Supplement of

Organic vapors from Savannah and European Boreal fire emissions: Insights from photochemical and dark aging experiments in a smog chamber

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Supplementary Figures

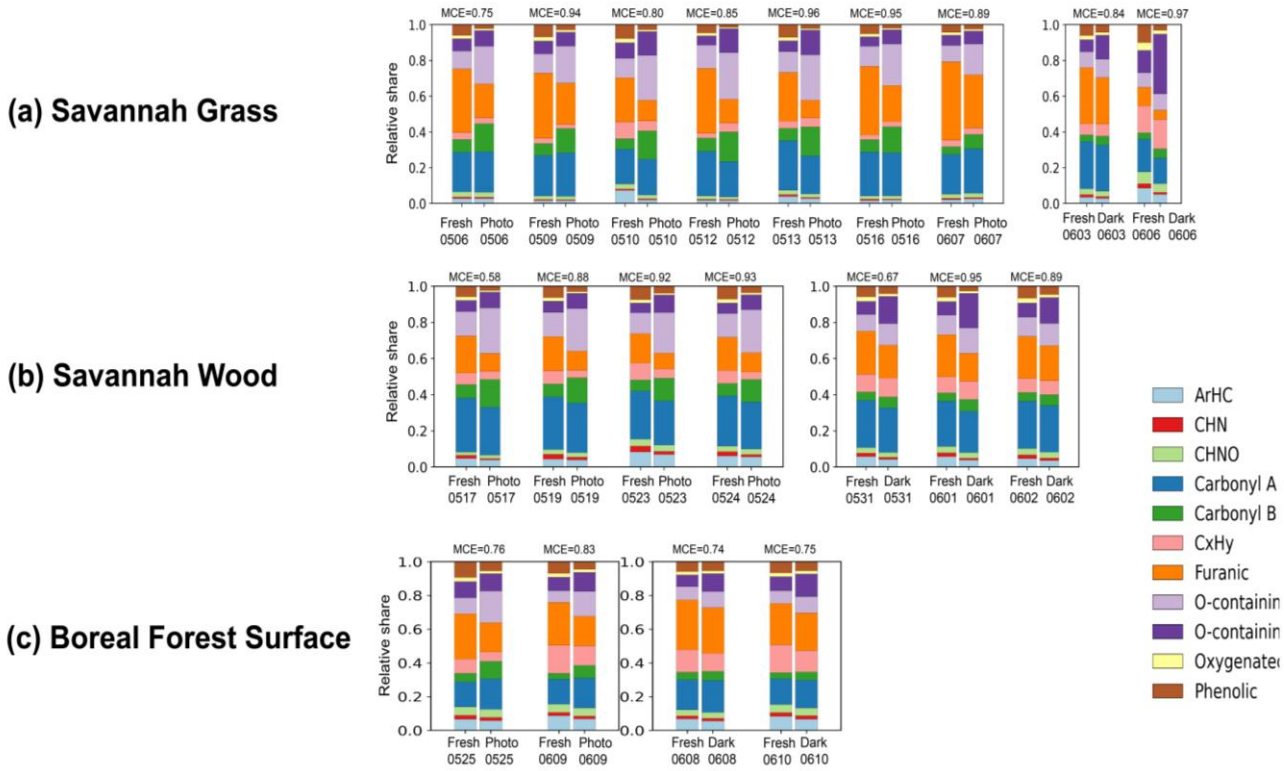


Figure S1. Relative share of organic vapor classes in the BB emissions measured by Vocus PTR-MS for photoaging and dark aging experiments for (a) savannah grass (b) savannah wood and (c) boreal forest surface

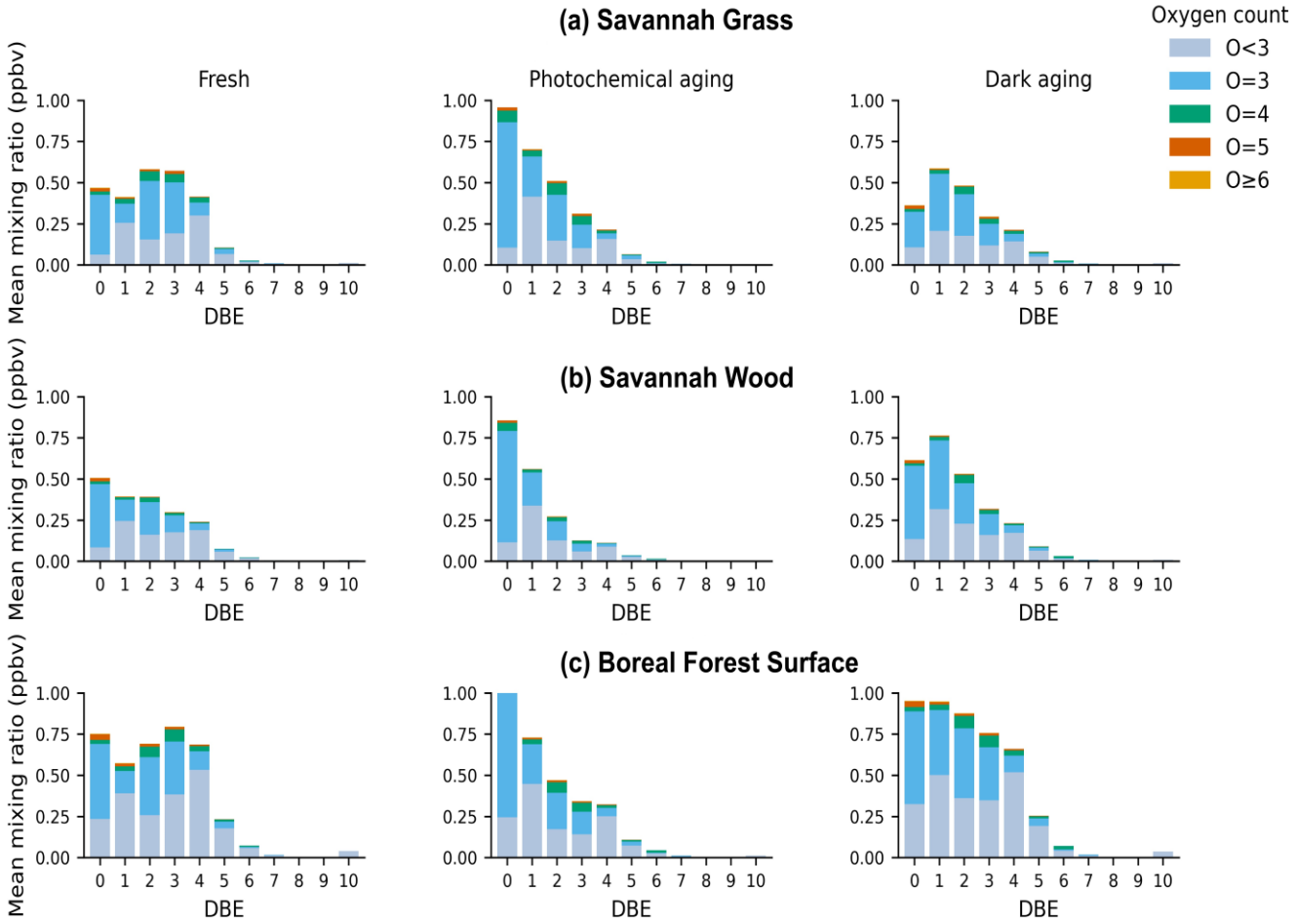
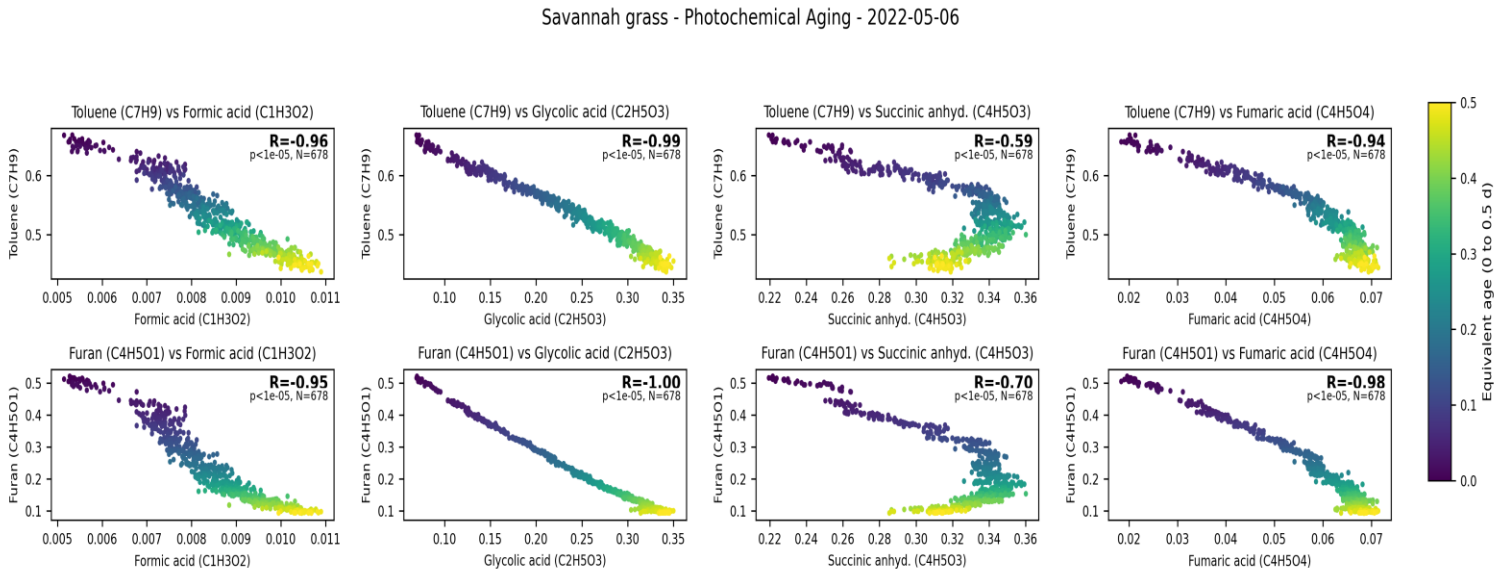
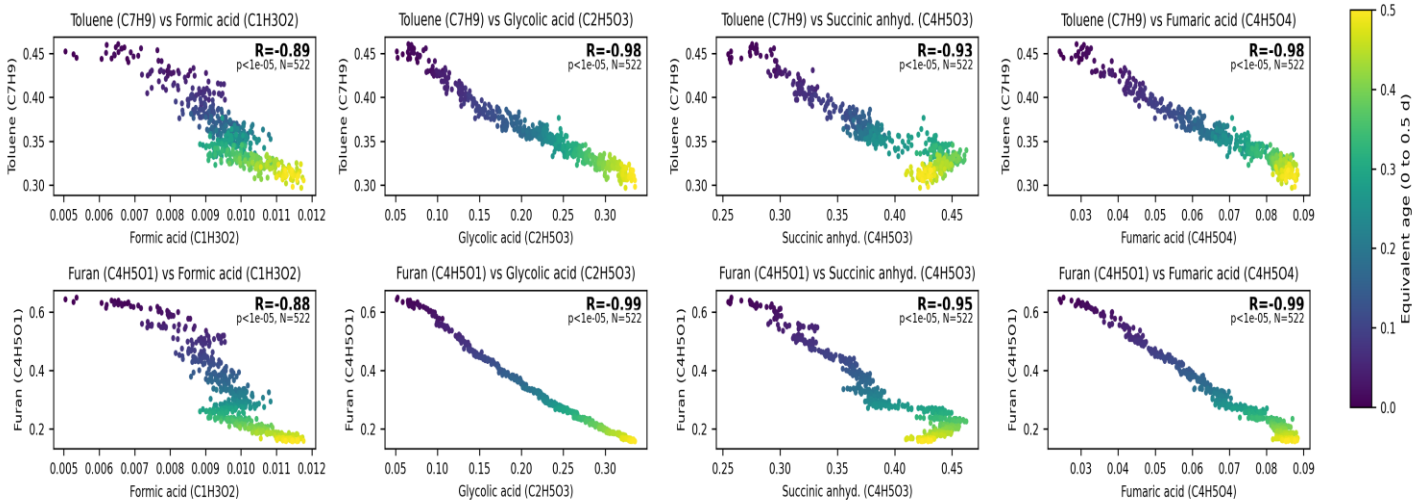


