Supplemental of

"Triggers of the 2022 Larsen B multi-year landfast sea ice break-out and initial glacier response"

Ochwat et al., 2023

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Table 1: DEMs from Worldview Imagery			
Sensor	Acquisition Date	Sensor	Acquisition Date
WV2	3/9/17	WV3	4/21/21
WV2	4/18/17	WV3	1/15/22
WV1	4/22/17	WV2	2/14/22
WV2	11/27/17	WV3	2/19/22
WV2	3/26/18	WV2	10/3/22
WV2	9/30/18	WV3	11/21/22
WV3	2/9/20	WV3	12/25/22
WV2	3/22/21	WV2	2/16/23

Table 1: Date and sensor of Worldview images used for this study

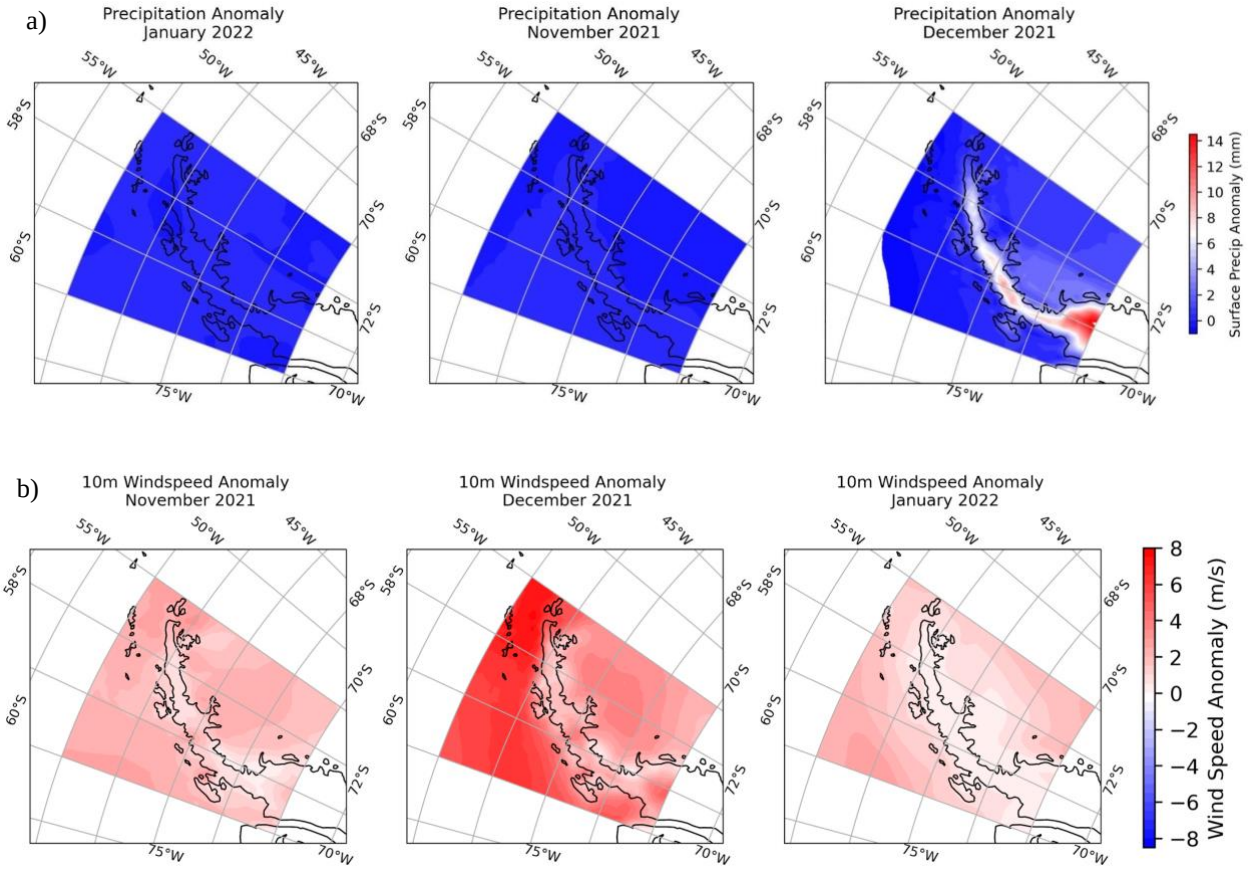

Figure S1

Precipitation and windspeed anomalies (1979-2022) for the AP region in November 2021, December 2021, and January 2022.

