Supplement of Geosci. Model Dev., 17, 4673–4687, 2024
https://doi.org/10.5194/gmd-17-4673-2024-supplement

Geoscientific Model Development
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EGU

Supplement of

Incorporating Oxygen Isotopes of Oxidized Reactive Nitrogen in the Regional Atmospheric Chemistry Mechanism, version 2 (ICOIN-RACM2)

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Table S1. ICOIN-RACM2 species list. Modified from Goliff et al., 2013 to include the addition of 55 species to track the $\Delta^{17}O$ transfer and propagation from O_3 into NO_y and O_x molecules.

Species	Definition	Molecular Weight
ACD	Acetaldehyde	44
ACE	Acetylene	26
ACO3	Acetyl peroxy radicals	75
ACT	Acetone	58
ACTP	Peroxy radicals formed from ACT	89
ADCN	Aromatic-NO_3 adduct from PHEN	156
ADCNQ	Aromatic-NO_3 adduct from PHEN $\Delta^{17}O$ tracer	156
ADCNQ2	Aromatic-NO_3 adduct from PHEN $\Delta^{17}O$ tracer	156
ADCNQ3	Aromatic-NO_3 adduct from PHEN $\Delta^{17}O$ tracer	156
ADDC	Aromatic-HO adduct from CSL	125
ALD	C3 and higher aldehydes	58
API	Alpha-pinenes and other cyclic terpenes with one double bond	136
APIP	Peroxy radicals formed from API	185
BALD	Benzaldehyde and other aromatic aldehydes	106
BALP	Peroxy radicals formed from BALD	137
BAL1	Peroxy radicals formed from BALD	121
BAL2	Peroxy radicals formed from BALD	105
BEN	Benzene	78
BENP	Peroxy radicals formed from BEN	159
CH4	Methane	16
CHO	Phenoxy radical formed from CSL	139
CO	Carbon monoxide	28
CO2	Carbon dioxide	44
CSL	Cresol and other hydroxy substituted aromatics	108
DCB1	Unsaturated dicarbonyls	91
DCB2	Unsaturated dicarbonyls	110
DCB3	Unsaturated dicarbonyls	84
DIEN	Butadiene and other anthropogenic dienes	54
EOH	Ethanol	46
EPX	Epoxide formed in TOL, XYL and XYO reactions	122
ETE	Ethene	28
ETEG	Ethylene glycol	62
ETEP	Peroxy radicals formed from ETE	77
ETH	Ethane	30
ETHP	Peroxy radicals formed from ETH	61
GLY	Glyoxal	58
H2	Hydrogen	2
H2O	Water	18
H2O2	Hydrogen peroxide	34
H2OQ	Hydrogen peroxide $\Delta^{17}O$ tracer	34
H2Q2	Hydrogen peroxide $\Delta^{17}O$ tracer	34

HC3	Alkanes, esters and alkynes with HO rate constant (298 K, 1 atm) less than 3.4×10^{-12} cm^3 s^{-1}	44
HC3P	Peroxy radicals formed from HC3	75
HC5	Alkanes, esters and alkynes with HO rate constant (298 K, 1 atm) between 3.4×10^{-12} and 6.8×10^{-12} cm^3 s^{-1}	72
HC5P	Peroxy radicals formed from HC5	103
HC8	Alkanes, esters and alkynes with HO rate constant (298 K, 1 atm) greater than 6.8×10^{-12} cm^3 s^{-1}	114
HC8P	Peroxy radicals formed from HC8	145
HCHO	Formaldehyde	30
HKET	Hydroxy ketone	74
HNO3	Nitric acid	63
HNO2Q	Nitric acid $\Delta^{17}O$ tracer	63
HNOQ2	Nitric acid $\Delta^{17}O$ tracer	63
HNQ3	Nitric acid $\Delta^{17}O$ tracer	63
HO2NO2	Pernitric acid	79
HO2NOQ	Pernitric acid $\Delta^{17}O$ tracer	79
HO2NQ2	Pernitric acid $\Delta^{17}O$ tracer	79
HOQNO2	Pernitric acid $\Delta^{17}O$ tracer	79
HOQNOQ	Pernitric acid $\Delta^{17}O$ tracer	79
HOQNOQ2	Pernitric acid $\Delta^{17}O$ tracer	79
HQ2NO2	Pernitric acid $\Delta^{17}O$ tracer	79
HQ2NOQ	Pernitric acid $\Delta^{17}O$ tracer	79
HQ2NQ2	Pernitric acid $\Delta^{17}O$ tracer	79
HO	Hydroxy radical	17
HQ	Hydroxy radical $\Delta^{17}O$ tracer	17
HO2	Hydroperoxy radical	33
HOQ	Hydroperoxy radical $\Delta^{17}O$ tracer	33
HQ2	Hydroperoxy radical $\Delta^{17}O$ tracer	33
HONO	Nitrous acid	47
HONQ	Nitrous acid $\Delta^{17}O$ tracer	47
HQNQ	Nitrous acid $\Delta^{17}O$ tracer	47
ISHP	Beta-hydroxy hydroperoxides from ISOP+HO_2	118
ISO	Isoprene	68
ISON	Beta-hydroxyalkylnitrates from ISOP+NO alkylnitrates from ISO+NO_3	147
ISONQ	Beta-hydroxyalkylnitrates from ISOP+NO alkylnitrates from ISO+NO_3 $\Delta^{17}O$ tracer	147
ISONQ2	Beta-hydroxyalkylnitrates from ISOP+NO alkylnitrates from ISO+NO_3 $\Delta^{17}O$ tracer	147
ISONQ3	Beta-hydroxyalkylnitrates from ISOP+NO alkylnitrates from ISO+NO_3 $\Delta^{17}O$ tracer	147
ISOP	Peroxy radicals formed from ISO+HO	117
KET	Ketones	86
KETP	Peroxy radicals formed from KET	117
LIM	d-limonene and other cyclic diene-terpenes	136
LIMP	Peroxy radicals formed from LIM	185

MACP	Peroxy radicals formed from MACR+HO	101
MACR	Methacrolein	70
MAHP	Hydroperoxides from MACP+HO_2	102
MCP	Peroxy radical formed from MACR + HO which does not form MPAN	119
MCT	Methyl catechol	124
MCTO	Alkoxy radical formed from MCT+HO and MCT+NO_3	123
MCTP	Radical formed from MCT+O_3 reaction	172
MEK	Methyl ethyl ketone	72
MEKP	Peroxy radicals formed from MEK	103
MGLY	Methylglyoxal and other alpha-carbonyl aldehydes	72
MO2	Methyl peroxy radical	47
MOH	Methanol	32
MPAN	Peroxymethacryloylnitrate and other higher peroxyacylnitrates from isoprene oxidation	148
MPANQ	Peroxymethacryloylnitrate and other higher peroxyacylnitrates from isoprene oxidation $\Delta^{17}O$ tracer	148
MPANQ2	Peroxymethacryloylnitrate and other higher peroxyacylnitrates from isoprene oxidation $\Delta^{17}O$ tracer	148
MVK	Methyl vinyl ketone	70
MVKP	Peroxy radicals formed from MVK	119
N2	Nitrogen	28
N2O5	Dinitrogen pentoxide	108
N2O4Q	Dinitrogen pentoxide $\Delta^{17}O$ tracer	108
N2O3Q2	Dinitrogen pentoxide $\Delta^{17}O$ tracer	108
N2O2Q3	Dinitrogen pentoxide $\Delta^{17}O$ tracer	108
N2OQ4	Dinitrogen pentoxide $\Delta^{17}O$ tracer	108
N2Q5	Dinitrogen pentoxide $\Delta^{17}O$ tracer	108
NALD	Nitrooxyacetaldehyde	105
NALDQ	Nitrooxyacetaldehyde $\Delta^{17}O$ tracer	105
NALDQ2	Nitrooxyacetaldehyde $\Delta^{17}O$ tracer	105
NALDQ3	Nitrooxyacetaldehyde $\Delta^{17}O$ tracer	105
NO	Nitric oxide	30
NQ	Nitric oxide $\Delta^{17}O$ tracer	30
NO2	Nitrogen dioxide	46
NOQ	Nitrogen dioxide $\Delta^{17}O$ tracer	46
NQ2	Nitrogen dioxide $\Delta^{17}O$ tracer	46
NO3	Nitrogen trioxide	62
NO2Q	Nitrogen trioxide $\Delta^{17}O$ tracer	62
NOQ2	Nitrogen trioxide $\Delta^{17}O$ tracer	62
NQ3	Nitrogen trioxide $\Delta^{17}O$ tracer	62
O1D	Excited state oxygen atom, $O(^1D)$	16
Q1D	Excited state oxygen atom, $O(^1D)$ $\Delta^{17}O$ tracer	16
O2	Oxygen	32
O3	Ozone	48
O3P	Ground state oxygen atom, $O(^3P)$	16
Q3P	Ground state oxygen atom, $O(^3P)$ $\Delta^{17}O$ tracer	16

OLI	Internal alkenes	68
OLIP	Peroxy radicals formed from OLI	117
OLND	NO_3-alkene adduct reacting via decomposition	136
OLNDQ	NO_3-alkene adduct reacting via decomposition $\Delta^{17}O$ tracer	136
OLNDQ2	NO_3-alkene adduct reacting via decomposition $\Delta^{17}O$ tracer	136
OLNDQ3	NO_3-alkene adduct reacting via decomposition $\Delta^{17}O$ tracer	136
OLNN	NO_3-alkene adduct reacting to form carbonitrates + HO_2	136
OLNNQ	NO_3-alkene adduct reacting to form carbonitrates + HO_2 $\Delta^{17}O$ tracer	136
OLNQ2	NO_3-alkene adduct reacting to form carbonitrates + HO_2 $\Delta^{17}O$ tracer	136
OLNQ3	NO_3-alkene adduct reacting to form carbonitrates + HO_2 $\Delta^{17}O$ tracer	136
OLT	Terminal alkenes	42
OLTP	Peroxy radicals formed from OLT	91
ONIT	Organic nitrate	119
ONITQ	Organic nitrate $\Delta^{17}O$ tracer	119
ONITQ2	Organic nitrate $\Delta^{17}O$ tracer	119
ONITQ3	Organic nitrate $\Delta^{17}O$ tracer	119
OP1	Methyl hydrogen peroxide	48
OP2	Higher organic peroxides	62
ORA1	Formic acid	46
ORA2	Acetic acid and higher acids	60
ORAP	Peroxy radical formed from ORA2 + HO reaction	109
PAA	Peroxyacetic acids and higher analogs	76
PAN	Peroxyacetyl nitrate and higher saturated PANs	121
PANQ	Peroxyacetyl nitrate and higher saturated PANs $\Delta^{17}O$ tracer	121
PANQ2	Peroxyacetyl nitrate and higher saturated PANs $\Delta^{17}O$ tracer	121
PER1	Peroxy intermediate formed from TOL	141
PER2	Peroxy intermediate formed from TOL	157
PHEN	Phenol	94
PHO	Phenoxy radical formed from phenol	93
PPN	Peroxypropionyl nitrate	135
PPNQ	Peroxypropionyl nitrate $\Delta^{17}O$ tracer	135
PPNQ2	Peroxypropionyl nitrate $\Delta^{17}O$ tracer	135
RCO3	Higher saturated acyl peroxy radicals	90
ROH	C3 and higher alcohols	60
SO2	Sulfur dioxide	64
SULF	Sulfuric acid	98
TLP1	Peroxy radicals formed from TOL	91
TOL	Toluene and less reactive aromatics	92
TOLP	Peroxy radicals formed from TOL	141
TR2	Peroxy radicals formed from TOL	109
UALD	Unsaturated aldehydes	84
UALP	Peroxy radicals formed from UALD	133
XO2	Accounts for addition NO to NO_2 conversions	N/A
XY2	Peroxy radicals formed from XYL	124
XYL1	Peroxy radicals formed from XYL	156
XYM	M-xylene	106

XYP	P-xylene	106
XYLP	Peroxy radicals formed from XYL	155
XYO	o-xylene	106
XYO2	Peroxy radicals formed from XYO	155
XYOP	Peroxy radicals formed from XYO	155

Table S2. The ICOIN-RACM2 Mechanism: Photolysis Reactions.

Reaction No.	Reaction	Photolysis Frequency
R001	O3=Q3P+O2	J(O3P)
R002	O3=Q1D+O2	J(O1D)
R003	H2O2=OH+OH	J(H2O2)
R003a	H2OQ=OH+QH	J(H2O2)
R003b	H2Q2=QH + QH	J(H2O2)
R004	NO2=O3P+NO	J(NO2)
R004a	NOQ=0.5Q3P+0.5NO + 0.5O3P + 0.5NQ	J(NO2)
R004b	NQ2=Q3P+NQ	J(NO2)
R005	NO3=O2+NO	J(NO3_NO)
R005a	NO2Q= 0.33*NQ + 0.66*NO	J(NO3_NO)
R005b	NOQ2= 0.66*NQ + 0.33*NO	J(NO3_NO)
R005c	NQ3=NQ	J(NO3_NO)
R006	NO3=O3P+NO2	J(NO3_NO2)
R006a	NO2Q=0.333*Q3P + 0.333*NO2 + 0.666*O3P + 0.666*NOQ	J(NO3_NO2)
R006b	NOQ2=0.666*Q3P + 0.666*NOQ + 0.333*O3P + 0.333*NQ2	J(NO3_NO2)
R006c	NQ3=Q3P+NQ2	J(NO3_NO2)
R007	HONO=OH+NO	J(HONO)
R007a	HONQ=0.5*NO +0.5*NQ + 0.5*OH + 0.5*QH	J(HONO)
R007b	HQNQ=QH+NQ	J(HONO)
R008	HNO3=OH+NO2	J(HNO3)
R008a	HNO2Q = (2/3)*NOQ + (1/3)*NO2 + (2/3)*OH + (1/3)*QH	J(HNO3)
R008b	HNOQ2 = (2/3)*NOQ + (1/3)*NQ2 + (2/3)*QH + (1/3)OH	J(HNO3)
R008c	HNQ3= NQ2 + QH	J(HNO3)
R009	HO2NO2 = 0.2OH+0.2NO3+0.8HO2+0.8NO2	J(HO2NO2)
R009a	HO2NOQ = 0.2OH+0.2NO2Q+0.8HO2+0.8NOQ	J(HO2NO2)
R009b	HO2NQ2 = 0.2OH+0.2NOQ2+0.8HO2+0.8NQ2	J(HO2NO2)
R009c	HOQNO2 = 0.1OH+0.1NO2Q+0.4HOQ+0.4NO2+0.1QH+0.1NO3+0.4HOQ+0.4NO2	J(HO2NO2)
R009d	HOQNOQ = 0.1QH+0.1NO2Q+0.4HOQ+0.4NOQ+0.1OH+0.1NOQ2+0.4HOQ+0.4NOQ	J(HO2NO2)
R009e	HOQNQ2 = 0.1OH+0.1NQ3+0.4HOQ+0.4NQ2+0.1QH+0.1NOQ2+0.4HOQ+0.4NQ2	J(HO2NO2)
R009f	HQ2NO2 = 0.2QH+0.2NO2Q+0.8HQ2+0.8NO2	J(HO2NO2)
R009g	HQ2NOQ = 0.2QH+0.2NOQ2+0.8HQ2+0.8NOQ	J(HO2NO2)
R009h	HQ2NQ2 = 0.2QH+0.2NQ3+0.8HQ2+0.8NQ2	J(HO2NO2)
R010	HCHO=H2+CO	J(HCHO_H2)
R011	HCHO=HO2+HO2+CO	J(HCHO_HO2)
R012	ACD=HO2+MO2+CO	J(ACD)
R013	ALD=HO2+ETHP+CO	J(ALD)
R014	ACT=ACO3+MO2	J(ACT)
R015	UALD=1.22HO2+0.784ACO3+1.22CO+0.35HCHO+0.434ALD+0.216KET	J(UALD)
R016	MEK=ACO3+0.5ETHP+0.5MO2	J(MEK)

R017	KET=ETHP+ACO3	J(KET)
R018	HKET=HO2+ACO3+HCHO	J(HKET)
R019	MACR=0.34OH+0.66HO2+0.67ACO3+0.33MACP+0.34XO2+0.67CO+0.67HCHO	J(MACR)
R020	MVK=0.7UALD+0.7CO+0.3MO2+0.3MACP	J(MVK)
R021	GLY=H2+CO+CO	J(GLY1)
R022	GLY=HCHO+CO+CO	J(GLY2)
R023	GLY=HO2+HO2+CO+CO	J(GLY3)
R024	MGLY=HO2+ACO3+CO	J(MGLY)
R025	DCB1=2XO2+1.5HO2+0.5GLY+0.5MGLY+CO+0.5ACO3	J(DCB1)
R026	DCB2=2XO2+1.5HO2+0.5GLY+0.5MGLY+CO+0.5ACO3	J(DCB2)
R027	BALD=CHO+HO2+CO	J(BALD)
R028	OP1=OH+HO2+HCHO	J(OP1)
R029	OP2=OH+HO2+ALD	J(OP2)
R030	PAA=OH+MO2	J(PAA)
R031	ONIT=HO2+0.2ALD+NO2+0.8KET	J(ONIT)
R031a	ONITQ=HO2+0.2ALD+(2/3)*NOQ+(1/3)*NO2+0.8KET	J(ONIT)
R031b	ONITQ2=HO2+0.2ALD+(2/3)*NOQ+(1/3)*NQ2+0.8KET	J(ONIT)
R031c	ONITQ3=HOQ+0.2ALD+NQ2+0.8KET	J(ONIT)
R032	PAN=ACO3+NO2	J(PAN1)
R032a	PANQ=ACO3+NOQ	J(PAN1)
R032b	PANQ2=ACO3+NQ2	J(PAN1)
R033	PAN=MO2+NO3+CO2	J(PAN2)
R033a	PANQ=MO2+NO2Q+CO2	J(PAN2)
R033b	PANQ2=MO2+NOQ2+CO2	J(PAN2)

[a]The photolysis frequency (*J*) were calculated in the F0AM model using literature derived cross sections and quantum yields taken from latest IUPAC and JPL recommendations as previously documented (Wolfe et al., 2016).

Table S3. The ICOIN-RACM2 Mechanism: Thermal Reactions.

