Supplementary materials

Primary and secondary organic aerosol in summer of Beijing, China

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Fig. S1 Locations of the sampling sites CP and PKUERS

Fig. S2 Mixing ratios of gaseous pollutants and meteorological conditions at (a) CP and (b) PKUERS, including concentrations of SO_2, O_3, NO, NO_2, temperature, relative humidity, wind speed as well as wind direction. Parameters of the gaseous pollutants and meteorological conditions from 1 to 5 June were not available due to technical reasons.

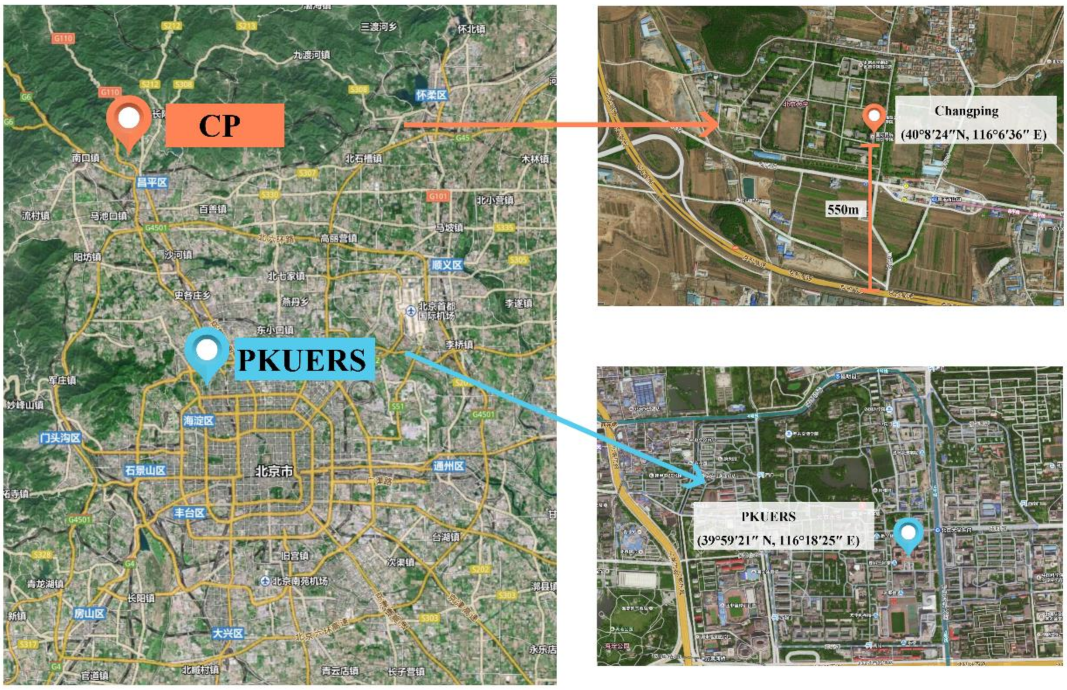
Fig. S3 Back trajectory clusters during the campaign at (a) CP (b) PKUERS

Fig. S4 $PM_{2.5}$ chemical compositions at the regional site CP (a & c) and urban site PKUERS (b & d)

Fig. S5 Three categories of $PM_{2.5}$ chemical compositions according to back trajectory clustering analysis

Fig. S6 Primary organic matter from different directions of CP and PKUERS

Fig. S7 Daily average concentrations for different classes of primary organic matter, (a) n-alkanes (b) saccharides (c) PAHs (d) hopanes



