

Recent Greenland Ice Sheet Variability

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Over the last two decades, many of Greenland's marine-terminating outlet glaciers have sped up and varied their speed dramatically. Some glaciers have undergone sustained speedup, while others have accelerated and then later slowed down. As ocean and atmospheric temperatures have warmed, many calving fronts have retreated. These retreats generally have been accompanied by increases in speed, which suggest that the acceleration is related to a shift in force balance as the glacier terminus retreats, often into deeper water. Similarly, where glaciers have re-advanced their speeds have tended to decline. While this relationship between terminus and position is now reasonably well accepted, far less is understood about how warming temperatures have induced a trend, albeit highly variable, toward calving front retreat. Several hypotheses have been put forward, including basal melt, ice mélange, and meltwater induced hydro-fracture. So far none of these processes have been shown to be the dominant mechanism that produces retreat. In actuality, the underlying cause may involve some combination of all of these processes, which may vary from glacier to glacier. Here we look at the variability of some of Greenland's major outlet glaciers and examine how these processes may have influenced their behavior.