Improved methods for PCA-based reconstructions: case study using the Steig *et al.* (2009) Antarctic temperature reconstruction

Supporting Information

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S1. Replication of S09

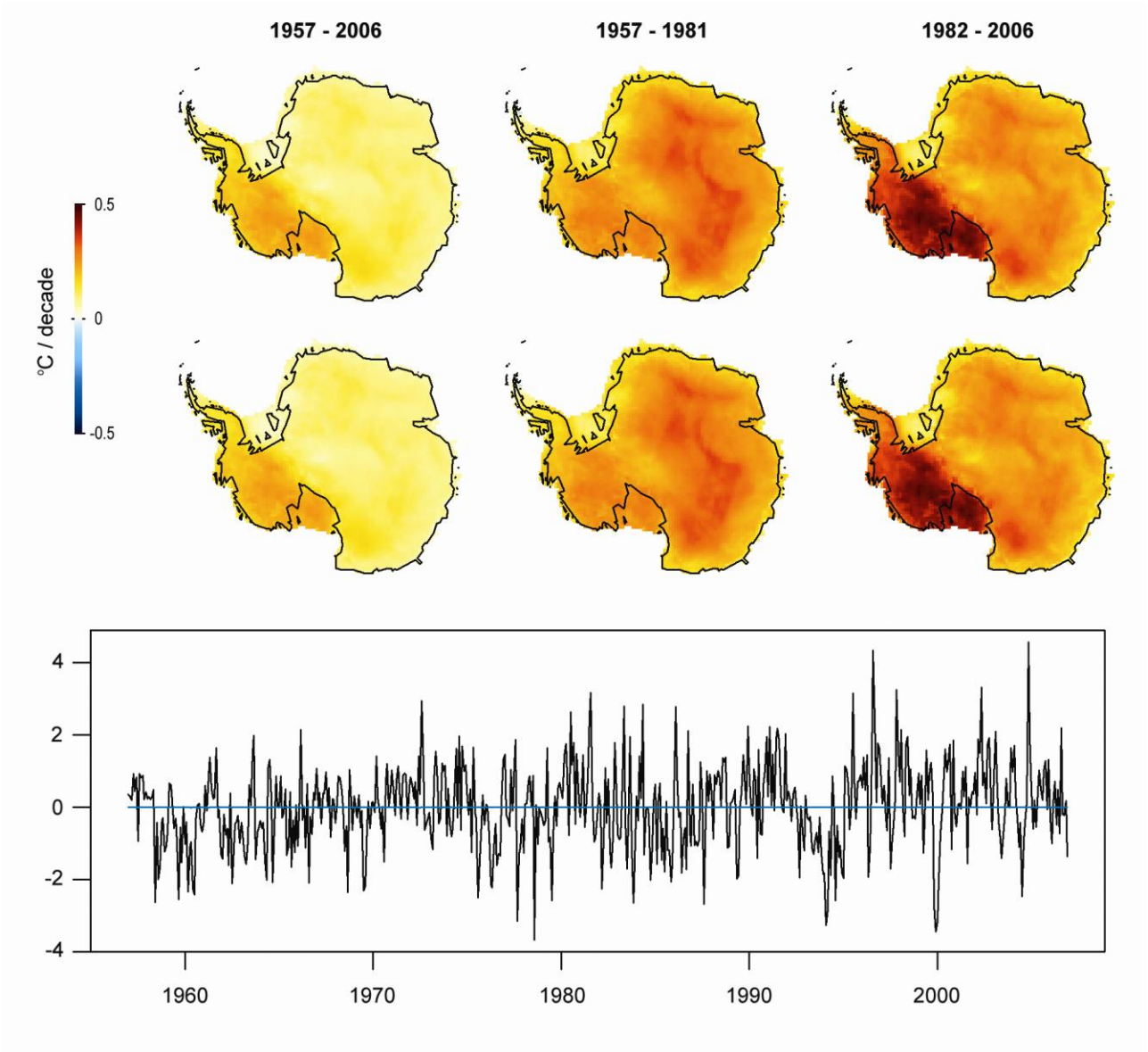

FIG. S1. S09 replication. Top three panels: S09. Middle 3 panels: Replication effort. Bottom panel: Monthly means for the S09 reconstruction, with the blue line indicating the difference between the replication and S09.

S2. Geographic boundaries

For our study, we define the following regions in Antarctica:

- Peninsula: The portion of West Antarctica that lies north of a line between Cape Adams and the mainland south of the Eklund Islands.
- West Antarctica: The portion of the continent to the west of the Transantarctic Mountains, including the Ross Sea and excluding the Peninsula.
- East Antarctica: The remainder of the continent.