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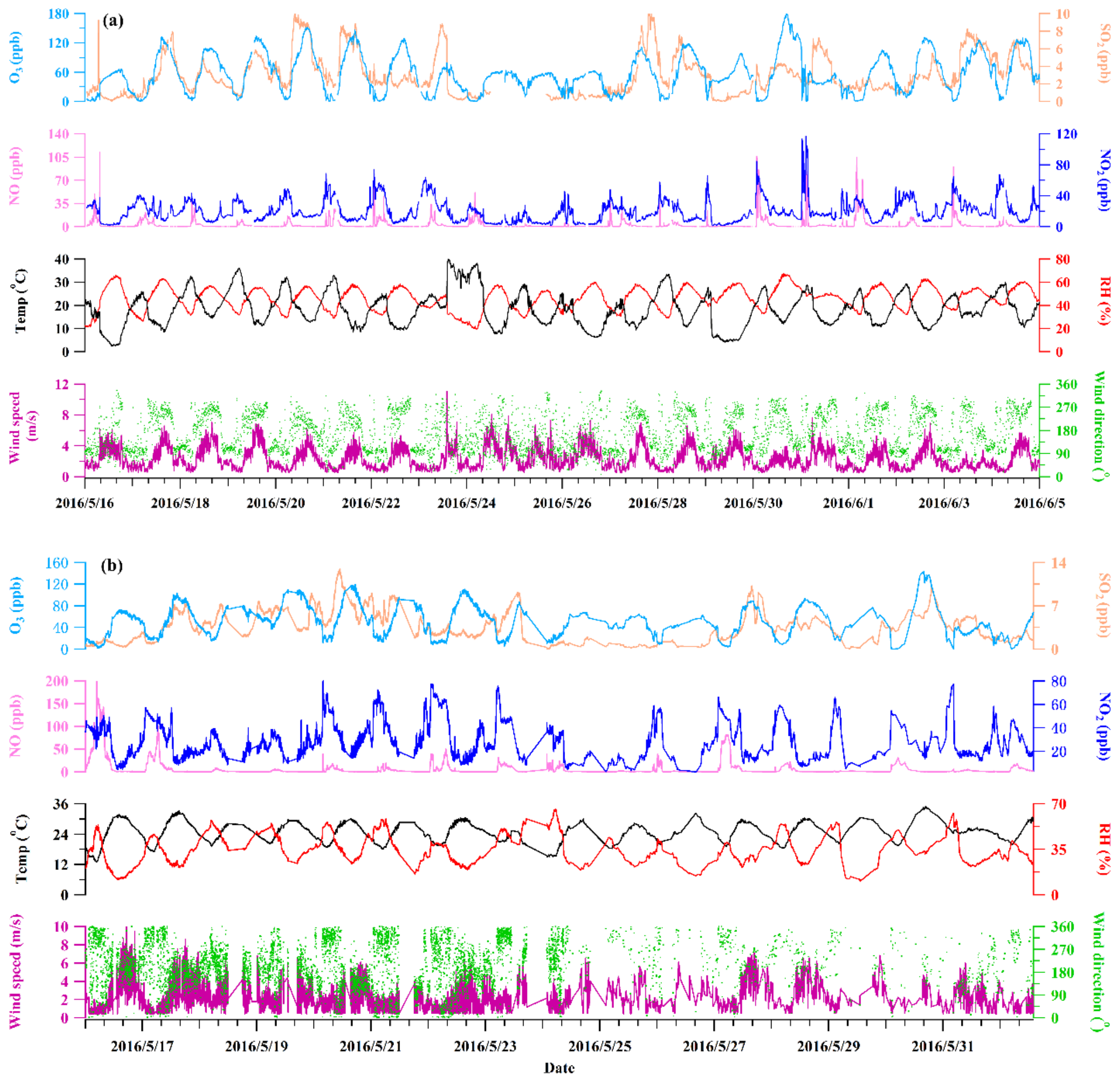

