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Supplement of

Analysis of new particle formation (NPF) events at nearby rural, urban background and urban roadside sites

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10 **Table S1: Data availability per season (all numbers are percentages of available data)**

	Harwell				N. Kensington				Marylebone Road			
	Winte r	Sprin g	Summe r	Autum n	Winte r	Sprin g	Summe r	Autum n	Winte r	Sprin g	Summe r	Autum n
2009	15	97	10	80	57	97	100	100	100	65	86	68
2010	37	53	100	95	58	87	93	100	46	100	87	86
2011	72	75	99	73	89	87	73	89	79	99	100	67
2012	82	86	100	95	56	88	99	86	0	0	87	66
2013	91	70	99	100	84	92	98	98	57	92	84	100
2014	97	62	99	99	84	78	97	98	89	79	76	99
2015	77	100	61	70	80	99	65	100	74	100	98	100

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14 **Table S2:** Conditions per air mass origin for NPF event days (April – October average in
 15 parenthesis) for all areas of study.

Harwell				
	Continental	Arctic	Polar	Tropical
Condensation sink (s ⁻¹)	5.05E-03 (5E-03)	2.71E-03 (3.32E-03)	2.57E-03 (2.87E-03)	3.19E-03 (2.87E-03)
Wind speed (m s ⁻¹)	3.52 (3.63)	3.87 (3.47)	3.64 (3.69)	3.74 (4.17)
Temperature (°C)	15.5 (13.6)	12.2 (11.5)	13.6 (13.1)	16.3 (15)
SO ₂ (µg m ⁻³)	1.87 (1.81)	1.11 (1.82)	1.11 (1.27)	1.22 (1.36)
NO _x (µg m ⁻³)	9.58 (13.9)	5.49 (8.01)	4.66 (7.2)	5.81 (7.69)
SO ₄ ²⁻ (µg m ⁻³)	2.70 (3.3)	1.37 (2.05)	1.44 (1.64)	1.37 (1.57)
Particulate OC (µg m ⁻³)	2.85 (2.88)	1.35 (1.59)	1.52 (1.63)	1.98 (1.76)

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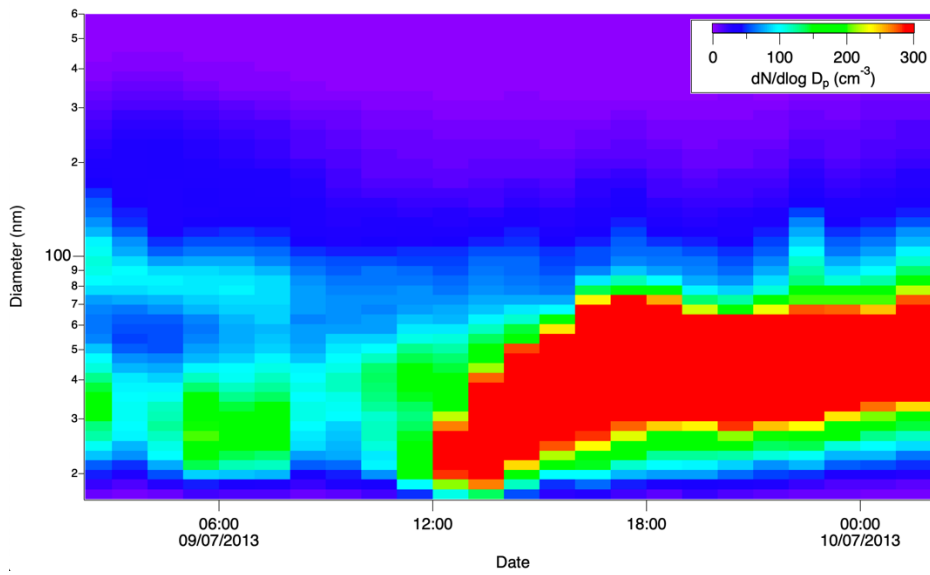
North Kensington				
	Continental	Arctic	Polar	Tropical
Condensation sink (s ⁻¹)	7.20E-03 (9.35E-03)	5.20E-03 (6.37E-03)	5.40E-03 (6.38E-03)	4.89E-03 (6.32E-03)
Wind speed (m s ⁻¹)	3.89 (3.44)	3.92 (3.65)	4.46 (4.2)	4.74 (4.44)
Temperature (°C)	18.4 (15)	12.7 (13.1)	15.5 (14.6)	17 (16.4)
SO ₂ (µg m ⁻³)	1.68 (2.23)	1.33 (1.89)	1.73 (1.75)	1.74 (1.72)
NO _x (µg m ⁻³)	33.5 (55)	28.5 (39.2)	30.3 (39.4)	24 (34.9)
SO ₄ ²⁻ (µg m ⁻³)	1.93 (2.23)	0.95 (1.36)	0.98 (1.13)	1.30 (1.47)
Particulate OC (µg m ⁻³)	3.84 (4.90)	2.24 (2.95)	2.81 (2.96)	2.43 (3.03)

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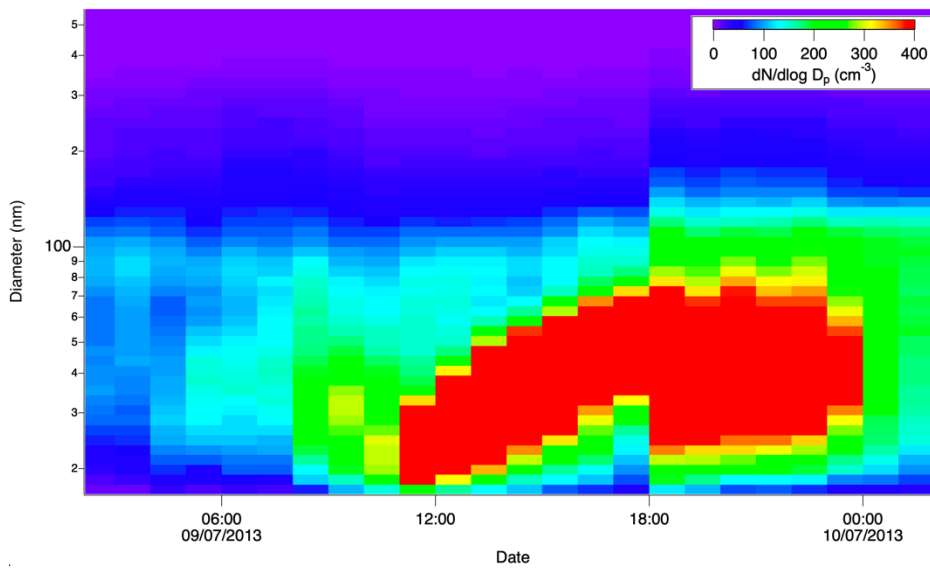
Marylebone				
	Continental	Arctic	Polar	Tropical
Condensation sink (s ⁻¹)	1.65E-02 (1.96E-02)	1.16E-02 (1.57E-02)	1.4E-02 (2.14E-02)	1.82E-02 (2.39E-02)
Wind speed (m s ⁻¹)	3.92 (3.41)	3.50 (3.64)	3.84 (4.13)	4.77 (4.4)
Temperature (°C)	17.4 (15.2)	13.4 (13.4)	15.3 (14.8)	16.9 (16.3)
SO ₂ (µg m ⁻³)	4.99 (6.39)	4.31 (5.63)	5.38 (7.43)	6.95 (8.17)
NO _x (µg m ⁻³)	172 (250)	139 (214)	191 (303)	269 (336)
SO ₄ ²⁻ (µg m ⁻³)	3.24 (3.35)	1.47 (1.6)	1.52 (1.61)	1.24 (1.8)
Particulate OC (µg m ⁻³)	6.03 (6.91)	3.81 (4.73)	4.67 (5.97)	5.31 (6.6)

