bulk carbon measurements. Compounds are grouped by compound class and sorted by increasing molecular weight within each class.

Figure 6. Resolved organic molecular markers broken down by compound class and season. The sum of all species averaged annually and by season is displayed above the corresponding bars.

Figure 7. Ratio-ratio plots for a) two hopanes normalized by EC and b) two polycyclic aromatic hydrocarbons (PAHs) normalized by EC covering 1.5 years of daily measurements. The ambient measurements are stratified by weekdays, weekends and holidays (New Years, Thanksgiving and Christmas). The numbered triangles represent the location of published gasoline and diesel vehicle emission profiles on the ratio-ratio plots. Profiles 1 and 2 are from Robinson et al. (2006a,b) and represent an average of many published mobile source profiles for 1) gasoline vehicles and 2) diesel vehicles. Profiles 3 – 8 are from the NFRAQS study (Zielenska et al., 1998) and represent average Denver mobile source profiles for 3) low emitter gasoline vehicles, 4) non-smoking gasoline vehicles, 5) high emitter gasoline vehicles, 6) smoking gasoline vehicles, 7) light duty diesel vehicles and 8) heavy duty diesel vehicles. Profile 9 is from a separate published report on the NFRAQS study (Watson et al., 1998) for 9) heavy duty diesel vehicles.

Figure S1. Flow rate and temperature profiles for the PTV inlet and GC oven used during all GC-MS analyses. In the beginning of the analysis, the PTV is heated quickly at a rate of 300 °C/min and obtains a maximum temperature of 345 °C. During the data collection phase, the GC

oven is heated at 30 °C/min to a maximum temperature of 325 °C where it is held for ten minutes.

Figure S2. Example calibration curves for a) heptacosane, b) benz[a]anthracene, c) dodecanoic acid and d) a combination of decanoic acid and dodecanoic acid. The latter is an example of a combined calibration curve used to quantify undecanoic acid which was not present in the quantification standards. In each example, the open circles are the observed calibration points measured at five dilutions of the calibration standards: 50:1, 100:1, 200:1, 400:1 and 800:1. The solid line is the quadratic fit to the calibration points and the dashed lines are the empirically derived uncertainty bounds.

Figure 1, Supplemental

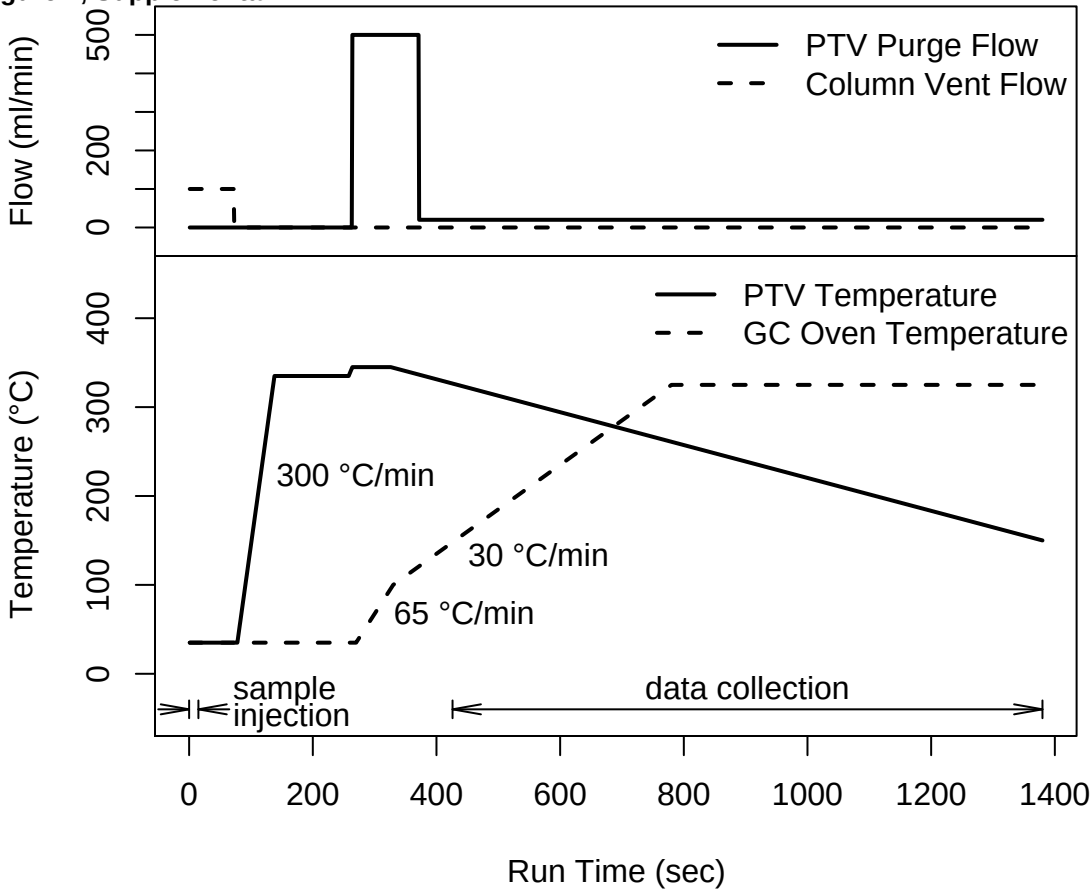

Table S1: Organic molecular marker compounds and their referenced internal standards.

