Supplementary information for

"Underestimation of brown carbon absorption based on the methanol extraction method and its impacts on source analysis"

Zhenqi Xu[a], Wei Feng[a], Yicheng Wang[a], Haoran Ye[a], Yuhang Wang[b], Hong Liao[a], Mingjie Xie[a,*]

[a]Collaborative Innovation Center of Atmospheric Environment and Equipment Technology, Jiangsu Key Laboratory of Atmospheric Environment Monitoring and Pollution Control, School of Environmental Science and Engineering, Nanjing University of Information Science & Technology, 219 Ningliu Road, Nanjing 210044, China

[b]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, GA 30332, United States

*Corresponding to:

Mingjie Xie (mingjie.xie@nuist.edu.cn, mingjie.xie@colorado.edu);

Mailing address: 219 Ningliu Road, Nanjing, Jiangsu, 210044, China

Text S1. Calculations of the coefficient of divergence and average relative percent difference

The coefficient of divergence (COD) used earlier comparing PM component concentrations at pairs of sampling sites (Wongphatarakul et al., 1998) was calculated to show the degree of uniformity between collocated measurements of solvent extract absorption, and is defined as

$$\mathrm{COD}_{12} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\frac{x_{i1}-x_{i2}}{x_{i1}+x_{i2}}\right)^2} \quad (1)$$

where x_{i1} and x_{i2} represent the light-absorbing property of i^{th} sample from Sampler I and II, and n is the size of paired samples. COD values approaching 0 and 1 indicate no and maximum difference between collocated measurements, and a COD value of 0.2 was used to define a significant heterogeneity (Wilson et al., 2005; Krudysz et al., 2008). The average relative percent difference (ARPD, %) was calculated as an estimate of fractional uncertainty from collocated measurement data, and is defined as

$$\mathrm{ARPD} = \frac{2}{n}\sum_{i=1}^{n}\frac{|x_{i1}-x_{i2}|}{(x_{i1}+x_{i2})} \times 100\% \quad (2)$$

Table S1. $PM_{2.5}$ sampling information for solvent test and concentrations of bulk carbon fractions (μg m^{-3}).

Sampling date	Sampling Periods	ΔM (μg m^{-3}) [a]	OC1	OC2	OC3	OC4	EC1	EC2	EC3	OC[b]	EC[c]
One-time extraction (*N* = 11)											
2019/12/3	8:00 a.m.–7:00 p.m.	95.2	0.55 ± 0.20[d]	2.17 ± 0.20	3.17 ± 0.32	2.46 ± 0.12	1.98 ± 0.32	0.55 ± 0.14	0.17 ± 0.34	8.36 ± 0.69	2.70 ± 0.48
2019/12/4	8:00 a.m.–7:00 p.m.	68.1	0.32 ± 0.052	1.90 ± 0.044	2.85 ± 0.072	2.35 ± 0.074	1.85 ± 0.20	0.49 ± 0.18	0.028 ± 0.14	7.42 ± 0.13	2.36 ± 0.47
2019/12/7	8:00 p.m. –7:00 a.m.	98.9	1.07 ± 0.11	3.20 ± 0.07	4.38 ± 0.30	3.44 ± 0.13	2.55 ± 0.43	0.46 ± 0.20	0.35 ± 0.35	12.1 ± 0.36	3.36 ± 0.74
2019/12/8	8:00 a.m.–7:00 p.m.	87.2	0.79 ± 0.07	2.74 ± 0.18	3.51 ± 0.34	2.69 ± 0.21	2.37 ± 0.60	0.44 ± 0.020	0.22 ± 0.25	9.72 ± 0.39	3.03 ± 0.57
2019/12/8	8:00 p.m. –7:00 a.m.	71.9	0.76 ± 0.091	2.87 ± 0.17	3.87 ± 0.14	3.23 ± 0.081	2.23 ± 0.49	0.37 ± 0.20	0.28 ± 0.35	10.7 ± 0.45	2.88 ± 0.93
2019/12/9	8:00 a.m.–7:00 p.m.	81.6	0.58 ± 0.026	2.87 ± 0.084	4.08 ± 0.076	3.51 ± 0.19	2.31 ± 0.37	0.40 ± 0.11	0.37 ± 0.37	11.0 ± 0.31	3.08 ± 0.52
2019/12/9	8:00 p.m. –7:00 a.m.	76.4	0.91 ± 0.090	3.65 ± 0.15	5.12 ± 0.087	4.41 ± 0.34	2.90 ± 0.56	0.62 ± 0.31	0.73 ± 0.17	14.1 ± 0.15	4.25 ± 0.89
2019/12/19	8:00 p.m. –7:00 a.m.	69.6	0.60 ± 0.18	2.36 ± 0.11	2.66 ± 0.032	2.28 ± 0.081	2.64 ± 0.22	0.46 ± 0.12	0.098 ± 0.23	7.90 ± 0.35	3.19 ± 0.14
2019/12/20	8:00 a.m.–7:00 p.m.	93.7	0.65 ± 0.22	2.30 ± 0.060	2.77 ± 0.065	2.30 ± 0.075	1.87 ± 0.21	0.54 ± 0.32	0.30 ± 0.33	8.02 ± 0.41	2.71 ± 0.83
2019/12/21	8:00 p.m. –7:00 a.m.	81.5	0.66 ± 0.096	2.24 ± 0.15	2.49 ± 0.15	1.95 ± 0.11	1.77 ± 0.12	0.62 ± 0.23	0.23 ± 0.29	7.34 ± 0.45	2.62 ± 0.56
2019/12/22	8:00 a.m.–7:00 p.m.	62.1	0.41 ± 0.055	3.31 ± 0.18	1.98 ± 0.28	1.62 ± 0.064	1.13 ± 0.064	0.21 ± 0.066	/	7.32 ± 0.45	1.33 ± 0.14
Two-time extraction (*N* = 10)											
2019/12/10	8:00 a.m.–7:00 p.m.	93.8	0.66 ± 0.067	3.44 ± 0.15	5.18 ± 0.15	4.25 ± 0.066	2.30 ± 0.11	0.35 ± 0.061	0.20 ± 0.050	13.5 ± 0.35	2.84 ± 0.13
2019/12/10	8:00 p.m. –7:00 a.m.	120	1.86 ± 0.092	4.25 ± 0.13	8.64 ± 0.39	7.49 ± 0.62	3.86 ± 0.35	0.28 ± 0.053	0.15 ± 0.12	22.2 ± 0.29	4.29 ± 0.49
2019/12/11	8:00 a.m.–7:00 p.m.	119	0.67 ± 0.097	3.39 ± 0.13	5.94 ± 0.39	4.99 ± 0.026	2.68 ± 0.093	0.38 ± 0.036	0.22 ± 0.17	15.0 ± 0.51	3.28 ± 0.21
2019/12/11	8:00 p.m. –7:00 a.m.	86.5	0.93 ± 0.13	3.08 ± 0.19	4.28 ± 0.24	3.15 ± 0.056	1.96 ± 0.21	0.29 ± 0.11	0.21 ± 0.18	11.4 ± 0.60	2.45 ± 0.45
2019/12/12	8:00 a.m.–7:00 p.m.	83.3	0.64 ± 0.015	2.50 ± 0.095	3.59 ± 0.060	2.44 ± 0.20	1.82 ± 0.18	0.67 ± 0.091	0.30 ± 0.12	9.17 ± 0.28	2.79 ± 0.33
2019/12/15	8:00 a.m.–7:00 p.m.	71.7	0.29 ± 0.092	2.13 ± 0.085	2.77 ± 0.072	1.96 ± 0.13	1.33 ± 0.14	0.82 ± 0.11	0.59 ± 0.20	7.15 ± 0.29	2.74 ± 0.44
2019/12/15	8:00 p.m. –7:00 a.m.	60.5	0.35 ± 0.079	1.98 ± 0.19	2.18 ± 0.10	1.74 ± 0.19	1.01 ± 0.047	0.25 ± 0.11	0.22 ± 0.37	6.24 ± 0.49	1.47 ± 0.46
2019/12/16	8:00 a.m.–7:00 p.m.	81.1	0.41 ± 0.026	2.70 ± 0.11	3.53 ± 0.12	2.80 ± 0.14	2.03 ± 0.11	0.45 ± 0.035	0.15 ± 0.16	9.43 ± 0.39	2.63 ± 0.23
2019/12/16	8:00 p.m. –7:00 a.m.	65.2	0.35 ± 0.021	2.31 ± 0.090	2.82 ± 0.098	2.49 ± 0.17	1.71 ± 0.10	0.21 ± 0.079	0.12 ± 0.17	7.97 ± 0.35	2.04 ± 0.31
2019/12/17	8:00 a.m.–7:00 p.m.	66.2	0.41 ± 0.21	1.82 ± 0.21	2.23 ± 0.11	2.23 ± 0.078	2.02 ± 0.044	0.25 ± 0.079	0.10 ± 0.13	6.76 ± 0.44	2.37 ± 0.24

