

Supplementary Materials

In the following pages, we have included tables that outline the version of the observational data sets used in generating Figures 1, 2, 3, 4, and 5, along with the CMIP5 model simulations used in the generation of Figures 2 and 5.

TABLE S1. This table outlines the observational data sets used in construction of Figures 1, 2, 3, 4, and 5 in the main text.

#	Observation	Temporal Coverage (YYYYMM format)	Data Set Version (if labeled)	Reference
1	IPRC	200501–201806	-	-
2	JAMSTEC	200101–201805	-	Hosoda et al., 2008
3	UCSD	200401–201806	-	Roemmich and Gilson, 2009
4	Purkey & Johnson (updated)	1981–2018 (repeat sections/snapshot/annual data)	-	Purkey and Johnson, 2010
5	NCEI/NODC	1955–2017 (annual)	-	Levitus et al., 2012
6	EN4.2.1	190001–201806	4.2.1.g10	Good et al., 2013
7	PMEL	2005–2017 (annual)	-	G.C. Johnson et al., 2018

For the calculation of Figure 2 results, the full-time histories of the CMIP5 historical experiments were used, and these were extended past 2005 using the RCP85 future projection data from 2006 to 2017. All data sets were generated using a quadratic drift removal calculated from the full temporal history of the appropriate piControl simulations.

TABLE S2. This table outlines the CMIP5 model simulations used in construction of Figure 2 in the main text.

#	Model and Realization	Historical and RCP85 (Realization) Extension	PiControl Drift Removal (Order)
1	ACCESS1-0 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 300-798 (quadratic)
2	ACCESS1-3 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 250-748 (quadratic)
3	CanESM2 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 2015-3009 (quadratic)
4	CCSM4 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 250-1299 (quadratic)
5	CESM1-BGC r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 101-599 (quadratic)
6	CSIRO-Mk3-6-0 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1-499 (quadratic)
7	GFDL-CM3 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1-499 (quadratic)
8	GFDL-ESM2M r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1-499 (quadratic)
9	GISS-E2-H-CC r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 2081-2328 (quadratic)
10	HadGEM2-CC r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1859-2098 (quadratic)
11	HadGEM2-ES r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1859-2435 (quadratic)
12	IPSL-CM5A-LR r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1800-2798 (quadratic)
13	IPSL-CM5A-MR r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1800-2098 (quadratic)
14	IPSL-CM5B-LR r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1830-2128 (quadratic)
15	MIROC5 r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 2000-2668 (quadratic)
16	MPI-ESM-LR r1i1p1	1864-2025 (r1i1p1)	r1i1p1; 1850-2848 (quadratic)

For the calculation of Figure 5 results, the 1950 to 2004 history of the CMIP5 historical experiments were used. All trend maps were drift corrected using a linear drift removal calculated from the 1900 to 2049 (150 years straddling the 1950 to 2004 period of analysis) from the corresponding piControl simulations. To calculate the multi-model mean (MMM) result presented in the map, first a single model ensemble mean is calculated, collapsing the 113 simulations noted below to 30 fields, one for each model, and then the multi-model mean is calculated, ensuring each model contributes evenly to the MMM.

TABLE S3. This table outlines the CMIP5 model simulations used in construction of Figure 5 in the main text.

#	Model (experiment; 1950–2004)	Realizations	piControl drift removal (order 1900–2049 equiv.)
1	ACCESS1-0 (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
2	ACCESS1-3 (historical)	r1i1p1, r2i1p1	r1i1p1 1900-2049 (linear)
3	bcc-csm1-1 (historical)	r2i1p1	r1i1p1 1900-2049 (linear)
4	CanESM2 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1	r1i1p1 1900-2049 (linear)
5	CCSM4 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r6i1p1	r1i1p1 1900-2049 (linear)
6	CESM1-BGC (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
7	CMCC-CESM (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
8	CMCC-CMS (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
9	CNRM-CM5 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r6i1p1, r7i1p1, r8i1p1, r9i1p1, r10i1p1	r1i1p1 1900-2049 (linear)
10	CSIRO-Mk3-6-0 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r6i1p1, r7i1p1, r8i1p1, r9i1p1, r10i1p1	r1i1p1 1900-2049 (linear)
11	EC-EARTH (historical)	r2i1p1, r3i1p1, r5i1p1, r6i1p1, r7i1p1, r9i1p1, r10i1p1, r12i1p1, r14i1p1	r1i1p1 1900-2049 (linear)
12	FGOALS-s2 (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
13	FIO-ESM (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
14	GFDL-CM3 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1	r1i1p1 1900-2049 (linear)
15	GISS-E2-H-CC (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
16	GISS-E2-H (historical)	r1i1p1, r1i1p2, r1i1p3, r2i1p1, r2i1p2, r2i1p3, r3i1p2, r3i1p3, r4i1p2, r4i1p3, r5i1p2, r5i1p3	r1i1p1-3 1900-2049 (linear)
17	GISS-E2-R-CC (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
18	GISS-E2-R (historical)	r1i1p1, r1i1p3, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r6i1p1	r1i1p1 1900-2049 (linear)
19	HadGEM2-CC (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
20	HadGEM2-ES (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1	r1i1p1 1900-2049 (linear)
21	IPSL-CM5A-LR (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1, r6i1p1	r1i1p1 1900-2049 (linear)
22	IPSL-CM5A-MR (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
23	IPSL-CM5B-LR (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
24	MIROC5 (historical)	r1i1p1, r2i1p1, r3i1p1, r4i1p1, r5i1p1	r1i1p1 1900-2049 (linear)
25	MIROC-ESM-CHEM (historical)	r1i1p1	r1i1p1 1900-2049 (linear)
26	MIROC-ESM (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
27	MPI-ESM-LR (historical)	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)
28	MPI-ESM-P (historical)	r2i2p1	r1i1p1 1900-2049 (linear)
29	NorESM1-ME	r1i1p1	r1i1p1 1900-2049 (linear)
30	NorESM1-M	r1i1p1, r2i1p1, r3i1p1	r1i1p1 1900-2049 (linear)