Supplementary Material for

Elemental Analysis of Chamber Organic Aerosol Using an Aerodyne High-Resolution Aerosol Mass Spectrometer

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Table S1: Experimental conditions and elemental ratios for each experiment. Elemental ratios given are those at the time of maximum O/C.

Table S2: Calibration factors and estimated uncertainties for O/C, H/C, N/C and OM/OC as determined by Aiken et al. (2008).

Table S3: Ratios of particle-phase signals of CO^+ to CO_2^+. The particle phase signals of H_2O^+, OH^+ and O^+ were taken to be 22.5%, 5.625%, and 0.90% of the particle phase CO_2^+ signal.

Table S4: O/C and H/C ratios of α-pinene ozonolysis SOA determined from offline analysis by Yu et al. (1999, Table XI).

Figure S1: O/C_{HR} and O/C_{44} for glyoxal uptake SOA.

Figure S2: High-resolution spectra of N-containing ions for glyoxal uptake SOA.

Figure S3: O/C_{HR} and O/C_{44} for a-pinene ozonolysis SOA.

Figure S4: O/C_{HR} and O/C_{44} for isoprene SOA formed under low-NO_x conditions.

Figure S5: High-resolution spectrum of *m/z* 91 for isoprene high-NO_x SOA.

Figure S6: O/C_{HR} and O/C_{44} for isoprene SOA formed under high-NO_x conditions.

Figure S7: O/C_{HR} and O/C_{44} for single-ring aromatic SOA.

Figure S8: O/C_{HR} and O/C_{44} for naphthalene SOA formed under low-NO_x conditions.

Figure S9: O/C_{HR} and O/C_{44} for naphthalene SOA formed under high-NO_x conditions.

High-resolution AMS spectra will be available online at http://cires.colorado.edu/jimenez-group/HRAMSsd/.

Expt. #	VOC System	Experiment Type	ΔM_O (Max) (μg/m^3)	O/C (Max)	H/C	N/C	OM/OC
1	Glyoxal uptake	humid	31.80	1.12	1.55	0.01	2.64
2	Glyoxal uptake	humid	68.30	1.12	1.54	0.01	2.63
3	Glyoxal uptake	humid	NA	1.15	1.52	0.02	2.68
4	α-pinene + O_3	no H_2O_2; dry	59.70	0.38	1.48	0.00	1.63
5	α-pinene + O_3	no H_2O_2; humid	87.50	0.48	1.46	0.01	1.76
6	α-pinene + O_3	H_2O_2; dry	127.10	0.40	1.48	0.00	1.68
7	α-pinene + O_3	H_2O_2; humid	192.46	0.45	1.44	0.01	1.72
8	Isoprene + OH	low NO_x	3.71	0.58	1.66	0.00	1.92
9	Isoprene + OH	low NO_x	7.00	0.58	1.69	0.00	1.92
10	Isoprene + OH	low NO_x	10.47	0.60	1.57	0.00	1.94
11	Isoprene + OH	high NO_x	1.35	0.60	1.40	0.03	1.95
12	Isoprene + OH	high NO_x	4.27	0.62	1.49	0.04	2.00
13	Isoprene + OH	high NO_x	11.83	0.65	1.49	0.04	2.04
14	Toluene + OH	low NO_x	141.45	0.74	1.39	0.00	2.10
15	Toluene + OH	high NO_x	50.26	0.72	1.38	0.07	2.15
16	*m*-xylene + OH	low NO_x	190.40	0.60	1.54	0.00	1.93
17	*m*-xylene + OH	high NO_x	52.04	0.66	1.48	0.08	2.09
18	Naphthalene + OH	low NO_x	12.15	0.62	0.95	0.00	1.92
19	Naphthalene + OH	low NO_x	44.91	0.73	0.93	0.00	2.05
20	Naphthalene + OH	low NO_x, nucleation	47.17	0.62	0.85	0.00	1.91
21	Naphthalene + OH	low NO_x	53.12	0.73	0.86	0.00	2.06
22	Naphthalene + OH	low NO_x	201.75	0.60	0.82	0.00	1.87
23	Naphthalene + OH	high NO_x	5.90	0.65	1.01	0.07	2.03
24	Naphthalene + OH	high NO_x	39.02	0.60	0.88	0.04	1.92
25	Naphthalene + OH	high NO_x, nucleation	39.26	0.51	0.90	0.04	1.79
26	Naphthalene + OH	high NO_x	75.43	0.54	0.80	0.02	1.82

Table S1

Ratio	Calibration Factor	Measurement Uncertainty
O/C	0.75	31%
H/C	0.91	10%
N/C	0.96	22%
OM/OC	-	6%

