3D Octree-grid inversion of MT data from North-Eastern Finland

C. Patzer[1], L. Xiao[2] and J. Kamm[3]
[1]Geological Survey of Finland, GTK, cedric.patzer@gtk.fi
[2]Geological Survey of Finland, GTK, longying.xiao@gtk.fi
[3]Geological Survey of Finland, GTK, jochen.kamm@gtk.fi

SUMMARY

In 2022 we collected MT data across the Koillismaa ultra-mafic intrusion in North-Eastern Finland. The dataset contains a highly uneven site distribution with very dense site spacing of 100 m in the central parts of the survey area and more than 5 km spacing to the outer survey regions. Such multiresolution data are typically challenging to invert on a unified mesh with traditional finite difference based inversions software such as ModEM.

Within DroneSOM project we are currently developing a new multiresolution inversion software, which can jointly invert many different frequency domain EM data, such as Drone-EM, CSEM as well as MT. The forward modelling is based on the finite element method with hexahedral grids while the inversion is obtained through a Gauss-Newton minimization. To achieve the multiresolution, we allow for locally refined hexahedral cells in the inverse grid based on octree-refinement. We also allow the forward mesh to be a refined version of the mesh used for the inversion. This allows us to limit the number of free inversion parameters while still achieving high accuracy in the solution of the forward modelling.

In this study we show results of our first experiments using the new 3D finite element octree grid inversion with the MT data collected at the Koillismaa intrusion. We will discuss similarities and differences of the main features with results obtained by ModEM using identical input data.

Keywords: MT, 3D inversion, multi-resolution