Supplementary information for:

Primary sources of PM2.5 particles in an industrial Mediterranean city, Marseille

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Table S1: average, min and max concentrations [µg m^{-3}] of $PM_{2.5}$ components measured during the sampling period.

	Average	**Min**	**Max**
$PM_{2.5}$	15.565	6.917	33.167
OC	4.668	2.900	9.600
EC	1.342	0.700	3.400
WSOC	2.164	1.231	4.196
NH_4^+	1.108	0.289	2.197
K^+	0.093	0.042	0.193
Mg^{2+}	0.025	0.012	0.041
Na^+	0.048	<dl	0.175
Cl^-	0.072	0.010	0.263
NO_3-	0.622	0.300	1.833
SO_4^{2-}	3.924	0.529	9.438

Table S2: average, min and max concentrations [ng m^{-3}] of elements measured during the sampling period.

Elements	Average	Min	Max	Elements	Average	Min	Max
Na	101.31	27.55	207.7	Sb	1.14	0.3	5.61
Mg	19.52	3.2	73.66	Cs	0.04	<dl	0.22
Al	34.72	8.47	115.45	Ba	0.86	0.38	1.58
Ca	62.1	14.26	113.53	La	0.12	0.03	0.43
V	7.18	0.77	22.72	Ce	0.09	0.02	0.27
Cr	5.4	0.70	13.41	Pr	0.005	<dl	0.01
Mn	1.41	0.27	5.14	Nd	0.01	<dl	0.05
Fe	52.77	14.55	131.42	Sm	<dl	<dl	<dl
Co	0.15	0.04	0.5	Eu	<dl	<dl	<dl
Ni	5.08	1.85	13.3	Tb	<dl	<dl	<dl
Cu	3.29	0.5	7.27	Gd	<dl	<dl	<dl
Zn	10.55	0.84	45.71	Dy	<dl	<dl	<dl
Ga	0.02	0.01	0.05	Ho	<dl	<dl	<dl
As	2.17	1.34	2.93	Er	<dl	<dl	<dl
Se	<dl	<dl	<dl	Yb	<dl	<dl	<dl
Rb	0.3	0.07	0.81	Lu	<dl	<dl	<dl
Sr	0.41	0.16	1.58	Hf	<dl	<dl	<dl
Y	0.01	<dl	0.04	Ta	0.01	<dl	0.04
Zr	0.21	0.03	2.42	W	0.13	0.03	0.44
Nb	<dl	<dl	<dl	Tl	0.03	<dl	0.11
Mo	1.63	0.11	9.08	Pb	2.4	0.57	8.85
Cd	0.05	0.01	0.26	Th	<dl	<dl	<dl
Sn	<dl	<dl	<dl	U	0.01	<dl	0.05

Table S3: average, min and max concentrations [ng m^{-3}] of organic compounds measured during the sampling period.

