Supplementary material for “Topography exerts primary control on the rate of Gulf of Alaska ice-marginal lake area change over the Landsat record”

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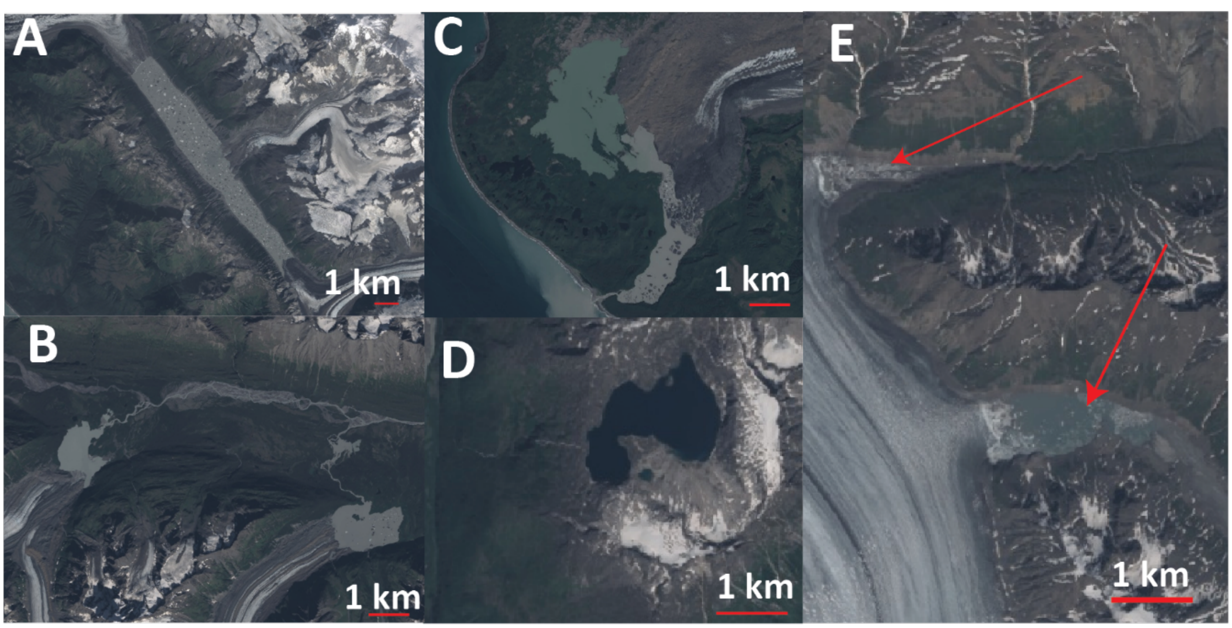

Figure S1. Examples of some of the different settings in which ice-marginal lakes are found, with a) proglacial bounded by a relatively uniform valley; b) proglacial lake that initially formed in a relatively unconstrained trunk valley and are expanding into more tightly constrained side valleys; c) a proglacial lake formed in a relatively flat area; d) a cirque proglacial lake, and; e) an ice-dammed lake. Images are from Landsat 8.

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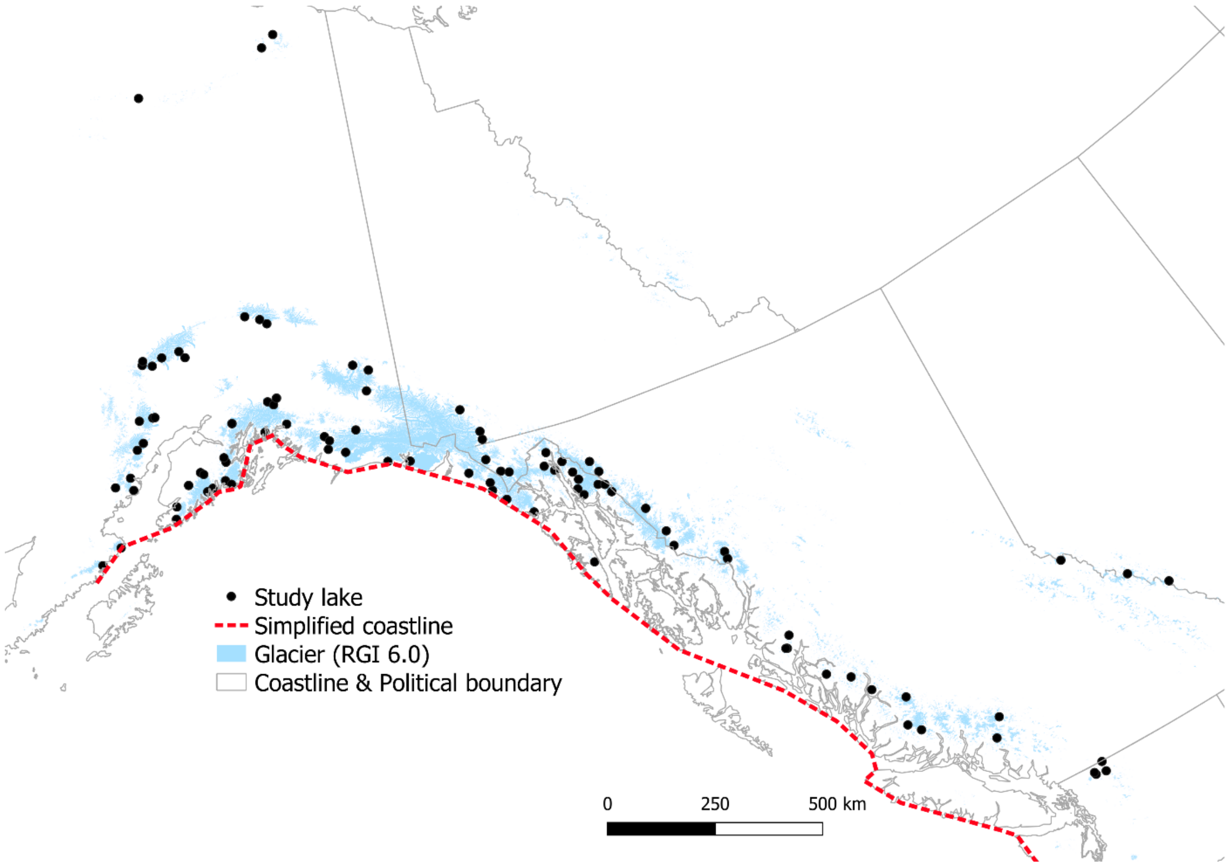

Figure S2. Illustration of simplified coastline (dashed red line) used for measuring a study lake's (black dots) distance to the open ocean. The length of the shortest line between a lake and the simplified coastline was measured manually.

