

Supplementary Information for: 32-year record-high surface melt in 2019/2020 on north George VI Ice Shelf, Antarctic Peninsula

by A. F. Banwell *et al.*

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Supplementary Figures

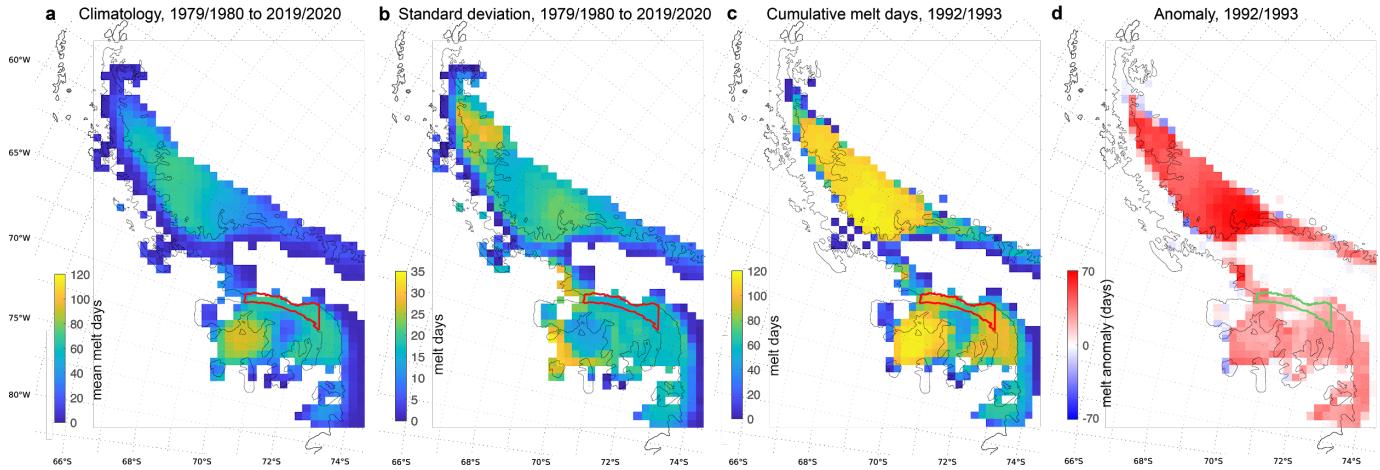


Figure S1. Microwave radiometer-derived maps of near-surface melt days over the AP, highlighting the 1992/1993 melt season, which had the highest spatially-averaged cumulative melt days over the AP out of the seasons from 1979/1980 to 2019/2020 (excluding 1987/1988). Cumulative melt days are highest over south Larsen C Ice Shelf in 1992/1993. (a) The climatology (i.e. mean cumulative melt days per season) from 1979/1980 to 2019/2020 (excluding 1987/1988); (b) Standard deviation of the climatology in (a); (c) Cumulative melt days in 1992/1993; (d) The 1992/1993 melt season anomaly (i.e. (c) minus (a)). Melt days are counted within the period November 1 to March 31 (inclusive) each austral summer. The location of the AOI is shown by a red outline in panels a), b), and c) and as a green outline in panel d). Note that the colour bar scale in b) is different to in a) and c), and that the colour bar scale in a) and c) is the same as in Figs. 2a and b.

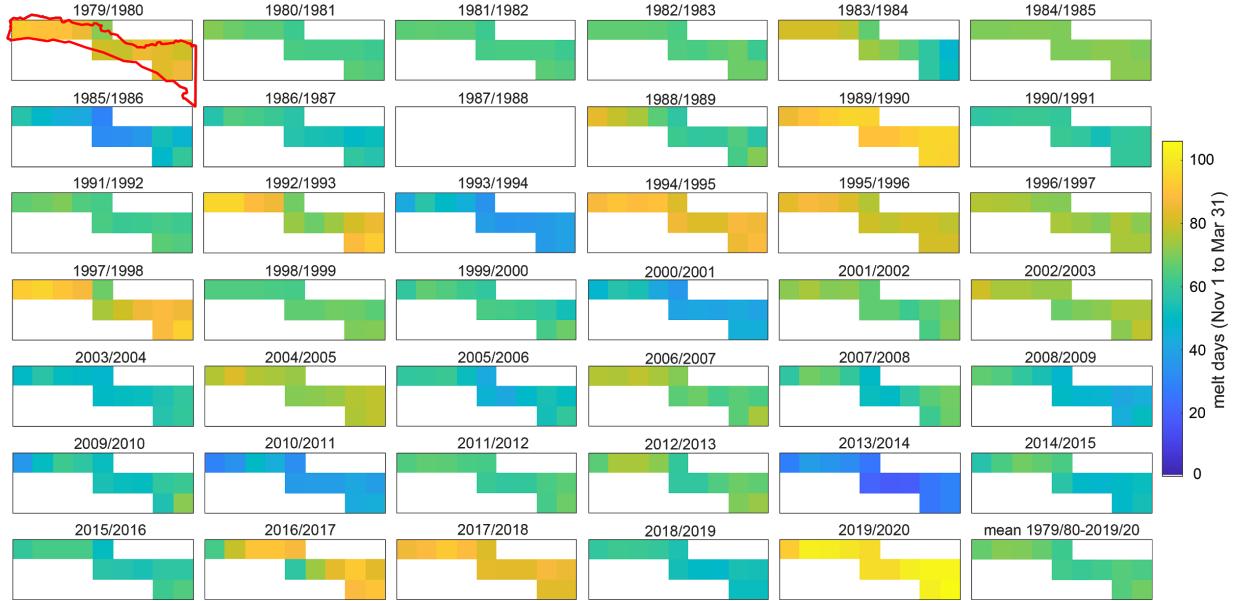
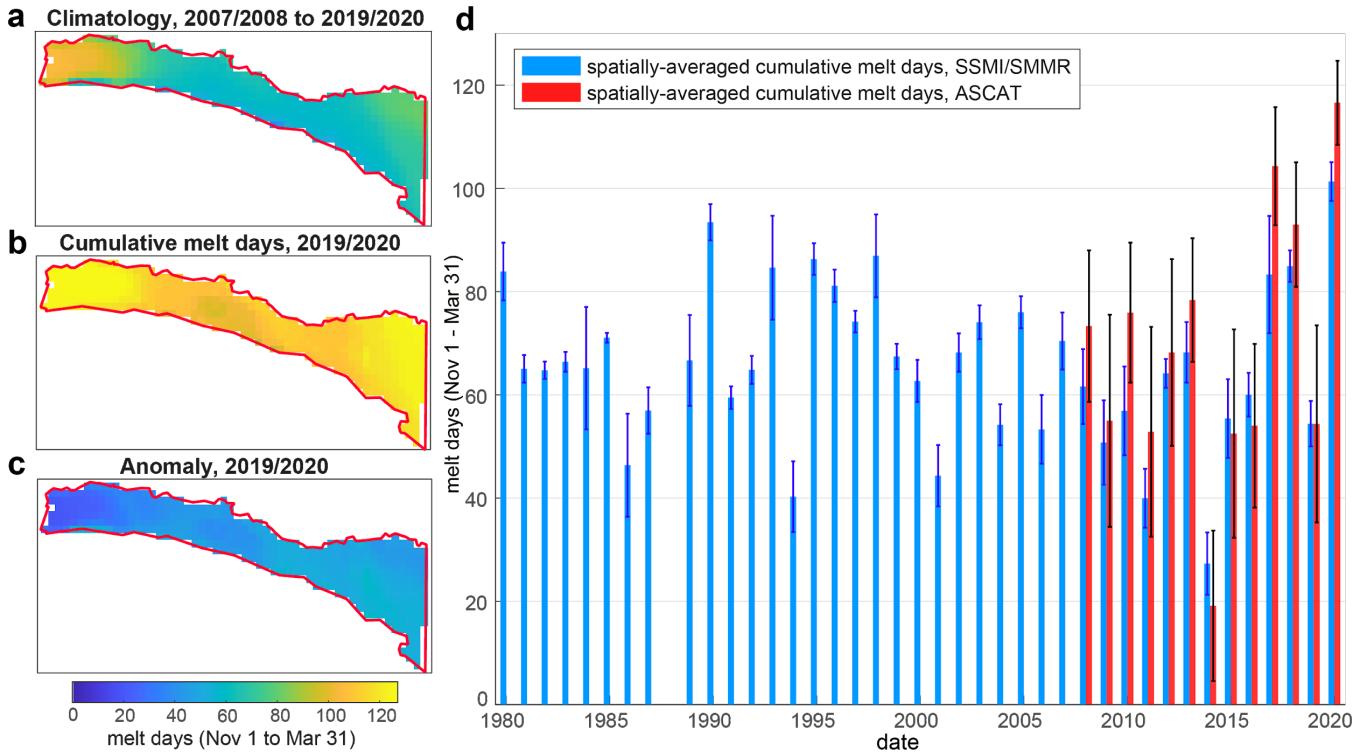


