Supplementary Information –

Kinetic modelling of formation and evaporation of SOA from NO_3 oxidation of pure and mixed monoterpenes

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S.1 Particle-Phase Oligomerization Scheme

Gas-phase oxidation products may undergo reversible oligomerization in the particle phase, which is treated in the kinetic model. The volatility information of the monomeric building blocks is tracked in their oligomeric state and regained after decomposition into monomers. We assume both, formation and decomposition of oligomers, to be pseudo-first order processes that occur with a rate depending on the precursor material. Formation of hetero-oligomers is hence implicitly considered, but occurs with the speed of product from either precursor, not with a combined rate.

$$A_{\mathrm{monomer}} \xrightarrow{k_{\mathrm{form,A}}} A_{\mathrm{oligomer}} \quad (1)$$

$$A_{\mathrm{oligomer}} \xrightarrow{k_{\mathrm{decom,A}}} A_{\mathrm{monomer}} \quad (2)$$

Furthermore, gradual oligomerization will affect the availability of reaction sites for oligomerization reactions. This is accounted for with a conservatively chosen factor that can reduce the oligomer formation rate by up to a factor of 0.5, depending on the oligomer fraction, f_{oligomer}.

$$k^{*}_{\mathrm{form,A}} = k_{\mathrm{form,A}} \cdot \left(1 - 0.5 \cdot f_{\mathrm{oligomer}}\right) \quad (3)$$

This assumes that every monoterpene oxidation product has two possible reaction sites for oligomerization, but for simplicity, there is no further oligomerization beyond the dimer level. The real reduction in formation rate will depend on the exact number of reaction sites and average chain length of the oligomer in solution. A schematic representation of the oligomer formation and decomposition processes employed in the kinetic model is shown in Fig. S3.

SI Figures

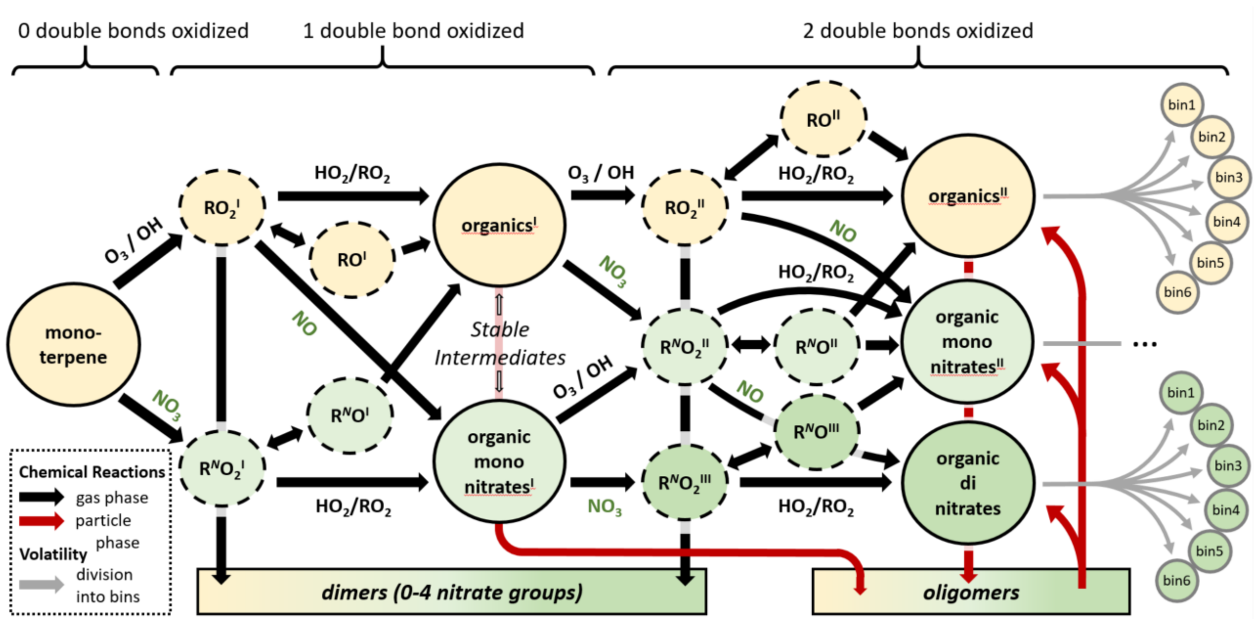


Fig. S1. Schematic representation of the extended lumped chemical mechanism for monoterpenes with two double bonds (e.g. limonene). Yellow colors denote non-nitrated products, while green colors denote mono-nitrated organics (light green), di-nitrated organics (green), and nitrogen oxides (dark green), respectively. Stable products are divided into product bins analogous to Fig. 1 (not depicted for clarity).

