SUPPLEMENTARY INFORMATION

Interpretation of Particle Number Size Distributions Measured across Urban Area during the FASTER Campaign

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Table S1: Lognormal modes fitted to average size distribution (eqn 1) for each wind direction sector (°, measured at LHR, value is midpoint of 45 ° sector). Location refers to the diameter.

BT Tower

First mode				
Wind Direction	Location (nm)	Amplitude	Area nm cm^{-3}	FWHM
0	25.35	3928.49	234104	48.51
45	28.66	4067.12	361898	68.13
90	25.22	3915.02	229514	47.83
135	24.38	5330.23	202014	32.81
180	23.83	5580.83	237266	36.25
225	40.33	6276.17	759237	93.61
270	24.04	8859.68	583838	51.98
315	32.42	4776.51	455667	74.1

Second mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	90.17	3169.93	522734	140.16
45	115.67	2050.77	382737	161.42
90	89.7	3202.53	527251	139.85
135	69.49	6570.34	825761	110.16
180	66.22	3539.76	310627	77.59
225				
270	107.06	2413	464582	164.11
315	118.145	1854.66	392172	180.56

Third mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	252.39	1083.55	256315	214.96
45	255.28	1062.52	256633	219.37
90	252.27	1083.66	256300	214.92
135	192.92	999.77	231929	207.04
180	163.22	1615.88	218842	176
225				
270				
315				

Regent's University

First mode				
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0	20.57	5126.57	278786	43.24
45	16.97	4003.494	506720	27.22
90	30.62	8629.39	841799	74.37
135	21.56	10656.4	761568	53.67
180	14.38	8390.3	232405	23.34
225	8.59	4391.335	55150	10.98
270	11.671	7877.21	119545	13.44
315	22.83	5396.65	445362	60.92

Second mode				
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0	82.12	3047.83	415980	117.54
45	70.84	3102.88	221919	133.59
90	143.12	1417.51	331597	202.21
135	81	4228.59	711679	140.22
180	52.76	5815.76	807440	110.6
225	28.59	7083.26	618987	67.27
270	32.69	7246.06	716049	76.28
315	81.57	2827.28	509009	148.51

Third mode				
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0	249.69	1019.65	255664	226.915
45	248.3	875.56	129033	229.14
90	278.84	319.75	68855.3	197.61
135				
180				
225				
270				
315				

North Kensington

First mode	First mode			
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	25.16	3677.62	68003	17
45	25.07	28-4.69	53038	17.37
90	25.45	3839.42	69211	16.6
135	23.59	3586.46	47019	12.16
180	24.2	2504.2	39961	14.73
225	22.37	2443.1	24056	9.17
270	23.54	5533.2	98390	16.33
315	26.05	4620.27	96761	19.18

Second mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	57	4922.5	558961	95.2
45	57.62	3387.15	395938	97.71
90	47.79	6516.87	450853	60.74
135	36.53	4261.6	163946	34.68
180	46.63	4150.9	275245	58.19
225	32.96	4337.3	122760	25.84
270	40.56	7844.84	451356	50.51
315	52.8	6519.26	529691	70.66

Third mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	224.9	970.54	228005	211.9
45	216.54	1059.13	251998	213.93
90	143.93	2319.51	508160	190.92
135	73.95	5745.6	887776	128.58
180	125.15	1756.3	318387	158.81
225	63.1	5216.349	664931	106.64
270	106.98	2366.82	425075	154.514
315	131.62	1770.74	363740	178.437

Marylebone Road

First mode	First mode			
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	22.88	3691.19	72084.7	17.83
45	22.89	3771.4	84406.1	20.28
90	23.54	7924.86	152534	17.61
135	21.83	5367.5	60459.1	10.46
180	22.08	8296.72	112315	12.52
225	20.79	7178.56	67461.8	8.75
270	24.07	12222	273331	20.32
315	20.94	2866.11	35984	11.62

Second mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	56.62	4834.02	724755	119.34
45	63.48	4079.18	634362	125.74
90	48.13	10413.3	942478	76.57
135	31.47	7858.62	257815	29.6
180	32.24	9933.89	395955	35.57
225	27.91	10344.56	258991	22.81
270	54.85	13664.8	1879800	110.66
315	29.46	4554.66	154631	30.4

Third mode				
Wind Direction	Location (nm)	Amplitude	Area	FWHM
0	263.19	864.15	198503	209.57
45	257.32	903.69	222882	223.84
90	159.57	2495.6	601853	210.5
135	63.65	11942.15	1756280	120.21
180	76.12	9900.46	1535980	129.64
225	60.01	12575.8	1662990	108.96
270				
315	66.06	6338.68	970765	125.12

31 **Westminster University**

First mode				
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0				
45	21.58	5152	52139	9.42
90	23.6	8396.8	118970	13.1
135	24.5	13092.5	179378	12.7
180	24.3	10784.1	182681	15.6
225				
270				
315				

Second mode				
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0				
45	32.3	8185.6	393600	41.9
90	38.9	10776.5	552790	45.4
135	39.5	12488.9	577503	40.2
180	49.3	12827.5	2E+06	101.73
225				
270				
315				

	Third mode			
Wind Direction	**Location (nm)**	**Amplitude**	**Area**	**FWHM**
0				
45	73.33	4964.3	795991	132.41
90	87.4	4312.4	781895	151.4
135	66.26	10615.5	1467720	115.1
180				
225				
270				
315				

