

1 **Wintertime Particulate Pollution Episodes in an Urban Valley of the Western**
2 **U.S.: A Case Study**

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Supplement Information

24 **Table S0.** List of organic marker compounds measured by thermal-desorption-gas
 25 chromatography/mass spectrometry (TD-GC/MS), total organic carbon (TOC), and ion
 26 chromatography-pulsed amperometric detection (IC-PAD) analyses.

Group	Abbreviation	Chemical Species	Analytical Method ^a
Polycyclic Aromatic Hydrocarbons (PAHs)	Acnapy	acenaphthene	TD-GC-MS
	Acnape	acenaphthylene	TD-GC-MS
	Fluore	fluorene	TD-GC-MS
	Phenan	phenanthrene	TD-GC-MS
	anthra	anthracene	TD-GC-MS
	fluora	fluoranthene	TD-GC-MS
	pyrene	pyrene	TD-GC-MS
	baanth	benzo[a]anthracene	TD-GC-MS
	chrysn	chrysene	TD-GC-MS
	bbfl	benzo(b)fluoranthene	TD-GC-MS
	bjkfl	benzo(j,k)fluoranthene	TD-GC-MS
	bbjkfl	bbfl + bjkfl	TD-GC-MS
	baf1	benzo[a]fluoranthene	TD-GC-MS
	bepyrn	benzo[e]pyrene	TD-GC-MS
	bapyrn	benzo[a]pyrene	TD-GC-MS
	peryle	perylene	TD-GC-MS
	retene	retene	TD-GC-MS
	incdpy	indeno[1,2,3-cd]pyrene	TD-GC-MS
	dbanth	dibenzo[a,h]anthracene	TD-GC-MS
	bghipe	benzo[ghi]perylene	TD-GC-MS
	corone	coronene	TD-GC-MS
	dbaepy	dibenzo(a,e)pyrene	TD-GC-MS
	fl9one	9-fluorenone	TD-GC-MS
	m_9ant	9 methyl anthracene	TD-GC-MS
	m_13fl	2-methylfluoranthene	TD-GC-MS
	cp_cdpyr	cyclopenta(c,d)pyrene	TD-GC-MS
	baa7_12	benz[a]anthracene-7,12-dione	TD-GC-MS
chry56m	methyl chrysene	TD-GC-MS	
pic	picene	TD-GC-MS	
Hopanes & Steranes	hop13	18 α (H),21 β (H)-22,29,30-trisnorhopane	TD-GC-MS
	hop15	17 α (H),21 β (H)-22,29,30-trisnorhopane	TD-GC-MS
	hop17	17 α (H),21 β (H)-30-norhopane	TD-GC-MS
	hop15a	17 β (H),21 α (H)-22,29,30-norhopane	TD-GC-MS
	hop17a	17 β (H),21 α (H)-30-norhopane	TD-GC-MS
	hop19	17 α (H),21 β (H)-hopane	TD-GC-MS
	hop19a	17 α (H),21 α (H)-hopane	TD-GC-MS
	hop20	17 β (H),21 α (H)-hopane	TD-GC-MS
	hop21	22S-17 α (H),21 β (H)-30-homohopane	TD-GC-MS
	hop22	22R-17 α (H),21 β (H)-30-homohopane	TD-GC-MS
	hop24	22S-17 α (H),21 β (H)-30,31-bishomohopane	TD-GC-MS
	hop25	22R-17 α (H),21 β (H)-30,31-bishomohopane	TD-GC-MS
	hop26	22S-17 α (H),21 β (H)-30,31,32-trisomohopane	TD-GC-MS
	hop27	22R-17 α (H),21 β (H)-30,31,32-trishomohopane	TD-GC-MS
	hop28	22S-tetrahomohopane	TD-GC-MS
	hop29	22R-tetrahomohopane	TD-GC-MS
	hop30	22S-pentashomohopane	TD-GC-MS
	hop31	22R-pentashomohopane	TD-GC-MS
	ster1	$\alpha\alpha\alpha$ 20S-cholestane	TD-GC-MS
	ster2	$\alpha\beta\beta$ 20R-cholestane	TD-GC-MS
ster3	$\alpha\beta\beta$ 20S-cholestane	TD-GC-MS	
ster4	$\alpha\alpha\alpha$ 20R-cholestane	TD-GC-MS	
ster5	$\alpha\alpha\alpha$ 20S 24S-methylcholestane	TD-GC-MS	

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29 Table S0 (continued)

Group	Mnemonic	Chemical Species	Analytical Method ^a
Hopanes & Steranes, continued	ster6	$\alpha\beta$ 20R 24S-methylcholestane	TD-GC-MS
	ster7	$\alpha\beta$ 20S 24S-methylcholestane	TD-GC-MS
	ster8	$\alpha\alpha$ 20R 24R-methylcholestane	TD-GC-MS
	ster9	$\alpha\alpha$ 20R,24S- methylcholestane	TD-GC-MS
	ster10	$\alpha\beta$ 20R 24R-ethylcholestane	TD-GC-MS
	ster11	$\alpha\beta$ 20S 24R-ethylcholestane	TD-GC-MS
	ster12	$\alpha\alpha$ 20S 24R/S-ethylcholestane	TD-GC-MS
n-Alkanes	pentad	n-pentadecane	TD-GC-MS
	hexad	n-hexadecane	TD-GC-MS
	heptad	n-heptadecane	TD-GC-MS
	octad	n-octadecane	TD-GC-MS
	nonad	n-nonadecane	TD-GC-MS
	eicosa	n-eicosane	TD-GC-MS
	heneic	n-heneicosane	TD-GC-MS
	docosa	n-docosane	TD-GC-MS
	tricos	n-tricosane	TD-GC-MS
	tetcos	n-tetracosane	TD-GC-MS
	pencos	n-pentacosane	TD-GC-MS
	hexcos	n-hexacosane	TD-GC-MS
	hepcos	n-heptacosane	TD-GC-MS
	octcos	n-octacosane	TD-GC-MS
	noncos	n-nonacosane	TD-GC-MS
	tricont	n-triacontane	TD-GC-MS
	htricont	n-hentriacontane	TD-GC-MS
	dtricont	n-dotriacontane	TD-GC-MS
	ttricont	n-tritriacontane	TD-GC-MS
	tetricont	n-tettriacontane	TD-GC-MS
ptricont	n-pentatriacontane	TD-GC-MS	
hxtricont	n-hexatriacontane	TD-GC-MS	
hptribcont	n-heptatriacontane	TD-GC-MS	
otribcont	n-octatriacontane	TD-GC-MS	
ntribcont	n-nonatriacontane	TD-GC-MS	
tetracont	n-tetracontane	TD-GC-MS	
Branched Alkanes	isoc29	iso-nonacosane	TD-GC-MS
	anteisoc29	anteiso-nonacosane	TD-GC-MS
	isoc30	iso-triacontane	TD-GC-MS
	anteisoc30	anteiso-triacontane	TD-GC-MS
	isoc31	iso-hentriacontane	TD-GC-MS
	anteisoc31	anteiso-hentriacontane	TD-GC-MS
	isoc32	iso-dotriacontane	TD-GC-MS
	anteisoc32	anteiso-dotriacontane	TD-GC-MS
	isoc33	iso-tritriacontane	TD-GC-MS
	anteisoc33	anteiso-tritriacontane	TD-GC-MS
	nonad2m	2-methylnonadecane	TD-GC-MS
	nonad3m	3-methylnonadecane	TD-GC-MS
	prist	pristane	TD-GC-MS
phytan	phytane	TD-GC-MS	
squal	squalane	TD-GC-MS	
Cycloalkane	chexa8	n-octylcyclohexane	TD-GC-MS
	chex10	n-decylcyclohexane	TD-GC-MS
	chex13	n-tridecylcyclohexane	TD-GC-MS
	chex17	n-heptadecylcyclohexane	TD-GC-MS
	chex19	n-nonadecylcyclohexane	TD-GC-MS
Alkenes	octdecen	1-octadecene	TD-GC-MS
Water Soluble Organics	npoc	water soluble organic carbon (WSOC)	TOC
	levg	levoglucosan	IC-PAD

^a TD-GC-MS: thermal desorption-gas chromatography-mass spectrometry; TOC: total organic carbon; IC-PAD: ion chromatography-pulsed amperometric detection.