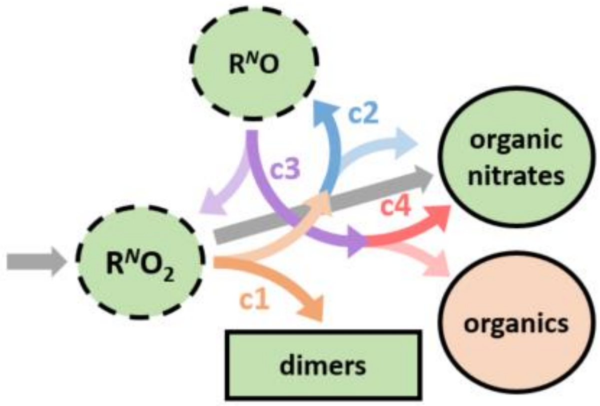


Fig. S2. Scheme detailing the branching ratios c1-c4 of RO_2 and RO radical chemistry used in the oxidation of α-pinene. The branching ratios detail the success of dimer fomation (c1), RO yield from not-dimer-forming RO_2 self-reaction (c2), success of RO making product upon unimolecular decay (c3) and the branching between nitrated and non-nitrated products from stabilization of RO (c4). The darker color in the arrow pairs indicates which of the two branches is increased with increasing numerical value of the branching ratio. The formation of α-pinene oxidation products from RO_2^{II} and limonene oxidation products from RO_2^{IV} and RO_2^{V} was treated analogous.

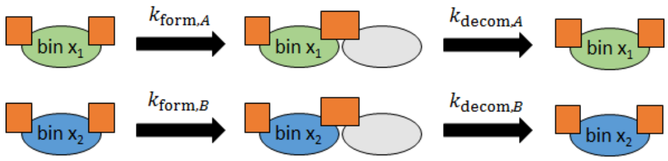
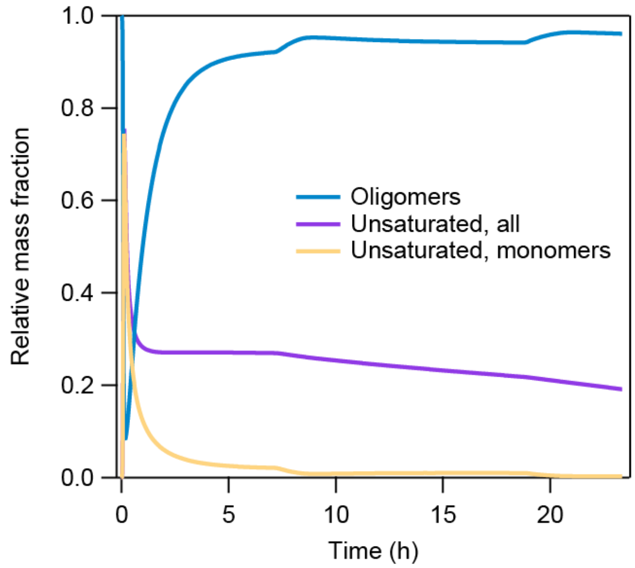


Fig. S3. Schematic representation of the oligomer formation and decomposition scheme A employed in the kinetic model presented in this study. Chemical reaction of the oxidation products from precursor 1 (green ellipsoid) and precursor 2 (blue ellipsoid) occurs at specific reaction sites (orange squares) under formation of dimers.



45
46 **Fig. S4.** Detailed composition highlighting saturation and oligomerization degree of oxidation products of the particle
47 phase during the LIM experiment according to the model in the best fit simulation.