[a] ΔM = difference between pre- and post-weigh mass of each filter sample (μg)/sample volume (m^3); [b] OC = OC1 + OC2 + OC3 + OC4; [c] EC = EC1 + EC2 + EC3; [d] average ± standard deviation derived from three times analysis.

Table S2. Species information of the 25-PAH mixture.

Compound Name (Formula)	Abbreviation	MW
naphthalene ($C_{10}H_8$)	NAP	128
2-methylnaphthalene ($C_{11}H_{10}$)	2-MeNAP	142
1-methylnaphthalene ($C_{11}H_{10}$)	1-MeNAP	142
biphenyl ($C_{12}H_{10}$)	BP	154
acenaphthene ($C_{12}H_{10}$)	ACE	154
acenaphthylene ($C_{12}H_8$)	ACY	152
fluorene ($C_{13}H_{10}$)	FLU	166
2,6-dimethylnaphthalene ($C_{12}H_{12}$)	2,6-DMN	156
2,3,5-trimethylnaphthalene ($C_{13}H_{14}$)	2,3,5-TMNAP	170
dibenzothiophene ($C_{12}H_8S$)	DBT	184
phenanthrene ($C_{14}H_{10}$)	PHE	178
anthracene ($C_{14}H_{10}$)	ANT	178
1-methylphenanthrene ($C_{15}H_{12}$)	1-MePHE	192
fluoranthene ($C_{16}H_{10}$)	FLT	202
pyrene ($C_{16}H_{10}$)	PYR	202
benz[a]anthracene ($C_{18}H_{12}$)	BaA	228
chrysene ($C_{18}H_{12}$)	CHY	228
benzo[b]fluoranthene ($C_{20}H_{12}$)	BbF	252
benzo[k]fluoranthene ($C_{20}H_{12}$)	BkF	252
benz[e]pyrene ($C_{20}H_{12}$)	BeP	252
benz[a]pyrene ($C_{20}H_{12}$)	BaP	252
perylene ($C_{20}H_{12}$)	PER	252
indeno[1,2,3-cd]pyrene ($C_{22}H_{12}$)	IDP	276
benzo[ghi]perylene ($C_{22}H_{12}$)	BghiP	276
dibenz[ah]anthracene ($C_{22}H_{14}$)	DahA	278

Table S3. Input species data for PMF analysis of BrC absorption from Xie et al. (2022).

