Quantification of Uncertainty in Potential Field Inversion

Objectives

Inversion is the process by which geological information is inferred from geophysical data. It is inherently non-unique, so that results cannot be assigned an absolute measure of uncertainty. This complicates evaluation of inversion outcomes and leads to misunderstanding of the level of support that inversion provides for a particular geological model or, conversely, of how confidently results can be accepted as precluding a model. The purpose of this study is to provide insight into the significance of the detail in a model and to develop a self-adaptive inversion that results in a model with a level of detail as required to match significant features in the data.

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Figure 1. A 2D modelled gravitational anomaly (top panel) and the source body of complex shape (bottom panel).

Figure 2. A sequence of polygons 2000 steps apart with varying dimensions, converging towards the model during the Reversible Jump Markov Chain Monte Carlo method's burn in period. (Figure from Luo, 2010)