GEOS-Chem Chemical Mechanism Version 8-02-04

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Updates in v8-02-04:

1. Change the branch ratio of HNO4 photolysis in ratj.d

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Line 13 HNO4+hv->OH+NO3 from 33.3 to 5.0
Line 14 HNO4+hv->HO2+NO2 from 66.7 to 95.0
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This is based on Jimenez et al. (Quantum yields of OH, HO2 and NO3 in the UV photolysis of HO2NO2, PHYSICAL CHEMISTRY CHEMICAL PHYSICS, 2005), which shows that HO_2 yield should be 0.95 and OH yield should be 0.05 for wavelength above 290nm.

This way all the near-IR photolysis will have most weight on HO2 channel (Stark et al., Overtone dissociation of peroxynitric acid (HO2NO2): Absorption cross sections and photolysis products, JOURNAL OF PHYSICAL CHEMISTRY A, 2008).

2. Comment out the near-IR calculation of HNO4 photolysis in calcrate.f since FastJX already takes this into account.

No.	Reaction	Rate Constant	Reference	Notes
1	NO + O3 → NO2 + O2	3.00E-12 exp(-1500/T)	JPL00	
		Same	JPL06	
2	O3+OH = HO2+O2	1.70E-12 exp(-940/T)	JPL02	
		Same	JPL06	
3	O3+HO2 = OH+2O2	1.00E-14 exp(-490/T)	JPL02	
		Same	JPL06	
4	O3+NO2 = O2+NO3	1.20E-13 exp(-2450/T)	JPL97	
		Same	JPL06	
5	O3+MO2 = CH2O+HO2+2O2	2.90E-16 exp(-1000/T)	JPL02	
		Same	JPL06	
6	OH+OH = H2O+O3	~~4.20E-12 exp (-240/T)~~	~~JPL97~~	
		1.8E-12	JPL06	JMAO
7	OH+OH+M = H2O2	LPL: 6.9E-31(300/T)	JPL02	
		HPL: 2.60E-11		
		Fc:0.6		
		Same	JPL06	
8	OH+HO2 = H2O + O2	4.80E-11 exp (250/T)	JPL97	
		Same	JPL06	
9	OH+H2O2 = H2O + HO2	~~2.90E-12 exp (-160/T)~~	~~JPL97~~	
		1.8E-12	JPL06	JMAO
10	HO2+NO = OH + NO2	3.50E-12 exp(250/T)	JPL97	
		Same	JPL06	
11	HO2+HO2 = H2O2	~~K1=2.30E-13 exp(600/T)~~	~~JPL97~~	
	HO2+HO2+M=H2O2	~~K2=1.70E-33 [M]~~		
		~~exp(1000/T)~~		
		~~K = (K1 + K2)*(1+1.4E-~~		
		~~21*[H2O]*EXP(2200/T))~~		
		K1=3.50E-13 exp(430/T)	JPL06	JMAO
		K2=1.70E-33 [M]exp(1000/T)		
		K = (K1 + K2)*(1+1.4E-21*[H2O]*EXP(2200/T)		
12	OH+H2 = H2O + HO2	~~5.50E-12 exp(-2000/T)~~	~~JPL97~~	
		2.80E-12 exp(-1800/T)	JPL06	JMAO
13	CO+OH = HO2 + CO2	~~K0=1.50E-13~~	~~JPL97~~	
		~~K = K0(1+0.6 Patm)~~		
	CO+OH = HOCO	LPL: 5.9E-33(300/T)^1.4 HPL:1.1E-12(300/T)^-1.3 Fc:0.6	JPL06	JMAO(in calcrate.f) Ignore the intermediate species HOCO and use two 3-body reactions
	HOCO + O2= HO2 + CO2	2.00E-12		
	CO+OH=HO2+CO2 (different formula)	LPL: 1.5E-13(300/T)^-0.6 HPL:2.10E9(300/T)^-6.1 Fc:0.6	JPL06	

14	OH+ CH4 = MO2+H2O	~~1.26E-12 (300/T)^(-6.7E-01) exp(-1575/T)~~	~~JPL97~~	This reaction coeffciient was not found on JPL97.
		2.45E-12exp(−1775/T)	JPL06	JMAO:could also be 2.8E-14T^0.667 exp(−1575/T)
15	MO2+NO =CH2O+HO2+NO2	2.80E-12 exp(300/T)	Tyndall 2001	Tyndall et al., Atmospheric Chemistry of small organic peroxy radicals,JGR 106, 12157-12182, 2001.
		Same	JPL06	
16	MO2+HO2 = MP+O2	~~K1=4.10E-13 exp(750/T)~~ ~~K2=2.00E-03exp(1160/T)~~ ~~K=K1/(1+K2)~~	~~Tyndall 2001&Elrod 2001~~	
		4.1E-13 exp(750/T)	JPL06	JMAO
17	MO2+HO2 = CH2O + O2	~~K1=4.10E-13 exp(750/T)~~ ~~K2=4.98E+2 exp(-1160/T)~~ ~~K=K1/(1+K2)~~	~~Tyndall 2001&Elrod 2001~~	
		Not recommended in JPL06	JPL06(P1-59,D35)	JMAO
18	MO2+MO2 =MOH+CH2O+O2	K1=9.5E-14 exp(390/T)	Tyndall 2001	This reaction coeffciient was not found on Tyndall.
		K2=2.62E+1 exp(-1130/T)		
		Same		
19	MO2+MO2 = 2CH2O + 2HO2	K1=9.5E-14 exp(390/T)	Tyndall 2001	This reaction coeffciient was not found on Tyndall.
		K2=4.00E-02		
		exp(1130/T)		
		K=K1 / (1+K2)		
		Same		
20	MP+OH = MO2+H2O	2.66E-12 exp(200/T)	JPL97	
		Same	JPL06	
21	MP+OH = CH2O+OH+H2O	1.14E-12 exp(200/T)	JPL97	
		Same	JPL06	
22	CH2O+OH = CO+HO2+H2O	~~9.00E-12~~	~~JPL02~~	
	CH2O+OH = HCO +H2O	5.5E-12 exp(125/T)	JPL06	JMAO(use the first rate)
	HCO + O2 = CO + HO2	5.2E-12	JPL06	
23	NO2+OH+M = HNO3+M	~~LPL: 2.00E-30(300/T)^3~~ ~~HPL:2.50E-11(300/T)^0~~ ~~Fc: 0.6~~	~~JPL02~~	
	OH + NO2 + M = HONO2	LPL: 1.80E-30(300/T)^3 HPL:2.80E-11(300/T)^0 Fc:0.6	JPL06	JMAO: Ignore the HOONO channel for now.

	OH + NO2 + M=HOONO	LPL:9.10E-32(300/T)^3.9 HPL:4.20E-11(300/T)^0.5 Fc:0.6	JPL06	This adds a new species HOONO,should we include this reaction?
24	HNO3+OH = H2O+NO3	K0=2.41E-14 exp(460/T) K2=2.69E-17exp(2199/T) K3=6.51E-34exp(1335/T)	Brown 98	OH + HNO3: K = K0 + K3[M] / (1 + K3[M]/K2)
		Same	JPL06,same source	Brown, S. S., R. K. Talukdar and A. R. Ravishankara, 1999, J. Phys. Chem. A, 103, 3031-3037.
25	NO+OH+M = HNO2+M	LPL: 7.00E-31(300/T)^2.6	JPL97	
		HPL: 3.60E-11(300/T)^0.1		
		Fc: 0.6		
		LPL: 7.00E-31(300/T)^2.6	JPL06	
		HPL: 3.60E-11(300/T)^0.1		
		Fc: 0.6		
26	HNO2+OH = H2O+NO2	1.80E-11 exp(-390/T)	JPL97	
		Same	JPL06	
27	HO2+NO2+M = HNO4+M	~~LPL: 1.80E-31(300/T)^3.2;~~ ~~HPL:4.7E-12(300/T)^1.4; Fc= 0.6~~	~~JPL97~~	
		LPL: 2.0E-31(300/T)^3.4	JPL06	JMAO
		HPL:2.9E-12(300/T)^1.1		
		Fc= 0.6		
28	HNO4+M = HO2+NO2	~~LPL: 8.64E-5(300/T)^3.2* exp(-10900/T);~~ ~~HPL:2.24E+15*(300/T)^1.4*exp(-10900/T); Fc=0.6~~	~~K=forward rxn/Keq Keq=2.1E-27exp(10900/T) JPL97~~	
		LPL: 9.52E-5(300/T)^3.2* exp(-10900/T)	K=forward rxn/Keq	JMAO
		HPL:1.38E+15*(300/T)^1.4*exp(-10900/T);	Keq=2.1E-27exp(10900/T)	
		Fc=0.6	JPL06	
29	HNO4+OH = H2O+NO2+O2	1.30E-12 exp(380/T)	JPL97	
		Same	JPL06	
30	NO+NO3=2NO2	1.50E-11 exp(170/T)	JPL97	
		Same	JPL06	
31	HO2+NO3 = OH+NO2+O2	3.50E-12		
		Same	JPL06	
32	OH+NO3 = HO2+NO2	2.20E-11	JPL97	
		Same	JPL06	
33	NO2+NO3+M = N2O5+M	LPL: 2.0E-30(300/T)^4.4; HPL:1.4E-12(300/T)^0.7; Fc=0.6	JPL00	

