Supplement

Comparing ozone production efficiency (OPE) of chemical mechanisms using chemical process analysis (CPA)

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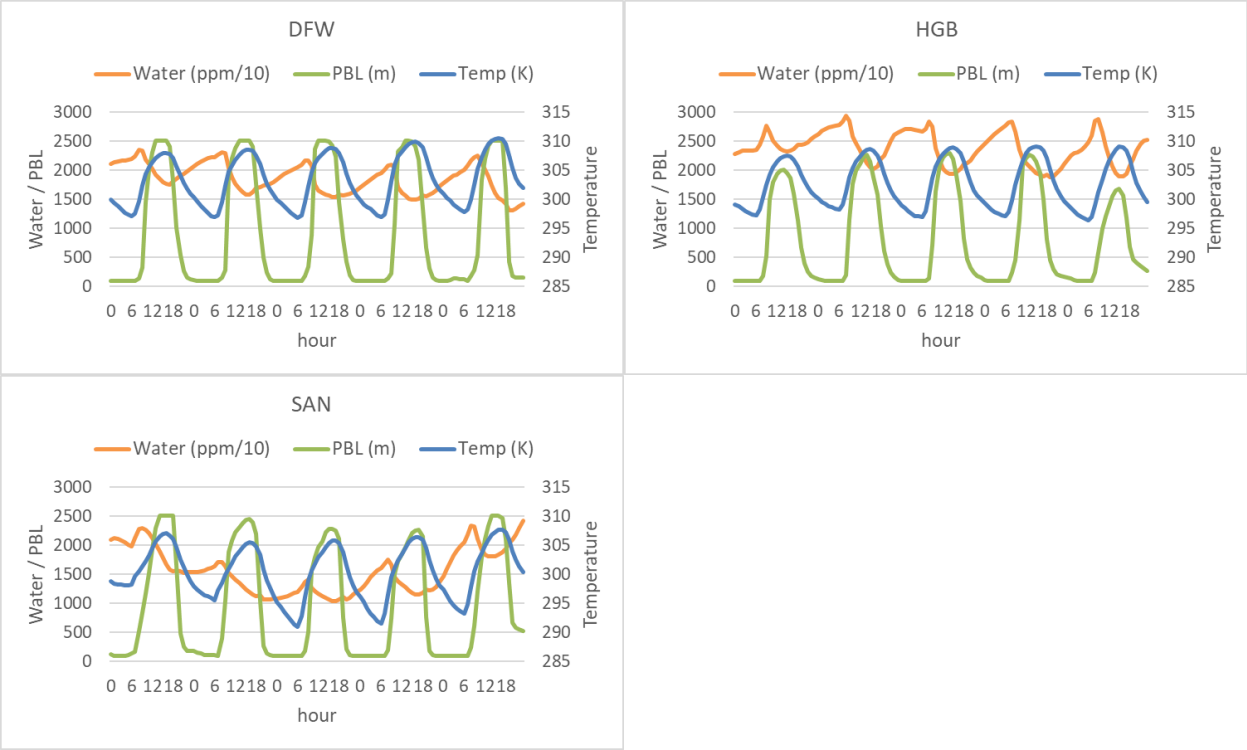

Figure S1. Meteorological conditions for the DFW, HGB, and SAN box model scenarios in local time. Temperature and water content are for layer 1 in the 2-box model setup.

Table S1. Daily emissions of NO_X, anthropogenic VOC (AVOC), biogenic VOC (BVOC), and CO for the HGB, DFW, and SAN base case 2-box model scenario

Location	**Date**	**NO_X (mole/km^2/day)**	**AVOC [a] (moleC/km^2/day)**	**BVOC (moleC/km^2/day)**	**CO (mole/km^2/day)**
HGB	Sept 3, 2019	4.90E+02	1.59E+03	5.66E+02	5.44E+03
	Sept 4, 2019	4.84E+02	1.59E+03	6.07E+02	5.43E+03
	Sept 5, 2019	4.92E+02	1.59E+03	6.06E+02	5.45E+03
	Sept 6, 2019	5.12E+02	1.59E+03	5.98E+02	5.62E+03
	Sept 7, 2019	4.11E+02	1.38E+03	5.72E+02	4.61E+03
DFW	Sept 3, 2019	5.22E+02	1.61E+03	9.39E+02	7.19E+03
	Sept 4, 2019	5.21E+02	1.61E+03	9.64E+02	7.19E+03
	Sept 5, 2019	5.25E+02	1.61E+03	9.67E+02	7.19E+03
	Sept 6, 2019	5.44E+02	1.62E+03	1.03E+03	7.48E+03
	Sept 7, 2019	4.19E+02	1.35E+03	1.05E+03	5.87E+03
SAN	July 23, 2019	2.36E+02	6.11E+02	7.26E+02	2.40E+03

Location	Date	NO_X (mole/km^2/day)	AVOC [a] (moleC/km^2/day)	BVOC (moleC/km^2/day)	CO (mole/km^2/day)
	July 24, 2019	2.37E+02	6.11E+02	6.25E+02	2.40E+03
	July 25, 2019	2.38E+02	6.11E+02	5.91E+02	2.40E+03
	July 26, 2019	2.43E+02	6.16E+02	6.31E+02	2.57E+03
	July 27, 2019	2.10E+02	5.14E+02	7.10E+02	2.00E+03

[a] Here, VOC includes ethane and acetone although they are excluded from the regulatory definition of VOC.

Table S2. Estimates of net OPE from aircraft measurements in the eastern U.S.

Measurement program [a]	Location	Plume type	Altitude (m)	Time period	OPE-plot [b]	Reference
DISCOVER-AQ	Baltimore, MD	urban	300 - 1700	July 2011	8.4 ± 4.1 [d, e]	Hembeck et al. (2019)
INTEX-NA	Southeast U.S.	regional[c]	< 1500	July - Aug. 2004	14.1 ± 1.1 [f, g]	Travis et al. (2016)
SEAC^{4}RS	Southeast U.S.	regional[c]	< 1500	Aug. - Sept. 2013	17.4 ± 0.4 [f, g]	
AEROMMA	New York City	urban	~ 550	July 28, Aug. 9, 16, 2023	9 ± 4 [d, h]	Chace et al. (2025)
	Chicago	urban	~ 550	Aug. 1, 2, 8, 12, 15, 2023	6 ± 3 [d, h]	
	Los Angeles	urban	~ 550	Aug. 23, 25, 26, 2023	6 ± 3 [d, h]	

[a] DISCOVER-AQ = Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality; INTEX-NA = Intercontinental Chemical Transport Experiment - North America; SEAC^{4}RS = Studies of Emissions and Atmospheric Composition, Clouds and Climate Coupling by Regional Surveys; AEROMMA = Atmospheric Emissions and Reactions Observed from Megacities to Marine Areas

[b] $O_x = O_3 + NO_2$ used to determine OPE.

[c] Multistate flights that sampled combined urban and industrial plumes and rural air.

[d] NO_Z determined as $NO_Z = NO_Y - NO_X$

[e] May be an average of OPE for different transects/plumes and an uncertainty based on the variation of OPE values.

[f] Uncertainty is from the linear fit of O_X to NO_Z data.

[g] NO_Z determined as HNO_3 + PAN + aerosol nitrate + alkyl nitrates

[h] Mean over all transects with 1 σ uncertainty

Table S3. Estimates of net OPE from surface measurements in the eastern U.S.

Measurement program [a]	Location	Site type	Time period	OPE-plot [b]	Reference
NEAQS 2002	Durham, NH	rural	Aug. 2002	7.7 - 9.1	Griffin et al. (2004)

Measurement program [a]	**Location**	**Site type**	**Time period**	**OPE-plot** [b]	**Reference**
SEARCH	Atlanta, GA	urban	June - July 2013	14.8 ± 0.9[c, d]	Blanchard and Hidy (2018)
	Birmingham, AL	urban	June - July 2013	13.1 ± 1.2[c, d]	
	Centreville, AL	rural	June - July 2013	25.7 ± 2.8[c, d]	
	Pensacola outlying landing field, FL	suburban	June - July 2013	19.6 ± 2.2[c, d]	
	Yorkville, GA	rural	June - July 2013	18.8 ± 1.4[c, d]	
SUNY-A/ NYSDEC	Addison, NY	rural	June - Sept. 2016	11 - 13[e]	Ninneman et al. (2017)
	Flushing, NY	urban	Aug. - Sept. 2016	6 - 8[e, f]	
SUNY-A	Addison, NY	rural	May - Sept., 2000-2009	5 - 7	Ninneman et al. (2019)
	Addison, NY	rural	May - Sept., 2012-2017	13	
	Whiteface Mt., NY	rural	May - Sept., 2015-2017	18	

[a] NEAQS = New England Air Quality Study; SEARCH = Southeast Aerosol Research and Characterization; SUNY-A = State University of New York at Albany; NYSDEC = New York State Department of Environmental Conservation

[b] O_3 and $NO_Z = NO_Y - NO_X$ used to determine OPE unless otherwise indicated.

[c] Results for earlier years are available in the reference.

[d] Uncertainty is from the linear fit of O_3 or O_X to NO_Z data.

[e] $O_X = O_3 + NO_2$ used instead of O_3.

[f] $NO_Z = HNO_3$ + PANs + alkyl nitrates + particulate nitrate; $NO_2 = NO_Y - NO_Z - NO$.

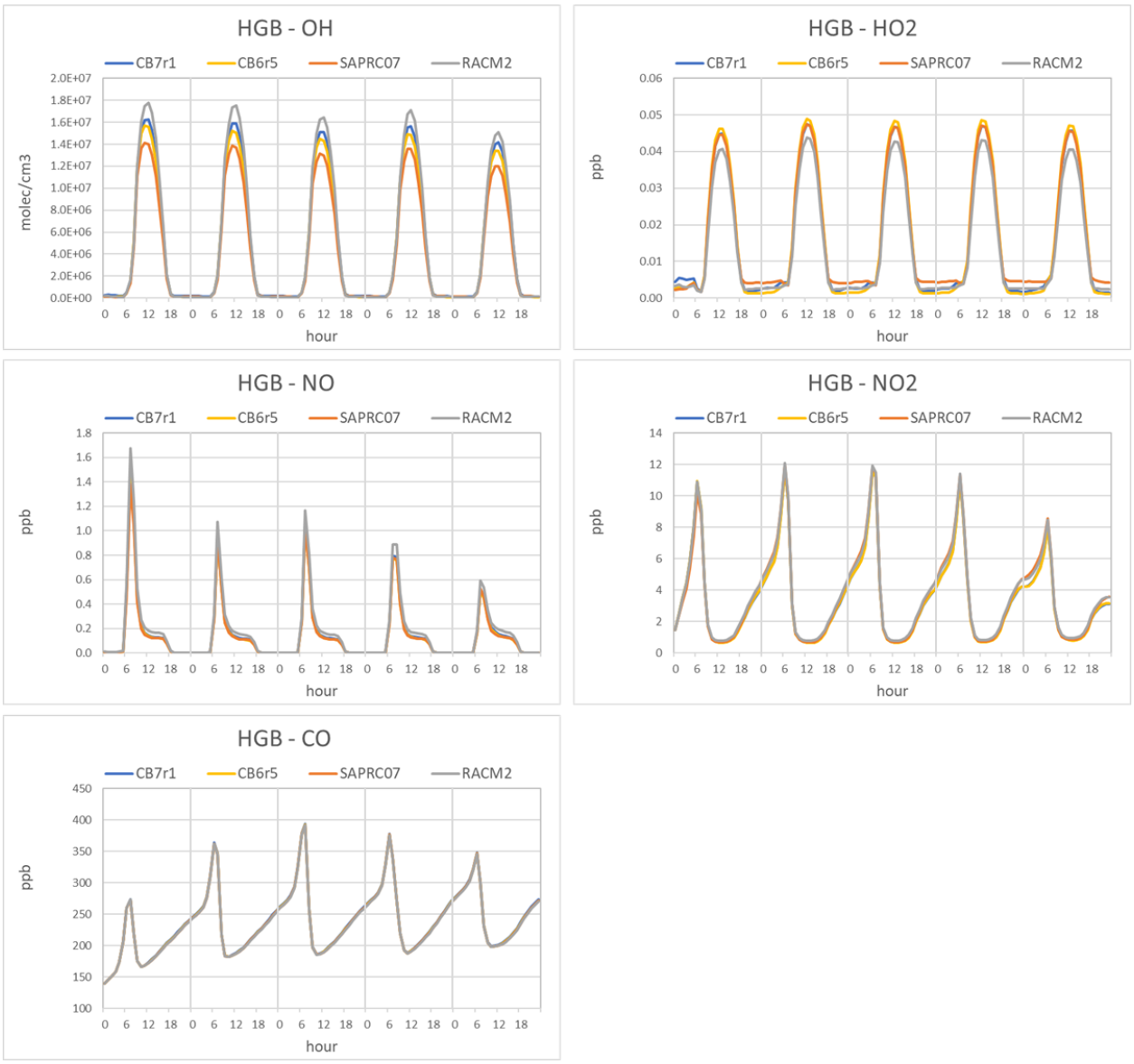

Figure S2. Time series of OH, HO_2, NO, NO_2, and CO simulated by four chemical mechanisms for the HGB box model scenario, shown in local time from Sept 3-7, 2019.

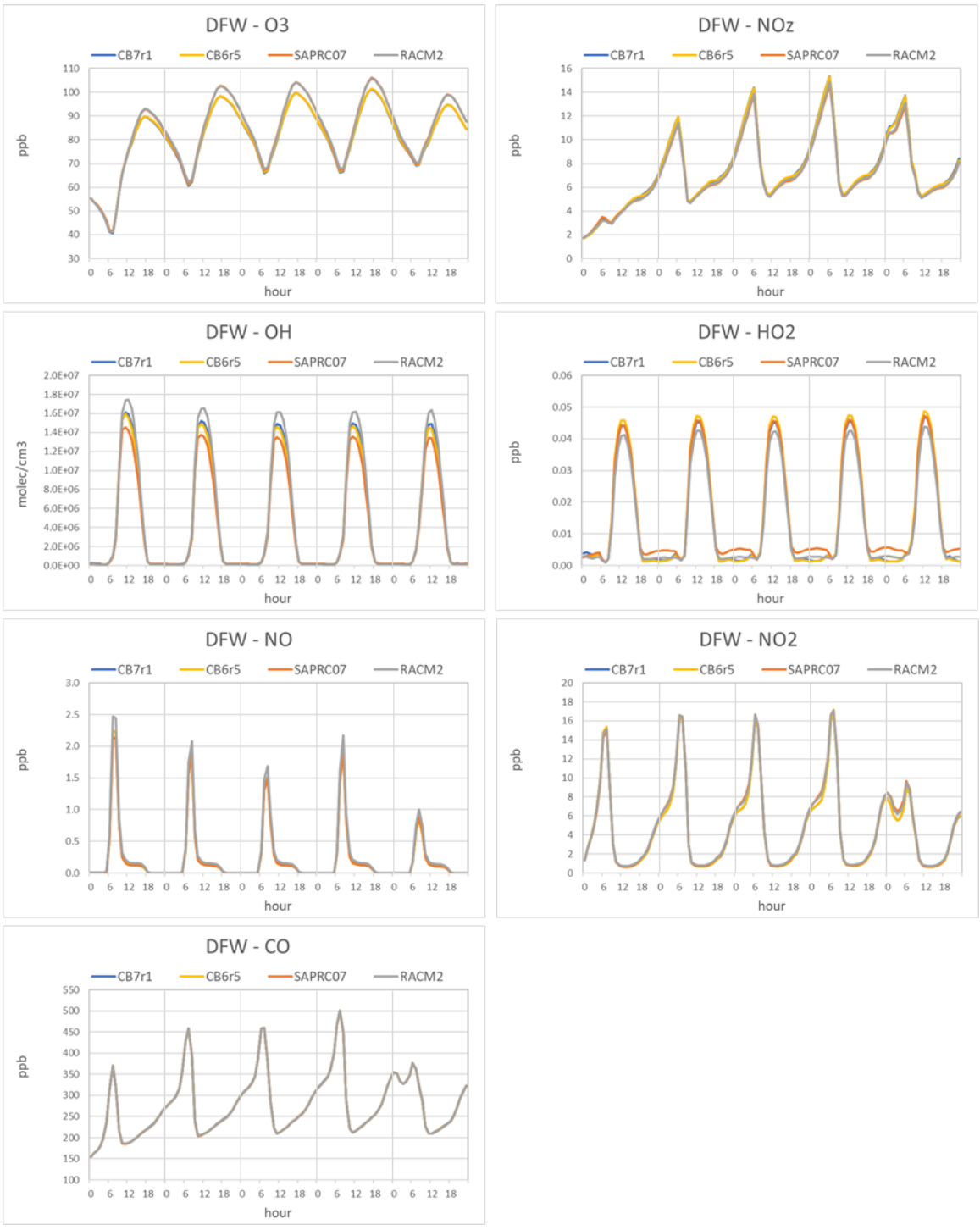

Figure S3. Time series of O_3, NO_Z (HNO_3+ONs+PANs), OH, HO_2, NO, NO_2, and CO simulated by four chemical mechanisms for the DFW box model scenario, shown in local time from Sept 3-7, 2019.

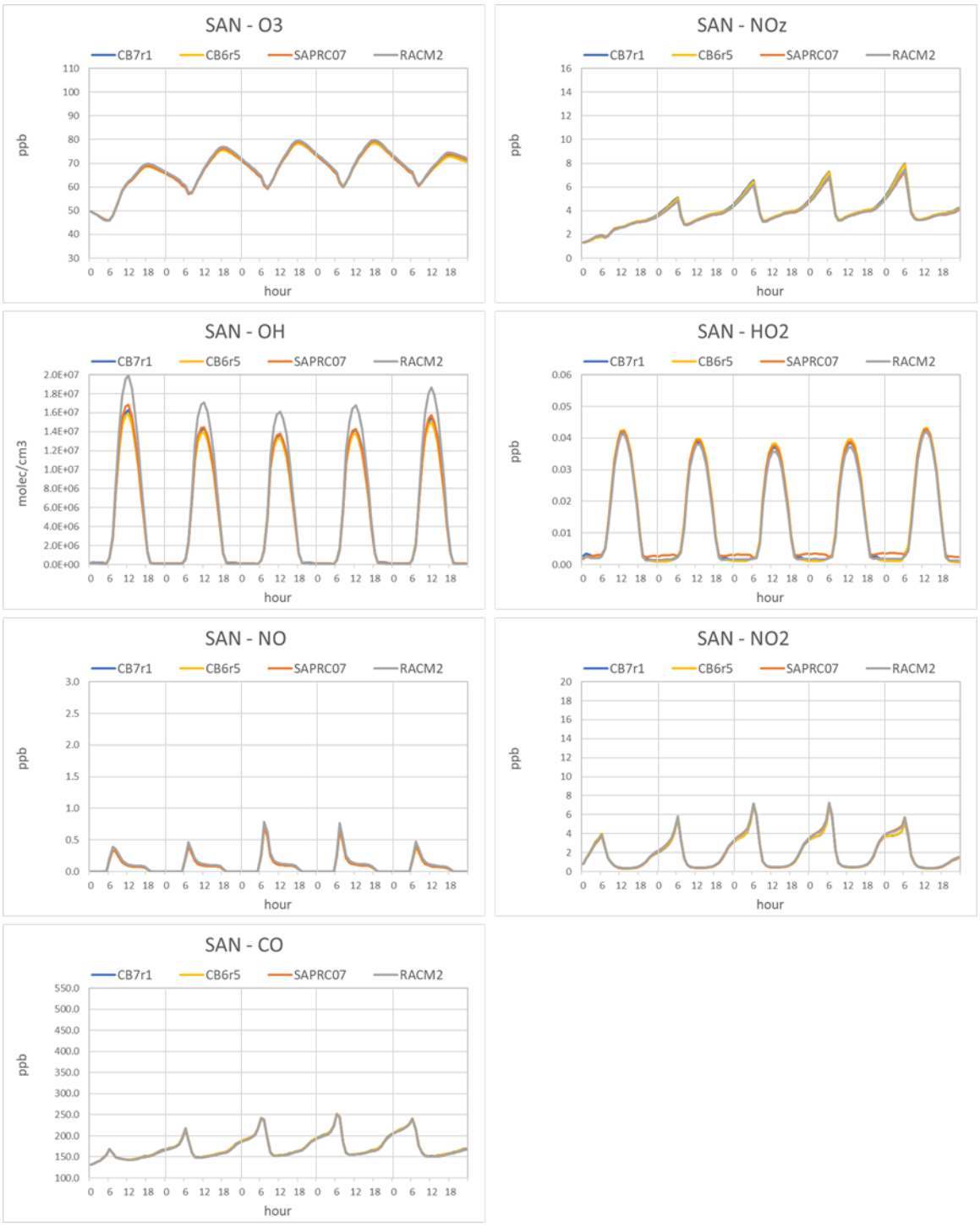

Figure S4. Time series of O_3, NO_Z (HNO_3+ONs+PANs), OH, HO_2, NO, NO_2, and CO simulated by four chemical mechanisms for the SAN box model scenario, shown in local time from July 23-27, 2019.

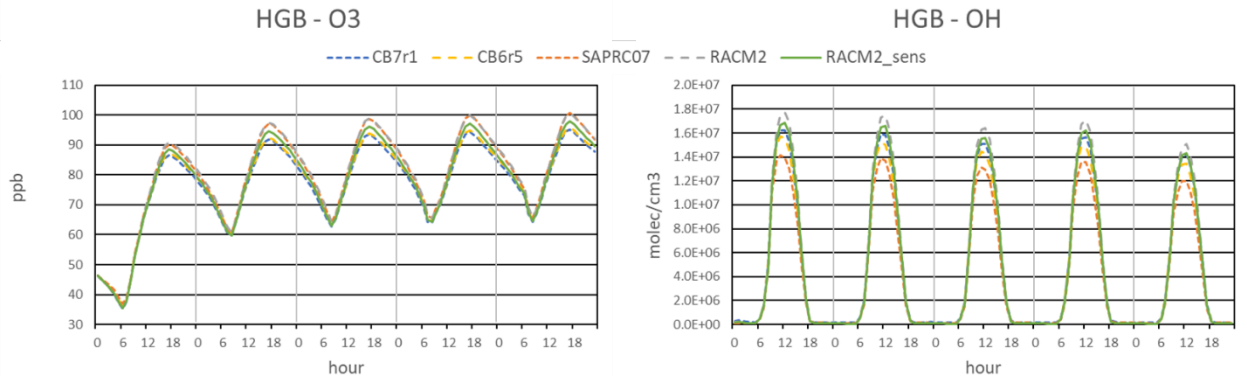

Figure S5. Time series of O_3 and OH simulated by four chemical mechanisms and the OH + NO_2 sensitivity test for the HGB box model scenario, shown in local time from Sept 3-7, 2019. The original RACM2 run (dashed gray line) used the NASA, 2019 recommendation for the OH + NO_2 rate constant and the RACM2_sens run (solid green line) used the NASA, 2006 recommendation, consistent with CB7r1, CB6r5, and SAPRC07.

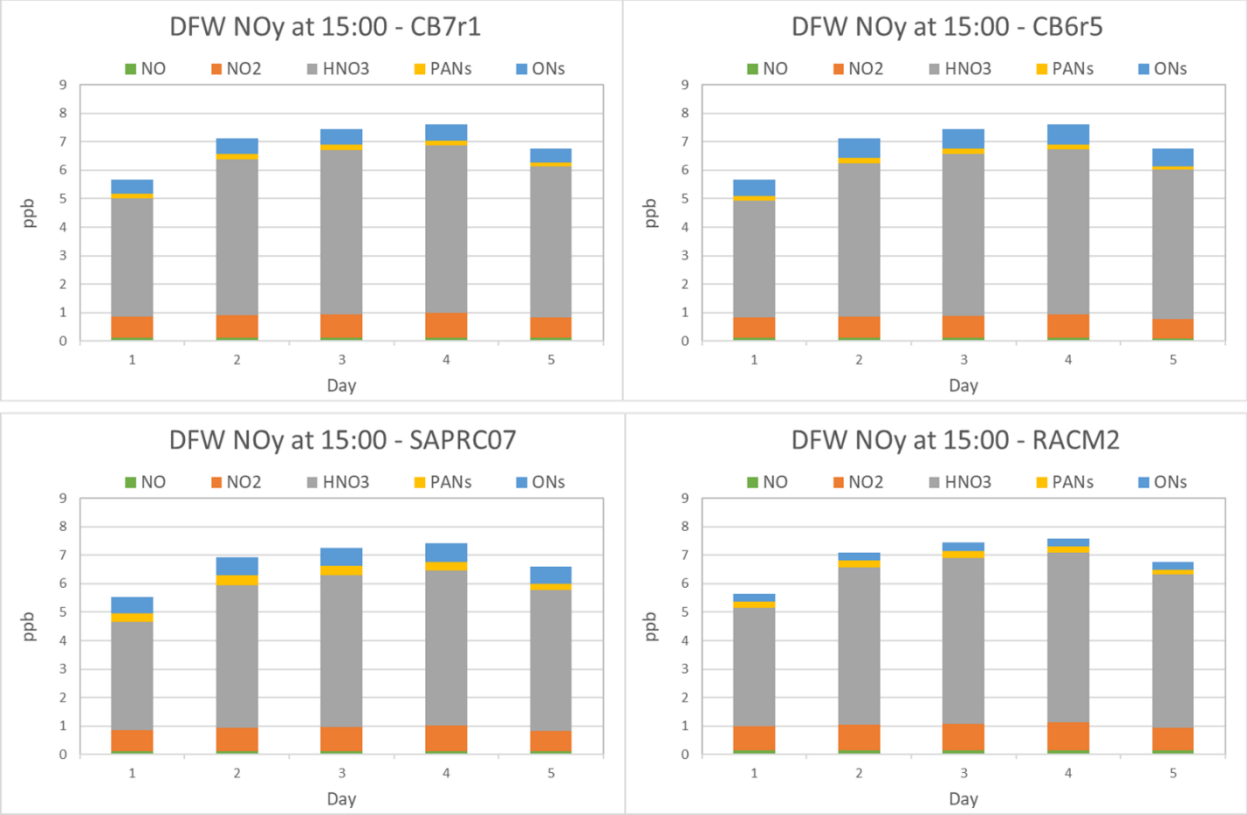

Figure S6. NO_Y composition simulated by four chemical mechanisms for the DFW box model scenarios, shown at 15:00 (local time) for each modeled day.

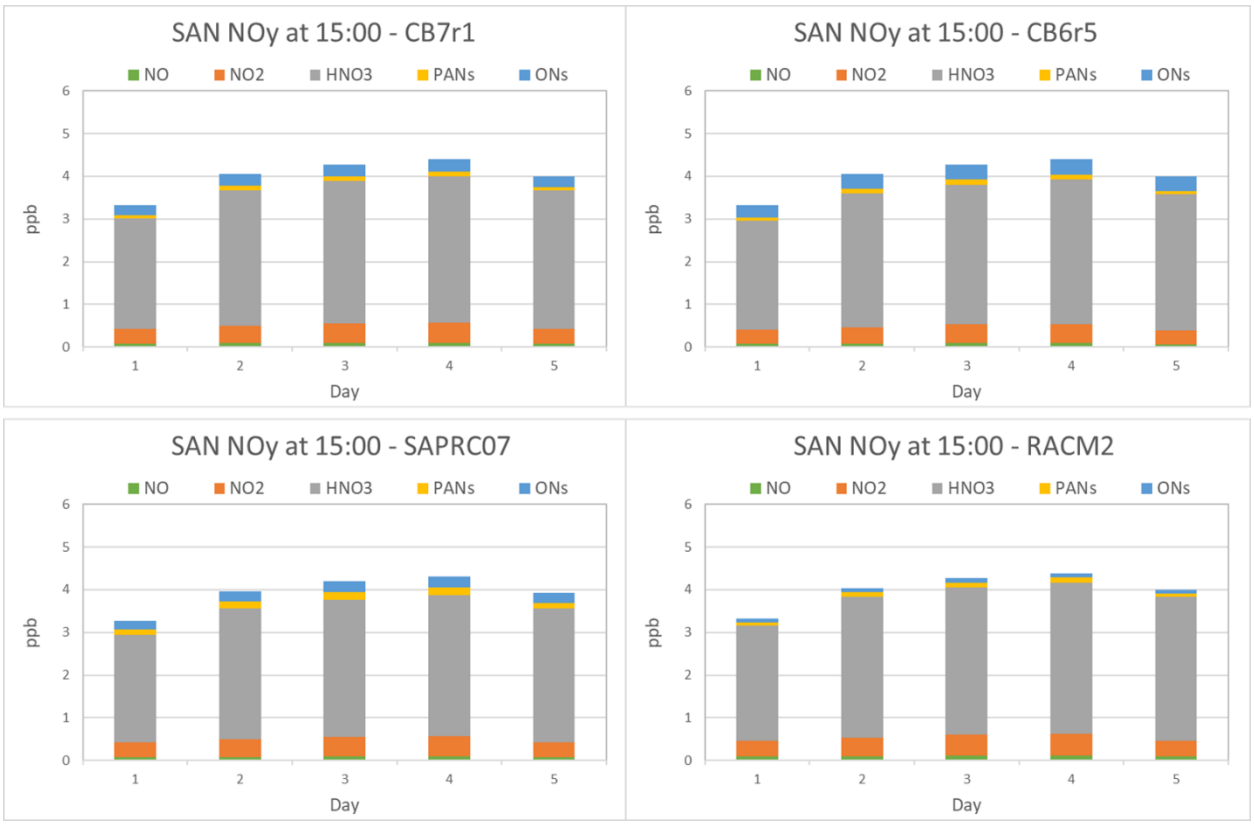

Figure S7. NO_Y composition simulated by four chemical mechanisms for the SAN box model scenarios, shown at 15:00 (local time) for each modeled day.

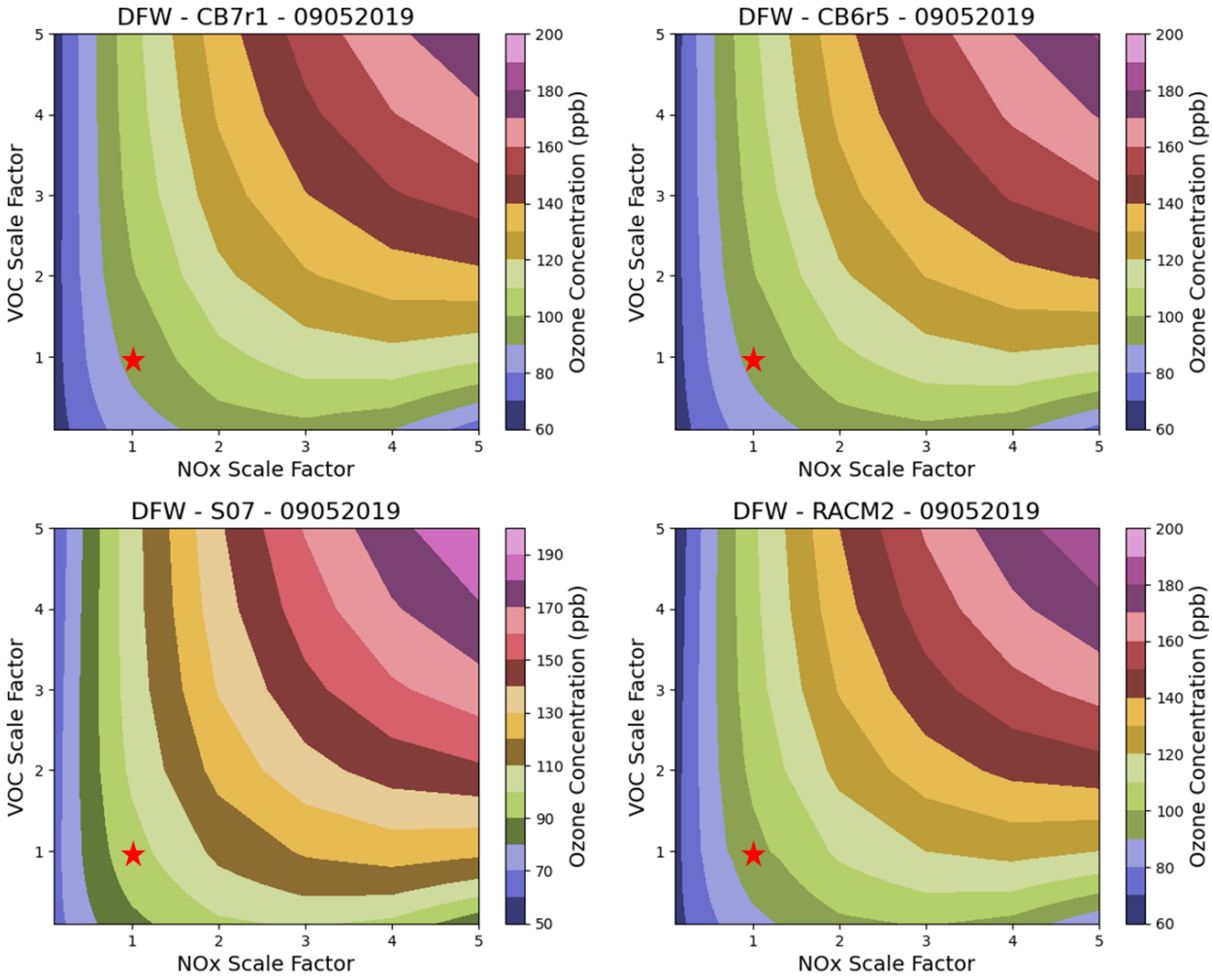

Figure S8. O_3 response surface plots at varying anthropogenic VOC and anthropogenic NO_X emissions for four chemical mechanisms, with the star indicating the base case. O_3 at 15:00 local time for day 3 (Sept 5, 2019) of the DFW box model scenario is shown. Other modeled days show similar O_3 responses.

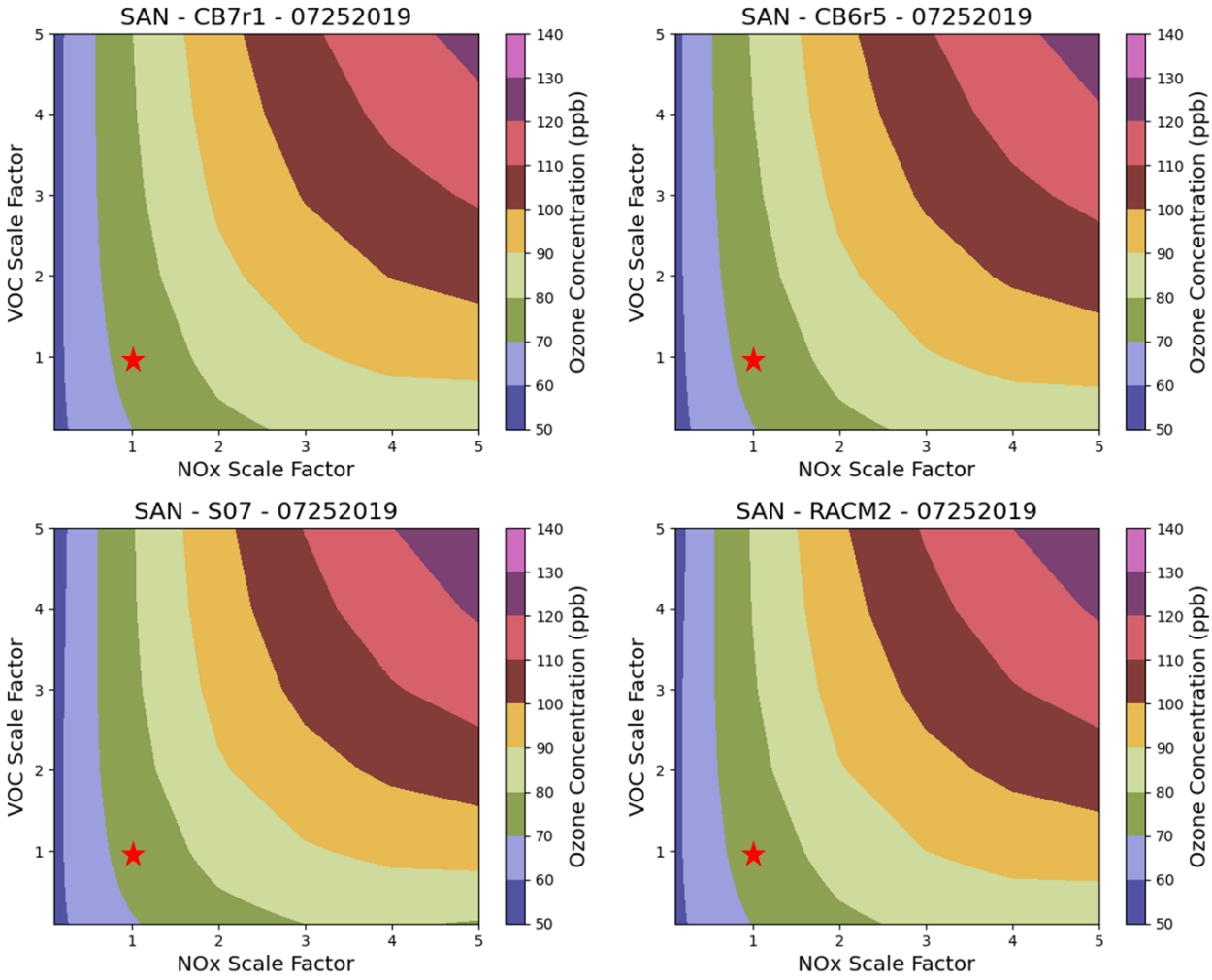

Figure S9. O_3 response surface plots at varying anthropogenic VOC and anthropogenic NO_X emissions for four chemical mechanisms, with the star indicating the base case. O_3 at 15:00 local time for day 3 (July 25, 2019) of the SAN box model scenario is shown. Other modeled days show similar O_3 responses.

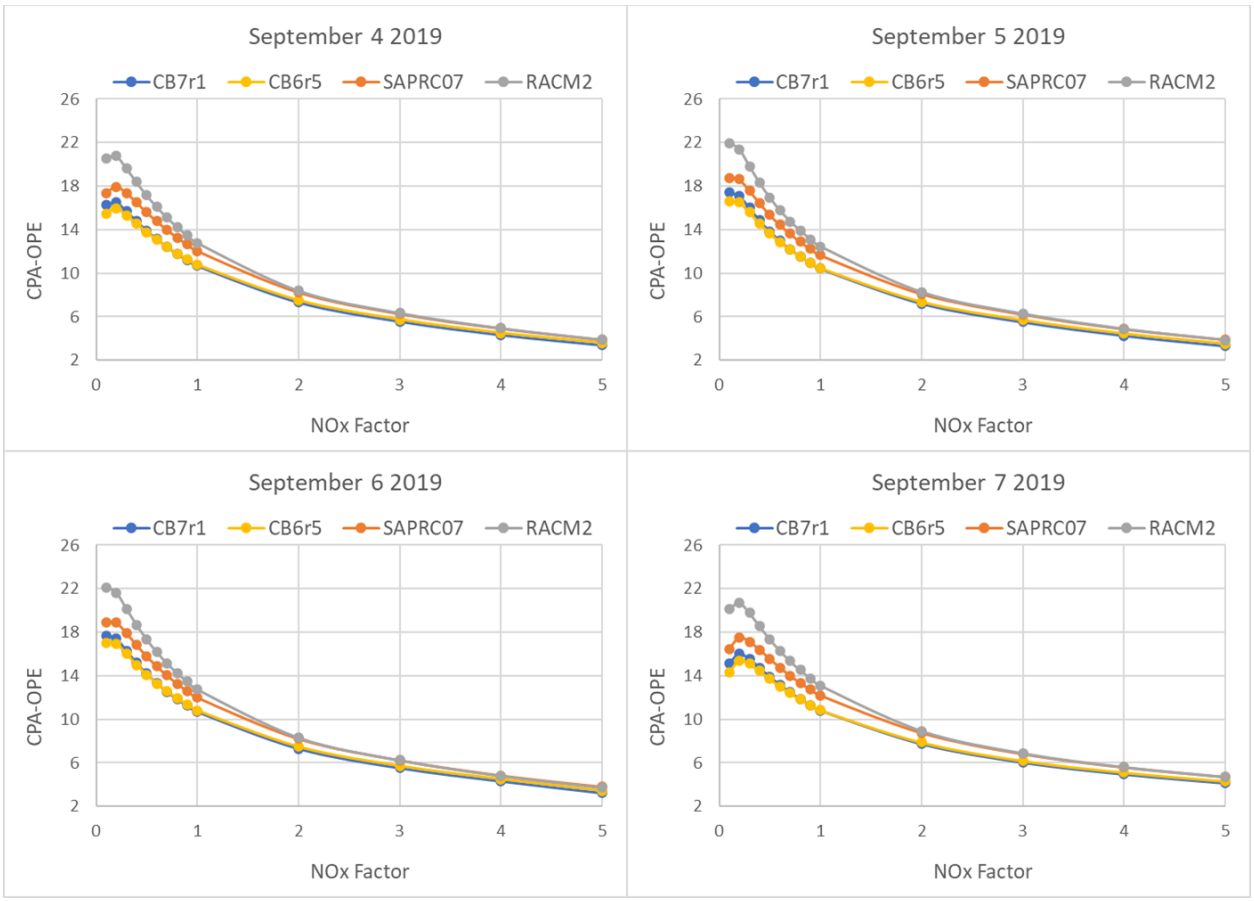

Figure S10. CPA-OPE calculated with t_2=15:00 (local time) at varying anthropogenic NO_X emission scaling factors and base VOC emissions, simulated by four chemical mechanisms for the DFW box model scenario.

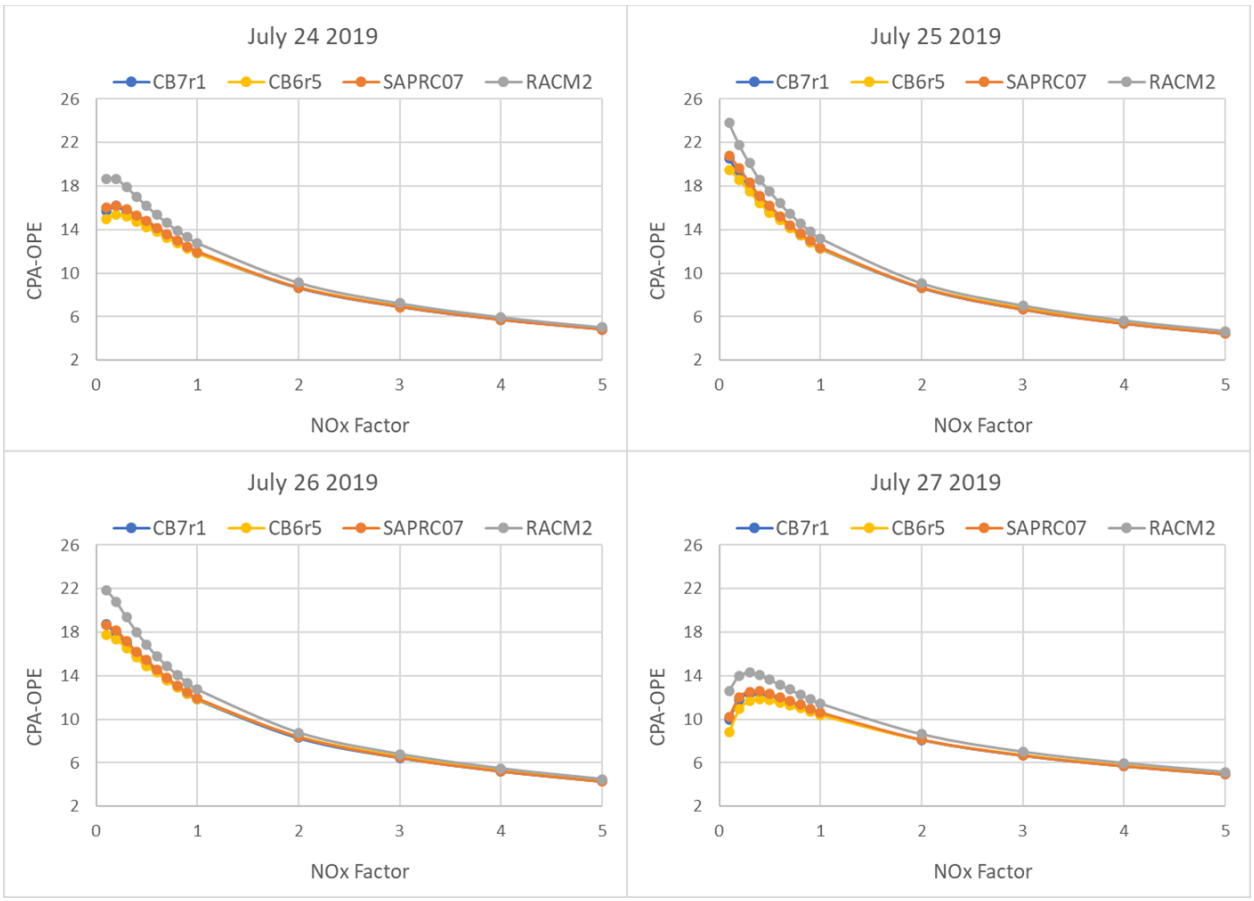

Figure S11. CPA-OPE calculated with t_2=15:00 (local time) at varying anthropogenic NO_X emission scaling factors and base VOC emissions, simulated by four chemical mechanisms for the SAN box model scenario.