	No. of Obs.	Median	Mean ± stdev	Range
Light absorption coefficients (Mm^{-1})				
$Abs_{365,m}$[a]	109	5.59	6.43 ± 4.66	0.38 – 29.6
Bulk components				
WSOC	109	4.20	4.45 ± 2.13	1.22–10.3
MEOC[b]	109	5.82	6.22 ± 2.53	1.93 – 12.9
OC	109	7.03	7.82 ± 3.36	2.15–16.7
EC	109	2.82	2.97 ± 1.10	1.01–5.91
ammonium (NH_4^+)	109	4.04	4.98 ± 3.26	1.14–21.5
nitrate (NO_3^-)	109	9.48	11.7 ± 10.4	0.12–53.0
sulfate (SO_4^{2-})	109	7.73	8.89 ± 4.24	2.87–21.6
calcium (Ca^{2+})	109	1.58	1.93 ± 1.45	0.080–6.87
magnesium (Mg^{2+})	108	0.11	0.13 ± 0.097	0.0048–0.45
Organic molecular markers (OMMs)				
n-Alkanes				
dodecane (n-C12)	102	36.7	38.4 ± 17.7	5.76 – 95.4
tridecane (n-C13)	102	35.8	37.6 ± 14.6	12.9 – 88.1
pentadecane (n-C15)	102	36.3	38.7 ± 15.0	10.6 – 81.6
hexadecane (n-C16)	102	29.4	32.1 ± 17.0	5.23 – 104
heptadecane (n-C17)	102	22.8	25.7 ± 15.5	3.96 – 83.0
octadecane (n-C18)	102	15.2	16.0 ± 8.60	3.82 – 47.8
eicosane (n-C20)	102	7.43	8.45 ± 4.72	1.30 – 27.6
henicosane (n-C21)	102	6.94	7.47 ± 3.55	1.47 – 21.3
docosane (n-C22)	102	6.54	7.23 ± 4.74	0.60 – 33.1
tricosane (n-C23)	102	6.69	8.14 ± 5.69	1.68 – 41.2
tetracosane (n-C24)	102	5.31	7.19 ± 5.51	1.75 – 39.1
pentacosane (n-C25)	102	7.18	8.32 ± 5.16	1.94 – 36.2
hexacosane (n-C26)	102	4.12	4.82 ± 3.11	1.00 – 22.3
heptacosane (n-C27)	102	5.52	6.10 ± 3.40	1.24 – 17.8
octacosane (n-C28)	102	2.99	3.15 ± 2.04	0.25 – 13.8
nonacosane (n-C29)	102	6.33	9.26 ± 8.86	0.92 – 47.2
triacontane (n-C30)	101	1.88	2.05 ± 1.44	0.083 – 9.29
hentriacontane (n-C31)	102	4.62	5.78 ± 3.99	0.76 – 23.6
dotriacontane (n-C32)	102	1.45	1.59 ± 0.83	0.34 – 5.15
tritriacontane (n-C33)	102	2.76	3.62 ± 3.02	0.77 – 21.5
tetratriacontane (n-C34)	102	1.58	1.80 ± 1.13	0.16 – 8.63
pentatriacontane (n-C35)	101	0.96	1.18 ± 0.78	0.25 – 4.98
PAHs				
naphthalene (NAP)	102	75.2	92.5 ± 56.7	16.7 – 299
2-methylnaphthalene (2-MeNAP)	102	21.3	24.6 ± 13.7	4.91 – 66.0
dimethylnaphthalene-156-sum[e] (ISO-156-SUM)	102	17.2	25.0 ± 18.2	4.07 – 78.7
trimethylnaphthalene-170-sum[f] (ISO-170-SUM)	102	10.3	14.5 ± 10.8	0.96 – 47.8
phenanthrene (PHE)	102	10.1	12.8 ± 8.54	0.90 – 40.2
fluoranthene (FLT)	102	5.02	6.30 ± 4.36	1.08 – 20.2
pyrene (PYR)	102	2.06	2.86 ± 2.25	0.38 – 10.9
benz[a]anthracene (BaA)	102	0.52	0.94 ± 1.08	0.080 – 6.97
chrysene/triphenylene (CHY/TP)	102	1.03	1.41 ± 1.24	0.20 – 7.93
benzo[b&k]fluoranthene (BbkF)	102	0.86	1.21± 1.09	0.14 – 6.29
benz[e]pyrene (BeP)	102	0.8	1.05 ± 0.94	0.10 – 5.55
benz[a]pyrene (BaP)	102	0.69	0.89 ± 0.74	0.13 – 4.68
indeno[1,2,3-cd]pyrene (IDP)	102	0.83	1.04 ± 0.69	0.14 – 3.44
benzo[ghi]perylene (BghiP)*	102	0.88	1.15 ± 0.88	0.13 – 4.66

[a] Light absorption coefficients of methanol extracts at 365 nm; [b] methanol-extractable OC.

Table S3. Continue

	No. of Obs.	Median	Mean ± stdev	Range
Steranes and Hopanes				
aaa-20R-cholestane (aaa-CHO)	102	2.07	2.42 ± 1.76	0.33 – 10.7
abb-20R 24S-methylcholestane (abb-MeCHO)	102	0.58	0.68 ± 0.47	0.10 – 2.84
aaa-20R 24R-ethylcholestane (aaa-EtCHO)	102	0.77	0.97 ± 0.64	0.16 – 3.22
17a(H),21b(H)-30-norhopane (NorHOP)	102	1.02	1.13 ± 0.78	0.11 – 5.38
17a(H),21b(H)-hopane (HOP)	102	0.77	0.86 ± 0.54	0.083 – 3.72
Isoprene SOA tracers				
C5-alkene triols	104	0.96	14.5 ± 43.7	0.022 – 319
2-Methyltetrols	104	1.72	10.8 ± 19.1	0.031 – 111
Anhydro sugar				
levoglucosan	104	45	64.8 ± 71.0	0.016 – 415
Sugars and sugar alcohols				
fructose	104	3.22	14.7 ± 62.3	0.0057 – 473
mannose	103	0.33	0.42 ± 0.32	0.0034 – 1.62
glucose	104	7.52	14.0 ± 31.0	0.11 – 239
xylitol	93	0.82	0.89 ± 0.63	0.036 – 3.15
arabitol	103	5.16	7.29 ± 7.00	0.026 – 39.3
mannitol	103	6.95	11.3 ± 11.6	0.10 – 74.2

Table S4. Light absorbance (A_λ) of authentic standard compounds at specific wavelengths (λ).

