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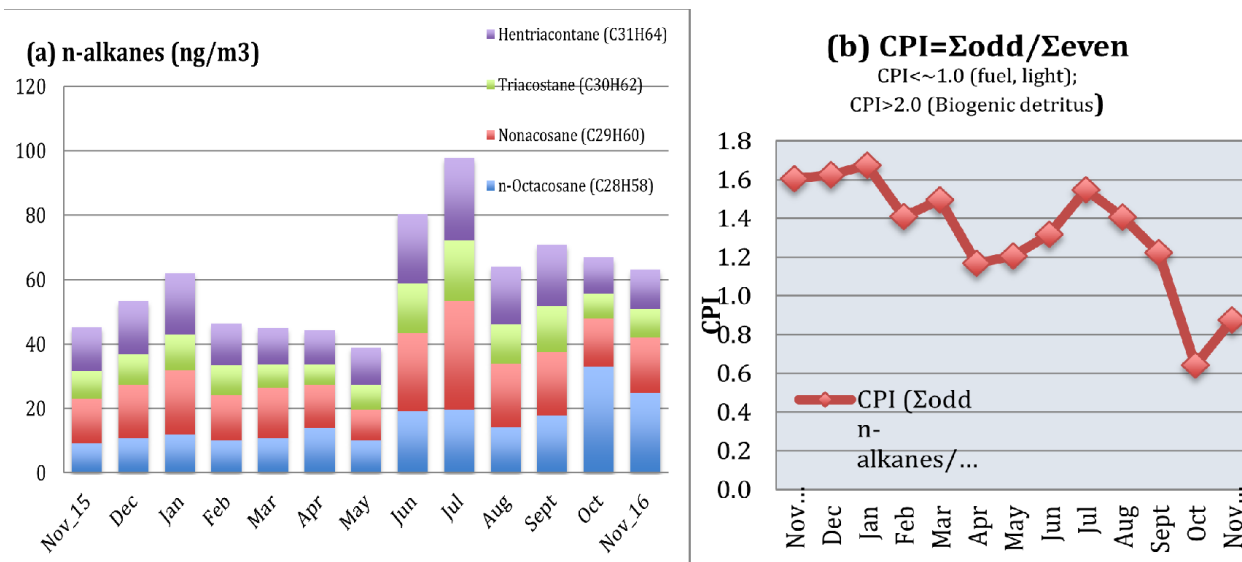**Supplementary Figures and Tables**

Supplemental Figures

Figure S1. n-alkanes (a) Stacked graph of monthly n-alkanes (ngm⁻³), (b) Carbon Preference Index (CPI) (Sum of Odd/Even n-alkanes).

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Table S1. Summary of previous PM$_{2.5}$ and PM$_{10}$ source apportionment results carried out on cities in Africa.

Study site; Study year; Site typology; Mean PM$_{2.5}$, Mean PM$_{10}$	Popula-tion estimate (mill)	Particle size Fraction	Method-ology; sampling sea-son	SEA SALT %	DUST %	TRAFFIC/ Motor Vehicle*** %	IN-DUST RIES %	BIOMASS BURN-ING/ RESI-DEN-TIAL%	OTHER (unspeci-fied Human origin)%	Reference *
Accra, Ghana; 2013; urban; 66	~1.6	PM$_{2.5}$	PMF; year		17.0	22.5		50.5	10.0	Zhou Z; Zhou L; 2013*
Addis Ababa, Ethiopia; 2008; 80	2.8	PM$_{10}$	Reconstructed mass; Dry & Wet months		76-95				5-24	Gebre**, ur-ban/suburb; 2010
Addis Ababa, Ethiopia; 2015/2016; urban; 54	**~4.0**	**PM$_{2.5}$**	**CMB; year**		**17.4**	**28.0*****		**18.3**	**36.3**	**This study**
Cairo, Egypt; 2010/2011; ur-ban; 51	9.12	PM$_{2.5}$	PCA; year		55.7	8.9	18.0	5.7	11.7	Boman, 2012*
Cairo, Egypt; 1999/2002; ur-ban; 86	9.12	PM$_{2.5}$	CMB; year	2.0	7.0	22.0	13.0	30.0	26.0	ESMAP Report, 2011*
Cairo, Egypt; 1999/2002; ur-ban; 187	9.12	PM$_{10}$	CMB; year	2.0	33.0	9.0	11.0	28.0	17.0	ESMAP Report, 2011*
Dar es Salam, Tanzania; 2005/2007; rural; 13	1.361	PM$_{10}$	PCA; year	33.8	17.2	25.8			23.2	Mmari, 2013*
Dar es Salam, Tanzania; 2005/2007; urban; 14	1.361	PM$_{10}$	PCA; year			63.6			36.4	Mmari, 2013*
Dar es Salam, Tanzania; 2005/2007; urban; 17	1.361	PM$_{10}$	PCA; year	29.3		37.1	7.1	13.6	12.9	Mmari, 2013*
Ikeja, Nigeria; 1989/1991; industrial; 176	0.313	PM$_{10}$	CMB; year	27.8		33.6	7.4		31.2	Oluyemi, 2001*
Ikoyi, Nigeria; 1989/1991; urban; 92	5.195	PM$_{10}$	CMB; year	24.4		57.6	4.5		13.5	Oluyemi, 2001*
Qalabotjha, South Africa; 1997; urban; 124	~0.016	PM$_{10}$	CMB; winter		1.0		1.0	75.0	23.0	ESMAP Report, 2011*
Qalabotjha, South Africa; 1997; urban; 113	~0.016	PM$_{2.5}$	CMB; winter		11.0		2.0	63.0	24.0	ESMAP Report, 2011*
Yaba, Nigeria; 1989/1991; residential; 188	5.195	PM$_{10}$	CMB; year	34.2		39.0	7.8		19.0	Oluyemi, 2001*