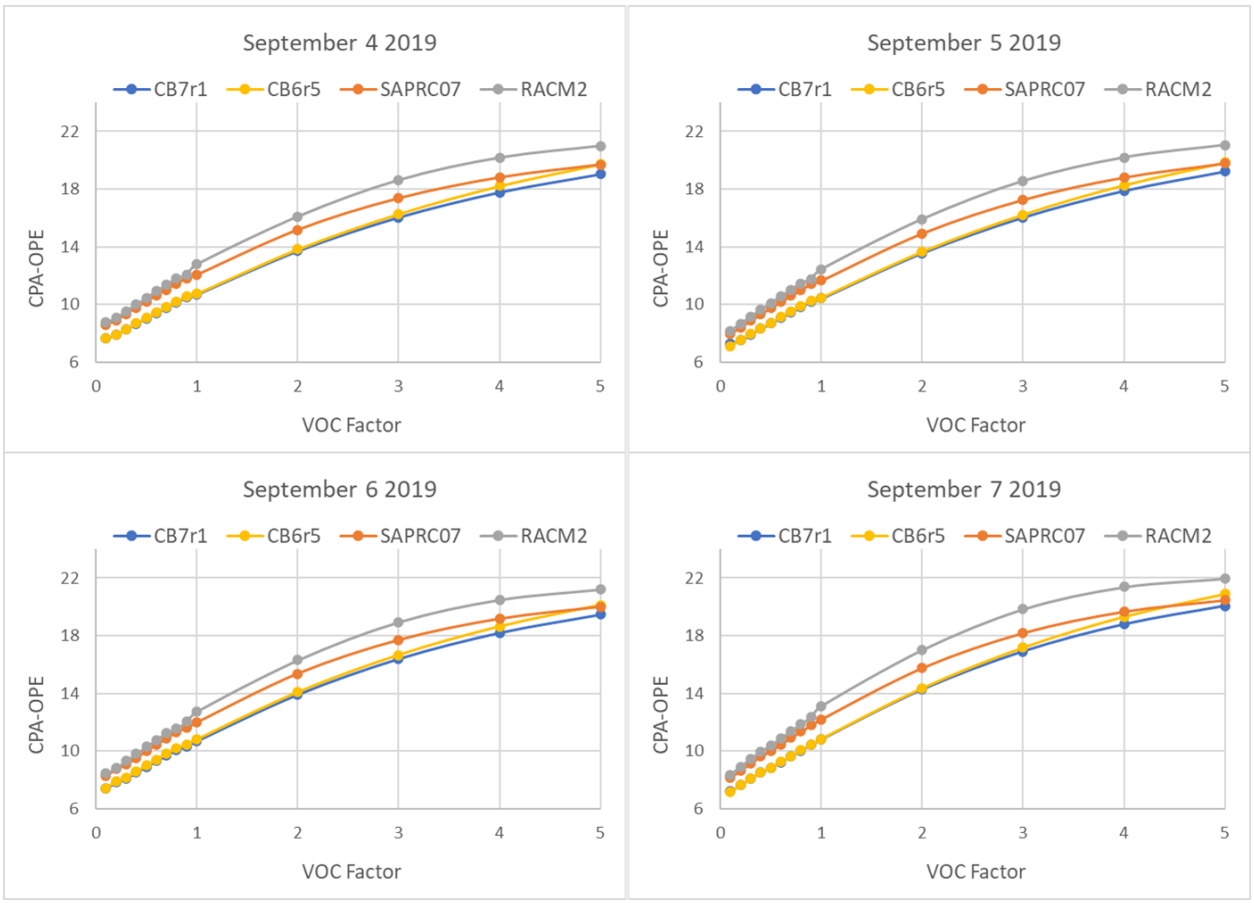

Figure S12. CPA-OPE calculated with t_2=15:00 (local time) at varying anthropogenic VOC emission scaling factors and base NO_X emissions, simulated by four chemical mechanisms for the DFW box model scenario.

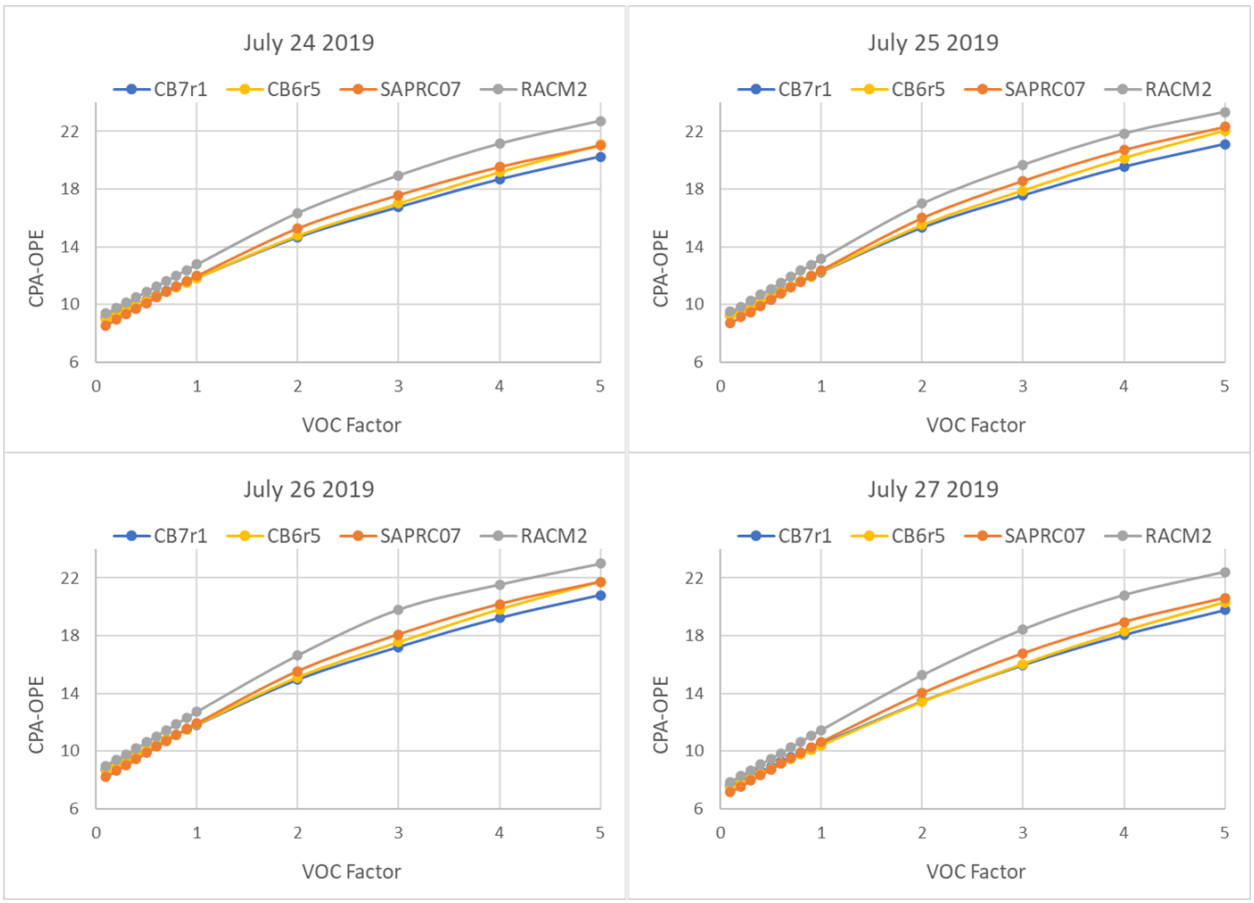

Figure S13. CPA-OPE calculated with t_2=15:00 (local time) at varying anthropogenic VOC emission scaling factors and base NO_X emissions, simulated by four chemical mechanisms for the SAN box model scenario.

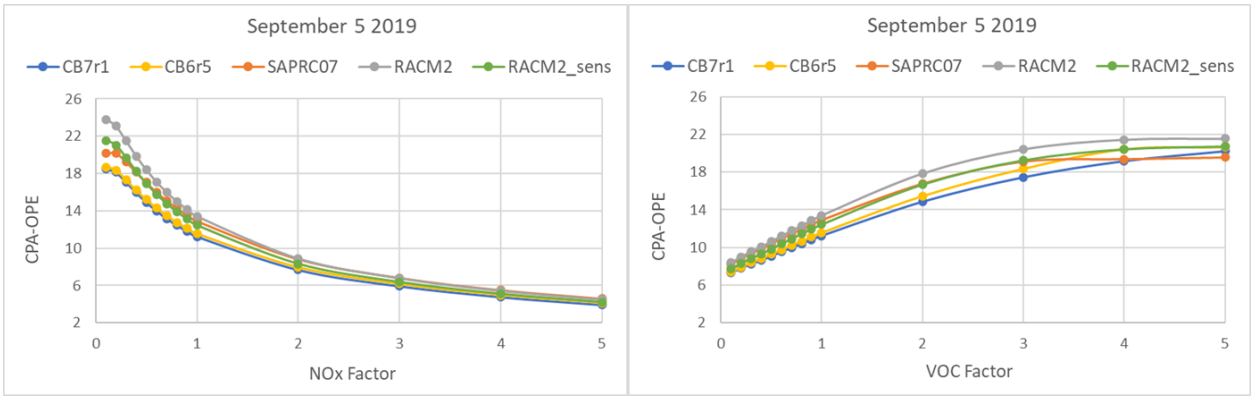

Figure S14. OPE-CPA calculated with t_2=15:00 (local time) on Sept 5, 2019, simulated by four chemical mechanisms for the HGB box model scenario. The left plot shows varying anthropogenic NO_X emission scaling factors and base VOC emissions and the right plot shows varying anthropogenic VOC emission scaling factors and base NO_X emissions. The original RACM2 run (gray line) used the NASA, 2019 recommendation for the OH + NO_2 rate constant and the RACM2_sens run (green line) used the NASA, 2006 recommendation, consistent with CB7r1, CB6r5, and SAPRC07.

Table S4. Reactions and rate constant expressions for the CB6r5 mechanism. See Table S5 for species names. k_{298} is the rate constant at 298 K and 1 atmosphere using units in cm^3 $molecule^{-1}$ s^{-1}. For photolysis reactions k_{298} shows the photolysis frequency (J) at a solar zenith angle of 60° (see Table S6).

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
1	NO2 = NO + O	Photolysis	6.30×10^{-3}
2	O + O2 + M = O3 + M	$k = 6.00 \times 10^{-34} (T/300)^{-2.6}$	6.11×10^{-34}
3	O3 + NO = NO2	$k = 2.07 \times 10^{-12} \exp(-1400/T)$	1.89×10^{-14}
4	O + NO = NO2	Falloff: F=0.85; n=0.84 $k(0) = 1.00 \times 10^{-31} (T/300)^{-1.6}$ $k(inf) = 5.00 \times 10^{-11} (T/300)^{-0.3}$	2.26×10^{-12}
5	O + NO2 = NO	$k = 5.10 \times 10^{-12} \exp(198/T)$	9.91×10^{-12}
6	O + NO2 = NO3	Falloff: F=0.6; n=1.03 $k(0) = 1.30 \times 10^{-31} (T/300)^{-1.5}$ $k(inf) = 2.30 \times 10^{-11} (T/300)^{0.24}$	2.09×10^{-12}
7	O + O3 =	$k = 8.00 \times 10^{-12} \exp(-2060/T)$	7.96×10^{-15}
8	O3 = O	Photolysis	3.33×10^{-4}
9	O3 = O1D	Photolysis	8.78×10^{-6}
10	O1D + M = O + M	$k = 2.23 \times 10^{-11} \exp(115/T)$	3.28×10^{-11}
11	O1D + H2O = 2 OH	$k = 2.14 \times 10^{-10}$	2.14×10^{-10}
12	O3 + OH = HO2	$k = 1.70 \times 10^{-12} \exp(-940/T)$	7.25×10^{-14}
13	O3 + HO2 = OH	$k = 2.03 \times 10^{-16} (T/300)^{4.57} \exp(693/T)$	2.01×10^{-15}
14	OH + O = HO2	$k = 2.40 \times 10^{-11} \exp(110/T)$	3.47×10^{-11}
15	HO2 + O = OH	$k = 3.00 \times 10^{-11} \exp(200/T)$	5.87×10^{-11}
16	OH + OH = O	$k = 6.20 \times 10^{-14} (T/298)^{2.6} \exp(945/T)$	1.48×10^{-12}
17	OH + OH = H2O2	Falloff: F=0.42; n=1.23 $k(0) = 9.00 \times 10^{-31} (T/300)^{-3.2}$ $k(inf) = 3.90 \times 10^{-11} (T/300)^{-0.47}$	6.21×10^{-12}
18	OH + HO2 =	$k = 4.80 \times 10^{-11} \exp(250/T)$	1.11×10^{-10}
19	HO2 + HO2 = H2O2	$k = k1 + k2 [M]$ $k1 = 2.20 \times 10^{-13} \exp(600/T)$ $k2 = 1.90 \times 10^{-33} \exp(980/T)$	2.90×10^{-12}
20	HO2 + HO2 + H2O = H2O2	$k = k1 + k2 [M]$ $k1 = 3.08 \times 10^{-34} \exp(2800/T)$ $k2 = 2.66 \times 10^{-54} \exp(3180/T)$	6.53×10^{-30}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
21	H2O2 = 2 OH	Photolysis	3.78×10^{-6}
22	H2O2 + OH = HO2	$k = 1.80\times10^{-12}$	1.80×10^{-12}
23	H2O2 + O = OH + HO2	$k = 1.40\times10^{-12}\ \exp(-2000/T)$	1.70×10^{-15}
24	NO + NO + O2 = 2 NO2	$k = 4.25\times10^{-39}\ \exp(664/T)$	3.95×10^{-38}
25	HO2 + NO = OH + NO2	$k = 3.45\times10^{-12}\ \exp(270/T)$	8.54×10^{-12}
26	NO2 + O3 = NO3	$k = 1.40\times10^{-13}\ \exp(-2470/T)$	3.52×10^{-17}
27	NO3 = NO2 + O	Photolysis	1.56×10^{-1}
28	NO3 = NO	Photolysis	1.98×10^{-2}
29	NO3 + NO = 2 NO2	$k = 1.80\times10^{-11}\ \exp(110/T)$	2.60×10^{-11}
30	NO3 + NO2 = NO + NO2	$k = 4.50\times10^{-14}\ \exp(-1260/T)$	6.56×10^{-16}
31	NO3 + O = NO2	$k = 1.70\times10^{-11}$	1.70×10^{-11}
32	NO3 + OH = HO2 + NO2	$k = 2.00\times10^{-11}$	2.00×10^{-11}
33	NO3 + HO2 = OH + NO2	$k = 4.00\times10^{-12}$	4.00×10^{-12}
34	NO3 + O3 = NO2	$k = 1.00\times10^{-17}$	1.00×10^{-17}
35	NO3 + NO3 = 2 NO2	$k = 8.50\times10^{-13}\ \exp(-2450/T)$	2.28×10^{-16}
36	NO3 + NO2 = N2O5	Falloff: F=0.35; n=1.33 $k(0) = 3.60\times10^{-30}\ (T/300)^{-4.1}$ $k(inf) = 1.90\times10^{-12}\ (T/300)^{0.2}$	1.24×10^{-12}
37	N2O5 = NO3 + NO2	Falloff: F=0.35; n=1.33 $k(0) = 1.30\times10^{-3}\ (T/300)^{-3.5}\ \exp(-11000/T)$ $k(inf) = 9.70\times10^{14}\ (T/300)^{0.1}\ \exp(-11080/T)$	4.46×10^{-2}
38	N2O5 = NO2 + NO3	Photolysis	2.52×10^{-5}
39	N2O5 + H2O = 2 HNO3	$k = 1.00\times10^{-22}$	1.00×10^{-22}
40	NO + OH = HONO	Falloff: F=0.81; n=0.87 $k(0) = 7.40\times10^{-31}\ (T/300)^{-2.4}$ $k(inf) = 3.30\times10^{-11}\ (T/300)^{-0.3}$	9.77×10^{-12}
41	NO + NO2 + H2O = 2 HONO	$k = 5.00\times10^{-40}$	5.00×10^{-40}
42	HONO + HONO = NO + NO2	$k = 1.00\times10^{-20}$	1.00×10^{-20}
43	HONO = NO + OH	Photolysis	1.04×10^{-3}
44	HONO + OH = NO2	$k = 2.50\times10^{-12}\ \exp(260/T)$	5.98×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
45	NO2 + OH = HNO3	Falloff: F=0.6; n=1 k(0) = $1.80\text{x}10^{-30}$ (T/300)#$^{-3}$ k(inf) = $2.80\text{x}10^{-11}$	$1.06\text{x}10^{-11}$
46	HNO3 + OH = NO3	k = k1 + k3 [M] / (1 + k3 [M] / k2) k1 = $2.40\text{x}10^{-14}$ exp(460/T) k2 = $2.70\text{x}10^{-17}$ exp(2199/T) k3 = $6.50\text{x}10^{-34}$ exp(1335/T)	$1.54\text{x}10^{-13}$
47	HNO3 = OH + NO2	Photolysis	$2.54\text{x}10^{-7}$
48	HO2 + NO2 = PNA	Falloff: F=0.4; n=1.26 k(0) = $1.40\text{x}10^{-31}$ (T/300)$^{-3.1}$ k(inf) = $4.00\text{x}10^{-12}$	$7.50\text{x}10^{-13}$
49	PNA = HO2 + NO2	Falloff: F=0.4; n=1.26 k(0) = $4.10\text{x}10^{-5}$ exp(−10650/T) k(inf) = $6.00\text{x}10^{15}$ exp(−11170/T)	$6.20\text{x}10^{-2}$
50	PNA = 0.59 HO2 + 0.59 NO2 + 0.41 OH + 0.41 NO3	Photolysis	$2.36\text{x}10^{-6}$
51	PNA + OH = NO2	k = $3.20\text{x}10^{-13}$ exp(690/T)	$3.24\text{x}10^{-12}$
52	SO2 + OH = SULF + HO2	Falloff: F=0.53; n=1.1 k(0) = $2.80\text{x}10^{-31}$ (T/300)$^{-2.6}$ k(inf) = $2.00\text{x}10^{-12}$	$9.35\text{x}10^{-13}$
53	C2O3 + NO = NO2 + MEO2 + RO2	k = $7.50\text{x}10^{-12}$ exp(290/T)	$1.98\text{x}10^{-11}$
54	C2O3 + NO2 = PAN	Falloff: F=0.3; n=1.41 k(0) = $3.61\text{x}10^{-28}$ (T/300)$^{-6.87}$ k(inf) = $1.24\text{x}10^{-11}$ (T/300)$^{-1.105}$	$9.86\text{x}10^{-12}$
55	PAN = NO2 + C2O3	Falloff: F=0.3; n=1.41 k(0) = $1.10\text{x}10^{-5}$ exp(−10100/T) k(inf) = $1.90\text{x}10^{17}$ exp(−14100/T)	$4.31\text{x}10^{-4}$
56	PAN = 0.6 NO2 + 0.6 C2O3 + 0.4 NO3 + 0.4 MEO2 + 0.4 RO2	Photolysis	$3.47\text{x}10^{-7}$
57	C2O3 + HO2 = 0.37 PACD + 0.13 AACD + 0.13 O3 + 0.5 OH + 0.5 MEO2 + 0.5 RO2	k = $3.14\text{x}10^{-12}$ exp(580/T)	$2.20\text{x}10^{-11}$
58	C2O3 + RO2 = MEO2	k = $4.40\text{x}10^{-13}$ exp(1070/T)	$1.60\text{x}10^{-11}$
59	C2O3 + C2O3 = 2 MEO2 + 2 RO2	k = $2.90\text{x}10^{-12}$ exp(500/T)	$1.55\text{x}10^{-11}$
60	C2O3 + CXO3 = MEO2 + ALD2 + XO2H + 2 RO2	k = k(ref) K k(ref) = k(59) K = 1.0	$1.55\text{x}10^{-11}$
61	CXO3 + NO = NO2 + ALD2 + XO2H + RO2	k = $6.70\text{x}10^{-12}$ exp(340/T)	$2.10\text{x}10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
62	CXO3 + NO2 = PANX	k = k(ref) K k(ref) = k(54) K = 1.19×10^{0}	8.28×10^{-12}
63	PANX = NO2 + CXO3	k = k(ref) K k(ref) = k(55) K = 1.19×10^{0}	3.62×10^{-4}
64	PANX = 0.6 NO2 + 0.6 CXO3 + 0.4 NO3 + 0.4 ALD2 + 0.4 XO2H + 0.4 RO2	Photolysis	3.47×10^{-7}
65	CXO3 + HO2 = 0.37 PACD + 0.13 AACD + 0.13 O3 + 0.5 OH + 0.5 MEO2 + 0.5 RO2	k = k(ref) K k(ref) = k(57) K = 1.0	2.20×10^{-11}
66	CXO3 + RO2 = MEO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
67	CXO3 + CXO3 = 2 MEO2 + 2 RO2	k = k(ref) K k(ref) = k(59) K = 1.0	1.55×10^{-11}
68	RO2 + NO = NO	$k = 2.40 \times 10^{-12} \exp(360/T)$	8.03×10^{-12}
69	RO2 + HO2 = HO2	$k = 4.80 \times 10^{-13} \exp(800/T)$	7.03×10^{-12}
70	RO2 + RO2 =	$k = 6.50 \times 10^{-14} \exp(500/T)$	3.48×10^{-13}
71	MEO2 + NO = FORM + HO2 + NO2	$k = 2.30 \times 10^{-12} \exp(360/T)$	7.70×10^{-12}
72	MEO2 + HO2 = 0.9 MEPX + 0.1 FORM	$k = 3.80 \times 10^{-13} \exp(780/T)$	5.21×10^{-12}
73	MEO2 + C2O3 = FORM + 0.9 HO2 + 0.9 MEO2 + 0.1 AACD + 0.9 RO2	$k = 2.00 \times 10^{-12} \exp(500/T)$	1.07×10^{-11}
74	MEO2 + RO2 = 0.685 FORM + 0.315 MEOH + 0.37 HO2 + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
75	XO2H + NO = NO2 + HO2	$k = 2.70 \times 10^{-12} \exp(360/T)$	9.04×10^{-12}
76	XO2H + HO2 = ROOH	$k = 6.80 \times 10^{-13} \exp(800/T)$	9.96×10^{-12}
77	XO2H + C2O3 = 0.8 HO2 + 0.8 MEO2 + 0.2 AACD + 0.8 RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
78	XO2H + RO2 = 0.6 HO2 + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
79	XO2 + NO = NO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
80	XO2 + HO2 = ROOH	k = k(ref) K k(ref) = k(76) K = 1.0	9.96×10^{-12}
81	XO2 + C2O3 = 0.8 MEO2 + 0.2 AACD + 0.8 RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
82	XO2 + RO2 = RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
83	XO2N + NO = 0.5 NTR1 + 0.5 NTR2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
84	XO2N + HO2 = ROOH	k = k(ref) K k(ref) = k(76) K = 1.0	9.96×10^{-12}
85	XO2N + C2O3 = 0.8 HO2 + 0.8 MEO2 + 0.2 AACD + 0.8 RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
86	XO2N + RO2 = RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
87	MEPX + OH = 0.6 MEO2 + 0.6 RO2 + 0.4 FORM + 0.4 OH	$k = 5.30 \times 10^{-12} \exp(190/T)$	1.00×10^{-11}
88	MEPX = MEO2 + RO2 + OH	Photolysis	2.68×10^{-6}
89	ROOH + OH = 0.54 XO2H + 0.06 XO2N + 0.6 RO2 + 0.4 OH	$k = 5.30 \times 10^{-12} \exp(190/T)$	1.00×10^{-11}
90	ROOH = HO2 + OH	Photolysis	2.68×10^{-6}
91	NTR1 + OH = NTR2	$k = 2.00 \times 10^{-12}$	2.00×10^{-12}
92	NTR1 = NO2	Photolysis	1.06×10^{-6}
93	FACD + OH = HO2	$k = 4.50 \times 10^{-13}$	4.50×10^{-13}
94	AACD + OH = MEO2 + RO2	$k = 4.00 \times 10^{-14} \exp(850/T)$	6.93×10^{-13}
95	PACD + OH = C2O3	$k = 5.30 \times 10^{-12} \exp(190/T)$	1.00×10^{-11}
96	FORM + OH = HO2 + CO	$k = 5.40 \times 10^{-12} \exp(135/T)$	8.49×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
97	FORM = 2 HO2 + CO	Photolysis	1.69×10^{-5}
98	FORM = CO + H2	Photolysis	2.69×10^{-5}
99	FORM + NO3 = HNO3 + HO2 + CO	$k = 5.50 \times 10^{-16}$	5.50×10^{-16}
100	FORM + HO2 = HCO3	$k = 9.70 \times 10^{-15} \exp(625/T)$	7.90×10^{-14}
101	HCO3 = FORM + HO2	$k = 2.40 \times 10^{12} \exp(-7000/T)$	1.51×10^{2}
102	HCO3 + NO = FACD + NO2 + HO2	$k = 5.60 \times 10^{-12}$	5.60×10^{-12}
103	HCO3 + HO2 = 0.5 MEPX + 0.5 FACD + 0.2 OH + 0.2 HO2	$k = 5.60 \times 10^{-15} \exp(2300/T)$	1.26×10^{-11}
104	ALD2 + OH = C2O3	$k = 4.70 \times 10^{-12} \exp(345/T)$	1.50×10^{-11}
105	ALD2 + NO3 = C2O3 + HNO3	$k = 1.40 \times 10^{-12} \exp(-1860/T)$	2.73×10^{-15}
106	ALD2 = MEO2 + RO2 + CO + HO2	Photolysis	1.96×10^{-6}
107	ALDX + OH = CXO3	$k = 4.90 \times 10^{-12} \exp(405/T)$	1.91×10^{-11}
108	ALDX + NO3 = CXO3 + HNO3	$k = 6.30 \times 10^{-15}$	6.30×10^{-15}
109	ALDX = ALD2 + XO2H + RO2 + CO + HO2	Photolysis	2.62×10^{-5}
110	GLYD + OH = 0.2 GLY + 0.2 HO2 + 0.8 C2O3	$k = 8.00 \times 10^{-12}$	8.00×10^{-12}
111	GLYD = 0.74 FORM + 0.89 CO + 1.4 HO2 + 0.15 MEOH + 0.19 OH + 0.11 GLY + 0.11 XO2H + 0.11 RO2	Photolysis	2.76×10^{-6}
112	GLYD + NO3 = HNO3 + C2O3	k = k(ref) K k(ref) = k(105) K = 1.0	2.73×10^{-15}
113	GLY + OH = 1.8 CO + 0.2 XO2 + 0.2 RO2 + HO2	$k = 3.10 \times 10^{-12} \exp(340/T)$	9.70×10^{-12}
114	GLY = 2 HO2 + 2 CO	Photolysis	5.01×10^{-4}
115	GLY + NO3 = HNO3 + 1.5 CO + 0.5 XO2 + 0.5 RO2 + HO2	$k = 4.00 \times 10^{-16}$	4.00×10^{-16}
116	MGLY = C2O3 + HO2 + CO	Photolysis	1.46×10^{-4}
117	MGLY + NO3 = HNO3 + C2O3 + XO2 + RO2	$k = 5.00 \times 10^{-16}$	5.00×10^{-16}
118	MGLY + OH = C2O3 + CO	$k = 1.90 \times 10^{-12} \exp(575/T)$	1.31×10^{-11}
119	H2 + OH = HO2	$k = 7.70 \times 10^{-12} \exp(-2100/T)$	6.70×10^{-15}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
120	CO + OH = HO2	k = k1 + k2 [M] k1 = 1.44×10^{-13} k2 = 3.43×10^{-33}	2.28×10^{-13}
121	CH4 + OH = MEO2 + RO2	k = 1.85×10^{-12} exp(−1690/T)	6.37×10^{-15}
122	ETHA + OH = 0.991 ALD2 + 0.991 XO2H + 0.009 XO2N + RO2	k = 6.90×10^{-12} exp(−1000/T)	2.41×10^{-13}
123	MEOH + OH = FORM + HO2	k = 2.85×10^{-12} exp(−345/T)	8.95×10^{-13}
124	ETOH + OH = 0.95 ALD2 + 0.9 HO2 + 0.1 XO2H + 0.1 RO2 + 0.078 FORM + 0.011 GLYD	k = 3.00×10^{-12} exp(20/T)	3.21×10^{-12}
125	KET = 0.5 ALD2 + 0.5 C2O3 + 0.5 XO2H + 0.5 CXO3 + 0.5 MEO2 + RO2 − 2.5 PAR	Photolysis	2.27×10^{-7}
126	ACET = 0.38 CO + 1.38 MEO2 + 1.38 RO2 + 0.62 C2O3	Photolysis	2.08×10^{-7}
127	ACET + OH = FORM + C2O3 + XO2 + RO2	k = 1.41×10^{-12} exp(−620.6/T)	1.76×10^{-13}
128	PRPA + OH = XPRP	k = 7.60×10^{-12} exp(−585/T)	1.07×10^{-12}
129	PAR + OH = XPAR	k = 8.10×10^{-13}	8.10×10^{-13}
130	ROR = 0.2 KET + 0.42 ACET + 0.74 ALD2 + 0.37 ALDX + 0.04 XO2N + 0.94 XO2H + 0.98 RO2 + 0.02 ROR − 2.7 PAR	k = 5.70×10^{12} exp(−5780/T)	2.15×10^{4}
131	ROR + O2 = KET + HO2	k = 1.50×10^{-14} exp(−200/T)	7.67×10^{-15}
132	ROR + NO2 = NTR1	k = 8.60×10^{-12} exp(400/T)	3.29×10^{-11}
133	ETHY + OH = 0.7 GLY + 0.7 OH + 0.3 FACD + 0.3 CO + 0.3 HO2	Falloff: F=0.37; n=1.3 k(0) = 5.00×10^{-30} $(T/300)^{-1.5}$ k(inf) = 1.00×10^{-12}	7.52×10^{-13}
134	ETH + OH = XO2H + RO2 + 1.56 FORM + 0.22 GLYD	Falloff: F=0.48; n=1.15 k(0) = 8.60×10^{-29} $(T/300)^{-3.1}$ k(inf) = 9.00×10^{-12} $(T/300)^{-0.85}$	7.84×10^{-12}
135	ETH + O3 = FORM + 0.35 CO + 0.27 HO2 + 0.17 OH + 0.42 FACD	k = 6.82×10^{-15} exp(−2500/T)	1.55×10^{-18}
136	ETH + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.5 XO2H + 0.5 XO2 + RO2 + 1.125 FORM	k = 3.30×10^{-12} exp(−2880/T)	2.10×10^{-16}
137	OLE + OH = 0.781 FORM + 0.488 ALD2 + 0.488 ALDX + 0.976 XO2H + 0.195 XO2 + 0.024 XO2N + 1.195 RO2 − 0.73 PAR	Falloff: F=0.5; n=1.13 k(0) = 8.00×10^{-27} $(T/300)^{-3.5}$ k(inf) = 3.00×10^{-11} $(T/300)\#^{-1}$	2.86×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
138	OLE + O3 = 0.295 ALD2 + 0.555 FORM + 0.27 ALDX + 0.15 XO2H + 0.15 RO2 + 0.334 OH + 0.08 HO2 + 0.378 CO + 0.075 GLY + 0.075 MGLY + 0.09 FACD + 0.13 AACD + 0.04 H2O2 − 0.79 PAR	$k = 5.50 \times 10^{-15} \exp(-1880/T)$	1.00×10^{-17}
139	OLE + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.48 XO2 + 0.48 XO2H + 0.04 XO2N + RO2 + 0.5 FORM + 0.25 ALD2 + 0.375 ALDX − 1 PAR	$k = 4.60 \times 10^{-13} \exp(-1155/T)$	9.54×10^{-15}
140	IOLE + OH = 1.3 ALD2 + 0.7 ALDX + XO2H + RO2	$k = 1.05 \times 10^{-11} \exp(519/T)$	5.99×10^{-11}
141	IOLE + O3 = 0.732 ALD2 + 0.442 ALDX + 0.128 FORM + 0.245 CO + 0.5 OH + 0.3 XO2H + 0.3 RO2 + 0.24 GLY + 0.06 MGLY + 0.29 PAR + 0.08 AACD + 0.08 H2O2	$k = 4.70 \times 10^{-15} \exp(-1013/T)$	1.57×10^{-16}
142	IOLE + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.48 XO2 + 0.48 XO2H + 0.04 XO2N + RO2 + 0.5 ALD2 + 0.625 ALDX + PAR	$k = 3.70 \times 10^{-13}$	3.70×10^{-13}
143	ISOP + OH = ISO2 + RO2	$k = 2.70 \times 10^{-11} \exp(390/T)$	9.99×10^{-11}
144	ISO2 + NO = 0.1 INTR + 0.9 NO2 + 0.673 FORM + 0.9 ISPD + 0.818 HO2 + 0.082 XO2H + 0.082 RO2	$k = 2.39 \times 10^{-12} \exp(365/T)$	8.13×10^{-12}
145	ISO2 + HO2 = 0.88 ISPX + 0.12 OH + 0.12 HO2 + 0.12 FORM + 0.12 ISPD	$k = 7.43 \times 10^{-13} \exp(700/T)$	7.78×10^{-12}
146	ISO2 + C2O3 = 0.598 FORM + 1 ISPD + 0.728 HO2 + 0.072 XO2H + 0.8 MEO2 + 0.2 AACD + 0.872 RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
147	ISO2 + RO2 = 0.598 FORM + 1 ISPD + 0.728 HO2 + 0.072 XO2H + 1.072 RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
148	ISO2 = HO2 + HPLD	$k = 3.30 \times 10^{9} \exp(-8300/T)$	2.64×10^{-3}
149	ISOP + O3 = 0.6 FORM + 0.65 ISPD + 0.15 ALDX + 0.2 CXO3 + 0.35 PAR + 0.266 OH + 0.2 XO2 + 0.2 RO2 + 0.066 HO2 + 0.066 CO	$k = 1.03 \times 10^{-14} \exp(-1995/T)$	1.27×10^{-17}
150	ISOP + NO3 = 0.35 NO2 + 0.65 NTR2 + 0.64 XO2H + 0.33 XO2 + 0.03 XO2N + RO2 + 0.35 FORM + 0.35 ISPD	$k = 3.03 \times 10^{-12} \exp(-448/T)$	6.74×10^{-13}
151	ISPD + OH = 0.022 XO2N + 0.521 XO2 + 0.115 MGLY + 0.115 MEO2 + 0.269 GLYD + 0.269 C2O3 + 0.457 OPO3 + 0.117 PAR +	$k = 5.58 \times 10^{-12} \exp(511/T)$	3.10×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
	0.137 ACET + 0.137 CO + 0.137 HO2 + 0.658 RO2		
152	ISPD + O3 = 0.04 ALD2 + 0.231 FORM + 0.531 MGLY + 0.17 GLY + 0.17 ACET + 0.543 CO + 0.461 OH + 0.15 FACD + 0.398 HO2 + 0.143 C2O3	$k = 3.88 \times 10^{-15} \exp(-1770/T)$	1.02×10^{-17}
153	ISPD + NO3 = 0.717 HNO3 + 0.142 NTR2 + 0.142 NO2 + 0.142 XO2 + 0.142 XO2H + 0.113 GLYD + 0.113 MGLY + 0.717 PAR + 0.717 CXO3 + 0.284 RO2	$k = 4.10 \times 10^{-12} \exp(-1860/T)$	7.98×10^{-15}
154	ISPD = 0.76 HO2 + 0.34 XO2H + 0.16 XO2 + 0.34 MEO2 + 0.208 C2O3 + 0.26 FORM + 0.24 OLE + 0.24 PAR + 0.17 ACET + 0.128 GLYD + 0.84 RO2	Photolysis	1.60×10^{-5}
155	ISPX + OH = 0.904 EPOX + 0.933 OH + 0.067 ISO2 + 0.067 RO2 + 0.029 IOLE + 0.029 ALDX	$k = 2.23 \times 10^{-11} \exp(372/T)$	7.77×10^{-11}
156	HPLD = OH + ISPD	Photolysis	4.41×10^{-4}
157	HPLD + NO3 = HNO3 + ISPD	$k = 6.00 \times 10^{-12} \exp(-1860/T)$	1.17×10^{-14}
158	EPOX + OH = EPX2 + RO2	$k = 5.78 \times 10^{-11} \exp(-400/T)$	1.51×10^{-11}
159	EPX2 + HO2 = 0.275 GLYD + 0.275 GLY + 0.275 MGLY + 1.125 OH + 0.825 HO2 + 0.375 FORM + 0.074 FACD + 0.251 CO + 2.175 PAR	$k = 7.43 \times 10^{-13} \exp(700/T)$	7.78×10^{-12}
160	EPX2 + NO = 0.275 GLYD + 0.275 GLY + 0.275 MGLY + 0.125 OH + 0.825 HO2 + 0.375 FORM + NO2 + 0.251 CO + 2.175 PAR	$k = 2.39 \times 10^{-12} \exp(365/T)$	8.13×10^{-12}
161	EPX2 + C2O3 = 0.22 GLYD + 0.22 GLY + 0.22 MGLY + 0.1 OH + 0.66 HO2 + 0.3 FORM + 0.2 CO + 1.74 PAR + 0.8 MEO2 + 0.2 AACD + 0.8 RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
162	EPX2 + RO2 = 0.275 GLYD + 0.275 GLY + 0.275 MGLY + 0.125 OH + 0.825 HO2 + 0.375 FORM + 0.251 CO + 2.175 PAR + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
163	INTR + OH = 0.63 XO2 + 0.37 XO2H + RO2 + 0.444 NO2 + 0.185 NO3 + 0.104 INTR + 0.592 FORM + 0.331 GLYD + 0.185 FACD + 2.7 PAR + 0.098 OLE + 0.078 ALDX + 0.266 NTR2	$k = 3.10 \times 10^{-11}$	3.10×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
164	TERP + OH = 0.75 XO2H + 0.5 XO2 + 0.25 XO2N + 1.5 RO2 + 0.28 FORM + 1.66 PAR + 0.47 ALDX	$k = 1.50 \times 10^{-11} \exp(449/T)$	6.77×10^{-11}
165	TERP + O3 = 0.57 OH + 0.07 XO2H + 0.69 XO2 + 0.18 XO2N + 0.94 RO2 + 0.24 FORM + 0.001 CO + 7 PAR + 0.21 ALDX + 0.39 CXO3	$k = 1.20 \times 10^{-15} \exp(-821/T)$	7.63×10^{-17}
166	TERP + NO3 = 0.47 NO2 + 0.28 XO2H + 0.75 XO2 + 0.25 XO2N + 1.28 RO2 + 0.47 ALDX + 0.53 NTR2	$k = 3.70 \times 10^{-12} \exp(175/T)$	6.66×10^{-12}
167	BENZ + OH = 0.53 CRES + 0.352 BZO2 + 0.352 RO2 + 0.118 OPEN + 0.118 OH + 0.53 HO2	$k = 2.30 \times 10^{-12} \exp(-190/T)$	1.22×10^{-12}
168	BZO2 + NO = 0.918 NO2 + 0.082 NTR2 + 0.918 GLY + 0.918 OPEN + 0.918 HO2	$k = 2.70 \times 10^{-12} \exp(360/T)$	9.04×10^{-12}
169	BZO2 + C2O3 = GLY + OPEN + HO2 + MEO2 + RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
170	BZO2 + HO2 =	$k = 1.90 \times 10^{-13} \exp(1300/T)$	1.49×10^{-11}
171	BZO2 + RO2 = GLY + OPEN + HO2 + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
172	TOL + OH = 0.18 CRES + 0.65 TO2 + 0.72 RO2 + 0.1 OPEN + 0.1 OH + 0.07 XO2H + 0.18 HO2	$k = 1.80 \times 10^{-12} \exp(340/T)$	5.63×10^{-12}
173	TO2 + NO = 0.86 NO2 + 0.14 NTR2 + 0.417 GLY + 0.443 MGLY + 0.66 OPEN + 0.2 XOPN + 0.86 HO2	$k = 2.70 \times 10^{-12} \exp(360/T)$	9.04×10^{-12}
174	TO2 + C2O3 = 0.48 GLY + 0.52 MGLY + 0.77 OPEN + 0.23 XOPN + HO2 + MEO2 + RO2	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
175	TO2 + HO2 =	$k = 1.90 \times 10^{-13} \exp(1300/T)$	1.49×10^{-11}
176	TO2 + RO2 = 0.48 GLY + 0.52 MGLY + 0.77 OPEN + 0.23 XOPN + HO2 + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	3.48×10^{-13}
177	XYL + OH = 0.155 CRES + 0.544 XLO2 + 0.602 RO2 + 0.244 XOPN + 0.244 OH + 0.058 XO2H + 0.155 HO2	$k = 1.85 \times 10^{-11}$	1.85×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
178	XLO2 + NO = 0.86 NO2 + 0.14 NTR2 + 0.221 GLY + 0.675 MGLY + 0.3 OPEN + 0.56 XOPN + 0.86 HO2	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
179	XLO2 + HO2 =	$k = 1.90x10^{-13} \exp(1300/T)$	$1.49x10^{-11}$
180	XLO2 + C2O3 = 0.26 GLY + 0.77 MGLY + 0.35 OPEN + 0.65 XOPN + HO2 + MEO2 + RO2	k = k(ref) K k(ref) = k(58) K = 1.0	$1.60x10^{-11}$
181	XLO2 + RO2 = 0.26 GLY + 0.77 MGLY + 0.35 OPEN + 0.65 XOPN + HO2 + RO2	k = k(ref) K k(ref) = k(70) K = 1.0	$3.48x10^{-13}$
182	CRES + OH = 0.025 GLY + 0.025 OPEN + HO2 + 0.2 CRO + 0.732 CAT1 + 0.02 XO2N + 0.02 RO2	$k = 1.70x10^{-12} \exp(950/T)$	$4.12x10^{-11}$
183	CRES + NO3 = 0.3 CRO + HNO3 + 0.48 XO2 + 0.12 XO2H + 0.24 GLY + 0.24 MGLY + 0.48 OPO3 + 0.1 XO2N + 0.7 RO2	$k = 1.40x10^{-11}$	$1.40x10^{-11}$
184	CRO + NO2 = CRON	$k = 2.10x10^{-12}$	$2.10x10^{-12}$
185	CRO + HO2 = CRES	$k = 5.50x10^{-12}$	$5.50x10^{-12}$
186	CRON + OH = NTR2 + 0.5 CRO	$k = 1.53x10^{-12}$	$1.53x10^{-12}$
187	CRON + NO3 = NTR2 + 0.5 CRO + HNO3	$k = 3.80x10^{-12}$	$3.80x10^{-12}$
188	CRON = HONO + HO2 + FORM + OPEN	Photolysis	$9.45x10^{-5}$
189	XOPN = 0.4 GLY + XO2H + 0.7 HO2 + 0.7 CO + 0.3 C2O3	Photolysis	$5.04x10^{-4}$
190	XOPN + OH = MGLY + 0.4 GLY + 2 XO2H + 2 RO2	$k = 9.00x10^{-11}$	$9.00x10^{-11}$
191	XOPN + O3 = 1.2 MGLY + 0.5 OH + 0.6 C2O3 + 0.1 ALD2 + 0.5 CO + 0.3 XO2H + 0.3 RO2	$k = 1.08x10^{-16} \exp(-500/T)$	$2.02x10^{-17}$
192	XOPN + NO3 = 0.5 NO2 + 0.5 NTR2 + 0.45 XO2H + 0.45 XO2 + 0.1 XO2N + RO2 + 0.25 OPEN + 0.25 MGLY	$k = 3.00x10^{-12}$	$3.00x10^{-12}$
193	OPEN = OPO3 + HO2 + CO	Photolysis	$5.04x10^{-4}$
194	OPEN + OH = 0.6 OPO3 + 0.4 XO2H + 0.4 RO2 + 0.4 GLY	$k = 4.40x10^{-11}$	$4.40x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
195	OPEN + O3 = 1.4 GLY + 0.24 MGLY + 0.5 OH + 0.12 C2O3 + 0.08 FORM + 0.02 ALD2 + 1.98 CO + 0.56 HO2	$k = 5.40 \times 10^{-17} \exp(-500/T)$	1.01×10^{-17}
196	OPEN + NO3 = OPO3 + HNO3	$k = 3.80 \times 10^{-12}$	3.80×10^{-12}
197	CAT1 + OH = 0.14 FORM + 0.2 HO2 + 0.5 CRO	$k = 5.00 \times 10^{-11}$	5.00×10^{-11}
198	CAT1 + NO3 = CRO + HNO3	$k = 1.70 \times 10^{-10}$	1.70×10^{-10}
199	OPO3 + NO = NO2 + 0.5 GLY + 0.5 CO + 0.8 HO2 + 0.2 CXO3	k = k(ref) K k(ref) = k(61) K = 1.0	2.10×10^{-11}
200	OPO3 + NO2 = OPAN	k = k(ref) K k(ref) = k(62) K = 1.0	8.28×10^{-12}
201	OPAN = OPO3 + NO2	k = k(ref) K k(ref) = k(63) K = 1.0	3.62×10^{-4}
202	OPO3 + HO2 = 0.37 PACD + 0.13 AACD + 0.13 O3 + 0.5 OH + 0.5 MEO2 + 0.5 RO2	k = k(ref) K k(ref) = k(57) K = 1.0	2.20×10^{-11}
203	OPO3 + C2O3 = MEO2 + XO2 + ALDX + 2 RO2	k = k(ref) K k(ref) = k(59) K = 1.0	1.55×10^{-11}
204	OPO3 + RO2 = 0.8 XO2H + 0.8 ALDX + 1.8 RO2 + 0.2 AACD	k = k(ref) K k(ref) = k(58) K = 1.0	1.60×10^{-11}
205	OPAN + OH = 0.5 NO2 + 0.5 GLY + CO + 0.5 NTR2	$k = 3.60 \times 10^{-11}$	3.60×10^{-11}
206	PANX + OH = ALD2 + NO2	$k = 3.00 \times 10^{-12}$	3.00×10^{-12}
207	NTR2 = HNO3	$k = 2.30 \times 10^{-5}$	2.30×10^{-5}
208	ECH4 + OH = MEO2 + RO2	$k = 1.85 \times 10^{-12} \exp(-1690/T)$	6.37×10^{-15}

[a] Rate constants defined by a Troe falloff expression are evaluated as described by Mellouki et al. (2021)

Table S5. CB6r5 species names, descriptions, atom counts and molecular weights (g/mol).