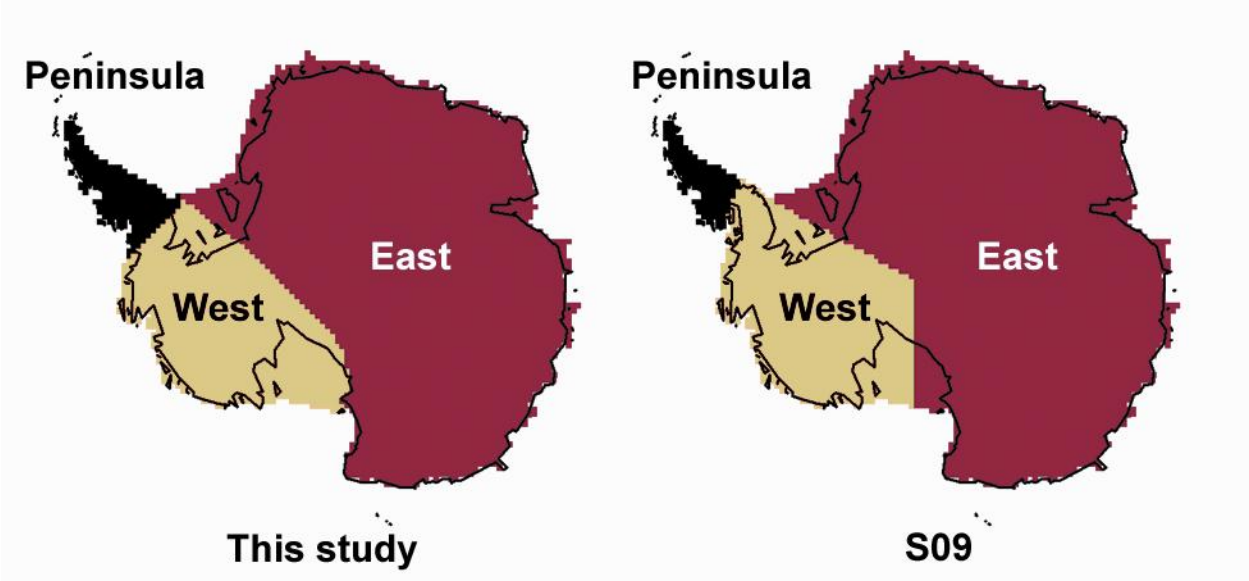

FIG. S2. Geographic masks for this study (left) vs. S09 (right).

S3. Ground station metadata

TABLE S1. Ground station names, colors for Figs. 2 and 8, locations, and usage in S09 and this study. Symbols in the usage columns correspond to the symbols in Fig. 1 of the main text.

Name	Lat	Lon	Record Length (Months)	S09 Predictor	Predictor (This study)	Verification Only (This study)
Manned Ground Stations						
■Adelaide	-67.8	292.1	152	○		Δ
■Amundsen Scott	-90.0	0.0	600	○	+	
■Arturo Prat	-62.5	300.3	423	○	+	
■Asuka	-71.5	24.1	58	○		Δ
■Belgrano I	-78.0	321.2	273	○	+	
■Belgrano II	-77.9	325.4	128	○	+	
■Byrd	-80.0	240.0	177	○	+	
■Campbell	-52.0	169.0	368	○		
■Casey	-66.3	110.5	575	○	+	
■Davis	-68.6	78.0	547	○	+	
■Deception	-63.0	299.3	107	○		Δ
■Dumont Durville	-66.7	140.0	584	○	+	
■Esperanza	-63.4	303.0	475	○	+	
■Faraday	-65.4	295.6	600	○	+	
■Ferraz	-62.1	301.6	186	○		
■Great Wall	-62.2	301.0	258	○		
■Grytviken	-54.3	323.5	418	○		
■Halley	-75.5	333.6	600	○	+	
■Jubany	-62.2	301.4	157	○		
■King Sejong	-62.2	301.3	169	○		
■Leningradskaja	-69.5	159.4	240	○	+	
■Macquarie	-54.5	158.9	580	○		
■Marambio	-64.2	303.3	415	○	+	
■Mario Zuchelli	-74.7	164.1	192	○	+	
■Marsh	-62.2	301.1	358	○		
■Mawson	-67.6	62.9	600	○	+	
■McMurdo	-77.9	166.7	577	○	+	
■Mirny	-66.5	93.0	600	○	+	
■Molodeznaja	-67.7	45.9	437	○	+	
■Neumayer	-70.7	351.6	308	○	+	
■Novolazarevskaya	-70.8	11.8	549	○	+	
■O'Higgins	-63.3	302.1	492	○	+	

TABLE S1. Continued.

Name	Lat	Lon	Record Length (Months)	S09 Predictor	Predictor (This study)	Verification Only (This study)
■Orcadas	-60.7	315.3	551	○		
■Rothera	-67.5	291.9	356	○	+	
■Russkaya	-74.8	223.1	119	○	+	
■San Martin	-68.1	292.9	203	○	+	
■Scott Base	-77.9	166.7	596	○	+	
■Signy	-60.7	314.4	468	○		
■Syowa	-69.0	39.6	535	○	+	
■Vostok	-78.5	106.9	540	○	+	
■Zhongshan	-69.4	76.4	167	○	+	
AWS Stations						
■Bonaparte Point	-64.8	295.9	95			Δ
■Butler Island	-72.2	299.8	176		+	
■Byrd	-80.0	240.6	187		+	
■Cape Denison	-67.0	142.7	70			Δ
■Cape King	-73.6	166.6	201		+	
■Cape Phillips	-73.1	169.6	151		+	
■Cape Ross	-76.7	163.0	169		+	
■Clean Air	-90.0	0.0	192		+	
■D10	-66.7	139.8	162		+	
■D47	-67.4	138.7	50			Δ
■D57	-68.1	137.5	37			Δ
■D80	-70.0	134.9	32			Δ
■Dome C II	-75.1	123.4	93			Δ
■Doug	-82.3	246.8	51			Δ
■Drescher	-72.9	341.0	108		+	
■Elaine	-83.1	174.2	151		+	
■Elizabeth	-82.6	222.9	70			Δ
■Enigma Lake	-74.7	164.0	126		+	
■Erin	-84.9	231.2	62		+	
■Ferrell	-77.9	170.8	204		+	
■GC41	-71.6	111.3	177		+	
■GEO3	-68.7	61.1	84			Δ
■GF08	-68.5	102.1	133		+	
■Gill	-80.0	181.4	193		+	
■Harry	-83.0	238.6	66			Δ
■Henry	-89.0	359.0	109		+	
■LGB10	-71.3	59.2	75			Δ
■LGB20	-73.8	55.7	136		+	

TABLE S1. Continued.

