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Inter-comparison of laboratory smog chamber and flow reactor systems on organic aerosol yield and composition

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Table S1. Primary emission characteristics in the SC from wood combustion experiments.*

experiment	MCE	wood burned per chamber volume (g m^{-3})	CO_2 (ppm)	CO (ppm)	CH_4 (ppm)	THC (ppmC)	NO_x (ppb)	BC ($\mu g\ m^{-3}$)+	POA ($\mu g\ m^{-3}$)+	NO_3 ($\mu g\ m^{-3}$)+	SO_4 ($\mu g\ m^{-3}$)+	NH_4 ($\mu g\ m^{-3}$)+	chloride ($\mu g\ m^{-3}$)+	% of POA mass above *m /z* 100
5	0.97(0.01)	0.713(0.005)	700(5)	21.7(0.1)	1.915(0.003)	4.37(0.02)	>200	38.5(0.4)	255(9)	31(5)	1.5(0.1)	7.3(0.8)	7(1)	12.6
6	0.952(0.03)	0.319(0.007)	305(7)	15.27(0.04)	1.161(0.002)	4.08(0.02)	123.9(0.7)	19.8(0.2)	380(10)	49(2)	1.3(0.1)	13.0(0.1)	9(1)	13.2
7	0.958(0.001)	0.5087(0.0005)	492.5(0.5)	21.56(0.09)	1.540(0.001)	3.95(0.07)	169.3(0.9)	107.3(0.9)	134(5)	15.2(0.5)	0.44(0.05)	4.5(0.2)	7.6(0.3)	13.3
8	0.973(0.003)	0.701(0.001)	700(1)	19.22(0.08)	1.387(0.002)	4.12(0.02)	168(1)	44.2(0.4)	166(4)	35(1)	1.44(0.06)	8.0(0.2)	3.3(0.1)	15.8
9	0.992(0.002)	0.616(0.001)	621(1)	4.88(0.04)	0.211(0.008)	0.60(0.01)	174(2)	~350	53(1)	15.2(0.3)	0.8(0.1)	0.9(0.1)	0.47(0.05)	18.7
10	0.960(0.002)	0.7644(0.0009)	742.8(0.9)	30.71(0.08)	2.924(0.002)	5.03(0.04)	142.5(0.8)	168(6)	58(4)	4.8(0.2)	1.1(0.1)	0.55(0.09)	3.5(0.2)	20.2
11	0.929(0.003)	0.5152(0.001)	473(1)	36.2(0.1)	6.55(0.02)	14.73(0.06)	83.8(0.7)	501(20)	116(5)	6.8(0.2)	0.97(0.06)	1.6(0.1)	3.7(0.3)	53.1
12	0.890(0.002)	0.4899(0.0008)	443.6(0.8)	55.0(0.1)	10.41(0.03)	>10	50(8)	211(3)	100(20)	8(1)	1.0(0.2)	1.4(0.2)	1.7(0.3)	57.2

*Two sample standard deviations are given in parentheses.

+Reported particulate concentrations take wall losses into account.

Table S2. Aerosol yields and emission factors without accounting for particulate wall losses in the PAM.[+]

	organic aerosol yield			factor increase in yields due to wall loss correction applied to Table 1
experiment	PAM_{high}	PAM_{low}		PAM_{high}, PAM_{low}
1	0.23(0.02)	0.34(0.05)		1.42[*], 1.43[*]
2	0.24(0.02)	0.22(0.03)		1.42[*], 1.43[*]
3	0.28(0.04)	0.22(0.06)		1.42, 1.43
4	0.48(0.05)	--		1.42[*], 1.43[*]
	total organic aerosol per mass wood burned (g kg^{-1})			factor increase in yields due to wall loss correction applied to Table 1
experiment	PAM_{high}	PAM_{low}	$PAM_{direct\ sampling}$	PAM_{high}, PAM_{low}, $PAM_{direct\ sampling}$
5	1.4(0.2)	0.4(0.1)	-	1.32, 1.29
6	3.6(0.7)	1.0(0.2)	-	1.27, 1.25
7	1.9(0.3)	0.418(0.007)	0.61	1.29, 1.28, 1.29
8	1.1(0.3)	0.61(0.08)	-	1.33, 1.31
9	0.201(0.005)	0.106(0.004)	0.12	1.31[*], 1.30[*], 1.31[*]
10	0.65(0.05)	0.28(0.06)	-	1.31[*], 1.30[*]
11	4.1(0.5)	0.7(0.1)	-	1.31, 1.32
12	2.49(0.07)	0.62(0.03)	-	1.31[*], 1.30[*]

