Journal of Geophysical Research Atmospheres

Supporting Information for

Sources of atmospheric volatile organic compounds during the Salt Lake regional Smoke, Ozone and Aerosol Study (SAMOZA) 2022

Emily M. Cope[1], Damien T. Ketcherside[1], Lixu Jin[1], Lu Tan[1], Marc Mansfield[2,3], Colleen Jones[3], Seth Lyman[2,3], Dan Jaffe[4,5], and Lu Hu[1]

[1]Department of Chemistry and Biochemistry, University of Montana, Missoula, MT, USA.

[2]Department of Chemistry and Biochemistry, Utah State University, Logan, UT, USA.

[3]Bingham Research Center, Utah State University, Vernal, UT, USA.

[3]School of STEM, University of Washington Bothell, Bothell, WA, USA.

[4]Department of Atmospheric Sciences, University of Washington, Seattle, WA, USA.

Contents of this file

Introduction

Here we present wind information (Figure S1), full VOC mapping information from PMF analysis (Figure S2), key VOC species plotted against each other or CO (Figures S3-S5), OH reactivity by species or group of species (Figures S6-S7), ozone production regime throughout the campaign (Figure S8), and information on all species used in this analysis (Table S1).

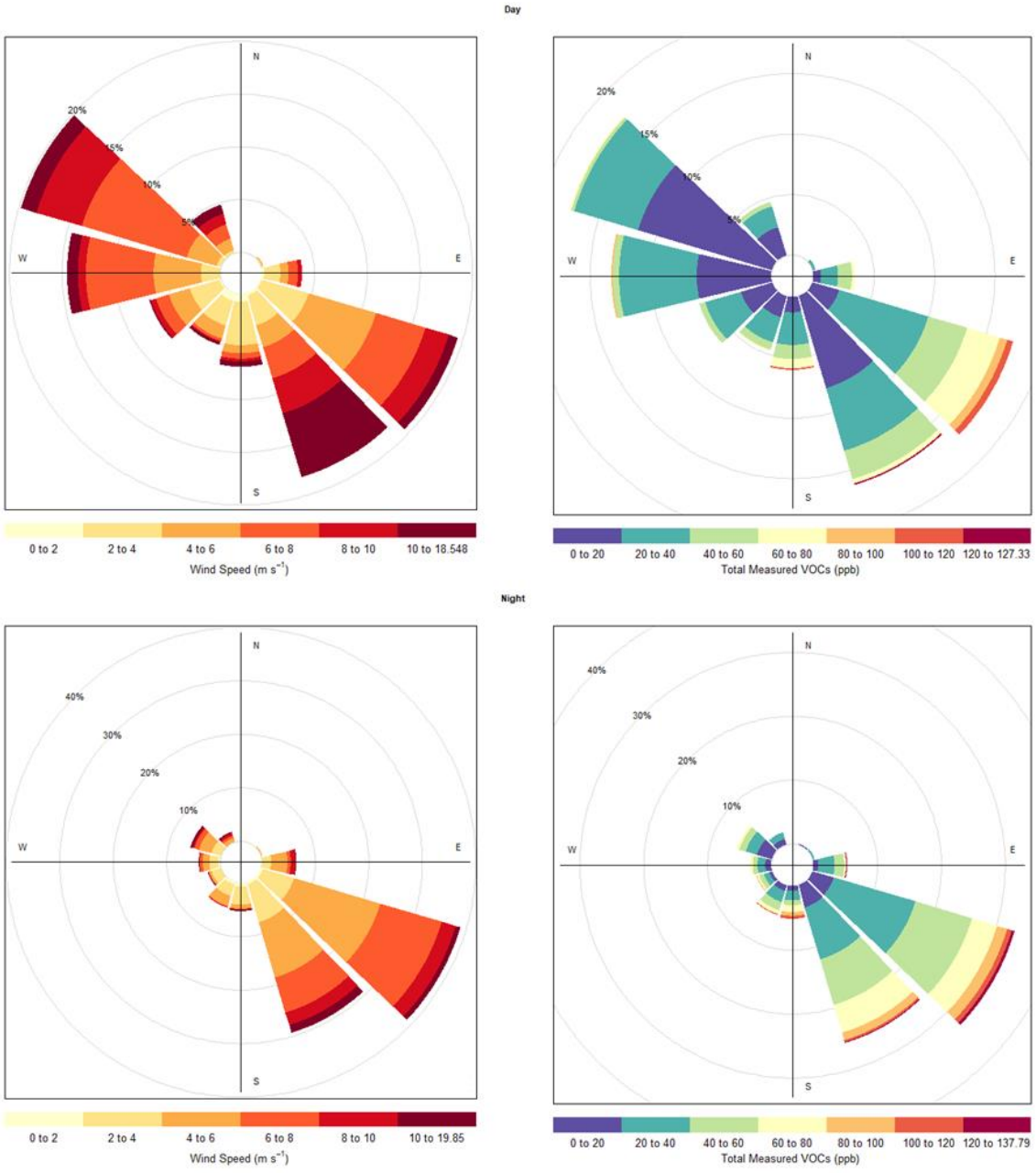

Figure S1. Wind rose plots for conditions at the UTDEQ UTC site during the SAMOZA field campaign (August 1-Septerber 30, 2022). Conditions are shown for wind direction and speed, as well as for total measured VOC concentration by wind direction, denoted

by the legends for each plot. Conditions are separated by day and night; day was defined as 6:00-18:00 MST, and night was defined as 18:00-6:00 MST.

	Factor 1: Personal Care Products	Factor 2: Solvent Use	Factor 3: Traffic	Factor 4: Secondary/ Biogenic	Factor 5: Biomass Burning
Formaldehyde	14	28	4	54	0
Methanol	19	11	16	46	7
Propyne	16	10	44	23	8
Acetonitrile	8	19	1	2	70
Acetaldehyde	7	23	42	24	5
Formic Acid	10	0	9	54	28
Ethanol	10	14	71	0	5
Butene	21	17	39	17	5
Acetone	12	0	19	56	12
Acetic Acid	0	43	13	0	44
Furan	0	0	25	6	69
Isoprene	25	2	23	40	10
MVK + MACR	1	19	22	50	9
MEK	9	56	0	15	21
Benzene	18	11	41	22	8
Methylfuran	0	1	42	24	32
Toluene	30	19	43	8	0
Furfural	14	4	0	24	58
Maleic Anhydride	0	4	8	23	65
Hexanone	36	30	19	10	4
C8 Aromatics	32	13	48	4	3
Methyl Furfural	12	2	0	27	58
C9 Aromatics	40	9	41	0	10
C10 Aromatics	76	8	3	0	13
Monoterpenes	44	0	32	13	11
D5 Siloxane	18	5	62	6	10

Figure S2. VOCs attributed to each of the 5 factors in PMF analysis. The color of each box indicates the percent of total species concentration that was attributed to each factor, with blue being 0% concentration and red being 80% concentration.

