Dataset S1

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Dataset S1a. Proxy sites and original studies used in this analysis

Location	Mean Latitude (◦N)	Mean Longitude (◦E)	Median Age Range (CE)	N	References
Western North Atlantic Ocean					
Connecticut, USA	41.3	-71.9	-1174 to 1981	162	ref. 36, 42, 62, 73, 85–87
Florida, USA	30.6	-81.7	-559 to 1999	65	ref. 61
Greenland	65.7	-51.0	1328 to 1950	44	ref. 68
Louisiana, USA	29.9	-91.8	448 to 1807	23	ref. 55
Massachusetts, USA	42.2	-70.8	-1440 to 1963	39	ref. 5, 44, 45, 75, 83
New Jersey, USA	39.3	-74.6	-476 to 2000	151	ref. 36, 41, 43, 58, 60, 72, 74, 82
North Carolina, USA	35.6	-75.9	-1694 to 2000	180	ref. 5, 36, 57, 79
Nova Scotia, Canada	44.7	-63.3	-836 to 1996	78	ref. 47, 77
Eastern North Atlantic Ocean					
Brittany, France	48.3	-4.3	-872 to 1467	7	ref. 80
Denmark	55.6	-8.3	-808 to 1881	22	ref. 48, 84
Iceland	64.8	-22.4	-141 to 2002	93	ref. 49, 76
Isle of Wight, UK	50.7	-1.4	-517 to 2011	26	ref. 66, 67, 69
Scotland, UK	58.4	-4.8	-198 to 2009	108	ref. 34, 38, 78
South West England, UK	50.3	-3.9	-482 to 1448	11	ref. 51, 53
Spain	43.4	-2.9	-1075 to 2003	52	ref. 46, 63–65
South Atlantic Ocean					
Rio de Janeiro, Brazil	-23.0	-43.5	-1302 to 1388	16	ref. 40, 59, 71
Santa Catarina, Brazil	-28.5	-48.8	-688 to 1834	20	ref. 33
South Africa	-33.7	26.7	-1197 to 2010	41	ref. 35, 37, 39, 70, 81
Mediterranean Sea					
Israel	32.5	34.9	-10 to 1132	65	ref. 7
Pacific Ocean					
Christmas Island, Kiribati	2.0	-157.5	-1050 to 1860	72	ref. 8, 89
Cook Islands	-20.2	-159.8	363 to 1900	12	ref. 56
New Zealand	-46.5	169.7	-299 to 1991	15	ref. 50, 54
Tasmania, Australia	-42.3	147.9	1820 to 2004	28	ref. 52
Indian Ocean					
Seychelles	-4.7	55.5	-646 to 1442	10	ref. 88

Mean latitude, mean longitude and the range of median data point age estimates are shown for the N individual data points from each site.