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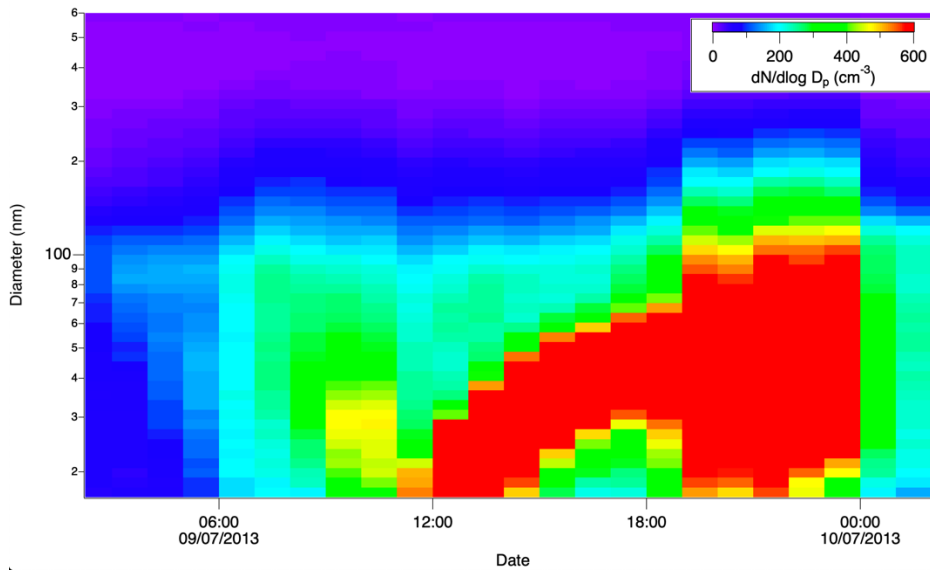
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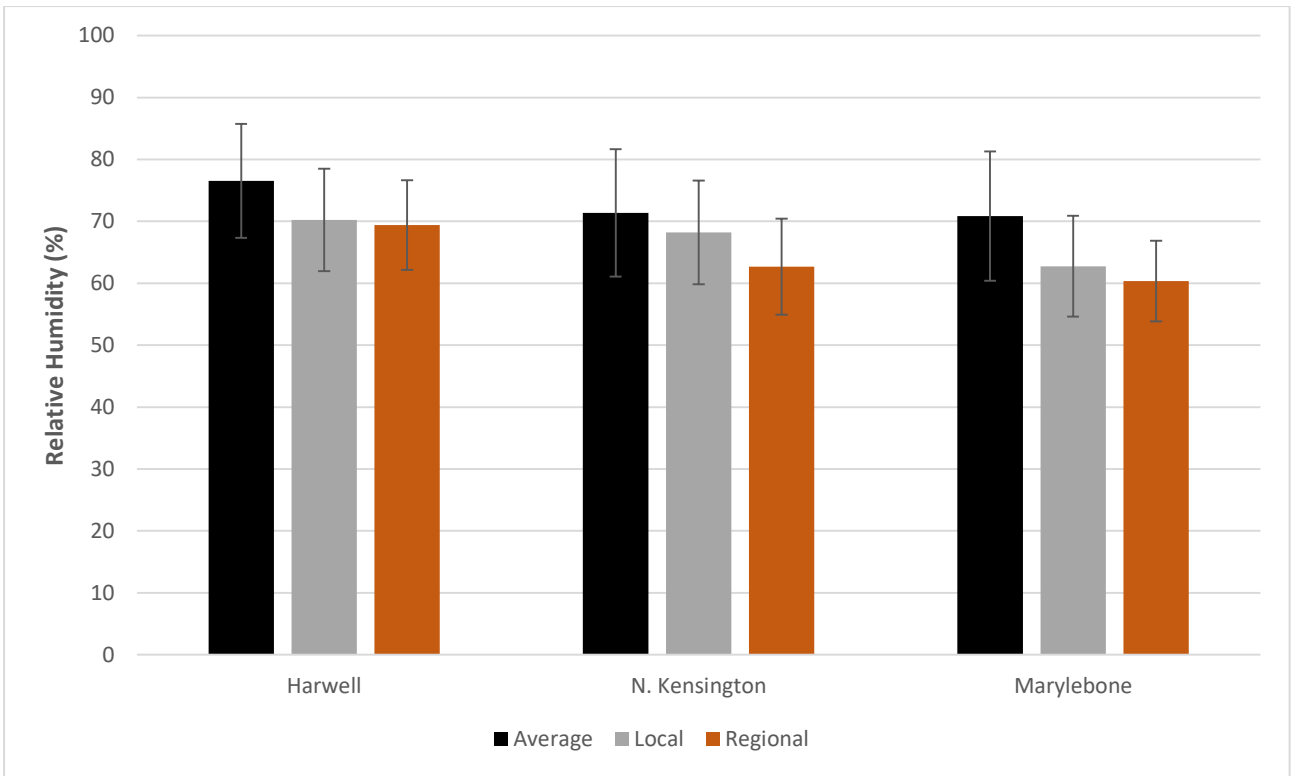
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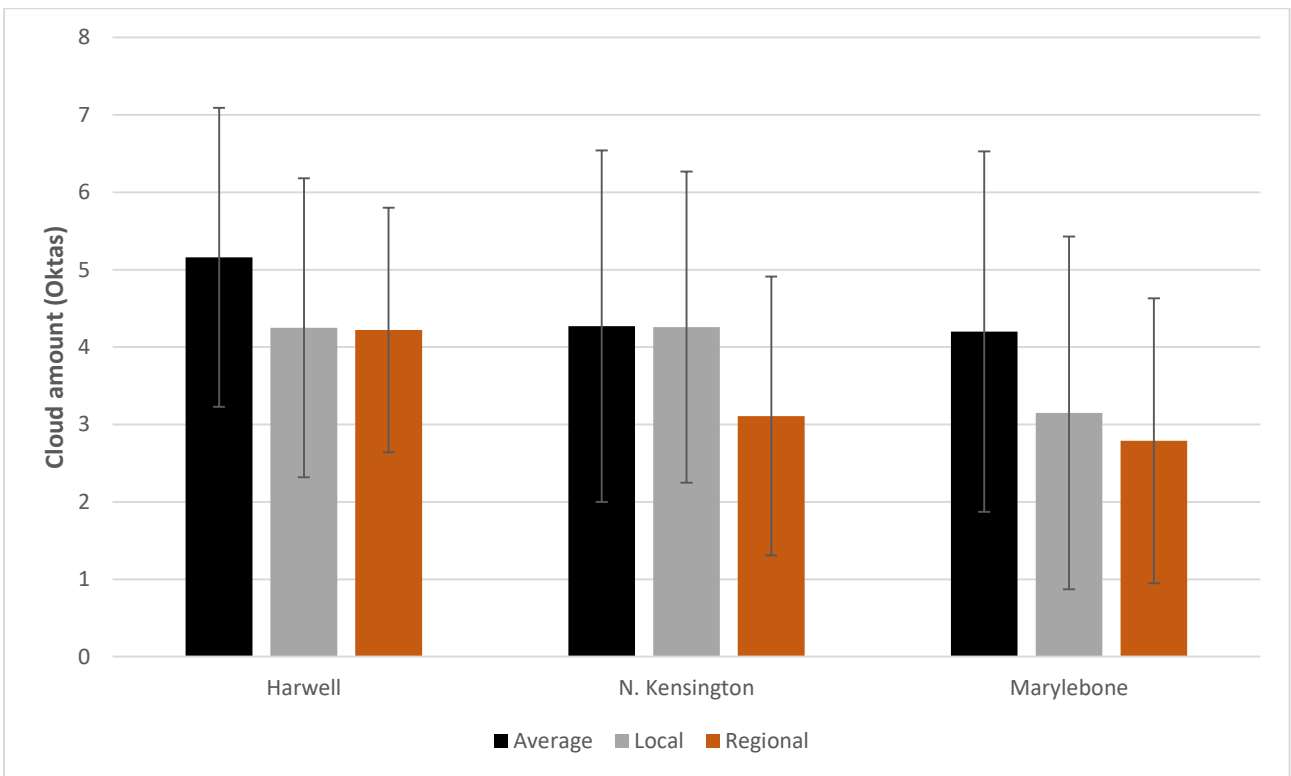
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23 **Figure S1:** Example of a regional NPF event for all the sites of the present study (from top to bottom
 24 is HW, NK, MR)

