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How COVID-19 related policies reshaped organic aerosol source contributions in Central London

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Table S 1 Criteria list to select the solutions from the rolling PMF analysis as recommended by (Chen et al., 2022).

	Criterion	Type	Threshold	Comments
1	HOA vs NO_x	R^2, normal time series	p-value ≤ 0.05	Traffic factor has the best correlation with the NOx than other PMF factors
2	Explained Variation [60] by BBOA	Average, normal time series	to-factor (p-value ⩽ 0.05)	Investigate the explained variation of m/z 60 by BBOA, make sure it explained most of 60 variabilities by this fresh BBOA
3	(HOA+BBOA) vs BC	R^2, normal time series	to-factor (p-value ⩽ 0.05)	To ensure HOA and BBOA explain the fresh black carbon emission at Honor oak park
4	$\frac{(\mathrm{COA}[13]+\mathrm{COA}[14])/2}{(\mathrm{COA}[8]+\mathrm{COA}[9]+\mathrm{COA}[10])/3}$	Average, hours	>1	Make sure the lunch peak is larger than the morning rush hours to avoid mixing with HOA
5	factor_4[44]	Profiles, fraction, sorting criterion	>0	Sorting criteria to make sure MO-OOA is situated at the 4th position for all PMF runs
6	factor_4[43]	Profiles, fraction	>0	To ensure the intensity of m/z 43 in MO-OOA is larger than 0
7	factor_5[44]	Profiles, fraction	>0	To ensure the intensity of m/z 44 in LO-OOA is larger than 0
8	factor_5[43]	Profiles, fraction	>0	To ensure the intensity of m/z 43 in LO-OOA is larger than 0

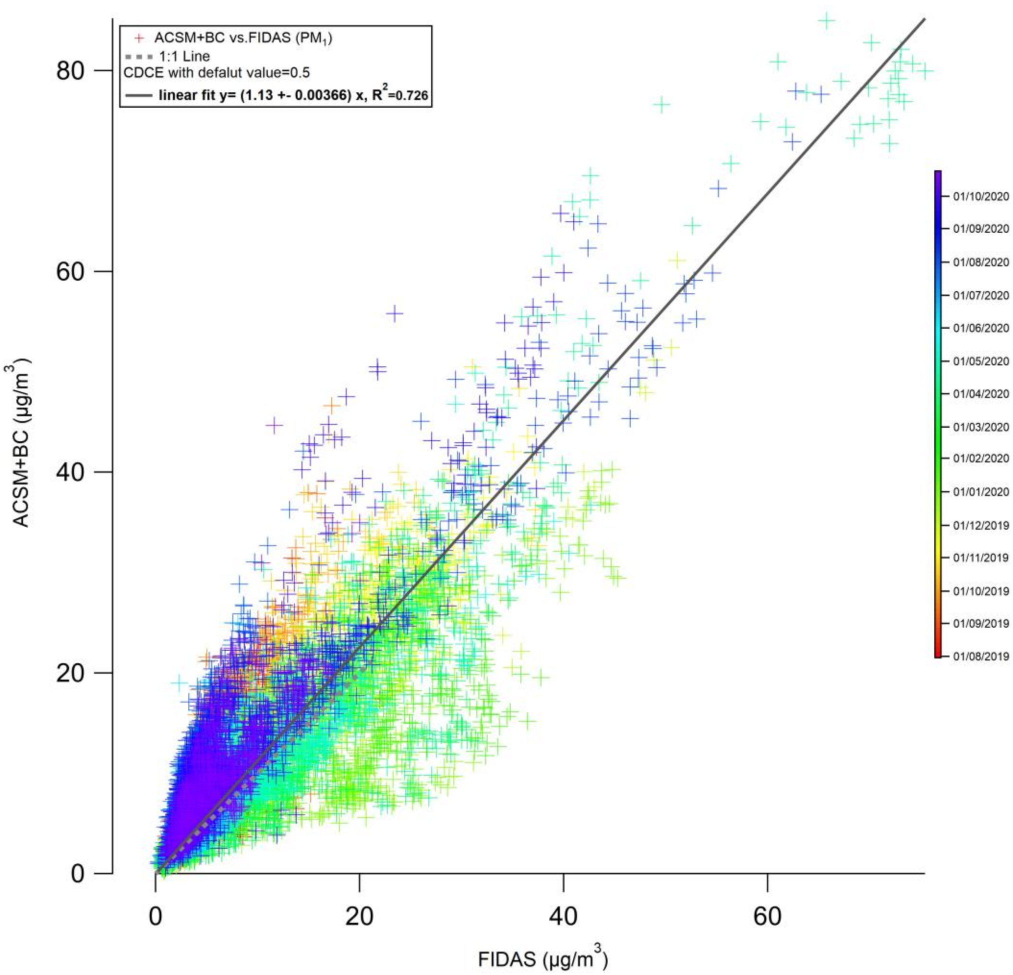

Figure S 1 Mass closure of ACSM plus BC concentration vs. FIDAS PM_1 concentration using the composition dependent collection efficiency (CDCE) correction with a default collection efficiency of 0.5 (Middlebrook et al., 2012).

