

Ross M, Scott S, Campbell JE, Chen H, Kelly R, Chouteau M, Shamsipour P, Hodder TJ, 2019, Reconstructing the dynamics of palaeo-ice stream lateral shear margins from landforms and stratigraphic records, Abstract, International Union for Quaternary Research, Dublin, Ireland

Lateral shear margins (LSM) form along the sides of an ice stream due to the steep velocity gradient across the narrow boundary separating fast and slow ice flow. Processes taking place along these margins are thought to play an important role in the long-term behaviour of ice streams. For example, migration of LSM can affect ice stream width, which can lead to changes in ice and sediment discharge to ice stream terminus. It is still unclear what controls the initial location of LSM, but their behaviour appears to be sensitive to basal conditions and feedbacks between migration rate and the local temperature field. We have examined the geological record of a number of palaeo-ice stream LSMs from the Canadian glacial landscape to get insights into their long-term dynamics. We used geomorphological mapping, airborne and ground geophysics, as well as targeted stratigraphic and till provenance analysis and data classification techniques. Our results show evidence for lateral migration of LSM, especially for the large palaeo-ice streams thought to have operated over several thousand years. Certain LSM are characterized by stratified drumlins containing stacked till sheets of contrasting dominant provenance (i.e. proximal vs distal), which we interpret as evidence of oscillations in the position of the LSM across zones a few kilometers wide. Some of these zones are located along regional fault systems suggesting a possible bedrock control on LSM position, notably in upstream regions. Other LSM investigated in this study show less evidence for lateral migration and, in some cases, better developed LSM moraines. The relationship with bedrock structures and properties, and other potential controlling factors (e.g. scale of ice stream, duration) will need to be further investigated.

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