



Oasis montaj Best Practice Guide

VOXI Earth Modelling - Comparing Upper Bound Constrained and Unconstrained
Inversion Results



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Comparing Upper Bound Constrained and Unconstrained Inversion Results

Introduction

The observed data subjected to a 3D inversion is normally collected on a 2D plane, while the modelled volume is three dimensional. This fact makes the inversion inherently underdetermined. The consequence of an underdetermined problem is that many different models can satisfy the same observed data within an acceptable error margin.

Introducing a priori information helps direct the solution towards the known information. This document compares two models produced from the same observed data set; one produced with no constraints and the other with a depth controlled constraint.

Compare constrained and unconstrained inversion results

In a 3D View, compare the modelled voxels of the constrained and unconstrained inversions of the same dataset. Isosurfaces of the high susceptibilities can illustrate the difference more clearly.

To prepare the data for the 3D View:

1. Export the unconstrained susceptibility model by right clicking the *Susceptibility* item in the *Inversions* results tree and selecting **Export**. Name the output 3D voxel model *Mahaffy_Occam*.
2. Export the constrained susceptibility model by right clicking the *Susceptibility* item in the *Inversions* results tree and selecting **Export**. Name the output 3D voxel model *Mahaffy_upperBound*.

To generate the 3D View:

1. From the *Oasis montaj* toolbar, select **3D | Create a new 3D view** and name it *Mahaffy*.
2. Add to the 3D view:
 - The DEM grid as a 3D relief surface,
 - the top-of-conductor depth grid as a 3D relief surface,
 - the constrained susceptibility model of the [Run an Inversion with an Upper Bound Constraint](#) inversion, and
 - the unconstrained susceptibility model of the [Run an Inversion](#) inversion.
3. Create the isosurface for the susceptibility value of *0.015 SI* for both models.
4. Either uncheck the voxel models or increase their transparency to emphasize the isosurfaces.
5. Increase the transparency of the relief surfaces.

Observe how the high susceptibility volumes of the upper-bound constrained inversion have been forced below the top-of-conductor horizon. In order to produce the same amplitude, these isosurfaces occupy a larger volume.

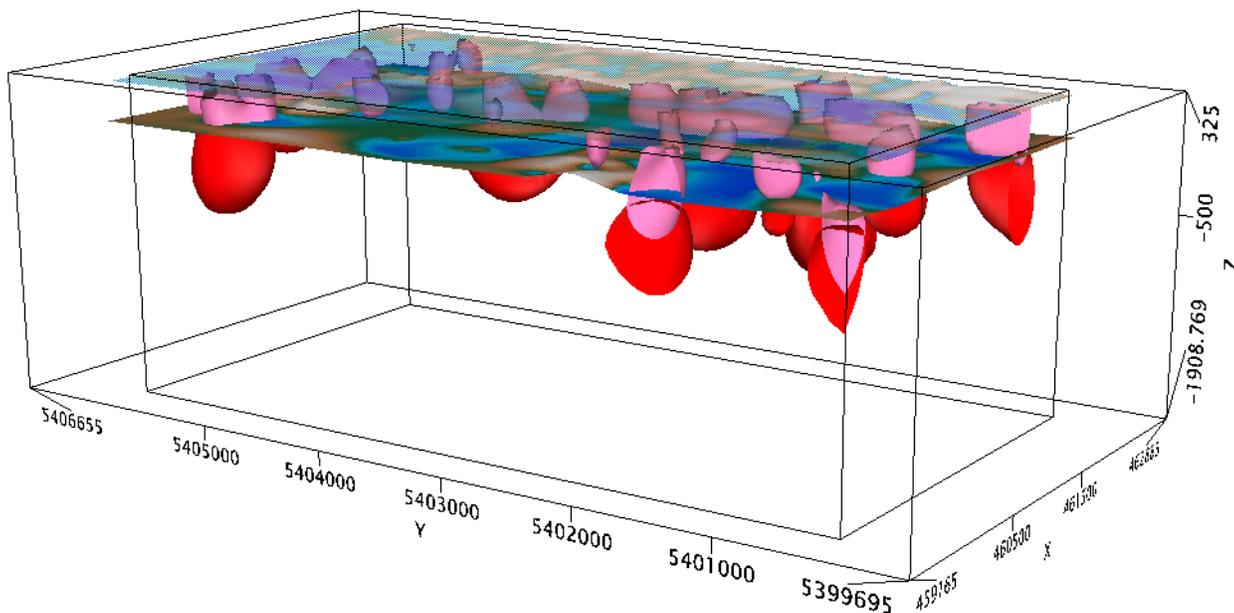


Figure 1: The unconstrained inversion model isosurfaces are illustrated in pink and the upper bound constrained inversion model isosurfaces are illustrated in red. The transparent surface is the DEM and the lower surface depicts the top-of-conductor horizon.