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Influence of ice sheet bed morphology on spatial and seasonal patterns of ice flow in Greenland: preliminary results from an automated method for interpreting high resolution ice velocity data derived from Landsat imagery.

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Ice sheet bed morphology affects ice flow rates and patterns by topographically directing and resisting ice flow and by modulating rates of basal sliding. Notably, reverse bedslopes are anticipated to modulate basal sliding rates and mechanisms through their control on subglacial drainage system morphology and efficiency. In ice sheet contexts, understanding of the significance of these controls, their relative importance and ubiquity, remains weak. We aim to use contemporary remote sensing data products that provide high spatial and temporal resolution ice velocity and bed data for the Greenland ice sheet to attempt a comprehensive and systematic analysis of spatial and seasonal variation in flow behaviour and its links to bed morphology. Here we present an automated method for high resolution 4-dimensional analysis of a large archive dataset (Rosenau et al, 2015) of Landsat-derived ice velocity that enables the extraction of velocity data along a large number of longitudinal flowlines for individual glacier catchments and the analysis of along-flow velocity patterns. Analysis can be undertaken on individual flowlines, or adjacent flowlines can be custom aggregated both spatially and temporarily to investigate factors such as intra-annual or inter-annual seasonal patterns. We present initial analyses of seasonal velocity changes at a sample of glacier catchments and their relationship to glacier bed characteristics.