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Climatology of the 79N glacier (northeast Greenland) and the impacts of winter warming events on the glacier surface.

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Nioghalvfjerdsfjorden glacier (79N glacier) in the northeast of Greenland has undergone surface thinning and increased ice velocity since the early 2000s, leading to calving episodes at the front of the glacier. As 8% of the Greenland ice sheet drains into 79N, there are concerns that changes in the stability of the glacier could propagate into the interior of the ice sheet. Previous research in this region has focused on ocean circulation and the base of the floating glacier. However, relatively little is known about the atmospheric conditions surrounding 79N and the northeast of Greenland. Here we present the climatology of the region from ERA-Interim reanalysis data (1979-2017) and from four Automatic Weather Stations (spanning 1996-1999 and 2009-2017).
From the climatology analysis we found that large magnitude (+10°C), rapid (48-hour) temperature increases occur over the glacier during the five-month dark period (November to March). The warm-air events are present over the glacier in every year of available data, with 8(+/- 4) events occurring each year. Two mechanisms appear to be responsible for the temperature increases: warm-air advection from the Atlantic and katabatic mixing. We use the Weather Research and Forecasting (WRF) model to simulate a particular warm-air event (30th November to 2nd December 2014) to discover more information about the atmospheric processes responsible for the warming, and the impact of the event on the ice surface. Finally, we present a short Surface Energy Balance (SEB) analysis during and prior to the warm-air event, in an effort to highlight which components of the SEB undergo the largest changes and why.