Figure S2. Mean mixing ratio distribution of DBE for (a) savannah grass (b) savannah wood and (c) boreal forest surface. Bar colors represent compounds with different oxygen content

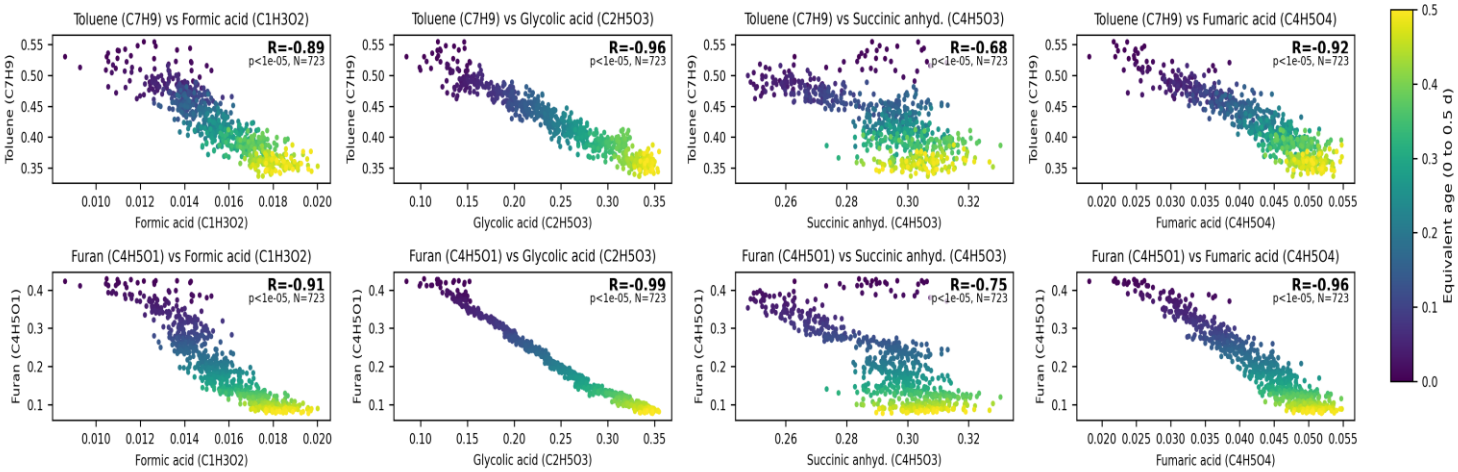
(a) Savannah Grass



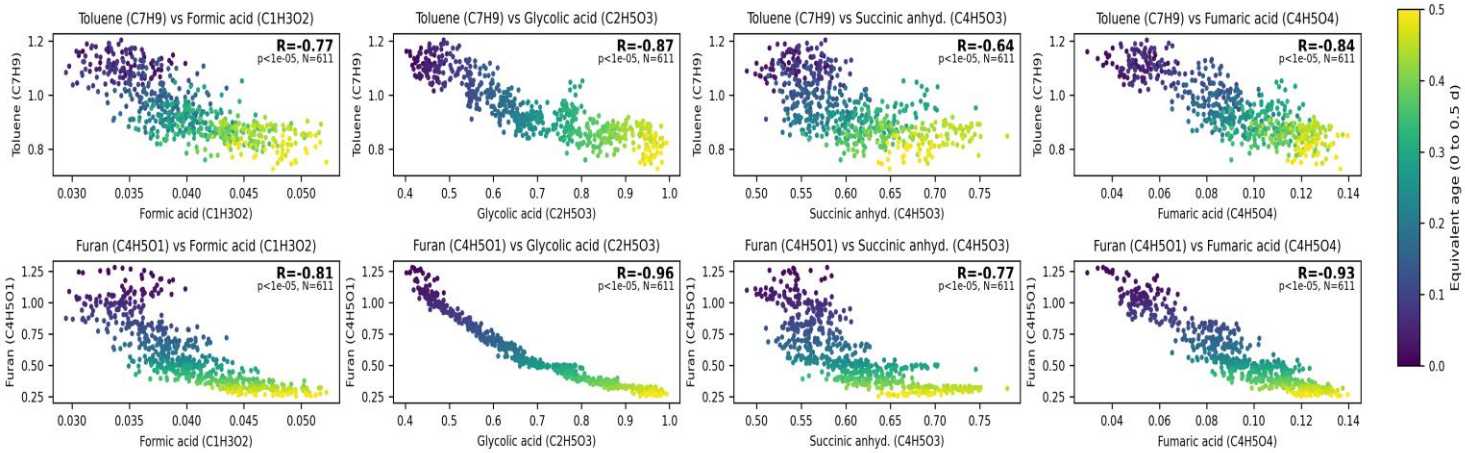
Savannah grass - Photochemical Aging - 2022-05-09