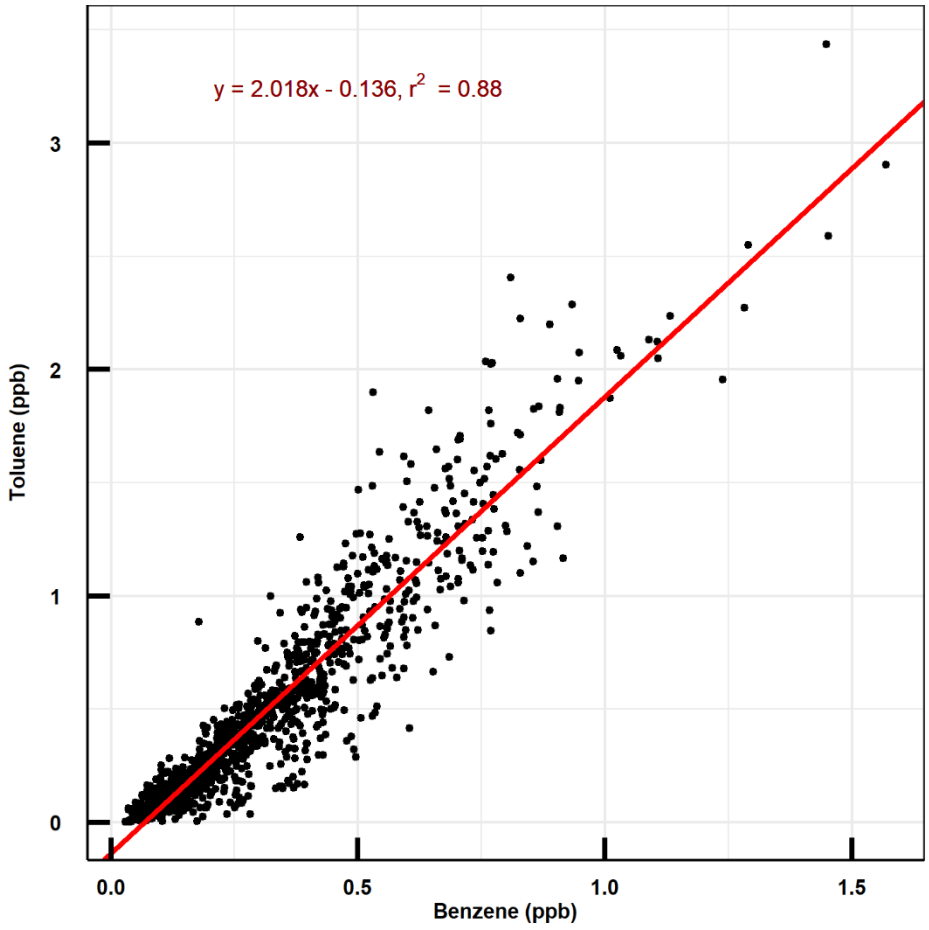

Figure S3. Toluene concentration plotted against benzene concentration, both in ppb, for the full 61-day SAMOZA measurement period. The reduced major axis regression line is plotted in red. This regression gives a line of y=2.018x-0.136, with an r^2 value of 0.88.