Name	Lat	Lon	Record Length (Months)	S09 Predictor	Predictor (This study)	Verification Only (This study)
LGB35	-76.0	65.0	151		+	
LGB59	-73.5	76.8	95			Δ
Larsen Ice Shelf	-66.9	299.1	129		+	
Law Dome Summit	-66.7	112.7	89			Δ
Lettau	-82.5	185.6	149		+	
Limbert	-75.4	300.1	63			Δ
Linda	-78.5	168.4	112		+	
Lynn	-74.2	160.4	83			Δ
Manuela	-74.9	163.7	222		+	
Marble Point	-77.4	163.7	266		+	
Marilyn	-80.0	165.1	152		+	
Minna Bluff	-78.6	166.7	110		+	
Mount Siple	-73.2	232.9	140		+	
Nansen Ice Sheet	-74.8	163.3	163		+	
Nico	-89.0	89.7	120		+	
Pegasus North	-77.9	166.5	115		+	
Pegasus South	-78.0	166.6	136		+	
Penguin Point	-67.6	146.2	66			Δ
Port Martin	-66.8	141.4	82			Δ
Priestley Glacier	-74.3	163.2	176		+	
Relay Station	-74.0	43.1	103		+	
Santa Claus Island	-65.0	294.3	43			Δ
Schwerdtfeger	-79.9	170.0	201		+	
Siple	-75.9	276.0	85			Δ
Sutton	-67.1	141.4	26			Δ
Theresa	-84.6	244.2	74			Δ
Tourmaline Plateau	-74.1	163.4	166		+	
Uranus Glacier	-71.4	291.1	119		+	

S4. Full reconstruction statistics (no predictors withheld)

TABLE S2. Station-by-station results for rms error (μ_{rms}), correlation coefficient (r), and average explained variance (R^2) when no predictors are withheld for verification. Stations not used as predictors in this study are italicized. Colors as in Table S1.

	μ_{rms}			r			R^2		
Name	RLS	E-W	S09	RLS	E-W	S09	RLS	E-W	S09
Manned Ground Stations									
■*Adelaide*	*1.30*	*1.62*	*2.10*	*0.87*	*0.76*	*0.66*	*0.72*	*0.57*	*0.27*
■Amundsen Scott	0.38	1.12	1.92	0.99	0.89	0.60	0.97	0.78	0.35
■Arturo Prat	0.43	0.95	1.56	0.96	0.82	0.34	0.93	0.67	0.10
■*Asuka*	*1.00*	*1.16*	*1.29*	*0.78*	*0.70*	*0.59*	*0.61*	*0.48*	*0.35*
■Belgrano I	0.57	1.78	3.11	0.99	0.95	0.58	0.97	0.73	0.18
■Belgrano II	0.55	1.04	1.46	0.95	0.82	0.50	0.89	0.61	0.23
■Byrd	1.26	0.72	2.28	0.95	0.99	0.70	0.82	0.94	0.44
■*Campbell* [a]	-	-	-	-	-	-	-	-	-
■Casey	0.48	1.37	1.75	0.98	0.86	0.62	0.95	0.61	0.38
■Davis	0.32	1.04	1.62	0.99	0.91	0.68	0.98	0.77	0.44
■*Deception*	*0.76*	*1.60*	*1.61*	*0.90*	*0.60*	*0.54*	*0.81*	*0.19*	*0.18*
■Dumont Durville	0.38	0.96	1.44	0.98	0.88	0.58	0.95	0.70	0.33
■Esperanza	0.41	0.87	2.43	0.99	0.94	0.39	0.97	0.88	0.09
■Faraday	0.64	1.31	2.25	0.97	0.86	0.36	0.93	0.70	0.12
■*Ferraz* [a]	-	-	-	-	-	-	-	-	-
■*Great Wall* [a]	-	-	-	-	-	-	-	-	-
■*Grytviken* [a]	-	-	-	-	-	-	-	-	-
■Halley	0.64	1.83	2.49	0.99	0.86	0.37	0.94	0.49	0.12
■*Jubany* [a]	-	-	-	-	-	-	-	-	-
■*King Sejong* [a]	-	-	-	-	-	-	-	-	-
■Leningradskaja	0.34	1.01	1.35	0.99	0.79	0.62	0.96	0.44	0.31
■Macquarie	-	-	-	-	-	-	-	-	-
■Marambio	0.50	1.24	2.89	0.99	0.92	0.28	0.97	0.83	0.06
■Mario Zuchelli	0.68	1.04	1.58	0.93	0.83	0.49	0.86	0.66	0.23
■*Marsh* [a]	-	-	-	-	-	-	-	-	-
■Mawson	0.37	1.05	1.44	0.99	0.88	0.71	0.96	0.71	0.45
■McMurdo	0.82	1.18	1.85	0.95	0.87	0.68	0.88	0.76	0.41
■Mirny	0.36	1.39	1.46	0.99	0.73	0.75	0.97	0.53	0.48
■Molodeznaja	0.34	1.16	1.32	0.98	0.70	0.58	0.96	0.49	0.34
■Neumayer	0.55	1.73	2.05	0.99	0.79	0.46	0.99	0.44	0.21

TABLE S2. Continued.