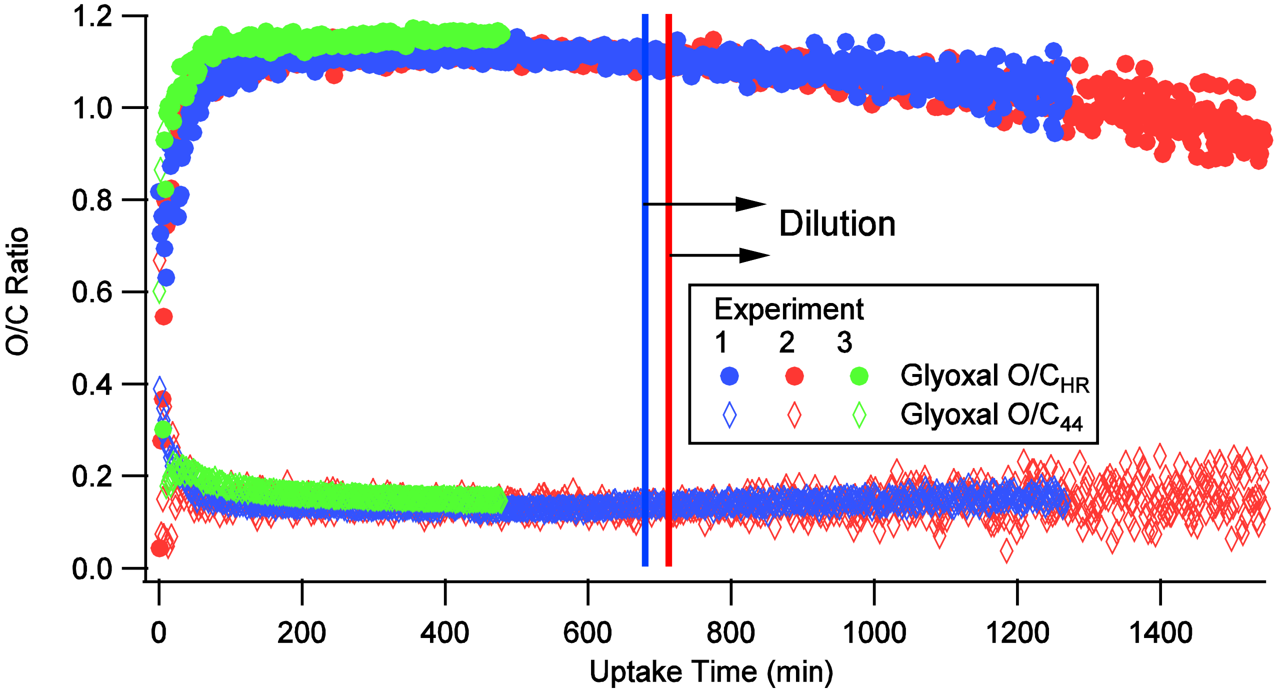
Table S2

System	Organic CO^+/CO_2^+ Estimate
α-pinene-O_3	0.98
Glyoxal Uptake	5.00
Isoprene-OH	1.00
Aromatic-OH	1.03
Naphthalene-OH	1.17

Table S3

		Molar Yield		
Product Name	Formula	6-9-98a	6-9-98b	6-17-98a
Pinic Acid	$C_9H_{14}O_4$	1.8	3.9	2.8
Norpinic Acid	$C_8H_{12}O_4$	0.08	0.09	0.05
Hydroxy pinonaldehydes	$C_{10}H_{16}O_3$	2.4	1.1	2
Pinonic Acid	$C_{10}H_{16}O_3$	1.7	1.6	1.3
Norpinonic Acid and Isomers	$C_9H_{14}O_3$	2.1	4.8	2.8
Pinonaldehyde	$C_{10}H_{16}O_2$	0.8	0.3	0.9
Norpinonaldehyde	$C_9H_{14}O_2$	0.1	0.2	0.2
Hydroxy pinonic acid	$C_{10}H_{14}O_4$	2.1	1.3	2.1
A13	$C_{10}H_{16}O_3$	0.08	0.12	0.1
A14	$C_{10}H_{14}O_3$	0.55	0.48	0.8
O/C		**0.34**	**0.36**	**0.35**
H/C		**1.58**	**1.56**	**1.57**

Table S4



O/C Ratio
Uptake Time (min)
Dilution
Experiment
1 2 3
Glyoxal O/C$_{HR}$
Glyoxal O/C$_{44}$