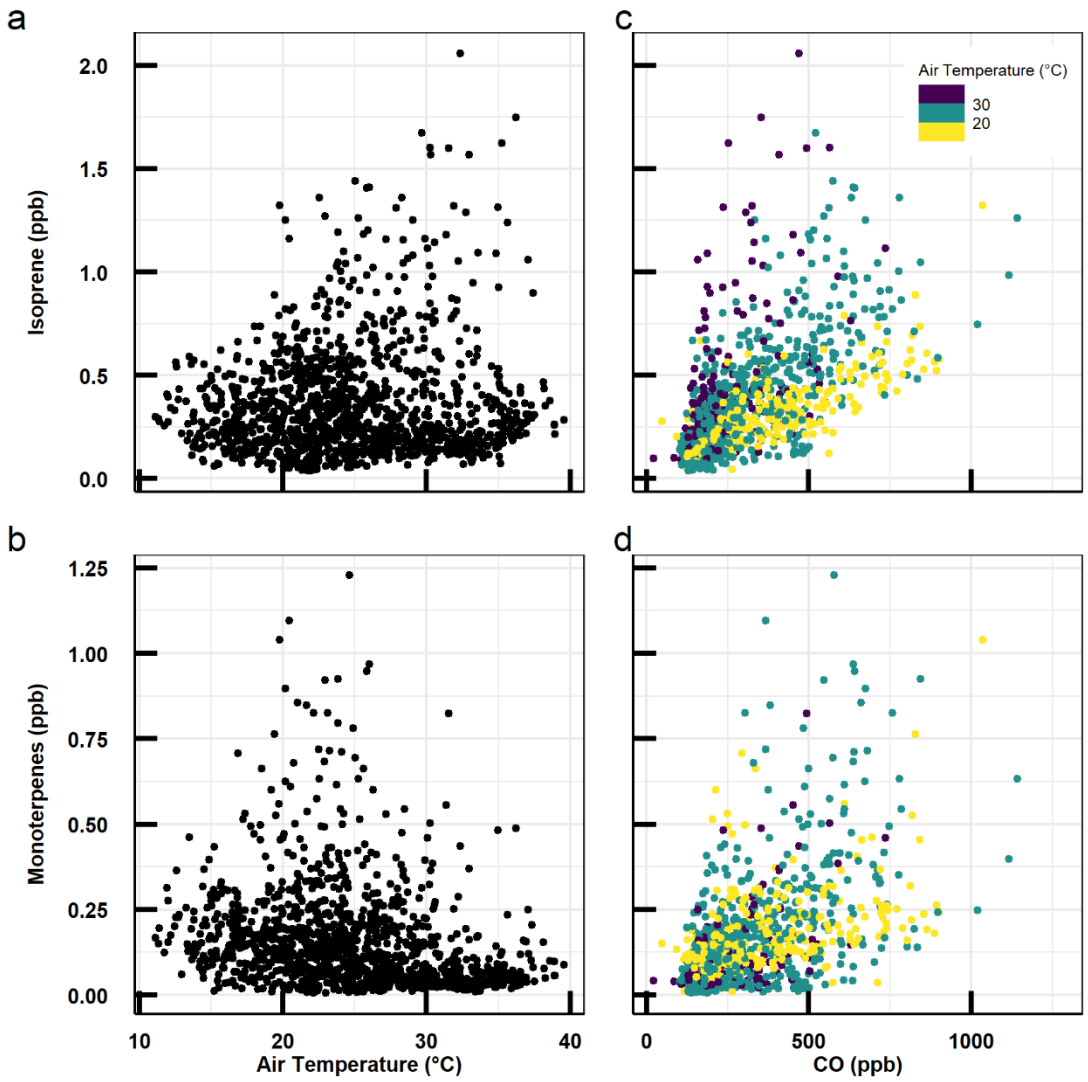

Figure S4. a) Isoprene and b) monoterpenes concentration in ppb plotted against air temperature in °C. c) Isoprene and d) monoterpenes concentration in ppb plotted against CO concentration in ppb. Data in these plots are colored by air temperature in degrees Celsius.

