Supplementary information

Table captions Supplementary Information

Table S0. WOUDC station geographical information, including the WOUDC identification numbers. Station heights are in meters, N stands for the number of sonde measurements available for the entire period 1996-2001.

Table S1. As Table 1, but for all available WOUDC sonde stations. TM5 evaluation of UTLS partial O_3 columns (250-50 hPa) for a subset of available WOUDC sonde observations. Locations are ordered according to their latitude. The statistics shown here are the standard Pearson's correlation coefficient (R) for the six year period 1996-2001, the correlation for monthly means (Rm), the correlation for the 6-year climatological monthly means (Rcl), the average bias (Δ) and the root-mean-square differences (σ). Biases and differences are in Dobson Units (DU; 2.69×10^{18} molecules/cm^2). The bold numbers indicate the better statistical values for the comparison of sonde measurements and model results with assimilation compared to without assimilation. "Better" refers to larger correlations, smaller biases and smaller rms differences. Stations shown in Fig. 2 are indicated in grey. Statistics for all available sonde stations can be found in supplementary information Table S1.

Table S2. As supplementary Table S1 but for the tropospheric O_3 columns, based on ECMWF tropopause heights.

879 **Table S3**. Correlations (R^2) between the free TM5 run and the assimilation run for all
880 sonde locations in supplementary table S0 as well as the root-mean-square values (σ; in
881 DU) of the differences between the free TM5 run and the assimilation run. Shown are the
882 statistics for both UTLS and TTOC variations.
883
884 **Table S4.** As supplementary table S2 but for the TORA residuals, *i.e.* total O_3 column
885 observations minus assimilated stratospheric O_3 columns. Climatological monthly mean
886 statistics were not calculated due to insufficient sonde collocations for most sonde
887 stations. Stations shown in Fig. 3 are indicated in grey. The bold numbers indicate
888 statistics that have improved compared to the TM5 CARIOLLE assimilation TTOC's
889 (Table 2).

