Supplemental Information

Changes in PM$_{2.5}$ Peat Combustion Source Profiles with Atmospheric Aging in an Oxidation Flow Reactor

Judith C. Chow[a,b*], Junji Cao[b,c], L.-W. Antony Chen[d], Xiaoliang Wang[a], Qiyuan Wang[b,c], Jie Tian[b,c], Steven Sai Hang Ho[a,e], Tessa B. Carlson[a], Steven D. Kohl[a], John G. Watson[a,b]

[a]Division of Atmospheric Sciences, Desert Research Institute, Reno, Nevada, USA

[b]Key Laboratory of Aerosol Chemistry and Physics, Institute of Earth Environment, Chinese Academy of Sciences, Xi'an, 710061, China.

[c]CAS Center for Excellence in Quaternary Science and Global Change, Xi'an, 710061, China

[d]Department of Environmental and Occupational Health, University of Nevada, Las Vegas, Nevada, USA

[e]Hong Kong Premium Services and Research Laboratory, Hong Kong, China

[*]Corresponding Author: judith.chow@dri.edu

Table S1

Paired comparison of fresh vs. aged averaged peat combustion source profiles between 25% and 60% moisture content for Putnam County Lakebed, Florida peat

	Average ± Standard Deviation of Percent PM$_{2.5}$ Mass			
	Subtropical			
	Putnam County Lakebed, Florida			
Aging Time	2 (25%) days		2 (60%) days	
	Fresh 2	Aged 2	Fresh 2	Aged 2
Peat IDs in the average	PEAT008, PEAT009		PEAT042, PEAT043, PEAT044	
Nitric Acid (HNO$_3$)	0.18 ± 0.033	0.39 ± 0.17	0.30 ± 0.14	0.35 ± 0.12
Ammonia (NH$_3$)	28.030 ± na	4.76 ± 0.52	19.97 ± 1.22	7.64 ± 1.77
Water-Soluble Sodium (Na$^+$)	0.015 ± 0.00033	4.060 ± 5.70	0.020 ± 0.0051	0.030 ± 0.014
Water-Soluble Potassium (K$^+$)	0.010 ± 0.015	na[a]	0.019 ± 0.0074	na[a]
Chloride (Cl$^-$)	0.14 ± 0.035	0.18 ± 0.10	0.021 ± 0.035	0.10 ± 0.037
Nitrite (NO$_2^-$)	0.053 ± 0.071	0.011 ± 0.015	0.013 ± 0.023	0.0012 ± 0.0013
Nitrate (NO$_3^-$)	0.16 ± 0.12	0.87 ± 0.15	0.13 ± 0.093	0.48 ± 0.12
Sulfate (SO$_4^=$)	0.89 ± 0.97	1.60 ± 1.33	0.17 ± 0.031	0.74 ± 0.032
Ammonium (NH$_4^+$)	0.00070 ± 0.00099	0.052 ± 0.074	0.0028± 0.0012	0.39 ± 0.049
OC1 (140 °C)	9.54 ± 2.50	7.48 ± 3.12	11.93 ± 3.51	5.25 ± 0.79
OC2 (280 °C)	21.66 ± 2.045	19.50 ± 0.85	20.98 ± 0.40	15.66 ± 2.71
OC3 (480 °C)	25.30 ± 7.61	24.97 ± 0.95	29.42 ± 1.63	25.93 ± 3.050
OC4 (580 °C)	7.60 ± 4.045	7.76 ± 1.017	6.71 ± 1.35	7.61 ± 2.46
Pyrolized Carbon	7.61 ± 1.80	10.45 ± 1.14	12.90 ± 0.72	9.59 ± 2.18
Organic Carbon (OC)	71.71 ± 9.40	70.16 ± 5.033	81.94 ± 3.86	64.032 ± 7.51
EC1 (580 °C)	7.61 ± 2.43	9.58 ± 1.36	9.33 ± 0.85	8.19 ± 1.15
EC2 (740 °C)	3.51 ± 2.51	2.94 ± 2.34	6.38 ± 0.055	3.81 ± 1.010
EC3 (840 °C)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Elemental Carbon (EC)	3.51 ± 1.72	2.076 ± 0.16	2.80 ± 0.42	2.42 ± 2.43
Total Carbon (TC)	75.23 ± 11.12	72.24 ± 4.88	84.74 ± 4.26	66.45 ± 9.51
Water-Soluble OC (WSOC)	19.53 ± 4.67	22.71 ± 4.43	29.61 ± 14.67	23.75 ± 4.02
Formate (CH$_2$O$_2^-$)	0.11 ± 0.097	0.20 ± 0.13	0.13 ± 0.049	0.27 ± 0.053
Acetate (C$_2$H$_4$O$_2^-$)	0.19 ± 0.15	0.047 ± 0.011	0.57 ± 0.22	0.78 ± 0.34
Oxalate (C$_2$H$_2$O$_4^=$)	0.050 ± 0.070	0.58 ± 0.26	0.38 ± 0.091	0.73 ± 0.070
Propionate (C$_3$H$_5$O$_2^-$)	0.00 ± 0.00	0.00 ± 0.00	0.021 ± 0.019	0.021 ± 0.036
Levoglucosan (C$_6$H$_{10}$O$_5$)	3.15 ± 0.0092	2.78 ± 0.041	3.79 ± 0.42	2.45 ± 0.22
Mannosan (C$_6$H$_{10}$O$_5$)	0.00 ± 0.00	0.00 ± 0.00	0.25 ± 0.42	0.29 ± 0.50
Galactose/Maltitol (C$_6$H$_{12}$O$_6$/C$_{12}$H$_{24}$O$_{11}$)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Glycerol (C$_3$H$_8$O$_3$)	0.00 ± 0.00	0.00 ± 0.00	0.096 ± 0.11	0.00 ± 0.00
Mannitol (C$_6$H$_{14}$O$_6$)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00