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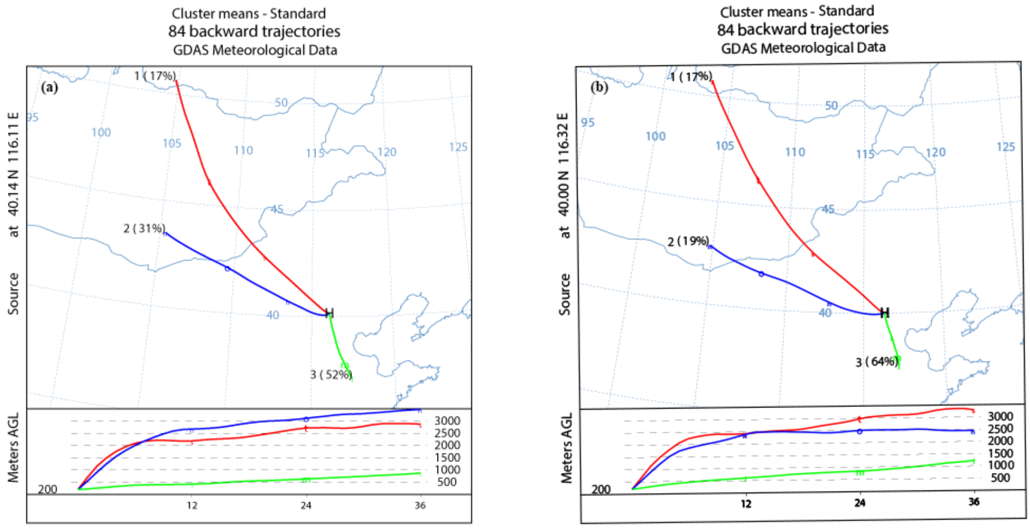

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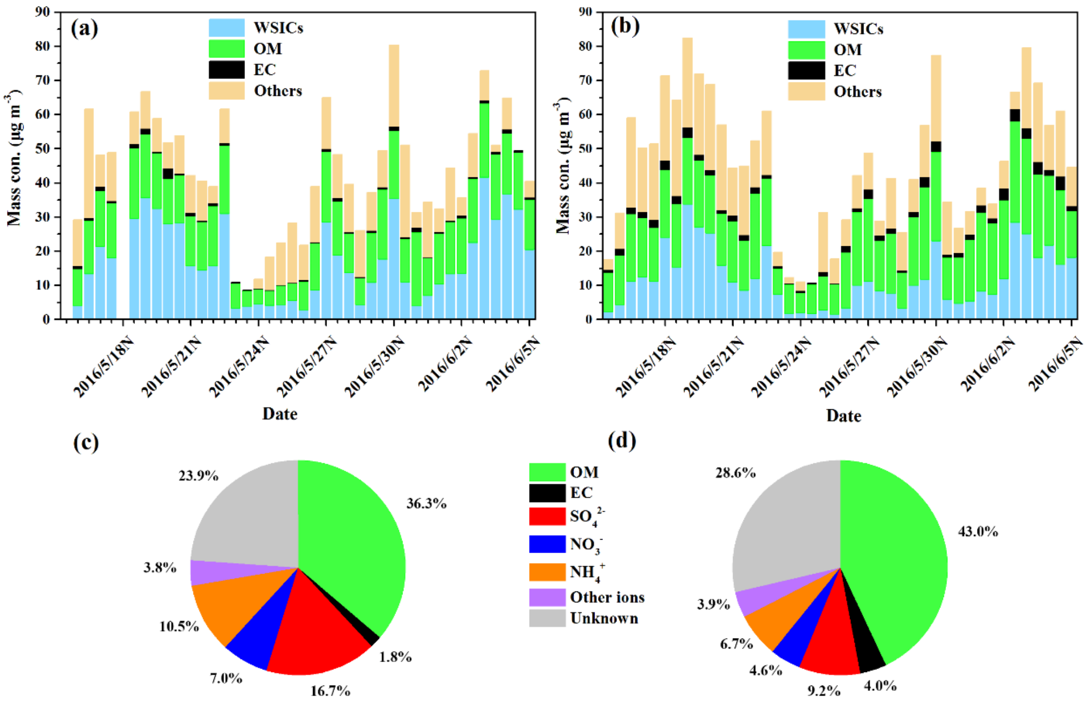