Dataset S1b. Tide gauges used in this analysis

Name	Latitude (◦N)	Longitude (◦E)	First Year	Last Year	PSMSL ID
AMSTERDAM	52.37	4.90	1700	1925	—
KRONSTADT	59.98	29.77	1777	1993	—
STOCKHOLM	59.32	18.08	1774	2000	—
BREST	48.38	-4.49	1807	2013	1
SWINOUJSCIE	53.92	14.23	1811	1999	2
SHEERNESS	51.45	0.74	1833	2006	3
CUXHAVEN 2	53.87	8.72	1843	2010	7
WISMAR 2	53.90	11.46	1849	2012	8
MAASSLUIS	51.92	4.25	1848	2013	9
SAN FRANCISCO	37.81	-122.47	1855	2013	10
WARNEMUNDE 2	54.17	12.10	1856	2012	11
NEW YORK	40.70	-74.01	1856	2013	12
LIVERPOOL	53.40	-3.00	1858	1983	15
VLISSINGEN	51.44	3.60	1862	2013	20
ABERDEEN II	57.15	-2.08	1862	1965	21
HOEK VAN HOLLAND	51.98	4.12	1864	2013	22
DEN HELDER	52.96	4.75	1865	2013	23
HARLINGEN	53.18	5.41	1865	2013	25
IJMUIDEN	52.46	4.55	1872	2013	32
STAVANGER	58.97	5.73	1919	2012	47
BERGEN	60.40	5.32	1916	2012	58
NORTH SHIELDS	55.01	-1.44	1896	2013	95
HALIFAX	44.67	-63.58	1896	2011	96
FERNANDINA BEACH	30.67	-81.47	1898	2013	112
TROIS-RIVIERES	46.33	-72.55	1925	2013	126
PHILADELPHIA	39.93	-75.14	1901	2013	135
DUNEDIN II	-45.88	170.51	1900	2013	136
BALTIMORE	39.27	-76.58	1903	2013	148
GALVESTON II	29.31	-94.79	1909	2013	161
ATLANTIC CITY	39.35	-74.42	1912	2013	180
PORTLAND	43.66	-70.25	1912	2013	183
NEWLYN	50.10	-5.54	1916	2013	202
CHARLESTON I	32.78	-79.92	1922	2013	234
BOSTON	42.35	-71.05	1921	2013	235
WEST-TERSCHELLING	53.36	5.22	1921	2013	236
PENSACOLA	30.40	-87.21	1924	2011	246
PORT SAID	31.25	32.30	1923	1946	253
SEWELLS POINT	36.95	-76.33	1928	2013	299
ANNAPOLIS	38.98	-76.48	1929	2013	311
PORTSMOUTH	50.80	-1.11	1962	2012	350
NEWPORT	41.51	-71.33	1931	2013	351
WASHINGTON DC	38.87	-77.02	1931	2013	360
SANDY HOOK	40.47	-74.01	1933	2013	366
WOODS HOLE	41.52	-70.67	1933	2013	367
FORT PULASKI	32.03	-80.90	1935	2013	395
WILMINGTON	34.23	-77.95	1936	2013	396
NEW LONDON	41.36	-72.09	1939	2013	429
EUGENE ISLAND	29.37	-91.39	1940	1974	440
ST JEAN DE LUZ	43.40	-1.68	1943	2010	469
SANTANDER I	43.46	-3.79	1944	2012	485
REYKJAVIK	64.15	-21.94	1957	2013	638
CANANEIA	-25.02	-47.93	1955	2004	726
PORT ELIZABETH	-33.95	25.63	1980	2010	820
SIMONS BAY	-34.19	18.44	1958	2013	826
MALIN HEAD	55.37	-7.33	1959	2001	916
KNYSNA	-34.05	23.05	1961	2013	950
DEVONPORT	50.37	-4.19	1962	2013	982
ILHA FISCAL	-22.90	-43.17	1965	2013	1032
BRIDGEPORT	41.17	-73.18	1965	2013	1068
WICK	58.44	-3.09	1965	2012	1109
ULLAPOOL	57.90	-5.16	1983	2013	1112
CAPE MAY	38.97	-74.96	1966	2013	1153
SPRING BAY	-42.55	147.93	1992	2013	1216
CHRISTMAS ISLAND II	1.98	-157.48	1974	2010	1371
RAROTONGA	-21.20	-159.77	1978	2001	1453
DUCK PIER OUTSIDE	36.18	-75.75	1985	2013	1636

Dataset S1c. Hyperparameters under different modeling assumptions

Model	log likelihood	σ_g (mm)	τ_g (yr)	σ_l (mm/yr)	λ_l (°)	σ_m (mm)	τ_m (yr)	λ_m (°)	σ_w (mm)	σ_0 (mm)	σ_{g0} (mm)
$ML_{2,1}$	-12260	57.3	100.0	1.1	5.5	50.9	—	6.4	20.9	18.1	121.1
$ML_{2,2}$	-12257	772.3	2004.9	0.9	2.7	57.0	100.0	9.0	20.9	16.6	0.2
$ML_{1,1}$	-12266	53.7	100.0	1.1	5.7	—	—	7.0	20.8	18.2	118.5
NC	-12255	396.9	692.3	0.9	1.9	57.7	100.0	7.4	20.8	0.4	235.9
Gr	-12259	165.8	311.7	1.1	4.9	53.1	100.0	7.1	21.0	18.1	121.2

Dataset S1d. Prior estimates of rates of GSL change under different modeling assumptions (mm/yr)

	$ML_{2,1}$	$ML_{2,2}$	$ML_{1,1}$	NC	Gr
0–300	0.00 ± 0.48	0.00 ± 1.03	0.00 ± 0.45	0.00 ± 1.50	0.00 ± 1.04
300–700	0.00 ± 0.40	0.00 ± 0.75	0.00 ± 0.38	0.00 ± 1.24	0.00 ± 0.91
700–1000	0.00 ± 0.53	0.00 ± 0.70	0.00 ± 0.50	0.00 ± 1.37	0.00 ± 1.09
1000–1400	0.00 ± 0.40	0.00 ± 0.75	0.00 ± 0.38	0.00 ± 1.24	0.00 ± 0.91
1400–1800	0.00 ± 0.38	0.00 ± 1.03	0.00 ± 0.36	0.00 ± 1.41	0.00 ± 0.92
1800–1900	0.00 ± 1.11	0.00 ± 1.26	0.00 ± 1.04	0.00 ± 1.81	0.00 ± 1.48
1860–1900	0.00 ± 1.56	0.00 ± 1.29	0.00 ± 1.46	0.00 ± 1.89	0.00 ± 1.65
1900–2000	0.00 ± 1.16	0.00 ± 1.28	0.00 ± 1.08	0.00 ± 1.78	0.00 ± 1.47
Amplitude (cm)	± 10 (8–15)	± 17 (8–37)	± 11 (8–14)	± 27 (14–48)	± 20 (12–33)

