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Supplement of

A Lagrangian analysis of the dynamical and thermodynamic drivers of large-scale Greenland melt events during 1979–2017

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Supplementary material

Table S1. Melt events EV1–EV22 listed with their start and end date ("YYYY-MM-DD HH"), duration (dur.), maximum elevation (ME), maximum $T2M$ at maximum elevation ($T2M_{max}^{ME}$), minimum melt extent (min. A.) and maximum melt extent (max. A.) – sorted by date.

ID	start	end	dur. [d]	ME [m]	$T2M_{max}^{ME}$ [°C]	min. A. [frac]	max. A. [frac]
1	1979-07-24 18	1979-07-26 18	2.25	2606	−1.17	0.14	0.46
2	1981-06-25 18	1981-06-27 18	2.25	2549	−1.29	0.13	0.40
3	1981-07-21 12	1981-07-24 18	3.5	2729	2.44	0.13	0.38
4	1983-06-30 18	1983-07-01 18	1.25	2606	−0.27	0.10	0.43
5	1984-07-03 18	1984-07-08 18	5.25	2549	−1.72	0.04	0.45
6	1984-07-22 18	1984-07-24 18	2.25	2537	−0.57	0.05	0.41
7	1984-07-26 18	1984-07-27 18	1.25	2333	−0.06	0.19	0.38
8	1985-08-12 18	1985-08-14 18	2.25	2810	−0.51	0.14	0.34
9	1986-07-02 18	1986-07-03 18	1.25	2394	0.67	0.04	0.31
10	1986-07-20 18	1986-07-22 18	2.25	2729	2.43	0.16	0.32
11	1987-06-12 18	1987-06-13 18	1.25	2717	−1.17	0.15	0.36
12	1987-06-18 18	1987-06-22 18	4.25	2826	−1.87	0.02	0.40
13	1987-08-07 18	1987-08-10 18	3.25	2734	−1.07	0.03	0.49
14	1988-07-04 12	1988-07-12 18	8.5	2658	−0.10	0.05	0.45
15	1988-07-21 18	1988-07-22 18	1.25	2413	0.27	0.05	0.38
16	1989-07-13 18	1989-07-20 18	7.25	2810	−1.27	0.09	0.45
17	1990-07-28 18	1990-07-30 18	2.25	2748	−0.43	0.06	0.46
18	1990-08-05 18	1990-08-06 18	1.25	2628	−1.27	0.09	0.38
19	1991-06-18 18	1991-06-19 18	1.25	2810	−1.62	0.04	0.34
20	1991-06-26 18	1991-06-27 18	1.25	2394	−1.53	0.10	0.29
21	1991-06-29 12	1991-07-02 18	3.5	2606	−0.47	0.04	0.31
22	1991-07-04 18	1991-07-13 18	9.25	3000	−1.46	0.02	0.44

Table S2. As Table S1 for EV23–EV55.

ID	start	end	dur. [d]	ME [m]	$T2M_{max}^{ME}$ [°C]	min. A. [frac]	max. A. [frac]
23	1994-07-07 18	1994-07-08 18	1.25	2443	0.55	0.09	0.43
24	1995-06-30 18	1995-07-03 18	3.25	2810	−0.25	0.05	0.40
25	1995-07-12 18	1995-07-16 18	4.25	2969	−0.36	0.09	0.51
26	1997-08-11 18	1997-08-13 18	2.25	2970	0.99	0.12	0.42
27	1998-08-01 18	1998-08-03 18	2.25	2637	−0.83	0.09	0.39
28	1999-06-28 18	1999-07-03 18	5.25	2721	−0.62	0.05	0.45
29	1999-07-25 18	1999-07-31 18	6.25	2628	−0.89	0.05	0.41
30	1999-08-02 18	1999-08-06 18	4.25	2826	−2.56	0.05	0.39
31	2000-07-28 18	2000-07-29 18	1.25	2637	0.49	0.22	0.47
32	2000-08-01 00	2000-08-02 18	2	2729	0.61	0.21	0.38
33	2000-08-19 18	2000-08-21 18	2.25	2634	0.43	0.10	0.34
34	2002-06-11 18	2002-06-14 18	3.25	2810	−0.67	0.02	0.48
35	2002-06-27 18	2002-07-03 18	6.25	3156	−0.44	0.08	0.84
36	2002-07-06 18	2002-07-07 18	1.25	2444	1.23	0.05	0.40
37	2002-07-20 18	2002-07-21 18	1.25	2719	−0.67	0.13	0.45
38	2003-08-26 18	2003-08-30 18	4.25	2729	−0.30	0.08	0.43
39	2004-06-18 12	2004-06-23 18	5.5	2826	−1.05	0.04	0.42
40	2004-07-05 18	2004-07-12 18	7.25	3175	−0.15	0.08	0.60
41	2004-08-11 18	2004-08-12 18	1.25	2810	−0.06	0.26	0.47
42	2005-06-13 18	2005-06-16 18	3.25	2628	0.67	0.05	0.49
43	2005-07-02 18	2005-07-03 18	1.25	2486	−0.17	0.07	0.44
44	2005-07-13 18	2005-07-15 18	2.25	2729	2.98	0.18	0.43
45	2005-07-21 18	2005-07-30 18	9.25	2916	−0.58	0.12	0.65
46	2006-07-19 18	2006-07-28 18	9.25	3100	−0.51	0.07	0.59
47	2006-08-03 18	2006-08-05 18	2.25	2606	−0.98	0.12	0.40
48	2006-08-15 00	2006-08-18 18	4	2758	−0.91	0.16	0.53
49	2007-06-10 18	2007-06-13 18	3.25	2637	1.88	0.11	0.42
50	2007-06-22 18	2007-06-29 18	7.25	2637	5.04	0.04	0.49
51	2007-07-06 18	2007-07-22 18	16.25	2658	0.70	0.05	0.48
52	2007-07-24 18	2007-07-25 18	1.25	2381	−2.37	0.08	0.39
53	2008-06-13 18	2008-06-14 18	1.25	2637	1.14	0.24	0.42
54	2008-06-17 18	2008-06-18 18	1.25	2482	2.37	0.06	0.31
55	2008-07-05 18	2008-07-06 18	1.25	2786	−0.91	0.16	0.50