890

Station number, [name, country]	LAT	LON	ALT	N
stn018 [Alert, Canada]	82.5	-62.3	66	238
stn315 [Eureka, Canada]	80.0	-85.9	10	385
stn089 [Ny Alsund, Norway]	78.9	11.9	11	443
stn460 [Thule, Greenland]	76.5	-68.7	57	73
stn024 [Resolute, Canada]	74.7	-95.0	46	151
stn459 [Scoresbysund, Greenland]	70.5	-22.0	51	282
stn262 [Sodankyla, Finland]	67.4	26.6	179	223
stn404 [Jokioinen, Finland]	60.8	23.5	103	57
stn043 [Lerwick, United Kingdom]	60.1	-1.2	80	331
stn077 [Churchill, Canada]	58.7	-94.1	30	260
stn021 [Edmonton, Canada]	53.5	-114.1	766	277
stn076 [Goose Bay, Canada]	53.3	-60.4	36	264
stn221 [Legionowo, Poland]	52.4	21.0	96	381
stn174 [Lindenberg, Germany]	52.2	14.1	112	279
stn316 [de Bilt, the Netherlands]	52.1	5.2	4	300
stn257 [Vanscoy, Canada]	52.0	-107.0	510	5
stn318 [Valentia, Ireland]	51.9	-10.2	14	143
stn053 [Uccle, Belgium]	50.8	4.3	100	667
stn242 [Prague, Czechia]	50.0	14.4	304	274
stn099 [Hohenpeissenberg, Germany]	47.8	11.0	975	718
stn156 [Payerne, Switzerland]	46.5	6.6	491	946
stn040 [Haute Provence, France]	43.9	5.7	650	50
stn012 [Sapporo, Japan]	43.1	141.3	26	222
stn445 [Trinidad Head]	40.8	-124.2	0	74
stn308 [Madrid, Spain]	40.5	-3.6	631	201
stn067 [Boulder, USA]	40.0	-105.2	1689	47
stn348 [Ankara, Turkey]	40.0	32.9	891	105
stn107 [Wallops Island, USA]	37.8	-75.5	13	358
stn014 [Tateno, Japan]	36.1	140.1	31	312
stn418 [Huntsville, USA]	35.3	-86.6	196	104
stn336 [Ishfahan, Iran]	32.5	51.7	1550	24
stn007 [Kagoshima, Japan]	31.6	130.6	31	209
stn010 [New Delhi, India]	28.6	77.2	220	49
stn401 [Santa Cruz, Canary Islands]	28.5	-16.3	36	182
stn190 [Naha, Japan]	26.2	127.7	27	241
stn095 [Taipei, Taiwan]	25.0	121.4	11	49
stn344 [Hong Kong]	22.3	114.2	66	53
stn109 [Hilo, USA]	19.4	-155.0	0	125
stn187 [Poona, India]	18.5	73.8	559	37
stn205 [Thriruvananthapuram, India]	8.5	76.9	60	60
stn435 [Paramaribo, Surinam]	5.8	-55.2	7	107
stn443 [Sepang, Malaysia]	2.7	101.7	17	83
stn434 [San Christobal, Ecuador]	-0.9	-89.6	8	178
stn175 [Nairobi, Kenya]	-1.3	36.8	1795	214
stn448 [Malindi, Kenya]	-3.0	40.2	-6	44
stn219 [Natal, Brazil]	-5.9	-35.2	32	90
stn437 [Watukosek, Indonesia]	-7.5	112.6	50	55
stn328 [Ascension Island]	-8.0	-14.4	91	199
stn191 [Samoa]	-14.2	-170.6	77	189
stn432 [Papeete, Tahiti]	-18.0	-149.0	2	143
stn438 [Suva, Fiji]	-18.1	178.4	6	145
stn436 [La Reunion]	-21.1	55.5	24	86
stn265 [Irene, South Africa]	-25.9	28.2	1524	83
stn441 [Easter Island, Chile]	-27.2	-109.4	69	49
stn394 [Broad Meadows, Australia]	-37.7	144.9	110	134
stn254 [Laverton, Australia]	-37.9	144.8	21	128
stn256 [Lauder, New Zealand]	-45.0	169.7	370	167
stn029 [Macquarie Island, Australia]	-54.5	158.9	7	219
stn233 [Marambio]	-64.2	-56.7	196	79
stn101 [Syowa, Antarctica]	-69.0	39.6	21	411
stn400 [Maitri, Antarctica]	-70.5	11.4	330	53
stn323 [Neumayer, Antarctica]	-70.7	-8.3	42	453

