***Using simpegMT to demonstrate a modular modelling and inversion* framework applied in a workflow for a hydrothermal system.**

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The MagnetoTelluric (MT) method is widely used in geophysical exploration, especially in geothermal exploration. The extensive frequency range allows mapping the resistivity structure to greater depths than typically achieved using controlled sources (on the order of 10 km's). This is advantageous in identifying structures of interest, such as those related to hydrothermal alterations in a geothermal system and the heat source of the system. To obtain information about subsurface resistivity structures from MT data, an inversion modelling is commonly performed. The goal of an inversion is to recover a resistivity model that explains the data (within a degree of accuracy), given sets of constraints on the model. An attention to detail, often through an iterative process, is required during the inversion. A workflow that is transparent and repeatable is important for addressing the complexities encountered in an inversion and make the iterative process more effective.

In this presentation, we will show examples of a workflow for an inversion of MT data from the Krysuvik geothermal area in Iceland. The workflow is implemented as a Python script, where the SimPEG framework (http://simpeg.xyz) is used to implement an open-source code base to work with MT data . The SimPEG framework uses finite-volume discretizations for structured and semi-structured meshes and has built-in routines for optimization and regularization. By structuring and writing the simpegMT code in compliance with the modular, object-oriented framework of SimPEG, full compatibility is achieved and its functions can be leveraged directly. Further, the structure facilitates interoperability with other problem-types, streamlines testing and fosters cooperations between developers and users of the code.

We will step through the workflow, where varying complexity leads to a recovery of 3D models of different detail. We show how we guide steps in the workflow based on the preceding results, iteratively building our knowledge and incorporating it to converge to an improved resulting resistivity model. We will discuss the issues that arise and choices made in the workflow, interpret our resistivity model in terms of relevant structures and visualize along with other data sources from the area.