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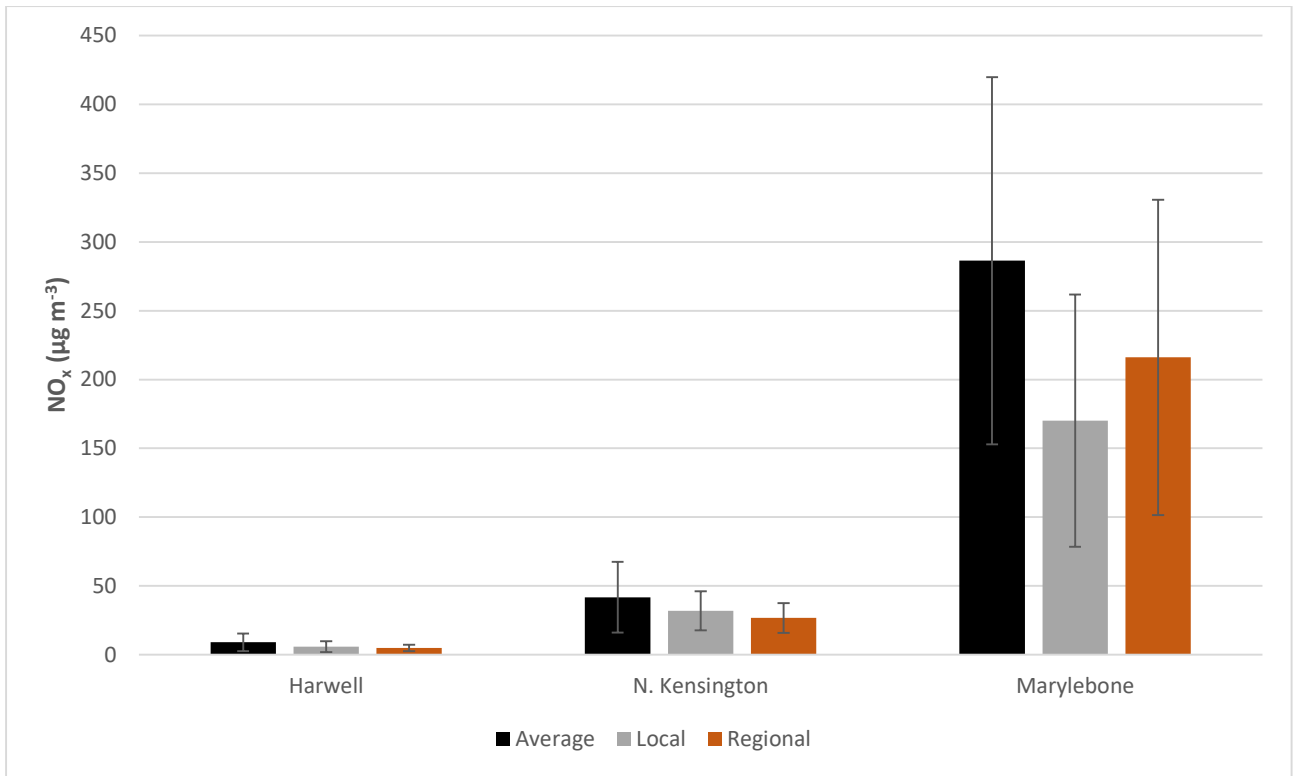


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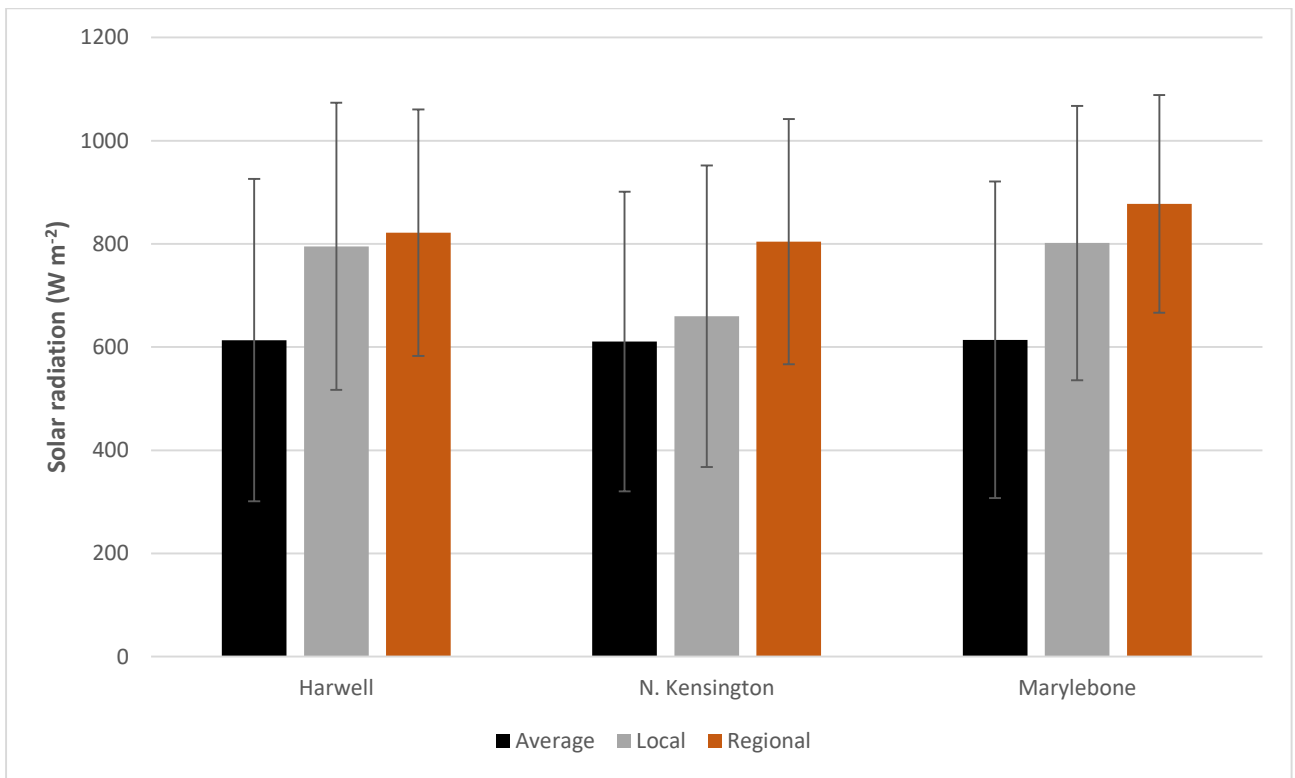


