Supplementary Material

Polar semi-volatile organic compounds in biomass burning emissions and their chemical transformations during aging in an oxidation flow reactor

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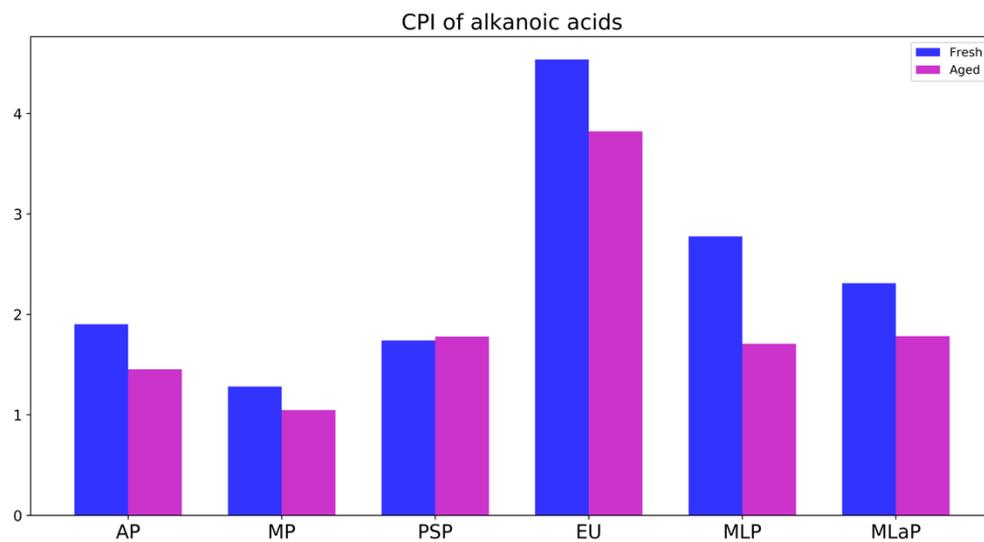
Figure S1. Carbon performance index (CPI) of gas- and particle-phase alkanoic acids assigned to six different fuels: Alaskan peat (AP), Moscow peat (MP), Pskov peat (PSP), Eucalyptus (EU), Malaysian peat (MLP), Malaysian agricultural peat (MLaP). CPI was calculated by calculating even-over-odd ratios of monocarboxylic acids ranging from C_6 to C_{24}.

Table S1: Emission factors (in mg kg^{-1}) for fresh emissions in both gas and particle phase

