

## **Where are the diamonds? - using Earth's potentials**

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### **Short (400 char):**

Gravity and magnetic data (Earth's potentials) provide information that can be used to find valuable resources, such as diamonds! Using the SimPEG framework, we implement 3D potential-field inversions. The modular nature of the package allows us to implement an Iteratively Re-weighted Least Squares method to recover sharper models. We demonstrate the framework on a realistic geological model typically found in diamond exploration.

### **Long (300 Words):**

Intruding mantle plumes often carry along precious minerals (like shiny diamonds!) as well as altering the density and magnetic properties of rocks, which has an effect on the local gravity and magnetic fields. We demonstrate how the geophysical signature of these diamond-bearing rocks can be translated into 3D images through an optimization-driven inversion.

At the core of geophysical inversions across all applications are numerical simulation, regularization, and optimization. The time investment required to implement the stack necessary for a geophysical inversion for a given methods is considerable and can rapidly become prohibitive for neophyte researchers. Meanwhile, experimental scientists find themselves having to replicate existing codes in order to tackle different geophysical problems. The SimPEG framework provides a common language and set of resources that can be leveraged across geophysical methods. In this presentation, we explore how SimPEG (<http://simpeg.xyz>) is used to perform a 3D inversion for imaging the subsurface using gravity and magnetic data, arising from a realistic geological model commonly found in diamond exploration.

The modular nature of the package allows us to easily implement an Iteratively Re-weighted Least Squares method to recover sharper models. The technology developed in this project is now available for researchers to use in other branches of geophysics through the SimPEG framework. This poster is a part of a community effort, using a diamond exploration example as motivation, to investigate the integration of a large spectrum of geophysical methods using SimPEG.