A global historical ozone data set and signatures of El Niño and the 11-yr solar cycle

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Supplementary material

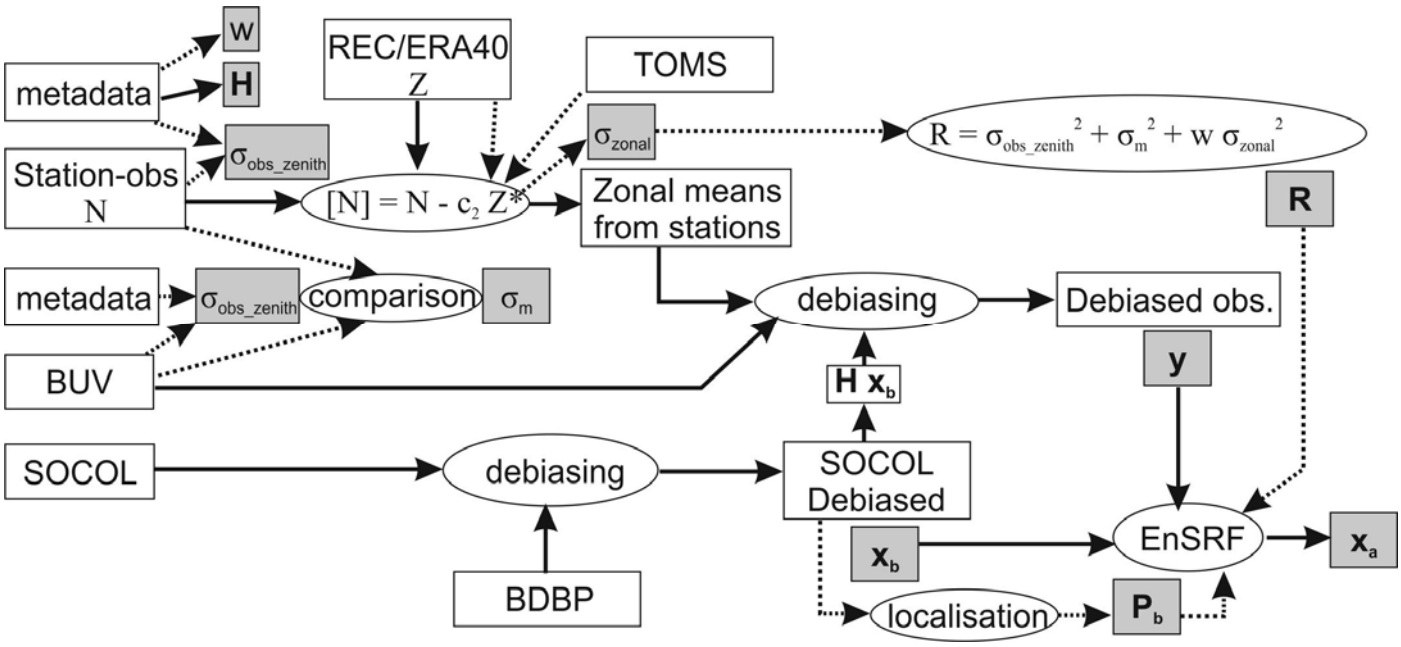

Figure S1. Schematic depiction of the approach.