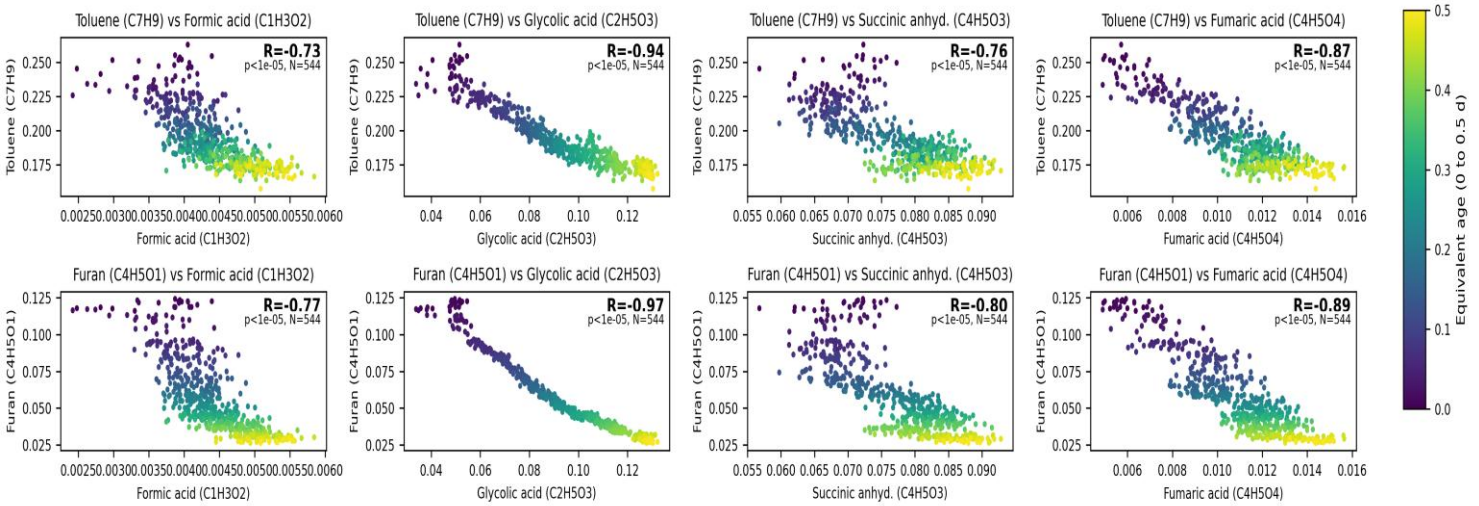
Savannah grass - Photochemical Aging - 2022-05-10



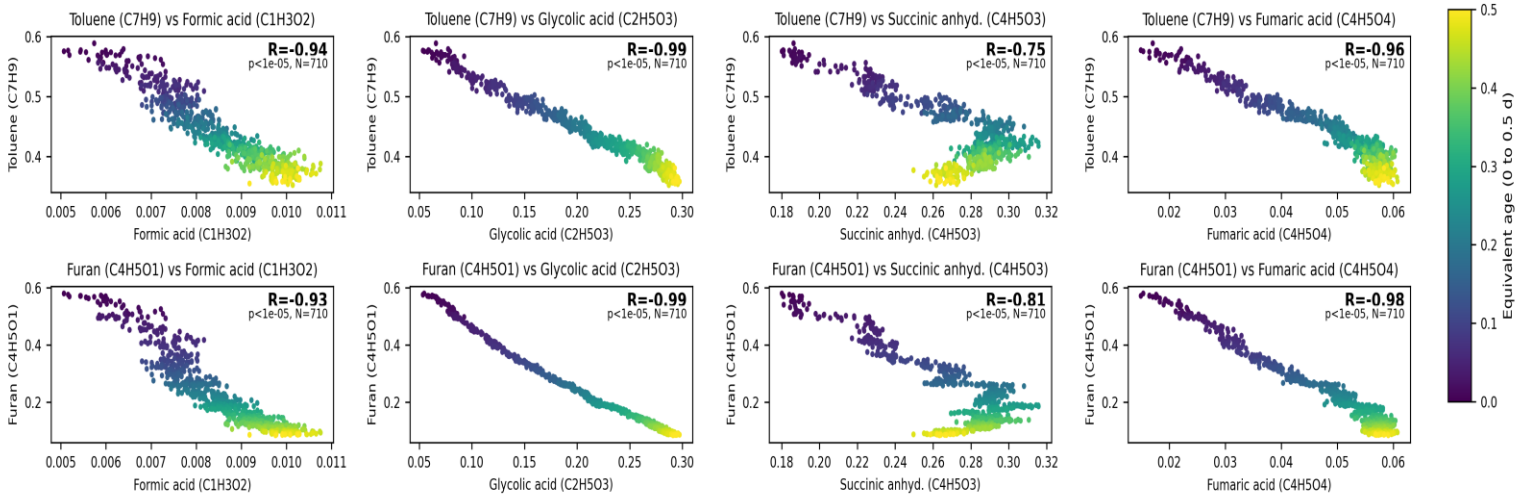
Savannah grass - Photochemical Aging - 2022-05-12



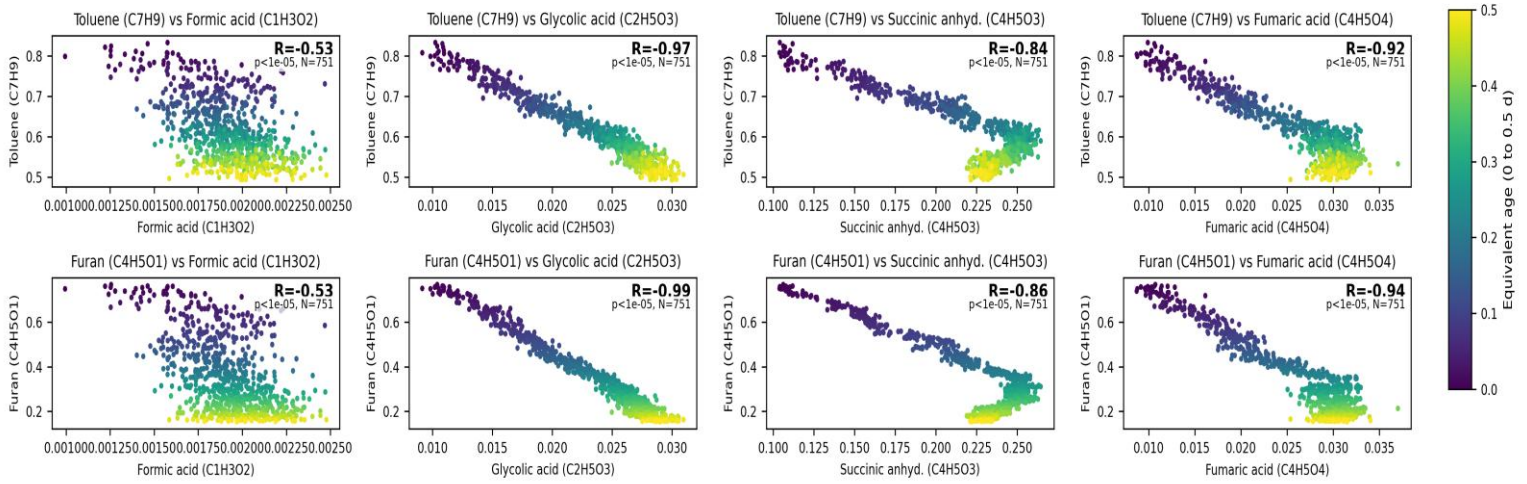
Savannah grass - Photochemical Aging - 2022-05-13



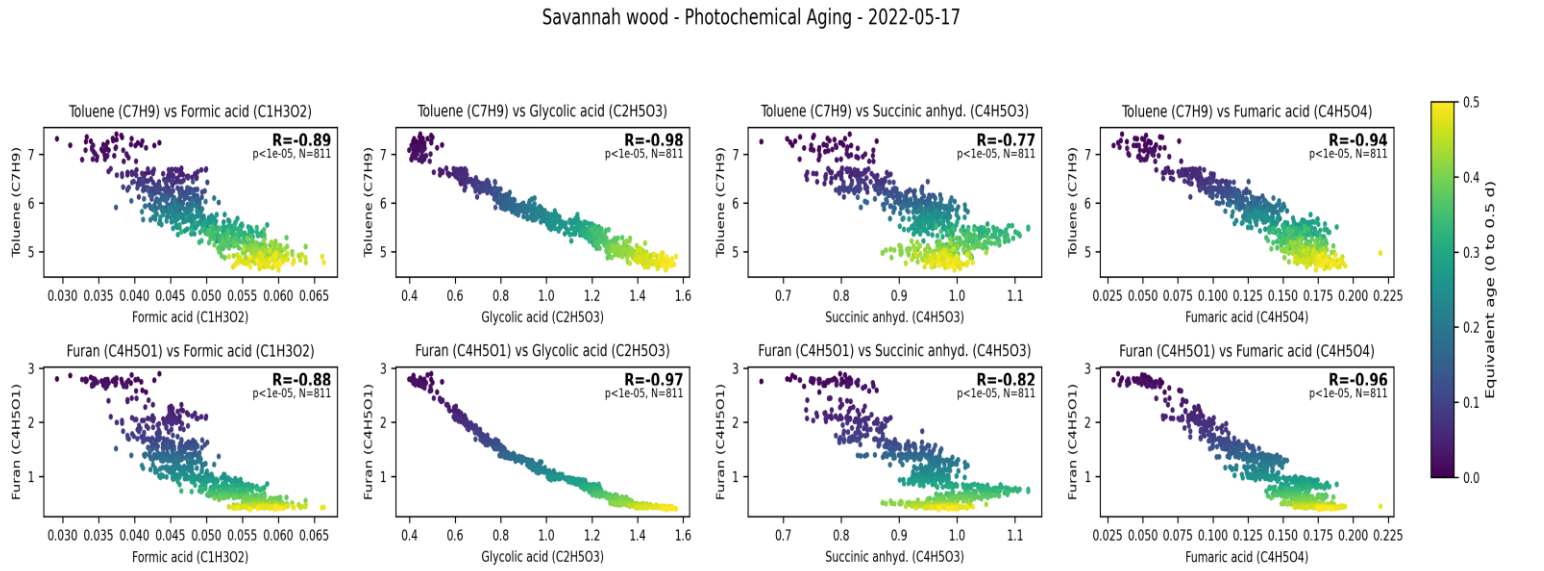
Savannah grass - Photochemical Aging - 2022-05-16