Errors are $\pm 2\sigma$. Amplitude row indicates the median (5th–95th percentile) prior estimate of the amplitude of variability over 0–1900 CE.

Dataset S1e. Posterior estimates of rates of GSL change under different modeling assumptions (mm/yr)

	$ML_{2,1}$	$ML_{2,2}$	$ML_{1,1}$	NC	Gr
0–300	0.13 ± 0.25 (0.87)	0.18 ± 0.21 (0.96)	0.14 ± 0.25 (0.88)	0.17 ± 0.26 (0.91)	0.17 ± 0.25 (0.92)
300–700	0.08 ± 0.20 (0.79)	0.04 ± 0.18 (0.68)	0.07 ± 0.20 (0.78)	0.05 ± 0.21 (0.68)	0.06 ± 0.21 (0.71)
700–1000	-0.03 ± 0.26 (0.40)	-0.02 ± 0.22 (0.44)	-0.03 ± 0.26 (0.42)	0.02 ± 0.28 (0.56)	-0.02 ± 0.27 (0.45)
1000–1400	-0.23 ± 0.19 (0.01)	-0.17 ± 0.17 (0.02)	-0.23 ± 0.19 (0.01)	-0.25 ± 0.20 (0.01)	-0.24 ± 0.20 (0.01)
1400–1800	0.01 ± 0.16 (0.55)	-0.02 ± 0.14 (0.38)	0.00 ± 0.17 (0.53)	0.01 ± 0.17 (0.55)	0.01 ± 0.17 (0.58)
1800–1900	-0.03 ± 0.38 (0.45)	0.40 ± 0.28 (1.00)	-0.05 ± 0.39 (0.40)	0.23 ± 0.38 (0.89)	0.09 ± 0.39 (0.69)
1860–1900	0.41 ± 0.54 (0.94)	0.69 ± 0.32 (1.00)	0.40 ± 0.56 (0.93)	0.60 ± 0.48 (0.99)	0.50 ± 0.51 (0.98)
1900–2000	1.38 ± 0.15 (1.00)	1.35 ± 0.13 (1.00)	1.37 ± 0.15 (1.00)	1.40 ± 0.14 (1.00)	1.39 ± 0.14 (1.00)
Amplitude (0–1900; cm)	± 8 (7–11)	± 6 (4–8)	± 9 (7–11)	± 8 (6–10)	± 8 (6–11)

Errors are $\pm 2\sigma$. Parenthetical numbers indicate probability greater than 0–1700 CE average rate. Amplitude row indicates the median (5th–95th percentile) estimate of the amplitude of variability over 0–1900 CE.

Dataset S1f. Rates of GSL change employing different data subsets (mm/yr; prior $ML_{2,1}$)

