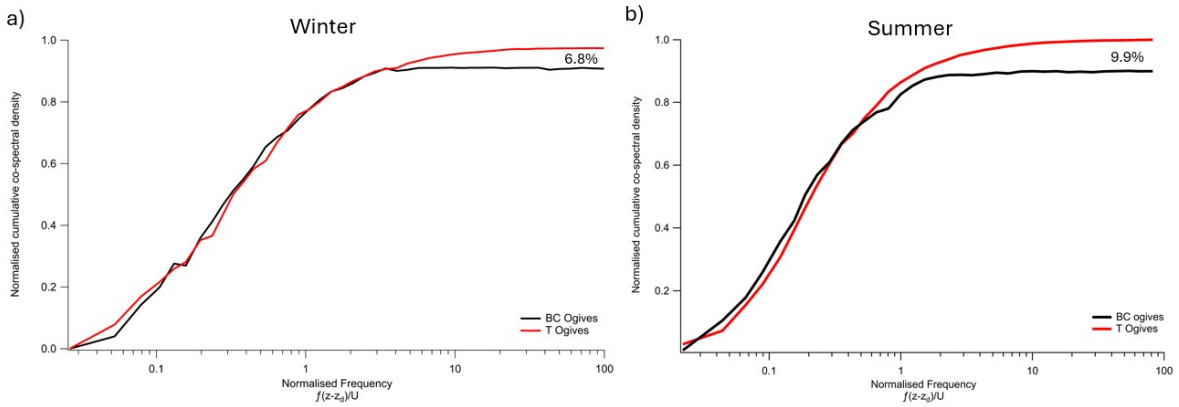


Figure S9 Scaled Ogives for a) winter and b) summer spectral analysis. a) Winter is scaled using factor 0.96 resulting 6.8% flux losses. b) Summer is scaled using factor 0.90 resulting 9.9% flux losses.

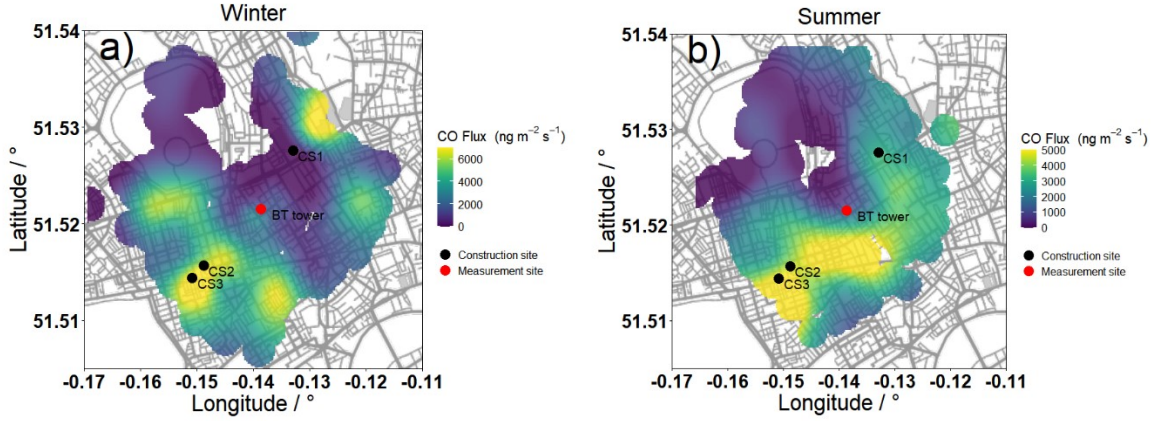


Figure S10 Footprint spatial map for CO fluxes during winter (a) and summer (b) campaign

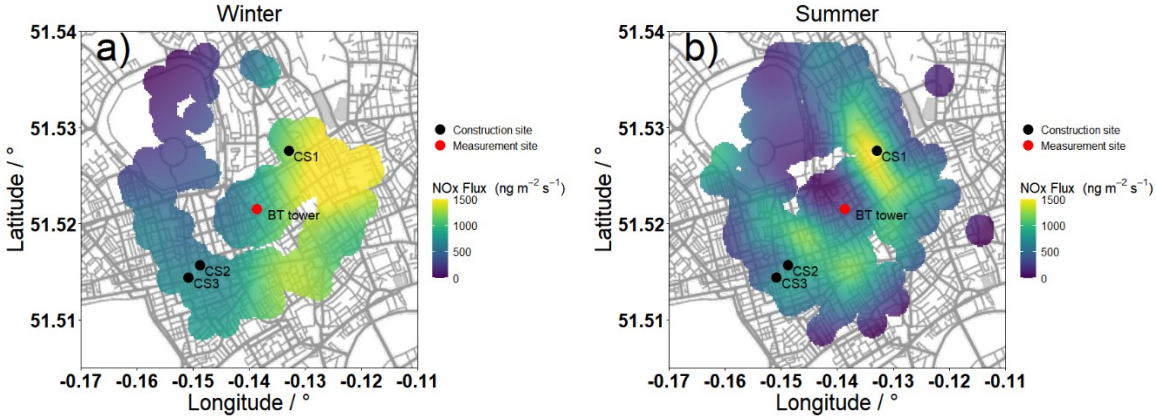


Figure S11 Footprint spatial map for NOx fluxes during winter (a) and summer (b) campaign. Long term NOx fluxes are reported previously[2].

References

1. W. S. Drysdale, A. R. Vaughan, F. A. Squires, S. J. Cliff, S. Metzger, D. Durden, N. Pingintha-Durden, C. Helfter, E. Nemitz, C. S. B. Grimmond, J. Barlow, S. Beevers, G. Stewart, D. Dajnak, R. M. Purvis and

J. D. Lee, Eddy covariance measurements highlight sources of nitrogen oxide emissions missing from inventories for central London, *Atmospheric Chemistry and Physics*, 2022, **22**, 9413-9433.

2. S. J. Cliff, W. Drysdale, J. D. Lee, C. Helfter, E. Nemitz, S. Metzger and J. F. Barlow, Pandemic restrictions in 2020 highlight the significance of non-road NO_x sources in central London, *Atmospheric Chemistry and Physics*, 2023, **23**, 2315-2330.