Appendix A

Summary of Abundances, Lifetimes, Ozone Depletion Potentials (ODPs), Radiative Efficiencies (REs), Global Warming Potentials (GWPs), and Global Temperature change Potentials (GTPs)

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Cover photo: Experimental apparatus used in fundamental kinetic and photochemical laboratory studies. Laboratory measurements provide key input to the derivation of the parameters reported in this appendix. Photo: W. von Dauster, NOAA.

APPENDIX A

SUMMARY OF ABUNDANCES, LIFETIMES, OZONE DEPLETION POTENTIALS (ODPs), RADIATIVE EFFICIENCIES (REs), GLOBAL WARMING POTENTIALS (GWPs), AND GLOBAL TEMPERATURE CHANGE POTENTIALS (GTPs)

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Appendix A

Introduction

Table A-1 in this appendix contains a compilation of atmospheric abundance, lifetime, ozone depletion potential (ODP), and radiative metrics for ozone depleting substances (ODSs), replacement compounds, and related species covered under the umbrella of the present ozone assessment. The table builds upon the metrics reported in various previous assessments from the Intergovernmental Panel on Climate Change (IPCC, 2013) and the World Meteorological Organization and United Nations – Environment (WMO, 2014).

The abundances and metrics reported in Table A-1 were evaluated based on the best available data and analysis methods as described in the table heading footnotes. Table entries have associated abundance, lifetime, ODP, and radiative metric footnotes that provide the literature source, parameters, or method used to derive the reported metric. Long- and short-lived (lifetimes <~0.5 years) source compounds are included in the table. Metrics given for short-lived species are dependent on the time and location of their emission because they do not become atmospherically well-mixed and, hence, the abundances and metrics reported are not valid for all emission scenarios.

In the absence of experimental kinetic or photochemical data for some molecules, the OH radical reactivity and UV photolysis rates were estimated using structure activity relationships (SARs), trends in reactivity and photolysis for a class of compounds, or comparison with similar molecules where experimental data are available. In the absence of experimental infrared absorption spectra, radiative efficiencies were calculated, in some cases, based on theoretically calculated spectra (e.g. for many of the hydrochlorofluorocarbons (HCFCs) included in the table).

The ODPs and global warming potentials (GWPs) given in the table may differ, in some cases, from the official metrics for controlled substances reported in the Montreal Protocol Handbook (Handbook, 2018) due to consideration of recent experimental data, methods of analysis, and/or assessment recommendations (Ammann et al., 2017; Burkholder et al., 2015; IPCC, 2013; Ko et al., 2013; WMO, 2014).

Appendix A

Summary of Abundances, Lifetimes, Ozone Depletion Potentials (ODPs), Radiative Efficiencies (REs), Global Warming Potentials (GWPs), and Global Temperature change Potentials (GTPs)

Table A-1. Atmospheric abundances, lifetimes, ozone depletion potential (ODPs), radiative efficiencies (REs), Global Warming Potentials (GWPs) for 20 and 100-year time horizons, and Global Temperature change Potentials (GTPs) for 20, 50, and 100-year time horizons. Atmospheric abundances are taken from the present Assessment as noted in the footnotes. Global, annually averaged, atmospheric lifetimes (total, arising from tropospheric OH reaction, and arising from stratospheric loss) were derived using the methods and kinetic and photochemical data described in the footnotes. The ODPs reported here are semi-empirical values or from atmospheric model calculations as cited in the compounds footnote. The radiative metrics reported here are based on a CO_2 abundance of 391 ppm (the CO_2

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
Carbon dioxide	CO_2	402.9 ppm			–
Methane	CH_4	1842 ppb	12.4	12.4	10.4
Fossil methane #	CH_4		12.4	12.4	10.4
Nitrous oxide	N_2O	329 ppb	121	123	–
Hydrocarbons					
Propene	$CH_2{=}CHCH_3$	–	0.35 days (0.27–0.50 days)	0.4 days (0.27–0.50 days)	0.4 days (0.27–0.50 days)
Isobutene	$(CH_3)_2C{=}CH_2$	–	0.20 days (0.15–0.29 days)	0.2 days (0.15–0.29 days)	0.2 days (0.15–0.29 days)
Propane, R-290	$CH_3CH_2CH_3$	–	12.5 days (9.9–27 days)	15 days (9.9–27 days)	15 days (9.9–27 days)
Isobutane, R-600a	$(CH_3)_2CHCH_3$	–	6.0 days (5.2–10.7 days)	7 days (5.2–10.7 days)	7 days (5.2–10.7 days)
n-pentane	$CH_3CH_2CH_2CH_2CH_3$	–	3.4 days (2.7–6.5 days)	3 days (2.7–6.5 days)	3 days (2.7–6.5 days)
Cyclopentane	c-$CH_2CH_2CH_2CH_2CH_2$	–	2.7 days (2.2–5.3 days)	3 days (2.2–5.3 days)	3 days (2.2–5.3 days)
Isopentane	$(CH_3)_2CHCH_2CH_3$	–	3.4 days (2.9–6.0 days)	4 days (2.9–6.0 days)	4 days (2.9–6.0 days)
Oxygenated Hydrocarbons					
Methyl formate	CH_3OCHO	–	66 days (60–143 days)	87 days (60–143 days)	87 days (60–143 days)
Isopropanol	$(CH_3)_2CHOH$	–	2.0 days (1.5–2.9 days)	2 days (1.5–2.9 days)	2 days (1.5–2.9 days)
Methylal	$CH_3OCH_2OCH_3$	–	2.2 days (1.5–2.8 days)	2 days (1.5–2.8 days)	2 days (1.5–2.8 days)
Chlorofluorocarbons					
CFC-11	CCl_3F	230.2 ppt	52	52	–
CFC-12	CCl_2F_2	515.9 ppt	102	102	–
CFC-13	$CClF_3$	3.0 ppt	640	640	–
CFC-112	CCl_2FCCl_2F	0.4 ppt	59	63.6	–

absolute GWPs for the 20- and 100-yr time horizons are 2.495 × 10^{-14} and 9.171 × 10^{-14} W yr/(m^2 kg); the CO_2 absolute GTPs for the 20-, 50-, and 100-yr time horizons are 6.841 × 10^{-16}, 6.167 × 10^{-16}, and 5.469 × 10^{-16} K/kg, see Chapter 6) and are consistent with the values reported in IPCC (2013) and the last ozone assessment (WMO, 2014). Radiative efficiencies were calculated using the methods given in Hodnebrog et al. (2013) with lifetime and stratospheric temperature change adjustments applied. Climate-carbon feedbacks are included for CO_2 (see IPCC (2013) for further details). The derivation of GTP assumes a climate sensitivity of 1.06 K (W m^{-2})$^{-1}$, equivalent to a 3.9 K equilibrium temperature increase in response to a doubling of CO_2, toward the higher end of the uncertainty in climate sensitivity. For further details on the specific values used see Supplementary Material Section S8.12 and references therein in IPCC (2013).

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance L: Lifetime	 O: ODP	 R: RE, GWP, & GTP	
	0	1.375e-5	1	1	1	1	1	A1	L1		R1
	0	3.63e-4	84	28	67	14	4	A2	L1		R1
	0	3.63e-4	85	30	68	15	6	A2	L1		R1
123	–	3.00e-3	264	265	277	282	234	A3	L:2,3	O1	R1
–	0	1.5e-4	<<1	<<1	<<1	<<1	<<1			O2	R2
–	0	6.8e-5	<<1	<<1	<<1	<<1	<<1			O2	R2
–	0	3.6e-4	<1	<1	<1	<1	<1			O2	R2
–	0	2.5e-4	<<1	<<1	<<1	<<1	<<1		L4	O2	R2
–	0	1.7e-4	<<1	<<1	<<1	<<1	<<1		L4	O2	R2
–	0	1.3e-4	<<1	<<1	<<1	<<1	<<1		L4	O2	R2
–	0	2.4e-4	<<1	<<1	<<1	<<1	<<1		L4	O2	R2
–	0	0.045	40	11	12	1.8	1.5		L5	O2	R2
–	0	1.4e-3	<<1	<<1	<<1	<<1	<<1			O2	R2
–	0	4.0e-3	<<1	<<1	<<1	<<1	<<1		L6	O2	R2
55	1.0	0.26	7,090	5,160	7,160	5,480	2,920	A4	L:2,3		R3
103	0.73–0.81	0.32	10,800	10,300	11,300	11,000	8,590	A4	L:2,3	O:3,4	R3
–	1.0	0.25	10,900	13,900	11,700	14,200	15,900	A4	L7	O5	R3
65.4	0.98	0.29	5,500	4,370	5,631	4,715	2,875	A4	L:2,8	O6	R4

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
CFC-112a	$CClF_2CCl_3$	0.07 ppt	51	52	–
CFC-113	CCl_2FCClF_2	71.7 ppt	93	93	–
CFC-113a	CCl_3CF_3	0.66 ppt	59	55	–
CFC-114	$CClF_2CClF_2$	15 ppt	189	189	–
CFC-114a	CCl_2FCF_3	1 ppt	~100	105	–
CFC-115	$CClF_2CF_3$	8.5 ppt	540	540	–
CFC-216ba	$CClF_2CClFCF_3$	38 ppq	–	135	–
CFC-216ca	$CClF_2CF_2CClF_2$	20 ppq	–	~135	–
(E)-R316c (*(E)*-1,2-dichlorohexafluoro-cyclobutane)	*(E)*-1,2-c-$C_4F_6Cl_2$		75	75	–
(Z)-R316c (*(Z)*-1,2-dichlorohexafluoro-cyclobutane)	*(Z)*-1,2-c-$C_4F_6Cl_2$		114	114	–
Hydrochlorofluorocarbons					
HCFC-21	$CHFCl_2$		1.7	1.7	1.8
HCFC-22	CHF_2Cl	235.3 ppt	11.9	11.9	13.0
HCFC-31	CH_2FCl	0.080 ppt	1.2	1.2	1.3
HCFC-121	$CHCl_2CCl_2F$		–	1.11	1.17
HCFC-121a	$CHClFCCl_3$		–	2.67	2.96
HCFC-122	$CHCl_2CClF_2$		–	0.9	0.96
HCFC-122a	$CHClFCCl_2F$		–	3.1	3.4
HCFC-122b	CHF_2CCl_3		–	9.31	12.6
HCFC-123	$CHCl_2CF_3$		1.3	1.3	1.38
HCFC-123a	$CHClFCClF_2$		4.0	4.0	4.3
HCFC-123b	CHF_2CCl_2F		~6	11.8	15.1
HCFC-124	$CHClFCF_3$	1.1 ppt	5.9	5.9	6.3
HCFC-124a	CHF_2CClF_2		~9.2	17	19
HCFC-131	$CHCl_2CHClF$		–	0.76	0.752
HCFC-131a	CH_2ClCCl_2F		–	2.57	2.8
HCFC-131b	CH_2FCCl_3		–	2.33	2.55
HCFC-132	$CHClFCHClF$		–	1.73	1.81
HCFC-132a	$CHCl_2CHF_2$		–	1.12	1.18
HCFC-132b	$CH_2ClCClF_2$		–	3.5	3.7
HCFC-132c	CH_2FCCl_2F		4.3	4.1	4.5
HCFC-133	$CHClFCHF_2$		–	3.1	3.21
HCFC-133a	CH_2ClCF_3	0.38 ppt	4.0	4.6	4.7
HCFC-133b	CH_2FCClF_2		–	7.2	7.71
HCFC-141	$CH_2ClCHClF$		–	1.14	1.19
HCFC-141a	CH_2FCHCl_2		–	0.50	0.49

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
53.8	0.86	0.26	4,770	3,455	4,823	3,690	1,970	A4	L:2,8	O6	R4
94.5	0.81–0.82	0.30	6,560	6,080	6,830	6,510	4,860	A4	L:2,3	O:3,4	R3
57.5	0.73	0.25	5,040	3,750	5,114	4,020	2,230	A4	L:2,8	O6	R4
191	0.50	0.31	7,710	8,580	8,180	9,010	8,530	A4	L:2,3	O:3,4	R3
106.7	0.72	0.29	6,960	6,670	7,287	7,175	5,650	A4	L:2,8	O6	R4
664	0.26	0.20	5,780	7,310	6,210	7,500	8,290	A4	L:3,9	O:3,4	R3
135	0.35							A4	L10	O7	
~135	~0.35							A4	L10	O7	
76	0.46	0.28	4,750	4,050	4,909	4,375	2,935		L11	O8	R5
115	0.54	0.31	5,500	5,400	5,773	5,800	4,715		L11	O8	R5
~35	0.036	0.15	545	150	190	26	20	A5	L:12,13	O9	R3
161	0.024–0.034	0.21	5,310	1,780	4,230	845	265	A5	L:3,12,13	O3	R3
~35	0.019	0.0587	230	65	77	11	9	A5	L1	O9	R6
20	0.030	0.183	245	65	80	11	9	A5	L14	O10	R7
27.3	0.066	0.180	580	160	235	29	22	A5	L14	O10	R7
21	0.022	0.17	220	60	70	10	8	A5	L14	O9	R3
34	0.067	0.21	865	235	375	44	33	A5	L14	O9	R3
35.5	0.170	0.213	2,330	715	1,705	255	102	A5	L14	O10	R7
31	0.01	0.15	290	80	98	14	11	A5		O11	R3
65	0.039	0.23	1,350	370	660	72	51	A5		O9	R3
54	0.124	0.24	3,400	1,130	2,700	530	168	A5	L14	O10	R7
98	0.022	0.20	1,870	530	1,120	121	74	A5		O5	R3
161	0.026	0.241	4,675	1,825	4,085	1,260	330	A5	L14	O10	R7
20	0.019	0.101	115	30	36	5	4	A5	L14	O10	R7
31	0.056	0.169	645	175	260	32	24	A5	L14	O10	R7
26	0.054	0.132	460	125	175	22	17	A5	L14	O10	R7
39	0.025	0.152	440	120	155	21	17	A5	L14	O10	R7
24	0.020	0.131	245	65	81	12	9	A5	L14	O10	R7
67	0.038	0.202	1,175	320	540	61	45	A5	L14	O10	R6
41	0.062	0.17	1,155	315	570	62	44	A5		O9	R3
68	0.017	0.173	1,010	275	435	51	38	A5	L14	O10	R7
103	0.019	0.15	1,295	355	680	72	50	A5	L15	O9	R8
110	0.024	0.206	2,645	765	1,740	205	108	A5	L14	O10	R7
30	0.022	0.0772	170	45	56	8	6	A5	L14	O10	R7
20	0.011	0.0594	55	15	17	3	2	A5	L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HCFC-141b	CH_3CCl_2F	24.4 ppt	9.4	9.4	10.7
HCFC-142	CH_2ClCHF_2		–	2.6	2.73
HCFC-142a	$CH_2FCHClF$		–	1.58	1.64
HCFC-142b	CH_3CClF_2	22.2 ppt	18	18	19.3
HCFC-151	CH_2ClCH_2F		–	0.49	0.487
HCFC-151a	CH_3CHClF		–	1.16	1.2
HCFC-221aa	$CHCl_2CCl_2CCl_2F$		–	0.93	0.98
HCFC-221ab	$CHClFCCl_2CCl_3$		–	2.67	2.96
HCFC-221ba	$CHCl_2CClFCCl_3$		–	1.11	1.17
HCFC-221da	$CCl_3CHClCCl_2F$		–	3.29	3.71
HCFC-221ea	$CCl_3CHFCCl_3$		–	3.52	3.99
HCFC-222aa	$CHCl_2CCl_2CClF_2$		–	1.11	1.17
HCFC-222ab	$CHClFCCl_2CCl_2F$		–	2.67	2.96
HCFC-222ac	$CHF_2CCl_2CCl_3$		–	9.29	12.6
HCFC-222ba	$CHCl_2CClFCCl_2F$		–	1.11	1.17
HCFC-222bb	$CHClFCClFCCl_3$		–	3.15	3.54
HCFC-222ca	$CHCl_2CF_2CCl_3$		–	1.38	1.47
HCFC-222da	$CCl_2FCHClCCl_2F$		–	4.48	5.23
HCFC-222db	$CCl_3CHClCClF_2$		–	4.62	5.42
HCFC-222ea	$CCl_3CHFCCl_2F$		–	4.68	5.49
HCFC-223aa	$CHCl_2CCl_2CF_3$		–	1.11	1.17
HCFC-223ab	$CHClFCCl_2CClF_2$		–	3.18	3.54
HCFC-223ac	$CHF_2CCl_2CCl_2F$		–	9.29	12.6
HCFC-223ba	$CHCl_2CClFCClF_2$		–	1.39	1.47
HCFC-223bb	$CHClFCClFCCl_2F$		–	3.18	3.54
HCFC-223bc	$CHF_2CClFCCl_3$		–	10.6	15.1
HCFC-223ca	$CHCl_2CF_2CCl_2F$		–	1.38	1.47
HCFC-223cb	$CHClFCF_2CCl_3$		–	3.88	4.45
HCFC-223da	$CCl_2FCHClCClF_2$		–	6.48	7.86
HCFC-223db	$CCl_3CHClCF_3$		–	6.47	8.02
HCFC-223ea	$CCl_2FCHFCCl_2F$		–	6.28	7.74
HCFC-223eb	$CCl_3CHFCClF_2$		–	6.46	8.02
HCFC-224aa	$CHClFCCl_2CF_3$		–	3.15	3.54
HCFC-224ab	$CHF_2CCl_2CClF_2$		–	11.3	15.1
HCFC-224ba	$CHCl_2CClFCF_3$		–	1.39	1.47
HCFC-224bb	$CHClFCClFCClF_2$		–	4.1	4.45