Subset	0–700	700–1000	1000–1400	1400–1600	1600–1800	1800–1900	1900–2000
+All+GSL	$0.10 \pm 0.10^{**}$	-0.03 ± 0.26	$-0.23 \pm 0.19^{***}$	$0.29 \pm 0.35^{**}$	$-0.28 \pm 0.31^{**}$	-0.03 ± 0.38	$1.38 \pm 0.15^{***}$
+All-GSL	$0.10 \pm 0.10^{**}$	-0.04 ± 0.26	$-0.23 \pm 0.19^{***}$	$0.29 \pm 0.35^{**}$	$-0.25 \pm 0.32^{*}$	-0.04 ± 0.40	$1.31 \pm 0.33^{***}$
+NWAtlantic+GSL	-0.00 ± 0.13	-0.00 ± 0.30	$-0.13 \pm 0.21^{\dagger}$	$0.37 \pm 0.38^{**}$	$-0.21 \pm 0.38^{\dagger}$	-0.07 ± 0.53	$1.37 \pm 0.16^{***}$
+NWAtlantic-GSL	-0.00 ± 0.13	-0.00 ± 0.30	$-0.12 \pm 0.21^{\dagger}$	$0.37 \pm 0.38^{**}$	$-0.20 \pm 0.39^{\dagger}$	$-0.18 \pm 0.58^{\dagger}$	$1.48 \pm 0.52^{***}$
-NWAtlantic+GSL	$0.19 \pm 0.14^{***}$	0.04 ± 0.37	$-0.29 \pm 0.29^{**}$	0.02 ± 0.54	$-0.34 \pm 0.44^{*}$	-0.04 ± 0.47	$1.37 \pm 0.16^{***}$
-NWAtlantic-GSL	$0.18 \pm 0.14^{***}$	0.04 ± 0.37	$-0.29 \pm 0.29^{**}$	0.03 ± 0.54	$-0.26 \pm 0.45^{\dagger}$	0.01 ± 0.49	$1.01 \pm 0.40^{***}$
+NEAtlantic+GSL	$0.16 \pm 0.17^{**}$	0.01 ± 0.45	$-0.16 \pm 0.35^{\dagger}$	-0.04 ± 0.65	$-0.48 \pm 0.53^{**}$	-0.00 ± 0.54	$1.35 \pm 0.16^{***}$
+NEAtlantic-GSL	$0.15 \pm 0.17^{**}$	-0.01 ± 0.45	$-0.17 \pm 0.35^{\dagger}$	-0.04 ± 0.65	$-0.28 \pm 0.54^{\dagger}$	0.08 ± 0.57	$0.51 \pm 0.54^{**}$
-NEAtlantic+GSL	$0.06 \pm 0.11^{\dagger}$	-0.04 ± 0.27	$-0.18 \pm 0.20^{**}$	$0.31 \pm 0.35^{**}$	$-0.19 \pm 0.35^{\dagger}$	$-0.17 \pm 0.48^{\dagger}$	$1.39 \pm 0.16^{***}$
-NEAtlantic-GSL	$0.06 \pm 0.11^{\dagger}$	-0.04 ± 0.27	$-0.18 \pm 0.20^{**}$	$0.31 \pm 0.35^{**}$	$-0.20 \pm 0.36^{\dagger}$	$-0.28 \pm 0.51^{\dagger}$	$1.56 \pm 0.40^{***}$
+NAtlantic+GSL	$0.06 \pm 0.12^{\dagger}$	-0.01 ± 0.28	$-0.19 \pm 0.20^{**}$	$0.33 \pm 0.37^{**}$	$-0.30 \pm 0.34^{**}$	0.04 ± 0.41	$1.36 \pm 0.15^{***}$
+NAtlantic-GSL	$0.06 \pm 0.12^{\dagger}$	-0.01 ± 0.28	$-0.20 \pm 0.20^{**}$	$0.33 \pm 0.37^{**}$	$-0.23 \pm 0.34^{*}$	0.05 ± 0.43	$1.18 \pm 0.40^{***}$
-NAtlantic+GSL	$0.12 \pm 0.15^{*}$	0.04 ± 0.41	$-0.21 \pm 0.31^{*}$	0.02 ± 0.56	$-0.16 \pm 0.53^{\dagger}$	$-0.29 \pm 0.70^{\dagger}$	$1.41 \pm 0.17^{***}$
-NAtlantic-GSL	$0.12 \pm 0.15^{*}$	0.04 ± 0.41	$-0.21 \pm 0.31^{*}$	0.02 ± 0.56	$-0.14 \pm 0.54^{\dagger}$	$-0.30 \pm 0.75^{\dagger}$	$1.30 \pm 0.55^{***}$
+SAmerica+GSL	$0.06 \pm 0.20^{\dagger}$	-0.07 ± 0.53	0.01 ± 0.40	0.01 ± 0.70	$-0.34 \pm 0.71^{\dagger}$	$-0.31 \pm 0.99^{\dagger}$	$1.40 \pm 0.18^{***}$
+SAmerica-GSL	$0.04 \pm 0.20^{\dagger}$	-0.07 ± 0.53	0.01 ± 0.40	-0.01 ± 0.70	-0.09 ± 0.75	$-0.38 \pm 1.07^{\dagger}$	$0.67 \pm 1.00^{*}$
-SAmerica+GSL	$0.09 \pm 0.11^{**}$	-0.02 ± 0.26	$-0.23 \pm 0.19^{***}$	$0.30 \pm 0.35^{**}$	$-0.27 \pm 0.31^{**}$	-0.01 ± 0.38	$1.37 \pm 0.15^{***}$
-SAmerica-GSL	$0.09 \pm 0.11^{**}$	-0.02 ± 0.26	$-0.23 \pm 0.19^{***}$	$0.30 \pm 0.35^{**}$	$-0.24 \pm 0.32^{*}$	-0.01 ± 0.40	$1.26 \pm 0.34^{***}$
+AtlanticMediterranean+GSL	$0.10 \pm 0.11^{**}$	0.00 ± 0.27	$-0.33 \pm 0.21^{***}$	$0.45 \pm 0.37^{***}$	$-0.26 \pm 0.34^{*}$	0.01 ± 0.42	$1.35 \pm 0.15^{***}$
+AtlanticMediterranean-GSL	$0.10 \pm 0.11^{**}$	0.00 ± 0.27	$-0.34 \pm 0.21^{***}$	$0.45 \pm 0.37^{***}$	$-0.19 \pm 0.34^{\dagger}$	0.04 ± 0.44	$1.11 \pm 0.39^{***}$
-AtlanticMediterranean+GSL	$0.04 \pm 0.17^{\dagger}$	$-0.08 \pm 0.43^{\dagger}$	$0.10 \pm 0.29^{\dagger}$	$-0.16 \pm 0.54^{\dagger}$	$-0.27 \pm 0.53^{\dagger}$	$-0.24 \pm 0.67^{\dagger}$	$1.41 \pm 0.17^{***}$
-AtlanticMediterranean-GSL	$0.04 \pm 0.17^{\dagger}$	$-0.07 \pm 0.43^{\dagger}$	$0.10 \pm 0.29^{\dagger}$	$-0.16 \pm 0.54^{\dagger}$	$-0.27 \pm 0.53^{\dagger}$	$-0.38 \pm 0.70^{\dagger}$	$1.58 \pm 0.54^{***}$