891 **Table S0.**

		UTLS (250-50 hPa) assimilated GOME					UTLS (250-50 hPa) no assimilation				
Station	**lat**	**R**	**Rm**	**Rcl**	**Δ**	**σ**	**R**	**Rm**	**Rcl**	**Δ**	**σ**
stn018	82.5	0.71	0.78	0.98	18.2	30.0	***0.73***	***0.81***	0.98	***11.2***	***28.9***
stn315	80.0	0.60	0.74	0.92	25.4	32.7	***0.63***	***0.77***	0.92	***18.2***	***31.6***
stn089	78.9	0.56	0.73	***0.96***	9.6	***32.1***	***0.57***	***0.75***	0.94	***3.2***	32.3
stn460	76.5	0.56	0.68	***0.89***	20.4	***34.2***	0.56	***0.71***	0.86	***12.4***	34.3
stn024	74.7	0.76	***0.85***	0.95	20.0	27.9	***0.78***	0.84	0.95	***12.9***	***26.6***
stn459	70.5	0.78	0.86	0.95	11.5	23.2	***0.82***	***0.88***	0.95	***6.1***	***21.7***
stn262	67.4	0.72	0.82	0.97	***1.6***	25.1	***0.76***	***0.85***	0.97	-2.0	***23.5***
stn404	60.8	0.84	***0.94***	***0.94***	6.0	20.6	***0.87***	0.93	0.93	***2.9***	***19.1***
stn043	60.1	0.79	0.89	0.98	6.5	23.8	***0.85***	***0.93***	***0.99***	***3.1***	***20.8***
stn077	58.7	0.82	0.89	0.98	17.8	26.5	***0.84***	***0.91***	0.98	***9.6***	***24.6***
stn021	53.5	0.78	0.91	0.99	10.7	23.6	***0.82***	***0.92***	***1.00***	***4.5***	***21.5***
stn076	53.3	0.86	0.92	0.99	12.2	20.2	***0.88***	***0.93***	0.99	***4.0***	***18.4***
stn221	52.4	0.74	0.86	0.98	6.3	25.6	***0.82***	***0.91***	0.99	***0.8***	***22.0***
stn174	52.2	0.74	0.84	***0.98***	10.6	25.6	***0.80***	***0.89***	0.97	***5.7***	***22.7***
stn316	52.1	0.73	0.85	0.97	***-1.3***	23.1	***0.80***	***0.89***	***0.98***	-6.2	***20.3***
stn257	52.0	0.85			***1.4***	***7.8***	0.85			-4.7	8.3
stn318	51.9	0.67	0.78	0.90	***0.4***	27.3	***0.75***	***0.88***	***0.95***	-2.9	***24.6***
stn053	50.8	0.75	0.88	0.96	***0.4***	20.6	***0.84***	***0.94***	***0.98***	-5.4	***17.0***
stn242	50.0	0.65	0.65	***0.98***	8.9	30.7	***0.78***	***0.82***	0.94	***3.2***	***25.8***
stn099	47.8	0.74	0.86	0.97	8.9	24.7	***0.81***	***0.91***	***0.98***	***3.2***	***21.8***
stn156	46.5	0.76	0.88	0.98	***1.4***	19.2	***0.84***	***0.93***	***0.99***	-4.0	***15.9***
stn040	43.9	0.72	0.75	-0.75	***-10.2***	22.1	***0.81***	***0.84***	***0.02***	-12.2	***18.1***
stn012	43.1	0.88	0.95	***1.00***	***-0.9***	20.2	***0.92***	***0.96***	0.99	-10.3	***16.6***
stn445	40.8	0.77	0.80	0.89	***-1.0***	21.3	***0.83***	***0.87***	***0.94***	-7.9	***18.2***
stn308	40.5	0.76	0.77	0.88	***-0.9***	17.7	***0.85***	***0.88***	***0.96***	-6.5	***14.6***
stn067	40.0	0.84	0.96		***-9.1***	14.6	0.84	0.96		-12.1	***14.4***
stn348	40.0	0.85	0.88	0.98	***1.9***	17.8	***0.89***	***0.90***	0.98	-5.1	***15.3***
stn107	37.8	0.72	0.81	0.97	5.8	20.8	***0.74***	***0.82***	***0.98***	***0.8***	***20.0***
stn014	36.1	0.83	0.94	0.98	***-18.2***	14.9	***0.87***	***0.95***	***0.99***	-25.4	***14.1***
stn418	35.3	0.78	0.84	0.92	***-6.1***	11.5	***0.81***	***0.87***	***0.95***	-12.2	11.5