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32 **Table S1.** Average of PM_{2.5} mass and chemical concentrations ($\mu\text{g m}^{-3}$) and the respective
 33 signal-to-noise ratio (SNR). (Shaded species were selected for EV-CMB modeling.)

	Site/Network	Central Reno Site (RENO_C/Speciation Trend Network)			
	Sampling Period	12/03/09 – 01/29/10			
	No. of Samples	20 ^a			
Group	Chemical Species	Number of Valid Data	Concentration Range ($\mu\text{g m}^{-3}$)	Average ^a Concentration ($\mu\text{g m}^{-3}$)	SNR ^c
Mass	PM _{2.5}	20	1.9 - 52	17	19
Elements	Na	20	0 - 0.15	0.042	3.8
	Mg	20	0 - 0.0087	0.00083	0.39
	Al	20	0.0087 - 0.17	0.044	5.6
	Si	20	0.026 - 0.51	0.13	11
	P	20	0 - 0	0	0
	S	20	0.015 - 0.48	0.14	14
	Cl	20	0.00093 - 0.45	0.072	14
	K	20	0.014 - 0.23	0.083	14
	Ca	20	0.0041 - 0.13	0.038	12
	Ti	20	0 - 0.023	0.0051	4
	V	20	0 - 0.003	0.00063	1
	Cr	20	0 - 0.017	0.0018	4.6
	Mn	20	0 - 0.014	0.0019	4.4
	Fe	20	0.02 - 0.27	0.097	13
	Co	20	0 - 0.0017	0.0003	0.83
	Ni	20	0 - 0.0021	0.00063	1.7
	Cu	20	0 - 0.011	0.0033	3.1
	Zn	20	0 - 0.037	0.012	9.3
	As	20	0 - 0.0018	0.00026	0.63
	Se	20	0 - 0.00083	0.000097	0.26
	Br	20	0 - 0.0076	0.0023	2.8
	Rb	20	0 - 0.0013	0.0002	0.51
	Sr	20	0 - 0.0023	0.00069	0.29
Zr	20	0 - 0.0049	0.00086	0.18	
Ag	20	0 - 0.0023	0.00026	0.078	
Cd	20	0 - 0.016	0.0016	0.35	
In	20	0 - 0.012	0.0014	0.22	
Sn	20	0 - 0.023	0.0029	0.48	
Sb	20	0 - 0.013	0.0011	0.14	
Ba	20	0 - 0.01	0.0017	0.51	
Pb	20	0 - 0.0068	0.0018	1.4	
Water Soluble Ions	NO ₃ ⁻	20	0.18 - 11	4	14
	SO ₄ ⁺	20	0.049 - 1.2	0.36	13
	NH ₄ ⁺	19	0.085 - 3.7	1.2	14
	Na ⁺	20	0.022 - 0.26	0.086	1.7
	K ^{+a}	18	0 - 0.18	0.072	13
Thermal Carbon Fractions ^d	OC1	20	0.21 - 5.4	1.3	25
	OC2	20	0.16 - 3	1	17
	OC3	20	0.25 - 3.3	1.3	21
	OC4	20	0.12 - 1.1	0.63	20
	OPR	20	0 - 4.6	0.68	34
	OCR	20	0.8 - 17	5	46
	EC1	20	0.27 - 8.4	2.4	33
	EC2	20	0.022 - 0.09	0.047	7.7
	EC3	20	0 - 0.011	0.00057	7.8
	ECR	20	0.23 - 4	1.8	20

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36 Table S1 (continued)

Group	Site/Network	Central Reno Site (RENO_C/Speciation Trend Network)			
	Period	12/3/09 – 1/29/10			
	# of Samples	20 ^a			
Species ^b	# of Valid Data	Range ($\mu\text{g m}^{-3}$)	Average ^a Concentration ($\mu\text{g m}^{-3}$)	SNR ^c	
Polycyclic Aromatic Hydrocarbons	Acnapy $\times 10^3$	20	0 - 0.6	0.035	0.47
	acnape $\times 10^3$	20	0 - 0	0	0
	fluore $\times 10^3$	20	0 - 0.011	0.00053	0.087
	phenan $\times 10^3$	20	0 - 0.69	0.069	2.8
	anthra $\times 10^3$	20	0 - 0.22	0.011	0.19
	fluora $\times 10^3$	20	0 - 2.3	0.3	13
	pyrene $\times 10^3$	20	0 - 2.7	0.38	17
	baanth $\times 10^3$	20	0.043 - 2.4	0.46	20
	chrysn $\times 10^3$	20	0 - 2.1	0.45	18
	bbfl $\times 10^3$	20	0.13 - 1.6	0.5	20
	bjkfl $\times 10^3$	20	0.075 - 1.5	0.43	20
	bbjkfl $\times 10^3$	20	0.22 - 3.1	0.93	28
	bafl $\times 10^3$	20	0 - 0.69	0.18	10
	bepyrn $\times 10^3$	20	0.068 - 1.3	0.39	20
	bapyrn $\times 10^3$	20	0.094 - 2.1	0.6	20
	peryle $\times 10^3$	20	0 - 0.42	0.049	0.97
	retene $\times 10^3$	20	0.15 - 13	1.7	20
	incdpy $\times 10^3$	20	0.033 - 1.6	0.39	20
	dbanth $\times 10^3$	20	0 - 0.21	0.048	11
	bghipe $\times 10^3$	20	0.036 - 1.6	0.45	20
	corone $\times 10^3$	20	0 - 0.43	0.12	19
	dbaepy $\times 10^3$	20	0 - 0.31	0.07	20
	fl9one $\times 10^3$	20	0 - 0.5	0.051	2.5
	m_9ant $\times 10^3$	20	0 - 0	0	0
	m_13fl $\times 10^3$	20	0 - 0.47	0.05	5.9
	cp_cdpyr $\times 10^3$	20	0 - 8.5	2.3	11
baa7_12 $\times 10^3$	20	0.015 - 0.59	0.16	20	
chry56m $\times 10^3$	20	0 - 0.23	0.041	3.3	
pic $\times 10^3$	20	0 - 0.19	0.029	2.2	
Hopanes & Steranes	hop13 $\times 10^3$	20	0.0066 - 0.16	0.052	20
	hop15 $\times 10^3$	20	0.0094 - 0.2	0.066	20
	hop17 $\times 10^3$	20	0.018 - 0.51	0.19	20
	hop15a $\times 10^3$	20	0.0019 - 0.091	0.03	20
	hop17a $\times 10^3$	20	0.0014 - 0.099	0.03	20
	hop19 $\times 10^3$	20	0.012 - 0.46	0.16	20
	hop19a $\times 10^3$	20	0 - 0.024	0.0093	5.5
	hop20 $\times 10^3$	20	0 - 0.06	0.02	17
	hop21 $\times 10^3$	20	0.0064 - 0.23	0.082	20
	hop22 $\times 10^3$	20	0.0082 - 0.27	0.093	20
	hop24 $\times 10^3$	20	0 - 0.14	0.05	14
	hop25 $\times 10^3$	20	0 - 0.095	0.032	17
	hop26 $\times 10^3$	20	0.003 - 0.073	0.027	20
	hop27 $\times 10^3$	20	0.004 - 0.075	0.026	20
	hop28 $\times 10^3$	20	-0.0027 - 0.063	0.02	20
	hop29 $\times 10^3$	20	-0.0022 - 0.042	0.014	20
	hop30 $\times 10^3$	20	-0.0037 - 0.077	0.023	20
	hop31 $\times 10^3$	20	-0.0036 - 0.045	0.015	18
	ster1 $\times 10^3$	20	0.0032 - 0.13	0.047	20
	ster2 $\times 10^3$	20	0.0038 - 0.093	0.033	20
ster3 $\times 10^3$	20	0.0037 - 0.079	0.027	20	
ster4 $\times 10^3$	20	0.0053 - 0.11	0.041	20	
ster5 $\times 10^3$	20	0.0016 - 0.13	0.034	20	
ster6 $\times 10^3$	20	0.0031 - 0.079	0.027	20	
ster7 $\times 10^3$	20	0.0033 - 0.093	0.03	20	
ster8 $\times 10^3$	20	0.0038 - 0.1	0.033	20	