Figure S2. Microwave radiometer-derived maps of cumulative melt days (see Section 3.1 for methods) over north GVIIS, for each 25 km grid cell, from November 1 to March 31, for austral summers from 1979/1980 to 2019/2020. Data in 1987/1988 are unavailable. Also shown is the mean number of cumulative melt days per grid cell for summers 1979/1980 to 2019/2020, excluding 1987/1988 (bottom right plot). The relative location and shape of the study AOI (see Fig. 1b for location) is shown as a red outline in the top left plot. White cells are out of the AOI.

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25 **Figure S3.** (a – c) Active microwave-derived (i.e. ASCAT) cumulative melt days over the northern GVIIS AOI (see Fig. 1b for location, red outline). **a)** Mean cumulative melt days for austral summers from 2007/2008 to 2019/2020. **b)** Cumulative melt days in the 2019/2020 austral summer. **c)** Anomaly of the 2019/2020 melt season (i.e. (b) minus (a)). **d)** Red bars represent microwave scatterometer-derived (i.e. ASCAT) spatially-averaged (i.e. over the AOI) cumulative melt days, for austral summers from 1979/1980 to 2019/2020 with red error bars showing +/- one standard deviation from the mean. Blue bars show microwave radiometer-derived (i.e. SSMI/SMMR) spatially-averaged cumulative days from 1979/1980 to 2019/2020, with blue error bars showing +/- one standard deviation from the mean. The x-axis dates indicate the second year of each austral summer, e.g., 2020 = 2019/2020

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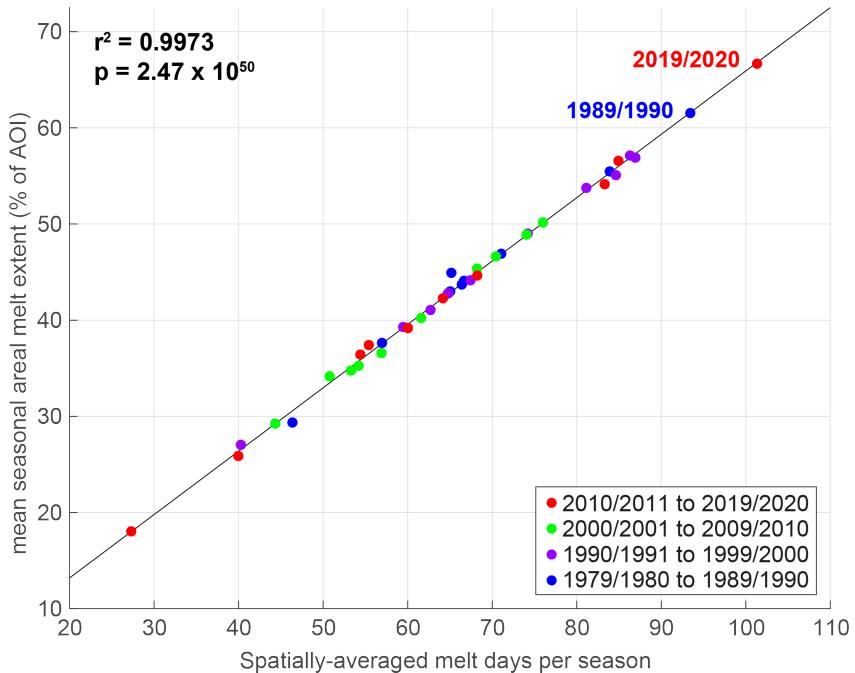


Figure S4. Scatter plot of spatially-averaged melt days per season against mean seasonal areal extent of melt (as a % of the AOI) derived from the microwave melt data. The coloured dots depict melt seasons in the four decades stated in the legend. The largest and second largest melt seasons, 2019/2020 and 1989/1990 respectively, are labelled.

