Table S1. Comparison of WSOC, OC concentrations (μg m^{-3}) and WSOC/OC ratios in Beijing in recent years.

Sampling period	Size	WSOC	OC	WSOC/OC	OC method[*]	Reference
2017 Winter (haze)	PM_1	14.7 ± 8.2	23.4 ± 12.0	0.63 ± 0.10	IMPROVE (TOR)	This study
	$PM_{2.5}$	29.2 ± 18.4	44.1 ± 25.5	0.65 ± 0.14		
	PM_{10}	33.4 ± 19.7	52.1 ± 28.7	0.63 ± 0.08		
2017 Spring (haze)	PM_1	6.3 ± 1.8	9.0 ± 3.2	0.75 ± 0.20		
	$PM_{2.5}$	9.0 ± 3.0	12.8 ± 4.5	0.72 ± 0.12		
	PM_{10}	10.9 ± 3.5	16.6 ± 6.1	0.69 ± 0.16		
2013 Autumn	$PM_{2.5}$	Not mentioned	Not mentioned	0.70 ± 0.27	IMPROVE (TOR)	Zhao et al. (2018)
2013 Winter				0.49 ± 0.11		
2014 Spring				0.56 ± 0.07		
2014 Summer				0.58 ± 0.10		
2013 Winter	$PM_{2.5}$	10.8 ± 3.1	32.9 ± 16.8	0.39 ± 0.16	IMPROVE-A (TOT)	Yan et al. (2015)
2013 Summer		6.4 ± 2.2	9.7 ± 2.9	0.66 ± 0.06		
2013 Winter	$PM_{1.1}$	13.9 ± 4.5[a]	23.4 ± 6.2[a]	0.59[a]	Not mentioned	Tian et al. (2014)
		7.7 ± 1.9[b]	15.7 ± 3.0[b]	0.49[b]		
		3.4 ± 1.6[c]	7.9 ± 4.1[c]	0.43[c]		
	$PM_{2.1}$	21.9 ± 8.5[a]	39.1 ± 12.1[a]	0.56[a]		
		10.2 ± 2.7[b]	21.7 ± 4.3[b]	0.47[b]		
		4.4 ± 2.9[c]	9.5 ± 5.1[c]	0.46[c]		
	$PM_{2.1-9}$	7.7 ± 2.7[a]	13.7 ± 5.7[a]	0.56[a]		
		2.9 ± 1.3[b]	5.4 ± 2.2[b]	0.54[b]		
		1.8 ± 0.7[c]	5.0 ± 3.2[c]	0.36[c]		
2011-2012 Winter	$PM_{2.5}$	Not mentioned	Not mentioned	0.36 ± 0.05[d]	IMPROVE-A (TOT)	Cheng et al. (2015)
				0.44 ± 0.05[e]		
				0.47 ± 0.05[f]		
2011 Summer	$PM_{2.5}$	4.48	13.55	0.33	IMPROVE (TOR)	Xiang et al. (2017)
2011 Autumn		5.82	25.42	0.25		
2011 Winter		5.53	28.16	0.20		
2012 Spring		3.90	16.57	0.27		
2012 Summer		5.81	16.54	0.34		
2011 Summer	$PM_{2.5}$	7.8 ± 4.4	12.0 ± 6.3	0.65	IMPROVE-A (TOT)	Cheng et al. (2013)