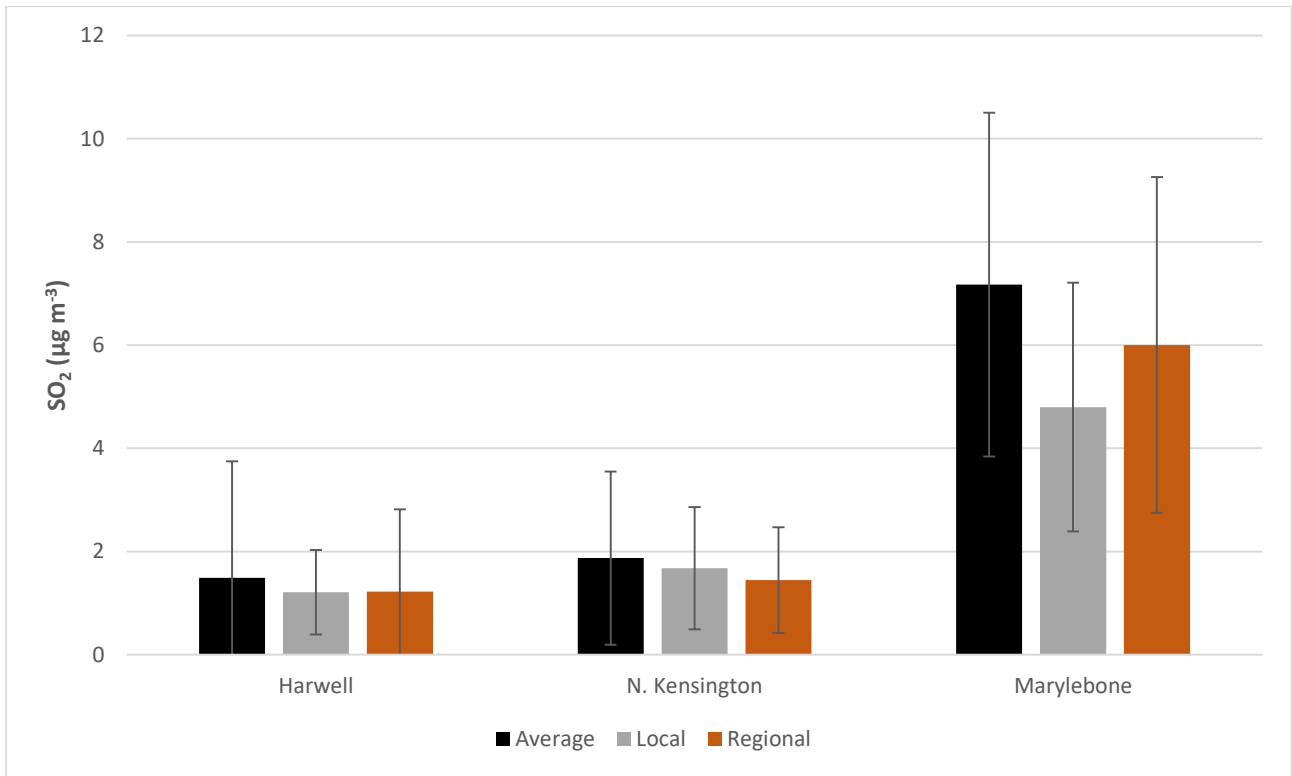
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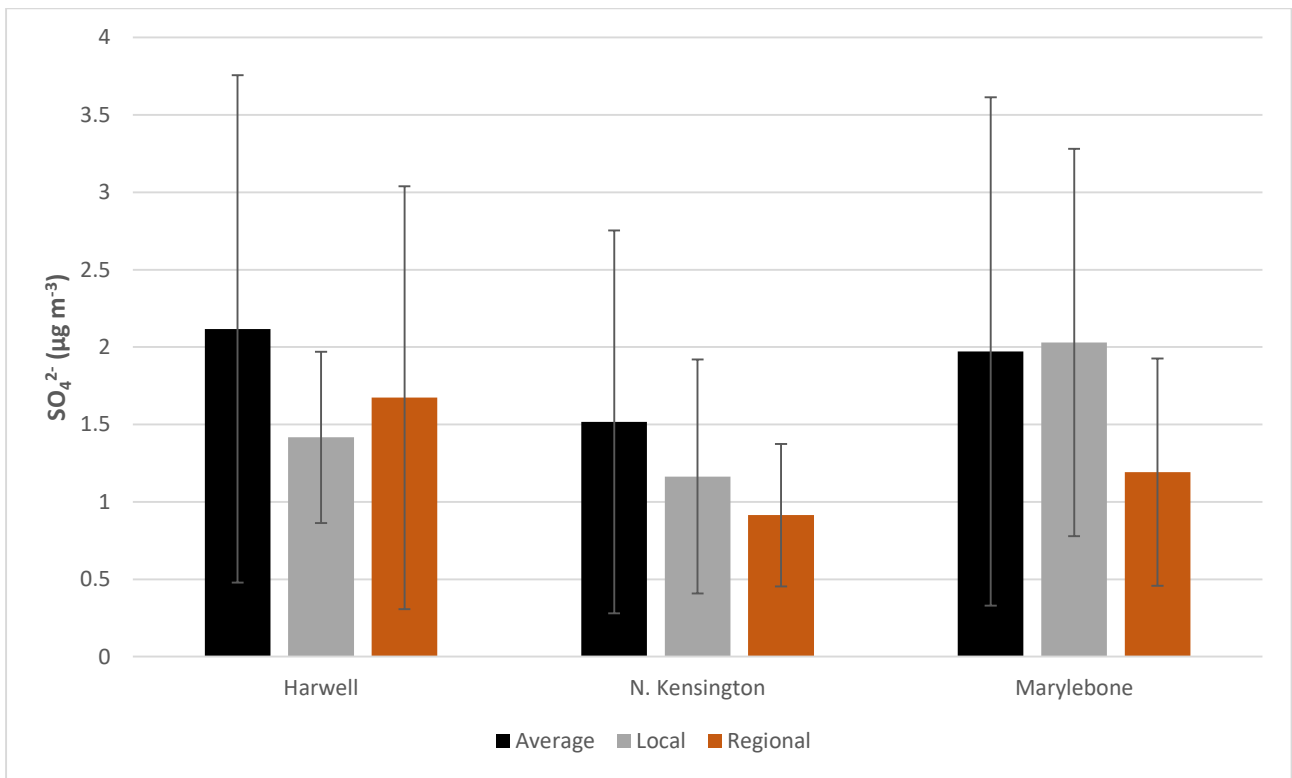


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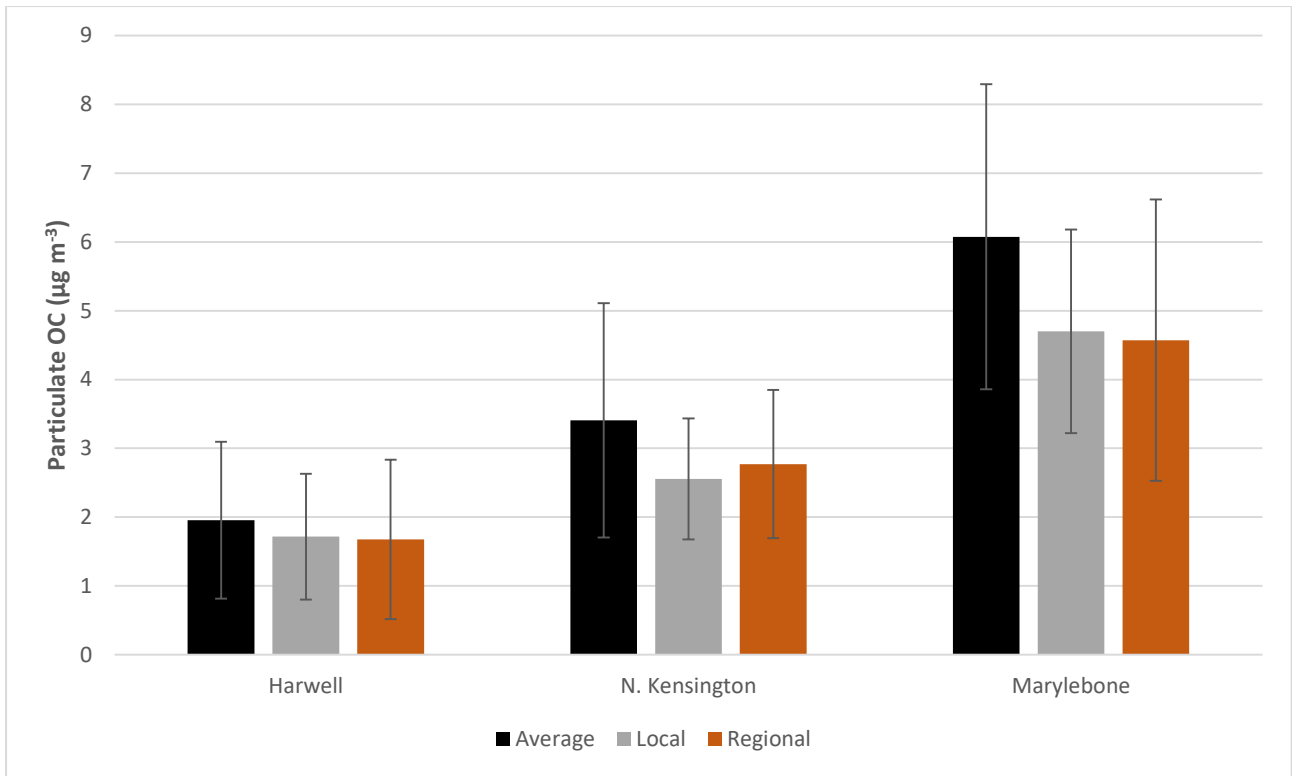


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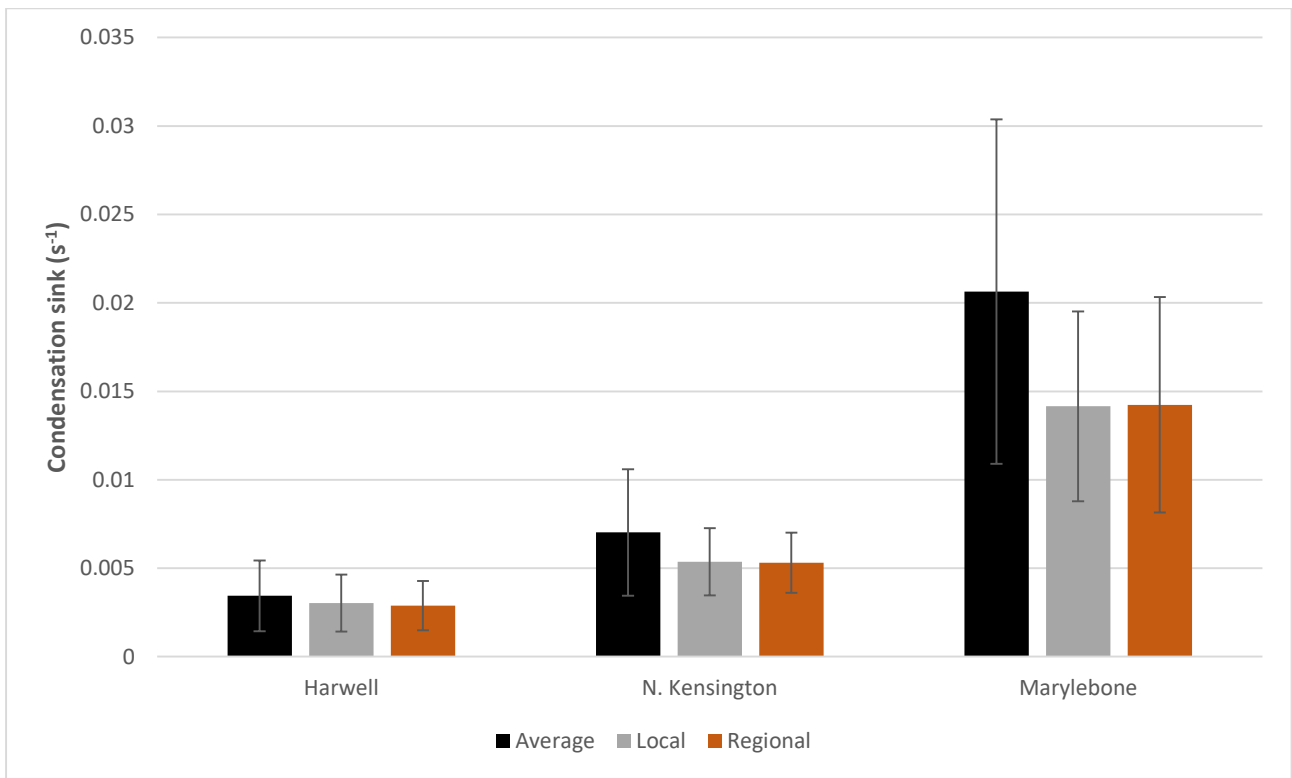