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance O: ODP L: Lifetime R: RE, GWP, & GTP			
72.3	0.069–0.102	0.16	2,590	800	1,900	285	114	A5	L:3,13	O4	R3
60	0.019	0.110	645	175	260	32	24	A5	L14	O10	R7
42	0.015	0.113	400	110	140	19	15	A5	L14	O10	R7
212	0.023-0.057	0.19	5,140	2,070	4,530	1,490	390	A5	L:3,13	O4	R3
20	0.008	0.0306	40	10	12	2	2	A5	L14	O10	R7
33	0.015	0.0629	200	55	66	9	7	A5	L14	O10	R7
20	0.027	0.183	140	38	46	7	5		L14	O10	R7
27	0.069	0.181	405	110	165	20	15		L14	O10	R7
20	0.032	0.174	160	44	53	8	6		L14	O10	R7
29	0.083	0.243	670	180	300	34	25		L14	O10	R7
30	0.088	0.219	640	175	295	33	24		L14	O10	R7
20	0.028	0.224	220	60	73	10	8		L14	O10	R7
27	0.061	0.234	560	150	225	28	21		L14	O10	R7
35	0.191	0.221	1,620	500	1,185	175	71		L14	O10	R7
20	0.028	0.210	210	56	68	10	8		L14	O10	R7
29	0.071	0.199	560	150	245	28	21		L14	O10	R7
22	0.034	0.205	250	68	86	12	10		L14	O10	R7
31	0.097	0.283	1,120	305	580	62	43		L14	O10	R7
31	0.100	0.265	1,080	295	570	61	41		L14	O10	R7
31	0.101	0.245	1,010	280	535	57	39		L14	O10	R7
20	0.024	0.195	205	56	68	10	8		L14	O10	R7
31	0.059	0.282	855	230	375	43	32		L14	O10	R7
35	0.164	0.289	2,265	695	1,660	245	99		L14	O10	R7
23	0.029	0.258	340	92	116	16	13		L14	O10	R7
31	0.059	0.235	710	195	310	36	27		L14	O10	R7
36	0.185	0.249	2,140	680	1,640	282	99		L14	O10	R7
22	0.029	0.234	310	83	105	15	12		L14	O10	R7
30	0.073	0.238	875	240	420	46	33		L14	O10	R7
37	0.111	0.313	1,850	525	1,155	129	74		L14	O10	R7
33	0.117	0.229	1,350	385	845	94	54		L14	O10	R7
33	0.114	0.282	1,620	460	1000	110	64		L14	O10	R7
33	0.117	0.262	1,540	440	965	108	62		L14	O10	R7
29	0.049	0.247	800	215	345	40	30		L14	O10	R7
45	0.141	0.306	2,945	960	2,305	430	142		L14	O10	R7
24	0.023	0.215	310	83	105	14	12		L14	O10	R7
51	0.047	0.283	1,180	320	585	64	45		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
HCFC-224bc	$CHF_2CClFCCl_2F$		–	11.3	15.1	
HCFC-224ca	$CHCl_2CF_2CClF_2$		–	1.79	1.92	
HCFC-224cb	$CHClFCF_2CCl_2F$		–	1.57	1.64	
HCFC-224cc	$CHF_2CF_2CCl_3$		–	12.5	19	
HCFC-224da	$CClF_2CHClCClF_2$		–	10.4	12.3	
HCFC-224db	$CCl_2FCHClCF_3$		–	9.39	12	
HCFC-224ea	$CCl_2FCHFCClF_2$		–	9.16	11.6	
HCFC-224eb	CCl_3CHFCF_3		–	8.88	11.9	
HCFC-225aa	$CHF_2CCl_2CF_3$		–	11.8	15.1	
HCFC-225ba	$CHClFCClFCF_3$		–	4.2	4.45	
HCFC-225bb	$CHF_2CClFCClF_2$		–	15.9	19	
HCFC-225ca	$CHCl_2CF_2CF_3$		0.02 ppt	1.9	2.0	
HCFC-225cb	$CHClFCF_2CClF_2$		0.04 ppt	5.9	6.3	
HCFC-225cc	$CHF_2CF_2CCl_2F$		–	14.1	19	
HCFC-225da	$CClF_2CHClCF_3$		–	16.3	19.5	
HCFC-225ea	$CClF_2CHFCClF_2$		–	15.3	18.1	
HCFC-225eb	$CCl_2FCHFCF_3$		–	13.4	17.7	
HCFC-226ba	$CHF_2CClFCF_3$		–	17	19	
HCFC-226ca	$CHClFCF_2CF_3$		–	5.47	5.8	
HCFC-226cb	$CHF_2CF_2CClF_2$		–	21.6	24.7	
HCFC-226da	$CF_3CHClCF_3$		–	27.7	32.6	
HCFC-226ea	$CClF_2CHFCF_3$		–	24.9	28.8	
HCFC-231aa	$CHCl_2CCl_2CHClF$		–	0.799	0.839	
HCFC-231ab	$CH_2ClCCl_2CCl_2F$		–	1.61	1.73	
HCFC-231ac	$CH_2FCCl_2CCl_3$		–	2.33	2.55	
HCFC-231ba	$CHCl_2CClFCHCl_2$		–	0.56	0.586	
HCFC-231bb	$CH_2ClCClFCCl_3$		–	2.54	2.8	
HCFC-231da	$CHCl_2CHClCCl_2F$		–	0.54	0.557	
HCFC-231db	$CHClFCHClCCl_3$		–	1.34	1.43	
HCFC-231ea	$CHCl_2CHFCCl_3$		–	0.76	0.799	
HCFC-231fa	$CCl_2FCH_2CCl_3$		–	6.26	7.71	
HCFC-232aa	$CHClFCCl_2CHClF$		–	1.65	1.77	
HCFC-232ab	$CHCl_2CCl_2CHF_2$		–	1.01	1.07	
HCFC-232ac	$CH_2ClCCl_2CClF_2$		–	2.56	2.8	
HCFC-232ad	$CH_2FCCl_2CCl_2F$		–	2.33	2.55	
HCFC-232ba	$CHCl_2CClFCHClF$		–	0.99	1.04	

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance L: Lifetime O: ODP R: RE, GWP, & GTP			
45	0.141	0.308	2,965	970	2,320	430	142		L14	O10	R7
28	0.028	0.262	480	130	173	23	18		L14	O10	R7
35	0.022	0.248	400	108	139	19	15		L14	O10	R7
37	0.174	0.314	3,215	1,090	2,600	550	165		L14	O10	R7
67	0.096	0.349	3,180	1,010	2,425	410	146		L14	O10	R7
43	0.119	0.285	2,420	745	1,780	265	107		L14	O10	R7
43	0.117	0.312	2,600	795	1,895	275	114		L14	O10	R7
35	0.126	0.235	1,915	580	1,380	195	83		L14	O10	R7
54	0.094	0.264	2,820	935	2,240	440	139		L14	O10	R7
74	0.025	0.254	1,175	320	590	65	45		L14	O10	R7
100	0.069	0.319	4,030	1,520	3,470	985	260		L14	O10	R7
44	0.025	0.220	470	127	170	22	18	A5	L3	O5	R3
101	0.033	0.290	1,860	525	1,110	120	73	A5	L3	O5	R3
55	0.110	0.344	4,080	1,455	3,410	835	230		L14	O10	R7
100	0.071	0.302	3,860	1,475	3,340	980	255		L14	O10	R7
99	0.068	0.340	4,210	1,560	3,590	975	260		L14	O10	R7
55	0.105	0.287	3,310	1,155	2,725	630	180		L14	O10	R7
161	0.019	0.267	3,790	1,480	3,310	1,020	265		L14	O10	R7
98	0.013	0.261	1,680	465	965	105	66		L14	O10	R7
174	0.022	0.341	5,370	2,385	4,915	1,970	540		L14	O10	R7
185	0.025	0.251	4,315	2,210	4,105	2,075	665		L14	O10	R7
180	0.023	0.307	5,095	2,455	4,775	2,195	650		L14	O10	R7
20	0.022	0.128	98	27	31	5	4		L14	O10	R7
23	0.042	0.180	280	75	98	13	10		L14	O10	R7
26	0.058	0.156	350	94	135	17	13		L14	O10	R7
20	0.015	0.114	62	17	19	3	2		L14	O10	R7
27	0.063	0.163	400	108	159	20	15		L14	O10	R7
20	0.015	0.136	70	19	22	3	3		L14	O10	R7
21	0.036	0.144	185	50	63	9	7		L14	O10	R7
20	0.021	0.131	96	26	30	4	4		L14	O10	R7
33	0.143	0.213	1,230	350	755	83	49		L14	O10	R7
245	0.036	0.177	300	82	106	14	11		L14	O10	R7
20	0.024	0.143	150	41	49	7	6		L14	O10	R7
29	0.053	0.222	590	160	235	29	22		L14	O10	R7
26	0.050	0.213	515	140	198	25	19		L14	O10	R7
20	0.023	0.162	165	45	54	8	6		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HCFC-232bb	$CH_2ClCClFCCl_2F$		–	2.56	2.8
HCFC-232bc	$CH_2FCClFCCl_3$		–	3.64	4.14
HCFC-232ca	$CHCl_2CF_2CHCl_2$		–	0.70	0.737
HCFC-232cb	$CH_2ClCF_2CCl_3$		–	4.47	5.21
HCFC-232da	$CHCl_2CHClCClF_2$		–	0.82	0.859
HCFC-232db	$CHClFCHClCCl_2F$		–	1.51	1.61
HCFC-232dc	$CHF_2CHClCCl_3$		–	2.83	3.15
HCFC-232ea	$CHCl_2CHFCCl_2F$		–	0.83	0.872
HCFC-232eb	$CHClFCHFCCl_3$		–	2.04	2.22
HCFC-232fa	$CCl_2FCH_2CCl_2F$		–	9.23	12.5
HCFC-232fb	$CCl_3CH_2CClF_2$		–	10.2	14.4
HCFC-233aa	$CHClFCCl_2CHF_2$		–	2.63	2.87
HCFC-233ab	$CH_2ClCCl_2CF_3$		–	2.57	2.8
HCFC-233ac	$CH_2FCCl_2CClF_2$		–	3.71	4.14
HCFC-233ba	$CHClFCClFCHClF$		–	2.1	2.23
HCFC-233bb	$CHCl_2CClFCHF_2$		–	1.27	1.34
HCFC-233bc	$CH_2ClCClFCClF_2$		–	4.75	5.21
HCFC-233bd	$CH_2FCClFCCl_2F$		–	3.71	4.14
HCFC-233ca	$CHCl_2CF_2CHClF$		–	1.27	1.34
HCFC-233cb	$CH_2ClCF_2CCl_2F$		–	4.57	5.21
HCFC-233cc	$CH_2FCF_2CCl_3$		–	6.26	7.71
HCFC-233da	$CHCl_2CHClCF_3$		–	0.896	0.939
HCFC-233db	$CHClFCHClCClF_2$		–	2.37	2.52
HCFC-233dc	$CHF_2CHClCCl_2F$		–	3.55	3.96
HCFC-233ea	$CHCl_2CHFCClF_2$		–	0.982	1.03
HCFC-233eb	$CHClFCHFCCl_2F$		–	2.32	2.51
HCFC-233ec	$CHF_2CHFCCl_3$		–	4.13	4.77
HCFC-233fa	$CCl_2FCH_2CClF_2$		–	15.4	23.3
HCFC-233fb	$CCl_3CH_2CF_3$		–	16.4	29.3
HCFC-234aa	$CHF_2CCl_2CHF_2$		–	6.51	7.54
HCFC-234ab	$CH_2FCCl_2CF_3$		–	3.76	4.14
HCFC-234ba	$CHClFCClFCHF_2$		–	3.39	3.61
HCFC-234bb	$CH_2ClCClFCF_3$		–	4.84	5.21
HCFC-234bc	$CH_2FCClFCClF_2$		–	7.01	7.71
HCFC-234ca	$CHClFCF_2CHClF$		–	2.74	2.9
HCFC-234cb	$CHCl_2CF_2CHF_2$		–	1.65	1.74

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance O: ODP L: Lifetime R: RE, GWP, & GTP			
29	0.053	0.222	590	160	235	29	22		L14	O10	R7
30	0.075	0.205	770	210	360	40	29		L14	O10	R7
20	0.017	0.130	95	26	30	4	4		L14	O10	R7
31	0.090	0.208	950	260	490	53	37		L14	O10	R7
20	0.019	0.178	151	41	48	7	6		L14	O10	R7
24	0.033	0.200	310	84	108	15	12		L14	O10	R7
28	0.060	0.184	540	145	225	27	20		L14	O10	R7
20	0.019	0.165	142	38	45	7	5		L14	O10	R7
25	0.045	0.183	390	104	143	19	15		L14	O10	R7
35	0.176	0.267	2,255	690	1,645	242	99		L14	O10	R7
36	0.194	0.249	2,255	710	1,710	280	103		L14	O10	R7
32	0.043	0.185	545	145	220	27	20		L14	O10	R7
31	0.042	0.194	560	150	225	27	21		L14	O10	R7
35	0.057	0.250	1,030	280	490	54	39		L14	O10	R7
38	0.031	0.202	475	128	178	23	18		L14	O10	R7
23	0.023	0.171	245	66	81	11	9		L14	O10	R7
53	0.057	0.261	1,365	375	730	78	53		L14	O10	R7
35	0.057	0.257	1,060	290	500	56	40		L14	O10	R7
23	0.023	0.174	245	67	83	12	9		L14	O10	R7
37	0.069	0.250	1,260	345	660	71	49		L14	O10	R7
33	0.100	0.246	1,650	465	1,020	112	66		L14	O10	R7
20	0.017	0.142	142	38	46	7	5		L14	O10	R7
40	0.034	0.238	630	170	245	31	24		L14	O10	R7
35	0.055	0.245	970	265	445	50	37		L14	O10	R7
20	0.019	0.183	200	54	65	9	8		L14	O10	R7
30	0.038	0.221	575	155	220	28	22		L14	O10	R7
31	0.068	0.236	1,080	295	540	58	41		L14	O10	R7
46	0.207	0.321	4,020	1,495	3,435	940	250		L14	O10	R7
37	0.247	0.204	2,635	1,010	2,285	675	175		L14	O10	R7
47	0.062	0.198	1,500	425	940	105	60		L14	O10	R7
41	0.039	0.215	980	265	465	51	37		L14	O10	R7
57	0.028	0.215	885	240	400	45	34		L14	O10	R7
67	0.035	0.218	1,265	350	680	73	49		L14	O10	R7
77	0.045	0.279	2,245	645	1,455	170	91		L14	O10	R7
51	0.025	0.205	685	185	280	34	26		L14	O10	R7
29	0.020	0.199	400	110	141	19	15		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
HCFC-234cc	$CH_2ClCF_2CClF_2$		–	9.46	10.6	
HCFC-234cd	$CH_2FCF_2CCl_2F$		–	6.64	7.71	
HCFC-234da	$CHClFCHClCF_3$		–	2.67	2.82	
HCFC-234db	$CHF_2CHClCClF_2$		–	5.69	6.18	
HCFC-234ea	$CHCl_2CHFCF_3$		–	1.06	1.11	
HCFC-234eb	$CHClFCHFCClF_2$		–	2.88	3.04	
HCFC-234ec	$CHF_2CHFCCl_2F$		–	5.32	6.04	
HCFC-234fa	$CClF_2CH_2CClF_2$		–	31	43.4	
HCFC-234fb	$CCl_2FCH_2CF_3$		~45	45	98	
HCFC-235ba	$CHF_2CClFCHF_2$		–	8.8	9.5	
HCFC-235bb	$CH_2FCClFCF_3$		–	7.21	7.71	
HCFC-235ca	$CH_2ClCF_2CF_3$		–	9.82	10.6	
HCFC-235cb	$CHClFCF_2CHF_2$		–	4.45	4.7	
HCFC-235cc	$CH_2FCF_2CClF_2$		–	14.2	15.7	
HCFC-235da	$CHF_2CHClCF_3$		–	7.55	8.09	
HCFC-235ea	$CHClFCHFCF_3$		–	7.36	7.88	
HCFC-235eb	$CHF_2CHFCClF_2$		–	3.18	3.33	
HCFC-235fa	$CClF_2CH_2CF_3$		–	61.7	88.6	
HCFC-241aa	CH_2ClCCl_2CHClF		–	1.43	1.52	
HCFC-241ab	$CH_2FCCl_2CHCl_2$		–	0.77	0.803	
HCFC-241ac	$CH_3CCl_2CCl_2F$		–	5.18	6.18	
HCFC-241ba	$CH_2ClCClFCHCl_2$		–	0.79	0.826	
HCFC-241bb	$CH_3CClFCCl_3$		–	7.76	10	
HCFC-241da	$CHCl_2CHClCHClF$		–	0.56	0.581	
HCFC-241db	$CH_2ClCHClCCl_2F$		–	0.53	0.549	
HCFC-241dc	$CH_2FCHClCCl_3$		–	0.75	0.786	
HCFC-241ea	$CHCl_2CHFCHCl_2$		–	0.42	0.429	
HCFC-241eb	$CH_2ClCHFCCl_3$		–	1.05	1.11	
HCFC-241fa	$CHCl_2CH_2CCl_2F$		–	0.53	0.555	
HCFC-241fb	$CHClFCH_2CCl_3$		–	1.48	1.59	
HCFC-242aa	$CHF_2CCl_2CH_2Cl$		–	2.13	2.29	
HCFC-242ab	CH_2FCCl_2CHClF		–	1.78	1.91	
HCFC-242ac	$CH_3CCl_2CClF_2$		–	8.09	10	
HCFC-242ba	$CHClFCClFCH_2Cl$		–	1.99	2.11	
HCFC-242bb	$CHCl_2CClFCH_2F$		–	1.03	1.09	
HCFC-242bc	$CH_3CClFCCl_2F$		–	8.09	10	