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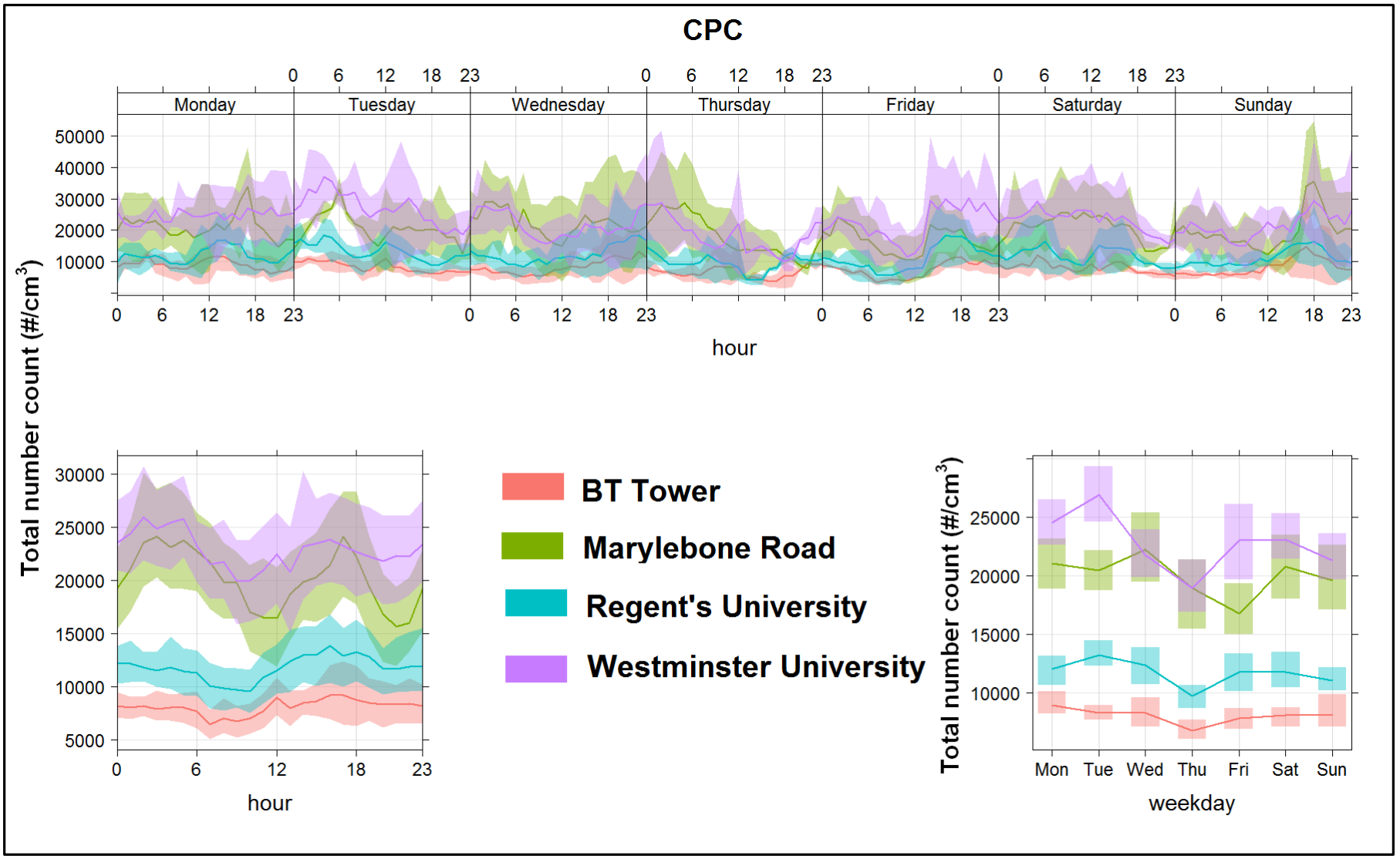


Figure S1: Average total number count from CPC instruments by day of week and time of day.

