

Subglacial bed morphology as a controlling mechanism for variation in seasonal speed up and slow down of ice velocity across longitudinal profiles of Greenland glaciers.

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Ice velocity of Greenland glaciers varies over the course of the year due to changes in the availability and conditions of meltwater at the bed. It is established that the relationship between melt and ice velocity is complex. Previous studies have demonstrated glacier velocity responding differently to a given melt regime at proximal glaciers indicated other mechanisms are also influencing seasonal ice velocity speed up and slow down. Ice sheet bed morphology affects ice velocity by modulating rates of basal sliding. Notably, reverse bedslopes are anticipated to influence subglacial drainage system morphology and efficiency. In ice sheet contexts, these controls are poorly understood. Here we present analysis of patterns of seasonal ice velocity speed up and slow down for a selection of Greenland glaciers using monthly mean velocity values from a large archive dataset (Howat, 2017), and the relationship these patterns have to subglacial bed morphology. Analysis is conducted at 150m intervals, from the ice front up the central glacier streamline, producing a comprehensive and detailed new dataset. Patterns of seasonal ice velocity speed up and slow down are shown to be non-uniform along the longitudinal profile, with systematic variation between normal and reverse bedslopes.