Species	Description	C	H	O	N	S	M Wt
AACD	Acetic acid	2	4	2			60.1
ACET	Acetone	3	6	1			58.1
ALD2	Acetaldehyde	2	4	1			44.1
ALDX	Higher aldehydes (R-C-CHO)	2	3	1			43.0
BENZ	Benzene	6	6				78.1
CAT1	Methyl-catechols	7	8	2			124.1
CO	Carbon monoxide	1		1			28.0
CH4	Background methane (see also ECH4)	1	4				16.0
CRES	Cresols	7	8	1			108.1
CRON	Nitro-cresols	7	7	3	1		153.1
DMS	Dimethyl sulfide	2	6			1	62.1
ECH4	Emitted methane (to enable tracking separate from CH4)	1	4				16.0
EPOX	Epoxide formed from ISPX reaction with OH	5	10	3			118.1
ETH	Ethene	2	4				28.1
ETHA	Ethane	2	6				30.1
ETHY	Ethyne	2	2				26.0
ETOH	Ethanol	2	6	1			46.1
FACD	Formic acid	1	2	2			46.0
FORM	Formaldehyde	1	2	1			30.0
GLY	Glyoxal	2	2	2			58.0
GLYD	Glycolaldehyde	2	4	2			60.1
H2	Background hydrogen		2				2.0
H2O2	Hydrogen peroxide		2	2			34.0
HNO3	Nitric acid		1	3	1		63.0
HONO	Nitrous acid		1	2	1		47.0
HPLD	Hydroperoxyaldehyde from ISO2 isomerization	5	8	3			116.1

Species	Description	C	H	O	N	S	M Wt
INTR	Organic nitrates from ISO2 reaction with NO	5	9	4	1		147.1
IOLE	Internal olefin carbon bond (R-C=C-R)	4	8				56.1
ISOP	Isoprene	5	8				68.1
ISPD	Isoprene product (methacrolein, methyl vinyl ketone, etc.)	4	6	1			70.1
ISPX	Hydroperoxides from ISO2 reaction with HO2	5	10	3			118.1
KET	Larger ketones (C4+); 4C species beginning CB7r2	4	6	1			70.1
MEOH	Methanol	1	4	1			32.0
MEPX	Methylhydroperoxide	1	4	2			48.0
MGLY	Methylglyoxal	3	4	2			72.1
N2O5	Dinitrogen pentoxide			5	2		108.0
NO	Nitric oxide			1	1		30.0
NO2	Nitrogen dioxide			2	1		46.0
NO3	Nitrate radical			3	1		62.0
NTR1	Simple organic nitrates	4	9	3	1		119.1
NTR2	Multi-functional organic nitrates	4	9	4	1		135.1
O3	Ozone			3			48.0
OLE	Terminal olefin carbon bond (R-C=C)	2	5				29.1
OPAN	Other peroxyacyl nitrates (PAN compounds) from OPO3	4	3	6	1		161.1
OPEN	Aromatic ring opening product (unsaturated dicarbonyl)	4	4	2			84.1
PACD	Peroxyacetic and higher peroxycarboxylic acids	2	4	3			76.1
PAN	Peroxyacetyl Nitrate	2	3	5	1		121.0
PANX	Larger alkyl peroxyacyl nitrates (from CXO3)	2	3	5	1		121.0
PAR	Paraffin carbon bond (C-C)	1	2.5				14.5
PNA	Peroxynitric acid		1	4	1		79.0
PRPA	Propane	3	8				44.1
ROOH	Higher organic peroxide	4	10	2			90.1
SO2	Sulfur dioxide			2		1	64.1

Species	Description	C	H	O	N	S	M Wt
SULF	Sulfuric acid (gaseous)		2	4		1	98.1
TERP	Monoterpenes	10	16				136.2
TOL	Toluene and other monoalkyl aromatics	7	8				92.1
XOPN	Aromatic ring opening product (unsaturated dicarbonyl)	5	6	2			98.1
XYL	Xylene and other polyalkyl aromatics	8	10				106.2
BZO2	Peroxy radical from OH addition to benzene	6	7	5			159.1
C2O3	Acetylperoxy radical	2	3	3			75.0
CRO	Alkoxy radical from cresol	7	7	1			107.1
CXO3	C3 and higher acylperoxy radicals	2	3	3			75.0
EPX2	Peroxy radical from EPOX reaction with OH	5	9	5			149.1
HCO3	Adduct from HO2 plus formaldehyde	1	3	3			63.0
HO2	Hydroperoxy radical		1	2			33.0
ISO2	Peroxy radical from OH addition to isoprene	5	9	3			117.1
MEO2	Methylperoxy radical	1	3	2			47.0
O	Oxygen atom in the $O^3(P)$ electronic state			1			16.0
O1D	Oxygen atom in the $O^1(D)$ electronic state			1			16.0
OH	Hydroxyl radical		1	1			17.0
OPO3	Peroxyacyl radical from OPEN and other model species	4	3	4			115.1
RO2	Operator to approximate total peroxy radical concentration	4	7	2			87.1
ROR	Secondary alkoxy radical from PAR	4	7	1			71.1
TO2	Peroxy radical from OH addition to TOL	7	9	5			173.1
XLO2	Peroxy radical from OH addition to XYL	8	11	5			187.2
XO2	NO to NO2 conversion from a peroxy radical	4	7	2			87.1
XO2H	NO to NO2 conversion (XO2) accompanied by HO2 production from a peroxy radical	4	7	2			87.1
XO2N	NO to organic nitrate conversion from a peroxy radical	4	7	2			87.1
XPRP	Operator to enable T-dependent organic nitrate yield from PRPA	3	7	2			75.1

Species	Description	C	H	O	N	S	M Wt
XPAR	Operator to enable T-dependent organic nitrate yield from PAR	1	2.5	2			46.5

Table S6. Zenith angle (degrees) dependence of photolysis frequencies (s^{-1}) for CB6r5 reactions computed by the TUV discrete ordinates radiative transfer scheme (Stamnes et al., 1988) with cross-section and quantum yield data for each reaction recommended by the mechanism developer. Conditions are 600 m above ground level at mean sea level with surface UV albedo of 0.04, stratospheric ozone column of 0.3 atm cm, and the aerosol profile of Elterman (1968) provided with TUV.

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
1	NO2	$1.01x10^{-2}$	$9.77x10^{-3}$	$8.75x10^{-3}$	$6.30x10^{-3}$	$2.09x10^{-3}$	$5.12x10^{-4}$
8	O3	$4.26x10^{-4}$	$4.19x10^{-4}$	$3.94x10^{-4}$	$3.33x10^{-4}$	$1.79x10^{-4}$	$4.27x10^{-5}$
9	O3	$4.55x10^{-5}$	$3.99x10^{-5}$	$2.54x10^{-5}$	$8.78x10^{-6}$	$9.20x10^{-7}$	$1.52x10^{-7}$
21	H2O2	$8.79x10^{-6}$	$8.26x10^{-6}$	$6.64x10^{-6}$	$3.78x10^{-6}$	$8.81x10^{-7}$	$2.03x10^{-7}$
27	NO3	$1.88x10^{-1}$	$1.86x10^{-1}$	$1.79x10^{-1}$	$1.56x10^{-1}$	$8.22x10^{-2}$	$1.79x10^{-2}$
28	NO3	$2.32x10^{-2}$	$2.31x10^{-2}$	$2.23x10^{-2}$	$1.98x10^{-2}$	$1.12x10^{-2}$	$2.63x10^{-3}$
38	N2O5	$5.54x10^{-5}$	$5.23x10^{-5}$	$4.26x10^{-5}$	$2.52x10^{-5}$	$6.30x10^{-6}$	$1.48x10^{-6}$
43	HONO	$1.74x10^{-3}$	$1.68x10^{-3}$	$1.49x10^{-3}$	$1.04x10^{-3}$	$3.29x10^{-4}$	$8.35x10^{-5}$
47	HNO3	$8.47x10^{-7}$	$7.70x10^{-7}$	$5.57x10^{-7}$	$2.54x10^{-7}$	$4.20x10^{-8}$	$7.98x10^{-9}$
50	PNA	$7.02x10^{-6}$	$6.46x10^{-6}$	$4.84x10^{-6}$	$2.36x10^{-6}$	$4.16x10^{-7}$	$7.73x10^{-8}$
56	PAN	$9.53x10^{-7}$	$8.81x10^{-7}$	$6.72x10^{-7}$	$3.47x10^{-7}$	$7.05x10^{-8}$	$1.52x10^{-8}$
64	PANX	$9.53x10^{-7}$	$8.81x10^{-7}$	$6.72x10^{-7}$	$3.47x10^{-7}$	$7.05x10^{-8}$	$1.52x10^{-8}$
88	MEPX	$6.02x10^{-6}$	$5.68x10^{-6}$	$4.61x10^{-6}$	$2.68x10^{-6}$	$6.52x10^{-7}$	$1.53x10^{-7}$
90	ROOH	$6.02x10^{-6}$	$5.68x10^{-6}$	$4.61x10^{-6}$	$2.68x10^{-6}$	$6.52x10^{-7}$	$1.53x10^{-7}$
92	NTR1	$3.29x10^{-6}$	$3.01x10^{-6}$	$2.22x10^{-6}$	$1.06x10^{-6}$	$1.85x10^{-7}$	$3.60x10^{-8}$
97	FORM	$4.16x10^{-5}$	$3.90x10^{-5}$	$3.10x10^{-5}$	$1.69x10^{-5}$	$3.55x10^{-6}$	$7.35x10^{-7}$
98	FORM	$5.43x10^{-5}$	$5.18x10^{-5}$	$4.35x10^{-5}$	$2.69x10^{-5}$	$7.06x10^{-6}$	$1.73x10^{-6}$
106	ALD2	$7.29x10^{-6}$	$6.59x10^{-6}$	$4.65x10^{-6}$	$1.96x10^{-6}$	$2.54x10^{-7}$	$3.93x10^{-8}$
109	ALDX	$6.88x10^{-5}$	$6.41x10^{-5}$	$4.99x10^{-5}$	$2.62x10^{-5}$	$5.17x10^{-6}$	$1.04x10^{-6}$
111	GLYD	$9.03x10^{-6}$	$8.24x10^{-6}$	$6.01x10^{-6}$	$2.76x10^{-6}$	$4.40x10^{-7}$	$7.94x10^{-8}$
114	GLY	$7.40x10^{-4}$	$7.23x10^{-4}$	$6.61x10^{-4}$	$5.01x10^{-4}$	$1.83x10^{-4}$	$4.23x10^{-5}$
116	MGLY	$2.36x10^{-4}$	$2.29x10^{-4}$	$2.04x10^{-4}$	$1.46x10^{-4}$	$4.92x10^{-5}$	$1.16x10^{-5}$
125	KET	$1.16x10^{-6}$	$1.02x10^{-6}$	$6.50x10^{-7}$	$2.27x10^{-7}$	$2.34x10^{-8}$	$3.59x10^{-9}$

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
126	ACET	1.02×10^{-6}	9.02×10^{-7}	5.83×10^{-7}	2.08×10^{-7}	2.25×10^{-8}	3.51×10^{-9}
154	ISPD	2.96×10^{-5}	2.84×10^{-5}	2.45×10^{-5}	1.60×10^{-5}	4.60×10^{-6}	1.16×10^{-6}
156	HPLD	7.04×10^{-4}	6.84×10^{-4}	6.12×10^{-4}	4.41×10^{-4}	1.46×10^{-4}	3.58×10^{-5}
188	CRON	1.51×10^{-4}	1.47×10^{-4}	1.31×10^{-4}	9.45×10^{-5}	3.13×10^{-5}	7.68×10^{-6}
189	XOPN	8.04×10^{-4}	7.82×10^{-4}	7.00×10^{-4}	5.04×10^{-4}	1.67×10^{-4}	4.09×10^{-5}
193	OPEN	8.04×10^{-4}	7.82×10^{-4}	7.00×10^{-4}	5.04×10^{-4}	1.67×10^{-4}	4.09×10^{-5}

Table S7. Reactions and rate constant expressions for the CB7r1 mechanism. See Table S8 for species names. k_{298} is the rate constant at 298 K and 1 atmosphere using units in cm^3 $molecule^{-1}$ s^{-1}. For photolysis reactions k_{298} shows the photolysis frequency (J) at a solar zenith angle of 60° (see Table S9).

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
1	NO2 = NO + O	Photolysis	6.30×10^{-3}
2	O2 + O + M = O3 + M	$k = 6.00 \times 10^{-34} (T/300)^{-2.6}$	6.11×10^{-34}
3	NO + O3 = NO2	$k = 2.07 \times 10^{-12} \exp(-1400/T)$	1.89×10^{-14}
4	NO + O = NO2	Falloff: F=0.85; n=0.84 $k(0) = 1.00 \times 10^{-31} (T/300)^{-1.6}$ $k(inf) = 5.00 \times 10^{-11} (T/300)^{-.3}$	2.26×10^{-12}
5	NO2 + O = NO	$k = 5.10 \times 10^{-12} \exp(198/T)$	9.91×10^{-12}
6	NO2 + O = NO3	Falloff: F=0.6; n=1.03 $k(0) = 1.30 \times 10^{-31} (T/300)^{-1.5}$ $k(inf) = 2.30 \times 10^{-11} (T/300)^{0.24}$	2.09×10^{-12}
7	O3 + O =	$k = 8.00 \times 10^{-12} \exp(-2060/T)$	7.96×10^{-15}
8	O3 = O	Photolysis	3.33×10^{-4}
9	O3 = O1D	Photolysis	8.78×10^{-6}
10	O1D + M = O + M	$k = 2.23 \times 10^{-11} \exp(115/T)$	3.28×10^{-11}
11	O1D + H2O = 2. OH	$k = 2.14 \times 10^{-10}$	2.14×10^{-10}
12	O3 + OH = HO2	$k = 1.70 \times 10^{-12} \exp(-940/T)$	7.25×10^{-14}
13	O3 + HO2 = OH	$k = 2.03 \times 10^{-16} (T/300)^{4.57} \exp(693/T)$	2.01×10^{-15}
14	OH + O = HO2	$k = 2.40 \times 10^{-11} \exp(110/T)$	3.47×10^{-11}
15	HO2 + O = OH	$k = 3.00 \times 10^{-11} \exp(200/T)$	5.87×10^{-11}
16	OH + OH = O	$k = 6.20 \times 10^{-14} (T/298)^{2.6} \exp(945/T)$	1.48×10^{-12}
17	OH + OH = H2O2	Falloff: F=0.42; n=1.23 $k(0) = 9.00 \times 10^{-31} (T/300)^{-3.2}$ $k(inf) = 3.90 \times 10^{-11} (T/300)^{-.47}$	6.21×10^{-12}
18	OH + HO2 =	$k = 4.80 \times 10^{-11} \exp(250/T)$	1.11×10^{-10}
19	HO2 + HO2 = H2O2	$k = k1 + k2 [M]$ $k1 = 2.20 \times 10^{-13} \exp(600/T)$ $k2 = 1.90 \times 10^{-33} \exp(980/T)$	2.90×10^{-12}
20	HO2 + HO2 + H2O = H2O2	$k = k1 + k2 [M]$ $k1 = 3.08 \times 10^{-34} \exp(2800/T)$ $k2 = 2.66 \times 10^{-54} \exp(3180/T)$	6.53×10^{-30}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
21	H2O2 = 2. OH	Photolysis	3.78×10^{-6}
22	H2O2 + OH = HO2	$k = 1.80 \times 10^{-12}$	1.80×10^{-12}
23	H2O2 + O = OH + HO2	$k = 1.40 \times 10^{-12} \exp(-2000/T)$	1.70×10^{-15}
24	NO + NO + O2 = 2. NO2	$k = 4.25 \times 10^{-39} \exp(664/T)$	3.95×10^{-38}
25	NO + HO2 = OH + NO2	$k = 3.45 \times 10^{-12} \exp(270/T)$	8.54×10^{-12}
26	NO2 + O3 = NO3	$k = 1.40 \times 10^{-13} \exp(-2470/T)$	3.52×10^{-17}
27	NO3 = NO2 + O	Photolysis	1.56×10^{-1}
28	NO3 = NO	Photolysis	1.98×10^{-2}
29	NO3 + NO = 2. NO2	$k = 1.80 \times 10^{-11} \exp(110/T)$	2.60×10^{-11}
30	NO3 + NO2 = NO + NO2	$k = 4.50 \times 10^{-14} \exp(-1260/T)$	6.56×10^{-16}
31	NO3 + OH = HO2 + NO2	$k = 2.00 \times 10^{-11}$	2.00×10^{-11}
32	NO3 + HO2 = OH + NO2	$k = 4.00 \times 10^{-12}$	4.00×10^{-12}
33	NO3 + NO3 = 2. NO2	$k = 8.50 \times 10^{-13} \exp(-2450/T)$	2.28×10^{-16}
34	NO3 + NO2 = N2O5	Falloff: F=0.35; n=1.33 $k(0) = 3.60 \times 10^{-30} (T/300)^{-4.1}$ $k(inf) = 1.90 \times 10^{-12} (T/300)^{0.2}$	1.24×10^{-12}
35	N2O5 = NO3 + NO2	Falloff: F=0.35; n=1.33 $k(0) = 1.30 \times 10^{-3} (T/300)^{-3.5} \exp(-11000/T)$ $k(inf) = 9.70 \times 10^{14} (T/300)^{0.1} \exp(-11080/T)$	4.46×10^{-2}
36	N2O5 = NO2 + NO3	Photolysis	2.52×10^{-5}
37	N2O5 + H2O = 2. HNO3	$k = 1.00 \times 10^{-22}$	1.00×10^{-22}
38	NO + OH = HONO	Falloff: F=0.81; n=0.87 $k(0) = 7.40 \times 10^{-31} (T/300)^{-2.4}$ $k(inf) = 3.30 \times 10^{-11} (T/300)^{-.3}$	9.77×10^{-12}
39	HONO = NO + OH	Photolysis	1.04×10^{-3}
40	HONO + OH = NO2	$k = 2.50 \times 10^{-12} \exp(260/T)$	5.98×10^{-12}
41	NO2 + OH = HNO3	Falloff: F=0.6; n=1 $k(0) = 1.80 \times 10^{-30} (T/300)\#^{-3}$ $k(inf) = 2.80 \times 10^{-11}$	1.06×10^{-11}
42	NO2 + OH + H2O = HNO3 + H2O	$k = 1.10 \times 10^{-30}$	1.10×10^{-30}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
43	HNO3 + OH = NO3	k = k1 + k3 [M] / (1 + k3 [M] / k2) k1 = 2.40×10^{-14} exp(460/T) k2 = 2.70×10^{-17} exp(2199/T) k3 = 6.50×10^{-34} exp(1335/T)	1.54×10^{-13}
44	HNO3 = OH + NO2	Photolysis	2.54×10^{-7}
45	NO2 + HO2 = PNA	Falloff: F=0.4; n=1.26 k(0) = 1.40×10^{-31} (T/300)$^{-3.1}$ k(inf) = 4.00×10^{-12}	7.50×10^{-13}
46	PNA = HO2 + NO2	Falloff: F=0.4; n=1.26 k(0) = 4.10×10^{-5} exp(−10650/T) k(inf) = 6.00×10^{15} exp(−11170/T)	6.20×10^{-2}
47	PNA = 0.59 HO2 + 0.59 NO2 + 0.41 OH + 0.41 NO3	Photolysis	2.36×10^{-6}
48	PNA + OH = NO2	k = 3.20×10^{-13} exp(690/T)	3.24×10^{-12}
49	H2 + OH = HO2	k = 7.70×10^{-12} exp(−2100/T)	6.70×10^{-15}
50	CO + OH = HO2	k = k1 + k2 [M] k1 = 1.44×10^{-13} k2 = 3.43×10^{-33}	2.28×10^{-13}
51	SO2 + OH = SULF + HO2	Falloff: F=0.53; n=1.1 k(0) = 2.80×10^{-31} (T/300)$^{-2.6}$ k(inf) = 2.00×10^{-12}	9.35×10^{-13}
52	SO2 = SULF	k = 0	0
53	DMS + OH = SO2 + FORM + MEO2	k = 1.12×10^{-11} exp(−250/T)	4.84×10^{-12}
54	DMS + OH + O2 = SULF + MEO2	k = 1.28×10^{-37} exp(4480/T)	4.33×10^{-31}
55	DMS + NO3 = SO2 + FORM + MEO2 + HNO3	k = 1.90×10^{-13} exp(520/T)	1.09×10^{-12}
56	C2O3 + NO = NO2 + MEO2 + RO2	k = 7.50×10^{-12} exp(290/T)	1.98×10^{-11}
57	C2O3 + NO2 = PAN	Falloff: F=0.3; n=1.41 k(0) = 3.61×10^{-28} (T/300)$^{-6.87}$ k(inf) = 1.24×10^{-11} (T/300)$^{-1.105}$	9.86×10^{-12}
58	PAN = NO2 + C2O3	Falloff: F=0.3; n=1.41 k(0) = 1.10×10^{-5} exp(−10100/T) k(inf) = 1.90×10^{17} exp(−14100/T)	4.31×10^{-4}
59	PAN = 0.6 NO2 + 0.6 C2O3 + 0.4 NO3 + 0.4 MEO2 + 0.4 RO2	Photolysis	3.47×10^{-7}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
60	C2O3 + HO2 = 0.37 PACD + 0.13 AACD + 0.13 O3 + 0.5 OH + 0.5 MEO2 + 0.5 RO2	$k = 3.14 \times 10^{-12} \exp(580/T)$	2.20×10^{-11}
61	C2O3 + RO2 = 0.3 AACD + 0.7 MEO2 + 1.7 RO2	$k = 4.40 \times 10^{-13} \exp(1070/T)$	1.60×10^{-11}
62	C2O3 + C2O3 = 2. MEO2 + 2. RO2	$k = 2.90 \times 10^{-12} \exp(500/T)$	1.55×10^{-11}
63	CXO3 + NO = NO2 + 0.5 ALD2 + XO2H + RO2	$k = 6.70 \times 10^{-12} \exp(340/T)$	2.10×10^{-11}
64	CXO3 + NO2 = PANX	k = k(ref) K k(ref) = k(57) K = 1.19	8.28×10^{-12}
65	PANX = NO2 + CXO3	k = k(ref) K k(ref) = k(58) K = 1.19	3.62×10^{-4}
66	PANX + OH = 0.5 ALD2 + NO2	$k = 3.00 \times 10^{-12}$	3.00×10^{-12}
67	CXO3 + HO2 = 0.19 PACD + 0.06 AACD + 0.25 ALD2 + 0.06 O3 + 0.25 OH + 0.25 HO2	k = k(ref) K k(ref) = k(60) K = 1.0	2.20×10^{-11}
68	CXO3 + RO2 = 0.3 AACD + 0.7 ALD2 + 0.7 XO2H + 1.7 RO2	k = k(ref) K k(ref) = k(61) K = 1.0	1.60×10^{-11}
69	OPO3 + NO = NO2 + 0.5 GLY + 0.5 CO + 0.8 HO2 + 0.2 CXO3	k = k(ref) K k(ref) = k(63) K = 1.0	2.10×10^{-11}
70	OPO3 + NO2 = OPAN	k = k(ref) K k(ref) = k(64) K = 1.0	8.28×10^{-12}
71	OPAN = OPO3 + NO2	k = k(ref) K k(ref) = k(65) K = 1.0	3.62×10^{-4}
72	OPAN + OH = 0.5 NO2 + 0.5 NTR2 + 0.5 GLY + CO	$k = 3.60 \times 10^{-11}$	3.60×10^{-11}
73	OPO3 + HO2 = 0.37 PACD + 0.13 AACD + 0.13 O3 + 0.5 OH + 0.5 MEO2 + 0.5 RO2	k = k(ref) K k(ref) = k(60) K = 1.0	2.20×10^{-11}
74	OPO3 + RO2 = 0.3 AACD + 0.35 GLY + 0.4 XO2H 0.35 CO + 0.14 CXO3 + 1.4 RO2	k = k(ref) K k(ref) = k(61) K = 1.0	1.60×10^{-11}
75	RO2 + NO = NO	$k = 2.70 \times 10^{-12} \exp(360/T)$	9.04×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
76	RO2 + HO2 = HO2	$k = 1.93x10^{-13} \exp(1300/T)$	$1.52x10^{-11}$
77	RO2 + RO2 =	$k = 1.55x10^{-13} \exp(350/T)$	$5.00x10^{-13}$
78	MEO2 + NO = FORM + HO2 + NO2	$k = 2.30x10^{-12} \exp(360/T)$	$7.70x10^{-12}$
79	MEO2 + HO2 = 0.9 MEPX + 0.1 FORM	$k = 3.80x10^{-13} \exp(780/T)$	$5.21x10^{-12}$
80	MEO2 + C2O3 = FORM + 0.9 HO2 + 0.9 MEO2 + 0.1 AACD + 0.9 RO2	$k = 2.00x10^{-12} \exp(500/T)$	$1.07x10^{-11}$
81	MEO2 + RO2 = 0.685 FORM + 0.315 MEOH + 0.37 HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	$5.00x10^{-13}$
82	MEPX + OH = 0.6 MEO2 + 0.6 RO2 + 0.4 FORM + 0.4 OH	$k = 5.30x10^{-12} \exp(190/T)$	$1.00x10^{-11}$
83	MEPX = MEO2 + RO2 + OH	Photolysis	$2.68x10^{-6}$
84	XO2H + NO = NO2 + HO2	k = k(ref) K k(ref) = k(75) K = 1.0	$9.04x10^{-12}$
85	XO2H + HO2 = 0.9 ROOH + 0.1 OH + 0.1 HO2	k = k(ref) K k(ref) = k(76) K = 1.0	$1.52x10^{-11}$
86	XO2H + RO2 = 0.6 HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	$5.00x10^{-13}$
87	XO2 + NO = NO2	k = k(ref) K k(ref) = k(75) K = 1.0	$9.04x10^{-12}$
88	XO2 + HO2 = 0.9 ROOH + 0.1 OH	k = k(ref) K k(ref) = k(76) K = 1.0	$1.52x10^{-11}$
89	XO2 + RO2 = RO2	k = k(ref) K k(ref) = k(77) K = 1.0	$5.00x10^{-13}$
90	XO2N + NO = 0.5 NTR1 + 0.5 NTR2	k = k(ref) K k(ref) = k(75) K = 1.0	$9.04x10^{-12}$
91	XO2N + HO2 = 0.9 ROOH + 0.1 OH	k = k(ref) K k(ref) = k(76) K = 1.0	$1.52x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
92	XO2N + RO2 = RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
93	ROOH + OH = 0.56 XO2H + 0.04 XO2N + 0.6 RO2 + 0.4 OH	$k = 5.30 \times 10^{-12} \exp(190/T)$	1.00×10^{-11}
94	ROOH = HO2 + OH	Photolysis	2.68×10^{-6}
95	NTR1 + OH = NO2	$k = 2.00 \times 10^{-12}$	2.00×10^{-12}
96	NTR1 = NO2	Photolysis	1.06×10^{-6}
97	NTR2 = HNO3	$k = 2.30 \times 10^{-5}$	2.30×10^{-5}
98	MEOH + OH = FORM + HO2	$k = 2.85 \times 10^{-12} \exp(-345/T)$	8.95×10^{-13}
99	ETOH + OH = 0.95 ALD2 + 0.9 HO2 + 0.1 XO2H + 0.1 RO2 + 0.078 FORM + 0.011 GLYD	$k = 3.00 \times 10^{-12} \exp(20/T)$	3.21×10^{-12}
100	FORM + OH = HO2 + CO	$k = 5.40 \times 10^{-12} \exp(135/T)$	8.49×10^{-12}
101	FORM = 2. HO2 + CO	Photolysis	1.69×10^{-5}
102	FORM = CO + H2	Photolysis	2.69×10^{-5}
103	FORM + NO3 = HNO3 + HO2 + CO	$k = 5.50 \times 10^{-16}$	5.50×10^{-16}
104	ALD2 + OH = C2O3	$k = 4.70 \times 10^{-12} \exp(345/T)$	1.50×10^{-11}
105	ALD2 + NO3 = C2O3 + HNO3	$k = 1.40 \times 10^{-12} \exp(-1860/T)$	2.73×10^{-15}
106	ALD2 = MEO2 + RO2 + CO + HO2	Photolysis	1.96×10^{-6}
107	ALDX + OH = CXO3	$k = 4.90 \times 10^{-12} \exp(405/T)$	1.91×10^{-11}
108	ALDX + NO3 = CXO3 + HNO3	$k = 6.30 \times 10^{-15}$	6.30×10^{-15}
109	ALDX = 0.5 ALD2 + XO2H + RO2 + CO + HO2	Photolysis	6.96×10^{-6}
110	GLYD + OH = 0.2 GLY + 0.2 HO2 + 0.8 C2O3	$k = 8.00 \times 10^{-12}$	8.00×10^{-12}
111	GLYD = 0.74 FORM + 0.89 CO + 1.4 HO2 + 0.15 MEOH + 0.19 OH + 0.11 GLY + 0.11 XO2H + 0.11 RO2	Photolysis	2.76×10^{-6}
112	GLYD + NO3 = HNO3 + C2O3	k = k(ref) K k(ref) = k(105) K = 1.0	2.73×10^{-15}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
113	GLY + OH = 1.8 CO + 0.2 XO2 + 0.2 RO2 + HO2	$k = 3.10x10^{-12} \exp(340/T)$	$9.70x10^{-12}$
114	GLY = 2. HO2 + 2. CO	Photolysis	$7.95x10^{-5}$
115	GLY + NO3 = HNO3 + 1.5 CO + 0.5 XO2 + 0.5 RO2 + HO2	$k = 4.00x10^{-16}$	$4.00x10^{-16}$
116	MGLY = C2O3 + HO2 + CO	Photolysis	$1.46x10^{-4}$
117	MGLY + NO3 = HNO3 + C2O3 + XO2 + RO2	$k = 5.00x10^{-16}$	$5.00x10^{-16}$
118	MGLY + OH = C2O3 + CO	$k = 1.90x10^{-12} \exp(575/T)$	$1.31x10^{-11}$
119	ACET = 0.38 CO + 1.38 MEO2 + 1.38 RO2 + 0.62 C2O3	Photolysis	$2.27x10^{-7}$
120	ACET + OH = FORM + C2O3 + XO2 + RO2	$k = 1.41x10^{-12} \exp(-620.6/T)$	$1.76x10^{-13}$
121	KET = 0.15 FORM + 0.58 ALD2 + 0.34 ALDX + 0.96 HO2 + 0.7 C2O3 + 0.3 CXO3 + 1.3 XO2 + 0.03 XO2N + 1.33 RO2 − 3. PAR	Photolysis	$2.08x10^{-7}$
122	KET + OH = 0.06 KET + 0.15 FORM + 0.29 ALD2 + 0.46 ALDX + 0.61 HO2 + 0.27 C2O3 + 0.06 CXO3 + 0.72 XO2 + 0.04 XO2N + 0.76 RO2 − 1.38 PAR	$k = 1.00x10^{-12}$	$1.00x10^{-12}$
123	HACT + OH = MGLY + HO2	$k = 2.00x10^{-12} \exp(320/T)$	$5.85x10^{-12}$
124	FACD + OH = HO2	$k = 4.50x10^{-13}$	$4.50x10^{-13}$
125	AACD + OH = MEO2 + RO2	$k = 4.00x10^{-14} \exp(850/T)$	$6.93x10^{-13}$
126	PACD + OH = C2O3	$k = 5.30x10^{-12} \exp(190/T)$	$1.00x10^{-11}$
127	CH4 + OH = MEO2 + RO2	$k = 1.85x10^{-12} \exp(-1690/T)$	$6.37x10^{-15}$
128	ECH4 + OH = MEO2 + RO2	$k = 1.85x10^{-12} \exp(-1690/T)$	$6.37x10^{-15}$
129	ETHA + OH = 0.991 ALD2 + 0.991 XO2H + 0.009 XO2N + RO2	$k = 6.90x10^{-12} \exp(-1000/T)$	$2.41x10^{-13}$
130	PRPA + OH = XPRP	$k = 7.60x10^{-12} \exp(-585/T)$	$1.07x10^{-12}$
131	XPRP = XO2N + RO2	Falloff: F=0.41; n=1 $k(0) = 2.37x10^{-21}$ $k(inf) = 4.30x10^{-1}$ (T/298)#$^{-8}$	$3.09x10^{-2}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
132	XPRP = 0.732 ACET + 0.268 ALDX + 0.268 PAR + XO2H + RO2	k = 1.0	1.0
133	PAR + OH = XPAR	k = $3.09\text{x}10^{-13}$ (T/300)#2 exp(300/T)	$8.34\text{x}10^{-13}$
134	XPAR = XO2N + RO2 − 3. PAR	Falloff: F=0.41; n=1 k(0) = $4.81\text{x}10^{-20}$ k(inf) = $4.30\text{x}10^{-1}$ (T/298)#$^{-8}$	$1.49\text{x}10^{-1}$
135	XPAR = 0.87 ROR + 0.13 ALDX + 0.13 XO2H + 0.13 RO2 − 0.13 PAR	k = 1.0	1.0
136	ROR = 0.32 ACET + 0.3 KET + 0.04 FORM + 0.46 ALD2 + 0.1 ALDX + 0.62 HO2 + 0.11 MEO2 + 1.75 XO2 + 0.25 XO2H + 0.02 XO2N + 2.13 RO2 − 1.63 PAR	k = k1 + k2 [M] k1 = $2.40\text{x}10^{12}$ exp(−5000/T) k2 = $5.00\text{x}10^{-15}$ exp(−250/T)	$1.77\text{x}10^{5}$
137	ROR + O2 = 0.15 ACET + 0.85 KET + HO2 − 0.3 PAR	k = $2.00\text{x}10^{-14}$ exp(−250/T)	$8.64\text{x}10^{-15}$
138	ETHY + OH = 0.7 GLY + 0.7 OH + 0.3 FACD + 0.3 CO + 0.3 HO2	Falloff: F=0.37; n=1.3 k(0) = $5.00\text{x}10^{-30}$ (T/300)$^{-1.5}$ k(inf) = $1.00\text{x}10^{-12}$	$7.52\text{x}10^{-13}$
139	ETH + OH = XO2H + RO2 + 1.56 FORM + 0.22 GLYD	Falloff: F=0.48; n=1.15 k(0) = $8.60\text{x}10^{-29}$ (T/300)$^{-3.1}$ k(inf) = $9.00\text{x}10^{-12}$ (T/300)$^{-.85}$	$7.84\text{x}10^{-12}$
140	ETH + O3 = FORM + 0.35 CO + 0.27 HO2 + 0.17 OH + 0.42 FACD	k = $6.82\text{x}10^{-15}$ exp(−2500/T)	$1.55\text{x}10^{-18}$
141	ETH + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.5 XO2H + 0.5 XO2 + RO2 + 1.125 FORM	k = $3.30\text{x}10^{-12}$ exp(−2880/T)	$2.10\text{x}10^{-16}$
142	OLE + OH = 0.781 FORM + 0.488 ALD2 + 0.488 ALDX + 0.976 XO2H + 0.195 XO2 + 0.024 XO2N + 1.195 RO2 − 0.73 PAR	Falloff: F=0.5; n=1.13 k(0) = $8.00\text{x}10^{-27}$ (T/300)$^{-3.5}$ k(inf) = $3.00\text{x}10^{-11}$ (T/300)#$^{-1}$	$2.86\text{x}10^{-11}$
143	OLE + O3 = 0.295 ALD2 + 0.555 FORM + 0.27 ALDX + 0.15 XO2H + 0.15 RO2 + 0.334 OH + 0.08 HO2 + 0.378 CO + 0.075 GLY + 0.075 MGLY + 0.09 FACD + 0.13 AACD + 0.04 H2O2 − 0.79 PAR	k = $5.50\text{x}10^{-15}$ exp(−1880/T)	$1.00\text{x}10^{-17}$
144	OLE + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.48 XO2 + 0.48 XO2H + 0.04 XO2N + RO2 + 0.5 FORM + 0.25 ALD2 + 0.375 ALDX − 1. PAR	k = $4.60\text{x}10^{-13}$ exp(−1155/T)	$9.54\text{x}10^{-15}$
145	IOLE + OH = 1.3 ALD2 + 0.7 ALDX + XO2H + RO2	k = $1.05\text{x}10^{-11}$ exp(519/T)	$5.99\text{x}10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
146	IOLE + O3 = 0.732 ALD2 + 0.442 ALDX + 0.128 FORM + 0.245 CO + 0.5 OH + 0.3 XO2H + 0.3 RO2 + 0.24 GLY + 0.06 MGLY + 0.29 PAR + 0.08 AACD + 0.08 H2O2	$k = 4.70 \times 10^{-15} \exp(-1013/T)$	1.57×10^{-16}
147	IOLE + NO3 = 0.5 NO2 + 0.5 NTR1 + 0.48 XO2 + 0.48 XO2H + 0.04 XO2N + RO2 + 0.5 ALD2 + 0.625 ALDX + PAR	$k = 3.70 \times 10^{-13}$	3.70×10^{-13}
148	BENZ + OH = 0.53 CRES + 0.352 BZO2 + 0.352 RO2 + 0.118 OPEN + 0.118 OH + 0.53 HO2	$k = 2.30 \times 10^{-12} \exp(-190/T)$	1.22×10^{-12}
149	BZO2 + NO = 0.918 NO2 + 0.082 NTR2 + 0.918 GLY + 0.918 OPEN + 0.918 HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
150	BZO2 + HO2 = ARPX	k = k(ref) K k(ref) = k(76) $K = 7.83 \times 10^{-1}$	1.94×10^{-11}
151	BZO2 + RO2 = GLY + OPEN + HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
152	TOL + OH = 0.18 CRES + 0.65 TO2 + 0.72 RO2 + 0.1 OPEN + 0.1 OH + 0.07 XO2H + 0.18 HO2	$k = 1.80 \times 10^{-12} \exp(340/T)$	5.63×10^{-12}
153	TO2 + NO = 0.86 NO2 + 0.14 NTR2 + 0.417 GLY + 0.443 MGLY + 0.66 OPEN + 0.2 XOPN + 0.86 HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
154	TO2 + HO2 = ARPX	k = k(ref) K k(ref) = k(76) $K = 7.60 \times 10^{-1}$	1.99×10^{-11}
155	TO2 + RO2 = 0.48 GLY + 0.52 MGLY + 0.77 OPEN + 0.23 XOPN + HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
156	XYL + OH = 0.155 CRES + 0.544 XLO2 + 0.602 RO2 + 0.244 XOPN + 0.244 OH + 0.058 XO2H + 0.155 HO2	$k = 1.85 \times 10^{-11}$	1.85×10^{-11}
157	XLO2 + NO = 0.86 NO2 + 0.14 NTR2 + 0.221 GLY + 0.675 MGLY + 0.3 OPEN + 0.56 XOPN + 0.86 HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
158	XLO2 + HO2 = ARPX	k = k(ref) K k(ref) = k(76) $K = 7.44 \times 10^{-1}$	2.04×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
159	XLO2 + RO2 = 0.26 GLY + 0.77 MGLY + 0.35 OPEN + 0.65 XOPN + HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
160	OPEN = OPO3 + HO2 + CO	Photolysis	1.89×10^{-4}
161	OPEN + OH = 0.6 OPO3 + 0.4 XO2H + 0.4 RO2 + 0.4 GLY	$k = 4.40 \times 10^{-11}$	4.40×10^{-11}
162	OPEN + O3 = 1.4 GLY + 0.24 MGLY + 0.5 OH + 0.12 C2O3 + 0.08 FORM + 0.02 ALD2 + 1.98 CO + 0.56 HO2	$k = 5.40 \times 10^{-17} \exp(-500/T)$	1.01×10^{-17}
163	OPEN + NO3 = OPO3 + HNO3	$k = 3.80 \times 10^{-12}$	3.80×10^{-12}
164	XOPN = 0.4 GLY + XO2H + 0.7 HO2 + 0.7 CO + 0.3 C2O3	Photolysis	5.04×10^{-4}
165	XOPN + OH = MGLY + 0.4 GLY + 2. XO2H + 2. RO2	$k = 9.00 \times 10^{-11}$	9.00×10^{-11}
166	XOPN + O3 = 1.2 MGLY + 0.5 OH + 0.6 C2O3 + 0.1 ALD2 + 0.5 CO + 0.3 XO2H + 0.3 RO2	$k = 1.08 \times 10^{-16} \exp(-500/T)$	2.02×10^{-17}
167	XOPN + NO3 = 0.5 NO2 + 0.5 NTR2 + 0.45 XO2H + 0.45 XO2 + 0.1 XO2N + RO2 + 0.25 OPEN + 0.25 MGLY	$k = 3.00 \times 10^{-12}$	3.00×10^{-12}
168	CRES + OH = 0.7 CAT1 + 0.7 HO2 + 0.2 CRO + 0.1 TO2 + 0.1 RO2	$k = 1.70 \times 10^{-12} \exp(950/T)$	4.12×10^{-11}
169	CRES + NO3 = 0.5 HNO3 + 0.5 CRON + 0.4 CRO + 0.1 TO2 + 0.1 RO2	$k = 1.40 \times 10^{-11}$	1.40×10^{-11}
170	CRO + NO2 = CRON	$k = 2.10 \times 10^{-12}$	2.10×10^{-12}
171	CRO + HO2 = CRES	$k = 5.50 \times 10^{-12}$	5.50×10^{-12}
172	CRON + OH = NTR2 + 0.5 CRO	$k = 1.53 \times 10^{-12}$	1.53×10^{-12}
173	CRON + NO3 = HNO3 + NTR2 + 0.5 CRO	$k = 3.80 \times 10^{-12}$	3.80×10^{-12}
174	CRON = HONO + 0.5 CRO	Photolysis	9.45×10^{-5}
175	CAT1 + OH = 0.5 CRO	$k = 5.00 \times 10^{-11}$	5.00×10^{-11}
176	CAT1 + NO3 = 0.5 CRO + HNO3	$k = 1.70 \times 10^{-10}$	1.70×10^{-10}
177	ARPX + OH = 0.5 OH + 0.2 BZO2 + 0.15 TO2 + 0.15 XLO2 + 0.5 RO2	$k = 8.00 \times 10^{-11}$	8.00×10^{-11}
178	ISOP + OH = ISO2 + RO2	$k = 2.70 \times 10^{-11} \exp(390/T)$	9.99×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
179	ISO2 + NO = 0.9 NO2 + 0.1 INTR + 0.9 FORM + 0.9 ISPD + 0.9 HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
180	ISO2 + HO2 = 0.94 ISPX + 0.06 FORM + 0.06 ISPD + 0.06 OH + 0.06 HO2	k = k(ref) K k(ref) = k(76) $K = 9.13 \times 10^{-1}$	1.66×10^{-11}
181	ISO2 + RO2 = ISPD + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
182	ISO2 = 0.4 HPLD + 0.1 ISPD + 0.1 GLY + 0.1 GLYD + CO + 1.7 OH + 0.35 HO2	$k = 3.30 \times 10^{9} \exp(-8300/T)$	2.64×10^{-3}
183	ISOP + O3 = 0.8 FORM + 0.5 ISPD + 0.58 FACD + 0.5 CO + 0.28 OH + 0.5 HO2 + 0.4 MEO2 + 0.4 RO2	$k = 1.03 \times 10^{-14} \exp(-1995/T)$	1.27×10^{-17}
184	ISOP + NO3 = 0.25 NO2 + 0.75 NTR2 + 0.25 FORM + 0.25 ISPD + 0.25 OH + 0.25 XO2 + 0.25 RO2	$k = 2.95 \times 10^{-12} \exp(-450/T)$	6.52×10^{-13}
185	ISPD + OH = 0.4 MGLY + 0.2 GLYD + 0.1 FORM + CO + 0.1 OH + 0.1 HO2 + 0.1 OPO3 + 0.4 C2O3	$k = 7.00 \times 10^{-12} \exp(430/T)$	2.96×10^{-11}
186	ISPD + NO3 = 0.9 NTR2 + 0.1 HNO3 + 0.1 CO + 0.1 C2O3	$k = 3.94 \times 10^{-14} \exp(475/T)$	1.94×10^{-13}
187	ISPD = 0.8 ISPD + 0.15 MGLY + 0.1 GLYD + 0.1 FORM + 0.2 OH	Photolysis	1.60×10^{-5}
188	ISPX + OH = 0.6 EPOX + 0.2 MGLY + 0.2 FORM + 0.2 ROOH + OH + 0.5 HO2	$k = 2.80 \times 10^{-11} \exp(370/T)$	9.69×10^{-11}
189	HPLD = 0.6 HPLD + 0.3 ISPD + 1.65 OH + 0.2 HO2 + 0.8 CO	Photolysis	4.41×10^{-4}
190	HPLD + OH = ISPD + 0.2 FORM + 0.5 CO + 1.1 OH	$k = 1.17 \times 10^{-11} \exp(450/T)$	5.30×10^{-11}
191	EPOX + OH = 0.2 ISPD + 0.2 HO2 + 0.8 EPX2 + 0.8 RO2	$k = 5.43 \times 10^{-11} \exp(-450/T)$	1.20×10^{-11}
192	EPX2 + NO = 0.98 NO2 + 0.02 NTR2 + 0.7 MGLY + 0.7 GLYD + 0.2 GLY + 0.2 CO + 0.2 ISPD + 0.7 OH + HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
193	EPX2 + HO2 = 0.3 ISPD + 0.3 MGLY + 0.1 GLY + 0.2 GLYD + 1.5 FORM + ROOH + 0.2 CO + 1.7 OH + HO2	k = k(ref) K k(ref) = k(76) $K = 8.13 \times 10^{-1}$	1.86×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
194	EPX2 + RO2 = 0.6 MGLY + 0.5 GLY + 0.5 FORM + 0.3 GLYD + 0.1 ISPD + 0.2 CO + 0.85 OH + HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
195	INTR + OH = 0.5 NO2 + 0.5 NTR2 + 0.1 INTR + 0.4 ISPD + 0.1 EPOX	$k = 1.00 \times 10^{-11} \exp(300/T)$	2.74×10^{-11}
196	APIN + OH = APO2	$k = 1.34 \times 10^{-11} \exp(410/T)$	5.30×10^{-11}
197	APO2 + NO = 0.77 NO2 + 0.23 NTR2 + 0.62 TPRD + 0.21 FORM + 0.09 ACET + 0.77 HO2 + 0.11 ROOH	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
198	APO2 + HO2 = 0.35 TPRD + 0.08 FORM + 0.06 ACET + 0.48 HO2 + 0.35 OH + 0.65 ROOH	k = k(ref) K k(ref) = k(76) $K = 7.44 \times 10^{-1}$	2.04×10^{-11}
199	APO2 + RO2 = 0.87 TPRD + 0.06 ACET + 0.5 HO2 + 0.13 ROOH + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
200	APIN + O3 = 0.39 TPRD + 0.27 FORM + 0.22 H2O2 + 0.17 CO + 0.77 OH + 0.17 HO2 + 0.27 CXO3 + 0.33 XO2 + 0.33 RO2	$k = 8.22 \times 10^{-16} \exp(-640/T)$	9.60×10^{-17}
201	APIN + NO3 = 0.76 NO2 + 0.24 NTR2 + 0.78 TPRD + 0.42 OH	$k = 1.20 \times 10^{-12} \exp(490/T)$	6.21×10^{-12}
202	TERP + OH = TPO2	$k = 4.07 \times 10^{-11} \exp(350/T)$	1.32×10^{-10}
203	TPO2 + NO = 0.75 NO2 + 0.25 NTR2 + 0.61 TPRD + 0.45 FORM + 0.1 ACET + 0.75 HO2	k = k(ref) K k(ref) = k(75) K = 1.0	9.04×10^{-12}
204	TPO2 + HO2 = 0.06 TPRD + 0.04 FORM + 0.01 ACET + 0.06 HO2 + 0.06 OH + 0.94 ROOH	k = k(ref) K k(ref) = k(76) $K = 7.44 \times 10^{-1}$	2.04×10^{-11}
205	TPO2 + RO2 = TPRD + 0.31 FORM + 0.05 ACET + 0.5 HO2 + RO2	k = k(ref) K k(ref) = k(77) K = 1.0	5.00×10^{-13}
206	TERP + O3 = 0.74 TPRD + 0.63 FORM + 0.04 ACET + 0.03 HACT + 0.05 FACD + 0.27 H2O2 + 0.44 OH + 0.09 HO2 + 0.08 C2O3 + 0.26 CXO3 + 0.07 XO2 + 0.07 RO2	$k = 4.46 \times 10^{-15} \exp(-960/T)$	1.78×10^{-16}
207	TERP + NO3 = 0.35 NO2 + 0.65 NTR2 + 0.36 TPRD + 0.09 ACET + 0.29 OH + 0.2 HO2	$k = 7.00 \times 10^{-12}$	7.00×10^{-12}
208	SQT + OH = 0.6 TPRD + 0.6 XO2H + 0.4 XO2N + RO2	$k = 2.00 \times 10^{-10}$	2.00×10^{-10}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
209	SQT + O3 = 0.87 TPRD + 0.08 FORM + 0.17 H2O2 + 0.08 OH + 0.08 HO2	$k = 1.20x10^{-14}$	$1.20x10^{-14}$
210	SQT + NO3 = 0.58 NO2 + 0.42 NTR2 + 0.66 TPRD + 0.3 OH	$k = 1.90x10^{-11}$	$1.90x10^{-11}$
211	TPRD + OH = FORM + 0.5 ACET + 0.5 CO + 0.8 HO2 + 0.3 C2O3 + 1.1 XO2 + 0.4 XO2N + 1.5 RO2	$k = 1.72x10^{-11}$ exp(400/T)	$6.58x10^{-11}$
212	TPRD + NO3 = 0.87 HNO3 + 0.08 NO2 + 0.05 NTR2 + 0.3 FORM + 0.1 CO + 0.1 HO2 + 0.6 CXO3	$k = 1.00x10^{-13}$	$1.00x10^{-13}$
213	TPRD + O3 = 0.5 FORM + 0.2 FACD + 0.1 H2O2 + 0.1 OH + 0.3 MEO2 + 0.3 RO2	$k = 1.10x10^{-17}$	$1.10x10^{-17}$
214	TPRD = 1.5 FORM + 0.5 ACET + 1.8 CO + 1.8 HO2 + 0.5 C2O3 + 0.3 XO2N + 1.5 XO2 + 1.8 RO2	Photolysis	$1.13x10^{-6}$

[a] Rate constants defined by a Troe falloff expression are evaluated as described by Mellouki et al. (2021)

Table S8. CB7r1 species names, descriptions, atom counts and molecular weights (g/mol).