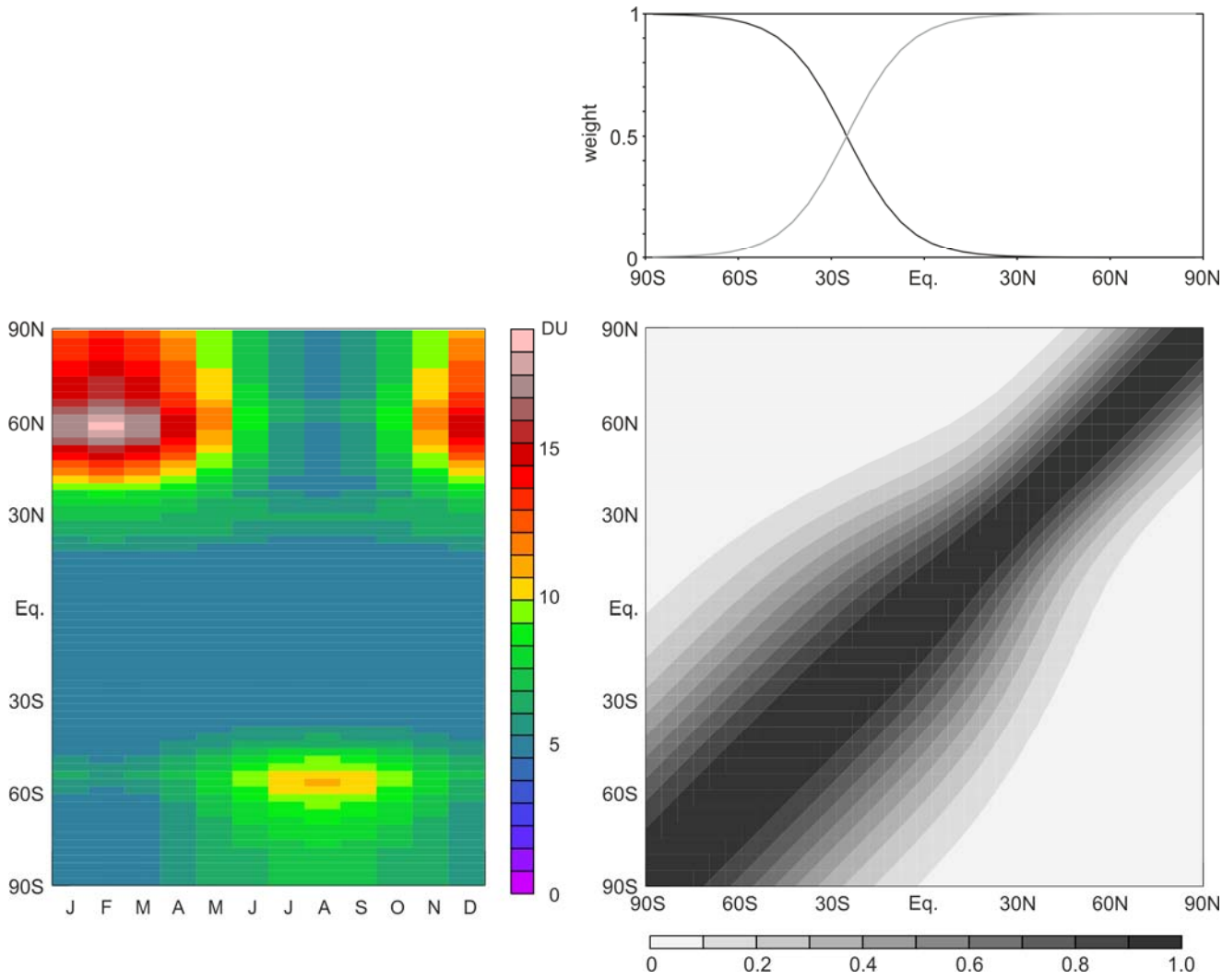

Figure S2. Left: Error of the zonal adjustment as a function of calendar month and latitude. Right: Localisation weights of the background error covariance matrix. The top panel shows the function *a* (grey is for boreal winter, black is for aural winter) used to determine the weights.