Compound name	Alaskan peat Gas	Particle	Moscow peat Gas	Particle	Pskov peat Gas	Particle	Eucalyptus Gas	Particle	Malaysian peat Gas	Particle	Malaysian agro peat Gas	Particle	Group name
hexanoic acid	8.99±0.88	0.93±0.00	20.62±2.01	0.41±0.00	14.23±1.39	1.02±0.00	0.00±0.00	0.06±0.00	6.49±0.63	1.00±0.00	4.90±0.48	1.90±0.00	monocarboxylic acids
heptanoic acid	16.04±1.80	0.75±0.23	13.57±1.52	0.42±0.12	19.34±2.17	1.02±0.31	0.28±0.03	0.05±0.02	8.85±0.99	0.45±0.13	7.01±0.79	1.26±0.38	monocarboxylic acids
me-malonic	0.00±1.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.04±0.00	0.00±0.00	0.00±0.00	0.01±0.00	dicarboxylic acids
guaiacol	0.87±0.08	0.19±0.00	31.94±3.10	1.55±0.00	48.41±4.70	1.26±0.00	0.02±0.00	0.00±0.00	67.82±6.58	0.74±0.00	0.50±0.05	0.06±0.00	methoxyphenol derivatives
benzoic acid	0.00±0.00	1.51±0.00	0.00±0.00	7.00±0.00	0.00±0.00	6.37±0.00	0.00±0.00	0.03±0.00	0.00±0.00	5.65±0.00	7.86±0.77	2.12±0.00	aromatic acids
octanoic acid	16.56±1.56	1.17±0.00	21.34±2.01	2.41±0.00	24.32±2.30	3.30±0.00	0.42±0.04	0.11±0.00	10.14±0.96	0.93±0.00	6.45±0.61	3.93±0.00	monocarboxylic acids
maleic acid	2.52±0.35	0.91±0.00	5.93±0.83	1.19±0.00	7.01±0.98	2.08±0.00	0.18±0.02	0.00±0.00	2.08±0.29	0.57±0.00	0.00±0.00	0.00±0.00	dicarboxylic acids
succinic acid	0.00±0.00	4.43±0.59	5.55±0.64	6.98±0.93	2.92±0.33	12.56±1.67	0.00±0.00	0.06±0.01	0.00±0.00	5.65±0.75	0.00±0.00	0.00±0.00	dicarboxylic acids
4-me-guaiacol	1.46±0.14	0.00±0.00	2.14±0.21	0.00±0.00	2.71±0.26	0.00±0.00	0.03±0.00	0.00±0.00	3.06±0.30	0.19±0.00	0.71±0.07	0.30±0.00	methoxyphenol derivatives
me-succinic acid	4.70±0.48	1.29±0.19	0.00±0.00	2.12±0.31	8.57±0.87	3.06±0.44	0.17±0.02	0.04±0.01	2.11±0.21	1.03±0.15	0.56±0.06	0.00±0.00	dicarboxylic acids
o-toluic	0.81±0.09	0.00±0.00	10.08±1.12	1.25±0.00	3.58±0.40	0.00±0.00	0.00±0.00	0.00±0.00	2.64±0.29	0.41±0.00	0.35±0.04	0.09±0.00	aromatic acids
m-toluic	0.51±0.06	0.49±0.14	3.53±0.39	3.35±0.96	1.52±0.17	1.87±0.53	0.00±0.00	0.04±0.01	1.22±0.14	1.06±0.30	0.41±0.04	0.42±0.12	aromatic acids
nonanoic acid	5.14±0.61	2.19±0.00	6.98±0.83	5.83±0.00	5.16±0.61	4.24±0.00	0.00±0.00	0.20±0.00	3.88±0.46	2.24±0.00	0.00±0.00	15.74±0.00	monocarboxylic acids
p-toluic	0.00±0.00	0.37±0.18	0.00±0.00	4.97±2.49	0.00±0.00	3.39±1.69	0.00±0.00	0.03±0.01	0.60±0.08	1.40±0.70	0.02±0.00	0.29±0.14	aromatic acids
4-ethyl-guaiacol	0.00±0.00	0.10±0.00	5.76±0.56	0.00±0.00	1.27±0.12	0.00±0.00	0.00±0.00	0.00±0.00	1.54±0.15	0.00±0.00	0.31±0.03	0.10±0.00	methoxyphenol derivatives
2,6-dimethylbenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.40±0.00	0.24±0.00	0.26±0.00	0.00±0.00	aromatic acids
syringol	0.00±0.00	0.00±0.00	20.37±2.70	0.00±0.00	0.92±0.12	0.00±0.00	0.14±0.02	0.19±0.03	0.61±0.08	3.76±0.50	5.06±0.67	0.39±0.05	methoxyphenol derivatives
glutaric acid	0.22±0.03	2.13±0.29	1.70±0.26	6.88±0.92	1.80±0.27	16.65±2.24	0.00±0.00	0.10±0.01	0.23±0.04	1.60±0.22	0.10±0.01	0.05±0.01	dicarboxylic acids
2-methylglutaric	0.00±0.00	4.82±0.00	3.54±0.00	1.54±0.00	8.17±0.00	2.93±0.00	0.00±0.00	0.11±0.00	0.00±0.00	2.66±0.00	0.00±0.00	0.79±0.00	dicarboxylic acids
3-methylglutaric acid	0.00±0.00	0.00±0.00	0.00±0.00	0.16±0.00	0.09±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.14±0.00	0.00±0.00	0.00±0.00	dicarboxylic acids
2,5-dimethylbenzoic acid	0.29±0.04	0.41±0.12	0.53±0.07	2.16±0.62	0.38±0.05	1.47±0.42	0.00±0.00	0.03±0.01	0.47±0.07	0.89±0.25	0.00±0.00	0.31±0.09	aromatic acids
2,4-dimethylbenzoic acid	0.00±0.00	0.47±0.00	0.00±0.00	1.96±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.52±0.00	0.00±0.00	0.00±0.00	aromatic acids
2,3-and 3,5-dimethylbenzoic acid	0.40±0.00	0.00±0.00	0.59±0.00	0.48±0.00	0.45±0.00	0.00±0.00	0.04±0.00	0.00±0.00	0.40±0.00	0.27±0.00	0.58±0.00	0.22±0.00	aromatic acids
decanoic acid	2.48±0.24	3.90±0.00	2.55±0.25	4.68±0.00	2.69±0.26	6.76±0.00	0.04±0.00	0.25±0.00	1.87±0.18	3.03±0.00	0.61±0.06	6.15±0.00	monocarboxylic acids
4-allyl-guaiacol (eugenol)	0.10±0.02	0.00±0.00	6.36±0.98	0.00±0.00	0.63±0.10	0.00±0.00	0.00±0.00	0.00±0.00	0.51±0.08	0.00±0.00	0.00±0.00	0.03±0.00	methoxyphenol derivatives
4-methyl-syringol	3.15±0.38	1.12±0.26	6.31±0.77	4.47±1.05	1.14±0.14	5.60±1.31	0.44±0.05	0.59±0.14	1.34±0.16	10.42±2.44	5.17±0.63	0.33±0.08	methoxyphenol derivatives
3,4-dimethylbenzoic acid	0.00±0.00	0.69±0.00	0.00±0.00	3.35±0.00	0.00±0.00	2.10±0.00	0.00±0.00	0.03±0.00	0.07±0.01	1.09±0.00	0.09±0.01	0.19±0.00	aromatic acids