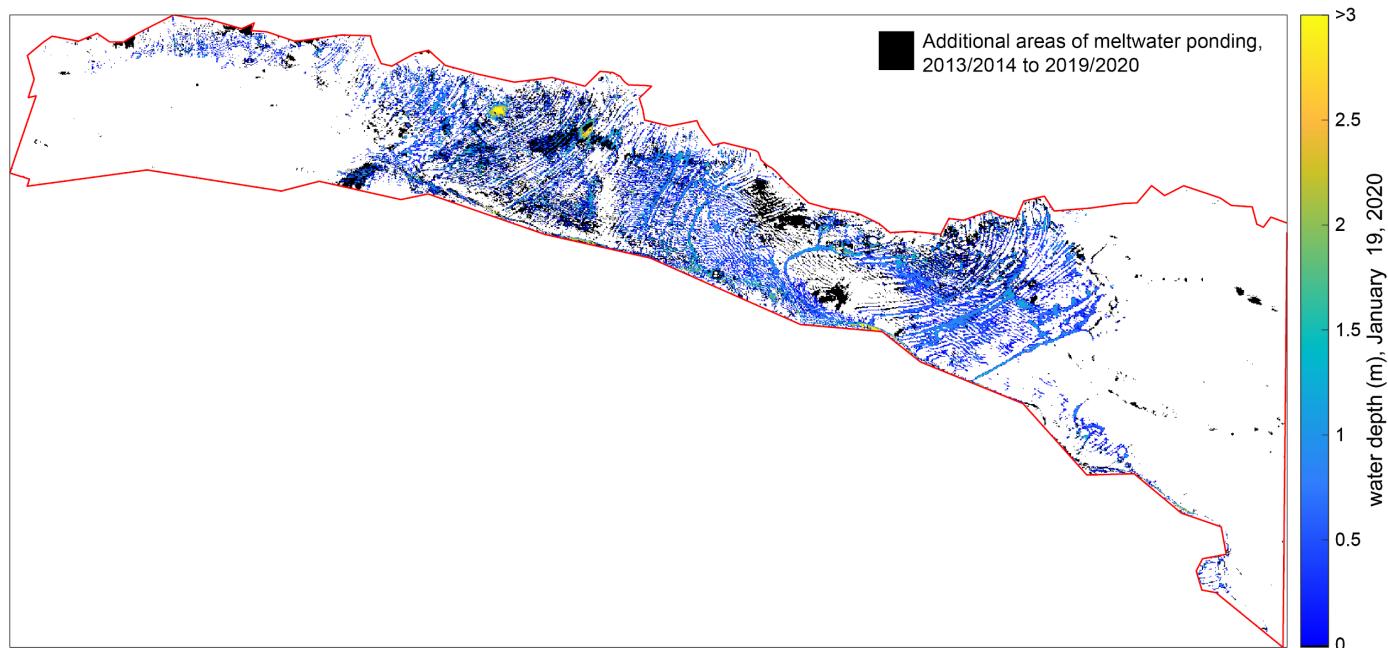


Figure S5. Map of lake areas and depths over the northern GVIIS AOI (red outline, see Fig. 1b for location). The blue to yellow colour bar represents lake depths (m) on January 19, 2020; the date when maximum areas and volumes of surface

ponding are observed in Landsat 8 and Sentinel-2 images (Fig. 1b, background image). The solid black coloured areas show additional areas of meltwater ponding from 2013/2014 to 2019/2020 (i.e. that were not wet on Jan 19, 2020).

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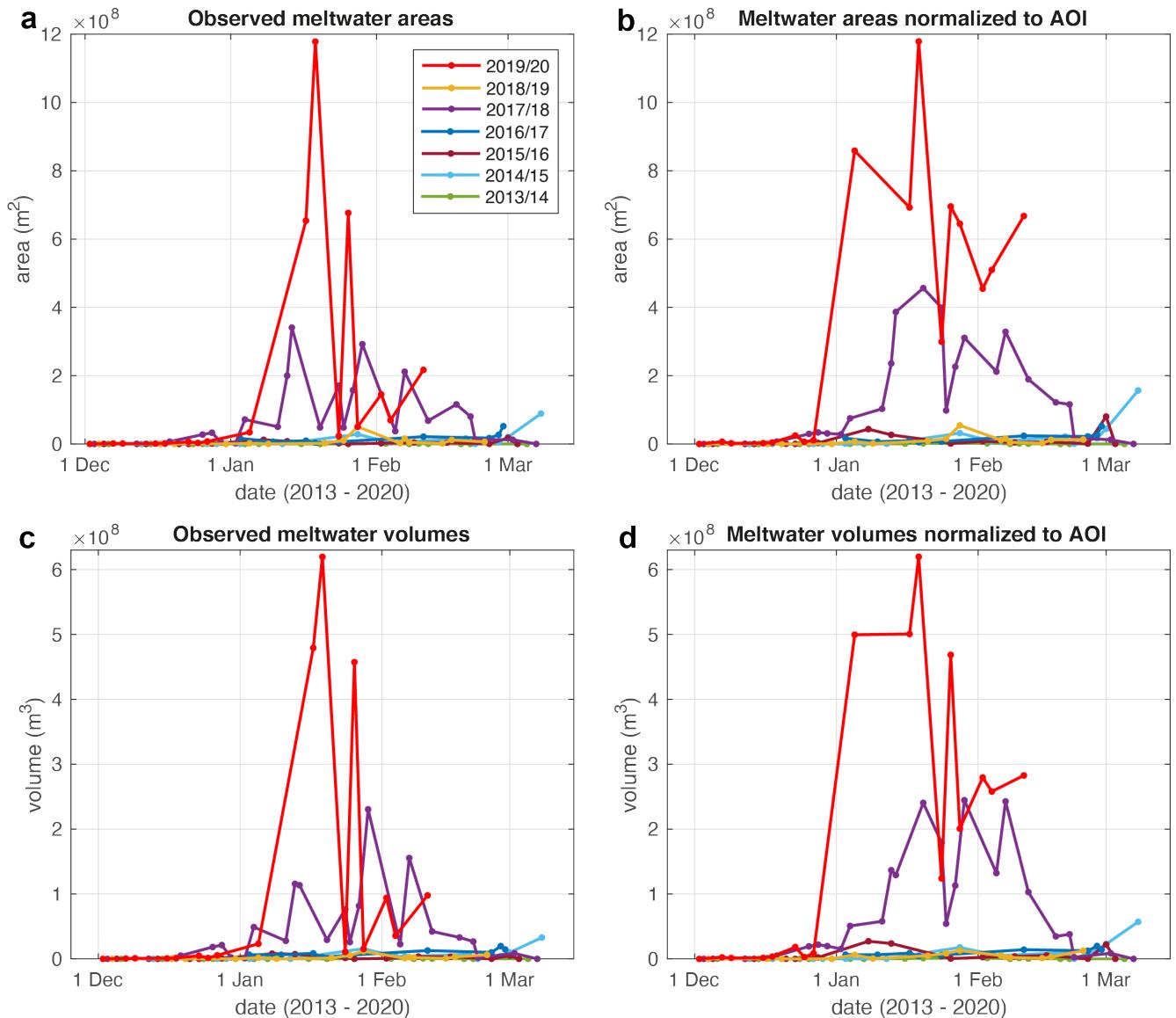