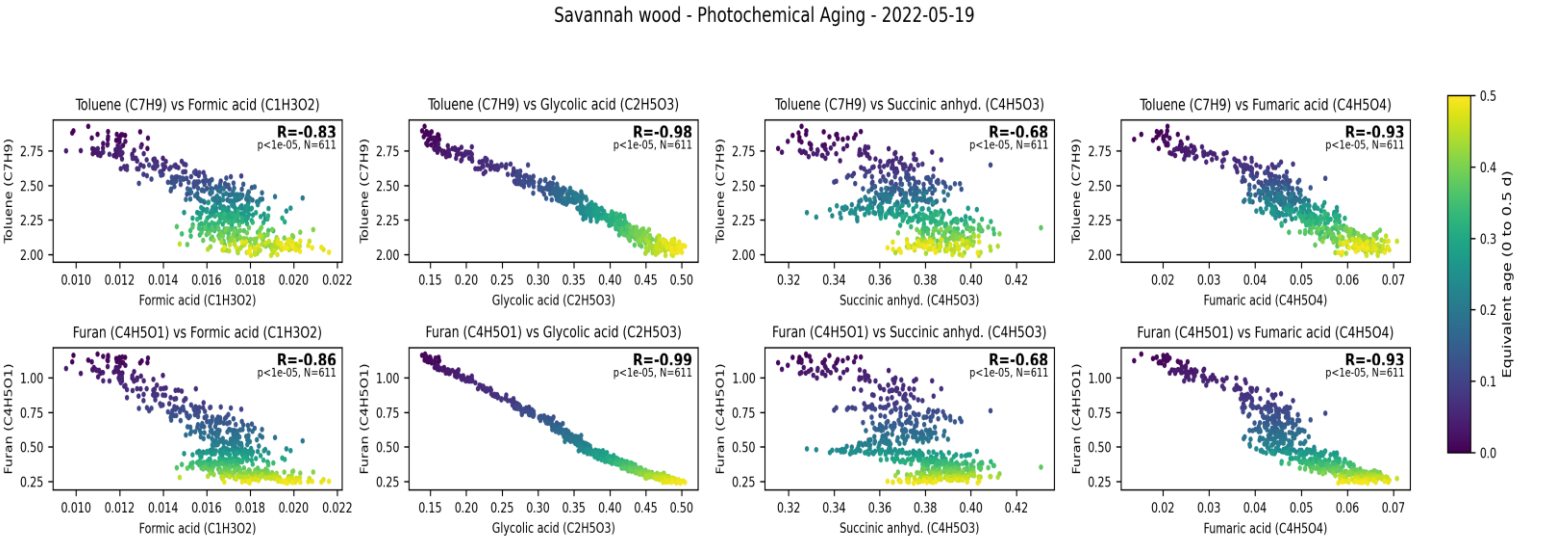


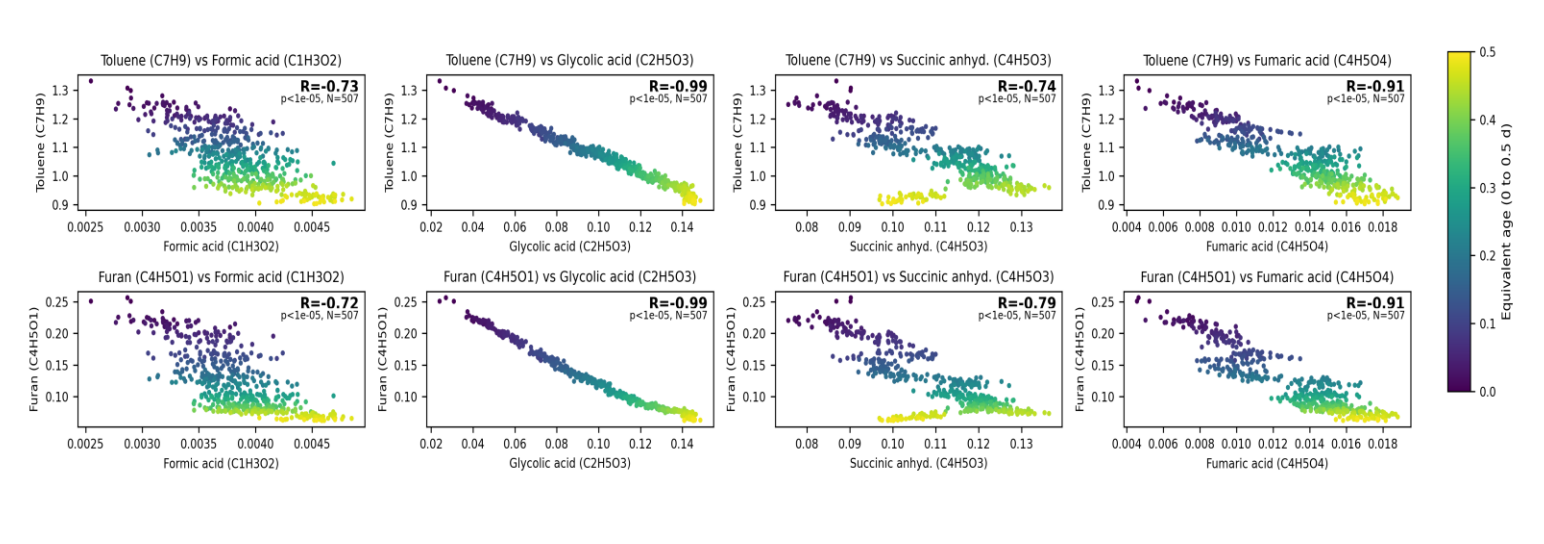
Savannah grass - Photochemical Aging - 2022-06-07