		Same	JPL06	
34	N2O5+M = NO2+NO3	~~LPL: 6.67E-4(300/T)^4.4* exp(-10990/T); HPL:4.67E+14*(300/T)^0.7*exp(-10990/T); Fc=0.6~~	~~K=forwardrxn/ Keq; Keq = 3.00E-27exp(10990/T); JPL00~~	
		LPL: 7.4E-4(300/T)^4.4* exp(-11000/T); HPL:5.18E+14*(300/T)^0.7*exp(-11000/T); Fc=0.6	K=forwardrxn/ Keq; Keq = 2.70E-27exp(11000/T); JPL06	JMAO
35	HCOOH+OH =H2O+CO2+HO2	4.00E-13	JPL97	
		Same	JPL06	
36	MOH+OH = HO2+CH2O	~~7.30E-12 exp(-620/T)~~	~~JPL02~~	
		2.9E-12 exp(-345/T)	JPL06	
37	NO2+NO3 = NO+NO2+O2	4.50E-14 exp(-1260/T)	JPL97	
		Same	JPL06	
38	NO3+CH2O = HNO3+HO2+CO	5.80E-16	JPL97	
		Same	JPL06	
39	~~ALD2+OH = MCO3+H2O~~	~~5.60E-12 exp(270/T)~~	~~JPL97~~	
		Same		JMAO:Can not find this reaction from JPL06, it was in JPL02. It is 4.4 E-12exp(365/T) in IUPAC06
	ALD2 + OH=H2O + 0.95 MCO3 + 0.05 CH2O + 0.05 CO + 0.05 HO2	4.4 E-12exp(365/T)	IUPAC06	DBM
40	ALD2+NO3 = HNO3+MCO3	~~1.40E-12 exp(-1860/T)~~	~~IUPAC02~~	
		1.40E-12 exp(-1900/T)	JPL06	JMAO
41	MCO3+NO2+M = PAN	~~LPL: 8.50E-29(300/T)^6.5; HPL:1.10E-11(300/T); Fc: 0.6~~	~~Tyndall~~	
		LPL: 9.70E-29(300/T)^5.6; HPL:9.3E-12(300/T)^1.5; Fc: 0.6	JPL06	JMAO
42	PAN = MCO3+NO2	9.30E-29 exp(14000/T)	Tyndall	
			IUPAC06	
43	MCO3+NO = MO2+NO2+CO2	8.10E-12 exp(270/T)	Tyndall	
		Same	JPL06	
44	C2H6+OH = ETO2+H2O	8.7E-12 exp(-1070/T)	JPL97	
		Same	JPL06	
45	ETO2+NO =ALD2+NO2+HO2	~~2.70E-12 exp(350/T)~~	~~Tyndall~~	
		2.60E-12 exp(365/T)	JPL06	JMAO

46	C3H8+OH = B3O2	K1=7.60e-12 exp(-585/T); K2=5.87*(300/T)^0.64exp(-816/T); K=K1 / (1+K2)	IUPAC02	
	C3H8+OH = A3O2	K1=7.60E-12 exp(-585/T); K2= 0.17*(300/T)^-0.64exp(816/T); K=K1 / (1+K2)	IUPAC02	Cant find from Tyndall
			IUPAC06	JMAO
47	A3O2+NO = NO2 + HO2 + RCHO	~~2.70E-12 exp(350/T)~~	Tyndall	The products is not from Tyndall
		2.90E-12 exp(350/T)	IUPAC06	JMAO
48	PO2+NO = NO2+HO2+CH2O+ALD2	2.70E-12 exp(350/T)	Tyndall	
49	ALK4+OH = R4O2	9.10E-12 exp(-405/T)	IUPAC02	
		Same	IUPAC06	
50	R4O2+NO = NO2 +0.32ACET + 0.19MEK +0.18MO2 + 0.27HO2 +0.32ALD2 + 0.13RCHO +0.50A3O2 + 0.18B3O2 + 0.32ETO2	K* (1-YN) where YN isreturned from fyrno3.f; K=2.7E-12 exp(350/T) (Xcarbn=4.50E00)	Atkinson 97	
				A3O2 is 0.05 in the input file(Palmer)
51	R4O2+NO = R4N2	K* YN where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=4.50E00)	Atkinson97	
52	ATO2+NO = 0.96NO2 + 0.960CH2O +0.960MCO3 + 0.04R4N2	2.80E-12 exp(300/T)	Tyndall	
53	KO2+NO = 0.93NO2+0.93NO + 0.93ALD2 +0.93MCO3 + 0.07R4N2	2.70E-12 exp(350/T)	Tyndall ETO2+NO	
~~54~~	~~RIO2+NO = NO2+0.864HO2+0.690CH2O+0.402MVK+0.288MACR+0.136RIO1+0.127IALD~~	K* (1-YN) where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=5.00E00)	~~Atkinson 97~~	
	RIO2 + NO = 0.90NO2 + 0.90HO2 + 0.34IALD + 0.34MVK + 0.22MACR + 0.56CH2O			DBM(MCM 3.1)

55	RIO2+NO = HNO3	K* YN where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=5.00E00)	Atkinson 97	
56	IAO2+NO = 0.92HO2+0.61CO+0.17H2+0.33HAC+0.24GLYC +0.53MGLY+0.92NO2 +0.35CH2O+0.08HNO3	2.7E-12 exp(350/T)	Tyndall ETO2+NO	
57	~~ISN1+NO = 1.9NO2+0.95GLYC+0.95HAC +0.05HNO3+0.05NO2~~	2.7E-12 exp(350/T)	Tyndall ETO2+NO	
	ISN1+NO = 1.9NO2+0.95GLYC+0.95HAC +0.05HNO3+0.05NO2+0.05HO2		Paulson&Seinfeld 1992	HO2 term(Palmer, JMAO)
58	VRO2+NO = NO2+0.28HO2+0.28CH2O+0.72MCO3+0.72GLYC+0.28MGLY	K* (1-YN) where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=4.00E00)	Atkinson 97	
59	VRO2+NO = HNO3	K* YN where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=4.00E00)	Atkinson 97	
~~60~~	~~MRO2+NO = NO2+HO2 +0.17MGLY+0.83HAC +0.83CO+0.17CH2O~~	K* (1-YN) where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=4.00E00)	~~Atkinson 97~~	
	MRO2 + NO = NO2 + HAC + CH2O + HO2			DBM(MCM 3.1)
61	MRO2+NO = HNO3	K* YN where YN is returned from fyrno3.f K=2.7E-12 exp(350/T) (Xcarbn=4.00E00)	Atkinson 97	
62	MVN2+NO = 1.90NO2 +0.30HO2+0.30CH2O+0.60MCO3+0.60GLYC+0.30MGLY+0.10HNO3	2.7E-12 exp(350/T)		
63	MAN2+NO = 2NO2+CH2O+MGLY	2.7E-12 exp(350/T)	Tyndall ETO2+NO	
64	B3O2+NO = NO2+HO2+ACET	2.7E-12 exp(350/T)		

65	INO2+NO = 1.10NO2+0.80HO2+0.85HNO3+0.05NO2+0.10MACR+0.15CH2O+0.05MVK	2.7E-12 exp(350/T)	Tyndall ETO2+NO	
66	PRN1+NO = 2NO2+CH2O+ALD2	2.7E-12 exp(350/T)	Tyndall ETO2+NO	
67	ALK4+NO3 = HNO3 + R4O2	2.8E-12 exp(-3280/T)	IUPAC02	
		Same	IUPAC06	? Can't find
68	R4N2+OH = R4N1+H2O	~~1.30E-12~~	~~Atkinson 92~~	HO + 1-C4H9ONO2 → products
		1.6E-12	IUPAC06	JMAO
69	ACTA+OH = MO2+CO2++H2O	~~4.00E-13 exp(200/T)~~	~~DeMore et al., 1994~~	
		4.20E-14 exp(855/T)	IUPAC06	JMAO
70	OH+RCHO= RCO3+H2O	~~5.10E-12 exp(405/T)~~	~~IUPAC02~~	HO + CH3CH2CH2CHO → products
		6.0E-12exp(410/T)	IUPAC06	JMAO
71	RCO3+NO2 = PPN	LPL: 9.00E-28(300/T)^8.9 HPL:7.70E-12(300/T)^0.2 Fc: 0.6	JPL02	
		Same	JPL06	
72	PPN = RCO3+NO2	9e-29*exp(14000/T)	JPL02	
		Same	JPL06	
73	MAO3+NO2 = PMN	LPL: 9.00E-28(300/T)^8.9 HPL:7.70E-12(300/T)^0.2 Fc: 0.6	JPL02 Same	
		Same	as PPN	
74	PMN = MAO3+NO2	9e-29*exp(14000/T)	JPL02	
		Same		
75	GLCO3+NO2 = GLPAN	LPL: 9.00E-28(300/T)^8.9 HPL:7.70E-12(300/T)^0.2 Fc: 0.6	JPL02 Same as PPN	Should be same as RCO3???
76	GLPAN = GLCO3+NO2	9e-29*exp(14000/T)	JPL02 PPN	
77	GCO3+NO2 = GPAN	LPL: 9.00E-28(300/T)^8.9 HPL:7.70E-12(300/T)^0.2 Fc: 0.6	JPL02 Same as PPN	
78	GPAN = GCO3+NO2N	9e-29*exp(14000/T)	JPL02 PPN	
79	RCO3+NO = NO2+ETO2	6.70E-12 exp(340/T)	IUPAC02 C2H5CO3+NO	
		Same	IUPAC06	
80	GCO3+NO = NO2+HO2 +CH2O	6.70E-12 exp(340/T)	IUPAC02 C2H5CO3+NO	
		Same	IUPAC06	