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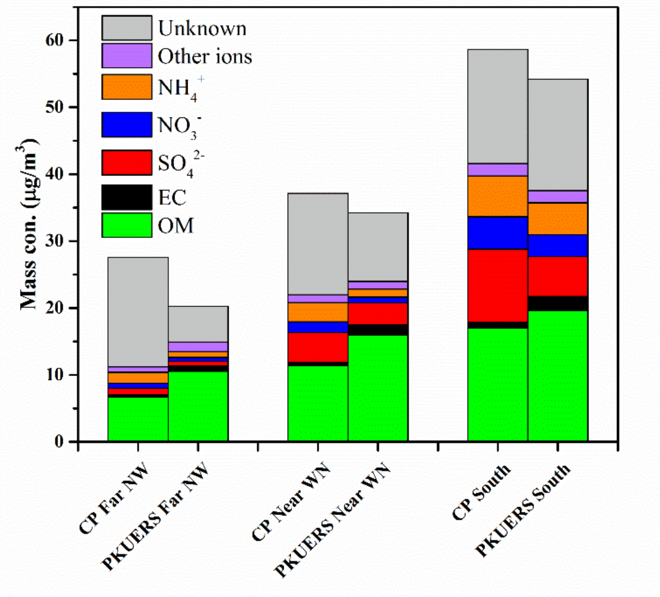

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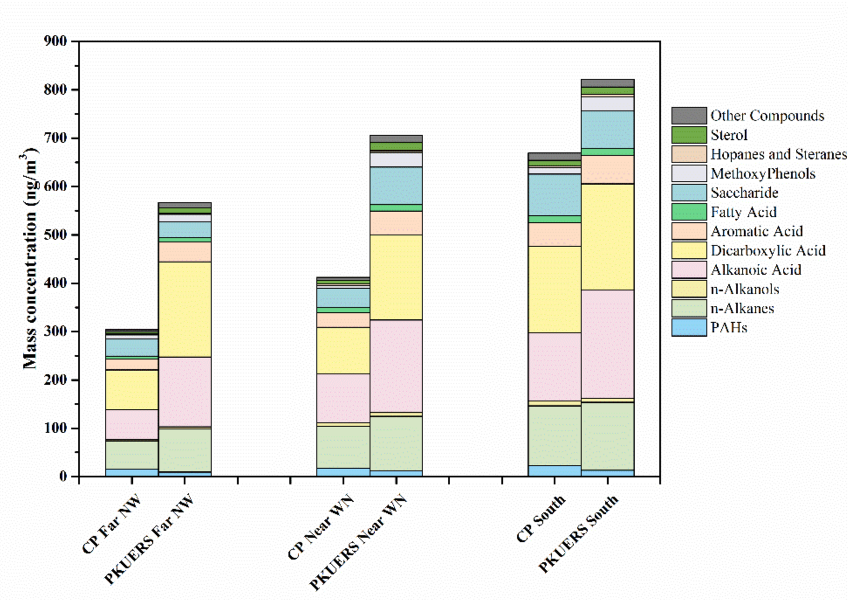

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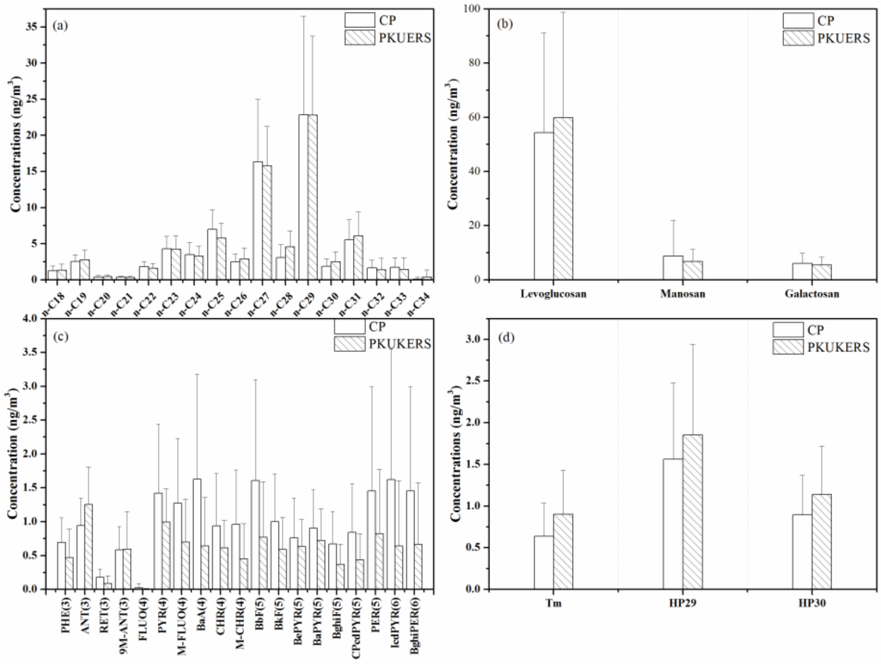