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
85	0.054	0.267	2,705	835	1,990	300	120		L14	O10	R7
48	0.063	0.281	2,160	615	1,370	155	87		L14	O10	R7
50	0.024	0.203	660	180	268	33	25		L14	O10	R7
72	0.039	0.271	1,820	510	1,070	115	71		L14	O10	R7
23	0.014	0.158	205	55	67	10	8		L14	O10	R7
52	0.026	0.241	845	230	355	42	32		L14	O10	R7
45	0.052	0.276	1,745	485	990	105	68		L14	O10	R7
108	0.132	0.347	6,225	3,405	6,005	3,330	1,170		L14	O10	R7
58	0.40	0.264	5,190	3,490	5,190	3,685	1,760			O9	R7
121	0.018	0.225	2,375	715	1,700	238	102		L14	O10	R7
110	0.017	0.237	2,140	620	1,410	167	87		L14	O10	R7
126	0.018	0.215	2,455	765	1,830	288	110		L14	O10	R7
85	0.014	0.234	1,375	375	710	76	53		L14	O10	R7
146	0.021	0.282	4,040	1,450	3,385	840	230		L14	O10	R7
112	0.017	0.227	2,130	620	1,430	175	88		L14	O10	R7
111	0.017	0.227	2,085	605	1,385	165	86		L14	O10	R7
69	0.012	0.274	1,160	315	510	59	44		L14	O10	R7
204	0.051	0.297	6,780	5,320	6,930	5,730	3,430		L14	O10	R7
24	0.035	0.116	187	51	64	9	7		L14	O10	R7
20	0.020	0.0937	81	22	25	4	3		L14	O10	R7
32	0.112	0.191	1,090	300	610	65	42		L14	O10	R7
20	0.020	0.121	108	29	34	5	4		L14	O10	R7
34	0.163	0.191	1,545	450	1,050	131	64		L14	O10	R7
20	0.014	0.100	63	17	19	3	2		L14	O10	R7
20	0.014	0.119	71	19	22	3	3		L14	O10	R7
20	0.019	0.115	97	26	31	5	4		L14	O10	R7
20	0.011	0.081	38	10	12	2	1		L14	O10	R7
20	0.027	0.125	147	40	48	7	6		L14	O10	R7
20	0.014	0.117	70	19	22	3	3		L14	O10	R7
22	0.037	0.152	255	69	87	12	10		L14	O10	R7
29	0.039	0.131	340	93	129	17	13		L14	O10	R7
27	0.034	0.132	290	78	103	14	11		L14	O10	R7
42	0.125	0.227	2,065	610	1,430	185	87		L14	O10	R7
37	0.033	0.151	370	100	135	18	14		L14	O10	R7
21	0.021	0.133	168	46	55	8	6		L14	O10	R7
42	0.125	0.244	2,220	655	1,535	199	93		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HCFC-242ca	$CHCl_2CF_2CH_2Cl$		–	1.09	1.15
HCFC-242cb	$CH_3CF_2CCl_3$		–	12.3	18.7
HCFC-242da	$CHClFCHClCHClF$		–	1.32	1.38
HCFC-242db	$CHCl_2CHClCHF_2$		–	0.73	0.761
HCFC-242dc	$CH_2ClCHClCClF_2$		–	1.2	1.25
HCFC-242dd	$CH_2FCHClCCl_2F$		–	0.83	0.871
HCFC-242ea	$CHCl_2CHFCHClF$		–	0.72	0.756
HCFC-242eb	$CH_2ClCHFCCl_2F$		–	1.24	1.31
HCFC-242ec	$CH_2FCHFCCl_3$		–	1.7	1.84
HCFC-242fa	$CHCl_2CH_2CClF_2$		–	0.74	0.768
HCFC-242fb	$CHClFCH_2CCl_2F$		–	1.61	1.71
HCFC-242fc	$CHF_2CH_2CCl_3$		–	4.14	4.78
HCFC-243aa	$CHF_2CCl_2CH_2F$		–	2.99	3.25
HCFC-243ab	$CH_3CCl_2CF_3$		–	8.33	10
HCFC-243ba	$CHF_2CClFCH_2Cl$		–	3.63	3.88
HCFC-243bb	$CHFClCClFCH_2F$		–	2.67	2.82
HCFC-243bc	$CH_3CClFCF_2Cl$		–	15.6	18.7
HCFC-243ca	CH_2ClCF_2CHClF		–	2.89	3.14
HCFC-243cb	$CHCl_2CF_2CH_2F$		–	1.46	1.54
HCFC-243cc	$CH_3CF_2CFCl_2$		19.5	18	27.1
HCFC-243da	$CHF_2CHClCHFCl$		–	1.97	2.07
HCFC-243db	$CH_2ClCHClCF_3$		–	1.44	1.51
HCFC-243dc	$CH_2FCHClCF_2Cl$		–	2.03	2.13
HCFC-243ea	$CHFClCHFCHFCl$		–	1.57	1.64
HCFC-243eb	$CHCl_2CHFCHF_2$		–	0.90	0.938
HCFC-243ec	$CH_2ClCHFCF_2Cl$		–	1.7	1.78
HCFC-243ed	$CH_2FCHFCFCl_2$		–	2.03	2.17
HCFC-243fa	$CHCl_2CH_2CF_3$		–	0.78	0.813
HCFC-243fb	$CHFClCH_2CF_2Cl$		–	2.24	2.36
HCFC-243fc	$CHF_2CH_2CFCl_2$		–	5.07	5.73
HCFC-244ba	$CH_2FCClFCHF_2$		–	5.17	5.49
HCFC-244bb	$CH_3CClFCF_3$		–	16.6	18.7
HCFC-244ca	$CH_2ClCF_2CHF_2$		–	6.39	6.82
HCFC-244cb	CH_2FCF_2CHFCl		–	4.02	4.24
HCFC-244cc	$CH_3CF_2CF_2Cl$		–	31.2	38.1
HCFC-244da	$CHF_2CHClCHF_2$		–	3.88	4.09

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W m^{-2} ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
22	0.022	0.144	193	52	63	9	7		L14	O10	R7
36	0.206	0.251	3,045	1,025	2,450	510	154		L14	O10	R7
29	0.024	0.147	238	64	80	11	9		L14	O10	R7
20	0.015	0.119	106	29	33	5	4		L14	O10	R7
28	0.023	0.170	250	68	83	12	9		L14	O10	R7
20	0.017	0.159	162	44	52	8	6		L14	O10	R7
20	0.015	0.119	106	29	33	5	4		L14	O10	R7
23	0.025	0.167	255	69	85	12	10		L14	O10	R7
24	0.034	0.174	365	98	129	17	14		L14	O10	R7
20	0.015	0.153	138	37	43	6	5		L14	O10	R7
26	0.031	0.203	400	109	140	19	15		L14	O10	R7
31	0.075	0.198	1000	270	500	54	38		L14	O10	R7
37	0.036	0.154	620	168	265	31	23		L14	O10	R7
49	0.085	0.205	2,095	625	1,465	195	89		L14	O10	R7
58	0.033	0.146	710	195	330	37	27		L14	O10	R7
50	0.027	0.161	580	157	235	29	22		L14	O10	R7
94	0.088	0.264	4,010	1,500	3,440	955	252		L14	O10	R7
37	0.035	0.182	710	192	295	35	27		L14	O10	R7
27	0.020	0.147	290	78	99	14	11		L14	O10	R7
54	0.19	0.315	5,130	2,060	4,540	1,495	390			O9	R6
42	0.022	0.162	430	116	158	21	16		L14	O10	R7
34	0.018	0.138	270	73	92	13	10		L14	O10	R7
43	0.023	0.203	555	150	206	27	21		L14	O10	R7
36	0.019	0.172	365	99	127	17	14		L14	O10	R7
21	0.014	0.141	170	46	55	8	6		L14	O10	R7
38	0.020	0.182	420	113	148	20	16		L14	O10	R7
32	0.026	0.215	590	159	218	28	22		L14	O10	R7
20	0.012	0.120	125	34	40	6	5		L14	O10	R7
45	0.024	0.231	700	189	265	34	26		L14	O10	R7
44.0	0.056	0.263	1,765	490	975	104	68		L14	O10	R7
90	0.017	0.173	1,310	360	730	78	51		L14	O10	R7
148	0.027	0.238	4,140	1,600	3,600	1,080	280		L14	O10	R7
101	0.018	0.173	1,580	450	985	109	63		L14	O10	R7
79	0.015	0.178	1,065	290	520	57	41		L14	O10	R7
173	0.039	0.277	6,120	3,360	5,905	3,290	1,160		L14	O10	R7
77	0.015	0.182	1,050	285	505	56	40		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
HCFC-244db	$CH_2FCHClCF_3$		–	2.44	2.54	
HCFC-244ea	$CHF_2CHFCHFCl$		–	2.39	2.5	
HCFC-244eb	$CH_2ClCHFCF_3$		–	2.04	2.12	
HCFC-244ec	$CH_2FCHFCF_2Cl$		–	2.88	3.01	
HCFC-244fa	$CHFClCH_2CF_3$		–	2.37	2.48	
HCFC-244fb	$CHF_2CH_2CF_2Cl$		–	7.76	8.35	
HCFC-251aa	$CH_2FCCl_2CH_2Cl$		–	1.26	1.34	
HCFC-251ab	CH_3CCl_2CHFCl		–	1.73	1.85	
HCFC-251ba	$CH_2ClCClFCH_2Cl$		–	1.34	1.4	
HCFC-251bb	$CH_3CClFCHCl_2$		–	1.02	1.07	
HCFC-251da	$CH_2ClCHClCHFCl$		–	0.69	0.719	
HCFC-251db	$CH_2FCHClCHCl_2$		–	0.40	0.416	
HCFC-251dc	$CH_3CHClCFCl_2$		–	0.52	0.535	
HCFC-251ea	$CH_2ClCHFCHCl_2$		–	0.47	0.489	
HCFC-251eb	$CH_3CHFCCl_3$		–	0.68	0.709	
HCFC-251fa	$CHClFCH_2CCl_2H$		–	0.33	0.339	
HCFC-251fb	$CH_2ClCH_2CCl_2F$		–	0.45	0.467	
HCFC-251fc	$CH_2FCH_2CCl_3$		–	0.65	0.676	
HCFC-252aa	$CH_2FCCl_2CH_2F$		–	1.94	2.07	
HCFC-252ab	$CH_3CCl_2CHF_2$		–	4.41	4.93	
HCFC-252ba	$CH_2ClCClFCH_2F$		–	2.19	2.31	
HCFC-252bb	$CH_3CClFCHClF$		–	2.87	3.04	
HCFC-252ca	$CH_2ClCF_2CH_2Cl$		–	2.47	2.61	
HCFC-252cb	$CH_3CF_2CHCl_2$		–	1.19	1.25	
HCFC-252da	$CH_2ClCHClCHF_2$		–	1.0	1.04	
HCFC-252db	$CH_2FCHClCHClF$		–	1.15	1.2	
HCFC-252dc	$CH_3CHClCClF_2$		–	0.77	0.799	
HCFC-252ea	$CH_2ClCHFCHClF$		–	1.02	1.06	
HCFC-252eb	$CH_2FCHFCHCl_2$		–	0.65	0.67	
HCFC-252ec	$CH_3CHFCCl_2F$		–	0.84	0.882	
HCFC-252fa	$CHClFCH_2CHClF$		–	1.15	1.19	
HCFC-252fb	$CHCl_2CH_2CHF_2$		–	0.66	0.684	
HCFC-252fc	$CH_2ClCH_2CClF_2$		–	0.94	0.972	
HCFC-252fd	$CH_2FCH_2CCl_2F$		–	0.70	0.732	
HCFC-253ba	$CH_2FCClFCH_2F$		–	3.66	3.86	
HCFC-253bb	$CH_3CClFCHF_2$		–	7.85	8.46	

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
	57	0.012	0.164	600	162	235	29	23		L14	O10	R7
	57	0.012	0.191	685	185	267	33	26		L14	O10	R7
	51	0.011	0.151	460	125	170	22	17		L14	O10	R7
	64	0.013	0.226	975	265	410	49	37		L14	O10	R7
	56	0.012	0.185	655	178	255	32	25		L14	O10	R7
	111	0.020	0.285	3,060	900	2,080	260	127		L14	O10	R7
	23	0.028	0.0752	129	35	43	6	5		L14	O10	R7
	27	0.037	0.110	260	70	93	12	10		L14	O10	R7
	29	0.027	0.0951	173	47	59	8	7		L14	O10	R7
	21	0.023	0.109	151	41	49	7	6		L14	O10	R7
	20	0.016	0.0821	77	21	24	4	3		L14	O10	R7
	20	0.009	0.0631	35	9	11	2	1		L14	O10	R7
	20	0.012	0.122	85	23	26	4	3		L14	O10	R7
	20	0.011	0.0776	50	14	15	2	2		L14	O10	R7
	20	0.016	0.134	124	34	39	6	5		L14	O10	R7
	20	0.008	0.0739	33	9	10	2	1		L14	O10	R7
	20	0.011	0.107	66	18	20	3	2		L14	O10	R7
	20	0.015	0.103	91	25	28	4	3		L14	O10	R7
	31	0.029	0.105	310	83	113	15	12		L14	O10	R7
	42	0.056	0.153	1,010	275	520	56	39		L14	O10	R7
	44	0.027	0.0992	330	89	125	16	12		L14	O10	R7
	51	0.032	0.147	640	173	265	32	24		L14	O10	R7
	47	0.029	0.126	470	127	186	23	18		L14	O10	R7
	24	0.019	0.146	265	71	87	12	10		L14	O10	R7
	27	0.016	0.0897	135	37	44	6	5		L14	O10	R7
	29	0.017	0.101	176	48	58	8	7		L14	O10	R7
	22	0.013	0.149	174	47	55	8	7		L14	O10	R7
	27	0.016	0.112	173	47	57	8	7		L14	O10	R7
	20	0.011	0.0922	90	24	28	4	3		L14	O10	R7
	20	0.015	0.175	223	60	71	10	8		L14	O10	R7
	29	0.017	0.143	250	67	82	12	9		L14	O10	R7
	20	0.011	0.114	113	31	35	5	4		L14	O10	R7
	25	0.015	0.153	217	59	70	10	8		L14	O10	R7
	20	0.012	0.155	164	45	52	8	6		L14	O10	R7
	73	0.017	0.131	810	221	380	42	31		L14	O10	R7
	108	0.024	0.184	2,260	665	1,545	195	94		L14	O10	R7