Compound Name (Empirical Formula)	M/Z[a]	Internal Standard (Empirical Formula)[b]
alkanes and cycloalkanes		
docosane ($C_{22}H_{46}$)	310	eicosane ($C_{20}D_{42}$)
tricosane ($C_{23}H_{48}$)	324	eicosane ($C_{20}D_{42}$)
tetracosane ($C_{24}H_{50}$)	338	octacosane ($C_{28}D_{58}$)
pentacosane ($C_{25}H_{52}$)	352	octacosane ($C_{28}D_{58}$)
hexacosane ($C_{26}H_{54}$)	366	octacosane ($C_{28}D_{58}$)
heptacosane ($C_{27}H_{56}$)	380	octacosane ($C_{28}D_{58}$)
octacosane ($C_{28}H_{58}$)	394	octacosane ($C_{28}D_{58}$)
nonacosane ($C_{29}H_{60}$)	408	octacosane ($C_{28}D_{58}$)
triacontane ($C_{30}H_{62}$)	422	octacosane ($C_{28}D_{58}$)
hentriacontane ($C_{31}H_{64}$)	436	octacosane ($C_{28}D_{58}$)
dotriacontane ($C_{32}H_{66}$)	450	hexatriacontane ($C_{36}D_{74}$)
tritriacontane ($C_{33}H_{68}$)	464	hexatriacontane ($C_{36}D_{74}$)
tetratriacontane ($C_{34}H_{70}$)	478	hexatriacontane ($C_{36}D_{74}$)
pentatriacontane ($C_{35}H_{72}$)	492	hexatriacontane ($C_{36}D_{74}$)
hexatriacontane ($C_{36}H_{74}$)	506	hexatriacontane ($C_{36}D_{74}$)
heptatriacontane ($C_{37}H_{76}$)	520	hexatriacontane ($C_{36}D_{74}$)
octatriacontane ($C_{38}H_{78}$)	534	hexatriacontane ($C_{36}D_{74}$)
nonatriacontane ($C_{39}H_{80}$)	548	hexatriacontane ($C_{36}D_{74}$)
tetracontane ($C_{40}H_{82}$)	562	hexatriacontane ($C_{36}D_{74}$)
pentadecylcyclohexane ($C_{21}H_{42}$)	294	eicosane ($C_{20}D_{42}$)
nonadecylcyclohexane ($C_{25}H_{50}$)	350	octacosane ($C_{28}D_{58}$)
PAHs		
fluoranthene ($C_{16}H_{10}$)	202	chrysene ($C_{18}D_{12}$)
pyrene ($C_{16}H_{10}$)	202	chrysene ($C_{18}D_{12}$)
benzo[ghi]fluoranthene ($C_{18}H_{10}$)	226	chrysene ($C_{18}D_{12}$)
cyclopenta[cd]pyrene ($C_{18}H_{10}$)	226	chrysene ($C_{18}D_{12}$)
benz[a]anthracene ($C_{18}H_{12}$)	228	chrysene ($C_{18}D_{12}$)
chrysene/triphenylene ($C_{18}H_{12}$)	228	chrysene ($C_{18}D_{12}$)
benzo[b&k]fluoranthene ($C_{20}H_{12}$)	252	chrysene ($C_{18}D_{12}$)
benzo[j]fluoranthene ($C_{20}H_{12}$)[c]	252	chrysene ($C_{18}D_{12}$)
benz[a&e]pyrene ($C_{20}H_{12}$)	252	chrysene ($C_{18}D_{12}$)
perylene ($C_{20}H_{12}$)	252	chrysene ($C_{18}D_{12}$)
indeno[1,2,3-cd]pyrene ($C_{22}H_{12}$)	276	dibenz[ah]anthracene ($C_{22}D_{14}$)
benzo[ghi]perylene ($C_{22}H_{12}$)	276	dibenz[ah]anthracene ($C_{22}D_{14}$)
dibenz[ah]anthracene ($C_{22}H_{14}$)	278	dibenz[ah]anthracene ($C_{22}D_{14}$)
picene ($C_{22}H_{14}$)	278	dibenz[ah]anthracene ($C_{22}D_{14}$)
coronene ($C_{24}H_{12}$)	300	dibenz[ah]anthracene ($C_{22}D_{14}$)
methyl-202-PAH sum ($C_{17}H_{12}$)[c]	216	chrysene ($C_{18}D_{12}$)
retene ($C_{18}H_{18}$)	234	chrysene ($C_{18}D_{12}$)
methyl-228-PAH sum ($C_{19}H_{14}$)[c]	242	chrysene ($C_{18}D_{12}$)
oxy-PAHs		
acenaphthenone ($C_{12}H_8O$)[c]	168	acenaphthene ($C_{12}D_{10}$)
fluorenone ($C_{13}H_8O$)[c]	180	acenaphthene ($C_{12}D_{10}$)

