Supporting Information

Global emissions of HFC-143a (CH_3CF_3) and HFC-32 (CH_2F_2) from *in situ* and air archive atmospheric observations

S. O'Doherty[1], M. Rigby[1], J. Mühle[2], D.J. Ivy[3], B.R. Miller[4,5], D. Young[1], P.G. Simmonds[1], S. Reimann[6], M.K. Vollmer[6], P.B. Krummel[7], P.J. Fraser[7], L.P. Steele[7], B. Dunse[7], P.K. Salameh[2], C.M. Harth[2], T. Arnold[2], R.F. Weiss[2], J. Kim[2], S. Park[8], S. Li[9], C. Lunder[10], O. Hermansen[10], N. Schmidbauer[10], L.X. Zhou[11], B. Yao[11], R.H.J. Wang[12], A.J. Manning[13], and R.G. Prinn[3].

[1]Atmospheric Chemistry Research Group, University of Bristol, Bristol, BS8 1TS, UK.

[2]Scripps Institution of Oceanography, University of California, San Diego, La Jolla, California, USA.

[3]Department of Earth, Atmospheric and Planetary Sciences, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA.

[4]Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado, USA

[5]Global Monitoring Division, ESRL, NOAA, Boulder, Colorado, USA

[6]Laboratory for Air Pollution and Environmental Technology, Swiss Federal Laboratories for Materials Testing and Research (Empa), Dübendorf, Switzerland.

[7]Centre for Australian Weather and Climate Research, CSIRO Marine and Atmospheric Research, Aspendale, Victoria, Australia.

[8]Departement of Oceanography, Kungpook National University, Sangju, Republic of Korea.

[9]Research Institute of Oceanography, Seoul National University, Seoul, South Korea

[10]Norwegian Institute for Air Research (NILU), Kjeller, Norway

[11]Chinese Academy of Meteorological Sciences (CAMS), Beijing, China

[12]School of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta, Georgia, USA.

[13]UK Meteorological Office, Exeter, UK.

Contents:

Table S1 Northern Hemisphere archive analyses. HFC-143a dry air mole fractions, associated precisions and number of measurements (n). Samples were measured at Scripps Institution of Oceanography.

Sample ID	Time	Mole Fraction (ppt)	Precision (1–σ)	n
CDK63981Q	1977-10-04	0.078	0.027	7
CC10150	1978-08-10	0.033	0.011	3
RKHA5178	1986-09-10	0.258	0.006	4
EU05	1989-05-21	0.362	0.000	1
HH26936	1991-03-29	0.508	0.006	3
CC70135	1991-04-23	0.519	0.022	4
CC70015	1994-03-22	0.666	0.023	2
CC70345	1994-03-22	0.637	0.055	2
CDK1645	1995-10-29	0.889	0.031	6
15L-960418	1996-04-18	1.053	0.008	2
J-036	1998-01-31	1.595	0.045	5
TH980131.5258	1998-01-31	1.617	0.021	3
LL9082	1998-06-02	1.756	0.031	9
J-040	1999-04-01	2.113	0.038	28
J-043	1999-04-01	2.128	0.040	21
CDK6074Q	2000-02-17	2.425	0.045	4
J-064	2000-04-27	2.705	0.074	4
J-067	2000-04-27	2.585	0.000	1
TH00E000427	2000-04-27	2.677	0.051	18
TH00F_5395	2000-04-27	2.617	0.037	10
5404	2000-04-28	2.670	0.021	14
J-061	2000-04-28	2.692	0.074	12
Smethie4304	2002-05-28	3.901	0.007	2
J-070	2003-04-20	4.569	0.052	11
J-071	2003-04-20	4.570	0.045	20
J-075	2003-04-20	4.578	0.047	20
J-076	2003-04-20	4.557	0.066	23
J-077	2003-04-20	4.564	0.038	21
J-078	2003-04-20	4.592	0.042	41
J-080	2003-04-20	4.588	0.054	12
J-081	2003-04-20	4.555	0.036	17
R1	2003-04-20	4.563	0.049	92
T-003	2003-04-20	4.612	0.083	49
T-003A	2003-04-20	4.579	0.057	96
T-003B	2003-04-20	4.568	0.053	60
LJ040223.100	2004-02-23	5.089	0.000	1
LJ040223.136	2004-02-23	5.103	0.095	19