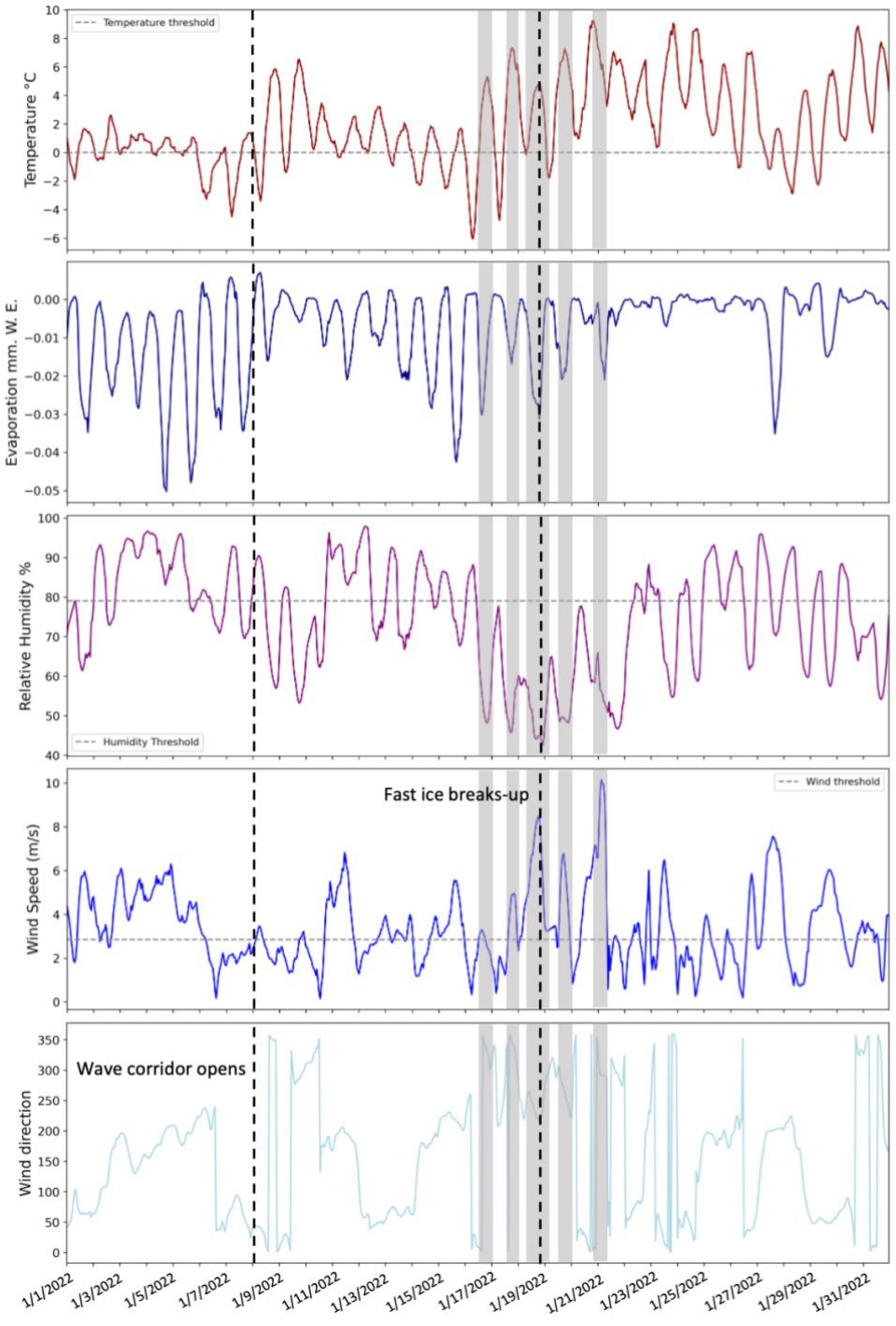
Temperature threshold
Temperature °C
Evaporation mm. W. E.
Relative Humidity %
Humidity Threshold
Fast ice breaks-up
Wind threshold
Wind Speed (m/s)
Wave corridor opens
Wind direction
1/1/2022
1/3/2022
1/5/2022
1/7/2022
1/9/2022
1/11/2022
1/13/2022
1/15/2022
1/17/2022
1/19/2022
1/21/2022
1/23/2022
1/25/2022
1/27/2022
1/29/2022
1/31/2022