37 Table S1 (continued)

	Site/Network	Central Reno Site (RENO_C/Speciation Trend Network)			
	Period	12/3/09 – 1/29/10			
	# of Samples	20 ^a			
Group	Species ^b	# of Valid Data	Range ($\mu\text{g m}^{-3}$)	Average ^a Concentration ($\mu\text{g m}^{-3}$)	SNR ^c
Hopanes & Steranes, continued	ster9 $\times 10^3$	20	0.0025 - 0.06	0.017	20
	ster10 $\times 10^3$	20	0.0036 - 0.12	0.036	20
	ster11 $\times 10^3$	20	0.0082 - 0.18	0.063	20
	ster12 $\times 10^3$	20	0.02 - 0.54	0.21	20
Water Soluble Organics	npoc $\times 10^3$	18	230 - 7000	1900	10
	levg $\times 10^{3a}$	18	93 - 1300	430	16
n-Alkanes	pentad $\times 10^3$	20	0 - 0.34	0.041	0.44
	hexad $\times 10^3$	20	0 - 0.56	0.052	0.53
	heptad $\times 10^3$	20	0 - 0.94	0.17	1.2
	octad $\times 10^3$	20	0 - 1	0.22	1.6
	nonad $\times 10^3$	20	0 - 2.6	0.37	2.4
	eicosa $\times 10^3$	20	0.23 - 8	0.92	20
	heneic $\times 10^3$	20	0.25 - 9.6	1.2	20
	docosa $\times 10^3$	20	0.22 - 6.9	1.2	20
	tricoso $\times 10^3$	20	0.32 - 5.8	1.3	20
	tetcos $\times 10^3$	20	0.33 - 5.1	1.6	20
	pencos $\times 10^3$	20	0.11 - 5.2	1.6	20
	hexcos $\times 10^3$	20	0.23 - 3.3	1.2	20
	hepcos $\times 10^3$	20	0.4 - 4.6	1.5	20
	octcos $\times 10^3$	20	0.2 - 3.2	1	20
	noncos $\times 10^3$	20	0.17 - 4.2	1.3	20
	tricont $\times 10^3$	20	0.15 - 2.1	0.77	20
	htricont $\times 10^3$	20	0.5 - 3.6	1.6	20
	dtricont $\times 10^3$	20	0 - 2	0.76	15
	ttricont $\times 10^3$	20	0.53 - 3.2	1.4	20
	tetricont $\times 10^3$	20	0.28 - 2.4	1	20
ptricont $\times 10^3$	20	0.6 - 3	1.3	20	
hxtricont $\times 10^3$	20	0.63 - 2.5	1.1	20	
hptribcont $\times 10^3$	20	0 - 0	0	0	
otribcont $\times 10^3$	20	0 - 0	0	0	
ntribcont $\times 10^3$	20	0 - 0	0	0	
tetracont $\times 10^3$	20	0 - 0	0	0	
Branched Alkanes	isoc29 $\times 10^3$	20	0 - 0.36	0.13	5.6
	anteisoc29 $\times 10^3$	20	0 - 0.29	0.071	2.6
	isoc30 $\times 10^3$	20	0 - 0.37	0.075	1.7
	anteisoc30 $\times 10^3$	20	0.13 - 0.85	0.39	20
	isoc31 $\times 10^3$	20	0.28 - 1.1	0.57	20
	anteisoc31 $\times 10^3$	20	0 - 0.63	0.22	4.5
	isoc32 $\times 10^3$	20	0 - 0.83	0.37	7.8
	anteisoc32 $\times 10^3$	20	0.39 - 1.3	0.72	20
	isoc33 $\times 10^3$	20	0.34 - 1	0.6	20
	anteisoc33 $\times 10^3$	20	0.14 - 0.74	0.31	20
	nonad2m $\times 10^3$	20	0 - 0.26	0.06	7.3
	nonad3m $\times 10^3$	20	0 - 0.37	0.055	8
	prist $\times 10^3$	20	0 - 0.38	0.048	0.71
	phytan $\times 10^3$	20	0 - 0.63	0.094	1.5
squal $\times 10^3$	20	0 - 0.18	0.05	16	
Cycloalkane	chexa8 $\times 10^3$	20	0 - 0.017	0.00086	0.11
	chex10 $\times 10^3$	20	0 - 0	0	0
	chex13 $\times 10^3$	20	0 - 0.074	0.011	0.92
	chex17 $\times 10^3$	20	0.019 - 0.3	0.075	20
	chex19 $\times 10^3$	20	0 - 0.32	0.092	15
Alkenes	octdecen $\times 10^3$	20	0 - 1.1	0.24	3.4

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39 Table S1 (continued)

	Site/Network	Central Reno Site (RENO_C/Speciation Trend Network)			
	Period	12/3/09 – 1/29/10			
	# of Samples	20 ^a			
Group	Species	# of Valid Data	Range (Mm ⁻¹)	Average ^a Concentration (Mm ⁻¹)	SNR ^c
Absorption (Mm ⁻¹)	<i>b</i> _{abs} (370 nm)	20	5.5 - 86	39	20
	<i>b</i> _{abs} (880 nm)	20	1.8 - 50	19	20

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41 ^a Average of 20 samples except for some water-soluble species.42 ^b See Table S0 for organic species names.43 ^c Signal-to-noise ratio (SNR) is calculated by $\sqrt{\sum_i C_i^2 / \sum_i \sigma_i^2}$ where C_i and σ_i are value and uncertainty of each

44 measurement.

45 ^d OC and EC were measured by the IMPROVE_A TOR protocol (Chow et al., 2007; 2011) where OC1–OC4 are the
 46 organic carbon evolved at 140, 280, 480, and 580 °C, respectively, in a 100% He atmosphere; EC1–EC3 are the
 47 elemental carbon evolved at 580, 740, and 840 °C, respectively, in a 98% He/2% O₂ atmosphere; OPR is pyrolyzed
 48 OC; OCR is OC by reflectance (OC1+OC2+OC3+OC4+OPR); and ECR is EC by reflectance (EC1+EC2+EC3-
 49 OPR). It is assumed that the analytical uncertainties are similar to those reported by the IMPROVE program for the
 50 urban Phoenix site (PHOE1) for the same sampling period. The uncertainty of each RENO_C carbon measurement
 51 was assigned as the uncertainty of PHOE1 measurement with the closest concentration level.

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54 Table S2. Source profiles assembled for EV-CMB receptor modeling. (Shaded entries designate
55 profiles included in the final source apportionment.)