LJ040223.169	2004-02-23	5.109	0.063	21
J-083	2005-03-14	6.042	0.042	20
J-084	2005-03-14	6.013	0.075	19
J-085	2005-03-14	6.029	0.086	34
J-086	2005-03-14	6.031	0.058	27
J-087	2005-03-14	6.017	0.064	21
J-088	2005-03-14	5.985	0.062	34
J-089	2005-03-14	6.036	0.074	23
J-090	2005-03-14	6.062	0.064	21
J-091	2005-03-14	6.072	0.061	24
J-092	2005-03-14	6.061	0.069	23
T-004	2005-03-14	5.991	0.056	53
T-004A	2005-03-14	6.019	0.053	33
TH050314.1000	2005-03-14	6.005	0.059	10
S2958	2005-05-23	6.219	0.046	3
S3011	2005-05-23	6.112	0.025	3
S3024	2005-05-24	6.134	0.052	3
S2956	2005-05-25	6.182	0.006	3
S3001	2005-05-25	6.212	0.052	3
J-093	2006-02-06	6.832	0.079	23
J-094	2006-02-06	6.803	0.061	21
J-095	2006-02-06	7.132	0.080	26
J-096	2006-02-06	6.943	0.104	34
J-097	2006-02-06	6.854	0.066	29
J-098	2006-02-06	6.939	0.089	23
J-099	2006-02-06	7.076	0.075	25
J-100	2006-02-06	7.131	0.092	22
T-005A	2006-02-06	6.785	0.070	50
T-005B	2006-02-06	6.788	0.057	67
T-005	2006-02-07	7.090	0.063	43
J-102	2007-03-20	7.989	0.088	21
J-104	2007-03-20	8.012	0.092	21
J-105	2007-03-20	8.020	0.098	21
J-106	2007-03-20	8.001	0.057	29
J-108	2007-03-20	7.992	0.079	20
J-109	2007-03-20	7.972	0.086	15
J-110	2007-03-20	7.951	0.097	21
J-112	2007-03-20	8.004	0.155	11
T-006	2007-03-20	8.011	0.054	41
T-006A	2007-03-20	8.007	0.061	42
T-006B	2007-03-20	7.998	0.068	51
J-113	2008-03-12	9.106	0.063	20
J-114	2008-03-12	9.108	0.057	20
J-115	2008-03-12	9.156	0.082	23
J-116	2008-03-12	9.107	0.069	35

J-117	2008-03-12	9.073	0.142	10
J-118	2008-03-12	9.135	0.080	20
T-007A	2008-03-12	9.157	0.080	10
T-007B	2008-03-12	9.187	0.063	29
T-008B	2009-03-03	10.387	0.088	11
J-119	2009-03-03	10.192	0.046	9
J-120	2009-03-03	10.331	0.128	10
J-121	2009-03-04	10.280	0.086	25
J-122	2009-03-03	10.396	0.073	11
J-123	2009-03-03	10.356	0.054	10
J-124	2009-03-02	10.228	0.102	10
J-125	2009-03-03	10.381	0.041	11
J-126	2009-03-04	10.228	0.128	13
J-127	2009-03-02	10.238	0.084	11
J-128	2009-03-03	10.321	0.109	12
T-009A	2010-03-17	11.453	0.035	10

Table S2 Southern Hemisphere archive analyses. HFC-143a dry air mole fractions, associated precisions and number of measurements (n). Measured at Centre for Australian Weather and Climate Research/CSIRO Marine and Atmospheric Research, Aspendale.

Sample ID	Time	Mole Fraction (ppt)	Precision (1–σ)	n
UAN780001	1978-04-26	0.077	0.0098	3
UAN780002	1978-07-07	0.086	0.0072	3
UAN790001	1979-02-06	0.101	0.0182	3
UAN910380	1981-05-20	0.124	0.0234	2
UAN910377	1984-01-20	0.171	0.0011	2
UAN840004	1984-05-23	0.179	0.01	4
UAN860001	1986-02-06	0.209	0.0169	4
UAN860005	1986-11-12	0.254	0.0131	4
UAN870006	1987-05-28	0.266	0.0195	4
UAN880002	1988-06-21	0.285	0.0197	4
UAN880003	1988-06-21	0.296	0.0156	6
UAN890002	1989-04-20	0.339	0.0255	4
UAN890005	1989-11-08	0.372	0.0199	4
UAN900027	1990-02-16	0.371	0.0319	4
UAN900048	1990-04-26	0.385	0.0162	5
UAN900008	1990-11-13	0.43	0.0364	4
UAN900051	1990-11-15	0.427	0.035	5
UAN910361	1991-08-29	0.458	0.0194	3
UAN920469	1992-03-18	0.476	0.0142	3
UAN920655	1992-09-23	0.507	0.0295	4
UAN930279	1993-03-02	0.506	0.0121	3
UAN940378	1994-02-11	0.554	0.0264	3
UAN940679	1994-04-27	0.579	0.008	3
UAN941096	1994-10-04	0.605	0.019	4
UAN950527	1995-03-13	0.634	0.0203	4
UAN950789	1995-06-13	0.67	0.0275	6
UAN950894	1995-08-02	0.69	0.0387	4
UAN960115	1995-10-24	0.705	0.0204	4
UAN960051	1995-12-04	0.728	0.0063	3
UAN960957	1996-05-28	0.811	0.0121	5
UAN961164	1996-08-21	0.812	0.0429	3
UAN961409	1996-10-03	0.855	0.0167	3
UAN970092	1996-11-20	0.875	0.0332	4
UAN970008	1997-01-07	0.878	0.036	5
UAN970010	1997-01-07	0.876	0.015	3
UAN970011	1997-01-07	0.918	0.0351	3