[+]All measurements when sampling from the SC. Two sample standard deviations are given in parentheses. Yields and emission factors correspond to OH exposures given in Table 1.

[*]AMS size distributions not available; value is average of other experiments from same system.

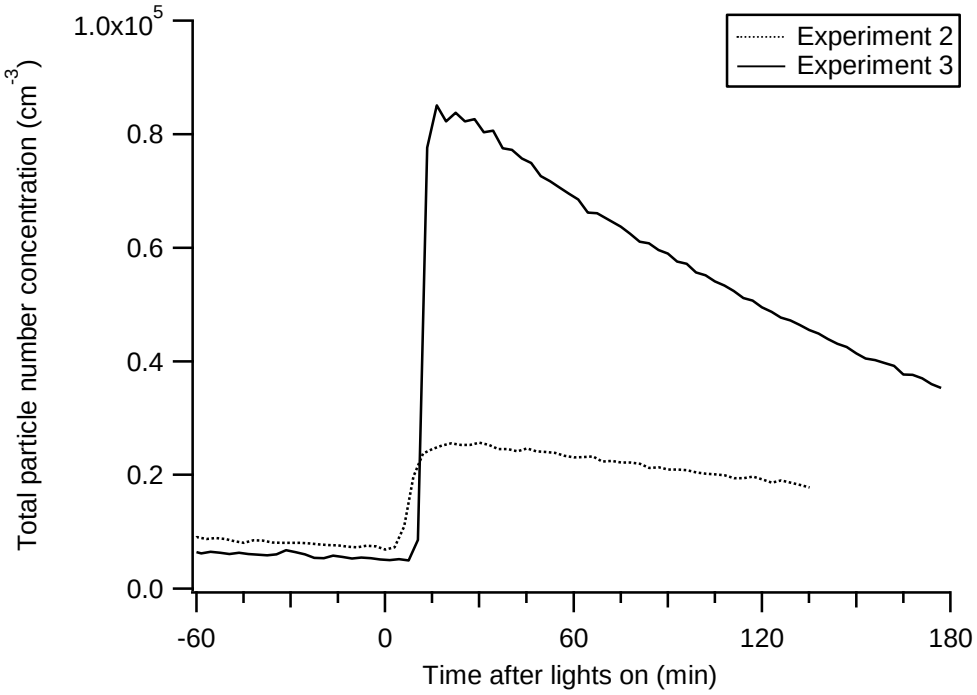

Figure S1. Temporal evolution of particle number concentration in the SC during α-pinene photo-oxidation. Wall losses have not been taken into account.