hexanedioic (adipic) acid	0.00±0.00	11.91±1.27	0.00±0.00	4.73±0.50	1.55±0.29	0.00±0.00	0.14±0.03	0.00±0.00	0.08±0.01	3.71±0.39	0.00±0.00	1.26±0.13	dicarboxylic acids
salicylic acid	0.00±0.00	2.54±0.45	0.38±0.04	6.95±1.23	0.23±0.03	6.07±1.07	0.02±0.00	0.05±0.01	0.00±0.00	3.09±0.55	0.00±0.00	1.28±0.23	aromatic acids
cis-pinonic acid	1.24±0.00	0.00±0.00	5.33±0.00	0.00±0.00	2.40±0.00	0.00±0.00	0.14±0.00	0.00±0.00	1.36±0.00	0.00±0.00	1.39±0.00	0.00±0.00	dicarboxylic acids
3-methyladipic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.56±0.00	0.00±0.00	0.00±0.00	0.00±0.00	dicarboxylic acids
4-formyl-guaiacol (vanillin)	5.47±0.60	3.64±0.42	26.83±2.93	12.76±1.47	33.06±3.61	13.59±1.56	0.11±0.01	0.20±0.02	18.27±1.99	8.75±1.01	0.70±0.08	2.89±0.33	methoxyphenol derivatives
undecanoic acid	1.00±0.10	11.86±1.14	1.80±0.18	8.22±0.79	1.52±0.15	20.75±2.00	0.03±0.00	0.17±0.02	0.97±0.10	6.12±0.59	0.13±0.01	3.86±0.37	monocarboxylic acids
isoeugenol	0.09±0.01	1.11±0.19	6.01±0.78	4.07±0.71	0.64±0.08	3.87±0.67	0.00±0.00	0.00±0.00	0.31±0.04	2.09±0.36	0.00±0.00	0.02±0.00	methoxyphenol derivatives
heptanedioic (pimelic) acid	0.00±0.00	2.46±0.41	0.00±0.00	3.27±0.55	0.00±0.00	6.71±1.12	0.00±0.00	0.00±0.00	0.01±0.00	2.44±0.41	0.00±0.00	0.00±0.00	dicarboxylic acids
2,3-dimethoxybenzoic acid	3.54±1.06	0.00±0.00	17.55±5.26	1.00±0.22	5.45±1.63	0.00±0.00	0.39±0.12	0.00±0.00	4.41±1.32	0.00±0.00	3.43±1.03	0.02±0.01	aromatic acids
acetovanillone	0.80±0.09	4.71±0.46	23.86±2.78	40.63±3.96	17.06±1.99	33.35±3.25	2.51±0.29	0.43±0.04	9.92±1.16	19.74±1.92	24.85±2.90	2.59±0.25	methoxyphenol derivatives
2,6-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.25±0.00	0.00±0.00	0.01±0.00	aromatic acids
dodecanoic (lauric) acid	1.40±0.29	12.55±1.23	1.24±0.26	13.39±1.31	2.98±0.62	14.00±1.37	0.15±0.03	0.38±0.04	0.27±0.06	7.38±0.72	0.00±0.00	8.57±0.84	monocarboxylic acids
2,5-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.66±0.00	0.02±0.00	aromatic acids
phthalic acid	0.00±0.00	0.82±0.14	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.38±0.24	0.00±0.00	0.00±0.00	aromatic acids
suberic acid	0.00±0.00	1.95±0.21	0.73±0.00	1.55±0.17	0.00±0.00	3.24±0.36	0.00±0.00	0.21±0.02	0.27±0.00	2.64±0.29	0.33±0.00	7.65±0.84	dicarboxylic acids
levoglucosan*	0.00±0.00	4.70±0.47	0.74±0.10	1.76±0.18	1.96±0.25	6.62±0.67	0.03±0.00	4.19±0.42	0.74±0.10	4.21±0.43	0.09±0.01	65.44±6.61	anhydrosugars
3,5-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.41±0.09	0.00±0.00	0.21±0.05	1.23±0.19	aromatic acids
syringaldehyde	0.20±0.03	2.23±0.22	0.49±0.07	2.12±0.21	0.39±0.06	8.56±0.84	0.05±0.01	0.58±0.06	1.27±0.19	3.67±0.36	0.37±0.05	13.85±1.35	methoxyphenol derivatives
3,4-dimethoxybenzoic acid	0.21±0.00	0.00±0.00	0.00±0.00	1.14±0.15	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.24±0.00	1.00±0.13	0.00±0.00	5.64±0.75	aromatic acids
2,4-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	2.06±0.30	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.53±0.08	0.00±0.00	aromatic acids
tridecanoic acid	0.14±0.03	4.92±0.51	0.26±0.05	8.14±0.85	0.21±0.04	6.28±0.65	0.00±0.00	0.07±0.01	0.19±0.04	2.45±0.25	0.00±0.00	3.08±0.32	monocarboxylic acids
isophthalic acid	0.00±0.00	0.40±0.04	0.00±0.00	0.48±0.05	0.00±0.00	0.64±0.06	0.00±0.00	0.05±0.00	0.00±0.00	1.13±0.11	1.54±0.18	0.81±0.08	aromatic acids
vanillic acid	2.67±0.31	29.50±3.04	3.45±0.40	10.50±1.08	1.63±0.19	21.40±2.21	0.05±0.01	0.56±0.06	2.97±0.35	15.62±1.61	3.91±0.46	31.35±3.23	methoxyphenol derivatives
homovanillic acid	0.05±0.00	2.31±0.49	0.00±0.00	2.86±0.60	0.00±0.00	5.91±1.25	0.00±0.00	0.07±0.02	0.00±0.00	5.46±1.15	0.00±0.00	2.08±0.44	methoxyphenol derivatives
azelaic acid	0.22±0.05	10.51±1.33	0.20±0.05	17.41±2.21	0.25±0.06	31.89±4.05	0.01±0.00	0.30±0.04	0.09±0.02	5.06±0.64	0.00±0.00	0.09±0.01	dicarboxylic acids
myristoleic acid	0.00±0.00	8.63±1.61	0.00±0.00	16.25±3.02	0.00±0.00	14.57±2.71	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.83±0.34	monocarboxylic acids
myristic acid	0.00±0.00	21.17±3.34	0.00±0.00	41.52±6.56	0.00±0.00	49.81±7.87	0.00±0.00	0.66±0.10	0.28±0.03	13.29±2.10	0.08±0.01	11.01±1.74	monocarboxylic acids
sebacic acid	0.24±0.00	1.93±0.34	0.00±0.00	3.11±0.55	0.00±0.00	5.91±1.05	0.00±0.00	0.07±0.01	0.00±0.00	1.96±0.35	0.00±0.00	0.08±0.01	dicarboxylic acids
syringic acid	0.00±0.00	6.68±1.07	0.07±0.00	16.61±2.67	0.00±0.00	37.86±6.08	0.00±0.00	0.70±0.11	0.13±0.00	37.54±6.03	0.11±0.00	20.03±3.22	methoxyphenol derivatives
