Testing the use of cosmogenic nuclides to determine subglacial bed deformation

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The Hartlen till is an extensive, variably thick (up to 20 m), highly compacted, grey silty diamicton that cores many of the drumlins exposed along the eastern shore of central Nova Sco-

tia. It has been well characterised and due to its apparent homogeneity many of the observations made at specific locations are transferrable to its other outcroppings. Based on ice flow measurements, pebble provenance, and offshore stratigraphy, it has been determined that the till was deposited during the Caledonian glacial phase but its exact age has yet to be determined. As it commonly occurs at the base of the terrestrial stacks of tills, it may comprise material from the Meguma and associated terranes that had been previously weathered. The overlying tills appear more immature (clasts are more angular, and greater abundance of clasts) but have different sources. The unit has been proposed to be a lodgement till. Diamicton pebble fabric data are being collected at Lawrencetown, Nova Scotia, to investigate this interpretation, and software will be used to determine the eigenvalue to characterize the till type based on previous research on glaciogenic sediments. The till provides an ideal means of demonstrating the plausibility of a deformable bed in a drumlin environment.

Although the concept of deformable beds beneath glaciers has been generally accepted, the thickness of a deforming bed at an instant in time is less predictable, and is expected to vary with the material properties of the bed, with flow velocity, and with subglacial hydrological conditions. Thickness of a deforming bed has only been observed under modern glaciers. Is it possible to use a combination of ^{10}Be with other sedimentological data to determine deformable bed thickness? The following experiment is being set up, using a vertical sequence of approximately eight samples of quartz sand from the Hartlen Till matrix. Based on previous measurements of ^{10}Be in till, it is assumed that the Hartlen quartz sand contains inherited ^{10}Be from exposure as regolith prior to deposition. The vertical distribution of the ^{10}Be concentrations will have two basic end member distributions: (i) If the concentration is invariant with depth, then there is either no deformable bed, or the entire Hartlen Till was completely deformed; (ii) if the concentration decreases with height in the till, then there was a deformable bed of thickness less than the total thickness of the Hartlen Till. The data are expected to aid in defining the deformable bed and thereby allow a better understanding of subglacial processes.