Name	μ_{rms}			r			R^2		
	RLS	E-W	S09	RLS	E-W	S09	RLS	E-W	S09
Novolazarevskaya	0.35	0.97	1.41	0.99	0.93	0.63	0.96	0.70	0.37
O'Higgins	0.44	0.86	1.59	0.97	0.86	0.34	0.93	0.73	0.09
Orcadas [a]	-	-	-	-	-	-	-	-	-
Rothera	0.70	1.34	2.38	0.97	0.88	0.18	0.92	0.69	0.03
Russkaya	0.66	1.93	2.34	0.99	0.86	0.68	0.95	0.58	0.38
San Martin	0.61	1.87	2.22	0.96	0.57	0.17	0.93	0.30	0.01
Scott Base	0.33	1.16	2.08	0.99	0.92	0.68	0.98	0.81	0.39
Signy [a]	-	-	-	-	-	-	-	-	-
Syowa	0.33	0.98	1.52	0.99	0.84	0.52	0.97	0.69	0.27
Vostok	0.27	1.18	1.63	0.99	0.89	0.74	0.99	0.76	0.54
Zhongshan	0.43	1.24	1.73	0.98	0.88	0.63	0.96	0.68	0.39
AWS Stations									
Bonaparte Point	*0.71*	*0.86*	*1.44*	*0.87*	*0.78*	*0.21*	*0.73*	*0.61*	*-0.10*
Butler Island	0.44	1.97	2.45	0.99	0.77	0.44	0.97	0.48	0.19
Byrd	1.32	2.07	2.46	0.97	0.86	0.68	0.83	0.60	0.42
Cape Denison	*0.86*	*0.82*	*1.17*	*0.77*	*0.79*	*0.56*	*0.58*	*0.61*	*0.21*
Cape King	0.29	0.77	1.44	0.99	0.93	0.60	0.97	0.82	0.37
Cape Phillips	0.48	0.80	1.42	0.96	0.89	0.53	0.92	0.77	0.28
Cape Ross	0.58	1.01	1.68	0.96	0.86	0.54	0.91	0.74	0.28
Clean Air	0.47	1.08	1.90	0.98	0.90	0.60	0.96	0.79	0.35
D10	0.49	1.13	1.56	0.97	0.87	0.63	0.94	0.69	0.40
D47	*1.17*	*1.24*	*1.53*	*0.80*	*0.73*	*0.57*	*0.58*	*0.53*	*0.29*
D57	*1.37*	*1.46*	*1.81*	*0.73*	*0.68*	*0.46*	*0.52*	*0.45*	*0.16*
D80	*1.47*	*1.70*	*1.83*	*0.85*	*0.81*	*0.74*	*0.71*	*0.61*	*0.55*
Dome C II	*1.64*	*1.62*	*1.65*	*0.72*	*0.69*	*0.70*	*0.45*	*0.46*	*0.44*
Doug	*1.21*	*1.51*	*1.60*	*0.85*	*0.76*	*0.71*	*0.71*	*0.55*	*0.50*
Drescher	0.47	1.61	2.07	0.99	0.86	0.50	0.96	0.54	0.24
Elaine	0.55	2.33	3.05	0.99	0.86	0.56	0.98	0.60	0.31
Elizabeth	*1.54*	*1.72*	*2.38*	*0.86*	*0.87*	*0.58*	*0.72*	*0.65*	*0.33*
Enigma Lake	0.50	0.93	1.47	0.96	0.86	0.55	0.92	0.72	0.29
Erin	0.40	1.24	1.68	0.98	0.84	0.59	0.96	0.64	0.34
Ferrell	0.57	1.35	2.25	0.98	0.94	0.69	0.96	0.80	0.43
GC41	0.35	2.44	3.06	0.99	0.76	0.48	0.99	0.50	0.22
GEO3	*1.16*	*1.32*	*1.58*	*0.87*	*0.83*	*0.72*	*0.74*	*0.66*	*0.52*
GF08	0.43	1.51	1.63	0.99	0.87	0.78	0.97	0.63	0.57
Gill	0.31	1.79	2.66	0.99	0.93	0.68	0.99	0.74	0.42
Harry	*1.29*	*1.46*	*1.90*	*0.85*	*0.82*	*0.61*	*0.71*	*0.63*	*0.37*
Henry	0.22	1.04	1.48	0.99	0.91	0.74	0.99	0.77	0.52

TABLE S2. Continued.

Name	μ_{rms}			r			R^2		
	RLS	E-W	S09	RLS	E-W	S09	RLS	E-W	S09
LGB10	*0.90*	*1.33*	*1.42*	*0.89*	*0.75*	*0.72*	*0.80*	*0.55*	*0.49*
LGB20	0.33	1.15	1.31	0.99	0.84	0.78	0.98	0.70	0.61
LGB35	0.34	1.12	1.44	0.99	0.85	0.72	0.97	0.70	0.49
LGB59	*1.23*	*1.32*	*1.49*	*0.78*	*0.75*	*0.64*	*0.54*	*0.46*	*0.33*
Larsen Ice Shelf	0.34	1.91	2.48	0.99	0.67	0.26	0.98	0.44	0.07
Law Dome Sum.	*1.18*	*1.40*	*1.70*	*0.84*	*0.81*	*0.62*	*0.70*	*0.57*	*0.37*
Lettau	0.28	1.93	2.90	0.99	0.93	0.62	0.99	0.72	0.36
Limbert	*1.42*	*1.88*	*2.21*	*0.82*	*0.69*	*0.45*	*0.67*	*0.42*	*0.20*
Linda	0.75	1.48	2.33	0.97	0.90	0.62	0.93	0.73	0.36
Lynn	*1.27*	*1.04*	*1.47*	*0.78*	*0.87*	*0.70*	*0.61*	*0.74*	*0.49*
Manuela	0.45	0.85	1.33	0.96	0.87	0.63	0.93	0.74	0.37
Marble Point	0.39	0.90	1.82	0.98	0.94	0.59	0.97	0.84	0.34
Marilyn	0.57	1.30	2.03	0.98	0.90	0.58	0.95	0.73	0.34
Minna Bluff	0.98	1.19	1.62	0.89	0.80	0.57	0.75	0.63	0.31
Mount Siple	0.40	1.35	1.60	0.99	0.80	0.66	0.96	0.59	0.42
Nansen Ice Sheet	0.60	0.92	1.44	0.95	0.89	0.63	0.89	0.75	0.39
Nico	0.14	0.77	1.64	0.99	0.93	0.66	0.99	0.86	0.36
Pegasus North	0.62	1.16	1.99	0.97	0.91	0.58	0.93	0.77	0.33
Pegasus South	0.77	1.38	2.28	0.97	0.91	0.59	0.92	0.75	0.32
Penguin Point	*0.99*	*0.97*	*1.34*	*0.78*	*0.87*	*0.53*	*0.58*	*0.74*	*0.24*
Port Martin	*0.77*	*0.83*	*1.07*	*0.86*	*0.85*	*0.67*	*0.71*	*0.66*	*0.44*
Priestley Glacier	0.58	0.87	1.41	0.94	0.88	0.57	0.89	0.75	0.33
Relay Station	0.20	1.30	1.48	0.99	0.82	0.75	0.99	0.66	0.56
Santa Claus Isl.	*0.84*	*0.81*	*1.19*	*0.81*	*0.76*	*0.33*	*0.55*	*0.58*	*0.10*
Schwerdtfeger	0.50	1.57	2.45	0.99	0.91	0.57	0.97	0.72	0.32
Siple	*2.22*	*1.97*	*1.76*	*0.41*	*0.57*	*0.70*	*0.11*	*0.30*	*0.44*
Sutton	*1.09*	*1.30*	*1.77*	*0.75*	*0.61*	*0.25*	*0.56*	*0.38*	*-0.15*
Theresa	*0.98*	*1.39*	*1.65*	*0.88*	*0.75*	*0.60*	*0.77*	*0.54*	*0.36*
Tourm. Plateau	0.48	0.65	1.26	0.95	0.92	0.60	0.95	0.82	0.35
Uranus Glacier	0.49	1.66	2.23	0.99	0.81	0.49	0.99	0.58	0.22