pentadecanoic acid	0.21±0.04	18.91±2.73	0.08±0.02	17.55±2.53	0.00±0.00	24.34±3.51	0.00±0.00	0.25±0.04	0.72±0.15	9.75±1.41	0.16±0.03	5.98±0.86	monocarboxylic acids
undecanedioic acid	0.18±0.00	0.87±0.11	0.22±0.00	2.41±0.29	0.00±0.00	3.34±0.41	0.00±0.00	0.06±0.01	0.00±0.00	0.57±0.07	0.00±0.00	0.00±0.00	dicarboxylic acids
palmitoleic acid	0.00±0.00	5.27±0.59	0.00±0.00	30.01±3.33	0.00±0.00	35.41±3.93	0.00±0.00	0.28±0.03	0.43±0.00	2.32±0.26	0.00±0.00	2.21±0.25	monocarboxylic acids
palmitic acid	0.00±0.00	55.72±6.65	0.00±0.00	12.82±1.53	0.00±0.00	45.96±5.48	0.00±0.00	1.83±0.22	0.00±0.00	51.77±6.18	0.00±0.00	20.38±2.43	monocarboxylic acids
isostearic acid	0.00±0.00	1.06±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.93±0.00	0.00±0.00	0.11±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	monocarboxylic acids
dodecanedioic acid	0.00±0.00	0.67±0.00	0.00±0.00	1.02±0.00	0.00±0.00	1.69±0.00	0.00±0.00	0.00±0.00	0.02±0.00	0.20±0.00	0.00±0.00	0.00±0.00	dicarboxylic acids
traumatic acid	0.03±0.00	9.90±1.15	0.00±0.00	10.24±1.19	0.00±0.00	14.25±1.65	0.00±0.00	0.18±0.02	0.96±0.14	6.36±0.74	0.07±0.01	4.80±0.56	monocarboxylic acids
heptadecanoic acid	0.00±0.00	12.84±1.58	0.00±0.00	13.32±1.64	0.00±0.00	18.68±2.30	0.00±0.00	0.22±0.03	0.81±0.00	8.20±1.01	0.00±0.00	4.55±0.56	monocarboxylic acids
1,11-undecanedicarboxylic acid	0.23±0.00	1.21±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.65±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	dicarboxylic acids
oleic acid	0.28±0.00	51.85±6.54	0.00±0.00	9.28±1.17	0.00±0.00	21.39±2.70	0.00±0.00	0.53±0.07	1.41±0.00	26.67±3.37	0.38±0.00	6.75±0.85	monocarboxylic acids
elaidic acid	0.00±0.00	40.05±4.08	0.23±0.03	9.08±0.92	0.00±0.00	19.62±2.00	0.03±0.00	0.11±0.01	1.39±0.17	16.67±1.70	1.01±0.13	2.96±0.30	monocarboxylic acids
stearic acid	0.00±0.00	40.84±6.62	0.00±0.00	8.49±1.38	0.00±0.00	30.17±4.89	0.00±0.00	1.16±0.19	0.00±0.00	18.68±3.03	0.00±0.00	13.26±2.15	monocarboxylic acids
1,12-dodecanedicarboxylic acid	0.00±0.00	0.88±0.11	0.00±0.00	0.00±0.00	0.01±0.00	0.91±0.11	0.00±0.00	0.00±0.00	0.04±0.00	0.20±0.02	0.00±0.00	0.00±0.00	dicarboxylic acids
8,15-pimaradien-18-oic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.05±0.01	0.22±0.00	0.14±0.03	0.00±0.00	0.37±0.07	rasin acids
pimaric acid	0.00±0.00	4.15±0.60	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	rasin acids
nonadecanoic acid	0.00±0.00	19.16±1.85	0.00±0.00	25.76±2.49	0.00±0.00	15.84±1.53	0.00±0.00	0.31±0.03	1.99±0.00	1.17±0.11	1.70±0.00	4.59±0.44	monocarboxylic acids
sandaracopimaric acid	0.00±0.00	1.77±0.23	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.87±0.11	0.00±0.00	0.15±0.02	rasin acids
isopimaric acid	0.00±0.00	4.34±0.77	0.00±0.00	1.70±0.30	0.00±0.00	2.07±0.37	0.00±0.00	0.04±0.01	0.00±0.00	0.29±0.05	0.00±0.00	0.00±0.00	rasin acids
dehydroabietic acid	0.29±0.08	91.86±13.71	0.09±0.02	48.53±7.25	0.00±0.00	72.54±10.83	0.00±0.00	1.05±0.16	1.22±0.32	0.93±0.14	0.34±0.09	3.11±0.46	rasin acids
abietic acid	0.00±0.00	12.87±1.88	0.00±0.00	4.22±0.62	0.00±0.00	5.72±0.83	0.00±0.00	0.28±0.04	0.19±0.00	0.00±0.00	0.00±0.00	0.18±0.03	rasin acids
eicosanoic acid	0.00±0.00	17.86±2.17	0.22±0.00	11.06±1.34	0.00±0.00	46.98±5.71	0.00±0.00	1.27±0.15	0.88±0.00	6.81±0.83	0.00±0.00	7.10±0.86	monocarboxylic acids
heneicosanoic acid	0.00±0.00	15.32±1.50	0.00±0.00	16.07±1.57	0.00±0.00	18.89±1.85	0.13±0.02	0.31±0.03	0.19±0.03	4.80±0.47	0.16±0.02	4.22±0.41	monocarboxylic acids
7-oxodehydroabietic acid	0.19±0.00	2.24±0.22	0.00±0.00	4.64±0.45	0.00±0.00	8.17±0.79	0.00±0.00	0.00±0.00	0.12±0.00	0.00±0.00	0.08±0.00	0.58±0.06	rasin acids
docosanoic acid	0.00±0.00	35.59±3.46	0.00±0.00	10.10±0.98	0.00±0.00	19.94±1.94	0.00±0.00	2.22±0.22	0.00±0.00	21.15±2.06	0.00±0.00	10.89±1.06	monocarboxylic acids
tricosanoic acid	0.00±0.00	28.44±2.86	0.00±0.00	12.57±1.27	0.00±0.00	26.73±2.69	0.11±0.03	0.60±0.06	0.00±0.00	11.38±1.15	0.00±0.00	6.92±0.70	monocarboxylic acids
tetracosanoic acid	0.00±0.00	40.35±4.90	0.00±0.00	16.71±2.03	0.00±0.00	19.78±2.40	0.00±0.00	3.82±0.46	0.00±0.00	34.26±4.16	0.00±0.00	42.02±5.11	monocarboxylic acids
cholesterol	0.80±0.00	0.00±0.00	0.46±0.00	0.00±0.00	0.76±0.00	0.00±0.00	0.11±0.00	0.00±0.00	0.53±0.00	1.22±0.00	0.81±0.00	2.10±0.00	sterols
b-sitosterol	0.00±0.00	36.84±8.28	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.18±0.00	0.33±0.00	0.08±0.00	5.18±0.00	0.59±0.00	1.45±0.00	sterols