Figure S1

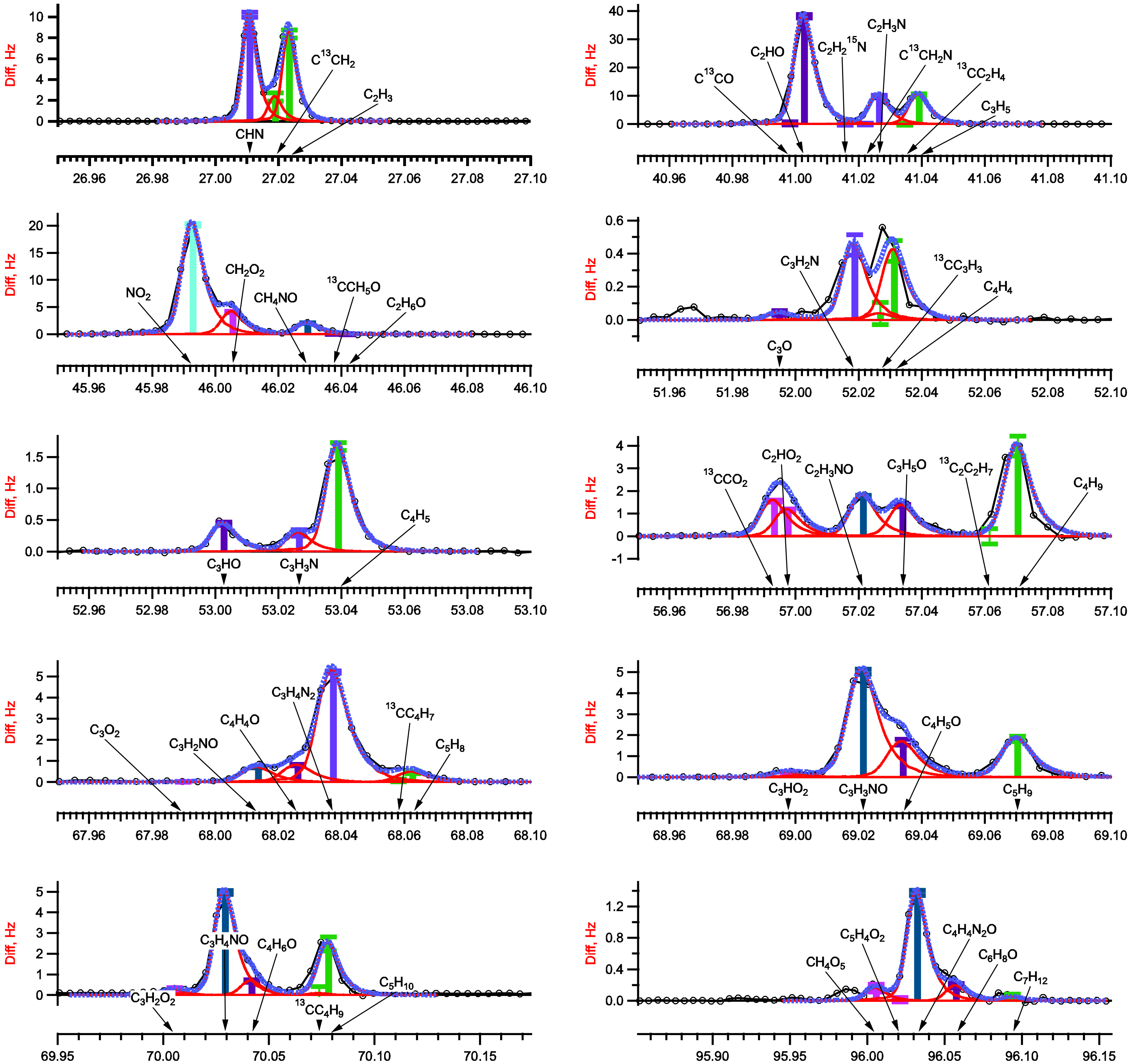

Diff, Hz
CHN
$C^{13}CH_2$
C_2H_3
$C^{13}CO$
C_2HO
$C_2H_2{}^{15}N$
C_2H_3N
$C^{13}CH_2N$
$^{13}CC_2H_4$
C_3H_5
NO_2
CH_2O_2
CH_4NO
$^{13}CCH_5O$
C_2H_6O
C_3H_2N
$^{13}CC_3H_3$
C_4H_4
C_3O
C_3HO
C_3H_3N
C_4H_5
$^{13}CCO_2$
C_2HO_2
C_2H_3NO
C_3H_5O
$^{13}C_2C_2H_7$
C_4H_9
C_3O_2
C_3H_2NO
C_4H_4O
$C_3H_4N_2$
$^{13}CC_4H_7$
C_5H_8
C_3HO_2
C_3H_3NO
C_4H_5O
C_5H_9
$C_3H_2O_2$
C_3H_4NO
C_4H_6O
$^{13}CC_4H_9$
C_5H_{10}
CH_4O_5
$C_5H_4O_2$
$C_4H_4N_2O$
C_6H_8O
C_7H_{12}