Figure S2

ERA-5 climate variables on hourly time scale during January 2022. The horizontal dashed lines indicate foehn wind thresholds determined by Laffin et al., 2022. The vertical dashed lines show the when the wave corridor opened and when the fast ice broke-up. The gray shaded lines indicate periods when all of the foehn wind thresholds were met, suggesting times of foehn wind events.

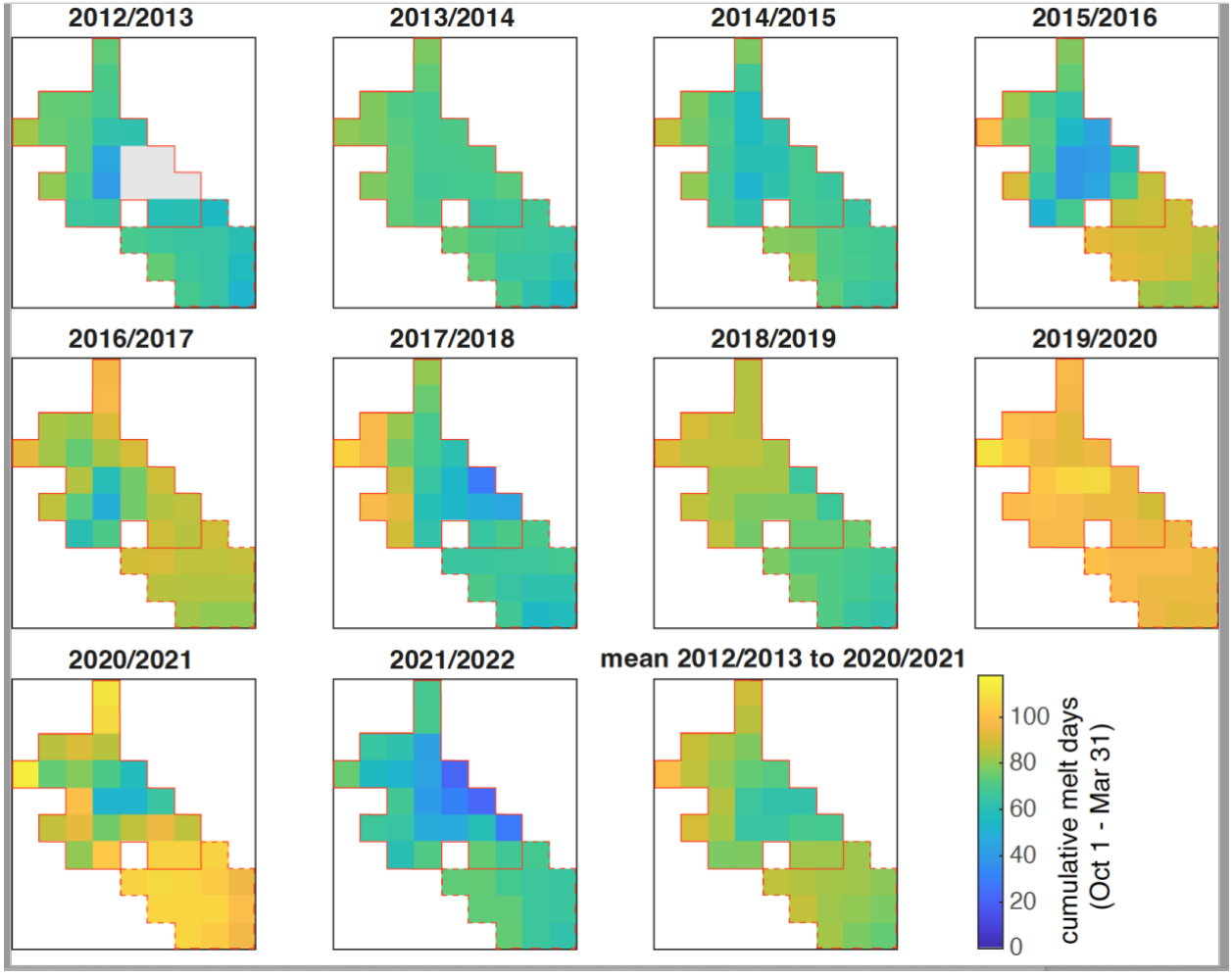

Figure S3

Cumulative melt day maps from 2012/2013 to 2020/2021 for the Larsen B embayment (solid lines) and Scar Inlet Ice Shelf (dashed lines).

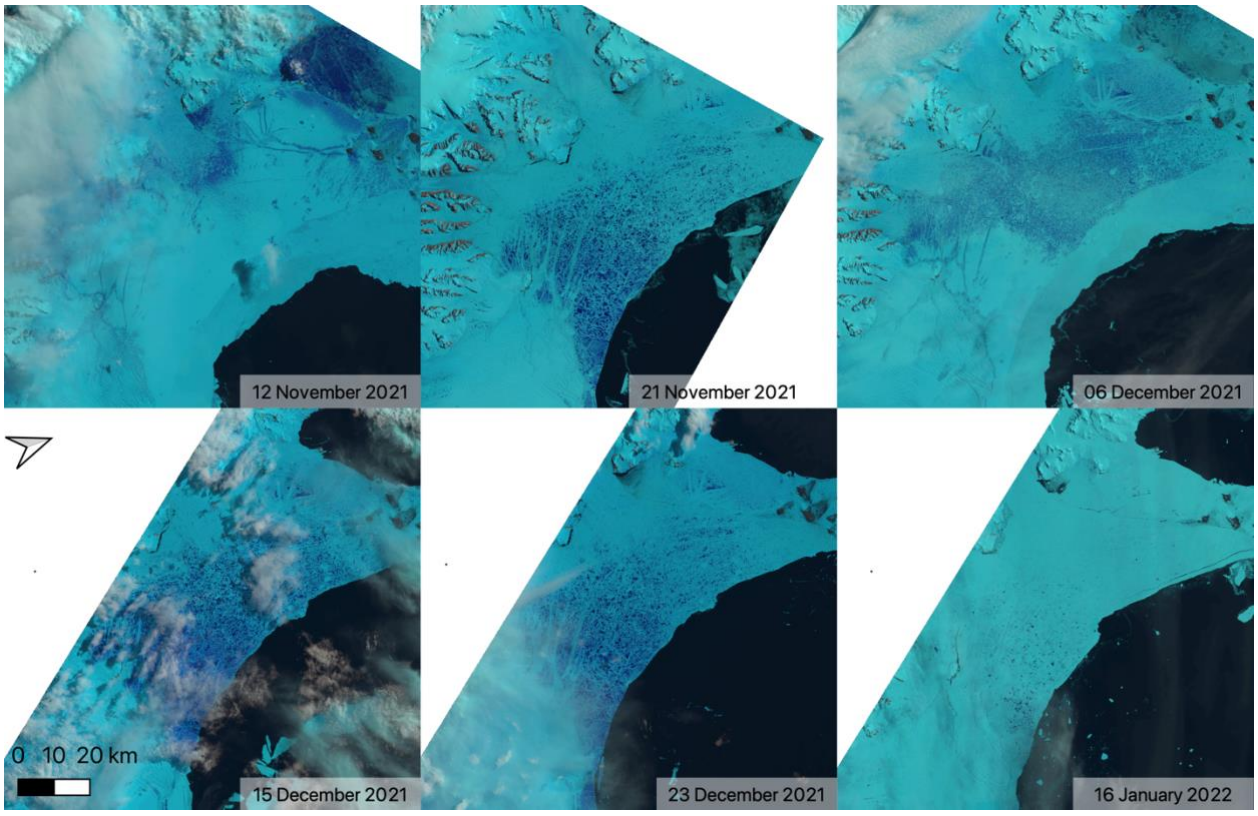

Figure S4

Melt pond evolution using Landsat imagery from November 2021 to January 2022.