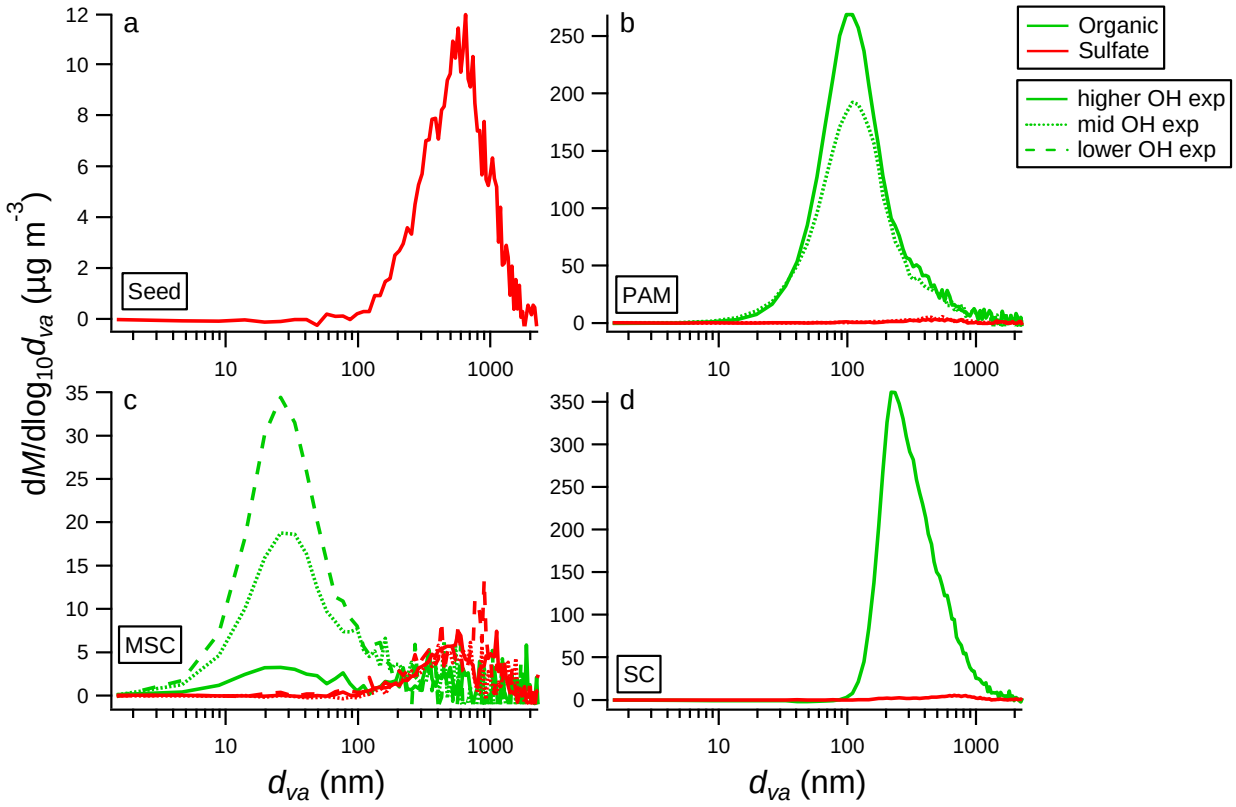

Figure S2. Organic and sulfate mass based size distributions from experiment 3 measured using AMS of (a) $(NH_4)HSO_4$ seed in the SC prior to oxidation, (b) particle distribution in the PAM after exposure to either 2.75×10^8 or 1.09×10^8 OH molec cm^{-3} h, (c) particle distribution in the MSC after exposure to 4.56×10^8, 3.88×10^8 or 2.54×10^8 OH molec cm^{-3} h and (d) particle distribution in the SC after exposure to 1.0×10^8 OH molec cm^{-3} h. Initial α-pinene mixing ratio was 200 ppb. Wall losses have not been taken into account.

