



Superimposition of transverse ridges (ribbed moraines) on an ice stream bed: new observations and implications for ice stream dynamics and shutdown

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The growing importance of ice streams has stimulated many workers to search for their locations in regions covered by palaeo-ice sheets. Significantly, it has been recognised that detailed examination of the sediments and landforms preserved on a palaeo-ice stream bed can provide important information about their basal conditions, flow mechanisms, and the processes accompanying ice stream shut-down. Such observations also provide a useful test for models that attempt to predict the geometric patterns of subglacial bedforms. In this paper, we present observations of an unusual assemblage of landforms on the Dubawnt Lake palaeo-ice stream bed, including their sedimentology and internal structure. Much of the ice stream bed is characterised by mega-scale glacial lineations and elongated drumlins but, in places, these bedforms are superimposed with discrete patches of ribbed moraines. For a small area of superimposed ribbed moraines we present data on their geometry, internal structure (from ground penetrating radar surveys), and sedimentological characteristics (e.g. sediment architecture and glaciogeological analysis). Taken together, our results appear to indicate a change in ice dynamics that correlates with the two phases of glacial landform development. Specifically, we hypothesise a switch from subglacial (ex) tension of the

sediments (fast ice flow) to subglacial compression (slow ice flow) that accompanied a change from elongated drumlins to ribbed moraine formation. This is consistent with the hypothesis that superimposed ribbed moraines are formed on an ice stream bed during or immediately after it shuts down