*Levoglucosan was analysed by IC-PAD method. See section 2.5 of main manuscript for details

Table S2a: Aged-to-fresh ratio of methoxyphenol derivatives

Methoxyphenol derivatives						
Compound name	Alaskan peat	Moscow peat	Pskov peat	Eucalyptus	Malaysian peat	Malaysian agro peat
guaiacol	1.15 ± 0.11	0.42 ± 0.04	0.04 ± 0.00	0.00 ± 0.00	0.05 ± 0.00	0.85 ± 0.08
4-me-guaiacol	0.00 ± 0.00	0.06 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.33 ± 0.03	1.22 ± 0.12
4-ethyl-guaiacol	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
syringol	0.00 ± 0.00	0.08 ± 0.01	0.00 ± 0.00	1.68 ± 0.22	0.28 ± 0.04	0.09 ± 0.01
4-allyl-guaiacol (eugenol)	0.00 ± 0.00	0.01 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.05 ± 0.01	0.09 ± 0.01
4-methyl-syringol	0.00 ± 0.00	0.10 ± 0.01	0.09 ± 0.01	0.26 ± 0.03	0.07 ± 0.01	0.05 ± 0.01
4-formyl-guaiacol (vanillin)	2.03 ± 0.23	0.69 ± 0.08	0.44 ± 0.05	0.31 ± 0.04	0.87 ± 0.10	2.29 ± 0.26
isoeugenol	0.35 ± 0.05	0.07 ± 0.01	0.09 ± 0.01	0.00 ± 0.00	0.19 ± 0.02	2.22 ± 0.29
acetovanillone	3.14 ± 0.36	0.30 ± 0.03	0.21 ± 0.02	0.65 ± 0.07	0.39 ± 0.04	1.15 ± 0.13
syringaldehyde	1.01 ± 0.11	0.38 ± 0.04	0.73 ± 0.08	0.20 ± 0.02	0.25 ± 0.03	0.31 ± 0.03
vanillic acid	0.74 ± 0.08	0.93 ± 0.10	1.30 ± 0.13	0.34 ± 0.03	0.97 ± 0.10	0.67 ± 0.07
homovanillic acid	0.62 ± 0.13	0.50 ± 0.11	0.53 ± 0.11	0.09 ± 0.02	0.56 ± 0.12	0.26 ± 0.06
syringic acid	0.67 ± 0.11	0.74 ± 0.12	0.57 ± 0.09	0.10 ± 0.02	0.74 ± 0.12	0.41 ± 0.07

Table S2b: Aged-to-fresh ratio of dicarboxylic acids

Dicarboxylic acids						
Compound name	Alaskan peat	Moscow peat	Pskov peat	Eucalyptus	Malaysian peat	Malaysian agro peat
me-malonic (d-c3)	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	247.42±42.06	0.43±0.07
maleic acid	33.57±4.71	11.60±1.63	19.64±2.75	8.17±1.15	59.45±8.33	0.00±0.00
succinic acid (d-c4)	18.28±2.22	5.07±0.62	7.27±0.89	6.06±0.74	8.38±1.02	0.00±0.00
me-succinic acid (d-c4)	2.32±0.25	10.45±1.13	2.09±0.23	1.59±0.17	2.80±0.30	3.36±0.36
glutaric acid (d-c5)	7.21±0.99	2.32±0.32	1.19±0.16	2.40±0.33	6.44±0.89	24.27±3.35
2-methylglutaric (d-c5)	2.46±0.00	1.97±0.00	1.14±0.00	0.00±0.00	4.84±0.00	2.04±0.00
3-methylglutaric acid (d-c5)	0.00±0.00	8.17±0.00	0.00±0.00	0.00±0.00	2.23±0.00	0.00±0.00
hexanedioic (adipic) acid (d-c6)	1.54±0.20	3.20±0.42	14.64±1.94	2.78±0.37	2.06±0.27	3.49±0.46
cis-pinonic acid	0.00±0.00	0.47±0.00	0.73±0.00	0.00±0.00	0.00±0.00	1.04±0.00
3-methyladipic acid (d-c6)	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	1.66±0.37	0.00±0.00
heptanedioic (pimelic) acid (d-c7)	3.21±0.60	2.81±0.52	2.04±0.38	0.00±0.00	2.88±0.54	0.00±0.00
suberic acid (d-c8)	2.33±0.26	2.14±0.23	2.75±0.30	2.20±0.24	2.44±0.27	0.55±0.06
azelaic acid (d-c9)	3.16±0.41	1.11±0.14	1.26±0.16	1.37±0.18	3.11±0.40	43.95±5.63
sebacic acid (d-c10)	3.41±0.61	2.71±0.48	1.97±0.35	1.90±0.34	3.22±0.58	27.23±4.86
undecanedioic acid (d-c11)	5.42±0.66	2.46±0.30	2.53±0.31	0.81±0.10	6.45±0.79	0.00±0.00
dodecanedioic acid (d-c12)	4.02±0.00	3.75±0.00	2.09±0.00	0.00±0.00	5.93±0.00	0.00±0.00
1,11-undecanedicarboxylic acid	2.87±0.00	0.00±0.00	2.60±0.00	0.00±0.00	0.00±0.00	0.00±0.00
1,12-dodecanedicarboxylic acid	3.17±0.40	0.00±0.00	2.68±0.34	0.00±0.00	5.31±0.66	0.00±0.00