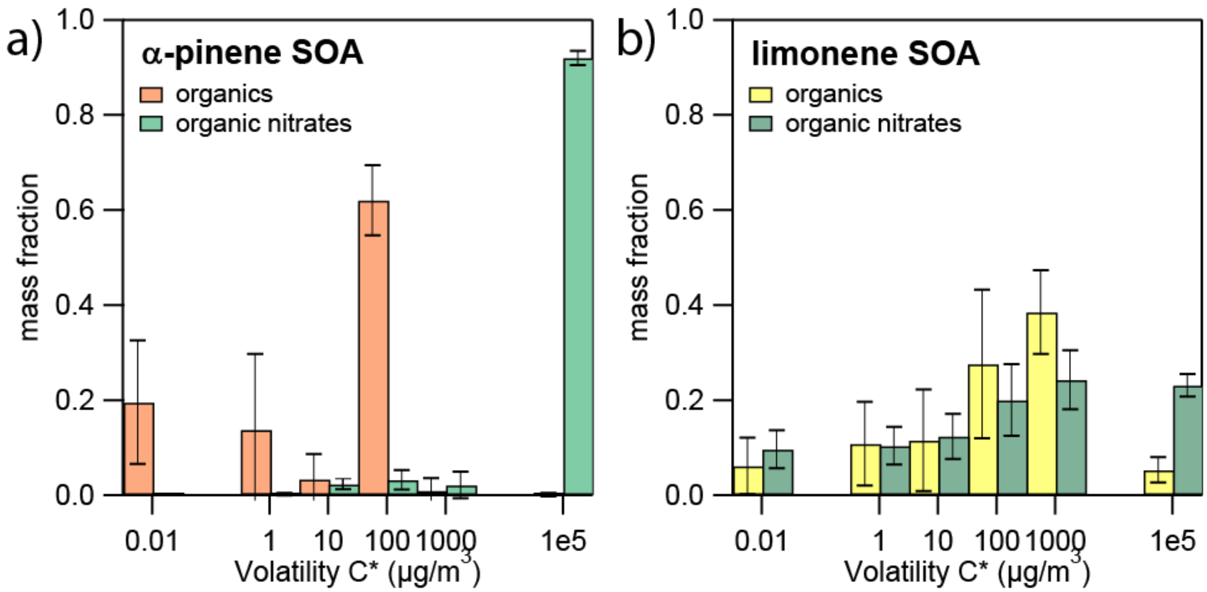


Fig. S5. Volatility distributions of monoterpene oxidation products as derived from kinetic model optimization to experimental data. These distribution keys are used to divide stable monomeric oxidation products into volatility bins. Volatility distributions were differentiated between nitrated and non-nitrated products as well as their precursor origin: (a) nitrated and non-nitrated α-pinene oxidation products ($f_{apin,org,bi}$, $f_{apin,nitr,bi}$), (b) nitrated and non-nitrated limonene products ($f_{lim,org,bi}$, $f_{lim,nitr,bi}$). Dinitrated and mononitrated molecules were considered as following the same volatility distribution. The bars show arithmetic means obtained from multiple model optimizations that each optimized six volatility bins while keeping all other model parameters constant. All fits possessed similar model-experiment correlation. Error bars represent standard deviations.

SI Tables

Table S1. Lumped gas-phase chemical mechanism employed in this study. Rate coefficients of gas phase reactions involving inorganic reactants are ported from MCM and unless explicitly indicated displayed for a temperature of 5.5 °C and 1 bar pressure. Note that all stable organic products are further subdivided into 6 volatility bins according to a fitted volatility distribution. [RO_2] stands for the total concentration of RO_2 radicals, T is temperature, $f_{oligomer}$ the oligomer fraction, c_1-c_4 are fittest branching ratios, and TF_{apin} and TF_{lim} are temperature-dependence factors for α-pinene and limonene, respectively. In the names of chemical species, the suffix "org" denotes a non-nitrated product, the suffix "orgnitr" denotes an organic nitrate. Among these, a superscript "1N" denotes a mononitrated compound, a superscript "2N" denotes a dinitrated compound, etc.