81	GLCO3+NO = NO2+HO2+CO	6.70E-12 exp(340/T)	IUPAC02 C2H5CO3+NO	
		Same	IUPAC06	
82	RCHO+NO3 = HNO3 +RCO3	~~1.82E-12exp(-1680/T)~~	~~IUPAC02 Mean of~~	
			~~CH3CHO+NO3 and~~	
			~~C3H7CH+NO3~~	
		6.5E-15	IUPAC06	NO3+C2H5CHO → HNO3 + C2H5CO
83	ACET+OH = ATO2 + H2O	1.33E-13+ 3.82E-11 exp(-2000/T)	JPL 02 Implemented as 2 reactions	
		Same	JPL06	JMAO
84	A3O2+MO2 = HO2 +0.75CH2O+0.75RCHO+0.25 MOH + 0.25ROH	5.92E-13	Tyndall RateMO2+MO2 Atkinson97RO2+RO2	K(RO2+MO2) = 2*sqrt(k(MO2+MO2)*k(RO2+RO2)).
85	PO2+MO2 = HO2 + 0.5ALD2+1.25CH2O +0.16HAC + 0.09RCHO +0.25MOH + 0.25ROH	5.92E-13	Tyndall RateMO2+MO2 Atkinson97RO2+RO2	
86	R4O2+HO2 = R4P	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
87	R4N1+HO2 = R4N2	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
88	ATO2+HO2 = MCO3 + MO2	8.60E-13 exp(700/T)		
89	KO2+HO2 = MO2 + MGLY	7.40E-13 exp(700/T)	Tyndall	Tyndall forms CH3C(O)CH2OOH ,this must then split and go to MCO3+MO2, the products in chem..dat ??
			ETO2+HO2	
90	RIO2+HO2 = RIP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
91	RIO1+HO2 = RIP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
92	IAO2 + HO2 = IAP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
93	ISN1+HO2 = ISNP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
94	VRO2+HO2 = VRP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
95	MRO2+HO2 = MRP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	

96	MVN2 + HO2 = ISNP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
97	MAN2 + HO2 = ISNP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
98	B3O2+HO2 = RB3P	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
99	INO2 + HO2 = INPN	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
100	PRN1 + HO2 = PRPN	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
101	MEK+OH = KO2+H2O	~~2.28E-13 * (300/T)^-2 *exp(503/T)~~	~~IUPAC02~~	
		1.3 E-12exp(-25/T)	IUPAC06	JMAO
102	MO2+ETO2 = 0.75CH2O+0.75ALD2+HO2+0.25MOH+0.25EOH	3.00E-13	Horowitz 98, Atkinson 92& 94	
103	MEK+NO3 = HNO3+ KO2	8.00E-16	Lurmann et	
			al., 1986.	
104	R4O2+MO2 = 0.16ACET+0.10MEK+0.09MO2+0.14HO2+0.16ALD2 +0.07RCHO+0.03A3O2 +0.09B3O2+0.16ETO2+0.25MEK+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
105	R4N1+MO2 = NO2+0.20CH2O+0.38ALD2 + 0.29RCHO+0.15R4O2+ 0.25RCHO+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
106	ATO2+MO2 = 0.30HO2+0.30CH20+0.30MCO3+0.20HAC+0.20CH2O+0.50MGLY+0.50MOH	7.5E-13 exp(500/T)	Tyndall,2001	
107	KO2+MO2 = 0.5ALD2 +0.50MCO3+0.25MEK+0.75CH2O+0.25MOH+0.25ROH+0.5HO2	8.37E-14		
108	RIO2+MO2 = 0.42HO2 +0.35CH2O+0.2MVK +0.14MACR + 0.07RIO1 +0.06IALD+0.25MEK+0.75CH2O+0.25MOH+0.25ROH + 0.5HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	

				HO2 term is 0.43 in input file, need to be changed back to 0.42(Palmer, JMAO)
109	RIO1+MO2 = 0.50IALD+0.50HO2+0.38CH2O+0.25MEK+0.75CH2O+0.25MOH+0.25ROH+ 0.5HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
110	IAO2+MO2 = 0.50HO2+0.33CO+0.09H2+0.18HAC+0.13GLYC+0.29MGLY+0.25MEK+0.95CH2O+0.25MOH+0.25ROH+0.5HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
111	ISN1+MO2 = NO2+0.50GLYC+0.50HAC+0.25RCHO+0.75CH2O+0.25MOH+ 0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
112	VRO2+MO2 = 0.14HO2+0.14CH2O+0.36MCO3+0.36GLYC+0.14MGLY+0.25MEK+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
~~113~~	~~MRO2+MO2 = 0.50HO2+0.09MGLY+0.42HAC+0.42CO+0.09CH2O+0.25MEK+0.75CH2O+0.25MOH+0.25ROH+0.50HO2~~	~~8.37E-14~~	~~Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)~~	
	MRO2 + MO2 = HAC + 0.85CH2O + 1.15HO2 + 0.15CO			DBM(MCM 3.1)
114	MVN2+MO2 = NO2+0.50CH2O+0.25MCO3+0.25MGLY+0.25HO2+0.25RCHO+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
115	MAN2+MO2= NO2+0.50CH2O+0.50MGLY+0.25RCHO+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	

116	B3O2+MO2 = 0.50HO2+0.50ACET+0.25ACET +0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
117	INO2+MO2 = 0.55NO2+0.40HO2+0.425HNO3+0.025NO2+0.05MACR+0.08CH2O+0.03MVK+0.25RCHO+0.75CH2O+0.25MOH+0.25ROH+0.05HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
				NISOPO2(in MCM), HO2 term is 0.5 in the input file, need to be fixed. (Palmer, JMAO)
118	PRN1+MO2 = NO2+0.50CH2O+ 0.50ALD2+0.25RCHO+0.75CH2O+0.25MOH+0.25ROH+0.50HO2	8.37E-14	Tyndall MO2+MO2 Atkinson97 RO2+RO2 (See note 11 below)	
119	EOH+OH = HO2+ALD2	6.90E-12 exp(-230/T)	JPL02	
120	ROH+OH = HO2+RCHO	4.6E-12 exp(70/T)	IUPAC	not in JPL06
		Same	IUPAC06	
121	ETO2+ETO2 = 2ALD2 +2HO2	4.10E-14	JPL97	
		Same	JPL06	
122	ETO2+ETO2 = EOH + ALD2	2.70E-14	JPL97	
		Same	JPL06	
123	HO2+ETO2 = ETP	7.40E-13 exp(700/T)	Tyndall (see note 4)	
			Not JPL 03	
124	A3O2+HO2 = RA3P	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
125	PO2+HO2 = PP	7.40E-13 exp(700/T)	Tyndall	
			ETO2+HO2	
~~126~~	~~HO2+MCO3 =ACTA+O3~~	~~K=K1/(1+K2); K1=4.30E-13exp(1040/T) K2=3.70E+1 exp(-660/T)~~	~~RateTyndall:br crawford& moortgart~~	
~~127~~	~~HO2+MCO3 = MAP~~	~~K=K1/(1+K2); K1=4.30E-13exp(1040/T) K2=2.70E-2 exp(660/T)~~	~~RateTyndall:br crawford& moortgart~~	

	MCO3 + HO2 = 0.15 ACTA + 0.15 O3 + 0.44 OH + 0.44 MO2 + 0.41 MAP	5.2e-13exp(980/T)	IUPAC(Feb2009)	DBM
128	RCO3+HO2=0.3RCOOH+0.3 O3+ 0.7RP	4.30E-13 exp(1040/T)		
129	~~GCO3+HO2=0.3RCOOH+0.3O3 +0.7GP~~	4.30E-13 exp(1040/T)		
	GCO3 + HO2 = 0.71GP + 0.29O3 + 0.29CH2O			DBM(MCM 3.1)
130	MAO3+HO2=0.3RCOOH+0.3 O3 + 0.7MAOP	4.30E-13 exp(1040/T)		
131	GLCO3+HO2=0.3RCOOH+0.3 O3+0.7GLP	4.30E-13 exp(1040/T)		
132	PRPE+OH+M = PO2	~~LPL: 8.00E-27(300/T)^3.5~~	~~Atkinson 92&IUPAC 03~~	
		~~HPL:3.00E-11~~	~~for Fc.~~	
		~~Fc: 0.5~~		
		LPL: 8.00E-27(300/T)^3.5	IUPAC06	JMAO
		HPL:3.00E-11(300/T)		
		Fc: 0.5		
133	PRPE+O3 = 0.535CH2O+0.500ALD2+0.420CO+0.300HO2+0.135OH+0.065H2+0.305MO2	~~6.50E-15 exp(-1880/T)~~	~~Paulson &Seinfeld 92~~	
		5.50E-15 exp(-1880/T)	IUPAC06	JMAO
134	GLYX+OH = HO2+2CO	~~K1=1.10E-11~~	~~Atkinson 92,94~~	
		~~K = K1*([O2]+3.5D18)/~~		
		~~(2*[O2]+3.5D18)~~		
		1.1E-11	IUPAC06	Already updated
135	MGLY+OH = MCO3+CO	~~1.70E-11~~	~~Atkinson 92,94~~	
		1.50E-11	IUPAC06	JMAO
136	GLYX+NO3 = HNO3 + HO2+ 2CO	K1=1.40E-12exp(-1860/T) K=K1*([O2]+3.5D18)/(2*[O2]+3.5D18)	Atkinson92&94, (ALD2)	
137	MGLY+NO3 = HNO3 + CO +MCO3	1.40E-12 exp(-1860/T)	Atkinson92&94, (ALD2)	
		Same	IUPAC06	
138	ISOP+OH = RIO2	2.70E-11 exp(390/T)	IUPAC02	

		Same	IUPAC06	
139	MVK+OH = VRO2	~~4.13E-12 exp(452/T)~~	~~Atkinson92,94; Tuazon~~	
			~~&Atkinson 89,90~~	
		2.6e-12exp(610/T)	IUPAC06	JMAO
140	MACR+OH = 0.5MAO3 +0.5MRO2	~~1.86E-11 exp(175/T)~~	~~Atkinson92,94;~~	
			~~Tuazon &Atkinson89,90~~	
	MACR + OH = 0.57MAO3 + 0.43MRO2	8.0E-12exp(380/T)	IUPAC06	JMAO,DBM(MCM3.1)
141	HAC+OH = MGLY+HO2	3E-12	Atkinson 92,94	
		Same	IUPAC06	
142	MCO3+A3O2 = MO2+RCHO+HO2	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
143	MCO3+PO2 = MO2 +ALD2+CH2O+HO2	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
144	MCO3+A3O2 = ACTA +RCHO	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	k 298 = 1e-11cm3 molec-1. Use T dep. From MCO3+MO2 according to Tyndall, and apply branching ratio from Tyndall. Keeping rate constant at 298K equal to 1E-11,means that A factor is 1.87E-12. Branching ratio from Tyndall sends 90% to the radical branch(A = 0.9*1.87E-12 = 1.68E-12), and 10% to molecular branch (A = 0.1* 1.87E-12 =1.87E-13).
145	MCO3+PO2 = ACTA + 0.35RCHO+0.65HAC	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	