* Source: WHO Ambient Air Quality Database, 2018; ** Gebre, G. et al., 2010; *** motor vehicles. CMB: Chemical Mass Balance; PCA: Principal Component Analysis; ESMAP: Energy Sector Management Assistance Program (World Bank).

Table S2. a) Organic Carbon (OC) source contribution estimates by concentration (μg OC/m^3) in Addis Ababa, November 2015 through November 2016.

Month	Measured OC	Meas-ured OC unc	R-square	CHI-square	Biomass burning	Biomass burning unc	Vehi-cles	Vehicles unc	Residen-tial coal combus-tion	Residen-tial coal combus-tion unc	Fuel oil	Fuel oil unc	Other OC	Other OC unc
Nov 15	16.3	2.5	0.99	0.56	4.6	0.9	3.8	0.4	0.80	0.18	0.010	0.002	7.1	2.7
Dec	17.0	3.1	0.99	0.62	5.4	1.1	4.0	0.8	0.70	0.21	0.011	0.003	*6.9*	*3.4*
Jan	14.4	4.6	0.99	0.36	6.7	1.4	3.8	0.6	0.89	0.26	0.008	0.001	*3.0*	*4.8*
Feb	19.1	4.4	0.99	0.58	4.2	0.9	4.8	1.2	0.79	0.19	0.016	0.002	9.4	4.6
Mar	15.5	2.1	0.98	1.57	4.6	0.9	4.2	0.6	0.75	0.18	0.011	0.003	5.9	2.4
Apr	13.7	3.3	0.98	1.39	4.5	0.9	3.7	0.5	0.66	0.17	0.009	0.002	*4.9*	*3.5*
May	11.1	0.9	0.99	1.22	5.4	1.1	4.8	0.7	0.53	0.16	0.009	0.002	*0.3*	*1.6*
Jun	24.1	1.4	0.99	0.56	14.2	2.9	10.5	1.0	0.97	0.28	0.020	0.002	*-1.6*	*3.3*
Jul	25.9	5.0	0.99	0.89	16.1	3.2	9.8	1.0	1.61	0.34	0.013	0.003	*-1.7*	*6.0*
Aug	19.0	3.9	0.98	1.55	10.1	2.0	9.0	1.5	0.68	0.18	0.009	0.002	*-0.8*	*4.6*
Sep	22.3	4.2	0.99	1.09	11.3	2.3	9.7	1.3	0.89	0.20	0.013	0.002	*0.4*	*4.9*
Oct	10.2	1.2	0.99	0.61	5.6	1.1	5.7	0.7	0.28	0.11	0.012	0.002	*-1.4*	*1.8*
Nov 16	11.9	1.6	0.99	0.49	8.8	1.8	6.5	1.0	0.83	0.19	0.010	0.002	*-4.2*	*2.5*

Units: micrograms of **organic carbon** per cubic meter (μg OC/m^3)

*Blue italic text indicates **non-significant** values (criteria: concentration is **less than** 2*uncertainty)*

Table S2. b) Organic Carbon (OC) source contribution estimates by percentage (%) in Addis Ababa, November 2015 through November 2016.