2011-2012 Winter		11.2 ± 8.2	24.6 ± 17.1	0.46		
2010 Fall		8.6 ± 6.4	20.4 ± 15.4	0.42		
2010 Winter		8.0 ± 6.7	20.6 ± 16.1	0.39		
2011 Spring	$PM_{2.5}$	4.7 ± 3.1	10.2 ± 6.8	0.46	IMPROVE (TOT)	Du et al. (2014)
2011 Summer		6.7 ± 4.4	10.7 ± 6.2	0.61		
2011 Fall		8.6 ± 6.1	19.7 ± 15.4	0.44		
2010 Spring		9.6 ± 5.3	16.9 ± 8.6	0.57		
2010 Summer	PM_{10}	8.1 ± 2.8	14.3 ± 4.0	0.56	IMPROVE-A (TOR)	Tang et al. (2016)
2010 Autumn		9.5 ± 6.2	18.0 ± 9.0	0.52		
2010-2011 Winter		12.3 ± 8.8	27.9 ± 25.1	0.46		
2009 Spring		6.7 ± 1.8	13.7 ± 4.4	0.49		
2009 Summer	$PM_{2.5}$	3.2 ± 1.1	11.1 ± 1.8	0.29	Not mentioned	Tao et al.(2016)
2009 Autumn		7.7 ± 5.0	17.8 ± 5.6	0.43		
2010 Winter		7.7 ± 3.6	24.9 ± 15.6	0.31		
2009 Winter	$PM_{2.5}$	7.28	27.7 ± 15.4[g]	0.26	IMPROVE-A (TOR)	Cheng et al. (2011)
			30.9 ± 16.3[h]	0.24		
			32.6 ± 18.6[g]	0.22	IMPROVE-A (TOT)	
			36.1 ± 19.5[h]	0.20		
2009 Summer		3.36	7.2 ± 2.4[g]	0.48	IMPROVE-A (TOR)	
			9.4 ± 2.7[h]	0.36		
			8.8 ± 3.3[g]	0.38	IMPROVE-A (TOT)	
			11.4 ± 3.6[h]	0.30		

[*] The thermal-optical reflectance (TOR) method and thermal-optical transmittance (TOT) method are two different charring correction methods to determine the split of OC and EC. The transmittance-defined EC is the carbon measured after the filter transmittance returns to its initial value in the He/O_2 atmosphere, whereas the reflectance-defined EC is the carbon measured after the filter reflectance returns to its initial value (Cheng et al., 2011).

[a,b,c] In Tian et al. (2014), "a" refers to the sampling period when $PM_{2.5}$ > 150 μg m^{-3}, "b" refers to the sampling period when 75 μg m^{-3} < $PM_{2.5}$ < 150 μg m^{-3}, and "c" refers to the sampling period when $PM_{2.5}$ < 75 μg m^{-3}.

[d,e,f] In Cheng et al. (2015), "d" refers to the constructed $PM_{2.5}$ below 30 μg m^{-3}, "e" between 30 μg m^{-3} and 90 μg m^{-3}, and "f" above 90 μg m^{-3}.

[g,h] In Cheng et al. (2011), "g" was measured using the denuded quartz filter and "h" was measured using the un-denuded (bare) quartz filter.

Table S2. Spearman correlations of SOC in PM_1, $PM_{2.5}$ and PM_{10} estimated by different methods during the sampling periods in winter and spring.

Size	Method	Winter				Spring			
		OC-EC	WSOC-Levo	WSOC-PMF	OC-PMF	OC-EC	WSOC-Levo	WSOC-PMF	OC-PMF
PM_1	OC-EC		0.89	0.89	0.89		0.79	0.63	0.72
	WSOC-Levo	0.89		0.94	0.94	0.79		0.75	0.81
	WSOC-PMF	0.89	0.94		1.00	0.63	0.75		0.95
	OC-PMF	0.89	0.94	1.00		0.72	0.81	0.95	
$PM_{2.5}$	OC-EC		0.93	0.91	0.91		0.64	0.40	0.47
	WSOC-Levo	0.93		0.97	0.97	0.64		0.79	0.81
	WSOC-PMF	0.91	0.97		1.00	0.40	0.79		0.96
	OC-PMF	0.91	0.97	1.00		0.47	0.81	0.96	
PM_{10}	OC-EC		0.97	0.95	0.94		0.73	0.55	0.59
	WSOC-Levo	0.97		0.96	0.95	0.73		0.66	0.63
	WSOC-PMF	0.95	0.96		1.00	0.55	0.66		0.95
	OC-PMF	0.94	0.95	1.00		0.59	0.63	0.95	