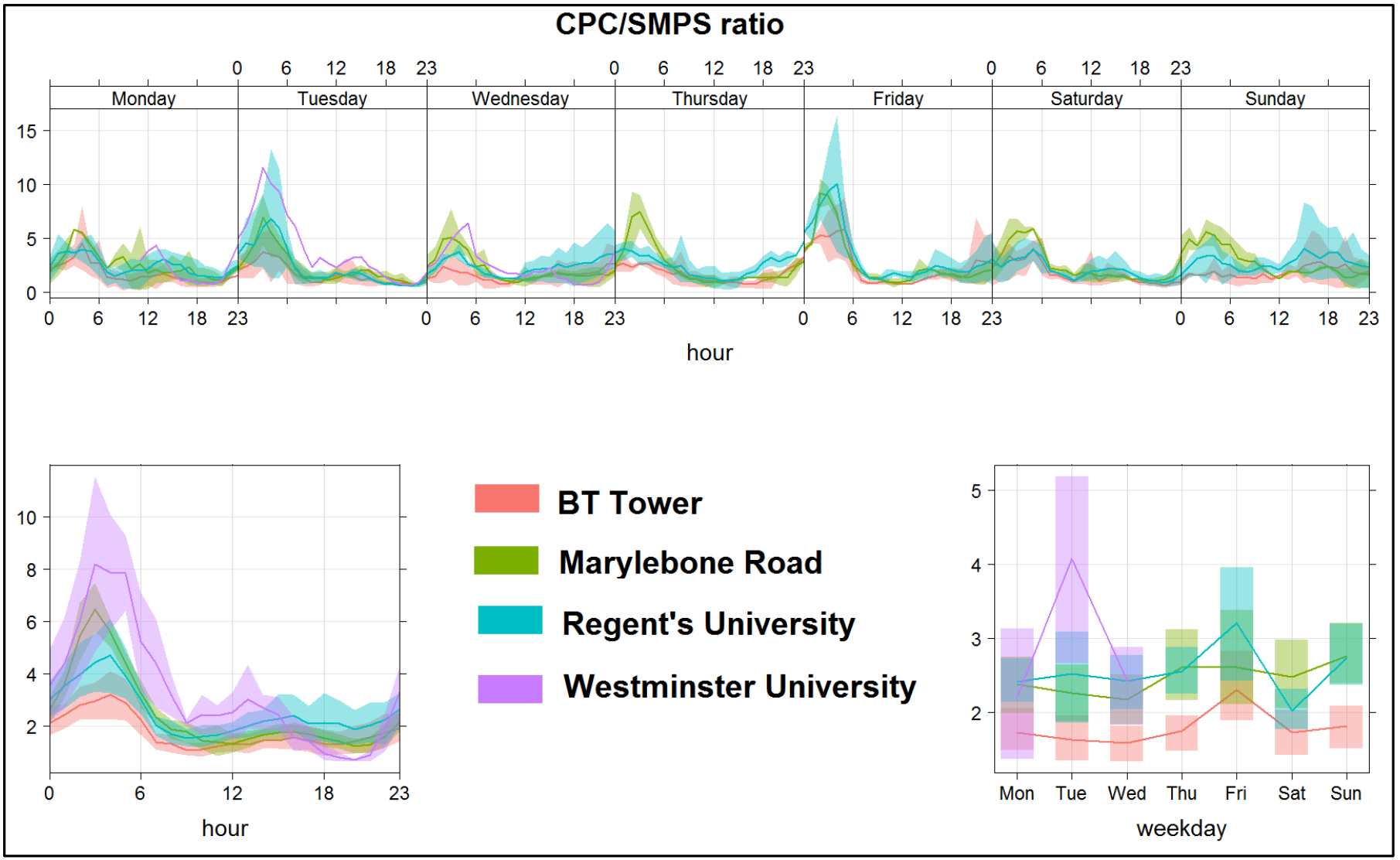


Figure S2: AsFigure S1 but ratio of CPC/SMPS total particle count data.

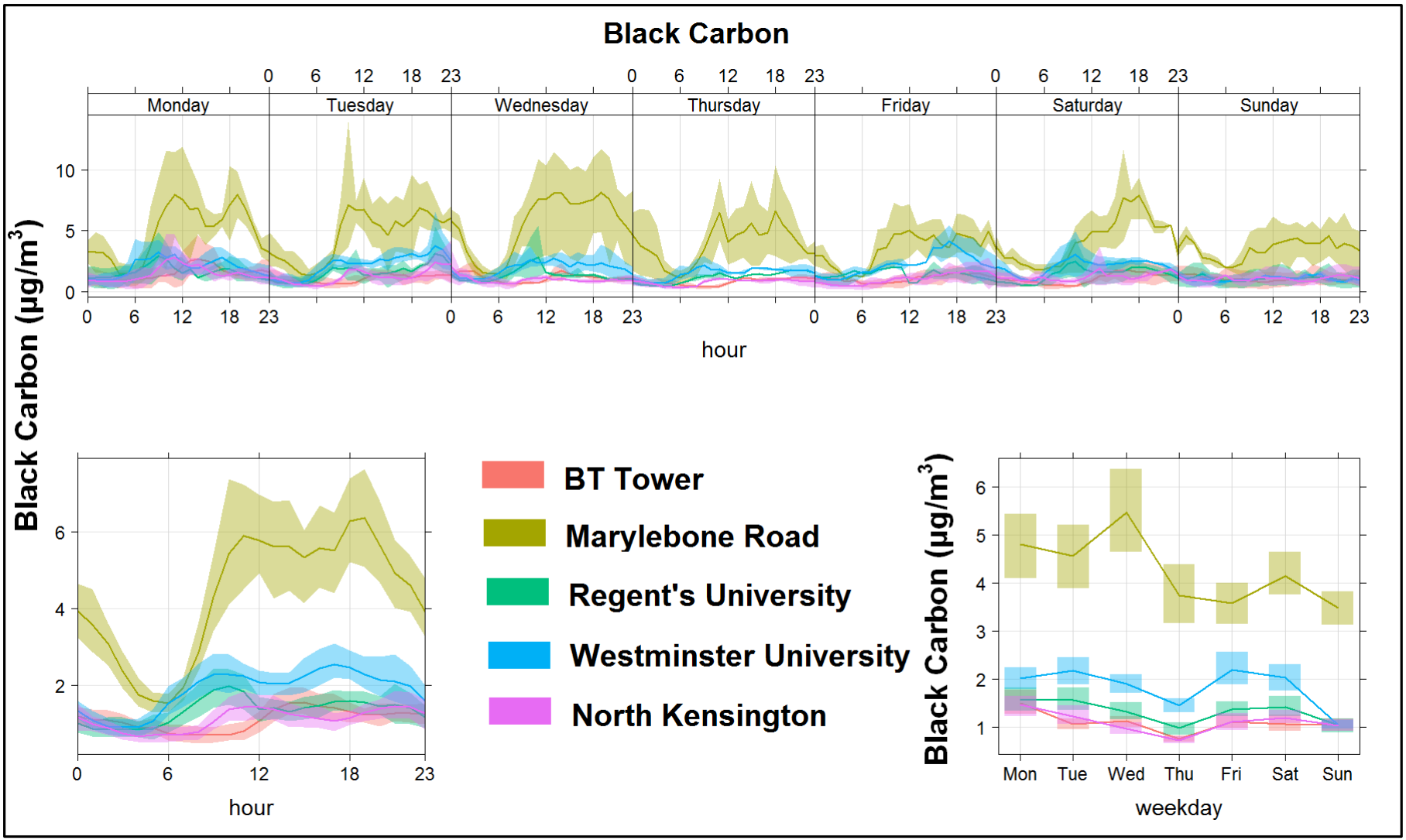


Figure S3: As Figure S1, but black carbon concentrations.

