EGU2020-16531
https://doi.org/10.5194/egusphere-egu2020-16531
EGU General Assembly 2020

Investigating calving front morphology as a precursor to dynamic behaviour at a large Greenlandic tidewater glacier

Charlie Bunce[1], Pete Nienow[1], Noel Gourmelen[1], and Tom Cowton[2]
[1]School of Geosciences, University of Edinburgh, Edinburgh, UK
[2]School of Geography and Sustainable Development, University of St Andrews, St Andrews, UK

Successful prediction of the response of the Greenland Ice Sheet to climate warming requires accurate estimation of future ice loss from tidewater glaciers. Patterns of tidewater glacier retreat and advance have acted as an important proxy for understanding the processes associated with frontal ablation. It has not however been possible to effectively constrain commonality in these observed patterns that can then be directly linked to the influence of specific controls on ice loss. Here, we investigate planform changes in calving front morphology, an aspect of glacier dynamics that has received little prior attention; however, an improved understanding and quantification of the role of morphometric change in influencing glacier dynamics and iceberg calving may provide critical insights into tidewater glacier behaviour. We develop a buffer analysis method to quantify changes in calving front morphology at Narsap Sermia, a large tidewater glacier in southwest Greenland that has experienced substantial recent retreat. Our results reveal no distinct temporal or spatial patterns in the timing or magnitude of morphological change. Furthermore, we found no statistically significant relationships between morphological change and a range of forcing factors including air temperatures, modelled estimates of subglacial discharge and variations in glacier bed geometry. Our results therefore suggest that process driven morphological terminus change is not an effective predictor of terminus retreat and instead support the application of generalised parameterisations of tidewater glacier retreat within ice-dynamic models.