Reaction No.	Reaction	Reaction Rate	Note
Inorganic Reactions			
R034	O3+OH=HOQ+O_2	1.70E-12.*exp(-940./T)	1
R034a	O3+QH=HQ2+O_2	1.70E-12.*exp(-940./T)	1
R035	O3+HO2=OH+O2+O2	1.00E-14.*exp(-490./T)	1
R035a	O3+HOQ=0.5QH+0.5OH	1.00E-14.*exp(-490./T)	1
R035b	O3+HQ2=QH	1.00E-14.*exp(-490./T)	1
R036	O3+NO=NOQ+O2	1.40e-12.*exp(-1310./T)	1
R036a	O3+NQ=NQ2+O2	1.40e-12.*exp(-1310./T)	1
R037	NO2+O3=NO2Q+O2	1.40e-13.*exp(-2470./T)	1
R037a	NOQ+O3=NOQ2+O2	1.40e-13.*exp(-2470./T)	1
R037b	NQ2+O3=NQ3+O2	1.40e-13.*exp(-2470./T)	1
R038	O3P+O2=O3	M.*5.60E-34.*((T./300).^-2.6).*0.21.*M	1
R038a	Q3P+O2=O3	M.*5.60E-34.*((T./300).^-2.6).*0.21.*M	1
R039	O3P+O3=O2+O2	8.00e-12.*exp(-2060./T)	1
R039a	Q3P+O3=O2+O2	8.00e-12.*exp(-2060./T)	1
R040	O1D+O2=O3P+O2	3.20e-11.*0.21.*M	1
R040a	Q1D+O2=Q3P	3.20e-11.*0.21.*M	1
R041	O1D+N2=O3P+N2	1.80e-11.*exp(107./T).*0.78.*M	1
R041a	Q1D+N2=Q3P+N2	1.80e-11.*exp(107./T).*0.78.*M	1
R042	O1D+H2O=OH+OH	2.20E-10.*H2O	1
R042a	Q1D+H2O=QH+OH	2.20E-10.*H2O	1
R043	OH+H2=HO2+H2O	7.70e-12.*exp(-2100./T)	1
R043a	QH+H2=HO2+H2O	7.70e-12.*exp(-2100./T)	1
R044	OH+HO2=H2O+O2	4.80E-11.*exp(250./T)	1
R044a	QH+HO2=H2O+O2	4.80E-11.*exp(250./T)	1
R044b	QH+HOQ= H2O+O2	4.80E-11.*exp(250./T)	1
R044c	QH+HQ2= H2O+O2	4.80E-11.*exp(250./T)	1
R044d	OH+HQ2= H2O+O2	4.80E-11.*exp(250./T)	1
R044e	OH+HOQ= H2O+O2	4.80E-11.*exp(250./T)	1
R045	HO2+HO2=H2O2+O2	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1
R045a	HOQ + HO2 = 0.5*H2OQ + 0.5*H2O2	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1

R045b	HQ2 + HO2 = H2OQ	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1
R045c	HOQ + HOQ = 0.25*H2O2 + 0.5*H2OQ + 0.25*H2Q2	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1
R045d	HQ2 + HOQ = 0.5*H2OQ + 0.5*H2Q2	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1
R045e	HQ2 + HQ2 = H2Q2	2.20e-13.*exp(600./T)+1.90e-33.*M.*exp(980./T)	1
R046	HO2+HO2+H2O=H2O2+H2O+O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R046a	HOQ + HO2 = 0.5*H2OQ + 0.5*H2O2+O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R046b	HQ2 + HO2 = H2OQ +O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R046c	HOQ + HOQ = 0.5*H2OQ + 0.25*H2Q2 + 0.25*H2O2 +O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R046d	HOQ + HQ2 = 0.5*H2Q2 + 0.5*H2OQ +O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R046e	HQ2 + HQ2 = H2Q2 +O2	(3.08e-34.*exp(2800./T)+2.59e-54.*M.*exp(3180./T)).*H2O	1
R047	H2O2+OH=HO2+H2O	2.90E-12.*exp(-160./T)	1
R047a	H2OQ+OH=0.5HOQ+0.5HO2 +H2O	2.90E-12.*exp(-160./T)	1
R047b	H2Q2+OH=HOQ+H2O	2.90E-12.*exp(-160./T)	1
R047c	H2O2+QH=HOQ+H2O	2.90E-12.*exp(-160./T)	1
R047d	H2OQ+QH=0.5HQ2+0.5HOQ+H2O	2.90E-12.*exp(-160./T)	1
R047e	H2Q2+QH=HQ2+H2O	2.90E-12.*exp(-160./T)	1
R048	NO+O3P=NO2	K_O3P_NO	Table 4
R048a	NQ+O3P=NOQ	K_O3P_NO	Table 4
R048b	NQ+Q3P=NQ2	K_O3P_NO	Table 4
R048c	NO+Q3P=NOQ	K_O3P_NO	Table 4
R049	NO+OH=HONO	K_OH_NO	1

R049a	NQ+OH=HONQ	K_OH_NO	1
R049b	NQ+QH=HQNQ	K_OH_NO	1
R049c	NO+QH=HONQ	K_OH_NO	1
R050	HO2+NO=OH+NO2	3.45E-12.*exp(270./T)	1
R050a	HO2+NQ=OH+NOQ	3.45E-12.*exp(270./T)	1
R050b	HOQ+NQ=0.5*QH + 0.5*NOQ + 0.5*OH + 0.5*NQ2	3.45E-12.*exp(270./T)	1
R050c	HQ2+NQ=QH+NQ2	3.45E-12.*exp(270./T)	1
R050d	HOQ+NO=0.5OH+0.5NOQ+0.5QH+0.5 NO2	3.45E-12.*exp(270./T)	1
R050e	HQ2+NO=QH+NOQ	3.45E-12.*exp(270./T)	1
R051	HO2+NO=HNO3	K_HO2_NO_HNO3	Table 6
R051a	HO2+NQ=HNO2Q	K_HO2_NO_HNO3	Table 6
R051b	HOQ+NQ=HNOQ2	K_HO2_NO_HNO3	Table 6
R051c	HQ2+NQ=HNQ3	K_HO2_NO_HNO3	Table 6
R051d	HQ2+NO=HNOQ2	K_HO2_NO_HNO3	Table 6
R051e	HOQ+NO=HNO2Q	K_HO2_NO_HNO3	Table 6
R052	NO+NO+O2=NO2+NO2	3.30e-39.*exp(530./T).*.21.*M	1
R052a	NQ+NO+O2=NOQ+NO2	3.30e-39.*exp(530./T).*.21.*M	1
R052b	NQ+NQ+O2=NOQ+NOQ	3.30e-39.*exp(530./T).*.21.*M	1
R053	HONO+OH=NO2+H2O	2.50e-12.*exp(260./T)	1
R053a	HONO+QH=NO2	2.50e-12.*exp(260./T)	1
R053b	HONQ+QH=NOQ	2.50e-12.*exp(260./T)	1
R053c	HQNQ+QH=NQ2	2.50e-12.*exp(260./T)	1
R053d	HQNQ+OH=NQ2	2.50e-12.*exp(260./T)	1
R053e	HONQ+OH=NOQ	2.50e-12.*exp(260./T)	1
R054	O3P+NO2=NO+O2	5.50e-12.*exp(188./T)	1
R054a	Q3P+NO2=NO+O2	5.50e-12.*exp(188./T)	1
R054b	Q3P+NOQ=0.5NQ + 0.5NO+O2	5.50e-12.*exp(188./T)	1
R054c	O3P+NOQ=NO+QO NQ+O2	5.50e-12.*exp(188./T)	1
R054d	O3P+NQ2=NQ+O2	5.50e-12.*exp(188./T)	1
R054e	Q3P+NQ2=NQ+O2	5.50e-12.*exp(188./T)	1
R055	O3P+NO2=NO3	K_O3P_NO2	Table 4
R055a	Q3P+NO2=NO2Q	K_O3P_NO2	Table 4
R055b	Q3P+NOQ=NOQ2	K_O3P_NO2	Table 4
R055c	Q3P+NQ2=NQ3	K_O3P_NO2	Table 4
R055d	O3P+NQ2=NOQ2	K_O3P_NO2	Table 4
R055e	O3P+NOQ=NO2Q	K_O3P_NO2	Table 4
R056	OH+NO2=HNO3	K_OH_NO2_HONO2	Table 4
R056a	QH+NO2=HNO2Q	K_OH_NO2_HONO2	Table 4
R056b	QH+NOQ=HNOQ2	K_OH_NO2_HONO2	Table 4
R056c	QH+NQ2=HNQ3	K_OH_NO2_HONO2	Table 4
R056d	OH+NQ2=HNOQ2	K_OH_NO2_HONO2	Table 4

R056e	OH+NOQ=HNO2Q	K_OH_NO2_HONO2	Table 4
R057	OH+HNO3=NO3+H2O	K_OH_HNO3	Table 6
R057a	QH+HNO3=NO3+H2O	K_OH_HNO3	Table 6
R057b	QH+HNO2Q=NO2Q+H2O	K_OH_HNO3	Table 6
R057c	QH+HNOQ2=NOQ2+H2O	K_OH_HNO3	Table 6
R057d	QH+HNQ3=NQ3+H2Q	K_OH_HNO3	Table 6
R057e	OH+HNQ3=NQ3+H2O	K_OH_HNO3	Table 6
R057f	OH+HNOQ2=NOQ2+H2O	K_OH_HNO3	Table 6
R057g	OH+HNO2Q=NO2Q+H2O	K_OH_HNO3	Table 6
R058	OH+NO3=HO2+NO2	2.00e-11	1
R058a	QH+NO3=HOQ+NO2	2.00e-11	1
R058b	QH+NO2Q=0.5HQ2+0.5NO2 +0.5HOQ+0.5NOQ	2.00e-11	1
R058c	QH+NOQ2=0.5HQ2+0.5NOQ+0.5HOQ+ 0.5NQ2	2.00e-11	1
R058d	QH+NQ3=HQ2+NQ2	2.00e-11	1
R058e	OH+NQ3=HOQ+NQ2	2.00e-11	1
R058f	OH+NOQ2=0.5HO2+0.5NQ2+0.5HOQ+ 0.5NOQ	2.00e-11	1
R058g	OH+NO2Q=0.5HOQ+0.5NO2 0.5HO2+0.5NOQ	2.00e-11	1
R059	HO2+NO3=0.7OH+0.7NO2+0.3HNO3	4.00e-12	1
R059a	HOQ+NO3=0.35OH+0.35QH+0.3HNO3 +0.7NO2	4.00e-12	1
R059b	HQ2+NO3=0.7QH+0.7NO2+0.3HNO3	4.00e-12	1
R059c	HQ2+NO2Q=0.7QH+0.3HNO3+0.467N OQ+0.233NO2	4.00e-12	1
R059d	HQ2+NOQ2=0.7QH+0.3HNOQ2+0.467 NOQ+0.233NQ2	4.00e-12	1
R059e	HQ2+NQ3=0.7QH+0.7NQ2+0.3HNQ3	4.00e-12	1
R059f	HOQ+NQ3=0.35OH+0.35QH+0.3HNQ3 +0.7NQ2	4.00e-12	1
R059g	HOQ+NOQ2=0.35OH+0.35QH+0.3HNO Q2+0.467NOQ+0.233NQ2	4.00e-12	1
R059h	HOQ+NO2Q=0.35OH+0.35QH+0.3HNO 2Q+0.467NOQ+0.233NO2	4.00e-12	1
R059i	HO2+NO2Q=0.7OH+0.3HNO2Q+0.467 NOQ+0.233NO2	4.00e-12	1
R059j	HO2+NOQ2=0.7OH+0.3HNOQ2+0.467 NOQ+0.233NQ2	4.00e-12	1
R059k	HO2+NQ3=0.7OH+0.3HNQ3+.7NQ2	4.00e-12	1
R060	NO+NO3=NO2+NO2	1.80E-11.*exp(110./T)	1
R060a	NQ + NO3 = NOQ + NO2	1.80E-11.*exp(110./T)	1
R060b	NQ + NO2Q = 0.333*NQ2 + 0.333*NO2 + 1.333*NOQ	1.80E-11.*exp(110./T)	1
R060c	NQ + NOQ2 = NOQ + NQ2	1.80E-11.*exp(110./T)	1

R060d	NQ + NQ3 = 2*NQ2	1.80E-11.*exp(110./T)	1
R060e	NO + NO2Q = NO2 + NOQ	1.80E-11.*exp(110./T)	1
R060f	NO + NOQ2 = 1.333*NOQ + 0.333*NO2 + 0.333*NQ2	1.80E-11.*exp(110./T)	1
R060g	NO + NQ3 = NOQ + NQ2	1.80E-11.*exp(110./T)	1
R061	NO2+NO3=NO+NO2+O2	4.50e-14.*exp(-1260./T)	1
R061a	NOQ+NO3=0.5NO+0.5NQ+NO2	4.50e-14.*exp(-1260./T)	1
R061b	NQ2+NO3=NQ+NQ2	4.50e-14.*exp(-1260./T)	1
R061c	NQ2+NO2Q=NQ+0.33NO2+0.66NOQ	4.50e-14.*exp(-1260./T)	1
R061d	NQ2+NOQ2=NQ+0.33NQ2+0.66NOQ	4.50e-14.*exp(-1260./T)	1
R061e	NQ2+NQ3=NQ+NQ2	4.50e-14.*exp(-1260./T)	1
R061f	NOQ+NQ3=0.5NO+0.5NQ+NQ2	4.50e-14.*exp(-1260./T)	1
R061g	NOQ+NOQ2=0.5NO+0.5NQ+0.66NOQ+ 0.333NQ2	4.50e-14.*exp(-1260./T)	1
R061h	NOQ+NO2Q=0.5NO+0.5NQ+0.66NOQ+ 0.33NO2	4.50e-14.*exp(-1260./T)	1
R061i	NO2+NO2Q=NO+0.33NO2+0.66NOQ	4.50e-14.*exp(-1260./T)	1
R061j	NO2+NOQ2=NO+0.33NQ2+0.66NOQ	4.50e-14.*exp(-1260./T)	1
R061k	NO2+NQ3=NO+NQ2	4.50e-14.*exp(-1260./T)	1
R062	NO3+NO3=NO2+NO2+O2	8.50E-13.*exp(-2450./T)	1
R062a	NO2Q + NO3 = (2/3)*NOQ + (4/3)NO2+O2	8.50E-13.*exp(-2450./T)	1
R062b	NOQ2 + NO3 = (2/3)*NOQ + (1/3)*NQ2 + NO2+O2	8.50E-13.*exp(-2450./T)	1
R062c	NQ3 + NO3 = NQ2 + NO2+O2	8.50E-13.*exp(-2450./T)	1
R062d	NQ3 + NO2Q = NQ2 + (2/3)*NOQ + (1/3)*NO2+O2	8.50E-13.*exp(-2450./T)	1
R062e	NQ3 + NQ3 = NQ2 + NQ2+O2	8.50E-13.*exp(-2450./T)	1
R062f	NO2Q + NO2Q = (4/3)*NOQ + (2/3)*NO2+O2	8.50E-13.*exp(-2450./T)	1
R062g	NO2Q + NOQ2 = (4/3)*NOQ (1/3)*NO2 + (1/3)*NQ2+O2	8.50E-13.*exp(-2450./T)	1
R062h	NOQ2 + NOQ2 = (4/3)*NOQ + (2/3)*NQ2+O2	8.50E-13.*exp(-2450./T)	1
R062i	NOQ2 + NQ3 = (2/3)*NOQ + (4/3)*NQ2+O2	8.50E-13.*exp(-2450./T)	1
R063	NO2+NO3=N2O5	K_NO2_NO3	Table 4
R063a	NOQ+NO3=N2O4Q	K_NO2_NO3	Table 4
R063b	NQ2+NO3=N2O3Q2	K_NO2_NO3	Table 4
R063c	NQ2+NO2Q=N2O2Q3	K_NO2_NO3	Table 4
R063d	NQ2+NOQ2=N2OQ4	K_NO2_NO3	Table 4
R063e	NQ2+NQ3=N2Q5	K_NO2_NO3	Table 4
R063f	NOQ+NQ3=N2OQ4	K_NO2_NO3	Table 4
R063g	NOQ+NOQ2=N2O2Q3	K_NO2_NO3	Table 4
R063h	NOQ+NO2Q=N2O3Q2	K_NO2_NO3	Table 4
R063i	NO2+NO2Q=N2O4Q	K_NO2_NO3	Table 4

R063j	NO2+NOQ2=N2O3Q2	K_NO2_NO3	Table 4
R063k	NO2+NQ3=N2O2Q3	K_NO2_NO3	Table 4
R064	N2O5= NO2+NO3	K_N2O5	Table 5
R064a	N2O4Q = (2/5)*NOQ + (2/5)*NO3 + (3/5)*NO2 + (3/5)*NO2Q	K_N2O5	Table 5
R064b	N2O3Q2 = 0.3*NO2 + 0.6*NOQ + 0.1*NQ2 + 0.1NO3 + 0.6*NO2Q + 0.3*NOQ2	K_N2O5	Table 5
R064c	N2O2Q3 = 0.1*NO2 + 0.6*NOQ + 0.3*NQ2 + 0.3*NO2Q + 0.6*NOQ2 + 0.1*NQ3	K_N2O5	Table 5
R064d	N2OQ4 = 0.4*NOQ + 0.6*NQ2 + 0.6*NOQ2 + 0.4*NQ3	K_N2O5	Table 5
R064e	N2Q5 = NQ3 + NQ2	K_N2O5	Table 5
R065	N2O5+H2O=HNO3+HNO3	2.50E-22.*H2O	1
R065a	N2O4Q +H2O = (2/5)*HNO2Q + (2/5)*HNO3 + (3/5)*HNO3 + (3/5)*HNO2Q	2.50E-22.*H2O	1
R065b	N2O3Q2 +H2O = 0.3*HNO3 + 0.6*HNO2Q + 0.1*HNOQ2 + 0.1HNO3 + 0.6*HNO2Q + 0.3*HNOQ2	2.50E-22.*H2O	1
R065c	N2O2Q3 +H2O = 0.1*HNO3 + 0.6*HNO2Q + 0.3*HNOQ2 + 0.3*HNO2Q + 0.6*HNOQ2 + 0.1*HNQ3	2.50E-22.*H2O	1
R065d	N2OQ4 +H2O = 0.4*HNO2Q + 0.6*HNOQ2 + 0.6*HNOQ2 + 0.4*HNQ3	2.50E-22.*H2O	1
R065e	N2Q5 +H2O = HNQ3 + HNOQ2	2.50E-22.*H2O	1
R066	HO2+NO2=HO2NO2	K_HO2_NO2	Table 4
R066a	HOQ+NO2=HOQNO2	K_HO2_NO2	Table 4
R066b	HQ2+NO2=HQ2NO2	K_HO2_NO2	Table 4
R066c	HQ2+NQ2=HQ2NQ2	K_HO2_NO2	Table 4
R066d	HQ2+NOQ=HQ2NOQ	K_HO2_NO2	Table 4
R066e	HOQ+NOQ=HOQNOQ	K_HO2_NO2	Table 4
R066f	HOQ+NQ2=HOQNQ2	K_HO2_NO2	Table 4
R066g	HO2+NQ2=HO2NQ2	K_HO2_NO2	Table 4
R066h	HO2+NOQ=HO2NOQ	K_HO2_NO2	Table 4
R067	HO2NO2=HO2+NO2	K_HO2NO2	Table 5
R067a	HOQNO2=HOQ+NO2	K_HO2NO2	Table 5
R067b	HQ2NO2=HQ2+NO2	K_HO2NO2	Table 5
R067c	HQ2NOQ=HQ2+NOQ	K_HO2NO2	Table 5
R067d	HQ2NQ2=HQ2+NQ2	K_HO2NO2	Table 5
R067e	HOQNQ2=HOQ+NQ2	K_HO2NO2	Table 5
R067f	HOQNOQ=HOQ+NOQ	K_HO2NO2	Table 5
R067g	HO2NOQ=HO2+NOQ	K_HO2NO2	Table 5
R067h	HO2NQ2=HO2+NQ2	K_HO2NO2	Table 5
R068	OH+HO2NO2=NO2+H2O+O2	1.30e-12.*exp(380./T)	1