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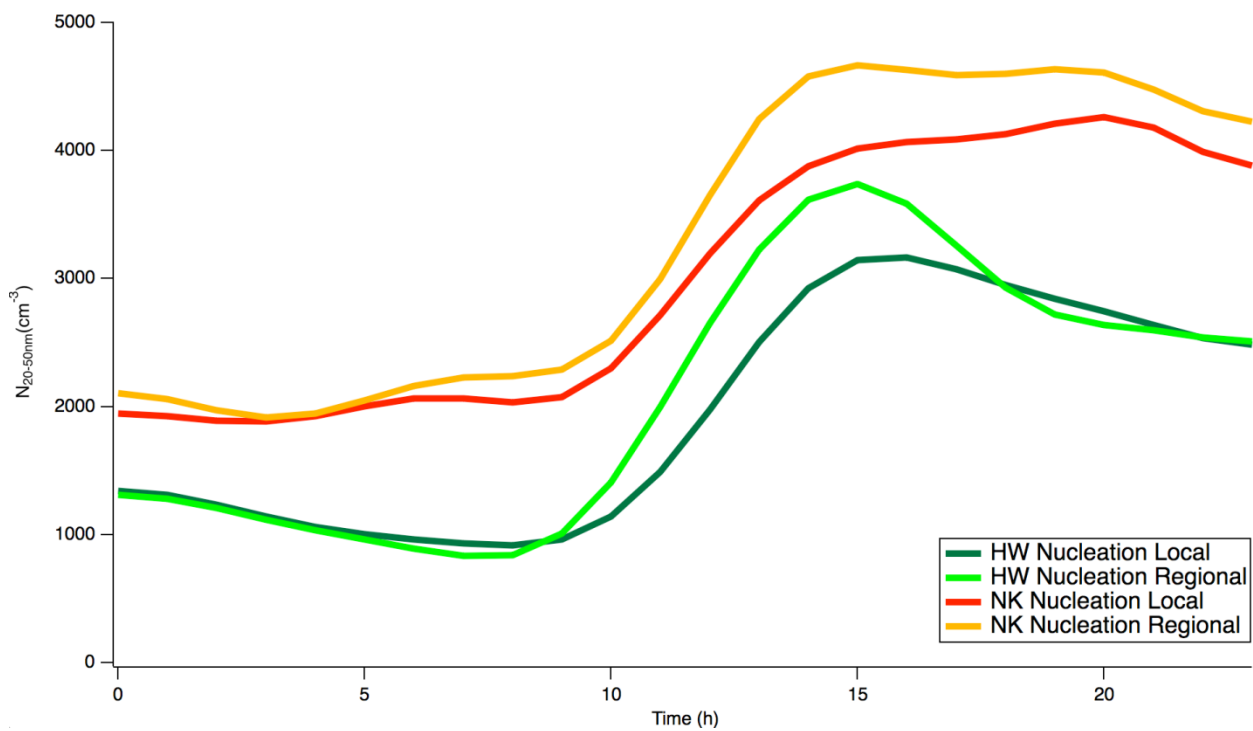
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35 **Figure S2:** Average and NPF event conditions for Harwell and N. Kensington and Marylebone Road.
 36 On Marylebone Road, Regional events' conditions refer to the Regional event days for all 3 sites.

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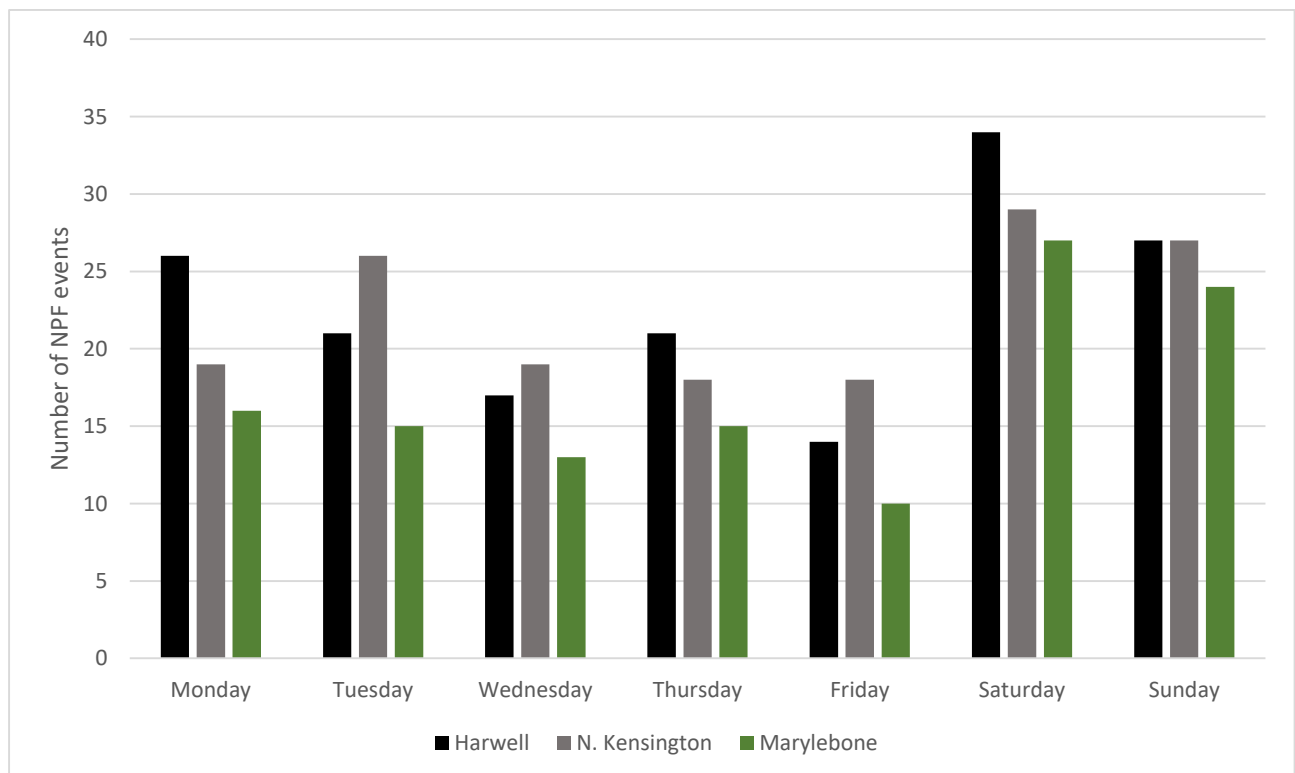
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41 **Figure S3:** Diurnal variation of $N_{20-50nm}$ for Harwell and N. Kensington during local and regional
 42 NPF events.

