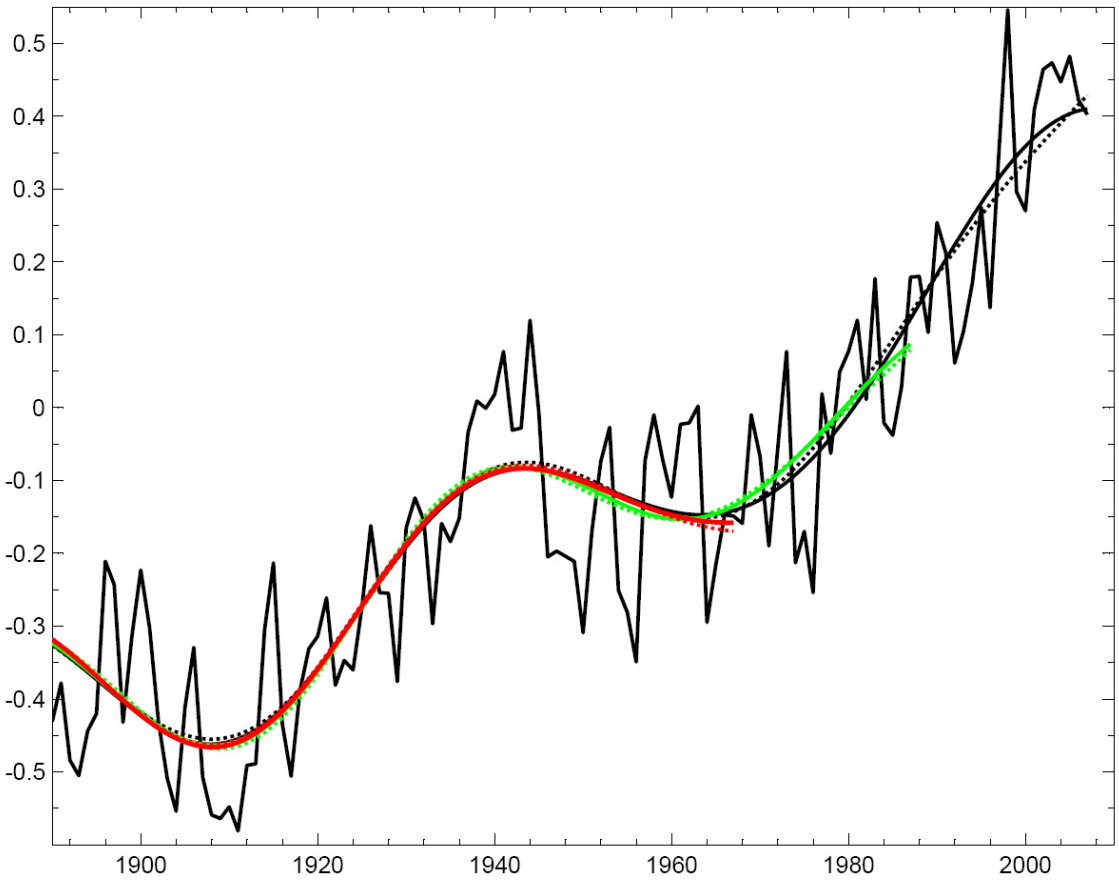