Table S3. As Table S1 for EV56–EV77.

ID	start	end	dur. [d]	ME [m]	$T2M_{max}^{ME}$ [°C]	min. A. [frac]	max. A. [frac]
56	2008-07-28 18	2008-07-31 18	3.25	2537	0.59	0.05	0.47
57	2009-07-06 18	2009-07-16 18	10.25	2943	−0.10	0.08	0.57
58	2009-07-20 18	2009-07-23 18	3.25	2486	0.09	0.06	0.46
59	2010-07-18 18	2010-07-19 18	1.25	2486	0.11	0.01	0.35
60	2010-07-23 18	2010-07-27 18	4.25	2486	−0.88	0.08	0.38
61	2010-07-29 18	2010-08-02 18	4.25	2537	−1.22	0.07	0.39
62	2010-08-09 18	2010-08-10 18	1.25	2455	−0.28	0.06	0.30
63	2010-08-15 18	2010-08-16 18	1.25	2628	−0.26	0.07	0.32
64	2011-06-13 18	2011-06-15 18	2.25	2856	0.93	0.01	0.44
65	2011-07-06 18	2011-07-10 18	4.25	2916	−0.78	0.10	0.49
66	2011-07-13 18	2011-07-15 18	2.25	2455	0.20	0.07	0.51
67	2011-07-18 18	2011-07-23 18	5.25	2526	0.03	0.07	0.44
68	2012-06-15 18	2012-06-29 18	14.25	2916	−1.81	0.03	0.56
69	2012-07-02 18	2012-07-17 18	15.25	3175	−0.13	0.05	0.95
70	2012-07-27 18	2012-08-08 18	12.25	3100	−1.08	0.06	0.70
71	2013-07-24 18	2013-07-28 18	4.25	2826	−2.44	0.06	0.46
72	2013-07-30 18	2013-08-02 18	3.25	2608	−1.07	0.07	0.38
73	2015-07-02 18	2015-07-09 18	7.25	2605	0.43	0.09	0.53
74	2016-06-10 18	2016-06-14 18	4.25	2652	−1.47	0.05	0.44
75	2016-06-22 18	2016-06-25 18	3.25	2581	2.50	0.08	0.35
76	2016-07-18 18	2016-07-24 18	6.25	2607	0.25	0.09	0.50
77	2017-07-25 12	2017-07-27 18	2.5	2628	1.98	0.11	0.49