Species	**Description**	**C**	**H**	**O**	**N**	**S**	**M Wt**
AACD	Acetic acid	2	4	2			60.1
ACET	Acetone	3	6	1			58.1
ALD2	Acetaldehyde	2	4	1			44.1
ALDX	Higher aldehydes (R-C-CHO)	2	3	1			43.0
APIN	α-Pinene	10	16				136.2
ARPX	Aromatic peroxide from BZO2, TO2 and XLO2	6	8	6			176.1
BENZ	Benzene	6	6				78.1
CAT1	Methyl-catechols	7	8	2			124.1
CO	Carbon monoxide	1		1			28.0
CH4	Methane	1	4				16.0
CRES	Cresols	7	8	1			108.1
CRON	Nitro-cresols	7	7	3	1		153.1
DMS	Dimethyl sulfide	2	6			1	62.1
ECH4	Emitted methane (to enable tracking seperate from CH4)	1	4				16.0
EPOX	Epoxide formed from ISPX reaction with OH	5	10	3			118.1
ETH	Ethene	2	4				28.1
ETHA	Ethane	2	6				30.1
ETHY	Ethyne	2	2				26.0
ETOH	Ethanol	2	6	1			46.1
FACD	Formic acid	1	2	2			46.0
FORM	Formaldehyde	1	2	1			30.0
GLY	Glyoxal	2	2	2			58.0
GLYD	Glycolaldehyde	2	4	2			60.1
H2	Background hydrogen		2				2.0
H2O2	Hydrogen peroxide		2	2			34.0
HACT	Hydroxyacetone	3	6	2			74.1

Species	Description	C	H	O	N	S	M Wt
HNO3	Nitric acid		1	3	1		63.0
HONO	Nitrous acid		1	2	1		47.0
HPLD	Hydroperoxyaldehyde from ISO2 isomerization	5	8	3			116.1
INTR	Organic nitrates from ISO2 reaction with NO	5	9	4	1		147.1
IOLE	Internal olefin carbon bond (R-C=C-R)	4	8				56.1
ISOP	Isoprene	5	8				68.1
ISPD	Isoprene product (methacrolein, methyl vinyl ketone, etc.)	4	6	1			70.1
ISPX	Hydroperoxides from ISO2 reaction with HO2	5	10	3			118.1
KET	Larger ketones (C4+); 4C species beginning CB7r2	4	6	1			70.1
MEOH	Methanol	1	4	1			32.0
MEPX	Methylhydroperoxide	1	4	2			48.0
MGLY	Methylglyoxal	3	4	2			72.1
N2O5	Dinitrogen pentoxide			5	2		108.0
NO	Nitric oxide			1	1		30.0
NO2	Nitrogen dioxide			2	1		46.0
NO3	Nitrate radical			3	1		62.0
NTR1	Simple organic nitrates	4	9	3	1		119.1
NTR2	Multi-functional organic nitrates	4	9	4	1		135.1
O3	Ozone			3			48.0
OLE	Terminal olefin carbon bond (R-C=C)	2	5				29.1
OPAN	Other peroxyacyl nitrates (PAN compounds) from OPO3	4	3	6	1		161.1
OPEN	Aromatic ring opening product (unsaturated dicarbonyl)	4	4	2			84.1
PACD	Peroxyacetic and higher peroxycarboxylic acids	2	4	3			76.1
PAN	Peroxyacetyl Nitrate	2	3	5	1		121.0
PANX	Larger alkyl peroxyacyl nitrates (from CXO3)	2	3	5	1		121.0
PAR	Paraffin carbon bond (C-C)	1	2.5				14.5
PNA	Peroxynitric acid		1	4	1		79.0

Species	Description	C	H	O	N	S	M Wt
PRPA	Propane	3	8				44.1
ROOH	Higher organic peroxide	4	10	2			90.1
SO2	Sulfur dioxide			2		1	64.1
SULF	Sulfuric acid (gaseous)		2	4		1	98.1
SQT	Sesqiterpenes	15	24				204.4
TERP	Monoterpenes	10	16				136.2
TOL	Toluene and other monoalkyl aromatics	7	8				92.1
XOPN	Aromatic ring opening product (unsaturated dicarbonyl)	5	6	2			98.1
XYL	Xylene and other polyalkyl aromatics	8	10				106.2
APO2	Peroxy radical from OH addition to α-pinene	10	17	3			185.2
BZO2	Peroxy radical from OH addition to benzene	6	7	5			159.1
C2O3	Acetylperoxy radical	2	3	3			75.0
CRO	Alkoxy radical from cresol	7	7	1			107.1
CXO3	C3 and higher acylperoxy radicals	2	3	3			75.0
EPX2	Peroxy radical from EPOX reaction with OH	5	9	5			149.1
HO2	Hydroperoxy radical		1	2			33.0
ISO2	Peroxy radical from OH addition to isoprene	5	9	3			117.1
MEO2	Methylperoxy radical	1	3	2			47.0
O	Oxygen atom in the $O^3(P)$ electronic state			1			16.0
O1D	Oxygen atom in the $O^1(D)$ electronic state			1			16.0
OH	Hydroxyl radical		1	1			17.0
OPO3	Peroxyacyl radical from OPEN and other model species	4	3	4			115.1
RO2	Operator to approximate total peroxy radical concentration	4	7	2			87.1
ROR	Secondary alkoxy radical from PAR	4	7	1			71.1
TPO2	Peroxy radical from OH addition to TERP	10	17	3			185.2
TO2	Peroxy radical from OH addition to TOL	7	9	5			173.1
SQO2	Peroxy radical from OH addition to SQT	15	25	3			253.4

Species	Description	C	H	O	N	S	M Wt
XLO2	Peroxy radical from OH addition to XYL	8	11	5			187.2
XO2	NO to NO2 conversion from a peroxy radical	4	7	2			87.1
XO2H	NO to NO2 conversion (XO2) accompanied by HO2 production from a peroxy radical	4	7	2			87.1
XO2N	NO to organic nitrate conversion from a peroxy radical	4	7	2			87.1
XPRP	Operator to enable T-dependent organic nitrate yield from PRPA	3	7	2			75.1
XPAR	Operator to enable T-dependent organic nitrate yield from PAR	1	2.5	2			46.5

Table S9. Zenith angle (degrees) dependence of photolysis frequencies (s^{-1}) for CB7r1 reactions computed by the TUV discrete ordinates radiative transfer scheme (Stamnes et al., 1988) with cross-section and quantum yield data for each reaction recommended by the mechanism developer. Conditions are 600 m above ground level at mean sea level with surface UV albedo of 0.04, stratospheric ozone column of 0.3 atm cm, and the aerosol profile of Elterman (1968) provided with TUV.

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
1	NO2	$1.01x10^{-2}$	$9.77x10^{-3}$	$8.75x10^{-3}$	$6.30x10^{-3}$	$2.09x10^{-3}$	$5.12x10^{-4}$
8	O3	$4.26x10^{-4}$	$4.19x10^{-4}$	$3.94x10^{-4}$	$3.33x10^{-4}$	$1.79x10^{-4}$	$4.27x10^{-5}$
9	O3	$4.55x10^{-5}$	$3.99x10^{-5}$	$2.54x10^{-5}$	$8.78x10^{-6}$	$9.20x10^{-7}$	$1.52x10^{-7}$
21	H2O2	$8.79x10^{-6}$	$8.26x10^{-6}$	$6.64x10^{-6}$	$3.78x10^{-6}$	$8.81x10^{-7}$	$2.03x10^{-7}$
27	NO3	$1.88x10^{-1}$	$1.86x10^{-1}$	$1.79x10^{-1}$	$1.56x10^{-1}$	$8.22x10^{-2}$	$1.79x10^{-2}$
28	NO3	$2.32x10^{-2}$	$2.31x10^{-2}$	$2.23x10^{-2}$	$1.98x10^{-2}$	$1.12x10^{-2}$	$2.63x10^{-3}$
36	N2O5	$5.54x10^{-5}$	$5.23x10^{-5}$	$4.26x10^{-5}$	$2.52x10^{-5}$	$6.30x10^{-6}$	$1.48x10^{-6}$
39	HONO	$1.74x10^{-3}$	$1.68x10^{-3}$	$1.49x10^{-3}$	$1.04x10^{-3}$	$3.29x10^{-4}$	$8.35x10^{-5}$
44	HNO3	$8.47x10^{-7}$	$7.70x10^{-7}$	$5.57x10^{-7}$	$2.54x10^{-7}$	$4.20x10^{-8}$	$7.98x10^{-9}$
47	PNA	$7.02x10^{-6}$	$6.46x10^{-6}$	$4.84x10^{-6}$	$2.36x10^{-6}$	$4.16x10^{-7}$	$7.73x10^{-8}$
59	PAN	$9.53x10^{-7}$	$8.81x10^{-7}$	$6.72x10^{-7}$	$3.47x10^{-7}$	$7.05x10^{-8}$	$1.52x10^{-8}$
83	MEPX	$6.02x10^{-6}$	$5.68x10^{-6}$	$4.61x10^{-6}$	$2.68x10^{-6}$	$6.52x10^{-7}$	$1.53x10^{-7}$
94	ROOH	$6.02x10^{-6}$	$5.68x10^{-6}$	$4.61x10^{-6}$	$2.68x10^{-6}$	$6.52x10^{-7}$	$1.53x10^{-7}$
96	NTR1	$3.29x10^{-6}$	$3.01x10^{-6}$	$2.22x10^{-6}$	$1.06x10^{-6}$	$1.85x10^{-7}$	$3.60x10^{-8}$
101	FORM	$4.16x10^{-5}$	$3.90x10^{-5}$	$3.10x10^{-5}$	$1.69x10^{-5}$	$3.55x10^{-6}$	$7.35x10^{-7}$
102	FORM	$5.43x10^{-5}$	$5.18x10^{-5}$	$4.35x10^{-5}$	$2.69x10^{-5}$	$7.06x10^{-6}$	$1.73x10^{-6}$
106	ALD2	$7.29x10^{-6}$	$6.59x10^{-6}$	$4.65x10^{-6}$	$1.96x10^{-6}$	$2.54x10^{-7}$	$3.93x10^{-8}$
109	ALDX	$2.20x10^{-5}$	$2.01x10^{-5}$	$1.48x10^{-5}$	$6.96x10^{-6}$	$1.15x10^{-6}$	$2.10x10^{-7}$
111	GLYD	$9.03x10^{-6}$	$8.24x10^{-6}$	$6.01x10^{-6}$	$2.76x10^{-6}$	$4.40x10^{-7}$	$7.94x10^{-8}$
114	GLY	$1.35x10^{-4}$	$1.30x10^{-4}$	$1.14x10^{-4}$	$7.95x10^{-5}$	$2.57x10^{-5}$	$6.08x10^{-6}$
116	MGLY	$2.36x10^{-4}$	$2.29x10^{-4}$	$2.04x10^{-4}$	$1.46x10^{-4}$	$4.92x10^{-5}$	$1.16x10^{-5}$
119	ACET	$1.16x10^{-6}$	$1.02x10^{-6}$	$6.50x10^{-7}$	$2.27x10^{-7}$	$2.34x10^{-8}$	$3.59x10^{-9}$
121	KET	$1.02x10^{-6}$	$9.02x10^{-7}$	$5.83x10^{-7}$	$2.08x10^{-7}$	$2.25x10^{-8}$	$3.51x10^{-9}$

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
160	OPEN	3.02×10^{-4}	2.93×10^{-4}	2.62×10^{-4}	1.89×10^{-4}	6.27×10^{-5}	1.54×10^{-5}
164	XOPN	8.04×10^{-4}	7.82×10^{-4}	7.00×10^{-4}	5.04×10^{-4}	1.67×10^{-4}	4.09×10^{-5}
174	CRON	1.51×10^{-4}	1.47×10^{-4}	1.31×10^{-4}	9.45×10^{-5}	3.13×10^{-5}	7.68×10^{-6}
187	ISPD	2.96×10^{-5}	2.84×10^{-5}	2.45×10^{-5}	1.60×10^{-5}	4.60×10^{-6}	1.16×10^{-6}
189	HPLD	7.04×10^{-4}	6.84×10^{-4}	6.12×10^{-4}	4.41×10^{-4}	1.46×10^{-4}	3.58×10^{-5}

Table S10. Reactions and rate constant expressions for the SAPRC07TC mechanism. See Table S11 for species names. k_{300} is the rate constant at 300 K and 1 atmosphere using units in cm^3 $molecule^{-1}$ s^{-1}. For photolysis reactions k_{298} shows the photolysis frequency (J) at a solar zenith angle of 60° (see Table S12).