Aluminum (Al)	0.026 ± 0.059	0.069 ± 0.97	0.043 ± 0.49	0.13 ± 0.16
Silicon (Si)	0.00 ± 0.00	0.021 ± 0.22	0.018 ± 0.30	0.14 ± 0.45
Phosphorous (P)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00

Table S1 (cont'd)

Sulfur (S)	0.19 ± 0.056	0.37 ± 0.24	0.13 ± 0.021	0.54 ± 0.019
Chlorine (Cl)	0.12 ± 0.0064	0.067 ± 0.024	0.18 ± 0.028	0.079 ± 0.0082
Potassium (K)	0.0092 ± 0.012	0.057 ± 0.035	0.22 ± 0.016	0.028 ± 0.0080
Calcium (Ca)	0.0040 ± 0.0056	0.00 ± 0.00	0.013 ± 0.023	0.00 ± 0.00
Scandium (Sc)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Titanium (Ti)	0.0036 ± 0.0050	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Vanadium (V)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Chromium (Cr)	0.00 ± 0.00	0.00 ± 0.00	0.0011 ± 0.0016	0.016 ± 0.023
Manganese (Mn)	0.0013 ± 0.0012	0.00033 ± 0.00047	0.0065 ± 0.0026	0.00077 ± 0.0011
Iron (Fe)	0.00 ± 0.00	0.047 ± 0.040	0.038 ± 0.012	0.13 ± 0.12
Cobalt (Co)	0.00 ± 0.00	0.00021 ± 0.00030	0.00 ± 0.00	0.00 ± 0.00
Nickel (Ni)	0.00045 ± 0.00064	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Copper (Cu)	0.00 ± 0.00	0.0035 ± 0.0049	0.036 ± 0.033	0.027 ± 0.024
Zinc (Zn)	0.0013 ± 0.0015	0.0023 ± 0.0032	0.025 ± 0.021	0.026 ± 0.026
Arsenic (As)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Selenium (Se)	0.0017 ± 0.00092	0.00 ± 0.00	0.0020 ± 0.0024	0.0033 ± 0.0047
Bromine (Br)	0.020 ± 0.00098	0.0077 ± 0.010	0.022 ± 0.0065	0.013 ± 0.0024
Rubidium (Rb)	0.00011 ± 0.00016	0.00095 ± 0.0013	0.0012 ± 0.0018	0.0019 ± 0.0026
Strontium (Sr)	0.0023 ± 0.00057	0.0038 ± 0.0013	0.0061 ± 0.0019	0.0042 ± 0.0026
Yttrium (Y)	0.0014 ± 0.00029	0.0012 ± 0.0018	0.0030 ± 0.0041	0.0029 ± 0.0017
Zirconium (Zr)	0.0016 ± 0.0023	0.0003 ± 0.00089	0.0042 ± 0.0046	0.0070 ± 0.0038
Niobium (Nb)	0.0016 ± 0.0023	0.00082 ± 0.0012	0.0013 ± 0.0015	0.0013 ± 0.0019
Molybdenum (Mo)	0.00 ± 0.00	0.00063 ± 0.00089	0.0034 ± 0.0036	0.0013 ± 0.0019
Silver (Ag)	0.0010 ± 0.0014	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Cadmium (Cd)	0.0034 ± 0.0049	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Indium (In)	0.00068 ± 0.00096	0.0025 ± 0.0036	0.0025 ± 0.0024	0.0038 ± 0.0054
Tin (Sn)	0.0037 ± 0.00047	0.0034 ± 0.0048	0.00049 ± 0.00085	0.0066 ± 0.0093
Antimony (Sb)	0.00 ± 0.00	0.0072 ± 0.010	0.0031 ± 0.0053	0.010 ± 0.014
Cesium (Cs)	0.00 ± 0.00	0.00 ± 0.00	0.018 ± 0.029	0.0086 ± 0.012
Barium (Ba)	0.00 ± 0.00	0.00 ± 0.00	0.013 ± 0.022	0.00 ± 0.00
Lanthanum (La)	0.042 ± 0.044	0.0053 ± 0.0075	0.045 ± 0.039	0.010 ± 0.014
Wolfram (W)	0.0037 ± 0.0018	0.0034 ± 0.0049	0.00010 ± 0.00018	0.0053 ± 0.0075
Gold (Au)	0.00062 ± 0.00088	0.00 ± 0.00	0.0016 ± 0.0015	0.00 ± 0.00
Mercury (Hg)	0.00020 ± 0.00028	0.0014 ± 0.0020	0.00 ± 0.00	0.00 ± 0.00
Lead (Pb)	0.0015 ± 0.0021	0.0014 ± 0.000962	0.0038 ± 0.0063	0.0033 ± 0.00