	A_{300}	A_{350}	A_{365}	A_{400}	A_{450}	A_{500}	A_{550}
4-Nitrophenol (1.90 ng μL^{-1})							
Water	0.11 ± 0.0023	0.071 ± 0.0013	0.039 ± 0.0004	0.015 ± 0.0015	0.0010 ± 0.00	0	0
MeOH	0.14 ± 0.0030	0.042 ± 0.0005	0.019 ± 0.0012	0.0072 ± 0.0019	0	0	0
MeOH/DCM (1:1)	0.14 ± 0.0052	0.060 ± 0.0018	0.029 ± 0.0028	0.016 ± 0.0060	0.0012 ± 0.0008	0	0
MeOH/DCM (1:2)	0.14 ± 0.0086	0.061 ± 0.0031	0.025 ± 0.0015	0.0060 ± 0.0029	0.0008 ± 0.0004	0	0
THF	0.17 ± 0.0022	0.022 ± 0.0011	0.0084 ± 0.0005	0.0006 ± 0.0005	0	0	0
DMF	0.10 ± 0.0044	0.048 ± 0.0023	0.022 ± 0.0004	0.058 ± 0.0086	0.10 ± 0.013	0	0
4-Nitrocatechol (1.84 ng μL^{-1})							
Water	0.043 ± 0.0064	0.064 ± 0.0055	0.058 ± 0.0024	0.039 ± 0.014	0.028 ± 0.017	0.0042 ± 0.0022	0
MeOH	0.056 ± 0.0015	0.077 ± 0.0019	0.060 ± 0.0015	0.014 ± 0.0007	0.0034 ± 0.0005	0	0
MeOH/DCM (1:1)	0.060 ± 0.0015	0.083 ± 0.0013	0.070 ± 0.0012	0.020 ± 0.0034	0.0058 ± 0.0033	0	0
MeOH/DCM (1:2)	0.059 ± 0.0036	0.082 ± 0.0047	0.069 ± 0.0038	0.020 ± 0.0026	0.0064 ± 0.0025	0	0
THF	0.063 ± 0.0013	0.083 ± 0.0016	0.055 ± 0.0013	0.0036 ± 0.0005	0	0	0
DMF	0.030 ± 0.0015	0.032 ± 0.0044	0.032 ± 0.0043	0.046 ± 0.0013	0.20 ± 0.016	0.011 ± 0.0005	0
PAHs mixture (0.024 ng $\mu L^{-1, a}$)							
MeOH	0.11 ± 0.0029	0.024 ± 0.0011	0.026 ± 0.0009	0.014 ± 0.0007	0.0014 ± 0.0005	0	0
MeOH/DCM (1:1)	0.12 ± 0.0046	0.026 ± 0.011	0.028 ± 0.0012	0.013 ± 0.0007	0.0014 ± 0.0005	0	0
MeOH/DCM (1:2)	0.013 ± 0.0027	0.027 ± 0.0008	0.029 ± 0.0005	0.013 ± 0.0004	0.0016 ± 0.0005	0	0
THF	0.13 ± 0.0098	0.026 ± 0.0019	0.028 ± 0.0022	0.011 ± 0.0009	0.0010 ± 0.00	0	0
DMF	0.14 ± 0.0044	0.027 ± 0.0012	0.030 ± 0.0009	0.011 ± 0.0009	0.0014 ± 0.0005	0	0
PAHs mixture (0.0080 ng $\mu L^{-1, a}$)							
MeOH	0.032 ± 0.011	0.0072 ± 0.0004	0.0072 ± 0.0004	0.0042 ± 0.0004	0	0	0
MeOH/DCM (1:1)	0.041 ± 0.0028	0.0080 ± 0.0007	0.0090 ± 0.0007	0.0042 ± 0.0004	0	0	0
MeOH/DCM (1:2)	0.045 ± 0.0023	0.0088 ± 0.0008	0.0092 ± 0.0008	0.0040 ± 0.0007	0	0	0
THF	0.043 ± 0.0022	0.0084 ± 0.0005	0.0092 ± 0.0004	0.0038 ± 0.0004	0	0	0
DMF	0.042 ± 0.0015	0.0072 ± 0.0004	0.0082 ± 0.0004	0.0022 ± 0.0004	0	0	0

[a] Concentration of each species in the 25-PAH mixture.

Table S5. Light absorption coefficients at 365 nm (Abs_{365}, Mm^{-1}) of collocated Q_f and Q_b sample extracts in DMF.

	Sampler I					Sampler II			
	No. of obs.	Median	Mean ± std	Range		No. of obs.	Median	Mean ± std	Range
					Q_f				
Abs_{365}	100	7.63	8.58 ± 5.12	1.14–23.3		104	6.64	8.55 ± 5.49	1.14–31.1
					Q_b				
Abs_{365}	56	0.70	0.69 ± 0.49	0.33–2.86		69	0.38	0.62 ± 0.46	0.33–3.15

Table S6. Comparisons between PMF estimations of DMF and MeOH extract absorption, bulk carbon components and artifact-corrected measurement data.

	Observation		PMF estimation		PMF estimation vs. observed data
	Median	Mean ± stdev	Median	Mean ± stdev	y: Observation
$Abs_{365,d}$	7.03	8.26 ± 4.89	7.14	7.54 ± 3.81	y = 1.13x - 0.28 (*r* = 0.88)
$Abs_{365,m}$	5.59	6.24 ± 4.11	4.64	5.57 ± 3.79	y = 0.94x + 1.02 (*r* = 0.86)
WSOC	4.11	4.38 ± 2.04	3.99	4.33 ± 1.79	y = 1.10x - 0.37 (*r* = 0.96)
MEOC	5.81	6.15 ± 2.45	5.98	6.17 ± 2.36	y = 0.99x + 0.053 (*r* = 0.95)
OC	7.03	7.75 ± 3.25	7.49	7.82 ± 3.13	y = 1.01x - 0.15 (*r* = 0.97)
EC	2.79	2.95 ± 1.09	2.82	2.88 ± 1.02	y = 0.95x + 0.21 (*r* = 0.88)
WSIIs[a]+OC+EC	34.3	38.5 ± 19.1	32.4	36.1 ± 15.8	y = 1.19x – 4.40 (*r* = 99)

[a] Water-soluble inorganic ions, including NH_4^+, NO_3^-, SO_4^{2-}, Ca^{2+}, and Mg^{2+}.

Table S7. Average relative contributions (%) of individual factors to Abs_{365} of DMF and MeOH extracts and bulk components.