146	ISOP+O3 = 0.387MACR + 0.159MVK+0.100O3+0.270OH +0.070PRPE+0.900CH2O+0.060HO2+0.150CO2+0.050CO	1.05E-14 exp(-2000/T)	Paulson &Seinfeld, 92 Aschmann &Atkinson, 94	
147	MVK+O3 = 0.82MGLY+ 0.80CH2O+0.20O2+0.05CO+0.06HO2+ 0.04ALD2	~~4.00E-15 exp(-2000/T)~~	~~Paulson & Seinfeld 92~~	
	0.20O2->0.20O3(Palmer, JMAO, according to Paulson & Seinfeld 92)	8.5 E-16exp(-1520/T)	IUPAC06	JMAO, 0.20O2->0.20O3(Palmer, JMAO, according to Paulson & Seinfeld 92)
148	MACR+O3 = 0.800MGLY +0.700CH2O+0.200O3+0.200CO+0.275HO2+0.215OH+0.160CO2	~~4.40E-15 exp(-2500/T)~~	~~Paulson & Seinfeld 92~~	
		1.4 E-15exp(-2100/T)	IUPAC06	JMAO
149	ISOP+NO3 = INO2	~~3.03E-12 exp(-446/T)~~	~~Atkinson 92,94~~	
		3.15E-12 exp(-450/T)	IUPAC06	JMAO
150	MVK+NO3 = MVN2	~~2.00E-14~~	~~Horowitz et al., 1998,~~	
			~~Lurmann et al., 1986~~	
		REMOVED (<6E-16,IUPAC06)		JMAO
151	MACR+NO3 = MAN2	~~6.70E-15~~	~~Lurmann et al., 1986~~	
		2.3E-15	IUPAC06	JMAO
152	MACR+NO3 = MAO3+HNO3	~~3.30E-15~~	~~Lurmann et al., 1986~~	IUPAC06 total rate is 3.4E-15, so use the ratio from Lurmann et al.,1986
		1.1E-15	IUPAC06	JMAO
153	RCO3+MO2 = CH2O+HO2+ETO2	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
154	GCO3+MO2 = 2CH2O +2HO2	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	

155	MAO3+MO2 = CH2O+HO2+CH2O+MCO3	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
156	GLCO3+MO2 = CH2O +2HO2+CO	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
157	RCO3+MO2 = RCOOH +CH2O	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
158	GCO3+MO2 = RCOOH + CH2O	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
159	MAO3+MO2 = RCOOH + CH2O	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
160	GLCO3+MO2 = RCOOH + CH2O	1.87E-13 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
161	INPN+OH = INO2	3.80E-12 exp(200/T)	DeMore,reported in Horowitz as MP+OH	
162	PRPN+OH = PRN1	3.80E-12 exp(200/T)	JPL97,MP+OH	
163	ETP+OH = 0.50OH+ 0.50ETO2+0.50ALD2	3.80E-12 exp(200/T)	JPL97,MP+OH	
164	RA3P+OH = 0.50OH + 0.50A3O2+0.50RCHO	3.80E-12 exp(200/T)	JPL97,MP+OH	
165	~~RB3P+OH = 0.50OH+0.50B3O2+0.50RCHO~~	3.80E-12 exp(200/T)	JPL97,MP+OH	
	RB3P + OH = 0.5OH + 0.5B3O2 + 0.5ACET			DBM,lumping from MCM3.1
166	R4P+OH = 0.50OH+0.50R4O2 + 0.50RCHO	3.80E-12 exp(200/T)	JPL97,MP+OH	

167	RP+OH = 0.50OH+0.50RCO3+0.50ALD2	3.80E-12 exp(200/T)	JPL97,MP+OH	
168	~~PP+OH = 0.50OH+0.50PO2+0.50RCHO~~	3.80E-12 exp(200/T)	JPL97,MP+OH	
	PP + OH = PO2			DBM(MCM 3.1)
169	~~GP+OH = 0.50OH+0.50GCO3+0.50CH2O~~	3.80E-12 exp(200/T)	~~JPL97,MP+OH~~	
	GP + OH = GCO3			DBM(MCM 3.1)
170	GLP+OH = 0.50OH+0.50GLCO3+0.50CO	3.80E-12 exp(200/T)	JPL97,MP+OH	
171	~~RIP+OH = 0.50IAO2 +0.40RIO2 + 0.20RIO1~~	3.80E-12 exp(200/T)	JPL97,MP+OH	
	RIP + OH = 0.509IALD + 0.509OH + 0.491RIO2			DBM,lumping from MCM3.1
172	~~IAP+OH = 0.50OH +0.50RCHO+0.50IAO2~~	3.80E-12 exp(200/T)	~~JPL97,MP+OH~~	
	IAP + OH = IAO2			DBM(MCM 3.1)
173	ISNP+OH = 0.50OH+0.50RCHO+0.50NO2 +0.50ISN1	3.80E-12 exp(200/T)	JPL97,MP+OH	
174	VRP+OH = 0.50OH+0.50RCHO+0.50VRO2	3.80E-12 exp(200/T)	JPL97,MP+OH	
~~175~~	~~MRP+OH = 0.50OH +0.50RCHO + 0.50MRO2~~	3.80E-12 exp(200/T)	~~JPL97,MP+OH~~	
	MRP + OH = MRO2			DBM(MCM 3.1)
176	~~MAOP+OH = 0.50OH+0.50RCHO + 0.50MAO3~~	3.80E-12 exp(200/T)	JPL97,MP+OH	
	MAOP + OH = MAO3			DBM(MCM 3.1)
177	OH+MAP = 0.50OH+0.50CH2O + 0.50MCO3	3.80E-12 exp(200/T)	JPL97,MP+OH	

178	C2H6+NO3 = ETO2+HNO3	1.40E-18	Atkinson,92	
		<1E-17		
179	MNO3+OH =CH2O+NOMNO32	~~5.00E-13 exp(-810/T)~~	~~JPL02~~	
		8.0E-13exp(-1000/T)	JPL06	JMAO, The product is NO2 in the input file instead of NOMNO32.
180	IALD+OH = 0.44IAO2 +0.41MAO3+0.15HO2	3.70E-11	Paulson &Seinfeld, 92	
181	IALD+O3 = 0.60MGLY+0.10OH+0.12CH2O+0.28GLYC+0.30O3+0.40CO+0.20H2+0.20HAC+0.20HCOOH	6.16E-15 exp(-1814/T)	Paulson &Seinfeld, 92	MCO3+NO,MCO3,HO2,RCO3,GCO3,MAO3,GLCO3 rates are used for other radicals.
182	MCO3+MCO3 = 2MO2	2.50E-12 exp(500/T)	Tyndall; See note 6.	RCO3+HO2 same as MCO3+HO2, RCO3+NO same as MCO3+NO, RCO3+MCO3 same asMCO3+MCO3
183	MCO3+MO2 = CH2O+MO2+HO2	1.80E-12 exp(500/T)	Tyndall	
184	MCO3+MO2 = ACTA +CH2O	2.00E-13 exp(500/T)	Tyndall	
185	R4O2+MCO3 = MO2 +0.32ACET+0.19MEK+0.18MO2+0.27HO2+0.32ALD2+0.13RCHO+0.05A3O2+0.18B3O2+0.32ETO2	1.68E-12 exp(500/T)	T dep & B.R.Tyndall K298Villenave 98 See note 12	
186	ATO2+MCO3 = MO2 +0.8HO2+0.2CH2O+0.2MCO3 +0.8MGLY	1.68E-12 exp(500/T)	Ibid.	
187	KO2+MCO3 = MO2 +ALD2+MCO3	1.68E-12 exp(500/T)	Ibid.	

188	RIO2+MCO3 = MO2+0.864HO2+0.690CH2O +0.402MVK+0.288MACR+0.136RIO1+0.127IALD	1.68E-12 exp(500/T)	Ibid.	
189	RIO1+MCO3 = MO2 +IALD+HO2+0.75CH2O	1.68E-12 exp(500/T)	Ibid.	
190	IAO2+MCO3 = MO2 +HO2+0.65CO+0.18H2+0.36HAC+0.26GLYC+0.58MGLY+0.4CH2O	1.68E-12 exp(500/T)	Ibid.	
191	ISN1+MCO3 = MO2+NO2+GLYC+HAC	1.68E-12 exp(500/T)	Ibid.	
192	VRO2+MCO3 = MO2+0.28HO2+0.28CH2O+0.72MCO3+0.72GLYC+0.28MGLY	1.68E-12 exp(500/T)	Ibid.	
193	MRO2+MCO3 = MO2+HO2+0.17MGLY+0.83HAC+0.83CO+0.17CH2O	1.68E-12 exp(500/T)	Ibid.	
194	B3O2+MCO3 = MO2+HO2+ACET	1.68E-12 exp(500/T)	Ibid.	
195	R4N1+MCO3 = MO2+NO2+0.39CH2O+0.75ALD2+0.57RCHO+0.30R4O2	1.68E-12 exp(500/T)	Ibid.	
196	MVN2+MCO3 = MO2 +NO2+CH2O+0.5MCO3+0.5MGLY+0.5HO2	1.68E-12 exp(500/T)	Ibid.	
197	MAN2+MCO3 = MO2 +NO2+CH2O+MGLY	1.68E-12 exp(500/T)	Ibid.	
198	INO2+MCO3 = MO2 +0.10NO2 + 0.80HO2 +0.85HNO3 + 0.05NO2 +0.10MACR + 0.15CH2O +0.05MVK	1.68E-12 exp(500/T)	Ibid.	
199	PRN1+MCO3 = MO2 +NO2+CH2O+ALD2	1.68E-12 exp(500/T)	Ibid.	