Number	**Reaction Equation**	**Rate coefficients** (s-1 or cm3/s)
Gas Phase Reactions Involving Inorganics		
1	$O \rightarrow O_3$	$6.27\cdot10^{4}\cdot(T/300)^{-2.6}$
2	$O \rightarrow O_3$	$1.78\cdot10^{4}\cdot(T/300)^{-2.6}$
3	O + O3 →	$8.00\cdot10^{-12}\cdot\exp(-2060/T)$
4	$O + NO \rightarrow NO_2$	$2.63\cdot10^{-12}$
5	$O + NO_2 \rightarrow NO$	$5.50\cdot10^{-12}\cdot\exp(188/T)$
6	$O + NO_2 \rightarrow NO_3$	$2.33\cdot10^{-12}$
7	$O_3 + NO \rightarrow NO_2$	$1.40\cdot10^{-12}\cdot\exp(-1310/T)$
8	$O_3 + NO_2 \rightarrow NO_3$	$1.40\cdot10^{-13}\cdot\exp(-2470/T)$
9	$NO + NO \rightarrow NO_2 + NO_2$	$1.79\cdot10^{-20}\cdot\exp(530/T)$
10	$NO + NO_3 \rightarrow NO_2 + NO_2$	$1.80\cdot10^{-11}\cdot\exp(110/T)$
11	$NO_2 + NO_3 \rightarrow$ NO + NO2	$4.50\cdot10^{-14}\cdot\exp(-1260/T)$
12	$NO_2 + NO_3 \rightarrow N_2O_5$	$1.28\cdot10^{-12}$
13	$O_3 + OH \rightarrow HO_2$	1.70·10-12·exp(-940/T)
14	$OH + CO \rightarrow HO_2$	$2.33\cdot10^{-13}$

15	$OH + H_2O_2 \rightarrow HO_2$	$2.9 \cdot 10^{-12} \cdot \exp(-160/T)$
16	$O_3 + HO_2 \rightarrow OH$	$2.03 \cdot 10^{-16} \cdot (T/300)^{4.57} \cdot \exp(693/T)$
17	$OH + HO_2 \rightarrow$	$4.80 \cdot 10^{-11} \cdot \exp(250/T)$
18	$HO_2 + HO_2 \rightarrow H_2O_2$	$2.20 \cdot 10^{-13} \cdot \exp(600/T)$
19	$HO_2 + HO_2 \rightarrow H_2O_2$	$4.94 \cdot 10^{-14} \cdot \exp(980/T)$
20	$NO + OH \rightarrow HONO$	$1.12 \cdot 10^{-11}$
21	$NO_2 + OH \rightarrow HNO_3$	$1.15 \cdot 10^{-11}$
22	$NO_3 + OH \rightarrow NO_2 + HO_2$	$2.00 \cdot 10^{-11}$
23	$NO + HO_2 \rightarrow NO_2 + OH$	$3.45 \cdot 10^{-12} \cdot \exp(270/T)$
24	$NO_2 + HO_2 \rightarrow HO_2NO_2$	$8.55 \cdot 10^{-13}$
25	$OH + HO_2NO_2 \rightarrow NO_2$	$3.20 \cdot 10^{-13} \cdot \exp(690/T)$
26	$NO_3 + HO_2 \rightarrow NO_2 + OH$	$4.00 \cdot 10^{-12}$
27	$OH + HONO \rightarrow NO_2$	$2.50 \cdot 10^{-12} \cdot \exp(260/T)$
28	$OH + HNO_3 \rightarrow NO_3$	$5.00 \cdot 10^{-3}$
29	$HNO_3 \rightarrow NA$	$6.00 \cdot 10^{-6}$
30	$N_2O_5 \rightarrow NA + NA$	$4.00 \cdot 10^{-4}$
31	$N_2O_5 \rightarrow NO_2 + NO_3$	$3.50 \cdot 10^{-3}$
32	$HO_2NO_2 \rightarrow NO_2 + HO_2$	$5.00 \cdot 10^{-3}$
Gas Phase Reactions Involving Organics		
34	O_3 + APINENE → OH + APINENE_RO_2^{I}	$0.85 \cdot 8.05 \cdot 10^{-16} \cdot e^{-640/T}$
35	O_3 + APINENE → APINENE_RO_2^{II}	$0.15 \cdot 8.05 \cdot 10^{-16} \cdot e^{-640/T}$
36	OH + APINENE → APINENE_RO_2^{II}	$1.2e^{-11} \cdot e^{440/T}$
37	NO_3 + APINENE → APINENE_RO_2^{III}	$1.2e^{-12} \cdot e^{490/T}$