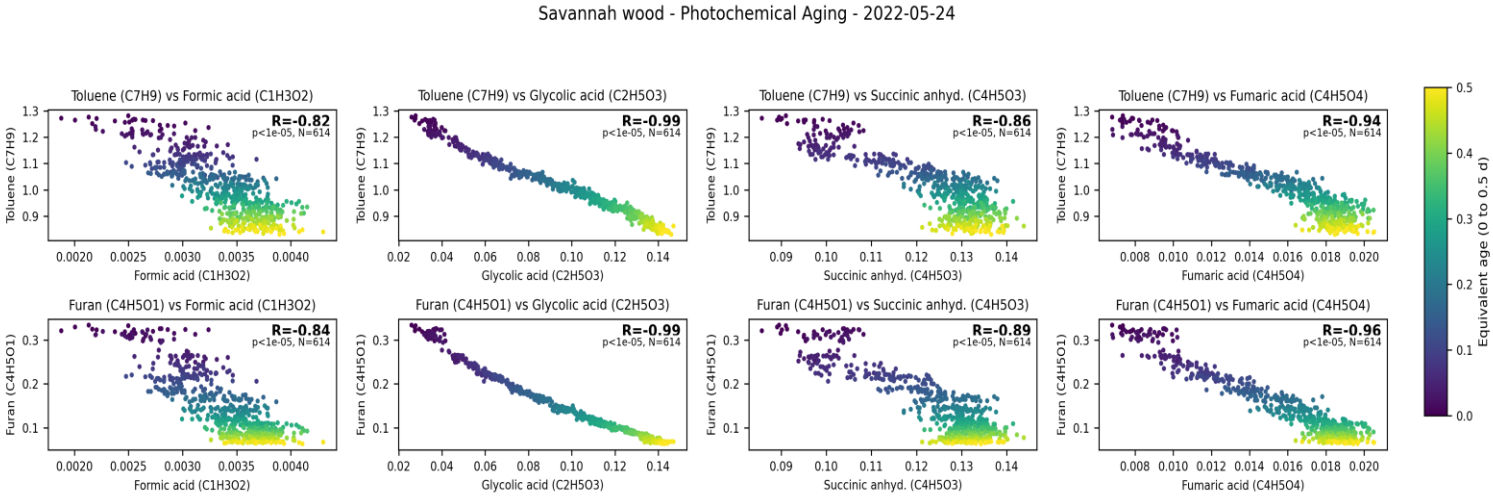


(b) Savannah Wood

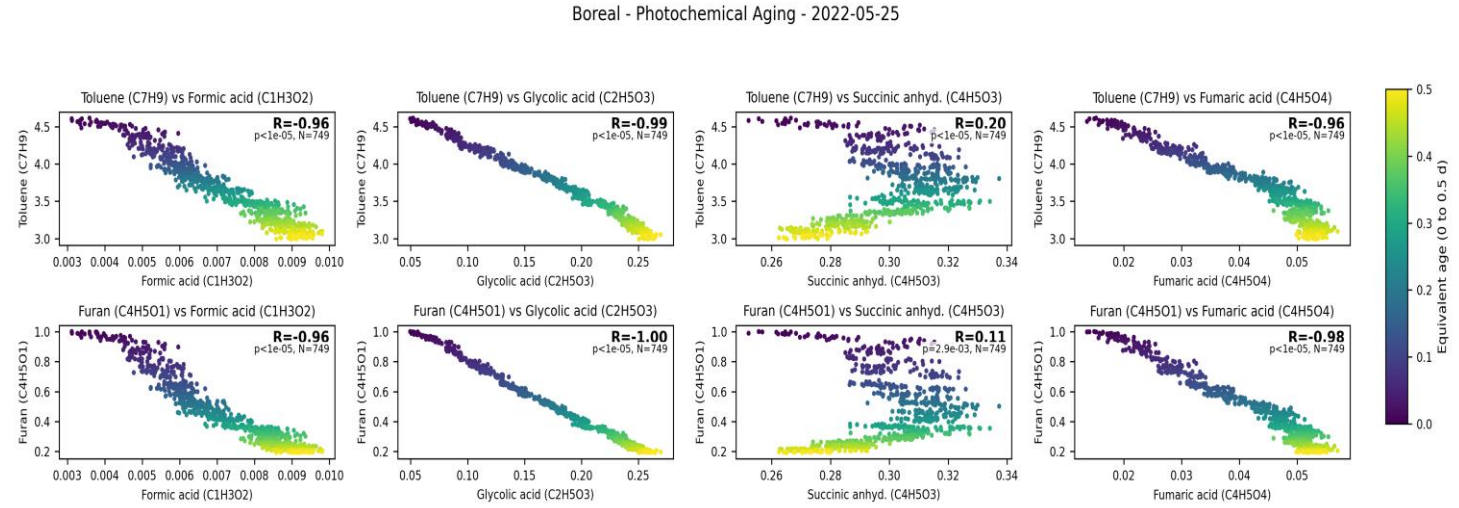








(c) Boreal Forest Surface



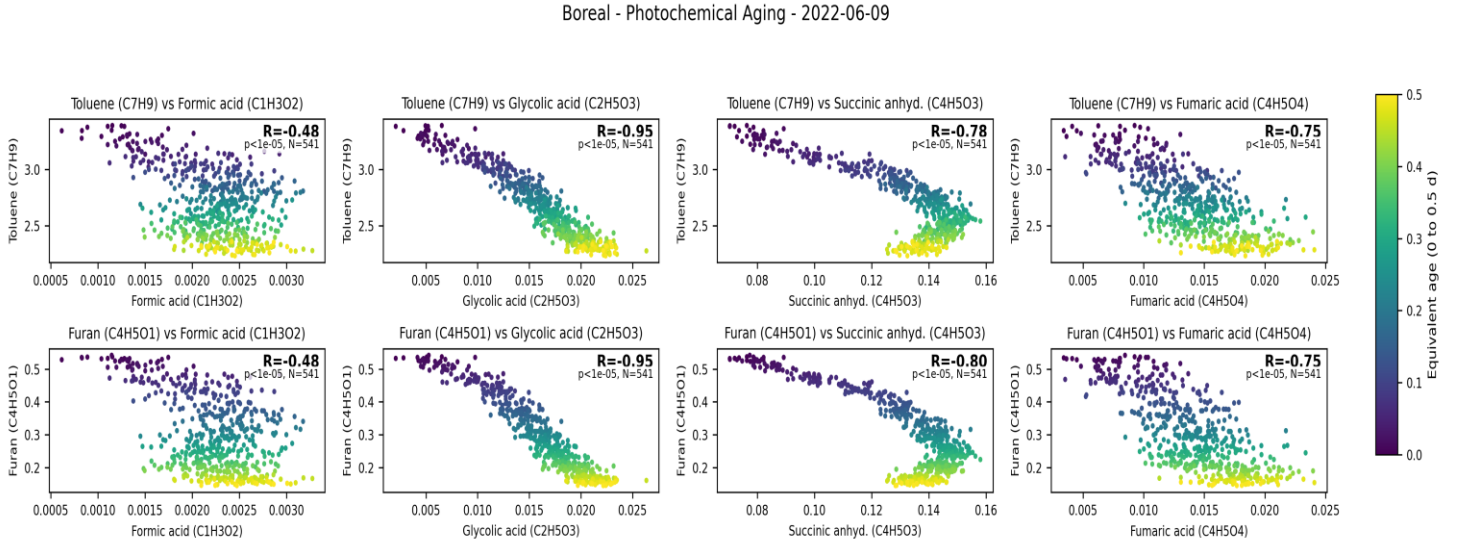


Figure S3. Correlations between decreasing EFs for toluene and furan and increasing EFs formic acid, glycolic acid, fumaric acid and succinic anhydride for (a) savannah grass (b) savannah wood and (c) boreal forest surface

Supplementary Tables

Table S1. Overview of BASFAA experiments including biomass, modified combustion efficiency (MCE) and type of aging performed in the chamber

Experiment No.	Date (M.D.Y)	Biomass	MCE	Aging type
1	05.06.2022	Savannah grass	0.756 ± 0.005	UV light + O_3
2	05.09.2022	Savannah grass	0.943 ± 0.001	UV light + O_3
3	05.10.2022	Savannah grass	0.803 ± 0.004	UV light + O_3
4	05.11.2022	Blank		
5	05.12.2022	Savannah grass	0.852 ± 0.002	UV light + O_3
6	05.13.2022	Savannah grass	0.969 ± 0.0005	UV light + O_3
7	05.16.2022	Savannah grass	0.952 ± 0.001	UV light + O_3
8	05.17.2022	Savannah wood	0.589 ± 0.055	UV light + O_3
9	05.19.2022	Savannah wood	0.886 ± 0.003	UV light + O_3
10	05.23.2022	Savannah wood	0.929 ± 0.001	UV light + O_3
11	05.24.2022	Savannah wood	0.935 ± 0.001	UV light + O_3
12	05.25.2022	Boreal forest	0.763 ± 0.009	UV light + O_3
13	05.31.2022	Savannah wood	0.672 ± 0.022	O_3
14	06.01.2022	Savannah wood	0.950 ± 0.001	O_3
15	06.02.2022	Savannah wood	0.892 ± 0.002	O_3
16	06.03.2022	Savannah grass	0.843 ± 0.002	O_3
17	06.06.2022	Savannah grass	0.973 ± 0.0004	O_3
18	06.07.2022	Savannah grass	0.895 ± 0.002	UV light + O_3
19	06.08.2022	Boreal forest	0.743 ± 0.006	O_3
20	06.09.2022	Boreal forest	0.839 ± 0.003	UV light + O_3
21	06.10.2022	Boreal forest	0.758 ± 0.009	O_3

Table S2. Limits of detection (LODs) estimated from background measurements as the 3σ (at 10 s)

Calibrant	LOD (ppbv)
C2H4N1	0.0543
C2H7O1	0.2250
C3H4N1	0.0025
C3H7O1	0.0201
C5H9	0.0134
C4H7O1	0.0142
C4H9O1	0.0174
C6H7	0.0236
C8H11	0.0022
C9H13	0.0013
C10H17	0.0084
C15H25	0.0233
C8H25O4Si4	0.0070
C10H31O5Si5	0.0057

Table S3. List of ion formulas, m/z values, tentative compound assignments and group classification based on Vocus PTR-MS measurements. All formulas refer to positive charged ions