200	R4O2+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
201	ATO2+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
202	KO2+MCO3 = MEK + ACTA	1.87E-13 exp(500/T)	Ibid.	
203	RIO2+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
204	RIO1+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
205	IAO2+MCO3 = MEK+ ACTA	1.87E-13 exp(500/T)	Ibid.	
206	VRO2+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
207	MRO2+MCO3 = MEK +ACTA	1.87E-13 exp(500/T)	Ibid.	
208	R4N1+MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
209	ISN1+MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
210	MVN2+MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
211	MAN2+MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
212	INO2+MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
213	PRN1 + MCO3 = RCHO +ACTA + NO2	1.87E-13 exp(500/T)	Ibid.	
214	B3O2+MCO3 = ACET +ACTA	1.87E-13 exp(500/T)	Ibid.	
215	MCO3+ETO2 = MO2+ALD2+HO2	1.68E-12 exp(500/T)	Ibid.	
216	MCO3+ETO2 = ACTA +ALD2	1.87E-13 exp(500/T)	Ibid.	
217	RCO3+MCO3 = MO2 + ETO2	2.50E-12 exp(500/T)	Tyndall,MCO3+MCO3	
218	GCO3+MCO3 = MO2 + HO2+ CH2O	2.50E-12 exp(500/T)	Tyndall,MCO3+MCO3	

219	MAO3+MCO3 = MO2 +	2.50E-12 exp(500/T)	Tyndall,MCO3+MCO3	
	CH2O + MCO3			
220	GLCO3+MCO3 = MO2+ HO2+ CO	2.50E-12 exp(500/T)	Tyndall,MCO3+MCO3	
221	NO3+NO3 = 2NO2 + O2	8.50E-13 exp(-2450/T)	JPL 97	
		Same	JPL06	
222	HO2 = 0.50H2O2	gamma=2E-1	Jacob, 2000	
223	NO2 = 0.50HNO3 +0.50HNO2	gamma=1E-4	Jacob, 2000	
224	NO3 = HNO3	gamma=1E-3	Jacob, 2000	
225	N2O5 = 2HNO3	gamma=	See	
		fct(aerosol type, rh,	Appendix	
		temp)		
226	DMS+OH = SO2+MO2+CH2O	~~1.20E-11 exp(-260/T)~~	~~JPL 2003~~	
		1.1E-11exp(-240/T)	JPL06	JMAO
227	DMS+OH+O2 = 0.75SO2+0.25MSA+MO2	~~K1 = 1.7E-42exp(7810/T) K2=5.5E-31exp(7460/T) K = K1/(1.0+K2*[O2])~~	~~Atkinson 89,yields from Chatfield and Crutzen 90,as reported by Chin et al., 1996.~~	
		K1=1.0E-39exp(5820/T) K2=5.0E-30exp(6280/T) K=K1*[O2]/(1.0+K2*[O2])	JPL06	MJE
228	DMS+NO3 = SO2+HNO3 +MO2+CH2O	1.90E-13 exp(500/T)	JPL2003	
229	SO2+OH+M = SO4+HO2	~~LPL: 3.00E-31(300/T)^3.3 HPL:1.50E-12 Fc: 0.6~~	~~JPL97~~	
		LPL: 3.30E-31(300/T)^4.3 HPL:1.60E-12 Fc: 0.6	JPL06	JMAO
230	MAO3+NO=1.0NO2+4.0CH2O +1.0HO2	6.7E-12exp(340/T)	IUPAC2006	This reaction doesn't exist in the manual but is in the input The rate is from IUPAC2006 (or 2003), using the rate of CH3CH2C(O)O2+NO=C2H5C(O)O+NO2.
	MAO3 + NO=MCO3 + CH2O + NO2			Palmer, May, JMAO

Photolysis reaction				
	Photolysis reaction	reference	Date updated	Flag
	O3 = 2OH	JPL97 and Atkinson97 as reported by Wild et al., 2000; See also notes with Q flag	1/2002	Q
	NO2 = NO + O3	As in Wild et al., 2000		
	H2O2 = 2OH	As in Wild et al., 2000		
	MP = CH2O + HO2 + OH	As in Wild et al., 2000.		
	CH2O = 2HO2 + CO	As in Wild et al., 2000.		
	CH2O = H2 + CO	As in Wild et al., 2000.		
	HNO3 = OH+NO2	As in Wild et al., 2000.		
	HNO2 = OH+NO	As in Wild et al., 2000.		
	HNO4 = OH+NO3	As in Wild et al., 2000.		
	NO3 = NO2 + O3	As in Wild et al., 2000.		
	NO3 = NO + O2	As in Wild et al., 2000.		
	N2O5 = NO2 + NO2	As in Wild et al., 2000.		
	N2O5 = NO3 + NO + O3	As in Wild et al., 2000.		
	HNO4 = HO2 + NO2	As in Wild et al., 2000.; See also T flag notes [Roehl, 2002]	1/2002	T
	ALD2 = MO2 + HO2 + CO	As in Wild et al., 2000.		
	ALD2 = CH4 + CO	As in Wild et al., 2000.		
	~~PAN = MCO3 + NO2~~	~~As in Wild et al.~~		
	PAN =0.6 MCO3 + 0.6 NO2 + 0.4 MO2 + 0.4 NO3	JPL06		DBM
	RCHO = ETO2 + HO2 + CO	As in Wild et al.		
	~~ACET = MCO3 + MO2~~	~~Pressure dependent crosssections from Cameron-Smith et al., 2000~~		
	ACET = MCO3 + MO2; ACET = 2MO2+CO	FAST_JX		Prather
	~~MEK = MCO3 + ETO2~~	As in Wild et al., 2000.		
	MEK = 0.15MO2+0.15RCO3+0.85MCO3 + 0.85ETO2	FAST_JX		Prather
	MNO3 = CH2O + H2O + NO2	As in Wild et al., 2000.		
	~~GLYC = CH2O + HO2 + CO~~	~~As in Wild et al.~~		
	GLYC =CH2O + 2.0 HO2 + CO	JPL06,Lurman1986	GLYC + hv → CH2OH + HCO; CH2OH + O2 → CH2O + HO2 ; HCO + O2 → CO + HO2	Palmer,JMAO
	~~GLYX = H2 + 2CO~~	~~As in Wild et al.~~		
	~~GLYX = 2CO + 2HO2~~	~~As in Wild et al.~~		
	~~GLYX = CH2O + CO~~	~~As in Wild et al.~~		
	GLYX=0.5H2+CO+0.5CH2O+0.5CO;	FAST_JX		Prather
	GLYX=2CO+2HO2			

	MGLY = MCO3 + CO + HO2	As in Wild et al.		
	~~MGLY = ALD2 + CO~~	~~As in Wild et al.~~	Removed; JPL06	Not important according to JPL06,DBM
				Updated in ratj.d for the yield
	MVK = PRPE + CO	As in Wild et al.		
	MVK = MCO3+CH2O+CO+ HO2	As in Wild et al.		
	MVK = MO2+MAO3	As in Wild et al.		
	MACR = MAO3 + HO2	As in Wild et al.		
	~~MACR = CO + HO2 +0.8MGLY+0.8HO2 +0.2MCO3+0.2CH2O~~	~~As in Wild et al.~~		
	MACR = CO + HO2 + CH2O + MCO3			DBM(MCM3.1)
	HAC = MCO3 + CH2O + HO2	Uses pressure-dependent acetone cross-section;Cameron-Smith et al., 2000.		
	INPN = OH + HO2 + RCHO + NO2	Uses MP cross-section		
	PRPN = OH + HO2 + RCHO + NO2	Uses MP cross-section		
	ETP = OH + HO2 + ALD2	Uses MP cross-section		
	RA3P = OH + HO2 + RCHO	Uses MP cross-section		
	~~RB3P = OH + HO2 + RCHO~~	Uses MP cross-section		
	RB3P = OH + HO2 + ACET			DBM
	R4P = OH + HO2 + RCHO	Uses MP cross-section		
	~~PP = OH + HO2 + RCHO~~	Uses MP cross-section		
	PP = OH + HO2 + ALD2 + CH2O			DBM(MCM 3.1)
	RP = OH + HO2 + ALD2	Uses MP cross-section		
	GP = OH + HO2 + CH2O	Uses MP cross-section		
	GLP = OH + HO2 + CO	Uses MP cross-section		
	~~RIP = OH +0.864HO2 + 0.69CH2O +0.402MVK + 0.288MACR +0.136RIO1 + 0.127IALD~~	~~Uses MP cross-section~~		
	RIP = OH + HO2 + 0.627CH2O + 0.368MVK + 0.259MACR + 0.373IALD	J(41)???		DBM(MCM3.1)
	IAP = OH + HO2 + 0.67CO +0.19H2+ 0.36HAC+0.26GLYC+ 0.58MGLY	Uses MP cross-section		
	ISNP = OH + HO2 + RCHO + NO2	Uses MP cross-section		

	~~VRP = OH + 0.28HO2 + 0.28CH2O+0.72MCO3+0.72GLYC+0.28MGLY~~	Uses MP cross-section		
	VRP = OH + 0.3HO2 + 0.3CH2O + 0.7MCO3 + 0.7GLYC + 0.3MGLY			DBM(MCM3.1)
	~~MRP = OH + HO2 + 0.17MGLY +0.83HAC+0.83CO+0.17CH2O~~	Uses MP cross-section		
	MRP = OH + HO2 + HAC + 0.5CO + 0.5CH2O			DBM(MCM3.1)
	~~MAOP = OH + HO2 + RCHO~~	~~Uses MP cross-section~~		
	MAOP = OH + MCO3 + CH2O			DBM(MCM3.1)
	R4N2 = NO2 + 0.32ACET +0.19MEK + 0.18MO2 + 0.27HO2 0.18B3O2+0.32ETO2+0.32ALD2+0.13RCHO+0.05A3O2+0.18B3O2+0.32ETO2	Uses MNO3 cross-section		
	MAP = OH + MO2	Uses MP cross-section		