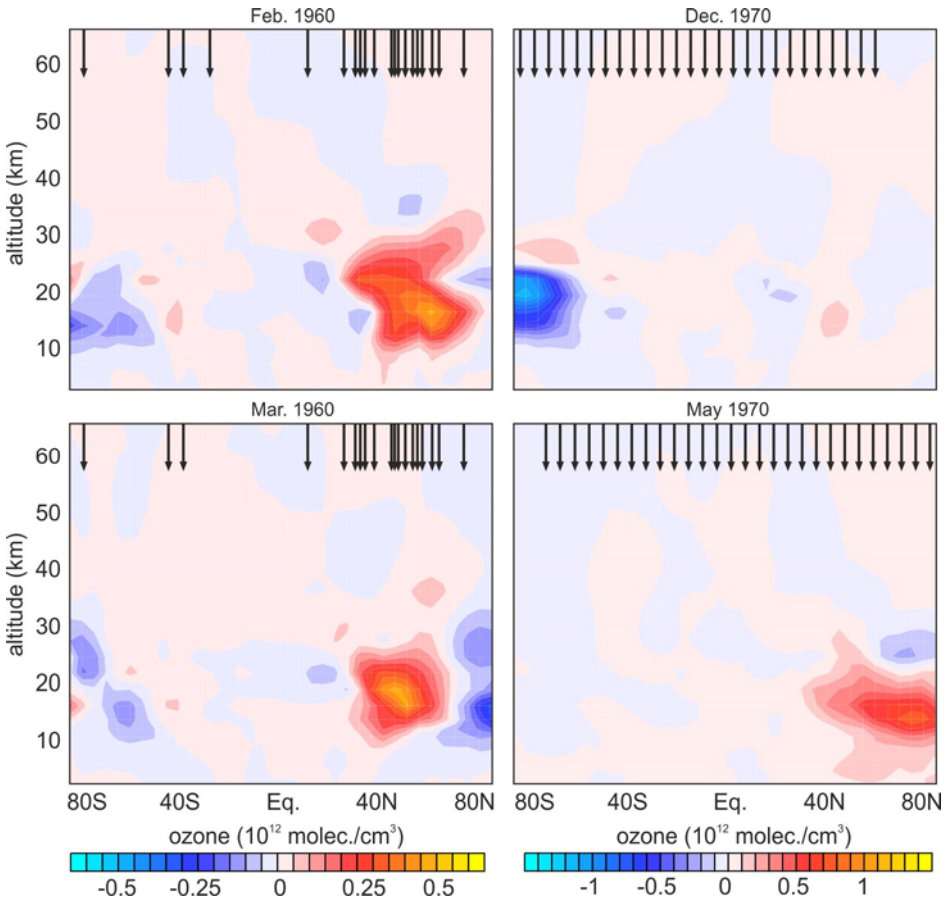

Figure S3. Results of the assimilation. Shown are the differences (assimilation minus background) for four sample months. Arrows indicate locations where observations (ground-based in the left two cases, BUV in the right two cases, note the different scale) were assimilated.

