



## Seismic 3D full waveform response of Outokumpu type ore

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Outokumpu assemblage (or Outokumpu association) means a regular occurrence of quartzites, skarns and carbonate rocks around serpentinite bodies. The core is serpentine and from there outwards deposit changes to, in this order, carbonate bearing serpentinite to carbonate rock to tremolite skarn to diopside skarn and to quartzite. The ore bodies are hosted by the Outokumpu assemblage and occur on the fringes of the serpentinitized peridotites. The Cu–Co–Zn ores form massive or semi-massive sulfide bodies of approx. 10-20 m thickness.

In the north-western part of Outokumpu area is a formation of Proterozoic cover sediments and Archaean basement rocks out-cropping about 2 km to northwest from the end of line V7 in the Saarivaara area. These rocks have felsic and mafic lithologies and show good reflectivity. Recent shallow drilling has revealed rapidly alternating 5–50 meters thick layers of Archaean granite gneiss, as well as Proterozoic quartzite, metadiabase, and calc-silicate rocks.

In this study the seismic signatures of Outokumpu type ore is calculated in two different host environments: (A) hosted by Outokumpu assemblage within mica schist and (B) in the presence Proterozoic-Archaean rocks.

The long history of the Outokumpu ore belt has produced a massive geological and geophysical knowledge base of the district. A 3D geological model is used as a basis, with some simplifications, for seismic full waveform modeling. Elastic finite-difference modeling (SOFI3D/2D) results are presented.

Modeling results shows very strong reflective signatures from host rock environment of the deposits compared to surrounding rocks and can be followed through modeled sections. The Outokumpu type massive ore has a strong reflection contrast even to hosting rocks. Reflection/diffraction patterns as well converted phases originating directly from a theoretical ore inclusion are calculated.

Modeling results are compared to the real existing high resolution seismic reflection profiles in Outokumpu area (HIRE; HIgh REsolution reflection seismics for ore exploration, 2007-2010 profiles).