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# PHOTOLYSIS REACTIONS - MASTER RATEFILE - Paul Brown, Oliver Wild & David Rowley
# Centre for Atmospheric Science, Cambridge, U.K.  Release date:  22 November 1993
# SCCS version information: @(#)photol.d  1.2 5/11/94
#
# Modified for Harvard chemistry: several reactions added, re-ordered per chem.dat
# Also putting in the Harvard names in col 1, the UCI x-sec names in last col !!!
#                              -Prashant Murti [4/13/98]
#
# The new peroxide recycling now activates the following photolysis species:
#   GP,IAP,INPN,ISN1,ISNP,MAOP,MRP,PP,PRPN,RIP,VRP.
# Also be sure to set parameter JPMAX = 55 in "cmn_fj.h".
#                                        - Randall Martin & Bob Yantosca [12/20/00]
# New updates from FASTJX.(jmao,ccarouge, 04/20/09)
#
# Harvard species             Products - UCI notation                              UCI xsec
# ===============            ===============================                       ========
    1 H2O        PHOTON     OH          HO2                   0.00E+00  0.00      0.0
    2 HO2        PHOTON     OH          O(3P)                 0.00E+00  0.00      0.0
    3 O2         PHOTON     O(3P)       O(3P)                 0.00E+00  0.00    100.0  O2
    4 O3_P       PHOTON     O2          O(3P)                 0.00E+00  0.00    100.0  O3
    5 O3         PHOTON     O2          O(1D)                 0.00E+00  0.00    100.0  O3_1d
    6 NO2        PHOTON     NO          O(3P)                 0.00E+00  0.00    100.0  NO2
    7 H2O2       PHOTON     OH          OH                    0.00E+00  0.00    100.0  H2O2
    8 MP         PHOTON     HCHO        OH          HO2       0.00E+00  0.00    100.0  ROOH
    9 CH2O       PHOTON     CO          HO2         HO2       0.00E+00  0.00    100.0  HCHO=H+
   10 CH2O       PHOTON     CO          H2                    0.00E+00  0.00    100.0  HCHO=H2
   11 HNO3       PHOTON     OH          NO2                   0.00E+00  0.00    100.0  HONO2
   12 HNO2       PHOTON     OH          NO                    0.00E+00  0.00    100.0  HONO
   13 HNO4       PHOTON     OH          NO3                   0.00E+00  0.00      5.0  HO2NO2
   14 HNO4       PHOTON     HO2         NO2                   0.00E+00  0.00     95.0  HO2NO2
   15 NO3        PHOTON     NO          O2                    0.00E+00  0.00    100.0  NO3=O2+
   16 NO3        PHOTON     NO2         O(3P)                 0.00E+00  0.00    100.0  NO3=O+
   17 N2O5       PHOTON     NO3         NO          O(3P)     0.00E+00  0.00      0.0  N2O5
   18 N2O5       PHOTON     NO3         NO2                   0.00E+00  0.00    100.0  N2O5
   19 ALD2       PHOTON     CH4         CO                    0.00E+00  0.00    100.0  Acet=R+
   20 ALD2       PHOTON     MeOO        HO2         CO        0.00E+00  0.00    100.0  Acet=RO
   21 PAN        PHOTON     MeCO3       NO2                   0.00E+00  0.00    100.0  PAN
   22 RCHO       PHOTON     EtO2        HO2         CO        0.00E+00  0.00    100.0  RCHO
   23 ACET       PHOTON     MeCO3       MeOO                  0.00E+00  0.00    100.0  AcetA
   24 ACET       PHOTON     MeOO        MeOO        CO        0.00E+00  0.00    100.0  AcetB
   25 MEK        PHOTON     MeCO3       EtOO                  0.00E+00  0.00    100.0  EtCOMe
   26 MNO3       PHOTON     HCHO        H2O         NO2       0.00E+00  0.00    100.0  MeNO3
   27 GLYC       PHOTON     HCHO        HO2         CO        0.00E+00  0.00    100.0  HOMeCHO
   28 GLYX       PHOTON     H2          CO          HCHO      0.00E+00  0.00    100.0  Glyxla
   29 GLYX       PHOTON     CO          HO2                   0.00E+00  0.00    100.0  Glyxlb
   30 MGLY       PHOTON     MeCO3       CO          HO2       0.00E+00  0.00    100.0  MeCOCHO
   31 MGLY       PHOTON     Acet        CO                    0.00E+00  0.00      0.0  MeCOCHO
   32 MVK        PHOTON     PRPE        CO                    0.00E+00  0.00     60.0  MeCOVi
   33 MVK        PHOTON     MeCO3       HCHO        CO  HO2   0.00E+00  0.00     20.0  MeCOVi
   34 MVK        PHOTON     MeOO        MAO3                  0.00E+00  0.00     20.0  MeCOVi
   35 MACR       PHOTON     MAO3        HO2                   0.00E+00  0.00     50.0  MACR
   36 MACR       PHOTON     CO  HO2  MGLY  HO2  MeCO3  HCHO  0.00E+00  0.00     50.0  MACR
   37 HAC        PHOTON     MeCO3       HCHO        HO2       0.00E+00  0.00    100.0  AcetA
   38 ETP        PHOTON     OH          HO2         Acet      0.00E+00  0.00    100.0  ROOH
   39 RA3P       PHOTON     OH          HO2         RCHO      0.00E+00  0.00    100.0  ROOH
   40 RB3P       PHOTON     OH          HO2         RCHO      0.00E+00  0.00    100.0  ROOH
   41 R4P        PHOTON     OH          HO2         RCHO      0.00E+00  0.00    100.0  ROOH
   42 RP         PHOTON     OH          HO2         Acet      0.00E+00  0.00    100.0  ROOH
   43 R4N2       PHOTON     NO2 MeCOMe MEK MO2 HO2 ALD2 ...  0.00E+00  0.00    100.0  MeNO3
   44 MAP        PHOTON     OH          MO2                   0.00E+00  0.00    100.0  ROOH
   45 INPN       PHOTON     OH          HO2         RCHO NO2  0.00E+00  0.00    100.0  ROOH
   46 PRPN       PHOTON     OH          HO2         RCHO NO2  0.00E+00  0.00    100.0  ROOH
   47 PP         PHOTON     OH          HO2         RCHO      0.00E+00  0.00    100.0  ROOH
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   48 GP         PHOTON     OH         HO2        RCHO      0.00E+00  0.00    100.0  ROOH
   49 GLP        PHOTON     OH         HO2        RCHO      0.00E+00  0.00    100.0  ROOH
   50 RIP        PHOTON     OH HO2 CH2O MVK MACR RIO1 IALD  0.00E+00  0.00    100.0  ROOH
   51 IAP        PHOTON     OH HO2  CO  H2  HAC  GLYC  MGLY 0.00E+00  0.00    100.0  ROOH
   52 ISNP       PHOTON     OH         HO2        RCHO NO2  0.00E+00  0.00    100.0  ROOH
   53 VRP        PHOTON     OH  HO2  CH2O  MCO3  GLYC  MGLY 0.00E+00  0.00    100.0  ROOH
   54 MRP        PHOTON     OH  HO2  MGLY  HAC  CO  CH2O    0.00E+00  0.00    100.0  ROOH
   55 MAOP       PHOTON     OH         HO2        RCHO      0.00E+00  0.00    100.0  ROOH
 9999                                                      0.00E-00  0.00      0.0
```

NOTES:

[4/15/98]
Oliver Wild: All reaction data from JPL '97, IUPAC IV. IUPAC V is soon expected. - ppm

All reaction data taken from IUPAC supplement IV unless otherwise indicated.

JPL - data from JPL (latest assessment as far as possible)

? - reaction products unknown
* - user strongly advised to consult source material
B - branching ratio assumed equal for all channels in the absence of more information
U - upper limit for rate coefficient

Changes since 08/3/93 release:
O now written as O(3P)

(Note that the second of the acetaldehyde channels above occurs at wavelengths less than 289 nm, and therefore doesn't appear in the Fast-J region at all - I've simply included it here for completeness) - [from Oliver, 3/7/98]

JV_SPEC.dat updates(mostly cut from the visible wavelength bins of FASTJX 6.4, except Solar Flux, O3 cross section, NO2 cross section are from Huisheng Bian and Michael Prather's latest updates in 2009): Green is the value to be updated.Red is the value significantly changed.

Notes:1.Acetone photolysis is implemented by Claire.2. Pressure dependence is updated for MVK,MEK, MGLY by Claire. 3.Glyoxal reactions and branching ratio have been changed here and ratj.d

jv_spec.dat	FAST-J std		JPL	0	(mje 4/02)		aer/dust(rvm,3/02)	
NW-JValue	27	7	1	7	NJVAL,	NWWW,	NW1:NW2	
w-beg(nm)		289	298.25	307.45	312.45	320.3	345	412.45
w-end(nm)		298.25	307.45	312.45	320.3	345	412.45	850
w-eff(nm)		294	303	310	316	333	380	574
SOL#/cm2/s		7.352E+14	7.332E+14	5.022E+14	8.709E+14	3.786E+15	1.544E+16	2.11E+17
	New	5.882E+14	7.686E+14	5.046E+14	8.906E+14	3.854E+15	1.548E+16	2.131E+17
Raylay	cm2	6.180E-26	5.430E-26	4.920E-26	4.540E-26	3.630E-26	2.09E-26	3.830E-27
		6.131E-26	5.422E-26	4.923E-26	4.514E-26	3.643E-26	2.087E-26	3.848E-27
BCarb	m2/g	10.08	9.96	9.87	9.79	9.58	9	6.5
O2	180							
O2	260							
O2	300							
O3	180	8.693E-19	2.365E-19	8.722E-20	3.694E-20	4.295E-21	1.804E-23	1.630E-21
	180	7.561E-19	2.367E-19	8.756E-20	3.69E-20	4.256E-21	1.806E-23	1.625E-21
O3	260	9.189E-19	2.571E-19	9.673E-20	4.141E-20	5.457E-21	2.775E-23	1.630E-21
	260	8.016E-19	2.572E-19	9.71E-20	4.136E-20	5.409E-21	2.784E-23	1.625E-21
O3	300	9.574E-19	2.777E-19	1.075E-19	4.725E-20	6.782E-21	4.824E-23	1.630E-21
	300	8.391E-19	2.778E-19	1.079E-19	4.72E-20	6.725E-21	4.845E-23	1.625E-21
O3_1d	180	0.9	0.9	0.3824	0.08092	0.0765	0	0
