

Quaternary Stratigraphy and Till Provenance of a Thick Drift Area, Central Nunavut with Implications for Drift Prospecting

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Abstract

Mineral exploration in glaciated terrains is shifting to deeper targets, sometimes under thick sediment cover with multi-till stratigraphy overlying altered rocks. This represents an important challenge and drift prospecting approaches need to adjust to this change by integrating surface and subsurface data as well as the recent advances in glacial geoscience and mineral exploration. Understanding the Quaternary stratigraphy of a prospective region and relating it to the surficial glacial record is an important step towards the successful application of drift prospecting in areas of thick drift. This study focuses on an area southeast of Aberdeen Lake, a region of central mainland Nunavut characterized by crosscutting glacial streamlined landform flowsets and near continuous till blanket. Detailed logging of 62 continuous cores of Quaternary sediment from Cameco Corp., totalling over 1000 m, facilitates in a major way the study of the Quaternary record of this remote region. Detailed sedimentological and stratigraphic analyses of these cores are coupled with mapping of outcrop ice flow indicators, river bluff investigation, remote mapping of glacial lineations and clast analysis to understand the glacial dynamics and till provenance of the region. Ice flow indicator mapping across the study area reveals a complex ice flow record reflecting the migration of the Keewatin ice divide. Core logging reveals variable Quaternary sediment thickness throughout the study area, with till thickness reaching a maximum of 37 m. This investigation has revealed multiple till units over drilling targets with varying till provenance reflecting the complex surficial ice flow record. Despite the complex stratigraphy, it is interpreted that northwesterly ice flows are responsible for the majority of the till production. These findings are being incorporated into tracing dispersal trains in 3D from known subcropping alteration zones associated with uranium mineralization and will have future implications for drift prospecting in the region.