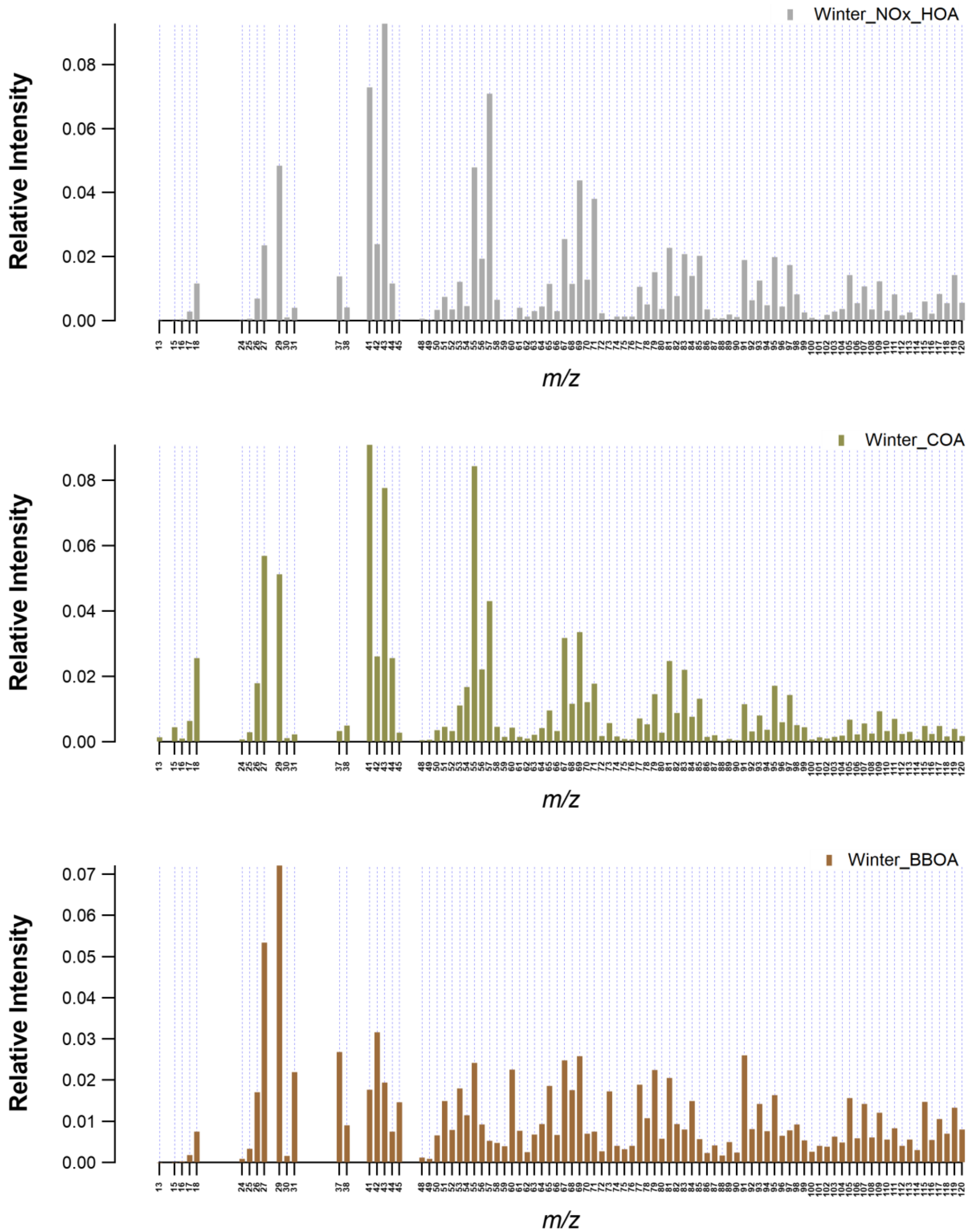

Figure S 2 HOA, COA, and BBOA profiles used to constrain profiles in rolling PMF.