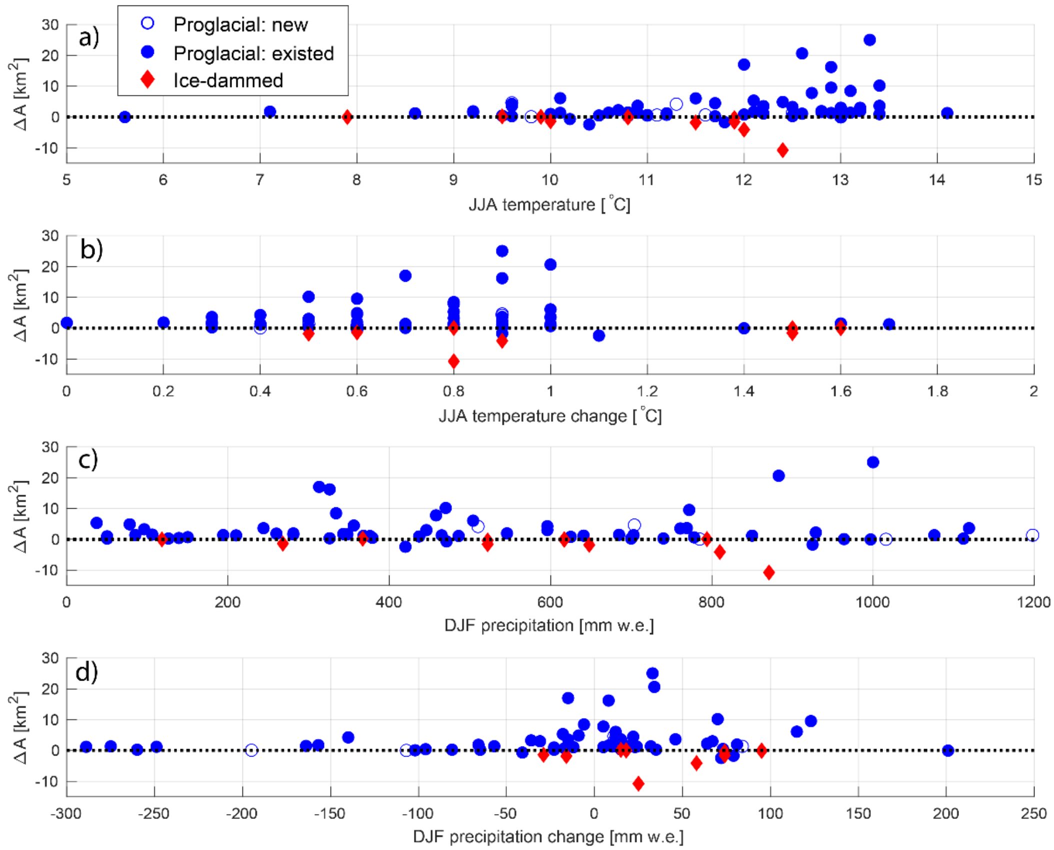

Figure S3. Absolute area change and climate parameters for proglacial (blue circle) and ice-dammed (red diamond) lakes. (a) Summer temperature at each lake for the 2000 – 2009 decade. (b) Change in summer air temperature at each lake between 2000 – 2009 and 1960 – 1969. A positive change indicates warmer temperatures in recent times. (c) Winter precipitation at each lake for the 2009 – 2009 decade. (d) Change in winter precipitation at each lake between 2000 – 2009 and 1960 – 1969. A positive change indicates warmer temperatures in recent times. A positive change indicates wetter winters in recent times.

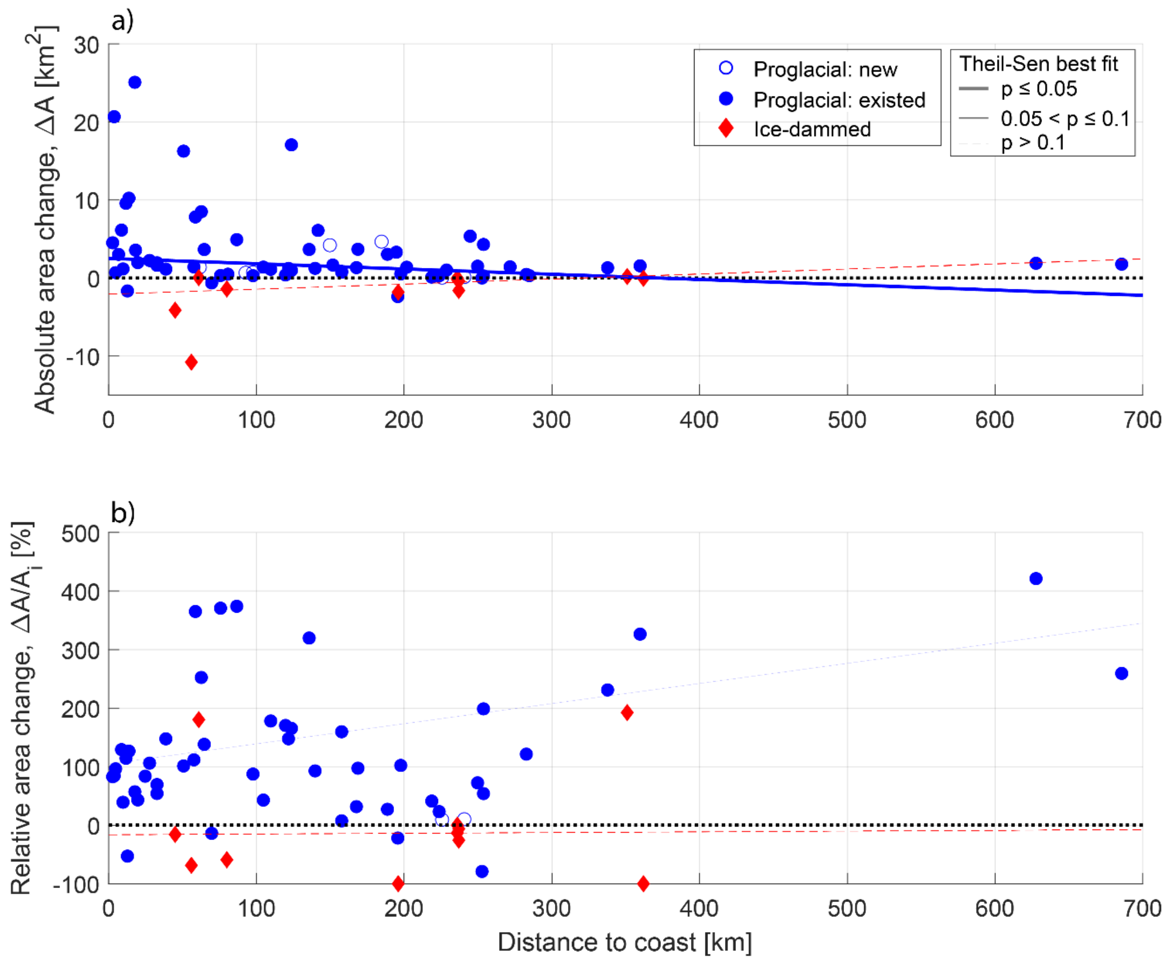

Figure S4. The relationship between an ice-marginal lake's distance from the open ocean and (a) absolute and (b) relative lake area change for proglacial (blue circle) and ice-dammed (red diamond) lakes. On both panels, lines show the linear fit to proglacial (blue) and ice-dammed (red) lakes as estimated to by the non-parametric Theil-Sen robust line. Thick solid lines show relationships that are significant at the *p* ≤ 0.05 level, thin solid lines show 0.05 < *p* ≤ 0.1 relationships, and thin dashed lines show *p* > 0.1 relationships. All significance values are estimated by the Kendall rank correlation test. The black dotted line shows zero lake area change. Unfilled symbols indicate lakes that appeared during the study period. a) shows that coastal lakes are growing faster in terms of absolute area, but interior lakes are growing faster in terms of relative area change.