$\dagger/*/**/***$ = 67%/90%/95%/99% probability of sign. '+' indicates a data set consisting only of the sites in the named region, '-' a data set consisting of sites except those in the named region. '+GSL' and '-GSL' represent the inclusion or exclusion of the Kalman smoother GMSL curve of ref. 12.

Dataset S1g. Rates of RSL change (mm/yr; prior $ML_{2,1}$)

Site	0–1700	0–700	700–1400	1400–1800	1800–1900	1900–2000
Brittany-Arun	$0.85 \pm 0.14^{***}$	$0.99 \pm 0.25^{*}$	$0.65 \pm 0.25^{*}$	$0.93 \pm 0.35^{\dagger}$	0.75 ± 0.52	$1.65 \pm 0.49^{***}$
Brittany-Tresseny	$0.59 \pm 0.47^{***}$	$0.73 \pm 0.51^{*}$	$0.39 \pm 0.52^{**}$	$0.68 \pm 0.57^{\dagger}$	0.50 ± 0.65	$1.39 \pm 0.61^{***}$
Christmas Island	$-0.06 \pm 0.07^{**}$	$0.01 \pm 0.19^{\dagger}$	-0.10 ± 0.21	$-0.15 \pm 0.32^{\dagger}$	0.04 ± 0.94	$1.19 \pm 0.74^{***}$
Connecticut-Barn Island			0.91 ± 0.22	1.06 ± 0.20	1.09 ± 0.62	2.69 ± 0.45
Connecticut-East River Marsh	$0.97 \pm 0.07^{***}$	$1.02 \pm 0.15^{\dagger}$	$0.91 \pm 0.14^{\dagger}$	$1.04 \pm 0.21^{\dagger}$	1.09 ± 0.61	$2.73 \pm 0.47^{***}$
Connecticut-Indian River	$0.91 \pm 0.24^{***}$	$0.96 \pm 0.28^{\dagger}$	$0.84 \pm 0.27^{\dagger}$	$0.97 \pm 0.33^{\dagger}$	$1.08 \pm 0.67^{\dagger}$	$2.71 \pm 0.52^{***}$
Cook Islands-Aitutaki			-0.58 ± 0.24	-0.54 ± 0.37	-1.10 ± 0.96	1.25 ± 0.87
Cook Islands-Rarotonga				-0.53 ± 0.36	-1.20 ± 0.90	1.23 ± 0.79
Denmark-Ho Bugt	$0.52 \pm 0.12^{***}$	$0.67 \pm 0.24^{*}$	$0.32 \pm 0.23^{**}$	$0.60 \pm 0.37^{\dagger}$	0.71 ± 0.89	$1.43 \pm 0.78^{***}$
Florida-Nassau	$0.40 \pm 0.06^{***}$	$0.43 \pm 0.15^{\dagger}$	0.38 ± 0.15	0.39 ± 0.27	0.49 ± 0.83	$1.82 \pm 0.49^{***}$
Greenland-Aasiaat				0.98 ± 0.33	0.46 ± 1.02	2.02 ± 1.05
Greenland-Nanortalik					1.31 ± 1.05	2.67 ± 1.09
Greenland-Sisimiut				0.66 ± 0.36	0.10 ± 1.03	1.67 ± 1.05
Iceland-Vioarholmi	$0.65 \pm 0.08^{***}$	$0.82 \pm 0.20^{**}$	$0.47 \pm 0.22^{*}$	0.66 ± 0.35	$0.89 \pm 0.89^{\dagger}$	$1.96 \pm 0.77^{***}$
Isle of Wight-Newtown Estuary	$0.59 \pm 0.33^{***}$	$0.74 \pm 0.38^{*}$	$0.38 \pm 0.38^{**}$	$0.69 \pm 0.49^{\dagger}$	0.56 ± 0.67	$1.43 \pm 0.61^{***}$
Israel-Casesarea	-0.01 ± 0.08	$0.14 \pm 0.16^{**}$	$-0.22 \pm 0.20^{**}$	0.01 ± 0.39	0.05 ± 1.07	$1.43 \pm 1.03^{***}$
Louisiana-Lydia			0.60 ± 0.18	0.49 ± 0.30	0.25 ± 0.96	3.41 ± 0.83