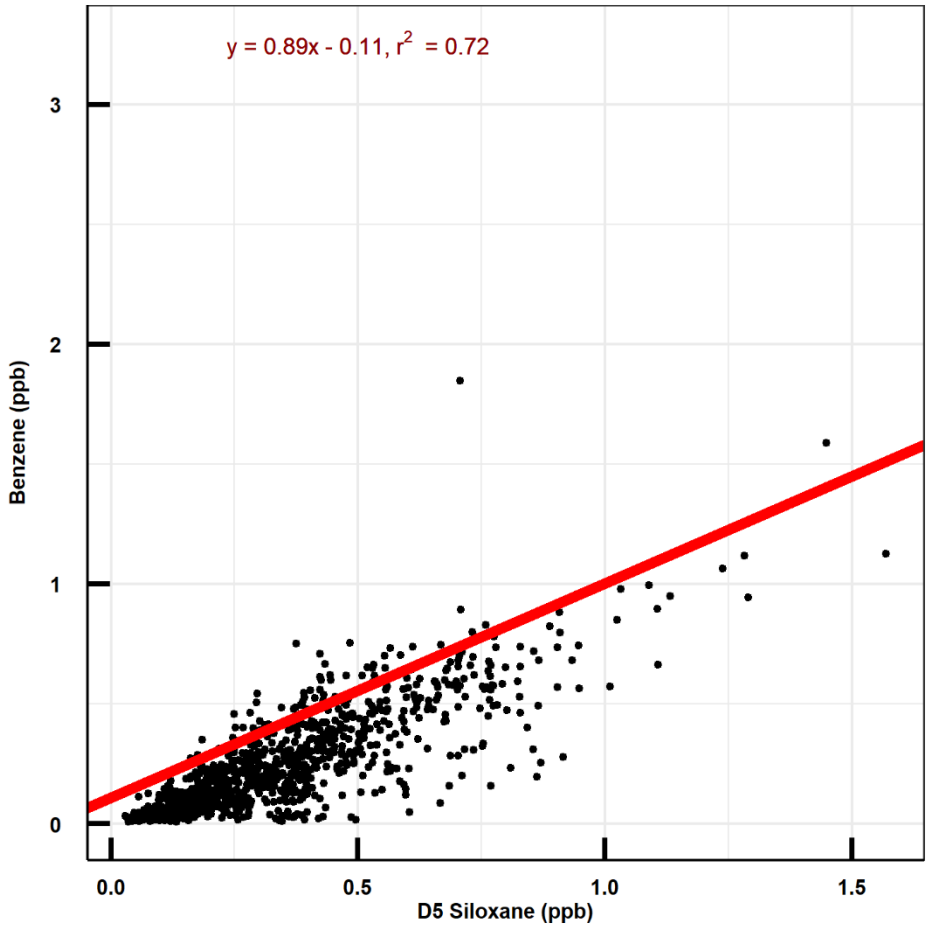

Figure S5. Benzene concentration plotted against D5 siloxane concentration, both in ppb, for the full 61-day SAMOZA measurement period. The reduced major axis regression line is plotted in red. This regression gives a line of y=0.89x-0.11, with an r^2 value of 0.72.