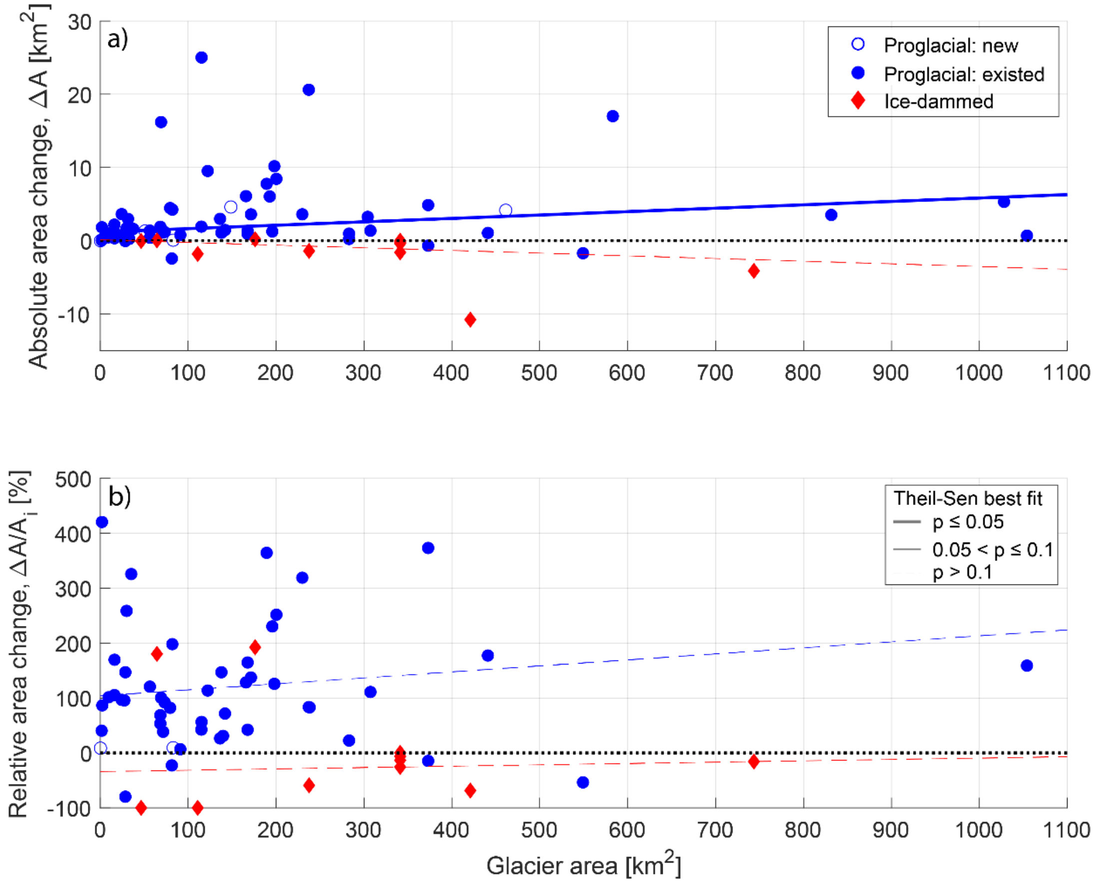

Figure S5. The relationship between lake-associated glacier area and (a) absolute and (b) relative lake area change for proglacial (blue circle) and ice-dammed (red diamond) lakes. On both panels, lines show the linear fit to proglacial (blue) and ice-dammed (red) lakes as estimated to by the non-parametric Theil-Sen robust line. Thick solid lines show relationships that are significant at the $p \leq 0.05$ level, thin solid lines show $0.05 < p \leq 0.1$ relationships, and thin dashed lines show $p > 0.1$ relationships. All significance values are estimated by the Kendall rank correlation test. The black dotted line shows zero lake area change. Unfilled symbols indicate lakes that appeared during the study period. a) shows that, in terms of absolute lake area, proglacial lakes downstream from larger glaciers are growing faster than those downstream from small glaciers.

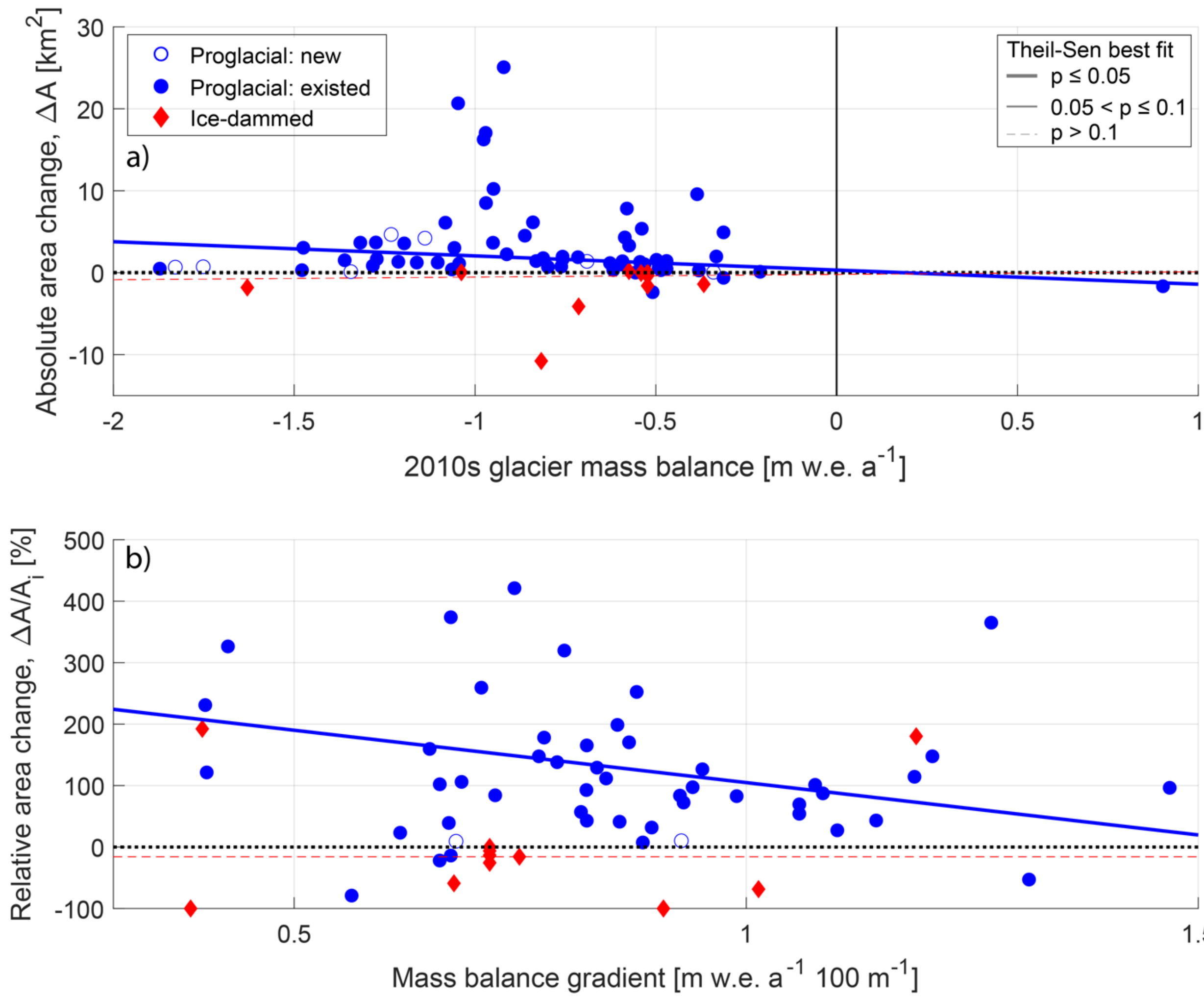

Figure S6. The relationship between (a) absolute lake area change and modeled glacier balance over 2010 – 2016, and (b) relative ice-marginal lake area change and modeled glacier mass balance gradient. Proglacial lakes are indicated by blue circles and ice-dammed lakes as red diamonds. On both panels, lines show the linear fit to proglacial (blue) and ice-dammed (red) lakes as estimated to by the non-parametric Theil-Sen robust line. Thick solid lines show relationships that are significant at the $p \leq 0.05$ level, thin solid lines show $0.05 < p \leq 0.1$ relationships, and thin dashed lines show $p > 0.1$ relationships. All significance values are estimated by the Kendall rank correlation test. The black dotted line shows zero lake area change. Unfilled symbols indicate lakes that appeared during the study period. The vertical black line in a) indicates a zero glacier-wide-average mass balance, indicating a glacier in equilibrium with climate. a) shows that proglacial lakes downstream from glaciers with more negative mass balance are growing fastest in terms of absolute lake area. b) shows that proglacial lakes downstream from glaciers with "flat" mass balance gradients, characteristic of continental glaciers, are growing more rapidly in terms of relative area change.