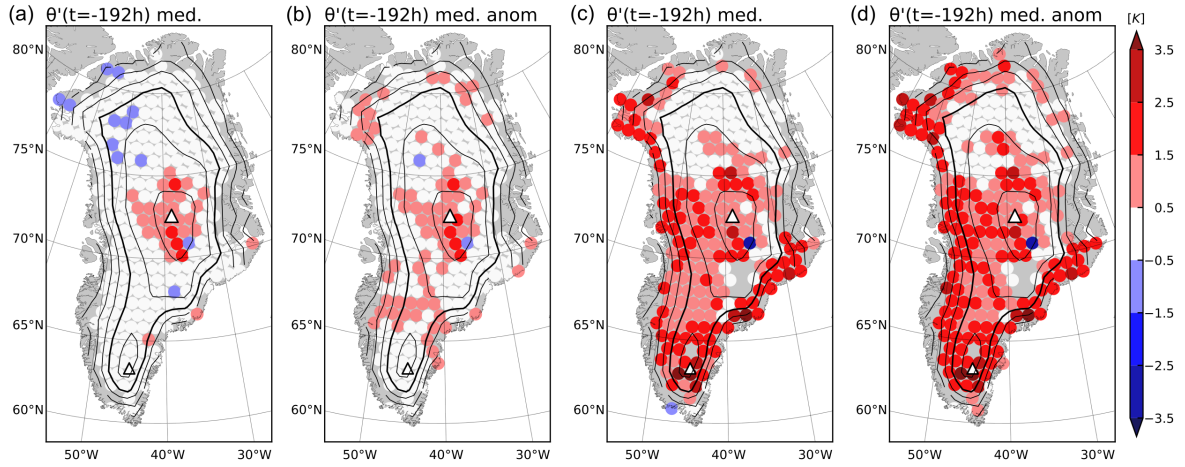

Figure S1. LFP maps of the median potential temperature anomaly θ' wrt. local climatology θ_{cl} at $t = -192\,\mathrm{h}$ (a) during all melt events, (c) during EV69, and (b,d) the respective anomaly wrt. the climatological summertime air streams. The contours indicate elevation in 500 m intervals with the 2000 m isoline in solid. Summit and Southdome are marked with triangles.

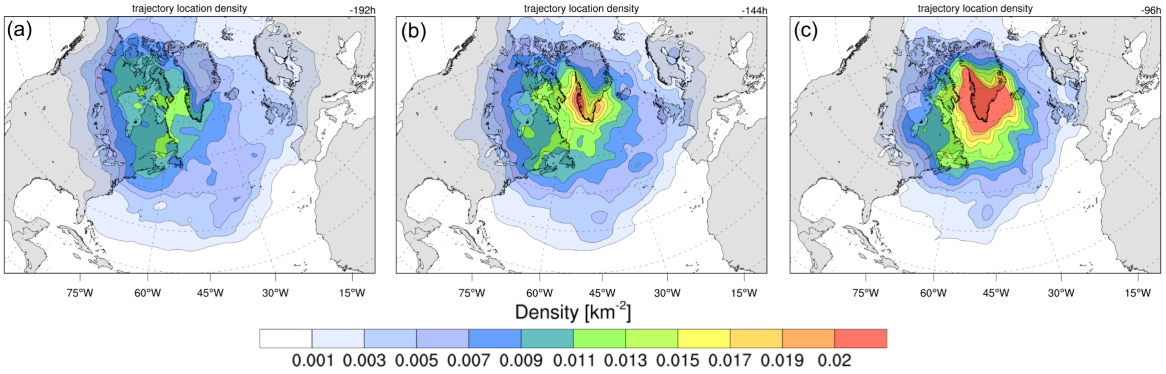

Figure S2. The trajectory density of melt air masses arriving during all large-scale melt events at (a) $t = -192\,\mathrm{h}$, (b) $t = -144\,\mathrm{h}$, and (c) $t = -96\,\mathrm{h}$. Trajectory density results from gridding all melt air masses at a specific time before the event, using the gridding tool v2.4.2 by Škerlak (2014) with a radius of 200 km and with the filtering option.