[a] Indicates stations used as predictors by S09 but, because they are more than 120km from the nearest AVHRR grid cell, were not used in this study.

S5. Verification statistics

TABLE S3. Station-by-station results for rms error (μ_{rms}), correlation coefficient (r), and coefficient-of-efficiency (CE) when that station is entirely withheld from the reconstruction. Stations that were never used as predictors for this study are italicized. Note: The 1982 – 2006 period of the S09 reconstruction is entirely instrumental data (the rank-3 AVHRR data).

	μ_{rms}			r			CE		
Name	RLS	E-W	S09	RLS	E-W	S09	RLS	E-W	S09
Manned Ground Stations									
■*Adelaide*	*1.30*	*1.62*	*2.13*	*0.87*	*0.77*	*0.59*	*0.72*	*0.57*	*0.25*
■Amundsen Scott	1.70	1.91	2.00	0.71	0.60	0.55	0.50	0.36	0.25
■Arturo Prat	0.79	1.06	1.56	0.88	0.77	0.34	0.77	0.58	0.10
■*Asuka*	*1.00*	*1.18*	*1.29*	*0.78*	*0.69*	*0.59*	*0.61*	*0.47*	*0.35*
■Belgrano I	2.53	2.77	3.24	0.74	0.73	0.38	0.45	0.35	0.10
■Belgrano II	1.25	1.16	1.46	0.75	0.74	0.50	0.43	0.51	0.23
■Byrd	2.41	2.60	2.61	0.61	0.55	0.51	0.37	0.27	0.26
■*Campbell* [a]	-	-	-	-	-	-	-	-	-
■Casey	1.36	1.62	1.80	0.79	0.72	0.58	0.62	0.46	0.32
■Davis	0.83	1.14	1.65	0.92	0.89	0.66	0.85	0.72	0.42
■*Deception*	*0.76*	*1.34*	*1.88*	*0.90*	*0.77*	*0.42*	*0.81*	*0.42*	*0.03*
■Dumont Durville	1.09	1.27	1.50	0.79	0.71	0.53	0.62	0.48	0.28
■Esperanza	1.28	1.35	2.43	0.87	0.85	0.39	0.75	0.72	0.09
■Faraday	1.77	2.21	2.30	0.68	0.43	0.30	0.46	0.16	0.09
■*Ferraz* [a]	-	-	-	-	-	-	-	-	-
■*Great Wall* [a]	-	-	-	-	-	-	-	-	-
■*Grytviken* [a]	-	-	-	-	-	-	-	-	-
■Halley	2.21	2.46	2.54	0.61	0.42	0.29	0.31	0.15	0.08
■*Jubany* [a]	-	-	-	-	-	-	-	-	-
■*King Sejong* [a]	-	-	-	-	-	-	-	-	-
■Leningradskaja	1.10	1.19	1.42	0.77	0.72	0.55	0.58	0.51	0.30
■Macquarie	-	-	-	-	-	-	-	-	-
■Marambio	1.38	1.65	2.89	0.89	0.84	0.28	0.79	0.69	0.06
■Mario Zuchelli	0.95	1.20	1.58	0.85	0.74	0.49	0.73	0.55	0.23
■*Marsh* [a]	-	-	-	-	-	-	-	-	-
■Mawson	1.02	1.22	1.43	0.87	0.82	0.72	0.73	0.61	0.46
■McMurdo	1.01	1.27	1.82	0.92	0.85	0.69	0.82	0.72	0.42
■Mirny	0.92	1.49	1.46	0.89	0.68	0.75	0.79	0.46	0.48
■Molodeznaja	0.99	1.29	1.32	0.80	0.61	0.58	0.63	0.37	0.33
■Neumayer	1.89	2.15	2.06	0.58	0.38	0.46	0.33	0.13	0.21

TABLE S3. Continued.

