



## **Origin and Internal Radar Structure of Ice Stream Bedforms from Nunavut, Canada**

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There are many competing models for the origin of subglacial landforms. Recent recognition of mega-scale glacial lineations (MSGs) as indicators of past ice stream activity has heightened the interest in deciphering the relationship between ice dynamics and the geometry of subglacial landforms. Whereas satellite remote sensing and marine geophysical surveys provide excellent constraints on map-view geometry of MSGs, they provide limited information on the internal structure of these landforms. Here, we report the results of three seasons of Ground Penetrating Radar (GPR) surveys performed on the Dubawnt Lake paleo-ice stream bed located in the Nunavut Province, Canada. The radar surveys used 50 and 100 MHz antennas and had vertical resolution of the order of 0.1 m. We collected tens of kilometers of radar reflection profiles transverse to and along MSGs and analyzed multiple natural exposures of glacial sediments in the vicinity of GPR profiles. We interpret that the studied MSGs were carved into preexisting outwash sediments, which presumably formed along the retreating ice sheet margin before onset of ice stream activity caused temporary margin readvance. The MSGs contain sorted sediments and the youngest till is often similar in grain-size composition to the underlying outwash deposits. Internal structures include thrust faults and folds. Our observations are largely consistent with the previously proposed groove-ploughing model of MSG formation (Clark et al., 2003) except that we did not find evidence for seeding of MSGs by bedrock bumps. We propose a modified version of this model, which does not rely on bedrock bumps to produce basal protuberances.