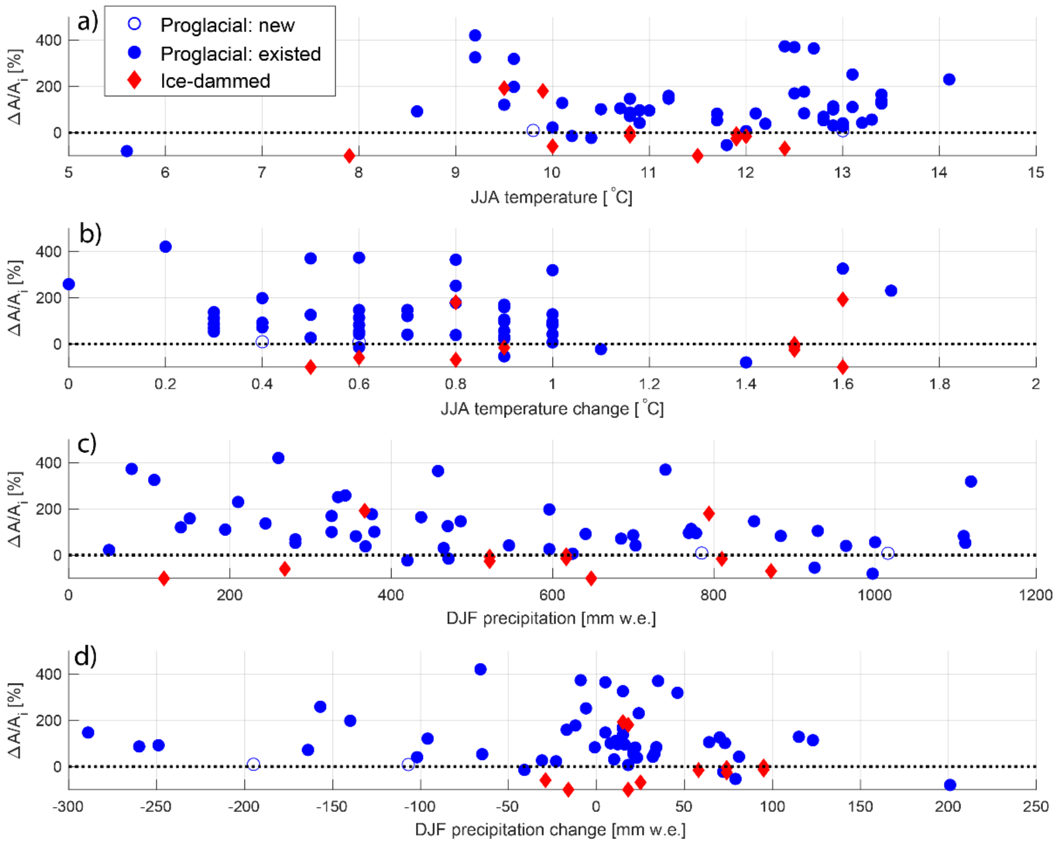

Figure S7. Relative area change and climate parameters for proglacial (blue circle) and ice-dammed (red diamond) lakes. (a) Summer temperature at each lake for the 2000 – 2009 decade. (b) Change in summer air temperature at each lake between 2000 – 2009 and 1960 – 1969. A positive change indicates warmer temperatures in recent times. (c) Winter precipitation at each lake for the 2009 – 2009 decade. (d) Change in winter precipitation at each lake between 2000 – 2009 and 1960 – 1969. A positive change indicates warmer temperatures in recent times. A positive change indicates wetter winters in recent times.

Supplementary Table 1. Excel spreadsheet with lake are time series and area change, as well as extracted climatic, glaciologic, and geometric parameters for all study lakes. This file is provided as a separate Excel spreadsheet.

Supplementary Table 2. Results from Kendall correlation tests between each variable investigated in this study and lake area change of all ice-marginal lakes (proglacial and ice-dammed). The correlation coefficient (τ) and p-value are shown for each statistical test. Red boxes indicate relationships that are significant at the $p \leq 0.05$ level, while yellow boxes show relationships with $0.05 < p \leq 0.1$. This file is provided as a separate Excel spreadsheet.

		Absolute area change				Relative area change			
		Proglacial		Ice-dammed		Proglacial		Ice-dammed	
index	Parameter	τ	p	τ	p	τ	p	τ	p
1	'lake_area_change'	N/A	N/A	N/A	N/A	0.14	0.07	0.56	0.00
2	'long'	-0.06	0.47	-0.16	0.45	0.05	0.53	0.01	1.00
3	'lat'	0.03	0.74	0.23	0.28	0.13	0.10	0.01	1.00
4	'elevation_m'	-0.27	0.00	0.30	0.15	0.19	0.02	0.12	0.58
5	'temp_jja_1960s_degC'	0.17	0.03	-0.26	0.23	-0.14	0.09	-0.12	0.58
6	'temp_jja_1980s_degC'	0.20	0.01	-0.20	0.35	-0.14	0.09	-0.07	0.78
7	'temp_jja_2000s_degC'	0.19	0.02	-0.20	0.35	-0.13	0.10	-0.07	0.78
8	'tempChange_jja_2000s-1960s_degC'	0.04	0.63	0.09	0.70	0.00	0.99	0.02	0.96
9	'precip_djf_1960s_mm'	-0.06	0.49	-0.46	0.03	-0.07	0.40	-0.06	0.83
10	'precip_djf_1960s_mm'	-0.02	0.79	-0.43	0.04	-0.09	0.28	-0.03	0.91
11	'precip_djf_1960s_mm'	-0.02	0.78	-0.46	0.03	-0.08	0.31	-0.06	0.83
12	'precip_dfj_change_2000s-1960s_mm'	0.20	0.01	-0.11	0.62	-0.15	0.06	0.11	0.62
13	'Init_lake_area'	0.33	0.00	-0.41	0.05	-0.52	0.00	-0.05	0.83
14	'glacier_Area'	0.29	0.00	-0.38	0.11	-0.02	0.80	0.10	0.73
15	'Zmin'	-0.26	0.00	0.60	0.01	0.20	0.01	0.19	0.44
16	'Zmax'	0.07	0.43	0.13	0.62	0.01	0.93	0.16	0.53
17	'Zmed'	-0.07	0.41	0.32	0.18	0.07	0.42	0.22	0.36
18	'Slope'	-0.21	0.01	-0.02	1.00	0.05	0.56	-0.21	0.40
19	'Aspect'	0.08	0.35	0.03	0.94	-0.05	0.53	0.00	1.00
20	'Lmax'	0.27	0.00	-0.35	0.14	-0.05	0.58	-0.06	0.83
21	'glacierWid_m'	0.32	0.00	-0.18	0.46	-0.14	0.10	0.18	0.46
22	'valleyWid_m'	0.31	0.00	-0.30	0.20	-0.11	0.19	-0.06	0.84
23	'1980s_averageAnnualBalance_mwea'	0.00	0.99	-0.03	0.94	-0.08	0.37	0.06	0.83
24	'1990s_averageAnnualBalance_mwea'	-0.07	0.44	0.00	1.00	-0.06	0.48	0.10	0.73
25	'2000s_averageAnnualBalance_mwea'	-0.06	0.51	0.06	0.83	-0.06	0.51	0.16	0.53
26	'2010s_averageAnnualBalance_mwea'	-0.17	0.04	0.03	0.94	-0.10	0.22	0.00	1.00
27	'1980_2016_averageAnnualBalance_mwea'	-0.07	0.41	0.03	0.94	-0.07	0.40	0.13	0.62
28	'1980_2016_summedAnnualBalance_mwe'	-0.07	0.41	0.03	0.94	-0.07	0.40	0.13	0.62
29	'Area(km2)'	0.22	0.01	-0.38	0.11	0.08	0.37	0.10	0.73
30	'Volume(km3)'	0.20	0.02	-0.38	0.11	0.07	0.42	-0.03	0.94
31	'max_thick(m)'	0.18	0.04	-0.19	0.44	0.07	0.45	-0.03	0.94
32	'h_min'	-0.14	0.11	0.35	0.14	0.10	0.23	0.19	0.44
33	'h_max'	-0.08	0.36	0.16	0.53	0.19	0.03	0.13	0.62
34	'h_med'	-0.15	0.08	0.41	0.08	0.19	0.03	0.32	0.18
35	'slope_AVG'	-0.17	0.05	0.36	0.13	-0.01	0.87	-0.13	0.62
36	'b_tongue(mw.e.a-1)'	-0.09	0.28	0.22	0.36	-0.02	0.82	-0.13	0.62
37	'acc_win(mw.e.a-1)'	0.07	0.43	-0.64	0.01	-0.18	0.04	-0.16	0.53
38	'tau(year)'	0.12	0.18	0.16	0.53	0.13	0.15	0.00	1.00
39	'dBdz(mw.e./100m)'	0.14	0.11	-0.38	0.11	-0.18	0.04	0.10	0.73
42	'dBdz_acc(mw.e./100m)'	0.00	0.97	-0.29	0.23	0.08	0.37	0.02	1.00
43	'min_thickness_m'	0.18	0.05	0.29	0.29	0.03	0.71	0.47	0.07
44	'p25_thickness_m'	0.23	0.01	0.33	0.22	0.12	0.18	0.69	0.00
45	'median_thickness_m'	0.25	0.00	0.02	1.00	0.11	0.20	0.47	0.07
46	'mean_thickness_m'	0.24	0.01	0.02	1.00	0.10	0.24	0.38	0.16
47	'p75_thickness_m'	0.25	0.00	-0.02	1.00	0.09	0.30	0.42	0.11
48	'max_thickness_m'	0.24	0.01	-0.07	0.86	0.09	0.30	0.29	0.29
49	'iqr_thickness_m'	0.24	0.01	-0.38	0.16	0.05	0.60	0.16	0.60
50	'stdev_thickness_m'	0.24	0.01	-0.33	0.22	0.06	0.49	0.11	0.73
51	dist_to_coast_km'	-0.23	0.01	0.39	0.12	0.16	0.08	0.09	0.75

