3D Inversion of aeromagnetic survey: a case study in the Patrocínio (MG) dome

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Abstract

The Patrocínio dome is located in the state of Minas Gerais, in the Alto Parnaíba Igneous Province (APIP), in the state of Minas Gerais, Brazil. This dome is a geological structure generated from a plutonic intrusion, with several kilometers of extension, and shows itself in the satellite images as a round structure with clear bounds. It is part of an extensive lineament, called Azimuth 125 (Az125), which starts in the Rondônia state and ends up in the Cabo Frio High. There are several known alkaline intrusions along the Az125 apart up to several hundreds of millions of years, This project aims at the geological/geophysical characterization of the Patrocinio dome, part of the Az125, taking advantage of different methods of 3D inversion of aeromagnetic data to recover both the magnetic susceptibility distribution as well the geometry of the body, depending on the choice of algorithm inversion. We propose to use different methodologies to help us build upon the geologic model of the Patrocinio dome. Among our options for the 3D magnetic data inversion, there is the solution offered by Oasis Montaj and the SimPEG framework (Cockett et al, 2015), that recover the magnetic susceptibility distribution of the subsurface, and the methodology proposed by Vital et al (2021), which recovers the geometry of the body given a value of magnetic susceptibility contrast. We propose to compare their results against the current geophysical/geological knowledge to assess their recovery capabilities in a real-case application.

Cockett, Rowan, Seogi Kang, Lindsey J. Heagy, Adam Pidlisecky, and Douglas W. Oldenburg. "SimPEG: An Open Source Framework for Simulation and Gradient Based Parameter Estimation in Geophysical Applications" Computers & Geosciences, September 2015. doi:10.1016/j.cageo.2015.09.015.

Vital, L. B., V. C. Oliveira Jr. and V. C. F. Barbosa (2021), Magnetic radial inversion for 3-D source geometry estimation, Geophysical Journal International, just accepted, doi:10.1093/gji/ggab195