Category	Subcategory	Mnemonic	Year	Location	Description	Reference
Geological	Paved Road Dust	TahoeNRD	2003	Lake Tahoe	Resuspension soil dust (PM _{2.5}) from Village Lakeshore	(Kuhns et al., 2004)
		TahoeSRD	2003	Lake Tahoe	Resuspension soil dust (PM _{2.5}) from Mays/Southwood	
		GPVRDC	1995	Las Vegas	Composite of 7 paved road dust samples	(Green et al., 2004)
		FDPVRD	1997	Central California	Composite of 2 paved road dust samples from San Joaquin Valley	(Chow et al., 2003)
		RNOPVRD	2010	Reno	Paved road dust samples collected along the two north lanes of the S 12th Ave, a well-traveled road a few blocks south of Anderson school near the Reno site (301 State Street)	This study
	Unpaved Road Dust & Surface Soil	GUPRDC	1995	Las Vegas	Composite of 2 unpaved road dust samples	(Green et al., 2004)
		FDUNPVRD	1997	Central California	Composite of 2 unpaved road dust samples from San Joaquin Valley	(Chow et al., 2003)
		GSOILC	1995	Las Vegas	Composite of 5 desert soil samples	(Green et al., 2004)
		RNOSOIL	2010	Reno	Mixture of surface soil from bare ground vacant lot along the east side of Anderson School near the Reno site (301 State Street)	This study
	Construction	CONST	1997	Central California	Composite of 2 construction & earthmoving dust profiles	(Chow et al., 2003)
	Asian Dust	AD_IMPRO	2001	California and Oregon	Composite of 3 IMPROVE samples (4/29/1998 at CRLA1 and LAVO1 and 4/16/2001 at LAVO1) representing Asian dust impact	This study
	De-Icing Agents	RNOSalt1	2010	Reno, NV	Reno de-icing material from Public Works stockpile. 5:1 mixture of rock salt and Paiute Pit granite sand	This study
		RNOSalt2	2010	Reno, NV	Reno de-icing material from Public Works stockpile. 5:1 mixture of rock salt and Paiute Pit granite sand	This study
Mobile	Diesel Exhaust	LVOOnRD	2003	Las Vegas	On-road diesel exhaust, a composite	(Green et al., 2004)
		LVOOffRD	2003	Las Vegas	Off-road diesel exhaust, a composite	
		DIESEL	2001	Southern California	Composite of medium and heavy duty diesel vehicles	(Fujita et al., 2007a; 2007b)
	Gasoline Exhaust	LVOOnRSW	2003	Las Vegas	Onroad gasoline vehicle exhaust at Swenson	(Green et al., 2004)
		GAS	2001	Southern California	Composite of low and high gasoline emitters	(Fujita et al., 2007a; 2007b)
Biomass Burning	Residential Wood Combustion	CRBURN_H	2001	Northern Nevada	California hardwood (oak, cedar, almond) combustion in a fireplace	(Fitz et al., 2004)
		CRBURN_S	2001	Northern Nevada	California softwood (pine, tamarack) combustion in a fireplace	
		LTFP_H	2004	Lake Tahoe	Residential hardwood combustion in a fireplace	(Kuhns et al., 2004)
		LTFP_S	2004	Lake Tahoe	Residential softwood combustion in a fireplace	
		LTWS_H	2004	Lake Tahoe	Residential hardwood combustion in a woodstove	
		LTWS_S	2004	Lake Tahoe	Residential softwood combustion in a woodstove	
Coal Combustion	Coal-Fired Power Plant	MZPPC	1995	Northern Colorado	Composite of ten coal-fired boiler emission samples	(Watson et al., 2001)
		BVCFPP	1999	Texas	Composite of 26 profiles of stack emissions from coal-fired boilers in Texas.	(Chow et al., 2004)
Oil Combustion	Oil-Fired Plant	IMGPEC	1992	Southern California Border	Composite of six Mexicali oil-fueled glass plant emission profiles collected on 12/17/92.	(Watson and Chow, 2001)
		BVCAT1	1999	Texas	Composite of 5 profiles of stack emissions from a Texas petroleum refinery's catalytic cracker	(Chow et al., 2004)
Cement	Cement Factory	BVCEM	1999	Texas	Composite of 11 profiles of cement kiln emissions	(Chow et al., 2004)

Table S-2 (continued)

Category	Subcategory	Mnemonic	Year	Location	Description	Reference
Cooking	Meat Cooking	BVCOOK	2000	Southern California	Composite of charcoal chicken, propane chicken, and charcoal hamburger cooking profiles.	(Chow et al., 2004)
Secondary	Secondary Bisulfate	AMBSUL			Ammonium bisulfate	(Watson et al., 1994)
	Secondary Sulfate	AMSUL			Ammonium sulfate	
	Secondary Nitrate	AMNIT			Ammonium nitrate	
	Secondary OC	SOC			Secondary organic carbon	

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58 **Table S3.** PM_{2.5} source profile abundances (in % of PM_{2.5} mass) for the four geological materials
 59 collected in this study. See profile descriptions in Table S2.

Group	Species	RNOPVRD	RNOSOIL	RNOSalt1	RNOSalt2
Mass	PM _{2.5}	100 ± 7.3	100 ± 7.6	100 ± 7.4	100 ± 7.8
Elements	Na	0 ± 0.41	0 ± 0.55	2.7 ± 0.28	3.3 ± 0.81
	Mg	0 ± 0.14	0 ± 0.18	0 ± 0.038	0 ± 0.21
	Al	4.4 ± 0.32	4.1 ± 0.3	5.1 ± 0.38	3.6 ± 0.28
	Si	18 ± 1.3	16 ± 1.1	15 ± 1.1	10 ± 0.78
	P	0.044 ± 0.0058	0 ± 0.0061	0 ± 0.0013	0 ± 0.0071
	S	0.45 ± 0.033	0.37 ± 0.028	0.96 ± 0.071	1.8 ± 0.13
	Cl	0.091 ± 0.0081	0.081 ± 0.0087	9.7 ± 0.72	12 ± 0.89
	K	1.3 ± 0.094	0.86 ± 0.064	1.4 ± 0.1	2.1 ± 0.16
	Ca	2.9 ± 0.21	7.5 ± 0.55	3.6 ± 0.26	2 ± 0.15
	Ti	0.53 ± 0.039	0.23 ± 0.019	0.37 ± 0.028	0.23 ± 0.021
	V	0.014 ± 0.0047	0.013 ± 0.0061	0.011 ± 0.0015	0.019 ± 0.0072
	Cr	0.029 ± 0.005	0.1 ± 0.0097	0.1 ± 0.0076	1.8 ± 0.13
	Mn	0.094 ± 0.016	0.11 ± 0.021	0.12 ± 0.01	0.25 ± 0.03
	Fe	5 ± 0.36	3.8 ± 0.28	5.2 ± 0.38	10 ± 0.78
	Co	0 ± 0.0046	0.0058 ± 0.0061	0 ± 0.0013	0 ± 0.0071
	Ni	0.012 ± 0.013	0.033 ± 0.018	0.042 ± 0.0049	0.71 ± 0.058
	Cu	0.021 ± 0.017	0.017 ± 0.022	0.01 ± 0.0047	0.12 ± 0.027
	Zn	0.083 ± 0.0077	0.012 ± 0.0061	0.011 ± 0.0015	0.034 ± 0.006
	As	0 ± 0.0046	0 ± 0.0061	0 ± 0.0013	0 ± 0.0071
	Se	0 ± 0.0046	0 ± 0.0061	0 ± 0.0013	0 ± 0.0071
	Br	0 ± 0.0046	0 ± 0.0061	0.0046 ± 0.0013	0.075 ± 0.0093
Rb	0.0005 ± 0.0046	0.002 ± 0.0061	0.0061 ± 0.0014	0.0003 ± 0.0071	
Sr	0.044 ± 0.0056	0.048 ± 0.007	0.054 ± 0.0042	0.034 ± 0.0075	
Zr	0 ± 0.0075	0.0037 ± 0.0099	0.017 ± 0.0025	0.03 ± 0.012	
Ag	0 ± 0.011	0 ± 0.014	0 ± 0.0029	0.0025 ± 0.016	
Cd	0.0045 ± 0.013	0.014 ± 0.018	0 ± 0.0037	0 ± 0.021	
In	0.0094 ± 0.014	0.0086 ± 0.019	0.0018 ± 0.004	0 ± 0.022	
Sn	0 ± 0.014	0 ± 0.019	0.0028 ± 0.004	0 ± 0.022	
Sb	0 ± 0.023	0 ± 0.03	0.0038 ± 0.0063	0 ± 0.035	
Ba	0.016 ± 0.053	0.023 ± 0.071	0 ± 0.015	0.073 ± 0.083	
Pb	0.0086 ± 0.0051	0 ± 0.0067	0.0055 ± 0.0015	0 ± 0.0078	
Water Soluble Ions	NO ₃ ⁻	0.12 ± 0.12	0.12 ± 0.16	0.022 ± 0.034	0.28 ± 0.19
	SO ₄ ⁺	0.037 ± 0.12	0.31 ± 0.16	2.8 ± 0.2	4.9 ± 0.41
	NH ₄ ⁺	0.068 ± 0.12	0 ± 0.16	0 ± 0.034	0 ± 0.19
	Na ⁺	0.19 ± 0.12	0.2 ± 0.16	7.1 ± 0.52	11 ± 0.88
	K ⁺	0.23 ± 0.12	0 ± 0.16	0.16 ± 0.036	0.99 ± 0.2
Thermal Carbon Fractions (IMPROVE_A protocol, Chow et al., 2007)	OC1	0.43 ± 0.031	0.45 ± 0.033	0 ± 0	0.27 ± 0.02
	OC2	1.2 ± 0.088	0.8 ± 0.059	0.086 ± 0.0062	1 ± 0.075
	OC3	7.5 ± 0.54	2.4 ± 0.18	0.65 ± 0.047	1.8 ± 0.13
	OC4	4.1 ± 0.3	1.9 ± 0.14	0.37 ± 0.027	0.42 ± 0.031
	OPR	1.6 ± 0.12	0.4 ± 0.03	0.014 ± 0.001	0 ± 0
	OCR	15 ± 1.7	5.9 ± 1.2	1.1 ± 0.24	3.4 ± 1.2
	EC1	2.1 ± 0.15	0.4 ± 0.03	0.014 ± 0.001	0 ± 0
	EC2	0.8 ± 0.058	0.26 ± 0.019	0 ± 0	0 ± 0
	EC3	0 ± 0	0 ± 0	0 ± 0	0 ± 0
ECR	1.3 ± 0.2	0.26 ± 0.23	0 ± 0.049	0 ± 0.27	