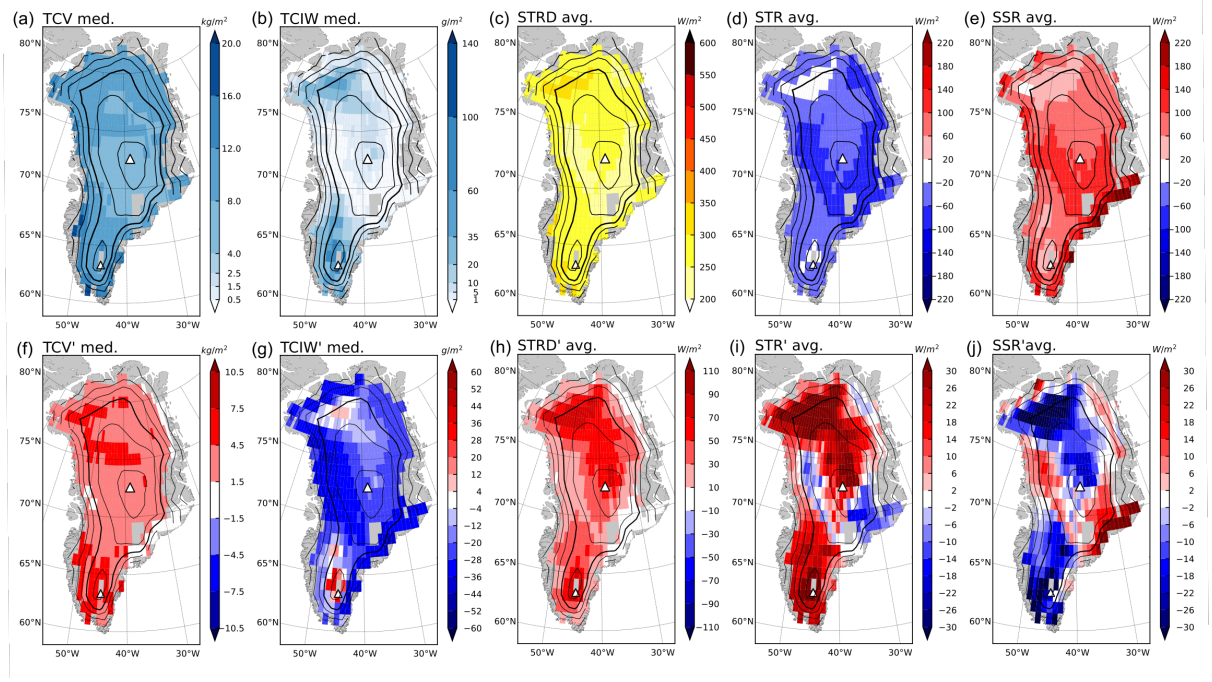

Figure S3. As Fig. 7 but for (a) total column water vapor (*TCV*), (b) total column liquid ice water (*TCIW*), (c) surface longwave downward radiation (*STRD*), (d) net surface longwave radiation (*STR*), (e) net surface shortwave radiation (*SSR*) during EV69 melt time steps, and (f–j) their anomalies wrt. climatology.

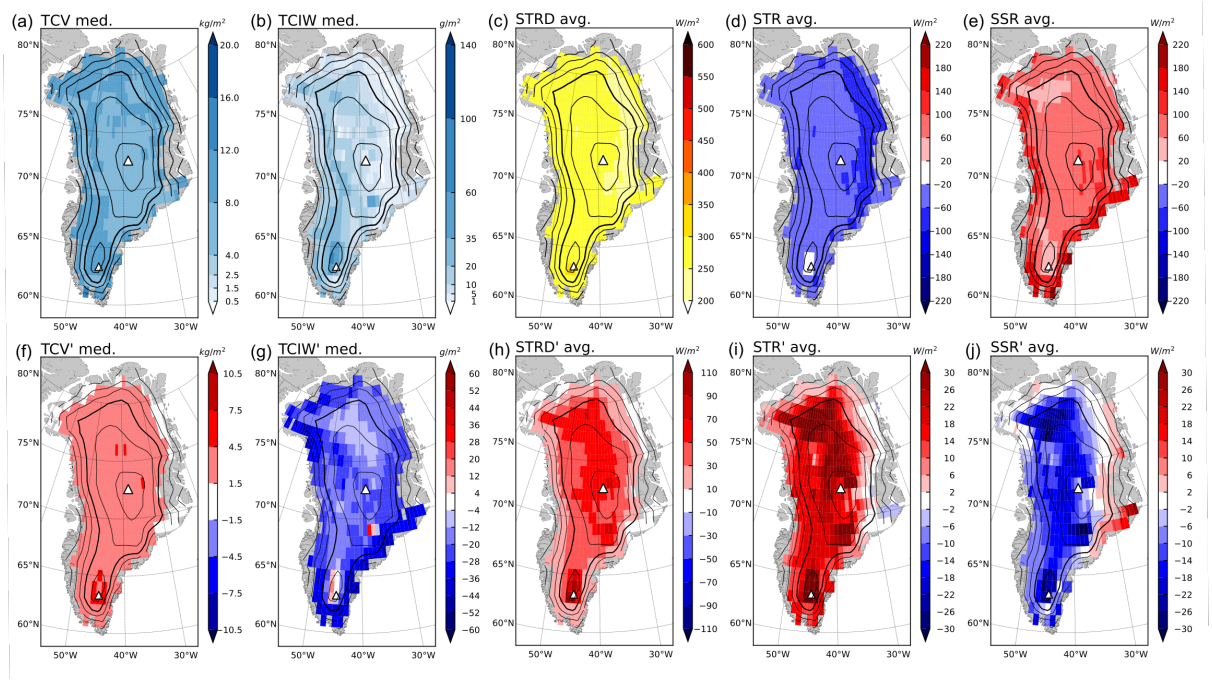

Figure S4. As Fig. S3 but for melt time steps during all large-scale melt events.

References

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