Name	μ_{rms} RLS	μ_{rms} E-W	μ_{rms} S09	r RLS	r E-W	r S09	CE RLS	CE E-W	CE S09
Novolazarevskaya	1.24	1.40	1.41	0.73	0.67	0.63	0.52	0.39	0.37
O'Higgins	0.64	0.96	1.59	0.92	0.82	0.34	0.64	0.67	0.09
Orcadas [a]	-	-	-	-	-	-	-	-	-
Rothera	1.45	1.71	2.38	0.82	0.77	0.18	0.64	0.50	0.03
Russkaya	2.31	2.28	2.35	0.69	0.72	0.67	0.39	0.41	0.37
San Martin	1.78	2.00	2.22	0.67	0.50	0.17	0.37	0.20	0.01
Scott Base	0.84	1.40	2.09	0.95	0.87	0.68	0.90	0.73	0.39
Signy [a]	-	-	-	-	-	-	-	-	-
Syowa	1.07	1.42	1.52	0.81	0.60	0.52	0.64	0.36	0.27
Vostok	1.62	1.72	1.72	0.74	0.70	0.70	0.54	0.49	0.49
Zhongshan	0.87	1.31	1.73	0.92	0.85	0.63	0.84	0.65	0.39
AWS Stations									
Bonaparte Point	*0.71*	*0.86*	*1.44*	*0.87*	*0.78*	*0.21*	*0.73*	*0.61*	*-0.10*
Butler Island	2.03	2.26	2.45	0.67	0.85	0.44	0.44	0.31	0.19
Byrd	2.47	2.42	2.46	0.70	0.72	0.68	0.42	0.45	0.42
Cape Denison	*0.86*	*0.82*	*1.17*	*0.77*	*0.79*	*0.56*	*0.58*	*0.62*	*0.21*
Cape King	0.59	0.81	1.44	0.94	0.92	0.60	0.89	0.80	0.37
Cape Phillips	0.77	0.87	1.42	0.89	0.86	0.53	0.79	0.73	0.28
Cape Ross	0.95	1.04	1.68	0.88	0.85	0.54	0.77	0.72	0.28
Clean Air	0.87	1.30	1.90	0.93	0.84	0.60	0.87	0.70	0.35
D10	0.83	1.22	1.56	0.92	0.83	0.63	0.83	0.63	0.40
D47	*1.17*	*1.24*	*1.53*	*0.80*	*0.73*	*0.57*	*0.58*	*0.53*	*0.29*
D57	*1.37*	*1.47*	*1.81*	*0.73*	*0.68*	*0.46*	*0.52*	*0.45*	*0.16*
D80	*1.47*	*1.71*	*1.83*	*0.85*	*0.81*	*0.74*	*0.71*	*0.61*	*0.55*
Dome C II	*1.64*	*1.61*	*1.65*	*0.72*	*0.70*	*0.70*	*0.45*	*0.47*	*0.44*
Doug	*1.21*	*1.51*	*1.60*	*0.85*	*0.76*	*0.71*	*0.71*	*0.55*	*0.50*
Drescher	1.30	1.71	2.07	0.85	0.80	0.50	0.70	0.48	0.24
Elaine	1.73	2.44	3.05	0.89	0.83	0.56	0.78	0.55	0.31
Elizabeth	*1.54*	*1.72*	*2.38*	*0.86*	*0.87*	*0.58*	*0.72*	*0.65*	*0.33*
Enigma Lake	0.69	0.94	1.47	0.92	0.86	0.55	0.84	0.71	0.29
Erin	1.28	1.32	1.68	0.81	0.80	0.59	0.62	0.59	0.34
Ferrell	1.13	1.39	2.25	0.93	0.93	0.69	0.86	0.78	0.43
GC41	2.75	2.97	3.06	0.61	0.52	0.48	0.37	0.27	0.22
GEO3	*1.16*	*1.33*	*1.58*	*0.87*	*0.82*	*0.72*	*0.74*	*0.66*	*0.52*
GF08	1.30	1.63	1.63	0.85	0.82	0.78	0.72	0.57	0.57
Gill	1.26	1.91	2.66	0.93	0.91	0.68	0.87	0.70	0.42
Harry	*1.29*	*1.44*	*1.90*	*0.85*	*0.82*	*0.61*	*0.71*	*0.63*	*0.37*
Henry	0.89	1.14	1.48	0.91	0.88	0.74	0.83	0.72	0.52

TABLE S3. Continued.

Name	μ_{rms} RLS	μ_{rms} E-W	μ_{rms} S09	r RLS	r E-W	r S09	CE RLS	CE E-W	CE S09
LGB10	*0.90*	*1.33*	*1.42*	*0.89*	*0.68*	*0.72*	*0.80*	*0.55*	*0.49*
LGB20	0.97	1.28	1.31	0.89	0.80	0.78	0.79	0.63	0.61
LGB35	0.94	1.26	1.44	0.89	0.79	0.72	0.78	0.62	0.49
LGB59	*1.23*	*1.33*	*1.49*	*0.78*	*0.68*	*0.64*	*0.54*	*0.46*	*0.33*
Larsen Ice Shelf	1.73	1.87	2.48	0.80	0.69	0.26	0.64	0.47	0.07
Law Dome Sum.	*1.18*	*1.40*	*1.70*	*0.84*	*0.81*	*0.62*	*0.70*	*0.58*	*0.37*
Lettau	1.26	2.04	2.90	0.94	0.90	0.62	0.88	0.68	0.36
Limbert	*1.42*	*1.87*	*2.21*	*0.82*	*0.70*	*0.45*	*0.67*	*0.43*	*0.20*
Linda	1.28	1.54	2.33	0.89	0.88	0.62	0.79	0.70	0.36
Lynn	*1.27*	*1.04*	*1.47*	*0.78*	*0.87*	*0.70*	*0.61*	*0.75*	*0.49*
Manuela	0.73	0.89	1.33	0.90	0.86	0.63	0.81	0.71	0.37
Marble Point	0.73	0.98	1.82	0.95	0.92	0.59	0.89	0.81	0.34
Marilyn	1.10	1.38	2.03	0.90	0.88	0.58	0.89	0.70	0.34
Minna Bluff	1.72	1.31	1.62	0.75	0.76	0.57	0.22	0.55	0.31
Mount Siple	1.75	1.73	1.60	0.56	0.58	0.66	0.30	0.32	0.42
Nansen Ice Sheet	0.81	0.96	1.44	0.90	0.88	0.63	0.81	0.73	0.39
Nico	0.68	0.91	1.64	0.95	0.90	0.66	0.89	0.81	0.36
Pegasus North	0.80	1.24	1.99	0.95	0.89	0.58	0.89	0.74	0.33
Pegasus South	0.99	1.43	2.28	0.94	0.89	0.59	0.87	0.73	0.32
Penguin Point	*0.99*	*0.96*	*1.34*	*0.78*	*0.78*	*0.53*	*0.58*	*0.58*	*0.24*
Port Martin	*0.77*	*0.85*	*1.07*	*0.86*	*0.84*	*0.67*	*0.71*	*0.65*	*0.44*
Priestley Glacier	0.81	0.97	1.41	0.88	0.85	0.57	0.78	0.70	0.33
Relay Station	1.05	1.49	1.48	0.88	0.74	0.75	0.78	0.55	0.56
Santa Claus Isl.	*0.84*	*0.82*	*1.19*	*0.81*	*0.76*	*0.33*	*0.55*	*0.57*	*0.10*
Schwerdtfeger	1.08	1.60	2.45	0.93	0.90	0.57	0.86	0.71	0.32
Siple	*2.22*	*1.97*	*1.76*	*0.41*	*0.57*	*0.70*	*0.11*	*0.30*	*0.44*
Sutton	*1.09*	*1.29*	*1.77*	*0.75*	*0.62*	*0.25*	*0.56*	*0.38*	*-0.15*
Theresa	*0.98*	*1.38*	*1.65*	*0.88*	*0.75*	*0.60*	*0.77*	*0.55*	*0.36*
Tourm. Plateau	0.77	0.74	1.26	0.88	0.89	0.60	0.75	0.78	0.35
Uranus Glacier	1.82	1.87	2.23	0.70	0.72	0.49	0.49	0.46	0.22