| Uranium (U) | 0.0034 ± 0.0044 | 0.00 ± 0.00 | 0.0023 ± 0.0040 | 0.0036 ± 0.0051 |

[a]Water-soluble K^+ data were contaminated due to the use of potassium iodide denuder downstream of the oxidation flow reactor

Table S2

Unpaired fresh or aged peat source profiles

	Average ± Standard Deviation of Percent PM$_{2.5}$ Mass				
Peat Location	Pskov, Siberia	Northern Alaska, USA	Putnam County Lakebed, Florida, USA	Borneo, Malaysia	Borneo, Malaysia
Aging Time	Fresh 2	Fresh 7	Aged 7	Fresh 2	Fresh 7
Peat ID	PEAT024	PEAT021	PEAT004	PEAT037	PEAT040- F7
Nitric Acid (HNO$_3$)	0.25 ± 0.00026	0.22 ± 0.00019	0.39 ± 0.00019	0.21 ± 0.00019	0.28 ± 0.00018
Ammonia (NH$_3$)	20.50 ± 0.0071	8.86 ± 0.0028	1.84 ± 0.00055	25.088 ± 0.0080	22.63 ± 0.0069
Water-Soluble Sodium (Na$^+$)	0.025 ± 0.00083	0.032 ± 0.00060	0.046 ± 0.00037	0.013 ± 0.00060	0.012 ± 0.00048
Water-Soluble Potassium (K$^+$)	0.051 ± 0.000083	0.035 ± 0.000059	na[a]	0.027 ± 0.000056	0.036 ± 0.000051
Chloride (Cl$^-$)	0.16 ± 0.00024	0.21 ± 0.00019	0.10 ± 0.00011	0.10 ± 0.00017	0.12 ± 0.00014
Nitrite (NO$_2^-$)	0.00 ± 0.00040	0.00 ± 0.00029	0.0011 ± 0.00018	0.00 ± 0.00029	0.0055 ± 0.00023
Nitrate (NO$_3^-$)	0.087 ± 0.00048	0.097 ± 0.00035	2.038 ± 0.00099	0.080 ± 0.00034	0.075 ± 0.00028
Sulfate (SO$_4^=$)	0.63 ± 0.00044	0.19 ± 0.00014	1.78 ± 0.0012	0.25 ± 0.00018	0.17 ± 0.00012
Ammonium (NH$_4^+$)	0.0024 ± 0.00012	0.0017 ± 0.000086	1.60 ± 0.0012	0.0017 ± 0.000086	0.0021 ± 0.000069
OC1 (140°C)	11.36 ± 0.028	15.22 ± 0.038	8.61 ± 0.021	11.26 ± 0.028	12.92 ± 0.032
OC2 (280°C)	20.84 ± 0.013	15.56 ± 0.0094	21.65 ± 0.012	24.48 ± 0.014	24.47 ± 0.014
OC3 (480°C)	28.60 ± 0.022	24.19 ± 0.018	27.92 ± 0.021	29.83 ± 0.022	27.041 ± 0.020
OC4 (590°C)	9.29 ± 0.0083	4.27 ± 0.0038	6.75 ± 0.0059	9.17 ± 0.0081	8.090 ± 0.0071
Pyrolized Carbon	13.04 ± 0.021	12.18 ± 0.019	11.58 ± 0.018	9.71 ± 0.015	8.90 ± 0.014
