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Contrasting retreat patterns of east Greenland tidewater glaciers

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Between 2000 and 2010, glaciers on Greenland's east coast were shown to have distinct contrasts in patterns and rates of ice front retreat north and south of 69°N latitude. The correspondence of this transition zone with the northern limit of subtropical waters carried by the Irminger Current has led to the hypothesis that variability in coastal heat transport is the dominant mechanisms causing this regional difference (e.g. Seale et al. 2011). However, whether these regional differences exist for recent glacier change is unknown. Here we examine seasonal and interannual variability in Landsat-8 derived ice-front positions with respect to atmospheric and oceanic forcings for 24 east Greenland outlet glaciers between 2013 and 2017.

We find that all glaciers exhibit seasonal advance and retreat cycles proportional to glacier width and velocity, though there is a distinct difference between the interannual trends of glacier termini north and south of 69°N throughout our study period. Glaciers above this latitude showed either limited or gradual terminus change over time that was mostly linear on annual timescales. This contrasts with glaciers south of 69°N where step-wise retreat was observed between 2016 and 2017, following a period of relative stability between 2013 and 2016. We find that retreat south of 69°N during 2016 was coincident with periods of anomalously warm atmospheric and subsurface oceanic temperatures, and a marked decline in sea ice/mélange. Warm atmospheric conditions were also experienced north of 69°N, though subsurface oceanic temperature increases and changes in mélange cover were not as marked. Our work supports the hypothesis that differences in the terminus response of glaciers either side of 69°N can be explained by contrasting oceanic forcing regimes above and below this latitude.

References: Seale, A., Christoffersen, P., Mugford, R. I. and O'Leary, M. (2011) Ocean forcing of the Greenland Ice Sheet: Calving fronts and patterns of retreat identified by automatic satellite monitoring of eastern outlet glaciers. *Journal of Geophysical Research Letters*, **116**, doi: 10.1029/2010JF001847.