R068a	QH+HO2NO2=NO2+H2Q+O2	1.30e-12.*exp(380./T)	1
R068b	QH+HOQNO2=NO2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068c	QH+HQ2NO2=NO2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068d	QH+HQ2NOQ=NOQ+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068e	QH+HQ2NQ2=NQ2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068f	QH+HOQNQ2=NQ2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068g	QH+HOQNOQ=NOQ+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068h	QH+HO2NQ2=NQ2+H2Q+O2	1.30e-12.*exp(380./T)	1
R068i	QH+HO2NOQ=NOQ+H2Q+O2	1.30e-12.*exp(380./T)	1
R068j	OH+HOQNO2=NO2+H2O+ O2	1.30e-12.*exp(380./T)	1
R068k	OH+HQ2NO2=NO2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068l	OH+HQ2NOQ=NOQ+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068m	OH+HQ2NQ2=NQ2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068n	OH+HOQNQ2=NQ2+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068o	OH+HOQNOQ=NOQ+H2Q+ O2	1.30e-12.*exp(380./T)	1
R068p	OH+HO2NQ2=NQ2+H2Q+O2	1.30e-12.*exp(380./T)	1
R068q	OH+HO2NOQ=NOQ+H2Q+O2	1.30e-12.*exp(380./T)	1
R069	OH+SO2=HO2+SULF	K_OH_SO2	Table 4
R069a	QH+SO2=HO2+SULF	K_OH_SO2	Table 4
R070	OH+CO=HO2+CO2	K_OH_CO	Table 6
R070a	QH+CO=HO2+CO2	K_OH_CO	Table 6
VOC + OH			
R071	OH+CH4=MO2+H2O	1.85e-12.*exp(-1690./T)	1
R071a	QH+CH4=MO2+H2O	1.85e-12.*exp(-1690./T)	1
R072	ETH+OH=ETHP+H2O	6.90E-12.*exp(-1000./T)	1
R072a	ETH+QH=ETHP+H2O	6.90E-12.*exp(-1000./T)	1
R073	OH+HC3=HC3P+H2O	7.68e-12.*exp(-370./T)	1
R073a	QH+HC3=HC3P+H2O	7.68e-12.*exp(-370./T)	1
R074	OH+HC5=HC5P+H2O	1.01e-11.*exp(-245./T)	1
R074a	QH+HC5=HC5P+H2O	1.01e-11.*exp(-245./T)	1
R075	OH+HC8=0.049HO2+0.951HC8P+H2O +0.025ALD+0.024HKET	2.82e-11.*exp(-273./T).*0.951	1
R075a	QH+HC8=0.049HO2+0.951HC8P+H2O +0.025ALD+0.024HKET	2.82e-11.*exp(-273./T).*0.951	1
R076	ETE+OH=ETEP	K_OH_ETE	Table 4
R076a	ETE+QH=ETEP	K_OH_ETE	Table 4
R077	OLT+OH=OLTP	5.72E-12.*exp(500./T)	1
R077a	OLT+QH=OLTP	5.72E-12.*exp(500./T)	1
R078	OLI+OH=OLIP	1.33E-11.*exp(500./T)	1
R078a	OLI+QH=OLIP	1.33E-11.*exp(500./T)	1
R079	DIEN+OH=OLIP	1.48E-11.*exp(448./T)	1
R079a	DIEN+QH=OLIP	1.48E-11.*exp(448./T)	1
R080	OH+ACE=0.35ORA1+0.35CO+0.35HO2 +0.65GLY+0.65OH	K_OH_ACE	Table 4
R080a	QH+ACE=0.35ORA1+0.35CO+0.35HO2 +0.65GLY+0.65OH	K_OH_ACE	Table 4

R081	BEN+OH=0.648 HO2+0.352 BENP+0.118 EPX+0.53 PHEN	2.33E-12.*exp(-193./T)	1
R081a	BEN+QH=0.648 HO2+0.352 BENP+0.118 EPX+0.53 PHEN	2.33E-12.*exp(-193./T)	1
R082	TOL+OH=0.177 HO2+0.763 TR2+0.06 TLP1+0.177 CSL	1.81E-12.*exp(354./T)	1
R082a	TOL+QH=0.177 HO2+0.763 TR2+0.06 TLP1+0.177 CSL	1.81E-12.*exp(354./T)	1
R083	XYM+OH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	2.31E-11	1
R083a	XYM+QH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	2.31E-11	1
R084	XYP+OH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	1.43E-11	1
R084a	XYP+QH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	1.43E-11	1
R085	XYO+OH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	1.36E-11	1
R085a	XYO+QH=0.177 HO2+0.763 XY2+0.06 XYL1+0.117 CSL	1.36E-11	1
R086	ISO+OH=ISOP	2.54E-11.*exp(410./T)	1
R086a	ISO+QH=ISOP	2.54E-11.*exp(410./T)	1
R087	API+OH=APIP	1.21E-11.*exp(440./T)	1
R087a	API+QH=APIP	1.21E-11.*exp(440./T)	1
R088	LIM+OH=LIMP	4.20e-11.*exp(401./T)	1
R088a	LIM+QH=LIMP	4.20e-11.*exp(401./T)	1
oVOC + OH			
R089	OH+HCHO=HO2+CO+H2O	5.50E-12.*exp(125./T)	1
R089a	QH+HCHO=HO2+CO+H2O	5.50E-12.*exp(125./T)	1
R090	OH+ACD=ACO3+H2O	4.38E-12.*exp(366./T)	1
R090a	QH+ACD=ACO3+H2O	4.38E-12.*exp(366./T)	1
R091	OH+ALD=RCO3+H2O	5.10E-12.*exp(405./T)	1
R091a	QH+ALD=RCO3+H2O	5.10E-12.*exp(405./T)	1
R092	ACT+OH=ACTP+H2O	1.39E-13+3.72E-11.*exp(-2044./T)	1
R092a	ACT+QH=ACTP+H2O	1.39E-13+3.72E-11.*exp(-2044./T)	1
R093	OH+MEK=MEKP+H2O	1.30E-12.*exp(-25./T)	1
R093a	QH+MEK=MEKP+H2O	1.30E-12.*exp(-25./T)	1
R094	OH+KET=KETP+H2O	2.80E-12.*exp(10./T)	1
R094a	QH+KET=KETP+H2O	2.80E-12.*exp(10./T)	1
R095	HKET+OH=HO2+MGLY+H2O	3.00E-12	1
R095a	HKET+QH=HO2+MGLY+H2O	3.00E-12	1
R096	MACR+OH=0.57 MACP+0.43 MCP	8.00E-12.*exp(380./T)	1
R096a	MACR+QH=0.57 MACP+0.43 MCP	8.00E-12.*exp(380./T)	1
R097	MVK+OH=MVKP	2.60E-12.*exp(610./T)	1

R097a	MVK+QH=MVKP	2.60E-12.*exp(610./T)	1
R098	UALD+OH=0.313 ACO3+0.687 UALP	5.77E-12.*exp(533./T)	1
R098a	UALD+QH=0.313 ACO3+0.687 UALP	5.77E-12.*exp(533./T)	1
R099	GLY+OH=HO2+CO+CO+H2O	1.10E-11	1
R099a	GLY+QH=HO2+CO+CO+H2O	1.10E-11	1
R100	MGLY+OH=ACO3+CO+H2O	9.26E-13.*exp(830./T)	1
R100a	MGLY+QH=ACO3+CO+H2O	9.26E-13.*exp(830./T)	1
R101	DCB1+OH = 0.52HO2+0.33CO+0.40ALD+0.78KET+0.10GLY+0.01MGLY	2.80E-11.*exp(175./T)	1
R101a	DCB1+QH = 0.52HO2+0.33CO+0.40ALD+0.78KET+0.10GLY+0.01MGLY	2.80E-11.*exp(175./T)	1
R102	DCB2+OH= 0.52HO2+0.33CO+0.13MEK+0.10GLY+0.01MGLY+0.78OP2	2.80E-11.*exp(175./T)	1
R102a	DCB2+QH= 0.52HO2+0.33CO+0.13MEK+0.10GLY+0.01MGLY+0.78OP2	2.80E-11.*exp(175./T)	1
R103	DCB3+OH= 0.56HO2+0.21MACP+0.11CO+0.27GLY+0.01MGLY+0.79OP2	1.00E-13	1
R103a	DCB3+QH= 0.56HO2+0.21MACP+0.11CO+0.27GLY+0.01MGLY+0.79OP2	1.00E-13	1
R104	BALD+OH=BALP+H2O	5.32E-12.*exp(243./T)	1
R104a	BALD+QH=BALP+H2O	5.32E-12.*exp(243./T)	1
R105	PHEN+OH=0.73 HO2+0.20 ADDC+0.07 CHO+0.73 MCT	6.75E-12.*exp(405./T)	1
R105a	PHEN+QH=0.73 HO2+0.20 ADDC+0.07 CHO+0.73 MCT	6.75E-12.*exp(405./T)	1
R106	CSL+OH=0.73 HO2+0.20 ADDC+0.07 CHO+0.73 MCT	4.65E-11	1
R106a	CSL+QH=0.73 HO2+0.20 ADDC+0.07 CHO+0.73 MCT	4.65E-11	1
R107	EPX+OH=XO2+HO2+ALD+CO	2.80E-11.*exp(175./T)	1
R107a	EPX+QH=XO2+HO2+ALD+CO	2.80E-11.*exp(175./T)	1
R108	MCT+OH=MCTO	2.05E-10	1
R108a	MCT+QH=MCTO	2.05E-10	1
R109	OH+MOH=HO2+HCHO	2.85e-12.*exp(-345./T)	1
R109a	QH+MOH=HO2+HCHO	2.85e-12.*exp(-345./T)	1
R110	OH+EOH=HO2+ACD	3.00e-12.*exp(-20./T)	1
R110a	QH+EOH=HO2+ACD	3.00e-12.*exp(-20./T)	1
R111	OH+ROH=HO2+0.719 ALD+0.184 ACD	2.60E-12.*exp(-200./T)	1
R111a	QH+ROH=HO2+0.719 ALD+0.184 ACD	2.60E-12.*exp(-200./T)	1
R112	ETEG+OH=ALD+HO2	1.47E-11	1
R112a	ETEG+QH=ALD+HO2	1.47E-11	1

R113	OP1+OH=0.35 OH+0.65 MO2+0.35 HCHO	2.90E-12.*exp(190./T)	1
R113a	OP1+QH=0.35 OH+0.65 MO2+0.35 HCHO	2.90E-12.*exp(190./T)	1
R114	OP2+OH=0.49 HO+0.44 HC3P+0.07 XO2+0.08 ALD+0.41 KET	3.40E-12.*exp(190./T)	1
R114a	OP2+QH=0.49 HO+0.44 HC3P+0.07 XO2+0.08 ALD+0.41 KET	3.40E-12.*exp(190./T)	1
R115	ISHP+OH=MACR+OH	1.00E-10	1
R115a	ISHP+QH=MACR+OH	1.00E-10	1
R116	MAHP+OH=MACP	3.00E-11	1
R116a	MAHP+QH=MACP	3.00E-11	1
R117	ORA1+OH=HO2+CO2+H2O	4.50E-13	1
R117a	ORA1+QH=HO2+CO2+H2O	4.50E-13	1
R118	ORA2+OH=0.64 MO2+0.36 ORAP+0.64 CO2	2.20E-14.*exp(1012./T)	1
R118a	ORA2+QH=0.64 MO2+0.36 ORAP+0.64 CO2	2.20E-14.*exp(1012./T)	1
R119	PAA+OH=0.35 HO+0.65 ACO3+0.35 XO2+0.35 HCHO	2.93E-12.*exp(190./T)	1
R119a	PAA+QH=0.35 HO+0.65 ACO3+0.35 XO2+0.35 HCHO	2.93E-12.*exp(190./T)	1
R120	PAN+OH=XO2+NO3+HCHO+H2O	4.00E-14	1
R120a	PAN+QH=XO2+NO3+HCHO+H2O	4.00E-14	1
R120b	PANQ+OH=XO2+NO2Q+HCHO+H2O	4.00E-14	1
R120c	PANQ+QH=XO2+NO2Q+HCHO+H2Q	4.00E-14	1
R120d	PANQ2+OH=XO2+NOQ2+HCHO+H2O	4.00E-14	1
R120e	PANQ2+QH=XO2+NOQ2+HCHO+H2O	4.00E-14	1
R121	PPN+OH=XO2+NO3+HCHO+H2O	4.00E-14	1
R121a	PPN+QH=XO2+NO3+HCHO+H2O	4.00E-14	1
R121b	PPNQ+OH=XO2+NO2Q+HCHO+H2O	4.00E-14	1
R121c	PPNQ+QH=XO2+NO2Q+HCHO+H2Q	4.00E-14	1
R121d	PPNQ2+OH=XO2+NOQ2+HCHO+H2O	4.00E-14	1
R121e	PPNQ2+QH=XO2+NOQ2+HCHO+H2Q	4.00E-14	1
R122	MPAN+OH=HKET+NO2	3.20E-11	1
R122a	MPAN+QH=HKET+NO2	3.20E-11	1
R122b	MPANQ+OH=HKET+NO2	3.20E-11	1
R122c	MPANQ+QH=HKET+NO2	3.20E-11	1
R122d	MPANQ2+OH=HKET+NO2	3.20E-11	1
R122e	MPANQ2+QH=HKET+NO2	3.20E-11	1
R123	ONIT+OH=HC3P+NO2+H2O	5.31E-12.*exp(-260./T)	1
R123a	ONIT+QH=HC3P+NO2+H2O	5.31E-12.*exp(-260./T)	1
R123b	ONITQ+OH=HC3P+(2/3)NOQ+(1/3)NO2+H2O	5.31E-12.*exp(-260./T)	1
R123c	ONITQ+QH=HC3P+(2/3)NOQ+(1/3)NO2+H2O	5.31E-12.*exp(-260./T)	1

R123d	ONITQ2+OH=HC3P+(1/3)*NQ2+(2/3)*NOQ+H2O	5.31E-12.*exp(-260./T)	1
R123e	ONITQ2+QH=HC3P+(1/3)*NQ2+(2/3)*NOQ+H2O	5.31E-12.*exp(-260./T)	1
R123f	ONITQ3+OH=HC3P+NQ2+H2O	5.31E-12.*exp(-260./T)	1
R123g	ONITQ3+QH=HC3P+NQ2+H2Q	5.31E-12.*exp(-260./T)	1
R124	NALD+OH=NO2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124a	NALD+QH=NO2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124b	NALDQ+OH=(2/3)*NOQ+(1/3)*NO2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124c	NALDQ+QH=(2/3)*NOQ+(1/3)*NO2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124d	NALDQ2+OH=(2/3)*NOQ+(1/3)*NQ2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124e	NALDQ2+QH=(2/3)*NOQ+(1/3)*NQ2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124f	NALDQ3+OH=NQ2+XO2+HKET	5.60E-12.*exp(270./T)	1
R124g	NALDQ3+QH=NQ2+XO2+HKET	5.60E-12.*exp(270./T)	1
R125	ISON+OH=NALD+0.07 HKET+0.07 HCHO	1.30E-11	1
R125a	ISON+QH=NALD+0.07 HKET+0.07 HCHO	1.30E-11	1
R125b	ISONQ+OH=NALDQ+0.07 HKET+0.07 HCHO	1.30E-11	1
R125c	ISONQ+QH=NALDQ+0.07 HKET+0.07 HCHO	1.30E-11	1
R125d	ISONQ2+OH=NALDQ2+0.07 HKET+0.07 HCHO	1.30E-11	1
R125e	ISONQ2+QH=NALDQ2+0.07 HKET+0.07 HCHO	1.30E-11	1
R125f	ISONQ3+OH=NALDQ3+0.07 HKET+0.07 HCHO	1.30E-11	1
R125g	ISONQ3+QH=NALDQ3+0.07 HKET+0.07 HCHO	1.30E-11	1
VOC + O_3			
R126	ETE+O3= 0.08QH+0.15HO2+0.43CO+HCHO+0.37ORA1+0.13H2	9.14E-15.*exp(-2580./T)	1
R127	OLT+O3=0.22QH+0.32HO2+0.08MO2+0.06ETHP+0.068H2O2+0.43CO+0.01CH4+0.02ETH+0.56HCHO+0.44ALD+0.06MEK+0.03ORA1+0.06ORA2+0.01ACD+0.01HKET+0.015HC3+0.004HC3P+0.03ACT+0.006HC5+0.02HC5P+0.02BALD+0.032BEN	4.33E-15.*exp(-1800./T)	1
R128	OLI+O3= 0.46QH+0.07HO2+0.32MO2+0.07ETHP	4.40E-15.*exp(-845./T)	1