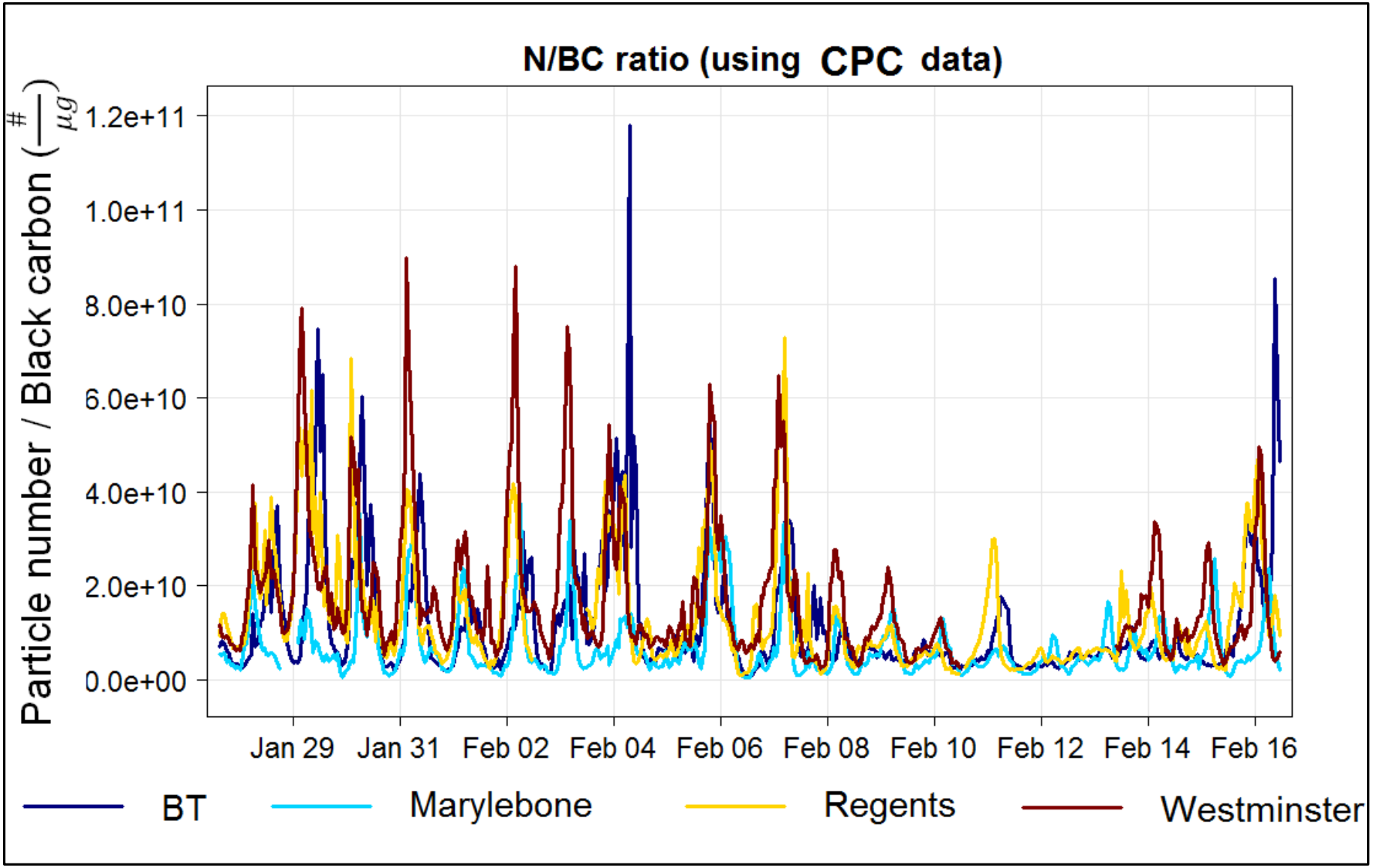


Figure S4: Time series (15 min) of the ratio of total particle number (from CPC) to black carbon for the entire campaign.