Supplementary Table 3. Reported Kendall tau values for significant ($p < 0.10$) singular linear correlations between climatic, geomorphic, and glaciologic parameters investigated in this study. This file is provided as a separate Excel spreadsheet.

Index	Parameter	'lake_area_change'	'long'	'lat'	'elevation_m'	'temp_jja_1960s_degC'	'temp_jja_1980s_degC'	'temp_jja_2000s_degC'	'tempChange_jja_2000s-1960s_degC'	'precip_djf_1960s_mm'	'precip_djf_1960s_mm'	'precip_djf_1960s_mm'	'precip_dfj_change_2000s-1960s_mm'	'Init_lake_area'	'glacier_Area'	'Zmin'	'Zmax'	'Zmed'	'Slope'	'Aspect'	'Lmax'	'glacierWid_m'	'valleyWid_m'
1	'lake_area_change'	1.00	-	-	-0.24	0.20	0.21	0.19	-	-	-	-	-	0.20	-	-0.16	-	-	-0.14	-	-	-	-
2	'long'	-	1.00	-0.61	0.16	-	-0.13	-0.15	-0.14	0.41	0.29	0.32	-0.39	-0.13	-0.21	0.22	-	0.17	-	-	-0.22	-0.20	-0.19
3	'lat'	-	-0.61	1.00	-	-	-	-	0.25	-0.51	-0.43	-0.46	0.14	-	0.31	-	0.17	-	-	-	0.33	0.21	0.20
4	'elevation_m'	-0.24	0.16	-	1.00	-0.36	-0.42	-0.41	-0.15	-	-	-	-0.36	-0.38	-0.16	0.67	0.16	0.41	0.18	-	-0.13	-0.26	-0.25
5	'temp_jja_1960s_degC'	0.20	-	-	-0.36	1.00	0.87	0.89	-0.24	-	-	-	-	0.22	-	-0.32	-0.17	-0.29	-	-	-	0.13	0.15
6	'temp_jja_1980s_degC'	0.21	-0.13	-	-0.42	0.87	1.00	0.96	-	-	-	-	0.18	0.25	-	-0.36	-0.13	-0.29	-	-	-	0.20	0.20
7	'temp_jja_2000s_degC'	0.19	-0.15	-	-0.41	0.89	0.96	1.00	-	-	-	-	0.18	0.25	0.13	-0.34	-	-0.29	-	-	-	0.20	0.20
8	'tempChange_jja_2000s-1960s_degC'	-	-0.14	0.25	-0.15	-0.24	-	-	1.00	-	-	-	0.33	-	0.24	-0.15	0.19	-	-	-	0.28	0.22	0.20
9	'precip_djf_1960s_mm'	-	0.41	-0.51	-	-	-	-	-	1.00	0.86	0.89	-	-	-0.21	-	-0.16	-0.16	-	-	-0.22	-	-
10	'precip_djf_1960s_mm'	-	0.29	-0.43	-	-	-	-	-	0.86	1.00	0.91	-	-	-0.20	-0.16	-0.20	-0.24	-	-	-0.20	-	-
11	'precip_djf_1960s_mm'	-	0.32	-0.46	-	-	-	-	-	0.89	0.91	1.00	-	-	-0.18	-0.16	-0.19	-0.22	-	-	-0.18	-	-
12	'precip_dfj_change_2000s-1960s_mm'	-	-0.39	0.14	-0.36	-	0.18	0.18	0.33	-	-	-	1.00	0.28	0.16	-0.44	-	-0.31	-0.13	-	0.18	0.28	0.24
13	'Init_lake_area'	0.20	-0.13	-	-0.38	0.22	0.25	0.25	-	-	-	-	0.28	1.00	0.27	-0.40	-	-0.15	-0.21	-	0.26	0.33	0.33
14	'glacier_Area'	-	-0.21	0.31	-0.16	-	-	0.13	0.24	-0.21	-0.20	-0.18	0.16	0.27	1.00	-0.20	0.43	-	-0.40	-0.20	0.86	0.48	0.49
15	'Zmin'	-0.16	0.22	-	0.67	-0.32	-0.36	-0.34	-0.15	-	-0.16	-0.16	-0.44	-0.40	-0.20	1.00	0.15	0.47	0.24	-	-0.18	-0.31	-0.30
16	'Zmax'	-	-	0.17	0.16	-0.17	-0.13	-	0.19	-0.16	-0.20	-0.19	-	-	0.43	0.15	1.00	0.37	-	-	0.45	0.23	0.23
17	'Zmed'	-	0.17	-	0.41	-0.29	-0.29	-0.29	-	-0.16	-0.24	-0.22	-0.31	-0.15	-	0.47	0.37	1.00	0.13	-	-	-0.16	-
18	'Slope'	-0.14	-	-	0.18	-	-	-	-	-	-	-	-0.13	-0.21	-0.40	0.24	-	0.13	1.00	0.15	-0.39	-0.22	-0.27
19	'Aspect'	-	-	-	-	-	-	-	-	-	-	-	-	-	-0.20	-	-	-	0.15	1.00	-0.20	-	-
20	'Lmax'	-	-0.22	0.33	-0.13	-	-	-	0.28	-0.22	-0.20	-0.18	0.18	0.26	0.86	-0.18	0.45	-	-0.39	-0.20	1.00	0.50	0.51
21	'glacierWid_m'	-	-0.20	0.21	-0.26	0.13	0.20	0.20	0.22	-	-	-	0.28	0.33	0.48	-0.31	0.23	-0.16	-0.22	-	0.50	1.00	0.75
22	'valleyWid_m'	-	-0.19	0.20	-0.25	0.15	0.20	0.20	0.20	-	-	-	0.24	0.33	0.49	-0.30	0.23	-	-0.27	-	0.51	0.75	1.00
23	'1980s_averageAnnualBalance_mwea'	-	-0.57	0.46	-	-	-	0.14	-	-0.27	-0.18	-0.20	0.44	0.16	0.24	-	-	-	-0.21	-	0.24	0.18	0.17