Figure S2

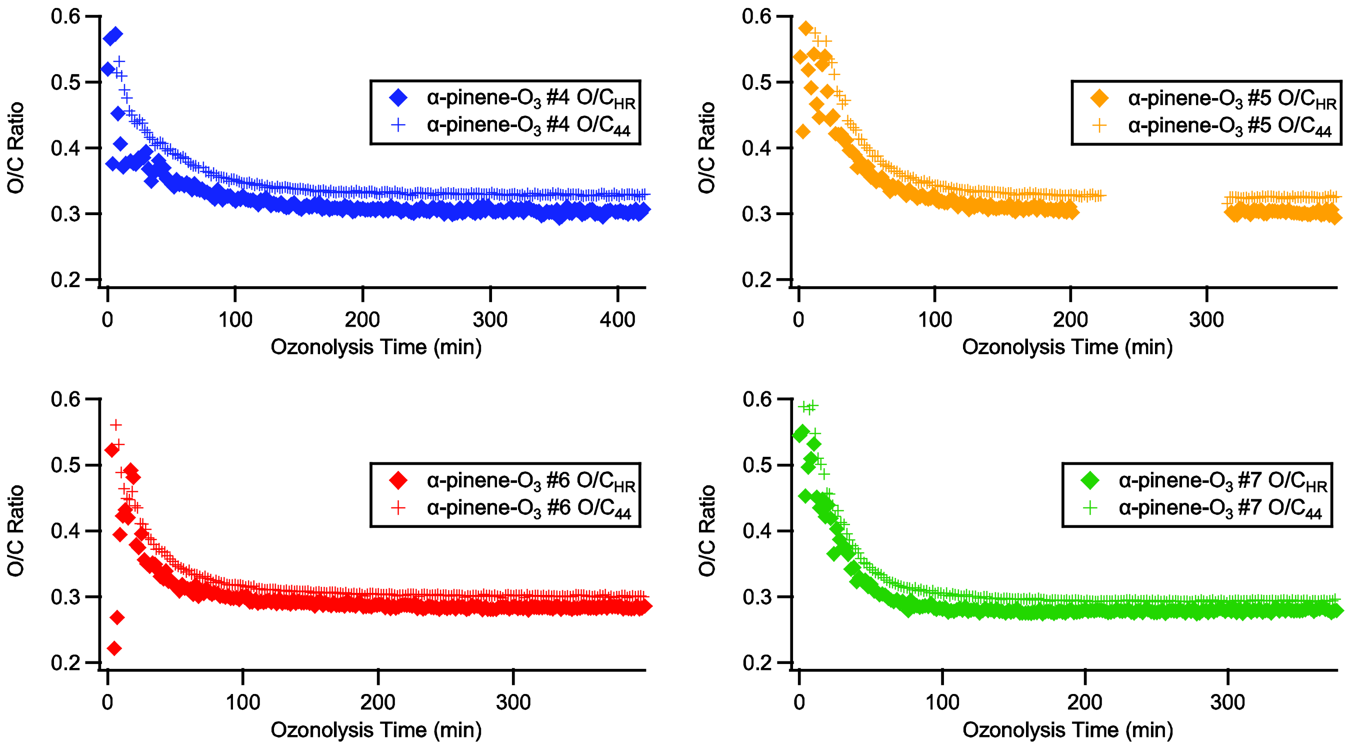
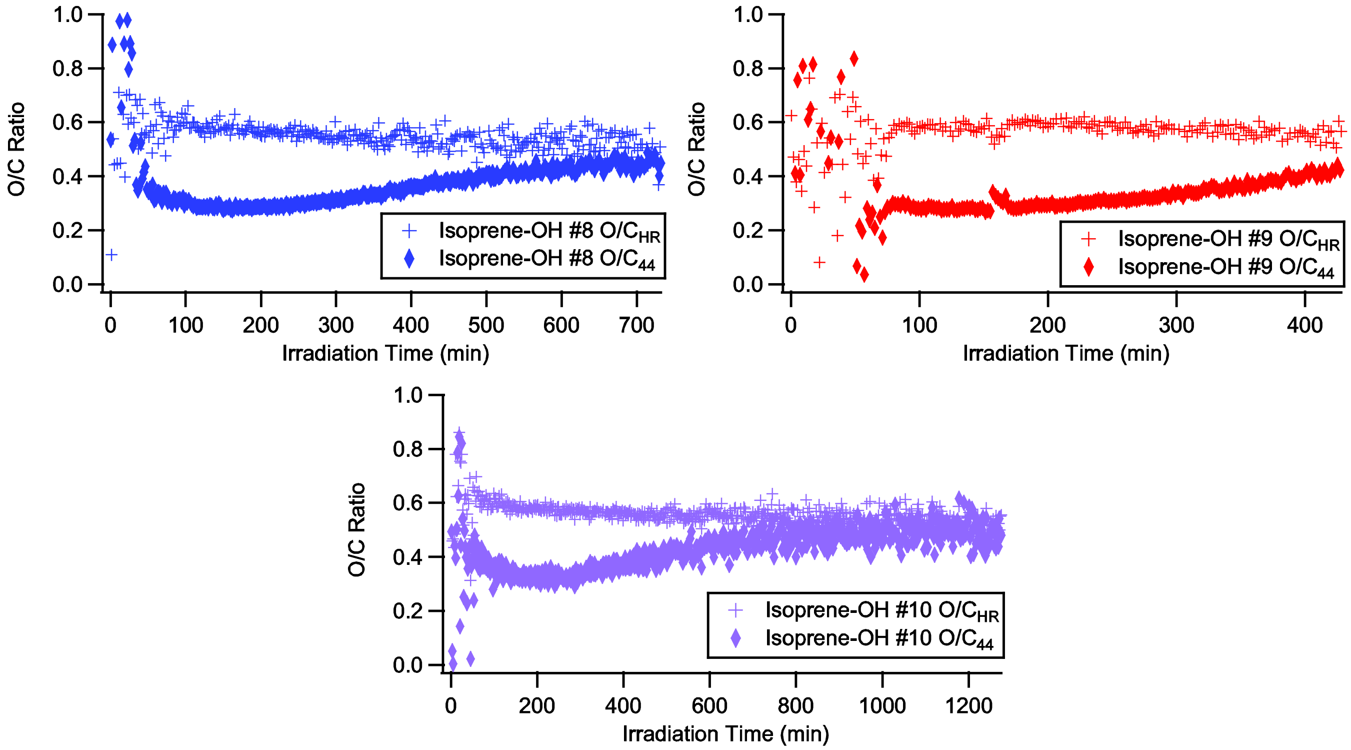
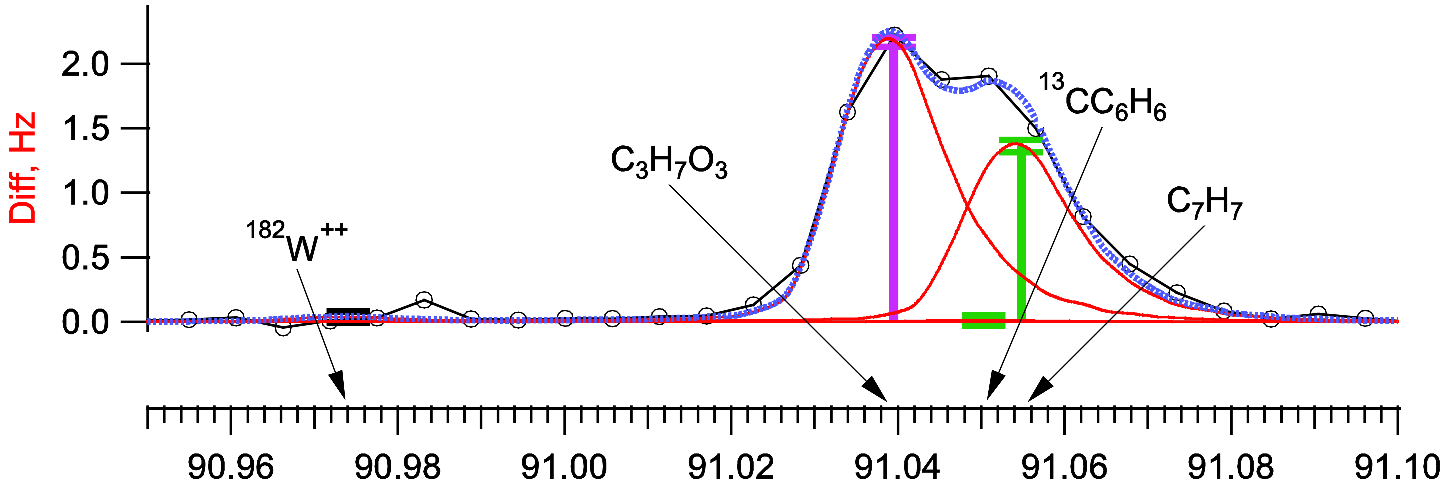

