

3D MAGNETIC INVERSION TUTORIAL

Steps:***Page*****0. Introductions****1****1. Import data** to new or existing database**3****2. Examine data****8****3. Perform initial forward modeling****15****4. Perform 3D magnetic inversions****16****5. Check mode and create plots****28**

Introduction

Magnetics is often lumped into the term Potential Fields and understood to be like gravity data. But, magnetics differ greatly from gravity. First, the magnetic fields are governed by very different equations than gravity and these equations are actually analogous to DC resistivity. We try to incorporate these differences in EMIGMA.

First, the source field for a magnetic survey is a regional magnetic vector field. Whereas, gravity is defined by a virtually homogeneous field which is only vertical at the surface and defined only by the distance from the center of the earth. While, there are regional and local gravity variations, they effect little the measured fields. The magnetic fields are affected by regional and well as local structures. To deal with this, EMIGMA considers the total response and not just the residual. It is thus important to pay attention to the corrections for temporal variations as well as considering the bulk regional field.

It is important to consider the first stage of corrections. It is often thought that only the diurnal variation correction is important but the temporal variations consist of both an internal component (diurnal) as well as an external variation due to atmosphere effects most commonly thought of as the magnetotelluric source field. As such, a simple subtraction of the base station measurement is problematic as these changes are due to the diurnal variation, the external signal and cultural noise at the base station. We thus suggest first processing the base station data in EMIGMA to delete obvious cultural noise and to remove the external high frequency noise by filtering prior to performing the diurnal correction removing only the variation in this final effect.

Using the total field measurement after corrections allows one to estimate the regional source field. While this will be similar to the IGRF, there will always be a difference in the average field to the IGRF amplitude. Only by measuring three component data can one estimate the actual inclination and declination of the regional field.

If your data is automatically reduced by the base station, we suggest to add the average base station response to your data before import. If the base station values are not available from the instrument manufacturer then the only alternative is to determine the IGRF and add this to your data before import.

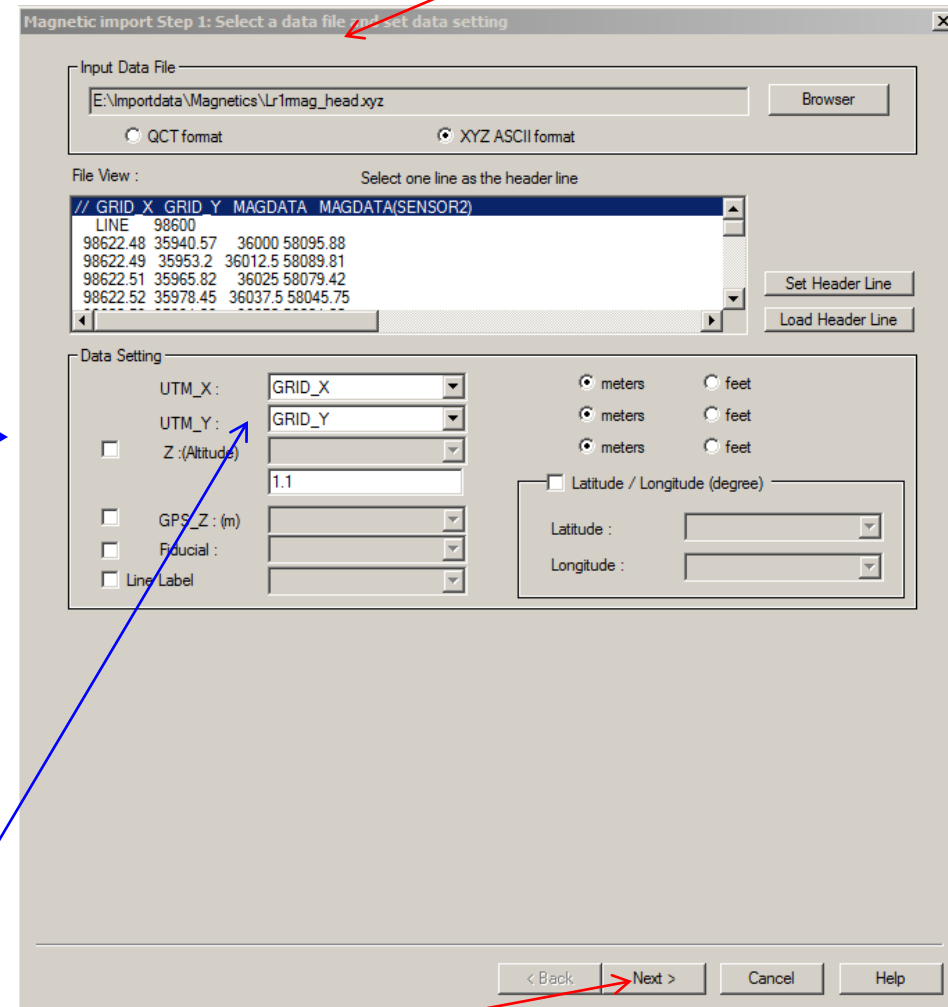
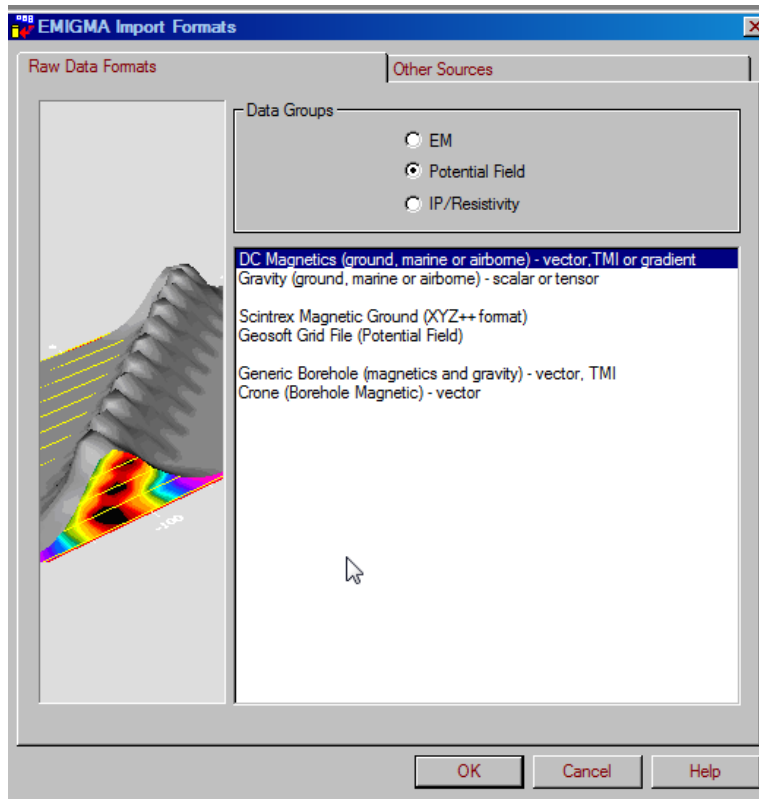
1. Import data