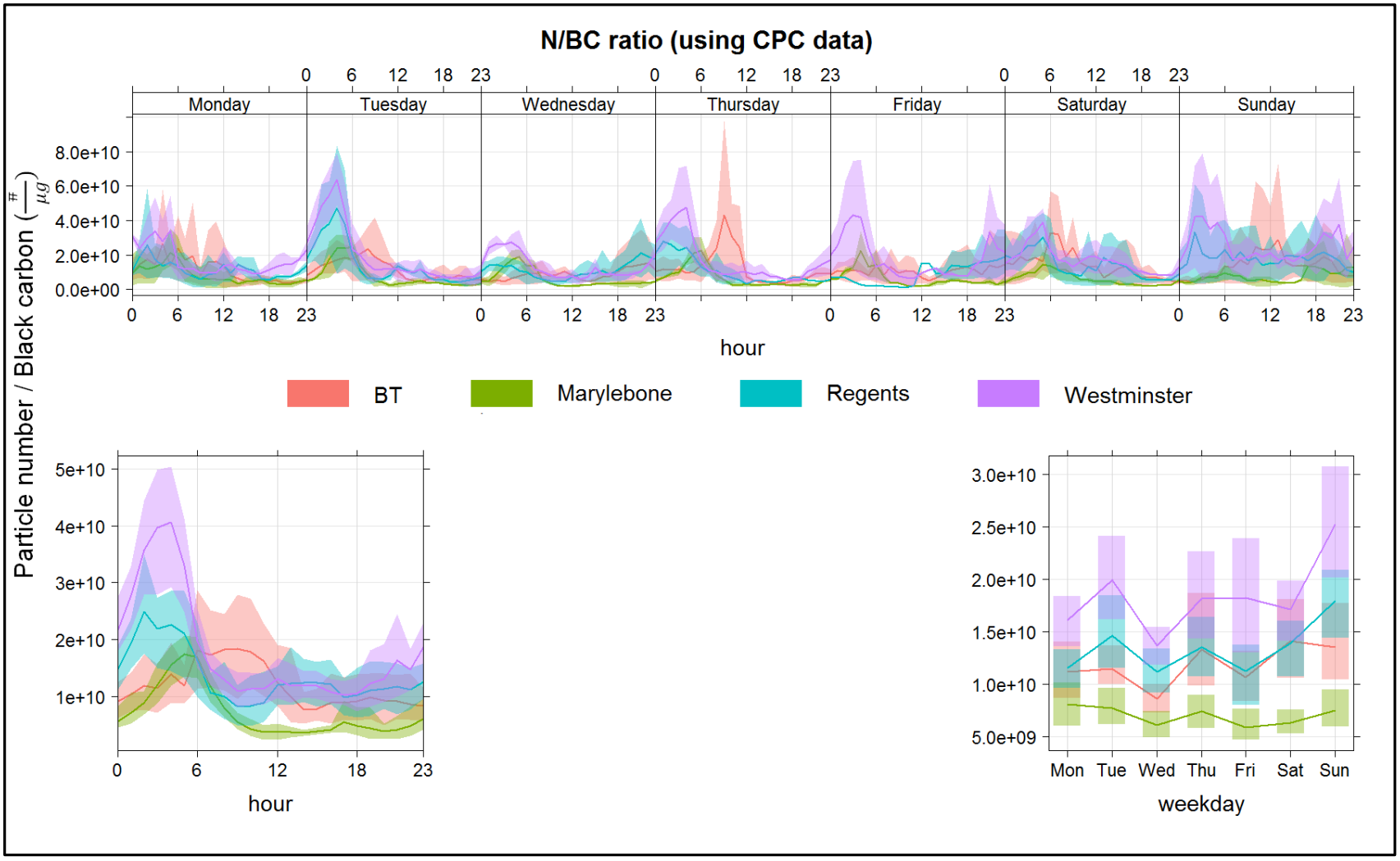


Figure S5: As Figure S1 but ratio of total particle number (from CPC) to black carbon.