Table S2c: Aged-to-fresh ratio of monocarboxylic acids

Compound name	Alaskan peat	Moscow peat	Pskov peat	Eucalyptus	Malaysian peat	Malaysian agro peat
hexanoic acid (c6)	0.89±0.09	0.88±0.09	0.33±0.03	0.53±0.05	1.47±0.14	1.40±0.14
heptanoic acid (c7)	1.15±0.13	2.37±0.27	0.93±0.11	0.49±0.06	1.92±0.22	1.31±0.15
octanoic acid (c8)	0.88±0.08	0.85±0.08	0.48±0.05	0.10±0.01	1.27±0.12	0.78±0.07
nonanoic acid (c9)	1.97±0.23	0.97±0.12	0.68±0.08	0.41±0.05	2.46±0.29	0.25±0.03
decanoic acid (c10)	1.01±0.10	1.84±0.18	0.86±0.08	0.25±0.02	1.82±0.18	0.99±0.10
undecanoic acid (c11)	0.42±0.04	1.20±0.12	0.71±0.07	0.52±0.05	1.36±0.13	1.20±0.12
dodecanoic (lauric) acid (c12)	0.49±0.08	0.98±0.15	0.52±0.08	0.40±0.06	0.93±0.14	0.54±0.08
tridecanoic acid (c13)	0.89±0.11	1.28±0.16	0.88±0.11	0.63±0.08	1.45±0.18	1.18±0.15
myristoleic acid	0.00±0.00	0.09±0.02	0.00±0.00	0.00±0.00	0.00±0.00	0.20±0.04
myristic acid (c14)	0.57±0.09	0.86±0.13	0.47±0.07	0.36±0.06	0.68±0.11	0.72±0.11
pentadecanoic acid (c15)	0.67±0.10	1.14±0.17	0.62±0.09	0.47±0.07	0.78±0.11	0.96±0.14
palmitoleic acid	0.00±0.00	0.11±0.01	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
palmitic acid (c16)	0.63±0.08	1.36±0.16	1.05±0.13	0.51±0.06	0.67±0.08	0.59±0.07
isostearic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
traumatic acid	0.86±0.10	1.14±0.14	0.68±0.08	0.40±0.05	0.79±0.09	0.80±0.10
heptadecanoic acid (c17)	0.83±0.10	1.12±0.14	0.65±0.08	0.35±0.04	0.72±0.09	1.05±0.13
oleic acid	0.09±0.01	0.17±0.02	0.14±0.02	0.42±0.05	0.16±0.02	0.60±0.08
elaidic acid	0.03±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.07±0.01	0.16±0.02
stearic acid (c18)	0.63±0.10	1.20±0.19	0.73±0.12	0.50±0.08	0.82±0.13	0.81±0.13
nonadecanoic acid (c19)	0.85±0.08	0.79±0.08	0.66±0.06	0.37±0.04	1.99±0.19	1.28±0.12
eicosanoic acid (c20)	1.08±0.13	1.03±0.12	0.70±0.09	0.35±0.04	0.90±0.11	0.95±0.12
heneicosanoic acid (c21)	0.75±0.08	0.78±0.08	0.81±0.08	0.50±0.05	1.43±0.14	1.56±0.16
docosanoic acid (c22)	0.48±0.05	0.89±0.09	1.48±0.14	0.29±0.03	0.76±0.07	1.04±0.10
tricosanoic acid	0.73±0.08	0.79±0.08	0.82±0.09	0.23±0.02	0.87±0.09	1.75±0.18
tetracosanoic acid (c24)	0.53±0.06	0.19±0.02	1.24±0.15	0.26±0.03	0.61±0.07	0.73±0.09

