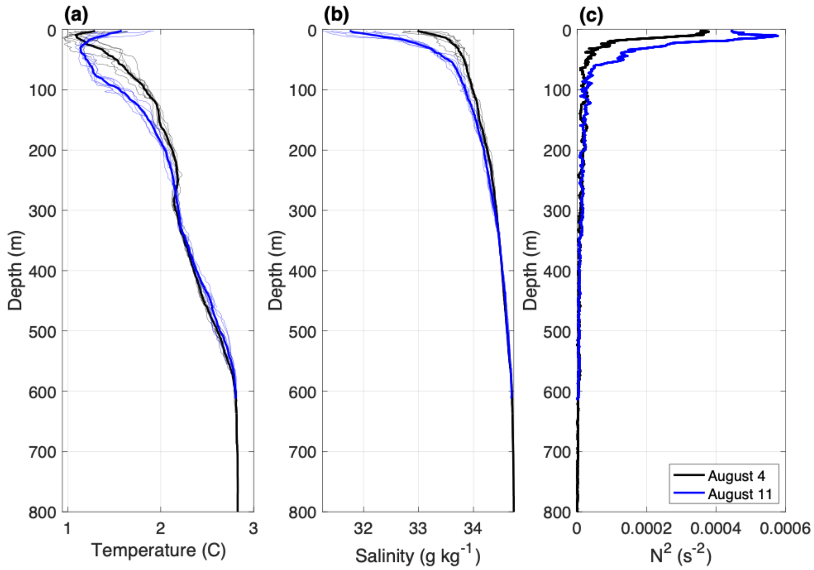

Figure S1. Changes in *T* (a), *S* (b), and N^2 (c) pre- (black line; August 4) and post-event (blue line; August 11; zoomed in profiles shown in Figure 2). Thin lines indicate individual CTD casts across the width of the glacial fjord, while thick lines indicate the average. In (c), N^2 has been smoothed with a 10 m moving average.

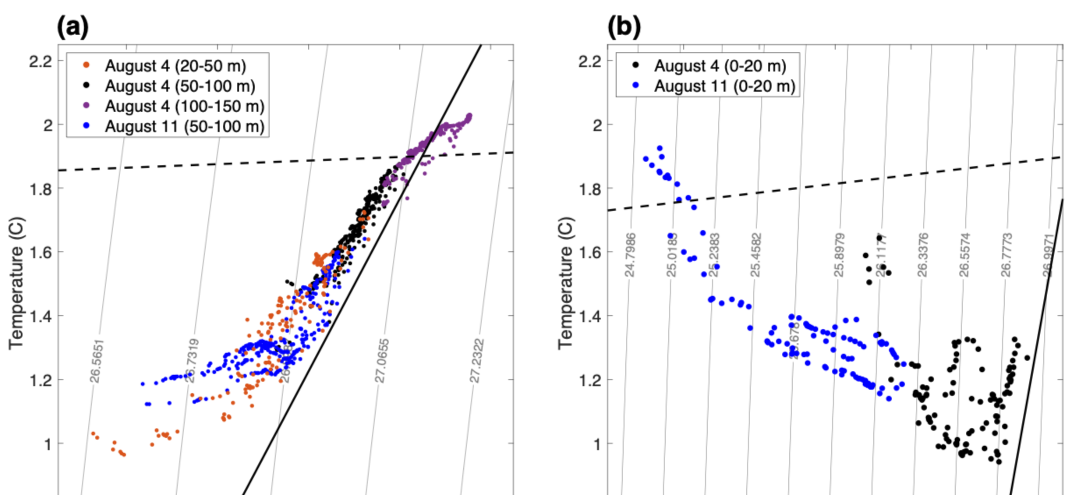

Figure S2. Across-fjord averaged water column properties before (orange, black, and purple dots) and after (blue dots) the ephemeral ice mélange event in the (a) depth range of significant stratification change and (b) in the surface water column.