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Table S3 (continued).

Group	Species ^a	RNOPVRD	RNOSOIL	RNOSalt1	RNOSalt2
Polycyclic Aromatic Hydrocarbons (PAHs)	Acnapy × 10 ³	0 ± 76	0 ± 97	0 ± 21	0 ± 110
	acnape × 10 ³	0 ± 22	0 ± 29	0 ± 6.2	0 ± 33
	fluore × 10 ³	0 ± 6.5	0 ± 8.3	0 ± 1.8	0 ± 9.4
	phenan × 10 ³	0 ± 18	0 ± 23	0 ± 4.9	0 ± 26
	anthra × 10 ³	0 ± 62	0 ± 80	0 ± 17	0 ± 90
	fluora × 10 ³	0 ± 18	0 ± 23	0 ± 4.9	0 ± 26
	pyrene × 10 ³	0 ± 17	0 ± 22	0 ± 4.7	0 ± 25
	baanth × 10 ³	0 ± 8.3	0 ± 11	0 ± 2.3	0 ± 12
	chrysn × 10 ³	0 ± 15	0 ± 19	0 ± 4.1	0 ± 22
	bbfl × 10 ³	0 ± 8.6	0 ± 11	0 ± 2.4	0 ± 12
	bjkfl × 10 ³	0 ± 17	0 ± 22	0 ± 4.7	0 ± 25
	bbjkfl × 10 ³	0 ± 19	0 ± 25	0 ± 5.3	0 ± 28
	bafl × 10 ³	0 ± 15	0 ± 19	0 ± 4.2	0 ± 22
	bepyrn × 10 ³	0 ± 7.8	0 ± 10	0 ± 2.1	0 ± 11
	bapyrn × 10 ³	0 ± 17	0 ± 22	0 ± 4.6	0 ± 24
	peryle × 10 ³	0 ± 35	0 ± 45	0 ± 9.6	0 ± 51
	retene × 10 ³	0 ± 8.4	0 ± 11	0.23 ± 0.35	0 ± 12
	incdpy × 10 ³	0 ± 6.2	0 ± 7.9	0 ± 1.7	0 ± 9
	dbanth × 10 ³	0 ± 3.7	0 ± 4.7	0 ± 1	0 ± 5.3
	bghipe × 10 ³	0 ± 11	0 ± 14	0 ± 2.9	0 ± 15
	corone × 10 ³	0 ± 6.2	0 ± 7.9	0 ± 1.7	0 ± 8.9
	dbaepy × 10 ³	0 ± 1.7	0 ± 2.1	0 ± 0.46	0 ± 2.4
	fl9one × 10 ³	0 ± 15	0 ± 19	0 ± 4	0 ± 21
	m_9ant × 10 ³	0 ± 270	0 ± 350	0 ± 74	0 ± 390
	m_13fl × 10 ³	0 ± 6.6	0 ± 8.5	0 ± 1.8	0 ± 9.6
	cp_cdpyr × 10 ³	0 ± 170	0 ± 220	0 ± 47	0 ± 250
	baa7_12 × 10 ³	0 ± 6.8	0 ± 8.8	0.44 ± 0.45	0 ± 9.9
	chry56m × 10 ³	0 ± 7.6	0 ± 9.7	0 ± 2.1	0 ± 11
	pic × 10 ³	0 ± 7.9	0 ± 10	0 ± 2.2	0 ± 11
	Hopanes & Steranes	hop13 × 10 ³	0.19 ± 0.56	0.088 ± 0.68	0.018 ± 0.14
hop15 × 10 ³		0.33 ± 0.62	0.17 ± 0.7	0 ± 0.32	0 ± 1.7
hop17 × 10 ³		0.81 ± 0.9	0.43 ± 0.71	0.027 ± 0.13	0 ± 1.7
hop15a × 10 ³		0.22 ± 0.77	0.15 ± 0.96	0 ± 0.25	0 ± 1.3
hop17a × 10 ³		0 ± 1.3	0.1 ± 1.3	0.019 ± 0.28	0 ± 1.8
hop19 × 10 ³		1.2 ± 1.4	0.54 ± 1.2	0 ± 0.52	0 ± 2.7
hop19a × 10 ³		0.12 ± 0.67	0 ± 1.4	0 ± 0.3	0 ± 1.6
hop20 × 10 ³		0.18 ± 0.55	0.065 ± 0.67	0 ± 0.22	0 ± 1.2
hop21 × 10 ³		0.47 ± 0.97	0.26 ± 1.1	0 ± 0.27	0 ± 1.4
hop22 × 10 ³		0.54 ± 0.92	0.32 ± 1	0 ± 0.23	0 ± 1.2
hop24 × 10 ³		0.3 ± 0.51	0 ± 3.3	0 ± 0.72	0 ± 3.8
hop25 × 10 ³		0.3 ± 0.67	0.18 ± 0.8	0 ± 0.39	0 ± 2.1
hop26 × 10 ³		0.25 ± 0.52	0.14 ± 0.61	0 ± 0.13	0 ± 0.67
hop27 × 10 ³		0.25 ± 0.76	0.096 ± 0.92	0 ± 0.2	0 ± 1
hop28 × 10 ³		0.2 ± 0.6	0.13 ± 0.74	0 ± 0.16	0 ± 0.83
hop30 × 10 ³		0.24 ± 0.77	0.19 ± 0.95	0 ± 0.2	0 ± 1.1
hop31 × 10 ³		0.15 ± 3	0.18 ± 1.8	0 ± 0.39	0 ± 2.1
ster1 × 10 ³		0.25 ± 0.59	0.092 ± 0.69	0 ± 0.22	0.077 ± 0.78
ster2 × 10 ³		0.12 ± 0.54	0.052 ± 0.67	0 ± 0.14	0 ± 0.76
ster3 × 10 ³		0.11 ± 0.81	0.04 ± 1	0 ± 0.14	0 ± 0.76
ster4 × 10 ³		0.32 ± 1	0.041 ± 1.2	0 ± 0.1	0 ± 0.54
ster5 × 10 ³		0.17 ± 0.73	0.06 ± 0.91	0 ± 0.1	0 ± 0.53
ster6 × 10 ³		0.17 ± 0.63	0.043 ± 0.78	0 ± 0.13	0 ± 0.68
ster7 × 10 ³		0.23 ± 0.36	0.065 ± 0.36	0 ± 0.12	0 ± 0.66
ster8 × 10 ³		0.22 ± 0.89	0.051 ± 1.1	0 ± 0.047	0 ± 0.25
ster9 × 10 ³		0.031 ± 0.52	0.061 ± 0.67	0 ± 0.047	0 ± 0.25
ster10 × 10 ³	0.12 ± 1.7	0.053 ± 2.1	0 ± 0.11	0 ± 0.58	
ster11 × 10 ³	0.13 ± 1.4	0.05 ± 1.7	0 ± 0.086	0 ± 0.46	
ster12 × 10 ³	0.4 ± 0.99	0.14 ± 1.2	0 ± 0.23	0 ± 1.2	