Table S2d: Aged-to-fresh ratio of aromatic acids

Aromatic acids						
Compound name	Alaskan peat	Moscow peat	Pskov peat	Eucalyptus	Malaysian peat	Malaysian agro peat
benzoic acid	0.81±0.08	0.69±0.07	0.73±0.07	0.00±0.00	4.49±0.44	2.32±0.23
o-toluic	1.93±0.21	0.34±0.04	0.42±0.05	0.00±0.00	0.78±0.09	5.26±0.58
m-toluic	1.33±0.16	1.07±0.13	0.69±0.08	1.16±0.14	1.12±0.13	1.75±0.21
p-toluic	1.17±0.17	0.84±0.12	0.53±0.08	0.55±0.08	1.24±0.18	2.67±0.39
2,6-dimethylbenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	2.34±0.00	6.56±0.00
2,5-dimethylbenzoic acid	1.31±0.20	0.73±0.11	0.51±0.08	0.00±0.00	0.74±0.11	1.44±0.22
2,4-dimethylbenzoic acid	0.00±0.00	0.46±0.04	0.00±0.00	0.00±0.00	0.69±0.07	0.00±0.00
2,3-and 3,5-dimethylbenzoic acid	0.74±0.00	0.73±0.00	0.92±0.00	1.01±0.00	0.93±0.00	0.54±0.00
3,4-dimethylbenzoic acid	0.96±0.12	0.65±0.08	0.37±0.04	0.00±0.00	1.00±0.12	4.14±0.51
salicylic acid	1.53±0.23	1.30±0.19	0.90±0.13	1.45±0.22	1.12±0.17	1.18±0.18
2,3-dimethoxybenzoic acid	1.49±0.37	0.35±0.09	0.68±0.17	0.44±0.11	1.91±0.48	1.62±0.41
2,6-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.10±0.00
2,5-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
phthalic acid	10.48±1.83	0.00±0.00	0.00±0.00	0.00±0.00	6.68±1.17	0.00±0.00
3,5-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.71±0.13	0.33±0.06
3,4-dimethoxybenzoic acid	2.23±0.30	0.67±0.09	0.00±0.00	0.00±0.00	0.72±0.10	0.31±0.04
2,4-dimethoxybenzoic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
isophthalic acid	2.46±0.27	1.67±0.18	1.58±0.17	1.64±0.18	6.57±0.71	5.32±0.58

Table S2e: Aged-to-fresh ratio of resin acids and levoglucosan

Resin acids & Levoglogosan						
Compound name	Alaskan peat	Moscow peat	Pskov peat	Eucalyptus	Malaysian peat	Malaysian agro peat
8,15-pimaradien-18-oic acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
pimaric acid	0.46±0.07	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
sandaracopimaric acid	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
isopimaric acid	0.36±0.06	0.37±0.07	0.00±0.00	0.00±0.00	0.78±0.14	0.00±0.00
dehydroabietic acid	0.62±0.09	0.80±0.12	0.49±0.07	0.44±0.07	1.01±0.15	0.48±0.07
abietic acid	0.08±0.01	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
7-oxodehydroabietic acid	0.88±0.09	0.51±0.05	0.58±0.06	0.00±0.00	0.99±0.10	0.00±0.00
Levoglucosan*				0.69±0.02	0.67±0.02	

*Levoglucosan data were analyzed using IC-PAD technique for two fuels

3.3.4 Aromatic Acids
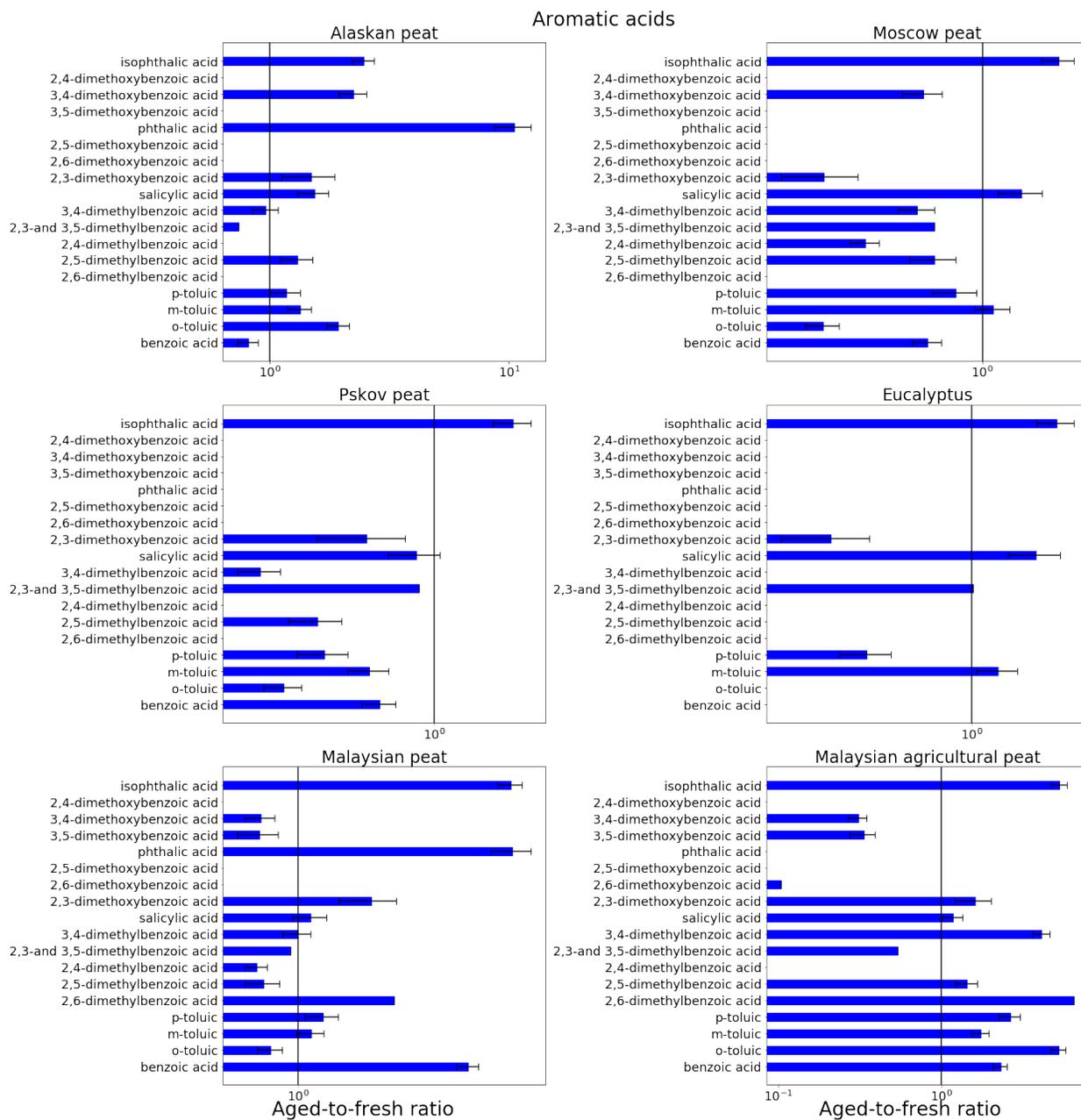
Figure S2a. Aged-to-fresh ratios of total (gas + particle) EF's for aromatic acids from biomass burning emissions for six different biomass type presented in log scale . We did not burn fuels in replicates, and SD were calculated based on replicate analysis of similar fuels (with same experimental conditions) from our previous campaigns. SD values derived from EFs were scaled to ratio.