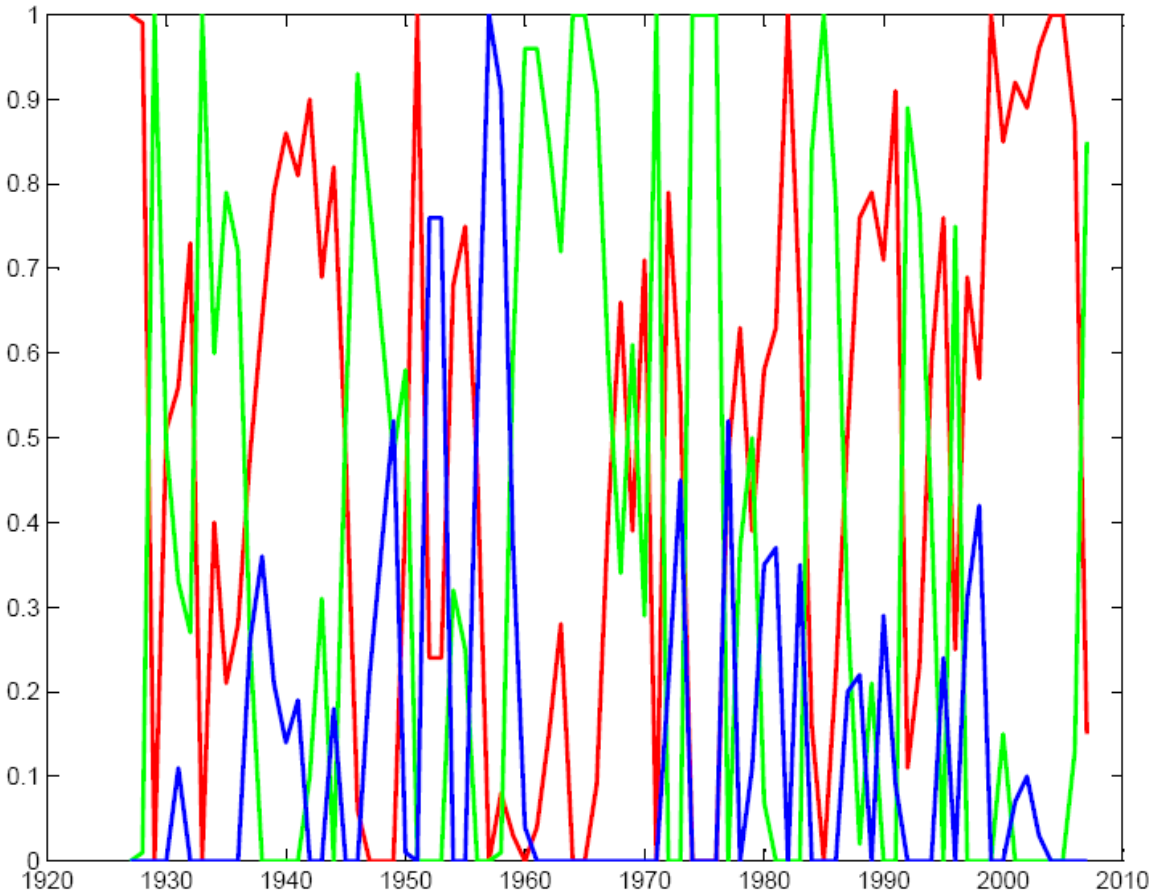
SUPPLEMENTARY INFORMATION