Figure S6. Areas and volumes of surface meltwater ponding over the north GVIIS AOI from 2013/14 to 2019/20, derived from Landsat 8 and Sentinel-2 optical imagery, following Moussavi et al. (2020; see Section 3.3 for methods). Data from mosaiced images are only plotted if the image includes >10% of the study's AOI (location shown in Fig. 1b) that is cloud free; data from mosaiced images on 113 images total are shown. When the image mosaic does not cover 100% of the AOI, data are normalized to the AOI in the way described in Section 3.3. **(a)** Observed meltwater areas. **(b)** Meltwater areas normalized to the AOI. **(c)** Observed meltwater volumes. **(d)** Meltwater volumes normalized to the AOI.

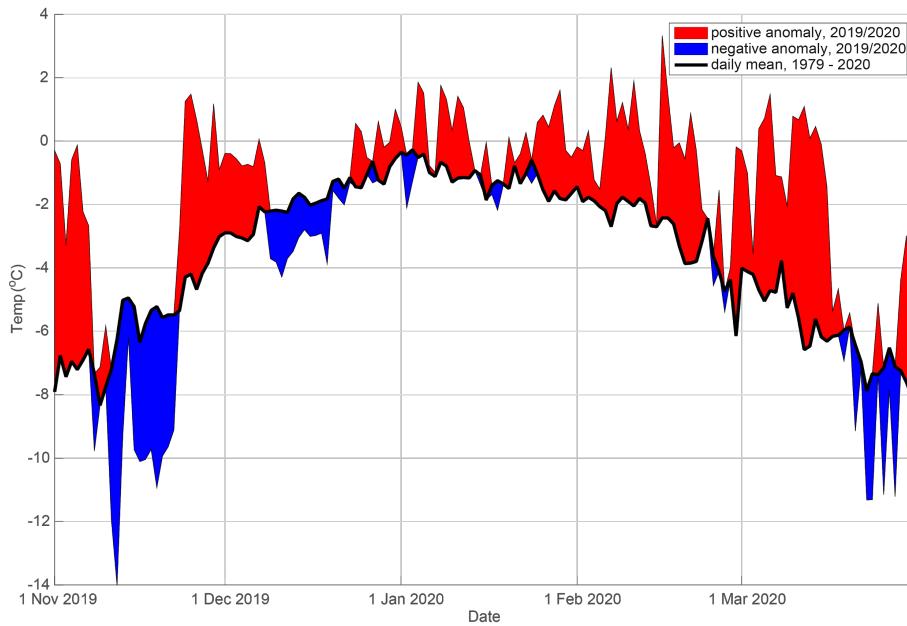
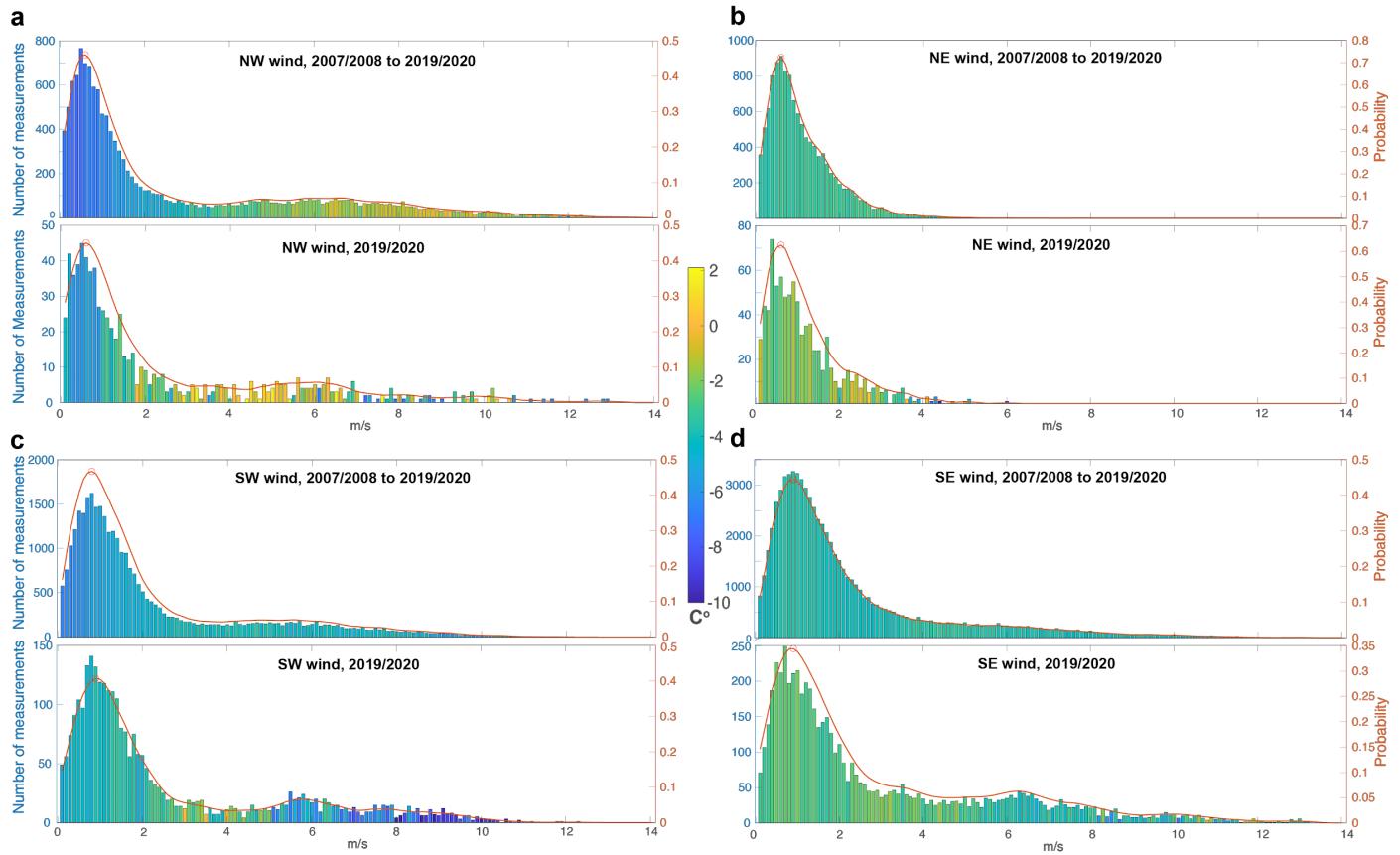