	+0.04HC3P+0.09ACO3+0.37CO+0.026 H2O2+0.04CH4+0.01ETH+0.01HC3+0.0 9HCHO+0.457ACD+0.73ALD+0.11ACT+ 0.017KET+0.44HKET+0.017ORA2		
R129	DIEN+O3= 0.09O3P+0.28QH+0.30HO2+0.03MO2+ 0.15ACO3+0.02KETP+0.13XO2+0.001H 2O2+0.36CO+0.35OLT+0.90HCHO+0.3 9MACR+0.15ORA1+0.05H2	1.34E-14.*exp(-2283./T)	1
R130	ISO+O3= 0.25QH+0.25HO2+0.08MO2+0.1ACO3+ 0.1MACP+0.09H2O2+0.14CO+0.58HC HO+0.461MACR+0.189MVK+0.28ORA1 +0.153OLT	7.86E-15.*exp(-1913./T)	1
R131	API+O3= 0.85QH+0.10HO2+0.20ETHP+0.42KETP +0.14CO+0.02H2O2+0.65ALD+0.53KET	5.00E-16.*exp(-530./T)	1
R132	LIM+O3= 0.85QH+0.10HO2+0.16ETHP+0.42KETP +0.02H2O2+0.14CO+0.46OLT+0.04HC HO+0.79MACR+0.01ORA1+0.07ORA2	2.95E-15.*exp(-783./T)	1
R133	MACR+O3= 0.19QH+0.14HO2+0.10ACO3+0.22CO+ 0.50MGLY+0.45ORA1	1.36E-15.*exp(-2112./T)	1
R134	MVK+O3=0.16QH+0.11HO2+0.28ACO3 +0.01XO2+0.56CO+0.01HCHO+0.54MG LY+0.07ORA1+0.07ORA2+0.1ALD	7.51E-16.*exp(-1520./T)	1
R135	UALD+O3= 0.1QH+0.072HO2+0.008MO2+0.002AC O3+0.1XO2+0.243CO+0.080HCHO+0.4 20ACD+0.028KET+0.491GLY+0.003MGL Y+0.044ORA1	1.66E-18	1
R136	DCB1+O3= 0.05QH+HO2+0.60RCO3+0.6XO2+1.5C O+0.05HCHO+0.05GLY+0.08MGLY+0.6 5OP2+0.5CO2	2.00E-16	1
R137	DCB2+O3= 0.05QH+HO2+0.60RCO3+0.60XO2+1.5 CO+0.05HCHO+0.05GLY+0.08MGLY+0. 70DCB1+0.65OP2+0.5CO2	2.00E-16	1
R138	DCB3+O3 = 0.05QH+HO2+1.5CO+0.48GLY+0.70DC B1+0.25ORA1+0.25ORA2+0.11PAA+1.5 CO2	9.00E-17	1
R139	EPX+O3=0.05QH+1.5HO2+1.5CO+0.5C O2+GLY+0.85BALD	1.00E-16	1
R140	MCTO+O3=MCTP	2.86E-13	1

Stable Organics + NO_3			
R141	ETE+NO3=0.80 OLNN+0.20 OLND	4.88E-18.*T.^2.*exp(-2282./T)	1
R141a	ETE+NO2Q=0.80 OLNNQ+0.20 OLNDQ	4.88E-18.*T.^2.*exp(-2282./T)	1
R141b	ETE+NOQ2=0.80 OLNNQ2+0.20 OLNDQ2	4.88E-18.*T.^2.*exp(-2282./T)	1
R141c	ETE+NQ3=0.80 OLNNQ3+0.20 OLNDQ3	4.88E-18.*T.^2.*exp(-2282./T)	1
R142	OLT+NO3=0.43 OLNN+0.57 OLND	1.79E-13.*exp(-450./T)	1
R142a	OLT+NO2Q=0.43 OLNNQ+0.57 OLNDQ	1.79E-13.*exp(-450./T)	1
R142b	OLT+NOQ2=0.43 OLNNQ2+0.57 OLNDQ2	1.79E-13.*exp(-450./T)	1
R142c	OLT+NQ3=0.43 OLNNQ3+0.57 OLNDQ3	1.79E-13.*exp(-450./T)	1
R143	OLI+NO3=0.11 OLNN+0.89 OLND	8.64E-13.*exp(450./T)	1
R143a	OLI+NO2Q=0.11 OLNNQ+0.89 OLNDQ	8.64E-13.*exp(450./T)	1
R143b	OLI+NOQ2=0.11 OLNNQ2+0.89 OLNDQ2	8.64E-13.*exp(450./T)	1
R143c	OLI+NQ3=0.11 OLNNQ3+0.89 OLNDQ3	8.64E-13.*exp(450./T)	1
R144	DIEN+NO3=0.90 OLNN+0.10 OLND+0.90 MACR	1.0E-13	1
R144a	DIEN+NO2Q=0.90 OLNNQ+0.10 OLNDQ+0.90 MACR	1.0E-13	1
R144b	DIEN+NOQ2=0.90 OLNNQ2+0.10 OLNDQ2+0.90 MACR	1.0E-13	1
R144c	DIEN+NQ3=0.90 OLNNQ3+0.10 OLNDQ3+0.90 MACR	1.0E-13	1
R145	ISO+NO3=ISON	3.03E-12.*exp(-446./T)	1
R145a	ISO+NO2Q=ISONQ	3.03E-12.*exp(-446./T)	1
R145b	ISO+NOQ2=ISONQ2	3.03E-12.*exp(-446./T)	1
R145c	ISO+NQ3=ISONQ3	3.03E-12.*exp(-446./T)	1
R146	API+NO3=0.10 OLNN+0.90 OLND	1.19E-12.*exp(490./T)	1
R146a	API+NO2Q=0.10 OLNNQ+0.90 OLNDQ	1.19E-12.*exp(490./T)	1
R146b	API+NOQ2=0.10 OLNNQ2+0.90 OLNDQ2	1.19E-12.*exp(490./T)	1
R146c	API+NQ3=0.10 OLNNQ2+0.90 OLNDQ3	1.19E-12.*exp(490./T)	1
R147	LIM+NO3=0.71 OLNN+0.29 OLND	1.22E-11	1
R147a	LIM+NO2Q=0.71 OLNNQ+0.29 OLNDQ	1.22E-11	1
R147b	LIM+NOQ2=0.71 OLNNQ2+0.29 OLNDQ2	1.22E-11	1
R147c	LIM+NQ3=0.71 OLNNQ3+0.29 OLNDQ3	1.22E-11	1
R148	HCHO+NO3=HO2+HNO3+CO	2.00E-12.*exp(-2440./T)	1
R148a	HCHO+NO2Q=HO2+HNO2Q+CO	2.00E-12.*exp(-2440./T)	1
R148b	HCHO+NOQ2=HO2+HNOQ2+CO	2.00E-12.*exp(-2440./T)	1
R148c	HCHO+NQ3=HO2+HNQ3+CO	2.00E-12.*exp(-2440./T)	1
R149	ACD+NO3=ACO3+HNO3	1.40E-12.*exp(-1900./T)	1

R149a	ACD+NO2Q=ACO3+HNO2Q	1.40E-12.*exp(-1900./T)	1
R149b	ACD+NOQ2=ACO3+HNOQ2	1.40E-12.*exp(-1900./T)	1
R149c	ACD+NQ3=ACO3+HNQ3	1.40E-12.*exp(-1900./T)	1
R150	ALD+NO3=RCO3+HNO3	3.76E-12.*exp(-1900./T)	1
R150a	ALD+NO2Q=RCO3+HNO2Q	3.76E-12.*exp(-1900./T)	1
R150b	ALD+NOQ2=RCO3+HNOQ2	3.76E-12.*exp(-1900./T)	1
R150c	ALD+NQ3=RCO3+HNQ3	3.76E-12.*exp(-1900./T)	1
R151	MACR+NO3=0.32 MACP+0.68 XO2+0.32 HNO3+0.68 HCHO+0.68 MGLY+0.68 NO2	3.40E-15	1
R151a	MACR+NO2Q=0.32 MACP+0.68 XO2+0.32 HNO2Q+0.68 HCHO+0.68 MGLY+0.453 NOQ + 0.227 NO2	3.40E-15	1
R151b	MACR+NOQ2=0.32 MACP+0.68 XO2+0.32 HNOQ2+0.68 HCHO+0.68 MGLY+0.453 NOQ + 0.227 NQ2	3.40E-15	1
R151c	MACR+NQ3=0.32 MACP+0.68 XO2+0.32 HNQ3+0.68 HCHO+0.68 MGLY+0.68NQ2	3.40E-15	1
R152	UALD+NO3= HO2+XO2+0.668 CO+0.332 HCHO+0.332 ALD+ONIT	5.02E-13.*exp(-1076./T)	1
R152a	UALD+NO2Q= HO2+XO2+0.668 CO+0.332 HCHO+0.332 ALD+ONITQ	5.02E-13.*exp(-1076./T)	1
R152b	UALD+NOQ2= HO2+XO2+0.668 CO+0.332 HCHO+0.332 ALD+ONITQ2	5.02E-13.*exp(-1076./T)	1
R152c	UALD+NQ3= HO2+XO2+0.668 CO+0.332 HCHO+0.332 ALD+ONITQ3	5.02E-13.*exp(-1076./T)	1
R153	GLY+NO3=HNO3+HO2+CO+CO	2.90E-12.*exp(-1900./T)	1
R153a	GLY+NO2Q=HNO2Q+HO2+CO+CO	2.90E-12.*exp(-1900./T)	1
R153b	GLY+NOQ2=HNOQ2+HO2+CO+CO	2.90E-12.*exp(-1900./T)	1
R153c	GLY+NQ3=HNQ3+HO2+CO+CO	2.90E-12.*exp(-1900./T)	1
R154	MGLY+NO3=HNO3+ACO3+CO	3.76E-12.*exp(-1900./T)	1
R154a	MGLY+NO2Q=HNO2Q+ACO3+CO	3.76E-12.*exp(-1900./T)	1
R154b	MGLY+NOQ2=HNOQ2+ACO3+CO	3.76E-12.*exp(-1900./T)	1
R154c	MGLY+NQ3=HNQ3+ACO3+CO	3.76E-12.*exp(-1900./T)	1
R155	PHEN+NO3=0.4 CHO+0.1 ADDC+0.5 ADCN+0.5 HNO3	3.78E-12	1
R155a	PHEN+NO2Q=0.4 CHO+0.1 ADDC+0.5 ADCNQ+0.5 HNO2Q	3.78E-12	1
R155b	PHEN+NOQ2=0.4 CHO+0.1 ADDC+0.5 ADCNQ2+0.5 HNOQ2	3.78E-12	1
R155c	PHEN+NQ3=0.4 CHO+0.1 ADDC+0.5 ADCNQ3+0.5 HNQ3	3.78E-12	1
R156	CSL+NO3=0.4 CHO+0.1 ADDC+0.5 ADCN+0.5 HNO3	1.06E-12	1
R156a	CSL+NO2Q=0.4 CHO+0.1 ADDC+0.5 ADCNQ+0.5 HNO2Q	1.06E-12	1

R156b	CSL+NOQ2=0.4 CHO+0.1 ADDC+0.5 ADCNQ2+0.5 HNOQ2	1.06E-12	1
R156c	CSL+NQ3=0.4 CHO+0.1 ADDC+0.5 ADCNQ3+0.5 HNQ3	1.06E-12	1
R157	EPX+NO3=0.50 HO+1.50 HO2+1.50 CO+0.50 CO2+GLY+0.50 NO2+0.50 HNO3	2.87E-13.*exp(-1000./T)	1
R157a	EPX+NO2Q=0.50 HO+1.50 HO2+1.50 CO+0.50 CO2+GLY+0.33 NOQ + 0.166NO2 +0.50 HNO2Q	2.87E-13.*exp(-1000./T)	1
R157b	EPX+NOQ2=0.50 HO+1.50 HO2+1.50 CO+0.50 CO2+GLY+0.33 NOQ + 0.166NQ2 +0.50 HNOQ2	2.87E-13.*exp(-1000./T)	1
R157c	EPX+NQ3=0.50 HO+1.50 HO2+1.50 CO+0.50 CO2+GLY+0.5 NQ2 + 0.50 HNQ3	2.87E-13.*exp(-1000./T)	1
R158	MCT+NO3=MCTO+HNO3	2.01E-10	1
R158a	MCT+NO2Q=MCTO+HNO2Q	2.01E-10	1
R158b	MCT+NOQ2=MCTO+HNOQ2	2.01E-10	1
R158c	MCT+NQ3=MCTO+HNQ3	2.01E-10	1
R159	MPAN+NO3=MACP+NO2	2.20E-14.*exp(-500./T)	1
R159a	MPAN+NO2Q=MACP+(2/3)NOQ + (1/3)NO2	2.20E-14.*exp(-500./T)	1
R159b	MPAN+NOQ2=MACP+(2/3)NOQ + (1/3)NQ2	2.20E-14.*exp(-500./T)	1
R159c	MPAN+NQ3=MACP+ NQ2	2.20E-14.*exp(-500./T)	1
R159d	MPANQ+NO3=MACP+NO2	2.20E-14.*exp(-500./T)	1
R159e	MPANQ+NO2Q=MACP+(2/3)NOQ + (1/3)NO2	2.20E-14.*exp(-500./T)	1
R159f	MPANQ+NOQ2=MACP+(2/3)NOQ + (1/3)NQ2	2.20E-14.*exp(-500./T)	1
R159g	MPANQ+NQ3=MACP+ NQ2	2.20E-14.*exp(-500./T)	1
R159h	MPANQ2+NO3=MACP+NO2	2.20E-14.*exp(-500./T)	1
R159i	MPANQ2+NO2Q=MACP+(2/3)NOQ + (1/3)NO2	2.20E-14.*exp(-500./T)	1
R159j	MPANQ2+NOQ2=MACP+(2/3)NOQ + (1/3)NQ2	2.20E-14.*exp(-500./T)	1
R159k	MPANQ2+NQ3=MACP+ NQ2	2.20E-14.*exp(-500./T)	1
Aromatic Intermediate Decomposition			
R160	TR2= 0.28OH+0.29HO2+0.28TOLP+0.15PER1 +0.28DCB2+0.01CSL+0.28EPX	1.00E3	1
R161	TOLP= 0.49OH+0.01HO2+0.50PER1+0.49DCB 2+0.01CSL	1.00E3	1
R162	XY2= 0.158OH+0.308HO2+0.25RCO3+0.308X	1.00E3	1

	YLP+0.150PER2+0.224DCB2+0.01CSL+0.84EPX		
R163	XYLP= 0.39OH+0.01HO2+0.50PER2+0.49DCB2+0.01CSL	1.00E3	1
R164	XYO2= 0.158OH+0.308HO2+0.25RCO3+0.308XYLP+0.150PER2+0.224DCB2+0.01CSL+0.84EPX	1.00E3	1
R165	XYOP= 0.390OH+0.010HO2+0.500PER2+0.490DCB2+0.010CSL	1.00E3	1
RO_2NO_2 Formation and Decomposition			
R166	ACO3+NO2=PAN	K_ACO3_NO2	Table 4
R166a	ACO3+NOQ=PANQ	K_ACO3_NO2	Table 4
R166b	ACO3+NQ2=PANQ2	K_ACO3_NO2	Table 4
R167	PAN=ACO3+NO2	K_PAN	Table 5
R167a	PANQ=ACO3+NOQ	K_PAN	Table 5
R167b	PANQ2=ACO3+NQ2	K_PAN	Table 5
R168	RCO3+NO2=PPN	K_ACO3_NO2	Table 4
R168a	RCO3+NOQ=PPNQ	K_ACO3_NO2	Table 4
R168b	RCO3+NQ2=PPNQ2	K_ACO3_NO2	Table 4
R169	PPN=RCO3+NO2	K_PAN	Table 5
R169a	PPNQ=RCO3+NOQ	K_PAN	Table 5
R169b	PPNQ2=RCO3+NQ2	K_PAN	Table 5
R170	MACP+NO2=MPAN	K_ACO3_NO2	Table 4
R170a	MACP+NOQ=MPANQ	K_ACO3_NO2	Table 4
R170b	MACP+NQ2=MPANQ2	K_ACO3_NO2	Table 4
R171	MPAN=MACP+NO2	1.60E16.*exp(-13486./T)	1
R171a	MPANQ=MACP+NOQ	1.60E16.*exp(-13486./T)	1
R171b	MPANQ2=MACP+NQ2	1.60E16.*exp(-13486./T)	1
Organic Peroxy Radicals + NO			
R172	MO2+NO=HCHO+HO2+NO2	2.80E-12.*exp(300./T)	1
R172a	MO2+NQ=HCHO+HO2+NOQ	2.80E-12.*exp(300./T)	1
R173	ETHP+NO=HO2+ACD+NO2	2.60E-12.*exp(365./T)	1
R173a	ETHP+NQ=HO2+ACD+NOQ	2.60E-12.*exp(365./T)	1
R174	HC3P+NO=0.66HO2+0.131MO2+0.048ETHP+0.089XO2+0.935NO2+0.504ACD+0.132ALD+0.165ACT+0.042MEK+0.065ONIT	4.00E-12	1
R174a	HC3P+NQ=0.66HO2+0.131MO2+0.048ETHP+0.089XO2+0.935NOQ+0.504ACD+0.132ALD+0.165ACT+0.042MEK+0.065ONITQ	4.00E-12	1
R175	HC5P+NO=0.200HO2+0.051MO2+0.231ETHP+0.235XO2+0.864NO2+0.018HCHO+0.045ACD+0.203ALD+0.217ACT+0.	4.00E-12	1