Formula	m/z	Potential compound	Group
C11H13	145.1017	C11 ArHC	ArHC
C11H15	147.1174	C11 ArHC	ArHC
C9H11	119.0861	PAH- 1-deuterio-2,3-dihydro-1H-indenes/ alpha-Methylstyrene	ArHC
C10H15	135.1174	SRA- C10-aromatics	ArHC
C10H17	137.1330	SRA- Monoterpene	ArHC
C11H17	149.1330	C11-aromatics	ArHC
C12H19	163.1487	SRA- Hexyl benzene/ 1,3-dimethylbutylbenzene	ArHC
C13H21	177.1643	SRA- Benzene, heptyl-	ArHC
C6H7	79.0548	SRA- benzene	ArHC
C7H9	93.0704	SRA- Toluene	ArHC
C8H11	107.0861	SRA- Xylene or ethylbenzene	ArHC
C9H13	121.1017	SRA-Mesitylene	ArHC
C12H8	152.0626003	C12 ArHC	ArHC
C15H23	203.1799757	C15 ArHc	ArHC
C13H17	173.1330		CxHy
C14H19	187.1487		CxHy
C7H7	91.0548		CxHy
C11H19	151.1487		CxHy
C12H25	169.1956		CxHy
C13H23	179.1800		CxHy
C14H23	191.1800		CxHy
C14H29	197.2269		CxHy
C15H25	205.1956		CxHy
C3H5	41.0391	HC-fragment	CxHy
C4H6	54.04695019		CxHy
C4H5	53.0391	cyclobutadiene	CxHy
C4H9	57.0704	Butene	CxHy
C5H3	63.0234751		CxHy
C5H5	65.03912516		CxHy
C5H6	66.04695019		CxHy
C5H10	70.07825032		CxHy
C5H11	71.0861	Eg. Pentene	CxHy
C5H7	67.0548	1,3-cyclopentadiene	CxHy
C5H8	68.06260026		CxHy
C5H9	69.0704	isoprene cyclopentene	CxHy
C6H11	83.0861	cyclohexene	CxHy
C6H13	85.1017	(E)-hex-2-ene 2-methyl-pent-2-ene	CxHy
C6H9	81.0704	1,3-cyclohexadiene	CxHy
C7H11	95.0861		CxHy
C8H13	109.1017		CxHy
C8H15	111.1174	e.g. Octyne, Octadiene	CxHy
C8H17	113.1330		CxHy
C9H15	123.1174		CxHy
C9H17	125.1330		CxHy
C4H6N1	68.0500	e.g. Pyrrole	CHN
C4H8N1	70.0657	Isobutyronitrile	CHN
C5H10N1	84.0813	e.g. Pentanenitrile	CHN
C5H6N1	80.0500	Pyridine	CHN
C5H8N1	82.0657	1H-Pyrrole, 1-methyl-	CHN
C6H8N1	94.0657	Methylpyridine	CHN
C6H8N2	108.0687483		CHN
C6H15N2	115.1235235		CHN
C5H5N3	107.0483472		CHN
C7H12N1	110.0970		CHN
C7H6N1	104.0500	Benzonitrile	CHN
C8H6N1	116.0500242		CHN
C8H14N1	124.1126		CHN
C8H8N1	118.0657	e.g. indole (includes also C9H8-H+ isotope)	CHN
C9H8N1	130.0657	Quinoline	CHN
C7H10N1	108.0813	2,6-Lutidine	CHN

C10H10N1O2	176.0712		CHNO
C10H12N1O2	178.0868036		CHNO
C10H14N1O1	164.1075		CHNO
C10H16N1O1	166.1232		CHNO
C11H18N1O2	196.1338		CHNO
C2H4N1O1	58.0293	Methyl isocyanate	CHNO
C2H4N1O2	74.0242		CHNO
C2H4N1O3	90.0191		CHNO
C3H4N1O1	70.0293	Vinyl isocyanate	CHNO
C3H4N1O2	86.0242		CHNO
C3H4N1O3	102.0191		CHNO
C3H6N1O1	72.0449	Methoxyacetonitrile or acrylamide	CHNO
C3H6N1O2	88.0399	Nitropropene	CHNO
C3H6N1O3	104.0348		CHNO
C4H10N1O1	88.0762		CHNO
C4H10N1O2	104.0712		CHNO
C4H10N1O3	120.0661		CHNO
C4H4N1O1	82.0293		CHNO
C4H4N1O2	98.0242		CHNO
C4H4N1O3	114.0191	Nitrofuran	CHNO
C4H6N1O1	84.0449		CHNO
C4H6N1O2	100.0399	2,5-Pyrrolidinedione	CHNO
C4H6N1O3	116.0348		CHNO
C4H6N1O4	132.0297		CHNO
C4H8N1O1	86.0606	Methacrylamide	CHNO
C4H8N1O2	102.0555		CHNO
C4H8N1O3	118.0504		CHNO
C4H8N1O4	134.0453		CHNO
C5H10N1O1	100.0762		CHNO
C5H10N1O2	116.0712	Proline	CHNO
C5H10N1O4	148.0610		CHNO
C5H10N1O5	164.0559		CHNO
C5H12N1O1	102.0919		CHNO
C5H12N1O2	118.0868		CHNO
C5H12N1O4	150.0766		CHNO
C5H12N1O5	166.0715		CHNO
C5H4N1O1	94.0293		CHNO
C5H4N1O3	126.0191		CHNO
C5H6N1O1	96.0449	Pyridine-N-oxide	CHNO
C5H6N1O2	112.0399	Dihydroxypyridine	CHNO
C5H8N1O1	98.0606	furfurylamine	CHNO
C5H8N1O2	114.0555	Ethyl cyanoacetate	CHNO
C5H8N1O3	130.0504		CHNO
C5H8N1O4	146.0453		CHNO
C5H8N1O6	178.035162		CHNO
C6H4N1O4	154.0140326		CHNO
C6H10N1O1	112.0762		CHNO
C6H10N1O2	128.0712		CHNO
C6H10N1O3	144.0661		CHNO
C6H10N1O5	176.0559		CHNO
C6H10N1O6	192.050812		CHNO
C6H12N1O1	114.0919		CHNO
C6H12N1O2	130.0868		CHNO
C6H12N1O3	146.0817		CHNO
C6H12N1O4	162.0766		CHNO
C6H14N1O1	116.1075		CHNO
C6H14N1O4	164.0923		CHNO
C6H16N1O4	166.107933		CHNO
C6H6N1O1	108.0449		CHNO
C6H6N1O2	124.0399	Nitrobenzene	CHNO
C6H6N1O3	140.0348		CHNO
C6H6N1O4	156.0297		CHNO
C6H8N1O1	110.0606		CHNO
C6H8N1O2	126.0555		CHNO
C6H8N1O3	142.0504		CHNO
C6H14N1O5	180.0871976		CHNO
C6H16N1O3	150.1130184		CHNO
C6H16N1O7	214.0926769		CHNO
C7H8N1O3	154.0504181		CHNO
C7H10N1O1	124.0762		CHNO
C7H10N1O2	140.0712		CHNO

C7H12N1O1	126.0919	cyclohexylisocyanate	CHNO
C7H12N1O3	158.0817		CHNO
C7H14N1O4	176.0923		CHNO
C7H6N1O1	120.0449	Benzisoxazole	CHNO
C7H6N1O4	168.0297		CHNO
C7H8N1O1	122.0606	Benzamide	CHNO
C7H8N1O4	170.0453		CHNO
C7H18N1O3	164.1286684		CHNO
C8H8N1O3	166.0504181		CHNO
C8H6N1O1	132.0449388		CHNO
C8H10N1O1	136.0762		CHNO
C8H12N1O1	138.0919		CHNO
C8H12N1O2	154.0868		CHNO
C8H14N1O1	140.1075		CHNO
C8H14N1O2	156.1025		CHNO
C8H16N1O1	142.1232		CHNO
C8H16N1O3	174.1130		CHNO
C8H18N1O2	160.1338		CHNO
C8H6N1O3	164.0348		CHNO
C9H10N1O1	148.0762		CHNO
C9H10N1O2	164.0712		CHNO
C9H10N1O3	180.0661		CHNO
C9H12N1O1	150.0919		CHNO
C9H12N1O2	166.0868		CHNO
C9H14N1O2	168.1025		CHNO
C9H16N1O2	170.1181		CHNO
C9H16N1O3	186.1130		CHNO
C9H18N1O3	188.1287		CHNO
C9H20N1O1	158.1545		CHNO
C9H8N1O1	146.0606		CHNO
C9H8N1O2	162.0555		CHNO
C2H6N1O1	60.0449	Acetamide	CHNO
C2H6N1O2	76.0399	e.g. Nitroethane	CHNO
C9H11O1	135.0810	e.g. 4-Ethylbenzaldehyde	Oxygenated aromatic
C10H11O1	147.0810	C10 O-Aromatic	Oxygenated aromatic
C10H13O1	149.0966	C10 O-Aromatic	Oxygenated aromatic
C11H13O1	161.0966	3,3-dimethyl-1-indanone	Oxygenated aromatic
C13H11O1	183.0810	Benzophenone	Oxygenated aromatic
C8H5O3	149.0239	Phthalic anhydride	Oxygenated aromatic
C6H6O1	94.04186481		Oxygenated aromatic
C7H8O1	108.0575149		Oxygenated aromatic
C7H8O2	124.0524295		Oxygenated aromatic
C6H6O2	110.0367794		Oxygenated aromatic
C6H6O3	126.0316941		Oxygenated aromatic
C6H6O4	142.0266087		Oxygenated aromatic
C6H9O2	113.0603	Benzoquinones	Oxygenated aromatic
C9H11O3	167.0708192		Oxygenated aromatic
C9H12O3	168.0786442		Oxygenated aromatic
C10H13O3	181.0865	1-(4-hydroxy-3-methoxyphenyl)propan-2-one	Oxygenated aromatic
C8H7O3	151.0395	4-Carboxybenzaldehyde	Oxygenated aromatic
C9H7O2	147.0446	indene-1,3-dione	Oxygenated aromatic
C10H15O1	151.1123	Verbenone	Oxygenated aromatic
C7H9O3	141.0552	3-Methoxycatechol	Phenolic
C10H15O3	183.1021	4-ethyl-2,6-dimethoxyphenol	Phenolic
C8H11O3	155.0708	2,6-Dimethoxyphenol	Phenolic
C9H13O3	169.0865	2,6-dimethoxy-4-methylphenol	Phenolic
C10H15O2	167.1072	2-Methoxy-4- propylphenol	Phenolic
C8H11O2	139.0759	creosol	Phenolic
C9H13O2	153.0916	4-Ethyl-2-methoxyphenol	Phenolic
C10H13O2	165.0916	Isoeugenol	Phenolic
C11H15O3	195.1021	4-Propenyl-2,6-dimethoxyphenol	Phenolic
C8H9O3	153.0552	Vanillin	Phenolic
C9H11O2	151.0759	Vinylguaiacol	Phenolic
C7H9O1	109.0653	m-/o-/p-cresol	Phenolic
C8H11O1	123.0810	Dimethylphenol	Phenolic
C6H7O1	95.0497	phenol	Phenolic
C7H9O2	125.0603	Guaiacol	Phenolic
C9H13O1	137.0966	p - cumenol	Phenolic
C4H5O1	69.0340	Furan	Furanic
C5H7O1	83.0497	Methylfurans	Furanic

