

A Mini-Surge on the Ryder Glacier, Greenland

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We have detected a dramatic short-term speed up of the Ryder Glacier, Greenland, using satellite radar interferometry. The accelerated flow represents a substantial, though short-lived, change in the ice discharge from this basin. We use the term "mini-surge," to highlight the rapid ice motion and short duration that characterized this event.

In its normal flow mode, the Ryder flows at a few hundred meters per year. The speed of the Ryder Glacier appears to have increased roughly threefold during the mini-surge. Although we are unable to determine the exact duration of this event, interferograms acquired before and after the mini-surge indicate that it lasted less than 7 weeks.

We believe that meltwater was involved in this event, either as an active or passive participant, as meltwater-filled lakes on the surface of the glacier may have drained during the period of rapid motion. The exact mechanism behind the increase is difficult to determine from the remotely-sensed data alone. The Ryder glacier, however, must have been responding to changes in basal hydrology, be it drainage of surface meltwater to the bed or internal changes in the basal water system.

The Ryder glacier demonstrates sensitivity to changes in boundary conditions of large outlet glaciers. There are too few measurements of other large outlet glaciers to determine whether this type of event is a wide-spread phenomenon in Greenland, but because most other outlet glaciers are at lower latitude, they should experience much more extensive melting. The Ryder mini-surge indicates that a program of satellite monitoring of the behavior of such glaciers combined with *in situ* observation is needed to improve our understanding of the role that variable discharge plays in determining the mass balance of the Greenland Ice Sheet.

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