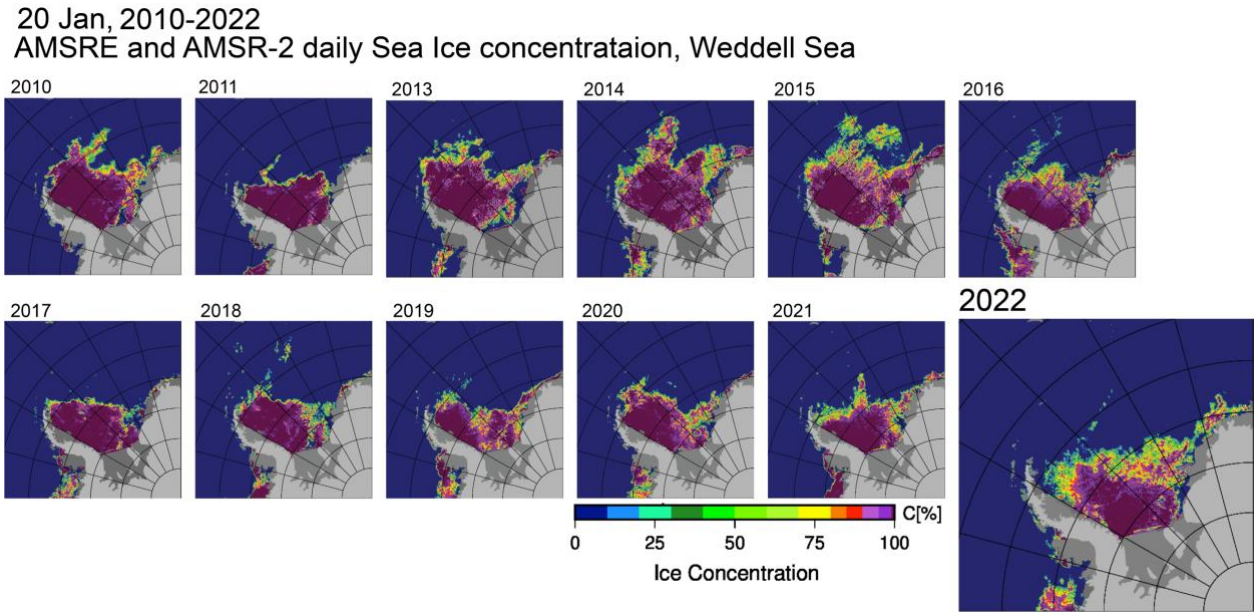

Figure S5

Sea ice concentration in Weddell Sea on 20 January from 2010 to 2011 and 2013 to 2022. The open corridor was not present in any of the previous seasons on record during this time of year.