Massachusetts-Barnstable	$1.16 \pm 0.26^{***}$	$1.22 \pm 0.31^{\dagger}$	$1.07 \pm 0.29^{\dagger}$	$1.24 \pm 0.36^{\dagger}$	1.23 ± 0.75	$2.81 \pm 0.57^{***}$
Massachusetts-Revere	$0.62 \pm 0.08^{***}$	$0.69 \pm 0.17^{\dagger}$	$0.53 \pm 0.15^{\dagger}$	$0.71 \pm 0.25^{\dagger}$	0.69 ± 0.69	$2.35 \pm 0.45^{***}$
Massachusetts-Wood Island	$0.54 \pm 0.09^{***}$	$0.61 \pm 0.19^{\dagger}$	$0.45 \pm 0.13^{\dagger}$	$0.63 \pm 0.24^{\dagger}$	0.64 ± 0.69	$2.23 \pm 0.47^{***}$
New Jersey-Cape May Courthouse	$1.54 \pm 0.10^{***}$	$1.64 \pm 0.16^{*}$	$1.49 \pm 0.17^{\dagger}$	$1.49 \pm 0.24^{\dagger}$	$1.78 \pm 0.62^{\dagger}$	$3.87 \pm 0.43^{***}$
New Jersey-Cheesequake Marsh	$1.46 \pm 0.33^{***}$	$1.53 \pm 0.35^{*}$	$1.38 \pm 0.36^{\dagger}$	1.47 ± 0.42	$1.72 \pm 0.72^{\dagger}$	$3.47 \pm 0.50^{***}$
New Jersey-Leeds Point	$1.53 \pm 0.06^{***}$	$1.63 \pm 0.13^{**}$	$1.45 \pm 0.13^{\dagger}$	1.52 ± 0.24	$1.77 \pm 0.63^{\dagger}$	$3.76 \pm 0.41^{***}$
New Zealand-Blueskin Bay	-0.03 ± 0.21	$0.10 \pm 0.29^{\dagger}$	$-0.18 \pm 0.30^{\dagger}$	-0.07 ± 0.40	0.14 ± 0.90	$1.47 \pm 0.56^{***}$
New Zealand-Pounawea			0.20 ± 0.33	0.30 ± 0.40	0.56 ± 0.84	2.08 ± 0.60
North Carolina-Croatan National Forest			0.66 ± 0.30	0.45 ± 0.34	0.83 ± 0.67	2.77 ± 0.57
North Carolina-Hatteras Island				0.99 ± 0.60	1.21 ± 0.79	3.40 ± 0.76
North Carolina-Sand Point	$1.12 \pm 0.04^{***}$	$1.08 \pm 0.10^{\dagger}$	$1.24 \pm 0.09^{***}$	$0.99 \pm 0.16^{*}$	1.08 ± 0.50	$3.33 \pm 0.47^{***}$
North Carolina-Tump Point	$1.06 \pm 0.08^{***}$	1.05 ± 0.16	$1.16 \pm 0.15^{*}$	$0.91 \pm 0.14^{**}$	$1.33 \pm 0.48^{\dagger}$	$3.47 \pm 0.41^{***}$
North Carolina-Wilmington	$0.68 \pm 0.17^{***}$	0.69 ± 0.23	$0.73 \pm 0.22^{\dagger}$	$0.58 \pm 0.30^{\dagger}$	$0.90 \pm 0.73^{\dagger}$	$2.58 \pm 0.54^{***}$
Nova Scotia-Chezzetcook	$1.78 \pm 0.13^{***}$	$1.87 \pm 0.24^{\dagger}$	$1.65 \pm 0.23^{\dagger}$	$1.89 \pm 0.22^{\dagger}$	1.66 ± 0.53	$3.14 \pm 0.45^{***}$
Rio de Janeiro-Arraial do Cabro	$-0.79 \pm 0.28^{***}$	$-0.68 \pm 0.35^{\dagger}$	$-0.94 \pm 0.35^{\dagger}$	-0.80 ± 0.47	-0.90 ± 1.08	$0.90 \pm 0.95^{***}$
Rio de Janeiro-Buzios	$-0.66 \pm 0.25^{***}$	$-0.54 \pm 0.33^{\dagger}$	$-0.80 \pm 0.33^{\dagger}$	-0.66 ± 0.45	-0.76 ± 1.07	$1.03 \pm 0.94^{***}$
Rio de Janeiro-Frade	$-0.63 \pm 0.30^{***}$	$-0.51 \pm 0.37^{\dagger}$	$-0.77 \pm 0.37^{\dagger}$	-0.64 ± 0.48	-0.73 ± 1.07	$1.08 \pm 0.94^{***}$