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HCFC-253ca	$CH_2ClCF_2CH_2F$		–	4.23	4.47
HCFC-253cb	CH_3CF_2CHClF		–	3.48	3.66
HCFC-253da	$CH_2FCHClCHF_2$		–	1.67	1.74
HCFC-253db	$CH_3CHClCF_3$		–	1.02	1.06
HCFC-253ea	$CH_2ClCHFCHF_2$		–	1.44	1.5
HCFC-253eb	$CH_2FCHFCHClF$		–	1.5	1.56
HCFC-253ec	$CH_3CHFCClF_2$		–	1.13	1.17
HCFC-253fa	$CHClFCH_2CHF_2$		–	1.83	1.9
HCFC-253fb	$CH_2ClCH_2CF_3$		–	1.05	1.09
HCFC-253fc	$CH_2FCH_2CClF_2$		–	1.48	1.54
HCFC-261aa	$CH_3CCl_2CH_2F$		–	1.06	1.11
HCFC-261ba	$CH_3CClFCH_2Cl$		–	2.19	2.31
HCFC-261da	$CH_2ClCHClCH_2F$		–	0.45	0.462
HCFC-261db	$CH_3CHClCHClF$		–	0.47	0.478
HCFC-261ea	$CH_2ClCHFCH_2Cl$		–	0.54	0.554
HCFC-261eb	$CH_3CHFCHCl_2$		–	0.31	0.315
HCFC-261fa	CH_2ClCH_2CHClF		–	0.57	0.591
HCFC-261fb	$CH_2FCH_2CHCl_2$		–	0.33	0.339
HCFC-261fc	$CH_3CH_2CCl_2F$		–	0.61	0.638
HCFC-262ba	$CH_3CClFCH_2F$		–	3.4	3.59
HCFC-262ca	$CH_3CF_2CH_2Cl$		–	3.2	3.33
HCFC-262da	$CH_2FCHClCH_2F$		–	0.92	0.956
HCFC-262db	$CH_3CHClCHF_2$		–	0.64	0.662
HCFC-262ea	$CH_2FCHFCH_2Cl$		–	0.83	0.856
HCFC-262eb	$CH_3CHFCHFCl$		–	0.66	0.685
HCFC-262fa	$CH_2ClCH_2CHF_2$		–	0.80	0.828
HCFC-262fb	CH_2FCH_2CHFCl		–	0.87	0.902
HCFC-262fc	$CH_3CH_2CF_2Cl$		–	1.2	1.24
HCFC-271ba	$CH_3CClFCH_3$		–	5.0	5.37
HCFC-271da	$CH_3CHClCH_2F$		–	0.27	0.278
HCFC-271ea	CH_3CHFCH_2Cl		–	0.30	0.302
HCFC-271fa	$CH_2ClCH_2CH_2F$		–	0.34	0.345
HCFC-271fb	CH_3CH_2CHClF		–	0.49	0.506
Hydrofluorocarbons					
HFC-23	CHF_3	28.9 ppt	228	228	243
HFC-32	CH_2F_2	10 ppt	5.4	5.4	5.5

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance L: Lifetime O: ODP R: RE, GWP, & GTP			
	79	0.018	0.135	960	265	485	52	37		L14	O10	R7
	71	0.017	0.183	1,080	295	490	56	41		L14	O10	R7
	44	0.012	0.118	335	91	118	16	13		L14	O10	R7
	30	0.009	0.120	208	56	68	10	8		L14	O10	R7
	39	0.011	0.113	275	75	95	13	10		L14	O10	R7
	40	0.011	0.125	320	86	110	15	12		L14	O10	R7
	33	0.009	0.183	350	95	116	16	13		L14	O10	R7
	46	0.012	0.175	545	147	196	26	20		L14	O10	R7
	31	0.009	0.121	215	58	70	10	8		L14	O10	R7
	40	0.011	0.194	490	132	168	23	18		L14	O10	R7
	23	0.020	0.0727	132	36	43	6	5		L14	O10	R7
	44	0.031	0.0827	310	84	118	15	12		L14	O10	R7
	20	0.009	0.0338	26	7	8	1	1		L14	O10	R7
	20	0.009	0.0625	50	14	15	2	2		L14	O10	R7
	20	0.010	0.0493	45	12	14	2	2		L14	O10	R7
	20	0.006	0.0618	33	9	10	2	1		L14	O10	R7
	20	0.011	0.0746	73	20	23	3	3		L14	O10	R7
	20	0.006	0.0557	32	9	10	1	1		L14	O10	R7
	20	0.012	0.137	145	39	45	7	5		L14	O10	R7
	69	0.020	0.125	835	227	380	43	32		L14	O10	R7
	66	0.019	0.117	730	197	320	37	27		L14	O10	R7
	28	0.009	0.0587	107	29	34	5	4		L14	O10	R7
	21	0.007	0.0813	103	28	32	5	4		L14	O10	R7
	25	0.009	0.0657	107	29	34	5	4		L14	O10	R7
	21	0.007	0.0982	128	35	40	6	5		L14	O10	R7
	25	0.008	0.0858	135	37	43	6	5		L14	O10	R7
	26	0.009	0.0991	170	46	54	8	6		L14	O10	R7
	34	0.011	0.168	395	107	131	18	15		L14	O10	R7
	83	0.028	0.106	1,225	340	675	72	47		L14	O10	R7
	20	0.004	0.0261	17	5	5	1	1		L14	O10	R7
	20	0.004	0.0330	23	6	7	1	1		L14	O10	R7
	20	0.004	0.0284	22	6	7	1	1		L14	O10	R7
	20	0.007	0.0652	75	20	23	3	3		L14	O10	R7
	4420	0	0.18	11,085	12,690	11,825	13,340	13,150	A6	L3		R3
	124	0	0.11	2,530	705	1,440	154	98	A6	L3		R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HFC-41	CH_3F		2.8	2.8	2.9
HFC-125	CHF_2CF_3	20.4 ppt	31	30	32
HFC-134	CHF_2CHF_2		9.7	10	10.5
HFC-134a	CH_2FCF_3	90 ppt	14	14	14.1
HFC-143	CH_2FCHF_2		3.5	3.6	3.70
HFC-143a	CH_3CF_3	19.1 ppt	51	51	57
HFC-152	CH_2FCH_2F		146 days (114-335 days)	172 days (114-335 days)	172 days (114-335 days)
HFC-152a	CH_3CHF_2	6.7 ppt	1.6	1.6	1.55
HFC-161	CH_3CH_2F		66 days (51–154 days)	80 days (51–154 days)	80 days (51–154 days)
HFC-227ca	$CF_3CF_2CHF_2$		28.2	30	32
HFC-227ea	CF_3CHFCF_3	1.2 ppt	36	36	37.5
HFC-236cb	$CH_2FCF_2CF_3$		~13	13.4	14
HFC-236ea	CHF_2CHFCF_3		11.0	11.4	11.9
HFC-236fa	$CF_3CH_2CF_3$	0.15 ppt	222	213	253
HFC-245ca	$CH_2FCF_2CHF_2$		6.5	6.6	6.9
HFC-245cb	$CF_3CF_2CH_3$		47.1	39.9	43
HFC-245ea	$CHF_2CHFCHF_2$		3.2	3.2	3.3
HFC-245eb	$CH_2FCHFCF_3$		3.2	3.2	3.3
HFC-245fa	$CHF_2CH_2CF_3$	2.4 ppt	7.9	7.9	8.2
HFC-263fb	$CH_3CH_2CF_3$		1.1	1.1	1.16
HFC-272ca	$CH_3CF_2CH_3$		2.6	9	9.7
HFC-281ea	CH_3CHFCH_3		23 days (19–46 days)	27 days (19–46 days)	27 days (19–46 days)
HFC-329p	$CHF_2CF_2CF_2CF_3$		~30	32	34
HFC-338pcc	$CHF_2CF_2CF_2CHF_2$		12.9	13.5	14.0
HFC-356mcf	$CH_2FCH_2CF_2CF_3$		1.2	1.2	1.26
HFC-356mff	$CF_3CH_2CH_2CF_3$		8.3	8.5	8.9
HFC-365mfc	$CH_3CF_2CH_2CF_3$	0.94 ppt	8.7	8.9	9.3
HFC-43-10mee	$CF_3CHFCHFCF_2CF_3$	0.27 ppt	16.1	17.0	17.9
HFC-458mfcf	$CF_3CH_2CF_2CH_2CF_3$		22.9	23.8	25.5
HFC-55-10mcff	$CF_3CF_2CH_2CH_2CF_2CF_3$		7.5	7.7	8.0
HFC-52-13p	$CHF_2CF_2CF_2CF_2CF_2CF_3$		32.7	35.2	37.0
HFC-72-17p	$CHF_2CF_2CF_2CF_2CF_2CF_2$-$CF_2CF_3$		–	23.8	24.9
Unsaturated Hydrofluorocarbons					
HFO-1123	$CHF{=}CF_2$		–	1.4 days	1.4 days

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance O: ODP L: Lifetime R: RE, GWP, & GTP			
								A	L	O	R
65	0	0.02	430	116	177	21	16		L:12,13		R3
595	0	0.23	6,280	3,450	6,040	3,350	1180	A6	L:3,13		R3
240	0	0.19	3,625	1,135	2,725	440	164				R3
267	0	0.16	3,810	1,360	3,170	770	215	A6	L:3,13		R3
100	0	0.13	1,250	340	580	64	48				R3
612	0	0.16	7,050	5,080	7,110	5,390	2,830	A6	L3		R3
–	0	0.04	64	17	20	3.0	2.4				R3
39	0	0.10	545	148	190	26	21	A6	L:3,13		R3
–	0	0.02	20	6	6	<1	<1				R3
640	0	0.27	5,260	2,865	5,070	2,795	975		L16		R3
673	0	0.26	5,250	3,140	5,140	3,180	1,260	A6	L:3,17		R3
305	0	0.23	3,540	1,235	2,915	670	192				R3
270	0	0.30	4,190	1,370	3,290	620	202				R3
1350	0	0.24	6,785	7,680	7,230	8,090	7,870				R3
165	0	0.24	2,530	720	1,600	180	102				R3
550	0	0.24	6,340	4,000	6,280	4,150	1,800				R3
95	0	0.16	860	233	375	44	32				R3
90	0	0.20	1,070	290	460	54	40				R3
149	0	0.24	2,980	880	2,040	260	124	A6	L3		R3
40	0	0.10	250	68	83	12	9.5				R3
185	0	0.07	1,580	480	1,140	163	69		L18		R3
–	0	–	–	–	–	–	–	A6			R9
675	0	0.31	4,720	2,630	4,565	2,595	935		L19		R3
360	0	–	–	–	–	–	–				R9
40	0	–	–	–	–	–	–				R9
190	0	–	–	–	–	–	–				R9
190	0	0.22	2,660	810	1,915	271	115	A6			R3
365	0	0.359	3,770	1,470	3,295	1,015	265	A6			R10
375	0	–	–	–	–	–	–				R9
175	0	–	–	–	–	–	–				R9
710	0	–	–	–	–	–	–		L20		R9
525	0	–	–	–	–	–	–		L21		R9
–	0	0.0019	<1	<<1	<<1	<<1	<<1		L22		R11

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
HFO-1132a	$CH_2=CF_2$		4.0 days (3–5.7 days)	4.6 days (3–5.7 days)	4.6 days (3–5.7 days)
HFO-1141	$CH_2=CHF$		2.1 days (1.4–3.1 days)	2.5 days (1.4–3.1 days)	2.5 days (1.4–3.1 days)
HFO-1234ye*(E)*	*(E)*-$CHF=CFCHF_2$		<5 days	<5 days	<5 days
HFO-1234ye*(Z)*	*(Z)*-$CHF=CFCHF_2$		<5 days	<5 days	<5 days
HFO-1225ye*(E)*	*(E)*-$CF_3CF=CHF$		4.9 days (3.7–6.9 days)	5.7 days (3.7–6.9 days)	5.7 days (3.7–6.9 days)
HFO-1225ye*(Z)*	*(Z)*-$CF_3CF=CHF$		8.5 days (6.2–12 days)	10 days (6.2–12 days)	10 days (6.2–12 days)
2,3,3,4,4-pentafluorocyclobut-1-ene	c-$CH=CFCF_2CF_2$-		–	270 days	270 days
HFO-1234ze*(E)*	*(E)*-$CF_3CH=CHF$		16.4 days (12.8–24 days)	19 days (12.8–24 days)	19 days (12.8–24 days)
HFO-1234ze*(Z)*	*(Z)*-$CF_3CH=CHF$		10.0 days	10.0 days	10.0 days
3,3,4,4-tetrafluorocyclobut-1-ene	c-$CH=CHCF_2CF_2$-		–	84 days	84 days
HFO-1234yf	$CF_3CF=CH_2$		10.5 days (8.4–16 days)	12 days (8.4–16 days)	12 days (8.4–16 days)
HFO-1261zf	$CH_2FCH=CH_2$		0.7 days (0.5–1.0 days)	0.8 days (0.5–1.0 days)	0.8 days (0.5–1.0 days)
HFO-1234yc	$CF_2=CFCH_2F$		~2 days	~2 days	~2 days
HFO-1225zc	$CF_2=CHCF_3$		~2 days	~2 days	~2 days
HFO-1234zc	$CF_2=CHCHF_2$		<5 days	<5 days	<5 days
HFO-1336mzz*(E)*	*(E)*-$CF_3CH=CHCF_3$		– (~16–30 days)	122 days	122 days
HFO-1336mzz*(Z)*	*(Z)*-$CF_3CH=CHCF_3$		22 days (16.3–32 days)	27 days (16.3–32 days)	27 days (16.3–32 days)
HFO-1243zf	$CF_3CH=CH_2$		7.0 days (5.5–11 days)	9 days (5.5–11 days)	9 days (5.5–11 days)
HFO-1345zf	$C_2F_5CH=CH_2$		7.6 days (5.8–11.4 days)	9 days (5.8–11.4 days)	9 days (5.8–11.4 days)
HFO-1438mzz*(E)*	*(E)*-$CF_3CH=CHCF_2CF_3$		– (16–30 days)	122 days	122 days
HFO-1447zf	$CH_2=CHCF_2CF_2CF_3$		– (6–10 days)	9 days (6–10 days)	9 days (6–10 days)
3,3,4,4,5,5,6,6,6-Nonafluorohex-1-ene	$C_4F_9CH=CH_2$		7.6 days	9 days	9 days
3,3,4,4,5,5,6,6,7,7,8,8,8-Tridecafluorooct-1-ene HFO-174-13fz	$C_6F_{13}CH=CH_2$		7.6 days	9 days	9 days
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-Heptadecafluorodec-1-ene HFO-194-17fz	$C_8F_{17}CH=CH_2$		7.6 days	9 days	9 days
HFO-1438ezy*(E)*	*(E)*-$(CF_3)_2CFCH=CHF$		–	43 days	43 days
Chlorocarbons and Hydrochlorocarbons					
Methyl chloroform	CH_3CCl_3	2.6 ppt	5.0	5.0	6.1
Carbon tetrachloride	CCl_4	80.5 ppt	26.0	32	–
Methyl chloride	CH_3Cl	555 ppt	0.9	0.9	1.57

