Supplementary Information

Indoor secondary organic aerosols: towards an improved representation of their formation and composition in models

Kruza M.[a], McFiggans G.[b], Waring M.S.[c], Wells J.R.[d], Carslaw N.[a] *

[a] Department of Environment and Geography, University of York, Wentworth Way, York YO10 5NG, UK
[b] School of Earth and Environmental Sciences, University of Manchester, Manchester, UK
[c] Department of Civil, Architectural and Environmental Engineering, Drexel University, Philadelphia, PA, USA
[d] National Institute for Occupational Safety and Health, Morgantown, West Virginia, USA

* Corresponding author:

Nicola Carslaw

Department of Environment and Geography, University of York, Wentworth Way, York YO10 5NG, UK

Tel: +44 1904 324777

Email address: nicola.carslaw@york.ac.uk

30   **Table S1** HOM and HOMDIMER reaction rate coefficients.

Reaction	Rate coefficient [cm^3 molecule^{-1} s^{-1}]
α-pinene + O_3 → $HOMRO_2$	$6.3*10^{-16}$ x $exp^{(-580/T)}$ x f1
α-pinene + OH → $HOMRO_2$	$1.2*10^{-11}$ x $exp^{(440/T)}$ x f2
$HOMRO_2$ + HO_2 → HOM	$2.91*10^{-13}$ x $exp^{(1300/T)}$ x f3
$HOMRO_2$ +NO → HOM	$2.7*10^{-12}$ x $exp^{(360/T)}$ x f4
$HOMRO_2$ +NO → HOMRO + NO_2	$2.7*10^{-12}$ x $exp^{(360/T)}$ x f5
HOMRO → $HOMRO_2$	1.0 x 10^6
$HOMRO_2$ + NO_3 → HOM + NO_2	2.3 x 10^{-12}
$HOMRO_2$ + RO_2 → HOM	9.2 x 10^{-14}
$HOMRO_2$ + $HOMRO_2$ → HOMDIMER	1.0 x 10^{-10}

31   f1 = 0.1; f2 = 0.08; f3 = 0.914*; f4 = 0.23*; f5 = 0.77*; *based on the α-pinene oxidation
32   mechanism in MCM
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Table S2 The root mean square (rms) difference between the average measured and modelled concentrations of SOA for the NVP method following α-pinene ozonolysis averaged over the 60 minute experiment.

Run number		60 min average
1	O_3 10%, OH 8%	0.24
2	O_3 15%, OH 8%	0.10
3	O_3 10%, OH 5%	0.30
4	O_3 15%, OH 5%	0.15
5	O_3 15%, OH 10%	0.07
6	O_3 20%, OH 8%	0.04
7	O_3 20%, OH 10%	0.08
8	O_3 10%, OH 0%	0.39
9	O_3 15%, OH 0%	0.25
10	O_3 20%, OH 0%	0.10
11	O_3 0%, OH 5%	0.59
12	O_3 0%, OH 8%	0.54
13	O_3 0%, OH 10%	0.51

44 **Table S3** Conditions and SOA measurement results of 21 chamber experiments together with modelling results performed for the EVAP, NVP

45 and MY method without and with HOM. Rms difference* was calculated for 21 runs for the EVAP, NVP and MY method for 30 min results.