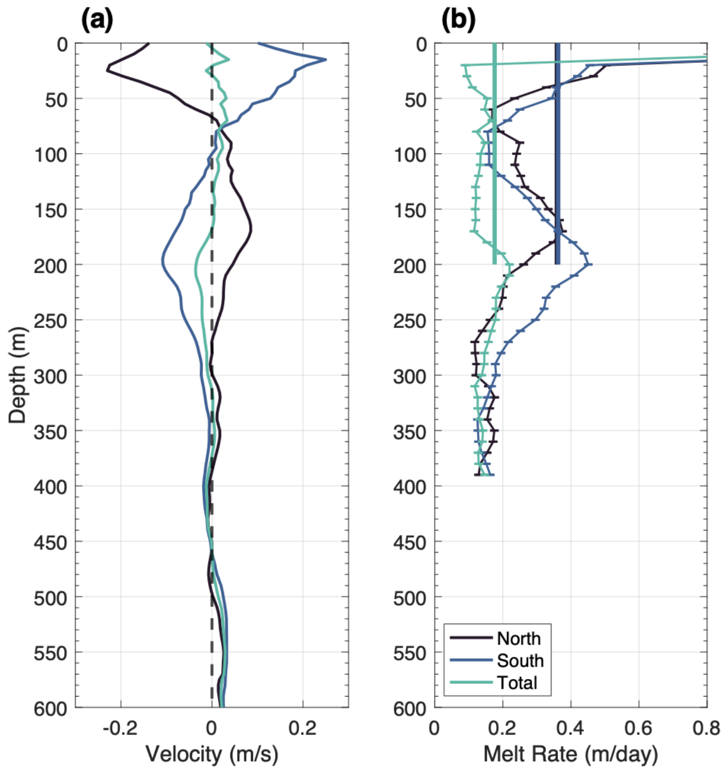

Figure S3. (a) ADCP-derived ocean velocities averaged over the northern half, southern half, and total width of the fjord. (b) Modeled iceberg melt rates averaged across all depth classes for each average ocean velocity profile with error bars indicating ± 1 standard deviation (thin lines) and keel-depth averaged iceberg melt rate for an iceberg that extends 200 m into the water column (thick lines).

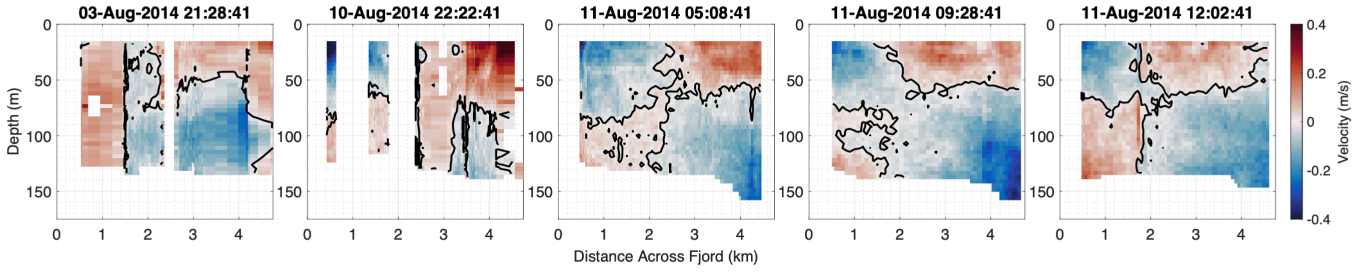

Figure S4. Gridded SADCP-derived along-fjord velocities prior to the ice mélange event (August 3) and after the ice mélange event (August 10) taken at the hydrographic transect in Figure 1a. Positive values indicate flow towards the glacier, and a black contour is present at 0 m/s. Distance across fjord increases southward. The surface recirculation is strongest just after the ice mélange event but is present in all water column velocity transects.