	033MEK+0.039KET+0.272HKET+0.136ONIT		
R175a	HC5P+NQ=0.200HO2+0.051MO2+0.231ETHP+0.235XO2+0.864NOQ+0.018HCHO+0.045ACD+0.203ALD+0.217ACT+0.033MEK+0.039KET+0.272HKET+0.136ONITQ	4.00E-12	1
R176	HC8P+NO=0.606 HO2+0.133 ETHP+0.416 XO2+0.739 NO2+0 .150 ALD+0.642 KET+0.261 ONIT	4.00E-12	1
R176a	HC8P+NQ=0.606 HO2+0.133 ETHP+0.416 XO2+0.739 NOQ+0 .150 ALD+0.642 KET+0.261 ONITQ	4.00E-12	1
R177	ETEP+NO=HO2+NO2+1.6 HCHO+0.2 ALD	9.00E-12	1
R177a	ETEP+NQ=HO2+NOQ+1.6 HCHO+0.2 ALD	9.00E-12	1
R178	OLTP+NO= 0.78HO2+0.97NO2+0.78HCHO+0.012ACD+0.44ALD+0.06ACT+0.13MEK+0.03ONIT	4.00E-12	1
R178a	OLTP+NQ= 0.78HO2+0.97NOQ+0.78HCHO+0.012ACD+0.44ALD+0.06ACT+0.13MEK+0.03ONITQ	4.00E-12	1
R179	OLIP+NO = 0.83HO2+0.95NO2+0.81ACD+0.68ALD+0.20ACT+0.09KET+0.02HKET+0.05ONIT	4.00E-12	1
R179a	OLIP+NQ = 0.83HO2+0.95NOQ+0.81ACD+0.68ALD+0.20ACT+0.09KET+0.02HKET+0.05ONITQ	4.00E-12	1
R180	BENP+NO=0.918 HO2+0.918 NO2+0.459 DCB2+0.459 DCB3+0.918 GLY+0.082 ONIT	2.54E-12.*exp(360./T)	1
R180a	BENP+NQ=0.918 HO2+0.918 NOQ+0.459 DCB2+0.459 DCB3+0.918 GLY+0.082 ONITQ	2.54E-12.*exp(360./T)	1
R181	TLP1+NO=NO2+BALD	4.00E-12	1
R181a	TLP1+NQ=NOQ+BALD	4.00E-12	1
R182	TOLP+NO=0.95 HO2+0.95 NO2+0.95 DCB2+0.050 ONIT	2.70E-12.*exp(360./T)	1
R182a	TOLP+NQ=0.95 HO2+0.95 NOQ+0.95 DCB2+0.050 ONITQ	2.70E-12.*exp(360./T)	1
R183	PER1+NO=0.5 HO2+0.95 NO2+0.5 BALD+0.5 MGLY+0.5 DCB1+0.05 ONIT	2.70E-12.*exp(360./T)	1

R183a	PER1+NQ=0.5 HO2+0.95 NOQ+0.5 BALD+0.5 MGLY+0.5 DCB1+0.05 ONITQ	2.70E-12.*exp(360./T)	1
R184	XYL1+NO=NO2+BALD	4.00E-12	1
R184a	XYL1+NQ=NOQ+BALD	4.00E-12	1
R185	XYLP+NO=0.95 HO2+0.95 NO2+0.95 DCB3+0.050 ONIT	2.70E-12.*exp(360./T)	1
R185a	XYLP+NQ=0.95 HO2+0.95 NOQ+0.95 DCB3+0.050 ONITQ	2.70E-12.*exp(360./T)	1
R186	PER2+NO=0.95 HO2+0.95 NO2+0.95 MGLY+0.95 DCB1+1.05 DCB3+0.05 ONIT	2.70E-12.*exp(360./T)	1
R186a	PER2+NQ=0.95 HO2+0.95 NOQ+0.95 MGLY+0.95 DCB1+1.05 DCB3+0.05 ONITQ	2.70E-12.*exp(360./T)	1
R187	XYOP+NO= 0.95HO2+0.95NO2+0.350GLY+0.600MGLY+0.700DCB1+0.073DCB2+0.177DCB3+0.05ONIT	2.70E-12.*exp(360./T)	1
R187a	XYOP+NQ= 0.95HO2+0.95NOQ+0.350GLY+0.600MGLY+0.700DCB1+0.073DCB2+0.177DCB3+0.05ONITQ	2.70E-12.*exp(360./T)	1
R188	ISOP+NO=0.88HO2+0.88NO2+0.72HCHO+0.28MACR+0.44MVK+0.12ISON+0.021GLY+0.029HKET+0.27ALD	2.43E-12.*exp(360./T)	1
R188a	ISOP+NQ=0.88HO2+0.88NOQ+0.72HCHO+0.28MACR+0.44MVK+0.12ISONQ+0.021GLY+0.029HKET+0.27ALD	2.43E-12.*exp(360./T)	1
R189	APIP+NO= 0.82HO2+0.82NO2+0.23HCHO+0.43ALD+0.11ACT+0.44KET+0.07ORA1+0.18ONIT	4.00E-12	1
R189a	APIP+NQ= 0.82HO2+0.82NOQ+0.23HCHO+0.43ALD+0.11ACT+0.44KET+0.07ORA1+0.18ONITQ	4.00E-12	1
R190	LIMP+NO= HO2+NO2+0.05OLI+0.43HCHO+0.68UALD+0.07ORA1	4.00E-12	1
R190a	LIMP+NQ= HO2+NOQ+0.05OLI+0.43HCHO+0.68UALD+0.07ORA1	4.00E-12	1
R191	ACO3+NO=MO2+NO2	8.10E-12.*exp(270./T)	1
R191a	ACO3+NQ=MO2+NOQ	8.10E-12.*exp(270./T)	1
R192	RCO3+NO=ETHP+NO2	8.10E-12.*exp(270./T)	1
R192a	RCO3+NQ=ETHP+NOQ	8.10E-12.*exp(270./T)	1
R193	ACTP+NO=ACO3+NO2+HCHO	2.90E-12.*exp(300./T)	1

R193a	ACTP+NQ=ACO3+NOQ+HCHO	2.90E-12.*exp(300./T)	1
R194	MEKP+NO=0.67 HO2+NO2+0.33 HCHO+0.67 DCB1	4.00E-12	1
R194a	MEKP+NQ=0.67 HO2+NOQ+0.33 HCHO+0.67 DCB1	4.00E-12	1
R195	KETP+NO= 0.77HO2+0.23ACO3+0.16XO2+NO2+0.54MGLY+0.46ALD	4.00E-12	1
R195a	KETP+NQ= 0.77HO2+0.23ACO3+0.16XO2+NOQ+0.54MGLY+0.46ALD	4.00E-12	1
R196	MACP+NO=0.75 HO2+0.25 ACO3+NO2+0.25 CO+0.75 HCHO+0.50 MGLY+0.25 HKET	2.54E-12.*exp(360./T)	1
R196a	MACP+NQ=0.75 HO2+0.25 ACO3+NOQ+0.25 CO+0.75 HCHO+0.50 MGLY+0.25 HKET	2.54E-12.*exp(360./T)	1
R197	MCP+NO=NO2+0.50 HO2+0.50 HCHO+HKET	2.54E-12.*exp(360./T)	1
R197a	MCP+NQ=NOQ+0.50 HO2+0.50 HCHO+HKET	2.54E-12.*exp(360./T)	1
R198	MVKP+NO=0.3 HO2+0.7 ACO3+0.7 XO2+NO2+0.3 HCHO+0.7 ALD+0.3 MGLY	2.54E-12.*exp(360./T)	1
R198a	MVKP+NQ=0.3 HO2+0.7 ACO3+0.7 XO2+NOQ+0.3 HCHO+0.7 ALD+0.3 MGLY	2.54E-12.*exp(360./T)	1
R199	UALP+NO= HO2+0.61CO+NO2+0.03HCHO+0.27ALD+0.7KET+0.18GLY+0.21MGLY	2.54E-12.*exp(360./T)	1
R199a	UALP+NQ= HO2+0.61CO+NOQ+0.03HCHO+0.27ALD+0.7KET+0.18GLY+0.21MGLY	2.54E-12.*exp(360./T)	1
R200	BALP+NO=BAL1+NO2	4.00E-12	1
R200a	BALP+NQ=BAL1+NOQ	4.00E-12	1
R201	BAL1+NO=BAL2+NO2	4.00E-12	1
R201a	BAL1+NQ=BAL2+NOQ	4.00E-12	1
R202	ADDC+NO=HO2+NO2+0.32 HKET+0.68 GLY+0.68 OP2	2.70E-12.*exp(360./T)	1
R202a	ADDC+NQ=HO2+NOQ+0.32 HKET+0.68 GLY+0.68 OP2	2.70E-12.*exp(360./T)	1
R203	MCTP+NO=MCTO+NO2	2.70E-12.*exp(360./T)	1
R203a	MCTP+NQ=MCTO+NOQ	2.70E-12.*exp(360./T)	1
R204	ORAP+NO=HO2+NO2+GLY	4.00E-12	1
R204a	ORAP+NQ=HO2+NOQ+GLY	4.00E-12	1
R205	OLNN+NO=ONIT+NO2+HO2	4.00E-12	1
R205a	OLNN+NQ=ONIT+NOQ+HO2	4.00E-12	1

R205b	OLNNQ+NO=ONITQ+NO2+HO2	4.00E-12	1
R205c	OLNNQ+NQ=ONITQ+NOQ+HO2	4.00E-12	1
R205d	OLNNQ2+NO=ONITQ2+NO2+HO2	4.00E-12	1
R205e	OLNNQ2+NQ=ONITQ2+NOQ+HO2	4.00E-12	1
R205f	OLNNQ3+NO=ONITQ3+NO2+HO2	4.00E-12	1
R205g	OLNNQ3+NQ=ONITQ3+NOQ+HO2	4.00E-12	1
R206	OLND+NO=2NO2+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206a	OLND+NQ=NO2+NOQ+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206b	OLNDQ+NO=(2/3)NO2+(1/3)NOQ+NO2+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206c	OLNDQ+NQ=(2/3)NO2+(1/3)NOQ+NO2NOQ+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206d	OLNDQ2+NO=(2/3)NOQ+(1/3)NQ2+NO2+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206e	OLNDQ2+NQ=(2/3)NOQ+(1/3)NQ2+NOQ+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206f	OLNDQ3+NO=NQ2+NO2+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R206g	OLNDQ3+NQ=NQ2+NOQ+0.287HCHO+1.24ALD+0.464KET	4.00E-12	1
R207	ADCN+NO=GLY+NO2+NO2+OP2	2.70E-12.*exp(360./T)	1
R207a	ADCN+NQ=GLY+NO2+NOQ+OP2	2.70E-12.*exp(360./T)	1
R207b	ADCNQ+NO=GLY+(2/3)NOQ+(1/3)NO2+NO2+OP2	2.70E-12.*exp(360./T)	1
R207c	ADCNQ+NQ=GLY+(2/3)NOQ+(1/3)NO2+NOQ+OP2	2.70E-12.*exp(360./T)	1
R207d	ADCNQ2+NO=GLY+(2/3)NOQ+(1/3)NQ2+NO2+OP2	2.70E-12.*exp(360./T)	1
R207e	ADCNQ2+NQ=GLY+(2/3)NOQ+(1/3)NQ2+NOQ+OP2	2.70E-12.*exp(360./T)	1
R207f	ADCNQ3+NO=GLY+NQ2+NO2+OP2	2.70E-12.*exp(360./T)	1
R207g	ADCNQ3+NQ=GLY+NQ2+NOQ+OP2	2.70E-12.*exp(360./T)	1
R208	XO2+NO=NO2	4.00E-12	1
R208a	XO2+NQ=NOQ	4.00E-12	1
Organic Termination with Nitrogen Dioxide			
R209	BAL2+NO2=ONIT	2.00E-11	1
R209a	BAL2+NOQ=ONITQ	2.00E-11	1
R209b	BAL2+NQ2=ONITQ2	2.00E-11	1
R210	CHO+NO2=ONIT	2.00E-11	1
R210a	CHO+NOQ=ONITQ	2.00E-11	1
R210b	CHO+NQ2=ONITQ2	2.00E-11	1
R211	MCTO+NO2=ONIT	2.08E-12	1
R211a	MCTO+NOQ=ONITQ	2.08E-12	1
R211b	MCTO+NQ2=ONITQ2	2.08E-12	1

Organic Peroxy Radicals + HO_2			
R212	MO2+HO2=OP1	4.10E-13.*exp(750./T)	1
R212a	MO2+HOQ=OP1	4.10E-13.*exp(750./T)	1
R212b	MO2+H2Q=OP1	4.10E-13.*exp(750./T)	1
R213	ETHP+HO2=OP2	7.50E-13.*exp(700./T)	1
R213a	ETHP+HOQ=OP2	7.50E-13.*exp(700./T)	1
R213b	ETHP+HQ2=OP2	7.50E-13.*exp(700./T)	1
R214	HC3P+HO2=OP2	1.66E-13.*exp(1300./T)	1
R214a	HC3P+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R214b	HC3P+HQ2=OP2	1.66E-13.*exp(1300./T)	1
R215	HC5P+HO2=OP2	1.66E-13.*exp(1300./T)	1
R215a	HC5P+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R215b	HC5P+HQ2=OP2	1.66E-13.*exp(1300./T)	1
R216	HC8P+HO2=OP2	1.66E-13.*exp(1300./T)	1
R216a	HC8P+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R216b	HC8P+HQ2=OP2	1.66E-13.*exp(1300./T)	1
R217	ETEP+HO2=OP2	1.90E-13.*exp(1300./T)	1
R217a	ETEP+HOQ=OP2	1.90E-13.*exp(1300./T)	1
R217b	ETEP+HQ2=OP2	1.90E-13.*exp(1300./T)	1
R218	OLTP+HO2=OP2	1.66E-13.*exp(1300./T)	1
R218a	OLTP+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R218b	OLTP+HQ2=OP2	1.66E-13.*exp(1300./T)	1
R219	OLIP+HO2=OP2	1.66E-13.*exp(1300./T)	1
R219a	OLIP+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R219b	OLIP+HQ2=OP2	1.66E-13.*exp(1300./T)	1
R220	BENP+HO2=OP2	2.91E-13.*exp(1300./T)	1
R220a	BENP+HOq=OP2	2.91E-13.*exp(1300./T)	1
R220b	BENP+HQ2=OP2	2.91E-13.*exp(1300./T)	1
R221	TLP1+HO2=OP2	3.75E-13.*exp(980./T)	1
R221a	TLP1+HOQ=OP2	3.75E-13.*exp(980./T)	1
R221b	TLP1+HQ2=OP2	3.75E-13.*exp(980./T)	1
R222	TOLP+HO2=OP2	3.75E-13.*exp(980./T)	1
R222a	TOLP+HOQ=OP2	3.75E-13.*exp(980./T)	1
R222b	TOLP+HQ2=OP2	3.75E-13.*exp(980./T)	1
R223	PER1+HO2=OP2	3.75E-13.*exp(980./T)	1
R223a	PER1+HOQ=OP2	3.75E-13.*exp(980./T)	1
R223b	PER1+HQ2=OP2	3.75E-13.*exp(980./T)	1
R224	XYL1+HO2=OP2	3.75E-13.*exp(980./T)	1
R224a	XYL1+HOQ=OP2	3.75E-13.*exp(980./T)	1
R224b	XYL1+HQ2=OP2	3.75E-13.*exp(980./T)	1
R225	XYLP+HO2=OP2	3.75E-13.*exp(980./T)	1
R225a	XYLP+HOQ=OP2	3.75E-13.*exp(980./T)	1
R225b	XYLP+HQ2=OP2	3.75E-13.*exp(980./T)	1
R226	PER2+HO2=OP2	3.75E-13.*exp(980./T)	1
R226a	PER2+HOQ=OP2	3.75E-13.*exp(980./T)	1
R226b	PER2+HQ2=OP2	3.75E-13.*exp(980./T)	1

R227	XYOP+HO2=OP2	3.75E-13.*exp(980./T)	1
R227a	XYOP+HOQ=OP2	3.75E-13.*exp(980./T)	1
R227b	XYOP+HQ2=OP2	3.75E-13.*exp(980./T)	1
R228	ISOP+HO2=ISHP	2.05E-13.*exp(1300./T)	1
R228a	ISOP+HOQ=ISHP	2.05E-13.*exp(1300./T)	1
R228b	ISOP+HQ2=ISHP	2.05E-13.*exp(1300./T)	1
R229	APIP+HO2=OP2	1.50E-11	1
R229a	APIP+HOQ=OP2	1.50E-11	1
R229b	APIP+HQ2=OP2	1.50E-11	1
R230	LIMP+HO2=OP2	1.50E-11	1
R230a	LIMP+HOQ=OP2	1.50E-11	1
R230b	LIMP+HQ2=OP2	1.50E-11	1
R231	ACO3+HO2=0.44 HO+0.44 MO2+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R231a	ACO3+HOQ=0.44 HO+0.44 MO2+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R231b	ACO3+HQ2=0.44 HO+0.44 MO2+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R232	RCO3+HO2=0.44 HO+0.44 ETHP+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R232a	RCO3+HOQ=0.44 HO+0.44 ETHP+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R232b	RCO3+HQ2=0.44 HO+0.44 ETHP+0.44 CO2+0.15 ORA2+0.41 PAA	4.30E-13.*exp(1040./T)	1
R233	ACTP+HO2= 0.15 HO+0.15 ACO3+0.15 HCHO+0.850 OP2	1.15E-13.*exp(1300./T)	1
R233a	ACTP+HOQ= 0.15 HO+0.15 ACO3+0.15 HCHO+0.850 OP2	1.15E-13.*exp(1300./T)	1
R233b	ACTP+HQ2= 0.15 HO+0.15 ACO3+0.15 HCHO+0.850 OP2	1.15E-13.*exp(1300./T)	1
R234	MEKP+HO2=OP2	1.15E-13.*exp(1300./T)	1
R234a	MEKP+HOQ=OP2	1.15E-13.*exp(1300./T)	1
R234b	MEKP+HQ2=OP2	1.15E-13.*exp(1300./T)	1
R235	KETP+HO2=OP2	1.15E-13.*exp(1300./T)	1
R235a	KETP+HOQ=OP2	1.15E-13.*exp(1300./T)	1
R235b	KETP+HQ2=OP2	1.15E-13.*exp(1300./T)	1
R236	MACP+HO2=MAHP	1.82E-13.*exp(1300./T)	1
R236a	MACP+HOQ=MAHP	1.82E-13.*exp(1300./T)	1
R236b	MACP+HQ2=MAHP	1.82E-13.*exp(1300./T)	1
R237	MCP+HO2=MAHP	1.82E-13.*exp(1300./T)	1
R237a	MCP+HOQ=MAHP	1.82E-13.*exp(1300./T)	1
R237b	MCP+HQ2=MAHP	1.82E-13.*exp(1300./T)	1
R238	MVKP+HO2=OP2	7.70E-14.*exp(1298./T)	1
R238a	MVKP+HOQ=OP2	7.70E-14.*exp(1298./T)	1
R238b	MVKP+HQ2=OP2	7.70E-14.*exp(1298./T)	1
R239	UALP+HO2=OP2	7.70E-14.*exp(1298./T)	1