Compounds	Average	Min	Max	Compounds	Average	Min	Max
n-nonadecane	0.08	<dl	0.28	n-octacosane	1.19	0.48	2.07
n-eicosane	0.60	0.10	2.00	n-nonacosane	4.44	1.48	10.10
n-heneicosane	0.45	<dl	0.99	n-triacontane	0.90	0.27	1.63
n-docosane	0.80	0.36	1.19	n-hentriacontane	3.79	1.35	7.93
n-tricosane	1.51	0.81	2.47	n-dotriacontane	0.72	0.13	1.32
n-tetracosane	1.51	0.78	2.31	n-tritriacontane	1.58	<dl	4.25
n-pentacosane	2.99	1.72	4.62	n-tetratriacontane	0.61	<dl	3.46
n-hexacosane	1.15	0.51	2.08	n-pentatriacontane	0.24	<dl	0.91
n-heptacosane	2.96	1.08	5.94	n-hexatriacontane	0.06	<dl	0.91
fluoranthene	0.26	0.01	1.12	benzo-e-pyrene	0.18	0.02	0.81
acephenanthrene	0.03	<dl	0.09	benzo-a-pyrene	0.14	0.01	0.85
pyrene	0.20	0.03	0.67	indeno[1,2,3-cd] fluoranthene	0.06	<dl	0.21
benzo[a]anthracene	0.16	0.02	1.19	indeno[1,2,3-cd]pyrene	0.17	0.02	0.84
chyrsene/triphenylene	0.29	0.07	1.17	dibenzoanthracene	0.08	<dl	0.55
benzo[b,k]fluoranthene	0.34	0.05	1.69	benzo-ghi-perylene	0.18	0.02	0.66
benzo[j]fluoranthene	0.03	<dl	0.21				
20R+S,5α(H),14β(H),17β(H)-cholestane	0.09	0.04	0.15	20R+S-5α(H)-14β(H)-17β(H)-ergostane	0.10	0.04	0.29
20R,5α(H),14α(H),17α(H)-cholestane	0.10	0.06	0.18	20R+S-5α(H)-14β(H)-17β(H)-stigmastane	0.13	0.06	0.37
trisnorneohopane	0.04	0.01	0.08	17α(H)-21β(H)-22R-homohopane	0.09	0.03	0.18
17α(H)-trisnorhopane	0.04	0.01	0.10	17α(H)-21β(H)-22S-bishomohopane	0.09	<dl	0.19
17α(H)-21β(H)-norhopane	0.23	0.12	0.61	17α(H)-21β(H)-22R-bishomohopane	0.06	<dl	0.13
17α(H)-21β(H)-hopane	0.20	0.09	0.55	17α(H)-21β(H)-22S-trishomohopane	0.03	<dl	0.18
17α(H)-21β(H)-22S-homohopane	0.12	0.05	0.26	17α(H)-21β(H)-22R-trishomohopane	0.02	<dl	0.11
di-isobutyl phtalate	24.20	6.79	69.45	benzyl butyl phtalate	0.72	0.11	3.85
di-butyl phtalate	12.23	2.80	30.29	bis(2-ethyl hexyl) phtalate	10.85	1.79	25.58
cholesterol	0.41	0.13	3.32	stigmasterol	0.10	<dl	0.18
campesterol	0.09	<dl	0.13	β-sitosterol	0.25	<dl	0.98
palmitic acid	24.88	4.61	66.88	oleic acid	0.78	0.09	6.19
stearic acid	9.12	1.17	19.68	linoleic acid	1.77	0.06	12.70
1,2-phtalic acid	2.66	0.29	8.17	1,4-phtalic acid	0.68	0.09	4.16
1,3-phtalic acid	0.20	0.04	1.08				
D-fructose α	0.26	<dl	1.16	D-mannose α	<dl	<dl	<dl
D-fructose β	0.32	<dl	1.60	D-mannose β	<dl	<dl	<dl
D-galactose α	<dl	<dl	<dl	D-glucose α	2.40	<dl	15.54
D-galactose β	<dl	<dl	<dl	D-glucose β	2.38	<dl	11.98
D-arabitol	0.51	<dl	2.40	D-mannitol	0.45	<dl	2.39
sucrose	0.98	<dl	7.91	trehalose	0.10	<dl	0.57
galactosan	0.25	<dl	1.12	levoglucosan	5.02	0.26	18.70
mannosan	0.38	<dl	1.96				

Table S3: continues.

Compounds	Average	Min	Max	Compounds	Average	Min	Max
vanillin	0.26	<dl	1.28	3-guaiacylpropanol	0.01	<dl	0.04
acetovanillone	0.14	<dl	0.51	vanillic acid	0.16	<dl	0.40
coniferyl aldehyde	0.07	<dl	0.25				
syringalaldehyde	0.14	<dl	0.51	3-syringyllpropanol	<dl	<dl	<dl
acetosyringone	0.39	<dl	0.39	synapyl aldehyde	0.09	<dl	0.32
propionyl syringol	<dl	<dl	<dl	syringic acid	0.08	<dl	0.30
syringyl acetone	<dl	<dl	<dl	homosyringic acid	<dl	<dl	<dl
abietic acid	<dl	<dl	<dl				
glyceric acid	0.39	<dl	1.73				
2-methylglyceric acid	1.80	0.03	5.90	2-methylerythritol	1.34	0.02	9.20
2-methylthreitol	0.55	<dl	3.50		0.00	0.00	0.00
3-hydroxyglutaric acid	3.50	0.26	14.00	3-isopropylglutaric acid	1.73	0.16	6.15
3-(2-hydroxyethyl)-2,2-dimethylcyclobutane carboxylic acid	0.43	0.13	1.10	3-methyl-1,2,3-butanetricarboxylic	5.01	0.33	17.93
3-hydroxy-4,4-dimethylglutaric acid	0.95	<dl	2.20	pinonic acid	15.18	1.63	34.46
3-acetylglutaric acid	2.40	0.30	7.30	pinic acid	4.50	0.80	11.68
3-acetyladipic acid	0.98	0.17	2.80				
β-caryophyllenic acid	0.27	<dl	1.10				
3-carboxyheptanedioic acid	0.83	0.16	2.20				
oxalic acid	82.20	35.70	322.00				