Factors	Biomass burning	Non-combustion fossil	Lubricating oil combustion	Coal combustion	Dust resuspension	Biogenic emission	Isoprene oxidation	Secondary inorganics
$Abs_{365,d}$	34.5	10.9	3.33	11.1	23.2	0.04	11.9	5.00
$Abs_{365,m}$	47.7	3.20	6.40	19.2	20.7	0	0	2.84
WSOC	27.2	5.12	8.07	0.00	27.4	5.25	17.4	9.61
MEOC	20.2	6.78	11.9	1.82	27.3	7.29	16.4	8.39
OC	20.3	5.92	9.71	2.46	31.2	9.70	13.6	7.12
EC	18.6	8.40	12.7	5.26	22.7	12.1	8.37	11.9
WSII+OC+EC	20.9	3.79	7.57	7.45	14.9	5.89	9.63	29.8

Figure S1

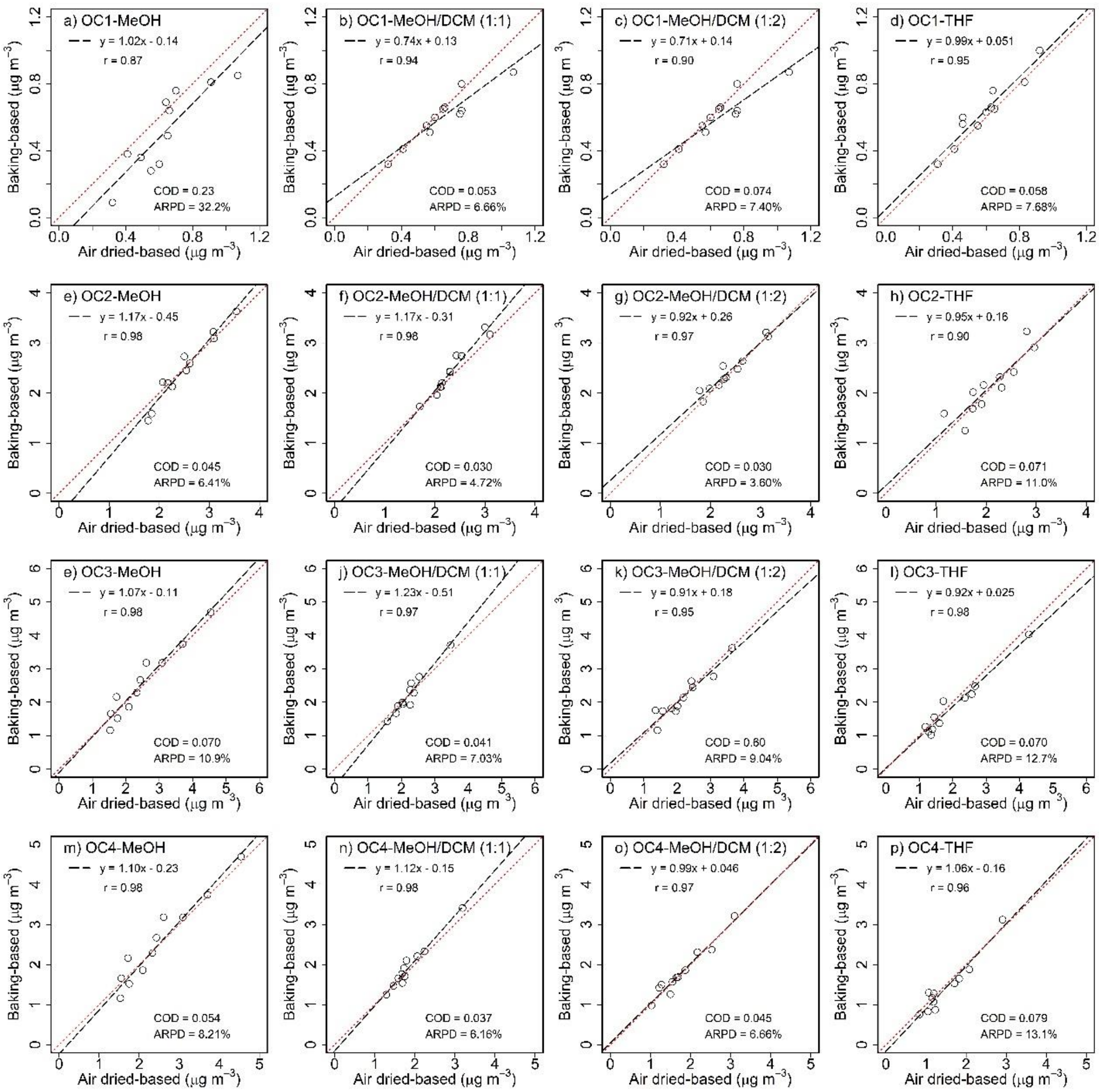

Figure S1. Comparisons of extracted OC fractions based on rOC measurements after air-dried and baking processes with the one-time extraction procedure.