38	$NO + APINENE\_RO_2^I \rightarrow NO_2 + APINENE\_RO^I$	$9.10 \cdot 10^{-12}$
39	$NO_3 + APINENE\_RO_2^I \rightarrow NO_2 + APINENE\_RO^I$	$2.30 \cdot 10^{-12}$
40	$HO_2 + APINENE\_RO_2^I \rightarrow APINENE\_org$	$2.20 \cdot 10^{-11}$
41	$NO + APINENE\_RO_2^{II} \rightarrow APINENE\_orgnitr^{1N}$	$9.10 \cdot 10^{-12}$
42	$NO + APINENE\_RO_2^{II} \rightarrow NO_2 + APINENE\_RO^I$	$9.10 \cdot 10^{-12}$
43	$NO_3 + APINENE\_RO_2^{II} \rightarrow NO_2 + APINENE\_RO^I$	$2.30 \cdot 10^{-12}$
44	$HO_2 + APINENE\_RO_2^{II} \rightarrow APINENE\_org$	$2.20 \cdot 10^{-11}$
45	$NO + APINENE\_RO_2^{III} \rightarrow NO_2 + APINENE\_RO^{II}$	$9.10 \cdot 10^{-12}$
46	$NO_3 + APINENE\_RO_2^{III} \rightarrow NO_2 + APINENE\_RO^{II}$	$2.30 \cdot 10^{-12}$
47	$HO_2 + APINENE\_RO_2^{III} \rightarrow APINENE\_orgnitr^{1N}$	$2.20 \cdot 10^{-11}$
48	$APINENE\_RO_2^I \rightarrow APINENE\_RO^I$	$[RO_2] \cdot (1-c_1) \cdot c_2 \cdot 10^{-13}$
49	$APINENE\_RO_2^I \rightarrow APINENE\_org$	$[RO_2] \cdot (1-c_1) \cdot (1-c_2) \cdot 10^{-13}$
50	$APINENE\_RO_2^{II} \rightarrow APINENE\_RO^I$	$[RO_2] \cdot (1-c_1) \cdot c_2 \cdot 10^{-14}$
51	$APINENE\_RO_2^{II} \rightarrow APINENE\_org$	$[RO_2] \cdot (1-c_1) \cdot (1-c_2) \cdot 10^{-14}$
52	$APINENE\_RO_2^{III} \rightarrow APINENE\_RO^{II}$	$[RO_2] \cdot (1-c_1) \cdot c_2 \cdot 10^{-14}$
53	$APINENE\_RO_2^{III} \rightarrow APINENE\_orgnitr^{1N}$	$[RO_2] \cdot (1-c_1) \cdot (1-c_2) \cdot 10^{-14}$
54	$APINENE\_RO^I \rightarrow HO_2 + APINENE\_org$	$c_{3\_apin} \cdot 10^6$
55	$APINENE\_RO^I \rightarrow APINENE\_RO_2II$	$(1- c_{3\_apin}) \cdot 10^6$
56	$APINENE\_RO^{II} \rightarrow NO_2 + APINENE\_org$	$c_{3\_apin} \cdot (1-c_{4\_apin}) \cdot 10^6$
57	$APINENE\_RO^{II} \rightarrow APINENE\_orgnitr^{1N}$	$c_{3\_apin} \cdot c_{4\_apin} \cdot 10^6$
58	$APINENE\_RO^{II} \rightarrow APINENE\_RO_2^{III}$	$(1-c_{3\_apin}) \cdot 10^6$
59	$APINENE\_RO_2^I \rightarrow APINENE\_dimer\_org$	$c_1 \cdot [RO_2] \cdot 10^{-13}$
60	$APINENE\_RO_2^{II} \rightarrow APINENE\_dimer\_org$	$c_1 \cdot [RO_2] \cdot 10^{-14}$
61	$APINENE\_RO_2^{III} \rightarrow APINENE\_dimer\_orgnitr^{1N}$	$c_1 \cdot [RO_2] \cdot 10^{-14}$
62	$O_3 + LIMONENE \rightarrow OH + LIMONENE\_RO_2^I$	$0.865 \cdot 2.80 \cdot 10^{-15} \cdot \exp(-770/T)$