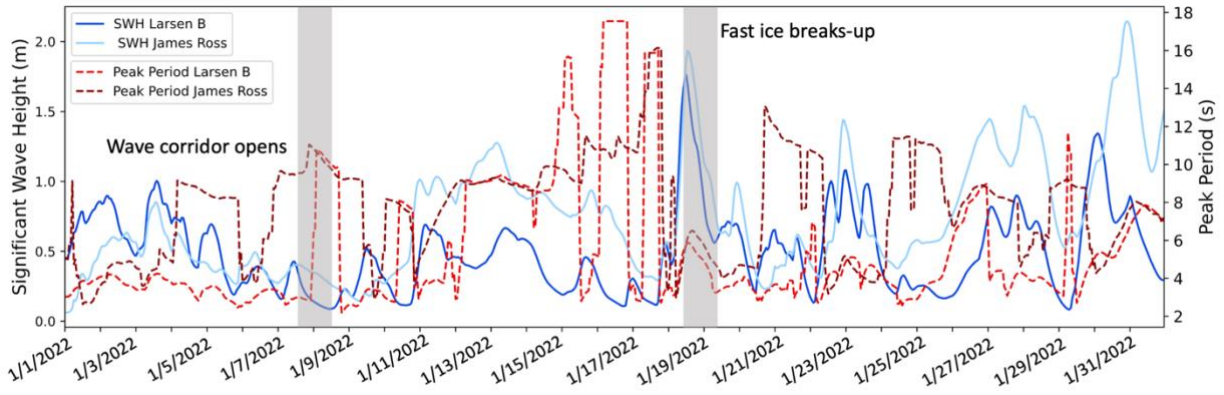

Figure S6

We obtain ocean wave-field data from the WaveWatch III model hindcast from the Collaboration for Australian Weather and Climate Research (CAWCR; Wave Hindcast Aggregated Collection; Durrant et al., 2019). From June 2013 onwards the dataset is generated using WaveWatch III v4.18 wave model forced with NCEP CFSv2 hourly winds and daily sea ice producing gridded spectral wave data on a global 0.4 (24 arcminute) grid. Here we examine an hourly time series of the variables for

January 2022, averaging over four grid cells in front of the Larsen B embayment and near the James Ross Island, where a wave corridor was present.

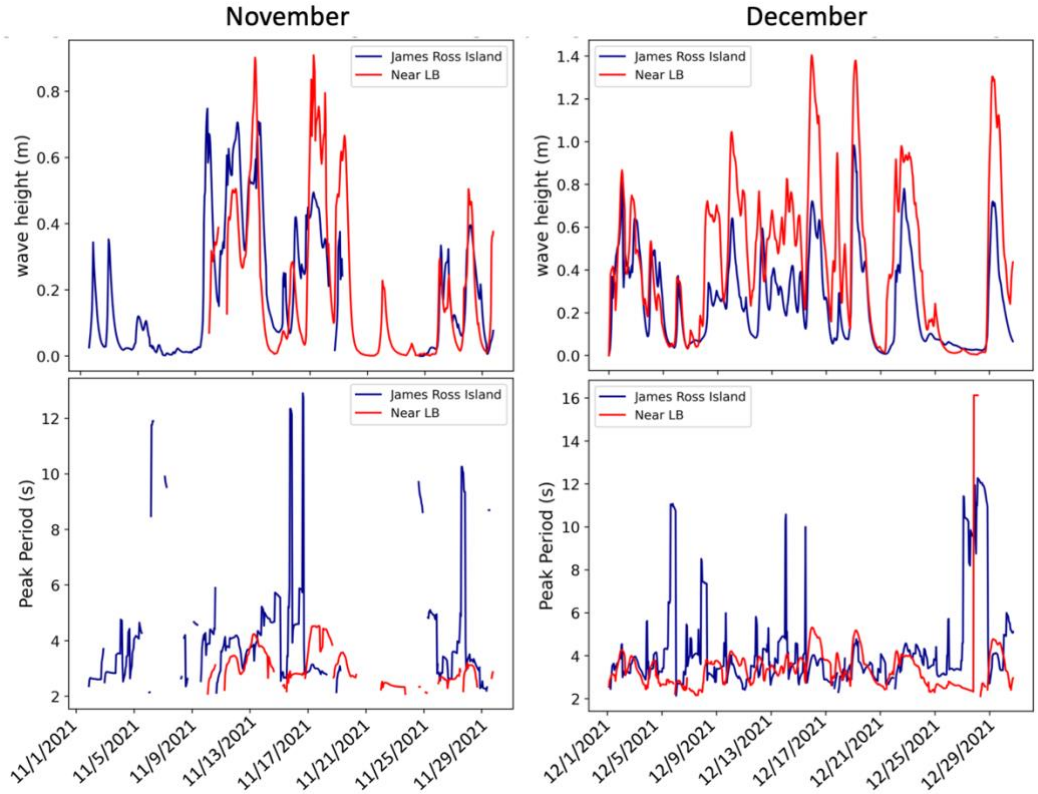

Figure S7

Wavewatch wave data showing the peak period and significant wave height for November and December 2021 for locations near James Ross Island and in front of the Larsen B embayment.