24	'1990s_averageAnnualBalance_mwea'	-0.15	-0.45	0.51	-	-	-	-	-	-0.27	-0.20	-0.22	0.28	-	0.23	-	-	-	-0.15	-	0.22	0.14	-
25	'2000s_averageAnnualBalance_mwea'	-0.17	-0.45	0.53	-	-	-	-	0.19	-0.29	-0.24	-0.24	0.30	-	0.31	-	0.14	-	-0.17	-	0.31	0.24	0.22
26	'2010s_averageAnnualBalance_mwea'	-0.21	-0.36	0.40	0.18	-	-	-	-	-0.27	-0.21	-0.24	0.13	-	-	0.16	0.16	0.17	-	-	-	-	-
27	'1980_2016_averageAnnualBalance_mwea'	-0.16	-0.52	0.51	-	-	-	-	-	-0.29	-0.22	-0.24	0.35	-	0.24	-	-	-	-0.16	-	0.24	0.15	0.15
28	'1980_2016_summedAnnualBalance_mwe'	-0.16	-0.52	0.51	-	-	-	-	-	-0.29	-0.22	-0.24	0.35	-	0.24	-	-	-	-0.16	-	0.24	0.15	0.15
29	'Area(km2)'	-	-0.17	0.26	-	-	-	0.14	0.23	-	-	-	-	0.19	1.00	-0.15	0.38	-	-0.38	-0.24	0.85	0.45	0.47
30	'Volume(km3)'	-	-0.16	0.26	-	-	0.14	0.15	0.20	-0.14	-	-	-	0.18	0.94	-0.15	0.36	-	-0.43	-0.24	0.85	0.44	0.47
31	'max_thick(m)'	-	-0.16	0.28	-	-	-	-	0.22	-	-	-	-	0.16	0.72	-0.15	0.30	-	-0.45	-0.20	0.78	0.44	0.45
32	'h_min'	-	0.15	-	0.56	-0.28	-0.31	-0.31	-0.15	-	-0.16	-0.17	-0.36	-0.23	-0.19	0.69	0.18	0.52	0.26	-	-0.20	-0.26	-0.26
33	'h_max'	-0.20	-	-	0.25	-0.17	-0.16	-0.14	-	-0.15	-0.21	-0.19	-0.26	-	0.35	0.29	0.84	0.31	-	-0.14	0.36	-	-
34	'h_med'	-	0.21	-	0.48	-0.31	-0.33	-0.33	-	-0.16	-0.26	-0.24	-0.43	-0.29	-	0.57	0.31	0.92	-	-	-	-0.23	-0.19
35	'slope_AVG'	-	-	-0.18	0.14	-	-	-	-	-	-	-	-0.14	-0.22	-0.55	0.21	-	-	0.65	0.17	-0.52	-0.31	-0.35
36	'b_tongue(mw.e.a-1)'	-	-0.28	0.28	-	-	-	-	0.14	-0.16	-	-	-	-	-	-	-	-	0.16	-	-	-	-
37	'acc_win(mw.e.a-1)'	-	-	-0.26	-0.31	0.26	0.26	0.26	-	0.40	0.46	0.45	0.21	0.28	-	-0.34	-0.17	-0.52	-	-	-	0.17	0.15
38	'tau(year)'	-	-0.39	0.52	-	-	-	-	0.34	-0.22	-0.19	-0.17	0.16	-	0.47	-	0.24	-	-0.24	-	0.49	0.35	0.32
39	'dBdz(mw.e./100m)'	0.16	0.25	-0.43	-0.25	0.25	0.23	0.22	-0.24	0.35	0.38	0.36	-	0.25	-	-0.31	-0.25	-0.28	-	-	-0.13	-	-
40	'dBdz_acc(mw.e./100m)'	-	0.21	-0.41	-0.25	0.25	0.24	0.22	-0.20	0.38	0.40	0.40	-	0.15	-0.31	-0.24	-0.52	-0.31	-	-	-0.34	-	-
41	'sample_area_m2'	-	-0.18	0.27	-0.19	-	0.17	0.17	0.28	-0.19	-0.18	-0.16	-	0.14	0.67	-0.17	0.31	-	-0.36	-0.17	0.66	0.45	0.48
42	'sample_area_px'	-	-0.16	0.21	-0.23	-	0.15	0.14	0.26	-0.16	-0.14	-	-	-	0.19	-0.21	-	-0.22	-0.16	-	0.19	0.30	0.29
43	'min_thickness_m'	-	-0.16	0.27	-	-	-	-	0.20	-	-	-	-	-	0.38	-	0.24	-	-0.21	-	0.37	0.25	0.30
44	'p25_thickness_m'	-	-0.19	0.35	-	-	-	-	0.27	-0.17	-0.15	-	-	-	0.60	-0.14	0.30	-	-0.32	-0.14	0.60	0.39	0.42
45	'median_thickness_m'	-	-0.18	0.33	-	-	-	-	0.27	-0.16	-	-	-	-	0.62	-0.15	0.32	-	-0.31	-	0.62	0.41	0.44
46	'mean_thickness_m'	-	-0.18	0.34	-	-	-	-	0.27	-0.17	-0.14	-	-	-	0.63	-0.15	0.32	-	-0.31	-	0.64	0.41	0.43
47	'p75_thickness_m'	-	-0.18	0.33	-	-	-	-	0.26	-0.16	-	-	-	0.15	0.63	-0.17	0.32	-	-0.30	-	0.64	0.43	0.45
48	'max_thickness_m'	-	-0.17	0.33	-	-	-	-	0.27	-0.18	-0.15	-	-	0.14	0.65	-0.15	0.33	-	-0.29	-	0.66	0.44	0.46
49	'iqr_thickness_m'	-	-	0.24	-0.17	-	-	-	0.23	-	-	-	-	0.21	0.60	-0.25	0.28	-	-0.27	-	0.61	0.41	0.44
50	'stdev_thickness_m'	-	-0.15	0.27	-0.17	-	-	-	0.24	-0.15	-	-	-	0.20	0.63	-0.22	0.30	-	-0.28	-	0.65	0.42	0.45
51	'dist_to_coast_km'	-0.25	0.16	-	0.41	-0.36	-0.34	-0.35	0.13	-0.12	-0.20	-0.17	-0.29	-0.30	-	0.46	0.25	0.38	0.18	-	-	-0.19	-0.22