UAN970380	1997-03-13	0.936	0.036	14
UAN970754	1997-04-04	0.993	0.0224	4
UAN970756	1997-05-30	0.986	0.0203	5
UAN971115	1997-07-15	1.039	0.0348	3
UAN980724	1998-04-15	1.226	0.0279	5
UAN980918	1998-06-25	1.322	0.0431	6
UAN981563	1998-10-15	1.411	0.0331	16
UAN991060	1999-02-17	1.522	0.0369	6
UAN991062	1999-04-13	1.577	0.0344	4
UAN991381	1999-08-04	1.761	0.0552	3
UAN992045	1999-11-16	1.816	0.0361	5
UAN992982	2000-03-14	1.939	0.0242	6
UAN993562	2000-09-29	2.216	0.0782	4
UAN993563	2001-01-15	2.354	0.0342	7
UAN994885	2001-07-19	2.645	0.0196	3
UAN994886	2002-06-20	3.116	0.0362	4
UAN995445	2003-02-17	3.501	0.0308	6
UAN996454	2003-05-21	3.617	0.0321	3
UAN996455	2003-10-03	3.933	0.0899	4
UAN996456	2004-01-20	4.074	0.0764	3
UAN998318	2004-01-22	4.058	0.0837	5
UAN996457	2004-04-08	4.279	0.0287	3
UAN996458	2004-06-17	4.394	0.0559	3
UAN997089	2004-12-01	4.759	0.0769	16
UAN997090	2005-02-10	4.819	0.0597	5
UAN998005	2005-06-28	5.21	0.0641	14
UAN998006	2005-10-05	5.302	0.0727	8
UAN998195	2006-02-10	5.633	0.0546	14
UAN998852	2006-12-11	6.292	0.0945	5

Table S3 Northern Hemisphere archive analyses. HFC-32 dry air mole fractions, associated precisions and number of measurements (n). Samples were measured at Scripps Institution of Oceanography.

Sample ID	Time	Mole Fraction (ppt)	Precision (1–σ)	n
LL9082	1998-06-02	0.121	0.072	5
J-040	1999-04-01	0.149	0.046	11
J-067	2000-04-27	0.257	0.000	1
TH00F_5395	2000-04-27	0.220	0.021	10
5404	2000-04-28	0.218	0.021	3
J-061	2000-04-28	0.222	0.000	1
Smethie4304	2002-05-28	0.535	0.026	2
J-070	2003-04-20	0.672	0.027	10
J-071	2003-04-20	0.657	0.037	20
J-075	2003-04-20	0.671	0.030	20
J-076	2003-04-20	0.650	0.035	23
J-077	2003-04-20	0.660	0.041	21
J-078	2003-04-20	0.630	0.057	45
J-080	2003-04-20	0.660	0.045	12
J-081	2003-04-20	0.636	0.041	18
R1	2003-04-20	0.658	0.033	91
T-003	2003-04-20	0.656	0.039	52
T-003A	2003-04-20	0.659	0.029	88
T-003B	2003-04-20	0.659	0.033	65
LJ030627.120	2003-06-27	0.767	0.045	59
LJ030627.146	2003-06-27	0.782	0.063	27
LJ030627.5251	2003-06-27	0.777	0.079	4
LJ040223.100	2004-02-23	0.890	0.000	1
LJ040223.136	2004-02-23	0.866	0.065	19
LJ040223.169	2004-02-23	0.861	0.076	22
LJ041012.5211	2004-10-12	1.207	0.052	8
J-083	2005-03-14	1.474	0.025	19
J-084	2005-03-14	1.486	0.037	18
J-085	2005-03-14	1.543	0.038	32
J-086	2005-03-14	1.501	0.038	29
J-087	2005-03-14	1.480	0.046	22
J-088	2005-03-14	1.504	0.042	32
J-089	2005-03-14	1.469	0.042	23
J-090	2005-03-14	1.461	0.056	23
J-091	2005-03-14	1.465	0.031	24