Rio de Janeiro-Ilha Grande	$-0.87 \pm 0.47^{***}$	$-0.75 \pm 0.53^{\dagger}$	$-1.02 \pm 0.51^{\dagger}$	-0.89 ± 0.60	-1.03 ± 1.14	$0.86 \pm 1.00^{***}$
Rio de Janeiro-Itaipu-Acu	$-0.20 \pm 0.16^{***}$	$-0.09 \pm 0.27^{\dagger}$	$-0.35 \pm 0.27^{\dagger}$	-0.21 ± 0.41	-0.31 ± 1.04	$1.53 \pm 0.88^{***}$
Rio de Janeiro-Mangaratiba	$-0.64 \pm 0.24^{***}$	$-0.52 \pm 0.32^{\dagger}$	$-0.79 \pm 0.32^{\dagger}$	-0.66 ± 0.45	-0.79 ± 1.06	$1.09 \pm 0.91^{***}$
Rio de Janeiro-Parati-Mirim	$-0.85 \pm 0.42^{***}$	$-0.73 \pm 0.47^{\dagger}$	$-1.00 \pm 0.48^{\dagger}$	-0.87 ± 0.57	-1.02 ± 1.12	$0.87 \pm 0.99^{***}$
Rio de Janeiro-Tarituba	$-0.91 \pm 0.43^{***}$	$-0.79 \pm 0.48^{\dagger}$	$-1.06 \pm 0.49^{\dagger}$	-0.93 ± 0.57	-1.08 ± 1.13	$0.81 \pm 1.00^{***}$
Santa Catarina-Cape of Santa Marta	$-0.58 \pm 0.24^{***}$	$-0.46 \pm 0.32^{\dagger}$	$-0.74 \pm 0.32^{\dagger}$	-0.59 ± 0.45	-0.81 ± 1.10	$1.00 \pm 1.01^{***}$
Santa Catarina-Ponta de Itapiruba	$-0.49 \pm 0.54^{**}$	$-0.37 \pm 0.58^{\dagger}$	$-0.65 \pm 0.58^{\dagger}$	-0.51 ± 0.66	-0.73 ± 1.20	$1.10 \pm 1.10^{***}$
Scotland-Kyle of Tongue			-0.36 ± 0.27	-0.16 ± 0.38	-0.25 ± 0.85	0.83 ± 0.71
Scotland-Loch Laxford			-0.07 ± 0.25	0.13 ± 0.36	0.03 ± 0.85	1.13 ± 0.71
Scotland-Wick	$-0.15 \pm 0.12^{***}$	$0.01 \pm 0.24^{**}$	$-0.35 \pm 0.23^{**}$	-0.14 ± 0.36	-0.22 ± 0.83	$0.85 \pm 0.67^{***}$
Seychelles-Barbarons	$0.44 \pm 0.15^{***}$	$0.54 \pm 0.26^{\dagger}$	$0.30 \pm 0.26^{\dagger}$	0.44 ± 0.41	0.41 ± 1.11	$1.81 \pm 1.05^{***}$
South Africa-Groenvlei			0.03 ± 0.36	0.36 ± 0.47	0.10 ± 1.04	1.48 ± 0.85
South Africa-Kariega Estuary			0.42 ± 0.28	0.79 ± 0.37	0.49 ± 1.01	1.76 ± 0.89
South Africa-Langebaan	-0.02 ± 0.16	$0.12 \pm 0.27^{*}$	$-0.25 \pm 0.25^{**}$	$0.08 \pm 0.40^{\dagger}$	-0.11 ± 1.05	$1.31 \pm 0.89^{***}$
South West England-Thurlestone	$0.95 \pm 0.16^{***}$	$1.10 \pm 0.29^{*}$	$0.73 \pm 0.23^{**}$	$1.04 \pm 0.37^{\dagger}$	0.93 ± 0.70	$1.78 \pm 0.60^{***}$
Spain-Muskiz Estuary	$0.92 \pm 0.51^{***}$	$1.02 \pm 0.55^{\dagger}$	$0.75 \pm 0.55^{*}$	$1.00 \pm 0.63^{\dagger}$	0.90 ± 0.98	$1.87 \pm 0.78^{***}$
Spain-Urdaibai Estuary	$0.52 \pm 0.41^{***}$	$0.61 \pm 0.44^{\dagger}$	$0.34 \pm 0.44^{*}$	$0.60 \pm 0.57^{\dagger}$	0.51 ± 0.82	$1.45 \pm 0.70^{***}$
Tasmania-Little Swanport					0.98 ± 1.19	1.88 ± 0.76