O/C Ratio
Ozonolysis Time (min)
α-pinene-O3 #4 O/CHR
α-pinene-O3 #4 O/C44
α-pinene-O3 #5 O/CHR
α-pinene-O3 #5 O/C44
α-pinene-O3 #6 O/CHR
α-pinene-O3 #6 O/C44
α-pinene-O3 #7 O/CHR
α-pinene-O3 #7 O/C44

Figure S3



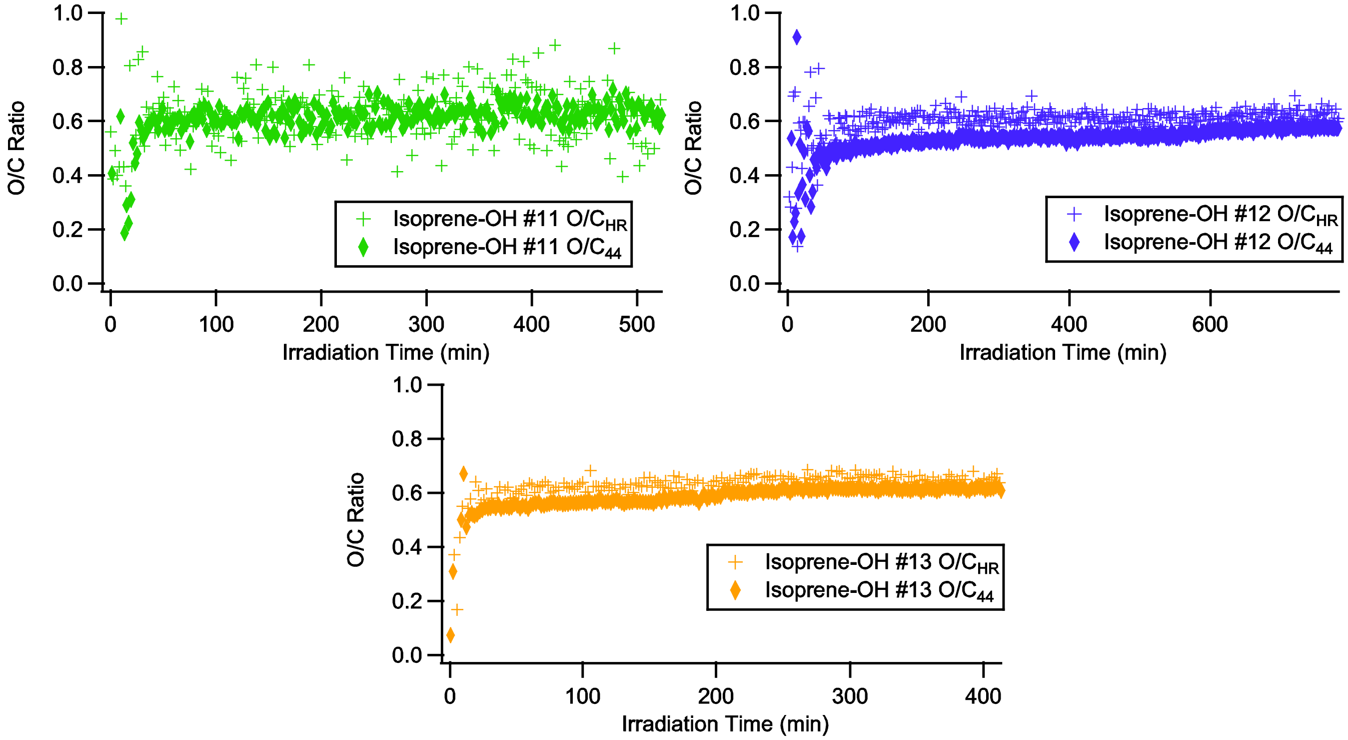
O/C Ratio
Irradiation Time (min)
Isoprene-OH #8 O/C$_{HR}$
Isoprene-OH #8 O/C$_{44}$
Isoprene-OH #9 O/C$_{HR}$
Isoprene-OH #9 O/C$_{44}$
Isoprene-OH #10 O/C$_{HR}$
Isoprene-OH #10 O/C$_{44}$