Table S-3 (continued).

Group	Species ^a	RNOPVRD	RNOSOIL	RNOSalt1	RNOSalt2
Water Soluble Organics	npoc × 10 ³	- - -	- - -	- - -	- - -
	levg × 10 ³	- - -	- - -	- - -	- - -
n-Alkanes	pentad × 10 ³	4.4 ± 5.3	5.5 ± 6.6	0 ± 17	5.3 ± 6.7
	hexad × 10 ³	4.7 ± 4.7	7.5 ± 7.2	0 ± 20	6 ± 5.8
	heptad × 10 ³	0 ± 89	0 ± 110	0 ± 24	0 ± 130
	octad × 10 ³	0 ± 74	0 ± 95	0 ± 20	0 ± 110
	nonad × 10 ³	0 ± 95	0 ± 120	0 ± 26	0 ± 140
	eicosa × 10 ³	0 ± 44	0 ± 57	0 ± 12	0 ± 64
	heneic × 10 ³	0 ± 28	0 ± 36	0 ± 7.8	0 ± 41
	docosa × 10 ³	0 ± 32	0 ± 41	0 ± 8.9	0 ± 47
	tricoso × 10 ³	0 ± 18	0 ± 23	0 ± 4.9	0 ± 26
	tetcos × 10 ³	0 ± 19	0 ± 24	0 ± 5.2	0 ± 27
	pencos × 10 ³	0.8 ± 1	0 ± 16	0 ± 3.4	0 ± 18
	hexcos × 10 ³	0 ± 16	0 ± 20	0 ± 4.3	0 ± 23
	hepcos × 10 ³	0 ± 16	0 ± 20	0 ± 4.3	0 ± 23
	octcos × 10 ³	0 ± 18	0 ± 23	0 ± 5	0 ± 26
	noncos × 10 ³	0 ± 19	0 ± 24	0 ± 5.1	0 ± 27
	tricont × 10 ³	0 ± 25	0 ± 32	0 ± 6.9	0 ± 36
	htricont × 10 ³	0 ± 32	0 ± 41	0 ± 8.8	0 ± 46
	dtricont × 10 ³	0 ± 41	0 ± 52	0 ± 11	0 ± 59
	ttricont × 10 ³	2.4 ± 2.3	0 ± 57	0 ± 12	0 ± 64
	tetricont × 10 ³	2.8 ± 2.7	0 ± 48	0 ± 10	0 ± 55
ptricont × 10 ³	5.9 ± 5.7	0 ± 63	0 ± 13	0 ± 71	
hxtricont × 10 ³	9.4 ± 9.1	0 ± 180	0 ± 39	0 ± 200	
hptribcont × 10 ³	0 ± 860	0 ± 1100	0 ± 240	0 ± 1300	
otribcont × 10 ³	0 ± 1300	0 ± 1700	0 ± 360	0 ± 1900	
ntribcont × 10 ³	0 ± 1100	0 ± 1500	0 ± 310	0 ± 1700	
tetracont × 10 ³	0 ± 1200	0 ± 1500	0 ± 330	0 ± 1700	
Branched Alkanes	isoc29 × 10 ³	0 ± 15	0 ± 19	0 ± 4.1	0 ± 22
	anteisoc29 × 10 ³	0 ± 15	0 ± 19	0 ± 4.1	0 ± 22
	isoc30 × 10 ³	0 ± 24	0 ± 30	0 ± 6.5	0 ± 34
	anteisoc30 × 10 ³	0 ± 24	0 ± 30	0 ± 6.5	0 ± 34
	isoc31 × 10 ³	0 ± 32	0 ± 41	0 ± 8.8	0 ± 46
	anteisoc31 × 10 ³	0 ± 32	0 ± 41	0 ± 8.8	0 ± 46
	isoc32 × 10 ³	0 ± 39	0 ± 50	0 ± 11	0 ± 57
	anteisoc32 × 10 ³	0 ± 39	0 ± 50	0 ± 11	0 ± 57
	isoc33 × 10 ³	0 ± 44	0 ± 56	0 ± 12	0 ± 63
	anteisoc33 × 10 ³	0 ± 44	3.1 ± 2.9	0 ± 12	0 ± 63
	nonad2m × 10 ³	0 ± 4.7	0 ± 6	0 ± 1.3	0 ± 6.8
	nonad3m × 10 ³	0 ± 3.9	0 ± 5	0 ± 1.1	0 ± 5.7
	prist × 10 ³	0 ± 45	3.2 ± 3.9	0 ± 12	0 ± 65
	phytan × 10 ³	2.1 ± 2.8	3.2 ± 3.9	0 ± 10	0 ± 54
squal × 10 ³	0 ± 2.5	0 ± 3.3	0 ± 0.7	0 ± 3.7	
Group	Species ^a	RNOPVRD	RNOSOIL	RNOSalt1	RNOSalt2
Cycloalkane	chexa8 × 10 ³	0 ± 8.6	0 ± 11	0 ± 2.3	0 ± 12
	chex10 × 10 ³	0 ± 9.1	0.76 ± 7.7	0 ± 2.5	0 ± 13
	chex13 × 10 ³	0 ± 8.1	0 ± 10	0 ± 2.2	0 ± 12
	chex17 × 10 ³	0 ± 2.5	0 ± 3.1	0 ± 0.67	0 ± 3.6
	chex19 × 10 ³	0 ± 4.6	0 ± 5.9	0 ± 1.3	0 ± 6.7
Alkenes	octdecen × 10 ³	0 ± 46	0 ± 59	0.95 ± 2.7	0 ± 67
Light Transmission	<i>b</i> _{abs} (370 nm)	55 ± 2.8	29 ± 1.5	39 ± 1.9	36 ± 1.8
	<i>b</i> _{abs} (880 nm)	20 ± 1	9.5 ± 0.47	8.3 ± 0.42	21 ± 1.1

^a See Table S0 for organic species names.

76 **Table S4.** EV-CMB sensitivity tests for the 1/17/2010 and 1/5/2010 sample. PM_{2.5} source
77 contribution estimates (SCEs ± 1σ) in μg m⁻³ and performance measures (i.e., r², χ²,
78 and %MASS) are reported. The best profile combination, marked in bold, were found in Trial V
79 and selected for EV-CMB modeling of all samples.