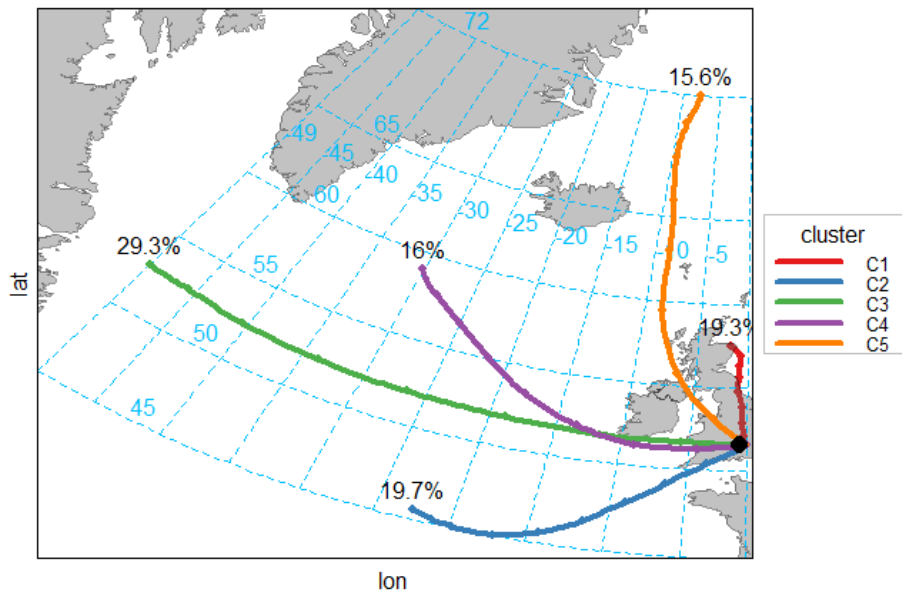
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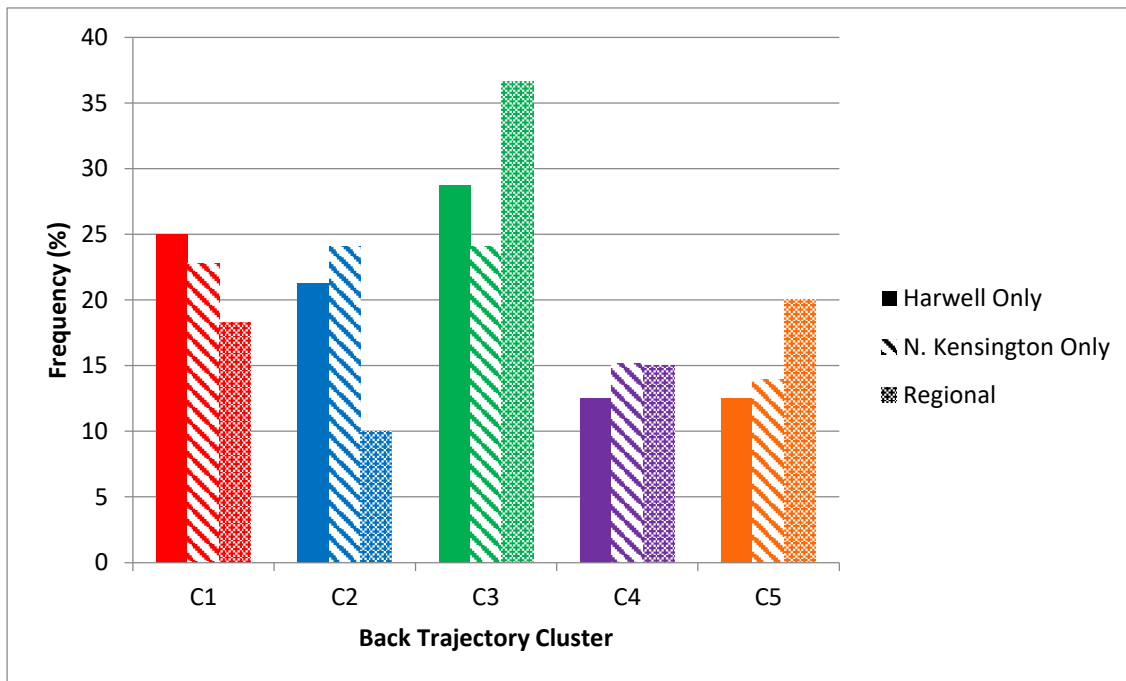
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45 **Figure S4:** Weekly variation of NPF events in Marylebone Road.