stn336	32.5	0.73	0.73	0.74	***-3.8***	15.3	***0.76***	***0.76***	***0.80***	-7.6	***14.7***
stn007	31.6	0.77	0.82	***0.96***	***-8.6***	***9.0***	0.77	0.82	0.95	-12.3	9.4
stn010	28.6	0.20	0.25	0.44	***-5.5***	16.9	***0.25***	***0.29***	0.44	-7.2	***16.6***
stn401	28.5	0.78	0.81	0.94	***-6.3***	10.9	***0.80***	***0.86***	0.94	-10.8	***10.7***
stn190	26.2	0.45	0.48	0.60	***-11.7***	***7.7***	***0.47***	***0.54***	***0.69***	-14.2	8.1
stn095	25.0	0.60	0.51	***0.29***	***-7.3***	***7.3***	***0.62***	***0.52***	0.26	-9.7	7.5
stn344	22.3	***0.69***	***0.72***	0.92	***-5.6***	***6.1***	0.67	0.70	***0.95***	-7.5	6.5
stn109	19.4	***0.68***	***0.79***	***0.88***	***-1.9***	***6.8***	0.66	0.75	0.87	-3.8	7.2
stn187	18.5	***0.29***	0.28	***0.44***	4.3	18.6	0.28	***0.29***	0.39	***3.3***	18.6
stn205	8.5	***0.26***	0.44	0.82	1.4	***10.8***	0.22	0.44	***0.85***	***0.8***	11.0
stn435	5.8	***0.43***	***0.58***	***0.80***	2.3	***5.3***	0.34	0.55	0.78	***1.0***	6.1
stn443	2.7	***0.42***	0.58	***0.93***	2.8	***4.9***	0.41	0.58	0.90	***2.2***	5.0
stn434	-0.9	***0.33***	***0.43***	***0.69***	***-4.0***	***5.3***	0.32	0.42	0.67	-4.5	5.5
stn175	-1.3	***0.46***	***0.62***	***0.85***	***0.2***	***4.9***	0.45	0.61	0.84	-0.9	5.1
stn448	-3.0	0.40	0.51	0.67	2.7	***4.2***	***0.44***	***0.58***	***0.77***	***1.0***	4.3
stn219	-5.9	***0.37***	***0.53***	***0.87***	***-3.1***	***5.3***	0.29	0.49	0.82	-4.1	5.8
stn437	-7.5	***0.41***	***0.43***	***0.75***	***-0.9***	***4.5***	0.34	0.36	0.69	-1.2	4.8
stn328	-8.0	***0.49***	***0.68***	***0.83***	***-0.6***	***5.1***	0.44	0.64	0.77	-1.6	5.5
stn191	-14.2	***0.71***	0.81	0.91	***-4.3***	***3.9***	0.70	0.81	***0.92***	-5.0	4.2
stn432	-18.0	0.74	0.83	0.89	***-4.4***	***5.0***	0.74	0.83	***0.92***	-5.4	5.3
stn438	-18.1	0.57	0.67	0.93	***-4.7***	8.7	***0.62***	***0.70***	***0.95***	-6.3	***8.5***
stn436	-21.1	***0.65***	***0.73***	***0.77***	***-1.5***	***5.9***	0.63	0.66	0.68	-3.2	7.0
stn265	-25.9	***0.72***	***0.78***	0.80	***0.0***	***6.2***	0.70	0.77	***0.81***	-1.9	7.1
stn441	-27.2	0.55	0.77	0.34	***-3.3***	25.4	***0.57***	***0.80***	***0.40***	-5.1	***24.8***
stn394	-37.7	0.81	0.91	0.96	***-1.5***	15.5	***0.82***	***0.92***	***0.97***	-9.2	***15.1***
stn254	-37.9	0.77	0.86	0.95	***-4.1***	15.8	***0.84***	***0.90***	***0.97***	-8.6	***13.6***
stn256	-45.0	0.83	0.94	0.97	***0.5***	15.8	***0.88***	***0.96***	***0.98***	-6.4	***13.3***
stn029	-54.5	0.71	0.80	0.95	***1.0***	20.5	***0.79***	***0.84***	***0.97***	-5.8	***18.1***
stn233	-64.2	0.48	0.39	***0.59***	***-10.3***	29.1	***0.55***	***0.49***	0.56	-14.4	***27.7***
stn101	-69.0	0.53	0.65	0.75	***-8.7***	35.3	***0.66***	***0.72***	***0.78***	-12.5	***32.8***
stn400	-70.5	0.53	0.58	0.84	***-18.5***	35.2	***0.66***	***0.68***	***0.88***	-22.6	***31.6***
stn323	-70.7	0.61	0.70	0.78	***-15.0***	31.5	***0.76***	***0.81***	***0.87***	-17.8	***27.3***