63	O_3 + LIMONENE → LIMONENE_RO_2^{I}	$0.135 \cdot 2.80 \cdot 10^{-15} \cdot \exp(-770/T)$
64	OH + LIMONENE → LIMONENE_RO_2^{I}	$4.28 \cdot 10^{-11} \cdot \exp(401/T)$
65	NO_3 + LIMONENE → LIMONENE_RO_2^{II}	$1.22 \cdot 10^{-11}$
66	NO + LIMONENE_RO_2^{I} → LIMONENE_intermed_orgnitr^{1N}	$0.228 \cdot 2.70 \cdot 10^{-12} \cdot \exp(360/T)$
67	NO + LIMONENE_RO_2^{I} → NO_2 + LIMONENE_RO^{I}	$0.772 \cdot 2.70 \cdot 10^{-12} \cdot \exp(360/T)$
68	NO_3 + LIMONENE_RO_2^{I} → NO_2 + LIMONENE_RO^{I}	$2.30 \cdot 10^{-12}$
69	HO_2 + LIMONENE_RO_2^{I} → LIMONENE_intermed_org	$0.914 \cdot 2.91 \cdot 10^{-13} \cdot \exp(1300/T)$
70	NO + LIMONENE_RO_2^{II} → LIMONENE_intermed_orgnitr^{1N}	$0.228 \cdot 2.70 \cdot 10^{-12} \cdot \exp(360/T)$
71	NO + LIMONENE_RO_2^{II} → NO_2 + LIMONENE_RO^{II}	$0.772 \cdot 2.70 \cdot 10^{-12} \cdot \exp(360/T)$
72	NO_3 + LIMONENE_RO_2^{II} → NO_2 + LIMONENE_RO^{II}	$2.30 \cdot 10^{-12}$
73	HO_2 + LIMONENE_RO_2^{II} → LIMONENE_intermed_orgnitr^{1N}	$0.914 \cdot 2.91 \cdot 10^{-13} \cdot \exp(1300/T)$
74	LIMONENE_RO_2^{I} → LIMONENE_RO^{I}	$[RO_2] \cdot (1-c_1) \cdot c_2 \cdot 8.80 \cdot 10^{-13}$
75	LIMONENE_RO_2^{I} → LIMONENE_intermed_org	$[RO_2] \cdot (1-c_1) \cdot (1-c_2) \cdot 8.80 \cdot 10^{-13}$
76	LIMONENE_RO_2^{II} → LIMONENE_RO_^{II}	$[RO_2] \cdot (1-c_1) \cdot c_2 \cdot 9.20 \cdot 10^{-14}$
77	LIMONENE_RO_2^{II} → LIMONENE_intermed_orgnitr_^{1N}	$[RO_2] \cdot (1-c_1) \cdot (1-c_2) \cdot 9.20 \cdot 10^{-14}$
78	LIMONENE_RO^{I} → HO_2 + LIMONENE_intermed_org	$c_{3,lim} \cdot 10^6$
79	LIMONENE_RO^{I} → LIMONENE_RO_2^{II}	$(1-c_{3,lim}) \cdot 10^6$
80	LIMONENE_RO^{II} → NO_2 + LIMONENE_intermed_org	$c_{3,lim} \cdot 10^6$
81	LIMONENE_RO^{II} → LIMONENE_RO_2^{III}	$(1-c_{3,lim}) \cdot 10^6$
82	O_3 + LIMONENE_intermed_org → OH + LIMONENE_RO_2^{III}	$0.67 \cdot 8.30 \cdot 10^{-18}$
83	O_3 + LIMONENE_intermed_org → LIMONENE_RO_2^{III}	$0.33 \cdot 8.30 \cdot 10^{-18}$
84	OH + LIMONENE_intermed_org → LIMONENE_RO_2^{III}	$1.10 \cdot 10^{-10}$