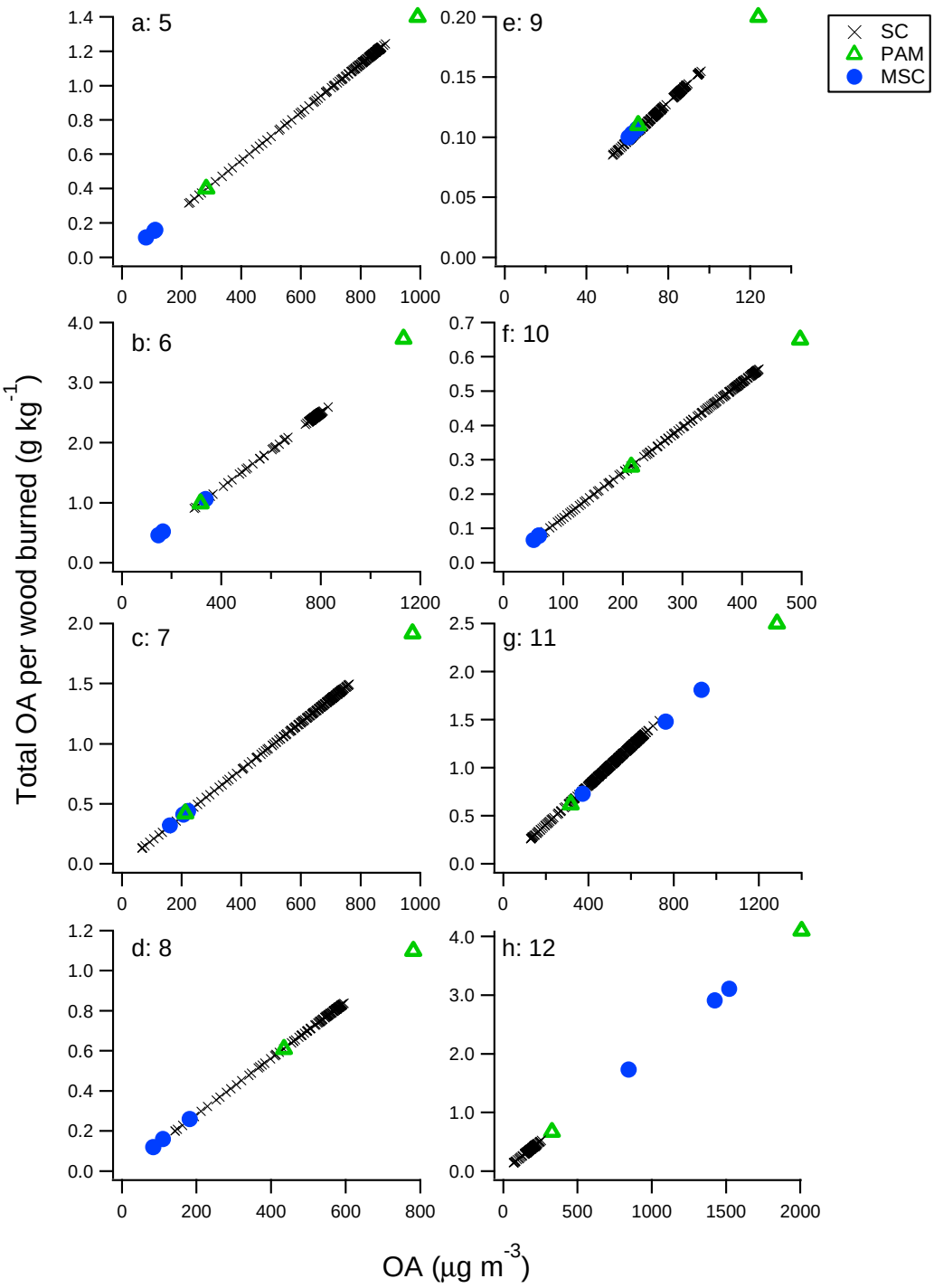

Figure S3. Total organic aerosol per mass wood burned as a function of organic aerosol loading for the SC, PAM and MSC for each wood combustion experiment (a-h; experiments 5-12, respectively).