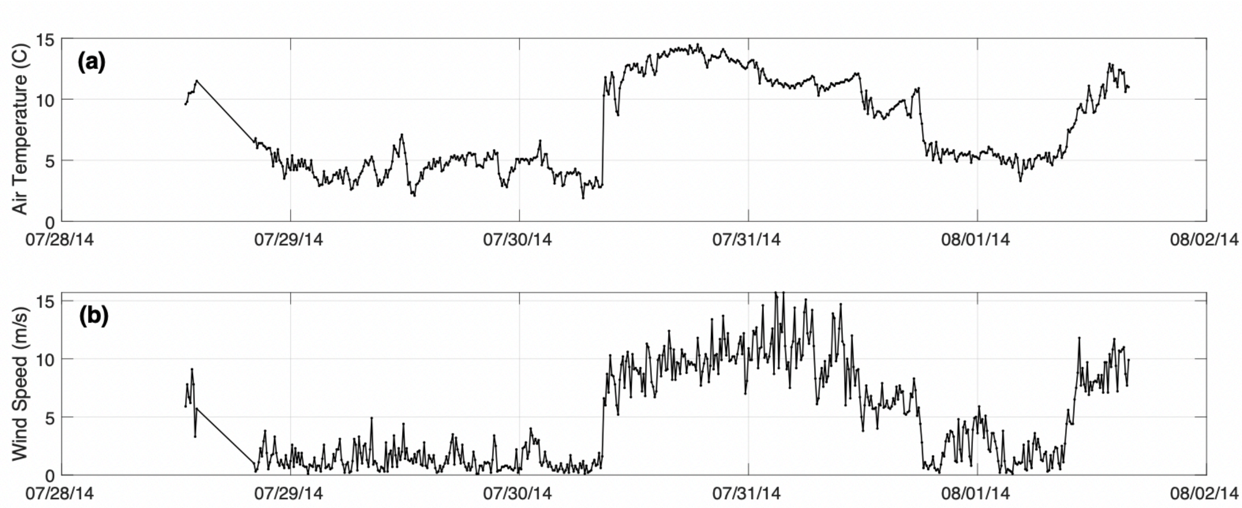

Figure S5. Time series of (a) air temperature and (b) wind speed collected at a meteorological station on the north side of Kangilliup Sermia's terminus (Fig. 1a) and used as input to the iceberg melt model. Weather stations were recovered just before the observed ice mélange event, and we therefore use the average air temperature and wind speed during the final 5 days of the data record.

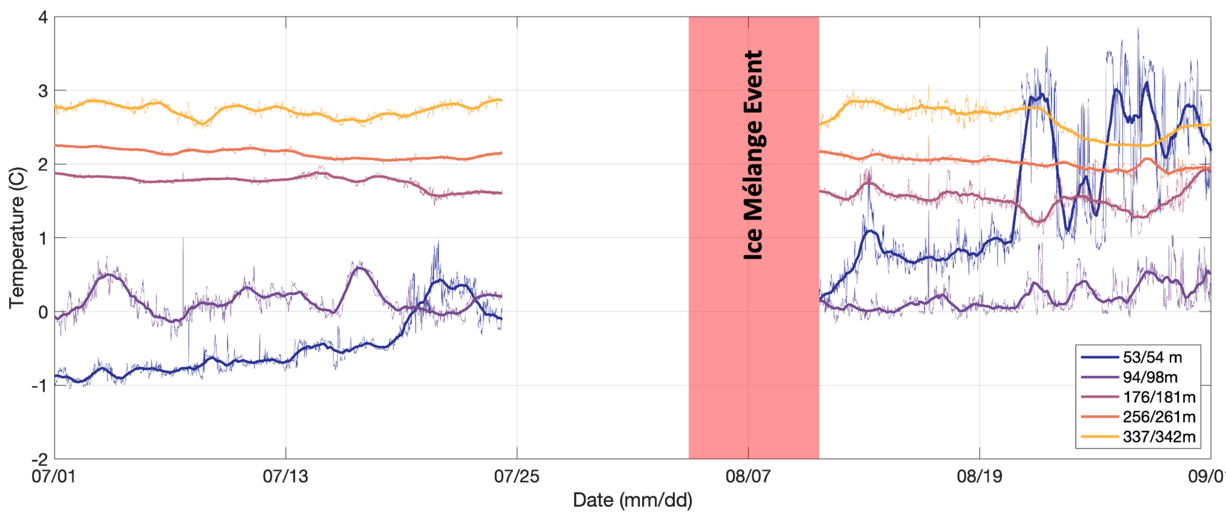

Figure S6. Time series of ocean temperature taken at the depth of each instrument (legend) on a subsurface mooring located outside of the sills of Kangilliup Sermia and Kangerlussuup Sermia (Fig. 1a), with the timing of hydrographic observations that bound the investigated ephemeral ice mélange event indicated by the red shaded box. The thick lines indicate a 1-day moving average of ocean temperature taken at 15-minute intervals (thin lines). Hydrographic moorings were recovered, serviced, and redeployed between July 25 and August 11, leading to a gap in the hydrographic record and a slight change in deployment depths indicated in the figure legend.