[a] Indicates stations used as predictors by S09 but, because they are more than 120km from the nearest AVHRR grid cell, were not used in this study.

S6. Reconstructions using TTLS infilling of ground stations

TABLE S4. Comparison of 1957 – 2006 trends (in ^{o}C decade^{-1}) between the IRidge reconstructions in the main text (bolded) and the TTLS reconstructions by truncation parameter k_{gnd}. Reconstructions using the optimal setting of k_{gnd} are underlined.

Reconstruction Type	Continent	East Antarctica	West Antarctica	Peninsula
RLS, IRidge	**0.06 ± 0.08**	**0.03 ± 0.09**	**0.10 ± 0.09**	**0.35 ± 0.11**
RLS, TTLS, k_{gnd}=5	0.10 ± 0.09	0.04 ± 0.10	0.21 ± 0.11	0.52 ± 0.14
RLS, TTLS, k_{gnd}=6	0.09 ± 0.09	0.03 ± 0.10	0.20 ± 0.11	0.50 ± 0.14
<u>RLS, TTLS, k_{gnd}=7</u>	<u>0.07 ± 0.09</u>	<u>0.05 ± 0.09</u>	<u>0.07 ± 0.07</u>	<u>0.36 ± 0.11</u>
RLS, TTLS, k_{gnd}=8	0.07 ± 0.09	0.05 ± 0.09	0.11 ± 0.08	0.38 ± 0.12
E-W, IRidge	**0.04 ± 0.06**	**0.02 ± 0.07**	**0.06 ± 0.07**	**0.32 ± 0.09**
E-W, TTLS, k_{gnd}=5	0.07 ± 0.07	0.04 ± 0.07	0.10 ± 0.08	0.39 ± 0.09
E-W, TTLS, k_{gnd}=6	0.07 ± 0.06	0.04 ± 0.07	0.09 ± 0.08	0.37 ± 0.09
<u>E-W, TTLS, k_{gnd}=7</u>	<u>0.07 ± 0.06</u>	<u>0.05 ± 0.07</u>	<u>0.05 ± 0.06</u>	<u>0.33 ± 0.09</u>
E-W, TTLS, k_{gnd}=8	0.07 ± 0.07	0.05 ± 0.07	0.11 ± 0.07	0.32 ± 0.08