Figure S4



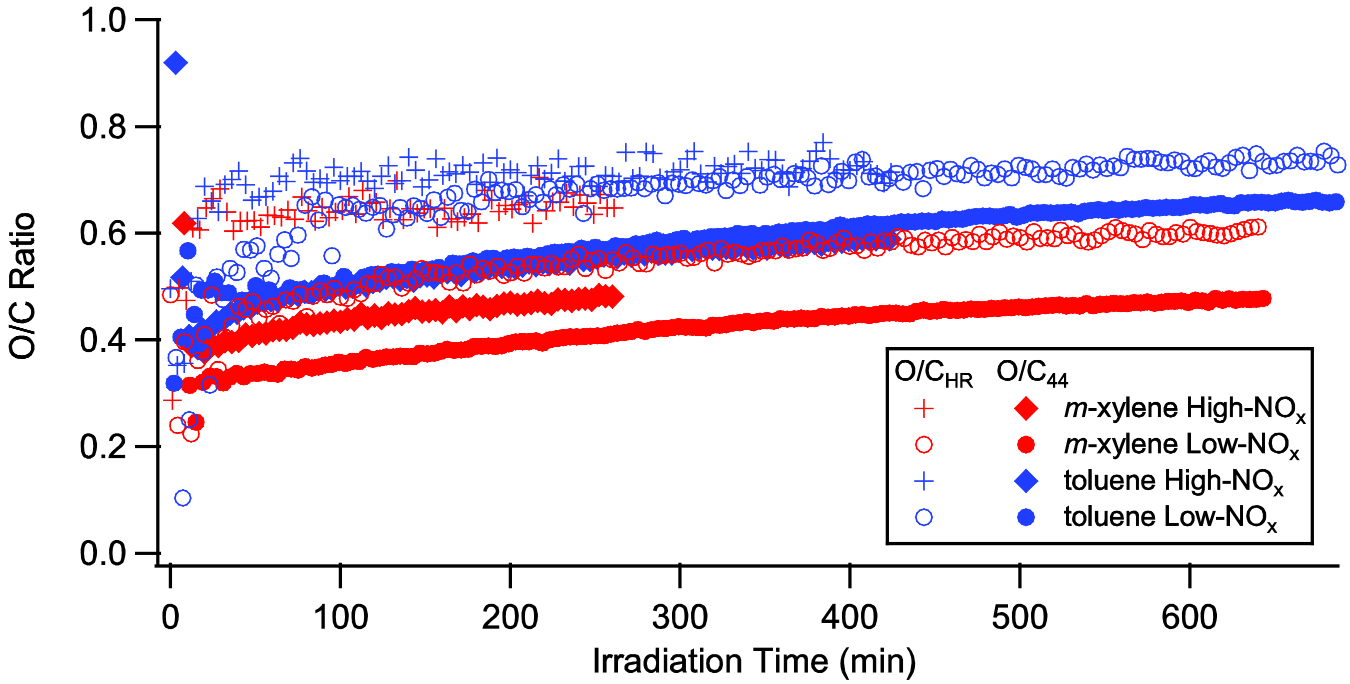
Diff, Hz
2.0
1.5
1.0
0.5
0.0
$^{182}W^{++}$
$C_3H_7O_3$
$^{13}CC_6H_6$
C_7H_7
90.96
90.98
91.00
91.02
91.04
91.06
91.08
91.10