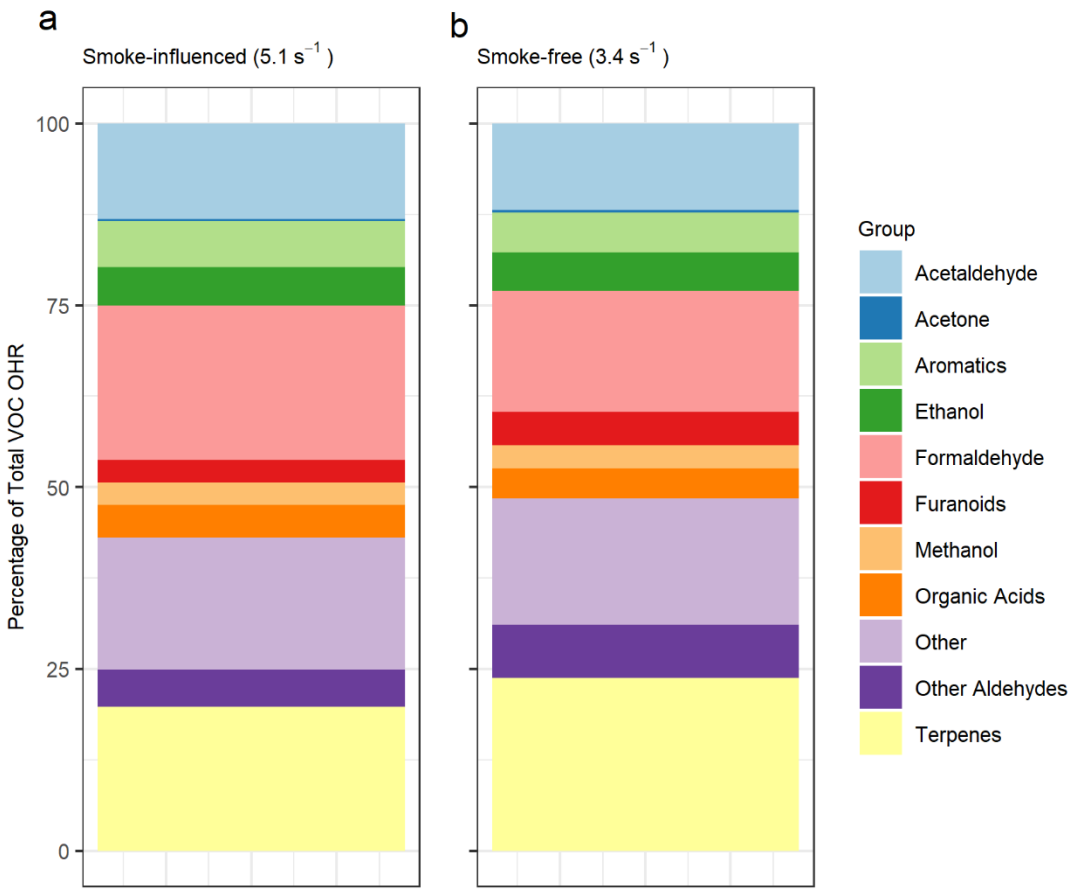

Figure S6. The average percentage contributions of major VOC species/groups to the total OH reactivity in s^{-1} in SLC for a) smoke-influenced and b) smoke-free days during SAMOZA.