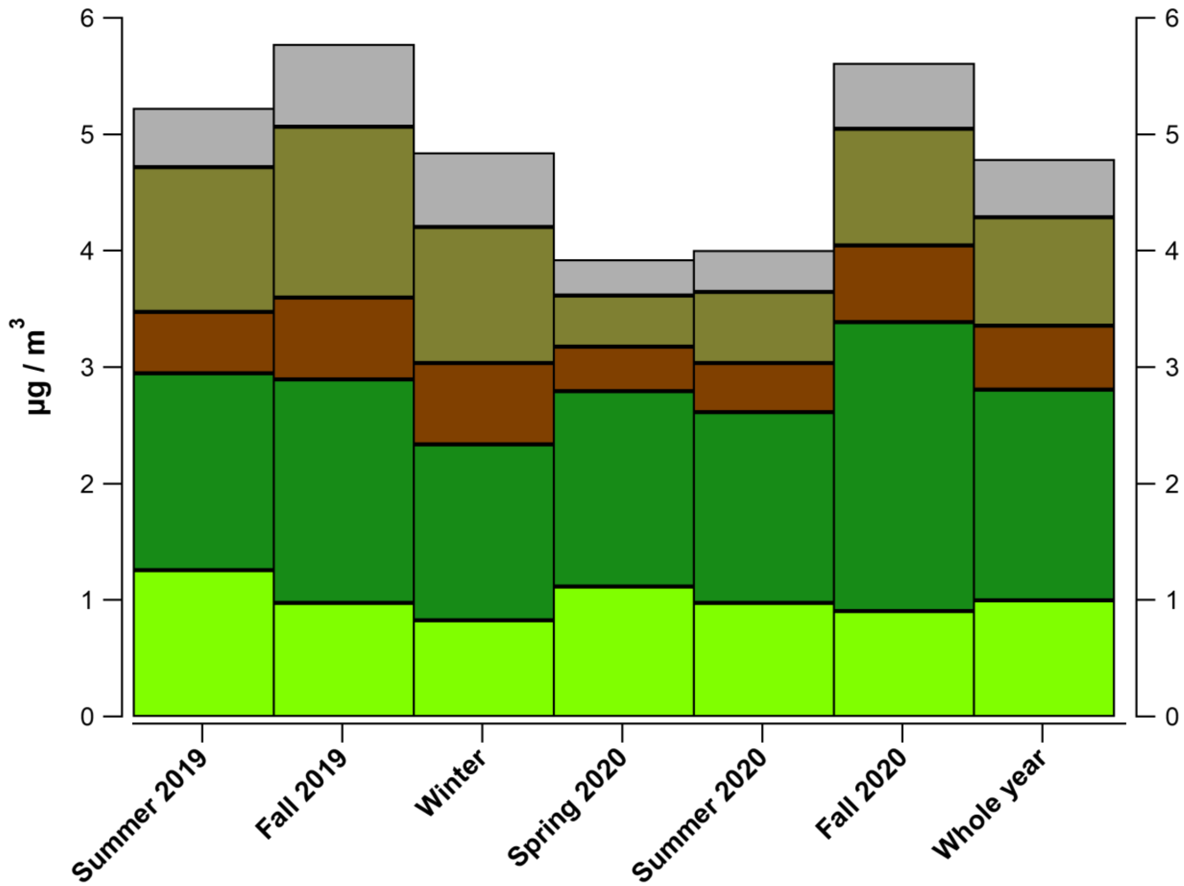

Figure S 3 Stacked mass concentration of OA sources for different seasons during the measurement period.

