

JAKOBHAVN ISBRAE SURFACE MELTING AND RECENT INCREASE IN CREEP THINNING RATES

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Recent airborne laser-altimeter surveys show thinning of most coastal parts of the Greenland ice sheet during the 1990s. Although some of this thinning was probably caused by increased melting during warm summers, this explains only part of the observed thinning. Jakobshavn Isbrae is the most active glacier in Greenland, with an annual discharge of about 30 cu km of ice, and it is one of the few surveyed glaciers to thicken between 1993 and 1998, despite locally warm summers. The calving front retreated 26 km between 1850 and 1953, but it has occupied approximately the same location since, and measurements during the 1980s suggest that the glacier was then approximately in balance. Repeated airborne laser-altimeter surveys along a 120-km profile in the glacier basin show slow, sporadic thickening between 1991 and 1997, suggesting a small positive mass balance, but since 1997 there has been sustained thinning of several m/yr within 20 km of the ice front, with lower rates of thinning further inland. Here, we use weather-station data from the coast and the ice sheet to show that estimated surface melt rates cannot explain the observed thinning after 1997, which must have been caused by increased creep thinning of the glacier. If this continues, the glacier calving front and probably its grounding line will retreat substantially in the very near future.