85	NO_3 + LIMONENE_intermed_org → LIMONENE_RO_2^{IV}	$2.60\cdot10^{-13}$
86	O_3 + LIMONENE_intermed_orgnitr^{1N} → OH + LIMONENE_RO_2^{IV}	$0.67\cdot8.30\cdot10^{-18}$
87	O_3 + LIMONENE_intermed_orgnitr^{1N} → LIMONENE_RO_2^{IV}	$0.33\cdot8.30\cdot10^{-18}$
88	OH + LIMONENE_intermed_orgnit_^{1N} → LIMONENE_RO_2^{IV}	$1.10\cdot10^{-10}$
89	NO_3 + LIMONENE_intermed_orgnitr^{1N} → LIMONENE_RO2^{V}	$2.60\cdot10^{-13}$
90	HO_2 + LIMONENE_RO2^{III} → LIMONENE_org	$0.914\cdot2.91\cdot10^{-13}\cdot\exp(1300/T)$
91	NO_3 + LIMONENE_RO2^{III} → NO_2 + LIMONENE_RO^{III}	$2.30\cdot10^{-12}$
92	NO + LIMONENE_RO_2^{III} → NO_2 + LIMONENE_RO^{III}	$0.772\cdot2.70\cdot10^{-12}\cdot\exp(360/T)$
93	NO + LIMONENE_RO_2^{III} → LIMONENE_orgnitr^{1N}	$0.228\cdot2.70\cdot10^{-12}\cdot\exp(360/T)$
94	LIMONENE_RO_2^{III} → LIMONENE_RO^{III}	$[RO_2]\cdot(1-c_1)\cdot c_2\cdot9.20\cdot10^{-14}$
95	LIMONENE_RO_2^{III} → LIMONENE_org	$[RO_2]\cdot(1-c_1)\cdot(1-c_2)\cdot9.20\cdot10^{-14}$
96	HO_2 + LIMONENE_RO_2^{IV} → LIMONENE_orgnitr^{1N}	$0.914\cdot2.91\cdot10^{-13}\cdot\exp(1300/T)$
97	NO_3 + LIMONENE_RO_2^{IV} → NO_2 + LIMONENE_RO^{IV}	$2.30\cdot10^{-12}$
98	NO + LIMONENE_RO_2^{IV} → NO_2 + LIMONENE_RO^{IV}	$2.70\cdot10^{-12}\cdot\exp(360/T)$
99	NO + LIMONENE_RO_2^{IV} → LIMONENE_orgnitr^{2N}	$2.70\cdot10^{-12}\cdot\exp(360/T)$
100	LIMONENE_RO_2^{IV} → LIMONENE_RO^{IV}	$[RO_2]\cdot(1-c_1)\cdot c_2\cdot9.20\cdot10^{-14}$
101	LIMONENE_RO_2^{IV} → LIMONENE_orgnitr^{1N}	$[RO_2]\cdot(1-c_1)\cdot(1-c_2)\cdot9.20\cdot10^{-14}$
102	HO_2 + LIMONENE_RO_2^{V} → LIMONENE_orgnitr^{2N}	$0.914\cdot2.91\cdot10^{-13}\cdot\exp(1300/T)$
103	NO_3 + LIMONENE_RO_2^{V} → NO_2 + LIMONENE_RO^{V}	$2.30\cdot10^{-12}$
104	NO + LIMONENE_RO_2V → NO_2 + LIMONENE_RO^{V}	$2.70\cdot10^{-12}\cdot\exp(360/T)$
105	LIMONENE_RO2^{V} → LIMONENE_RO^{V}	$[RO_2]\cdot(1-c_1)\cdot c_2\cdot9.20\cdot10^{-14}$