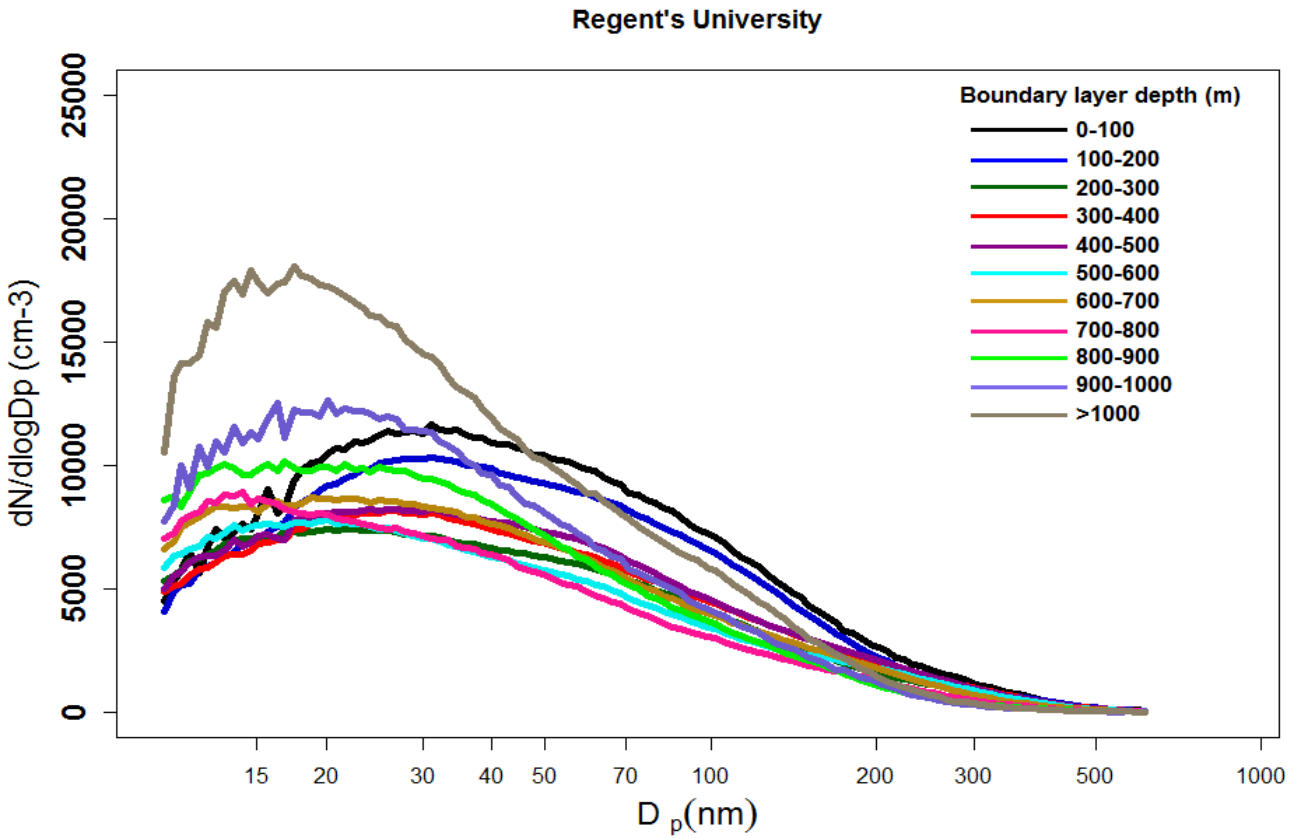
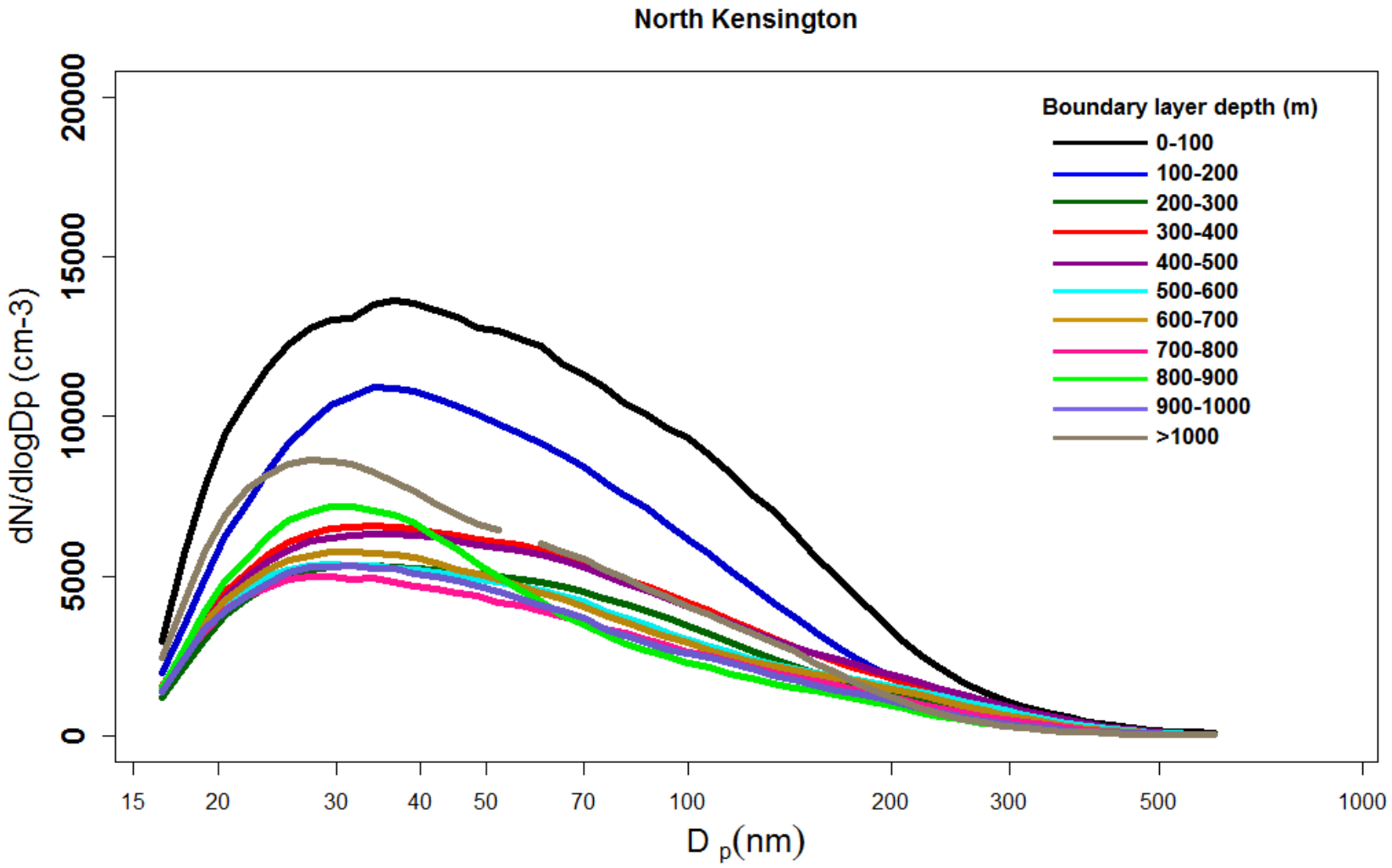


Figure S6: Average particle size distributions at Regent's University as a function of mixed layer height (m) as observed at Marylebone Road. Data analysed are 15 min data. Rain periods are included but account for only 2% of total time.



52 **Figure S7:** As Figure S6, but for North Kensington.