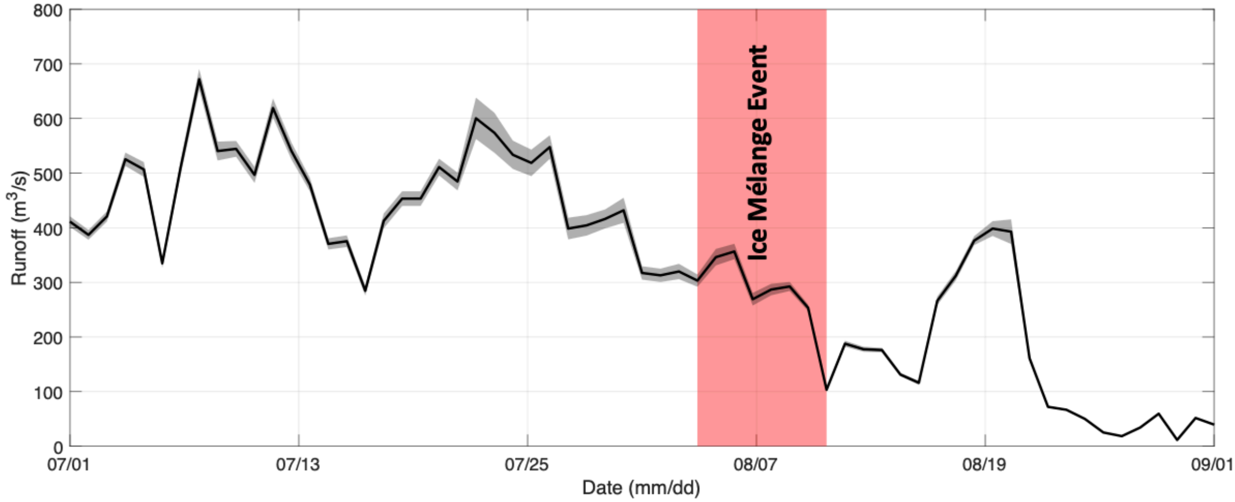

Figure S7. Time series of subglacial discharge with grey shading indicating sensitivity of the model to high and low melt scenarios from Carroll et al. (2016). The red shaded box indicates the timing of hydrographic observations that bound the investigated ephemeral ice mélange event.