C6H9O1	97.0653	Dimethyl- & ethyl furan	Furanic
C5H7O3	115.0395	4-methoxy-2(5H)-furanone	Furanic
C6H7O3	127.0395	5-(hydroxymethyl)furan-2-carbaldehyde/hydroxymethylfurfural	Furanic
C6H9O3	129.0552	2,5-dimethyl-4-hydroxy-3(2H)-furanone	Furanic
C4H5O2	85.0290	2-furanone	Furanic
C5H5O2	97.0290	2-Furaldehyde (furfural)/Furan-2-carbaldehyde	Furanic
C5H7O2	99.0446	furfuryl alcohol/ 2-methyl-2-butenedial	Furanic
C6H7O2	111.0446	5-Methylfurfural	Furanic
C10H11O2	163.0759	6-methoxy-3-methylbenzofuran	Furanic
C6H5O3	125.0239	2,5-Furandicarboxaldehyde	Furanic
C9H7O3	163.0395	2.5-diethoxytetrahydro-furan	Furanic
C6H11O3	131.0708	Methyloxopentanoic acid	O-containing : C≥6
C7H11O3	143.0708192		O-containing : C≥6
C10H15O4	199.0970		O-containing : C≥6
C10H17O1	153.1279402		O-containing : C≥6
C10H17O3	185.1178		O-containing : C≥6
C10H17O4	201.1127		O-containing : C≥6
C10H21O1	157.1592403		O-containing : C≥6
C10H19O1	155.1435902		O-containing : C≥6
C10H19O3	187.1334		O-containing : C≥6
C10H19O4	203.1283		O-containing : C≥6
C10H23O3	191.1647		O-containing : C≥6
C11H17O1	165.1279		O-containing : C≥6
C11H17O3	197.1178		O-containing : C≥6
C11H19O3	199.1334		O-containing : C≥6
C11H19O4	215.1283		O-containing : C≥6
C11H21O1	169.1592403		O-containing : C≥6
C11H23O1	171.1748904		O-containing : C≥6
C12H25O1	185.1905404		O-containing : C≥6
C6H11O4	147.0657		O-containing : C≥6
C6H11O5	163.0606		O-containing : C≥6
C11H15O1	163.1123		O-containing : C≥6
C12H11O1	171.0810		O-containing : C≥6
C12H15O1	175.1123		O-containing : C≥6
C12H17O1	177.1279		O-containing : C≥6
C13H15O1	187.1123		O-containing : C≥6
C13H18O1	190.1357652		O-containing : C≥6
C4H12O6	156.0633881		O-containing : C≥6
C6H11O6	179.0555631		O-containing : C≥6
C6H11O7	195.0505		O-containing : C≥6
C6H13O3	133.0865		O-containing : C≥6
C6H13O4	149.0814		O-containing : C≥6
C6H13O5	165.0763		O-containing : C≥6
C6H13O6	181.0712		O-containing : C≥6
C6H15O3	135.1021		O-containing : C≥6
C6H18O4	154.1205091		O-containing : C≥6
C6H20O5	172.1310737		O-containing : C≥6
C6H7O4	143.0344		O-containing : C≥6
C6H8O2	112.0524295		O-containing : C≥6
C6H9O4	145.0501		O-containing : C≥6
C6H9O5	161.0450		O-containing : C≥6
C6H9O6	177.0399		O-containing : C≥6
C7H10O1	110.0731649		O-containing : C≥6
C7H11O1	111.08099		O-containing : C≥6
C7H13O1	113.09664		O-containing : C≥6
C7H11O4	159.0657		O-containing : C≥6
C7H11O5	175.0606		O-containing : C≥6
C7H11O6	191.0556		O-containing : C≥6
C7H13O3	145.0865		O-containing : C≥6
C7H13O4	161.0814		O-containing : C≥6
C7H13O5	177.0763		O-containing : C≥6
C7H15O3	147.1021		O-containing : C≥6
C7H15O4	163.0970		O-containing : C≥6
C7H17O3	149.1178		O-containing : C≥6
C7H17O4	165.1127		O-containing : C≥6
C7H25O6	205.1651135		O-containing : C≥6
C7H9O4	157.0501		O-containing : C≥6
C7H9O5	173.0450		O-containing : C≥6

C8H9O1	121.0653399	O-containing : C≥6
C8H12O1	124.088815	O-containing : C≥6
C8H11O4	171.0657	O-containing : C≥6
C8H11O5	187.0606	O-containing : C≥6
C8H12O4	172.0735589	O-containing : C≥6
C8H13O3	157.0865	O-containing : C≥6
C8H13O4	173.0814	O-containing : C≥6
C8H13O5	189.0763	O-containing : C≥6
C8H15O1	127.1122901	O-containing : C≥6
C8H15O3	159.1021	O-containing : C≥6
C8H15O4	175.0970	O-containing : C≥6
C8H17O1	129.1279402	O-containing : C≥6
C8H17O3	161.1178	O-containing : C≥6
C8H19O3	163.1334	O-containing : C≥6
C9H13O4	185.0814	O-containing : C≥6
C9H13O5	201.0763	O-containing : C≥6
C9H15O1	139.1122901	O-containing : C≥6
C9H15O3	171.1021	O-containing : C≥6
C9H15O4	187.0970	O-containing : C≥6
C9H15O5	203.0919	O-containing : C≥6
C9H16O3	172.1099444	O-containing : C≥6
C9H17O1	141.1279402	O-containing : C≥6
C9H17O4	189.1127	O-containing : C≥6
C9H19O1	143.1435902	O-containing : C≥6
C9H19O4	191.1283	O-containing : C≥6
C9H21O3	177.1491	O-containing : C≥6
C10H17O2	169.1229	O-containing : C≥6
C10H19O2	171.1385	O-containing : C≥6
C10H21O2	173.1542	O-containing : C≥6
C10H23O2	175.1698	O-containing : C≥6
C11H17O2	181.1229	O-containing : C≥6
C11H19O2	183.1385	O-containing : C≥6
C11H21O2	185.1542	O-containing : C≥6
C11H23O2	187.1698	O-containing : C≥6
C11H25O2	189.1855	O-containing : C≥6
C12H19O2	195.1385	O-containing : C≥6
C12H21O2	197.1542	O-containing : C≥6
C12H23O2	199.1698	O-containing : C≥6
C6H11O2	115.0759	O-containing : C≥6
C15H23O1	219.1749	O-containing : C≥6
C6H15O2	119.1072	O-containing : C≥6
C7H11O2	127.0759	O-containing : C≥6
C7H13O2	129.0916	O-containing : C≥6
C7H15O2	131.1072	O-containing : C≥6
C7H17O2	133.1229	O-containing : C≥6
C8H13O2	141.0916	O-containing : C≥6
C8H15O2	143.1072	O-containing : C≥6
C8H17O2	145.1229	O-containing : C≥6
C8H19O2	147.1385	O-containing : C≥6
C9H15O2	155.1072	O-containing : C≥6
C9H17O2	157.1229	O-containing : C≥6
C9H19O2	159.1385	O-containing : C≥6
C9H21O2	161.1542	O-containing : C≥6
C10H11O3	179.0708	O-containing : C≥6
C10H11O4	195.0657	O-containing : C≥6
C10H13O4	197.0814	O-containing : C≥6
C10H9O3	177.0552	O-containing : C≥6
C11H11O2	175.0759	O-containing : C≥6
C11H13O2	177.0916	O-containing : C≥6
C11H13O3	193.0865	O-containing : C≥6
C11H13O4	209.0814	O-containing : C≥6
C11H15O2	179.1072	O-containing : C≥6
C11H15O4	211.0970	O-containing : C≥6
C11H9O2	173.0603	O-containing : C≥6
C12H13O2	189.0916	O-containing : C≥6
C12H15O2	191.1072	O-containing : C≥6
C12H15O3	207.1021	O-containing : C≥6
C12H17O2	193.1229	O-containing : C≥6
C13H23O1	195.1748904	O-containing : C≥6
C13H25O1	197.1905404	O-containing : C≥6
C13H11O2	199.0759	O-containing : C≥6