3.3.5 Resin Acids
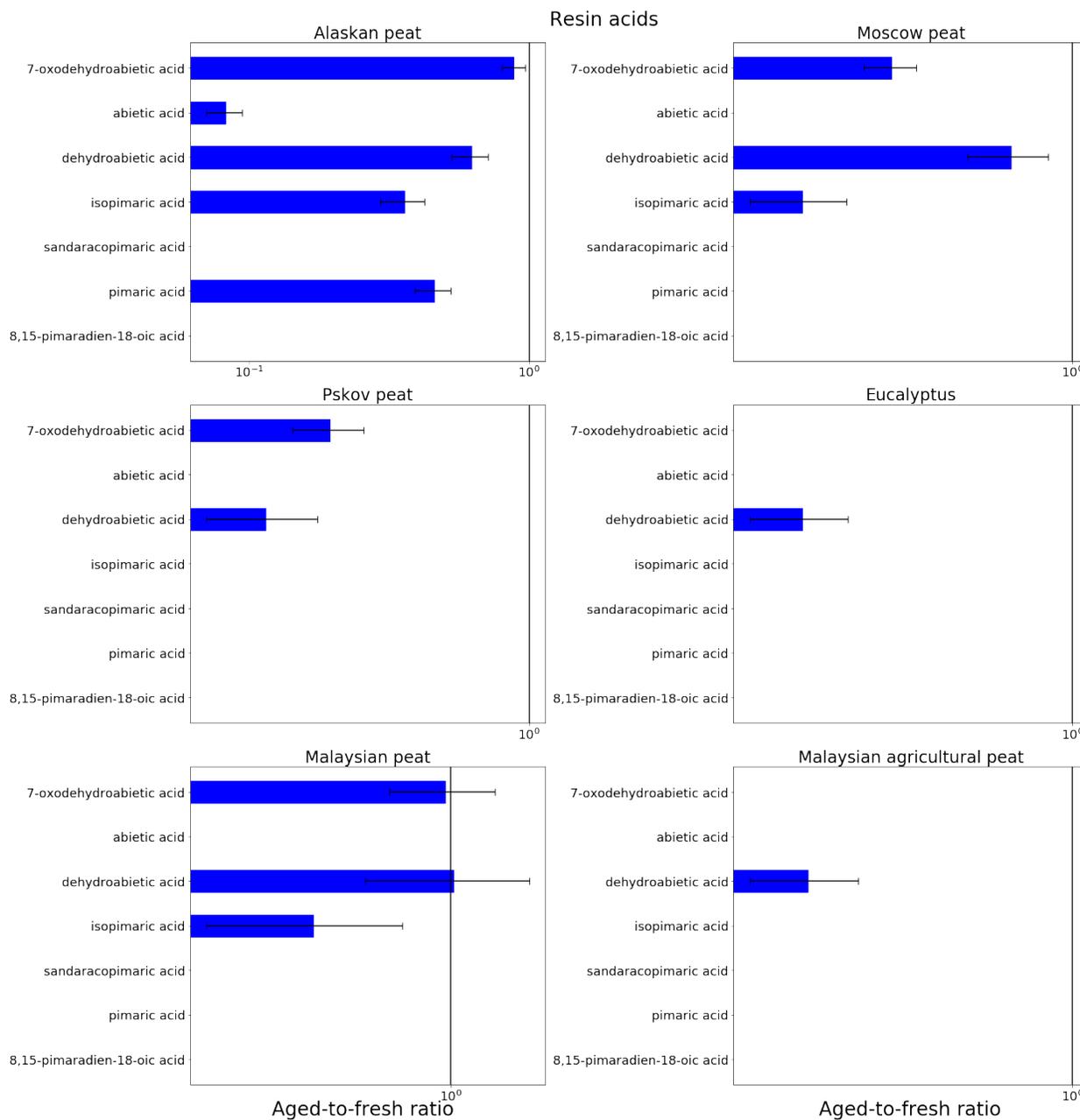
Figure S2b. Aged-to-fresh ratios of total (gas + particle) EFs for resin acids from biomass burning emissions for six different biomass type presented in log scale. We did not burn fuels in replicates, and SD were calculated based on replicate analysis of similar fuels (with same experimental conditions) from our previous campaigns. SD values derived from EFs were scaled to ratio.