Fig. S7 Daily average concentrations for different classes of primary organic matter, (a) n-alkanes (b) saccharides (c) PAHs (d) hopanes

Table

Table S1 Mixing ratios of gaseous pollutants (SO_2, O_3, NO, NO_2)

Type	Sites	NO	NO_2	O_3	SO_2	CO
Urban	PKUERS (2010) (Zheng et al., 2016a)	7.1	26.0	32.0	4.9	820.0
	PKUERS (2016)	10.5	32.3	48.6	3.9	623.6
	CP(2016)	3.1	19.7	57.7	3.0	492.4

Table S2 Concentrations of tracer compounds for primary sources

	CP			PKUERS		
	Daytime	Nighttime	Diurnal	Daytime	Nighttime	Diurnal
Tracers (ng m^{-3})						
n-alkanes (C28-C33)						
C-28	2.74±1.18	3.34±2.29	3.10±1.84	3.99±1.93	5.06±2.44	4.54±2.24
C-29	23.12±14.38	22.54±13.38	22.82±13.68	20.49±8.48	24.96±12.69	22.79±10.94
C-30	1.54±0.62	2.19±1.25	1.88±1.04	2.06±0.72	3.25±1.30	2.72±1.23
C-31	5.22±1.98	5.85±3.40	5.54±2.78	5.23±2.31	7.24±3.72	6.23±3.22
C-32	1.67±1.05	1.72±1.11	1.70±1.07	1.91±0.92	2.69±1.71	2.34±1.43
C-33	1.83±0.94	2.49±1.25	2.19±1.15	2.54±1.12	2.74±1.51	2.65±1.32
Levoglucosan						
Levoglucosan	28.86±16.95	75.92±40.91	53.03±39.26	39.09±25.04	79.56±39.97	59.87±38.93
Hopanes						
17α(H)-22,29,30-trishopane	0.61±0.28	0.65±0.44	0.63±0.36	0.88±0.55	0.93±0.52	0.90±0.53
17β(H)-21α(H)-norhopane	1.42±0.48	1.66±0.97	1.55±0.70	1.93±1.24	1.79±0.96	1.86±1.09
17α(H)-21β(H)-hopane	0.80±0.32	0.95±0.59	0.88±0.47	1.12±0.64	1.16±0.55	1.14±0.58
PAHs						
benzo(b)fluoranthene	0.64±0.45	2.45±1.68	1.57±1.53	0.53±0.47	1.07±1.00	0.81±0.82
benzo(k)fluoranthene	0.50±0.25	1.42±0.73	0.98±0.72	0.50±0.38	0.69±0.54	0.60±0.47
benzo(e)pyrene	0.38±0.22	1.09±0.67	0.74±0.61	0.59±0.39	0.70±0.40	0.65±0.39
benzo(ghi)perylene	0.71±0.40	2.48±1.63	1.81±1.56	1.15±0.43	1.84±0.80	1.54±0.73
indeno(1,2,3-cd)pyrene	0.76±0.52	2.78±2.24	2.01±2.03	0.79±0.26	2.02±0.97	1.48±0.96

