

Local to Regional Scale 3D Study around Gällivare, Sweden based on Integration of 3D Magnetotellurics with other Geophysical Data

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SUMMARY

Geologically, Norrbotten has historically been one of the most active mining areas in Europe. Norrbotten hosts a world-class iron ore mine (in Kiruna), the largest copper mine (in Aitik) in Europe, which is also the largest gold producer in Sweden, together with other mines scattered in the county. Specially, Gällivare and Kiruna are probably the most productive mining areas of Fennoscandia. As a result, the areas have been extensively surveyed with mainly passive and non-invasive geophysical techniques such as ground and airborne gravimetry, aeromagnetism, and magnetotellurics. Therefore, it can be beneficial to understand the mechanism behind for its extreme enrichment in Norrbotten by using multi-scale multi-physics observations and the knowledge of the existing mineralization and polymetallic deposits. During summer 2021 regional and local scale magnetotelluric data were collected in Sweden around Gällivare. Area of about 100x100 km² was covered with average site spacing of 5 km. Additional deposit scale measurement around Gällivare and Pyhasalmi were measured to complement the regional data set as well as all previously available geophysical data. Extra CSEM data were also acquired.

Original data are processed and analysed to derive impedance and tipper transfer functions using conventional robust remote reference processing. We will continue to work with data and apply multivariate techniques which we expect will improve estimates of transfer functions at problematic sites and provide additional information to be used in inverse modelling. Overall the data quality is from excellent to good with some few exceptions related to instrumental and measurements problems.

Keywords: mineral systems, geophysics, magnetotellurics, data processing inversion