R239a	UALP+HOQ=OP2	7.70E-14.*exp(1298./T)	1
R239b	UALP+HQ2=OP2	7.70E-14.*exp(1298./T)	1
R240	ADDC+HO2=OP2	3.75E-13.*exp(980./T)	1
R240a	ADDC+HOQ=OP2	3.75E-13.*exp(980./T)	1
R240b	ADDC+HQ2=OP2	3.75E-13.*exp(980./T)	1
R241	CHO+HO2=CSL	1.00E-11	1
R241a	CHO+HOQ=CSL	1.00E-11	1
R241b	CHO+HQ2=CSL	1.00E-11	1
R242	MCTP+HO2=OP2	3.75E-13.*exp(980./T)	1
R242a	MCTP+HOQ=OP2	3.75E-13.*exp(980./T)	1
R242b	MCTP+HQ2=OP2	3.75E-13.*exp(980./T)	1
R243	ORAP+HO2=ONIT	1.15E-13.*exp(1300./T)	1
R243a	ORAP+HOQ=ONIT	1.15E-13.*exp(1300./T)	1
R243b	ORAP+HQ2=ONIT	1.15E-13.*exp(1300./T)	1
R244	OLNN+HO2=ONIT	1.66E-13.*exp(1300./T)	1
R244a	OLNN+HOQ=ONIT	1.66E-13.*exp(1300./T)	1
R244b	OLNN+HQ2=ONIT	1.66E-13.*exp(1300./T)	1
R244c	OLNNQ+HO2=ONITQ	1.66E-13.*exp(1300./T)	1
R244d	OLNNQ+HOQ=ONITQ	1.66E-13.*exp(1300./T)	1
R244e	OLNNQ+HQ2=ONITQ	1.66E-13.*exp(1300./T)	1
R244f	OLNNQ2+HO2=ONITQ2	1.66E-13.*exp(1300./T)	1
R244g	OLNNQ2+HOQ=ONITQ2	1.66E-13.*exp(1300./T)	1
R244h	OLNNQ2+HQ2=ONITQ2	1.66E-13.*exp(1300./T)	1
R244i	OLNNQ3+HO2=ONITQ3	1.66E-13.*exp(1300./T)	1
R244j	OLNNQ3+HOQ=ONITQ3	1.66E-13.*exp(1300./T)	1
R244k	OLNNQ3+HQ2=ONITQ3	1.66E-13.*exp(1300./T)	1
R245	OLND+HO2=ONIT	1.66E-13.*exp(1300./T)	1
R245a	OLND+HOQ=ONIT	1.66E-13.*exp(1300./T)	1
R245b	OLND+HQ2=ONIT	1.66E-13.*exp(1300./T)	1
R245c	OLNDQ+HO2=ONITQ	1.66E-13.*exp(1300./T)	1
R245d	OLNDQ+HOQ=ONITQ	1.66E-13.*exp(1300./T)	1
R245e	OLNDQ+HQ2=ONITQ	1.66E-13.*exp(1300./T)	1
R245f	OLNDQ2+HO2=ONITQ2	1.66E-13.*exp(1300./T)	1
R245g	OLNDQ2+HOQ=ONITQ2	1.66E-13.*exp(1300./T)	1
R245h	OLNDQ2+HQ2=ONITQ2	1.66E-13.*exp(1300./T)	1
R245i	OLNDQ3+HO2=ONITQ3	1.66E-13.*exp(1300./T)	1
R245j	OLNDQ3+HOQ=ONITQ3	1.66E-13.*exp(1300./T)	1
R245k	OLNDQ3+HQ2=ONITQ3	1.66E-13.*exp(1300./T)	1
R246	ADCN+HO2=OP2	3.75E-13.*exp(980./T)	1
R246a	ADCN+HOQ=OP2	3.75E-13.*exp(980./T)	1
R246b	ADCN+HQ2=OP2	3.75E-13.*exp(980./T)	1
R246c	ADCNQ+HO2=OP2	3.75E-13.*exp(980./T)	1
R246d	ADCNQ+HOQ=OP2	3.75E-13.*exp(980./T)	1
R246e	ADCNQ+HQ2=OP2	3.75E-13.*exp(980./T)	1
R246f	ADCNQ2+HO2=OP2	3.75E-13.*exp(980./T)	1
R246g	ADCNQ2+HOQ=OP2	3.75E-13.*exp(980./T)	1

R246h	ADCNQ2+HQ2=OP2	3.75E-13.*exp(980./T)	1
R246i	ADCNQ3+HO2=OP2	3.75E-13.*exp(980./T)	1
R246j	ADCNQ3+HOQ=OP2	3.75E-13.*exp(980./T)	1
R246k	ADCNQ3+HQ2=OP2	3.75E-13.*exp(980./T)	1
R247	XO2+HO2=OP2	1.66E-13.*exp(1300./T)	1
R247a	XO2+HOQ=OP2	1.66E-13.*exp(1300./T)	1
R247b	XO2+HQ2=OP2	1.66E-13.*exp(1300./T)	1
Organic Peroxy Radicals + Methyl Peroxy Radicals			
R248	MO2+MO2=0.74 HO2+1.37 HCHO+0.63 MOH	9.50E-14.*exp(390./T)	1
R249	ETHP+MO2=HO2+0.75 HCHO+0.75 ACD+0.25 MOH+0.25 EOH	1.18E-13.*exp(158./T)	1
R250	HC3P+MO2= 0.894HO2+0.080MO2+0.026ETHP+0.026XO2+0.827HCHO+0.198ALD+0.497KET+0.050GLY+0.25MOH+0.25ROH	9.46E-14.*exp(431./T)	1
R251	HC5P+MO2= 0.842HO2+0.018MO2+0.14ETHP+0.191XO2+0.777HCHO+0.251ALD+0.618KET+0.25MOH+0.25ROH	1.00E-13.*exp(467./T)	1
R252	HC8P+MO2= 0.910HO2+0.090ETHP+0.281XO2+0.750HCHO+0.197ALD+0.652KET+0.250MOH+0.250ROH	4.34E-14.*exp(633./T)	1
R253	ETEP+MO2= HO2+1.95HCHO+0.15ALD+0.25MOH+0.25ETEG	1.71E-13.*exp(708./T)	1
R254	OLTP+MO2= HO2+1.5HCHO+0.705ALD+0.045KET+0.25MOH+0.25ROH	1.46E-13.*exp(708./T)	1
R255	OLIP+MO2= HO2+0.75HCHO+1.28ALD+0.218KET+0.250MOH+0.250ROH	9.18E-14.*exp(708./T)	1
R256	BENP+MO2= 1.6HO2+0.459DCB3+HCHO+0.459DCB2+0.6GLY	3.56E-14.*exp(708./T)	1
R257	TLP1+MO2=HCHO+HO2+BALD	3.56E-14.*exp(708./T)	1
R258	TOLP+MO2= 2 HO2+HCHO+0.271 GLY+DCB2	3.56E-14.*exp(708./T)	1
R259	PER1+MO2=HCHO+HO2+HO2+MGLY+DCB1	3.56E-14.*exp(708./T)	1
R260	XYL1+MO2=HCHO+HO2+BALD	3.56E-14.*exp(708./T)	1
R261	XYLP+MO2=HCHO+HO2+HO2+DCB2	3.56E-14.*exp(708./T)	1
R262	PER2+MO2=HCHO+HO2+HO2+MGLY+DCB1+1.05DCB3	3.56E-14.*exp(708./T)	1

R263	XYOP+MO2= 2HO2+HCHO+0.368GLY+0.632MGLY+0.737DCB1+0.077DCB2+0.186DCB3	3.56E-14.*exp(708./T)	1
R264	ISOP+MO2=HO2+1.31HCHO+0.159MACR+0.250MVK+0.250MOH+0.250ROH+0.23ALD+0.018GLY+0.016HKET	3.40E-14.*exp(221./T)	1
R265	APIP+MO2=HO2+0.75 HCHO+0.75 ALD+0.75 KET+0.25 MOH+0.25 ROH	3.56E-14.*exp(708./T)	1
R266	LIMP+MO2= HO2+0.192OLI+1.04HCHO+0.308MACR+0.25MOH+0.25ROH	3.56E-14.*exp(708./T)	1
R267	ACO3+MO2=0.9HO2+0.9MO2+0.4CO2+HCHO+0.1ORA2	2.00E-12.*exp(500./T)	2
R268	RCO3+MO2=0.9HO2+0.9MO2+0.4CO2+HCHO+0.1ORA2	2.00E-12.*exp(500./T)	2
R269	ACTP+MO2=0.5 HO2+0.5 ACO3+1.5 HCHO+0.25 MOH+0.25 ROH+0.125 ORA2	7.50E-13.*exp(500./T)	1
R270	MEKP+MO2=0.834 HO2+HCHO+0.334 DCB1+0.25 MOH+0.25 ROH	6.91E-13.*exp(508./T)	1
R271	KETP+MO2=HO2+0.75 HCHO+0.50 DCB1+0.25 MOH+0.25 ROH	6.91E-13.*exp(508./T)	1
R272	MACP+MO2=0.5HO2+0.269ACO3+0.5CO+1.66HCHO+0.250MOH+0.250ROH+0.067ORA2+0.25MO2	3.40E-14.*exp(221./T)	1
R273	MCP+MO2=NO2+HO2+1.5 HCHO+0.5 HKET+0.25 MOH+0.25 ROH	3.40E-14.*exp(221./T)	1
R274	MVKP+MO2= HO2+1.16ACO3+1.16XO2+1.5HCHO+1.75ALD+0.50MGLY+0.25MOH+0.25ROH+0.292ORA2	3.40E-14.*exp(221./T)	1
R275	UALP+MO2= HO2+0.305CO+0.773HCHO+0.203ALD+0.525KET+0.105MGLY+0.135GLY+0.25MOH+0.25ROH	3.40E-14.*exp(221./T)	1
R276	BALP+MO2=HCHO+HO2+BAL1	3.56E-14.*exp(708./T)	1
R277	BAL1+MO2=HCHO+HO2+BAL2	3.56E-14.*exp(708./T)	1
R278	ADDC+MO2=2 HO2+HCHO+0.32 HKET+0.68 GLY+0.68 OP2	3.56E-14.*exp(708./T)	1
R279	MCTP+MO2=HCHO+HO2+MCTO	3.56E-14.*exp(708./T)	1
R280	ORAP+MO2=HO2+HCHO+GLY	7.50E-13.*exp(500./T)	1
R281	OLNN+MO2=HCHO+HO2+HO2+ONIT	1.60E-13.*exp(708./T)	1
R281a	OLNNQ+MO2=HCHO+HO2+HO2+ONITQ	1.60E-13.*exp(708./T)	1
R281b	OLNNQ2+MO2=HCHO+HO2+HO2+ONITQ2	1.60E-13.*exp(708./T)	1

R281c	OLNNQ3+MO2=HCHO+HO2+HO2+ONITQ3	1.60E-13.*exp(708./T)	1
R282	OLND+MO2= 0.50HO2+0.50NO2+0.965HCHO+0.93ALD+0.348KET+0.25MOH+0.25ROH+0.5ONIT	9.68E-14.*exp(708./T)	1
R282a	OLNDQ+MO2= 0.50HO2+0.25NOQ+0.25NO2+0.965HCHO+0.93ALD+0.348KET+0.25MOH+0.25ROH+0.5ONITQ	9.68E-14.*exp(708./T)	1
R282b	OLNDQ2+MO2= 0.50HO2+0.25NOQ+0.25NQ2+0.965HCHO+0.93ALD+0.348KET+0.25MOH+0.25ROH+0.5ONITQ2	9.68E-14.*exp(708./T)	1
R282c	OLNDQ3+MO2= 0.50HO2+0.5NQ2+0.965HCHO+0.93ALD+0.348KET+0.25MOH+0.25ROH+0.5ONITQ3	9.68E-14.*exp(708./T)	1
R283	ADCN+MO2=HO2+0.7 NO2+HCHO+0.7 GLY+0.7 OP2+0.3 ONIT	3.56E-14	1
R283a	ADCNQ+MO2=HO2+0.4667 NOQ + 0.233 NO2 +HCHO+0.7 GLY+0.7 OP2+0.3 ONITQ	3.56E-14	1
R283b	ADCNQ2+MO2=HO2+0.4667 NOQ + 0.233 NQ2 +HCHO+0.7 GLY+0.7 OP2+0.3 ONITQ2	3.56E-14	1
R283c	ADCNQ3+MO2=HO2+0.7 NQ2 +HCHO+0.7 GLY+0.7 OP2+0.3 ONITQ3	3.56E-14	1
R284	XO2+MO2=HCHO+HO2	5.99E-15.*exp(1510./T)	1
Organic Peroxy Radicals + Acetyl Peroxy Radical			
R285	ETHP+ACO3=0.500 HO2+0.5 MO2+ACD+0.5 ORA2	1.03E-12.*exp(211./T)	1
R286	HC3P+ACO3= 0.394HO2+0.580MO2+0.026ETHP+0.026XO2+0.130HCHO+0.273ALD+0.662KET+0.067GLY+0.50ORA2	6.90E-13.*exp(460./T)	1
R287	HC5P+ACO3= 0.342HO2+0.518MO2+0.140ETHP+0.191XO2+0.042HCHO+0.381ALD+0.824KET+0.5ORA2	5.59E-13.*exp(522./T)	1
R288	HC8P+ACO3= 0.303HO2+0.5MO2+0.067ETHP+0.208XO2+0.217ALD+0.642KET+0.495ORA2	2.47E-13.*exp(683./T)	1
R289	ETEP+ACO3=0.5 HO2+0.5 MO2+1.6 HCHO+0.2 ALD+0.5 ORA2	9.48E-13.*exp(765./T)	1

R290	OLTP+ACO3=0.50 HO2+0.50 MO2+HCHO+0.94 ALD+0.06 KET+0.50 ORA2	8.11E-13.*exp(765./T)	1
R291	OLIP+ACO3=0.50 HO2+0.50 MO2+1.71 ALD+0.29 KET+0.50 ORA2	5.09E-13.*exp(765./T)	1
R292	BENP+ACO3= 0.60HO2+MO2+0.459DCB2+0.458DCB 3+0.60GLY	7.40E-13.*exp(765./T)	1
R293	TLP1+ACO3=MO2+BALD	7.40E-13.*exp(765./T)	1
R294	TOLP+ACO3=DCB2+HO2+MO2	7.40E-13.*exp(765./T)	1
R295	PER1+ACO3=DCB1+MO2+MGLY+HO2	7.40E-13.*exp(765./T)	1
R296	XYL1+ACO3=MO2+BALD	7.40E-13.*exp(765./T)	1
R297	XYLP+ACO3=DCB2+MO2+HO2	7.40E-13.*exp(765./T)	1
R298	PER2+ACO3=DCB1+MO2+MGLY+HO2+ 1.05DCB3	7.40E-13.*exp(765./T)	1
R299	XYOP+ACO3= HO2+MO2+0.368 GLY+0.632 MGLY+0.737 DCB1+0.077 DCB2+0.186 DCB3	7.40E-13.*exp(765./T)	1
R300	ISOP+ACO3=0.5HO2+0.5MO2+0.75HC HO+0.159MACR+0.25MVK+0.5ORA2+0. 031ALD+0.024GLY+0.033HKET	8.40E-14.*exp(221./T)	1
R301	APIP+ACO3=0.5 HO2+0.5 MO2+ALD+KET+ORA2	7.40E-13.*exp(765./T)	1
R302	LIMP+ACO3=0.5 HO2+0.5 MO2+0.192 OLI+0.385 HCHO+0.308 MACR+0.5 ORA2	7.40E-13.*exp(765./T)	1
R303	ACO3+ACO3=MO2+MO2+CO2+CO2	2.50E-12.*exp(500./T)	1
R304	RCO3+ACO3=MO2+ETHP+CO2+CO2	2.50E-12.*exp(500./T)	1
R305	ACTP+ACO3=0.50 MO2+0.50 ACO3+HCHO+0.75 ORA2	7.51E-13.*exp(565./T)	1
R306	MEKP+ACO3=0.33 HO2+0.50 MO2+0.33 HCHO+0.334 DCB1+0.50 ORA2	7.51E-13.*exp(565./T)	1
R307	KETP+ACO3=0.50 HO2+0.50 MO2+0.50 DCB1+0.50 ORA2	7.51E-13.*exp(565./T)	1
R308	MACP+ACO3= 0.50HO2+0.50MO2+0.167ACO3+0.167 CO+HCHO+0.167HKET+0.33MGLY+0.5 83ORA2	8.40E-14.*exp(221./T)	1
R309	MCP+ACO3=NO2+0.5 HO2+HCHO +0.5 HKET+0.5 MO2+0.5 ORA2	8.40E-14.*exp(221./T)	1
R310	MVKP+ACO3= 0.5HO2+0.5MO2+1.16ACO3+1.16XO2+ HCHO+2.3ALD+0.5MGLY+1.083ORA2	8.40E-14.*exp(221./T)	1
R311	UALP+ACO3= 0.5HO2+0.5MO2+0.5CO+0.030HCHO+ 0.27ALD+0.70KET+0.18GLY+0.105MGLY +0.5ORA2	8.40E-14.*exp(221./T)	1

