

## **Factors leading to the onset of tidewater glacier terminus retreat**

Gordon Hamilton, Kristin Schild

University of Maine, Orono, ME

[gordon.hamilton@maine.edu](mailto:gordon.hamilton@maine.edu)

Greenland's tidewater outlet glaciers undergo an annual cycle of advance and retreat which, in many cases, is superimposed on a longer-term pattern of net terminus retreat initiated in the last two decades. The factors triggering the switch between advance and retreat are not fully known, and represent a major deficiency in models being used to predict the future evolution of the Greenland Ice Sheet. Possible mechanisms include enhanced calving caused by hydrofracture due to increased surface melting, or ungrounding of the terminus due to enhanced submarine melting as a result of increased oceanic heat transport into fjords. Warm anomalies in air and/or sea-surface temperatures appear to coincide with the initial long-term retreats, but are less well linked to the onsets of annual retreat. Other environmental factors, such as the presence and characteristics of a sea ice/iceberg melange, might also play a role in modulating terminus position change, but limited observational evidence is inconclusive. The response of individual glaciers to a given magnitude of environmental forcing is probably a function of near-terminus geometry, pointing to the need for detailed surveys of ice thickness and fjord bathymetry at the ice sheet's marine margins.