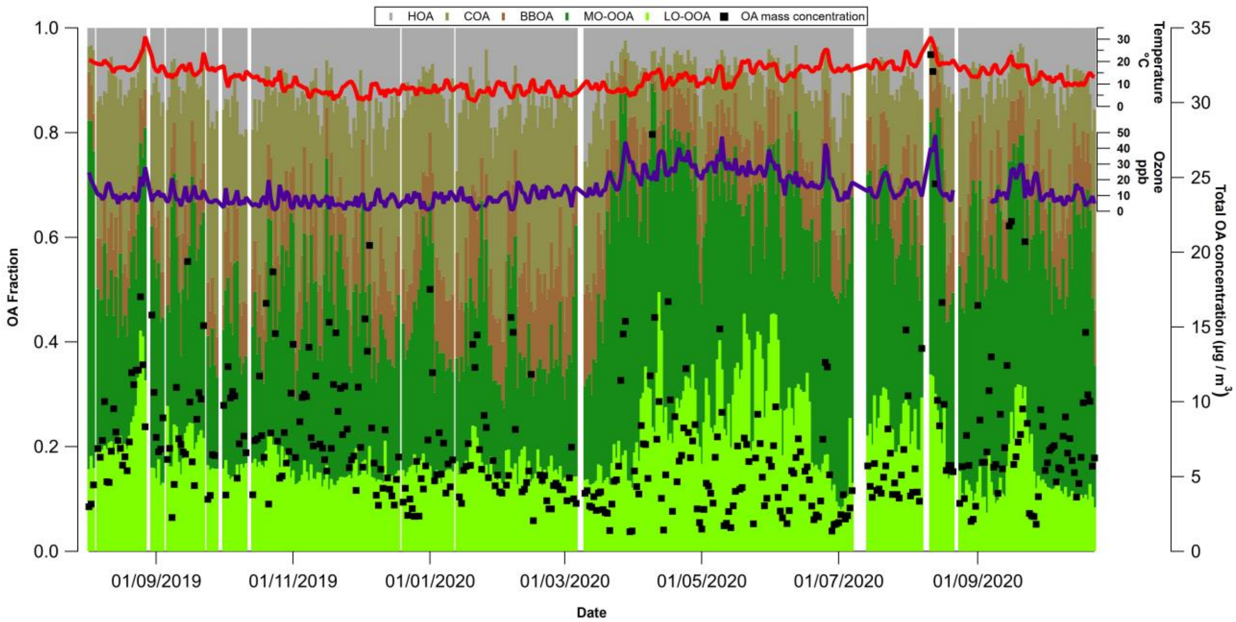

Figure S 4 Time series of OA fractions(left axis) with air temperature (red line) and total OA concentration (black squares) on the right axis.

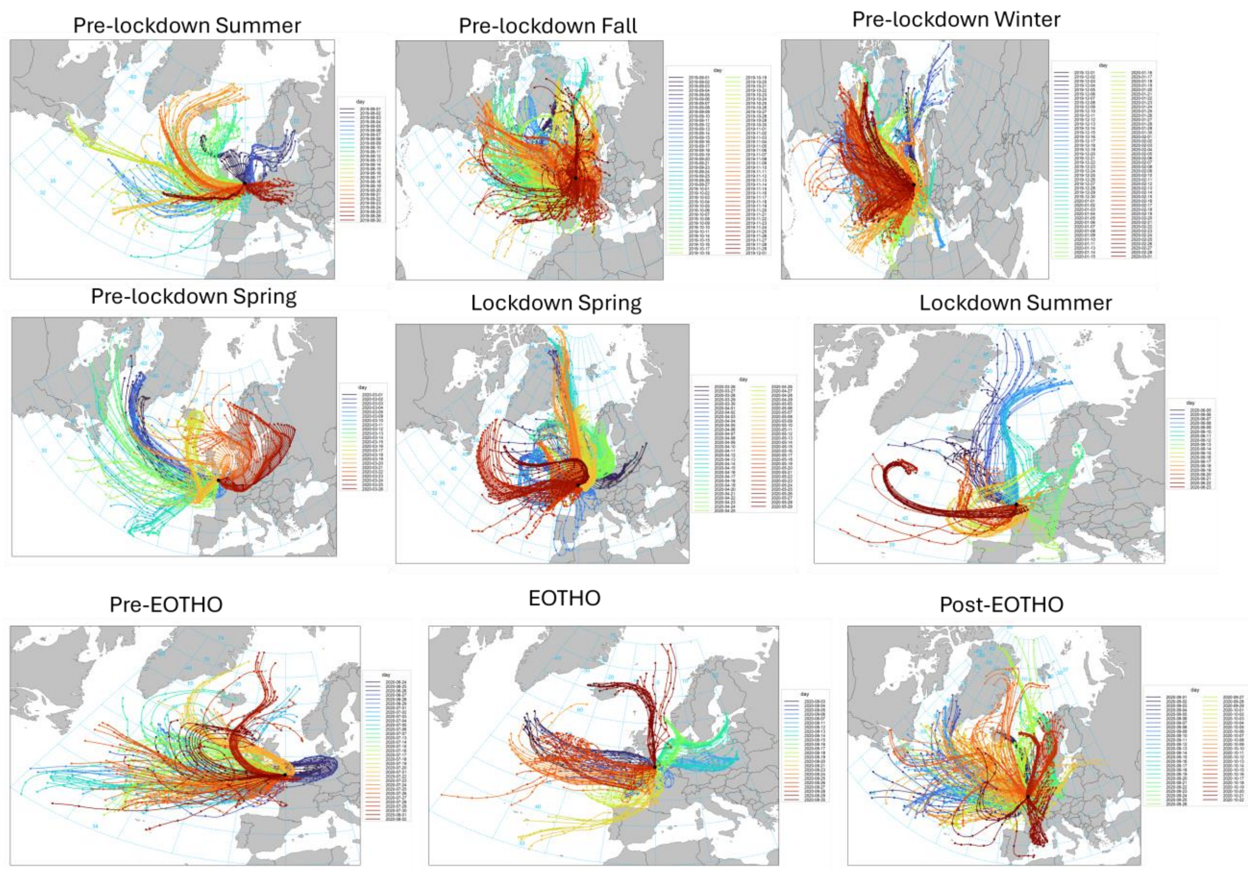

Figure S 5 Back trajectory analysis using HYSPLIT for all different periods coloured by dates.