Figure S7. Mean daily air temperatures in the 2019/2020 melt season compared to 1979–2020 mean daily temperatures (thick black line) from the Fossil Bluff AWS (Fig. 1b, yellow star). Positive (negative) anomalies are shaded red (blue). Daily mean temperatures are calculated from 12 hour values.



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Figure S8. Distribution of wind speed and associated mean air temperatures for the four major wind directions. For each direction (a - d), the top histogram shows all AWS measurements from 2007/2008 to 2019/2020, and the bottom histogram shows data for the 2019/2020 season alone.

65 Supplementary Tables

image mosaic date	% cloud-free AOI	water area (m ²)	water vol. (m ³)	% max wetted area (2013 to 2020)	% max volume (2013 to 2020)	normalized water area (m ²)	normalized water vol. (m ³)
6-Dec-2013	24.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8-Dec-2013	0.5	0.00E+00	0.00E+00	-	-	-	-
10-Dec-2013	0.6	0.00E+00	0.00E+00	-	-	-	-
13-Dec-2013	5.1	0.00E+00	0.00E+00	-	-	-	-
15-Dec-2013	68.3	3.15E+04	1.80E+04	2.07E-05	1.84E-03	3.87E+04	2.17E+04
22-Dec-2013	2.5	0.00E+00	0.00E+00	-	-	-	-
24-Dec-2013	44.8	1.17E+04	5.05E+03	2.13E-05	1.51E-03	3.98E+04	1.78E+04
26-Dec-2013	60.3	2.52E+04	1.53E+04	2.25E-05	2.24E-03	4.21E+04	2.64E+04

28-Dec-2013	0.0	0.00E+00	0.00E+00	-	-	-	-
31-Dec-2013	62.2	3.33E+04	1.99E+04	2.07E-05	1.93E-03	3.88E+04	2.27E+04
4-Jan-2014	23.8	1.98E+04	1.17E+04	1.34E-04	1.45E-02	2.50E+05	1.71E+05
7-Jan-2014	23.2	2.25E+04	9.43E+03	4.06E-05	2.63E-03	7.58E+04	3.10E+04
9-Jan-2014	6.6	7.20E+03	9.63E+02	-	-	-	-
16-Jan-2014	26.8	2.11E+05	1.32E+05	2.91E-04	2.85E-02	5.43E+05	3.36E+05
20-Jan-2014	13.9	2.97E+04	1.54E+04	1.05E-03	8.41E-02	1.97E+06	9.90E+05
25-Jan-2014	0.1	1.89E+04	3.43E+03	-	-	-	-
29-Jan-2014	0.2	0.00E+00	0.00E+00	-	-	-	-
30-Jan-2014	4.3	0.00E+00	0.00E+00	-	-	-	-
3-Feb-2014	52.0	7.94E+05	5.13E+05	9.14E-04	9.47E-02	1.71E+06	1.12E+06
8-Feb-2014	30.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
10-Feb-2014	68.3	8.59E+05	7.19E+05	7.55E-04	1.03E-01	1.41E+06	1.21E+06
12-Feb-2014	62.5	3.00E+05	2.30E+05	2.54E-04	3.11E-02	4.74E+05	3.66E+05
14-Feb-2014	0.0	0.00E+00	0.00E+00	-	-	-	-
19-Feb-2014	44.4	1.53E+04	7.19E+03	1.90E-05	1.48E-03	3.54E+04	1.74E+04
21-Feb-2014	31.8	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
26-Feb-2014	0.0	0.00E+00	0.00E+00	-	-	-	-
2-Mar-2014	0.0	0.00E+00	0.00E+00	-	-	-	-
5-Mar-2014	21.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
12-Mar-2014	5.1	1.34E+07	1.54E+07	-	-	-	-
4-Dec-2014	25.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
13-Dec-2014	60.8	1.62E+04	6.92E+03	1.43E-05	1.00E-03	2.67E+04	1.18E+04
18-Dec-2014	54.9	6.30E+03	2.64E+03	4.13E-06	2.71E-04	7.72E+03	3.20E+03
27-Dec-2014	98.9	1.18E+05	6.81E+04	6.46E-05	5.90E-03	1.21E+05	6.95E+04
29-Dec-2014	63.5	3.69E+04	1.71E+04	3.02E-05	2.23E-03	5.63E+04	2.63E+04
1-Jan-2015	4.9	0.00E+00	0.00E+00	-	-	-	-
3-Jan-2015	50.5	3.45E+05	1.98E+05	2.83E-04	2.52E-02	5.28E+05	2.96E+05
5-Jan-2015	9.9	0.00E+00	0.00E+00	-	-	-	-
10-Jan-2015	1.4	0.00E+00	0.00E+00	-	-	-	-
12-Jan-2015	16.0	1.03E+05	4.28E+04	2.59E-04	1.79E-02	4.83E+05	2.11E+05
16-Jan-2015	0.3	0.00E+00	0.00E+00	-	-	-	-
28-Jan-2015	78.4	2.84E+07	1.58E+07	1.70E-02	1.50E+00	3.17E+07	1.77E+07
2-Feb-2015	1.1	0.00E+00	0.00E+00	-	-	-	-
4-Feb-2015	46.0	4.01E+06	3.74E+06	4.17E-03	6.19E-01	7.79E+06	7.29E+06
6-Feb-2015	50.9	4.89E+06	3.68E+06	3.95E-03	4.58E-01	7.38E+06	5.40E+06
13-Feb-2015	6.7	0.00E+00	0.00E+00	-	-	-	-
18-Feb-2015	0.4	0.00E+00	0.00E+00	-	-	-	-
20-Feb-2015	50.1	1.62E+07	7.12E+06	1.16E-02	8.08E-01	2.17E+07	9.52E+06
22-Feb-2015	24.6	1.63E+05	9.29E+04	2.60E-04	2.30E-02	4.85E+05	2.71E+05
27-Feb-2015	34.9	5.09E+06	4.32E+06	8.78E-03	1.15E+00	1.64E+07	1.36E+07
1-Mar-2015	49.4	2.03E+07	9.94E+06	2.37E-02	1.93E+00	4.43E+07	2.28E+07
5-Mar-2015	0.0	0.00E+00	0.00E+00	-	-	-	-
6-Mar-2015	0.2	0.00E+00	0.00E+00	-	-	-	-
8-Mar-2015	31.4	8.89E+07	3.30E+07	0.0838	4.85E+00	1.57E+08	5.71E+07
2-Dec-2015	0.1	0.00E+00	0.00E+00	-	-	-	-
5-Dec-2015	71.9	1.06E+05	7.05E+04	6.15E-05	6.37E-03	1.15E+05	7.51E+04