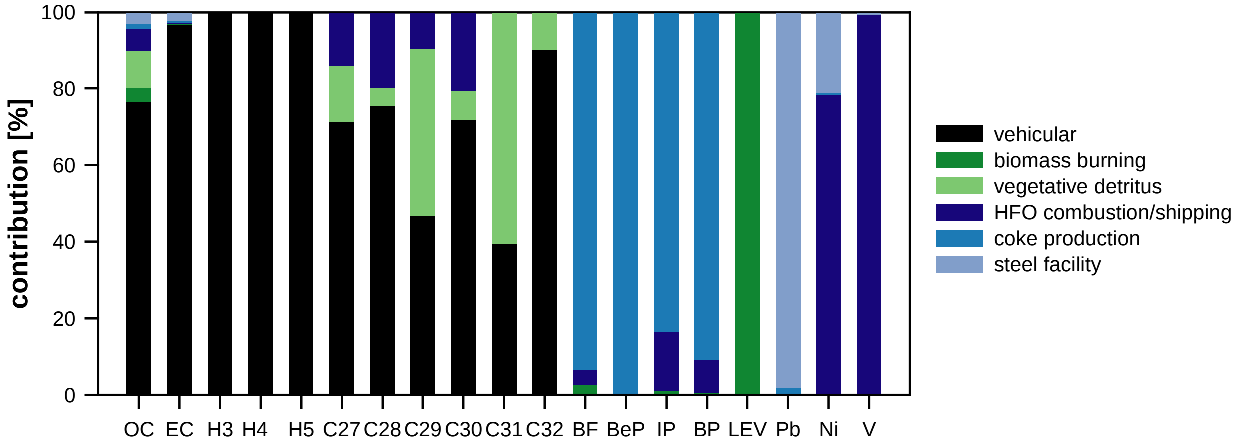

Figure S1: Average contributions of primary sources to markers included in the CMB model. For the OC, the contributions of different primary sources are normalized to total primary fraction of OC. These results are in total agreement with the preliminary PCA (Figure 2) performed in section 3.2. EC, hopanes and even carbon number n-alkanes are dominated by vehicular emissions. Odd carbon number n-alkanes are dominated by vehicular emissions. PAH and heavy metals (Pb, Ni and V) are dominated by industrial processes.

Table S4: comparison between concentrations [ng m^{-3}] of sugars and sugar derivatives in Marseille and those obtained in other sites.

sugars and sugar alcohols	Potential sources[c]	This study[d]	K-puszta forest summer[e]	western Germany forest summer[f]	Norway urban background fall[g]	Eastern China forests summer[h]	Howland forest, USA[i]		
							spring	summer	fall
glucose	lichens, soil biota, pollen, fungi, bacteria, viruses, biomass burning.	4.78 (<0.05-27.5)	ND	16.4	7.20	20.4	28.7	9.75	26.2
fructose	lichens, soil biota, pollen.	0.57 (<0.05-2.71)	ND	10.9	3.30	6.17	4.33	0.37	0.93
arabitol	fungal spores	0.51 (<0.05-2.40)	4.80	15.2	1.00	6.36	2.35	2.65	4.97
mannitol	fungal spores	0.45 (<0.05-2.39)	5.30	13.5	1.60	13.2	3.35	3.65	7.43
sucrose	pollen, soil biota	0.98 (<0.05-7.91)	ND	ND	15.0	ND	2.43	<DL	<DL
trehalose	yeast, bacteria, fungi	0.11 (<0.05-0.57)	ND	ND	5.30	ND	6.88	6.27	14.7
n-alkanes (C23-C34)	anthropogenic and biogenic sources	25.8 (6.20-33.2)	ND	ND	ND	ND	2.27	3.15	2.1
biogenic n-alkanes (C23-C34)[a]	vegetative detritus	12.4 (4.41-27.5)	ND	ND	ND	ND	ND	ND	ND
total OC[b]		4.7 (2.9-9.6)	4.2	4.6	ND	5.5	ND	ND	ND
Modern OC		3.2 (2.1-6.2)	ND	ND	ND	ND	ND	ND	ND

ND: not determined
<DL: < detection limit. Galactose and mannose were not detected.
a Sum of biogenic linear alkanes determined according to (Simoneit et al., 1990)
b OC [µg.m^{-3}] measured by NIOSH method
c references: (Ion et al., 2005;Medeiros et al., 2006;Yttri et al., 2007;Bauer et al., 2008;Kourtchev et al., 2008;Wang et al., 2008)
d mean value (min-max)
e (Ion et al., 2005) ($PM_{2.5}$ median value)
f (Kourtchev et al., 2008) ($PM_{2.5}$ mean value)
g (Yttri et al., 2007) ($PM_{2.5}$ mean value)
h (Wang et al., 2008) ($PM_{2.5}$ mean value for 4 sites)
I (Medeiros et al., 2006) (Bulk aerosol mean value for each season; for the summer value the biomass burning episodes were not considered in the calculation of the mean).

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