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
1	NO2 = NO + O3P	Photolysis	$6.37x10^{-3}$
2	O3P + O2 + M = O3	$k = 5.68x10^{-34} (T/300)^{-2.6}$	$5.68x10^{-34}$
3	O3P + O3 =	$k = 8.00x10^{-12} \exp(-2060/T)$	$8.34x10^{-15}$
4	O3P + NO = NO2	Falloff: F=0.6; n=1 $k(0) = 9.00x10^{-32} (T/300)^{-1.5}$ $k(inf) = 3.00x10^{-11}$	$1.64x10^{-12}$
5	O3P + NO2 = NO	$k = 5.50x10^{-12} \exp(188/T)$	$1.03x10^{-11}$
6	O3P + NO2 = NO3	Falloff: F=0.6; n=1 $k(0) = 2.50x10^{-31} (T/300)^{-1.8}$ $k(inf) = 2.20x10^{-11} (T/300)^{-.7}$	$3.24x10^{-12}$
7	O3 + NO = NO2	$k = 3.00x10^{-12} \exp(-1500/T)$	$2.02x10^{-14}$
8	O3 + NO2 = NO3	$k = 1.40x10^{-13} \exp(-2470/T)$	$3.72x10^{-17}$
9	NO + NO3 = 2. NO2	$k = 1.80x10^{-11} \exp(110/T)$	$2.60x10^{-11}$
10	NO + NO + O2 = 2. NO2	$k = 3.30x10^{-39} \exp(530/T)$	$1.93x10^{-38}$
11	NO2 + NO3 = N2O5	Falloff: F=0.35; n=1.33 $k(0) = 3.60x10^{-30} (T/300)^{-4.1}$ $k(inf) = 1.90x10^{-12} (T/300)^{0.2}$	$1.24x10^{-12}$
12	N2O5 = NO2 + NO3	Falloff: F=0.35; n=1.33 $k(0) = 1.30x10^{-3} (T/300)^{-3.5} \exp(-11000/T)$ $k(inf) = 9.70x10^{14} (T/300)^{0.1} \exp(-11080/T)$	$5.69x10^{-2}$
13	N2O5 + H2O = 2. HNO3	$k = 1.00x10^{-22}$	$1.00x10^{-22}$
14	N2O5 + H2O + H2O = 2. HNO3	k = 0	0
15	NO2 + NO3 = NO + NO2	$k = 4.50x10^{-14} \exp(-1260/T)$	$6.75x10^{-16}$
16	NO3 = NO	Photolysis	$1.98x10^{-2}$
17	NO3 = NO2 + O3P	Photolysis	$1.56x10^{-1}$
18	O3 = O1D	Photolysis	$9.47x10^{-6}$
19	O3 = O3P	Photolysis	$3.40x10^{-4}$
20	O1D + H2O = 2. OH	$k = 1.63x10^{-10} \exp(60/T)$	$1.99x10^{-10}$
21	O1D + M = O3P	$k = 2.38x10^{-11} \exp(96/T)$	$3.28x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
22	OH + NO = HONO	Falloff: F=0.6; n=1 k(0) = 7.00×10^{-31} $(T/300)^{-2.6}$ k(inf) = 3.60×10^{-11} $(T/300)^{-.1}$	7.31×10^{-12}
23	HONO = OH + NO	Photolysis	9.88×10^{-4}
24	OH + HONO = NO2	k = 2.50×10^{-12} exp(260/T)	5.95×10^{-12}
25	OH + NO2 = HNO3	Falloff: F=0.6; n=1 k(0) = 1.80×10^{-30} (T/300)#$^{-3}$ k(inf) = 2.80×10^{-11}	1.05×10^{-11}
26	OH + NO3 = HO2 + NO2	k = 2.00×10^{-11}	2.00×10^{-11}
27	OH + HNO3 = NO3	k = k1 + k3 [M] / (1 + k3 [M] / k2) k1 = 2.40×10^{-14} exp(460/T) k2 = 2.70×10^{-17} exp(2199/T) k3 = 6.50×10^{-34} exp(1335/T)	1.51×10^{-13}
28	HNO3 = OH + NO2	Photolysis	2.55×10^{-7}
29	OH + CO = HO2 + CO2	k = k1 + k2 [M] k1 = 1.44×10^{-13} k2 = 3.43×10^{-33}	2.28×10^{-13}
30	OH + O3 = HO2	k = 1.70×10^{-12} exp(−940/T)	7.41×10^{-14}
31	HO2 + NO = OH + NO2	k = 3.60×10^{-12} exp(270/T)	8.85×10^{-12}
32	HO2 + NO2 = PNA	Falloff: F=0.6; n=1 k(0) = 2.00×10^{-31} $(T/300)^{-3.4}$ k(inf) = 2.90×10^{-12} $(T/300)^{-1.1}$	1.12×10^{-12}
33	PNA = HO2 + NO2	Falloff: F=0.6; n=1 k(0) = 3.72×10^{-5} $(T/300)^{-2.4}$ exp(−10650/T) k(inf) = 5.42×10^{15} $(T/300)^{-2.3}$ exp(−11170/T)	1.07×10^{-1}
34	PNA = 0.61 HO2 + 0.61 NO2 + 0.39 OH + 0.39 NO3	Photolysis	3.17×10^{-6}
35	PNA + OH = NO2	k = 1.30×10^{-12} exp(380/T)	4.61×10^{-12}
36	HO2 + O3 = OH	k = 2.03×10^{-16} $(T/300)^{4.57}$ exp(693/T)	2.05×10^{-15}
37	HO2 + HO2 = H2O2	k = k1 + k2 [M] k1 = 2.20×10^{-13} exp(600/T) k2 = 1.90×10^{-33} exp(980/T)	2.84×10^{-12}
38	HO2 + HO2 + H2O = H2O2	k = k1 + k2 [M] k1 = 3.08×10^{-34} exp(2800/T) k2 = 2.66×10^{-54} exp(3180/T)	6.09×10^{-30}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
39	NO3 + HO2 = 0.8 OH + 0.8 NO2 + 0.2 HNO3	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
40	NO3 + NO3 = 2. NO2	$k = 8.50x10^{-13} \exp(-2450/T)$	$2.41x10^{-16}$
41	H2O2 = 2. OH	Photolysis	$3.78x10^{-6}$
42	H2O2 + OH = HO2	$k = 1.80x10^{-12}$	$1.80x10^{-12}$
43	OH + HO2 =	$k = 4.80x10^{-11} \exp(250/T)$	$1.10x10^{-10}$
44	OH + SO2 = HO2 + SULF	Falloff: F=0.6; n=1 $k(0) = 3.30x10^{-31} (T/300)^{-4.3}$ $k(inf) = 1.60x10^{-12}$	$9.49x10^{-13}$
45	OH + H2 = HO2	$k = 7.70x10^{-12} \exp(-2100/T)$	$7.02x10^{-15}$
46	MEO2 + NO = NO2 + HCHO + HO2	$k = 2.30x10^{-12} \exp(360/T)$	$7.64x10^{-12}$
47	MEO2 + HO2 = COOH	$k = 3.46x10^{-13} (T/300)^{0.36} \exp(780/T)$	$4.66x10^{-12}$
48	MEO2 + HO2 = HCHO	$k = 3.34x10^{-14} (T/300)^{-3.53} \exp(780/T)$	$4.50x10^{-13}$
49	MEO2 + NO3 = HCHO + HO2 + NO2	$k = 1.30x10^{-12}$	$1.30x10^{-12}$
50	MEO2 + MEO2 = MEOH + HCHO	$k = 6.39x10^{-14} (T/300)^{-1.8} \exp(365/T)$	$2.16x10^{-13}$
51	MEO2 + MEO2 = 2. HCHO + 2. HO2	$k = 7.40x10^{-13} \exp(-520/T)$	$1.31x10^{-13}$
52	RO2C + NO = NO2	$k = 2.60x10^{-12} \exp(380/T)$	$9.23x10^{-12}$
53	RO2C + HO2 =	$k = 3.80x10^{-13} \exp(900/T)$	$7.63x10^{-12}$
54	RO2C + NO3 = NO2	$k = 2.30x10^{-12}$	$2.30x10^{-12}$
55	RO2C + MEO2 = 0.5 HO2 + 0.75 HCHO + 0.25 MEOH	$k = 2.00x10^{-13}$	$2.00x10^{-13}$
56	RO2C + RO2C =	$k = 3.50x10^{-14}$	$3.50x10^{-14}$
57	RO2X + NO = XN	k = k(52)	$9.23x10^{-12}$
58	RO2X + HO2 =	k = k(53)	$7.63x10^{-12}$
59	RO2X + NO3 = NO2	k = k(54)	$2.30x10^{-12}$
60	RO2X + MEO2 = 0.5 HO2 + 0.75 HCHO + 0.25 MEOH	k = k(55)	$2.00x10^{-13}$
61	RO2X + RO2C =	k = k(56)	$3.50x10^{-14}$
62	RO2X + RO2X =	k = k(56)	$3.50x10^{-14}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
63	MCO3 + NO2 = PAN	Falloff: F=0.3; n=1.41 k(0) = 2.70×10^{-28} (T/300)$^{-7.1}$ k(inf) = 1.21×10^{-11} (T/300)$^{-.9}$	9.38×10^{-12}
64	PAN = MCO3 + NO2	Falloff: F=0.3; n=1.41 k(0) = 4.90×10^{-3} exp(−12100/T) k(inf) = 4.00×10^{16} exp(−13600/T)	6.27×10^{-4}
65	PAN = 0.6 MCO3 + 0.6 NO2 + 0.4 MEO2 + 0.4 CO2 + 0.4 NO3	Photolysis	3.50×10^{-7}
66	MCO3 + NO = MEO2 + CO2 + NO2	k = 7.50×10^{-12} exp(290/T)	1.97×10^{-11}
67	MCO3 + HO2 = 0.7 CO3H + 0.3 AACD + 0.3 O3	k = 5.20×10^{-13} exp(980/T)	1.36×10^{-11}
68	MCO3 + NO3 = MEO2 + CO2 + NO2	k = k(54)	2.30×10^{-12}
69	MCO3 + MEO2 = 0.1 AACD + HCHO + 0.9 HO2 + 0.9 MEO2 + 0.9 CO2	k = 2.00×10^{-12} exp(500/T)	1.06×10^{-11}
70	MCO3 + RO2C = MEO2 + CO2	k = 4.40×10^{-13} exp(1070/T)	1.56×10^{-11}
71	MCO3 + RO2X = MEO2 + CO2	k = k(70)	1.56×10^{-11}
72	MCO3 + MCO3 = 2. MEO2 + 2. CO2	k = 2.90×10^{-12} exp(500/T)	1.54×10^{-11}
73	RCO3 + NO2 = PAN2	k = 1.21×10^{-11} (T/300)$^{-1.07}$	1.21×10^{-11}
74	PAN2 = RCO3 + NO2	k = 8.30×10^{16} exp(−13940/T)	5.48×10^{-4}
75	PAN2 = 0.6 RCO3 + 0.6 NO2 + 0.4 RO2C + 0.4 XHO2 + 0.4 YRPX + 0.4 XCCH + 0.4 CO2 + 0.4 NO3	Photolysis	3.50×10^{-7}
76	RCO3 + NO = NO2 + RO2C + XHO2 + YRPX + XCCH + CO2	k = 6.70×10^{-12} exp(340/T)	2.08×10^{-11}
77	RCO3 + HO2 = 0.75 RO3H + 0.25 PACD + 0.25 O3	k = k(67)	1.36×10^{-11}
78	RCO3 + NO3 = NO2 + RO2C + XHO2 + YRPX + XCCH + CO2	k = k(54)	2.30×10^{-12}
79	RCO3 + MEO2 = HCHO + HO2 + RO2C + XHO2 + XCCH + YRPX + CO2	k = k(69)	1.06×10^{-11}
80	RCO3 + RO2C = RO2C + XHO2 + XCCH + YRPX + CO2	k = k(70)	1.56×10^{-11}
81	RCO3 + RO2X = RO2C + XHO2 + XCCH + YRPX + CO2	k = k(70)	1.56×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
82	RCO3 + MCO3 = 2. CO2 + MEO2 + RO2C + XHO2 + YRPX + XCCH	k = k(72)	$1.54x10^{-11}$
83	RCO3 + RCO3 = 2. RO2C + 2. XHO2 + 2. XCCH + 2. YRPX + 2. CO2	k = k(72)	$1.54x10^{-11}$
84	BZC3 + NO2 = PBZN	$k = 1.37x10^{-11}$	$1.37x10^{-11}$
85	PBZN = BZC3 + NO2	$k = 7.90x10^{16} \exp(-14000/T)$	$4.27x10^{-4}$
86	PBZN = 0.6 BZC3 + 0.6 NO2 + 0.4 CO2 + 0.4 BZO + 0.4 RO2C + 0.4 NO3	Photolysis	$3.50x10^{-7}$
87	BZC3 + NO = NO2 + CO2 + BZO + RO2C	k = k(76)	$2.08x10^{-11}$
88	BZC3 + HO2 = 0.75 RO3H + 0.25 PACD + 0.25 O3 + 4. XC	k = k(67)	$1.36x10^{-11}$
89	BZC3 + NO3 = NO2 + CO2 + BZO + RO2C	k = k(54)	$2.30x10^{-12}$
90	BZC3 + MEO2 = HCHO + HO2 + RO2C + BZO + CO2	k = k(69)	$1.06x10^{-11}$
91	BZC3 + RO2C = RO2C + BZO + CO2	k = k(70)	$1.56x10^{-11}$
92	BZC3 + RO2X = RO2C + BZO + CO2	k = k(70)	$1.56x10^{-11}$
93	BZC3 + MCO3 = 2. CO2 + MEO2 + BZO + RO2C	k = k(72)	$1.54x10^{-11}$
94	BZC3 + RCO3 = 2. CO2 + 2. RO2C + XHO2 + YRPX + XCCH + BZO	k = k(72)	$1.54x10^{-11}$
95	BZC3 + BZC3 = 2. BZO + 2. RO2C + 2. CO2	k = k(72)	$1.54x10^{-11}$
96	MAC3 + NO2 = MPAN	k = k(73)	$1.21x10^{-11}$
97	MPAN = MAC3 + NO2	$k = 1.60x10^{16} \exp(-13486/T)$	$4.80x10^{-4}$
98	MPAN = 0.6 MAC3 + 0.6 NO2 + 0.4 CO2 + 0.4 HCHO + 0.4 MCO3 + 0.4 NO3	Photolysis	$3.50x10^{-7}$
99	MAC3 + NO = NO2 + CO2 + HCHO + MCO3	k = k(76)	$2.08x10^{-11}$
100	MAC3 + HO2 = 0.75 RO3H + 0.25 PACD + 0.25 O3 + XC	k = k(67)	$1.36x10^{-11}$
101	MAC3 + NO3 = NO2 + CO2 + HCHO + MCO3	k = k(54)	$2.30x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
102	MAC3 + MEO2 = 2. HCHO + HO2 + CO2 + MCO3	k = k(69)	1.06×10^{-11}
103	MAC3 + RO2C = CO2 + HCHO + MCO3	k = k(70)	1.56×10^{-11}
104	MAC3 + RO2X = CO2 + HCHO + MCO3	k = k(70)	1.56×10^{-11}
105	MAC3 + MCO3 = 2. CO2 + MEO2 + HCHO + MCO3	k = k(72)	1.54×10^{-11}
106	MAC3 + RCO3 = HCHO + MCO3 + RO2C + XHO2 + YRPX + XCCH + 2. CO2	k = k(72)	1.54×10^{-11}
107	MAC3 + BZC3 = HCHO + MCO3 + BZO + RO2C + 2. CO2	k = k(72)	1.54×10^{-11}
108	MAC3 + MAC3 = 2. HCHO + 2. MCO3 + 2. CO2	k = k(72)	1.54×10^{-11}
109	TBUO + NO2 = RNO3 − 2. XC	$k = 2.40 \times 10^{-11}$	2.40×10^{-11}
110	TBUO = ACET + MEO2	$k = 7.50 \times 10^{14} \exp(-8152/T)$	1.19×10^{3}
111	BZO + NO2 = NPHE	$k = 2.30 \times 10^{-11} \exp(150/T)$	3.79×10^{-11}
112	BZO + HO2 = CRES − 1. XC	k = k(53)	7.63×10^{-12}
113	BZO = CRES + RO2C + XHO2 − 1. XC	$k = 1.00 \times 10^{-3}$	1.00×10^{-3}
114	XHO2 + NO = NO + HO2	k = k(52)	9.23×10^{-12}
115	XHO2 + HO2 = HO2	k = k(53)	7.63×10^{-12}
116	XHO2 + NO3 = NO3 + HO2	k = k(54)	2.30×10^{-12}
117	XHO2 + MEO2 = MEO2 + 0.5 HO2	k = k(55)	2.00×10^{-13}
118	XHO2 + RO2C = RO2C + 0.5 HO2	k = k(56)	3.50×10^{-14}
119	XHO2 + RO2X = RO2X + 0.5 HO2	k = k(56)	3.50×10^{-14}
120	XHO2 + MCO3 = MCO3 + HO2	k = k(70)	1.56×10^{-11}
121	XHO2 + RCO3 = RCO3 + HO2	k = k(70)	1.56×10^{-11}
122	XHO2 + BZC3 = BZC3 + HO2	k = k(70)	1.56×10^{-11}
123	XHO2 + MAC3 = MAC3 + HO2	k = k(70)	1.56×10^{-11}
124	XOH + NO = NO + OH	k = k(52)	9.23×10^{-12}
125	XOH + HO2 = HO2	k = k(53)	7.63×10^{-12}
126	XOH + NO3 = NO3 + OH	k = k(54)	2.30×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
127	XOH + MEO2 = MEO2 + 0.5 OH	k = k(55)	2.00×10^{-13}
128	XOH + RO2C = RO2C + 0.5 OH	k = k(56)	3.50×10^{-14}
129	XOH + RO2X = RO2X + 0.5 OH	k = k(56)	3.50×10^{-14}
130	XOH + MCO3 = MCO3 + OH	k = k(70)	1.56×10^{-11}
131	XOH + RCO3 = RCO3 + OH	k = k(70)	1.56×10^{-11}
132	XOH + BZC3 = BZC3 + OH	k = k(70)	1.56×10^{-11}
133	XOH + MAC3 = MAC3 + OH	k = k(70)	1.56×10^{-11}
134	XNO2 + NO = NO + NO2	k = k(52)	9.23×10^{-12}
135	XNO2 + HO2 = HO2 + XN	k = k(53)	7.63×10^{-12}
136	XNO2 + NO3 = NO3 + NO2	k = k(54)	2.30×10^{-12}
137	XNO2 + MEO2 = MEO2 + 0.5 NO2 + 0.5 XN	k = k(55)	2.00×10^{-13}
138	XNO2 + RO2C = RO2C + 0.5 NO2 + 0.5 XN	k = k(56)	3.50×10^{-14}
139	XNO2 + RO2X = RO2X + 0.5 NO2 + 0.5 XN	k = k(56)	3.50×10^{-14}
140	XNO2 + MCO3 = MCO3 + NO2	k = k(70)	1.56×10^{-11}
141	XNO2 + RCO3 = RCO3 + NO2	k = k(70)	1.56×10^{-11}
142	XNO2 + BZC3 = BZC3 + NO2	k = k(70)	1.56×10^{-11}
143	XNO2 + MAC3 = MAC3 + NO2	k = k(70)	1.56×10^{-11}
144	XMEO + NO = NO + MEO2	k = k(52)	9.23×10^{-12}
145	XMEO + HO2 = HO2 + XC	k = k(53)	7.63×10^{-12}
146	XMEO + NO3 = NO3 + MEO2	k = k(54)	2.30×10^{-12}
147	XMEO + MEO2 = 1.5 MEO2 + 0.5 XC	k = k(55)	2.00×10^{-13}
148	XMEO + RO2C = RO2C + 0.5 MEO2 + 0.5 XC	k = k(56)	3.50×10^{-14}
149	XMEO + RO2X = RO2X + 0.5 MEO2 + 0.5 XC	k = k(56)	3.50×10^{-14}
150	XMEO + MCO3 = MCO3 + MEO2	k = k(70)	1.56×10^{-11}
151	XMEO + RCO3 = RCO3 + MEO2	k = k(70)	1.56×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
152	XMEO + BZC3 = BZC3 + MEO2	k = k(70)	$1.56x10^{-11}$
153	XMEO + MAC3 = MAC3 + MEO2	k = k(70)	$1.56x10^{-11}$
154	XMC3 + NO = NO + MCO3	k = k(52)	$9.23x10^{-12}$
155	XMC3 + HO2 = HO2 + 2. XC	k = k(53)	$7.63x10^{-12}$
156	XMC3 + NO3 = NO3 + MCO3	k = k(54)	$2.30x10^{-12}$
157	XMC3 + MEO2 = MEO2 + 0.5 MCO3 + XC	k = k(55)	$2.00x10^{-13}$
158	XMC3 + RO2C = RO2C + 0.5 MCO3 + XC	k = k(56)	$3.50x10^{-14}$
159	XMC3 + RO2X = RO2X + 0.5 MCO3 + XC	k = k(56)	$3.50x10^{-14}$
160	XMC3 + MCO3 = 2. MCO3	k = k(70)	$1.56x10^{-11}$
161	XMC3 + RCO3 = RCO3 + MCO3	k = k(70)	$1.56x10^{-11}$
162	XMC3 + BZC3 = BZC3 + MCO3	k = k(70)	$1.56x10^{-11}$
163	XMC3 + MAC3 = MAC3 + MCO3	k = k(70)	$1.56x10^{-11}$
164	XRC3 + NO = NO + RCO3	k = k(52)	$9.23x10^{-12}$
165	XRC3 + HO2 = HO2 + 3. XC	k = k(53)	$7.63x10^{-12}$
166	XRC3 + NO3 = NO3 + RCO3	k = k(54)	$2.30x10^{-12}$
167	XRC3 + MEO2 = MEO2 + 0.5 RCO3 + 1.5 XC	k = k(55)	$2.00x10^{-13}$
168	XRC3 + RO2C = RO2C + 0.5 RCO3 + 1.5 XC	k = k(56)	$3.50x10^{-14}$
169	XRC3 + RO2X = RO2X + 0.5 RCO3 + 1.5 XC	k = k(56)	$3.50x10^{-14}$
170	XRC3 + MCO3 = MCO3 + RCO3	k = k(70)	$1.56x10^{-11}$
171	XRC3 + RCO3 = 2. RCO3	k = k(70)	$1.56x10^{-11}$
172	XRC3 + BZC3 = BZC3 + RCO3	k = k(70)	$1.56x10^{-11}$
173	XRC3 + MAC3 = MAC3 + RCO3	k = k(70)	$1.56x10^{-11}$
174	XMA3 + NO = NO + MAC3	k = k(52)	$9.23x10^{-12}$
175	XMA3 + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
176	XMA3 + NO3 = NO3 + MAC3	k = k(54)	$2.30x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
177	XMA3 + MEO2 = MEO2 + 0.5 MAC3 + 2. XC	k = k(55)	$2.00x10^{-13}$
178	XMA3 + RO2C = RO2C + 0.5 MAC3 + 2. XC	k = k(56)	$3.50x10^{-14}$
179	XMA3 + RO2X = RO2X + 0.5 MAC3 + 2. XC	k = k(56)	$3.50x10^{-14}$
180	XMA3 + MCO3 = MCO3 + MAC3	k = k(70)	$1.56x10^{-11}$
181	XMA3 + RCO3 = RCO3 + MAC3	k = k(70)	$1.56x10^{-11}$
182	XMA3 + BZC3 = BZC3 + MAC3	k = k(70)	$1.56x10^{-11}$
183	XMA3 + MAC3 = 2. MAC3	k = k(70)	$1.56x10^{-11}$
184	XTBU + NO = NO + TBUO	k = k(52)	$9.23x10^{-12}$
185	XTBU + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
186	XTBU + NO3 = NO3 + TBUO	k = k(54)	$2.30x10^{-12}$
187	XTBU + MEO2 = MEO2 + 0.5 TBUO + 2. XC	k = k(55)	$2.00x10^{-13}$
188	XTBU + RO2C = RO2C + 0.5 TBUO + 2. XC	k = k(56)	$3.50x10^{-14}$
189	XTBU + RO2X = RO2X + 0.5 TBUO + 2. XC	k = k(56)	$3.50x10^{-14}$
190	XTBU + MCO3 = MCO3 + TBUO	k = k(70)	$1.56x10^{-11}$
191	XTBU + RCO3 = RCO3 + TBUO	k = k(70)	$1.56x10^{-11}$
192	XTBU + BZC3 = BZC3 + TBUO	k = k(70)	$1.56x10^{-11}$
193	XTBU + MAC3 = MAC3 + TBUO	k = k(70)	$1.56x10^{-11}$
194	XCO + NO = NO + CO	k = k(52)	$9.23x10^{-12}$
195	XCO + HO2 = HO2 + XC	k = k(53)	$7.63x10^{-12}$
196	XCO + NO3 = NO3 + CO	k = k(54)	$2.30x10^{-12}$
197	XCO + MEO2 = MEO2 + 0.5 CO + 0.5 XC	k = k(55)	$2.00x10^{-13}$
198	XCO + RO2C = RO2C + 0.5 CO + 0.5 XC	k = k(56)	$3.50x10^{-14}$
199	XCO + RO2X = RO2X + 0.5 CO + 0.5 XC	k = k(56)	$3.50x10^{-14}$
200	XCO + MCO3 = MCO3 + CO	k = k(70)	$1.56x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
201	XCO + RCO3 = RCO3 + CO	k = k(70)	1.56×10^{-11}
202	XCO + BZC3 = BZC3 + CO	k = k(70)	1.56×10^{-11}
203	XCO + MAC3 = MAC3 + CO	k = k(70)	1.56×10^{-11}
204	HCHO = 2. HO2 + CO	Photolysis	1.78×10^{-5}
205	HCHO = CO	Photolysis	2.38×10^{-5}
206	HCHO + OH = HO2 + CO	$k = 5.40 \times 10^{-12} \exp(135/T)$	8.47×10^{-12}
207	HCHO + NO3 = HNO3 + HO2 + CO	$k = 2.00 \times 10^{-12} \exp(-2431/T)$	6.05×10^{-16}
208	CCHO + OH = MCO3	$k = 4.40 \times 10^{-12} \exp(365/T)$	1.49×10^{-11}
209	CCHO = CO + HO2 + MEO2	Photolysis	1.77×10^{-6}
210	CCHO + NO3 = HNO3 + MCO3	$k = 1.40 \times 10^{-12} \exp(-1860/T)$	2.84×10^{-15}
211	RCHO + OH = 0.965 RCO3 + 0.035 RO2C + 0.035 XHO2 + 0.035 XCO + 0.035 XCCH + 0.035 YRPX	$k = 5.10 \times 10^{-12} \exp(405/T)$	1.97×10^{-11}
212	RCHO = RO2C + XHO2 + YRPX + XCCH + CO + HO2	Photolysis	6.95×10^{-6}
213	RCHO + NO3 = HNO3 + RCO3	$k = 1.40 \times 10^{-12} \exp(-1601/T)$	6.74×10^{-15}
214	ACET + OH = RO2C + XMC3 + XHCH + YRPX	$k = 4.56 \times 10^{-14} (T/300)^{3.65} \exp(429/T)$	1.91×10^{-13}
215	ACET = 0.62 MCO3 + 1.38 MEO2 + 0.38 CO	Photolysis	1.04×10^{-7}
216	MEK + OH = 0.967 RO2C + 0.039 RO2X + 0.039 ZRN3 + 0.376 XHO2 + 0.51 XMC3 + 0.074 XRC3 + 0.088 XHCH + 0.504 XCCH + 0.376 XRCH + YRPX + 0.3 XC	$k = 1.30 \times 10^{-12} (T/300)\#2 \exp(^{-25}/T)$	1.20×10^{-12}
217	MEK = MCO3 + RO2C + XHO2 + XCCH + YRPX	Photolysis	8.13×10^{-7}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
218	MEOH + OH = HCHO + HO2	$k = 2.85 \times 10^{-12} \exp(-345/T)$	9.02×10^{-13}
219	FACD + OH = HO2 + CO2	$k = 4.50 \times 10^{-13}$	4.50×10^{-13}
220	AACD + OH = 0.509 MEO2 + 0.491 RO2C + 0.509 CO2 + 0.491 XHO2 + 0.491 XMGL + 0.491 YRPX − 0.491 XC	$k = 4.20 \times 10^{-14} \exp(855/T)$	7.26×10^{-13}
221	PACD + OH = RO2C + XHO2 + 0.143 CO2 + 0.142 XCCH + 0.4 XRCH + 0.457 XBAC + YRPX − 0.455 XC	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
222	COOH + OH = 0.3 HCHO + 0.3 OH + 0.7 MEO2	$k = 3.80 \times 10^{-12} \exp(200/T)$	7.40×10^{-12}
223	COOH = HCHO + HO2 + OH	Photolysis	2.72×10^{-6}
224	ROOH + OH = 0.744 OH + 0.251 RO2C + 0.004 RO2X + 0.004 ZRN3 + 0.744 RCHO + 0.239 XHO2 + 0.012 XOH + 0.012 XHCH + 0.012 XCCH + 0.205 XRCH + 0.034 XPD2 + 0.256 YRPX − 0.115 XC	$k = 2.50 \times 10^{-11}$	2.50×10^{-11}
225	ROOH = RCHO + HO2 + OH	Photolysis	2.72×10^{-6}
226	R6PX + OH = 0.84 OH + 0.222 RO2C + 0.029 RO2X + 0.029 ZRN3 + 0.84 PRD2 + 0.09 XHO2 + 0.041 XOH + 0.02 XCCH + 0.075 XRCH + 0.084 XPD2 + 0.16 YRPX + 0.02 XC	$k = 5.60 \times 10^{-11}$	5.60×10^{-11}
227	R6PX = OH + 0.142 HO2 + 0.782 RO2C + 0.077 RO2X + 0.077 ZRN3 + 0.085 RCHO + 0.142 PRD2 + 0.782 XHO2 + 0.026 XCCH + 0.058 XRCH + 0.698 XPD2 + 0.858 Y6PX + 0.017 XC	Photolysis	2.72×10^{-6}
228	RAPX + OH = 0.139 OH + 0.148 HO2 + 0.589 RO2C + 0.124 RO2X + 0.124 ZRN3 + 0.074 PRD2 + 0.147 MGLY + 0.139 IPRD + 0.565 XHO2 + 0.024 XOH + 0.448 XRCH + 0.026 XGLY + 0.03 XMEK + 0.252 XMGL + 0.073 XAF1 + 0.073 XAF2 + 0.713 Y6PX + 2.674 XC	$k = 1.41 \times 10^{-10}$	1.41×10^{-10}
229	RAPX = OH + HO2 + 0.5 GLY + 0.5 MGLY + 0.5 AFG1 + 0.5 AFG2 + 0.5 XC	Photolysis	2.72×10^{-6}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
230	GLY = 2. CO + 2. HO2	Photolysis	7.88×10^{-5}
231	GLY = HCHO + CO	Photolysis	2.23×10^{-5}
232	GLY + OH = 0.63 HO2 + 1.26 CO + 0.37 RCO3 − 0.37 XC	$k = 1.10 \times 10^{-11}$	1.10×10^{-11}
233	GLY + NO3 = HNO3 + 0.63 HO2 + 1.26 CO + 0.37 RCO3 − 0.37 XC	$k = 2.80 \times 10^{-12} \exp(-2376/T)$	1.02×10^{-15}
234	MGLY = HO2 + CO + MCO3	Photolysis	1.39×10^{-4}
235	MGLY + OH = CO + MCO3	$k = 1.50 \times 10^{-11}$	1.50×10^{-11}
236	MGLY + NO3 = HNO3 + CO + MCO3	$k = 1.40 \times 10^{-12} \exp(-1895/T)$	2.53×10^{-15}
237	BACL = 2. MCO3	Photolysis	2.45×10^{-4}
238	CRES + OH = 0.2 BZO + 0.8 RO2C + 0.8 XHO2 + 0.8 Y6PX + 0.25 XMGL + 5.05 XC	$k = 1.70 \times 10^{-12} \exp(950/T)$	4.03×10^{-11}
239	CRES + NO3 = HNO3 + BZO + XC	$k = 1.40 \times 10^{-11}$	1.40×10^{-11}
240	NPHE + OH = BZO + XN	$k = 3.50 \times 10^{-12}$	3.50×10^{-12}
241	NPHE = HONO + 6. XC	Photolysis	9.55×10^{-6}
242	NPHE = 6. XC + XN	Photolysis	9.55×10^{-5}
243	BALD + OH = BZC3	$k = 1.20 \times 10^{-11}$	1.20×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
244	BALD = 7. XC	Photolysis	2.48×10^{-5}
245	BALD + NO3 = HNO3 + BZC3	$k = 1.34 \times 10^{-12} \exp(-1860/T)$	2.72×10^{-15}
246	AFG1 + OH = 0.217 MAC3 + 0.723 RO2C + 0.06 RO2X + 0.06 ZRN3 + 0.521 XHO2 + 0.201 XMC3 + 0.334 XCO + 0.407 XRCH + 0.129 XMEK + 0.107 XGLY + 0.267 XMGL + 0.783 Y6PX + 0.284 XC	$k = 7.40 \times 10^{-11}$	7.40×10^{-11}
247	AFG1 + O3 = 0.826 OH + 0.522 HO2 + 0.652 RO2C + 0.522 CO + 0.174 CO2 + 0.432 GLY + 0.568 MGLY + 0.652 XRC3 + 0.652 XHCH + 0.652 Y6PX − 0.872 XC	$k = 9.66 \times 10^{-18}$	9.66×10^{-18}
248	AFG1 = 1.023 HO2 + 0.173 MEO2 + 0.305 MCO3 + 0.5 MAC3 + 0.695 CO + 0.195 GLY + 0.305 MGLY + 0.217 XC	Photolysis	3.07×10^{-3}
249	AFG2 + OH = 0.217 MAC3 + 0.723 RO2C + 0.06 RO2X + 0.06 ZRN3 + 0.521 XHO2 + 0.201 XMC3 + 0.334 XCO + 0.407 XRCH + 0.129 XMEK + 0.107 XGLY + 0.267 XMGL + 0.783 Y6PX + 0.284 XC	$k = 7.40 \times 10^{-11}$	7.40×10^{-11}
250	AFG2 + O3 = 0.826 OH + 0.522 HO2 + 0.652 RO2C + 0.522 CO + 0.174 CO2 + 0.432 GLY + 0.568 MGLY + 0.652 XRC3 + 0.652 XHCH + 0.652 Y6PX − 0.872 XC	$k = 9.66 \times 10^{-18}$	9.66×10^{-18}
251	AFG2 = PRD2 − 1. XC	Photolysis	3.07×10^{-3}
252	AFG3 + OH = 0.206 MAC3 + 0.733 RO2C + 0.117 RO2X + 0.117 ZRN3 + 0.561 XHO2 + 0.117 XMC3 + 0.114 XCO + 0.274 XGLY + 0.153 XMGL + 0.019 XBAC + 0.195 XAF1 + 0.195 XAF2 + 0.231 XIPR + 0.794 Y6PX + 0.938 XC	$k = 9.35 \times 10^{-11}$	9.35×10^{-11}
253	AFG3 + O3 = 0.471 OH + 0.554 HO2 + 0.013 MCO3 + 0.258 RO2C + 0.007 RO2X + 0.007 ZRN3 + 0.58 CO + 0.19 CO2 + 0.366 GLY + 0.184 MGLY + 0.35 AFG1 + 0.35 AFG2 + 0.139 AFG3 + 0.003 MACR + 0.004 MVK + 0.003 IPRD + 0.095 XHO2 +	$k = 1.43 \times 10^{-17}$	1.43×10^{-17}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
	0.163 XRC3 + 0.163 XHCH + 0.095 XMGL + 0.264 Y6PX − 0.575 XC		
254	MACR + OH = 0.5 MAC3 + 0.5 RO2C + 0.5 XHO2 + 0.416 XCO + 0.084 XHCH + 0.416 XMEK + 0.084 XMGL + 0.5 YRPX − 0.416 XC	$k = 8.00 \times 10^{-12} \exp(380/T)$	2.84×10^{-11}
255	MACR + O3 = 0.208 OH + 0.108 HO2 + 0.1 RO2C + 0.45 CO + 0.117 CO2 + 0.1 HCHO + 0.9 MGLY + 0.333 FACD + 0.1 XRC3 + 0.1 XHCH + 0.1 YRPX − 0.1 XC	$k = 1.40 \times 10^{-15} \exp(-2100/T)$	1.28×10^{-18}
256	MACR + NO3 = 0.5 MAC3 + 0.5 RO2C + 0.5 HNO3 + 0.5 XHO2 + 0.5 XCO + 0.5 YRPX + 1.5 XC + 0.5 XN	$k = 1.50 \times 10^{-12} \exp(-1815/T)$	3.54×10^{-15}
257	MACR + O3P = RCHO + XC	$k = 6.34 \times 10^{-12}$	6.34×10^{-12}
258	MACR = 0.33 OH + 0.67 HO2 + 0.34 MCO3 + 0.33 MAC3 + 0.33 RO2C + 0.67 CO + 0.34 HCHO + 0.33 XMC3 + 0.33 XHCH + 0.33 YRPX	Photolysis	1.39×10^{-6}
259	MVK + OH = 0.975 RO2C + 0.025 RO2X + 0.025 ZRN3 + 0.3 XHO2 + 0.675 XMC3 + 0.3 XHCH + 0.675 XGLD + 0.3 XMGL + YRPX − 0.05 XC	$k = 2.60 \times 10^{-12} \exp(610/T)$	1.99×10^{-11}
260	MVK + O3 = 0.164 OH + 0.064 HO2 + 0.05 RO2C + 0.05 XHO2 + 0.475 CO + 0.124 CO2 + 0.05 HCHO + 0.95 MGLY + 0.351 FACD + 0.05 XRC3 + 0.05 XHCH + 0.05 YRPX − 0.05 XC	$k = 8.50 \times 10^{-16} \exp(-1520/T)$	5.36×10^{-18}
261	MVK + O3P = 0.45 RCHO + 0.55 MEK + 0.45 XC	$k = 4.32 \times 10^{-12}$	4.32×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
262	MVK = 0.4 MEO2 + 0.6 CO + 0.6 PRD2 + 0.4 MAC3 − 2.2 XC	Photolysis	5.25×10^{-7}
263	IPRD + OH = 0.289 MAC3 + 0.67 RO2C + 0.67 XHO2 + 0.041 RO2X + 0.041 ZRN3 + 0.336 XCO + 0.055 XHCH + 0.129 XGLD + 0.013 XRCH + 0.15 XMEK + 0.332 XPD2 + 0.15 XGLY + 0.174 XMGL − 0.504 XC + 0.711 Y6PX	$k = 6.19 \times 10^{-11}$	6.19×10^{-11}
264	IPRD + O3 = 0.285 OH + 0.4 HO2 + 0.048 RO2C + 0.048 XRC3 + 0.498 CO + 0.14 CO2 + 0.124 HCHO + 0.21 MEK + 0.023 GLY + 0.742 MGLY + 0.1 FACD + 0.372 PACD + 0.047 XGLD + 0.001 XHCH + 0.048 Y6PX − 0.329 XC	$k = 4.18 \times 10^{-18}$	4.18×10^{-18}
265	IPRD + NO3 = 0.15 MAC3 + 0.15 HNO3 + 0.799 RO2C + 0.799 XHO2 + 0.051 RO2X + 0.051 ZRN3 + 0.572 XCO + 0.227 XHCH + 0.218 XRCH + 0.008 XMGL + 0.572 XRN3 + 0.85 Y6PX + 0.278 XN − 0.815 XC	$k = 1.00 \times 10^{-13}$	1.00×10^{-13}
266	IPRD = 1.233 HO2 + 0.467 MCO3 + 0.3 RCO3 + 1.233 CO + 0.3 HCHO + 0.467 GLYD + 0.233 MEK − 0.233 XC	Photolysis	1.39×10^{-6}
267	PRD2 + OH = 0.472 HO2 + 0.379 XHO2 + 0.029 XMC3 + 0.049 XRC3 + 0.473 RO2C + 0.071 RO2X + 0.071 ZRN3 + 0.002 HCHO + 0.211 XHCH + 0.001 CCHO + 0.083 XCCH + 0.143 RCHO + 0.402 XRCH + 0.115 XMEK + 0.329 PRD2 + 0.007 XPD2 + 0.528 Y6PX + 0.877 XC	$k = 1.55 \times 10^{-11}$	1.55×10^{-11}
268	PRD2 = 0.913 XHO2 + 0.4 MCO3 + 0.6 RCO3 + 1.59 RO2C + 0.087 RO2X + 0.087 ZRN3 + 0.303 XHCH + 0.163 XCCH + 0.78 XRCH + Y6PX − 0.091 XC	Photolysis	2.26×10^{-8}
269	RNO3 + OH = 0.189 HO2 + 0.305 XHO2 + 0.019 NO2 + 0.313 XNO2 + 0.976 RO2C + 0.175 RO2X + 0.175 ZRN3 + 0.011 XHCH + 0.429 XCCH + 0.001 RCHO + 0.036 XRCH + 0.004 XACE + 0.01 MEK + 0.17 XMEK + 0.008 PRD2 + 0.031 XPD2 + 0.189 RNO3 + 0.305 XRN3 + 0.157 YRPX + 0.636 Y6PX + 0.174 XN + 0.04 XC	$k = 7.20 \times 10^{-12}$	7.20×10^{-12}
270	RNO3 = 0.344 HO2 + 0.554 XHO2 + NO2 + 0.721 RO2C + 0.102 RO2X + 0.102 ZRN3 + 0.074 HCHO + 0.061 XHCH + 0.214 CCHO + 0.23 XCCH + 0.074 RCHO + 0.063 XRCH	Photolysis	1.20×10^{-6}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
	+ 0.008 XACE + 0.124 MEK + 0.083 XMEK + 0.19 PRD2 + 0.261 XPD2 + 0.066 YRPX + 0.591 Y6PX + 0.396 XC		
271	GLYD + OH = MCO3	k = k(208)	1.49×10^{-11}
272	GLYD = CO + 2. HO2 + HCHO	Photolysis	2.75×10^{-6}
273	GLYD + NO3 = HNO3 + MCO3	k = k(210)	2.84×10^{-15}
274	ACRO + OH = 0.25 XHO2 + 0.75 MAC3 + 0.25 RO2C + 0.167 XCO + 0.083 XHCH + 0.167 XCCH + 0.083 XGLY + 0.25 YRPX − 0.75 XC	$k = 1.99 \times 10^{-11}$	1.99×10^{-11}
275	ACRO + O3 = 0.83 HO2 + 0.33 OH + 1.005 CO + 0.31 CO2 + 0.5 HCHO + 0.185 FACD + 0.5 GLY	$k = 1.40 \times 10^{-15} \exp(-2528/T)$	3.07×10^{-19}
276	ACRO + NO3 = 0.031 XHO2 + 0.967 MAC3 + 0.031 RO2C + 0.002 RO2X + 0.002 ZRN3 + 0.967 HNO3 + 0.031 XCO + 0.031 XRN3 + 0.033 YRPX + 0.002 XN − 1.097 XC	$k = 1.18 \times 10^{-15}$	1.18×10^{-15}
277	ACRO + O3P = RCHO	$k = 2.37 \times 10^{-12}$	2.37×10^{-12}
278	ACRO = 1.066 HO2 + 0.178 OH + 0.234 MEO2 + 0.33 MAC3 + 1.188 CO + 0.102 CO2 + 0.34 HCHO + 0.05 AACD − 0.284 XC	Photolysis	1.28×10^{-6}
279	CO3H + OH = 0.98 MCO3 + 0.02 RO2C + 0.02 CO2 + 0.02 XOH + 0.02 XHCH + 0.02 YRPX	$k = 5.28 \times 10^{-12}$	5.28×10^{-12}
280	CO3H = MEO2 + CO2 + OH	Photolysis	3.60×10^{-7}
281	RO3H + OH = 0.806 RCO3 + 0.194 RO2C + 0.194 YRPX + 0.11 CO2 + 0.11 XOH + 0.11 XCCH + 0.084 XHO2 + 0.084 XRCH	$k = 6.42 \times 10^{-12}$	6.42×10^{-12}
282	RO3H = XHO2 + XCCH + YRPX + CO2 + OH	Photolysis	3.60×10^{-7}
283	XHCH + NO = NO + HCHO	k = k(52)	9.23×10^{-12}
284	XHCH + HO2 = HO2 + XC	k = k(53)	7.63×10^{-12}
285	XHCH + NO3 = NO3 + HCHO	k = k(54)	2.30×10^{-12}
286	XHCH + MEO2 = MEO2 + 0.5 HCHO + 0.5 XC	k = k(55)	2.00×10^{-13}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
287	XHCH + RO2C = RO2C + 0.5 HCHO + 0.5 XC	k = k(56)	$3.50x10^{-14}$
288	XHCH + RO2X = RO2X + 0.5 HCHO + 0.5 XC	k = k(56)	$3.50x10^{-14}$
289	XHCH + MCO3 = MCO3 + HCHO	k = k(70)	$1.56x10^{-11}$
290	XHCH + RCO3 = RCO3 + HCHO	k = k(70)	$1.56x10^{-11}$
291	XHCH + BZC3 = BZC3 + HCHO	k = k(70)	$1.56x10^{-11}$
292	XHCH + MAC3 = MAC3 + HCHO	k = k(70)	$1.56x10^{-11}$
293	XCCH + NO = NO + CCHO	k = k(52)	$9.23x10^{-12}$
294	XCCH + HO2 = HO2 + 2. XC	k = k(53)	$7.63x10^{-12}$
295	XCCH + NO3 = NO3 + CCHO	k = k(54)	$2.30x10^{-12}$
296	XCCH + MEO2 = MEO2 + 0.5 CCHO + XC	k = k(55)	$2.00x10^{-13}$
297	XCCH + RO2C = RO2C + 0.5 CCHO + XC	k = k(56)	$3.50x10^{-14}$
298	XCCH + RO2X = RO2X + 0.5 CCHO + XC	k = k(56)	$3.50x10^{-14}$
299	XCCH + MCO3 = MCO3 + CCHO	k = k(70)	$1.56x10^{-11}$
300	XCCH + RCO3 = RCO3 + CCHO	k = k(70)	$1.56x10^{-11}$
301	XCCH + BZC3 = BZC3 + CCHO	k = k(70)	$1.56x10^{-11}$
302	XCCH + MAC3 = MAC3 + CCHO	k = k(70)	$1.56x10^{-11}$
303	XRCH + NO = NO + RCHO	k = k(52)	$9.23x10^{-12}$
304	XRCH + HO2 = HO2 + 3. XC	k = k(53)	$7.63x10^{-12}$
305	XRCH + NO3 = NO3 + RCHO	k = k(54)	$2.30x10^{-12}$
306	XRCH + MEO2 = MEO2 + 0.5 RCHO + 1.5 XC	k = k(55)	$2.00x10^{-13}$
307	XRCH + RO2C = RO2C + 0.5 RCHO + 1.5 XC	k = k(56)	$3.50x10^{-14}$
308	XRCH + RO2X = RO2X + 0.5 RCHO + 1.5 XC	k = k(56)	$3.50x10^{-14}$
309	XRCH + MCO3 = MCO3 + RCHO	k = k(70)	$1.56x10^{-11}$
310	XRCH + RCO3 = RCO3 + RCHO	k = k(70)	$1.56x10^{-11}$
311	XRCH + BZC3 = BZC3 + RCHO	k = k(70)	$1.56x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
312	XRCH + MAC3 = MAC3 + RCHO	k = k(70)	$1.56x10^{-11}$
313	XACE + NO = NO + ACET	k = k(52)	$9.23x10^{-12}$
314	XACE + HO2 = HO2 + 3. XC	k = k(53)	$7.63x10^{-12}$
315	XACE + NO3 = NO3 + ACET	k = k(54)	$2.30x10^{-12}$
316	XACE + MEO2 = MEO2 + 0.5 ACET + 1.5 XC	k = k(55)	$2.00x10^{-13}$
317	XACE + RO2C = RO2C + 0.5 ACET + 1.5 XC	k = k(56)	$3.50x10^{-14}$
318	XACE + RO2X = RO2X + 0.5 ACET + 1.5 XC	k = k(56)	$3.50x10^{-14}$
319	XACE + MCO3 = MCO3 + ACET	k = k(70)	$1.56x10^{-11}$
320	XACE + RCO3 = RCO3 + ACET	k = k(70)	$1.56x10^{-11}$
321	XACE + BZC3 = BZC3 + ACET	k = k(70)	$1.56x10^{-11}$
322	XACE + MAC3 = MAC3 + ACET	k = k(70)	$1.56x10^{-11}$
323	XMEK + NO = NO + MEK	k = k(52)	$9.23x10^{-12}$
324	XMEK + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
325	XMEK + NO3 = NO3 + MEK	k = k(54)	$2.30x10^{-12}$
326	XMEK + MEO2 = MEO2 + 0.5 MEK + 2. XC	k = k(55)	$2.00x10^{-13}$
327	XMEK + RO2C = RO2C + 0.5 MEK + 2. XC	k = k(56)	$3.50x10^{-14}$
328	XMEK + RO2X = RO2X + 0.5 MEK + 2. XC	k = k(56)	$3.50x10^{-14}$
329	XMEK + MCO3 = MCO3 + MEK	k = k(70)	$1.56x10^{-11}$
330	XMEK + RCO3 = RCO3 + MEK	k = k(70)	$1.56x10^{-11}$
331	XMEK + BZC3 = BZC3 + MEK	k = k(70)	$1.56x10^{-11}$
332	XMEK + MAC3 = MAC3 + MEK	k = k(70)	$1.56x10^{-11}$
333	XPD2 + NO = NO + PRD2	k = k(52)	$9.23x10^{-12}$
334	XPD2 + HO2 = HO2 + 6. XC	k = k(53)	$7.63x10^{-12}$
335	XPD2 + NO3 = NO3 + PRD2	k = k(54)	$2.30x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
336	XPD2 + MEO2 = MEO2 + 0.5 PRD2 + 3. XC	k = k(55)	2.00×10^{-13}
337	XPD2 + RO2C = RO2C + 0.5 PRD2 + 3. XC	k = k(56)	3.50×10^{-14}
338	XPD2 + RO2X = RO2X + 0.5 PRD2 + 3. XC	k = k(56)	3.50×10^{-14}
339	XPD2 + MCO3 = MCO3 + PRD2	k = k(70)	1.56×10^{-11}
340	XPD2 + RCO3 = RCO3 + PRD2	k = k(70)	1.56×10^{-11}
341	XPD2 + BZC3 = BZC3 + PRD2	k = k(70)	1.56×10^{-11}
342	XPD2 + MAC3 = MAC3 + PRD2	k = k(70)	1.56×10^{-11}
343	XGLY + NO = NO + GLY	k = k(52)	9.23×10^{-12}
344	XGLY + HO2 = HO2 + 2. XC	k = k(53)	7.63×10^{-12}
345	XGLY + NO3 = NO3 + GLY	k = k(54)	2.30×10^{-12}
346	XGLY + MEO2 = MEO2 + 0.5 GLY + XC	k = k(55)	2.00×10^{-13}
347	XGLY + RO2C = RO2C + 0.5 GLY + XC	k = k(56)	3.50×10^{-14}
348	XGLY + RO2X = RO2X + 0.5 GLY + XC	k = k(56)	3.50×10^{-14}
349	XGLY + MCO3 = MCO3 + GLY	k = k(70)	1.56×10^{-11}
350	XGLY + RCO3 = RCO3 + GLY	k = k(70)	1.56×10^{-11}
351	XGLY + BZC3 = BZC3 + GLY	k = k(70)	1.56×10^{-11}
352	XGLY + MAC3 = MAC3 + GLY	k = k(70)	1.56×10^{-11}
353	XMGL + NO = NO + MGLY	k = k(52)	9.23×10^{-12}
354	XMGL + HO2 = HO2 + 3. XC	k = k(53)	7.63×10^{-12}
355	XMGL + NO3 = NO3 + MGLY	k = k(54)	2.30×10^{-12}
356	XMGL + MEO2 = MEO2 + 0.5 MGLY + 1.5 XC	k = k(55)	2.00×10^{-13}
357	XMGL + RO2C = RO2C + 0.5 MGLY + 1.5 XC	k = k(56)	3.50×10^{-14}
358	XMGL + RO2X = RO2X + 0.5 MGLY + 1.5 XC	k = k(56)	3.50×10^{-14}
359	XMGL + MCO3 = MCO3 + MGLY	k = k(70)	1.56×10^{-11}
360	XMGL + RCO3 = RCO3 + MGLY	k = k(70)	1.56×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
361	XMGL + BZC3 = BZC3 + MGLY	k = k(70)	$1.56x10^{-11}$
362	XMGL + MAC3 = MAC3 + MGLY	k = k(70)	$1.56x10^{-11}$
363	XBAC + NO = NO + BACL	k = k(52)	$9.23x10^{-12}$
364	XBAC + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
365	XBAC + NO3 = NO3 + BACL	k = k(54)	$2.30x10^{-12}$
366	XBAC + MEO2 = MEO2 + 0.5 BACL + 2. XC	k = k(55)	$2.00x10^{-13}$
367	XBAC + RO2C = RO2C + 0.5 BACL + 2. XC	k = k(56)	$3.50x10^{-14}$
368	XBAC + RO2X = RO2X + 0.5 BACL + 2. XC	k = k(56)	$3.50x10^{-14}$
369	XBAC + MCO3 = MCO3 + BACL	k = k(70)	$1.56x10^{-11}$
370	XBAC + RCO3 = RCO3 + BACL	k = k(70)	$1.56x10^{-11}$
371	XBAC + BZC3 = BZC3 + BACL	k = k(70)	$1.56x10^{-11}$
372	XBAC + MAC3 = MAC3 + BACL	k = k(70)	$1.56x10^{-11}$
373	XBAL + NO = NO + BALD	k = k(52)	$9.23x10^{-12}$
374	XBAL + HO2 = HO2 + 7. XC	k = k(53)	$7.63x10^{-12}$
375	XBAL + NO3 = NO3 + BALD	k = k(54)	$2.30x10^{-12}$
376	XBAL + MEO2 = MEO2 + 0.5 BALD + 3.5 XC	k = k(55)	$2.00x10^{-13}$
377	XBAL + RO2C = RO2C + 0.5 BALD + 3.5 XC	k = k(56)	$3.50x10^{-14}$
378	XBAL + RO2X = RO2X + 0.5 BALD + 3.5 XC	k = k(56)	$3.50x10^{-14}$
379	XBAL + MCO3 = MCO3 + BALD	k = k(70)	$1.56x10^{-11}$
380	XBAL + RCO3 = RCO3 + BALD	k = k(70)	$1.56x10^{-11}$
381	XBAL + BZC3 = BZC3 + BALD	k = k(70)	$1.56x10^{-11}$
382	XBAL + MAC3 = MAC3 + BALD	k = k(70)	$1.56x10^{-11}$
383	XAF1 + NO = NO + AFG1	k = k(52)	$9.23x10^{-12}$
384	XAF1 + HO2 = HO2 + 5. XC	k = k(53)	$7.63x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
385	XAF1 + NO3 = NO3 + AFG1	k = k(54)	2.30×10^{-12}
386	XAF1 + MEO2 = MEO2 + 0.5 AFG1 + 2.5 XC	k = k(55)	2.00×10^{-13}
387	XAF1 + RO2C = RO2C + 0.5 AFG1 + 2.5 XC	k = k(56)	3.50×10^{-14}
388	XAF1 + RO2X = RO2X + 0.5 AFG1 + 2.5 XC	k = k(56)	3.50×10^{-14}
389	XAF1 + MCO3 = MCO3 + AFG1	k = k(70)	1.56×10^{-11}
390	XAF1 + RCO3 = RCO3 + AFG1	k = k(70)	1.56×10^{-11}
391	XAF1 + BZC3 = BZC3 + AFG1	k = k(70)	1.56×10^{-11}
392	XAF1 + MAC3 = MAC3 + AFG1	k = k(70)	1.56×10^{-11}
393	XAF2 + NO = NO + AFG2	k = k(52)	9.23×10^{-12}
394	XAF2 + HO2 = HO2 + 5. XC	k = k(53)	7.63×10^{-12}
395	XAF2 + NO3 = NO3 + AFG2	k = k(54)	2.30×10^{-12}
396	XAF2 + MEO2 = MEO2 + 0.5 AFG2 + 2.5 XC	k = k(55)	2.00×10^{-13}
397	XAF2 + RO2C = RO2C + 0.5 AFG2 + 2.5 XC	k = k(56)	3.50×10^{-14}
398	XAF2 + RO2X = RO2X + 0.5 AFG2 + 2.5 XC	k = k(56)	3.50×10^{-14}
399	XAF2 + MCO3 = MCO3 + AFG2	k = k(70)	1.56×10^{-11}
400	XAF2 + RCO3 = RCO3 + AFG2	k = k(70)	1.56×10^{-11}
401	XAF2 + BZC3 = BZC3 + AFG2	k = k(70)	1.56×10^{-11}
402	XAF2 + MAC3 = MAC3 + AFG2	k = k(70)	1.56×10^{-11}
403	XAF3 + NO = NO + AFG3	k = k(52)	9.23×10^{-12}
404	XAF3 + HO2 = HO2 + 7. XC	k = k(53)	7.63×10^{-12}
405	XAF3 + NO3 = NO3 + AFG3	k = k(54)	2.30×10^{-12}
406	XAF3 + MEO2 = MEO2 + 0.5 AFG3 + 3.5 XC	k = k(55)	2.00×10^{-13}
407	XAF3 + RO2C = RO2C + 0.5 AFG3 + 3.5 XC	k = k(56)	3.50×10^{-14}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
408	XAF3 + RO2X = RO2X + 0.5 AFG3 + 3.5 XC	k = k(56)	$3.50x10^{-14}$
409	XAF3 + MCO3 = MCO3 + AFG3	k = k(70)	$1.56x10^{-11}$
410	XAF3 + RCO3 = RCO3 + AFG3	k = k(70)	$1.56x10^{-11}$
411	XAF3 + BZC3 = BZC3 + AFG3	k = k(70)	$1.56x10^{-11}$
412	XAF3 + MAC3 = MAC3 + AFG3	k = k(70)	$1.56x10^{-11}$
413	XMAC + NO = NO + MACR	k = k(52)	$9.23x10^{-12}$
414	XMAC + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
415	XMAC + NO3 = NO3 + MACR	k = k(54)	$2.30x10^{-12}$
416	XMAC + MEO2 = MEO2 + 0.5 MACR + 2. XC	k = k(55)	$2.00x10^{-13}$
417	XMAC + RO2C = RO2C + 0.5 MACR + 2. XC	k = k(56)	$3.50x10^{-14}$
418	XMAC + RO2X = RO2X + 0.5 MACR + 2. XC	k = k(56)	$3.50x10^{-14}$
419	XMAC + MCO3 = MCO3 + MACR	k = k(70)	$1.56x10^{-11}$
420	XMAC + RCO3 = RCO3 + MACR	k = k(70)	$1.56x10^{-11}$
421	XMAC + BZC3 = BZC3 + MACR	k = k(70)	$1.56x10^{-11}$
422	XMAC + MAC3 = MAC3 + MACR	k = k(70)	$1.56x10^{-11}$
423	XMVK + NO = NO + MVK	k = k(52)	$9.23x10^{-12}$
424	XMVK + HO2 = HO2 + 4. XC	k = k(53)	$7.63x10^{-12}$
425	XMVK + NO3 = NO3 + MVK	k = k(54)	$2.30x10^{-12}$
426	XMVK + MEO2 = MEO2 + 0.5 MVK + 2. XC	k = k(55)	$2.00x10^{-13}$
427	XMVK + RO2C = RO2C + 0.5 MVK + 2. XC	k = k(56)	$3.50x10^{-14}$
428	XMVK + RO2X = RO2X + 0.5 MVK + 2. XC	k = k(56)	$3.50x10^{-14}$
429	XMVK + MCO3 = MCO3 + MVK	k = k(70)	$1.56x10^{-11}$
430	XMVK + RCO3 = RCO3 + MVK	k = k(70)	$1.56x10^{-11}$
431	XMVK + BZC3 = BZC3 + MVK	k = k(70)	$1.56x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
432	XMVK + MAC3 = MAC3 + MVK	k = k(70)	$1.56x10^{-11}$
433	XIPR + NO = NO + IPRD	k = k(52)	$9.23x10^{-12}$
434	XIPR + HO2 = HO2 + 5. XC	k = k(53)	$7.63x10^{-12}$
435	XIPR + NO3 = NO3 + IPRD	k = k(54)	$2.30x10^{-12}$
436	XIPR + MEO2 = MEO2 + 0.5 IPRD + 2.5 XC	k = k(55)	$2.00x10^{-13}$
437	XIPR + RO2C = RO2C + 0.5 IPRD + 2.5 XC	k = k(56)	$3.50x10^{-14}$
438	XIPR + RO2X = RO2X + 0.5 IPRD + 2.5 XC	k = k(56)	$3.50x10^{-14}$
439	XIPR + MCO3 = MCO3 + IPRD	k = k(70)	$1.56x10^{-11}$
440	XIPR + RCO3 = RCO3 + IPRD	k = k(70)	$1.56x10^{-11}$
441	XIPR + BZC3 = BZC3 + IPRD	k = k(70)	$1.56x10^{-11}$
442	XIPR + MAC3 = MAC3 + IPRD	k = k(70)	$1.56x10^{-11}$
443	XRN3 + NO = NO + RNO3	k = k(52)	$9.23x10^{-12}$
444	XRN3 + HO2 = HO2 + 6. XC + XN	k = k(53)	$7.63x10^{-12}$
445	XRN3 + NO3 = NO3 + RNO3	k = k(54)	$2.30x10^{-12}$
446	XRN3 + MEO2 = MEO2 + 0.5 RNO3 + 0.5 XN + 3. XC	k = k(55)	$2.00x10^{-13}$
447	XRN3 + RO2C = RO2C + 0.5 RNO3 + 0.5 XN + 3. XC	k = k(56)	$3.50x10^{-14}$
448	XRN3 + RO2X = RO2X + 0.5 RNO3 + 0.5 XN + 3. XC	k = k(56)	$3.50x10^{-14}$
449	XRN3 + MCO3 = MCO3 + RNO3	k = k(70)	$1.56x10^{-11}$
450	XRN3 + RCO3 = RCO3 + RNO3	k = k(70)	$1.56x10^{-11}$
451	XRN3 + BZC3 = BZC3 + RNO3	k = k(70)	$1.56x10^{-11}$
452	XRN3 + MAC3 = MAC3 + RNO3	k = k(70)	$1.56x10^{-11}$
453	YRPX + NO = NO	k = k(52)	$9.23x10^{-12}$
454	YRPX + HO2 = HO2 + ROOH − 3. XC	k = k(53)	$7.63x10^{-12}$
455	YRPX + NO3 = NO3	k = k(54)	$2.30x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
456	YRPX + MEO2 = MEO2 + 0.5 MEK − 2. XC	k = k(55)	2.00×10^{-13}
457	YRPX + RO2C = RO2C + 0.5 MEK − 2. XC	k = k(56)	3.50×10^{-14}
458	YRPX + RO2X = RO2X + 0.5 MEK − 2. XC	k = k(56)	3.50×10^{-14}
459	YRPX + MCO3 = MCO3	k = k(70)	1.56×10^{-11}
460	YRPX + RCO3 = RCO3	k = k(70)	1.56×10^{-11}
461	YRPX + BZC3 = BZC3	k = k(70)	1.56×10^{-11}
462	YRPX + MAC3 = MAC3	k = k(70)	1.56×10^{-11}
463	Y6PX + NO = NO	k = k(52)	9.23×10^{-12}
464	Y6PX + HO2 = HO2 + R6PX − 6. XC	k = k(53)	7.63×10^{-12}
465	Y6PX + NO3 = NO3	k = k(54)	2.30×10^{-12}
466	Y6PX + MEO2 = MEO2 + 0.5 PRD2 − 3. XC	k = k(55)	2.00×10^{-13}
467	Y6PX + RO2C = RO2C + 0.5 PRD2 − 3. XC	k = k(56)	3.50×10^{-14}
468	Y6PX + RO2X = RO2X + 0.5 PRD2 − 3. XC	k = k(56)	3.50×10^{-14}
469	Y6PX + MCO3 = MCO3	k = k(70)	1.56×10^{-11}
470	Y6PX + RCO3 = RCO3	k = k(70)	1.56×10^{-11}
471	Y6PX + BZC3 = BZC3	k = k(70)	1.56×10^{-11}
472	Y6PX + MAC3 = MAC3	k = k(70)	1.56×10^{-11}
473	YAPX + NO = NO	k = k(52)	9.23×10^{-12}
474	YAPX + HO2 = HO2 + RAPX − 8. XC	k = k(53)	7.63×10^{-12}
475	YAPX + NO3 = NO3	k = k(54)	2.30×10^{-12}
476	YAPX + MEO2 = MEO2 + 0.5 PRD2 − 3. XC	k = k(55)	2.00×10^{-13}
477	YAPX + RO2C = RO2C + 0.5 PRD2 − 3. XC	k = k(56)	3.50×10^{-14}
478	YAPX + RO2X = RO2X + 0.5 PRD2 − 3. XC	k = k(56)	3.50×10^{-14}
479	YAPX + MCO3 = MCO3	k = k(70)	1.56×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
480	YAPX + RCO3 = RCO3	k = k(70)	$1.56x10^{-11}$
481	YAPX + BZC3 = BZC3	k = k(70)	$1.56x10^{-11}$
482	YAPX + MAC3 = MAC3	k = k(70)	$1.56x10^{-11}$
483	ZRN3 + NO = NO + RNO3 − 1. XN	k = k(52)	$9.23x10^{-12}$
484	ZRN3 + HO2 = HO2 + 6. XC	k = k(53)	$7.63x10^{-12}$
485	ZRN3 + NO3 = NO3 + PRD2 + HO2	k = k(54)	$2.30x10^{-12}$
486	ZRN3 + MEO2 = MEO2 + 0.5 PRD2 + 0.5 HO2 + 3. XC	k = k(55)	$2.00x10^{-13}$
487	ZRN3 + RO2C = RO2C + 0.5 PRD2 + 0.5 HO2 + 3. XC	k = k(56)	$3.50x10^{-14}$
488	ZRN3 + RO2X = RO2X + 0.5 PRD2 + 0.5 HO2 + 3. XC	k = k(56)	$3.50x10^{-14}$
489	ZRN3 + MCO3 = MCO3 + PRD2 + HO2	k = k(70)	$1.56x10^{-11}$
490	ZRN3 + RCO3 = RCO3 + PRD2 + HO2	k = k(70)	$1.56x10^{-11}$
491	ZRN3 + BZC3 = BZC3 + PRD2 + HO2	k = k(70)	$1.56x10^{-11}$
492	ZRN3 + MAC3 = MAC3 + PRD2 + HO2	k = k(70)	$1.56x10^{-11}$
493	XGLD + NO = NO + GLYD	k = k(52)	$9.23x10^{-12}$
494	XGLD + HO2 = HO2 + 2. XC	k = k(53)	$7.63x10^{-12}$
495	XGLD + NO3 = NO3 + GLYD	k = k(54)	$2.30x10^{-12}$
496	XGLD + MEO2 = MEO2 + 0.5 GLYD + XC	k = k(55)	$2.00x10^{-13}$
497	XGLD + RO2C = RO2C + 0.5 GLYD + XC	k = k(56)	$3.50x10^{-14}$
498	XGLD + RO2X = RO2X + 0.5 GLYD + XC	k = k(56)	$3.50x10^{-14}$
499	XGLD + MCO3 = MCO3 + GLYD	k = k(70)	$1.56x10^{-11}$
500	XGLD + RCO3 = RCO3 + GLYD	k = k(70)	$1.56x10^{-11}$
501	XGLD + BZC3 = BZC3 + GLYD	k = k(70)	$1.56x10^{-11}$
502	XGLD + MAC3 = MAC3 + GLYD	k = k(70)	$1.56x10^{-11}$
503	XACR + NO = NO + ACRO	k = k(52)	$9.23x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
504	XACR + HO2 = HO2 + 3. XC	k = k(53)	7.63×10^{-12}
505	XACR + NO3 = NO3 + ACRO	k = k(54)	2.30×10^{-12}
506	XACR + MEO2 = MEO2 + 0.5 ACRO + 1.5 XC	k = k(55)	2.00×10^{-13}
507	XACR + RO2C = RO2C + 0.5 ACRO + 1.5 XC	k = k(56)	3.50×10^{-14}
508	XACR + RO2X = RO2X + 0.5 ACRO + 1.5 XC	k = k(56)	3.50×10^{-14}
509	XACR + MCO3 = MCO3 + ACRO	k = k(70)	1.56×10^{-11}
510	XACR + RCO3 = RCO3 + ACRO	k = k(70)	1.56×10^{-11}
511	XACR + BZC3 = BZC3 + ACRO	k = k(70)	1.56×10^{-11}
512	XACR + MAC3 = MAC3 + ACRO	k = k(70)	1.56×10^{-11}
513	CH4 + OH = MEO2	$k = 1.85 \times 10^{-12} \exp(-1690/T)$	6.62×10^{-15}
514	ETHE + OH = XHO2 + RO2C + 1.61 XHCH + 0.195 XGLD + YRPX	Falloff: F=0.6; n=1 $k(0) = 1.00 \times 10^{-28} (T/300)^{-4.5}$ $k(inf) = 8.80 \times 10^{-12} (T/300)^{-.85}$	8.15×10^{-12}
515	ETHE + O3 = 0.16 HO2 + 0.16 OH + 0.51 CO + 0.12 CO2 + HCHO + 0.37 FACD	$k = 9.14 \times 10^{-15} \exp(-2580/T)$	1.68×10^{-18}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
516	ETHE + NO3 = XHO2 + RO2C + XRCH + YRPX + XN − 1. XC	$k = 3.30x10^{-12}$ (T/300)#2 exp(−2880/T)	$2.24x10^{-16}$
517	ETHE + O3P = 0.8 HO2 + 0.29 XHO2 + 0.51 MEO2 + 0.29 RO2C + 0.51 CO + 0.278 XCO + 0.278 XHCH + 0.1 CCHO + 0.012 XGLY + 0.29 YRPX + 0.2 XC	$k = 1.07x10^{-11}$ exp(−800/T)	$7.43x10^{-13}$
518	PRPE + OH = 0.984 XHO2 + 0.984 RO2C + 0.016 RO2X + 0.016 ZRN3 + 0.984 XHCH + 0.984 XCCH + YRPX − 0.048 XC	$k = 4.85x10^{-12}$ exp(504/T)	$2.60x10^{-11}$
519	PRPE + O3 = 0.165 HO2 + 0.35 OH + 0.355 MEO2 + 0.525 CO + 0.215 CO2 + 0.5 HCHO + 0.5 CCHO + 0.185 FACD + 0.075 AACD + 0.07 XC	$k = 5.51x10^{-15}$ exp(−1878/T)	$1.05x10^{-17}$
520	PRPE + NO3 = 0.949 XHO2 + 0.949 RO2C + 0.051 RO2X + 0.051 ZRN3 + YRPX + XN + 2.694 XC	$k = 4.59x10^{-13}$ exp(−1156/T)	$9.73x10^{-15}$
521	PRPE + O3P = 0.45 RCHO + 0.55 MEK − 0.55 XC	$k = 1.02x10^{-11}$ exp(−280/T)	$4.01x10^{-12}$
522	BD13 + OH = 0.951 XHO2 + 1.189 RO2C + 0.049 RO2X + 0.049 ZRN3 + 0.708 XHCH + 0.48 XACR + 0.471 XIPR + YRPX − 0.797 XC	$k = 1.48x10^{-11}$ exp(448/T)	$6.59x10^{-11}$
523	BD13 + O3 = 0.08 HO2 + 0.08 OH + 0.255 CO + 0.185 CO2 + 0.5 HCHO + 0.185 FACD + 0.5 ACRO + 0.375 MVK + 0.125 PRD2 − 0.875 XC	$k = 1.34x10^{-14}$ exp(−2283/T)	$6.64x10^{-18}$
524	BD13 + NO3 = 0.815 XHO2 + 0.12 XNO2 + 1.055 RO2C + 0.065 RO2X + 0.065 ZRN3 + 0.115 XHCH + 0.46 XMVK + 0.12 XIPR + 0.355 XRN3 + YRPX + 0.525 XN − 1.075 XC	$k = 1.00x10^{-13}$	$1.00x10^{-13}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
525	BD13 + O3P = 0.25 HO2 + 0.117 XHO2 + 0.118 XMA3 + 0.235 RO2C + 0.015 RO2X + 0.015 ZRN3 + 0.115 XCO + 0.115 XACR + 0.001 XAF1 + 0.001 XAF2 + 0.75 PRD2 + 0.25 YRPX − 1.532 XC	$k = 2.26 \times 10^{-11} \exp(^{-40}/T)$	1.98×10^{-11}
526	ISOP + OH = 0.907 XHO2 + 0.986 RO2C + 0.093 RO2X + 0.093 ZRN3 + 0.624 XHCH + 0.23 XMAC + 0.32 XMVK + 0.357 XIPR + Y6PX − 0.167 XC	$k = 2.54 \times 10^{-11} \exp(410/T)$	9.96×10^{-11}
527	ISOP + O3 = 0.066 HO2 + 0.266 OH + 0.192 XMA3 + 0.192 RO2C + 0.008 RO2X + 0.008 ZRN3 + 0.275 CO + 0.122 CO2 + 0.4 HCHO + 0.192 XHCH + 0.204 FACD + 0.39 MACR + 0.16 MVK + 0.15 IPRD + 0.1 PRD2 + 0.2 Y6PX − 0.559 XC	$k = 7.86 \times 10^{-15} \exp(-1912/T)$	1.34×10^{-17}
528	ISOP + NO3 = 0.749 XHO2 + 0.187 XNO2 + 0.936 RO2C + 0.064 RO2X + 0.064 ZRN3 + 0.936 XIPR + Y6PX + 0.813 XN − 0.064 XC	$k = 3.03 \times 10^{-12} \exp(-448/T)$	6.81×10^{-13}
529	ISOP + O3P = 0.25 MEO2 + 0.24 XMA3 + 0.24 RO2C + 0.01 RO2X + 0.01 ZRN3 + 0.24 XHCH + 0.75 PRD2 + 0.25 Y6PX − 1.01 XC	$k = 3.50 \times 10^{-11}$	3.50×10^{-11}
530	APIN + OH = 0.799 XHO2 + 0.004 XRC3 + 1.042 RO2C + 0.197 RO2X + 0.197 ZRN3 + 0.002 XCO + 0.022 XHCH + 0.776 XRCH + 0.034 XACE + 0.02 XMGL + 0.023 XBAC + Y6PX + 6.2 XC	$k = 1.21 \times 10^{-11} \exp(436/T)$	5.18×10^{-11}
531	APIN + O3 = 0.009 HO2 + 0.102 XHO2 + 0.728 OH + 0.001 XMC3 + 0.297 XRC3 + 1.511 RO2C + 0.337 RO2X + 0.337 ZRN3 + 0.029 CO + 0.051 XCO + 0.017 CO2 + 0.344 XHCH + 0.24 XRCH + 0.345 XACE + 0.008 MEK + 0.002 XGLY + 0.081 XBAC + 0.255 PRD2 + 0.737 Y6PX + 2.999 XC	$k = 5.00 \times 10^{-16} \exp(-530/T)$	8.55×10^{-17}
532	APIN + NO3 = 0.056 XHO2 + 0.643 XNO2 + 0.007 XRC3 + 1.05 RO2C + 0.293 RO2X + 0.293 ZRN3 + 0.005 XCO + 0.007 XHCH + 0.684 XRCH + 0.069 XACE + 0.002 XMGL + 0.056 XRN3 + Y6PX + 0.301 XN + 5.608 XC	$k = 1.19 \times 10^{-12} \exp(490/T)$	6.09×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
533	APIN + O3P = PRD2 + 4. XC	$k = 3.20 \times 10^{-11}$	3.20×10^{-11}
534	ACYE + OH = 0.3 HO2 + 0.7 OH + 0.3 CO + 0.3 FACD + 0.7 GLY	Falloff: F=0.6; n=1 $k(0) = 5.50 \times 10^{-30}$ (T/300)#$^{-2}$ $k(inf) = 8.30 \times 10^{-13}$	7.56×10^{-13}
535	ACYE + O3 = 1.5 HO2 + 0.5 OH + 1.5 CO + 0.5 CO2	$k = 1.00 \times 10^{-14} \exp(-4100/T)$	1.16×10^{-20}
536	BENZ + OH = 0.57 HO2 + 0.29 XHO2 + 0.116 OH + 0.29 RO2C + 0.024 RO2X + 0.024 ZRN3 + 0.29 XGLY + 0.57 CRES + 0.029 XAF1 + 0.261 XAF2 + 0.116 AFG3 + 0.314 YAPX − 0.976 XC	$k = 2.33 \times 10^{-12} \exp(-193/T)$	1.22×10^{-12}
537	TOLU + OH = 0.181 HO2 + 0.454 XHO2 + 0.312 OH + 0.454 RO2C + 0.054 RO2X + 0.054 ZRN3 + 0.238 XGLY + 0.151 XMGL + 0.181 CRES + 0.065 XBAL + 0.195 XAF1 + 0.195 XAF2 + 0.312 AFG3 + 0.073 Y6PX + 0.435 YAPX − 0.109 XC	$k = 1.81 \times 10^{-12} \exp(338/T)$	5.58×10^{-12}
538	MXYL + OH = 0.159 HO2 + 0.52 XHO2 + 0.239 OH + 0.52 RO2C + 0.082 RO2X + 0.082 ZRN3 + 0.1 XGLY + 0.38 XMGL + 0.159 CRES + 0.041 XBAL + 0.336 XAF1 + 0.144 XAF2 + 0.239 AFG3 + 0.047 Y6PX + 0.555 YAPX + 0.695 XC	$k = 2.31 \times 10^{-11}$	2.31×10^{-11}
539	OXYL + OH = 0.161 HO2 + 0.554 XHO2 + 0.198 OH + 0.554 RO2C + 0.087 RO2X + 0.087 ZRN3 + 0.084 XGLY + 0.238 XMGL + 0.185 XBAC + 0.161 CRES + 0.047 XBAL + 0.253 XAF1 + 0.253 XAF2 + 0.198 AFG3 + 0.055 Y6PX + 0.586 YAPX + 0.484 XC	$k = 1.36 \times 10^{-11}$	1.36×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
540	PXYL + OH = 0.159 HO2 + 0.487 XHO2 + 0.278 OH + 0.487 RO2C + 0.076 RO2X + 0.076 ZRN3 + 0.286 XGLY + 0.112 XMGL + 0.159 CRES + 0.088 XBAL + 0.045 XAF1 + 0.067 XAF2 + 0.278 AFG3 + 0.286 XAF3 + 0.102 Y6PX + 0.461 YAPX + 0.399 XC	$k = 1.43x10^{-11}$	$1.43x10^{-11}$
541	B124 + OH = 0.022 HO2 + 0.627 XHO2 + 0.23 OH + 0.627 RO2C + 0.121 RO2X + 0.121 ZRN3 + 0.074 XGLY + 0.405 XMGL + 0.112 XBAC + 0.022 CRES + 0.036 XBAL + 0.088 XAF1 + 0.352 XAF2 + 0.23 AFG3 + 0.151 XAF3 + 0.043 Y6PX + 0.705 YAPX + 1.19 XC	$k = 3.25x10^{-11}$	$3.25x10^{-11}$
542	ETOH + OH = 0.95 HO2 + 0.05 XHO2 + 0.05 RO2C + 0.081 XHCH + 0.95 CCHO + 0.01 XGLD + 0.05 YRPX − 0.001 XC	$k = 5.49x10^{-13}$ (T/300)#2 exp(530/T)	$3.21x10^{-12}$
543	ALK1 + OH = XHO2 + RO2C + XCCH + YRPX	$k = 1.34x10^{-12}$ (T/300)#2 exp(−499/T)	$2.54x10^{-13}$
544	ALK2 + OH = 0.965 XHO2 + 0.965 RO2C + 0.035 RO2X + 0.035 ZRN3 + 0.261 XRCH + 0.704 XACE + YRPX − 0.105 XC	$k = 1.49x10^{-12}$ (T/300)#2 exp($^{-87}$/T)	$1.11x10^{-12}$
545	ALK3 + OH = 0.695 XHO2 + 0.236 XTBU + 1.253 RO2C + 0.07 RO2X + 0.07 ZRN3 + 0.026 XHCH + 0.445 XCCH + 0.122 XRCH + 0.024 XACE + 0.332 XMEK + 0.983 YRPX + 0.017 Y6PX − 0.046 XC	$k = 1.51x10^{-12}$ exp(126/T)	$2.30x10^{-12}$
546	ALK4 + OH = 0.83 XHO2 + 0.01 XMEO + 0.011 XMC3 + 1.763 RO2C + 0.149 RO2X + 0.149 ZRN3 + 0.002 XCO + 0.029 XHCH + 0.438 XCCH + 0.236 XRCH + 0.426 XACE + 0.106 XMEK + 0.146 XPD2 + Y6PX − 0.119 XC	$k = 3.75x10^{-12}$ exp(44/T)	$4.34x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
547	ALK5 + OH = 0.647 XHO2 + 1.605 RO2C + 0.353 RO2X + 0.353 ZRN3 + 0.04 XHCH + 0.106 XCCH + 0.209 XRCH + 0.071 XACE + 0.086 XMEK + 0.407 XPD2 + Y6PX + 2.004 XC	$k = 2.70x10^{-12} \exp(374/T)$	$9.39x10^{-12}$
548	OLE1 + OH = 0.871 XHO2 + 0.001 XMEO + 1.202 RO2C + 0.128 RO2X + 0.128 ZRN3 + 0.582 XHCH + 0.01 XCCH + 0.007 XGLD + 0.666 XRCH + 0.007 XACE + 0.036 XACR + 0.001 XMAC + 0.012 XMVK + 0.009 XIPR + 0.168 XPD2 + 0.169 YRPX + 0.831 Y6PX + 0.383 XC	$k = 6.72x10^{-12} \exp(501/T)$	$3.57x10^{-11}$
549	OLE1 + O3 = 0.095 HO2 + 0.057 XHO2 + 0.128 OH + 0.09 RO2C + 0.005 RO2X + 0.005 ZRN3 + 0.303 CO + 0.088 CO2 + 0.5 HCHO + 0.011 XCCH + 0.5 RCHO + 0.044 XRCH + 0.003 XACE + 0.009 MEK + 0.185 FACD + 0.159 PACD + 0.268 PRD2 + 0.011 YRPX + 0.052 Y6PX + 0.11 XC	$k = 3.19x10^{-15} \exp(-1701/T)$	$1.10x10^{-17}$
550	OLE1 + NO3 = 0.772 XHO2 + 1.463 RO2C + 0.228 RO2X + 0.228 ZRN3 + 0.013 XCCH + 0.003 XRCH + 0.034 XACE + 0.774 XRN3 + 0.169 YRPX + 0.831 Y6PX + 0.226 XN − 1.149 XC	$k = 5.37x10^{-13} \exp(-1047/T)$	$1.64x10^{-14}$
551	OLE1 + O3P = 0.45 RCHO + 0.39 MEK + 0.16 PRD2 + 1.13 XC	$k = 1.61x10^{-11} \exp(-326/T)$	$5.43x10^{-12}$
552	OLE2 + OH = 0.912 XHO2 + 0.953 RO2C + 0.088 RO2X + 0.088 ZRN3 + 0.179 XHCH + 0.835 XCCH + 0.51 XRCH + 0.144 XACE + 0.08 XMEK + 0.002 XMVK + 0.012 XIPR + 0.023 XPD2 + 0.319 YRPX + 0.681 Y6PX + 0.135 XC	$k = 1.26x10^{-11} \exp(488/T)$	$6.41x10^{-11}$
553	OLE2 + O3 = 0.094 HO2 + 0.041 XHO2 + 0.443 OH + 0.307 MEO2 + 0.156 XMC3 + 0.008 XRC3 + 0.212 RO2C + 0.003 RO2X + 0.003 ZRN3 + 0.299 CO + 0.161 CO2 + 0.131 HCHO + 0.114 XHCH + 0.453 CCHO + 0.071 XCCH + 0.333 RCHO + 0.019 XRCH + 0.051 ACET + 0.033 MEK + 0.001 XMEK + 0.024 FACD + 0.065 AACD + 0.235 PACD + 0.037 PRD2 + 0.073 YRPX + 0.136 Y6PX + 0.16 XC	$k = 8.59x10^{-15} \exp(-1255/T)$	$1.31x10^{-16}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
554	OLE2 + NO3 = 0.4 XHO2 + 0.426 XNO2 + 0.035 XMEO + 1.193 RO2C + 0.14 RO2X + 0.14 ZRN3 + 0.072 XHCH + 0.579 XCCH + 0.163 XRCH + 0.116 XACE + 0.002 XMEK + 0.32 XRN3 + 0.319 YRPX + 0.681 Y6PX + 0.254 XN + 0.13 XC	$k = 2.31 \times 10^{-13} \exp(382/T)$	8.25×10^{-13}
555	OLE2 + O3P = 0.079 RCHO + 0.751 MEK + 0.17 PRD2 + 0.739 XC	$k = 1.43 \times 10^{-11} \exp(111/T)$	2.07×10^{-11}
556	ARO1 + OH = 0.123 HO2 + 0.566 XHO2 + 0.202 OH + 0.566 RO2C + 0.11 RO2X + 0.11 ZRN3 + 0.158 XGLY + 0.1 XMGL + 0.123 CRES + 0.072 XAF1 + 0.185 XAF2 + 0.202 AFG3 + 0.309 XPD2 + 0.369 Y6PX + 0.31 XC	$k = 7.84 \times 10^{-12}$	7.84×10^{-12}
557	ARO2 + OH = 0.077 HO2 + 0.617 XHO2 + 0.178 OH + 0.617 RO2C + 0.128 RO2X + 0.128 ZRN3 + 0.088 XGLY + 0.312 XMGL + 0.134 XBAC + 0.077 CRES + 0.026 XBAL + 0.221 XAF1 + 0.247 XAF2 + 0.178 AFG3 + 0.068 XAF3 + 0.057 XPD2 + 0.101 Y6PX + 1.459 XC	$k = 3.09 \times 10^{-11}$	3.09×10^{-11}
558	TERP + OH = 0.734 XHO2 + 0.064 XRC3 + 1.211 RO2C + 0.201 RO2X + 0.201 ZRN3 + 0.001 XCO + 0.411 XHCH + 0.385 XRCH + 0.037 XACE + 0.007 XMEK + 0.003 XMGL + 0.009 XBAC + 0.003 XMVK + 0.002 XIPR + 0.409 XPD2 + Y6PX + 4.375 XC	$k = 2.27 \times 10^{-11} \exp(435/T)$	9.68×10^{-11}
559	TERP + O3 = 0.078 HO2 + 0.046 XHO2 + 0.499 OH + 0.202 XMC3 + 0.059 XRC3 + 0.49 RO2C + 0.121 RO2X + 0.121 ZRN3 + 0.249 CO + 0.063 CO2 + 0.127 HCHO + 0.033 XHCH + 0.208 XRCH + 0.057 XACE + 0.002 MEK + 0.172 FACD + 0.068 PACD + 0.003 XMGL + 0.039 XBAC + 0.002 XMAC + 0.001 XIPR + 0.502 PRD2 + 0.428 Y6PX + 3.852 XC	$k = 8.28 \times 10^{-16} \exp(-785/T)$	6.05×10^{-17}
560	TERP + NO3 = 0.227 XHO2 + 0.287 XNO2 + 0.026 XRC3 + 1.786 RO2C + 0.46 RO2X + 0.46 ZRN3 + 0.012 XCO + 0.023 XHCH + 0.002 XGLD + 0.403 XRCH + 0.239 XACE + 0.005 XMAC + 0.001 XMVK + 0.004 XIPR + 0.228 XRN3 + Y6PX + 0.485 XN + 3.785 XC	$k = 1.33 \times 10^{-12} \exp(490/T)$	6.81×10^{-12}
561	TERP + O3P = 0.237 RCHO + 0.763 PRD2 + 4.711 XC	$k = 4.02 \times 10^{-11}$	4.02×10^{-11}