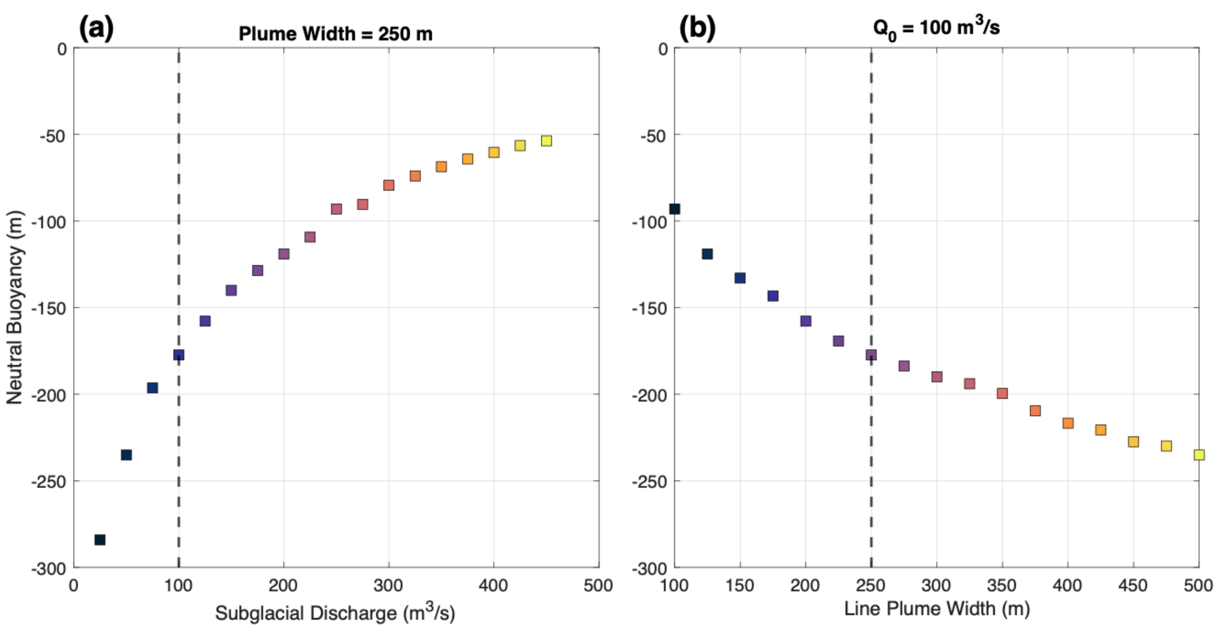

Figure S8. Sensitivity of the height of neutral buoyancy calculation from buoyant plume theory to subglacial discharge magnitude (a) and prescribed line plume width (b). Dashed line indicates the parameters discussed in the main text.

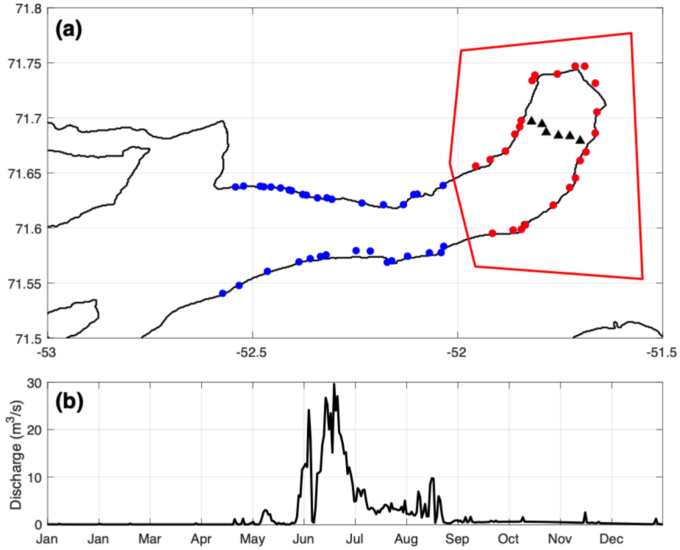

Figure S9. (a) Riverine freshwater outlets (dots) entering the proglacial fjord of Kangilliup Sermia from Mankoff et al. (2020b), with bounding box used to isolate near-glacier freshwater outlets (red dots) for runoff calculation indicated by the red line. Black triangles show the location of the CTD casts in front of Kangilliup Sermia used in this manuscript. (b) Total freshwater discharge into the proglacial fjord from near-glacier outlets in 2014 derived by adding together the discharge from all near-glacier riverine outlets highlighted in (a) by red dots.

Table S1. Sensitivity of the conservation of salt and volume calculations to the control volume chosen. The depth range over which the control volume was integrated, the change in water column salinity within that depth range (ΔS), the volume of ice mélange melt needed to explain the observed change in salinity (V_{melt}), and the amount of time needed to melt that volume of ice given a melt rate of 0.18 – 0.36 m d^{-1} are shown.

Depth Range Considered (m)	**ΔS (g kg^{-1})**	**V_{melt} (m^3)**	**t (days)**
5 – 100	0.41	4.58 x 10^7	4.3 – 8.8
5 – 200	0.25	5.47 x 10^7	5.1 – 10.5
5 – 300	0.18	6.06 x 10^7	5.7 – 11.7

Table S2. Summary statistics of temperature and salinity from 5-200 m depth both before and after an ephemeral ice mélange event in front of Kangilliup Sermia. Statistics for the full water column (5-800 m) are shown in parentheses.

	Temperature Variance	**Temperature Mean (°C)**	**Salinity Variance**	**Salinity Mean (g/kg)**
August 4	0.09 (0.19)	1.75 (2.35)	0.05 (0.10)	33.95 (34.42)
August 11	0.10 (0.23)	1.57 (2.15)	0.25 (0.24)	33.70 (34.25)
Difference	-	-0.18 (-0.19)	-	-0.25 (-0.18)