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Geochemical behaviour and mineral potential of Critical Elements in Swedish till

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The Geochemical Atlas of Sweden contains 67 maps of elements and pH in till. Chemical analyses (aqua regia leaching by ICP MS) were carried out at the ALS laboratory in Luleå and the SGU laboratory in Uppsala and included a strict quality control routine. In addition, 53 element maps of grazing land soil chemistry (from the GEMAS project), and 14 biogeochemical maps (based on geochemistry of aquatic plants from earlier SGU campaigns) are included.

During the last ice age, which ended about 10 000 years ago, large parts of the bedrock in Fennoscandia were covered by several generations of glacial deposits with till as most important. Till reflects the underlying bedrock with its numerous mineralisations and records sedimentary and soil-formation processes which lead to enrichment or depletion in many elements.

The list of Critical Raw Materials was updated by the European Comission in 2017 and now contains 27 metals and minerals. Among them, 17 are presented in the Geochemical Atlas of Sweden. The major factors influencing the observed spatial trends in the geochemical pattern of selected CRMs (Sb, Bi, Ga, Ge, Hf, REEs, Mg, Nb, P, Pd, Rh, Sc, Ta, W, V) in till are: bedrock lithology (mineralogy and chemical composition) and their affinity to large tectonic units (e.g. Caledonides versus Fennoscandian Shield), the presence of mineralisations, the prevailing fraction (e.g. sandy to clayey), and the climate zone controlled by the latitude and altitude (often related to pH). The occurrence of CRMs in till provides important information about their natural background concentrations, mineral potential and a basis for future environmental monitoring due to the global increase in CRMs use in every-day life.

The Atlas geochemical database is available free for the public and can be downloaded from https://www.sgu.se/en/mineral-resources/geochemical-atlas/

Reference:
M. Andersson, M. Carlsson, A. Ladenberger, G. Morris, M. Sadeghi, J. Uhlbäck, 2014. Geokemisk atlas över Sverige (Geochemical Atlas of Sweden). GEOLOGICAL SURVEY OF SWEDEN, ISBN: 978-91-7403-258-1, 210 pp.
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