12-Dec-2015	34.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
14-Dec-2015	51.7	7.92E+04	2.63E+04	6.71E-05	3.47E-03	1.25E+05	4.08E+04
18-Dec-2015	0.0	0.00E+00	0.00E+00	-	-	-	-
21-Dec-2015	18.8	3.33E+04	1.21E+04	1.93E-04	1.01E-02	3.60E+05	1.20E+05
23-Dec-2015	21.0	7.20E+03	1.39E+03	1.67E-05	4.97E-04	3.12E+04	5.85E+03
28-Dec-2015	34.1	8.24E+05	6.71E+05	1.51E-03	1.89E-01	2.82E+06	2.23E+06
1-Jan-2016	0.2	0.00E+00	0.00E+00	-	-	-	-
8-Jan-2016	28.2	1.22E+07	8.09E+06	2.33E-02	2.31E+00	4.35E+07	2.72E+07
13-Jan-2016	34.3	7.94E+06	7.28E+06	1.42E-02	2.01E+00	2.66E+07	2.37E+07
17-Jan-2016	0.0	0.00E+00	0.00E+00	-	-	-	-
19-Jan-2016	0.4	0.00E+00	0.00E+00	-	-	-	-
22-Jan-2016	0.5	0.00E+00	0.00E+00	-	-	-	-
24-Jan-2016	25.2	2.11E+06	1.44E+06	3.57E-03	3.71E-01	6.67E+06	4.37E+06
26-Jan-2016	30.9	1.31E+05	3.88E+04	5.86E-04	3.00E-02	1.09E+06	3.53E+05
2-Feb-2016	19.2	2.17E+06	7.37E+05	4.17E-03	2.21E-01	7.79E+06	2.60E+06
4-Feb-2016	0.0	0.00E+00	0.00E+00	-	-	-	-
9-Feb-2016	84.6	4.16E+06	3.61E+06	2.37E-03	3.25E-01	4.43E+06	3.83E+06
14-Feb-2016	1.1	2.70E+03	2.74E+03	-	-	-	-
16-Feb-2016	53.4	3.62E+06	3.23E+06	3.20E-03	4.50E-01	5.97E+06	5.30E+06
18-Feb-2016	5.1	0.00E+00	0.00E+00	-	-	-	-
25-Feb-2016	19.3	1.42E+05	5.30E+04	3.26E-04	1.91E-02	6.09E+05	2.25E+05
27-Feb-2016	1.4	0.00E+00	0.00E+00	-	-	-	-
1-Mar-2016	18.7	1.78E+07	5.02E+06	4.30E-02	1.89E+00	8.02E+07	2.22E+07
3-Mar-2016	18.1	8.28E+04	6.57E+03	1.57E-04	1.99E-03	2.93E+05	2.35E+04
5-Mar-2016	2.9	0.00E+00	0.00E+00	-	-	-	-
8-Mar-2016	0.3	0.00E+00	0.00E+00	-	-	-	-
10-Mar-2016	3.9	0.00E+00	0.00E+00	-	-	-	-
3-Jan-2017	92.3	1.65E+07	6.44E+06	8.91E-03	5.52E-01	1.67E+07	6.50E+06
10-Jan-2017	89.5	6.56E+06	6.36E+06	3.54E-03	5.44E-01	6.61E+06	6.40E+06
17-Jan-2017	97.5	9.54E+06	8.59E+06	5.25E-03	7.50E-01	9.80E+06	8.83E+06
19-Jan-2017	61.8	3.29E+06	2.77E+06	2.68E-03	3.61E-01	5.00E+06	4.25E+06
24-Jan-2017	60.7	6.31E+06	5.36E+06	3.80E-03	5.06E-01	7.10E+06	5.97E+06
11-Feb-2017	72.9	2.13E+07	1.29E+07	1.27E-02	1.21E+00	2.38E+07	1.43E+07
25-Feb-2017	53.1	1.73E+07	1.00E+07	1.17E-02	1.06E+00	2.19E+07	1.25E+07
27-Feb-2017	88.9	2.68E+07	1.97E+07	1.44E-02	1.69E+00	2.70E+07	1.99E+07
28-Feb-2017	99.7	5.21E+07	1.45E+07	2.80E-02	1.23E+00	5.22E+07	1.45E+07
3-Dec-2017	16.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
8-Dec-2017	0.1	0.00E+00	0.00E+00	-	-	-	-
10-Dec-2017	4.2	0.00E+00	0.00E+00	-	-	-	-
12-Dec-2017	58.8	4.10E+05	1.53E+05	3.98E-04	2.42E-02	7.44E+05	2.85E+05
17-Dec-2017	34.0	4.02E+05	3.18E+05	7.37E-04	8.99E-02	1.38E+06	1.06E+06
19-Dec-2017	98.8	7.00E+06	5.04E+06	3.76E-03	4.28E-01	7.02E+06	5.05E+06
24-Dec-2017	4.5	4.84E+05	1.39E+05	-	-	-	-
26-Dec-2017	75.4	2.75E+07	1.83E+07	1.58E-02	1.64E+00	2.94E+07	1.93E+07
28-Dec-2017	85.6	3.29E+07	2.13E+07	1.81E-02	1.86E+00	3.38E+07	2.20E+07
30-Dec-2017	34.8	3.95E+06	2.36E+06	1.65E-02	1.68E+00	3.09E+07	1.98E+07
2-Jan-2018	13.7	1.73E+06	9.55E+05	1.51E-02	1.31E+00	2.82E+07	1.54E+07