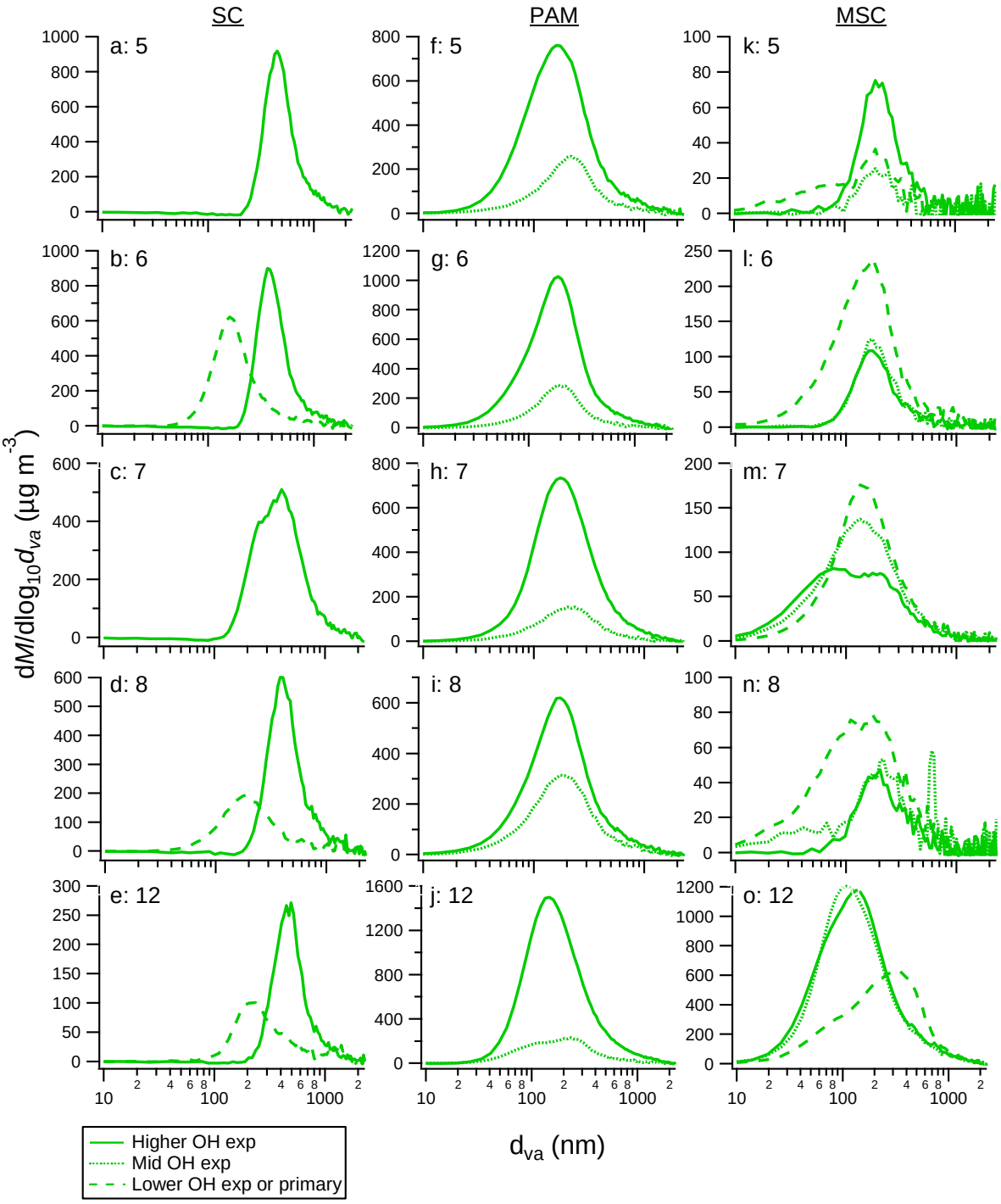

Figure S4. Organic mass size distributions from wood combustion experiments measured using AMS of (a-e) particle distributions in the SC before and after aging, (f-j) particle distribution in the PAM and (k-o) particle distribution in the MSC after aging for experiments 5-8 and 12, respectively. Exposures to OH are given in Table 1. Wall losses have not been taken into account.