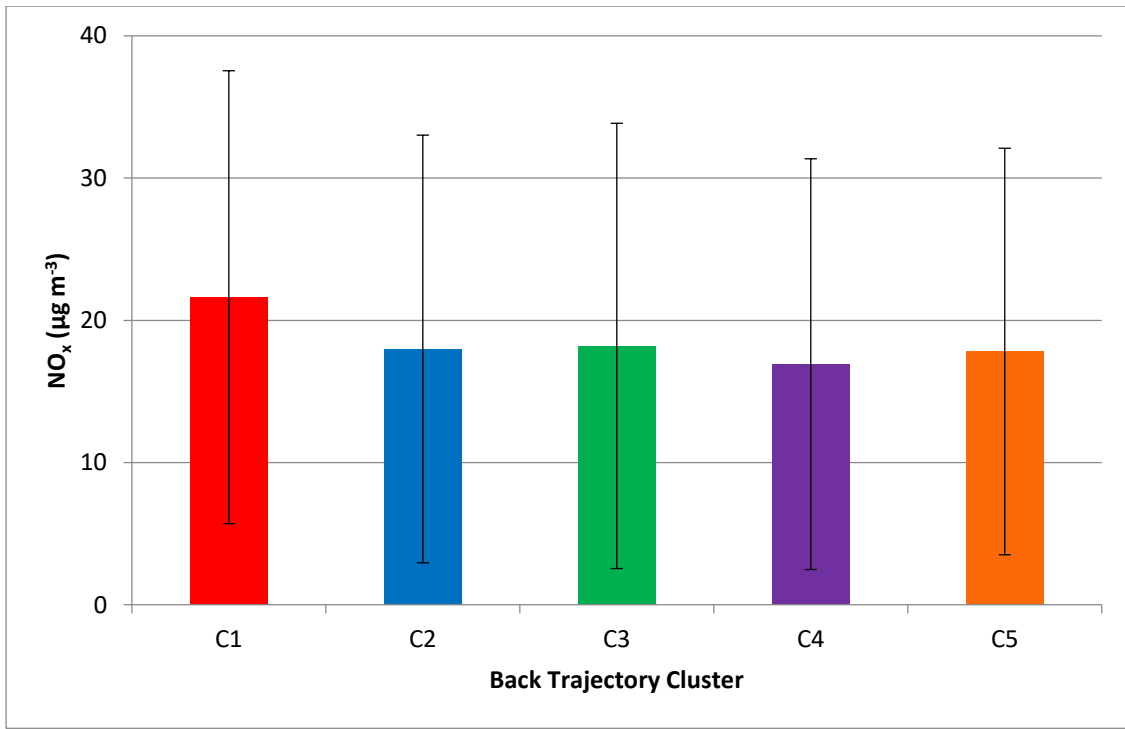
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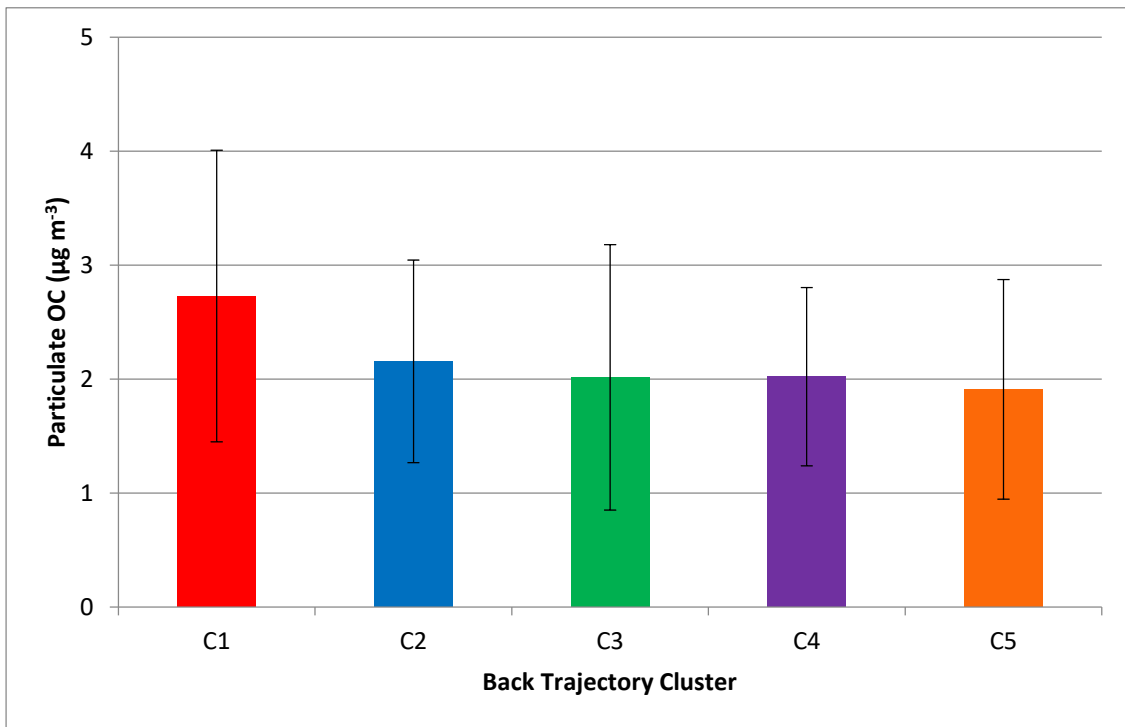
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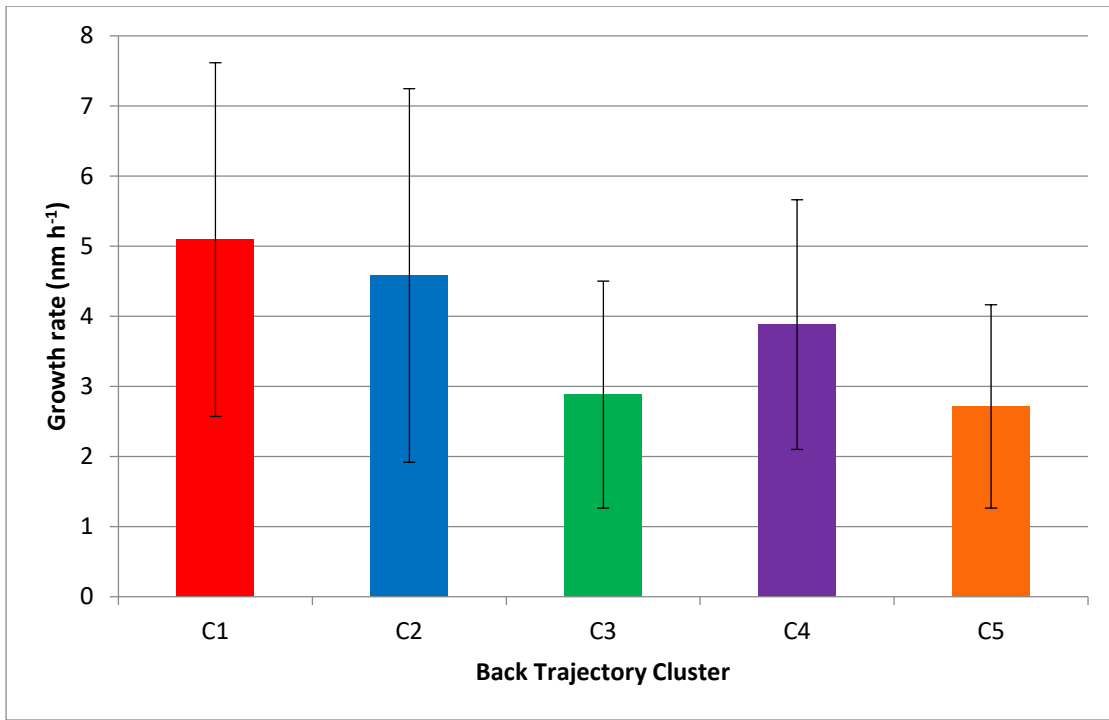
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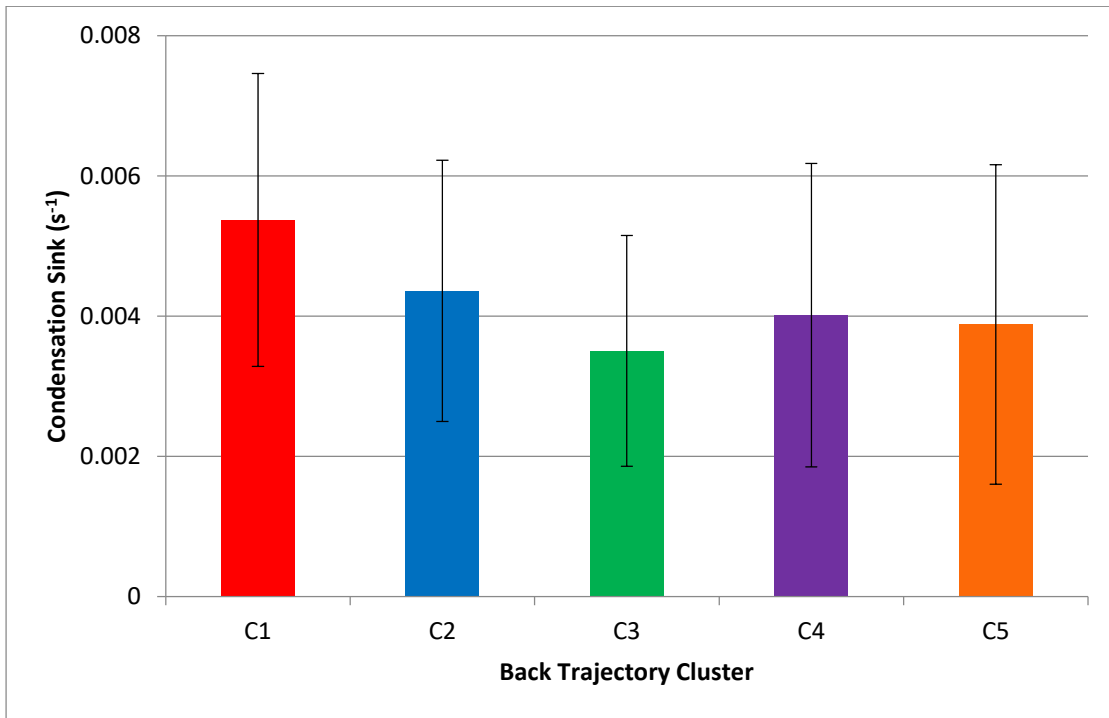
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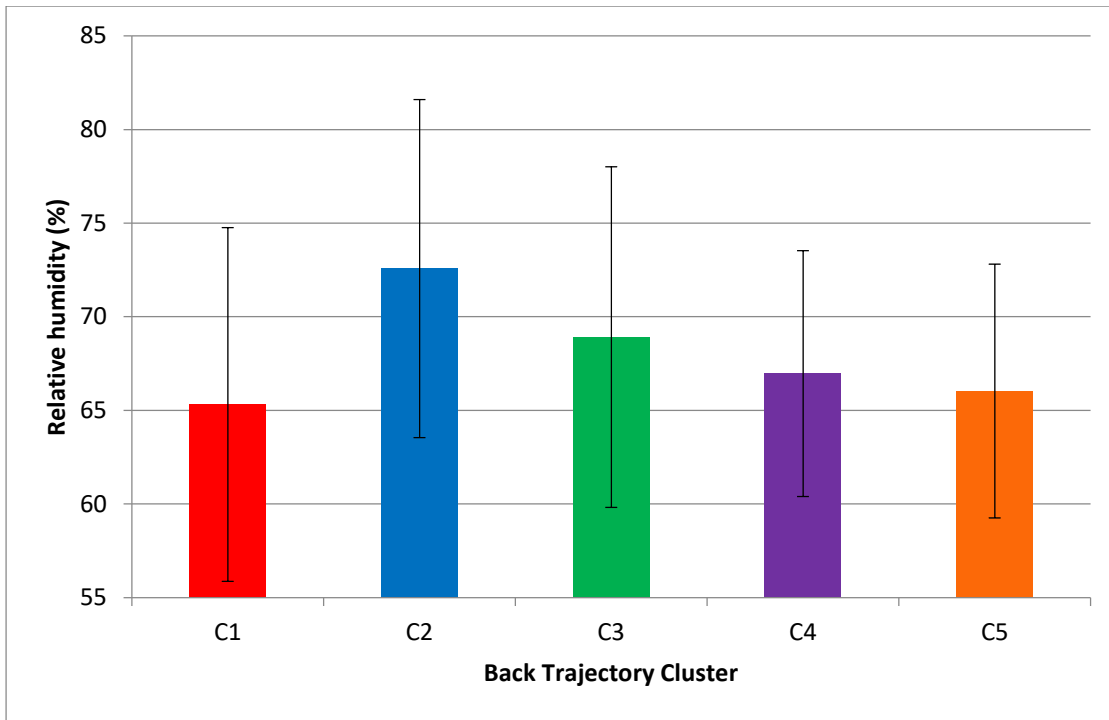