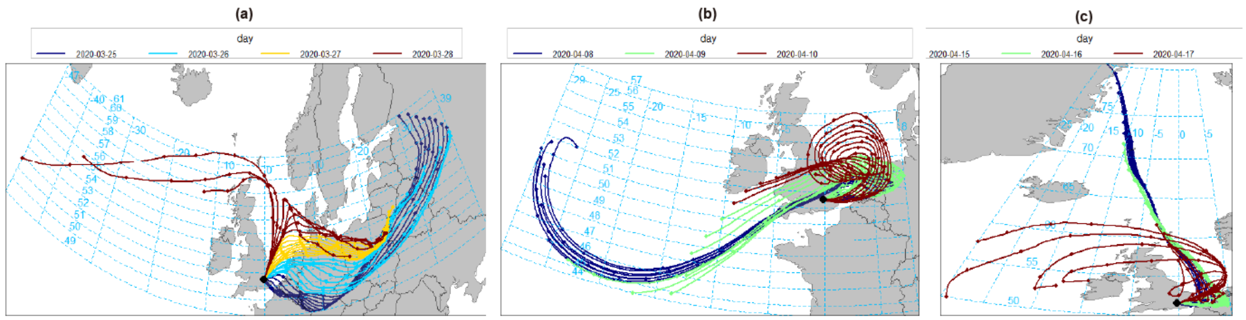

Figure S 6 Back trajectory analysis using HYSPLIT for three spikes in total PM.

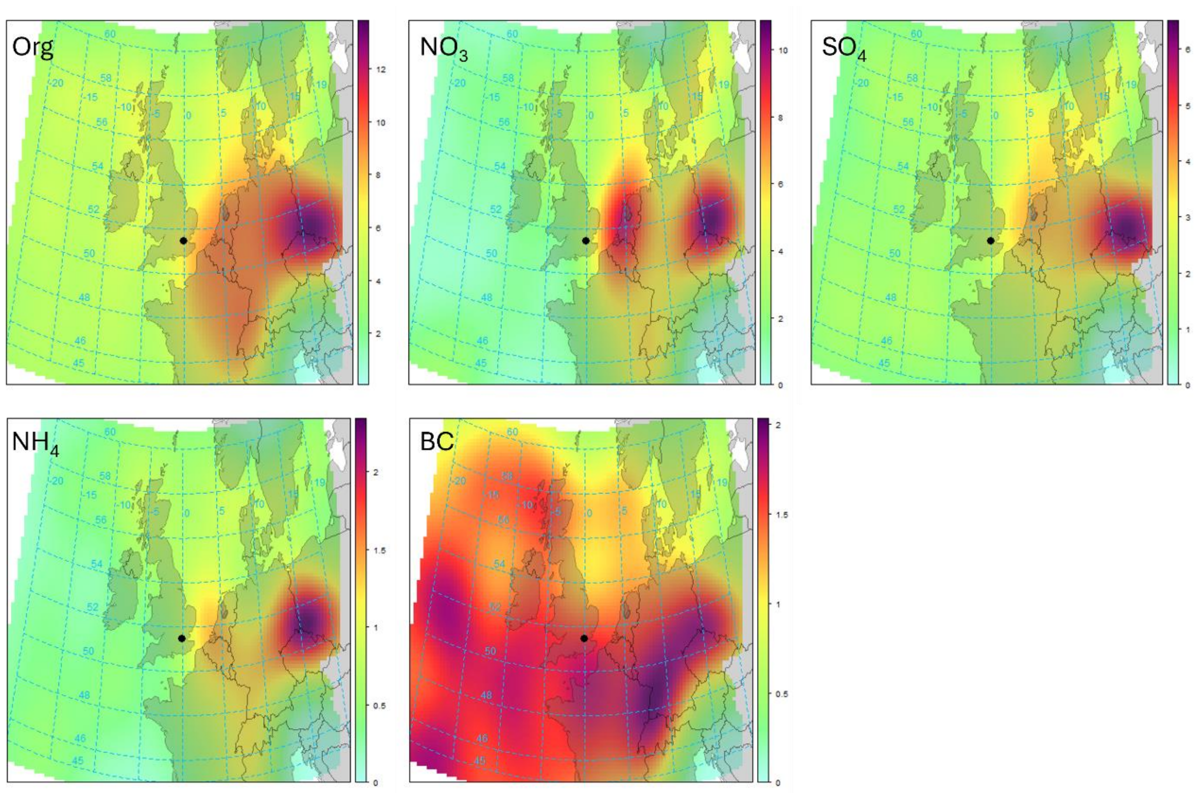

Figure S 7 Concentration weighted trajectory (CWT) analysis for the whole period for PM species.