Number	Reactants and Products	Rate Constant Expression [a]	k_{300}
562	SESQ + OH = 0.734 XHO2 + 0.064 XRC3 + 1.211 RO2C + 0.201 RO2X + 0.201 ZRN3 + 0.001 XCO + 0.411 XHCH + 0.385 XRCH + 0.037 XACE + 0.007 XMEK + 0.003 XMGL + 0.009 XBAC + 0.003 XMVK + 0.002 XIPR + 0.409 XPD2 + Y6PX + 9.375 XC	k = k(558)	9.68×10^{-11}
563	SESQ + O3 = 0.078 HO2 + 0.046 XHO2 + 0.499 OH + 0.202 XMC3 + 0.059 XRC3 + 0.49 RO2C + 0.121 RO2X + 0.121 ZRN3 + 0.249 CO + 0.063 CO2 + 0.127 HCHO + 0.033 XHCH + 0.208 XRCH + 0.057 XACE + 0.002 MEK + 0.172 FACD + 0.068 PACD + 0.003 XMGL + 0.039 XBAC + 0.002 XMAC + 0.001 XIPR + 0.502 PRD2 + 0.428 Y6PX + 8.852 XC	k = k(559)	6.05×10^{-17}
564	SESQ + NO3 = 0.227 XHO2 + 0.287 XNO2 + 0.026 XRC3 + 1.786 RO2C + 0.46 RO2X + 0.46 ZRN3 + 0.012 XCO + 0.023 XHCH + 0.002 XCCH + 0.403 XRCH + 0.239 XACE + 0.005 XMAC + 0.001 XMVK + 0.004 XIPR + 0.228 XRN3 + Y6PX + 0.485 XN + 8.785 XC	k = k(560)	6.81×10^{-12}
565	SESQ + O3P = 0.237 RCHO + 0.763 PRD2 + 9.711 XC	k = k(561)	4.02×10^{-11}
566	XN = HNO3	$k = 2.30 \times 10^{-5}$	2.30×10^{-5}
567	RNO3 = HNO3	$k = 2.30 \times 10^{-5}$	2.30×10^{-5}

[a] Rate constants defined by a Troe falloff expression are evaluated as described by Mellouki et al. (2021)

Table S11. SAPRC07TC species names for CAMx, descriptions, atom counts and molecular weights (g/mol).

Species	Description	C	H	O	N	S	M Wt [a]
AACD	Acetic acid	2	4	2			60.1
ACET	Acetone	3	6	1			58.1
ACRO	Acrolein	3	4	1			56.1
ACYE	Acetylene	2	2				26.0
AFG1	Lumped photoreactive monounsaturated dicarbonyl aromatic fragmentation products that photolyze to form radicals	5	6	2			98.1
AFG2	Lumped photoreactive monounsaturated dicarbonyl aromatic fragmentation products that photolyze to form non-radical products	5	6	2			98.1
AFG3	Lumped diunsaturatred dicarbonyl aromatic fragmentation product.	7	8	2			124.1
ALK1	Alkanes and other non-aromatic compounds that react only with OH, and have kOH between 2 and 5E2 ppm-1 min-1. (Primarily ethane)	2	6				30.1
ALK2	Alkanes and other non-aromatic compounds that react only with OH, and have kOH between 5E2 and 2.5E3 ppm-1 min-1. (Primarily propane and acetylene)	2.5	6.9				36.7
ALK3	Alkanes and other non-aromatic compounds that react only with OH, and have kOH between 2.5E3 and 5E3 ppm-1 min-1.	4.0	10.0				58.6
ALK4	Alkanes and other non-aromatic compounds that react only with OH, and have kOH between 5E3 and 1E4 ppm-1 min-1.	5.4	12.8				77.6
ALK5	Alkanes and other non-aromatic compounds that react only with OH, and have kOH greater than 1E4 ppm-1 min-1.	8.3	18.6				118.9
APIN	a-pinene	10	16				136.2
ARO1	Aromatics with kOH < 2E4 ppm-1 min-1.	7.2	8.6				95.3
ARO2	Aromatics with kOH > 2E4 ppm-1 min-1.	8.8	12.5				118.7
B124	1,2,4-trimethyl benzene	9	12				120.2
BACL	Biacetyl	4	6	2			86.1
BALD	Aromatic aldehydes (e.g., benzaldehyde)	7	6	1			106.1
BD13	1,3-butadiene	4	6				54.1
BENZ	Benzene	6	6				78.1
CCHO	Acetaldehyde	2	4	1			44.1
CH4	Background methane	1	4				16.0

Species	Description	C	H	O	N	S	M Wt [a]
CO	Carbon monoxide	1		1			28.0
CO3H	Peroxyacetic acid	2	4	3			76.1
COOH	Methyl hydroperoxide	1	4	2			48.0
CRES	Phenols and Cresols	7	8	1			108.1
ETHE	Ethene	2	4				28.1
ETOH	Ethanol	2	6	1			46.1
FACD	Formic Acid	1	2	2			46.0
GLY	Glyoxal	2	2	2			58.0
GLYD	Glycolaldehyde	2	4	2			60.1
H2	Background hydrogen		2				2.0
H2O2	Hydrogen peroxide		2	2			34.0
HCHO	Formaldehyde	1	2	1			30.0
HNO3	Nitric Acid		1	3	1		63.0
HONO	Nitrous Acid		1	2	1		47.0
IPRD	Lumped isoprene product species	5	8	2			100.1
ISOP	Isoprene	5	8				68.1
MACR	Methacrolein	4	6	1			70.1
MEK	Ketones and other non-aldehyde oxygenated products which react with OH radicals faster than 5E-13 but slower than 5E-12 cm3 molec-2 sec-1.	4	8	1			72.1
MEOH	Methanol	1	4	1			32.0
MGLY	Methyl glyoxal	3	4	2			72.1
MPAN	PAN analogue formed from Methacrolein	4	6	3	1	1	148.2
MVK	Methyl vinyl ketone	4	6	1			70.1
MXYL	m-xylene	8	10				106.2
N2O5	Nitrogen pentoxide			5	2		108.0
NO	Nitric oxide			1	1		30.0
NO2	Nitrogen dioxide			2	1		46.0

Species	Description	C	H	O	N	S	M Wt [a]
NO3	Nitrate radical			3	1		62.0
NPHE	Nitrophenols	6	5	3	1		139.1
O3	Ozone			3			48.0
OLE1	Alkenes (other than ethene) with kOH < 7E4 ppm-1 min-1.	5.2	10.3				72.3
OLE2	Alkenes with kOH > 7E4 ppm-1 min-1.	5.4	10.8				75.7
OXYL	o-xylene	8	10				106.2
PACD	Peroxy acid	2	4	3			76.1
PAN	Peroxy acetyl nitrate	2	3	5	1		121.0
PAN2	PPN and other higher alkyl PAN analogues	3	5	5	1		135.1
PBZN	PAN analogues formed from aromatic aldehydes	7	5	5	1		183.1
PNA	Peroxynitric acid		1	4	1		79.0
PRD2	Ketones and other non-aldehyde oxygenated products which react with OH radicals faster than 5E-12 cm3 molec-2 sec-1	6	12	2			116.2
PRPE	Propene	3	6				42.1
PXYL	p-xylene	8	10				106.2
R6PX	Lumped organic hydroperoxides with 5 or more carbons that aren't aromatic	6	14	2			118.2
RAPX	Organic hydroperoxides formed following OH addition to aromatic rings	8	12	5			188.2
RCHO	Lumped C3+ aldehydes	3	6	1			58.1
RNO3	Lumped organic nitrates	6	13	3	1		147.2
RO3H	Higher organic peroxy acids	3	6	3			90.1
ROOH	Lumped organic hydroperoxides	3	8	2			76.1
SESQ	Sesquiterpenes	15	24				204.4
SO2	Sulfur dioxide	0	0	2		1	64.1
SULF	Sulfates (SO3 or H2SO4)	0	2	4		1	98.1
TERP	Terpenes	10	16				136.2
TOLU	Toluene	7	8				92.1
XC	Lost carbon or carbon in unreactive products	1					12.0

Species	Description	C	H	O	N	S	M Wt [a]
XN	Lost nitrogen or nitrogen in unreactive products				1		14.0
BZC3	Peroxyacyl radical formed from aromatic aldehydes	7	5	3			137.1
BZO	Phenoxy radicals	6	5	1			93.1
HO2	Hydroperoxide radicals		1	2			33.0
MAC3	Peroxyacyl radicals from methacrolein	3	6	3			54.0
MCO3	Acetyl peroxy radicals	2	3	4			67.0
MEO2	Methyl peroxy radicals	1	3	2			35.0
O1D	Oxygen atom in the O1(D) electronic state			1			16.0
O3P	Oxygen atom in the O3(P) electronic state			1			16.0
OH	Hydroxyl radicals		1	1			17.0
RCO3	Peroxy propionyl and higher peroxy acyl radicals	2	5	3			53.0
RO2C	Peroxy radical Operator representing NO to NO2 and NO3 to NO2 conversions						
RO2X	Peroxy radical Operator representing NO consumption						
TBUO	t-Butoxy radicals	4	9	2			89.1
XACE	As for xHO2						
XACR	As for xHO2						
XAF1	As for xHO2						
XAF2	As for xHO2						
XAF3	As for xHO2						
XBAC	As for xHO2						
XBAL	As for xHO2						
XCCH	As for xHO2						
XCO	As for xHO2						
XGLD	As for xHO2						
XGLY	As for xHO2						
XHCH	As for xHO2						

Species	Description	C	H	O	N	S	M Wt [a]
XHO2	Formation of HO2 from alkoxy radicals that react with NO, NO3 or RO2						
XIPR	As for xHO2						
XMA3	As for xHO2						
XMAC	As for xHO2						
XMC3	As for xHO2						
XMEK	As for xHO2						
XMEO	As for xHO2						
XMGL	As for xHO2						
XMVK	As for xHO2						
XNO2	As for xHO2						
XOH	As for xHO2						
XPD2	As for xHO2						
XRC3	As for xHO2						
XRCH	As for xHO2						
XRN3	As for xHO2						
XTBU	As for xHO2						
Y6PX	As for YRPX						
YAPX	As for YRPX						
YRPX	Formation of ROOH from alkoxy radicals that react with HO2						
ZRN3	Formation of RNO3 from alkoxy radicals that react with NO						

[a] M Wt. not calculated for operators

Table S12. Zenith angle (degrees) dependence of photolysis frequencies (s^{-1}) for SAPRC07TC reactions computed by the TUV discrete ordinates radiative transfer scheme (Stamnes et al., 1988) with cross-section and quantum yield data for each reaction recommended by the mechanism developer. Conditions are 600 m above ground level at mean sea level with surface UV albedo of 0.04, stratospheric ozone column of 0.3 atm cm, and the aerosol profile of Elterman (1968) provided with TUV.

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
1	NO2	$1.02x10^{-2}$	$9.87x10^{-3}$	$8.85x10^{-3}$	$6.37x10^{-3}$	$2.12x10^{-3}$	$5.18x10^{-4}$
16	NO3	$2.32x10^{-2}$	$2.30x10^{-2}$	$2.23x10^{-2}$	$1.98x10^{-2}$	$1.12x10^{-2}$	$2.63x10^{-3}$
17	NO3	$1.88x10^{-1}$	$1.87x10^{-1}$	$1.78x10^{-1}$	$1.56x10^{-1}$	$8.22x10^{-2}$	$1.80x10^{-2}$
18	O3	$4.88x10^{-5}$	$4.28x10^{-5}$	$2.73x10^{-5}$	$9.47x10^{-6}$	$1.01x10^{-6}$	$1.68x10^{-7}$
19	O3	$4.35x10^{-4}$	$4.28x10^{-4}$	$4.02x10^{-4}$	$3.40x10^{-4}$	$1.82x10^{-4}$	$4.32x10^{-5}$
23	HONO	$1.65x10^{-3}$	$1.60x10^{-3}$	$1.42x10^{-3}$	$9.88x10^{-4}$	$3.10x10^{-4}$	$7.90x10^{-5}$
28	HNO3	$8.48x10^{-7}$	$7.72x10^{-7}$	$5.58x10^{-7}$	$2.55x10^{-7}$	$4.23x10^{-8}$	$8.07x10^{-9}$
34	PNA	$8.48x10^{-6}$	$7.85x10^{-6}$	$6.03x10^{-6}$	$3.17x10^{-6}$	$6.60x10^{-7}$	$1.44x10^{-7}$
41	H2O2	$8.78x10^{-6}$	$8.27x10^{-6}$	$6.63x10^{-6}$	$3.78x10^{-6}$	$8.82x10^{-7}$	$2.03x10^{-7}$
65	PAN	$9.58x10^{-7}$	$8.87x10^{-7}$	$6.77x10^{-7}$	$3.50x10^{-7}$	$7.15x10^{-8}$	$1.54x10^{-8}$
75	PAN2	$9.58x10^{-7}$	$8.87x10^{-7}$	$6.77x10^{-7}$	$3.50x10^{-7}$	$7.15x10^{-8}$	$1.54x10^{-8}$
86	PBZN	$9.58x10^{-7}$	$8.87x10^{-7}$	$6.77x10^{-7}$	$3.50x10^{-7}$	$7.15x10^{-8}$	$1.54x10^{-8}$
98	MPAN	$9.58x10^{-7}$	$8.87x10^{-7}$	$6.77x10^{-7}$	$3.50x10^{-7}$	$7.15x10^{-8}$	$1.54x10^{-8}$
204	HCHO	$4.35x10^{-5}$	$4.08x10^{-5}$	$3.25x10^{-5}$	$1.78x10^{-5}$	$3.78x10^{-6}$	$7.90x10^{-7}$
205	HCHO	$4.85x10^{-5}$	$4.62x10^{-5}$	$3.87x10^{-5}$	$2.38x10^{-5}$	$6.18x10^{-6}$	$1.51x10^{-6}$
209	CCHO	$6.52x10^{-6}$	$5.90x10^{-6}$	$4.17x10^{-6}$	$1.77x10^{-6}$	$2.30x10^{-7}$	$3.57x10^{-8}$
212	RCHO	$2.20x10^{-5}$	$2.02x10^{-5}$	$1.48x10^{-5}$	$6.95x10^{-6}$	$1.15x10^{-6}$	$2.10x10^{-7}$
215	ACET	$5.12x10^{-7}$	$4.52x10^{-7}$	$2.92x10^{-7}$	$1.04x10^{-7}$	$1.13x10^{-8}$	$1.75x10^{-9}$
217	MEK	$2.65x10^{-6}$	$2.42x10^{-6}$	$1.77x10^{-6}$	$8.13x10^{-7}$	$1.29x10^{-7}$	$2.28x10^{-8}$
223	COOH	$6.08x10^{-6}$	$5.73x10^{-6}$	$4.67x10^{-6}$	$2.72x10^{-6}$	$6.65x10^{-7}$	$1.57x10^{-7}$
225	ROOH	$6.08x10^{-6}$	$5.73x10^{-6}$	$4.67x10^{-6}$	$2.72x10^{-6}$	$6.65x10^{-7}$	$1.57x10^{-7}$
227	R6PX	$6.08x10^{-6}$	$5.73x10^{-6}$	$4.67x10^{-6}$	$2.72x10^{-6}$	$6.65x10^{-7}$	$1.57x10^{-7}$
229	RAPX	$6.08x10^{-6}$	$5.73x10^{-6}$	$4.67x10^{-6}$	$2.72x10^{-6}$	$6.65x10^{-7}$	$1.57x10^{-7}$

Reaction Number	Reactant	Solar zenith angle (degree)					
		0	**20**	**40**	**60**	**78**	**86**
230	GLY	$1.27x10^{-4}$	$1.24x10^{-4}$	$1.10x10^{-4}$	$7.88x10^{-5}$	$2.72x10^{-5}$	$6.28x10^{-6}$
231	GLY	$4.83x10^{-5}$	$4.58x10^{-5}$	$3.75x10^{-5}$	$2.23x10^{-5}$	$5.67x10^{-6}$	$1.30x10^{-6}$
234	MGLY	$2.15x10^{-4}$	$2.08x10^{-4}$	$1.88x10^{-4}$	$1.39x10^{-4}$	$5.05x10^{-5}$	$1.15x10^{-5}$
237	BACL	$3.63x10^{-4}$	$3.55x10^{-4}$	$3.23x10^{-4}$	$2.45x10^{-4}$	$9.02x10^{-5}$	$2.08x10^{-5}$
241	NPHE	$1.52x10^{-5}$	$1.48x10^{-5}$	$1.33x10^{-5}$	$9.55x10^{-6}$	$3.18x10^{-6}$	$7.78x10^{-7}$
242	NPHE	$1.52x10^{-4}$	$1.48x10^{-4}$	$1.33x10^{-4}$	$9.55x10^{-5}$	$3.18x10^{-5}$	$7.78x10^{-6}$
244	BALD	$4.63x10^{-5}$	$4.43x10^{-5}$	$3.80x10^{-5}$	$2.48x10^{-5}$	$7.00x10^{-6}$	$1.77x10^{-6}$
248	AFG1	$5.73x10^{-3}$	$5.48x10^{-3}$	$4.68x10^{-3}$	$3.07x10^{-3}$	$9.07x10^{-4}$	$2.18x10^{-4}$
251	AFG2	$5.73x10^{-3}$	$5.48x10^{-3}$	$4.68x10^{-3}$	$3.07x10^{-3}$	$9.07x10^{-4}$	$2.18x10^{-4}$
258	MACR	$3.05x10^{-6}$	$2.88x10^{-6}$	$2.37x10^{-6}$	$1.39x10^{-6}$	$3.38x10^{-7}$	$7.93x10^{-8}$
262	MVK	$1.16x10^{-6}$	$1.10x10^{-6}$	$8.97x10^{-7}$	$5.25x10^{-7}$	$1.28x10^{-7}$	$2.98x10^{-8}$
266	IPRD	$3.05x10^{-6}$	$2.88x10^{-6}$	$2.37x10^{-6}$	$1.39x10^{-6}$	$3.38x10^{-7}$	$7.93x10^{-8}$
268	PRD2	$7.37x10^{-8}$	$6.72x10^{-8}$	$4.91x10^{-8}$	$2.26x10^{-8}$	$3.58x10^{-9}$	$6.35x10^{-10}$
270	RNO3	$3.68x10^{-6}$	$3.38x10^{-6}$	$2.50x10^{-6}$	$1.20x10^{-6}$	$2.07x10^{-7}$	$3.90x10^{-8}$
272	GLYD	$9.00x10^{-6}$	$8.22x10^{-6}$	$5.98x10^{-6}$	$2.75x10^{-6}$	$4.37x10^{-7}$	$7.82x10^{-8}$
278	ACRO	$2.73x10^{-6}$	$2.58x10^{-6}$	$2.13x10^{-6}$	$1.28x10^{-6}$	$3.22x10^{-7}$	$7.65x10^{-8}$
280	CO3H	$9.40x10^{-7}$	$8.73x10^{-7}$	$6.78x10^{-7}$	$3.60x10^{-7}$	$7.52x10^{-8}$	$1.62x10^{-8}$
282	RO3H	$9.40x10^{-7}$	$8.73x10^{-7}$	$6.78x10^{-7}$	$3.60x10^{-7}$	$7.52x10^{-8}$	$1.62x10^{-8}$

Table S13. Reactions and rate constant expressions for the RACM2s21 mechanism. See Table S14 for species names. k_{298} is the rate constant at 298 K and 1 atmosphere using units in cm^3 $molecule^{-1}$ s^{-1}. For photolysis reactions k_{298} shows the photolysis frequency (J) at a solar zenith angle of 60° (see Table S15).