		RENO_C: 9.08 ± 0.52 μg m ⁻³ ; collected on 1/17/2010)						
Source	Profile ^a	I	II	III	IV	V	VI	VII
Geological	RNOPVRD	0.54 ± 0.17	0.56 ± 0.16	0.64 ± 0.12	0.78 ± 0.12	0.78 ± 0.13		
	RNOSOIL						0.36 ± 0.13	0.45 ± 0.10
	RNOSALT1							
	RNOSALT2	0.37 ± 0.12	0.37 ± 0.11	0.29 ± 0.09	0.26 ± 0.09	0.25 ± 0.09	0.48 ± 0.09	0.43 ± 0.08
Gasoline	GAS	0.64 ± 0.31	0.48 ± 0.25		0.14 ± 0.15	0.15 ± 0.16	0.63 ± 0.31	0.32 ± 0.25
	LVOOnRGas			0.03 ± 0.01				
Diesel	DIESEL	1.58 ± 0.41	1.36 ± 0.37	0.52 ± 0.28	1.31 ± 0.35	1.68 ± 0.39	1.69 ± 0.43	1.67 ± 0.43
	LVOOnRDie							
Biomass Burning	CRBURN_H	2.77 ± 0.25	2.50 ± 0.26	1.78 ± 0.29	1.27 ± 0.27	1.36 ± 0.29	2.13 ± 0.23	1.31 ± 0.31
	CRBURN_S	-	-	1.80 ± 0.65				
	LTWS_H				2.07 ± 0.82	2.82 ± 0.89		2.80 ± 1.01
	LTWS_S						1.19 ± 0.38	
Secondary	AMSUL	0.04 ± 0.09	0.07 ± 0.07	0.15 ± 0.03	0.12 ± 0.06	0.10 ± 0.07	0.04 ± 0.09	0.08 ± 0.07
	AMBSUL							
	AMNIT	1.36 ± 0.17	1.36 ± 0.17	1.38 ± 0.17	1.38 ± 0.17	1.38 ± 0.17	1.37 ± 0.17	1.38 ± 0.17
	SOC							
Cooking	BVCOOK		1.16 ± 0.57	1.91 ± 0.37	1.57 ± 0.56			
	r ²	0.75	0.77	0.81	0.94	0.92	0.93	0.91
	χ ²	5.93	6.59	10.23	1.71	1.66	1.42	1.82
	%MASS	80.4	86.5	93.6	98.0	93.9	86.9	93.0

80 ^a See Table S2 for a short description of each source profile. Profiles not included in a test are left blank. A dash is
81 used to indicate profiles that were included in the test but eliminated by the model (due to negative contributions).
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		RENO_C: 39.2 ± 2.0 μg m ⁻³ ; collected on 1/5/2010)						
Source	Profile ^a	I	II	III	IV	V	VI	VII
Geological	RNOPVRD	2.09 ± 0.37	2.15 ± 0.35	2.30 ± 0.33	2.27 ± 0.33	2.22 ± 0.33		
	RNOSOIL						1.11 ± 0.27	1.14 ± 0.21
	RNOSALT1							
	RNOSALT2	0.93 ± 0.28	0.92 ± 0.27	0.84 ± 0.27	0.95 ± 0.26	0.98 ± 0.27	1.60 ± 0.24	1.70 ± 0.23
Gasoline	GAS	0.84 ± 0.48	0.62 ± 0.39		0.00 ± 0.21	0.01 ± 0.21	0.87 ± 0.53	0.08 ± 0.24
	LVOOnRGas			0.09 ± 0.05				
Diesel	DIESEL	5.36 ± 1.07	3.99 ± 1.02	3.70 ± 0.88	3.82 ± 0.95	4.99 ± 1.03	6.02 ± 1.17	4.92 ± 1.07
	LVOOnRDie							
Biomass Burning	CRBURN_H	9.90 ± 0.82	8.15 ± 0.78	8.60 ± 0.79	6.17 ± 0.87	7.94 ± 1.03	6.94 ± 0.70	7.89 ± 1.07
	CRBURN_S	-	-	-				
	LTWS_H				4.81 ± 1.88	7.24 ± 2.29		7.73 ± 2.45
	LTWS_S						3.32 ± 1.01	
Secondary	AMSUL	0.16 ± 0.21	0.24 ± 0.17	0.31 ± 0.14	0.31 ± 0.15	0.25 ± 0.18	0.14 ± 0.23	0.21 ± 0.18
	AMBSUL							
	AMNIT	10.68 ± 1.32	10.70 ± 1.32	10.71 ± 1.32	10.72 ± 1.32	10.71 ± 1.32	10.71 ± 1.32	10.71 ± 1.32
	SOC							
Cooking	BVCOOK		7.20 ± 1.61	7.66 ± 1.52	7.28 ± 1.60			
	r ²	0.84	0.86	0.86	0.96	0.95	0.92	0.92
	χ ²	4.90	5.40	5.65	1.39	1.61	2.18	2.28
	%MASS	76.5	86.7	87.3	92.8	87.6	78.4	87.7

83 ^a See Table S2 for a short description of each source profile. Profiles not included in a test are left blank. A dash is
84 used to indicate profiles that were included in the test but eliminated by the model (due to negative contributions).
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87 Table S5. MPIN matrix for the 1/17/2010 and 1/5/2010 Trial V sample. High MPIN values (>
 88 0.4) are marked.

SPECIES ^a	AMSUL	AMNIT	LTWS_H	CRBURN_H	GAS	DIESEL	RNOPVRD	RNOSalt2
NO ₃ ⁻	0	1	0	0	0	0	0	0
Na ⁺	-0.04	0	-0.09	0.01	0.06	0	-0.45	0.64
K ⁺	0	0	0.05	0.47	-0.05	-0.13	0.02	-0.02
OC	-0.04	0	0.71	0.09	-0.11	0.21	0.08	-0.16
EC	-0.15	0	-0.22	-0.09	-0.08	1	-0.23	0
Al	0.03	0	0.14	-0.03	-0.12	-0.07	0.44	-0.11
Si	0.02	0	0.02	0	0.09	-0.16	1	-0.5
P	-0.05	0	-0.18	0.01	0.15	0.13	-0.08	0.02
S	1	0	0	0	0	0	0	0
Cl	-0.04	0	0.22	0.03	0.01	-0.1	-0.53	0.8
K	0.04	0	0.55	0.15	-0.16	-0.19	0.14	-0.05
Ca	-0.04	0	-0.18	0.06	0.02	0.21	0.47	-0.21
Ti	0.03	0	0.1	-0.01	-0.09	-0.05	0.37	-0.21
Mn	-0.01	0	-0.02	0	0	-0.03	-0.13	0.36
Fe	-0.06	0	-0.09	-0.06	-0.03	0.08	-0.25	1
Cu	-0.05	0	-0.15	0.03	0.13	0.04	-0.2	0.25
Zn	-0.11	0	-0.2	0.1	0.17	0.42	-0.14	-0.01
As	0	0	0	0	0	0	0	0
Se	0	0	0	0	0	0.01	0	0
Br	-0.03	0	-0.07	0	0.04	0.11	-0.11	0.11
Rb	0	0	-0.01	0.01	0	0	0	0
Sr	0	0	0.01	0	-0.01	0	0.04	-0.01
Pb	-0.01	0	-0.03	0.01	0.03	0.01	-0.01	0
retene	-0.03	-0.01	-0.74	1	0.09	-0.09	-0.04	-0.08
incdpy	0.02	0	1	-0.3	0.09	-0.33	0.08	-0.04
bghipe	-0.03	0	0.18	-0.07	0.24	-0.16	-0.06	0.03
corone	-0.18	-0.02	-0.64	0.15	1	-0.26	-0.39	0.18
hop17	-0.03	0	0.17	-0.11	-0.01	0.17	-0.02	-0.01
hop19	-0.03	0	0.49	-0.2	0.2	-0.13	-0.02	0
hop26	0	0	-0.07	0.09	0.01	-0.01	0.02	-0.03
hop27	0	0	-0.01	0.02	0	0	0.02	-0.02
levg	0.05	0	0.76	-0.22	-0.17	-0.14	0.14	-0.06
prist	-0.01	0	-0.03	0	-0.01	0.07	-0.01	0
phytan	-0.04	0	-0.15	-0.01	-0.04	0.33	-0.07	0