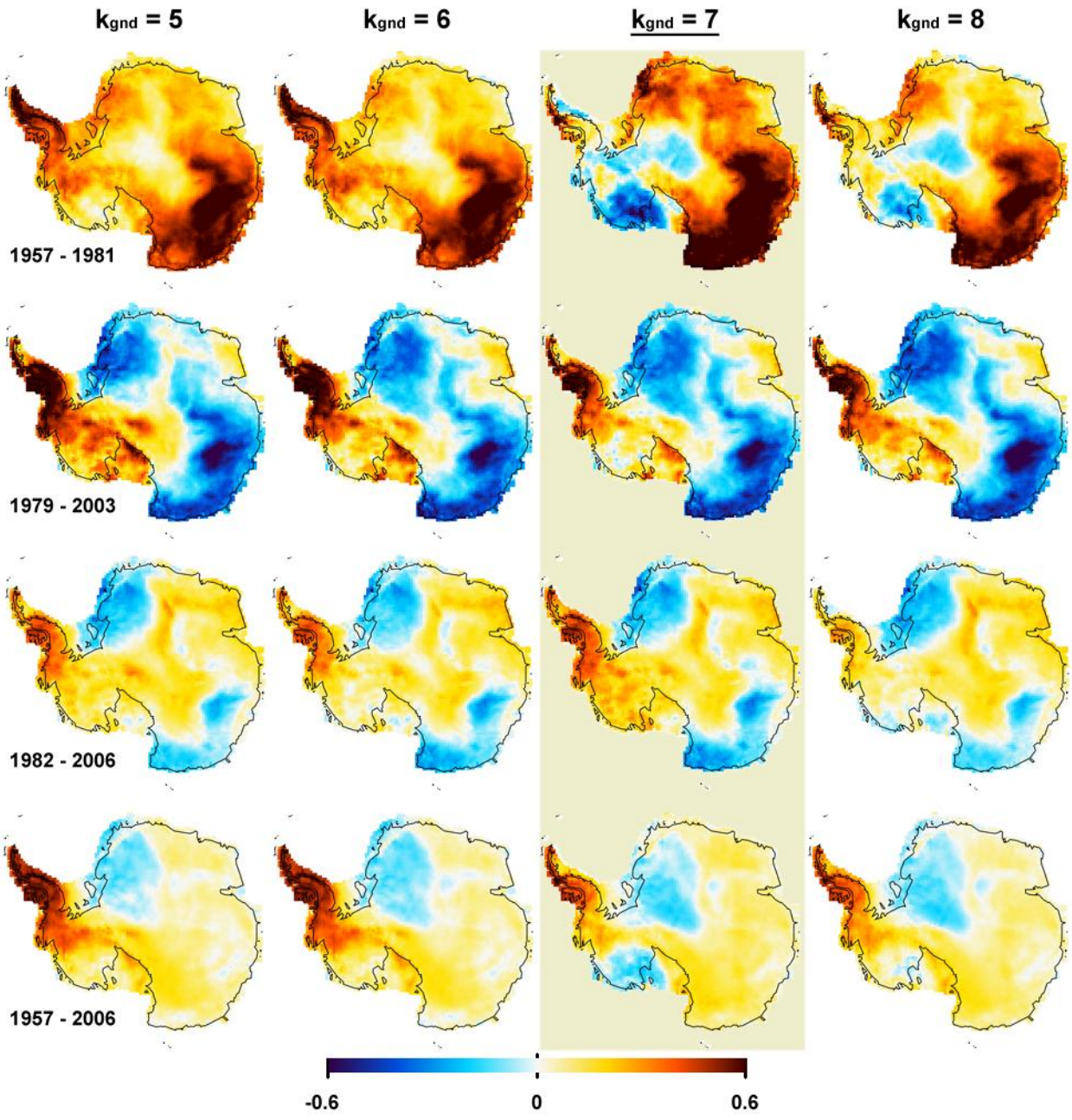

FIGURE S3. RLS reconstructions using TTLS-infilled ground stations. Minimum cross-validation error was obtained with $k_{gnd} = 7$.

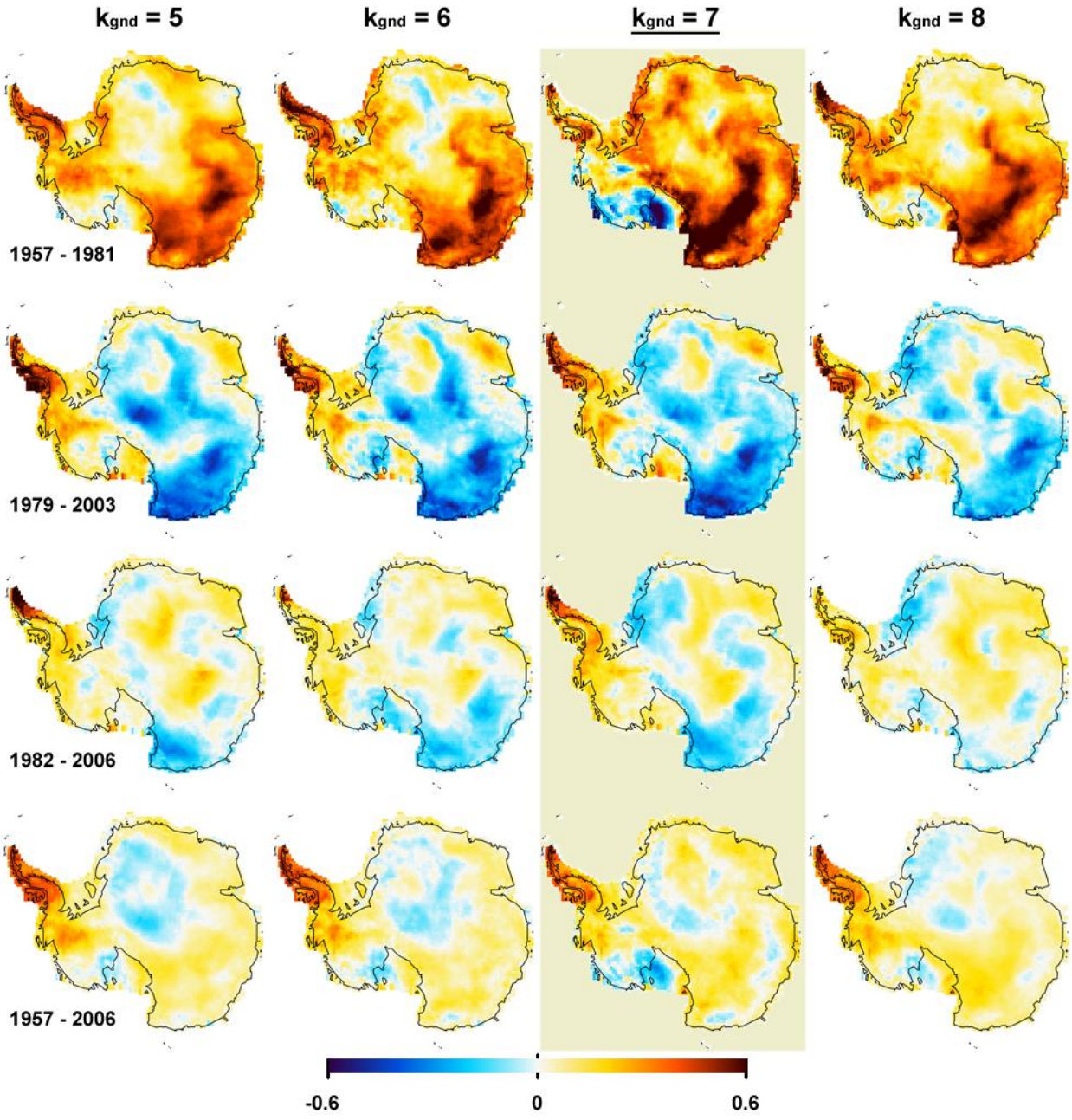

FIGURE S4. E-W reconstructions using TTLS-infilled ground stations. Minimum cross-validation error was obtained with $k_{gnd} = 7$.