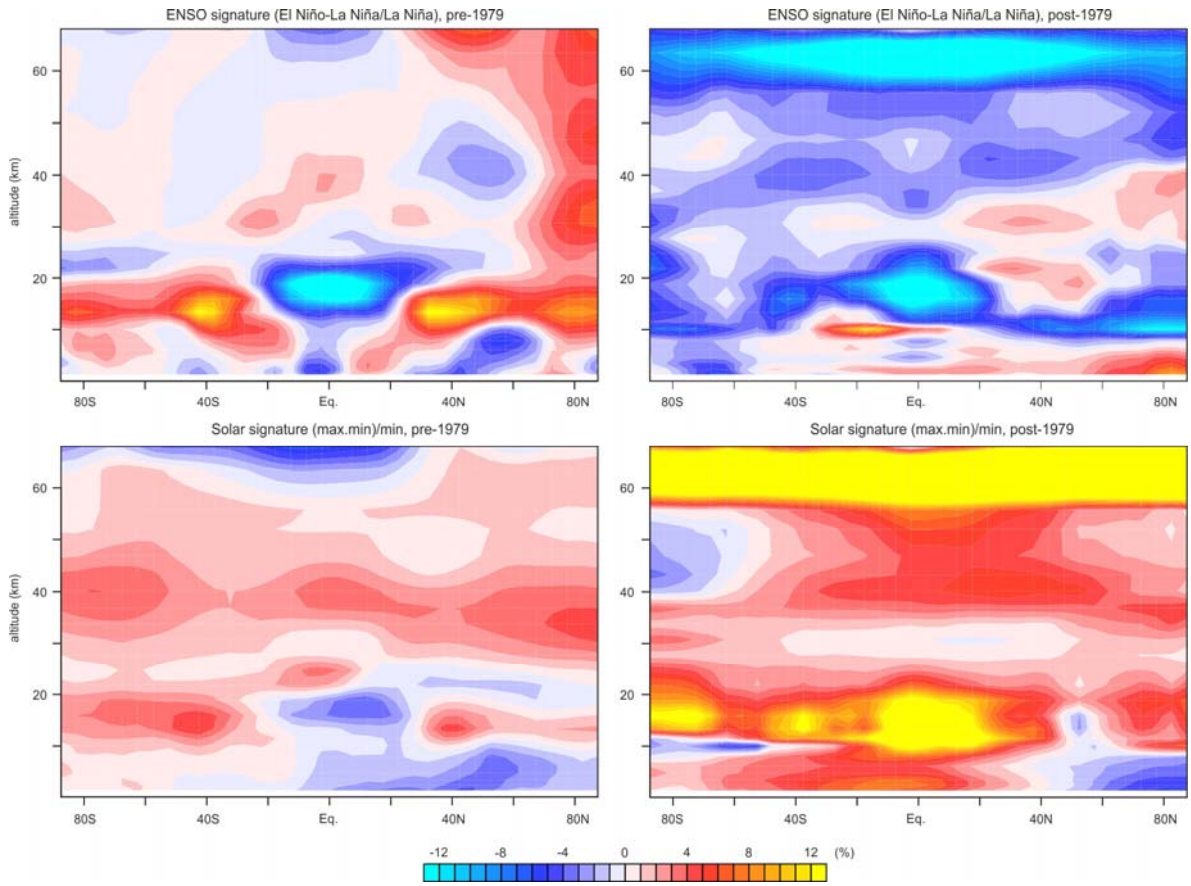

Figure S4. (top) Differences in ozone between El Niño and La Niña events in the pre-1979 period in HISTOZ (left) and the post-1979 period in BDBP. (bottom) Differences in ozone between solar maxima and solar minima in the pre-1979 period in HISTOZ (left) and the post-1979 period in BDBP. Note that the figures are the same as in Fig. 10 and 11, but plotted in terms of relative rather than absolute differences.

Table S1. List of stations with ground-based total ozone observatios used for the assimilation. Station start years in bracketrs denote changes in the instrument. Error 1 and 2 refer to the pre-1957 and post-1957 periods.