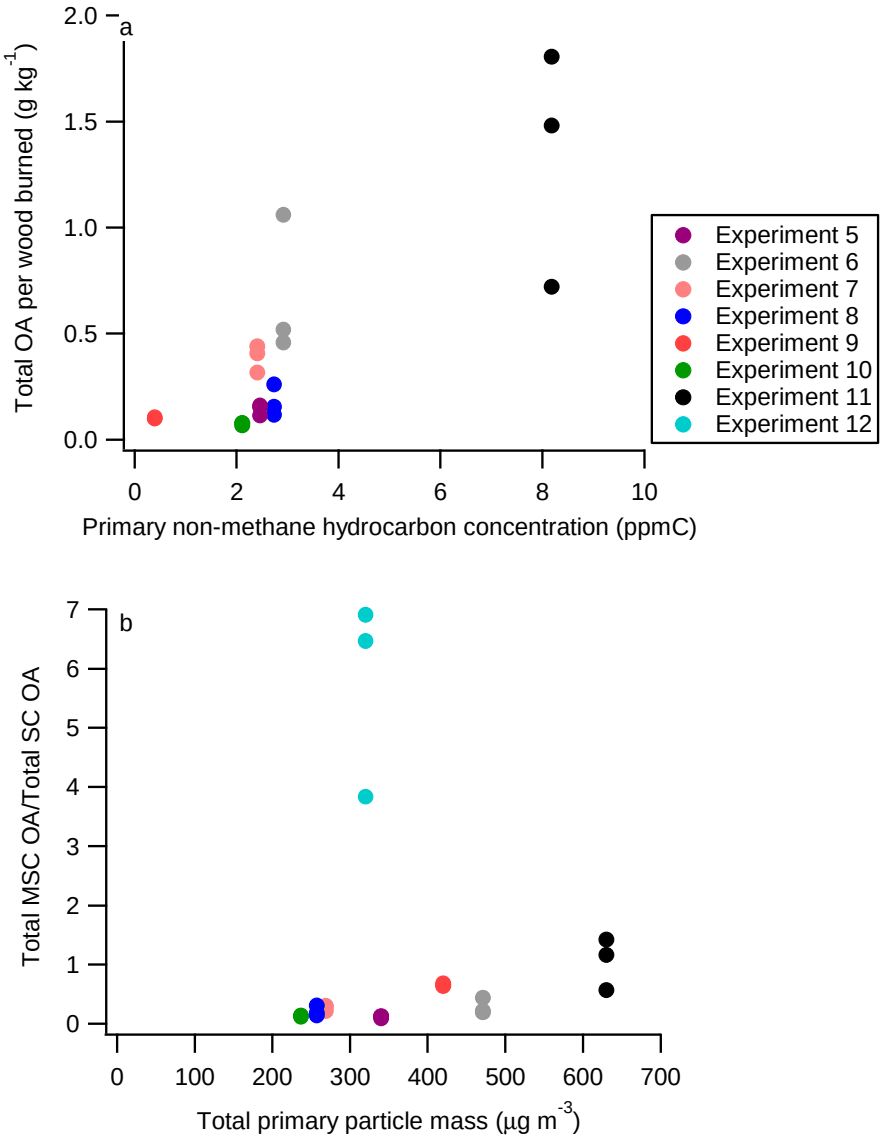

Figure S5. (a) Total OA emission factors determined in the MSC as a function of starting gas-phase non-methane hydrocarbons concentration as measured with the THC analyzer. (b) Ratio of total OA formed in the SC and MSC as a function of total primary particle mass measured in the AMS and Aethalometer in the SC. Legend in (a) also applied to (b).