Figure S2

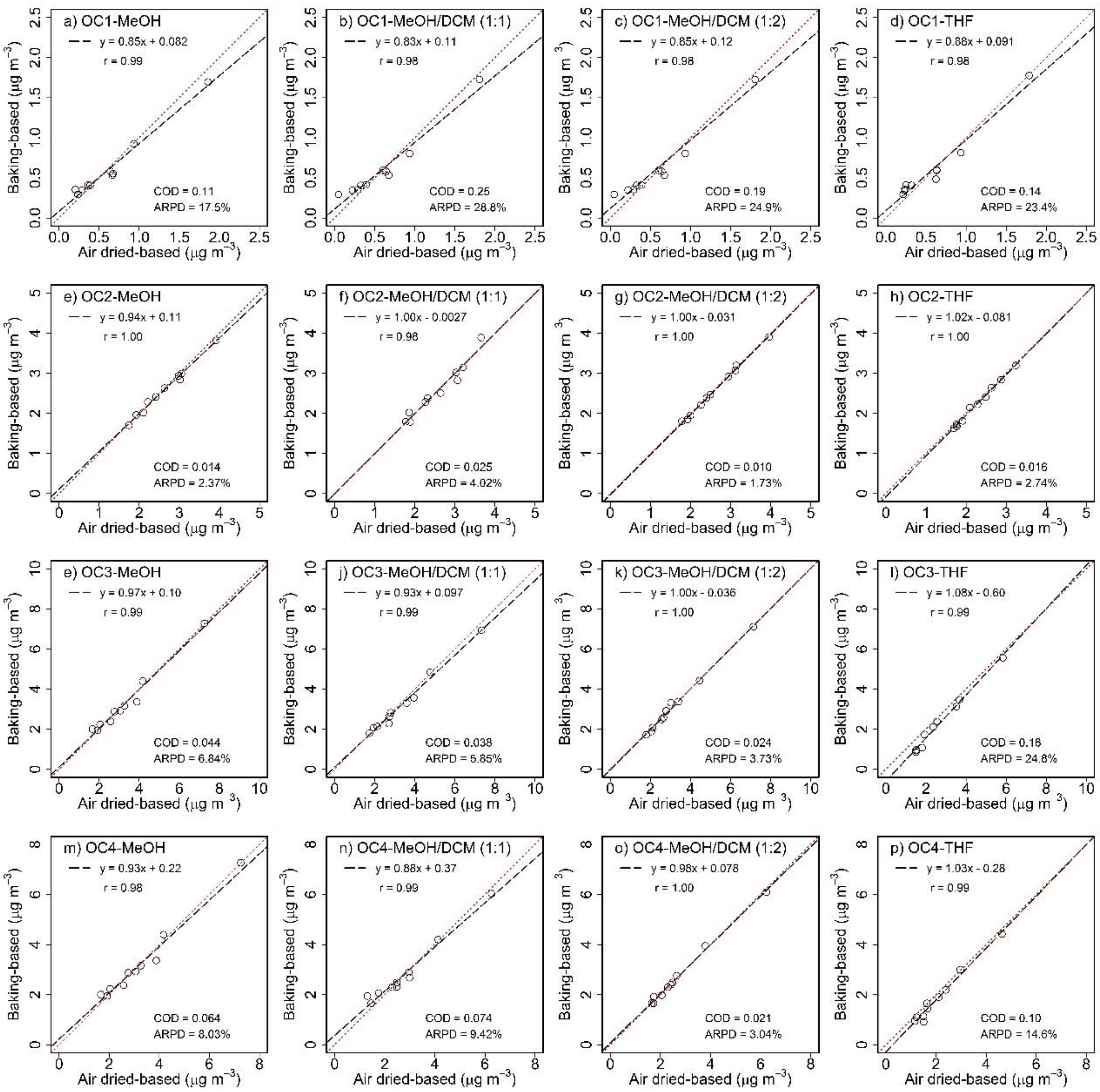

Figure S2. Comparisons of extracted OC fractions based on rOC measurements after air-dried and baking processes with the two-time extraction procedure.

Figure S3

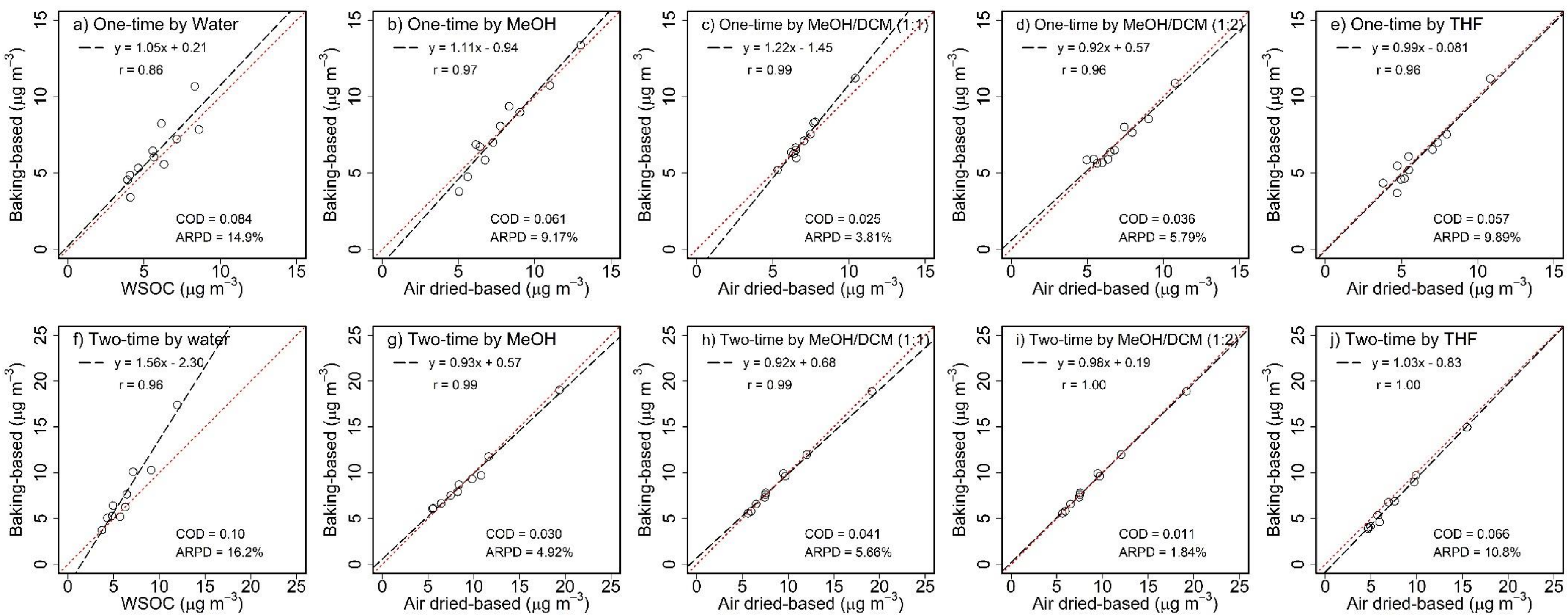

Figure S3. Comparisons of total SEOC based on rOC measurements after air-dried and baking processes for (a-e) one-time extraction and (f-j) two-time extraction procedures. The SEOC of water was determined by measuring WSOC in water extracts and rOC in the extracted filter after the baking process, respectively.