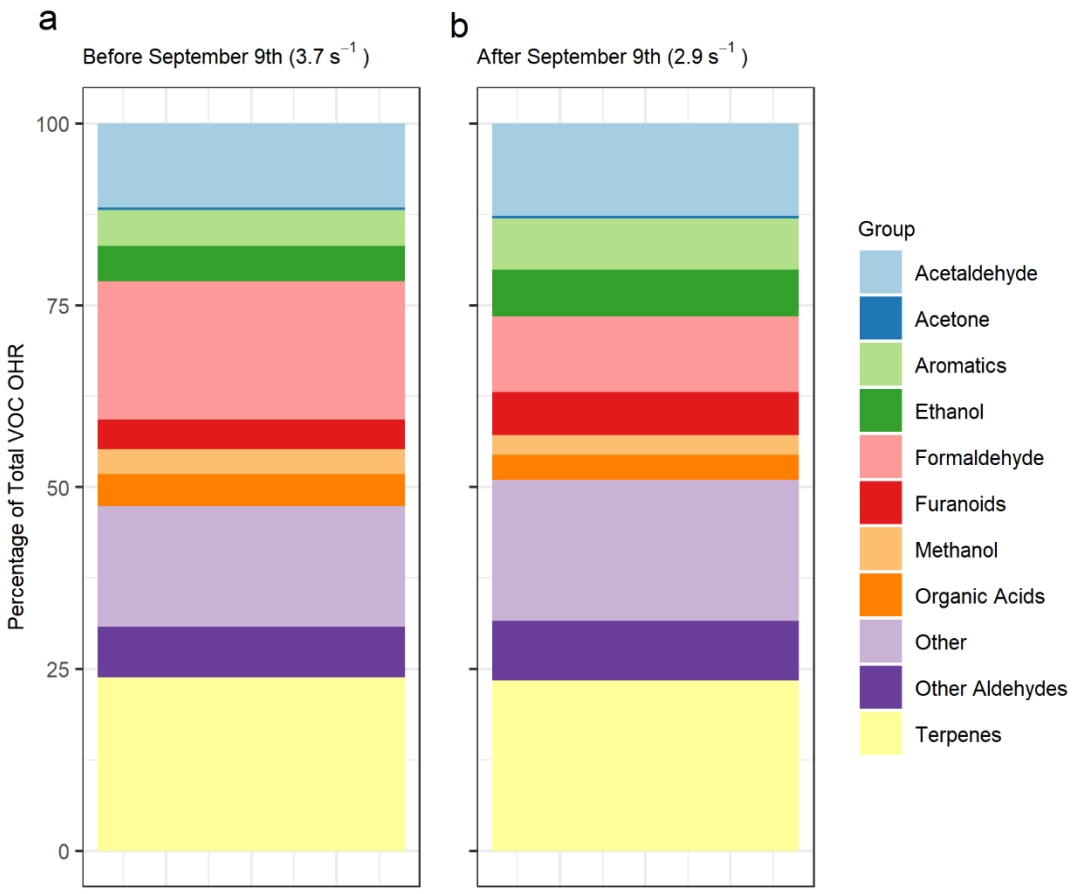

Figure S7. The average percentage contributions of major VOC species/groups to the total OH reactivity in s^{-1} in SLC for a) days before September 9th and b) days after September 9th during SAMOZA. Calculations were performed with daytime data only (6 AM to 6 PM MST).