Organic Carbon (OC)	83.13 ± 0.046	71.42 ± 0.038	76.52 ± 0.040	84.45 ± 0.045	81.41 ± 0.043
EC1 (580°C)	6.47 ± 0.014	7.043 ± 0.016	12.061 ± 0.026	7.11 ± 0.016	6.14 ± 0.014
EC2 (740°C)	6.95 ± 0.0077	5.13 ± 0.0056	2.15 ± 0.0024	4.17 ± 0.0046	4.88 ± 0.0053
EC3 (840°C)	0.00 ± 0.00028	0.00 ± 0.00021	0.00 ± 0.00013	0.00 ± 0.00020	0.00 ± 0.00016
Elemental Carbon (EC)	0.38 ± 0.0017	0.00 ± 0.0011	2.63 ± 0.0038	1.56 ± 0.0025	2.12 ± 0.0031
Total Carbon (TC)	83.51 ± 0.044	71.42 ± 0.036	79.15 ± 0.039	86.012 ± 0.043	83.54 ± 0.041
Water-Soluble OC	28.17 ± 0.038	31.49 ± 0.042	26.04 ± 0.035	17.14 ± 0.023	15.90 ± 0.021
Formate (CH$_2$O$_2^-$)	0.047 ± 0.000069	0.074 ± 0.00011	0.19 ± 0.00028	0.14 ± 0.00021	0.11 ± 0.00016
Acetate (C$_2$H$_4$O$_2^-$)	0.28 ± 0.00034	0.41 ± 0.00049	0.25 ± 0.00030	0.47 ± 0.00057	0.32 ± 0.00039
Oxalate (C$_2$H$_2$O$_4^=$)	0.00 ± 0.00	0.00 ± 0.00	1.45 ± 0.0022	0.27 ± 0.00041	0.33 ± 0.00049
Propionate (C$_3$H$_5$O$_2^-$)	0.050 ± 0.00020	0.00 ± 0.00014	0.00 ± 0.000088	0.00 ± 0.00014	0.020 ± 0.00011
Levoglucosan (C$_6$H$_{10}$O$_5$)	6.17 ± 0.015	11.82 ± 0.029	2.40 ± 0.0059	4.084 ± 0.010	5.66 ± 0.014
Mannosan (C$_6$H$_{10}$O$_5$)	0.00 ± 0.00043	5.32 ± 0.016	0.00 ± 0.00019	0.00 ± 0.00031	1.27 ± 0.0081
Galactose/Maltitol (C$_6$H$_{12}$O$_6$/C$_{12}$H$_{24}$O$_{11}$)	0.00 ± 0.00022	0.00 ± 0.00016	0.00 ± 0.000099	0.00 ± 0.00016	0.00 ± 0.00013
Glycerol (C$_3$H$_8$O$_3$)	0.00 ± 0.0000040	0.00 ± 0.0000029	0.00 ± 0.0000018	0.00 ± 0.0000029	0.00 ± 0.0000023
Mannitol (C$_6$H$_{14}$O$_6$)	0.00 ± 0.000079	0.00 ± 0.000057	0.00 ± 0.000035	0.00 ± 0.000057	0.00 ± 0.000046

Aluminum (Al)	0.00 ± 0.052	0.053 ± 0.038	na[b]	0.074 ± 0.038	0.016 ± 0.030
Silicon (Si)	0.00 ± 0.0061	0.043 ± 0.0045	na[b]	0.0071 ± 0.0045	0.0023 ± 0.0036
Phosphorous (P)	0.00 ± 0.00012	0.00 ± 0.000089	na[b]	0.00 ± 0.000088	0.00 ± 0.000071

Table S2 (cont'd)