Supplementary Figure 1. HadCRUT3 instrumental annual global mean surface temperatures 1850-2007 smoothed on 40 year and longer timescales based on the simple Matlab procedure (solid curves) and the multiple taper approach (dashed curves) as discussed in the main text. Results are shown for (i) the full interval 1850-2007 (black) and the shorter intervals (ii) 1850-1987 (green) and 1850-1967 (red). Note that the two methods (i.e. corresponding pairs of solid and dashed curves) yield smoothed curves that are only barely discernible from each other [To approximate a 40 year cutoff period in the multiple-taper approach, the following time-frequency bandwidth parameters were used: NW=4 for 1850-2007 and 1850-1987, corresponding to 39.5 year and 34.5 year period half power points respectively, and NW=3 for 1850-1967, corresponding to a 39.3 year period half power point].



Supplementary Figure 2. Weights on each of the three smoothing contraints (blue=minimum norm, green=minimum slope, red=minimum roughness) for 40 year smoothing of HadCRUT3 instrumental annual global mean surface temperatures back to 1850 as a function of the terminal year of the interval, which is varied from 1927 to 2007.

Interval #	Interval	ε^2 (minslp)	ε^2 (mpad)	ε^2 (adapt)	ε^2 (minslp/adapt)	ε^2 (mpad/adapt)
1	*1850-1927*	0.0146	0.0172	0.0038	3.83	4.51
2	*1850-1937*	0.0077	0.0039	0.0023	3.43	1.75
3	*1850-1947*	0.0028	0.0006	0.0010	2.88	0.57
4	*1850-1957*	0.0153	0.0011	0.0305	0.50	0.04
5	*1850-1967*	0.0378	0.0036	0.0160	2.37	0.23
6	*1850-1977*	0.0180	0.0696	0.0090	2.00	7.76
7	*1850-1987*	0.2457	0.3210	0.0082	29.9	39.0
Ave		*0.0488*	*0.0596*	*0.0101*	*6.42*	*8.16*

Supplementary Table 1. Relative error variances for the 'minslp', 'mpad', and 'adapt' methods and associated ratios for each of 7 different test intervals considered as applied to the HadCRU global mean temperature series 1850-2007.

	Interval	ε^2 (minslp)	ε^2 (mpad)	ε^2 (adapt)	ε^2 (minslp/adapt)	ε^2 (mpad/adapt)
1	*1900-1997*	0.0541	0.0763	0.0342	1.58	2.23
2	*1900-2002*	0.0227	0.0428	0.0082	2.75	5.20
3	*1900-2007*	0.0103	0.0224	0.0044	2.33	5.06
4	*1900-2012*	0.0064	0.0138	0.0042	1.52	3.26
5	*1900-2017*	0.0050	0.0092	0.0022	2.22	4.12
6	*1900-2022*	0.0046	0.0088	0.0021	2.16	4.09
7	*1900-2027*	0.0040	0.0080	0.0015	2.71	5.38
Ave		*0.0153*	*0.0259*	*0.0081*	*2.18*	*4.19*

Supplementary Table 2. Relative error variances for the 'minslp', 'mpad', and 'adapt' methods and associated ratios for each of 7 different test intervals considered, averaged over the 55 CMIP3 model simulations.

	Simulation	ε^2 (minslp)	ε^2 (mpad)	ε^2 (adapt)	ε^2 (minslp/adapt)	ε^2 (mpad/adapt)
1	*BCCR BCM2.0 (run 1)*	0.0103	0.0205	0.0052	1.978	3.927
2	*CCCMA CGM3.1 (run 1)*	0.0022	0.0060	0.0005	4.965	13.21
3	*CCCMA CGM3.1 (run 2)*	0.0028	0.0062	0.0013	2.148	4.834
4	*CCCMA CGM3.1 (run 3)*	0.0030	0.0080	0.0012	2.520	6.843
5	*CCCMA CGM3.1 (run 4)*	0.0025	0.0062	0.0012	2.124	5.190
6	*CCCMA CGM3.1 (run 5)*	0.0036	0.0086	0.0012	3.063	7.389
7	*CCCMA CGM3.1 T63 (run 1)*	0.0042	0.0100	0.0006	7.140	17.17
8	*CNRM CM3 (run 1)*	0.0041	0.0081	0.0018	2.319	4.634
9	*CSIRO MK3.0 (run 1)*	0.0029	0.0065	0.0027	1.059	2.377
10	*CSIRO MK3.5 (run 1)*	0.0055	0.0107	0.0023	2.427	4.710
11	*GFDL CM2.0 (run 1)*	0.0500	0.0678	0.0061	8.193	11.11
12	*GFDL CM2.1 (run 1)*	0.0211	0.0432	0.0212	0.995	2.036
13	*NASA GISS AOM (run 1)*	0.0041	0.0079	0.0014	2.966	5.707
14	*NASA GISS AOM (run 2)*	0.0074	0.0167	0.0034	2.153	4.870
15	*NASA GISS Model E-H (run 1)*	0.0182	0.0361	0.0122	1.496	2.965
16	*NASA GISS Model E-H (run 2)*	0.0237	0.0492	0.0172	1.376	2.860
17	*NASA GISS Model E-H (run 3)*	0.0224	0.0367	0.0151	1.479	2.428
18	*NASA GISS Model E-R (run 1)*	0.0404	0.0588	0.0216	1.866	2.717
19	*NASA GISS Model E-R (run 2)*	0.0216	0.0403	0.0097	2.219	4.139
20	*NASA GISS Model E-R (run 3)*	0.0313	0.0492	0.0138	2.275	3.574
21	*NASA GISS Model E-R (run 4)*	0.0106	0.0239	0.0035	3.018	6.831