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
1	NO2 = O + NO	Photolysis	$6.45x10^{-3}$
2	O3 = O + O2	Photolysis	$3.40x10^{-4}$
3	O3 = O1D + O2	Photolysis	$9.30x10^{-6}$
4	H2O2 = 2. HO	Photolysis	$3.78x10^{-6}$
5	NO3 = O2 + NO	Photolysis	$1.93x10^{-2}$
6	NO3 = O + NO2	Photolysis	$1.53x10^{-1}$
7	HONO = HO + NO	Photolysis	$9.12x10^{-4}$
8	HNO3 = HO + NO2	Photolysis	$2.52x10^{-7}$
9	HNO4 = 0.2 HO + 0.8 HO2 + 0.8 NO2 + 0.2 NO3	Photolysis	$3.07x10^{-6}$
10	HCHO = H2 + CO	Photolysis	$3.14x10^{-5}$
11	HCHO = HO2 + HO2 + CO	Photolysis	$1.73x10^{-5}$
12	ACD = HO2 + MO2 + CO	Photolysis	$1.73x10^{-6}$
13	ALD = HO2 + ETHP + CO	Photolysis	$6.80x10^{-6}$
14	ACT = MO2 + ACO3	Photolysis	$1.85x10^{-7}$
15	UALD = 1.22 HO2 + 0.784 ACO3 + 1.22 CO + 0.35 HCHO + 0.434 ALD + 0.216 KET	Photolysis	$8.43x10^{-6}$
16	MEK = 0.1 MO2 + ETHP + 0.9 ACO3 + 0.1 CO	Photolysis	$1.54x10^{-6}$
17	KET = 1.5 ETHP + 0.5 ACO3 + 0.5 CO	Photolysis	$1.59x10^{-6}$
18	HKET = HO2 + ACO3 + HCHO	Photolysis	$8.51x10^{-7}$
19	MACR = 0.34 HO + 0.66 HO2 + 0.67 ACO3 + 0.33 MACP + 0.34 XO2 + 0.67 CO + 0.67 HCHO	Photolysis	$2.52x10^{-6}$
20	MVK = 0.3 MO2 + 0.3 MACP + 0.7 CO + 0.7 UALD	Photolysis	$5.10x10^{-7}$
21	GLY = H2 + 2. CO	Photolysis	$3.12x10^{-6}$
22	GLY = HCHO + CO	Photolysis	$1.57x10^{-5}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
23	GLY = 2. HO2 + 2. CO	Photolysis	4.53×10^{-5}
24	MGLY = HO2 + ACO3 + CO	Photolysis	4.89×10^{-4}
25	DCB1 = 1.5 HO2 + 0.25 ACO3 + 0.2 XO2 + CO + 0.5 GLY + 0.5 MGLY	Photolysis	4.89×10^{-4}
26	DCB2 = 1.5 HO2 + 0.25 ACO3 + 0.2 XO2 + CO + 0.5 GLY + 0.5 MGLY	Photolysis	4.89×10^{-4}
27	BALD = CHO + HO2 + CO	Photolysis	2.41×10^{-5}
28	OP1 = HO + HO2 + HCHO	Photolysis	2.64×10^{-6}
29	OP2 = HO + HO2 + ALD	Photolysis	2.64×10^{-6}
30	PAA = MO2 + HO	Photolysis	3.54×10^{-7}
31	ONIT = HO2 + NO2 + 0.2 ALD + 0.8 KET	Photolysis	1.07×10^{-6}
32	PAN = ACO3 + NO2	Photolysis	2.20×10^{-7}
33	PAN = MO2 + CO2 + NO3	Photolysis	1.37×10^{-7}
34	O3 + HO = HO2 + O2	$k = 1.70 \times 10^{-12} \exp(-940/T)$	7.25×10^{-14}
35	O3 + HO2 = HO + 2. O2	$k = 1.00 \times 10^{-14} \exp(-490/T)$	1.93×10^{-15}
36	O3 + NO = NO2 + O2	$k = 1.40 \times 10^{-12} \exp(-1310/T)$	1.73×10^{-14}
37	O3 + NO2 = NO3 + O2	$k = 1.40 \times 10^{-13} \exp(-2470/T)$	3.52×10^{-17}
38	O + O2 + M = O3	$k = 5.74 \times 10^{-34} (T/300)^{-2.6}$	5.84×10^{-34}
39	O + O3 = 2. O2	$k = 8.00 \times 10^{-12} \exp(-2060/T)$	7.96×10^{-15}
40	O1D + O2 = O + O2	$k = 3.20 \times 10^{-11} \exp(67/T)$	4.01×10^{-11}
41	O1D + N2 = O + N2	$k = 2.00 \times 10^{-11} \exp(130/T)$	3.09×10^{-11}
42	O1D + H2O = 2. HO	$k = 2.14 \times 10^{-10}$	2.14×10^{-10}
43	HO + H2 = H2O + HO2	$k = 7.70 \times 10^{-12} \exp(-2100/T)$	6.70×10^{-15}
44	HO + HO2 = H2O + O2	$k = 4.80 \times 10^{-11} \exp(250/T)$	1.11×10^{-10}
45	HO2 + HO2 = H2O2 + O2	$k = k1 + k2\ [M]$ $k1 = 2.20 \times 10^{-13} \exp(600/T)$ $k2 = 1.90 \times 10^{-33} \exp(980/T)$	2.90×10^{-12}
46	HO2 + HO2 + H2O = H2O2 + H2O + O2	$k = k1 + k2\ [M]$ $k1 = 3.08 \times 10^{-34} \exp(2800/T)$ $k2 = 2.66 \times 10^{-54} \exp(3180/T)$	6.53×10^{-30}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
47	H2O2 + HO = HO2 + H2O	$k = 2.90\text{x}10^{-12}\ \exp(-160/T)$	$1.70\text{x}10^{-12}$
48	NO + O = NO2	Falloff: F=0.6; n=1 $k(0) = 9.10\text{x}10^{-32}\ (T/300)^{-1.5}$ $k(inf) = 3.00\text{x}10^{-11}$	$1.68\text{x}10^{-12}$
49	NO + HO = HONO	Falloff: F=0.6; n=1 $k(0) = 7.00\text{x}10^{-31}\ (T/300)^{-2.6}$ $k(inf) = 3.60\text{x}10^{-11}\ (T/300)^{-.1}$	$7.41\text{x}10^{-12}$
50	NO + HO2 = HO + NO2	$k = 3.44\text{x}10^{-12}\ \exp(260/T)$	$8.23\text{x}10^{-12}$
51	NO + HO2 = HNO3	k = k(ref)/K k(ref) = k(50) $K = 1.10\text{x}10^{3}\ \exp(-500/T)$	$4.01\text{x}10^{-14}$
52	NO + NO + O2 = 2. NO2	$k = 4.25\text{x}10^{-39}\ \exp(663.5/T)$	$3.94\text{x}10^{-38}$
53	HONO + HO = H2O + NO2	$k = 2.50\text{x}10^{-12}\ \exp(260/T)$	$5.98\text{x}10^{-12}$
54	NO2 + O = NO + O2	$k = 5.30\text{x}10^{-12}\ \exp(200/T)$	$1.04\text{x}10^{-11}$
55	NO2 + O = NO3	Falloff: F=0.6; n=1 $k(0) = 3.40\text{x}10^{-31}\ (T/300)^{-1.6}$ $k(inf) = 2.30\text{x}10^{-11}\ (T/300)^{-.2}$	$4.03\text{x}10^{-12}$
56	NO2 + HO = HNO3	Falloff: F=0.6; n=1 $k(0) = 1.51\text{x}10^{-30}\ (T/300)\#^{-3}$ $k(inf) = 2.58\text{x}10^{-11}$	$9.34\text{x}10^{-12}$
57	HNO3 + HO = NO3 + H2O	k = k1 + k3 [M] / (1 + k3 [M] / k2) $k1 = 2.40\text{x}10^{-14}\ \exp(460/T)$ $k2 = 2.70\text{x}10^{-17}\ \exp(2199/T)$ $k3 = 6.50\text{x}10^{-34}\ \exp(1335/T)$	$1.54\text{x}10^{-13}$
58	NO3 + HO = HO2 + NO2	$k = 2.00\text{x}10^{-11}$	$2.00\text{x}10^{-11}$
59	NO3 + HO2 = 0.7 HO + 0.7 NO2 + 0.3 HNO3	$k = 4.00\text{x}10^{-12}$	$4.00\text{x}10^{-12}$
60	NO3 + NO = 2. NO2	$k = 1.80\text{x}10^{-11}\ \exp(110/T)$	$2.60\text{x}10^{-11}$
61	NO3 + NO2 = NO + NO2 + O2	$k = 4.35\text{x}10^{-14}\ \exp(-1335/T)$	$4.93\text{x}10^{-16}$
62	NO3 + NO3 = 2. NO2 + O2	$k = 8.50\text{x}10^{-13}\ \exp(-2450/T)$	$2.28\text{x}10^{-16}$
63	NO3 + NO2 = N2O5	Falloff: F=0.6; n=1 $k(0) = 2.40\text{x}10^{-30}\ (T/300)\#^{-3}$ $k(inf) = 1.60\text{x}10^{-12}\ (T/300)^{0.1}$	$1.35\text{x}10^{-12}$
64	N2O5 = NO2 + NO3	k = k(ref)/K k(ref) = k(63) $K = 5.80\text{x}10^{-27}\ \exp(10840/T)$	$3.69\text{x}10^{-2}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
65	N2O5 + H2O = 2. HNO3	$k = 2.00x10^{-21}$	$2.00x10^{-21}$
66	NO2 + HO2 = HNO4	Falloff: F=0.6; n=1 $k(0) = 1.90x10^{-31}\ (T/300)^{-3.4}$ $k(inf) = 4.00x10^{-12}\ (T/300)^{-.3}$	$1.31x10^{-12}$
67	HNO4 = HO2 + NO2	k = k(ref)/K k(ref) = k(66) $K = 2.10x10^{-27}\ exp(10900/T)$	$8.14x10^{-2}$
68	HNO4 + HO = NO2 + H2O + O2	$k = 1.30x10^{-12}\ exp(380/T)$	$4.65x10^{-12}$
69	SO2 + HO = HO2 + SULF	Falloff: F=0.6; n=1 $k(0) = 3.30x10^{-31}\ (T/300)^{-4.3}$ $k(inf) = 1.60x10^{-12}$	$9.59x10^{-13}$
70	CO + HO = HO2 + CO2	k = k1 + k2 [M] $k1 = 1.44x10^{-13}$ $k2 = 2.74x10^{-33}$	$2.11x10^{-13}$
71	CH4 + HO = MO2 + H2O	$k = 1.85x10^{-12}\ exp(-1690/T)$	$6.37x10^{-15}$
72	ETH + HO = ETHP + H2O	$k = 6.90x10^{-12}\ exp(-1000/T)$	$2.41x10^{-13}$
73	HC3 + HO = HC3P + H2O	$k = 7.68x10^{-12}\ exp(-370/T)$	$2.22x10^{-12}$
74	HC5 + HO = HC5P + H2O	$k = 1.01x10^{-11}\ exp(-245/T)$	$4.44x10^{-12}$
75	HC8 + HO = 0.049 HO2 + 0.951 HC8P + 0.025 ALD + 0.024 HKET + H2O	$k = 2.82x10^{-11}\ exp(-273/T)$	$1.13x10^{-11}$
76	ETE + HO = ETEP	Falloff: F=0.6; n=1 $k(0) = 1.00x10^{-28}\ (T/300)^{-4.5}$ $k(inf) = 8.80x10^{-12}\ (T/300)^{-.85}$	$8.20x10^{-12}$
77	OLT + HO = OLTP	$k = 5.72x10^{-12}\ exp(500/T)$	$3.06x10^{-11}$
78	OLI + HO = OLIP	$k = 1.33x10^{-11}\ exp(500/T)$	$7.12x10^{-11}$
79	DIEN + HO = OLIP	$k = 1.48x10^{-11}\ exp(448/T)$	$6.66x10^{-11}$
80	ACE + HO = 0.65 HO + 0.35 HO2 + 0.35 CO + 0.65 GLY + 0.35 ORA1	Falloff: F=0.6; n=1 $k(0) = 5.50x10^{-30}$ $k(inf) = 8.30x10^{-13}\ (T/300)\#2$	$7.47x10^{-13}$
81	BEN + HO = 0.648 HO2 + 0.352 BENP + 0.118 EPX + 0.53 PHEN	$k = 2.33x10^{-12}\ exp(-193/T)$	$1.22x10^{-12}$
82	TOL + HO = 0.177 HO2 + 0.763 TR2 + 0.06 TLP1 + 0.177 CSL	$k = 1.81x10^{-12}\ exp(354/T)$	$5.94x10^{-12}$
83	XYM + HO = 0.177 HO2 + 0.763 XY2 + 0.06 XYL1 + 0.177 CSL	$k = 2.31x10^{-11}$	$2.31x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
84	XYP + HO = 0.177 HO2 + 0.763 XY2 + 0.06 XYL1 + 0.177 CSL	$k = 1.43x10^{-11}$	$1.43x10^{-11}$
85	XYO + HO = 0.177 HO2 + 0.763 XYO2 + 0.06 XYL1 + 0.177 CSL	$k = 1.36x10^{-11}$	$1.36x10^{-11}$
86	ISO + HO = ISOP	$k = 2.70x10^{-11} \exp(390/T)$	$9.99x10^{-11}$
87	API + HO = APIP	$k = 1.21x10^{-11} \exp(440/T)$	$5.30x10^{-11}$
88	LIM + HO = LIMP	$k = 4.20x10^{-11} \exp(401/T)$	$1.61x10^{-10}$
89	HCHO + HO = HO2 + CO + H2O	$k = 5.50x10^{-12} \exp(125/T)$	$8.37x10^{-12}$
90	ACD + HO = ACO3 + H2O	$k = 4.70x10^{-12} \exp(345/T)$	$1.50x10^{-11}$
91	ALD + HO = RCO3 + H2O	$k = 4.90x10^{-12} \exp(405/T)$	$1.91x10^{-11}$
92	ACT + HO = ACTP + H2O	$k = 1.33x10^{-13}$	$1.33x10^{-13}$
93	MEK + HO = MEKP + H2O	$k = 1.50x10^{-12} \exp(^{-90}/T)$	$1.11x10^{-12}$
94	KET + HO = KETP + H2O	$k = 2.80x10^{-12} \exp(10/T)$	$2.90x10^{-12}$
95	HKET + HO = HO2 + MGLY + H2O	$k = 3.00x10^{-12}$	$3.00x10^{-12}$
96	MACR + HO = 0.57 MACP + 0.43 MCP	$k = 8.00x10^{-12} \exp(380/T)$	$2.86x10^{-11}$
97	MVK + HO = MVKP	$k = 2.60x10^{-12} \exp(610/T)$	$2.01x10^{-11}$
98	UALD + HO = 0.313 ACO3 + 0.687 UALP	$k = 5.77x10^{-12} \exp(533/T)$	$3.45x10^{-11}$
99	GLY + HO = HO2 + 2. CO + H2O	$k = 1.10x10^{-11}$	$1.10x10^{-11}$
100	MGLY + HO = ACO3 + CO + H2O	$k = 9.26x10^{-13} \exp(830/T)$	$1.50x10^{-11}$
101	DCB1 + HO = 0.52 HO2 + 0.33 CO + 0.4 ALD + 0.78 KET + 0.1 GLY + 0.01 MGLY	$k = 2.80x10^{-11} \exp(175/T)$	$5.04x10^{-11}$
102	DCB2 + HO = 0.52 HO2 + 0.33 CO + 0.13 MEK + 0.1 GLY + 0.01 MGLY + 0.78 OP2	$k = 2.80x10^{-11} \exp(175/T)$	$5.04x10^{-11}$
103	DCB3 + HO = 0.56 HO2 + 0.21 MACP + 0.11 CO + 0.27 GLY + 0.01 MGLY + 0.79 OP2	$k = 1.00x10^{-11}$	$1.00x10^{-11}$
104	BALD + HO = BALP + H2O	$k = 5.32x10^{-12} \exp(243/T)$	$1.20x10^{-11}$
105	PHEN + HO = 0.73 HO2 + 0.2 ADDC + 0.07 CHO + 0.73 MCT	$k = 6.75x10^{-12} \exp(405/T)$	$2.63x10^{-11}$
106	CSL + HO = 0.73 HO2 + 0.2 ADDC + 0.07 CHO + 0.73 MCT	$k = 4.65x10^{-11}$	$4.65x10^{-11}$
107	EPX + HO = HO2 + XO2 + CO + ALD	$k = 2.80x10^{-11} \exp(175/T)$	$5.04x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
108	MCT + HO = MCTO	$k = 2.05\text{x}10^{-10}$	$2.05\text{x}10^{-10}$
109	MOH + HO = HO2 + HCHO	$k = 2.85\text{x}10^{-12} \exp(-345/T)$	$8.95\text{x}10^{-13}$
110	EOH + HO = HO2 + ACD	$k = 3.00\text{x}10^{-12} \exp(20/T)$	$3.21\text{x}10^{-12}$
111	ROH + HO = HO2 + 0.184 ACD + 0.719 ALD	$k = 2.60\text{x}10^{-12} \exp(200/T)$	$5.09\text{x}10^{-12}$
112	ETEG + HO = HO2 + ALD	$k = 1.47\text{x}10^{-11}$	$1.47\text{x}10^{-11}$
113	OP1 + HO = 0.35 HO + 0.65 MO2 + 0.35 HCHO	$k = 2.90\text{x}10^{-12} \exp(190/T)$	$5.49\text{x}10^{-12}$
114	OP2 + HO = 0.01 HO + 0.44 HC3P + 0.07 XO2 + 0.08 ALD + 0.41 KET	$k = 3.40\text{x}10^{-12} \exp(190/T)$	$6.43\text{x}10^{-12}$
115	ISHP + HO = HO + MACR	$k = 1.00\text{x}10^{-10}$	$1.00\text{x}10^{-10}$
116	MAHP + HO = MACP	$k = 3.00\text{x}10^{-11}$	$3.00\text{x}10^{-11}$
117	ORA1 + HO = HO2 + CO2	$k = 4.50\text{x}10^{-13}$	$4.50\text{x}10^{-13}$
118	ORA2 + HO = 0.64 MO2 + 0.36 ORAP + 0.64 CO2	$k = 4.00\text{x}10^{-14} \exp(850/T)$	$6.93\text{x}10^{-13}$
119	PAA + HO = 0.35 HO + 0.65 ACO3 + 0.35 XO2 + 0.35 HCHO	$k = 2.93\text{x}10^{-12} \exp(190/T)$	$5.54\text{x}10^{-12}$
120	PAN + HO = XO2 + NO3 + HCHO + H2O	$k = 4.00\text{x}10^{-14}$	$4.00\text{x}10^{-14}$
121	PPN + HO = XO2 + NO3 + HCHO + H2O	$k = 4.00\text{x}10^{-14}$	$4.00\text{x}10^{-14}$
122	MPAN + HO = NO2 + HKET	$k = 3.20\text{x}10^{-11}$	$3.20\text{x}10^{-11}$
123	ONIT + HO = HC3P + NO2 + H2O	$k = 5.31\text{x}10^{-12} \exp(-260/T)$	$2.22\text{x}10^{-12}$
124	NALD + HO = NO2 + XO2 + HKET	$k = 5.60\text{x}10^{-12} \exp(270/T)$	$1.39\text{x}10^{-11}$
125	ISON + HO = NALD + 0.07 HKET + 0.07 HCHO	$k = 1.30\text{x}10^{-11}$	$1.30\text{x}10^{-11}$
126	ETE + O3 = 0.08 HO + 0.15 HO2 + 0.43 CO + HCHO + 0.37 ORA1 + 0.13 H2	$k = 9.14\text{x}10^{-15} \exp(-2580/T)$	$1.59\text{x}10^{-18}$
127	OLT + O3 = 0.56 HCHO + 0.44 ALD + 0.43 CO + 0.03 ORA1 + 0.06 ORA2 + 0.32 HO2 + 0.22 HO + 0.06 MEK + 0.01 ACD + 0.01 CH4 + 0.01 HKET + 0.02 ETH + 0.068 H2O2 + 0.08 MO2 + 0.06 ETHP + 0.015 HC3 + 0.04 HC3P + 0.03 ACT + 0.006 HC5 + 0.02 HC5P + 0.02 BALD + 0.032 BEN	$k = 4.33\text{x}10^{-15} \exp(-1800/T)$	$1.03\text{x}10^{-17}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
128	OLI + O3 = 0.46 HO + 0.07 HO2 + 0.32 MO2 + 0.07 ETHP + 0.04 HC3P + 0.09 ACO3 + 0.37 CO + 0.026 H2O2 + 0.04 CH4 + 0.01 ETH + 0.01 HC3 + 0.09 HCHO + 0.457 ACD + 0.73 ALD + 0.11 ACT + 0.017 KET + 0.044 HKET + 0.017 ORA2	$k = 4.40 \times 10^{-15} \exp(-845/T)$	2.58×10^{-16}
129	DIEN + O3 = 0.09 O + 0.28 HO + 0.3 HO2 + 0.03 MO2 + 0.15 ACO3 + 0.02 KETP + 0.13 XO2 + 0.001 H2O2 + 0.36 CO + 0.35 OLT + 0.9 HCHO + 0.39 MACR + 0.15 ORA1 + 0.05 H2	$k = 1.34 \times 10^{-14} \exp(-2283/T)$	6.31×10^{-18}
130	ISO + O3 = 0.25 HO + 0.25 HO2 + 0.08 MO2 + 0.1 ACO3 + 0.1 MACP + 0.09 H2O2 + 0.14 CO + 0.58 HCHO + 0.461 MACR + 0.189 MVK + 0.28 ORA1 + 0.153 OLT	$k = 7.86 \times 10^{-15} \exp(-1913/T)$	1.28×10^{-17}
131	API + O3 = 0.85 HO + 0.1 HO2 + 0.2 ETHP + 0.42 KETP + 0.14 CO + 0.02 H2O2 + 0.65 ALD + 0.53 KET	$k = 5.00 \times 10^{-16} \exp(-530/T)$	8.44×10^{-17}
132	LIM + O3 = 0.85 HO + 0.1 HO2 + 0.16 ETHP + 0.42 KETP + 0.02 H2O2 + 0.14 CO + 0.46 OLT + 0.04 HCHO + 0.79 MACR + 0.01 ORA1 + 0.07 ORA2	$k = 2.95 \times 10^{-15} \exp(-783/T)$	2.13×10^{-16}
133	MACR + O3 = 0.19 HO + 0.14 HO2 + 0.1 ACO3 + 0.22 CO + 0.5 MGLY + 0.45 ORA1	$k = 1.36 \times 10^{-15} \exp(-2112/T)$	1.14×10^{-18}
134	MVK + O3 = 0.16 HO + 0.11 HO2 + 0.28 ACO3 + 0.01 XO2 + 0.56 CO + 0.1 HCHO + 0.54 MGLY + 0.07 ORA1 + 0.07 ORA2 + 0.1 ALD	$k = 8.50 \times 10^{-16} \exp(-1520/T)$	5.18×10^{-18}
135	UALD + O3 = 0.1 HO + 0.072 HO2 + 0.008 MO2 + 0.002 ACO3 + 0.1 XO2 + 0.243 CO + 0.08 HCHO + 0.42 ACD + 0.028 KET + 0.491 GLY + 0.003 MGLY + 0.044 ORA1	$k = 1.66 \times 10^{-18}$	1.66×10^{-18}
136	DCB1 + O3 = 0.05 HO + HO2 + 0.6 RCO3 + 0.6 XO2 + 1.5 CO + 0.05 HCHO + 0.05 GLY + 0.08 MGLY + 0.65 OP2 + 0.5 CO2	$k = 2.00 \times 10^{-16}$	2.00×10^{-16}
137	DCB2 + O3 = 0.05 HO + HO2 + 0.6 RCO3 + 0.6 XO2 + 1.5 CO + 0.05 HCHO + 0.05 GLY + 0.08 MGLY + 0.7 DCB1 + 0.65 OP2 + 0.5 CO2	$k = 2.00 \times 10^{-16}$	2.00×10^{-16}
138	DCB3 + O3 = 0.05 HO + HO2 + 1.5 CO + 0.48 GLY + 0.7 DCB1 + 0.25 ORA1 + 0.25 ORA2 + 0.11 PAA + 0.5 CO2	$k = 9.00 \times 10^{-17}$	9.00×10^{-17}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
139	EPX + O3 = 0.05 HO + 1.5 HO2 + 1.5 CO + 0.85 BALD + GLY + 0.5 CO2	$k = 5.00 \times 10^{-16}$	5.00×10^{-16}
140	MCTO + O3 = MCTP	$k = 2.86 \times 10^{-13}$	2.86×10^{-13}
141	ETE + NO3 = 0.8 OLNN + 0.2 OLND	$k = 4.88 \times 10^{-18} \exp(-2282/T)$	2.31×10^{-21}
142	OLT + NO3 = 0.43 OLNN + 0.57 OLND	$k = 1.79 \times 10^{-13} \exp(-450/T)$	3.95×10^{-14}
143	OLI + NO3 = 0.11 OLNN + 0.89 OLND	$k = 8.64 \times 10^{-13} \exp(450/T)$	3.91×10^{-12}
144	DIEN + NO3 = 0.9 OLNN + 0.1 OLND + 0.9 MACR	$k = 1.00 \times 10^{-13}$	1.00×10^{-13}
145	ISO + NO3 = ISON	$k = 3.03 \times 10^{-12} \exp(-446/T)$	6.78×10^{-13}
146	API + NO3 = 0.1 OLNN + 0.9 OLND	$k = 1.19 \times 10^{-12} \exp(490/T)$	6.16×10^{-12}
147	LIM + NO3 = 0.71 OLNN + 0.29 OLND	$k = 1.22 \times 10^{-11}$	1.22×10^{-11}
148	HCHO + NO3 = HO2 + CO + HNO3	$k = 2.00 \times 10^{-12} \exp(-2440/T)$	5.56×10^{-16}
149	ACD + NO3 = ACO3 + HNO3	$k = 1.40 \times 10^{-12} \exp(-1900/T)$	2.38×10^{-15}
150	ALD + NO3 = RCO3 + HNO3	$k = 3.76 \times 10^{-12} \exp(-1900/T)$	6.40×10^{-15}
151	MACR + NO3 = 0.68 HCHO + 0.32 MACP + 0.68 XO2 + 0.68 MGLY + 0.32 HNO3 + 0.68 NO2	$k = 3.40 \times 10^{-15}$	3.40×10^{-15}
152	UALD + NO3 = HO2 + XO2 + 0.668 CO + 0.332 HCHO + 0.332 ALD + ONIT	$k = 5.02 \times 10^{-13} \exp(-1076/T)$	1.36×10^{-14}
153	GLY + NO3 = HO2 + 2. CO + HNO3	$k = 2.90 \times 10^{-12} \exp(-1900/T)$	4.94×10^{-15}
154	MGLY + NO3 = ACO3 + CO + HNO3	$k = 3.76 \times 10^{-12} \exp(-1900/T)$	6.40×10^{-15}
155	PHEN + NO3 = 0.4 CHO + 0.1 ADDC + 0.5 ADCN + 0.5 HNO3	$k = 3.78 \times 10^{-12}$	3.78×10^{-12}
156	CSL + NO3 = 0.4 CHO + 0.1 ADDC + 0.5 ADCN + 0.5 HNO3	$k = 1.06 \times 10^{-12}$	1.06×10^{-12}
157	EPX + NO3 = 0.5 HO + 1.5 HO2 + 1.5 CO + GLY + 0.5 NO2 + 0.5 HNO3 + 0.5 CO2	$k = 2.87 \times 10^{-13} \exp(-1000/T)$	1.00×10^{-14}
158	MCT + NO3 = MCTO + HNO3	$k = 2.01 \times 10^{-10}$	2.01×10^{-10}
159	MPAN + NO3 = MACP + NO2	$k = 2.20 \times 10^{-14} \exp(-500/T)$	4.11×10^{-15}
160	TR2 = 0.28 HO + 0.29 HO2 + 0.28 TOLP + 0.15 PER1 + 0.28 DCB2 + 0.01 CSL + 0.28 EPX	$k = 1.00 \times 10^{3}$	1.00×10^{3}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
161	TOLP = 0.49 HO + 0.01 HO2 + 0.5 PER1 + 0.49 DCB2 + 0.01 CSL	$k = 1.00 \times 10^{3}$	1.00×10^{3}
162	XY2 = 0.158 HO + 0.308 HO2 + 0.25 RCO3 + 0.308 XYLP + 0.15 PER2 + 0.224 DCB2 + 0.01 CSL + 0.84 EPX	$k = 1.00 \times 10^{3}$	1.00×10^{3}
163	XYLP = 0.39 HO + 0.01 HO2 + 0.5 PER2 + 0.49 DCB2 + 0.01 CSL	$k = 1.00 \times 10^{3}$	1.00×10^{3}
164	XYO2 = 0.158 HO + 0.308 HO2 + 0.25 RCO3 + 0.308 XYOP + 0.15 PER2 + 0.224 DCB2 + 0.01 CSL + 0.84 EPX	$k = 1.00 \times 10^{3}$	1.00×10^{3}
165	XYOP = 0.39 HO + 0.01 HO2 + 0.5 PER2 + 0.49 DCB2 + 0.01 CSL	$k = 1.00 \times 10^{3}$	1.00×10^{3}
166	ACO3 + NO2 = PAN	Falloff: F=0.6; n=1 $k(0) = 9.70 \times 10^{-29} (T/300)^{-5.6}$ $k(inf) = 9.30 \times 10^{-12} (T/300)^{-1.5}$	8.69×10^{-12}
167	PAN = ACO3 + NO2	$k = k(ref)/K$ $k(ref) = k(166)$ $K = 9.00 \times 10^{-29} \exp(14000/T)$	3.82×10^{-4}
168	RCO3 + NO2 = PPN	Falloff: F=0.6; n=1 $k(0) = 9.70 \times 10^{-29} (T/300)^{-5.6}$ $k(inf) = 9.30 \times 10^{-12} (T/300)^{-1.5}$	8.69×10^{-12}
169	PPN = RCO3 + NO2	$k = k(ref)/K$ $k(ref) = k(168)$ $K = 9.00 \times 10^{-29} \exp(14000/T)$	3.82×10^{-4}
170	MACP + NO2 = MPAN	$k = 2.80 \times 10^{-12} \exp(181/T)$	5.14×10^{-12}
171	MPAN = MACP + NO2	$k = 1.60 \times 10^{16} \exp(-13486/T)$	3.55×10^{-4}
172	MO2 + NO = HO2 + NO2 + HCHO	$k = 2.80 \times 10^{-12} \exp(300/T)$	7.66×10^{-12}
173	ETHP + NO = HO2 + NO2 + ACD	$k = 2.60 \times 10^{-12} \exp(365/T)$	8.85×10^{-12}
174	HC3P + NO = 0.66 HO2 + 0.131 MO2 + 0.048 ETHP + 0.089 XO2 + 0.935 NO2 + 0.504 ACD + 0.132 ALD + 0.165 ACT + 0.042 MEK + 0.065 ONIT	$k = 4.00 \times 10^{-12}$	4.00×10^{-12}
175	HC5P + NO = 0.2 HO2 + 0.051 MO2 + 0.231 ETHP + 0.235 XO2 + 0.864 NO2 + 0.018 HCHO + 0.045 ACD + 0.203 ALD + 0.039 KET + 0.217 ACT + 0.033 MEK + 0.272 HKET + 0.136 ONIT	$k = 4.00 \times 10^{-12}$	4.00×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
176	HC8P + NO = 0.606 HO2 + 0.133 ETHP + 0.416 XO2 + 0.739 NO2 + 0.15 ALD + 0.642 KET + 0.261 ONIT	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
177	ETEP + NO = HO2 + NO2 + 1.6 HCHO + 0.2 ALD	$k = 9.00x10^{-12}$	$9.00x10^{-12}$
178	OLTP + NO = 0.78 HO2 + 0.97 NO2 + 0.78 HCHO + 0.012 ACD + 0.44 ALD + 0.06 ACT + 0.13 MEK + 0.03 ONIT	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
179	OLIP + NO = 0.83 HO2 + 0.95 NO2 + 0.81 ACD + 0.68 ALD + 0.2 ACT + 0.09 KET + 0.02 HKET + 0.05 ONIT	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
180	BENP + NO = 0.918 HO2 + 0.918 NO2 + 0.459 DCB2 + 0.459 DCB3 + 0.918 GLY + 0.082 ONIT	$k = 2.54x10^{-12} \exp(360/T)$	$8.50x10^{-12}$
181	TLP1 + NO = NO2 + BALD	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
182	TOLP + NO = 0.95 HO2 + 0.95 NO2 + 0.95 DCB2 + 0.05 ONIT	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
183	PER1 + NO = 0.5 HO2 + 0.95 NO2 + 0.5 BALD + 0.5 MGLY + 0.5 DCB1 + 0.05 ONIT	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
184	XYL1 + NO = NO2 + BALD	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
185	XYLP + NO = 0.95 HO2 + 0.95 NO2 + 0.95 DCB3 + 0.05 ONIT	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
186	PER2 + NO = 0.95 HO2 + 0.95 NO2 + 0.95 MGLY + 0.95 DCB1 + 1.05 DCB3 + 0.05 ONIT	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
187	XYOP + NO = 0.95 HO2 + 0.95 NO2 + 0.35 GLY + 0.6 MGLY + 0.7 DCB1 + 0.073 DCB2 + 0.177 DCB3 + 0.05 ONIT	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
188	ISOP + NO = 0.88 HO2 + 0.88 NO2 + 0.2 HCHO + 0.28 MACR + 0.44 MVK + 0.12 ISON + 0.021 GLY + 0.029 HKET + 0.027 ALD	$k = 2.43x10^{-12} \exp(360/T)$	$8.13x10^{-12}$
189	APIP + NO = 0.82 HO2 + 0.82 NO2 + 0.23 HCHO + 0.43 ALD + 0.11 ACT + 0.44 KET + 0.07 ORA1 + 0.18 ONIT	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
190	LIMP + NO = HO2 + NO2 + 0.05 OLI + 0.43 HCHO + 0.68 UALD + 0.07 ORA1	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
191	ACO3 + NO = MO2 + NO2	$k = 8.10x10^{-12} \exp(270/T)$	$2.00x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
192	RCO3 + NO = ETHP + NO2	$k = 8.10x10^{-12} \exp(270/T)$	$2.00x10^{-11}$
193	ACTP + NO = ACO3 + NO2 + HCHO	$k = 2.90x10^{-12} \exp(300/T)$	$7.94x10^{-12}$
194	MEKP + NO = 0.67 HO2 + NO2 + 0.33 HCHO + 0.67 DCB1	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
195	KETP + NO = 0.77 HO2 + 0.23 ACO3 + 0.16 XO2 + NO2 + 0.54 MGLY + 0.46 ALD	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
196	MACP + NO = 0.65 MO2 + 0.35 ACO3 + 0.65 CO + NO2 + 0.65 HCHO	$k = 2.54x10^{-12} \exp(360/T)$	$8.50x10^{-12}$
197	MCP + NO = NO2 + 0.5 HO2 + 0.5 HCHO + HKET	$k = 2.54x10^{-12} \exp(360/T)$	$8.50x10^{-12}$
198	MVKP + NO = 0.3 HO2 + 0.7 ACO3 + 0.7 XO2 + NO2 + 0.3 HCHO + 0.7 ALD + 0.3 MGLY	$k = 2.54x10^{-12} \exp(360/T)$	$8.50x10^{-12}$
199	UALP + NO = HO2 + 0.61 CO + NO2 + 0.03 HCHO + 0.27 ALD + 0.7 KET + 0.18 GLY + 0.21 MGLY	$k = 2.54x10^{-12} \exp(360/T)$	$8.50x10^{-12}$
200	BALP + NO = BAL1 + NO2	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
201	BAL1 + NO = BAL2 + NO2	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
202	ADDC + NO = HO2 + NO2 + 0.32 HKET + 0.68 GLY + 0.68 OP2	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
203	MCTP + NO = MCTO + NO2	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
204	ORAP + NO = HO2 + NO2 + GLY	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
205	OLNN + NO = HO2 + NO2 + ONIT	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
206	OLND + NO = 2. NO2 + 0.287 HCHO + 1.24 ALD + 0.464 KET	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
207	ADCN + NO = 2. NO2 + GLY + OP2	$k = 2.70x10^{-12} \exp(360/T)$	$9.04x10^{-12}$
208	XO2 + NO = NO2	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
209	BAL2 + NO2 = ONIT	$k = 2.00x10^{-11}$	$2.00x10^{-11}$
210	CHO + NO2 = ONIT	$k = 2.00x10^{-11}$	$2.00x10^{-11}$
211	MCTO + NO2 = ONIT	$k = 2.08x10^{-12}$	$2.08x10^{-12}$
212	MO2 + HO2 = OP1	$k = 4.10x10^{-13} \exp(750/T)$	$5.08x10^{-12}$
213	ETHP + HO2 = OP2	$k = 7.50x10^{-13} \exp(700/T)$	$7.86x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
214	HC3P + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
215	HC5P + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
216	HC8P + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
217	ETEP + HO2 = OP2	$k = 1.90x10^{-13} \exp(1300/T)$	$1.49x10^{-11}$
218	OLTP + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
219	OLIP + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
220	BENP + HO2 = OP2	$k = 2.91x10^{-13} \exp(1300/T)$	$2.28x10^{-11}$
221	TLP1 + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
222	TOLP + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
223	PER1 + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
224	XYL1 + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
225	XYLP + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
226	PER2 + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
227	XYOP + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
228	ISOP + HO2 = ISHP	$k = 2.05x10^{-13} \exp(1300/T)$	$1.61x10^{-11}$
229	APIP + HO2 = OP2	$k = 1.50x10^{-11}$	$1.50x10^{-11}$
230	LIMP + HO2 = OP2	$k = 1.50x10^{-11}$	$1.50x10^{-11}$
231	ACO3 + HO2 = 0.44 HO + 0.44 MO2 + 0.15 ORA2 + 0.41 PAA + 0.44 CO2	$k = 4.30x10^{-13} \exp(1040/T)$	$1.41x10^{-11}$
232	RCO3 + HO2 = 0.44 HO + 0.44 ETHP + 0.15 ORA2 + 0.41 PAA + 0.44 CO2	$k = 4.30x10^{-13} \exp(1040/T)$	$1.41x10^{-11}$
233	ACTP + HO2 = 0.15 HO + 0.15 ACO3 + 0.15 HCHO + 0.85 OP2	$k = 1.15x10^{-13} \exp(1300/T)$	$9.02x10^{-12}$
234	MEKP + HO2 = OP2	$k = 1.15x10^{-13} \exp(1300/T)$	$9.02x10^{-12}$
235	KETP + HO2 = OP2	$k = 1.15x10^{-13} \exp(1300/T)$	$9.02x10^{-12}$
236	MACP + HO2 = MAHP	$k = 1.82x10^{-13} \exp(1300/T)$	$1.43x10^{-11}$
237	MCP + HO2 = MAHP	$k = 1.82x10^{-13} \exp(1300/T)$	$1.43x10^{-11}$
238	MVKP + HO2 = OP2	$k = 2.91x10^{-13} \exp(1300/T)$	$2.28x10^{-11}$
239	UALP + HO2 = OP2	$k = 2.91x10^{-13} \exp(1300/T)$	$2.28x10^{-11}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
240	ADDC + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
241	CHO + HO2 = CSL	$k = 1.00x10^{-11}$	$1.00x10^{-11}$
242	MCTP + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
243	ORAP + HO2 = OP2	$k = 1.15x10^{-13} \exp(1300/T)$	$9.02x10^{-12}$
244	OLNN + HO2 = ONIT	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
245	OLND + HO2 = ONIT	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
246	ADCN + HO2 = OP2	$k = 3.75x10^{-13} \exp(980/T)$	$1.01x10^{-11}$
247	XO2 + HO2 = OP2	$k = 1.66x10^{-13} \exp(1300/T)$	$1.30x10^{-11}$
248	MO2 + MO2 = 0.74 HO2 + 1.37 HCHO + 0.63 MOH	$k = 9.50x10^{-14} \exp(390/T)$	$3.52x10^{-13}$
249	ETHP + MO2 = HO2 + 0.75 HCHO + 0.75 ACD + 0.25 MOH + 0.25 EOH	$k = 1.18x10^{-13} \exp(158/T)$	$2.01x10^{-13}$
250	HC3P + MO2 = 0.894 HO2 + 0.08 MO2 + 0.026 ETHP + 0.026 XO2 + 0.827 HCHO + 0.198 ALD + 0.497 KET + 0.05 GLY + 0.25 MOH + 0.25 ROH	$k = 9.46x10^{-14} \exp(431/T)$	$4.02x10^{-13}$
251	HC5P + MO2 = 0.842 HO2 + 0.018 MO2 + 0.14 ETHP + 0.191 XO2 + 0.777 HCHO + 0.251 ALD + 0.618 KET + 0.25 MOH + 0.25 ROH	$k = 1.00x10^{-13} \exp(467/T)$	$4.79x10^{-13}$
252	HC8P + MO2 = 0.91 HO2 + 0.09 ETHP + 0.281 XO2 + 0.75 HCHO + 0.197 ALD + 0.652 KET + 0.25 MOH + 0.25 ROH	$k = 4.34x10^{-14} \exp(633/T)$	$3.63x10^{-13}$
253	ETEP + MO2 = HO2 + 1.95 HCHO + 0.15 ALD + 0.25 MOH + 0.25 ETEG	$k = 1.71x10^{-13} \exp(708/T)$	$1.84x10^{-12}$
254	OLTP + MO2 = HO2 + 1.5 HCHO + 0.705 ALD + 0.045 KET + 0.25 MOH + 0.25 ROH	$k = 1.46x10^{-13} \exp(708/T)$	$1.57x10^{-12}$
255	OLIP + MO2 = HO2 + 0.75 HCHO + 1.28 ALD + 0.218 KET + 0.25 MOH + 0.25 ROH	$k = 9.18x10^{-14} \exp(708/T)$	$9.88x10^{-13}$
256	BENP + MO2 = 1.6 HO2 + 0.459 DCB3 + HCHO + 0.459 DCB2 + 0.6 GLY	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
257	TLP1 + MO2 = HO2 + HCHO + BALD	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
258	TOLP + MO2 = 2. HO2 + HCHO + 0.271 GLY + DCB2	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
259	PER1 + MO2 = 2. HO2 + HCHO + MGLY + DCB1	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
260	XYL1 + MO2 = HO2 + HCHO + BALD	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
261	XYLP + MO2 = 2. HO2 + HCHO + DCB2	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
262	PER2 + MO2 = 2. HO2 + HCHO + MGLY + DCB1 + 1.05 DCB3	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
263	XYOP + MO2 = 2. HO2 + HCHO + 0.368 GLY + 0.632 MGLY + 0.737 DCB1 + 0.077 DCB2 + 0.186 DCB3	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
264	ISOP + MO2 = HO2 + 1.31 HCHO + 0.159 MACR + 0.25 MVK + 0.25 MOH + 0.25 ROH + 0.023 ALD + 0.018 GLY + 0.016 HKET	$k = 3.40x10^{-14} \exp(221/T)$	$7.14x10^{-14}$
265	APIP + MO2 = HO2 + 0.75 HCHO + 0.75 ALD + 0.75 KET + 0.25 MOH + 0.25 ROH	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
266	LIMP + MO2 = HO2 + 0.192 OLI + 1.04 HCHO + 0.308 MACR + 0.25 MOH + 0.25 ROH	$k = 3.56x10^{-14} \exp(708/T)$	$3.83x10^{-13}$
267	ACO3 + MO2 = 0.9 HO2 + 0.9 MO2 + HCHO + 0.1 ORA2 + 0.4 CO2	$k = 2.00x10^{-12} \exp(500/T)$	$1.07x10^{-11}$
268	RCO3 + MO2 = 0.9 HO2 + 0.9 MO2 + HCHO + 0.1 ORA2 + 0.4 CO2	$k = 2.00x10^{-12} \exp(500/T)$	$1.07x10^{-11}$
269	ACTP + MO2 = 0.5 HO2 + 0.5 ACO3 + 1.5 HCHO + 0.25 MOH + 0.25 ROH + 0.125 ORA2	$k = 7.50x10^{-13} \exp(500/T)$	$4.02x10^{-12}$
270	MEKP + MO2 = 0.834 HO2 + HCHO + 0.334 DCB1 + 0.25 MOH + 0.25 ROH	$k = 6.91x10^{-13} \exp(508/T)$	$3.80x10^{-12}$
271	KETP + MO2 = HO2 + 0.75 HCHO + 0.5 DCB1 + 0.25 MOH + 0.25 ROH	$k = 6.91x10^{-13} \exp(508/T)$	$3.80x10^{-12}$
272	MACP + MO2 = 0.5 HO2 + 0.269 ACO3 + 0.5 CO + 1.66 HCHO + 0.067 ORA2 + 0.25 MO2 + 0.25 MOH + 0.25 ROH	$k = 3.40x10^{-14} \exp(221/T)$	$7.14x10^{-14}$
273	MCP + MO2 = NO2 + HO2 + 1.5 HCHO + 0.5 HKET + 0.25 MOH + 0.25 ROH	$k = 3.40x10^{-14} \exp(221/T)$	$7.14x10^{-14}$
274	MVKP + MO2 = HO2 + 1.16 ACO3 + 1.16 XO2 + 1.5 HCHO + 1.75 ALD + 0.5 MGLY + 0.25 MOH + 0.25 ROH + 0.292 ORA2	$k = 8.37x10^{-14}$	$8.37x10^{-14}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
275	UALP + MO2 = HO2 + 0.305 CO + 0.773 HCHO + 0.203 ALD + 0.525 KET + 0.105 MGLY + 0.135 GLY + 0.25 MOH + 0.25 ROH	$k = 3.40 \times 10^{-14} \exp(221/T)$	7.14×10^{-14}
276	BALP + MO2 = HO2 + HCHO + BAL1	$k = 3.56 \times 10^{-14} \exp(708/T)$	3.83×10^{-13}
277	BAL1 + MO2 = HO2 + HCHO + BAL2	$k = 3.56 \times 10^{-14} \exp(708/T)$	3.83×10^{-13}
278	ADDC + MO2 = 2. HO2 + HCHO + 0.32 HKET + 0.68 GLY + 0.68 OP2	$k = 3.56 \times 10^{-14} \exp(708/T)$	3.83×10^{-13}
279	MCTP + MO2 = HO2 + MCTO + HCHO	$k = 3.56 \times 10^{-14} \exp(708/T)$	3.83×10^{-13}
280	ORAP + MO2 = HO2 + HCHO + GLY	$k = 7.50 \times 10^{-13} \exp(500/T)$	4.02×10^{-12}
281	OLNN + MO2 = 2. HO2 + HCHO + ONIT	$k = 1.60 \times 10^{-13} \exp(708/T)$	1.72×10^{-12}
282	OLND + MO2 = 0.5 HO2 + 0.5 NO2 + 0.965 HCHO + 0.93 ALD + 0.348 KET + 0.25 MOH + 0.25 ROH + 0.5 ONIT	$k = 9.68 \times 10^{-14} \exp(708/T)$	1.04×10^{-12}
283	ADCN + MO2 = HO2 + 0.7 NO2 + HCHO + 0.7 GLY + 0.7 OP2 + 0.3 ONIT	$k = 3.56 \times 10^{-14}$	3.56×10^{-14}
284	XO2 + MO2 = HO2 + HCHO	$k = 5.99 \times 10^{-15} \exp(1510/T)$	9.51×10^{-13}
285	ETHP + ACO3 = 0.5 HO2 + 0.5 MO2 + ACD + 0.5 ORA2	$k = 1.03 \times 10^{-12} \exp(211/T)$	2.09×10^{-12}
286	HC3P + ACO3 = 0.394 HO2 + 0.58 MO2 + 0.026 ETHP + 0.026 XO2 + 0.13 HCHO + 0.273 ALD + 0.662 KET + 0.067 GLY + 0.5 ORA2	$k = 6.90 \times 10^{-13} \exp(460/T)$	3.23×10^{-12}
287	HC5P + ACO3 = 0.342 HO2 + 0.518 MO2 + 0.14 ETHP + 0.191 XO2 + 0.042 HCHO + 0.381 ALD + 0.824 KET + 0.5 ORA2	$k = 5.59 \times 10^{-13} \exp(522/T)$	3.22×10^{-12}
288	HC8P + ACO3 = 0.303 HO2 + 0.5 MO2 + 0.067 ETHP + 0.208 XO2 + 0.217 ALD + 0.642 KET + 0.495 ORA2	$k = 2.47 \times 10^{-13} \exp(683/T)$	2.44×10^{-12}
289	ETEP + ACO3 = 0.5 HO2 + 0.5 MO2 + 1.6 HCHO + 0.2 ALD + 0.5 ORA2	$k = 9.48 \times 10^{-13} \exp(765/T)$	1.24×10^{-11}
290	OLTP + ACO3 = 0.5 HO2 + 0.5 MO2 + 0.94 ALD + HCHO + 0.06 KET + 0.5 ORA2	$k = 8.11 \times 10^{-13} \exp(765/T)$	1.06×10^{-11}
291	OLIP + ACO3 = 0.5 HO2 + 0.5 MO2 + 1.71 ALD + 0.29 KET + 0.5 ORA2	$k = 5.09 \times 10^{-13} \exp(765/T)$	6.63×10^{-12}
292	BENP + ACO3 = 0.6 HO2 + MO2 + 0.459 DCB2 + 0.458 DCB3 + 0.6 GLY	$k = 7.40 \times 10^{-13} \exp(765/T)$	9.64×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
293	TLP1 + ACO3 = MO2 + BALD	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
294	TOLP + ACO3 = HO2 + MO2 + DCB2	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
295	PER1 + ACO3 = HO2 + MO2 + MGLY + DCB1	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
296	XYL1 + ACO3 = MO2 + BALD	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
297	XYLP + ACO3 = HO2 + MO2 + DCB2	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
298	PER2 + ACO3 = HO2 + MO2 + MGLY + DCB1 + 1.05 DCB3	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
299	XYOP + ACO3 = HO2 + MO2 + 0.368 GLY + 0.632 MGLY + 0.737 DCB1 + 0.077 DCB2 + 0.186 DCB3	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
300	ISOP + ACO3 = 0.5 HO2 + 0.5 MO2 + 0.75 HCHO + 0.159 MACR + 0.25 MVK + 0.5 ORA2 + 0.031 ALD + 0.024 GLY + 0.033 HKET	$k = 8.40x10^{-14} \exp(221/T)$	$1.76x10^{-13}$
301	APIP + ACO3 = 0.5 HO2 + 0.5 MO2 + ALD + KET + ORA2	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
302	LIMP + ACO3 = 0.5 HO2 + 0.5 MO2 + 0.192 OLI + 0.385 HCHO + 0.308 MACR + 0.5 ORA2	$k = 7.40x10^{-13} \exp(765/T)$	$9.64x10^{-12}$
303	ACO3 + ACO3 = 2. MO2 + 2. CO2	$k = 2.50x10^{-12} \exp(500/T)$	$1.34x10^{-11}$
304	RCO3 + ACO3 = MO2 + ETHP + 2. CO2	$k = 2.50x10^{-12} \exp(500/T)$	$1.34x10^{-11}$
305	ACTP + ACO3 = 0.5 MO2 + 0.5 ACO3 + HCHO + 0.75 ORA2	$k = 7.51x10^{-13} \exp(565/T)$	$5.00x10^{-12}$
306	MEKP + ACO3 = 0.33 HO2 + 0.5 MO2 + 0.33 HCHO + 0.334 DCB1 + 0.5 ORA2	$k = 7.51x10^{-13} \exp(565/T)$	$5.00x10^{-12}$
307	KETP + ACO3 = 0.5 HO2 + 0.5 DCB1 + 0.5 MO2 + 0.5 ORA2	$k = 7.51x10^{-13} \exp(565/T)$	$5.00x10^{-12}$
308	MACP + ACO3 = 0.635 ORA2 + 0.5 MO2 + 0.269 ACO3 + 0.5 CO + HCHO	$k = 8.40x10^{-14} \exp(221/T)$	$1.76x10^{-13}$
309	MCP + ACO3 = NO2 + 0.5 HO2 + HCHO + 0.5 HKET + 0.5 MO2 + 0.5 ORA2	$k = 8.40x10^{-14} \exp(221/T)$	$1.76x10^{-13}$
310	MVKP + ACO3 = 0.5 HO2 + 0.5 MO2 + 1.16 ACO3 + 1.16 XO2 + HCHO + 2.3 ALD + 0.5 MGLY + 1.083 ORA2	$k = 1.68x10^{-12} \exp(500/T)$	$8.99x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
311	UALP + ACO3 = 0.5 HO2 + 0.5 MO2 + 0.5 CO + 0.03 HCHO + 0.27 ALD + 0.7 KET + 0.18 GLY + 0.105 MGLY + 0.5 ORA2	$k = 1.68 \times 10^{-12} \exp(500/T)$	8.99×10^{-12}
312	BALP + ACO3 = MO2 + BAL1	$k = 7.40 \times 10^{-13} \exp(765/T)$	9.64×10^{-12}
313	BAL1 + ACO3 = MO2 + BAL2	$k = 7.40 \times 10^{-13} \exp(765/T)$	9.64×10^{-12}
314	ADDC + ACO3 = 2. HO2 + MO2 + 0.32 HKET + 0.68 GLY + 0.68 OP2	$k = 7.40 \times 10^{-13} \exp(708/T)$	7.96×10^{-12}
315	MCTP + ACO3 = HO2 + MO2 + MCTO	$k = 7.40 \times 10^{-13} \exp(708/T)$	7.96×10^{-12}
316	ORAP + ACO3 = MO2 + GLY	$k = 7.51 \times 10^{-13} \exp(565/T)$	5.00×10^{-12}
317	OLNN + ACO3 = HO2 + MO2 + ONIT	$k = 8.85 \times 10^{-13} \exp(765/T)$	1.15×10^{-11}
318	OLND + ACO3 = 0.5 MO2 + NO2 + 0.287 HCHO + 1.24 ALD + 0.464 KET + 0.5 ORA2	$k = 5.37 \times 10^{-13} \exp(765/T)$	7.00×10^{-12}
319	ADCN + ACO3 = HO2 + MO2 + 0.7 NO2 + 0.7 GLY + 0.7 OP2 + 0.3 ONIT	$k = 7.40 \times 10^{-13} \exp(708/T)$	7.96×10^{-12}
320	XO2 + ACO3 = MO2	$k = 3.40 \times 10^{-14} \exp(1560/T)$	6.38×10^{-12}
321	RCO3 + RCO3 = 2. ETHP + 2. CO2	$k = 2.50 \times 10^{-12} \exp(500/T)$	1.34×10^{-11}
322	MO2 + NO3 = HO2 + HCHO + NO2	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
323	ETHP + NO3 = HO2 + NO2 + ACD	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
324	HC3P + NO3 = 0.254 HO2 + 0.14 MO2 + 0.092 XO2 + 0.503 ETHP + NO2 + 0.519 ACD + 0.147 ALD + 0.075 MEK + 0.095 ACT	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
325	HC5P + NO3 = 0.488 HO2 + 0.055 MO2 + 0.28 ETHP + 0.485 XO2 + NO2 + 0.024 HCHO + 0.241 ALD + 0.06 KET + 0.063 MEK + 0.247 ACT + 0.048 ACD + 0.275 HKET	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
326	HC8P + NO3 = 0.82 HO2 + 0.18 ETHP + 0.563 XO2 + NO2 + 0.203 ALD + 0.869 KET	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
327	ETEP + NO3 = HO2 + NO2 + 1.6 HCHO + 0.2 ALD	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
328	OLTP + NO3 = 0.47 ALD + 0.79 HCHO + 0.79 HO2 + NO2 + 0.18 MEK + 0.02 ACD + 0.09 ACT	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}
329	OLIP + NO3 = 0.86 HO2 + 0.72 ALD + 0.11 KET + NO2 + 0.2 ACT + 0.85 ACD + 0.04 HKET	$k = 1.20 \times 10^{-12}$	1.20×10^{-12}

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
330	BENP + NO3 = HO2 + NO2 + 0.5 DCB2 + 0.5 DCB3 + GLY	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
331	TLP1 + NO3 = NO2 + BALD	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
332	TOLP + NO3 = HO2 + NO2 + DCB2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
333	PER1 + NO3 = 0.5 HO2 + NO2 + 0.5 MGLY + 0.5 DCB1 + 0.5 BALD	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
334	XYL1 + NO3 = NO2 + BALD	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
335	XYLP + NO3 = HO2 + NO2 + DCB3	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
336	PER2 + NO3 = HO2 + NO2 + MGLY + DCB1 + 1.05 DCB3	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
337	XYOP + NO3 = HO2 + NO2 + 0.368 GLY + 0.632 MGLY + 0.737 DCB1 + 0.077 DCB2 + 0.186 DCB3	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
338	ISOP + NO3 = HO2 + NO2 + 0.75 HCHO + 0.318 MACR + 0.5 MVK + 0.024 GLY + 0.033 HKET + 0.031 ALD	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
339	APIP + NO3 = HO2 + NO2 + ALD + KET	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
340	LIMP + NO3 = HO2 + NO2 + 0.385 OLI + 0.385 HCHO + 0.615 MACR	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
341	ACO3 + NO3 = MO2 + NO2	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
342	RCO3 + NO3 = ETHP + NO2	$k = 4.00x10^{-12}$	$4.00x10^{-12}$
343	ACTP + NO3 = ACO3 + NO2 + HCHO	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
344	MEKP + NO3 = 0.67 HO2 + NO2 + 0.33 HCHO + 0.67 DCB1	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
345	KETP + NO3 = HO2 + NO2 + DCB1	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
346	MACP + NO3 = HCHO + 0.538 ACO3 + CO + NO2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
347	MCP + NO3 = NO2 + HO2 + HCHO + HKET	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
348	MVKP + NO3 = 0.3 HO2 + 0.7 ACO3 + 0.7 XO2 + NO2 + 0.3 HCHO + 0.7 ALD + 0.3 MGLY	$k = 2.50x10^{-12}$	$2.50x10^{-12}$
349	UALP + NO3 = HO2 + 0.61 CO + NO2 + 0.03 HCHO + 0.27 ALD + 0.7 KET + 0.18 GLY + 0.21 MGLY	$k = 2.50x10^{-12}$	$2.50x10^{-12}$

Number	Reactants and Products	Rate Constant Expression [a]	k_{298}
350	BALP + NO3 = BAL1 + NO2	$k = 2.50x10^{-12}$	$2.50x10^{-12}$
351	BAL1 + NO3 = BAL2 + NO2	$k = 2.50x10^{-12}$	$2.50x10^{-12}$
352	ADDC + NO3 = HO2 + NO2 + 0.32 HKET + 0.68 GLY + 0.68 OP2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
353	MCTP + NO3 = MCTO + NO2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
354	ORAP + NO3 = HO2 + NO2 + GLY	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
355	OLNN + NO3 = HO2 + NO2 + ONIT	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
356	OLND + NO3 = 2. NO2 + 0.287 HCHO + 1.24 ALD + 0.464 KET	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
357	ADCN + NO3 = 2. NO2 + GLY + OP2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
358	OLNN + OLNN = HO2 + 2. ONIT	$k = 7.00x10^{-14} \exp(1000/T)$	$2.01x10^{-12}$
359	OLNN + OLND = 0.5 HO2 + 0.5 NO2 + 0.202 HCHO + 0.64 ALD + 0.149 KET + 1.5 ONIT	$k = 4.25x10^{-14} \exp(1000/T)$	$1.22x10^{-12}$
360	OLND + OLND = NO2 + 0.504 HCHO + 1.21 ALD + 0.285 KET + ONIT	$k = 2.96x10^{-14} \exp(1000/T)$	$8.49x10^{-13}$
361	XO2 + NO3 = NO2	$k = 1.20x10^{-12}$	$1.20x10^{-12}$
362	XO2 + RCO3 = ETHP + CO2	$k = 2.50x10^{-12} \exp(500/T)$	$1.34x10^{-11}$
363	XO2 + XO2 =	$k = 7.13x10^{-17} \exp(2950/T)$	$1.42x10^{-12}$
364	ACT + HO = ACTP + H2O	$k = 3.82x10^{-11} \exp(-2000/T)$	$4.65x10^{-14}$
365	ECH4 + HO = MO2 + H2O	$k = 1.85x10^{-12} \exp(-1690/T)$	$6.37x10^{-15}$
366	DMS + OH = SO2 + HCHO + MO2	$k = 1.12x10^{-11} \exp(-250/T)$	$4.84x10^{-12}$
367	DMS + OH + O2 = SULF + MO2	$k = 1.28x10^{-37} \exp(4480/T)$	$4.33x10^{-31}$
368	DMS + NO3 = SO2 + HCHO + MO2 + HNO3	$k = 1.90x10^{-13} \exp(520/T)$	$1.09x10^{-12}$
369	SO2 = SULF	$k = 0$	0
370	ACT = CO + 2. MO2	Photolysis	$7.57x10^{-8}$
371	ONIT = HNO3	$k = 2.30x10^{-5}$	$2.30x10^{-5}$
372	ISON = HNO3	$k = 2.30x10^{-5}$	$2.30x10^{-5}$

[a] Rate constants defined by a Troe falloff expression are evaluated as described by Mellouki et al. (2021)

Table S14. RACM2s21 species names, descriptions, atom counts and molecular weights (g/mol).