Table S1.

		TTOC (surf-tropP) assimilated GOME					TTOC (surf-tropP) no assimilation				
Station	**lat**	**R**	**Rm**	**Rcl**	**Δ**	**σ**	**R**	**Rm**	**Rcl**	**Δ**	**σ**
stn018	82.5	0.43	0.56	***0.67***	-7.6	6.7	***0.50***	***0.59***	0.60	***-7.4***	***5.7***
stn315	80.0	0.48	0.43	***0.47***	***-3.8***	6.7	***0.57***	***0.49***	0.40	-3.9	***5.3***
stn089	78.9	0.43	0.58	0.86	***-4.0***	7.7	***0.53***	***0.73***	***0.94***	-4.7	***6.6***
stn460	76.5	0.47	0.62	***0.57***	***-3.9***	5.6	***0.55***	***0.69***	0.48	-4.9	***4.9***
stn024	74.7	0.41	0.38	0.67	-6.8	7.8	***0.46***	***0.50***	***0.72***	***-6.0***	***6.6***
stn459	70.5	0.54	0.67	0.94	***-3.0***	6.4	***0.64***	***0.72***	0.94	-4.7	***4.9***
stn262	67.4	0.48	0.67	0.69	***-5.7***	8.0	***0.74***	***0.81***	***0.90***	-8.1	***4.8***
stn404	60.8	0.07	0.29	0.53	***-1.9***	8.5	***0.48***	***0.58***	***0.82***	-7.7	***5.8***
stn043	60.1	0.47	0.64	0.86	***-3.6***	8.1	***0.71***	***0.82***	***0.94***	-6.5	***4.6***
stn077	58.7	0.45	0.61	***0.93***	***-3.9***	8.3	***0.54***	***0.71***	0.90	-5.1	***6.6***
stn021	53.5	0.48	0.66	0.83	***-5.4***	6.2	***0.59***	***0.73***	***0.90***	-6.1	***5.0***
stn076	53.3	0.62	0.78	0.94	***-6.5***	7.3	***0.73***	***0.82***	0.94	-7.6	***5.0***
stn221	52.4	0.42	0.64	0.83	***-2.4***	9.4	***0.69***	***0.86***	***0.94***	-5.9	***6.0***
stn174	52.2	0.41	0.72	0.81	***1.1***	10.1	***0.66***	***0.82***	***0.91***	-3.0	***6.3***
stn316	52.1	0.29	0.36	0.70	***-7.0***	10.7	***0.57***	***0.64***	***0.83***	-10.7	***6.6***
stn257	52.0	0.03			***-3.1***	8.2	***0.78***			-5.8	***3.8***
stn318	51.9	0.51	0.73	***0.97***	***-3.6***	7.0	***0.55***	0.73	0.85	-6.7	***6.2***
stn053	50.8	0.37	0.70	0.85	***-3.9***	10.1	***0.58***	***0.83***	***0.89***	-7.7	***6.3***
stn242	50.0	0.43	***0.86***	***1.00***	***-3.0***	8.3	***0.56***	0.82	0.99	-5.8	***5.9***
stn099	47.8	0.51	0.75	0.84	***-1.5***	7.9	***0.65***	**0.80**	***0.90***	-3.9	***5.7***
stn156	46.5	0.51	0.79	0.86	***-1.5***	8.2	***0.65***	**0.83**	***0.90***	-4.2	***6.1***
stn040	43.9	0.48	0.59	0.77	***-7.8***	7.8	***0.67***	**0.68**	***0.92***	-9.7	***5.7***
stn012	43.1	0.65	0.76	0.92	-7.9	7.6	***0.80***	**0.89**	***0.98***	***-7.7***	***5.4***
stn445	40.8	0.36	0.51	0.85	***-3.8***	13.1	***0.48***	**0.59**	***0.88***	-4.5	***11.6***
stn308	40.5	0.55	0.67	***0.80***	***-3.3***	8.0	***0.61***	**0.68**	0.78	-4.2	***6.9***
stn067	40.0	***0.54***	***0.82***		***-2.6***	6.3	0.53	0.79		-2.7	6.3
stn348	40.0	0.56	0.57	0.76	***-5.1***	8.4	***0.78***	***0.80***	***0.86***	-7.2	***5.7***
stn107	37.8	0.67	0.83	0.93	***-3.3***	8.0	***0.74***	***0.87***	***0.95***	-4.1	***6.4***
stn014	36.1	0.55	0.75	0.92	***-4.4***	9.0	***0.68***	***0.86***	***0.97***	-4.6	***7.2***
stn418	35.3	0.58	0.68	0.76	***-3.3***	8.5	***0.66***	***0.77***	***0.81***	-4.7	***6.9***