Month	Biomass burning	Biomass burning unc	Vehicles	Vehicles unc	Residential coal combustion	Residential coal combustion unc	Fuel oil	Fuel oil unc	Other OC	Other OC unc
Nov 15	28%	7%	23%	4%	4.9%	1.4%	0.06%	0.02%	44%	18%
Dec	32%	9%	23%	6%	4.1%	1.4%	0.07%	0.02%		
Jan	47%	18%	27%	9%	6.2%	2.6%	0.05%	0.02%		
Feb	22%	7%	25%	9%	4.1%	1.4%	0.08%	0.02%	49%	27%
Mar	30%	7%	27%	5%	4.9%	1.3%	0.07%	0.02%	38%	16%
Apr	32%	10%	27%	8%	4.8%	1.7%	0.06%	0.02%		
May	49%	11%	44%	7%	4.8%	1.5%	0.08%	0.02%		
Jun	59%	12%	44%	5%	4.0%	1.2%	0.08%	0.01%		
Jul	62%	17%	38%	8%	6.2%	1.8%	0.05%	0.02%		
Aug	53%	15%	47%	12%	3.6%	1.2%	0.05%	0.01%		
Sep	51%	14%	44%	10%	4.0%	1.2%	0.06%	0.01%		
Oct	55%	13%	56%	9%	2.8%	1.1%	0.12%	0.02%		
Nov 16	74%	18%	54%	11%	7.0%	1.8%	0.09%	0.02%		

Units: percent of total measured **organic carbon** (% OC)

Table S3. CMB Source Contribution of Fine Particulate Matter estimates of Organic Carbon (OC) and ions (Sulfate, Nitrate and Ammonium) by concentration (µg OC/m3) in Addis Ababa, November 2015 through November 2016.

Month	PM mass	mas-sunc	Sulfate	Sulfate std err	Nitrate	Nitrate std err	Ammonium	Ammonium std err	Dust	Dust unc	Biomass burning	Bb unc	Vehicles	ve-hunc	Residential coal combustion	coalunc	Fuel oil	fuel oil unc	Other PM	oth-erunc
Nov-15	39.92	7.71	2.59	0.13	0.32	0.04	0.64	0.10	5.02	1.23	5.47	1.11	8.52	1.15	1.86	0.43	0.26	0.06	*15.24*	*7.98*
Dec-15	40.58	16.56	3.27	0.77	0.38	0.09	0.69	0.08	8.79	2.82	6.45	1.32	8.92	2.04	1.62	0.48	0.30	0.07	*10.15*	*17.00*
Jan-16	45.37	37.39	3.24	0.68	0.36	0.01	0.91	0.13	6.87	3.14	8.01	1.63	8.29	1.61	2.06	0.59	0.21	0.03	*15.43*	*37.61*
Feb-16	41.23	7.98	3.63	0.86	0.32	0.01	0.76	0.17	11.01	1.45	4.99	1.02	11.01	3.14	1.82	0.44	0.43	0.06	*7.25*	*8.82*
Mar-16	40.89	9.13	2.23	0.24	0.19	0.07	0.70	0.27	11.39	1.42	5.53	1.12	9.53	1.67	1.74	0.41	0.29	0.07	*9.28*	*9.47*
Apr-16	33.64	11.14	1.34	0.33	0.34	0.04	0.58	0.08	4.25	0.83	5.34	1.08	8.21	1.40	1.53	0.39	0.23	0.06	*11.82*	*11.32*
May-16	35.35	12.99	1.74	0.35	0.39	0.04	0.46	0.15	13.24	5.08	6.46	1.31	11.17	1.92	1.22	0.38	0.24	0.05	*0.43*	*14.15*
Jun-16	83.74	6.83	3.99	0.70	0.20	0.05	1.18	0.09	16.75	2.39	17.02	3.43	24.07	2.70	2.24	0.65	0.53	0.06	17.77	8.50
Jul-16	70.13	17.80	2.89	0.41	0.26	0.09	1.25	0.22	6.58	1.32	19.32	3.88	22.03	2.70	3.72	0.78	0.35	0.09	*13.73*	*18.49*
Aug-16	74.86	18.57	2.74	0.67	0.15	0.03	1.11	0.24	3.83	1.23	12.12	2.43	20.55	3.81	1.58	0.41	0.23	0.06	*32.56*	*19.17*
Sep-16	61.11	13.01	4.61	0.41	0.20	0.06	2.32	0.14	5.88	1.22	13.55	2.72	22.48	3.36	2.06	0.46	0.34	0.06	*9.67*	*13.77*
Oct-16	36.71	8.56	4.12	0.46	0.07	0.02	1.55	0.23	6.07	1.09	6.68	1.35	12.86	1.81	0.66	0.25	0.31	0.06	*4.38*	*8.94*
Nov-16	39.49	7.56	3.38	0.34	0.05	0.03	0.69	0.17	4.33	0.42	10.49	2.11	14.61	2.59	1.93	0.43	0.27	0.04	*3.74*	*8.29*