22	*NASA GISS Model E-R (run 5)*	0.0105	0.0258	0.0068	1.547	3.790
23	*IAP FGOALS1.0-g (run 1)*	0.0043	0.0093	0.0048	0.895	1.921
24	*IAP FGOALS1.0-g (run 2)*	0.0042	0.0086	0.0068	0.612	1.264
25	*IAP FGOALS1.0-g (run 3)*	0.0049	0.0105	0.0072	0.675	1.461
26	*INGV ECHAM4 (run 1)*	0.0080	0.0123	0.0051	1.580	2.428
27	*INM CM3.0 (run 1)*	0.0302	0.0476	0.0191	1.583	2.496
28	*MIROC3.2 high res (run 1)*	0.0206	0.0341	0.0057	3.653	6.029
29	*MIROC3.2 med res (run 1)*	0.0279	0.0422	0.0123	2.272	3.445
30	*MIROC3.2 med res (run 2)*	0.0342	0.0521	0.0262	1.310	1.988
31	*MIROC3.2 med res (run 3)*	0.0278	0.0451	0.0214	1.300	2.111
32	*MIUB ECHO-G (run 1)*	0.0475	0.0633	0.0309	1.541	2.052
33	*MIUB ECHO-G (run 2)*	0.0137	0.0288	0.0067	2.030	4.272
34	*MIUB ECHO-G (run 3)*	0.0633	0.0855	0.0052	12.24	16.54
35	*MPI ECHAM5 (run 1)*	0.0073	0.0134	0.0117	0.626	1.147
36	*MPI ECHAM5 (run 2)*	0.0211	0.0358	0.0157	1.341	2.280
37	*MPI ECHAM5 (run 3)*	0.0065	0.0123	0.0079	0.824	1.566
38	*MPI ECHAM5 (run 4)*	0.0104	0.0160	0.0042	2.493	3.843
39	*MRI CGM2.3 2a (run 1)*	0.0035	0.0060	0.0034	1.023	1.767
40	*MRI CGM2.3 2a (run 2)*	0.0044	0.0104	0.0052	0.837	1.981
41	*MRI CGM2.3 2a (run 3)*	0.0072	0.0089	0.0045	1.584	1.962
42	*MRI CGM2.3 2a (run 4)*	0.0060	0.0110	0.0048	1.237	2.289
43	*MRI CGM2.3 2a (run 5)*	0.0089	0.0102	0.0108	0.826	0.943
44	*NCAR CCSM3.0 (run 1)*	0.0553	0.0754	0.0143	3.869	5.275
45	*NCAR CCSM3.0 (run 2)*	0.0107	0.0224	0.0069	1.561	3.265
46	*NCAR CCSM3.0 (run 3)*	0.0222	0.0370	0.0040	5.506	9.186
47	*NCAR CCSM3.0 (run 5)*	0.0182	0.0318	0.0021	8.567	14.94
48	*NCAR CCSM3.0 (run 6)*	0.0202	0.0327	0.0087	2.312	3.746
49	*NCAR CCSM3.0 (run 7)*	0.0093	0.0185	0.0079	1.182	2.341
50	*NCAR CCSM3.0 (run 9)*	0.0129	0.0250	0.0119	1.086	2.103
51	*NCAR PCM.1 (run 1)*	0.0048	0.0137	0.0048	1.012	2.871
52	*NCAR PCM.1 (run 2)*	0.0100	0.0252	0.0093	1.080	2.719
53	*NCAR PCM.1 (run 3)*	0.0040	0.0107	0.0019	2.122	5.609
54	*NCAR PCM.1 (run 4)*	0.0040	0.0105	0.0037	1.088	2.812
55	*UKMO HadCM3 (run 1)*	0.0055	0.0115	0.0025	2.223	4.642
Ave		*0.0153*	*0.0259*	*0.0081*	*2.39*	*4.48*

Supplementary Table 3. Relative error variances for the ‘minslp’, ‘mpad’, and ‘adapt’ methods and associated ratios for each of 55 CMIP3 model simulations analyzed, t test intervals considered, averaged over the 7 different test intervals considered.

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