	180	0.9	0.8941	0.4501	0.09189	0.07915	0.065	0
O3_1d	260	0.9	0.9	0.4531	0.1438	0.07654	0	0
	260	0.9	0.8948	0.4992	0.1463	0.08728	0.07017	0
O3_1d	300	0.9	0.9	0.5273	0.2395	0.07659	0	0
	300	0.9	0.8965	0.5636	0.2349	0.1002	0.07435	0
NO2	200	1.048E-19	1.494E-19	1.898E-19	2.295E-19	3.391E-19	4.230E-19	4.047E-22
	220	1.173E-19	1.603E-19	1.966E-19	2.349E-19	3.354E-19	4.473E-19	2.339E-22
NO2	300	1.039E-19	1.462E-19	1.845E-19	2.223E-19	3.256E-19	4.150E-19	4.02E-22
	298	1.165E-19	1.617E-19	2.021E-19	2.455E-19	3.619E-19	4.680E-19	4.291E-22
H2O2	200	8.838E-21	4.991E-21	3.190E-21	2.099E-21	7.716E-22	1.707E-23	0
	200	8.360E-21	5.008E-21	3.220E-21	2.115E-21	7.984E-22	2.101E-23	0
H2O2	300	9.801E-21	5.718E-21	3.773E-21	2.568E-21	1.02E-21	2.287E-23	0
	300	9.300E-21	5.735E-21	3.803E-21	2.583E-21	1.046E-21	2.715E-23	0
ROOH	300	5.883E-21	3.573E-21	2.437E-21	1.756E-21	7.428E-22	4.194E-23	0
	297	5.621E-21	3.573E-21	2.441E-21	1.755E-21	7.405E-22	4.261E-23	0
ROOH	300	5.883E-21	3.573E-21	2.437E-21	1.756E-21	7.428E-22	4.194E-23	0
	298	5.621E-21	3.573E-21	2.441E-21	1.755E-21	7.405E-22	4.261E-23	0
HCHO=H+	223	0	1.969E-20	1.274E-20	1.971E-20	4.354E-21	0	0
	223	0	1.945E-20	1.289E-20	1.969E-20	4.324E-21	5.105E-26	0
HCHO=H+	293	0	1.873E-20	1.304E-20	1.896E-20	3.949E-21	0	0
	293	0	1.85E-20	1.317E-20	1.895E-20	3.922E-21	4.467E-26	0
HCHO=H2	223	0	6.475E-21	4.392E-21	9.027E-21	1.041E-20	1.946E-22	0
	223	0	6.397E-21	4.443E-21	9.027E-21	1.04E-20	1.960E-22	0
HCHO=H2	293	0	6.163E-21	4.500E-21	8.715E-21	9.434E-21	1.883E-22	0
	293	0	6.086E-21	4.543E-21	8.717E-21	9.424E-21	1.903E-22	0
HONO2	200	3.706E-21	1.377E-21	5.451E-22	2.102E-22	2.154E-23	8.105E-26	0
	200	3.396E-21	1.377E-21	5.474E-22	2.100E-22	2.131E-23	8.822E-26	0
HONO2	300	4.747E-21	1.923E-21	8.314E-22	3.589E-22	4.764E-23	2.499E-25	0

	300	4.384E-21	1.923E-21	8.345E-22	3.586E-22	4.720E-23	2.683E-25	0
HONO	300	0	0	1.265E-20	3.469E-20	1.09E-19	8.644E-20	0
	297	0	0	1.175E-20	3.47E-20	1.093E-19	8.764E-20	0
HONO	300	0	0	1.265E-20	3.469E-20	1.09E-19	8.644E-20	0
	298	0	0	1.175E-20	3.47E-20	1.093E-19	8.764E-20	0
HO2NO2	300	2.869E-20	1.102E-20	5.222E-21	2.794E-21	3.255E-22	0	0
	297	2.601E-20	1.103E-20	5.239E-21	2.793E-21	2.250E-22	0	4.792E-23
HO2NO2	300	2.869E-20	1.102E-20	5.222E-21	2.794E-21	3.255E-22	0	0
	298	2.601E-20	1.103E-20	5.239E-21	2.793E-21	2.250E-22	0	4.792E-23
NO3=O+	298	0	0	0	0	0	0	7.428E-19
	297	0	0	0	0	0	0	7.321E-19
NO3=O+	298	0	0	0	0	0	0	7.428E-19
	298	0	0	0	0	0	0	7.321E-19
NO3=O2+	298	0	0	0	0	0	0	9.569E-20
	297	0	0	0	0	0	0	9.435E-20
NO3=O2+	298	0	0	0	0	0	0	9.569E-20
	298	0	0	0	0	0	0	9.435E-20
N2O5	225	4.13E-20	1.998E-20	1.167E-20	7.250E-21	2.296E-21	1.161E-22	0
	225	3.823E-20	1.998E-20	1.17E-20	7.246E-21	2.286E-21	1.173E-22	0
N2O5	300	5.718E-20	3.317E-20	2.223E-20	1.552E-20	6.409E-21	5.415E-22	0
	300	5.404E-20	3.317E-20	2.226E-20	1.551E-20	6.389E-21	5.481E-22	0
Acet=RO	298	4.008E-20	2.869E-20	1.84E-20	3.626E-21	0	0	0
with yield?	298	2.161E-20	1.46E-20	8.410E-21	3.335E-21	1.751E-22	0	0
Acet=RO	298	4.008E-20	2.869E-20	1.84E-20	3.626E-21	0	0	0
	298	2.161E-20	1.46E-20	8.410E-21	3.335E-21	1.751E-22	0	0
Acet=R+	298	0	0	0	0	0	0	0
	298	0	0	0	0	0	0	0
Acet=R+	298	0	0	0	0	0	0	0
	298	0	0	0	0	0	0	0
PAN	250	2.714E-21	9.251E-22	4.342E-22	2.290E-22	5.508E-23	6.551E-25	0
	250	2.438E-21	9.252E-22	4.355E-22	2.288E-22	5.480E-23	6.941E-25	0
PAN	298	3.931E-21	1.399E-21	6.730E-22	3.630E-22	9.301E-23	1.193E-24	0
	298	3.555E-21	1.399E-21	6.750E-22	3.627E-22	9.257E-23	1.265E-24	0
RCHO	298	5.203E-20	3.671E-20	2.22E-20	1.17E-20	1.569E-21	0	0
	297	5.548E-20	4.63E-20	3.578E-20	2.441E-20	5.853E-21	1.257E-23	0
RCHO	298	5.203E-20	3.671E-20	2.22E-20	1.17E-20	1.569E-21	0	0
	298	5.548E-20	4.63E-20	3.578E-20	2.441E-20	5.853E-21	1.257E-23	0
~~Acetone~~	~~235~~	~~2.98E-20~~	~~1.30E-20~~	~~4.32E-21~~	~~1.04E-21~~	~~5.88E-23~~	~~1.53E-25~~	~~0.00E+00~~
~~Acetone~~	~~298~~	~~3.26E-20~~	~~1.48E-20~~	~~5.18E-21~~	~~1.30E-21~~	~~9.62E-23~~	~~2.67E-25~~	~~0.00E+00~~
AcetA	220	3.100E-20	1.944E-20	1.088E-20	5.532E-21	4.637E-22	3.425E-25	0
AcetA	300	3.439E-20	2.255E-20	1.356E-20	7.273E-21	8.481E-22	6.682E-25	0
AcetB	240	5.156E-03	1.931E-03	8.022E-04	4.144E-04	4.156E-05	0	0
AcetB	300	8.564E-02	5.100E-02	3.298E-02	2.214E-02	3.533E-03	0	0
EtCOMe	298	1.432E-20	4.217E-21	1.150E-21	3.394E-22	4.706E-23	0	0
	297	4.170E-20	2.684E-20	1.57E-20	7.721E-21	8.142E-22	3.734E-25	0
EtCOMe	298	1.432E-20	4.217E-21	1.150E-21	3.394E-22	4.706E-23	0	0
	298	4.170E-20	2.684E-20	1.57E-20	7.721E-21	8.142E-22	3.734E-25	0

MeNO3	298	2.871E-20	1.08E-20	5.497E-21	3.460E-21	2.919E-22	0	0
	240	4.679E-21	2.022E-21	9.381E-22	3.730E-22	3.755E-23	0	0
MeNO3	298	2.871E-20	1.08E-20	5.497E-21	3.460E-21	2.919E-22	0	0
	298	6.029E-21	2.735E-21	1.346E-21	5.734E-22	6.957E-23	0	0
HOMeCHO	296	2.322E-20	1.773E-20	1.139E-20	5.584E-21	3.639E-22	0	0
	297	2.784E-20	1.706E-20	9.411E-21	4.388E-21	4.937E-22	0	0
HOMeCHO	296	2.322E-20	1.773E-20	1.139E-20	5.584E-21	3.639E-22	0	0
	298	2.784E-20	1.706E-20	9.411E-21	4.388E-21	4.937E-22	0	0
~~HCOCHO~~	~~298~~	~~9.701E-22~~	~~1.498E-21~~	~~8.257E-21~~	~~1.434E-21~~	~~2.078E-22~~	~~6.393E-22~~	~~3.277E-22~~
~~HCOCHO~~	~~298~~	~~9.701E-22~~	~~1.498E-21~~	~~8.257E-21~~	~~1.434E-21~~	~~2.078E-22~~	~~6.393E-22~~	~~3.277E-22~~
Glyxla	297	0	0	0	0	0	5.914E-22	2.199E-22
Glyxla	298	0	0	0	0	0	5.914E-22	2.199E-22
Glyxlb	297	1.333E-20	1.238E-20	1.117E-20	8.335E-21	2.625E-21	0	0
Glyxlb	298	1.333E-20	1.238E-20	1.117E-20	8.335E-21	2.625E-21	0	0
MeCOCHO	298	2.381E-21	1.853E-21	1.296E-21	9.572E-22	3.327E-22	2.004E-21	4.255E-22
	297	4.384E-20	3.465E-20	2.428E-20	1.788E-20	6.194E-21	2.237E-20	1.435E-21
MeCOCHO	298	2.381E-21	1.853E-21	1.296E-21	9.572E-22	3.327E-22	2.004E-21	4.255E-22
	298	4.384E-20	3.465E-20	2.428E-20	1.788E-20	6.194E-21	2.237E-20	1.435E-21
MeCOVi	298	1.388E-21	1.985E-21	2.587E-21	2.837E-21	3.115E-21	6.627E-22	0
	297	5.521E-21	7.955E-21	8.828E-21	7.236E-21	3.374E-21	1.790E-22	0
MeCOVi	298	1.388E-21	1.985E-21	2.587E-21	2.837E-21	3.115E-21	6.627E-22	0
	298	5.521E-21	7.955E-21	8.828E-21	7.236E-21	3.374E-21	1.790E-22	0
MACR	298	7.862E-22	1.215E-21	1.645E-21	1.804E-21	1.998E-21	3.654E-22	0
	297	2.107E-22	3.151E-22	3.995E-22	4.742E-22	5.222E-22	1.064E-22	0
MACR	298	7.862E-22	1.215E-21	1.645E-21	1.804E-21	1.998E-21	3.654E-22	0
	298	2.107E-22	3.151E-22	3.995E-22	4.742E-22	5.222E-22	1.064E-22	0
CH3I	225	3.289E-20	9.071E-21	4.037E-21	2.073E-21	3.577E-22	1.551E-24	0
	210	2.781E-20	8.253E-21	3.557E-21	1.826E-21	3.437E-22	2.347E-24	0
CH3I	298	5.024E-20	1.479E-20	6.296E-21	3.199E-21	6.783E-22	6.121E-24	0
	298	4.648E-20	1.511E-20	6.466E-21	3.293E-21	6.699E-22	9.781E-24	0
Q1A-Ac	240	1.00E+00	1.21E+00	4.133E+00	2.498E+01	9.452E+01	1.000E+02	1.00E+02
Q1A-Ac	300	1.01E+00	1.22E+00	2.411E+00	6.656E+00	1.969E+01	2.100E+01	2.10E+01
Q1B-Ac	240	1.03E+00	1.07E+01	5.202E+01	2.632E+02	2.760E+03	3.210E+03	3.21E+03
Q1B-Ac	300	8.79E-01	4.90E+00	1.617E+01	5.268E+01	3.023E+02	3.420E+02	3.42E+02

===================Pressure Dependencies===

Pressure Dep: 5

MeCOVi	1	1.67E-19	1.67E-19	1.670E-19	1.670E-19	1.670E-19	1.670E-19	1.67E-19
EtCOMe	1	8.00E-20	8.00E-20	8.000E-20	8.000E-20	8.000E-20	8.000E-20	8.00E-20
MeCOCHO	1	1.66E-19	1.66E-19	1.660E-19	1.660E-19	1.660E-19	1.660E-19	1.66E-19
AcetA	2	1.00E+00	1.00E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.00E+00
AcetB	3	1.00E+00	1.00E+00	1.000E+00	1.000E+00	1.000E+00	1.000E+00	1.00E+00

===================Pressure Dependencies===

From Fast-JX(Michael Prather)

NO3 => NO+O2 [0.11414] fixed

=> NO2+O [0.88586]

Acet=RO is multiplied by the branching ratio

PAN = Peroxyacetyl nitrate = CH3C(O)COONO2
=>CH3C(O)O2 + NO2
CH3NO3 = CH3ONO2 = Methyl nitrate
=> CH3O + NO2
ActAld = Acetaldehyde = CH3CHO
=> CH3 + HCO
MeVK =Methylvinyl ketone = CH3C(O)CH=CH2
=> C3H6+CO [0.6]
=> CH2CHCO+CH3 [0.4]
to be scaled by density 1/(1 + 1.67e-19*M)
MeAcr = Methacrolein CH2C(CH3)CHO
=> CH2=C(CH3)+HCO
X-sect includes q-yld =0.008
GlyAld = Glycol aldehyde = HOCH2CHO
=> HOCH2 + HCO
X-sect includes q-yld =0.75
MEKeto = Methylethyl ketone = CH3COC2H5
=> C2H5+CH3CO [.85]
=> CH3+C2H5CO [.15]
to be scaled by pressure 1/(1 + 2.0*M(bar))
EAld = Ethyl aldehyde = C2H5CHO
=> C2H5 + HCO
MGlyxl = Methyl glyoxal = CH3COCHO
=> CH3CO + HCO
includes *qyld-0(wvl)
to be scaled by pressure 1/(1 + 4.15*M(bar))
Glyxl = Glyoxal (CHO)2
Glyxla => H2+CO+CO or CO+CH2O wvl > 340 nm
X-sect includes qyld-2 [0.029]
Glyxlb => HCO + HCO wvl < 340 nm
X-sect includes qyld-1 [0.40]
C3H6O = Acet = Acetone = CH3C(O)CH3
Acet-A => CH3CO+CH3
Acet-B => CH3+CH3+CO
q-ylds scale with T and density
Q1A-Ac and Q1B-Ac are for the pressure dependence of Acetone.

Updates from Randall Martin