Units: micrograms of **fine particulate matter** per cubic meter (µg PM2.5/m³)
*Blue italic text indicates **non-significant** values (criteria: concentration is **less than** 2*uncertainty)*

Table S4. CMB Source Contribution of Fine Particulate Matter estimates of Organic Carbon (OC) and ions (Sulfate, Nitrate and Ammonium) by percent (%) in Addis Ababa, November 2015 through November 2016.

Month	Sulfate	Sulfate std err	Nitrate	Nitrate std err	Ammonium	Ammonium std err	Dust	Dust unc	Biomass burning	bbunc	Vehicles	vehunc	Residential coal combustion	Coal unc	Fuel oil	fuel oil unc	Other PM	oth-erunc
Nov 15	6.5%	1.3%	0.8%	0.2%	1.6%	0.4%	13%	4%	14%	4%	21%	5%	4.7%	1.4%	0.6%	0.2%	*38%*	*21%*
Dec	8.0%	3.8%	0.9%	0.4%	1.7%	0.7%	22%	11%	16%	7%	22%	10%	4.0%	2.0%	0.7%	0.4%	*25%*	*43%*
Jan	7.1%	6.1%	0.8%	0.6%	2.0%	1.7%	15%	14%	18%	15%	18%	15%	4.5%	4.0%	0.5%	0.4%	*34%*	*87%*
Feb	8.8%	2.7%	0.8%	0.2%	1.8%	0.6%	27%	6%	12%	3%	27%	9%	4.4%	1.4%	1.0%	0.3%	*18%*	*22%*
Mar	5.5%	1.4%	0.5%	0.2%	1.7%	0.8%	28%	7%	14%	4%	23%	7%	4.3%	1.4%	0.7%	0.2%	*23%*	*24%*
Apr	4.0%	1.6%	1.0%	0.4%	1.7%	0.6%	13%	5%	16%	6%	24%	9%	4.5%	1.9%	0.7%	0.3%	*35%*	*36%*
May	4.9%	2.1%	1.1%	0.4%	1.3%	0.6%	37%	20%	18%	8%	32%	13%	3.5%	1.7%	0.7%	0.3%	*1%*	*40%*
Jun	4.8%	0.9%	0.2%	0.1%	1.4%	0.2%	20%	3%	20%	4%	29%	4%	2.7%	0.8%	0.6%	0.1%	21%	10%
Jul	4.1%	1.2%	0.4%	0.2%	1.8%	0.6%	9%	3%	28%	9%	31%	9%	5.3%	1.7%	0.5%	0.2%	*20%*	*27%*
Aug	3.7%	1.3%	0.2%	0.1%	1.5%	0.5%	5%	2%	16%	5%	27%	8%	2.1%	0.8%	0.3%	0.1%	*43%*	*28%*
Sep	7.5%	1.7%	0.3%	0.1%	3.8%	0.8%	10%	3%	22%	6%	37%	10%	3.4%	1.0%	0.6%	0.2%	*16%*	*23%*
Oct	11.2%	2.9%	0.2%	0.1%	4.2%	1.2%	17%	5%	18%	6%	35%	10%	1.8%	0.8%	0.9%	0.2%	*12%*	*25%*
Nov 16	8.6%	1.8%	0.1%	0.1%	1.8%	0.5%	11%	2%	27%	7%	37%	10%	4.9%	1.4%	0.7%	0.2%	*9%*	*21%*
Avg	6.5%	2.2%	0.6%	0.2%	2.0%	0.7%	17.4%	6.6%	18.3%	6.6%	28.0%	9.1%	3.8%	1.6%	0.7%	0.2%	22.7%	31.2%
Min	3.7%	0.9%	0.1%	0.1%	1.3%	0.2%	5.1%	2.1%	12.1%	3.4%	18.3%	4.0%	1.8%	0.8%	0.3%	0.1%	1.2%	10.3%
Max	11.2%	6.1%	1.1%	0.6%	4.2%	1.7%	37.5%	19.9%	27.5%	15.0%	37.0%	15.5%	5.3%	4.0%	1.0%	0.4%	43.5%	87.5%

Units: percent of total measured **particulate matter** (% PM2.5)
*Blue italic text indicates **non-significant** values (criteria: concentration is **less than** 2*uncertainty)*