Figure S5



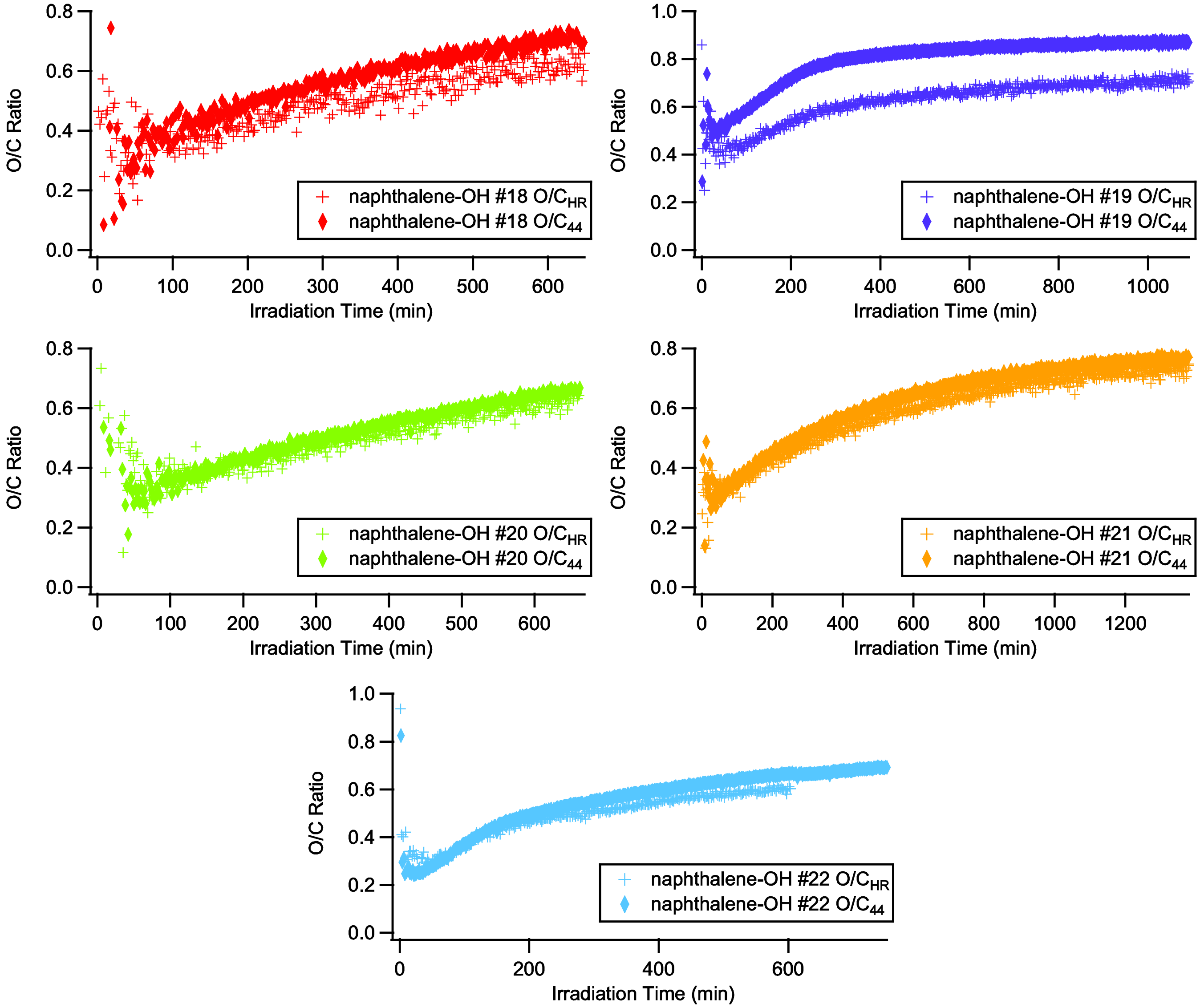
O/C Ratio
Irradiation Time (min)
Isoprene-OH #11 O/C$_{HR}$
Isoprene-OH #11 O/C$_{44}$
Isoprene-OH #12 O/C$_{HR}$
Isoprene-OH #12 O/C$_{44}$
Isoprene-OH #13 O/C$_{HR}$
Isoprene-OH #13 O/C$_{44}$