46 The measured and modelled results are in µg m^{-3}.

No	AT	NO$_2$	NO2/AT	Measured	EVAP model				NVP model				MY model			
					30 min	Rms difference	30 min HOM	Rms difference HOM	30 min	Rms difference	30 min HOM	Rms difference HOM	30 min	Rms difference	30 min HOM	Rms difference HOM
1	20	2000	100	1.66	0.1	0.93	2.7	0.60	0.1	0.92	2.7	0.62	0.1	0.94	2.6	0.59
2	20	200	10	6.65	0.3	0.96	3.6	0.46	0.4	0.94	3.8	0.43	0.1	0.98	3.4	0.48
3	50	500	10	21.9	0.5	0.98	8.9	0.59	1.4	0.93	9.8	0.55	0.1	0.99	8.3	0.62
4	20	40	2	14.7	1.2	0.92	5.4	0.63	2.0	0.86	6.0	0.59	0.2	0.99	4.6	0.69
5	50	100	2	52	4.2	0.92	14.3	0.73	11.2	0.79	18.1	0.65	0.6	0.99	11.3	0.78
6	100	200	2	155	15.6	0.90	32.3	0.79	56.4	0.64	52.7	0.66	1.5	0.99	22.9	0.85
7	50	50	1	51.8	8.7	0.83	18.4	0.64	18.9	0.63	24.4	0.53	1.5	0.97	12.8	0.75
8	100	100	1	141	29.3	0.79	43.6	0.69	79.4	0.44	74.5	0.47	4.6	0.97	26.8	0.81
9	20	10	0.5	8.98	4.1	0.54	8.5	0.06	6.0	0.34	9.7	0.08	0.9	0.90	5.6	0.38
10	50	25	0.5	37.7	15.2	0.60	24.4	0.35	27.8	0.26	32.2	0.15	3.8	0.90	14.8	0.61
11	100	50	0.5	143	47.2	0.67	59.1	0.59	96.2	0.33	93.9	0.34	11.8	0.92	32.5	0.77
12	200	100	0.5	293	162.5	0.45	165.5	0.44	301.5	0.03	287.2	0.02	41.1	0.86	76.4	0.74
13	200	50	0.25	310	198.1	0.36	202.8	0.35	316.1	0.02	307.7	0.01	68.3	0.78	96.9	0.69
14	200	50	0.25	272	198.1	0.27	202.8	0.25	316.1	0.16	307.7	0.13	68.3	0.75	96.9	0.64
15	20	2	0.1	10.5	8.7	0.17	14.6	0.40	11.2	0.07	14.5	0.38	2.5	0.76	6.7	0.36
16	50	5	0.1	41.5	30.6	0.26	38.5	0.07	44.4	0.07	48.3	0.16	11.1	0.73	20.0	0.52
17	100	10	0.1	123	83.6	0.32	93.2	0.24	124.3	0.01	126.1	0.03	32.8	0.73	48.2	0.61
18	200	10	0.05	328	247.4	0.25	255.7	0.22	341.5	0.04	339.1	0.03	114.3	0.65	134.8	0.59
19	20	0	0	12.7	9.1	0.28	13.3	0.05	11.0	0.13	14.5	0.14	2.9	0.77	7.0	0.45
20	50	0	0	39.6	33.8	0.15	42.0	0.06	45.7	0.15	50.4	0.27	13.5	0.66	21.7	0.45
21	200	0	0	317	253.6	0.20	263.6	0.17	343.0	0.08	341.3	0.08	125.5	0.60	144.7	0.54
Rms average						**0.56**		**0.4**		**0.37**		**0.30**		**0.85**		**0.62**

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48 *The rms difference is calculated as the square of the difference between model and measured value for each run normalized to the measured value
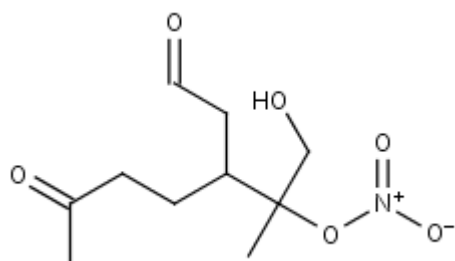
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51 **Table S4** The line equations and the coefficient of determination for the EVAP, NVP and
52 MY method with and without the inclusion of HOMs.

Method	Line function equation	Coefficient of determination
EVAP	y = 0.7027x - 7.6433	0.9033
NVP	y = 1.0693x - 18.676	0.9467
MY	y = 0.2799x - 7.6736	0.7625
EVAP HOM	y = 0.6988x - 14.877	0.8889
NVP HOM	y = 1.0294x - 13.675	0.9402
MY HOM	y = 0.352x - 1.8675	0.8907

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57 **Figure S1** LIMALNO₃ (MCMv3.3.1, http://mcm.leeds.ac.uk/MCM/).

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