Sulfur (S)	0.00 ± 0.000065	0.094 ± 0.000058	na[b]	0.097 ± 0.000058	0.091 ± 0.000048
Chlorine (Cl)	0.12 ± 0.000064	0.15 ± 0.000060	na[b]	0.082 ± 0.000043	0.12 ± 0.000046
Potassium (K)	0.047 ± 0.00017	0.11 ± 0.00013	na[b]	0.026 ± 0.00013	0.027 ± 0.00010
Calcium (Ca)	0.00 ± 0.00065	0.010 ± 0.00047	na[b]	0.00 ± 0.00046	0.00 ± 0.00037
Scandium (Sc)	0.00 ± 0.0029	0.00 ± 0.0021	na[b]	0.00 ± 0.0021	0.00 ± 0.0017
Titanium (Ti)	0.00 ± 0.00010	0.030 ± 0.000075	na[b]	0.016 ± 0.000074	0.013 ± 0.000060
Vanadium (V)	0.00 ± 0.000019	0.00 ± 0.000014	na[b]	0.00 ± 0.000014	0.00 ± 0.000011
Chromium (Cr)	0.00 ± 0.000065	0.025 ± 0.000047	na[b]	0.00 ± 0.000046	0.00 ± 0.000037
Manganese (Mn)	0.00 ± 0.00023	0.015 ± 0.00016	na[b]	0.012 ± 0.00016	0.0083 ± 0.00013
Iron (Fe)	0.00 ± 0.00039	0.24 ± 0.00030	na[b]	0.041 ± 0.00028	0.014 ± 0.00023
Cobalt (Co)	0.00 ± 0.000013	0.00 ± 0.0000093	na[b]	0.00010 ± 0.0000092	0.00 ± 0.0000074
Nickel (Ni)	0.0006 ± 0.000032	0.0070 ± 0.000023	na[b]	0.00010 ± 0.000023	0.00030 ± 0.000019
Copper (Cu)	0.00 ± 0.00020	0.0051 ± 0.00015	na[b]	0.00 ± 0.00014	0.0035 ± 0.00012
Zinc (Zn)	0.0024 ± 0.00011	0.0054 ± 0.000079	na[b]	0.0021 ± 0.000079	0.0077 ± 0.000063
Arsenic (As)	0.0031 ± 0.000051	0.00 ± 0.000037	na[b]	0.00 ± 0.000037	0.00 ± 0.000030
Selenium (Se)	0.0014 ± 0.000090	0.00 ± 0.000065	na[b]	0.00 ± 0.000065	0.00 ± 0.000052
Bromine (Br)	0.0036 ± 0.000026	0.0030 ± 0.000019	na[b]	0.013 ± 0.000019	0.0089 ± 0.000015
Rubidium (Rb)	0.00 ± 0.000032	0.00 ± 0.000023	na[b]	0.00080 ± 0.000023	0.0014 ± 0.000019
Strontium (Sr)	0.0041 ± 0.000032	0.0036 ± 0.000023	na[b]	0.0049 ± 0.000023	0.0045 ± 0.000019
Yttrium (Y)	0.00 ± 0.000032	0.0083 ± 0.000023	na[b]	0.00 ± 0.000023	0.00010 ± 0.000019
Zirconium (Zr)	0.0041 ± 0.00012	0.0020 ± 0.000089	na[b]	0.0062 ± 0.000088	0.0040 ± 0.000071
Niobium (Nb)	0.00 ± 0.000058	0.00 ± 0.000042	na[b]	0.00 ± 0.000042	0.00030 ± 0.000034
Molybdenum (Mo)	0.0027 ± 0.00012	0.00 ± 0.000089	na[b]	0.00 ± 0.000088	0.0010 ± 0.000071
Silver (Ag)	0.00 ± 0.00015	0.00 ± 0.00011	na[b]	0.00 ± 0.00011	0.00 ± 0.000089
Cadmium (Cd)	0.00 ± 0.00021	0.00 ± 0.00015	na[b]	0.00 ± 0.00015	0.00 ± 0.00012
Indium (In)	0.015 ± 0.00015	0.00 ± 0.00011	na[b]	0.00 ± 0.00011	0.0026 ± 0.000086
Tin (Sn)	0.0021 ± 0.00027	0.00 ± 0.00020	na[b]	0.018 ± 0.00019	0.011 ± 0.00016
Antimony (Sb)	0.00 ± 0.00041	0.00 ± 0.00029	na[b]	0.00 ± 0.00029	0.0061 ± 0.00023
Cesium (Cs)	0.00 ± 0.0011	0.00 ± 0.00082	na[b]	0.045 ± 0.00082	0.00 ± 0.00066
Barium (Ba)	0.00 ± 0.00085	0.00 ± 0.00062	na[b]	0.00 ± 0.00061	0.00 ± 0.00049
Lanthanum (La)	0.16 ± 0.0017	0.00 ± 0.0012	na[b]	0.00 ± 0.0012	0.00 ± 0.00097
Wolfram (W)	0.00 ± 0.00033	0.0056 ± 0.00024	na[b]	0.00 ± 0.00024	0.016 ± 0.00019
Gold (Au)	0.0011 ± 0.000097	0.00 ± 0.000070	na[b]	0.00 ± 0.000070	0.00 ± 0.000056
Mercury (Hg)	0.00 ± 0.000051	0.00 ± 0.000037	na[b]	0.00 ± 0.000037	0.00 ± 0.000030
Lead (Pb)	0.00 ± 0.000097	0.00 ± 0.000070	na[b]	0.00 ± 0.000070	0.00 ± 0.000056