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency ($W\ m^{-2}\ ppb^{-1}$) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes (A: Abundance)	Footnotes (L: Lifetime)	Footnotes (O: ODP)	Footnotes (R: RE, GWP, & GTP)
–	0	0.004	<1	<1	<1	<1	<1				R3
–	0	0.002	<1	<1	<1	<1	<1				R3
–	0	–	–	–	–	–	–		L23		R9
–	0	–	–	–	–	–	–		L23		R9
–	0	0.01	<1	<1	<1	<1	<1				R3
–	0	0.02	<1	<1	<1	<1	<1				R3
–	0	0.20	236	64	74	11	8.8		L24		R12
–	0	0.04	4	<1	<1	<1	<1				R3
–	0	0.02	1	<1	<1	<1	<1		L21		R3
–	0	0.10	40.6	11	12	1.8	1.5		L24		R12
–	0	0.02	1	<1	<1	<1	<1	A7			R3
–	0	–	–	–	–	–	–				R9
–	0	–	–	–	–	–	–		L23		R9
–	0	–	–	–	–	–	–		L23		R9
–	0	–	–	–	–	–	–		L23		R9
–	0	0.13	60	16	18	2.7	2.2		L25		R13
–	0	0.07	6	2	2	<1	<1				R3
–	0	0.01	<1	<1	<1	<1	<1				R3
–	0	0.01	<1	<1	<1	<1	<1				R3
–	0	–	–	–	–	–	–		L26		R9
–	0	–	–	–	–	–	–				R9
–	0	0.03	<1	<1	<1	<1	<1		L27		R3
–	0	0.03	<1	<1	<1	<1	<1		L27		R3
–	0	0.03	<1	<1	<1	<1	<1		L27		R3
–	0	0.34	42	11	12	1.9	1.6		L28		R14
38	0.14–0.17	0.07	555	153	300	32	21	A8	L:3,13	O3	R3
44	0.89	0.174	3,790	2,110	3,670	2,080	750	A8	L:13,29	O3	R15
30.4	0.015	0.004	16	4.3	5.1	<1	<1	A8	L:3,13,30	O3	R15

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
Methylene chloride	CH_2Cl_2	34 ppt	144 days (95–1070 days)	180 days (95–1070 days)	180 days (95–1070 days)
Chloroform	$CHCl_3$	8.9 ppt	149 days (97–1145 days)	183 days (97–1145 days)	183 days (97–1145 days)
1,2-Dichloroethane	CH_2ClCH_2Cl	12.8 ppt (10.4–18.3)	65.0 days (41–555 days)	82 days (41–555 days)	82 days (41–555 days)
Chloroethane	CH_3CH_2Cl		39 days (26–280 days)	48 days (26–280 days)	48 days (26–280 days)
1-Chloropropane	$CH_3CH_2CH_2Cl$		14 days (10–80 days)	16 days (10–80 days)	16 days (10–80 days)
2-Chloropropane	$CH_3CHClCH_3$		18 days (13–95 days)	22 days (13–95 days)	22 days (13–95 days)
Unsaturated Hydrochlorocarbons and Chlorocarbon					
Chloroethene (vinyl chloride)	$CH_2{=}CHCl$		1.5 days (0.9–2.2 days)	1.7 days (0.9–2.2 days)	1.7 days (0.9–2.2 days)
1,2-dichloroethene	$CH_2{=}CCl_2$		0.9 days (0.5–1.3 days)	1 days (0.5–1.3 days)	1 days (0.5–1.3 days)
(E)-1,2-dichloroethene	*(E)*-CClH=CClH		– (3.2–6.7 days)	5.5 days (3.2–6.7 days)	5.5 days (3.2–6.7 days)
(Z)-1,2-dichloroethene	*(Z)*-CClH=CClH		– (3.2–6.7 days)	5.2 days (3.2–6.7 days)	5.2 days (3.2–6.7 days)
Trichloroethene	$CHCl{=}CCl_2$	0.3 ppt	4.9 days (3.3–7.1 days)	5.6 days (3.3–7.1 days)	5.6 days (3.3–7.1 days)
Perchloroethene	$CCl_2{=}CCl_2$	1.5 ppt	90 days (66–245 days)	110 days (66–245 days)	110 days (66–245 days)
Unsaturated Chlorofluorocarbons and Hydrochlorofluorocarbons					
CFO-1113 Chlorotrifluoroethene	$CF_2{=}CFCl$		1.4 days (0.8–2.1 days)	1.5 days (0.8–2.1 days)	1.5 days (0.8–2.1 days)
HCFO-1233zd*(E)*	*(E)*-$CF_3CH{=}CHCl$		26 days (21–39 days)	42.5 days (34–64 days)	42.5 days (34–64 days)
HCFO-1233zd*(Z)*	*(Z)*-$CF_3CH{=}CHCl$		– ~(20–40) days	13 days	13 days
HCFO-1233xf (2-chloro-3,3,3-fluoro-1-propene)	$CF_3CCl{=}CH_2$		– ~(20–40) days	42.5 days (34–64 days)	42.5 days (34–64 days)
CFO-1215yc (3-chloro-1,1,2,3,3-fluoro-1-propene)	$CF_2{=}CFCF_2Cl$		~5 days ~(3–7 days)	~5 days ~(3–7 days)	~5 days ~(3–7 days)
CFO-1316yff (4,4-dichloro-1,1,2,3,3,4-fluoro-1-butene)	$CF_2{=}CFCF_2CFCl_2$		~5 days ~(3–7 days)	~5 days ~(3–7 days)	~5 days ~(3–7 days)
Bromocarbons, Hydrobromocarbons and Halons					
Methyl bromide	CH_3Br	6.8 ppt	0.8	0.8	1.8
Methylene bromide	CH_2Br_2	0.9 ppt (0.6–1.7)	123 days (80–890 days)	150 days (80–890 days)	150 days (80–890 days)
Bromoform	$CHBr_3$	1.2 ppt (0.4–4.0)	24 days (15–88 days)	16 days (8–23 days)	57 days (15–88 days)
Halon-1201	$CHBrF_2$		5.2	4.9	5.7
Halon-1202	CBr_2F_2	0.01 ppt	2.9	2.5	–
Halon-1211	$CBrClF_2$	3.6 ppt	16.0	16	–
Halon-1301	$CBrF_3$	3.3 ppt	65.0	72	–

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
–	–	0.028	37	10	11	1.7	1.4	A8			R15
–	–	0.07	66	18	20	3.0	2.2	A8			R15
–	–	0.01	5.1	1.4	1.5	<1	<1	A8			R3
–	–	0.004	1.8	<1	<1	<1	<1				R2
–	–	–	–	–	–	–	–				R9
–	–	0.005	0.9	<1	<1	<1	<1				R2
–	–	8.8e-4	<1	<<1	<<1	<<1	<<1				R2
–	–	1.17e-3	<<1	<<1	<<1	<<1	<<1				R2
–	<0.0003	–	–	–	–	–	–			O12	R9
–	<0.0003	2.95e-4	<<1	<<1	<<1	<<1	<<1			O12	R2
–	<0.004	5.74e-3	<1	<1	<1	<<1	<<1	A9		O12	R2
–	–	0.053	21.7	5.9	6.5	1.0	0.8	A9			R2
–	–	–	–	–	–	–	–				R9
–	<0.0004	0.067	13.5	3.7	4.0	0.6	0.5			O12	R16
–	<0.0004	0.025	1.5	0.4	0.45	0.07	0.06			O12	R16
–	–	–	–	–	–	–	–		L31		R9
–	–	–	–	–	–	–	–		L32		R9
–	–	–	–	–	–	–	–		L32		R9
26.3	0.57	0.004	7.6	2	2.4	<1	<1	A9	L:3,13	O3	R3
–	3–4	0.01	5.3	1.4	1.6	<1	<1	A9	L2	O12	R3
–	1–5	0.003	<1	<1	<1	<<1	<<1	A9	L2	O12	R9
35		0.15	1,240	340	675	72	48		L33		R3
36	1.7	0.27	720	196	285	35	27	A9	L:2,3	O3	R3
41	6.9–7.7	0.29	4,590	1,750	3,950	1,130	300	A9	L:2,3	O3	R3
73.5	15.2–19.0	0.30	7,930	6,670	8,160	7,160	4,700	A9	L:2,3	O3	R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
Bromochloromethane	CH_2BrCl	0.10 ppt (0.07–0.12)	137 days (89–1050 days)	165 days (89–1050 days)	165 days (89–1050 days)
Bromodichloromethane	$CHBrCl_2$	0.3 ppt (0.1–0.9)	78 days (38–250 days)	66 days (38–250 days)	95 days (56–460 days)
Dibromochloromethane	$CHBr_2Cl$	0.3 ppt (0.1–0.8)	59 days (28–225 days)	59 days (28–225 days)	71 days (45–325 days)
bromoethane	CH_3CH_2Br		41 days (28–260 days)	50 days (30–260 days)	50 days (30–260 days)
1,2-dibromoethane	CH_2BrCH_2Br		70 days (44–590 days)	89 days (44–590 days)	89 days (44–590 days)
n-bromopropane	$CH_3CH_2CH_2Br$		12.8 days (9–65 days)	15 days (9–65 days)	15 days (9–65 days)
Iso-bromopropane	$CH_3CHBrCH_3$		16.7 days (12–88 days)	20 days (12–88 days)	20 days (12–88 days)
Halon-2301	CH_2BrCF_3		3.4	3.2	3.2
Halon-2311 / Halothane	$CHBrClCF_3$	0.010 ppt	1.0	1.0	1.1
Halon-2401	$CHFBrCF_3$		2.9	2.9	3.1
Halon-2402 isomer	CF_3CFBr_2		–	2.5	–
Halon-2402	$CBrF_2CBrF_2$	0.42 ppt	20.0	28	–
Unsaturated Bromofluorocarbons					
Bromothrifluoroethene	$CFBr{=}CF_2$		1.4 days (0.9–2.0 days)	1.6 days (0.9–2.0 days)	1.6 days (0.9–2.0 days)
1-Bromo-2,2-fluoroethene	$CHBr{=}CF_2$		2.3 days (1.5–3.4 days)	2.7 days (1.5–3.4 days)	2.7 days (1.5–3.4 days)
2-Bromo-3,3,3-fluoro-1-propene	$CH_2{=}CBrCF_3$		2.7 days (1.8–3.9 days)	3.2 days (1.8–3.9 days)	3.2 days (1.8–3.9 days)
2-bromo-3,3,4,4,4-fluoro-1-butene	$CH_2{=}CBrCF_2CF_3$		3.1 days (2.0–4.6 days)	3.7 days (2.0–4.6 days)	3.7 days (2.0–4.6 days)
4-bromo-3,3,4,4-fluoro-1-butene	$CH_2{=}CHCF_2CF_2Br$		6.5 days (4.7–9.5 days)	7.5 days (4.7–9.5 days)	7.5 days (4.7–9.5 days)
Unsaturated Bromochlorofluorocarbons					
4-bromo-3-chloro-3,4,4-trifluoro-1-butene	$CH_2{=}CHCClFCBrF_2$		–	4.5 days	4.5 days
Fully Fluorinated Species					
Nitrogen trifluoride	NF_3	1.5 ppt	500.0	569	–
Perfluorotriethylamine	$N(C_2F_5)_3$		–	>1000	–
Perfluorotripropylamine	$N(C_3F_7)_3$		–	>1000	–
Perfluorotributylamine	$N(C_4F_9)_3$		–	>1000	–
Perfluorotripentylamine	$N(C_5F_{11})_3$		–	>1000	–
Sulphur hexafluoride	SF_6	8.9 ppt	3,200.0	3,200	–
(Trifluoromethyl)sulfur pentafluoride	SF_5CF_3	0.153 ppt	800.0	650–950	–
PFC-14 (Perfluoromethane)	CF_4	82.7 ppt	50,000.0	50,000	–
PFC-116 (Perfluoroethane)	C_2F_6	4.6 ppt	10,000.0	10,000	–

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes			
									A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
	–	–	0.022	17	4.7	5.2	0.8	0.6	A9			R2
	–	–	–	–	–	–	–	–	A9	L2		R9
	–	–	–	–	–	–	–	–	A9	L2		R9
	–	<0.46	0.0060	1.7	0.5	0.5	<1	<1			O12	R2
	–	–	0.012	3.7	1.0	1.1	0.17	0.14				R2
	–	<0.17	0.002	0.2	<1	<1	<<1	<<1			O12	R2
	–	–	0.004	0.4	0.1	0.1	<1	<1				R2
	–	–	0.14	620	167	270	31	23				R3
	20	~1.6	0.13	151	41	49	7	6	A9		O13	R3
	45	–	0.19	675	184	285	34	25		L33		R3
	–	–	–	–	–	–	–	–		L34		R9
	41	15.7	0.31	3,920	2,030	3,730	1,900	615	A9	L:3,13	O3	R3
	–	–	–	–	–	–	–	–			O14	R9
	–	–	–	–	–	–	–	–			O14	R9
	–	<0.05	–	–	–	–	–	–			O12	R9
	–	–	–	–	–	–	–	–			O14	R9
	–	–	–	–	–	–	–	–			O14	R9
	–	–	0.0135	<1	<1	<1	<<1	<<1		L35	O14	R17
	740	0	0.20	12,460	15,750	13,420	16,250	18,035	A10	L:3,36		R3
	–	0	0.68	8,150	10,610	8,800	10,880	12,500		L37		R18
	–	0	0.82	7,055	9,180	7,620	9,410	10,815		L37		R18
	–	0	0.97	6,470	8,420	6,980	8,630	9,910	A10	L37		R18
	–	0	1.07	5,780	7,520	6,240	7,710	8,860		L37		R18
	–	0	0.57	17,500	23,500	18,900	23,800	28,200	A10	L7		R3
	–	0	0.59	13,500	17,400	14,500	17,800	20,200	A10	L38		R3
	–	0	0.09	4,880	6,630	5,270	6,690	8,040	A10	L7		R3
	–	0	0.25	8,210	11,100	8,880	11,200	13,500	A10	L7		R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
PFC-c216 (Perfluorocyclopropane)	$c\text{-}C_3F_6$		3,000.0	3,000	–
PFC-218 (Perfluoropropane)	C_3F_8	0.63 ppt	2,600.0	2,600	–
PFC-c316 (Perfluorocyclobutene)	$c\text{-}C_4F_6$		–	1.2	1.2
PFC-c318 (Perfluorocyclobutane)	$c\text{-}C_4F_8$	1.44 ppt	3,200.0	3,200	–
PFC-31-10 (Perfluorobutane)	$n\text{-}C_4F_{10}$		2,600.0	2,600	–
PFC-c418 (Perfluorocyclopentene)	$c\text{-}C_5F_8$		31.0 days	1.1	1.1
PFC-41-12 (Perfluoropentane)	$n\text{-}C_5F_{12}$	0.148 ppt	4,100.0	4,100	–
PFC-51-14 (Perfluorohexane)	$n\text{-}C_6F_{14}$		3,100.0	3,100	–
PFC-61-16 (Perfluoroheptane)	$n\text{-}C_7F_{16}$		3,000.0	3,000	–
PFC-71-18 (Perfluorooctane)	$n\text{-}C_8F_{18}$		3,000.0	3,000	–
PFC-91-18 (isomer mixture)	$C_{10}F_{18}$		2,000.0	2,000	–
PFC-c91-18*(Z)* (Perfluorodecalin*(Z)*)	*(Z)*-$C_{10}F_{18}$		2,000.0	2,000	–
PFC-c91-18*(E)* (Perfluorodecalin*(E)*)	*(E)*-$C_{10}F_{18}$		2,000.0	2,000	–
PFC-1114	$CF_2{=}CF_2$		1.1 days (0.7–1.6 days)	1.2 days (0.7–1.6 days)	1.2 days (0.7–1.6 days)
PFC-1216	$CF_3CF{=}CF_2$		4.9 days (3.3–7.1 days)	5.5 days (3.3–7.1 days)	5.5 days (3.3–7.1 days)
Perfluorobuta-1,3-diene	$CF_2{=}CFCF{=}CF_2$		1.1 days	1.1 days	1.1 days
Perfluorobut-1-ene	$CF_3CF_2CF{=}CF_2$		6.0 days	6 days	6 days
Perfluorobut-2-ene (71% *(E)* and 29% *(Z)* isomer blend)	$CF_3CF{=}CFCF_3$		31.0 days	31 days	31 days
(E)-Perfluoro-2-butene	*(E)*-$CF_3CF{=}CFCF_3$		–	22 days	22 days
(Z)-Perfluoro-2-butene	*(Z)*-$CF_3CF{=}CFCF_3$		–	35 days	35 days
Perfluoro(2-methyl-2-pentene)	$(CF_3)_2C{=}CFCF_2CF_3$		–	192 days	192 days
Halogenated Ethers					
HFE-125	CHF_2OCF_3		119.0	135	147
HFE-134 (HG-00)	CHF_2OCHF_2		25.4	26.9	28.4
HFE-143a	CH_3OCF_3		4.8	4.9	5.05
HFE-152a	CH_3OCHF_2		–	1.8	1.85
HFE-227ea	$CF_3CHFOCF_3$		46.7	54.8	58
HCFE-235ca2 (enflurane)	CHF_2OCF_2CHFCl		4.3	4.42	4.62
HCFE-235da2 (isoflurane)	$CHF_2OCHClCF_3$	0.11 ppt	3.5	3.5	3.7
HFE-236ca	$CHF_2OCF_2CHF_2$		20.8	22.0	23.1
HFE-236ea2 (desflurane)	$CHF_2OCHFCF_3$	3.2 ppt	10.8	14.1	14.8
HFE-236fa	$CF_3CH_2OCF_3$		~7.5	~7.5	~8
HFE-245cb2	$CF_3CF_2OCH_3$		5.0	5.0	5.24
HFE-245fa1	$CHF_2CH_2OCF_3$		6.6	~6.7	~7

