Supplement to
Fossil fuel combustion, biomass burning and biogenic sources of fine carbonaceous aerosol in the Carpathian Basin

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Table S1. Mean apportionment multiplication factors of the coupled radiocarbon-levoglucosan marker model with SDs for regional background in the Carpathian Basin, suburban area and city centre of Budapest in different seasons.

Factor	Site type	Autumn	Winter	Spring	Summer
f_1 (%)	Region	69±3	75±3	63±13	74±9
	Suburb	68±6	76±7	50±6	57±11
	Centre	76±10	74±2	50±9	58±7
f_2 (%)	Region	7.6±1.3	14±1	1.6±0.5	0.41±0.15
	Suburb	8.3±1.7	15±2	3.5±1.1	0.50±0.24
	Centre	6.0±1.0	13±1	2.7±1.1	0.61±0.18
f_3 (%)	Region	49±9	93±6	10±3	2.4±1.0
	Suburb	53±12	97±16	21±7	2.9±1.5
	Centre	38±7	90±8	16±7	3.6±1.1
f_4 (%)	Region	28±14	5.3±2.4	35±13	24±14
	Suburb	14±11	6.8±2.0	36±8	33±5
	Centre	29±17	19±4	45±12	31±6

Table S2. Median atmospheric concentrations of SO_2, NO, NO_2, CO, O_3 and PM_{10} mass for regional background in the Carpathian Basin, suburban area and city centre of Budapest during the aerosol sampling campaign in different seasons.

Pollutant	Site type	Autumn	Winter	Spring	Summer
SO_2	Region	0.44	n.a.	n.a.	n.a.
(μg m^{-3})	Suburb	2.2	2.0	1.35	1.50
	Centre	7.0	5.3	4.7	2.7
NO	Region	n.a.	n.a.	n.a.	n.a.
(μg m^{-3})	Suburb	8.4	4.7	1.40	1.05
	Centre	74	51	17.3	10.6
NO_2	Region	2.9	n.a.	n.a.	n.a.
(μg m^{-3})	Suburb	36	25	19.3	12.8
	Centre	52	37	57	31
CO	Region	n.a.	n.a.	n.a.	n.a.
(mg m^{-3})	Suburb	0.50	0.60	0.78	0.69
	Centre	0.69	0.56	0.61	0.33
O_3	Region	n.a.	37	103	92
(μg m^{-3})	Suburb	12.4	15.5	67	74
	Centre	3.4	2.7	38	55
PM_{10} mass	Region	14.5	n.a.	n.a.	n.a.
(μg m^{-3})	Suburb	30	29	39	21
	Centre	38	41	42	23

n.a.: not available

Table S3. Mean air temperature (*T*), relative humidity (RH), wind speed (WS) and daily maximum global solar radiation ($GRad_{max}$) with SDs for regional background in the Carpathian Basin, suburban area and city centre of Budapest during the aerosol sampling campaign in different seasons.

Property	Site type	Autumn	Winter	Spring	Summer
T (°C)	Region	8.4±1.9	1.8±2.9	17.1±2.6	23±2
	Suburb	10.0±2.2	2.5±3.3	19.0±2.0	24±2
	Centre	12.9±1.9	2.5±3.5	19.9±1.0	24±2
RH (%)	Region	88±10	89±10	64±8	78±9
	Suburb	75±11	79±8	48±9	56±8
	Centre	79±4	82±4	49±9	64±9
WS ($m\ s^{-1}$)	Region	1.61±1.14	1.52±0.71	1.45±0.57	1.55±0.72
	Suburb	1.64±1.10	1.63±0.49	1.27±0.23	1.32±0.68
	Centre	1.82±0.84	2.1±0.4	2.5±0.5	3.9±1.7
$GRad_{max}$ ($kW\ m^{-2}$)	Region	n.a.	n.a.	n.a.	n.a.
	Suburb	0.31±0.15	0.186±0.106	0.77±0.09	0.79±0.11
	Centre	n.a.	n.a.	0.74±0.11	0.76±0.15

n.a.: not available

The differences in the mean WS can be explained by non-equal heights of the meteorological sensors (3 m above the ground in the regional background and at the suburban area, and 12 m above the street level in the city centre).

Table S4. Coefficients of correlation between EC_{FF}, OC_{FF}, EC_{BB}, OC_{BB} and OC_{BIO} on the one side and K, NO, and *T* on the other side for regional background in the Carpathian Basin, suburban area and city centre of Budapest.

Variable (unit)	Site type	EC_{FF} ($\mu g\ m^{-3}$)	OC_{FF} ($\mu g\ m^{-3}$)	EC_{BB} ($\mu g\ m^{-3}$)	OC_{BB} ($\mu g\ m^{-3}$)	OC_{BIO} ($\mu g\ m^{-3}$)
K ($\mu g\ m^{-3}$)	Region	0.02	0.73	*0.95*	*0.95*	-0.26
	Suburb	-0.69	0.51	*0.90*	*0.91*	0.20
	Centre	-0.22	0.44	*0.86*	*0.86*	0.20
NO ($\mu g\ m^{-3}$)	Region	n.a.	n.a.	n.a.	n.a.	n.a.
	Suburb	-0.36	*0.93*	0.60	0.60	0.42
	Centre	-0.17	0.39	0.76	0.77	0.44
T (K)	Region	-0.37	-0.58	*-0.87*	*-0.85*	0.60
	Suburb	0.59	-0.24	*-0.85*	*-0.87*	0.24
	Centre	0.53	-0.08	*-0.79*	*-0.80*	0.34

Table S5. Mean contributions with SDs of fossil fuel (FF) combustion, biomass burning (BB), biogenic sources (Bio) and unaccounted part (UnA) to the $PM_{2.5}$ mass in % for regional background in the Carpathian Basin, suburban area and city centre of Budapest in different seasons.

Environment	Source	Autumn	Winter	Spring	Summer
Regional background	FF	12±3	8±2	13±6	8±3
	BB	14±3	21±3	3±1	<2
	Bio	14±5	<2	23±5	24±4
	UnA	60±8	70±4	61±8	67±3
Suburban area	FF	14±5	8±3	20±5	15±4
	BB	16±6	23±3	5±3	<2
	Bio	13±5	3±2	16±4	24±3
	UnA	58±13	67±4	59±9	61±5
City centre	FF	9±5	9±2	18±6	20±4
	BB	11±2	22±4	4±2	<2
	Bio	16±3	3±1	18±6	31±6
	UnA	63±3	67±4	60±8	48±6