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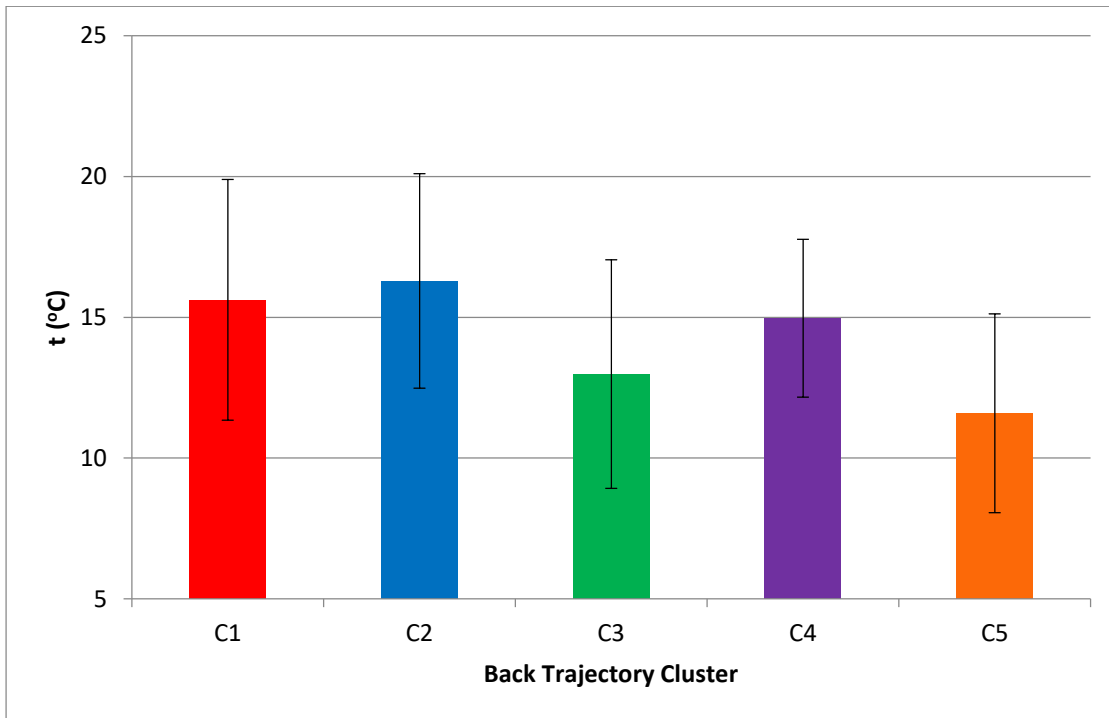


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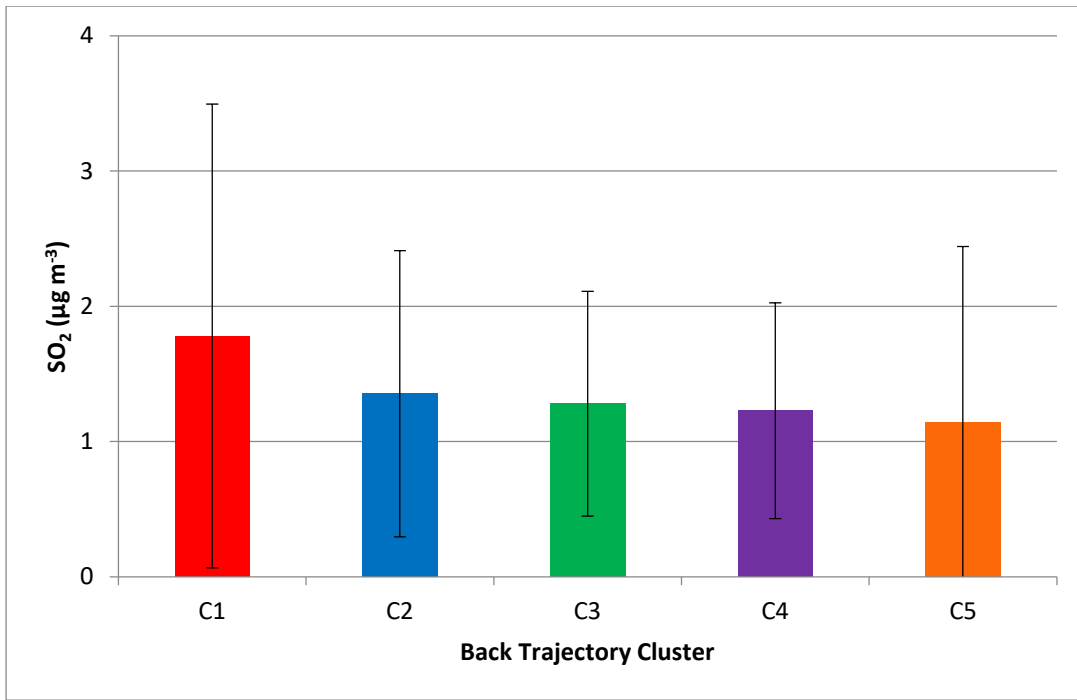


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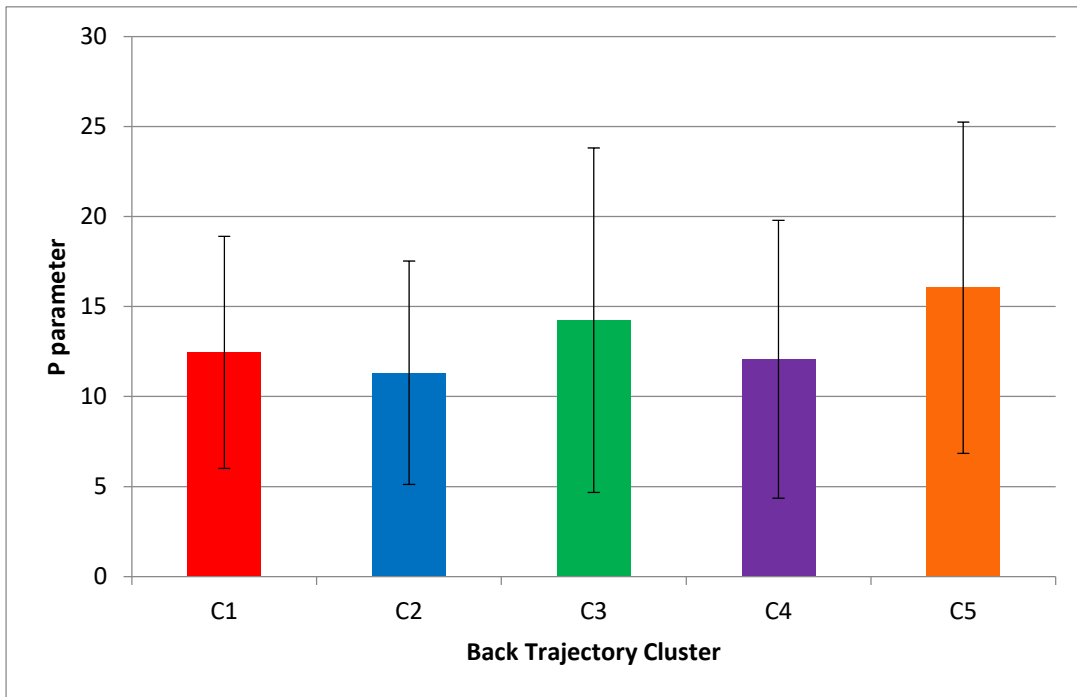


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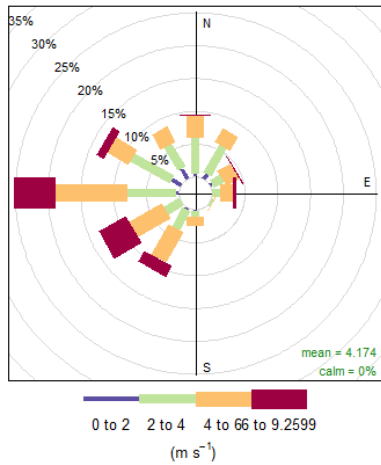
61 **Figure S5:** Air mass origin frequency and conditions for NPF events in Harwell and N. Kensington.

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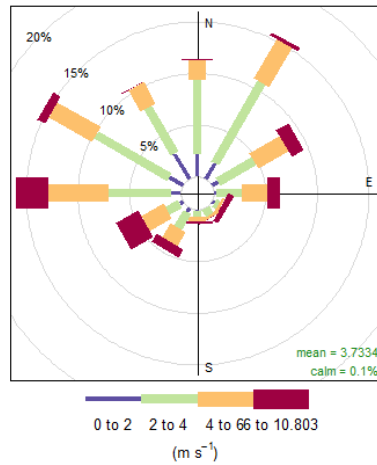
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Frequency of counts by wind direction (%)



Frequency of counts by wind direction (%)

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68 **Figure S6:** Wind profile for Local (left) and Regional (right) NPF events in Marylebone Road.

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