Index	Parameter	'1980s_averageAnnualBalance_mwea'	'1990s_averageAnnualBalance_mwea'	'2000s_averageAnnualBalance_mwea'	'2010s_averageAnnualBalance_mwea'	'1980_2016_averageAnnualBalance_mwea'	'1980_2016_summedAnnualBalance_mwe'	'Area(km2)'	'Volume(km3)'	'max_thick(m)'	'h_min'	'h_max'	'h_med'	'slope_AVG'	'b_tongue(mw.e.a-1)'	'acc_win(mw.e.a-1)'	'tau(year)'	'dBdz(mw.e./100m)'	'dBdz_acc(mw.e./100m)'	'sample_area_m2'	'sample_area_px'	'min_thickness_m'	'p25_thickness_m'	'median_thickness_m'	'mean_thickness_m'	'p75_thickness_m'	'max_thickness_m'	'iqr_thickness_m'	'stdev_thickness_m'	'dist_to_coast_km'
1	'lake_area_change'	-	-0.15	-0.17	-0.21	-0.16	-0.16	-	-	-	-	-0.20	-	-	-	-	-	0.16	-	-	-	-	-	-	-	-	-	-	-	-0.25
2	'long'	-0.57	-0.45	-0.45	-0.36	-0.52	-0.52	-0.17	-0.16	-0.16	0.15	-	0.21	-	-0.28	-	-0.39	0.25	0.21	-0.18	-0.16	-0.16	-0.19	-0.18	-0.18	-0.18	-0.17	-	-0.15	0.16
3	'lat'	0.46	0.51	0.53	0.40	0.51	0.51	0.26	0.26	0.28	-	-	-	-0.18	0.28	-0.26	0.52	-0.43	-0.41	0.27	0.21	0.27	0.35	0.33	0.34	0.33	0.33	0.24	0.27	-
4	'elevation_m'	-	-	-	0.18	-	-	-	-	-	0.56	0.25	0.48	0.14	-	-0.31	-	-0.25	-0.25	-0.19	-0.23	-	-	-	-	-	-	-0.17	-0.17	0.41
5	'temp_jja_1960s_degC'	-	-	-	-	-	-	-	-	-	-0.28	-0.17	-0.31	-	-	0.26	-	0.25	0.25	-	-	-	-	-	-	-	-	-	-	-0.36
6	'temp_jja_1980s_degC'	-	-	-	-	-	-	-	0.14	-	-0.31	-0.16	-0.33	-	-	0.26	-	0.23	0.24	0.17	0.15	-	-	-	-	-	-	-	-	-0.34
7	'temp_jja_2000s_degC'	0.14	-	-	-	-	-	0.14	0.15	-	-0.31	-0.14	-0.33	-	-	0.26	-	0.22	0.22	0.17	0.14	-	-	-	-	-	-	-	-	-0.35
8	'tempChange_jja_2000s-1960s_degC'	-	-	0.19	-	-	-	0.23	0.20	0.22	-0.15	-	-	-	0.14	-	0.34	-0.24	-0.20	0.28	0.26	0.20	0.27	0.27	0.27	0.26	0.27	0.23	0.24	0.13
9	'precip_djf_1960s_mm'	-0.27	-0.27	-0.29	-0.27	-0.29	-0.29	-	-0.14	-	-	-0.15	-0.16	-	-0.16	0.40	-0.22	0.35	0.38	-0.19	-0.16	-	-0.17	-0.16	-0.17	-0.16	-0.18	-	-0.15	-0.12
10	'precip_djf_1960s_mm'	-0.18	-0.20	-0.24	-0.21	-0.22	-0.22	-	-	-	-0.16	-0.21	-0.26	-	-	0.46	-0.19	0.38	0.40	-0.18	-0.14	-	-0.15	-	-0.14	-	-0.15	-	-	-0.20
11	'precip_djf_1960s_mm'	-0.20	-0.22	-0.24	-0.24	-0.24	-0.24	-	-	-	-0.17	-0.19	-0.24	-	-	0.45	-0.17	0.36	0.40	-0.16	-	-	-	-	-	-	-	-	-	-0.17
12	'precip_dfj_change_2000s-1960s_mm'	0.44	0.28	0.30	0.13	0.35	0.35	-	-	-	-0.36	-0.26	-0.43	-0.14	-	0.21	0.16	-	-	-	-	-	-	-	-	-	-	-	-	-0.29
13	'Init_lake_area'	0.16	-	-	-	-	-	0.19	0.18	0.16	-0.23	-	-0.29	-0.22	-	0.28	-	0.25	0.15	0.14	-	-	-	-	-	0.15	0.14	0.21	0.20	-0.30
14	'glacier_Area'	0.24	0.23	0.31	-	0.24	0.24	1.00	0.94	0.72	-0.19	0.35	-	-0.55	-	-	0.47	-	-0.31	0.67	0.19	0.38	0.60	0.62	0.63	0.63	0.65	0.60	0.63	-
15	'Zmin'	-	-	-	0.16	-	-	-0.15	-0.15	-0.15	0.69	0.29	0.57	0.21	-	-0.34	-	-0.31	-0.24	-0.17	-0.21	-	-0.14	-0.15	-0.15	-0.17	-0.15	-0.25	-0.22	0.46
16	'Zmax'	-	-	0.14	0.16	-	-	0.38	0.36	0.30	0.18	0.84	0.31	-	-	-0.17	0.24	-0.25	-0.52	0.31	-	0.24	0.30	0.32	0.32	0.32	0.33	0.28	0.30	0.25
17	'Zmed'	-	-	-	0.17	-	-	-	-	-	0.52	0.31	0.92	-	-	-0.52	-	-0.28	-0.31	-	-0.22	-	-	-	-	-	-	-	-	0.38
18	'Slope'	-0.21	-0.15	-0.17	-	-0.16	-0.16	-0.38	-0.43	-0.45	0.26	-	-	0.65	0.16	-	-0.24	-	-	-0.36	-0.16	-0.21	-0.32	-0.31	-0.31	-0.30	-0.29	-0.27	-0.28	0.18
19	'Aspect'	-	-	-	-	-	-	-0.24	-0.24	-0.20	-	-0.14	-	0.17	-	-	-	-	-	-0.17	-	-	-0.14	-	-	-	-	-	-	-
20	'Lmax'	0.24	0.22	0.31	-	0.24	0.24	0.85	0.85	0.78	-0.20	0.36	-	-0.52	-	-	0.49	-0.13	-0.34	0.66	0.19	0.37	0.60	0.62	0.64	0.64	0.66	0.61	0.65	-
21	'glacierWid_m'	0.18	0.14	0.24	-	0.15	0.15	0.45	0.44	0.44	-0.26	-	-0.23	-0.31	-	0.17	0.35	-	-	0.45	0.30	0.25	0.39	0.41	0.41	0.43	0.44	0.41	0.42	-0.19
22	'valleyWid_m'	0.17	-	0.22	-	0.15	0.15	0.47	0.47	0.45	-0.26	-	-0.19	-0.35	-	0.15	0.32	-	-	0.48	0.29	0.30	0.42	0.44	0.43	0.45	0.46	0.44	0.45	-0.22
23	'1980s_averageAnnualBalance_mwea'	1.00	0.75	0.68	0.51	0.85	0.85	0.21	0.21	0.20	-	-	-0.16	-0.17	0.29	-	0.37	-0.18	-	0.14	-	0.18	0.21	0.20	0.21	0.21	0.20	0.16	0.19	-
24	'1990s_averageAnnualBalance_mwea'	0.75	1.00	0.68	0.63	0.87	0.87	0.20	0.19	0.18	-	-	-	-0.13	0.34	-	0.41	-0.23	-0.13	0.14	-	0.22	0.25	0.24	0.26	0.25	0.23	0.19	0.22	-