R312	BALP+ACO3=BAL1+MO2	7.40E-13.*exp(765./T)	1
R313	BAL1+ACO3=BAL2+MO2	7.40E-13.*exp(765./T)	1
R314	ADDC+ACO3=2 HO2+MO2+0.32 HKET+0.68 GLY+0.68 OP2	7.40E-13.*exp(708./T)	1
R315	MCTP+ACO3=MO2+HO2+MCTO	7.40E-13.*exp(708./T)	1
R316	ORAP+ACO3=MO2+GLY	7.51E-13.*exp(565./T)	1
R317	OLNN+ACO3=ONIT+MO2+HO2	8.85E-13.*exp(765./T)	1
R317a	OLNNQ+ACO3=ONITQ+MO2+HO2	8.85E-13.*exp(765./T)	1
R317b	OLNNQ2+ACO3=ONITQ2+MO2+HO2	8.85E-13.*exp(765./T)	1
R317c	OLNNQ3+ACO3=ONITQ3+MO2+HO2	8.85E-13.*exp(765./T)	1
R318	OLND+ACO3= 0.50MO2+NO2+0.287HCHO+1.24ALD+ 0.464KET+0.50ORA2	5.37E-13.*exp(765./T)	1
R318a	OLNDQ+ACO3= 0.50MO2+(1/3)*NO2+(2/3)*NOQ+0.287 HCHO+1.24ALD+0.464KET+0.50ORA2	5.37E-13.*exp(765./T)	1
R318b	OLNDQ2+ACO3= 0.50MO2+(1/3)*NQ2+(2/3)*NOQ+0.287 HCHO+1.24ALD+0.464KET+0.50ORA2	5.37E-13.*exp(765./T)	1
R318c	OLNDQ3+ACO3= 0.50MO2+NQ2+0.287HCHO+1.24ALD+ 0.464KET+0.50ORA2	5.37E-13.*exp(765./T)	1
R319	ADCN+ACO3=HO2+MO2+0.7 NO2+0.7 GLY+0.7 OP2+0.3 ONIT	7.40E-13.*exp(708./T)	1
R319a	ADCNQ+ACO3=HO2+MO2+0.4667NOQ +0.233NO2 + 0.7 GLY+0.7 OP2+0.3 ONITQ	7.40E-13.*exp(708./T)	1
R319b	ADCNQ2+ACO3=HO2+MO2+0.4667NO Q+0.233NQ2 + 0.7 GLY+0.7 OP2+0.3 ONITQ2	7.40E-13.*exp(708./T)	1
R319c	ADCNQ3+ACO3=HO2+MO2+7NQ2 + 0.7 GLY+0.7 OP2+0.3 ONITQ3	7.40E-13.*exp(708./T)	1
R320	XO2+ACO3=MO2	3.40E-14.*exp(1560./T)	1
Organic Peroxy Radical + NO_3			
R321	MO2+NO3=HCHO+HO2+NO2	1.20E-12	1
R321a	MO2+NO2Q=HCHO+HO2+(1/3)*NO2+(2/3)*NOQ	1.20E-12	1
R321b	MO2+NOQ2=HCHO+HO2+(1/3)*NQ2+(2/3)*NOQ	1.20E-12	1
R321c	MO2+NQ3=HCHO+HO2+NQ2	1.20E-12	1
R322	ETHP+NO3=ACD+HO2+NO2	1.20E-12	1
R322a	ETHP+NO2Q=ACD+HO2+(1/3)*NO2+(2/ 3)*NOQ	1.20E-12	1
R322b	ETHP+NOQ2=ACD+HO2+(1/3)*NQ2+(2/ 3)*NOQ	1.20E-12	1
R322c	ETHP+NQ3=ACD+HO2+NQ2	1.20E-12	1

R323	HC3P+NO3=0.254HO2+0.140MO2+0.092XO2+0.503ETHP+NO2+0.519ACD+0.147ALD+0.075MEK+0.095ACT	1.20E-12	1
R323a	HC3P+NO2Q=0.254HO2+0.140MO2+0.092XO2+0.503ETHP +(1/3)*NO2 +(2/3)*NOQ +0.519ACD +0.147ALD +0.075MEK +0.095ACT	1.20E-12	1
R323b	HC3P+NOQ2=0.254HO2+0.140MO2+0.092XO2+0.503ETHP + (1/3)*NQ2 +(2/3)*NOQ +0.519ACD +0.147ALD +0.075MEK +0.095ACT	1.20E-12	1
R323c	HC3P+NQ3=0.254HO2+0.140MO2+0.092XO2+0.503ETHP +NQ2 +0.519ACD +0.147ALD +0.075MEK +0.095ACT	1.20E-12	1
R324	HC5P+NO3= 0.488HO2 + 0.055MO2 + 0.28ETHP + 0.485XO2 + NO2 + 0.024HCHO + 0.241ALD + 0.06KET + 0.063MEK + 0.247ACT + 0.048ACD + 0.275HKET	1.20E-12	1
R324a	HC5P+NO2Q= 0.488HO2 + 0.055MO2 + 0.28ETHP + 0.485XO2+(2/3)NOQ + (1/3)NO2+0.024HCHO + 0.241ALD + 0.06KET + 0.063MEK + 0.247ACT + 0.048ACD + 0.275HKET	1.20E-12	1
R324b	HC5P+NOQ2= 0.488HO2 + 0.055MO2 + 0.28ETHP + 0.485XO2+(2/3)NOQ + (1/3)NQ2+0.024HCHO + 0.241ALD + 0.06KET + 0.063MEK + 0.247ACT + 0.048ACD + 0.275HKET	1.20E-12	1
R324c	HC5P+NQ3= 0.488HO2 + 0.055MO2 + 0.28ETHP + 0.485XO2+NQ2 + 0.024HCHO + 0.241ALD + 0.06KET + 0.063MEK + 0.247ACT + 0.048ACD + 0.275HKET	1.20E-12	1
R325	HC8P+NO3= 0.82HO2 + 0.18ETHP + 0.563XO2 + NO2 + 0.203ALD + 0.869KET	1.20E-12	1
R325a	HC8P+NO2Q= 0.82HO2 + 0.18ETHP + 0.563XO2+(2/3)NOQ+(1/3)NO2+0.203ALD + 0.869KET	1.20E-12	1
R325b	HC8P+NOQ2= 0.82HO2 + 0.18ETHP + 0.563XO2+(2/3)NOQ+(1/3)NQ2+0.203ALD + 0.869KET	1.20E-12	1
R325c	HC8P+NQ3= 0.82HO2 + 0.18ETHP + 0.563XO2+NQ2+ 0.203ALD + 0.869KET	1.20E-12	1
R326	ETEP+NO3=HO2+NO2+1.6 HCHO+0.2 ALD	1.20E-12	1

R326a	ETEP+NO2Q=HO2+(2/3)NOQ+(1/3)NO2 +1.6 HCHO+0.2 ALD	1.20E-12	1
R326b	ETEP+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2 +1.6 HCHO+0.2 ALD	1.20E-12	1
R326c	ETEP+NQ3=HO2+NQ2+1.6 HCHO+0.2 ALD	1.20E-12	1
R327	OLTP+NO3= 0.47ALD + HCHO + 0.79HO2 + NO2 + 0.18MEK + 0.02ACD + 0.09ACT	1.20E-12	1
R327a	OLTP+NO2Q= 0.47ALD + HCHO + 0.79HO2+(2/3)NOQ+(1/3)NO2+ 0.18MEK + 0.02ACD + 0.09ACT	1.20E-12	1
R327b	OLTP+NOQ2= 0.47ALD + HCHO + 0.79HO2+(2/3)NOQ+(1/3)NQ2+ 0.18MEK + 0.02ACD + 0.09ACT	1.20E-12	1
R327c	OLTP+NQ3= 0.47ALD + HCHO + 0.79HO2+NQ2+ 0.18MEK + 0.02ACD + 0.09ACT	1.20E-12	1
R328	OLIP+NO3= 0.86HO2 + 0.72ALD + 0.11KET + NO2 + 0.20ACT + 0.85ACD + 0.04HKET	1.20E-12	1
R328a	OLIP+NO2Q= 0.86HO2 + 0.72ALD + 0.11KET +(2/3)NOQ+(1/3)NO2+ 0.20ACT + 0.85ACD + 0.04HKET	1.20E-12	1
R328b	OLIP+NOQ2= 0.86HO2 + 0.72ALD + 0.11KET +(2/3)NOQ+(1/3)NQ2+ 0.20ACT + 0.85ACD + 0.04HKET	1.20E-12	1
R328c	OLIP+NQ3= 0.86HO2 + 0.72ALD + 0.11KET +NQ2+ 0.20ACT + 0.85ACD + 0.04HKET	1.20E-12	1
R329	BENP+NO3=HO2+GLY+0.5DCB2+NO2+ 0.5DCB3	1.20E-12	1
R329a	BENP+NO2Q=HO2+GLY+0.5DCB2+(2/3)NOQ+(1/3)NO2+0.5DCB3	1.20E-12	1
R329b	BENP+NOQ2=HO2+GLY+0.5DCB2+(2/3)NOQ+(1/3)NQ2+0.5DCB3	1.20E-12	1
R329c	BENP+NQ3=HO2+GLY+0.5DCB2+NQ2+ 0.5DCB3	1.20E-12	1
R330	TLP1+NO3=NO2+BALD	1.20E-12	1
R330a	TLP1+NO2Q=(2/3)NOQ+(1/3)NO2+BAL D	1.20E-12	1
R330b	TLP1+NOQ2=(2/3)NOQ+(1/3)NQ2+BAL D	1.20E-12	1
R330c	TLP1+NQ3=NQ2+BALD	1.20E-12	1
R331	TOLP+NO3=DCB2+NO2+HO2	1.20E-12	1
R331a	TOLP+NO2Q=DCB2+(2/3)NOQ+(1/3)NO 2+HO2	1.20E-12	1

R331b	TOLP+NOQ2=DCB2+(2/3)NOQ+(1/3)NQ2+HO2	1.20E-12	1
R331c	TOLP+NQ3=DCB2+NQ2+HO2	1.20E-12	1
R332	PER1+NO3=0.5DCB1+NO2+0.5MGLY+0.5HO2+0.5BALD	1.20E-12	1
R332a	PER1+NO2Q=0.5DCB1+(2/3)NOQ+(1/3)NO2+0.5MGLY+0.5HO2+0.5BALD	1.20E-12	1
R332b	PER1+NOQ2=0.5DCB1+(2/3)NOQ+(1/3)NQ2+0.5MGLY+0.5HO2+0.5BALD	1.20E-12	1
R332c	PER1+NQ3=0.5DCB1+NQ2+0.5MGLY+0.5HO2+0.5BALD	1.20E-12	1
R333	XYL1+NO3=NO2+BALD	1.20E-12	1
R333a	XYL1+NO2Q=(2/3)NOQ+(1/3)NO2+BALD	1.20E-12	1
R333b	XYL1+NOQ2=(2/3)NOQ+(1/3)NQ2+BALD	1.20E-12	1
R333c	XYL1+NQ3=NQ2+BALD	1.20E-12	1
R334	XYLP+NO3=DCB3+NO2+HO2	1.20E-12	1
R334a	XYLP+NO2Q=DCB3+(2/3)NOQ+(1/3)NO2+HO2	1.20E-12	1
R334b	XYLP+NOQ2=DCB3+(2/3)NOQ+(1/3)NQ2+HO2	1.20E-12	1
R334c	XYLP+NQ3=DCB3+NQ2+HO2	1.20E-12	1
R335	PER2+NO3=DCB1+NO2+MGLY+HO2+1.05DCB3	1.20E-12	1
R335a	PER2+NO2Q=DCB1+(2/3)NOQ+(1/3)NO2+MGLY+HO2+1.05DCB3	1.20E-12	1
R335b	PER2+NOQ2=DCB1+(2/3)NOQ+(1/3)NQ2+MGLY+HO2+1.05DCB3	1.20E-12	1
R335c	PER2+NQ3=DCB1+NQ2+MGLY+HO2+1.05DCB3	1.20E-12	1
R336	XYOP+NO3=HO2+NO2+0.368 GLY+0.632 MGLY+0.737 DCB1+0.077 DCB2+0.186 DCB3	1.20E-12	1
R336a	XYOP+NO2Q=HO2+(2/3)NOQ+(1/3)NO2+0.368 GLY+0.632 MGLY+0.737 DCB1+0.077 DCB2+0.186 DCB3	1.20E-12	1
R336b	XYOP+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2+0.368 GLY+0.632 MGLY+0.737 DCB1+0.077 DCB2+0.186 DCB3	1.20E-12	1
R336c	XYOP+NQ3=HO2+NQ2+0.368 GLY+0.632 MGLY+0.737 DCB1+0.077 DCB2+0.186 DCB3	1.20E-12	1
R337	ISOP+NO3=HO2 + NO2 + 0.75HCHO + 0.318MACR + 0.5MVK + 0.024GLY + 0.033HKET + 0.031ALD	1.20E-12	1

R337a	ISOP+NO2Q=HO2+(2/3)NOQ+(1/3)NO2 + 0.75HCHO + 0.318MACR + 0.5MVK + 0.024GLY + 0.033HKET + 0.031ALD	1.20E-12	1
R337b	ISOP+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2 + 0.75HCHO + 0.318MACR + 0.5MVK + 0.024GLY + 0.033HKET + 0.031ALD	1.20E-12	1
R337c	ISOP+NQ3=HO2+NQ2+ 0.75HCHO + 0.318MACR + 0.5MVK + 0.024GLY + 0.033HKET + 0.031ALD	1.20E-12	1
R338	APIP+NO3=HO2+ALD+NO2+KET	1.20E-12	1
R338a	APIP+NO2Q=HO2+ALD+(1/3)*NO2+(2/3)*NOQ+KET	1.20E-12	1
R338b	APIP+NOQ2=HO2+ALD+(1/3)*NQ2+(2/3)*NOQ+KET	1.20E-12	1
R338c	APIP+NQ3=HO2+ALD+NQ2+KET	1.20E-12	1
R339	LIMP+NO3=HO2+NO2+0.385 OLI+0.385 HCHO+0.615 MACR	1.20E-12	1
R339a	LIMP+NO2Q=HO2+(2/3)NOQ+(1/3)NO2 +0.385 OLI+0.385 HCHO+0.615 MACR	1.20E-12	1
R339b	LIMP+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2 +0.385 OLI+0.385 HCHO+0.615 MACR	1.20E-12	1
R339c	LIMP+NQ3=HO2+NQ2+0.385 OLI+0.385 HCHO+0.615 MACR	1.20E-12	1
R340	ACO3+NO3=MO2+NO2	4.00E-12	1
R340a	ACO3+NO2Q=MO2+(1/3)*NO2+(2/3)*NOQ	4.00E-12	1
R340b	ACO3+NOQ2=MO2+(1/3)*NQ2+(2/3)*NOQ	4.00E-12	1
R340c	ACO3+NQ3=MO2+NQ2	4.00E-12	1
R341	RCO3+NO3=ETHP+NO2	4.00E-12	1
R341a	RCO3+NO2Q=ETHP+(1/3)*NO2+(2/3)*NOQ	4.00E-12	1
R341b	RCO3+NOQ2=ETHP+(1/3)*NQ2+(2/3)*NOQ	4.00E-12	1
R341c	RCO3+NQ3=ETHP+NQ2	4.00E-12	1
R342	ACTP+NO3=ACO3+NO2+HCHO	1.20E-12	1
R342a	ACTP+NO2Q=ACO3+(1/3)*NO2+(2/3)*NOQ+HCHO	1.20E-12	1
R342b	ACTP+NOQ2=ACO3+(1/3)*NQ2+(2/3)*NOQ+HCHO	1.20E-12	1
R342c	ACTP+NQ3=ACO3+NQ2HCHO	1.20E-12	1
R343	MEKP+NO3=0.67 HO2+NO2+0.33 HCHO+0.67 DCB1	1.20E-12	1
R343a	MEKP+NO2Q=0.67 HO2+(1/3)*NO2+(2/3)*NOQ+0.33 HCHO+0.67 DCB1	1.20E-12	1

R343b	MEKP+NOQ2=0.67 HO2+(1/3)*NQ2+(2/3)*NOQ+0.33 HCHO+0.67 DCB1	1.20E-12	1
R343c	MEKP+NQ3=0.67 HO2+NQ2+0.33 HCHO+0.67 DCB1	1.20E-12	1
R344	KETP+NO3=DCB1+HO2+NO2	1.20E-12	1
R344a	KETP+NO2Q=DCB1+HO2+(1/3)*NO2+(2/3)*NOQ	1.20E-12	1
R344b	KETP+NOQ2=DCB1+HO2+(1/3)*NQ2+(2/3)*NOQ	1.20E-12	1
R344c	KETP+NQ3=DCB1+HO2+NQ2	1.20E-12	1
R345	MACP+NO3=HO2+0.33 ACO3+NO2+0.33 CO+HCHO+0.33 HKET+0.667 MGLY	1.20E-12	1
R345a	MACP+NO2Q=HO2+0.33 ACO3+(2/3)NOQ+(1/3)NO2+0.33 CO+HCHO+0.33 HKET+0.667 MGLY	1.20E-12	1
R345b	MACP+NOQ2=HO2+0.33 ACO3+(2/3)NOQ+(1/3)NQ2+0.33 CO+HCHO+0.33 HKET+0.667 MGLY	1.20E-12	1
R345c	MACP+NQ3=HO2+0.33 ACO3+NQ2+0.33 CO+HCHO+0.33 HKET+0.667 MGLY	1.20E-12	1
R346	MCP+NO3 = NO2+HO2+HCHO+HKET	1.20E-12	1
R346a	MCP+NO2Q = (2/3)NOQ+(1/3)NO2+HO2+HCHO+HKET	1.20E-12	1
R346b	MCP+NOQ2 = (2/3)NOQ+(1/3)NQ2+HO2+HCHO+HKET	1.20E-12	1
R346c	MCP+NQ3 = NQ2+HO2+HCHO+HKET	1.20E-12	1
R347	MVKP+NO3=0.3 HO2+0.7 ACO3+0.7 XO2+NO2+0.3 HCHO+0.7 ALD+MGLY	1.20E-12	1
R347a	MVKP+NO2Q=0.3 HO2+0.7 ACO3+0.7 XO2+(2/3)NOQ+(1/3)NO2+0.3 HCHO+0.7 ALD+MGLY	1.20E-12	1
R347b	MVKP+NOQ2=0.3 HO2+0.7 ACO3+0.7 XO2+(2/3)NOQ+(1/3)NQ2+0.3 HCHO+0.7 ALD+MGLY	1.20E-12	1
R347c	MVKP+NQ3=0.3 HO2+0.7 ACO3+0.7 XO2+NQ2+0.3 HCHO+0.7 ALD+MGLY	1.20E-12	1
R348	UALP+NO3=HO2+NO2+0.61 CO+0.03 HCHO+0.27 ALD+0.7 KET+0.18 GLY+0.21 MGLY	1.20E-12	1
R348a	UALP+NO2Q=HO2+(2/3)NOQ+(1/3)NO2+0.61 CO+0.03 HCHO+0.27 ALD+0.7 KET+0.18 GLY+0.21 MGLY	1.20E-12	1