106	$LIMONENE\_RO_2^{V}$ → $LIMONENE\_orgnitr^{2N}$	$[RO_2]\cdot(1-c_1)\cdot(1-c_2)\cdot 9.20\cdot 10^{-14}$
107	$LIMONENE\_RO^{III}$ → HO_2 + LIMONENE_org	$c_{3,lim}\cdot 10^6$
108	$LIMONENE\_RO^{III}$ → $LIMONENE\_RO2^{III}$	$(1 - c_{3,lim})\cdot 10^6$
109	$LIMONENE\_RO^{IV}$ → NO2 + LIMONENE_org	$c_{3,lim}\cdot(1 - c_{4,lim})\cdot 10^6$
110	$LIMONENE\_RO^{IV}$ → $LIMONENE\_orgnitr^{1N}$	$c_{3,lim}\cdot c_{4,lim}\cdot 10^6$
111	$LIMONENE\_RO^{IV}$ → $LIMONENE\_RO2^{IV}$	$(1-c_{3,lim})\cdot 10^6$
112	$LIMONENE\_RO^{V}$ → NO_2 + $LIMONENE\_orgnitr^{1N}$	$c_{3,lim}\cdot(1 - c_{4,lim})\cdot 10^6$
113	$LIMONENE\_RO^{V}$ → $LIMONENE\_orgnitr^{2N}$	$c_{3,lim}\cdot c_{4,lim}\cdot 10^6$
114	$LIMONENE\_RO^{V}$ → $LIMONENE\_RO2^{V}$	$(1- c_{3,lim})\cdot 10^6$
115	$LIMONENE\_RO_2^{I}$ → LIMONENE_dimer_org	$c_1\cdot[RO_2]\cdot 9.20\cdot 10^{-14}$
116	$LIMONENE\_RO_2^{II}$ → $LIMONENE\_dimer\_orgnitr^{1N}$	$c_1\cdot[RO_2]\cdot 9.20\cdot 10^{-14}$
117	$LIMONENE\_RO_2^{III}$ → LIMONENE_dimer_org	$c_1\cdot[RO_2]\cdot 9.20\cdot 10^{-14}$
118	$LIMONENE\_RO_2^{IV}$ → $LIMONENE\_dimer\_orgnitr^{1N}$	$c_1\cdot[RO_2]\cdot 9.20\cdot 10^{-14}$
119	$LIMONENE\_RO_2^{V}$ → $LIMONENE\_dimer\_orgnitr^{2N}$	$c_1\cdot[RO_2]\cdot 9.20\cdot 10^{-14}$
Particle Phase Reactions		
120	LIMONENE_intermed_org → LIMONENE_olig_intermed_org	$k_{form,lim}\cdot(1-f_{oligomer}/2)$
121	$LIMONENE\_intermed\_orgnitr^{1N}$ → $LIMONENE\_olig\_intermed\_orgnitr^{1N}$	$k_{form,lim}\cdot(1-f_{oligomer}/2)$
122	APINENE_org → APINENE_olig_org	$k_{form,apin}\cdot(1-f_{oligomer}/2)$
123	$APINENE\_orgnitr\_^{1N}$ → $APINENE\_olig\_orgnitr^{1N}$	$k_{form,apin}\cdot(1-f_{oligomer}/2)$
124	APINENE_olig_org → APINENE_org	$k_{decom\_apin}\cdot\exp(TF_{apin}/T)$
125	$APINENE\_olig\_orgnitr^{1N}$ → $APINENE\_orgnitr^{1N}$	$k_{decom\_apin}\cdot\exp(TF_{apin}/T)$
126	LIMONENE_org → LIMONENE_olig_org	$k_{form,lim}\cdot(1-f_{oligomer}/2)$
127	$LIMONENE\_orgnitr^{1N}$ → $LIMONENE\_olig\_orgnitr^{1N}$	$k_{form,lim}\cdot(1-f_{oligomer}/2)$

128	LIMONENE_orgnitr^{2N} → LIMONENE_olig_orgnitr^{2N}	$k_{form,lim}\cdot(1-f_{oligomer}/2)$
129	LIMONENE_olig_org → LIMONENE_org	$k_{decom\_lim}\cdot\exp(TF_{lim}/T)$
130	LIMONENE_olig_orgnitr^{1N} → LIMONENE_orgnitr^{1N}	$k_{decom\_lim}\cdot\exp(TF_{lim}/T)$
131	LIMONENE_olig_orgnitr^{2N} → LIMONENE_orgnitr^{2N}	$k_{decom\_lim}\cdot\exp(TF_{lim}/T)$
132	LIMONENE_olig_intermed_org → LIMONENE_intermed_org	$k_{decom\_lim}\cdot\exp(TF_{lim}/T)$
133	LIMONENE_olig_intermed_orgnitr^{1N} → LIMONENE_intermed_orgnitr^{1N}	$k_{decom\_lim}\cdot\exp(TF_{lim}/T)$