

Re-examining the timing of recent dynamic changes in Northwestern Greenland

Ellyn M. Enderlin and Ian. M Howat

Geophysical evidence suggests that mass loss from the Greenland Ice Sheet has accelerated over the past decade, starting on a regional scale in the southeast and later spreading into the northwest. In Northwestern Greenland, increasing mass loss due to changes in glacier dynamics may have been obscured in the first half of the decade, however, by high accumulation rates. Here, we re-examine the timing of dynamic change in Northwestern Greenland using surface elevation time series for 34 marine-terminating outlet glaciers from 2000-2010. Over 2/3 of these glaciers thinned by tens of meters at their seaward margins between 2000 and 2005, indicating that dynamically-induced mass loss in this region initiated earlier in the decade than suggested by GRACE and GPS observations. Further, thinning before 2005 can be attributed mainly to loss between 2000 and 2005, and not to a late 1980s “event” as previously reported.

Disparities in the timing of reported mass loss are likely due to differences in spatial resolution and sampling of observations, which can lead to a perceived lag in accelerated mass loss or the identification of erroneous periods of dynamic thinning that are not necessarily associated with changes in external forcing. Thus, studies aimed at improving the current understanding of changes in the dynamics of marine-terminating outlet glaciers in response to environmental forcing must utilize datasets with both high spatial resolution and broad spatial coverage to ensure that the spatial and temporal variability in regional dynamic changes are accurately resolved.