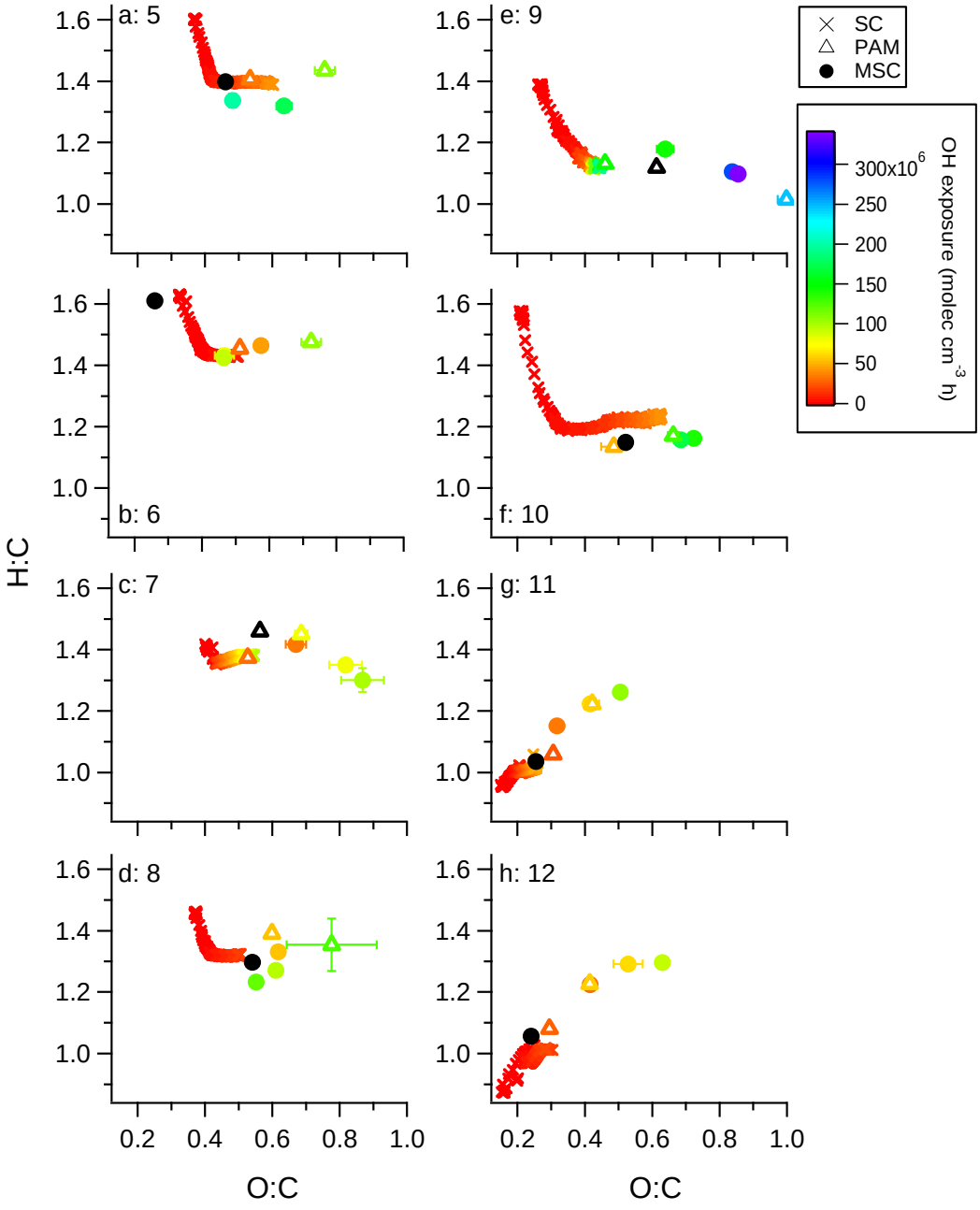

Figure S6. Elemental ratios of the bulk OA measured for each wood burning experiment (a-h, experiments 5-12, respectively) as a function of OH exposure. Colored data points correspond to the SC and the PAM and MSC when sampling from the SC. Black data points correspond to direct emission measurements, for which OH exposures are not known.