C13H17O2	205.1229		O-containing : C≥6
C7H7O3	139.0395		O-containing : C≥6
C7H7O4	155.0344		O-containing : C≥6
C8H7O4	167.0344		O-containing : C≥6
C8H9O4	169.0501		O-containing : C≥6
C8H9O5	185.0450		O-containing : C≥6
C9H11O5	199.0606		O-containing : C≥6
C9H9O2	149.0603		O-containing : C≥6
C9H9O3	165.0552		O-containing : C≥6
C9H9O4	181.0501		O-containing : C≥6
C1H5O1	33.03403978		O-containing : C<6
C2H3O1	43.01838972		O-containing : C<6
C2H7O2	63.04460446	Ethylene glycol	O-containing : C<6
C4H4O1	68.02621475		O-containing : C<6
C4H4O2	84.02112937		O-containing : C<6
C4H6O2	86.03677943		O-containing : C<6
C4H6O4	118.0266087		O-containing : C<6
C4H8O5	136.0371734		O-containing : C<6
C5H6O1	82.04186481		O-containing : C<6
C5H6O2	98.03677943		O-containing : C<6
C5H6O3	114.0316941		O-containing : C<6
C5H6O4	130.0266087		O-containing : C<6
C2H6O3	78.03169405		O-containing : C<6
C4H6O3	102.0316941		O-containing : C<6
C2H7O3	79.03951908		O-containing : C<6
C3H9O4	109.0500838		O-containing : C<6
C2H7O4	95.0344		O-containing : C<6
C3H6O1	58.04186481		O-containing : C<6
C3H3O3	87.00821895		O-containing : C<6
C3H5O4	105.0188		O-containing : C<6
C3H7O3	91.0395	Dihydroxyacetone	O-containing : C<6
C3H7O4	107.0344		O-containing : C<6
C3H9O2	77.06025453		O-containing : C<6
C3H9O3	93.0552		O-containing : C<6
C3H9O5	125.0450		O-containing : C<6
C4H10O5	138.0528234		O-containing : C<6
C4H11O3	107.0708192		O-containing : C<6
C4H11O4	123.0657		O-containing : C<6
C4H11O6	155.0556		O-containing : C<6
C4H7O4	119.0344		O-containing : C<6
C4H9O4	121.0501		O-containing : C<6
C5H4O2	96.02112937		O-containing : C<6
C5H4O3	112.016044		O-containing : C<6
C5H7O4	131.0344		O-containing : C<6
C5H7O5	147.0293		O-containing : C<6
C5H10O1	86.07316494		O-containing : C<6
C5H10O5	150.0528234		O-containing : C<6
C5H11O3	119.0708		O-containing : C<6
C5H13O3	121.0864693		O-containing : C<6
C5H11O4	135.0657		O-containing : C<6
C5H11O5	151.0606		O-containing : C<6
C5H11O6	167.0556		O-containing : C<6
C5H12O6	168.0633881		O-containing : C<6
C5H11O7	183.0504777		O-containing : C<6
C5H8O1	84.05751488		O-containing : C<6
C5H9O4	133.0501		O-containing : C<6
C5H9O5	149.0450		O-containing : C<6
C3H3O2	71.0133		O-containing : C<6
C5H13O2	105.0916		O-containing : C<6
C5H3O2	95.0133		O-containing : C<6
C2H5O1	45.0340	acetaldehyde	Carbonyl A
C2H4O2	60.02112937		Carbonyl A
C3H5O1	57.0340	Acrolein	Carbonyl A
C4H6O1	70.0419	Crotonaldehyde	Carbonyl A
C4H7O1	71.0497	Methacrolein, methyl vinyl ketone (MVK), butenal	Carbonyl A
C5H9O1	85.0653	Pentenal or 3-methyl-3-buten-2-one	Carbonyl A
C6H11O1	99.0810	Hexenal	Carbonyl A
C8H13O1	125.0966	e.g. octadienone	Carbonyl A
C4H9O1	73.0653	2-butanone and 2-methylpropanal Or MEK	Carbonyl A

C4H9O3	105.0552	hydroxybutanoic acid, methoxypropanoic acid	Carbonyl A
C5H9O3	117.0552	Acetoxyacetone	Carbonyl A
C4H7O3	103.0395	Acetic anhydride	Carbonyl A
C5H5O3	113.0239	2-Furoic acid	Carbonyl A
C3H5O2	73.0290	Acrylic acid, 2-Propenoic acid	Carbonyl A
C3H7O2	75.0446	hydroxyacetone, Hydroxy-2-propanone	Carbonyl A
C4H7O2	87.0446	butane-2,3-dione/ diacetyl/oxobutanal	Carbonyl A
C4H9O2	89.0603	Methyl propanoate or Acetoin	Carbonyl A
C5H11O2	103.0759	Methyl-butanoic acid	Carbonyl A
C5H9O2	101.0603	Acetylacetone	Carbonyl A
C6H5O2	109.0290	Benzoquinone	Carbonyl A
C7H7O2	123.0446	Benzoic acid	Carbonyl A
C8H7O2	135.0446	Isophthalaldehyde, phenylglyoxal	Carbonyl A
C8H9O2	137.0603	Methyl benzoic acid	Carbonyl A
C9H11O4	183.0657	3-Hydroxy-4,5-dimethoxybenzoic acid	Carbonyl A
C5H11O1	87.0810	e.g. Pentanal, pentanone OR 3-Methylbutan-2-one	Carbonyl A
C5H5O1	81.0340	2,4-cyclopentadiene-1-one	Carbonyl A
C6H13O1	101.0966	2-Hexanone	Carbonyl A
C3H7O1	59.0497	Acetone	Carbonyl B
C1H3O2	47.0133	Formic acid	Carbonyl B
C2H5O3	77.0239	glycolic acid	Carbonyl B
C3H5O3	89.0239	Pyruvic acid	Carbonyl B
C4H5O3	101.0239	Succinic anhydride	Carbonyl B
C4H5O4	117.0188	Fumaric acid	Carbonyl B
C2H5O2	61.0290	Acetic acid, glycolaldehyde	Carbonyl B
C7H15O1	115.1123	e.g. heptanal or 2-Heptanone	Carbonyl B

Table S4. Summary statistics (median [Q1–Q3]) of fresh-condition emission factors EF (g kg^{-1}) by fuel and compound class. Sample sizes: n= 9 for savannah grass, n= 7 for savannah wood and n=4 for boreal forest

Class	Savannah grass	Savannah wood	Boreal forest
ArHC	1.6 (1.2–2.5)	6.5 (3–10.8)	12.2 (9.7–14.6)
CHN	0.6 (0.5–0.8)	3.1 (1.2–4.6)	3.7 (3.1–4)
CHNO	1.6 (1.2–2.3)	4.1 (1.4–5.8)	7.6 (6.8–7.9)
Carbonyl A	16.4 (10.9–22.7)	37.4 (11.7–56.2)	24.3 (20.3–29.6)
Carbonyl B	4.2 (3.2–4.6)	7 (2.8–11.5)	7 (5.7-8)
CxHy	2.3 (1.8–3.8)	11 (3.4–17.3)	23.01 (16.2–28.7)
Furan	25.7 (13.8–30.98)	29.4 (7.5–47)	41.2 (36.3–48.1)
O-containing: C<6	7.4 (5.9–8.6)	14.9 (5.3–22.3)	13.7 (11.8–14.8)
O-containing: C≥6	4.9 (3.7–5.8)	9.8 (2.4–15)	14.4 (12.9–14.6)
Oxygenated aromatic	1.2 (1–1.8)	3 (0.8–5)	3.7 (3.2–4)
Phenolic	4.3 (3.4–5.5)	9.3 (3.1–12.3)	12.1 (10.4–13)

Table S5. PERMANOVA summary for group-level composition based on z-scaled mean mixing ratio. Regime refers to Fresh, O3 and UV+O3 conditions, and Fuel refers to savannah grass, savannah wood and boreal forest. F, R^2 and p values are computed from 999 permutations

Test / subset	F	R^2	p
Regime (pooled across fuels)	50.31	0.73	0.001
Fuel (pooled across regimes)	2.08	0.10	0.114
Regime within savannah grass	20.05	0.73	0.001
Regime within savannah wood	67.74	0.92	0.001
Regime within boreal	63.44	0.96	0.010