| Uranium (U) | 0.017 ± 0.00017 | 0.0038 ± 0.00013 | na[b] | 0.0012 ± 0.00013 | 0.0044 ± 0.00010 | |

[a]Water-soluble K^+ data were contaminated due to the use of potassium iodide denuder downstream of the oxidation flow reactor

[b]Data not available due to the lack of elemental measurements from x-ray fluorescence analysis

Table S3

Equivalence measures[a] for paired fresh and aged source profiles for the Putnam County Lakebed and Everglades National Park, Florida peats. Highlighted *P*-values indicate statistically significant differences.

Putnam County Lakebed (FL1) vs. Everglades National Park (FL2)

Paired Comparison[b]	R/U Ratio Percent Distribution				Correlation Coefficient (r)	Student *t*-Test	df[c]	*P*-value
	< 1 σ	1 - 2 σ	2 - 3 σ	> 3 σ				
FL1 Fresh 2 vs. FL2 Fresh 2	82.26%	16.13%	0.81%	0.81%	0.996	Paired	126	0.0000
FL1 Fresh 7 vs. FL2 Fresh 7	59.20%	18.40%	16.80%	5.60%	0.998	Paired	126	0.0000
FL1 Aged 2 vs. FL2 Aged 2	92.00%	6.40%	0.80%	0.80%	0.998	Paired	126	0.0006
FL1 Aged 7 vs. FL2 Aged 7	60.32%	15.87%	17.46%	6.35%	0.994	Paired	126	0.0015

FL1 and FL2 combined

Paired Comparison[d]	R/U Ratio Percent Distribution				Correlation Coefficient (r)	Student *t*-Test	df[c]	*P*-value
	< 1 σ	1 - 2 σ	2 - 3 σ	≥ 3 σ				
All Fresh 2 vs. All Aged 2	92.86%	6.35%	0.79%	0.00%	0.992	Paired	126	0.0000
All Fresh 7 vs. All Aged 7	73.02%	23.81%	2.38%	0.79%	0.974	Paired	126	0.0002
All Fresh 2 vs. All Fresh 7	98.41%	1.59%	0.00%	0.00%	0.997	Paired	126	0.5234
All Aged 2 vs. All Aged 7	93.65%	6.35%	0.00%	0.00%	0.998	Paired	126	0.0019
All Fresh vs. All Aged	92.86%	7.14%	0.00%	0.00%	0.985	Paired	126	0.0001

[a]For the *t*-test, a cutoff probability level of 5% is selected; if *P* <0.05, there is a 95% probability that the two profiles are different. For correlations, *r* >0.8 suggests similar profiles, 0.5 < *r* < 0.8 indicates a moderate similarity, and *r* <0.5 denotes little or no similarity. The *R/U* ratio indicates the percentage of the >93 reported chemical abundances differ by more than an expected number of uncertainty intervals. The normal probability density function of 68%, 95.5%, and 99.7% for ±1σ, ±2σ, and ±3σ, respectively, is used to evaluate the *R/U* ratios. The two profiles are considered to be similar, within the uncertainties of the chemical abundances when 80% of the *R/U* ratios are within ±3σ, with *r* >0.8 and *P* >0.05. Species with *R/U* ratios >3σ are further examined as these may be markers that further allow source contributions to be distinguishes by receptor measurements. They may also reflect the sampling and analysis artifacts that are not representative of the larger population of source profiles.

[b]Includes two paired samples for 2- and 7-days of atmospheric aging.

[c]Degree of freedom

[d]"All Fresh 2" includes fresh, unaged profiles from both Putnam (FL1) and Everglades (FL2) peats for the 2-days experiment (same as "All Fresh 7" for the 7-days experiment); "All Aged 2" includes 2-day aged profiles from both Putnam (FL1) and Everglades (FL2) peats, downstream of the oxidation flow reactor for the 2-days aging experiment (same as "All Aged 7" for the 7-days aging experiment); "All Fresh" includes combined Putnam (FL1) and Everglades (FL2) Fresh 2 and Fresh 7 peats (same as "All Aged" for Aged 2 and Aged 7 peats).