Meteorological influences for different periods on PM/OA species

Using the "worldmet" package in R (Carslaw, 2025; Grange and Carslaw, 2019), we conducted deweathering analysis by considering wind speed, wind direction, relative humidity (RH), and air temperature (collected from London Heathrow airport) for all the PM species as well as OA sources (Figure S 8). The meteorological influences of all the species are small except for prelockdown spring period, while the changes due to COVID lockdown or eat out to help out (EOTHO) are evident for all the species. The deweathered results for chloride were not included in Figure S 8 as it shows a large number of negative values. This is most likely due to its original mass concentration is low (avg. =0.06 μg/m^3), leading to negative mean values from the deweathering analysis (avg. = -0.62 μg/m^3).

Table S 2 Boot regression trees model performance on the testing dataset for each PM species/sources

	Slope	R^2 (Pearson)	RMSE
BC	0.98	0.94	0.46
Org	1.01	0.93	1.80
NH_4	1	0.87	0.39
NO_3	1.02	0.92	1.52
SO_4	1.01	0.94	0.63
HOA	0.97	0.77	0.34
COA	0.99	0.82	0.66
BBOA	1	0.86	0.29
MO-OOA	1.01	0.92	0.64
LO-OOA	1.01	0.89	0.45

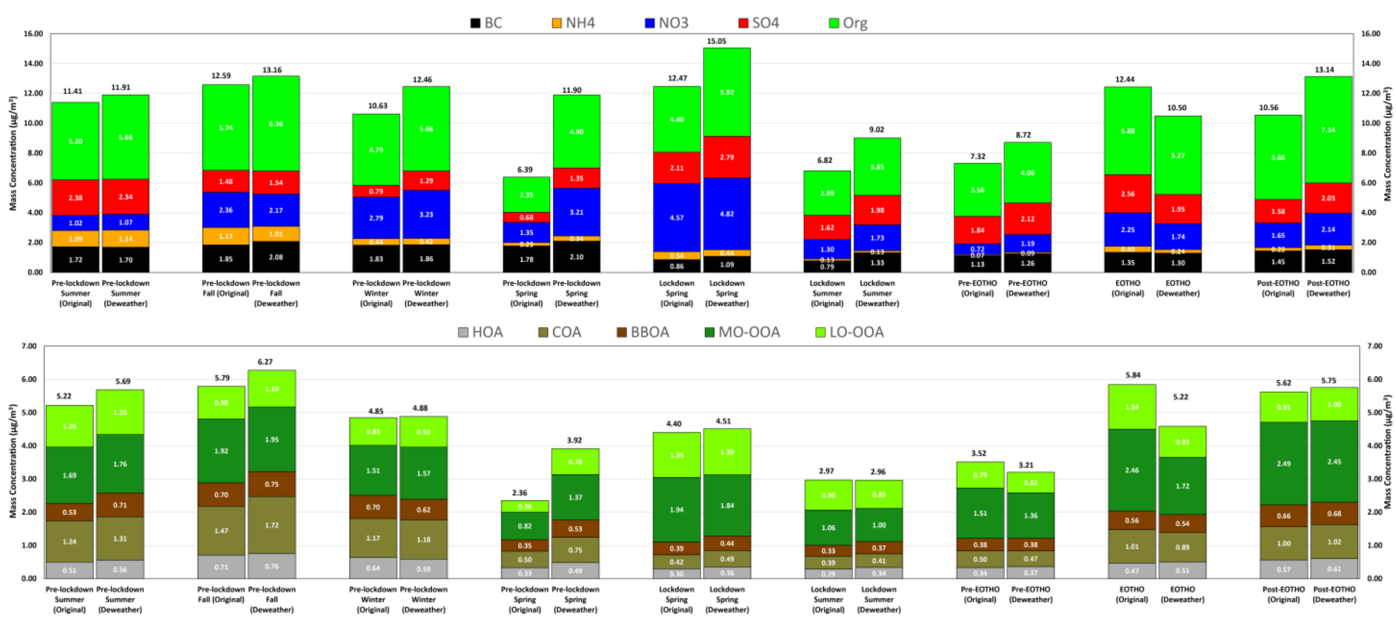

Figure S 8 Stacked mass concentration of PM/OA species at different periods.