Figure S4

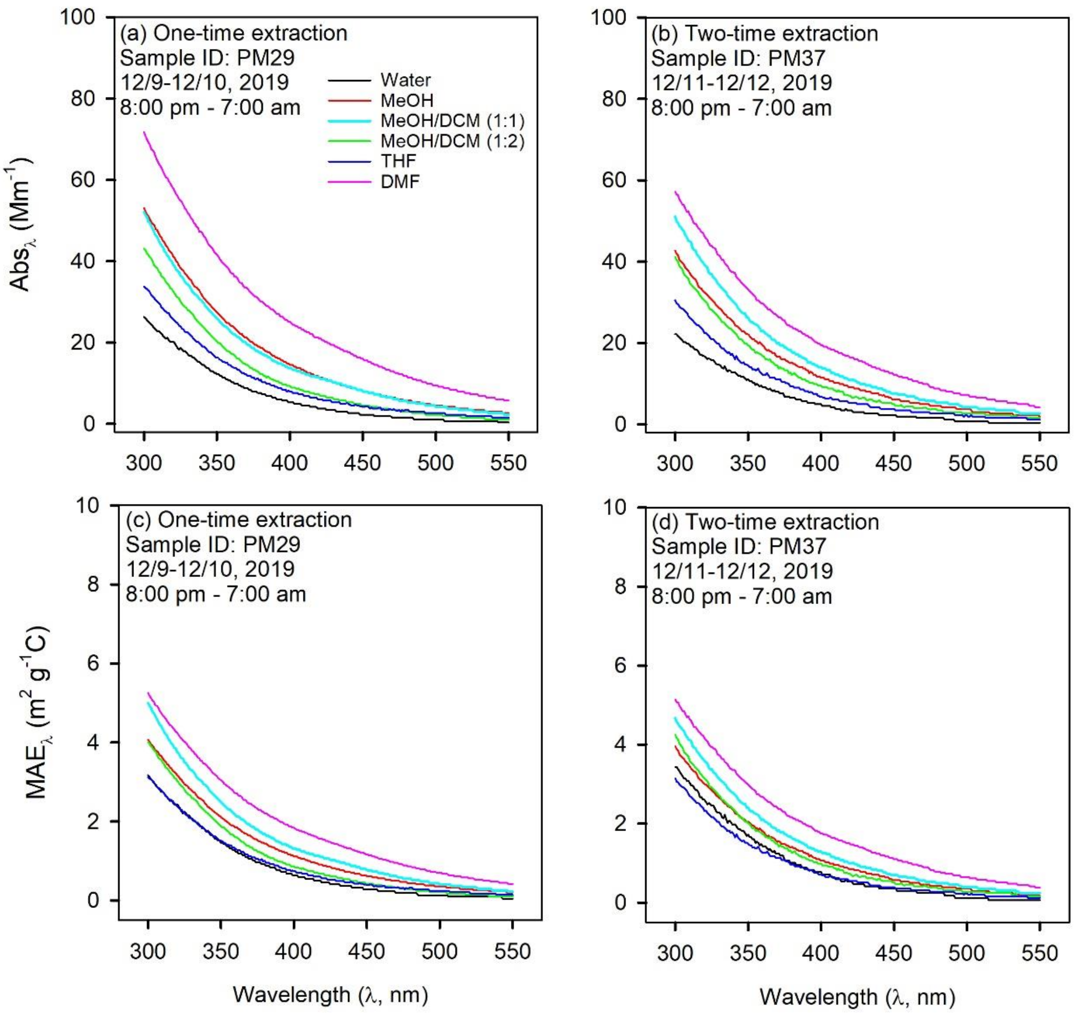

Figure S4. Abs$_\lambda$ and MAE$_\lambda$ spectra of (a, c) sample PM29 with one-time extraction and (b, d) sample PM37 with two-time extraction.