1H-phenalen-1-one ($C_{13}H_8O$)[c]	180	acenaphthene ($C_{12}D_{10}$)
xanthone ($C_{13}H_8O_2$)[c]	196	chrysene ($C_{18}D_{12}$)
1,8-naphthalic anhydride ($C_{12}H_6O_3$)[c]	198	chrysene ($C_{18}D_{12}$)
anthracene-9,10-dione ($C_{14}H_8O_2$)[c]	208	chrysene ($C_{18}D_{12}$)
benz[de]anthracene-7-one ($C_{17}H_{10}O$)[c]	230	chrysene ($C_{18}D_{12}$)
steranes		
20R-abb & 20S-aaa-cholestane ($C_{27}H_{48}$)	372	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
20R & S-abb-methylcholestane ($C_{28}H_{50}$)	386	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
20R & S-abb-ethylcholestane ($C_{29}H_{52}$)	400	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
a-22,29,30-trisnorhopane ($C_{27}H_{46}$)	370	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
ba-30-norhopane ($C_{29}H_{50}$)	398	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
ab-hopane ($C_{30}H_{52}$)	412	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
22S-ab-30-homohopane ($C_{31}H_{54}$)[c]	426	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
22R-ab-30-homohopane ($C_{31}H_{54}$)[c]	426	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
22S-ab-30-bishomohopane ($C_{32}H_{56}$)[c]	440	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
22R-ab-30-bishomohopane ($C_{32}H_{56}$)[c]	440	20R-aaa-cholestane ($C_{27}D_4H_{44}$)
fatty acids		
dodecanoic acid ($C_{12}H_{24}O_2$)	200	decanoic acid ($C_{10}D_{19}HO_2$)
tridecanoic acid ($C_{13}H_{26}O_2$)[c,d]	214	decanoic acid ($C_{10}D_{19}HO_2$)
tetradecanoic acid ($C_{14}H_{28}O_2$)	228	heptadecanoic acid ($C_{17}D_{33}HO_2$)
pentadecanoic acid ($C_{15}H_{30}O_2$)[c,d]	242	heptadecanoic acid ($C_{17}D_{33}HO_2$)
hexadecanoic acid ($C_{16}H_{32}O_2$)	256	heptadecanoic acid ($C_{17}D_{33}HO_2$)
heptadecanoic acid ($C_{17}H_{34}O_2$)[c,d]	270	heptadecanoic acid ($C_{17}D_{33}HO_2$)
octadecanoic acid ($C_{18}H_{36}O_2$)	284	heptadecanoic acid ($C_{17}D_{33}HO_2$)
oleic acid ($C_{18}H_{34}O_2$)	282	heptadecanoic acid ($C_{17}D_{33}HO_2$)
sterols and methoxyphenols		
cholesterol ($C_{27}H_{46}O$)	386	cholesterol-2,2,3,4,4,6 ($C_{27}D_6H_{40}O$)
stigmasterol ($C_{29}H_{48}O$)	412	cholesterol-2,2,3,4,4,6 ($C_{27}D_6H_{40}O$)
vanillin ($C_8H_8O_3$)	152	4,4-dimethoxybenzophenone ($C_{15}D_8H_6O_3$)
acetovanillone ($C_9H_{10}O_3$)	166	4,4-dimethoxybenzophenone ($C_{15}D_8H_6O_3$)
coniferaldehyde ($C_{10}H_{10}O_3$)	178	4,4-dimethoxybenzophenone ($C_{15}D_8H_6O_3$)
syringaldehyde ($C_9H_{10}O_4$)	182	4,4-dimethoxybenzophenone ($C_{15}D_8H_6O_3$)
acetosyringone ($C_{10}H_{12}O_4$)	196	4,4-dimethoxybenzophenone ($C_{15}D_8H_6O_3$)

a) Mass to charge ratio (m/z).

b) Referenced internal standard (IS) compounds isotopically labeled by deuterium (D) substitution.

c) Additional compounds not included in the quantification standards. Calibration curves for the next closest compound based on molecular structure and weight were used for quantification of these compounds.

d) A combined calibration curve based on calibration points from the two neighboring compounds was used to quantify these odd alkanoic acids no present in the quantification standards.