



Seismic reflection profiling in the Kylylahti Cu-Au-Zn mine area, Finland

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The COGITO-MIN project (COst-effective Geophysical Imaging Techniques for supporting Ongoing MINeral exploration in Europe) acquired 2D seismic reflection data at the Kylylahti Cu-Au-Zn mine area, Finland in 2016. The aim of the project is to develop cost-effective mineral exploration methods with special focus on seismic techniques. Seismic reflection profiling was done in two parallel profiles approximately perpendicular to the known Kylylahti massive sulfide deposit and intersecting the seismic reflection profiles previously acquired in the area during the HIRE project (High Resolution Reflection Seismics for Ore Exploration 2007-2010). New data correlate well with the HIRE seismic profiles, yet they have higher frequency content. The COGITO-MIN survey used wireless 10 Hz high sensitivity geophones with 10 m spacing, and two INOVA UniVib 9.5 ton trucks were used along the gravel roads with 16-s long linear upsweep from 4 to 220 Hz. In areas with no road access, 125-250 g of dynamite was used to produce the source signal. Nominal source spacing was 20 m.

In the Kylylahti area, ore hosting rock assemblage is expected to be internally highly reflective because of varying acoustic impedances of constituting rocks. The rocks of Kylylahti are deformed and metamorphosed resulting in complex geological structures. This is demonstrated in the processed seismic sections as discontinuous reflectivity originating from the ore hosting rocks. Continuous reflections observed in the new profiles are likely originating from the contacts between mica schist and sulfide-bearing black schist. Black schists are typically enveloping the ore-hosting rocks and also have possibly been acting as sliding surface during late thrusting. Because of near association of black schists to the ore-hosting rock assemblage, these newly observed reflectors are of interest for exploration; and because of association of black schist with thrusting, the reflectors are important for modeling the 3D structural framework of the Kylylahti mining and exploration area.

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