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency $(W\ m^{-2}\ ppb^{-1})$ [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
	–	0	0.23	6,850	9,200	7,400	9,310	11,000	A10	L39		R19
	–	0	0.28	6,640	8,900	7,180	9,010	10,700	A10	L39		R3
	–	0	0.25	425	115	141	20	16		L24		R12
	–	0	0.32	7,110	9,540	7,680	9,660	11,500	A10	L7		R3
	–	0	0.36	6,870	9,200	7,420	9,320	11,000	A10	L39		R3
	–	0	0.28	322	87	106	15	12		L40		R20
	–	0	0.41	6,350	8,550	6,860	8,650	10,300	A10	L7		R3
	–	0	0.44	5,890	7,910	6,370	8,010	9,490	A10	L7		R3
	–	0	0.50	5,830	7,820	6,290	7,920	9,380	A10	L39		R3
	–	0	0.55	5,680	7,620	6,130	7,710	9,140	A10	L39		R3
	–	0	0.55	5,390	7,190	5,820	7,290	8,570		L39		R3
	–	0	0.56	5,430	7,240	5,860	7,340	8,630		L39		R3
	–	0	0.48	4,720	6,290	5,090	6,380	7,500		L39		R3
	–	0	0.002	<1	<1	<1	<1	<1				R3
	–	0	0.01	<1	<1	<1	<1	<1				R3
	–	0	0.003	<1	<1	<1	<1	<1				R3
	–	0	0.02	<1	<1	<1	<1	<1		L41		R3
	–	0	0.07	6	2	2	<1	<1				R3
	–	0	0.068	5	1.3	1.4	<1	<1				R3
	–	0	–	–	–	–	–	–				R9
	–	0	–	–	–	–	–	–				R9
	1665	0	0.41	12,615	12,980	13,315	13,860	11,960				R3
	500	0	0.44	11,840	5,965	11,215	5,530	1,735				R3
	130	0	0.18	1,950	540	1,060	113	75				R3
	56	0	–	–	–	–	–	–				R9
	968	0	0.44	8,920	6,630	9,060	7,110	3,930				R3
	100	0.04	0.41	2,190	600	1,125	121	84			O13	R3
	86	0.03	0.42	1,800	490	820	93	68	A11		O13	R3
	436	0	0.56	9,855	4,420	9,050	3,700	1,020				R19
	316	0	0.45	6,440	2,300	5,385	1,320	365	A11		O13	R3
	196	0	0.36	3,350	980	2,240	273	138		L42		R3
	134	0	0.33	2,360	655	1,280	136	91				R3
	168	0	0.31	2,960	845	1,880	214	119		L43		R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
HFE-245fa2	$CHF_2OCH_2CF_3$		5.5	5.5	5.8	
HFE-254cb1	$CH_3OCF_2CHF_2$		2.5	2.5	2.62	
HFE-254eb2	$CH_3OCHFCF_3$		88 days (69–200 days)	110 days (69–200 days)	110 days (69–200 days)	
HFE-263fb2	$CF_3CH_2OCH_3$		23 days (19–47 days)	28 days (19–47 days)	28 days (19–47 days)	
HFE-263m1	$CF_3OCH_2CH_3$		0.4	~145 days	~145 days	
HFE-329mcc2	$CHF_2CF_2OCF_2CF_3$		~25	~25	~25	
HFE-338mmz1	$(CF_3)_2CHOCHF_2$		21.2	22.3	23.5	
HFE-338mcf2	$CF_3CH_2OCF_2CF_3$		~7.5	~7.5	~8	
HFE-347mmz1 (Sevoflurane)	$(CF_3)_2CHOCH_2F$	0.16 ppt	~2	1.9	1.96	
HFE-347mcc3 (HFE-7000)	$CH_3OCF_2CF_2CF_3$		5.0	5.1	5.3	
HFE-347mcf2	$CHF_2CH_2OCF_2CF_3$		~6.6	~6.7	~7	
HFE-347pcf2	$CHF_2CF_2OCH_2CF_3$		5.9	6.1	6.3	
HFE-347mmy1	$(CF_3)_2CFOCH_3$		3.7	3.7	3.8	
HFE-347mcf	$CHF_2OCH_2CF_2CF_3$		5.6	5.8	6.0	
HFE-356mec3	$CH_3OCF_2CHFCF_3$		~3	2.5	2.62	
HFE-356mff2	$CF_3CH_2OCH_2CF_3$		105 days (79–270 days)	128 days (79–270 days)	128 days (79–270 days)	
HFE-356pcf2	$CHF_2CH_2OCF_2CHF_2$		~6	~6	~6	
HFE-356pcf3	$CHF_2OCH_2CF_2CHF_2$		3.5	3.5	3.7	
HFE-356pcc3	$CH_3OCF_2CF_2CHF_2$		~3	2.5	2.62	
HFE-356mmz1	$(CF_3)_2CHOCH_3$		61 days (49–128 days)	65 days (49–128 days)	65 days (49–128 days)	
HFE-365mcf3	$CF_3CF_2CH_2OCH_3$		19.3 days (17–42 days)	25 days (17–42 days)	25 days (17–42 days)	
HFE-365mcf2	$CF_3CF_2OCH_2CH_3$		0.6	219 days	219 days	
HFE-374pc2	$CHF_2CF_2OCH_2CH_3$		64 days (49–128 days)	76 days (49–128 days)	76 days (49–128 days)	
HFE-43-10pccc124 (H-Galden 1040x, HG-11)	$CHF_2OCF_2OC_2F_4OCHF_2$		13.5	14.1	14.7	
HFE-449s1 (HFE-7100)	$C_4F_9OCH_3$		4.7	4.8	5.0	
n-HFE-7100	n-$C_4F_9OCH_3$		4.7	4.8	5.0	
i-HFE-7100	i-$C_4F_9OCH_3$		4.7	4.8	5.0	
HFE-54-11mecf	$CF_3CHFCF_2OCH_2CF_2CF_3$		8.8	9.1	9.5	
HFE-569sf2 (HFE-7200, isomer mix)	$C_4F_9OC_2H_5$		~0.8	0.8	0.8	
n-HFE-7200	n-$C_4F_9OC_2H_5$		0.8	0.8	0.8	
i-HFE-7200	i-$C_4F_9OC_2H_5$		0.8	0.63	0.65	
HFE-236ca12 (HG-10)	$CHF_2OCF_2OCHF_2$		25.0	26.5	28.0	
HFE-338pcc13 (HG-01)	$CHF_2OCF_2CF_2OCHF_2$		12.9	13.4	14.0	

Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
145	0	0.36	2,910	810	1,670	179	114				R3
74	0	0.26	1,110	300	440	54	42				R3
–	0	–	–	–	–	–	–				R9
–	0	0.04	6	1.6	1.8	<1	<1		L44		R3
–	0	0.13	102	28	31	4.7	3.8		L45		R3
580	0	0.53	6,960	3,360	6,520	3,010	895		L46		R3
440	0	0.44	6,000	2,715	5,525	2,290	635				R3
196	0	0.44	3,180	930	2,120	259	131		L47		R3
46	0	0.32	685	185	250	33	26	A11		O13	R3
135	0	0.35	1,970	545	1,090	116	76				R3
168	0	0.42	3,010	860	1,910	215	121				R3
155	0	0.48	3,170	890	1,930	211	126				R3
104	0	0.32	1,330	365	625	69	51				R3
150	0	–	–	–	–	–	–				R9
74	0	0.30	930	250	370	46	35		L48		R3
–	0	0.17	74	20	22	3.4	2.8				R3
145	0	0.37	2,650	745	1,595	174	105		L49		R3
97	0	0.38	1,640	445	750	84	62				R3
74	0	0.32	990	270	390	48	37		L48		R3
–	0	0.15	33	8.9	9.8	1.5	1.2		L35		R3
–	0	0.05	4.7	1.3	1.4	<1	<1		L50		R3
–	0	0.26	215	58	66	10	8		L51		R19
–	0	0.30	97	26	29	4.4	3.6				R3
315	0	1.02	8,180	2,920	6,835	1,680	464				R3
128	0	0.36	1,530	420	825	88	59				R3
128	0	0.42	1,790	490	960	102	69				R3
128	0	0.35	1,490	410	800	85	57				R3
212	0	–	–	–	–	–	–		L52		R9
27	0	0.30	210	57	66	10	8		L53		R3
27	0	0.35	235	65	75	11	9		L53		R19
22	0	0.24	129	35	40	5.9	4.8		L53		R3
500	0	0.65	11,165	5,575	10,550	5,140	1,591		L54		R3
304	0	0.86	8,595	3,000	7,085	1,630	466				R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
HG-02 (1,1′-Oxybis[2-(difluoromethoxy)-1,1,2,2-tetrafluoroethane)	$HF_2C(OCF_2CF_2)_2OCF_2H$		26	26.9	28.4	
HG-03 (1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12-Hexadecafluoro-2,5,8,11-tetraoxadodecane)	$HF_2C(OCF_2CF_2)_3OCF_2H$		26	26.9	28.4	
HG-04(1,1,3,3,4,4,6,6,7,7,9,9,10,10,12,12,13,13,15,15-Eicosafluoro-2,5,8,11,14-pentaoxapentadecane)	$HCF_2O(CF_2CF_2O)_4CF_2H$		26	26.9	28.4	
HG-20	$HF_2C(OCF_2)_2OCF_2H$		25.0	26.5	28.0	
HG-21	$HF_2COCF_2CF_2OCF_2OCF_2O$-$CF_2H$		13.5	13.4	14.0	
HG-30	$HF_2C(OCF_2)_3OCF_2H$		25.0	26.5	28.0	
1-Ethoxy-1,1,2,2,3,3,3-heptafluoropropane	$CF_3CF_2CF_2OCH_2CH_3$		0.8	0.75	0.77	
Fluoroxene	$CF_3CH_2OCH{=}CH_2$		3.6 days	3.6 days	3.6 days	
1,1,2,2-Tetrafluoro-1-(fluoromethoxy) ethane	$CH_2FOCF_2CF_2H$		6.2	6.2	6.5	
2-Ethoxy-3,3,4,4,5-pentafluorotetrahydro-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-furan	$C_{12}H_5F_{19}O_2$		1.0	0.81	0.83	
Fluoro(methoxy)methane	CH_3OCH_2F		73.0 days	73 days	73 days	
Difluoro(methoxy)methane	CH_3OCHF_2		1.1	1.1	1.1	
Fluoro(fluoromethoxy)methane	CH_2FOCH_2F		0.9	0.9	0.9	
Difluoro(fluoromethoxy)methane	CH_2FOCHF_2		3.3	3.2	3.3	
Trifluoro(fluoromethoxy)methane	CH_2FOCF_3		4.4	4.2	4.4	
HG′-01	$CH_3OCF_2CF_2OCH_3$		2.0	1.7	1.74	
HG′-02	$CH_3O(CF_2CF_2O)_2CH_3$		2.0	1.7	1.74	
HG′-03	$CH_3O(CF_2CF_2O)_3CH_3$		2.0	1.7	1.74	
HFE-329me3	$CF_3CFHCF_2OCF_3$		40.0	33.6	35.3	
2-Chloro-1,1,2-trifluoro-1-methoxyethane	CH_3OCF_2CHFCl		1.4	1.43	1.49	
PFPMIE (perfluoropolymethylisopropyl ether)	$CF_3OCF(CF_3)CF_2OCF_2OCF_3$		800.0	800	–	
HFE-216	$CF_3OCF{=}CF_2$		8.4 days	1.6 days	1.6 days	
Fluoroesters						
Trifluoromethyl formate	$HC(O)OCF_3$		<3.5	<3.5	3.7	
Perfluoroethyl formate	$HC(O)OCF_2CF_3$		<3.5	<3.6	3.7	
Perfluoropropyl formate	$HC(O)OCF_2CF_2CF_3$		<2.6	<2.6	2.7	
Perfluorobutyl formate	$HC(O)OCF_2CF_2CF_2CF_3$		3.0	<2.6	2.7	
2,2,2-Trifluoroethyl formate	$HC(O)OCH_2CF_3$		0.4	200 days	204 days	
3,3,3-Trifluoropropyl formate	$HC(O)OCH_2CH_2CF_3$		0.3	99 days	110 days	
1,2,2,2-Tetrafluoroethyl formate	$HC(O)OCHFCF_3$		3.2	3.1	3.2	

Stratospheric Lifetime (years)[e]	ODP[f]	Radiative Efficiency (W m^{-2} ppb^{-1})[g]	GWP 20-yr[h]	GWP 100-yr	GTP 20-yr[i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance O: ODP L: Lifetime R: RE, GWP, & GTP			
500	0	1.15	10,435	5,260	9,885	4,875	1,527		L54		R3
500	0	1.43	9,745	4,910	9,230	4,550	1,426		L54		R3
500	0	1.46	7,970	4,015	7,545	3,720	1,166		L54		R3
500	0	0.92	11,630	5,810	10,995	5,350	1,658		L55		R19
304	0	1.71	10,925	3,815	9,005	2,070	592		L56		R19
500	0	1.65	16,500	8,240	15,600	7,595	2,352		L55		R19
25	0	0.28	221	60	70	10	8.3		L51		R19
–	0	0.01	<1	<1	<1	<1	<1		L51		R19
153	0	0.34	3,040	855	1,860	205	121		L51		R19
28	0	0.49	165	45	52	7.6	6.2		L57		R3
–	0	0.07	46	13	14	2	2		L58		R19
35	0	0.17	515	139	168	24	19		L59		R19
30	0	0.19	470	127	150	22	18		L59		R19
92	0	0.30	2,155	585	950	109	82		L59		R19
120	0	0.33	2,620	715	1,315	142	100		L59		R19
51	0	0.29	685	185	245	33	26		L60		R19
51	0	0.56	770	210	275	37	29		L60		R3
51	0	0.76	740	200	260	35	28		L60		R3
680	0	0.48	6,900	3,955	6,715	3,955	1,485		L61		R3
42	0	0.21	455	123	156	22	17		L62		R3
–	0	0.65	7,500	9,710	8,070	9,910	11,300		L63		R3
–	0	0.02	<1	<1	<1	<1	<1		L64		R3
110	0	0.31	2,150	590	985	111	82		L65		R19
110	0	0.44	2,130	580	970	110	81		L66		R19
83	0	0.50	1,380	375	555	68	52		L66		R19
83	0	0.56	1,240	335	500	61	47		L66		R19
20	0	0.16	155	42	48	7	6		L67		R19
20	0	0.13	56	15	17	2.5	2.1		L68		R19
98	0	0.35	1,670	455	720	84	63		L69		R19