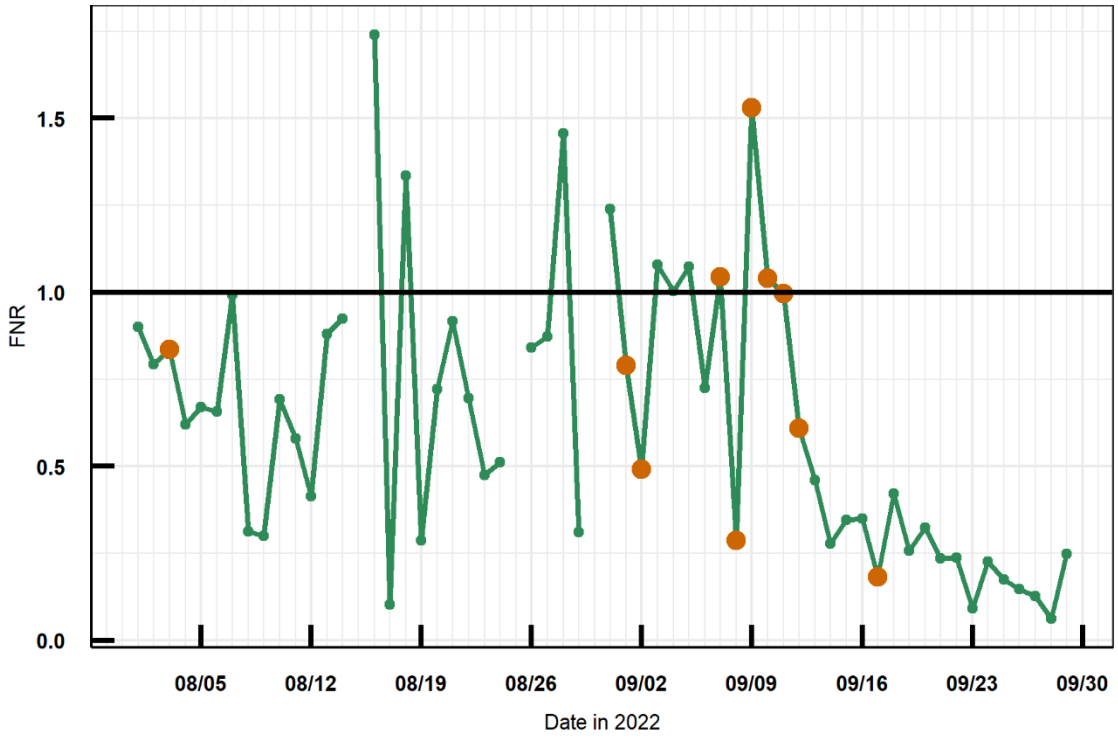

Figure S8. The average daily value of formaldehyde / NO_2 for daytime (6 AM to 6 PM MST). Smoke-influenced days are highlighted in orange. The black horizontal line at FNR = 1 shows the threshold between the VOC-limited regime (FNR<1) and the transitional regime (1<FNR<2).

Table S1. VOC species and other trace gases analyzed in this work, including the method used to measure their concentrations, the groups they were sorted into for analysis, and the average mixing ratio in ppb for the 51 smoke-free and 10 smoke-influenced days during SAMOZA.

Species	Measurement Method	Group	Smoke-free Mixing Ratio (ppb)	Smoke-influenced Mixing Ratio (ppb)
Formaldehyde	PTR-MS	Formaldehyde	3.64	7.07
Methanol	PTR-MS	Methanol	9.26	13.42
Propyne	PTR-MS	Other	1.14	1.81
Acetonitrile	PTR-MS	Other	0.13	0.24
Acetaldehyde	PTR-MS	Acetaldehyde	1.94	3.21
Formic Acid	PTR-MS	Organic Acids	1.48	1.64

Ethanol	PTR-MS	Ethanol	5.25	7.77
Acrolein	DNPH-HPLC	Other Aldehydes	0.18	0.18
Butene	PTR-MS	Other	0.92	1.41
Acetone	PTR-MS	Acetone	3.18	4.41
Propionaldehyde	DNPH-HPLC	Other Aldehydes	0.20	0.30
Acetic Acid	PTR-MS	Organic Acids	1.93	3.35
Dimethyl Sulfide	PTR-MS	Other	0.31	0.31
Furan	PTR-MS	Furanoids	0.04	0.03
Isoprene	PTR-MS	Terpenes	0.34	0.46
MVK + MACR	PTR-MS	Other	0.21	0.28
Crotonaldehyde	DNPH-HPLC	Other Aldehydes	0.14	0.15
Methyl Ethyl Ketone	PTR-MS	Other	0.28	0.65
N-Butyraldehyde	DNPH-HPLC	Other Aldehydes	0.23	0.23
Benzene	PTR-MS	Aromatic	0.26	0.44
Methylfuran	PTR-MS	Furanoids	0.05	0.06
Valeraldehyde	DNPH-HPLC	Other Aldehydes	0.16	0.16
Toluene	PTR-MS	Aromatic	0.40	0.69
Fufural	PTR-MS	Furanoids	0.04	0.04
Maleic Anhydride	PTR-MS	Other	0.01	0.05
Hexanone	PTR-MS	Other	0.03	0.06
Hexaldehyde	DNPH-HPLC	Other Aldehydes	0.11	0.09
Benzaldehyde	DNPH-HPLC	Other Aldehydes	0.31	0.16
C8 Aromatics	PTR-MS	Aromatic	0.63	1.05
Methyl fufural	PTR-MS	Furanoids	0.03	0.03
M-Tolualdehyde	DNPH-HPLC	Other Aldehydes	0.09	0.12
C9 Aromatics	PTR-MS	Aromatic	0.16	0.26
C10 Aromatics	PTR-MS	Aromatic	0.04	0.07
Monoterpenes	PTR-MS	Terpenes	0.15	0.18
D5 Siloxane	PTR-MS	Other	0.19	0.26
Carbon Monoxide	GC RCP	-	0.16	0.30

Nox	Teledyne API T200U	-	15.07	20.68
Ozone	Teledyne T400	-	37.56	39.59
PM2.5	Thermo 5030i	-	6.72	18.43