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Ice transport directions and distances as a tool for ore exploration in glaciated regions – a compilation in Sweden

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The complex information from SGU database has been used to evaluate ice transport directions and distances in Sweden. Till geochemistry, boulder counting and glacial striae have been applied to detect source rocks and mineralization in various regions of the country. The preliminary ice transport distances have been estimated in one region in middle Sweden (Bergslagen) and in two regions in northern Sweden (Västerbotten and Norbotten). Boulder dispersal trains have been recognized, classified based on lithology and morphology after which the maximum ice transport distance has been evaluated. In most areas the transport is short, up to 2-3 km. In Bergslagen, Cu-Zn and W mineralization can be traced in boulders from c. 300 m to c. 7 km. In Västerbotten, the transport distances range from 400 m to 3 km for sulphide mineralization. In Norbotten, a majority of known Ni mineralization can be detected in boulders located between 0.5 and 3 km.

The source bedrock can be found based on outcrop record, ice direction indicators, presence of geophysical anomalies and glacial morphological landforms. The morphological information may, however, provide contradicting information when compared with independent ice direction indicators such as striae on the bedrock. During the latest glaciation an ice divide existed in northern Sweden which complicates the detection of source rocks.

Till geochemistry provides information about local and regional anomalies, however quality of information depends on the methodology (e.g. sampling density) and the grid used, which sometimes is larger then the largest boulder train observed in the studied area. On the other hand, application of boulder trains can be difficult in areas with long transport distances. While boulder trains provide exact information about the mineralization, the till geochemistry carries uncertainty about exact ore type. Geochemical anomalies can be both very local or widely spread out, e.g. in southwestern Sweden (Falbygden) large Ni and As anomalies can be correlated with distribution of Cambro-Silurian gravel over the distance of 60 km, while in Västerbotten, geochemical anomalies for Cu and Zn are very small (up tp 3 km) and they often do not correlate with boulder trains.

Knowledge of transport distances gained from this project provides additional complementary information mainly for mineral exploration.