Geophysical Research Abstracts
Vol. 19, EGU2017-6318, 2017
EGU General Assembly 2017

Oceanic forcing and terminus retreat at east Greenland's tidewater glaciers

Tom Cowton (1), Andrew Sole (2), Peter Nienow (3), Donald Slater (3), David Wilton (2), and Edward Hanna (2)

(1) School of Geography and Sustainable Development, University of St Andrews, St Andrews, United Kingdom (tom.cowton@st-andrews.ac.uk), (2) Department of Geography, University of Sheffield, Sheffield, United Kingdom, (3) School of Geosciences, University of Edinburgh, Edinburgh, United Kingdom

The role of oceanic forcing in the retreat of Greenland's tidewater outlet glaciers remains equivocal, in part due to the difficulty of quantifying how this forcing varies over time and between glaciers. Using plume modelling, we demonstrate that the strength of buoyancy-driven circulation in fjords is highly sensitive to the glacier grounding line depth and runoff discharge, allowing a simple parameterisation for oceanic forcing based on up-fjord oceanic heat transport. In conjunction with time series of glacier runoff and shelf water temperature, we use this parameterisation to elucidate controls on the terminus position of 10 outlet glaciers in east Greenland over a 20-year period. We find that up to $\sim$ 70 % of terminus position variability is explained by modelled oceanic forcing, while comparably strong correlations are also obtained between glacier length and runoff and shelf water temperature. Our findings indicate that despite the complexity of tidewater glacier behaviour and current limitations in understanding of calving front processes, over multi-year time scales a significant proportion of terminus position change can be explained as a simple function of key environmental variables.