Figure S6



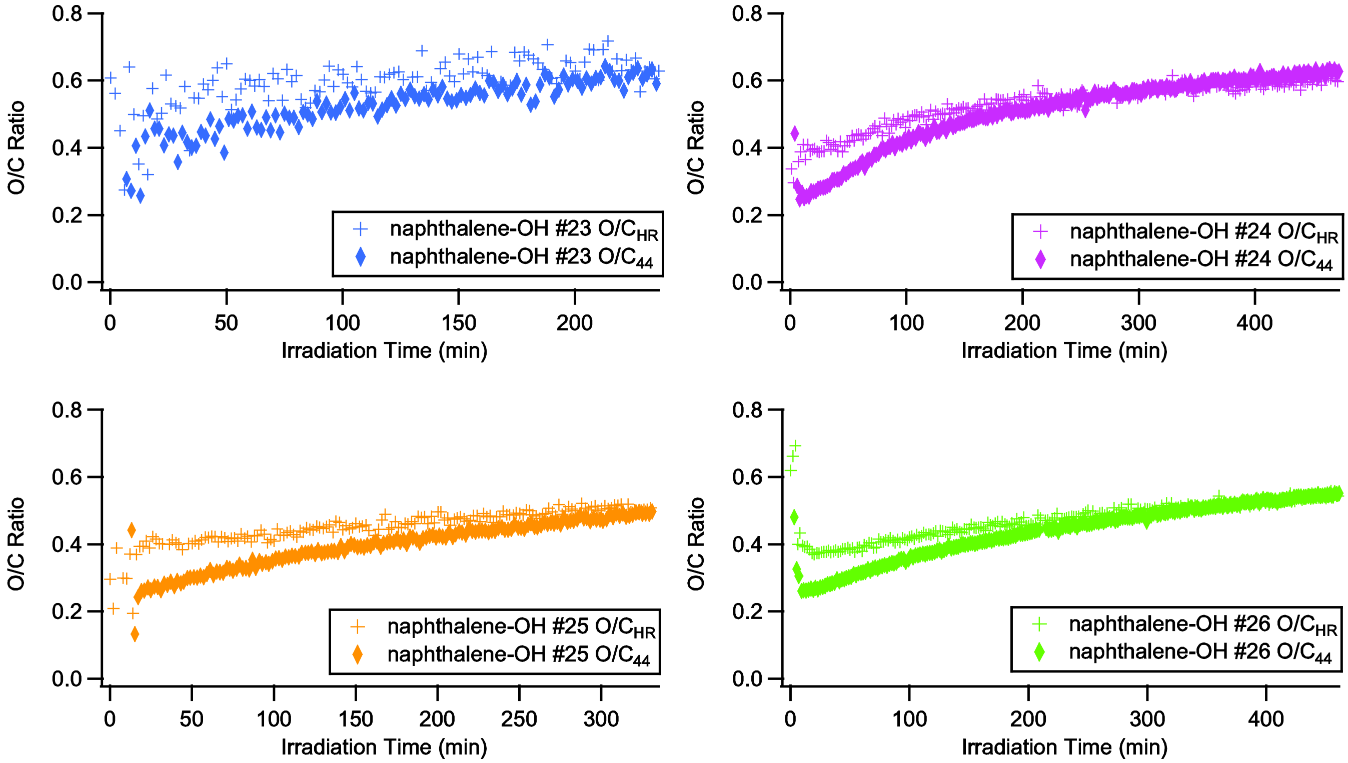
O/C Ratio
1.0
0.8
0.6
0.4
0.2
0.0
0
100
200
300
400
500
600
Irradiation Time (min)
O/C$_{HR}$ O/C$_{44}$
m-xylene High-NO$_x$
m-xylene Low-NO$_x$
toluene High-NO$_x$
toluene Low-NO$_x$

Figure S7



O/C Ratio
Irradiation Time (min)
naphthalene-OH #18 O/C$_{HR}$
naphthalene-OH #18 O/C$_{44}$
naphthalene-OH #19 O/C$_{HR}$
naphthalene-OH #19 O/C$_{44}$
naphthalene-OH #20 O/C$_{HR}$
naphthalene-OH #20 O/C$_{44}$
naphthalene-OH #21 O/C$_{HR}$
naphthalene-OH #21 O/C$_{44}$
naphthalene-OH #22 O/C$_{HR}$
naphthalene-OH #22 O/C$_{44}$

Figure S8



O/C Ratio
Irradiation Time (min)
naphthalene-OH #23 O/C$_{HR}$
naphthalene-OH #23 O/C$_{44}$
naphthalene-OH #24 O/C$_{HR}$
naphthalene-OH #24 O/C$_{44}$
naphthalene-OH #25 O/C$_{HR}$
naphthalene-OH #25 O/C$_{44}$
naphthalene-OH #26 O/C$_{HR}$
naphthalene-OH #26 O/C$_{44}$

Figure S9

References

Aiken, A. C., Decarlo, P. F., Kroll, J. H., Worsnop, D. R., Huffman, J. A., Docherty, K. S., Ulbrich, I. M., Mohr, C., Kimmel, J. R., Sueper, D., Sun, Y., Zhang, Q., Trimborn, A., Northway, M., Ziemann, P. J., Canagaratna, M. R., Onasch, T. B., Alfarra, M. R., Prevot, A. S. H., Dommen, J., Duplissy, J., Metzger, A., Baltensperger, U., and Jimenez, J. L.: O/C and OM/OC ratios of primary, secondary, and ambient organic aerosols with high-resolution time-of-flight aerosol mass spectrometry, Environ. Sci. Technol., 42, 4478–4485, doi:10.1021/Es703009q, 2008.

Yu, J. Z., Cocker, D. R., Griffin, R. J., Flagan, R. C., and Seinfeld, J. H.: Gas-phase ozone oxidation of monoterpenes: Gaseous and particulate products, J. Atmos. Chem., 34, 207–258, 1999.