TILL GEOCHEMISTRY AND HEAVY MINERALS IN MINERAL EXPLORATION

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Abstract

Surficial geology, till geochemistry and heavy mineral studies are practical exploration tools in glaciated terrains. Geochemical methods have been widely applied for mineral potential mapping and exploration in the Northern Hemisphere for more than 60 years. Till is an effective sampling media in mineral exploration due its glaciogenic erosion, transport and deposition. The composition of till reflects the nature and composition of fresh bedrock, pre-glacial weathered bedrock and older sediments of the up-ice region. Fine and heavy mineral fractions of till together with boulders and pebbles derived from a mineralized zone have been dispersed some distance from the sources in down-ice direction, resulting in dispersal trains that are generally larger than the source area exposed to glacial erosion.

Several studies have demonstrated that detrital dispersal differs amongst glacial geomorphological areas. Subglacial processes of active, moving ice differ from passive, ablating ice resulting in different distance of glacial transport. Furthermore, a number of case studies indicate that the distance of glacial transport varies amongst glacio-morphological terrains such as transverse ribbed moraines and streamlined moraines, associated to active ice conditions. Till deposits in the ice-divide zone have also specific characteristics.

Although conventional till geochemical and heavy mineral methods are largely used in mineral exploration, new methodological development is needed. Relatively high number of samples, time-consuming till and weathered bedrock sampling and laboratory procedures increase the costs of exploration. Furthermore, thick glaciogenic deposits, large mire areas and weathered bedrock are challenging. Those conditions are typical in large areas in Northern Hemisphere and for example in Finland. Recent development projects for till geochemistry and indicator mineral research have improved mineral exploration by promoting the use of cost- and eco-efficient solutions, nature-friendly sampling techniques and analysis methods suitable also in the environmentally sensitive northern regions.