stn336	32.5	0.44	0.44	0.68	5.6	14.2	***0.55***	***0.55***	0.68	***-0.7***	***12.5***
stn007	31.6	0.68	***0.79***	0.90	***-6.6***	7.8	***0.72***	0.78	***0.91***	-8.8	***6.9***
stn010	28.6	***0.14***	0.16	0.27	12.7	22.7	0.13	***0.20***	***0.36***	***10.2***	***22.5***
stn401	28.5	0.59	0.74	0.86	***-6.1***	9.2	***0.63***	***0.83***	***0.91***	-6.7	***8.1***
stn190	26.2	0.60	***0.66***	***0.72***	***-9.6***	8.0	0.60	0.65	0.68	-11.5	***7.7***
stn095	25.0	0.50	0.55	0.53	***-1.1***	8.9	***0.57***	***0.60***	***0.66***	-4.1	***8.3***
stn344	22.3	0.49	***0.69***	***0.93***	***-0.4***	7.9	0.49	0.58	0.76	-3.7	***7.2***
stn109	19.4	0.75	0.86	0.93	***-10.9***	6.8	***0.77***	0.86	0.93	-11.6	***6.4***
stn187	18.5	-0.03	0.07	0.37	4.7	13.4	***-0.01***	***0.08***	0.37	***2.6***	***13.2***
stn205	8.5	0.18	0.09	***0.56***	3.0	13.4	***0.20***	***0.10***	0.55	***2.5***	***13.1***
stn435	5.8	0.19	0.22	0.22	***-2.7***	6.5	***0.33***	***0.55***	***0.74***	-4.0	***5.7***
stn443	2.7	0.11	0.28	-0.19	***-8.9***	4.5	***0.19***	0.28	***-0.05***	-10.9	***3.6***
stn434	-0.9	***0.57***	***0.68***	***0.85***	***-11.3***	3.9	0.51	0.65	0.82	-13.4	***4.0***
stn175	-1.3	0.34	0.24	***0.35***	***-1.8***	5.5	***0.43***	***0.34***	0.27	-2.9	***5.0***
stn448	-3.0	0.26	0.07	***-0.11***	***-0.5***	6.5	***0.30***	***0.13***	-0.14	-2.6	***6.2***
stn219	-5.9	0.61	0.74	0.89	***-3.1***	6.5	***0.67***	***0.76***	***0.90***	-4.3	***6.2***
stn437	-7.5	0.42	0.38	0.70	***-7.6***	5.1	***0.54***	***0.63***	***0.74***	-10.5	***4.3***
stn328	-8.0	0.57	0.66	0.94	2.8	7.8	***0.64***	***0.74***	***0.97***	***1.3***	***7.4***
stn191	-14.2	0.62	0.64	0.74	***-13.3***	5.4	***0.68***	***0.70***	***0.81***	-15.0	***4.8***
stn432	-18.0	0.59	0.75	0.81	***-13.3***	6.3	***0.65***	***0.78***	***0.84***	-15.1	***5.3***
stn438	-18.1	0.69	0.77	0.86	***-12.3***	6.1	***0.70***	0.77	0.86	-15.4	***5.7***
stn436	-21.1	0.54	0.66	0.78	***-1.2***	7.0	***0.69***	***0.76***	***0.84***	-6.5	***5.7***
stn265	-25.9	0.28	0.33	***0.73***	***0.6***	8.0	***0.38***	***0.41***	0.69	-5.6	***6.9***
stn441	-27.2	0.47	0.54	0.58	-10.3	7.9	***0.52***	***0.70***	***0.72***	***-9.9***	***7.2***
stn394	-37.7	0.33	0.36	0.59	***0.3***	7.9	***0.54***	***0.71***	***0.79***	-2.1	***5.8***
stn254	-37.9	0.39	0.50	0.86	-1.4	7.9	***0.47***	***0.65***	***0.90***	***-1.2***	***6.7***
stn256	-45.0	0.43	0.45	0.62	***-4.6***	6.4	***0.64***	***0.72***	***0.73***	-6.3	***3.8***
stn029	-54.5	0.36	0.53	***0.75***	***-1.7***	7.7	***0.63***	***0.70***	0.69	-2.7	***5.0***
stn233	-64.2	0.33	0.66	0.75	-2.7	9.2	***0.52***	***0.69***	***0.79***	***-2.1***	***7.0***
stn101	-69.0	0.26	0.41	***0.67***	-1.4	9.1	***0.42***	***0.46***	0.63	***-0.9***	***6.3***
stn400	-70.5	0.09	0.12	0.61	***0.5***	22.2	***0.30***	***0.33***	***0.84***	2.2	***20.1***
stn323	-70.7	0.39	0.50	0.60	-6.2	7.3	***0.64***	***0.65***	***0.64***	***-5.7***	***3.8***