Station name	lon (°E)	lat (°N)	Start Year	n	Reference (pre-IGY only)	Source	error1	error2
Aarhus	10.6	56.3	1940 (1952)	227	Brönnimann et al. 2003ab	WOUDC	16	6
Aldergrove	-6.2	54.7	1952	54	Brönnimann et al. 2003ab	WOUDC	4	6
Alma-Ata	76.9	43.3	1974	58		WOUDC	8	6
Arosa	9.7	46.8	1926	588	Staehelin et al. 1998	WOUDC	4	4
Aspendale	145.1	-38.0	1957	256		WOUDC	8	6
Belsk	20.8	51.8	1963	185		WOUDC	8	6
Bismarck	-46.8	46.8	1957	216		WOUDC	8	6
Bombay	72.9	18.9	1936	17	Brönnimann et al. 2003ab	WOUDC	12	6
Brisbane	153.1	-27.4	1957	254		WOUDC	8	6
Buenos Aires	-58.5	-34.6	1965	156		WOUDC	8	6
Cairo	31.3	30.1	1928	135	Brönnimann et al. 2003ab	internal	8	6
Camborne	-5.3	50.2	1952	176	Brönnimann et al. 2003ab	WOUDC	12	6
Canberra	149.0	-35.3	1929	45	Brönnimann et al. 2003ab	internal	12	6
Caribou	-68.1	46.9	1958	199		WOUDC	8	6
Christchurch	172.6	-43.5	1928	116	Brönnimann et al. 2003ab	WOUDC	8	6
College	-147.5	64.7	1952	78	Brönnimann et al. 2003ab	WOUDC	16	6
Darwin	130.9	-12.4	1966	100		WOUDC	8	6
Dombas	9.1	62.1	1940	67	Svendby et al. 2003	WOUDC	8	6
Edmonton	-113.5	53.6	1950	282		WOUDC	8	6
Flagstaff	-111.7	35.2	1954	82		internal	8	6
HalleyBay	-26.7	-75.5	1957	94		WOUDC	8	6
Hemsby	1.7	52.7	1952	36	Brönnimann et al. 2003ab	WOUDC	8	6
Hobart*	147.5	-42.8	1967 (1973)	120		WOUDC	8	6
Huancayo	-75.3	-12.0	1964	176		WOUDC	8	6
Kagoshima	130.5	31.7	1958	236		WOUDC	8	6
King Edward Point	-36.5	-54.2	1971	91		WOUDC	8	6
Kodaikanal	77.5	10.2	1928	245	Brönnimann et al. 2003ab	internal	8	6
Lerwick	-1.2	60.1	1926 (1952)	295	Brönnimann et al. 2003ab	internal	4	6
Magny	2.1	48.7	1955	75	Brönnimann et al. 2003ab	WOUDC	8	6
Marseille	5.4	43.3	1927	22	Brönnimann et al. 2003ab	internal	8	6
Mauna Loa	-155.6	19.5	8	203		WOUDC	8	6
Minamitorishima	153.9	24.3	1958	66		WOUDC	8	6
Mount Abu	72.7	24.6	1951	197	Brönnimann et al. 2003ab	WOUDC	12	6
Nashville	-86.6	36.3	1962	188		WOUDC	8	6
New Delhi	77.2	28.6	1955	284		WOUDC	12	6
New York	-73.9	40.9	1941	42	Brönnimann et al. 2003ab	internal	16	6
Olso	10.7	60.0	1946	55	Svendby et al. 2003	WOUDC	8	6
Oxford	-1.2	51.8	1925	403	Vogler et al. 2006	WOUDC	4	4
Perth	115.9	-31.9	1969	113		WOUDC	8	6
Potsdam	13.0	52.3	1926 (1957)	175		WOUDC	8	6
Quetta	66.5	30.1	1958	170		WOUDC	8	6
Rome	12.2	42.1	1954	285	Brönnimann et al. 2003ab	WOUDC	8	6
Sapporo	141.3	43.1	1958	249		WOUDC	8	6
Spitsbergen	15.0	78.0	1950	127	Vogler et al. 2005	WOUDC	8	6
Sterling	-77.5	39.0	1957	84		WOUDC	8	6
Table Mountain	-117.3	34.1	1926	14	Brönnimann 2005	internal	20	6
Table Mountain	-117.3	34.1	1928	13		internal	8	6
Taipeh	121.4	25.1	1965	76		WOUDC	8	6
Tallahassee	-84.4	30.4	1964	134		WOUDC	8	6
Tateno	140.1	36.1	1955	277	Brönnimann et al. 2003ab	internal/WOUDC	8	6
Toronto	-79.5	43.8	1960	220		WOUDC	8	6
Tromsoe	19.0	69.7	1935	344	Hansen and Svenoe 2005	WOUDC	4	4
Uppsala	17.6	59.9	1951	175		WOUDC	8	6
Varanasi	83.0	25.3	1957	170		WOUDC	8	6
Vladivostok	131.9	43.1	1973	66		WOUDC	8	6
ZiKaWei	121.4	31.2	1932	122	Brönnimann et al. 2003ab	WOUDC	16	6