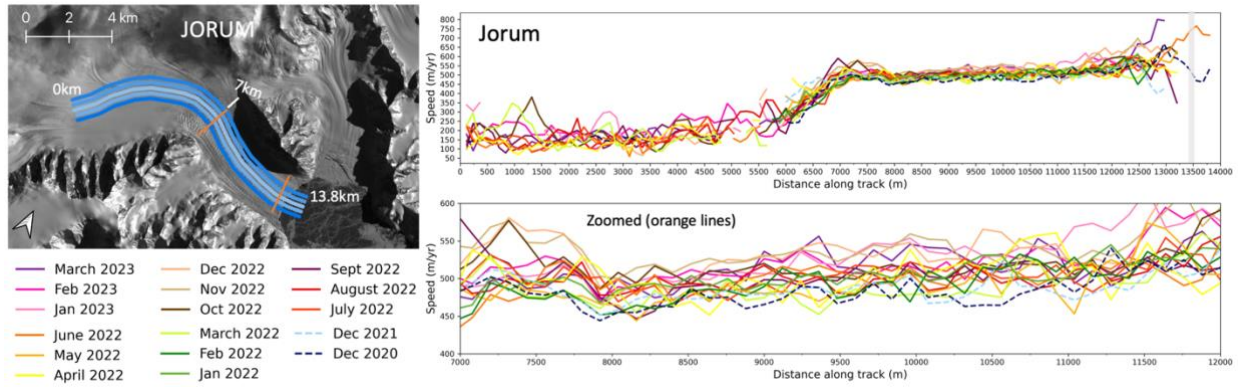

Figure S8

Jorum Glacier speeds derived from the ASF Vertex Tool and Hyp3 pipeline using Sentinel 1 imagery from December 2020 to March 2023.

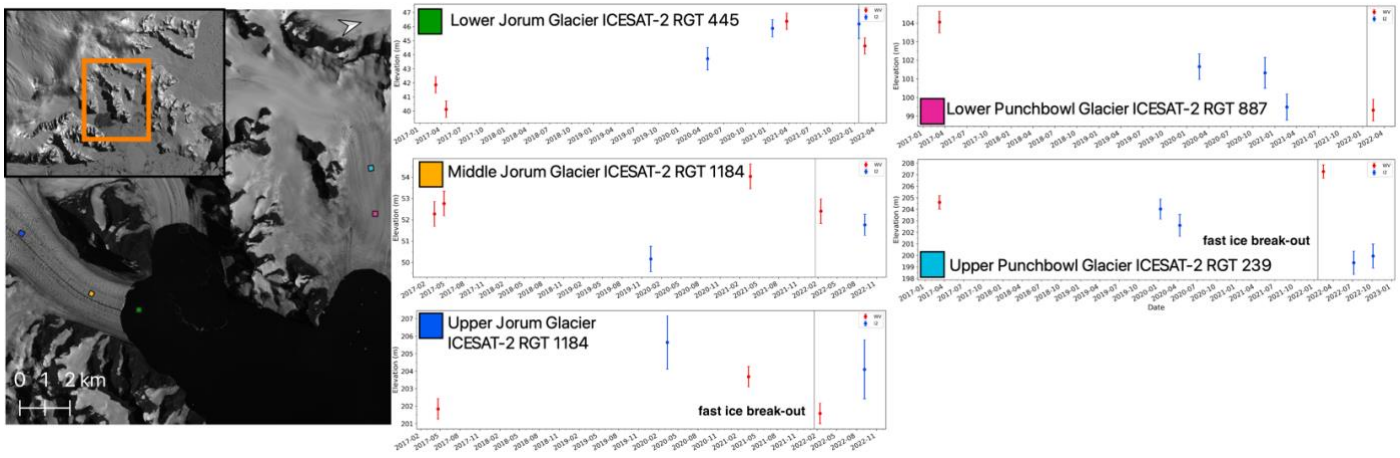

Figure S9

Jorum and Punchbowl elevation changes from ICEsat and Worldview DEMs.

References:

Durrant, T., Hemer, M., Smith, G., Trenham, C., Greenslade, D.: CAWCR Wave Hindcast - Aggregated Collection. v5. CSIRO. Service Collection. http://hdl.handle.net/102.100.100/137152?index=1, 2019.