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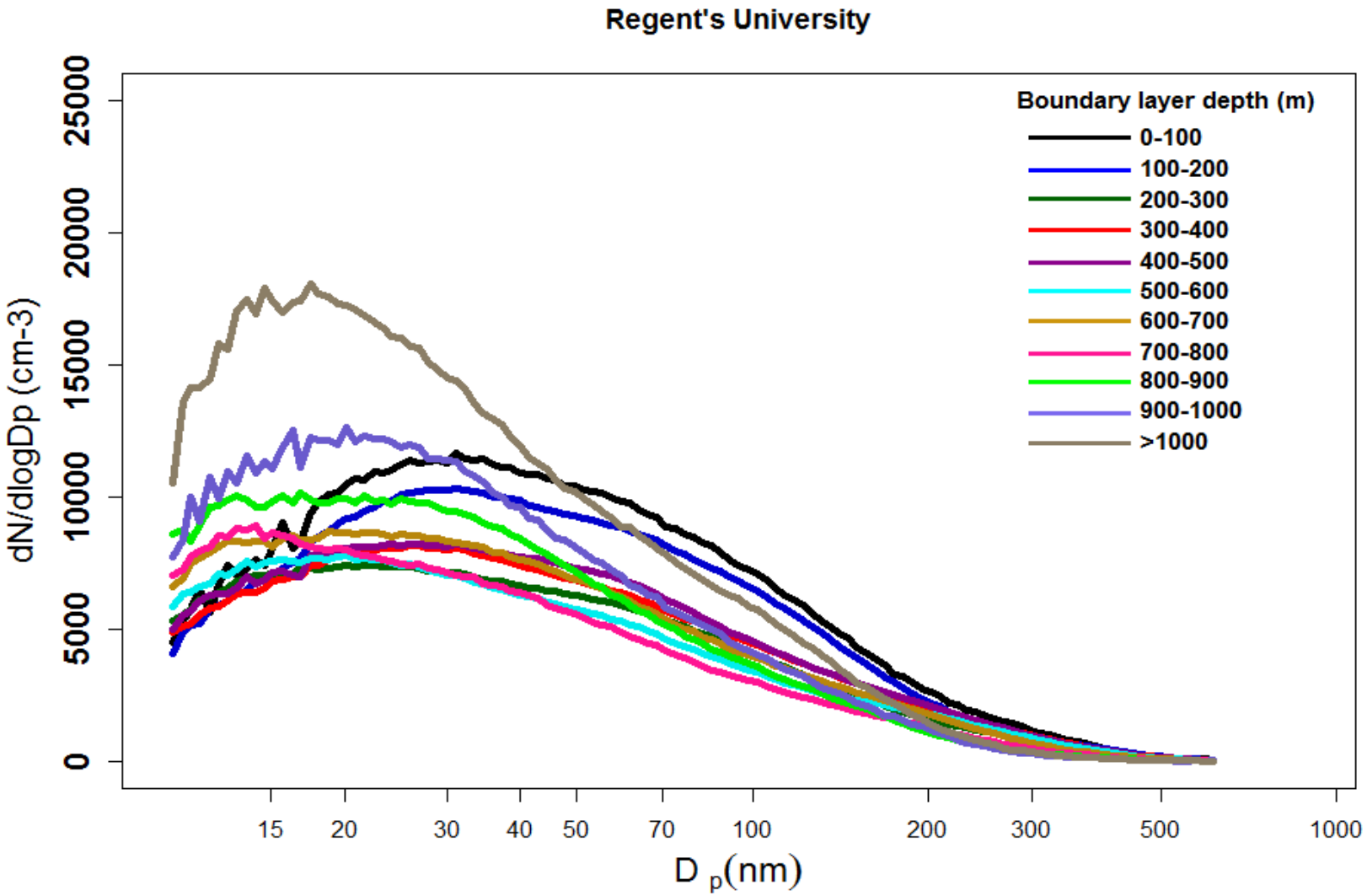


Figure S8: As Figure S6, but for Regent's University.