Species	Description	C	H	O	N	S	M Wt [a]
ACD	Acetaldehyde	2	4	1			44.0
ACE	Ethyne	2	2				26.0
ACT	Acetone	3	6	1			58.1
ALD	Higher aldehydes (R-C-CHO)	3	6	1			58.1
API	α-Pinene	10	16				136.2
BALD	Benzaldehyde	7	6	1			106.1
BEN	Benzene	6	6				78.1
CH4	Background methane (see also ECH4)	1	4				16.0
CO	Carbon monoxide	1		1			28.0
CSL	Cresols	7	8	1			108.1
DCB1	Aromatic ring opening product (unsaturated dicarbonyl)	4	4	2			84.0
DCB2	Aromatic ring opening product (unsaturated dicarbonyl)	4	4	2			84.0
DCB3	Aromatic ring opening product (unsaturated dicarbonyl)	4	4	2			84.0
DIEN	Dienes	4	8				56.1
DMS	Dimethyl sulfide	2	6			1	62.1
ECH4	Emitted methane (to enable tracking seperate from CH4)	1	4				16.0
EOH	Ethanol	2	6	1			46.1
EPX	Organic expoxide aldehyde	6	6	3			126.1
ETE	Ethene	2	4				28.0
ETEG	Ethylene glycol (Ethane-1,2-diol)	2	6	2			62.0
ETH	Ethane	2	6				30.1
GLY	Glyoxal	2	2	2			58.0
H2O2	Hydrogen		2				2.0
H2O2	Hydrogen peroxide		2	2			34.0
HC3	Propane and similar	3.6	9.2				52.5
HC5	Pentane and similar	5.6	13.2				80.5

Species	Description	C	H	O	N	S	M Wt [a]
HC8	Octane and similar	7.9	17.8				112.8
HCHO	Formaldehyde	1	2	1			30.0
HKET	Hydroxyketones	3	6	2			74.1
HNO3	Nitric acid		1	3	1		63.0
HNO4	Peroxynitric acid		1	4	1		79.0
HONO	Nitrous acid		1	2	1		47.0
ISHP	Hydroperoxides from ISOP reaction with HO2	5	10	3			118.1
ISO	Isoprene	5	8				68.1
ISON	Organic nitrates from ISOP reaction with NO	5	9	4	1		147.1
KET	Ketone	5	10	1			86.1
LIM	Limonene	10	16				136.2
MACR	Methacrolein (2-Methylprop-2-enal)	4	6	1			70.1
MAHP	Methacrolein hydroperoxide	4	8	4			120.1
MCT	Catechols	7	8	2			124.1
MEK	Methyl ethyl ketone (2-butanone)	4	8	1			72.1
MGLY	Methylglyoxal	3	4	2			72.0
MOH	Methanol	1	4	1			32.0
MPAN	PAN compound from Methacrolein	4	6	5	1		148.0
MVK	Methyl vinyl ketone (but-3-en-2-one)	4	6	1			70.1
N2O5	Dinitrogen pentoxide			5	2		108.0
NALD	Nitrooxyaldehyde	2	3	4	1		105.0
NO	Nitric oxide			1	1		30.0
NO2	Nitrogen dioxide			2	1		46.0
NO3	Nitrate radical			3	1		62.0
O3	Ozone			3			48.0
OLI	Internal olefins (R-C=C-R)	5	10				70.1
OLT	Terminal olefins (R-C=C)	3.8	7.6				53.3

Species	Description	C	H	O	N	S	M Wt [a]
ONIT	Organic nitrate	4	9	3	1		119.1
OP1	Methylhydroperoxide	1	4	2			48.0
OP2	Higher organic peroxide	4	10	2			90.1
ORA1	Formic acid	1	2	2			46.0
ORA2	Acetic and higher acids	2	4	2			60.0
PAA	Peroxyacetic and higher peroxycarboxylic acids	3	6	3			90.0
PAN	Peroxyacetyl Nitrate	2	3	5	1		121.0
PHEN	Phenol	7	8	1			108.1
PPN	Peroxypropionyl and higher peroxyacyl nitrates	3	5	5	1		135.0
ROH	Larger alcohols	3	8	1			60.1
SO2	Sulfur dioxide			2		1	64.0
SULF	Sulfuric acid (gaseous)		2	4		1	98.0
TOL	Toluene and other monoalkyl aromatics	7.1	9.1				94.4
UALD	Aldehyde	4	4	2			84.0
XYM	m-Xylene and other aromatics	8.9	12.9				119.9
XYO	o-Xylene and other aromatics	8.9	12.9				119.9
XYP	p-Xylene and other aromatics	9	13.0				121.2
ACO3	Acetylperoxy radical	2	3	3			75.0
ACTP	Acetone peroxy radical	3	5	3			89.0
ADCN	Nitrooxy peroxy radical from phenol/cresols	7	8	6	1		202.1
ADDC	Peroxy radical from phenol/cresols	7	7	2			123.1
APIP	α-Pinene peroxy radical	10	17	3			185.2
BAL1	Benzaldehyde peroxy radical	6	5	2			109.1
BAL2	Benzaldehyde oxy radical	6	5	1			93.1
BALP	Benzaldehyde peroxy radical	7	5	3			137.1
BENP	Benzene peroxy radical	6	7	3			127.1
CHO	Phenoxy radical	6	5	1			93.1

Species	Description	C	H	O	N	S	M Wt [a]
ETEP	Ethene peroxy radical	2	5	3			77.0
ETHP	Ethane peroxy radical	2	5	2			61.0
HC3P	HC3 peroxy radical	3.6	8.2	2			83.5
HC5P	HC5 peroxy radical	5.6	12.2	2			111.5
HC8P	HC8 peroxy radical	7.9	16.8	2			143.8
HO2	Hydroperoxy radical		1	2			33.0
ISOP	Peroxy radical from OH addition to isoprene	5	9	3			117.1
KETP	Ketone peroxy radical	5	9	3			117.1
LIMP	Limonene peroxy radical	10	17	3			185.2
MACP	Peroxymethacroyl radical	4	5	3			101.0
MCP	Methacrolein peroxy radical	4	7	3			103.1
MCTO	Catechol oxy radical	7	7	2			123.1
MCTP	Catechol peroxy radical	7	7	3			139.1
MEKP	Methylethyl ketone peroxy radical	4	7	3			103.1
MO2	Methyl peroxy radical	1	3	2			47.0
MVKP	Methylvinyl ketone peroxy radical	4	7	4			119.0
O	Oxygen atom in the O3(P) electronic state			1			16.0
O1D	Oxygen atom in the O1(D) electronic state			1			16.0
OH	Hydroxyl radical		1	1			17.0
OLIP	Internal olefin peroxy radical	5	11	3			119.1
OLND	Nitrooxy peroxy radical	2	5	5	1		123.0
OLNN	Nitrooxy peroxy radical	2	5	5	1		123.0
OLTP	Terminal olefin peroxy radical	3.8	8.6	3			102.3
ORAP	Organic acid peroxy radical	2	3	4			91.0
PER1	Toluene peroxy radical	7.1	10.1	3			143.4
PER2	Xylene peroxy radical	8.9	13.9	3			168.9
RCO3	Acylperoxy radical	3	5	3			89.0

Species	Description	C	H	O	N	S	M Wt [a]
TLP1	Toluene peroxy radical	7.1	10.1	3			143.4
TOLP	Toluene peroxy radical	7.1	10.1	3			143.4
TR2	Toluene peroxy radical	7.1	10.1	3			143.4
UALP	Aldehyde peroxy radical	4	3	4			115.0
XO2	Peroxy radical	2	5	2			61.0
XY2	Xylene peroxy radical	8.9	13.9	3			168.9
XYL1	Xylene peroxy radical	8.9	13.9	3			168.9
XYLP	Xylene peroxy radical	8.9	13.9	3			168.9
XYO2	Xylene peroxy radical	8.9	13.9	3			168.9
XYOP	Xylene peroxy radical	8.9	13.9	3			168.9

[a] M Wt. and atom count uncertain for lumped radicals, e.g., from aromatic species

Table S15. Zenith angle (degrees) dependence of photolysis frequencies (s^{-1}) for RACM2s21 reactions computed by the TUV discrete ordinates radiative transfer scheme (Stamnes et al., 1988) with cross-section and quantum yield data for each reaction recommended by the mechanism developer. Conditions are 600 m above ground level at mean sea level with surface UV albedo of 0.04, stratospheric ozone column of 0.3 atm cm, and the aerosol profile of Elterman (1968) provided with TUV.

Reaction Number	**Reactant**	**Solar zenith angle (degree)**					
		0	**20**	**40**	**60**	**78**	**86**
1	NO2	$1.03x10^{-2}$	$9.98x10^{-3}$	$8.95x10^{-3}$	$6.45x10^{-3}$	$2.15x10^{-3}$	$5.25x10^{-4}$
2	O3	$4.38x10^{-4}$	$4.31x10^{-4}$	$4.05x10^{-4}$	$3.40x10^{-4}$	$1.80x10^{-4}$	$4.28x10^{-5}$
3	O3	$4.81x10^{-5}$	$4.23x10^{-5}$	$2.70x10^{-5}$	$9.30x10^{-6}$	$9.63x10^{-7}$	$1.58x10^{-7}$
4	H2O2	$8.79x10^{-6}$	$8.26x10^{-6}$	$6.64x10^{-6}$	$3.78x10^{-6}$	$8.82x10^{-7}$	$2.03x10^{-7}$
5	NO3	$2.26x10^{-2}$	$2.25x10^{-2}$	$2.17x10^{-2}$	$1.93x10^{-2}$	$1.09x10^{-2}$	$2.54x10^{-3}$
6	NO3	$1.85x10^{-1}$	$1.83x10^{-1}$	$1.76x10^{-1}$	$1.53x10^{-1}$	$8.08x10^{-2}$	$1.76x10^{-2}$
7	HONO	$1.52x10^{-3}$	$1.47x10^{-3}$	$1.30x10^{-3}$	$9.12x10^{-4}$	$2.87x10^{-4}$	$7.28x10^{-5}$
8	HNO3	$8.35x10^{-7}$	$7.60x10^{-7}$	$5.50x10^{-7}$	$2.52x10^{-7}$	$4.20x10^{-8}$	$8.03x10^{-9}$
9	HNO4	$8.33x10^{-6}$	$7.71x10^{-6}$	$5.91x10^{-6}$	$3.07x10^{-6}$	$6.31x10^{-7}$	$1.36x10^{-7}$
10	HCHO	$6.29x10^{-5}$	$6.00x10^{-5}$	$5.05x10^{-5}$	$3.14x10^{-5}$	$8.27x10^{-6}$	$2.03x10^{-6}$
11	HCHO	$4.30x10^{-5}$	$4.03x10^{-5}$	$3.18x10^{-5}$	$1.73x10^{-5}$	$3.58x10^{-6}$	$7.35x10^{-7}$
12	ACD	$6.38x10^{-6}$	$5.77x10^{-6}$	$4.08x10^{-6}$	$1.73x10^{-6}$	$2.28x10^{-7}$	$3.58x10^{-8}$
13	ALD	$2.10x10^{-5}$	$1.93x10^{-5}$	$1.43x10^{-5}$	$6.80x10^{-6}$	$1.14x10^{-6}$	$2.11x10^{-7}$
14	ACT	$9.41x10^{-7}$	$8.27x10^{-7}$	$5.30x10^{-7}$	$1.85x10^{-7}$	$1.90x10^{-8}$	$2.85x10^{-9}$
15	UALD	$1.56x10^{-5}$	$1.50x10^{-5}$	$1.29x10^{-5}$	$8.43x10^{-6}$	$2.41x10^{-6}$	$6.05x10^{-7}$
16	MEK	$5.05x10^{-6}$	$4.61x10^{-6}$	$3.37x10^{-6}$	$1.54x10^{-6}$	$2.42x10^{-7}$	$4.25x10^{-8}$
17	KET	$5.32x10^{-6}$	$4.85x10^{-6}$	$3.52x10^{-6}$	$1.59x10^{-6}$	$2.42x10^{-7}$	$4.19x10^{-8}$
18	HKET	$2.51x10^{-6}$	$2.30x10^{-6}$	$1.72x10^{-6}$	$8.51x10^{-7}$	$1.64x10^{-7}$	$3.40x10^{-8}$
19	MACR	$4.64x10^{-6}$	$4.46x10^{-6}$	$3.84x10^{-6}$	$2.52x10^{-6}$	$7.22x10^{-7}$	$1.82x10^{-7}$
20	MVK	$1.13x10^{-6}$	$1.07x10^{-6}$	$8.71x10^{-7}$	$5.10x10^{-7}$	$1.23x10^{-7}$	$2.89x10^{-8}$
21	GLY	$7.87x10^{-6}$	$7.35x10^{-6}$	$5.78x10^{-6}$	$3.12x10^{-6}$	$6.63x10^{-7}$	$1.44x10^{-7}$
22	GLY	$3.52x10^{-5}$	$3.32x10^{-5}$	$2.70x10^{-5}$	$1.57x10^{-5}$	$3.83x10^{-6}$	$8.70x10^{-7}$
23	GLY	$7.99x10^{-5}$	$7.69x10^{-5}$	$6.67x10^{-5}$	$4.53x10^{-5}$	$1.43x10^{-5}$	$3.35x10^{-6}$

Reaction Number	Reactant	Solar zenith angle (degree)					
		0	**20**	**40**	**60**	**78**	**86**
24	MGLY	7.21×10^{-4}	7.04×10^{-4}	6.43×10^{-4}	4.89×10^{-4}	1.81×10^{-4}	4.15×10^{-5}
25	DCB1	7.21×10^{-4}	7.04×10^{-4}	6.43×10^{-4}	4.89×10^{-4}	1.81×10^{-4}	4.15×10^{-5}
26	DCB2	7.21×10^{-4}	7.04×10^{-4}	6.43×10^{-4}	4.89×10^{-4}	1.81×10^{-4}	4.15×10^{-5}
27	BALD	4.52×10^{-5}	4.34×10^{-5}	3.71×10^{-5}	2.41×10^{-5}	6.79×10^{-6}	1.71×10^{-6}
28	OP1	5.95×10^{-6}	5.61×10^{-6}	4.55×10^{-6}	2.64×10^{-6}	6.38×10^{-7}	1.50×10^{-7}
29	OP2	5.95×10^{-6}	5.61×10^{-6}	4.55×10^{-6}	2.64×10^{-6}	6.38×10^{-7}	1.50×10^{-7}
30	PAA	9.28×10^{-7}	8.63×10^{-7}	6.69×10^{-7}	3.54×10^{-7}	7.36×10^{-8}	1.58×10^{-8}
31	ONIT	3.36×10^{-6}	3.08×10^{-6}	2.27×10^{-6}	1.07×10^{-6}	1.85×10^{-7}	3.55×10^{-8}
32	PAN	6.28×10^{-7}	5.78×10^{-7}	4.35×10^{-7}	2.20×10^{-7}	4.43×10^{-8}	9.56×10^{-9}
33	PAN	3.47×10^{-7}	3.24×10^{-7}	2.54×10^{-7}	1.37×10^{-7}	2.92×10^{-8}	6.31×10^{-9}
370	ACT	3.07×10^{-7}	2.75×10^{-7}	1.88×10^{-7}	7.57×10^{-8}	9.48×10^{-9}	1.47×10^{-9}

Exhibit S1. Fortran code to compute CPA net ozone production (PO3_net) and net NO_Z production NOz_prod) from reaction rates (r) for CB6r5.

```
c
c --- Net O3 production
c
      PO3_net =
     &       +           r(  2)  ! O + O2 + M =
     &       + ( 0.130)*r( 57)  ! C2O3 + HO2 =
     &       + ( 0.130)*r( 65)  ! CXO3 + HO2 =
     &       + ( 0.130)*r(202)  ! OPO3 + HO2 =
     &       -           r(  3)  ! O3 + NO =
     &       -           r(  7)  ! O + O3 =
     &       -           r(  8)  ! O3 =
     &       -           r(  9)  ! O3 =
     &       -           r( 12)  ! O3 + OH =
     &       -           r( 13)  ! O3 + HO2 =
     &       -           r( 26)  ! NO2 + O3 =
     &       -           r( 34)  ! NO3 + O3 =
     &       -           r(135)  ! ETH + O3 =
     &       -           r(138)  ! OLE + O3 =
     &       -           r(141)  ! IOLE + O3 =
     &       -           r(149)  ! ISOP + O3 =
     &       -           r(152)  ! ISPD + O3 =
     &       -           r(165)  ! TERP + O3 =
     &       -           r(191)  ! XOPN + O3 =
     &       -           r(195)  ! OPEN + O3 =
```

```
c
c --- Net NOz production
c
      NO2wOH = + r( 45) + r(234)
c
      NO3wVOC =
     &       +          r( 99)  ! FORM + NO3 =
     &       +          r(105)  ! ALD2 + NO3 =
     &       +          r(108)  ! ALDX + NO3 =
     &       +          r(136)  ! ETH + NO3 =
     &       +          r(139)  ! OLE + NO3 =
     &       +          r(142)  ! IOLE + NO3 =
     &       +          r(150)  ! ISOP + NO3 =
     &       +          r(166)  ! TERP + NO3 =
c
      N2O5wH2O =
     &       + ( 2.000)*r( 39)  ! N2O5 + H2O =
c
      PAN_prdNet =
     &       +          r( 54)  ! C2O3 + NO2 =
     &       +          r( 62)  ! CXO3 + NO2 =
     &       +          r(200)  ! OPO3 + NO2 =
     &       -          r( 55)  ! PAN =
     &       -          r( 56)  ! PAN =
     &       -          r( 63)  ! PANX =
     &       -          r( 64)  ! PANX =
     &       -          r(201)  ! OPAN =
     &       -          r(205)  ! OPAN + OH =
     &       -          r(206)  ! PANX + OH =
c
      ON_prod =
     &       + ( 0.500)*r( 83)  ! XO2N + NO =   0.500 NTR1
     &       +          r(132)  ! ROR + NO2 =   1.000 NTR1
     &       + ( 0.500)*r(136)  ! ETH + NO3 =   0.500 NTR1
     &       + ( 0.500)*r(139)  ! OLE + NO3 =   0.500 NTR1
     &       + ( 0.500)*r(142)  ! IOLE + NO3 =   0.500 NTR1
     &       + ( 0.500)*r( 83)  ! XO2N + NO =   0.500 NTR2
     &       + ( 0.650)*r(150)  ! ISOP + NO3 =   0.650 NTR2
     &       + ( 0.142)*r(153)  ! ISPD + NO3 =   0.142 NTR2
     &       + ( 0.530)*r(166)  ! TERP + NO3 =   0.530 NTR2
     &       + ( 0.082)*r(168)  ! BZO2 + NO =   0.082 NTR2
     &       + ( 0.140)*r(173)  ! TO2 + NO =   0.140 NTR2
     &       + ( 0.140)*r(178)  ! XLO2 + NO =   0.140 NTR2
     &       + ( 0.500)*r(192)  ! XOPN + NO3 =   0.500 NTR2
     &       + ( 0.500)*r(205)  ! OPAN + OH =   0.500 NTR2
     &       + ( 0.100)*r(144)  ! ISO2 + NO =   0.100 INTR
     &       +          r(184)  ! CRO + NO2 =   1.000 CRON
c
      ON_dest =
     &       +          r( 92)  ! NTR1 =
     &       +          r(207)  ! NTR2 =
     &       + ( 0.629)*r(163)  ! INTR + OH =
     &       +          r(229)  ! INTR =
     &       +          r(188)  ! CRON =
c
```

```
        NOz_prod = NO2wOH + NO3wVOC + N2O5wH2O
     &             + PAN_prdNet + ON_prod - ON_dest
```

Exhibit S2. Fortran code to compute CPA net ozone production (PO3_net) and net NO_Z production NOz_prod) from reaction rates (r) for CB7r1.

```
c
c --- Net O3 production
c
      PO3_net =
     &       +          r(  2)  ! O2 + O + M =
     &       + ( 0.130)*r( 60)  ! C2O3 + HO2 =
     &       + ( 0.060)*r( 67)  ! CXO3 + HO2 =
     &       + ( 0.130)*r( 73)  ! OPO3 + HO2 =
     &       -          r(  3)  ! NO + O3 =
     &       -          r(  7)  ! O3 + O =
     &       -          r(  8)  ! O3 =
     &       -          r(  9)  ! O3 =
     &       -          r( 12)  ! O3 + OH =
     &       -          r( 13)  ! O3 + HO2 =
     &       -          r( 26)  ! NO2 + O3 =
     &       -          r(140)  ! ETH + O3 =
     &       -          r(143)  ! OLE + O3 =
     &       -          r(146)  ! IOLE + O3 =
     &       -          r(162)  ! OPEN + O3 =
     &       -          r(166)  ! XOPN + O3 =
     &       -          r(183)  ! ISOP + O3 =
     &       -          r(200)  ! APIN + O3 =
     &       -          r(206)  ! TERP + O3 =
     &       -          r(209)  ! SQT + O3 =
     &       -          r(213)  ! TPRD + O3 =
```

```
c
c --- Net NOz production
c
      NO2wOH = + r( 41) + r( 42)
c
      NO3wVOC =
     &       +          r(103)  ! FORM + NO3 =
     &       +          r(105)  ! ALD2 + NO3 =
     &       +          r(108)  ! ALDX + NO3 =
     &       +          r(141)  ! ETH + NO3 =
     &       +          r(144)  ! OLE + NO3 =
     &       +          r(147)  ! IOLE + NO3 =
     &       +          r(184)  ! ISOP + NO3 =
     &       +          r(201)  ! APIN + NO3 =
     &       +          r(207)  ! TERP + NO3 =
     &       +          r(210)  ! SQT + NO3 =
c
      N2O5wH2O =
     &       + ( 2.000)*r( 37)  ! N2O5 + H2O =
c
      PAN_prdNet =
```

```
     &       +          r( 57)  ! C2O3 + NO2 =
     &       +          r( 64)  ! CXO3 + NO2 =
     &       +          r( 70)  ! OPO3 + NO2 =
     &       -          r( 58)  ! PAN =
     &       -          r( 59)  ! PAN =
     &       -          r( 65)  ! PANX =
     &       -          r( 66)  ! PANX + OH =
     &       -          r( 71)  ! OPAN =
     &       -          r( 72)  ! OPAN + OH =
c
      ON_prod =
     &       + ( 0.500)*r( 72)  ! OPAN + OH =   0.500 NTR2
     &       + ( 0.500)*r( 90)  ! XO2N + NO =   0.500 NTR2
     &       + ( 0.082)*r(149)  ! BZO2 + NO =   0.082 NTR2
     &       + ( 0.140)*r(153)  ! TO2 + NO =   0.140 NTR2
     &       + ( 0.140)*r(157)  ! XLO2 + NO =   0.140 NTR2
     &       + ( 0.500)*r(167)  ! XOPN + NO3 =   0.500 NTR2
     &       + ( 0.750)*r(184)  ! ISOP + NO3 =   0.750 NTR2
     &       + ( 0.900)*r(186)  ! ISPD + NO3 =   0.900 NTR2
     &       + ( 0.020)*r(192)  ! EPX2 + NO =   0.020 NTR2
     &       + ( 0.230)*r(197)  ! APO2 + NO =   0.230 NTR2
     &       + ( 0.240)*r(201)  ! APIN + NO3 =   0.240 NTR2
     &       + ( 0.250)*r(203)  ! TPO2 + NO =   0.250 NTR2
     &       + ( 0.650)*r(207)  ! TERP + NO3 =   0.650 NTR2
     &       + ( 0.420)*r(210)  ! SQT + NO3 =   0.420 NTR2
     &       + ( 0.050)*r(212)  ! TPRD + NO3 =   0.050 NTR2
     &       + ( 0.500)*r( 90)  ! XO2N + NO =   0.500 NTR1
     &       + ( 0.500)*r(141)  ! ETH + NO3 =   0.500 NTR1
     &       + ( 0.500)*r(144)  ! OLE + NO3 =   0.500 NTR1
     &       + ( 0.500)*r(147)  ! IOLE + NO3 =   0.500 NTR1
     &       + ( 0.500)*r(169)  ! CRES + NO3 =   0.500 CRON
     &       +          r(170)  ! CRO + NO2 =   1.000 CRON
     &       + ( 0.100)*r(179)  ! ISO2 + NO =   0.100 INTR
c
      ON_dest =
     &       +          r( 97)  ! NTR2 =
     &       +          r( 95)  ! NTR1 + OH =
     &       +          r( 96)  ! NTR1 =
     &       +          r(174)  ! CRON =
     &       + ( 0.500)*r(195)  ! INTR + OH =
c
        NOz_prod = NO2wOH + NO3wVOC + N2O5wH2O
     &             + PAN_prdNet + ON_prod - ON_dest
```

Exhibit S3. Fortran code to compute CPA net ozone production (PO3_net) and net NO_Z production NOz_prod) from reaction rates (r) for SAPRC07TC.

```
c
c --- Net O3 production
c
      PO3_net =
     &       +          r(  2)  ! O3P + O2 + M =
     &       + ( 0.300)*r( 67)  ! MCO3 + HO2 =
```

```
     &       + ( 0.250)*r( 77)  ! RCO3 + HO2 =
     &       + ( 0.250)*r( 88)  ! BZC3 + HO2 =
     &       + ( 0.250)*r(100)  ! MAC3 + HO2 =
     &       -          r(  3)  ! O3P + O3 =
     &       -          r(  7)  ! O3 + NO =
     &       -          r(  8)  ! O3 + NO2 =
     &       -          r( 18)  ! O3 =
     &       -          r( 19)  ! O3 =
     &       -          r( 30)  ! OH + O3 =
     &       -          r( 36)  ! HO2 + O3 =
     &       -          r(247)  ! AFG1 + O3 =
     &       -          r(250)  ! AFG2 + O3 =
     &       -          r(253)  ! AFG3 + O3 =
     &       -          r(255)  ! MACR + O3 =
     &       -          r(260)  ! MVK + O3 =
     &       -          r(264)  ! IPRD + O3 =
     &       -          r(275)  ! ACRO + O3 =
     &       -          r(515)  ! ETHE + O3 =
     &       -          r(519)  ! PRPE + O3 =
     &       -          r(523)  ! BD13 + O3 =
     &       -          r(527)  ! ISOP + O3 =
     &       -          r(531)  ! APIN + O3 =
     &       -          r(535)  ! ACYE + O3 =
     &       -          r(549)  ! OLE1 + O3 =
     &       -          r(553)  ! OLE2 + O3 =
     &       -          r(559)  ! TERP + O3 =
     &       -          r(563)  ! SESQ + O3 =
```

```
c
c --- Net NOz production
c
      NO2wOH = + r( 25)
c
      NO3wVOC =
     &       +          r(207)  ! HCHO + NO3 =
     &       +          r(210)  ! CCHO + NO3 =
     &       +          r(213)  ! RCHO + NO3 =
     &       +          r(516)  ! ETHE + NO3 =
     &       +          r(520)  ! PRPE + NO3 =
     &       +          r(524)  ! BD13 + NO3 =
     &       +          r(528)  ! ISOP + NO3 =
     &       +          r(532)  ! APIN + NO3 =
     &       +          r(550)  ! OLE1 + NO3 =
     &       +          r(554)  ! OLE2 + NO3 =
     &       +          r(560)  ! TERP + NO3 =
     &       +          r(564)  ! SESQ + NO3 =
      N2O5wH2O =
     &       + ( 2.000)*r( 13)  ! N2O5 + H2O =
     &       + ( 2.000)*r( 14)  ! N2O5 + H2O + H2O =
c
      PAN_prdNet =
     &       +          r( 63)  ! MCO3 + NO2 =
     &       +          r( 73)  ! RCO3 + NO2 =
     &       +          r( 84)  ! BZC3 + NO2 =
     &       +          r( 96)  ! MAC3 + NO2 =
     &       -          r( 64)  ! PAN =
```

```
     &        -           r( 65)  ! PAN =
     &        -           r( 74)  ! PAN2 =
     &        -           r( 75)  ! PAN2 =
     &        -           r( 85)  ! PBZN =
     &        -           r( 86)  ! PBZN =
     &        -           r( 97)  ! MPAN =
     &        -           r( 98)  ! MPAN =
c
      ON_prod =
     &        +           r( 57)  ! RO2X + NO =   1.000 XN
     &        +           r(135)  ! XNO2 + HO2 =   1.000 XN
     &        + ( 0.500)*r(137)  ! XNO2 + MEO2 =   0.500 XN
     &        + ( 0.500)*r(138)  ! XNO2 + RO2C =   0.500 XN
     &        + ( 0.500)*r(139)  ! XNO2 + RO2X =   0.500 XN
     &        + ( 0.500)*r(256)  ! MACR + NO3 =   0.500 XN
     &        + ( 0.278)*r(265)  ! IPRD + NO3 =   0.278 XN
     &        + ( 0.002)*r(276)  ! ACRO + NO3 =   0.002 XN
     &        +           r(444)  ! XRN3 + HO2 =   1.000 XN
     &        + ( 0.500)*r(446)  ! XRN3 + MEO2 =   0.500 XN
     &        + ( 0.500)*r(447)  ! XRN3 + RO2C =   0.500 XN
     &        + ( 0.500)*r(448)  ! XRN3 + RO2X =   0.500 XN
     &        +           r(516)  ! ETHE + NO3 =   1.000 XN
     &        +           r(520)  ! PRPE + NO3 =   1.000 XN
     &        + ( 0.525)*r(524)  ! BD13 + NO3 =   0.525 XN
     &        + ( 0.813)*r(528)  ! ISOP + NO3 =   0.813 XN
     &        + ( 0.301)*r(532)  ! APIN + NO3 =   0.301 XN
     &        + ( 0.226)*r(550)  ! OLE1 + NO3 =   0.226 XN
     &        + ( 0.254)*r(554)  ! OLE2 + NO3 =   0.254 XN
     &        + ( 0.485)*r(560)  ! TERP + NO3 =   0.485 XN
     &        + ( 0.485)*r(564)  ! SESQ + NO3 =   0.485 XN
     &        +           r(109)  ! TBUO + NO2 =   1.000 RNO3
     &        +           r(443)  ! XRN3 + NO =   1.000 RNO3
     &        +           r(445)  ! XRN3 + NO3 =   1.000 RNO3
     &        + ( 0.500)*r(446)  ! XRN3 + MEO2 =   0.500 RNO3
     &        + ( 0.500)*r(447)  ! XRN3 + RO2C =   0.500 RNO3
     &        + ( 0.500)*r(448)  ! XRN3 + RO2X =   0.500 RNO3
     &        +           r(449)  ! XRN3 + MCO3 =   1.000 RNO3
     &        +           r(450)  ! XRN3 + RCO3 =   1.000 RNO3
     &        +           r(451)  ! XRN3 + BZC3 =   1.000 RNO3
     &        +           r(452)  ! XRN3 + MAC3 =   1.000 RNO3
     &        +           r(111)  ! BZO + NO2 =   1.000 NPHE
      frXNO2 = (
     &        +           r(134)  ! XNO2 + NO =
     &        +           r(136)  ! XNO2 + NO3 =
     &        + ( 0.500)*r(137)  ! XNO2 + MEO2 =
     &        + ( 0.500)*r(138)  ! XNO2 + RO2C =
     &        + ( 0.500)*r(139)  ! XNO2 + RO2X =
     &        +           r(140)  ! XNO2 + MCO3 =
     &        +           r(141)  ! XNO2 + RCO3 =
     &        +           r(142)  ! XNO2 + BZC3 =
     &        +           r(143)  ! XNO2 + MAC3 =
     &      )/(
     &        +           r(134)  ! XNO2 + NO =
     &        +           r(135)  ! XNO2 + HO2 =
     &        +           r(136)  ! XNO2 + NO3 =
```

```
     &       +          r(137)  ! XNO2 + MEO2 =
     &       +          r(138)  ! XNO2 + RO2C =
     &       +          r(139)  ! XNO2 + RO2X =
     &       +          r(140)  ! XNO2 + MCO3 =
     &       +          r(141)  ! XNO2 + RCO3 =
     &       +          r(142)  ! XNO2 + BZC3 =
     &       +          r(143)  ! XNO2 + MAC3 =
     &      )
      ON_dest =
     &       + ( 0.019)*r(269)  ! RNO3 + OH =
     &       +          r(270)  ! RNO3 =
     &       + ( 0.313)*r(269) * frXNO2 ! RNO3 + OH =
     &       +          r(241)  ! NPHE =
c
        NOz_prod = NO2wOH + NO3wVOC + N2O5wH2O
     &             + PAN_prdNet + ON_prod - ON_dest
```

Exhibit S4. Fortran code to compute CPA net ozone production (PO3_net) and net NO_Z production NOz_prod) from reaction rates (r) for RACM2s21.

```
c
c --- Net O3 production
c
      PO3_net =
     &       +          r( 38)  ! O + O2 + M =
     &       -          r(  2)  ! O3 =
     &       -          r(  3)  ! O3 =
     &       -          r( 34)  ! O3 + OH =
     &       -          r( 35)  ! O3 + HO2 =
     &       -          r( 36)  ! O3 + NO =
     &       -          r( 37)  ! O3 + NO2 =
     &       -          r( 39)  ! O + O3 =
     &       -          r(126)  ! ETE + O3 =
     &       -          r(127)  ! OLT + O3 =
     &       -          r(128)  ! OLI + O3 =
     &       -          r(129)  ! DIEN + O3 =
     &       -          r(130)  ! ISO + O3 =
     &       -          r(131)  ! API + O3 =
     &       -          r(132)  ! LIM + O3 =
     &       -          r(133)  ! MACR + O3 =
     &       -          r(134)  ! MVK + O3 =
     &       -          r(135)  ! UALD + O3 =
     &       -          r(136)  ! DCB1 + O3 =
     &       -          r(137)  ! DCB2 + O3 =
     &       -          r(138)  ! DCB3 + O3 =
     &       -          r(139)  ! EPX + O3 =
     &       -          r(140)  ! MCTO + O3 =
```

```
c
c --- Net NOz production
c
      NO2wOH = + r( 56)
c
```

```
      NO3wVOC =
     &       +          r(141)  ! ETE + NO3 =
     &       +          r(142)  ! OLT + NO3 =
     &       +          r(143)  ! OLI + NO3 =
     &       +          r(144)  ! DIEN + NO3 =
     &       +          r(145)  ! ISO + NO3 =
     &       +          r(146)  ! API + NO3 =
     &       +          r(147)  ! LIM + NO3 =
     &       +          r(148)  ! HCHO + NO3 =
     &       +          r(149)  ! ACD + NO3 =
     &       +          r(150)  ! ALD + NO3 =
c
      N2O5wH2O =
     &       + ( 2.000)*r( 65)  ! N2O5 + H2O =
c
      PAN_prdNet =
     &       +          r(166)  ! ACO3 + NO2 =
     &       +          r(168)  ! RCO3 + NO2 =
     &       +          r(170)  ! MACP + NO2 =
     &       -          r( 32)  ! PAN =
     &       -          r(122)  ! MPAN + OH =
     &       -          r(159)  ! MPAN + NO3 =
     &       -          r(167)  ! PAN =
     &       -          r(169)  ! PPN =
     &       -          r(171)  ! MPAN =
c
      ON_prod =
     &       +          r(152)  ! UALD + NO3 =   1.000 ONIT
     &       + ( 0.065)*r(174)  ! HC3P + NO =   0.065 ONIT
     &       + ( 0.136)*r(175)  ! HC5P + NO =   0.136 ONIT
     &       + ( 0.261)*r(176)  ! HC8P + NO =   0.261 ONIT
     &       + ( 0.030)*r(178)  ! OLTP + NO =   0.030 ONIT
     &       + ( 0.050)*r(179)  ! OLIP + NO =   0.050 ONIT
     &       + ( 0.082)*r(180)  ! BENP + NO =   0.082 ONIT
     &       + ( 0.050)*r(182)  ! TOLP + NO =   0.050 ONIT
     &       + ( 0.050)*r(183)  ! PER1 + NO =   0.050 ONIT
     &       + ( 0.050)*r(185)  ! XYLP + NO =   0.050 ONIT
     &       + ( 0.050)*r(186)  ! PER2 + NO =   0.050 ONIT
     &       + ( 0.050)*r(187)  ! XYOP + NO =   0.050 ONIT
     &       + ( 0.180)*r(189)  ! APIP + NO =   0.180 ONIT
     &       +          r(205)  ! OLNN + NO =   1.000 ONIT
     &       +          r(209)  ! BAL2 + NO2 =   1.000 ONIT
     &       +          r(210)  ! CHO + NO2 =   1.000 ONIT
     &       +          r(211)  ! MCTO + NO2 =   1.000 ONIT
     &       +          r(244)  ! OLNN + HO2 =   1.000 ONIT
     &       +          r(245)  ! OLND + HO2 =   1.000 ONIT
     &       +          r(246)  ! ADCN + HO2 =   1.000 ONIT
     &       +          r(281)  ! OLNN + MO2 =   1.000 ONIT
     &       + ( 0.500)*r(282)  ! OLND + MO2 =   0.500 ONIT
     &       + ( 0.300)*r(283)  ! ADCN + MO2 =   0.300 ONIT
     &       +          r(317)  ! OLNN + ACO3 =   1.000 ONIT
     &       + ( 0.300)*r(319)  ! ADCN + ACO3 =   0.300 ONIT
     &       +          r(355)  ! OLNN + NO3 =   1.000 ONIT
     &       + ( 2.000)*r(358)  ! OLNN + OLNN =   2.000 ONIT
     &       + ( 1.500)*r(359)  ! OLNN + OLND =   1.500 ONIT
```

```
     &       +          r(360)  ! OLND + OLND =   1.000 ONIT
     &       +          r(145)  ! ISO + NO3 =   1.000 ISON
     &       + ( 0.120)*r(188)  ! ISOP + NO =   0.120 ISON
c
      ON_dest =
     &       +          r( 31)  ! ONIT =
     &       +          r(123)  ! ONIT + OH =
     &       +          r(371)  ! ONIT =
     &       +          r(124)  ! NALD + OH =
     &       +          r(372)  ! ISON =
c
        NOz_prod = NO2wOH + NO3wVOC + N2O5wH2O
     &             + PAN_prdNet + ON_prod - ON_dest
```

References

Blanchard, C. L., and Hidy, G. M.: Ozone response to emission reductions in the southeastern United States, Atmos. Chem. Phys., 18, 8183-8202, doi.org/10.5194/acp-18-8183-2018, 2018.

Chace, W. S., Womack, C., Ball, K., Bates, K. H., Bohn, B., Coggon, M., Crounse, J. D., Fuchs, H., Gilman, J., Gkatzelis, G. I., Jernigan, C. M., Novak, G. A., Novelli, A., Peischl, J., Pollack, I., Robinson, M. A., Rollins, A., Schafer, N. B., Schwantes, R. H., Selby, M., Stainsby, A., Stockwell, C., Taylor, R., Treadaway, V., Veres, P. R., Warneke, C., Waxman, E., Wennberg, P. O., Wolfe, G. M., Xu, L., Zuraski, K., Brown, S. S.: Ozone production efficiencies in the three largest United States cities from airborne measurements, Environ. Sci. Technol., 59, 13306-13318, doi.org/10.1021/acs.est.5c02073, 2025

Elterman, L.: UV, visible, and IR attenuation for altitudes to 50 km, 1968 (No. 285), Air Force Cambridge Research Laboratories, Office of Aerospace Research, United States Air Force, 1968.

Griffin, R. J., Johnson, C. A., Talbot, R. W., Mao, H., Russo, R. S., Zhou, Y., and Sive, B. C.: Quantification of ozone formation metrics at Thompson Farm during the New England Air Quality Study (NEAQS) 2002, J. Geophys. Res., 109, D24302, doi.org/10.1029/2004JD005344, 2004.

Hembeck, L., He, H., Vinciguerra, T. P., Canty, T. P., Dickerson, R. R., Salawitch, R. J., and Loughner, C.: Measured and modelled ozone photochemical production in the Baltimore-Washington airshed, Atmos. Environ., X 2, 100017, 2019.

Mellouki, A., Ammann, M., Cox, R.A., Crowley, J.N., Herrmann, H., Jenkin, M.E., McNeill, V.F., Troe, J. and Wallington, T.J.: Evaluated kinetic and photochemical data for atmospheric chemistry: volume VIII–gas-phase reactions of organic species with four, or more, carbon atoms (≥ C 4), Atmos. Chem. Phys., 21(6), 4797-4808, 2021.

Ninneman, M., Lu, S., Lee, P., McQueen, J., Huang, J., Demerjian, K., and Schwab, J.: Observed and model-derived ozone production efficiency over urban and rural New York State, Atmosphere, 8, 126, doi.org/10.3390/atmos8070126, 2017.

Ninneman, M., Demerjian, K. L., and Schwab, J. J.: Ozone production efficiencies at rural New York State locations: Relationship to oxides of nitrogen concentrations, J. Geophys. Res.: Atmos., 124, 2018JD029932, doi.org/10.1029/2018JD029932, 2019.

Stamnes, K., Tsay, S.C., Wiscombe, W. and Jayaweera, K.: Numerically stable algorithm for discrete-ordinate-method radiative transfer in multiple scattering and emitting layered media, Applied optics, 27(12), 2502-2509, 1988.

Travis, K. R., Jacob, D. J., Fisher, J. A., Kim, P. S., Marais, E. A., Zhu, L., Yu, K., Miller, C. C., Yantosca, R. M., Sulprizio, M. P., Thompson, A. M., Wennberg, P. O., Crounse, J. D., St. Clair, J. M., Cohen, R. C., Laughner, J. L., Dibb, J. E., Hall, S. R., Ullmann, K., Wolfe, G. M., Pollack, I. B., Peischl, J., Neuman, J. A., and Zhou, X.: Why do models overestimate surface ozone in the Southeast United States?, Atmos. Chem. Phys. 16, 13561-13577, doi.org/10.5194/acp-16-13561-2016, 2016.