J-092	2005-03-14	1.478	0.049	22
T-004	2005-03-14	1.479	0.035	55
T-004A	2005-03-14	1.533	0.042	31
TH050314.1000	2005-03-14	1.484	0.039	11
S2958	2005-05-23	1.485	0.059	3
S3024	2005-05-24	1.502	0.030	3
S2956	2005-05-25	1.484	0.027	3
J-095	2006-02-06	2.022	0.053	24
J-096	2006-02-06	1.797	0.052	34
J-098	2006-02-06	1.847	0.066	23
J-099	2006-02-06	1.841	0.069	25
J-100	2006-02-06	2.067	0.068	22
T-005A	2006-02-06	1.796	0.065	51
T-005B	2006-02-06	1.830	0.054	65
T-005	2006-02-07	2.018	0.085	44
J-104	2007-03-20	2.696	0.074	21
J-107	2007-03-19	2.432	0.073	10
J-109	2007-03-20	2.706	0.092	15
J-112	2007-03-20	2.724	0.081	21
T-006	2007-03-20	2.682	0.048	42
T-006A	2007-03-20	2.683	0.050	41
J-113	2008-03-12	3.134	0.051	18
J-114	2008-03-12	3.077	0.081	21
J-115	2008-03-12	3.075	0.053	21
J-116	2008-03-12	3.127	0.068	36
J-117	2008-03-12	3.127	0.096	10
J-118	2008-03-12	3.099	0.062	21
T-007A	2008-03-12	3.177	0.085	11
T-007B	2008-03-12	3.174	0.049	27
T-008A	2009-03-02	3.885	0.018	7
T-008B	2009-03-03	3.962	0.085	11
J-119	2009-03-02	3.890	0.094	10
J-120	2009-03-03	3.953	0.062	10
J-121	2009-03-04	3.958	0.064	23
J-122	2009-03-03	3.973	0.122	11
J-123	2009-03-03	3.985	0.116	11
J-124	2009-03-02	3.929	0.082	10
J-125	2009-03-03	3.927	0.102	11
J-126	2009-03-04	3.910	0.090	12
J-127	2009-03-02	3.877	0.078	11
J-128	2009-03-03	3.953	0.079	11

Table S4 Southern Hemisphere archive analyses. HFC-32 dry air mole fractions, associated precisions and number of measurements (n). Measured at Centre for Australian Weather and Climate Research/CSIRO Marine and Atmospheric Research, Aspendale.

Sample ID	Time	Mole Fraction (ppt)	Precision (1–σ)	n
UAN970756	1997-05-30	0.070	0.0000	1
UAN980918	1998-06-25	0.110	0.0000	1
J-042	1999-04-01	0.155	0.0350	13
UAN20101335	2000-03-01	0.140	0.0210	2
UAN992982	2000-03-14	0.140	0.0460	3
UAN993563	2001-01-15	0.160	0.0290	4
UAN994885	2001-07-19	0.210	0.0170	6
UAN994886	2002-06-20	0.310	0.0390	6
UAN995445	2003-02-17	0.360	0.0320	5
UAN996455	2003-10-03	0.440	0.0120	5
UAN998318	2004-01-22	0.500	0.0230	6
UAN997089	2004-12-01	0.657	0.0433	18
UAN997090	2005-02-10	0.680	0.0350	5
UAN998005	2005-06-28	0.883	0.0377	18
UAN998195	2006-02-10	1.017	0.0670	16
G-139	2006-10-04	1.290	0.0540	6
UAN998425	2006-10-19	1.300	0.0410	6
UAN998852	2006-12-11	1.320	0.0420	5
UAN998898	2007-05-08	1.540	0.0490	5
UAN999276	2007-11-22	1.750	0.0470	5
UAN999756	2008-08-12	2.140	0.0800	6
UAN20100047	2008-12-16	2.280	0.0630	5
UAN20100609	2009-03-06	2.360	0.0400	8
G-182	2010-12-16	3.420	0.0795	80