4-Jan-2018	77.5	7.16E+07	4.91E+07	4.02E-02	4.31E+00	7.52E+07	5.08E+07
9-Jan-2018	5.0	1.26E+04	7.43E+03	-	-	-	-
11-Jan-2018	32.2	5.04E+07	2.79E+07	5.51E-02	4.92E+00	1.03E+08	5.79E+07
13-Jan-2018	74.5	2.00E+08	1.16E+08	1.26E-01	1.16E+01	2.36E+08	1.37E+08
14-Jan-2018	67.7	3.41E+08	1.13E+08	2.07E-01	1.10E+01	3.87E+08	1.29E+08
18-Jan-2018	6.1	2.24E+07	1.19E+07	-	-	-	-
20-Jan-2018	10.1	4.86E+07	2.94E+07	2.44E-01	2.04E+01	4.56E+08	2.40E+08
22-Jan-2018	4.2	5.72E+06	2.78E+06	-	-	-	-
24-Jan-2018	53.7	1.71E+08	7.66E+07	2.14E-01	1.52E+01	3.99E+08	1.79E+08
25-Jan-2018	53.6	4.82E+07	2.59E+07	5.25E-02	4.61E+00	9.81E+07	5.43E+07
27-Jan-2018	43.7	1.57E+08	8.17E+07	1.21E-01	9.60E+00	2.26E+08	1.13E+08
29-Jan-2018	79.6	2.92E+08	2.31E+08	1.66E-01	2.08E+01	3.11E+08	2.45E+08
3-Feb-2018	6.7	3.70E+07	2.49E+07	-	-	-	-
5-Feb-2018	15.8	3.75E+07	2.27E+07	1.13E-01	1.12E+01	2.12E+08	1.32E+08
7-Feb-2018	62.9	2.12E+08	1.55E+08	1.76E-01	2.06E+01	3.28E+08	2.43E+08
10-Feb-2018	3.8	0.00E+00	0.00E+00	-	-	-	-
12-Feb-2018	23.5	6.82E+07	4.24E+07	1.01E-01	8.74E+00	1.89E+08	1.03E+08
14-Feb-2018	2.1	0.00E+00	0.00E+00	-	-	-	-
16-Feb-2018	1.7	0.00E+00	0.00E+00	-	-	-	-
18-Feb-2018	83.1	1.16E+08	3.31E+07	6.52E-02	2.95E+00	1.22E+08	3.47E+07
19-Feb-2018	6.9	1.25E+06	3.94E+05	-	-	-	-
21-Feb-2018	54.2	8.06E+07	2.68E+07	6.20E-02	3.22E+00	1.16E+08	3.79E+07
22-Feb-2018	79.3	1.28E+07	1.89E+06	9.33E-03	2.21E-01	1.74E+07	2.61E+06
26-Feb-2018	3.3	0.00E+00	0.00E+00	-	-	-	-
28-Feb-2018	0.2	0.00E+00	0.00E+00	-	-	-	-
2-Mar-2018	78.5	1.23E+07	8.64E+06	6.67E-03	7.40E-01	1.25E+07	8.72E+06
4-Mar-2018	0.3	0.00E+00	0.00E+00	-	-	-	-
7-Mar-2018	10.5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
1-Dec-2018	6.7	0.00E+00	0.00E+00	-	-	-	-
4-Dec-2018	17.4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6-Dec-2018	5.7	0.00E+00	0.00E+00	-	-	-	-
10-Dec-2018	0.0	0.00E+00	0.00E+00	-	-	-	-
11-Dec-2018	4.1	0.00E+00	0.00E+00	-	-	-	-
17-Dec-2018	33.9	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
20-Dec-2018	17.5	9.00E+03	5.75E+03	2.73E-05	2.69E-03	5.09E+04	3.17E+04
22-Dec-2018	0.3	0.00E+00	0.00E+00	-	-	-	-
27-Dec-2018	5.0	0.00E+00	0.00E+00	-	-	-	-
29-Dec-2018	9.9	2.15E+05	1.43E+05	-	-	-	-
31-Dec-2018	27.1	9.36E+04	3.06E+04	2.14E-04	1.18E-02	3.99E+05	1.39E+05
2-Jan-2019	0.3	0.00E+00	0.00E+00	-	-	-	-
5-Jan-2019	21.3	1.91E+06	1.83E+06	3.67E-03	5.38E-01	6.85E+06	6.33E+06
9-Jan-2019	15.2	1.15E+05	5.42E+04	5.52E-04	4.39E-02	1.03E+06	5.17E+05
11-Jan-2019	0.3	0.00E+00	0.00E+00	-	-	-	-
12-Jan-2019	1.1	0.00E+00	0.00E+00	-	-	-	-
21-Jan-2019	29.8	2.28E+06	1.25E+06	4.85E-03	4.14E-01	9.07E+06	4.88E+06
23-Jan-2019	3.5	1.97E+05	9.19E+04	-	-	-	-
25-Jan-2019	63.5	1.00E+07	5.59E+06	8.18E-03	7.31E-01	1.53E+07	8.61E+06

