



Seasonal velocity variations on Jakobshaven Isbræ, Greenland

A. Luckman (1) and T.Murray (2)

(1) Department of Geography, Swansea University, (2) School of Geography, University of Leeds, (Contact A.Luckman@Swansea.ac.uk)

Jakobshavn Isbræ has received much attention because of its significance to the Greenland ice sheet and its seasonally invariant surface velocity despite high rate of flow [Echelmeyer and Harrison, 1990]. Its recent thinning [Thomas and others, 2003], acceleration and retreat [Joughin and others, 2004] has focussed even more attention on the ongoing response of the ice sheet to climate warming and its significance to future sea-level [Zwally and others, 2002].

In this study we employ feature tracking between repeat-pass ERS satellite radar images to investigate in more detail the dynamics of Jakobshavn Isbræ through the recent period of thinning and acceleration. Sufficient surface features exist around the ice stream to be tracked between images separated by a full satellite cycle (35 days) despite a total lack of phase coherence [Pritchard and others, 2005]. We can therefore present an improved frequency of velocity measurements over previous studies.

In 1995, where images were available from every satellite cycle, a seasonal pattern of velocity variation is apparent on Jakobshaven Isbræ. The velocity just downstream of the grounding line increases from 16 to 18 md⁻¹ from May through to July, just as surface meltwater is expected to be available, and then slowly decreases as winter commences. This seasonal pattern is echoed 35 km upstream but with greater uncertainties. The switch between the lack of seasonal variation previously reported [Echelmeyer and Harrison, 1990] and the clear seasonal response in 1995 is intriguing and may point to a change in boundary conditions in the fjord or a change in flow mechanism either of which may be associated with the retreat of Jakobshavn's floating tongue.

References

Echelmeyer K. and Harrison W.D., Jakobshavn Isbræ, West Greenland: Seasonal variations in velocity - or lack thereof, *J. Glaciol.*, 36(122): 82-88, 1990.

Thomas, R.H., Abdalati, W., Frederick, E., Krabill, W.B., Manizade, S. and Steffen, K., Investigation of surface melting and dynamic thinning on Jakobshavn Isbræ, Greenland, *J. Glaciol.*, 49(165): 231-239, 2003.

Joughin, I., Abdalati, W. and Fahnestock, M., Large fluctuations in speed on Greenland's Jakobshavn Isbræ, *Nature*, 432, 608-612, 2004.

Zwally H.J., Abdalati, W., Herring, T., Larson, K., Saba, J. and Steffen, K., Surface melt-induced acceleration of Greenland ice-sheet flow, *Science*, 297, 218-222, 2002.

Pritchard, H., Murray, T., Luckman, A., Strozzi, T., and Barr, S., Glacier surge dynamics of Sortebræ, East Greenland, from synthetic aperture radar feature tracking, *J. Geophys. Res.* (In review, 2005).