Figure S5

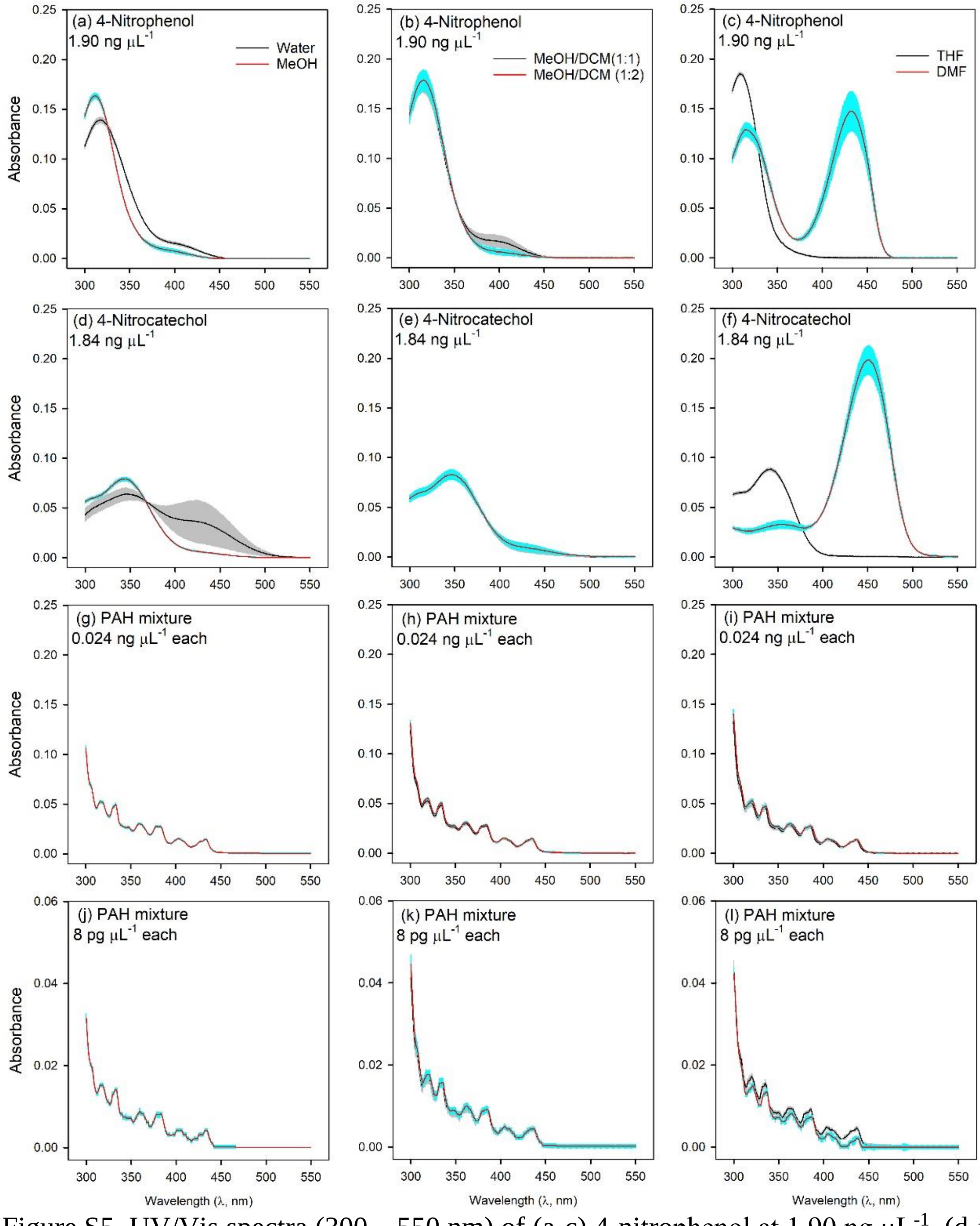

Figure S5. UV/Vis spectra (300 – 550 nm) of (a-c) 4-nitrophenol at 1.90 ng μL^{-1}, (d-f) 4-nitrocatechol at 1.84 ng μL^{-1}, and (g-i) 25 PAH mixtures at 0.024 ng μL^{-1}and (j-l) 8 pg μL^{-1} for each species in the five solvents and solvent mixtures.

Figure S6

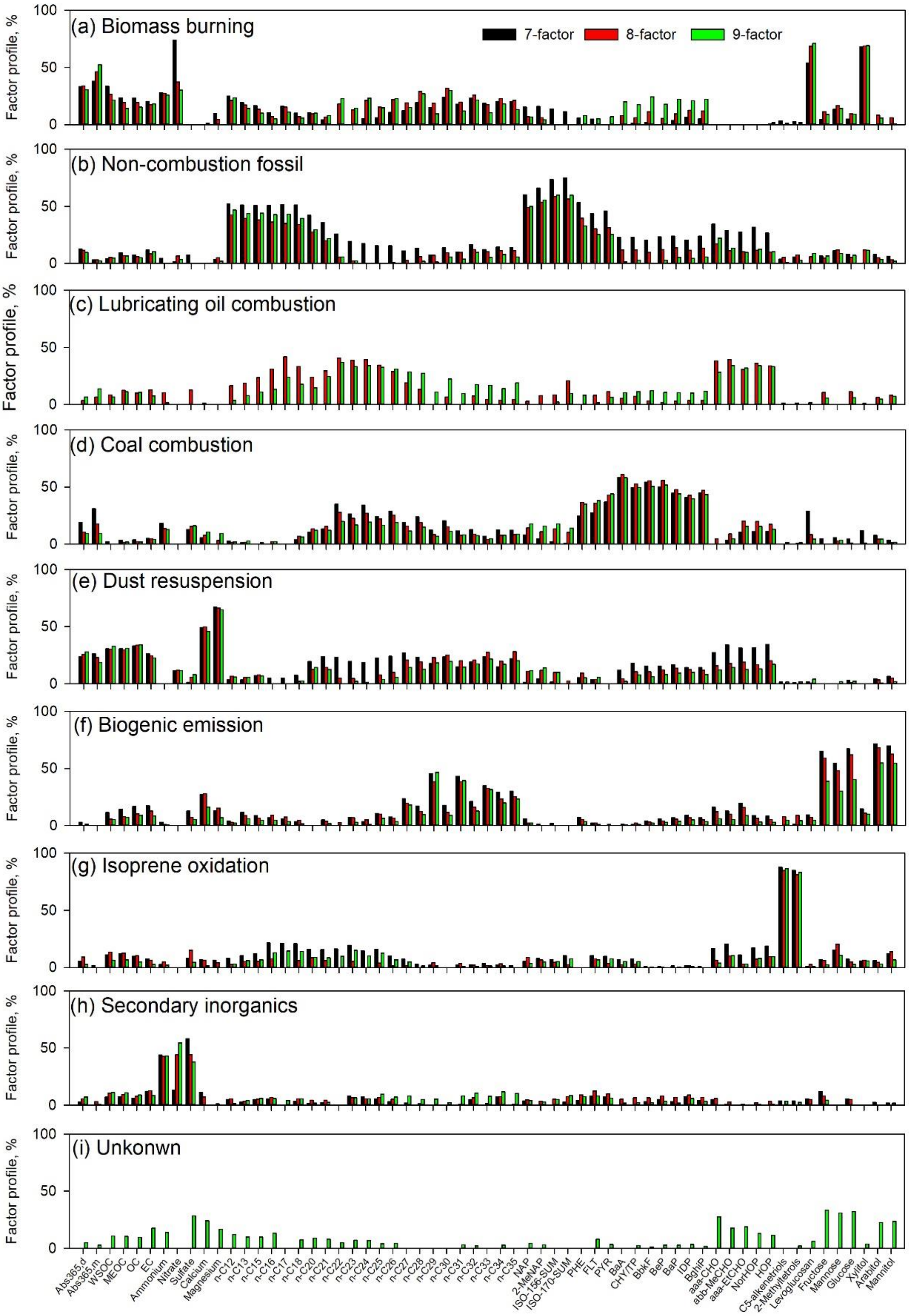

Figure S6. Normalized factor profiles of 7-, 8-, and 9-factor PMF solutions.

References

Krudysz, M. A., Froines, J. R., Fine, P. M., and Sioutas, C.: Intra-community spatial variation of size-fractionated PM mass, OC, EC, and trace elements in the Long Beach, CA area, Atmos. Environ., 42, 5374-5389, 10.1016/j.atmosenv.2008.02.060, 2008.

Wilson, J. G., Kingham, S., Pearce, J., and Sturman, A. P.: A review of intraurban variations in particulate air pollution: Implications for epidemiological research, Atmos. Environ., 39, 6444-6462, 10.1016/j.atmosenv.2005.07.030, 2005.

Wongphatarakul, V., Friedlander, S. K., and Pinto, J. P.: A comparative study of PM2.5 ambient aerosol chemical databases, Environ. Sci. Technol., 32, 3926-3934, 10.1021/es9800582, 1998.

Xie, M., Peng, X., Shang, Y., Yang, L., Zhang, Y., Wang, Y., and Liao, H.: Collocated measurements of light-absorbing organic carbon in PM2.5: Observation uncertainty and organic tracer-based source apportionment, J. Geophys. Res. Atmos., 127, e2021JD035874, https://doi.org/10.1029/2021JD035874, 2022.