25	'2000s_averageAnnualBalance_mwea'	0.68	0.68	1.00	0.43	0.72	0.72	0.27	0.27	0.27	-	-	-	-0.18	0.22	-	0.45	-0.26	-0.16	0.23	0.16	0.27	0.31	0.31	0.31	0.31	0.30	0.26	0.28	-
26	'2010s_averageAnnualBalance_mwea'	0.51	0.63	0.43	1.00	0.63	0.63	-	-	-	0.17	-	-	-	0.37	-0.14	0.25	-0.30	-0.20	-	-	0.14	0.15	-	0.14	-	-	-	-	-
27	'1980_2016_averageAnnualBalance_mwea'	0.85	0.87	0.72	0.63	1.00	1.00	0.21	0.20	0.18	-	-	-	-0.15	0.33	-	0.39	-0.25	-0.15	0.15	-	0.22	0.25	0.24	0.25	0.24	0.23	0.17	0.21	-
28	'1980_2016_summedAnnualBalance_mwe'	0.85	0.87	0.72	0.63	1.00	1.00	0.21	0.20	0.18	-	-	-	-0.15	0.33	-	0.39	-0.25	-0.15	0.15	-	0.22	0.25	0.24	0.25	0.24	0.23	0.17	0.21	-
29	'Area(km2)'	0.21	0.20	0.27	-	0.21	0.21	1.00	0.94	0.71	-0.18	0.35	-	-0.55	-	-	0.47	-	-0.31	0.66	0.20	0.38	0.60	0.62	0.63	0.63	0.64	0.60	0.63	-
30	'Volume(km3)'	0.21	0.19	0.27	-	0.20	0.20	0.94	1.00	0.76	-0.22	0.34	-	-0.58	-	-	0.47	-	-0.29	0.66	0.21	0.36	0.59	0.61	0.62	0.62	0.63	0.59	0.62	-
31	'max_thick(m)'	0.20	0.18	0.27	-	0.18	0.18	0.71	0.76	1.00	-0.27	0.29	-	-0.56	-	-	0.51	-	-0.25	0.61	0.24	0.33	0.56	0.56	0.58	0.58	0.59	0.53	0.56	-
32	'h_min'	-	-	-	0.17	-	-	-0.18	-0.22	-0.27	1.00	-	0.49	0.14	0.30	-0.29	-	-0.33	-0.20	-0.19	-0.23	-	-0.18	-0.16	-0.18	-0.18	-0.16	-0.20	-0.19	0.34
33	'h_max'	-	-	-	-	-	-	0.35	0.34	0.29	-	1.00	0.35	-	-	-0.18	0.17	-0.22	-0.52	0.25	-	0.20	0.29	0.28	0.30	0.29	0.30	0.23	0.24	0.33
34	'h_med'	-0.16	-	-	-	-	-	-	-	-	0.49	0.35	1.00	-	-	-0.54	-	-0.29	-0.33	-	-0.19	-	-	-	-	-	-	-	-	0.43
35	'slope_AVG'	-0.17	-0.13	-0.18	-	-0.15	-0.15	-0.55	-0.58	-0.56	0.14	-	-	1.00	-	-	-0.38	-	-	-0.44	-	-0.25	-0.42	-0.43	-0.43	-0.43	-0.43	-0.41	-0.43	0.19
36	'b_tongue(mw.e.a-1)'	0.29	0.34	0.22	0.37	0.33	0.33	-	-	-	0.30	-	-	-	1.00	-	0.38	-0.40	-	-	-	-	-	-	-	-	-	-	-	-
37	'acc_win(mw.e.a-1)'	-	-	-	-0.14	-	-	-	-	-	-0.29	-0.18	-0.54	-	-	1.00	-	0.44	0.47	-	-	-	-	-	-	-	-	-	-	-0.32
38	'tau(year)'	0.37	0.41	0.45	0.25	0.39	0.39	0.47	0.47	0.51	-	0.17	-	-0.38	0.38	-	1.00	-0.39	-0.35	0.46	0.32	0.30	0.45	0.47	0.47	0.46	0.48	0.42	0.44	-
39	'dBdz(mw.e./100m)'	-0.18	-0.23	-0.26	-0.30	-0.25	-0.25	-	-	-	-0.33	-0.22	-0.29	-	-0.40	0.44	-0.39	1.00	0.55	-	-	-	-	-	-	-	-0.14	-	-	-0.41
40	'dBdz_acc(mw.e./100m)'	-	-0.13	-0.16	-0.20	-0.15	-0.15	-0.31	-0.29	-0.25	-0.20	-0.52	-0.33	-	-	0.47	-0.35	0.55	1.00	-0.27	-	-0.20	-0.31	-0.30	-0.31	-0.30	-0.32	-0.24	-0.27	-0.28
41	'sample_area_m2'	0.14	0.14	0.23	-	0.15	0.15	0.66	0.66	0.61	-0.19	0.25	-	-0.44	-	-	0.46	-	-0.27	1.00	0.34	0.44	0.61	0.63	0.63	0.65	0.68	0.59	0.64	-
42	'sample_area_px'	-	-	0.16	-	-	-	0.20	0.21	0.24	-0.23	-	-0.19	-	-	-	0.32	-	-	0.34	1.00	0.15	0.27	0.30	0.28	0.30	0.31	0.29	0.28	-
43	'min_thickness_m'	0.18	0.22	0.27	0.14	0.22	0.22	0.38	0.36	0.33	-	0.20	-	-0.25	-	-	0.30	-	-0.20	0.44	0.15	1.00	0.59	0.56	0.56	0.53	0.50	0.33	0.36	-
44	'p25_thickness_m'	0.21	0.25	0.31	0.15	0.25	0.25	0.60	0.59	0.56	-0.18	0.29	-	-0.42	-	-	0.45	-	-0.31	0.61	0.27	0.59	1.00	0.93	0.93	0.88	0.82	0.61	0.68	-
45	'median_thickness_m'	0.20	0.24	0.31	-	0.24	0.24	0.62	0.61	0.56	-0.16	0.28	-	-0.43	-	-	0.47	-	-0.30	0.63	0.30	0.56	0.93	1.00	0.96	0.94	0.87	0.68	0.75	-
46	'mean_thickness_m'	0.21	0.26	0.31	0.14	0.25	0.25	0.63	0.62	0.58	-0.18	0.30	-	-0.43	-	-	0.47	-	-0.31	0.63	0.28	0.56	0.93	0.96	1.00	0.95	0.88	0.68	0.75	-
47	'p75_thickness_m'	0.21	0.25	0.31	-	0.24	0.24	0.63	0.62	0.58	-0.18	0.29	-	-0.43	-	-	0.46	-	-0.30	0.65	0.30	0.53	0.88	0.94	0.95	1.00	0.89	0.73	0.80	-
48	'max_thickness_m'	0.20	0.23	0.30	-	0.23	0.23	0.64	0.63	0.59	-0.16	0.30	-	-0.43	-	-	0.48	-0.14	-0.32	0.68	0.31	0.50	0.82	0.87	0.88	0.89	1.00	0.71	0.81	-
49	'iqr_thickness_m'	0.16	0.19	0.26	-	0.17	0.17	0.60	0.59	0.53	-0.20	0.23	-	-0.41	-	-	0.42	-	-0.24	0.59	0.29	0.33	0.61	0.68	0.68	0.73	0.71	1.00	0.86	-
50	'stdev_thickness_m'	0.19	0.22	0.28	-	0.21	0.21	0.63	0.62	0.56	-0.19	0.24	-	-0.43	-	-	0.44	-	-0.27	0.64	0.28	0.36	0.68	0.75	0.75	0.80	0.81	0.86	1.00	-
51	'dist_to_coast_km'	-	-	-	-	-	-	-	-	-	0.34	0.33	0.43	0.19	-	-0.32	-	-0.41	-0.28	-	-	-	-	-	-	-	-	-	-	1.00