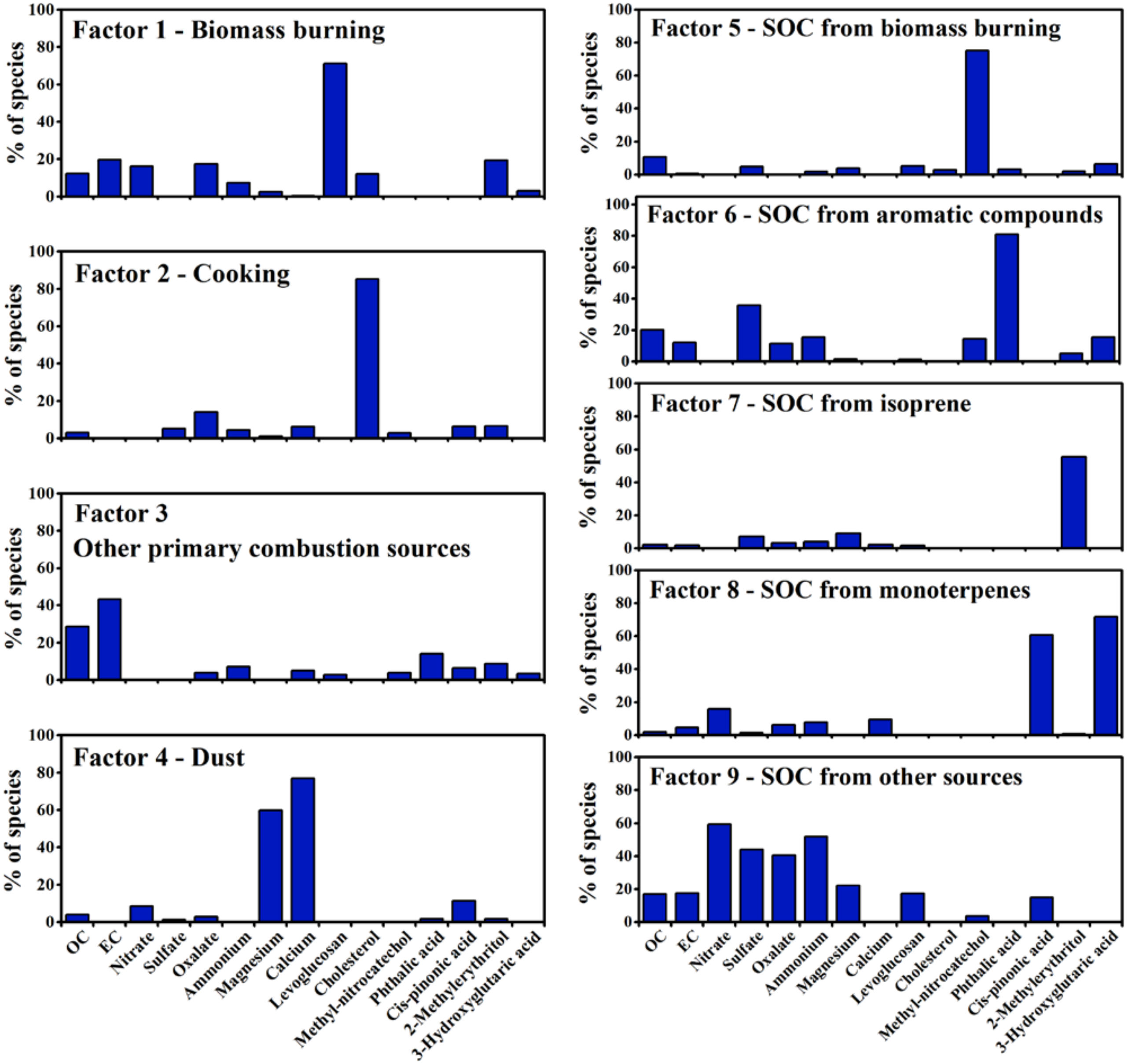

Figure S1. Source profiles of OC in atmospheric particulate matter in Beijing resolved by PMF.