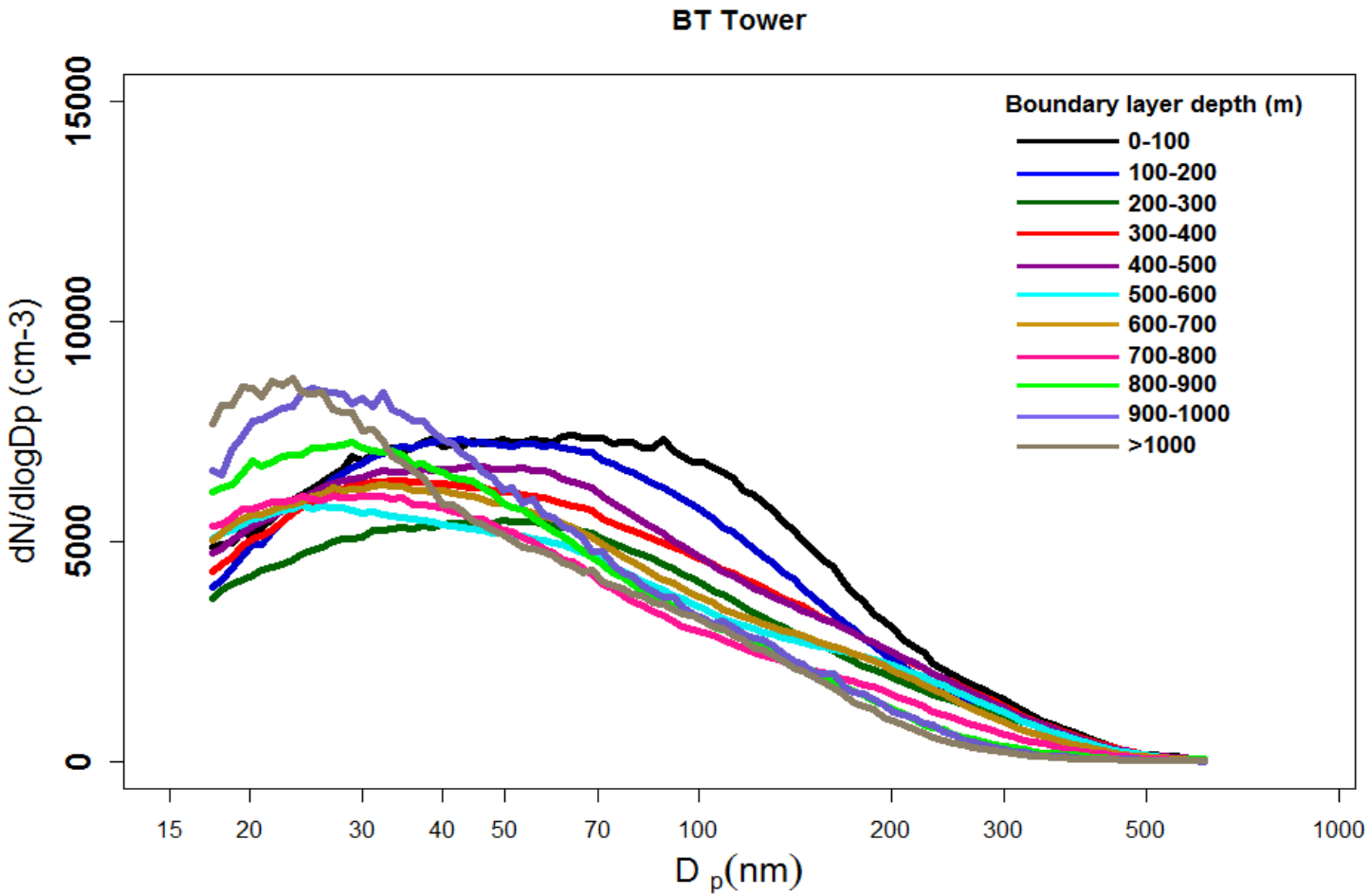
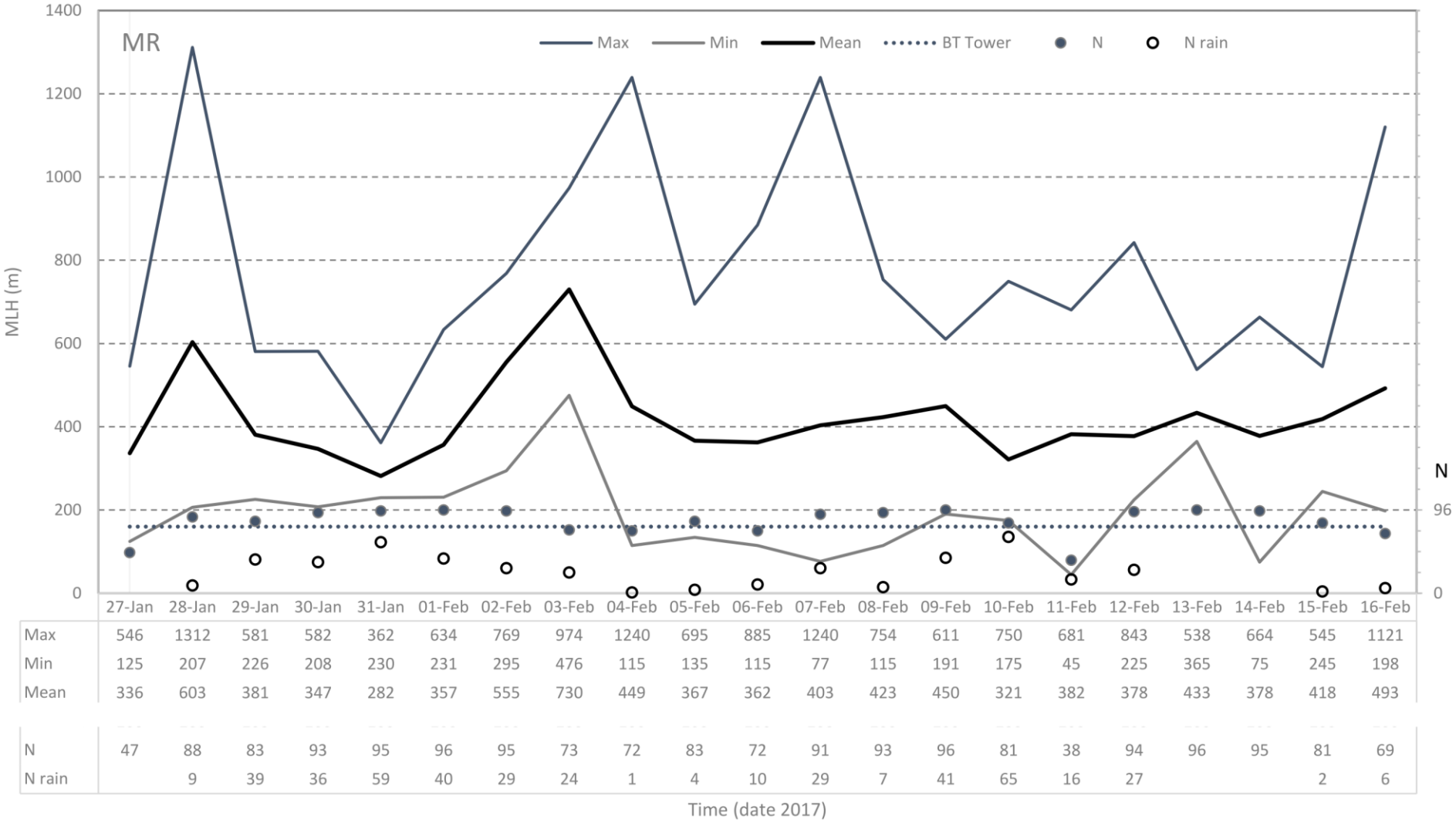


Figure S9: As Figure S6, but for BT Tower.



	27-Jan	28-Jan	29-Jan	30-Jan	31-Jan	01-Feb	02-Feb	03-Feb	04-Feb	05-Feb	06-Feb	07-Feb	08-Feb	09-Feb	10-Feb	11-Feb	12-Feb	13-Feb	14-Feb	15-Feb	16-Feb
Max	546	1312	581	582	362	634	769	974	1240	695	885	1240	754	611	750	681	843	538	664	545	1121
Min	125	207	226	208	230	231	295	476	115	135	115	77	115	191	175	45	225	365	75	245	198
Mean	336	603	381	347	282	357	555	730	449	367	362	403	423	450	321	382	378	433	378	418	493
N	47	88	83	93	95	96	95	73	72	83	72	91	93	96	81	38	94	96	95	81	69
N rain		9	39	36	59	40	29	24	1	4	10	29	7	41	65	16	27			2	6

Figure S10: Daily range of mixed layer height (MLH) at Marylebone road during the campaign period. The number of 15 min periods (N) available for analysis each day and if the number of 15 min periods remaining that still had rain (N rain) but the MLH could still be determined.