27-Jan-2019	0.2	0.00E+00	0.00E+00	-	-	-	-
28-Jan-2019	82.0	5.05E+07	1.18E+07	2.92E-02	1.09E+00	5.45E+07	1.28E+07
30-Jan-2019	0.4	0.00E+00	0.00E+00	-	-	-	-
6-Feb-2019	17.3	2.18E+06	9.71E+05	6.18E-03	4.37E-01	1.16E+07	5.15E+06
7-Feb-2019	92.1	1.57E+07	2.66E+06	8.48E-03	2.28E-01	1.58E+07	2.69E+06
8-Feb-2019	95.5	4.66E+06	2.10E+06	2.57E-03	1.84E-01	4.81E+06	2.17E+06
10-Feb-2019	7.2	2.19E+05	6.89E+04	-	-	-	-
15-Feb-2019	64.1	1.52E+06	7.73E+05	1.12E-03	8.95E-02	2.10E+06	1.05E+06
17-Feb-2019	89.9	1.17E+07	3.01E+06	6.40E-03	2.60E-01	1.20E+07	3.06E+06
19-Feb-2019	8.3	2.05E+05	6.89E+04	-	-	-	-
22-Feb-2019	8.0	0.00E+00	0.00E+00	-	-	-	-
24-Feb-2019	44.0	6.25E+06	6.33E+06	6.99E-03	1.08E+00	1.30E+07	1.27E+07
10-Mar-2019	7.6	3.60E+03	7.02E+01	-	-	-	-
12-Mar-2019	0.3	0.00E+00	0.00E+00	-	-	-	-
2-Dec-2019	19.3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
7-Dec-2019	27.9	1.24E+06	4.59E+05	3.47E-03	2.01E-01	6.48E+06	2.37E+06
9-Dec-2019	58.4	1.29E+06	9.47E+05	1.08E-03	1.23E-01	2.01E+06	1.45E+06
13-Dec-2019	0.0	0.00E+00	0.00E+00	-	-	-	-
14-Dec-2019	4.3	0.00E+00	0.00E+00	-	-	-	-
16-Dec-2019	40.7	9.79E+05	7.36E+05	1.18E-03	1.37E-01	2.21E+06	1.62E+06
18-Dec-2019	36.8	1.67E+06	1.48E+06	2.21E-03	3.06E-01	4.13E+06	3.61E+06
23-Dec-2019	29.3	6.35E+06	4.85E+06	1.33E-02	1.56E+00	2.48E+07	1.83E+07
25-Dec-2019	69.9	2.94E+06	1.38E+06	3.20E-03	2.38E-01	5.97E+06	2.80E+06
27-Dec-2019	63.2	7.24E+06	5.51E+06	5.92E-03	7.20E-01	1.11E+07	8.48E+06
1-Jan-2020	1.8	7.38E+04	1.17E+04	-	-	-	-
5-Jan-2020	12.1	3.42E+07	2.33E+07	4.60E-01	4.24E+01	8.59E+08	5.00E+08
10-Jan-2020	0.0	0.00E+00	0.00E+00	-	-	-	-
12-Jan-2020	4.3	1.90E+07	7.89E+06	-	-	-	-
15-Jan-2020	1.0	5.40E+03	3.29E+02	-	-	-	-
17-Jan-2020	76.6	6.54E+08	4.79E+08	3.71E-01	4.25E+01	6.92E+08	5.01E+08
19-Jan-2020	100.0	1.18E+09	6.20E+08	6.31E-01	5.26E+01	1.18E+09	6.20E+08
21-Jan-2020	5.8	4.51E+07	2.04E+07	-	-	-	-
24-Jan-2020	16.4	2.34E+07	1.08E+07	1.60E-01	1.05E+01	2.99E+08	1.24E+08
26-Jan-2020	92.1	6.76E+08	4.57E+08	3.72E-01	3.98E+01	6.95E+08	4.69E+08
28-Jan-2020	18.2	5.04E+07	1.53E+07	3.45E-01	1.70E+01	6.45E+08	2.01E+08
30-Jan-2020	0.1	0.00E+00	0.00E+00	-	-	-	-
31-Jan-2020	1.5	7.20E+03	3.49E+02	-	-	-	-
2-Feb-2020	30.2	1.45E+08	9.39E+07	2.43E-01	2.37E+01	4.55E+08	2.80E+08
4-Feb-2020	10.0	6.96E+07	3.57E+07	2.73E-01	2.19E+01	5.10E+08	2.58E+08
11-Feb-2020	16.5	2.17E+08	9.78E+07	3.57E-01	2.40E+01	6.68E+08	2.83E+08
15-Feb-2020	0.2	0.00E+00	0.00E+00	-	-	-	-
18-Feb-2020	0.0	0.00E+00	0.00E+00	-	-	-	-
25-Feb-2020	1.1	3.51E+04	4.89E+03	-	-	-	-
27-Feb-2020	2.4	8.29E+05	2.93E+05	-	-	-	-
7-Mar-2020	8.3	3.48E+07	7.32E+06	-	-	-	-
12-Mar-2020	5.8	2.16E+07	9.62E+06	-	-	-	-

Table S1. Details about all the 196 optical image mosaics analysed in the study, including their dates, % of cloud-free AOI cover, total observed area of water (m^2) and total observed volume of water (m^3). For those images that include at least 10% of the AOI area (113 total), we also state the total observed meltwater area as a percentage of the total *maximum wetted area mask* for the equivalent area, the total observed water volume as a percentage of the total *maximum volume mask* for the equivalent area, and their meltwater areas (m^2) and volumes (m^3) normalised to the whole AOI. See Section 3.3 for further details about the methods.