Table S2.

		with/without assimilation			
Station	**lat**	**R^2**	**σ**	**R^2**	**σ**
		UTLS		**TTOC**	
stn018	82.5	0.94	7.2	0.76	3.4
stn315	80.0	0.93	8.5	0.72	3.9
stn089	78.9	0.92	9.0	0.76	3.8
stn460	76.5	0.87	10.7	0.81	2.8
stn024	74.7	0.95	7.4	0.73	4.2
stn459	70.5	0.92	7.7	0.64	4.5
stn262	67.4	0.94	7.7	0.54	6.2
stn404	60.8	0.90	11.0	0.32	6.3
stn043	60.1	0.91	8.5	0.51	6.4
stn077	58.7	0.93	9.3	0.58	5.8
stn021	53.5	0.92	7.9	0.65	4.1
stn076	53.3	0.94	7.2	0.63	5.6
stn221	52.4	0.89	9.4	0.43	7.1
stn174	52.2	0.90	8.3	0.43	7.8
stn316	52.1	0.90	8.0	0.44	7.8
stn257	52.0	0.90	2.7	0.16	5.7
stn318	51.9	0.89	7.9	0.66	4.6
stn053	50.8	0.88	8.4	0.42	7.9
stn242	50.0	0.80	11.1	0.48	6.4
stn099	47.8	0.90	8.3	0.58	5.6
stn156	46.5	0.90	7.9	0.56	5.9
stn040	43.9	0.87	10.1	0.64	5.1
stn012	43.1	0.96	8.2	0.72	5.0
stn445	40.8	0.93	7.6	0.70	5.1
stn308	40.5	0.90	7.2	0.65	5.1
stn067	40.0	0.96	3.9	0.89	2.1
stn348	40.0	0.94	6.9	0.63	5.6
stn107	37.8	0.95	4.9	0.83	4.4
stn014	36.1	0.95	6.7	0.72	5.0
stn418	35.3	0.93	5.5	0.80	4.4
stn336	32.5	0.93	5.6	0.76	5.5
stn007	31.6	0.95	3.3	0.85	3.8
stn401	28.5	0.92	4.9	0.80	4.7
stn190	26.2	0.91	2.5	0.87	3.4
stn095	25.0	0.95	2.1	0.72	3.8
stn344	22.3	0.95	2.1	0.79	3.6
stn109	19.4	0.94	2.3	0.90	3.2
stn187	18.5	0.95	1.2	0.88	2.3
stn205	8.5	0.94	1.0	0.73	2.8
stn435	5.8	0.93	1.5	0.23	3.3
stn443	2.7	0.96	0.8	0.27	2.7
stn434	-0.9	0.96	1.0	0.56	2.4
stn175	-1.3	0.94	1.2	0.66	2.1
stn448	-3.0	0.73	2.1	0.70	2.2
stn219	-5.9	0.94	1.2	0.74	2.7
stn437	-7.5	0.95	0.9	0.46	3.5
stn328	-8.0	0.92	1.4	0.72	3.2
stn191	-14.2	0.97	1.2	0.81	2.6
stn432	-18.0	0.97	1.6	0.75	3.5
stn438	-18.1	0.96	2.1	0.78	3.6
stn436	-21.1	0.89	3.1	0.53	4.8
stn265	-25.9	0.87	3.6	0.52	4.6
stn441	-27.2	0.97	2.7	0.79	3.2
stn394	-37.7	0.94	5.8	0.43	5.3
stn254	-37.9	0.93	5.5	0.67	3.9
stn256	-45.0	0.91	7.9	0.56	4.6
stn029	-54.5	0.87	9.2	0.29	6.1
stn233	-64.2	0.80	7.4	0.41	5.9
stn101	-69.0	0.66	10.4	0.35	6.5
stn400	-70.5	0.75	10.5	0.43	7.2
stn323	-70.7	0.67	12.0	0.33	6.3