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]	
1,1,1,3,3,3-Hexafluoropropan-2-yl formate	$HC(O)OCH(CF_3)_2$		3.2	3.1	3.2	
Perfluorobutyl acetate	$CH_3C(O)OCF_2CF_2CF_2CF_3$		21.9 days	22 days	22 days	
Perfluoropropyl acetate	$CH_3C(O)OCF_2CF_2CF_3$		21.9 days	22 days	22 days	
Perfluoroethyl acetate	$CH_3C(O)OCF_2CF_3$		21.9 days	22 days	22 days	
Trifluoromethyl acetate	$CH_3C(O)OCF_3$		21.9 days	22 days	22 days	
Methyl carbonofluoridate	$FCOOCH_3$		1.8	1.8	1.8	
1,1-Difluoroethyl carbonofluoridate	$FC(O)OCF_2CH_3$		0.3	110 days	110 days	
1,1-Difluoroethyl 2,2,2-trifluoroacetate	$CF_3C(O)OCF_2CH_3$		0.3	110 days	110 days	
Ethyl 2,2,2-trifluoroacetate	$CF_3C(O)OCH_2CH_3$		21.9 days	22 days	22 days	
2,2,2-Trifluoroethyl 2,2,2-trifluoroacetate	$CF_3C(O)OCH_2CF_3$		54.8 days	180 days	180 days	
Methyl 2,2,2-trifluoroacetate	$CF_3C(O)OCH_3$		0.6	1.0	1.0	
Methyl 2,2-difluoroacetate	$HCF_2C(O)OCH_3$		40.1 days	124 days	124 days	
Difluoromethyl 2,2,2-trifluoroacetate	$CF_3C(O)OCHF_2$		0.3	110 days	110 days	
1,1,2-Trifluoro-2-(trifluoromethoxy)-ethane	$CHF_2CHFOCF_3$		9.8	9.0	9.3	
1-Ethoxy-1,1,2,3,3,3-hexafluoropropane	$CF_3CHFCF_2OCH_2CH_3$		0.4	147 days	150 days	
1,1,1,2,2,3,3-Heptafluoro-3-(1,2,2,2-tetrafluoroethoxy)-propane	$CF_3CF_2CF_2OCHFCF_3$		67.0	59.4	62	
1,1,2,2-Tetrafluoro-3-methoxypropane	$CHF_2CF_2CH_2OCH_3$		14.2 days	26 days	26 days	
3,3,3-Trifluoro-propanal	CF_3CH_2CHO		2 days	5 days	5 days	
Halogenated Alcohols						
3,3,3-Trifluoropropan-1-ol	$CF_3CH_2CH_2OH$		12 days	15 days	15 days	
2,2,3,3,3-Pentafluoropropan-1-ol	$CF_3CF_2CH_2OH$		0.3	172 days	172 days	
4,4,4-Trifluorobutan-1-ol	$CF_3(CH_2)_2CH_2OH$		4 days	5.4 days	5.4 days	
2,2,3,3,4,4,5,5-Octafluorocyclopentanol	$-(CF_2)_4CH(OH)-$		0.3	110 days	110 days	
1,1,1,3,3,3-Hexafluoropropan-2-ol	$(CF_3)_2CHOH$		1.9	1.9	1.95	
3,3,4,4,5,5,6,6,7,7,7-Undecafluoroheptan-1-ol	$CF_3(CF_2)_4CH_2CH_2OH$		20 days	17 days	17 days	
3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-Pentadecafluorononan-1-ol	$CF_3(CF_2)_6CH_2CH_2OH$		20 days	17 days	17 days	
3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-Nonadecafluoroundeca-1-o1	$CF_3(CF_2)_8CH_2CH_2OH$		20 days	17 days	17 days	
2,2,3,3,4,4,4-Heptafluorobutan-1-ol	$CF_3CF_2CF_2CH_2OH$		0.6	0.55	0.55	
2,2,3,3-Tetrafluoro-1-propanol	$CHF_2CF_2CH_2OH$		91.2 days	93 days	93 days	
2,2,3,4,4,4-Hexafluoro-1-butanol	$CF_3CHFCF_2CH_2OH$		112 days (85–280 days)	134 days (85–280 days)	134 days (85–280 days)	
2-Fluoroethanol	CH_2FCH_2OH		20.4 days	16 days	16 days	
2,2-Difluoroethanol	CHF_2CH_2OH		40 days	61 days	61 days	
2,2,2-Trifluoroethanol	CF_3CH_2OH		0.3	167 days	167 days	

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance	L: Lifetime	O: ODP	R: RE, GWP, & GTP
	96	0	0.33	1,175	320	510	59	44		L68		R19
	–	0	0.12	6	2	2	<1	<1		L70		R19
	–	0	0.11	6	2	2	<1	<1		L71		R19
	–	0	0.10	8	2	2	<1	<1		L71		R19
	–	0	0.07	8	2	2	<1	<1		L71		R19
	58	0	0.07	350	95	126	17	13		L69		R19
	–	0	0.17	90	24	27	4.1	3.4		L72		R19
	–	0	0.27	103	28	31	4.7	3.9		L68		R19
	–	0	0.05	5	1	1	<1	<1		L73		R19
	–	0	0.15	85	23	26	3.9	3.2		L73		R19
	34	0	0.18	315	86	103	15	12		L73		R19
	–	0	0.05	35	9	10	1.6	1.3		L73		R19
	–	0	0.24	99	27	30	5	4		L68		R19
	250	0	0.35	3,765	1,145	2,720	390	164		L74		R3
	20	0	0.19	88	24	27	4	3		L74		R3
	1400	0	0.58	7,750	5,980	7,910	6,435	3,755		L74		R3
	–	0	0.03	3	0.9	1	<1	<1		L75		R3
	–	0	0.004	<1	<1	<1	<1	<1		L76		R3
	–	0	0.02	1.6	<1	<1	<1	<1		L77		R3
	–	0	0.14	99	27	30	4.6	3.7				R3
	–	0	0.01	<1	<1	<1	<1	<1				R3
	–	0	0.16	47	13	14	2	2		L78		R3
	62	0	0.26	670	182	245	32	25				R3
	–	0	0.06	2	<1	<1	<1	<1		L79		R3
	–	0	0.07	1.8	<1	<1	<1	<1		L79		R3
	–	0	0.05	<1	<1	<1	<1	<1		L79		R3
	–	0	0.20	124	34	38	5.7	4.6		L80		R3
	–	0	0.11	48	13	14	2	1.8		L81		R3
	–	0	0.19	86	23	26	4.0	3.2				R3
	–	0	0.02	3	0.8	0.9	<1	<1				R3
	–	0	0.04	18	5	5	0.8	0.7				R3
	–	0	0.10	103	28	31	4.7	3.8				R3

Industrial Designation or Chemical Name	Chemical Formula	Atmospheric Abundance (2016) [a]	WMO (2014) Total Lifetime (years) [b]	Total Lifetime (years) [c]	Tropospheric (OH Reactive loss) Lifetime (years) [d]
2,2-3,3,4,4,5,5,5-fluoro-1-pentanol	$CF_3CF_2CF_2CF_2CH_2OH$		142 days (111–330 days)	172 days (111–330 days)	172 days (111–330 days)
Halogenated Ketones					
NOVEC-1230, FK-5-1-12 Perfluoro(2-methyl-3-pentanone)	$CF_3CF_2C(O)CF(CF_3)_2$		7.0 days (7–14 days)	7 days (7–14 days)	–
NOVEC-774 Tetradecafluoro-2,4-dimethylpentan-3-one	$(CF_3)_2CFC(O)CF(CF_3)_2$		–	–	–
Perfluoro(2-methyl-3-hexanone)	$CF_3CF_2CF_2C(O)CF(CF_3)_2$		–	–	–
Iodocarbons					
Methyl iodide	CH_3I	0.8 ppt (0.3–2.1)	7 days (3.5–9.6 days)	<14 days (3.5–14 days)	197 days
Trifluoroiodomethane	CF_3I		4 days (0.7–4 days)	<5 days (0.7–5 days)	3.0
Bromoiodomethane	CH_2BrI		–	≤60 mins	145 days
Chloroiodomethane	CH_2ClI		–	<100 mins	145 days
Diiodomethane	CH_2I_2		–	≤5 mins	4 days
Iodoethane	CH_3CH_2I		4 days (2.4–13.9 days)	<4 days (2.4–13.9 days)	52 days (13–94 days)
n-iodopropane	$CH_3CH_2CH_2I$		–	<2 days	15 days
i-iodopropane	CH_3CHICH_3		–	<1 day	13 days
1-iodo-heptafluoropropane	$CF_3CF_2CF_2I$		<2 days	<2 days	3.0
Special Compounds					
Carbonyl fluoride	COF_2		– (5–10 days)	7 days (5–10 days)	–
Phosphorus tribromide	PBr_3		– (<0.01 days)	– (<0.01 days)	–
Ammonia	NH_3	–	– (Few days)	– (Few days)	110 days
Carbonyl Sulfide	COS	505 ppt	–	2	–
Sulfuryl fluoride	SO_2F_2	2.3 ppt	36.0	36.0	>300

	Stratospheric Lifetime (years) [e]	ODP [f]	Radiative Efficiency (W m^{-2} ppb^{-1}) [g]	GWP 20-yr [h]	GWP 100-yr	GTP 20-yr [i]	GTP 50-yr	GTP 100-yr	Footnotes A: Abundance L: Lifetime O: ODP R: RE, GWP, & GTP			
	–	0	–	–	–	–	–	–				R9
	–	0	0.03	<1	<1	<1	<1	<1		L82		R3
	–	0	–	–	–	–	–	–		L83		R21
	–	0	–	–	–	–	–	–		L83		R21
	–	<0.42	6.0e-4	<<1	<<1	<<1	<<1	<<1	A12	L:20,84, 85,86	O12	R2
	–	<0.09	–	–	–	–	–	–	A12	L:84, 85,86	O12	R22
	–	–	–	–	–	–	–	–	A12	L:84, 87,88	O15	R22
	–	<0.07	–	–	–	–	–	–	A12	L:84, 87,88	O12	R22
	–	–	–	<<1	<<1	<<1	<<1	<<1	A12	L:84, 87,89	O15	R2
	–	–	–	–	–	–	–	–		L:84,86, 87,90	O15	R22
	–	–	–	–	–	–	–	–		L:84, 87,90	O15	R22
	–	–	–	<<1	<<1	<<1	<<1	<<1		L:84,87, 90	O15	R2
	–	<0.04	–	–	–	–	–	–		L:84,91	O16	R23
	0	–	8.0e-3	<1	<1	<1	<1	<1		L92		R2
	–	–	–	–	–	–	–	–		L92	O14	R9
	0	–	1.4e-3	<1	<1	<1	<1	<1		L82		R2
	0	–	5.7e-3	43	12	16	2.0	1.6	A10	L93		R2
	630	0	0.20	6,840	4,090	6,690	4,140	1,650	A10	L:13,94		R3

Table Heading Footnotes

a The data given in the abundance column are only intended to provide a "snapshot" of the compound's atmospheric abundance. The chapter and table(s) cited in the compound's footnote provides the analysis details, previously reported abundances and trends, and references. This summary does not represent a comprehensive survey of the abundance of all molecules included in the table. Compounds included in this table fall into several different abundance classifications: (1) compounds with known sources and global observations for which values are reported in the table, (2) compounds with known sources, but with only local or regional observations for which some values are reported in the table (note that the abundances for very short-lived substances (VSLSs) may represent local observations that can vary with location, altitude, and season), (3) compounds with natural and/or man-made sources that are not addressed in the report chapters, and (4) compounds with no presently known sources or observations.

b Total lifetime reported in WMO (2014).

c Total lifetime (τ_{Total}) is defined as the combination of the total atmospheric lifetime (τ_{Total}^{Atm}), which includes tropospheric loss (OH reaction and UV photolysis) and stratospheric loss (reactions with OH and O(^{1}D) and UV photolysis), with the lifetimes due to ocean and soil uptake. Except where noted in the footnotes, tropospheric loss due to Cl atom reaction is not included. Mesospheric loss processes are negligible except for very long-lived compounds as noted in the footnotes.

$$\frac{1}{\tau_{Total}^{Atm}} = \frac{1}{\tau_{Trop}} + \frac{1}{\tau_{Strat}} + \frac{1}{\tau_{Meso}}$$

$$\frac{1}{\tau_{Trop}} = \frac{1}{\tau_{OH}^{Trop}} + \frac{1}{\tau_{hv}^{Trop}}$$

$$\frac{1}{\tau_{Strat}} = \frac{1}{\tau_{OH}^{Strat}} + \frac{1}{\tau_{O(^1D)}^{Strat}} + \frac{1}{\tau_{hv}^{Strat}}$$

$$\frac{1}{\tau_{Total}} = \frac{1}{\tau_{Total}^{Atm}} + \frac{1}{\tau_{Ocean}} + \frac{1}{\tau_{Soil}}$$

d The tropospheric partial lifetime due reaction with the OH radical was calculated relative to the lifetime for CH_3CCl_3 (6.1 years) using a temperature of 272 K. OH reaction rate coefficients are taken from Burkholder et al. (2015) unless stated otherwise in the footnote. Lifetimes for very short-lived substances (VSLSs) are reported, although their local lifetimes will depend on the time and location of their emission. A representative range of VSLS local lifetimes taken from WMO (2014) Chapter 1 (Tables 1-5, 1-11) are given in parenthesis where available. The tropospheric OH partial lifetime for CH_3CCl_3 (6.1 years) was calculated from an overall lifetime of 5.0 years derived from the AGAGE and NOAA networks using a stratospheric partial lifetime of 38 years and an ocean partial lifetime of 94 years (Prinn et al., 2005).

e The stratospheric partial lifetime was estimated based on atmospheric model calculations, where available, and empirical relationships for the OH, O(^{1}D), and photolysis partial lifetimes. Stratospheric lifetimes are not reported for very short-lived substances (VSLSs). The minimum stratospheric partial lifetime was taken to be 20 years.

- * Stratospheric OH reactive loss partial lifetimes were estimated based on the empirical correlation derived using 2-D model results reported in Ko et al. (2013): $\log_{10}(\tau_{OH}^{Strat}) = 1.528 + 0.901 \times \log_{10}(\tau_{OH}^{Trop})$.
- * The O(^{1}D) lifetime was based on measured or estimated reaction rate coefficients ($k_{reactive}$, cm^3 molecule^{-1} s^{-1}) and estimated using the empirical lifetime relationship; $\tau(years) = 3.7 \times 10^{-8}/k_{reactive}$. Where experimental data were not available, the O(^{1}D) reactivity was estimated using the activity relationship for H atom and Cl atom abstraction given in Baasandorj et al. (2013).
- * Stratospheric photolysis partial lifetimes were taken from model calculations or based on the empirical estimates given in Orkin et al. (2013) or for the HCFCs from Papanastasiou et al. (2018).

f Atmospheric model calculated and semi-empirical values as cited in the footnotes.

g Radiative efficiency (RE) values were calculated using the empirical approach given in Hodgenbrog et al. (2013). The values reported in this table are lifetime adjusted using the exponential expression reported in Hodgenbrog et al., (2013) for compounds primarily removed by UV photolysis in the stratosphere and the S shaped curve for compounds primarily removed by reaction with the OH radical. The values also include a +10% stratospheric temperature change adjustment.

h Global warming potentials (GWPs) are calculated relative to CO_2.

i Global temperature change potentials (GTPs) calculated relative to CO_2 using the parameterization given in Supplementary Material Section S8.12 and references therein in IPCC (2013).

Abundance Footnotes

A1. See Chapter 6.
A2. See Chapter 1, Section 1.5.2 and Table 1-8.
A3. See Chapter 1, Section 1.5.1 and Table 1-8.
A4. See Chapter 1, Section 1.2.1 and Table 1-1.
A5. See Chapter 1, Section 1.2.5 and Table 1-1.
A6. See Chapter 2, Section 2.3 and Table 2-3.
A7. See Chapter 2, Section 2.3.5.
A8. See Chapter 1, Section 1.2 and Tables 1-1, 1-2, 1-3 and 1-4.
A9. See Chapter 1, Section 1.2 and 1.3 and Tables 1-1 and 1-4.
A10. See Chapter 1, Section 1.5 and Table 1-8.
A11. See Chapter 1, Section 1.5.
A12. See Chapter 1, Section 1.3 and Table 1-4.

Lifetime Footnotes

L1. Total lifetime reported in WMO (2014).
L2. Tropospheric photolysis partial lifetimes

Molecule	Formula	Lifetime (years)	Reference
Nitrous oxide	N_2O	14,600	SPARC Lifetime Report (Ko et al., 2013) *
Carbon tetrachloride	CCl_4	1,230	SPARC Lifetime Report (Ko et al., 2013) *
CFC-11	CCl_3F	1,770	SPARC Lifetime Report (Ko et al., 2013) *
CFC-12	CCl_2F_2	12,500	SPARC Lifetime Report (Ko et al., 2013) *
CFC-112	CCl_2FCCl_2F	2,280	Davis et al. (2016)
CFC-112a	CCl_3CClF_2	1,190	Davis et al. (2016)
CFC-113	CCl_2FCClF_2	8,120	SPARC Lifetime Report (Ko et al., 2013) *
CFC-113a	CCl_3CF_3	1,480	Davis et al. (2016)
CFC-114	$CClF_2CClF_2$	19,600	SPARC Lifetime Report (Ko et al., 2013) *
CFC-114a	CCl_2FCF_3	8,300	Davis et al. (2016)
(E)-R316c	*(E)*-1,2-c-$C_4F_6Cl_2$	3,600	Papadimitriou et al. (2013b)
(Z)-R316c	*(Z)*-1,2-c-$C_4F_6Cl_2$	10,570	Papadimitriou et al. (2013b)
Bromodichloromethane	$CHBrCl_2$	222 days	WMO (2014) Table 1-5
Dibromochloromethane	$CHBr_2Cl$	160 days	WMO (2014) Table 1-5
Methylene bromide	CH_2Br_2	13.7	WMO (2014) Table 1-5
Bromoform	$CHBr_3$	~23 days	Papanastasiou et al. (2014)
Halon-1202	CBr_2F_2	2.74	Papanastasiou et al. (2013)
Halon-1211	$CBrClF_2$	27.2	Papanastasiou et al. (2013)
Halon-1301	$CBrF_3$	4,050	SPARC Lifetime Report (Ko et al., 2013) **
Halon-2402	$CBrF_2CBrF_2$	85.5	Papanastasiou et al. (2013)

* Model mean given in SPARC Table 5.6 scaled to recommended total lifetime.