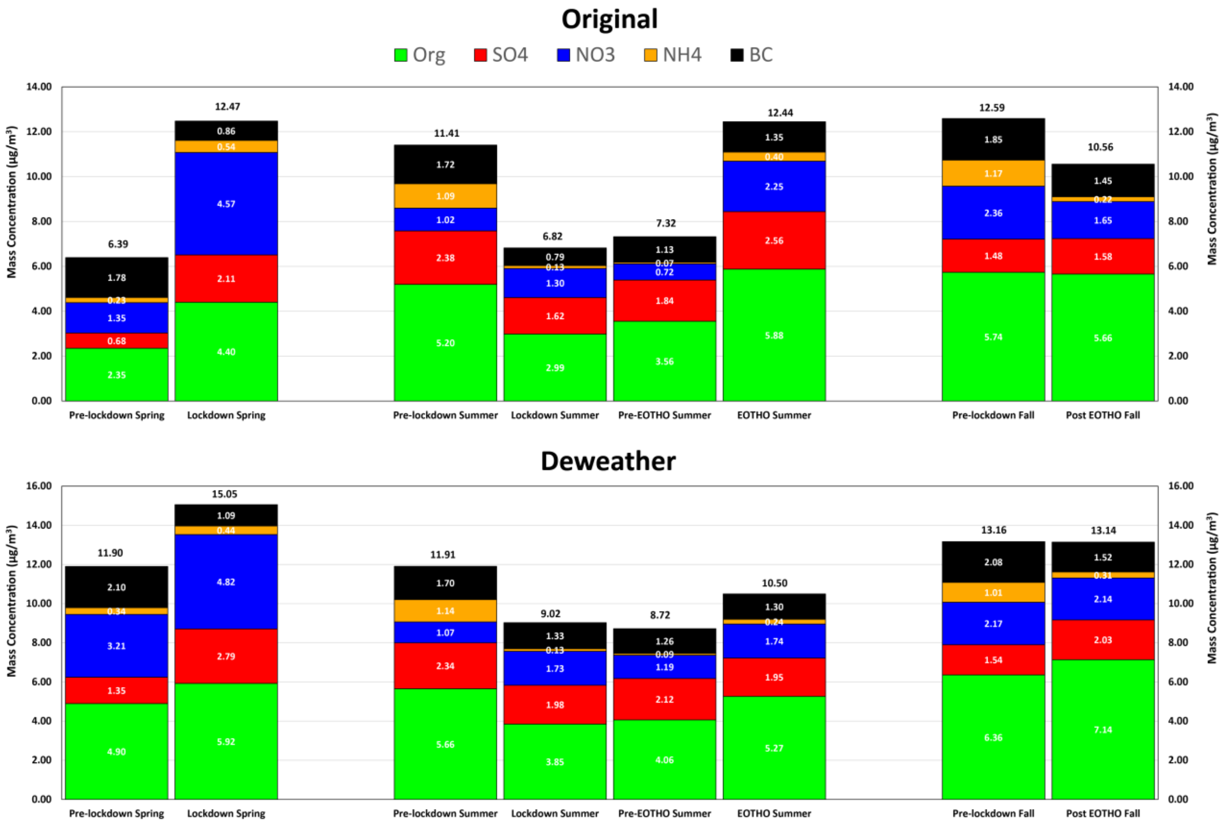

Figure S 9 The impacts on PM species during different periods compared with business as usual cases with and without deweathering analysis

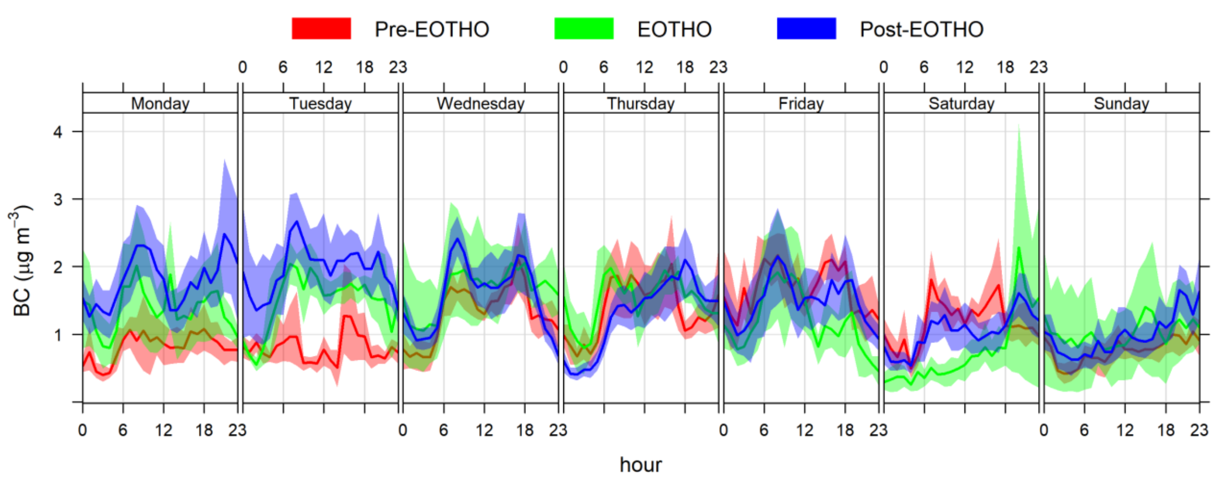

Figure S 10. BC diurnal cycles of each weekday after the lockdown before (red), during (green) and after (blue) the eat out to help out (EOTHO) policy.