†/*/**/*** = 67%/90%/95%/99% probability of sign (for 0–1700 CE) or of being distinct from the 0–1700 CE rate. Rates not shown when there are no observations within 0.5 degrees of a site. Probabilities not shown where no observations within 0.5 degrees of a site predate 0 CE.

Dataset S1h. Probability observed GSL rise since 1900 CE exceeded counterfactual projection

	Scenario 1 calibrated against:		Scenario 2 calibrated against:	
Year	Mann et al. (ref. 1)	Marcott et al. (ref. 2)	Mann et al. (ref. 1)	Marcott et al. (ref. 2)
1910	0.77	0.37	0.02	0.02
1920	0.94	0.51	0.13	0.11
1930	1.00	0.72	0.60	0.54
1940	1.00	0.88	0.96	0.94
1950	1.00	0.95	1.00	1.00
1960	1.00	0.98	1.00	1.00
1970	1.00	0.99	1.00	1.00
1980	1.00	0.99	1.00	1.00
1990	1.00	1.00	1.00	1.00

Dataset S1i. Semi-empirical projections of 21st century sea-level rise with different calibrations (cm)

	50	17–83	5–95	50	17–83	5–95	50	17–83	5–95
	Summary			Mann et al. (ref. 1)			Marcott et al. (ref. 2)		
RCP 2.6	38	28–51	24–61	38	29–50	25–59	38	28–51	24–61
RCP 4.5	51	39–69	33–85	51	39–66	34–81	52	39–69	33–85
RCP 8.5	76	59–105	51–131	75	59–99	52–121	78	60–105	52–131

Values with respect to year 2000 baseline. Results across the three temperature calibration sets show median of medians, minimum of 5th percentiles, and maximum of 95th percentiles.

Dataset S1j. Prior and posterior distributions $P(\Psi)$ for the parameters Ψ

Parameter	Prior	Mann et al. (ref. 1)	Marcott et al. (ref. 2)
a	$U(0, 20)$ mm/yr/K	4.0 $(3.2, 5.4)$	4.7 $(3.4, 7.0)$
c(500 CE)	$U(-10, 10)$ mm/yr	0.22 $(0.10, 0.42)$	0.05 $(0.02, 0.08)$
c(2000 CE)	$U(-2, 2)$ mm/yr	0.14 $(0.05, 0.29)$	0.03 $(0.01, 0.06)$
$T_0(-2000$ CE)	$<T(-2000$ to -1800 CE$)> + U(-0.6, 0.6)$	0.25 $(-0.19, 0.89)$	0.03 $(-0.42, 0.60)$
T_0(500 CE)	$\mathcal{N}(<T(500-700$ CE$)>$, $(0.2$ K$)^2)$	0.17 $(0.11, 0.23)$	-0.09 $(-0.17, -0.01)$
T_0(2000 CE)		-0.05 $(-0.12, 0.07)$	0.04 $(-0.10, 0.16)$
τ	$\log U(30, 300)$ yrs	174 $(87, 366)$	102 $(64, 203)$
τ_c	$\log U(1000, 20000)$ yrs	4175 $(1140, 17670)$	3392 $(1124, 16155)$

$\mathcal{N}(\mu, \sigma^2)$ denotes a normal distribution around μ with the standard deviation σ. $U(x_1, x_2)$ is a uniform distribution between x_1 and x_2. Ranges shown for posteriors are 5th–95th percentiles. Temperatures are relative to the 1850–2000 CE average.