Table S4

Summary of Student t-tests for fresh vs. aged peat combustion source profiles for $PM_{2.5}$ mass ($\mu g\ m^{-3}$).

Paired Comparison	n1[a]	n2[a]	Student t-Test	df[b]	P-value[c]
All Fresh vs.All Aged[d]	32	32	paired	31	0.504
Fresh2 vs. Aged2	17	17	paired	16	0.043
Fresh7 vs. Aged7	15	15	paired	14	0.041
Fresh2 vs. Fresh7	17	15	2 sample	30	0.712
Aged2 vs. Aged7	17	15	2 sample	30	0.272

[a]Includes 17 and 15 paired fresh and aged profiles for 2- and 7-days of atmospheric aging, respectively.

[b]Degree of freedom

[c]Student t-tests, a cutoff probability level of 5% is selected. The highlighted P-value denotes that $P < 0.05$ and there is a 95% probability that two profiles are different.

[d]"All Fresh" includes both Fresh 2 and Fresh 7 profiles; and "All Aged" includes both Aged 2 and Aged 7 profiles.

Table S5

Percent (%) of PM$_{2.5}$ mass explained by the sum of measured species for the six peats

Type of Peat	(Sum of Species[a]/Mass) x 100%			
	Fresh 2	Aged 2	Fresh 7	Aged 7
Odintsovo, Russia	62.2 ± 1.8	52.3 ± 6.1	63.5 ± 5.0	50.2 ± 7.7
Pskov, Siberia	79.1 ± 5.6	75.9 ± 13.4	83.7 ± 10.4	72.8 ± 13.4
Northern Alaska, USA	82.8 ± 6.5	76.7 ± 9.3	75.5 ± 21.3	63.3 ± 5.3
Putnam County Lakebed, Florida, USA	80.3 ± 17.5	79.3 ± 2.5	69.8 ± 4.7	73.4 ± 5.0
Everglades National Park, Florida, USA	89.8 ± 28.1	73.0 ± 10.1	88.4 ± 7.2	69.0 ± 4.4
Borneo, Malaysia	80.9 ± 3.6	79.5 ± 18.8	83.1 ± 1.3	70.2 ± 9.0
Average ± SD	79.2 ± 10.5	72.8 ± 10.0	77.3 ± 8.3	66.5 ± 7.5

[a]Sum of species includes 51 elements, water-soluble Na^+, NH_4^+, NO_2^-, NO_3^-, $SO_4^=$, OC, and EC. Water-soluble Cl^- and K^+ by ion chromatography are not included because of the inclusion of Cl and K measured by x-ray fluorescence, respectively, to avoid double counting.

Table S6

Equivalence measures[a] for 25 and 60% fuel moisture content source profiles for the Putnam County Lakebed, Florida peat. Highlighted *P*-values indicate statistically significant differences.

Paired Comparison[b]	Percent Distribution				Correlation Coefficient (r)	Student *t*-Test	df[c]	*P*-value
	< 1 σ	1 - 2 σ	2 - 3 σ	≥ 3 σ				
FL25 Fresh2 vs. FL60 Fresh2	73.39%	16.13%	4.03%	6.45%	0.997	Paired	126	0.00000021
FL25 Aged2 vs. FL60 Aged2	88.80%	6.40%	2.40%	2.40%	0.999	Paired	126	0.00020671
All Fresh vs. All Aged	79.37%	19.84%	0.00%	0.79%	0.998	Paired	126	0.00000243

[a]For the *t*-test, a cutoff probability level of 5% is selected; if *P* <0.05, there is a 95% probability that the two profiles are different. For correlations, *r* >0.8 suggests similar profiles, 0.5 < *r* < 0.8 indicates a moderate similarity, and *r* <0.5 denotes little or no similarity. The *R/U* ratio indicates the percentage of the >93 reported chemical abundances differ by more than an expected number of uncertainty intervals. The normal probability density function of 68%, 95.5%, and 99.7% for ±1σ, ±2σ, and ±3σ, respectively, is used to evaluate the *R/U* ratios. The two profiles are considered to be similar, within the uncertainties of the chemical abundances when 80% of the *R/U* ratios are within ±3σ, with *r* >0.8 and *P* >0.05. Species with *R/U* ratios >3σ are further examined as these may be markers that further allow source contributions to be distinguishes by receptor measurements. They may also reflect the sampling and analysis artifacts that are not representative of the larger population of source profiles.