Table S3

		TORA residual GDP v4.1 minus TM5/GOME			
Station	**lat**	**R**	**Rm**	**Δ**	**σ**
stn018	82.5	-0.16	-0.23	-8.6	32.1
stn315	80.0	-0.03	-0.05	***0.1***	38.7
stn089	78.9	0.03	0.08	8.4	38.9
stn460	76.5	-0.03	-0.09	-8.0	33.5
stn024	74.7	-0.10	0.06	-10.9	31.9
stn459	70.5	0.00	0.03	-11.9	29.7
stn262	67.4	-0.38	-0.64	***-0.2***	20.4
stn404	60.8	0.25	0.40	13.4	22.5
stn043	60.1	0.02	0.06	-7.8	35.8
stn077	58.7	-0.31	-0.34	-17.2	25.9
stn021	53.5	-0.04	-0.10	-14.4	25.9
stn076	53.3	0.03	0.04	-10.2	26.2
stn221	52.4	0.11	0.22	***1.7***	28.8
stn174	52.2	0.02	0.09	***-0.3***	28.4
stn316	52.1	0.06	0.08	-9.4	24.3
stn257	52.0	***0.94***		-14.5	6.0
stn318	51.9	0.06	0.22	4.7	24.7
stn053	50.8	0.23	0.57	-4.4	23.3
stn242	50.0	-0.09	-0.16	***-0.3***	30.6
stn099	47.8	0.13	0.23	-1.5	26.0
stn156	46.5	0.25	0.29	***-1.4***	25.2
stn040	43.9	0.06	0.02	***0.6***	20.7
stn012	43.1	0.27	0.23	-15.1	25.6
stn445	40.8	0.10	0.27	***-2.4***	31.6
stn308	40.5	0.54	0.60	5.3	21.1
stn067	40.0	0.38	0.59	9.9	18.6
stn348	40.0	0.09	0.09	***-3.8***	20.0
stn107	37.8	0.24	0.39	***-1.4***	21.3
stn014	36.1	0.27	0.40	***-2.7***	24.1
stn418	35.3	0.44	0.52	***-1.0***	20.8
stn336	32.5	***0.46***	***0.46***	***3.8***	21.7
stn007	31.6	0.43	0.46	-8.2	15.7
stn401	28.5	0.17	0.04	***3.6***	18.2
stn190	26.2	0.32	0.38	***-3.8***	16.3
stn095	25.0	0.34	0.24	-2.7	15.2
stn344	22.3	0.43	***0.76***	0.4	12.0
stn109	19.4	0.35	0.42	***-10.6***	17.2
stn187	18.5	0.19	0.30	9.6	14.9
stn205	8.5	-0.11	-0.11	3.2	15.5
stn435	5.8	0.05	-0.05	-1.4	14.2
stn443	2.7	-0.21	-0.18	-13.6	7.4
stn434	-0.9	0.46	0.40	***-11.0***	10.6
stn175	-1.3	***0.47***	***0.44***	-4.5	14.3
stn448	-3.0	0.24	***0.24***	3.0	12.4
stn219	-5.9	0.59	0.74	-5.6	11.7
stn437	-7.5	0.26	0.24	-12.0	9.6
stn328	-8.0	0.47	0.47	-3.7	12.3
stn191	-14.2	0.37	0.41	***-11.4***	12.1
stn432	-18.0	0.40	0.44	***-8.9***	13.0
stn438	-18.1	0.39	0.45	-15.2	17.6
stn436	-21.1	***0.62***	0.61	-17.9	18.7
stn265	-25.9	***0.42***	***0.41***	-12.3	13.5
stn441	-27.2	0.37	0.28	2.7	17.7
stn394	-37.7	0.25	0.25	3.0	20.6
stn254	-37.9	-0.22	-0.08	8.4	33.1
stn256	-45.0	0.28	0.34	-11.6	23.9
stn029	-54.5	0.18	0.30	***-0.7***	28.6
stn233	-64.2	-0.28	-0.48	56.8	46.5
stn101	-69.0	-0.21	-0.39	53.1	46.7
stn400	-70.5	-0.30	-0.69	46.1	44.3
stn323	-70.7	-0.43	-0.73	50.9	41.4

Table S4