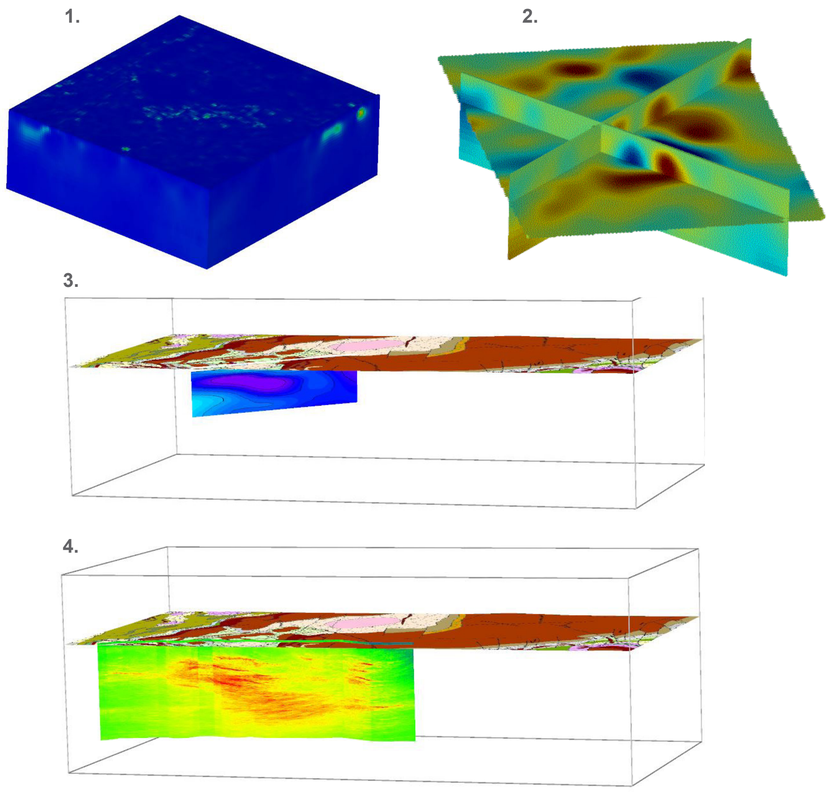
Geological 3D model within Alaliesi seismic profile in Sodankylä, northern Finland

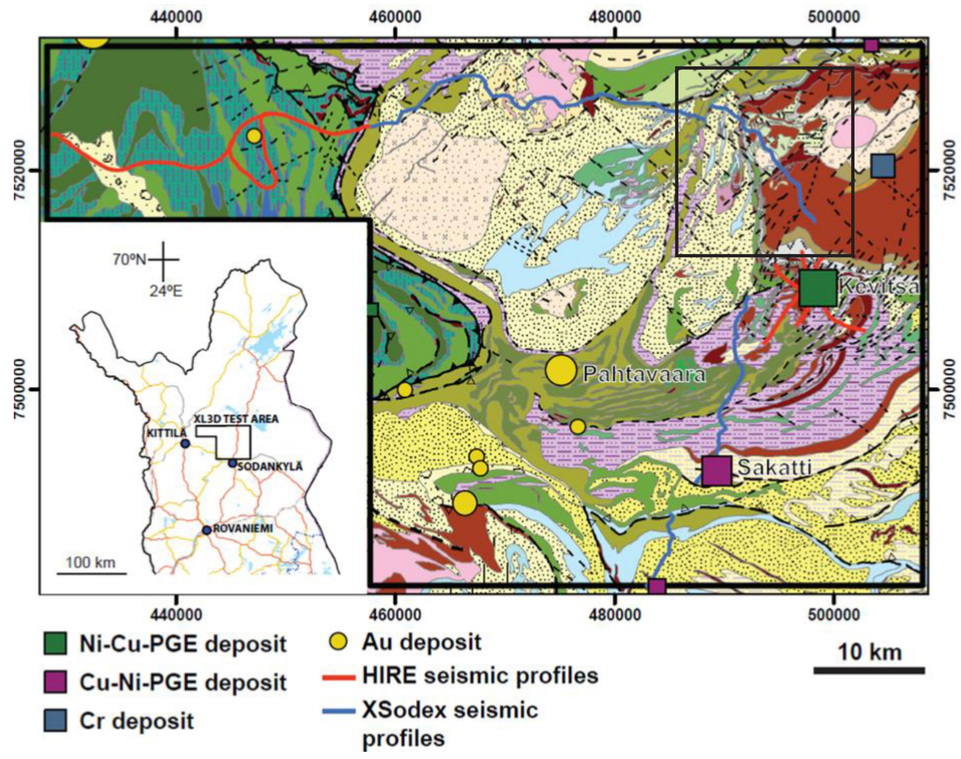
Introduction:

Exploration Lapland (XL3D) 2018-2020 project focuses on how to utilize digital geo-scientific datasets the best possible way for research and exploration. The project utilizes the data collected during the recent collaboration in the Experiment of Sodankylä Deep Exploration (XSODEX) project between Geological Survey of Finland (GTK), University of Oulu (UO) and TU Bergakademie Freiberg (TUBAF) in 2017-2018. One target of the XL3d is to produce a regional scale 3D model of the Sodankylä area in Central Lapland Greenstone belt (CLGB) and we present here the 3D geological model from Alaliesi sub-area.

Geology:

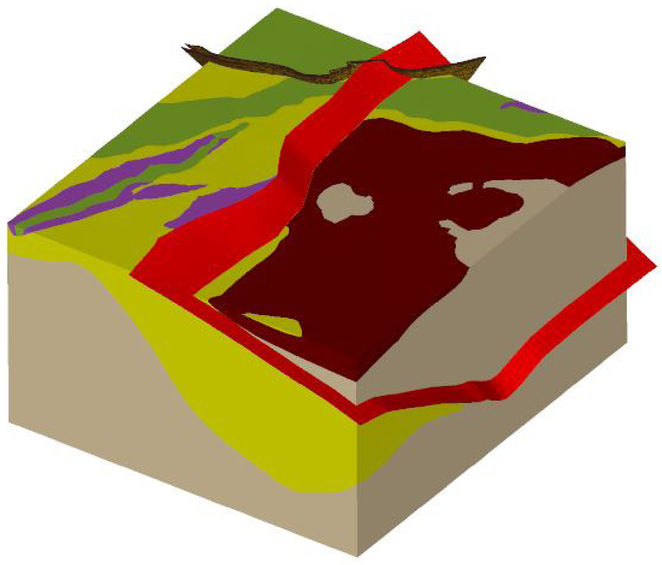
The Alaliesi area consists of a section of the stratigraphically lowermost units of the 2.45-2.0 Ga Central Lapland Greenstone Belt (CLGB), located in the proximity of 2.45 Ga Koitelainen layered intrusion. The Archaean basement is exposed in the central part of the intrusion. This feature has been interpreted to be due to a basement dome at the footwall of the sheet-like intrusion.





The geological 3D model:

The most notable feature in the geophysical data are the strong reflective areas located below the Koitelainen layered intrusion. These reflectors allow us to consider the Koitelainen and adjacent rocks to represent units that at some stage were thrust over the younger supracrustal units of the CLGB. Therefore, we assume that there is a large-scale fault located along the western boundary of the Koitelainen intrusion. The stress field for the thrust system requires E-W- trending shortening which could be related to the first deformation phase as described by Lahtinen & Huhma (2019. Precambrian Research 333, p. 1-19).



Geophysical data from the Alaliesi area includes:

1. Unconstrained 3D inversion of susceptibility from aeromagnetic data
2. Unconstrained 3D inversion of density variations from ground gravity survey
3. 1D and 2 D inversion of AMT data
4. Reflection seismic survey data

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