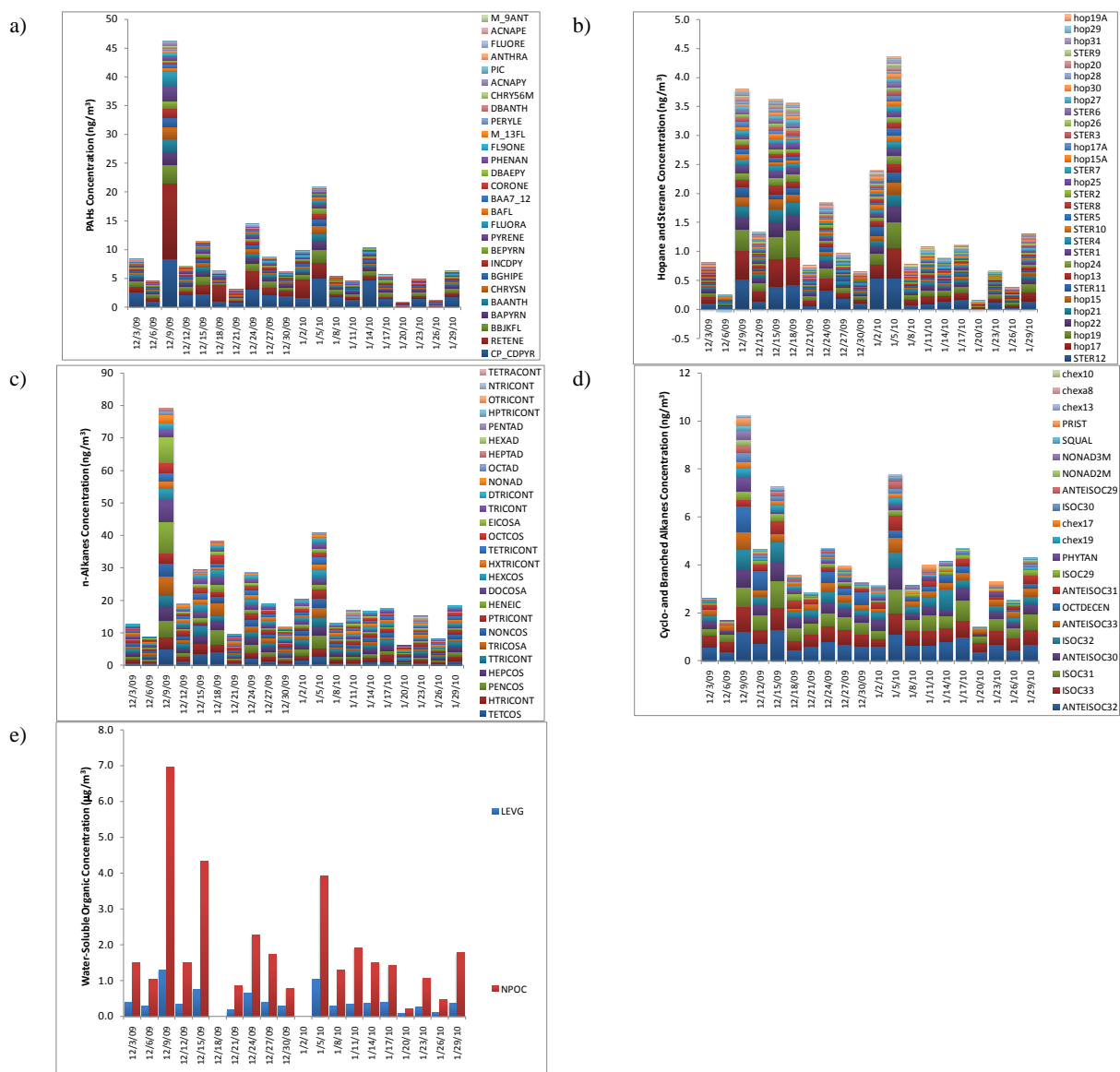
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91 Table S5, continued.

SPECIES ^a	AMSUL	AMNIT	LTWS_H	CRBURN_H	GAS	DIESEL	RNOPVRD	RNOSalt2
NO3-	0	1	0	0	0	0	0	0
Na+	-0.04	0	-0.02	0.01	0.03	0	-0.53	0.74
K+	-0.01	0	-0.1	0.76	-0.03	-0.18	-0.03	-0.01
OC	-0.06	0	0.48	0.28	-0.08	0.2	0.01	-0.09
EC	-0.14	0	-0.15	-0.15	-0.04	1	-0.22	0.02
Al	0.02	0	0.09	-0.03	-0.07	-0.12	0.5	-0.1
Si	0.03	0	0.01	-0.03	0.05	-0.11	1	-0.52
P	-0.06	0	-0.17	-0.03	0.12	0.33	-0.06	-0.02
S	1	0	0	0	0	0	0	0
Cl	-0.02	0	0.1	0.04	-0.01	-0.05	-0.29	0.41
K	0.01	0	0.28	0.3	-0.07	-0.2	0.04	0
Ca	-0.04	0	-0.18	0.08	0.01	0.26	0.46	-0.22
Ti	0.02	0	0.05	0.01	-0.05	-0.08	0.42	-0.26
Mn	-0.03	0	0	0.01	0	-0.07	-0.35	0.75
Fe	-0.06	0	-0.01	-0.09	-0.01	0.08	-0.37	1
Cu	-0.03	0	-0.06	0.02	0.05	0.06	-0.17	0.23
Zn	-0.09	0	-0.11	0.13	0.06	0.47	-0.09	-0.03
As	0	0	0	0	0	0	0	0
Se	0	0	-0.01	0	0	0.02	0	0
Br	-0.03	0	-0.04	-0.02	0.02	0.15	-0.13	0.13
Rb	0	0	-0.05	0.11	0	-0.01	0	-0.01
Sr	0	0	0	0.01	-0.01	-0.01	0.07	-0.02
Pb	-0.01	0	-0.03	0.02	0.02	0.02	0	-0.01
retene	-0.02	0	-0.53	1	0.03	-0.12	-0.02	-0.09
incdpy	0.03	0	1	-0.39	0.01	-0.3	0.07	0.01
bghipe	0	0	0.28	-0.12	0.11	-0.11	0	0.01
corone	-0.09	0	-0.37	0.14	1	-0.18	-0.2	0.08
hop17	-0.03	0	0.18	-0.16	-0.02	0.2	-0.03	0
hop19	-0.01	0	0.71	-0.37	0.09	-0.08	0.02	0.02
hop26	0	0	-0.1	0.18	0	-0.02	0.03	-0.04
hop27	0	0	-0.02	0.04	0	-0.01	0.03	-0.03
levg	0.03	0	0.65	-0.24	-0.1	-0.17	0.07	0
prist	-0.01	0	-0.04	0	-0.01	0.09	-0.02	0
phytan	-0.06	0	-0.15	-0.04	-0.02	0.42	-0.09	0

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95 **Figure S1.** Concentrations of organic marker species for: a) p-PAHs, b) hopanes and steranes, c)
 96 n-alkanes, d) cyclo- and branched alkanes, and e) water soluble organic compounds (WSOC,
 97 npoc) and levoglucosan (levg). Species are sorted by the average abundance. See Table S0 for
 98 details of mnemonics and chemical species.

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