```
15 Mdust 0.15 = mineral dust (R.V.Martin)
  300  4.0154  0.151  0.964 1.000 2.104 2.573 2.380 1.837 1.226  0.608  0.153
  400  3.0582  0.151  0.986 1.000 2.021 2.061 1.505 0.757 0.210  0.057  0.010
  600  1.2133  0.151  0.994 1.000 1.712 1.120 0.368 0.096 0.015  0.002  0.000
  999  0.2195  0.151  0.988 1.000 0.628 0.573 0.113 0.011 0.001  0.000  0.000
16 Mdust 0.25 = mineral dust (R.V.Martin)
  300  2.6560  0.253  0.905 1.000 1.666 2.248 1.871 2.248 2.056  2.231  2.048
  400  3.9669  0.253  0.980 1.000 2.060 2.715 2.658 2.515 2.163  1.591  1.024
  600  3.2556  0.253  0.996 1.000 2.077 2.287 1.790 1.017 0.388  0.147  0.031
  999  1.1019  0.253  0.994 1.000 1.708 1.120 0.374 0.096 0.015  0.002  0.000
17 Mdust 0.4 = mineral dust (R.V.Martin)
  300  2.6071  0.402  0.862 1.000 2.190 3.255 3.624 4.518 4.572  5.092  4.820
  400  2.1923  0.402  0.941 1.000 1.517 2.098 1.515 2.102 1.809  2.234  2.079
  600  3.9815  0.402  0.993 1.000 2.085 2.791 2.764 2.694 2.379  1.855  1.308
  999  2.9227  0.402  0.996 1.000 2.079 2.211 1.661 0.887 0.289  0.090  0.018
18 Mdust 0.8 = mineral dust (R.V.Martin)
  300  2.3459  0.818  0.784 1.000 2.411 3.560 4.213 5.255 5.832  6.783  7.227
  400  2.3417  0.818  0.907 1.000 2.223 3.180 3.372 4.151 4.298  5.044  5.206
  600  2.4688  0.818  0.978 1.000 1.987 2.992 3.061 4.004 3.935  4.526  4.272
  999  3.3741  0.818  0.992 1.000 1.984 2.703 2.614 2.793 2.687  2.533  2.298
19 Mdust 1.5 = mineral dust (R.V.Martin)
  300  2.1925  1.491  0.694 1.000 2.582 3.893 4.901 6.101 7.097  8.288  9.215
  400  2.2457  1.491  0.860 1.000 2.380 3.497 3.982 5.010 5.498  6.555  7.020
  600  2.3919  1.491  0.964 1.000 2.237 3.288 3.523 4.492 4.768  5.704  5.996
  999  2.6314  1.491  0.980 1.000 2.133 3.236 3.499 4.489 4.582  5.171  5.055
20 Mdust 2.5 = mineral dust (R.V.Martin)
  300  2.1427  2.417  0.627 1.000 2.698 4.194 5.526 6.930 8.263  9.655 10.931
  400  2.1881  2.417  0.805 1.000 2.493 3.713 4.426 5.563 6.301  7.494  8.213
  600  2.1559  2.417  0.944 1.000 2.293 3.361 3.606 4.583 4.849  5.859  6.157
  999  2.3282  2.417  0.967 1.000 2.240 3.252 3.437 4.274 4.506  5.346  5.708
21 Mdust 4.0 = mineral dust (R.V.Martin)
  300  2.1045  3.721  0.582 1.000 2.769 4.422 5.990 7.568 9.129 10.687 12.200
  400  2.1191  3.721  0.742 1.000 2.580 3.887 4.812 6.027 7.005  8.295  9.268
  600  2.2094  3.721  0.925 1.000 2.402 3.575 4.016 5.102 5.567  6.724  7.229
  999  2.3429  3.721  0.956 1.000 2.358 3.499 3.877 4.861 5.221  6.222  6.690
```