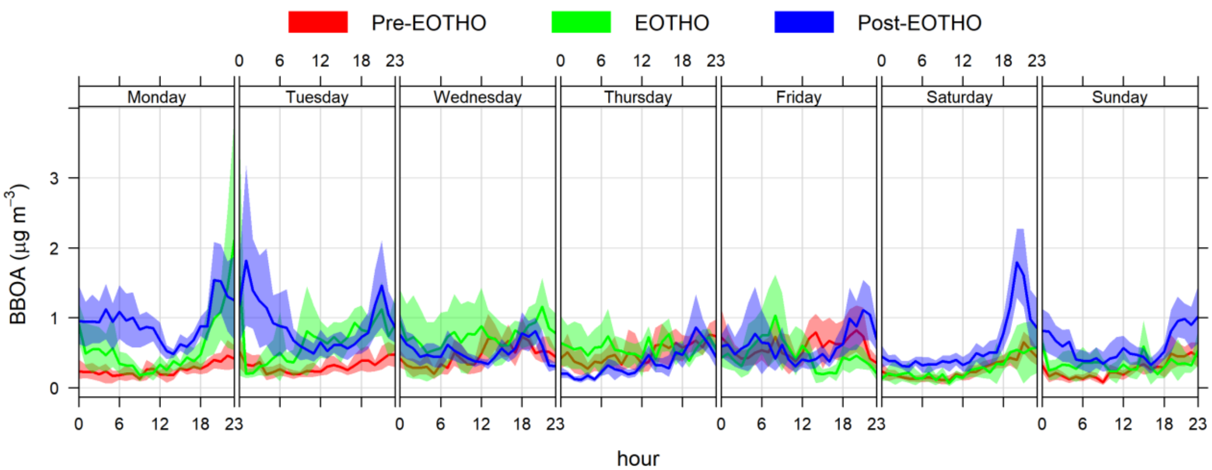

Figure S 11. BBOA diurnal cycles of each weekday after the lockdown before (red), during (green) and after (blue) the eat out to help out (EOTHO) policy.

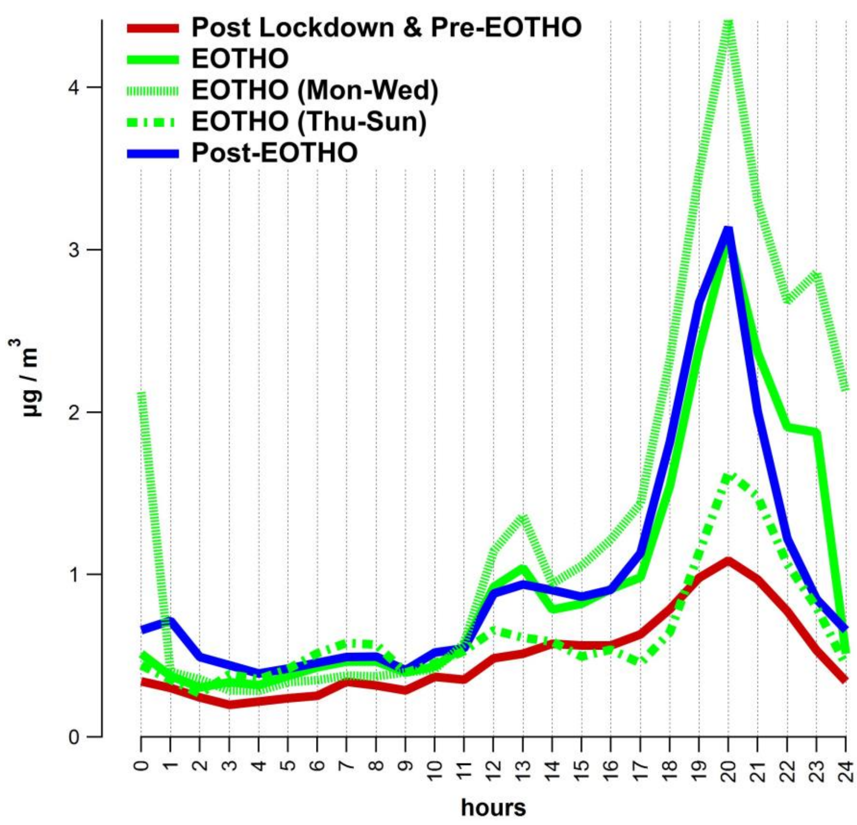

Figure S 12 The diurnal cycle of COA during different periods after lockdown, in which the eat out to help out (EOTHO) policy period was divided into Monday to Wednesday and Thursday to Sunday.

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