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In situ temperature measurements in the upper troposphere and lowermost stratosphere from 2 decades of IAGOS long-term routine observation

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Table S1: Temperature in the LMS between 1995 and 2012, averaged over seasons and regions. The numbers correspond to the 1-minute mean data.

Season	Region	Mean±stdev in K	Median in K	Number *1000	Season	Region	Mean±stdev in K	Median in K	Number *1000
MAM	North Canada	222.2±4.3	222.8	42	MAM	Greenland	223.3±3.3	223.4	78
JJA		226.1±2.1	225.8	28	JJA		226.9±1.7	226.8	80
SON		221.6±3.0	221.8	44	SON		223.3±2.6	223.7	81
DJF		218.4±4.2	218.2	73	DJF		218.0±3.4	218.1	100
MAM	Scandinavia	221.9±3.8	221.3	28	MAM	North Asia	220.2±4.5	221.1	122
JJA		226.0±2.1	226.1	22	JJA		227.3±1.6	227.6	94
SON		221.3±2.5	221.8	23	SON		219.8±2.7	220.2	103
DJF		216.4±2.6	216.6	20	DJF		214.0±1.9	213.8	82
MAM	North America	222.8±1.9	222.8	145	MAM	North Atlantic	223.3±1.8	223.6	374
JJA		225.2±1.2	225.3	81	JJA		226.4±0.9	226.3	309
SON		223.2±2.1	223.5	107	SON		224.6±1.9	224.4	291
DJF		221.6±1.9	221.3	185	DJF		221.2±1.6	221.2	342
MAM	Europe	219.9±1.9	220.1	283	MAM	Central Asia	219.8±2.5	220.0	199
JJA		224.8±1.6	224.7	209	JJA		226.2±1.3	226.4	81
SON		220.8±2.1	220.4	183	SON		220.6±2.2	220.5	129
DJF		218.1±1.7	217.9	252	DJF		217.9±2.5	217.4	184
MAM	Middle America	-	-	0	MAM	Tropical Atlantic	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0
MAM	North Africa	-	-	0	MAM	Tropical Asia	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0
MAM	South America	-	-	0	MAM	South Africa	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0

Table S2: Temperature in the TPL between 1995 and 2012, averaged over seasons and regions. The numbers correspond to the 1-minute mean data.

Season	Region	Mean±stdev in K	Median in K	Number *1000	Season	Region	Mean±stdev in K	Median in K	Number *1000
MAM	North Canada	214.1±2.0	214.5	3	MAM	Greenland	214.1±2.5	214.4	16
JJA		218.5±1.4	218.2	8	JJA		219.7±1.1	219.6	30
SON		215.9±2.3	216.5	4	SON		216.5±2.7	217	20
DJF		209.8±1.4	210	6	DJF		210.6±2.3	210.6	23
MAM	Scandinavia	213.6±3.9	215.4	2	MAM	North Asia	212.4±3.3	212.6	26
JJA		218.9±1.9	218.8	7	JJA		219.2±1.3	219.1	54
SON		215.5±2.7	215.4	4	SON		213.3±2.3	213.5	34
DJF		209.6±2.0	210.1	3	DJF		208.4±1.8	208.5	17
MAM	North America	215.4±1.7	215.3	64	MAM	North Atlantic	214.3±1.7	214.4	197
JJA		219.3±1.4	219.3	61	JJA		219.2±1.2	219.4	229
SON		217.2±1.9	217.4	53	SON		216.9±1.9	217	453
DJF		214.4±1.6	214.4	54	DJF		212.4±1.4	212.2	136
MAM	Europe	214.2±1.5	214.4	168	MAM	Central Asia	214.4±2.0	214.4	113
JJA		219.4±1.5	219.4	163	JJA		219.4±1.5	219.4	103
SON		215.3±1.9	215.2	148	SON		214.9±2.0	215.3	92
DJF		212.5±1.4	212.4	130	DJF		212.7±2.4	212.6	61
MAM	Middle America	-	-	0	MAM	Tropical Atlantic	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0
MAM	North Africa	-	-	0	MAM	Tropical Asia	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0
MAM	South America	-	-	0	MAM	South Africa	-	-	0
JJA		-	-	0	JJA		-	-	0
SON		-	-	0	SON		-	-	0
DJF		-	-	0	DJF		-	-	0

Table S3: Temperature in the UT between 1995 and 2012, averaged over seasons and regions. The numbers correspond to the 1-minute mean data.