[b]FL25 and FL60 denotes peats with 25% and 60% fuel moisture contents; "All Fresh" and "All Aged" includes both 25% and 60% fuel moisture content peats for the Fresh vs. Aged comparison with 2-day aging times.

[c]Degree of freedom
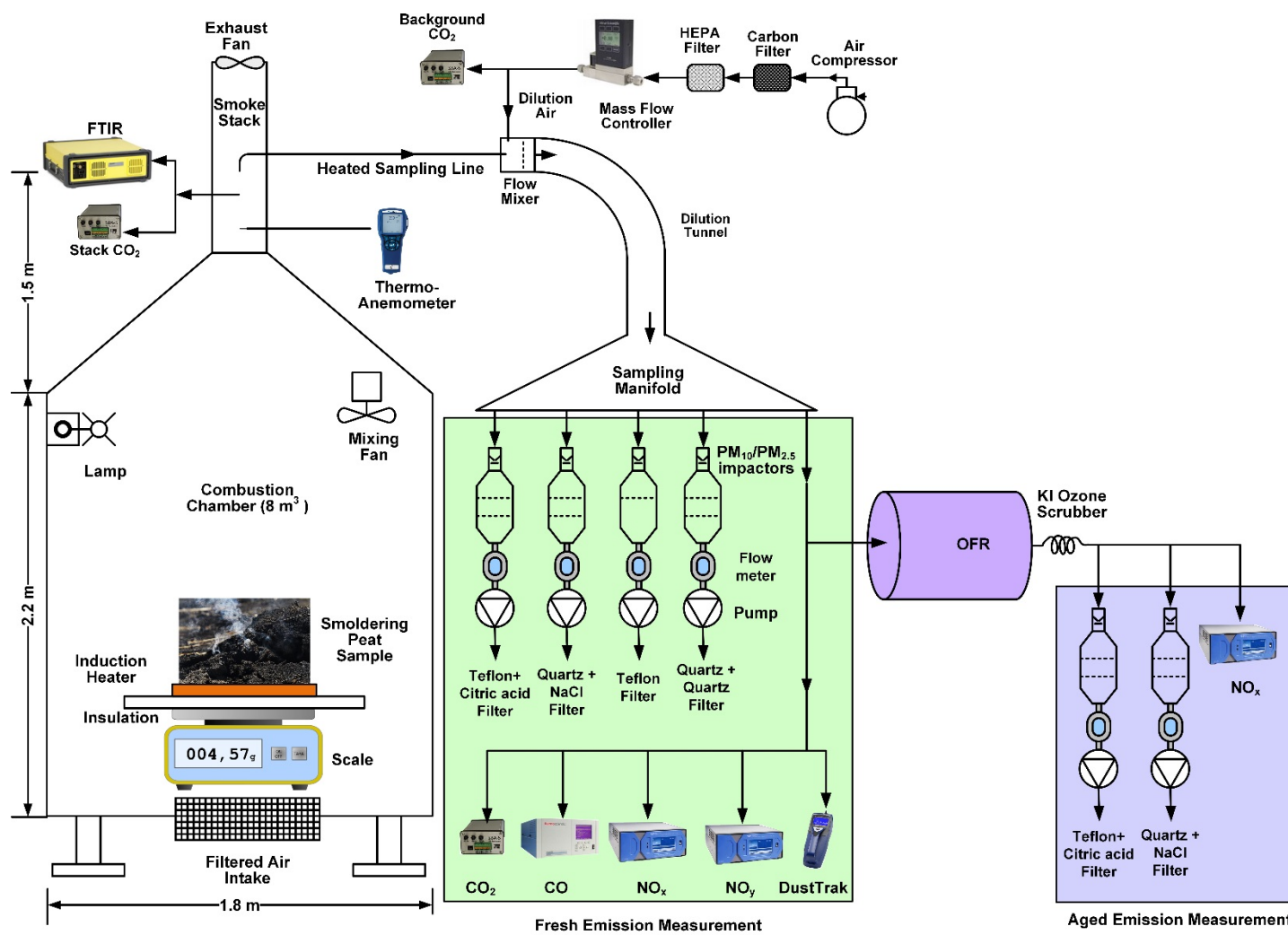
Figure S1. Configuration of peat combustion experimental set up. (FTIR: Fourier-transform infrared spectrometer; OFR: oxidation flow reactor; OFR lamps were operated at 2 and 3.5 volts to simulate aging of ~2 and 6.79 days, respectively) (Watson et al., 2019).