Table S3 Comparison of SOA tracers for the biogenic and anthropogenic sources in different regions

Species	Tracer (ng m-3)	IITB	CH	YL	CL	RTP	Yufa 2008	PKUERS 2008	PKUERS 2016	CP 2016
Isoprene	I-1	0.4±0.4	0.3±0.2	1.0±1.3	-	26.5±20.9	29.9±19.9	21.0±19.5	1.2±0.7	1.4±1.7
	I-2	-	0.2±0.1	8.3±12.9	11.2±5.8	63.4±19.2	63.6±46.8	42.2±28.2	7.7±4.7	9.9±4.6
	I-3	-	0.5±0.3	20.3±20.3	24.1±13.4	85.7±27.6	121.5±101.4	77.2±60.2	16.8±6.3	10.5±5.7
	∑isoprene	1.9±2.0	1.0±0.6	29.6±34.5	35.3±19.2	175.6±49.7	215.0±160.3	140.4±100.9	25.7±11.7	18.8±12.0
α-pinene	A-1	-	-	8.4±10.7	17.2±6.3	1.8±0.7	9.6±7.2	8.7±7.1	7.0±2.7	9.2±5.5
	A-2	-	-	5.9±4.9	17.1±5.4	16.3±7.3	5.3±2.8	6.8±7.1	4.8±2.8	4.2±2.4
	A-3	-	-	-	-	25.9±13.9	4.3±6.9	4.6±4.0	15.6±8.3	11.8±6.3
	A-4	-	-	4.6±3.6	-	46.1±18.9	7.7±5.5	8.3±5.8	4.8±1.2	4.4±1.3
	A-5	2.0±1.2	-	10.2±7.0	-	53.5±17.9	57.5±27.4	51.7±31.3	16.8±6.3	10.5±5.7
	A-6	-	-	9.7±15.1	-	12.0±1.0	8.3±6.7	9.9±9.1	13.0±4.8	13.6±8.0
	A-7	0.3±0.2	-	8.0±7.5	2.2±1.0	4.7±1.3	6.1±5.5	8.5±10.1	12.4±6.0	13.6±8.0
	PA	0.6±0.3	0.2±0.5	-	4.4±3.5	9.2±3.6	3.4±5.7	3.2±6.4	10.0±4.5	9.5±12.7
	PNA	5.5±3.9	0.1±0.1	-	6.7±1.9	-	21.9±9.2	11.9±6.3	11.9±3.3	15.4±8.1
	∑α-pinene	8.4±5.6	0.3±0.6	46.8±56.3	47.6±18.1	169.5±64.6	124.1±47.8	113.5±63.3	96.4±39.9	92.2±58.0
β-caryophyllene	C-1	0.7±0.3	0.2±0.5	12.5±16.9	1.4±0.4	25.3±4.2	3.6±2.3	5.1±4.5	6.0±2.8	6.1±3.5
Toluene	T-3	0.1±0.1	-	1.7±1.8	8.3±2.8	4.1±1.9	11.7±6.9	13.3±7.7	11.0±3.7	9.7±7.3

I-1 represented 2-methylglyceric acid, I-2 represented 2-Methylthreitol, I-3 represented 2-methylerythritol, A-1 represented 3-Isopropylpentanedioic acid, A-2 represented 3-Acetylpentanedioic acid, A-3 represented 2-Hydroxy-4-isopropyladipic acid, A-4 represented 3-Acetyl hexanedioic acid, A-5 represented 3-Hydroxyglutaric acid, A-6 represented 2-Hydroxy-4,4-dimethylglutaric acid, A-7 represented 3-(2-Hydroxy-ehyl)-2,2-dimethyl-cyclobutane-carboxylic acid, PA represented pinic acid, PNA represented pinonic acid, T-3 represented 2,3-dihydroxy-4-oxopentanoic acid, C-1 represented β-caryophyllinic acid.