Season	Region	Mean±stdev in K	Median in K	Number *1000	Season	Region	Mean±stdev in K	Median in K	Number *1000
MAM	North Canada	217.2±3.1	218.5	1	MAM	Greenland	215.5±3.2	216.1	8
JJA		222.5±1.6	221.9	2	JJA		222.1±1.4	221.9	13
SON		219.6±1.7	219.4	1	SON		219.6±3.1	220.1	15
DJF		210.0±3.2	209.5	1	DJF		212.1±1.9	212.3	22
MAM	Scandinavia	216.3±3.5	217	2	MAM	North Asia	214.6±4.1	214.4	11
JJA		223.8±.16	223.4	7	JJA		222.3±1.7	222.4	32
SON		219.2±2.8	219.5	7	SON		216.6±3.2	216.8	19
DJF		213.5±1.7	213.6	5	DJF		209.4±2.3	209.3	9
MAM	North America	221.4±1.7	221.3	136	MAM	North Atlantic	217.5±1.9	217.5	229
JJA		226.3±1.3	226.5	263	JJA		222.9±1.5	222.9	399
SON		223.6±2.2	224	190	SON		220.9±2.3	220.7	381
DJF		220.3±1.8	220.4	76	DJF		215.6±1.6	215.5	195
MAM	Europe	219.5±1.6	219.7	246	MAM	Central Asia	220.8±2.9	220.7	168
JJA		226.5±1.9	226.7	419	JJA		230.3±3.9	229.8	333
SON		221.6±2.3	221.3	383	SON		222.8±4.1	221.7	224
DJF		217.6±1.3	217.5	217	DJF		218.8±3.3	218.9	68
MAM	Middle America	229.1±4.6	228.5	6	MAM	Tropical Atlantic	226.0±2.3	225.6	109
JJA		228.2±5.1	227.9	3	JJA		227.6±2.4	228.1	86
SON		227.6±5.8	227.8	3	SON		226.0±2.5	226.2	87
DJF		229.7±4.5	229.2	7	DJF		225.5±2.6	225.9	98
MAM	North Africa	227.3±2.6	227.1	170	MAM	Tropical Asia	229.8±3.5	229.7	113
JJA		229.5±2.9	229.6	180	JJA		238.3±3.2	238.1	136
SON		226.9±2.7	226.3	184	SON		230.7±4.8	229.5	132
DJF		225.6±2.2	224.9	161	DJF		227.9±3.5	227.9	106
MAM	South America	230.2±1.7	229.8	39	MAM	South Africa	228.8±3.2	229.1	106
JJA		228.8±2.9	228.7	33	JJA		227.7±3.1	227.6	100
SON		228.8±2.5	229.2	28	SON		228.2±3.3	227.2	100
DJF		229.6±2.0	229.3	40	DJF		227.1±2.8	228.3	99

Table S4: Temperature trends of ERA-I and from the IAGOS observations within the LMS, TPL and UT as shown in table3 and compared to temperature trends derived from 17 years skipping the first (light gray) or last year (dark gray) in the analyses.

Region	ERA-I				IAGOS			
	ΔT_{18yr} K/dec	SE K/dec	$\Delta T_{17yr, first}$ K/dec	$\Delta T_{17yr, last}$ K/dec	ΔT_{18yr} K/dec	SE K/dec	$\Delta T_{17yr, first}$ K/dec	$\Delta T_{17yr, last}$ K/dec
LMS								
Greenland	-0.79	0.29	-1.03	-0.83	-1.39	0.29	-1.48	-1.45
North America	-0.25	0.21	-0.38	-0.21	-0.71	0.21	-0.73	-0.76
North Atlantic	+0.56	0.17	+0.53	+0.59	-0.05	0.17	+0.02	-0.01
Europe	+0.11	0.19	+0.12	+0.14	-0.53	0.20	-0.49	-0.62
TPL								
North America	+0.29	0.19	+0.11	+0.45	+0.23	0.20	-0.02	+0.42
North Atlantic	+0.46	0.15	+0.42	+0.62	+0.25	0.16	+0.20	+0.38
Europe	+0.20	0.15	+0.17	+0.19	-0.44	0.17	-0.46	-0.57
UT								
North America	-0.92	0.17	-0.99	-0.82	-1.08	0.18	-1.16	-1.00
North Atlantic	+0.38	0.18	+0.52	+0.58	+0.22	0.20	+0.33	+0.43
Europe	-0.24	0.14	-0.21	-0.29	-0.59	0.15	-0.55	-0.71
Central Asia	+0.66	0.33	+0.55	+0.91	+0.32	0.33	+0.27	+0.54
Tropical Asia	-0.58	0.39	-0.43	-0.24	-0.54	0.04	-0.30	-0.21