

**Delineating structures hosting REE-bearing apatite iron oxide (Sweden) and apatite-rich carbonatite-alkaline deposits (Finland) through systematic geophysical and geological investigations**

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The StartGeoDelineation project, initiated in 2015, aims at studying two mining sites in Sweden and Finland. In Blötberget-Sweden our goals are to delineate and better understand structures hosting iron-apatite deposits and provide information about their depth extent that are known down to 800 m depth. Downhole geophysical logging in six deep boreholes (> 450 m and intersecting the mineralization) and laboratory measurements have been conducted. These data provide constraints and valuable information for the interpretation of surface geophysical data that were recently acquired, including an approximately 3.5 km long seismic profile complemented by high-resolution magnetic and gravity surveys. The downhole logging data suggest potential relationships between occurrences of pegmatite and hematite (low-susceptibility) found under a distinct magnetite-rich zone (high-susceptibility); they also show major weak zones in the hanging-wall in the full-waveform sonic data.

In Siilinjärvi-Finland, one of our goals is to understand the relationships between the carbonatite-apatite mineralization and shear zones as well as different generations of basic dykes. This will benefit the mine planning and reduce the risk of unexpected failure in the open pit. Defining the contact between the alkaline intrusion and country rocks is another goal of the study. Three boreholes have been logged and four short seismic profiles (2 km in total) acquired to constrain the geophysical interpretations. Preliminary results are encouraging and illustrate the significance of a systematic approach combining physical properties, field geological mapping and surface geophysical surveys for deep exploration and multi-target tasks (e.g., exploration and mine planning).

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