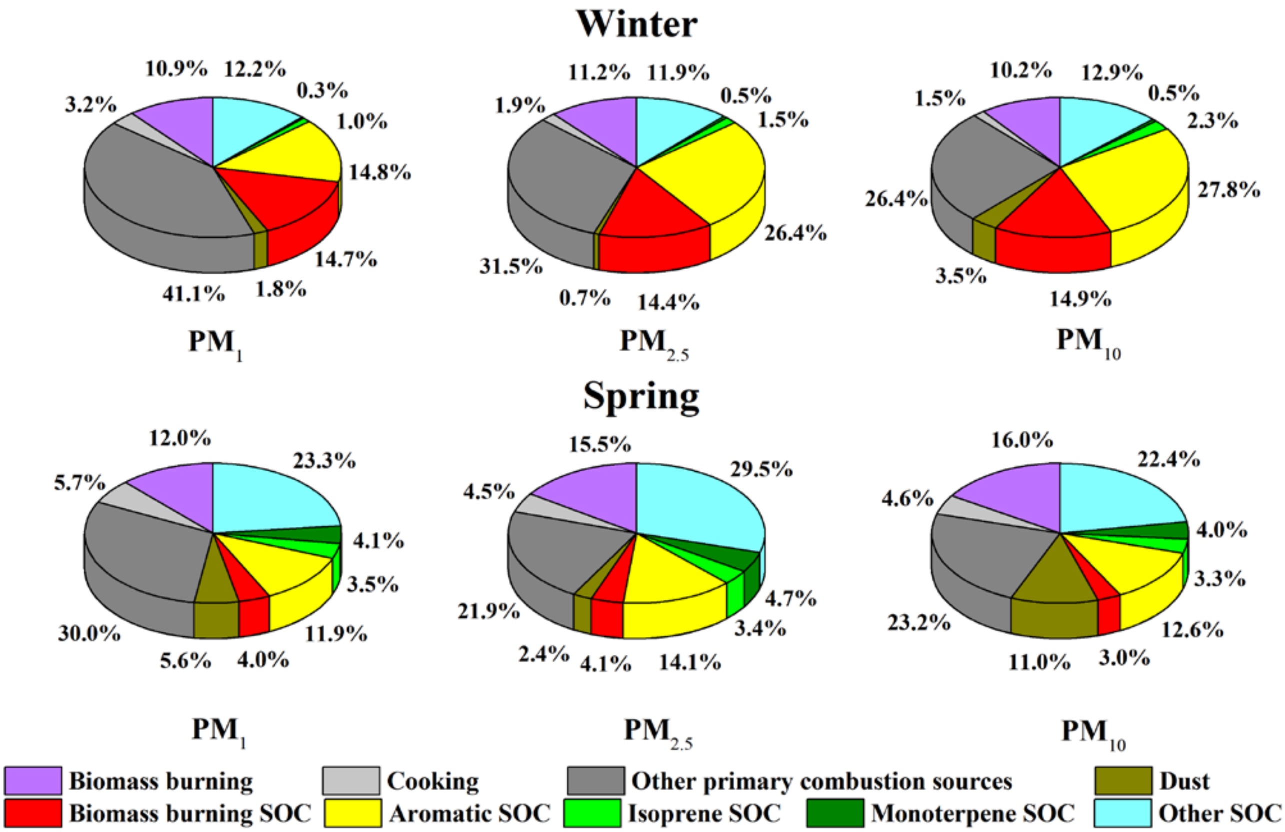

Figure S2. Source contributions to OC in PM_1, $PM_{2.5}$ and PM_{10} in Beijing during the sampling periods in winter and spring.