R348b	UALP+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2+0.61 CO+0.03 HCHO+0.27 ALD+0.7 KET+0.18 GLY+0.21 MGLY	1.20E-12	1
R348c	UALP+NQ3=HO2+NQ2+0.61 CO+0.03 HCHO+0.27 ALD+0.7 KET+0.18 GLY+0.21 MGLY	1.20E-12	1
R349	BALP+NO3=BAL1+NO2	1.20E-12	1
R349a	BALP+NO2Q=BAL1+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R349b	BALP+NOQ2=BAL1+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R349c	BALP+NQ3=BAL1+NQ2	1.20E-12	1
R350	BAL1+NO3=BAL2+NO2	1.20E-12	1
R350a	BAL1+NO2Q=BAL2+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R350b	BAL1+NOQ2=BAL2+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R350c	BAL1+NQ3=BAL2+NQ2	1.20E-12	1
R351	ADDC+NO3=HO2+NO2+0.32 HKET+0.68 GLY+0.68 OP2	1.20E-12	1
R351a	ADDC+NO2Q=HO2+(2/3)NOQ+(1/3)NO2+0.32 HKET+0.68 GLY+0.68 OP2	1.20E-12	1
R351b	ADDC+NOQ2=HO2+(2/3)NOQ+(1/3)NQ2+0.32 HKET+0.68 GLY+0.68 OP2	1.20E-12	1
R351c	ADDC+NQ3=HO2+NQ2+0.32 HKET+0.68 GLY+0.68 OP2	1.20E-12	1
R352	MCTP+NO3=MCTO+NO2	1.20E-12	1
R352a	MCTP+NO2Q=MCTO+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R352b	MCTP+NOQ2=MCTO+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R352c	MCTP+NQ3=MCTO+NQ2	1.20E-12	1
R353	ORAP+NO3=HO2+NO2+GLY	1.20E-12	1
R353a	ORAP+NO2Q=HO2+(1/3)*NO2+(2/3)*NOQ+GLY	1.20E-12	1
R353b	ORAP+NOQ2=HO2+(1/3)*NQ2+(2/3)*NOQ+GLY	1.20E-12	1
R353c	ORAP+NQ3=HO2+NQ2+GLY	1.20E-12	1
R354	OLNN+NO3=ONIT+NO2+HO2	1.20E-12	1
R354a	OLNN+NO2Q=ONIT+(1/3)*NO2+(2/3)*NOQ+HO2	1.20E-12	1
R354b	OLNN+NOQ2=ONIT+(1/3)*NQ2+(2/3)*NOQ+HO2	1.20E-12	1
R354c	OLNN+NQ3=ONIT+NQ2+HO2	1.20E-12	1
R354d	OLNNQ+NO3=ONITQ+NO2+HO2	1.20E-12	1
R354e	OLNNQ+NO2Q=ONITQ+(1/3)*NO2+(2/3)*NOQ+HO2	1.20E-12	1

R354f	OLNNQ+NOQ2=ONITQ+(1/3)*NQ2+(2/3)*NOQ+HO2	1.20E-12	1
R354g	OLNNQ+NQ3=ONITQ+NQ2+HO2	1.20E-12	1
R354h	OLNNQ2+NO3=ONITQ2+NO2+HO2	1.20E-12	1
R354i	OLNNQ2+NO2Q=ONITQ2+(1/3)*NO2+(2/3)*NOQ+HO2	1.20E-12	1
R354j	OLNNQ2+NOQ2=ONITQ2+(1/3)*NQ2+(2/3)*NOQ+HO2	1.20E-12	1
R354k	OLNNQ2+NQ3=ONITQ2+NQ2+HO2	1.20E-12	1
R354l	OLNNQ3+NO3=ONITQ3+NO2+HO2	1.20E-12	1
R354m	OLNNQ3+NO2Q=ONITQ3+(1/3)*NO2+(2/3)*NOQ+HO2	1.20E-12	1
R354n	OLNNQ3+NOQ2=ONITQ3+(1/3)*NQ2+(2/3)*NOQ+HO2	1.20E-12	1
R354o	OLNNQ3+NQ3=ONITQ3+NQ2+HO2	1.20E-12	1
R355	OLND+NO3=2 NO2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355a	OLND+NO2Q= NO2+NOQ+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355b	OLND+NOQ2=NO2+NOQ+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355c	OLND+NQ3=NO2+NOQ+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355d	OLNDQ+NO3=NO2+NOQ+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355e	OLNDQ+NO2Q=NO2+NOQ+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355f	OLNDQ+NOQ2=NO2+NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355g	OLNDQ+NQ3=NO2+NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355h	OLNDQ2+NO3=NO2+NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355i	OLNDQ2+NO2Q=NO2+NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355j	OLNDQ2+NOQ2=NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355k	OLNDQ2+NQ3=NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355l	OLNDQ3+NO3=NO2+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355m	OLNDQ3+NO2Q=NO2+NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355n	OLNDQ3+NOQ2=NOQ+NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1
R355o	OLNDQ3+NQ3=NQ2+0.287 HCHO+1.24 ALD+0.464 KET	1.20E-12	1

R356	ADCN+NO3=OP2+GLY+NO2+NO2	1.20E-12	1
R356a	ADCN+NO2Q=OP2+GLY+NO2+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R356b	ADCN+NOQ2=OP2+GLY+NO2+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R356c	ADCN+NQ3=OP2+GLY+NO2+NQ2	1.20E-12	1
R356d	ADCNQ+NO3=OP2+GLY+(2/3)NOQ+(1/3)NO2+NO2	1.20E-12	1
R356e	ADCNQ+NO2Q=OP2+GLY+(2/3)NOQ+(1/3)NO2+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R356f	ADCNQ+NOQ2=OP2+GLY+(2/3)NOQ+(1/3)NO2+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R356g	ADCNQ+NQ3=OP2+GLY+(2/3)NOQ+(1/3)NO2+NQ2	1.20E-12	1
R356h	ADCNQ2+NO3=OP2+GLY+(2/3)NOQ+(1/3)NQ2+NO2	1.20E-12	1
R356i	ADCNQ2+NO2Q=OP2+GLY+(2/3)NOQ+(1/3)NQ2+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R356j	ADCNQ2+NOQ2=OP2+GLY+(2/3)NOQ+(1/3)NQ2+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R356k	ADCNQ2+NQ3=OP2+GLY+(2/3)NOQ+(1/3)NQ2+NQ2	1.20E-12	1
R356l	ADCNQ3+NO3=OP2+GLY+NQ2+NO2	1.20E-12	1
R356m	ADCNQ3+NO2Q=OP2+GLY+NQ2+(2/3)NOQ+(1/3)NO2	1.20E-12	1
R356n	ADCNQ3+NOQ2=OP2+GLY+NQ2+(2/3)NOQ+(1/3)NQ2	1.20E-12	1
R356o	ADCNQ3+NQ3=OP2+GLY+NQ2+NQ2	1.20E-12	1
R357	XO2+NO3=NO2	1.20E-12	1
R357a	XO2+NO2Q=(1/3)*NO2+(2/3)*NOQ	1.20E-12	1
R357b	XO2+NOQ2=(1/3)*NQ2+(2/3)*NOQ	1.20E-12	1
R357c	XO2+NQ3=NQ2	1.20E-12	1
Self-Reaction of RCO_3 Radical			
R358	RCO3+RCO3=2ETHP+2CO2	2.5e-12.*exp(500./T)	1
R359	OLNN+OLNN=ONIT+ONIT+HO2	7.00E-14.*exp(1000./T)	1
R359a	OLNN+OLNNQ=ONIT+ONITQ+HO2	7.00E-14.*exp(1000./T)	1
R359b	OLNN+OLNNQ2=ONIT+ONITQ2+HO2	7.00E-14.*exp(1000./T)	1
R359c	OLNN+OLNNQ3=ONIT+ONITQ3+HO2	7.00E-14.*exp(1000./T)	1
R359d	OLNNQ+OLNNQ=ONITQ+ONITQ+HO2	7.00E-14.*exp(1000./T)	1
R359e	OLNNQ+OLNNQ2=ONITQ+ONITQ2+HO2	7.00E-14.*exp(1000./T)	1
R359f	OLNNQ+OLNNQ3=ONITQ+ONITQ3+HO2	7.00E-14.*exp(1000./T)	1
R359g	OLNNQ2+OLNNQ2=ONITQ2+ONITQ2+HO2	7.00E-14.*exp(1000./T)	1

R359h	OLNNQ2+OLNNQ3=ONITQ2+ONITQ3+ HO2	7.00E-14.*exp(1000./T)	1
R359i	OLNNQ3+OLNNQ3=ONITQ3+ONITQ3+ HO2	7.00E-14.*exp(1000./T)	1
R360	OLNN+OLND=0.50 HO2+0.50 NO2+0.202 HCHO+0.640 ALD+0.149 KET+1.50 ONIT	4.25E-14.*exp(1000./T)	1
R360a	OLNN+OLNDQ=0.50 HO2+NO2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONIT +ONITQ	4.25E-14.*exp(1000./T)	1
R360b	OLNN+OLNDQ2=0.50 HO2+NQ2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONIT +ONITQ2	4.25E-14.*exp(1000./T)	1
R360c	OLNN+OLNDQ3=0.50 HO2+NQ2+0.202 HCHO+0.640 ALD+0.149 KET+ ONIT +ONITQ3	4.25E-14.*exp(1000./T)	1
R360d	OLNNQ+OLND=0.50 HO2+NO2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ +ONIT	4.25E-14.*exp(1000./T)	1
R360e	OLNNQ+OLNDQ=0.50 HO2+NO2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ	4.25E-14.*exp(1000./T)	1
R360f	OLNNQ+OLNDQ2=0.50 HO2+NQ2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ+ONITQ2	4.25E-14.*exp(1000./T)	1
R360g	OLNNQ+OLNDQ3=0.50 HO2+NQ2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ+ONITQ3	4.25E-14.*exp(1000./T)	1
R360h	OLNNQ2+OLND=0.50 HO2+NO2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ2+ONIT	4.25E-14.*exp(1000./T)	1
R360i	OLNNQ2+OLNDQ=0.50 HO2+NO2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ2+ONITQ	4.25E-14.*exp(1000./T)	1
R360j	OLNNQ2+OLNDQ2=0.50 HO2+NQ2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ2+ONITQ2	4.25E-14.*exp(1000./T)	1
R360k	OLNNQ2+OLNDQ3=0.50 HO2+NQ2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ2+ONITQ3	4.25E-14.*exp(1000./T)	1
R360l	OLNNQ3+OLND=0.50 HO2+NO2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ3+ONIT	4.25E-14.*exp(1000./T)	1
R360m	OLNNQ3+OLNDQ=0.50 HO2+NO2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ3+ONITQ	4.25E-14.*exp(1000./T)	1

R360n	OLNNQ3+OLNDQ2=0.50 HO2+NQ2+NOQ+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ3+ONITQ2	4.25E-14.*exp(1000./T)	1
R360o	OLNNQ3+OLNDQ3=0.50 HO2+NQ2+0.202 HCHO+0.640 ALD+0.149 KET+ ONITQ3	4.25E-14.*exp(1000./T)	1
R361	OLND+OLND=NO2+0.504 HCHO+1.21 ALD+0.285 KET+ONIT	2.96E-14.*exp(1000./T)	1
R361a	OLND+OLNDQ=NO2+NOQ+0.504 HCHO+1.21 ALD+0.285 KET+ONIT+ONITQ	2.96E-14.*exp(1000./T)	1
R361b	OLND+OLNDQ2=NO2+NOQ+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONIT+ONITQ2	2.96E-14.*exp(1000./T)	1
R361c	OLND+OLNDQ3=NO2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONIT+ONITQ3	2.96E-14.*exp(1000./T)	1
R361d	OLNDQ+OLNDQ=NO2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ	2.96E-14.*exp(1000./T)	1
R361e	OLNDQ+OLNDQ2=NO2+NQ2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ+ONITQ2	2.96E-14.*exp(1000./T)	1
R361f	OLNDQ+OLNDQ3=NO2+NQ2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ+ONITQ3	2.96E-14.*exp(1000./T)	1
R361g	OLNDQ2+OLNDQ2=NQ2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ2	2.96E-14.*exp(1000./T)	1
R361h	OLNDQ2+OLNDQ3=NQ2+NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ2+ONITQ3	2.96E-14.*exp(1000./T)	1
R361i	OLNDQ3+OLNDQ3=NQ2+0.504 HCHO+1.21 ALD+0.285 KET+ONITQ3	2.96E-14.*exp(1000./T)	1
R362	XO2+XO2=	7.13E-17.*exp(2950./T)	1
R363	XO2+RCO3=ETHP +CO2	2.96E-14.*exp(1000./T)	1
Oxygen Isotope Exchange			
O_Exchange1	Q3P+O2=O3P+O2	2.9E-12.*0.21.*M	3
O_Exchange2	Q1D+O2=O1D+O2	2.9E-12.*0.21.*M	3
O_Exchange3	Q1D+NO=O1D+NQ	3.7E-11	3
O_Exchange4	O1D+NQ=Q1D+NO	3.7E-11	3
O_Exchange5	Q3P+NO=O3P+NQ	3.7E-11	3
O_Exchange6	O3P+NQ=Q3P+NO	3.7E-11	3
O_Exchange7	QH+H2O=OH+H2O	2.3E-13*exp(-2100/T)*H2O	3
O_Exchange8	QH+O2=OH+O2	1.0E-17*0.21*M	3
O_Exchange9	QH+HO2=OH+HOQ	1.E-11*exp(400/T)	3
O_Exchange10	OH+HOQ=0.5QH+0.5HO2+0.5OH+0.5HOQ	1.E-11*exp(400/T)	3

O_Exchange11	QH+HOQ=0.5OH+0.5HQ2+0.5QH+0.5HOQ	1.E-11*exp(400/T)	3
O_Exchange12	OH+HQ2=QH+HOQ	1.E-11*exp(400/T)	3
O_Exchange13	HOQ+O2=HO2+O2	3.0E-17*0.21*M	3
O_Exchange14	HQ2+O2=HO2+O2	3.0E-17*0.21*M	3
O_Exchange15	NQ+NO2=NO+NOQ	3.6E-14	3
O_Exchange16	NO+NOQ=0.5NQ+0.5NO2+0.5NO+0.5NOQ	3.6E-14	3
O_Exchange17	NQ+NOQ=0.5NO+0.5NQ2+0.5NQ+0.5NOQ	3.6E-14	3
O_Exchange18	NO+NQ2=NQ+NOQ	3.6E-14	3
O_Exchange19	NOQ+O2=NO2+O2	1.E-24*0.21*M	3
O_Exchange20	NQ2+O2=NO2+O2	1.E-24*0.21*M	3
O_Exchange21	QH+NO=OH+NQ	1.8E-11	3
O_Exchange22	OH+NQ=QH+NO	1.8E-11	3
O_Exchange23	QH+NO2=OH+NOQ	1.0E-11	3
O_Exchange24	OH+NOQ=0.5QH+0.5NO2+0.5OH+0.5NOQ	1.0E-11	3
O_Exchange25	QH+NOQ=0.5OH+0.5NQ2+0.5QH+0.5NOQ	1.0E-11	3
O_Exchange26	OH+NQ2=QH+NOQ	1.0E-11	3

Note 1, (Goliff et al., 2013)

Note 2, (Atkinson et al., 2006)

Note 3, (Lyons, 2001)

Table S4. The RACM2 Chemical Mechanism: Troe Reaction Parameters.

Reaction Rate Label	k_0^{300} **(cm^6 s^{-1})**	**n**	k_∞^{300} **(cm^3 s^{-1})**	**m**	**Note**
K_O3P_NO	9.00E-32	1.5	3.00E-11	0	1
K_O3P_NO2	2.5E-31	1.8	2.2E-11	0.7	1
K_OH_NO2_HONO2	1.8E-30	3.0	2.8E-11	0	1
K_NO2_NO3	2.0E-30	4.4	1.4E-12	0.7	1
K_HO2_NO2	2.0E-31	3.4	2.9E-12	1.1	1
K_OH_SO2	3.3E-31	4.3	1.6E-12	0	1
K_OH_ETE	1.0E-28	4.5	8.8E-12	0.85	1
K_OH_ACE	5.5E-30	0	8.3E-13	-2.0	1
K_ACO3_NO2	9.7E-29	5.6	9.3E-12	1.5	1

Note 1, (Goliff et al., 2013)

Table S5. The RACM2 Chemical Mechanism: Troe Equilibrium Reactions

Reaction Rate Label	**A**	**B**	k_0^{300}**(cm^6 s^{-1})**	**n**	k_∞^{300} **(cm^3 s^{-1})**	**m**	**Note**
K_N2O5	3.7E26	11,000	2.2E-30	3.9	1.5E-12	0.7	1
K_HO2NO2	4.76E26	10,900	2.00E-31	3.4	2.9E-12	1.1	1
K_PAN	1.16E28	13,954	9.70E-29	5.6	9.30E-12	1.5	1

Note 1, (Goliff et al., 2013)

Table S6. The RACM2 Chemical Mechanism: Reactions with Special Rate Expressions.

Reaction Rate Label	Rate Constant Expression	Note
K_HO2_NO_HNO3	k_1 = 3.45E-12*exp(270/T) k_2 = (530/T)+(4.8E-6)*pressure – 1.73 $k = k_1 * k_2/100$	1
K_OH_HNO3	k_0 = 2.4 E-14*exp(460/T) k_2 = 2.4E-17*exp(2199/T) k_3 = 6.5E-34*exp(1335/T)*[M] $k = k_0 + k_3/(1+k_3/k_2)$	1
K_OH_CO	1.44E-13*(1+0.8*[M]/4E19)	1

Note 1, (Goliff et al., 2013)

Table S7. Addition of heterogeneous reactions into ICOIN-RACM2 Mechanism (ICOIN-RACM2(het)).

Reaction No.	Reaction	k_{het} (s^{-1})[a]
Het_01	NO2=0.5HNO3+0.5HONO	2.67E-6
Het_01a	NOQ=0.5HNO2Q+0.5HONQ	2.67E-6
Het_01b	NQ2=0.5HNOQ2+0.5HQNQ	2.67E-6
Het_02	N2O5=HNO3+HNO3	4E-4
Het_02a	N2O4Q = (2/5)*HNO2Q + (2/5)*HNO3 + (3/5)*HNO3 + (3/5)*HNO2Q	4E-4
Het_02b	N2O3Q2 = 0.3*HNO3 + 0.6*HNO2Q + 0.1*HNOQ2 + 0.1HNO3 + 0.6*HNO2Q + 0.3*HNOQ2	4E-4
Het_02c	N2O2Q3 = 0.1*HNO3 + 0.6*HNO2Q + 0.3*HNOQ2 + 0.3*HNO2Q + 0.6*HNOQ2 + 0.1*HNQ3	4E-4
Het_02d	N2OQ4 = 0.4*HNO2Q + 0.6*HNOQ2 + 0.6*HNOQ2 + 0.4*HNQ3	4E-4
Het_02e	N2Q5 = HNQ3 + HNOQ2	4E-4

[a]The calculation of the pseudo-first order heterogeneous reaction rates was discussed in the manuscript for demonstration-purposes of diel cycles of $\Delta^{17}O$ only. These reaction rates should not be generalized for all model simulations.

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