** Model mean given in SPARC Table 5.6 scaled to $CBrF_3$ UV cross section reported by Bernard et al. (2015).

L3. Atmospheric lifetimes recommended in the SPARC Lifetime report (Ko et al., 2013). Note, in some cases there are slight differences between the combination of the partial lifetimes and the recommended total atmospheric lifetime, which was derived from multi-model results and field observations.

L4. OH rate coefficient taken from Atkinson (2003).

L5. OH rate coefficient taken from Le Calve et al. (1997).

L6. Room temperature OH rate coefficient taken from Wallington et al. (1997) and *E*/R assumed to be 1000 K.

L7. Total lifetime is the best estimate taken from Ravishankara et al. (1993) that includes mesospheric loss due to Lyman-α (121.567 nm) photolysis. Electron reactive loss was included for SF_6.

L8. Stratospheric partial lifetime was taken from the 2-D model calculations in Davis et al. (2016). These values are in agreement with the values reported in Laube et al. (2014) [59 (43–95) years for CFC-112, 51 (32–113) years for CFC-112a, and 59 (31–305) years for CFC-113a (scaled to a CFC-11 lifetime of 52 years)], but of higher precision.

L9. The total lifetime includes mesospheric loss due to Lyman-α (121.567 nm) photolysis.

L10. Lifetime taken from Kloss et al. (2014).

L11. Stratospheric partial lifetime taken from 2-D model calculations in Papadimitriou et al. (2013b).

L12. *k*(OH) in the NASA/JPL (Burkholder et al., 2015) data evaluation was updated since the previous assessment resulting in a slight change in the OH tropospheric loss partial lifetime from that given in WMO (2014).

L13. Ocean and soil loss partial lifetimes

Molecule	Formula	Soil Lifetime (years)	Reference	Ocean Lifetime (years)	Reference
Methyl chloride	CH_3Cl	4.2	Hu et al. (2012)	12	Hu et al. (2013)
Methyl bromide	CH_3Br	3.35	Montzka and Reimann et al. (WMO, 2014)	3.1	Hu et al. (2012)
Carbon tetrachloride	CCl_4	375 (288–536)*	Rhew and Happell (2016), SPARC (2016)	183 (147–241)*	Butler et al. (2016)
HCFC-21	$CHCl_2F$	–		673	Yvon-Lewis and Butler (2002)
HCFC-22	$CHClF_2$	–		1,174	Yvon-Lewis and Butler (2002)
HCFC-124	$CHClFCF_3$	–		1,855	Yvon-Lewis and Butler (2002)
HCFC-141b	CH_3CCl_2F	–		9,190	Yvon-Lewis and Butler (2002)
HCFC-142b	CH_3CClF_2	–		122,200	Yvon-Lewis and Butler (2002)
HFC-41	CH_3F	–		1,340	Yvon-Lewis and Butler (2002)
HFC-125	CHF_2CF_3	–		10,650	Yvon-Lewis and Butler (2002)
HFC-134a	CH_2FCF_3	–		5,909	Yvon-Lewis and Butler (2002)
HFC-152a	CH_3CHF_2	–		1,958	Yvon-Lewis and Butler (2002)
Methyl chloroform	CH_3CCl_3	–		94	Yvon-Lewis and Butler (2002)
Sulfuryl fluoride	SO_2F_2	–		40	Mühle et al. (2009)

* Possible range of lifetime given in parenthesis.

L14. Lifetimes taken from Papanastasiou et al. (2018) where *k*(OH) was calculated using the structure activity relationship (SAR) of DeMore (1996) and stratospheric lifetime estimated as described in footnote e.

L15. 2-D model calculated stratospheric lifetime reported in McGillen et al. (2015).

L16. OH reactivity assumed the same as CHF_2CF_3 (HFC-125).

L17. Stratospheric partial lifetime calculated using 2-D model with OH and $O(^1D)$ rate coefficients recommended in SPARC lifetime report, Chapter 3 (Ko et al., 2013).

L18. OH reactivity calculated using the structure activity relationships of DeMore (1996) with an assumed *E*/R of 1700 K.

L19. OH reactivity calculated using the room temperature rate coefficient reported by Young et al. (2009a) with an assumed *E*/R of 1700 K.

L20. OH reactivity taken from IUPAC evaluation (Ammann et al., 2017).

L21. OH reactivity taken from Chen et al. (2011).

L22. The OH rate coefficient data were taken from Baasandorj and Burkholder (2016).

L23. No experimental data available for the OH reaction and the lifetimes were estimated based on reactivity trends of fluorinated ethenes and propenes.

L24. The OH rate coefficient was taken from Jia et al. (2013).

L25. The OH rate coefficient data were taken from Baasandorj et al. (2018).

L26. Assumed to be the same as HFO-1336mzz*(E)*.

L27. OH reactivity was calculated using the room temperature rate coefficient reported by Sulbaek Andersen et al. (2005) with the *E*/R obtained for the OH + CH_2=$CHCF_3$ reaction, -170 K.

L28. OH reactivity was calculated using the rate coefficient data from Papadimitriou and Burkholder (2016).

L29. Lifetimes recommended in the SPARC CCl_4 report (2016).

L30. Lifetime due to reaction with Cl-atom of 259 years taken from the SPARC lifetime report, Chapter 5 model-mean (Ko et al., 2013).

L31. Local lifetime estimated as similar to that of *(E)*-CF_3CH=CHCl.

L32. Local lifetime estimated as similar to that of CF_3CF=CF_2.

L33. Stratospheric photolysis lifetime was estimated using the empirical relationship given in Orkin et al. (2013).

L34. Lifetime estimated to be similar to that of CBr_2F_2.

L35. OH rate coefficient taken from Orkin et al. (2017).

L36. Tropospheric (84,150 years) and mesospheric (2,531 years) lifetimes taken from 2-D model calculations in Papadimitriou et al. (2013a).

L37. Estimated total lifetime lower-limit.

L38. Total lifetime range taken from Takahashi et al. (2002) including mesospheric loss due to Lyman-α (121.567 nm) photolysis, dissociative electron attachment, and solar proton event loss processes.

L39. Total lifetime estimate based on the increase in Lyman-α (121.567 nm) absorption cross section (increased photolysis rate) with increasing number of –CF_2- groups in the perfluorocarbon.

L40. OH rate coefficient taken from Zhang et al. (2017).

L41. Room temperature OH rate coefficient taken from Young et al. (2009b) with the *E*/R assumed to be the same as for the OH + CF_3CF=CF_2 reaction, -415 K.

L42. Tropospheric OH partial lifetime estimated from that for $CF_3CH_2OCF_2CHF_2$ by adjusting for the reactivity contribution of –CF_2CHF_2 determined from the reactivity of $CF_3CF_2OCF_2CHF_2$.

L43. Tropospheric OH partial lifetime estimated from those for CF_3OCH_3 and $CHF_2CH_2CF_3$.

L44. Room temperature OH rate coefficient taken from Oyaro et al. (2005) with an assumed *E*/R of 500 K.

L45. Estimated OH reactivity.

L46. Tropospheric OH partial lifetime estimated to be greater than that of $CHF_2CF_2OCHF_2$ and less than that of $CHF_2CF_2CF_2CF_3$.

L47. Tropospheric OH partial lifetime estimated to be the same as for $CF_3OCH_2CF_3$.

L48. Tropospheric OH partial lifetime estimated to be the same as for $CH_3OCF_2CHF_2$.

L49. Tropospheric OH partial lifetime estimated from the sum of the OH partial lifetimes of $CF_3CF_2OCF_2CHF_2$ and $CF_3CF_2OCH_2CHF_2$.

L50. Room temperature OH rate coefficient taken from Oyaro et al. (2004) with an assumed *E*/R of 500 K.

L51. Tropospheric OH partial lifetime estimated in Bravo et al. (2011b).

L52. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Chen et al. (2005).

L53. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Christensen et al. (1998) with an assumed *E*/R of 1000 K.

L54. OH reactivity assumed to be similar to that of HCF_2OCF_2H.

L55. OH reactivity assumed to be similar to HG-10.

L56. OH reactivity assumed to be similar to HG-01.

L57. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Javadi et al. (2007) with an assumed *E*/R of 1000 K.

L58. Tropospheric OH partial lifetime calculated using the structure activity relationship estimated OH rate coefficient in Urata et al. (2003).

L59. OH rate coefficient calculated theoretically in Blowers et al. (2008).

L60. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Sulbaek Andersen et al. (2004) with an assumed *E*/R of 1000 K.

L61. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Wallington et al. (2004) with an assumed *E*/R of 1000 K.

L62. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Tokuhashi et al. (1999).

L63. Lifetime estimated in Young et al. (2006).

L64. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Mashino et al. (2000) with an assumed *E*/R of -400 K.

L65. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Chen et al. (2004a).

L66. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Chen et al. (2004b). There is no experimental data available for perfluorobutyl formate and it is assumed to be similar to perfluoroporopyl formate.

L67. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Oyaro et al. (2004) with an assumed *E*/R of 500 K.

L68. Lifetime estimated in Bravo et al. (2011a).

L69. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Chen et al. (2006).

L70. Tropospheric OH partial lifetime estimated in Christensen et al. (1998) based on comparison with Cl atom reactivity.

L71. OH reactivity assumed to be the same as for perfluorobutyl acetate.

L72. OH reactivity assumed to be the same as for $CF_3C(O)OCH_2CH_3$.

L73. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Blanco and Teruel (2007) with an assumed *E*/R of 1000 K.

L74. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Oyaro et al. (2005) with an assumed *E*/R of 1500 K.

L75. Tropospheric OH partial lifetime calculated using the room temperature OH rate coefficient from Oyaro et al. (2004) with an assumed *E*/R of 1000 K.

L76. Tropospheric OH partial lifetime calculated using the OH rate coefficient from Antiñolo et al. (2010).

L77. OH rate coefficient taken from Antiñolo et al. (2011).

L78. OH reactivity estimated by comparison with other fluoroalcohols.

L79. OH reactivity calculated using the room temperature rate coefficient reported by Ellis et al. (2003) with an assumed *E*/R of 1000 K.

L80. OH rate coefficient taken from Bravo et al. (2010).

L81. OH rate coefficient taken from Antiñolo et al. (2012).

L82. Tropospheric photolysis is the dominant loss process for perfluoroketones (Jackson et al., 2011; Taniguchi et al., 2003).

L83. OH reactivity assumed to be similar to that of NOVEC-1230.

L84. Lifetime primarily determined by UV photolysis with a decreasing local lifetime with increasing altitude.

L85. Lifetime estimates taken from the 3-D model simulations of Youn et al. (2010).

L86. Lifetime range is representative of the variation in local photolysis partial lifetime with time and location of emission.

L87. Photolysis lifetimes taken from Mössinger et al. (1998) for CH_2BrI and Roehl et al. (1997) for CH_2ClI, CH_3CH_2I, $CH_3CH_2CH_2I$, CH_3CHICH_3.

L88. OH reactivity assumed to be similar to that of CH_2Br_2.

L89. OH reactivity taken from Zhang et al. (2011).

L90. OH reactivity taken from Zhang et al. (2012)

L91. Photolysis and OH reactivity assumed the same as for CF_3I.

L92. Heterogeneous processing is the predominate removal process.

L93. Lifetime reported in Brühl et al. (2012).

L94. Lifetimes taken from Papadimitrou et al. (2008) and Mühle et al. (2009).

ODP Footnotes

O1. See Chapter 1, Section 1.5.1.

O2. Negligible and assigned a value of zero.
O3. ODP taken from WMO (2014) Table 5.2.
O4. A greater ODP value was reported from the 2-D model calculations in Davis et al. (2016): 0.95 (CFC-113), 0.78 (CFC-114), 0.44 (CFC-115), 1.01 (CFC-12), and 1.06 (CCl_4).
O5. Taken from Montreal Protocol.
O6. ODP taken from the 2-D model calculations in Davis et al. (2016). The semi-empirical ODP reported in Laube et al. (2014) is consistent with the latter Davis et al. (2016) value, but has a larger uncertainty range.
O7. ODP taken from Kloss et al. (2014).
O8. ODP taken from the 2-D model calculations in Papadimitriou et al. (2013b).
O9. Semi-empirical ODP calculated using empirical relationship of the fractional release factor with stratospheric lifetime given in Papanastasiou et al. (2018).
O10. Taken from Papanastasiou et al. (2018).
O11. ODP taken from WMO (2011).
O12. Upper-limit of ODPs of short-lived substances reported in the studies of Brioude et al. (2010) (C_2H_5Br, CH_2CBrCF_3, n-C_3H_7Br, C_2HCl_3, CCl_3CHO, CH_3I, CF_3I, C_3F_7I, CH_2ClI, $CHBr_3$), Wuebbles and co-workers (Patten et al., 2011; Patten and Wuebbles, 2010; Wuebbles et al., 2011; Wuebbles et al., 2009; Youn et al., 2010) (C_3H_7Br, C_2HCl_3, C_2Cl_4, HFO-1233zd, *(E)*-CHCl=CHCl, CF_3I, and CH_3I), and Tegtmeier et al. (2012) (CH_2Br_2, $CHBr_3$). The derived ODPs in these studies were shown to be strongly dependent on the region and season of the substance emission with the greatest values obtained for emissions in the Indian subcontinent.
O13. Taken from Langbein et al. (1999).
O14. Value not available.
O15. Assumed to be <0.02 for surface emission.
O16. Assumed to be the same as for CF_3I.

RE, GWP, and GTP Footnotes

R1. Radiative metrics taken from IPCC (2013).
R2. RE calculated using the room temperature infrared absorption spectrum reported in the Pacific Northwest National Laboratory (PNNL) database, https://secure2.pnl.gov/nsd/nsd.nsf (Sharpe et al., 2004).
R3. RE taken from recommendation given in Hodnebrog et al. (2013), which was based on a combination of literature review of experimental data and re-analysis.
R4. Radiative metrics calculated using the infrared absorption spectrum reported in Davis et al. (2016) and the lifetime reported here.
R5. Radiative metrics calculated using the infrared absorption spectrum reported in Papadimitriou et al. (2013b) and the lifetime reported here.
R6. Radiative metrics calculated using the theoretically calculated infrared absorption spectrum in Papanastasiou et al. (2018) and lifetimes given here.
R7. Radiative metrics calculated using the theoretically calculated infrared absorption spectrum and lifetimes reported in Papanastasiou et al. (2018).
R8. Radiative metrics calculated using the infrared spectrum and lifetimes reported in McGillen et al. (2015).
R9. Radiative efficiency not available.
R10. Radiative metrics calculated using the RE reported in Le Bris et al. (2018) and the lifetime reported here.
R11. Radiative metrics calculated using the infrared spectrum in Baasandorj and Burkholder (2016).
R12. Radiative metrics calculated using the RE reported in Jai et al. (2013) with lifetime and stratospheric temperature corrections applied here using the lifetimes reported here.
R13. Radiative metrics calculated using the infrared spectrum in Baasandorj et al. (2018).
R14. Radiative metrics calculated using the infrared spectrum in Papadimitriou and Burkholder (2016).
R15. Radiative metrics calculated using the infrared spectrum in Wallington et al. (2016).
R16. Radiative metrics calculated using the infrared spectrum in Gierczak et al. (2014).
R17. Radiative metrics calculated using the infrared spectrum in Orkin et al. (2017).
R18. Infrared absorption spectrum taken from Bernard et al. (2018).
R19. RE taken from recommendation given in Hodnebrog et al. (2013), which was based on theoretically calculated infrared absorption spectra and analysis.

R20. Radiative metrics calculated using the RE reported in Zhang et al. (2017) and the lifetime reported here.
R21. Assumed to be similar to NOVEC-1230.
R22. Assumed negligible.
R23. Assumed to be similar to that of CF_3I.

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