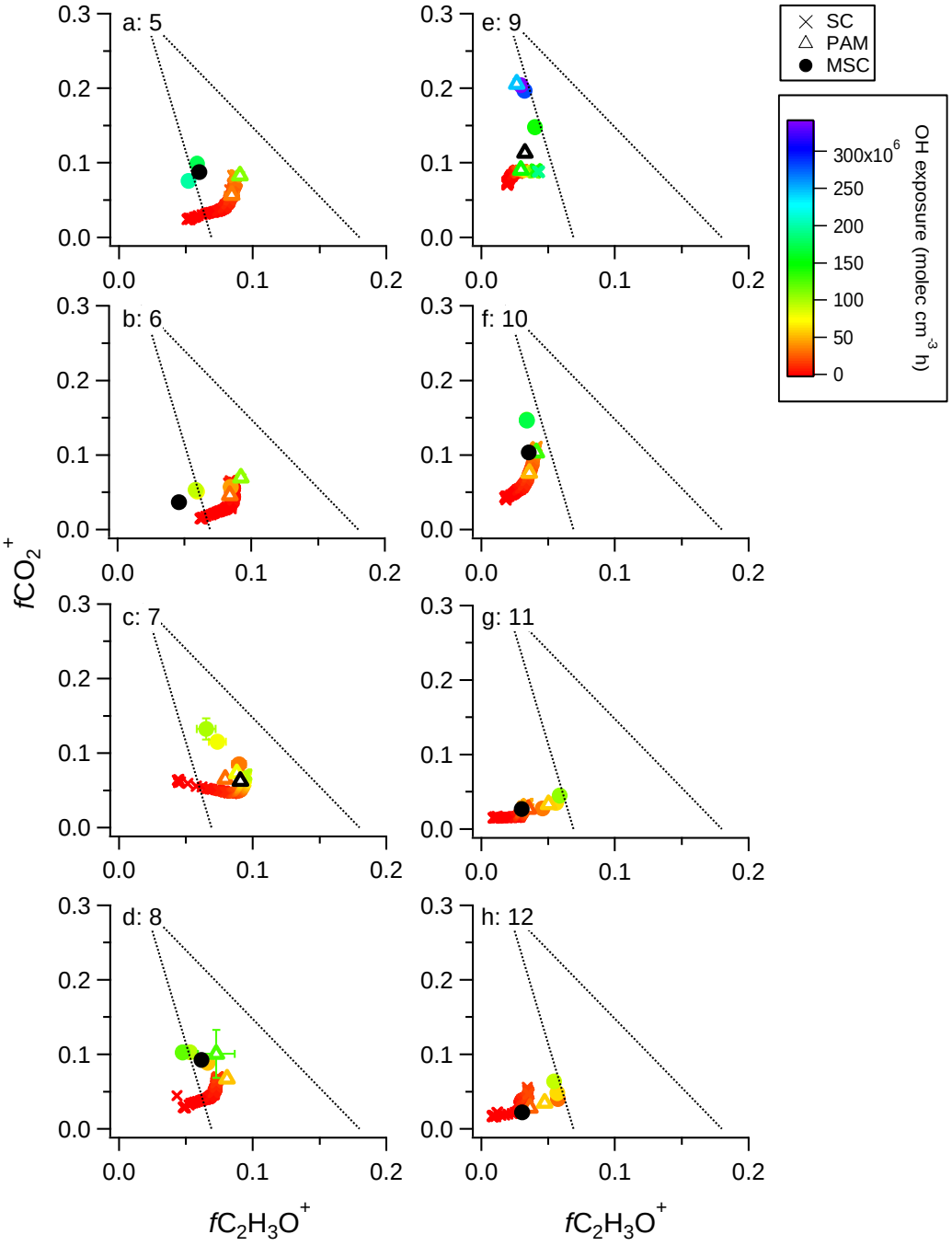

Figure S7. Plot of fCO_2^+ as a function of $fC_2H_3O^+$ for bulk OA generated in each wood burning experiment (a-h, experiments 5-12, respectively). Colored data points correspond to the SC and the PAM and MSC when sampling from the SC. Black data points correspond to direct emission measurements, for which OH exposures are not known.