2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
5. Check model and create plots

Magnetic Inverse

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Browse and select .qct or .xyz data file for import
This first example is an older data set on a grid without
GPS information or Latitude/Longitude.



Select data file columns corresponding to coordinate
axis, and specify their units as well

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Click "Next" button to proceed to the next step

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Select column name for magnetic data

In this case, there is only total field data and 1 sensor.

Select unit for imported data

LINE	GRID X	GRID Y	MAGDATA	MAGDATA(SENSOR2)
98622.48	35940.57	36000	58095.88	
98622.49	35953.2	36012.5	58089.81	
98622.51	35965.82	36025	58079.42	
98622.52	35978.45	36037.5	58045.75	
98622.53	35991.08	36050	58021.02	
98622.55	36003.71	36062.5	57990.87	
98622.56	36016.34	36075	57948.79	
98622.58	36028.96	36087.5	58312.7	

Magnetic Field

BTotal

☐ Multiple Sensors

☒ Sensor1: MAGDATA(SENSOR2)

☐ Sensor2: GRID_X

☐ Sensor3: GRID_X

☐ Sensor4: GRID_X

☐ Sensor5: GRID_X

☐ Sensor6: GRID_X

Units: nT

Derivative of Btotal

☐ In-Line: GRID_X

☐ Cross-Line: GRID_X

☐ Vertical: GRID_X

Vectors

☐ In-Line: GRID_X

☐ Cross-Line: GRID_X

☐ Vertical: GRID_X

< Back Next > Cancel Help

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Click "Next" button

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Show profile information, users can perform delete/reduction/shift operations on profiles in this dialog if desired but these tools are available once the data is inside EMIGMA.

Profile	# Locations
98600	81
98700	85
99200	81
99300	81
97300	73
97400	75
97500	73
97600	64
97700	83
97800	83
97900	83
99100	81
99000	77
98900	77
98800	79
98500	81
98400	81

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Click "Next" button

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You must determine the nature of the earth's magnetic field in the area of your survey. While the magnitude of the regional field may be estimated from your data, the angle of the field defines the internal magnetization of the susceptible structures. The regional field is described by the IGRF model.

if you data file did not have Lat/Long information, enter it into the fields shown along with approximate GPS elevation.

As the earth's field is not stationary but is slowly varying, you must enter the approximate date of the survey.

Click Process the Set

The screenshot shows the 'Profile and Locations Setting' dialog box. At the top, 'Total Number of Profiles' is 26 and 'Total Number of Locations' is 2009. The 'Inclination/Declination/Intensity Setting' sub-dialog is open, showing two options: 'Determine from data file or Latitude/Longitude user input' (selected) and 'User input for Inclination, Declination, Intensity'. Under 'Parameters (Average values from data file)', Latitude is 74.1 (N), Longitude is 61.65 (W), and Height is 100 m. The Date is 2000, 6, 24. The Coordinate Frame is Geodetic. IGRF Values are: Inclination 84.2665, Declination -52.155, and Intensity 56326.1 nT. There is a checkbox for 'Set Intensity from data'. Buttons at the bottom include 'Reset Values', 'Process', 'Cancel', and 'SET'.

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Click "Next" button

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Magnetic/Gravity Import Step 3: Import data to database

Earth Field System

Inclination downward from horizontal (in degrees)

East of North (in degrees)

Intensity (in nT)

Central Meridian (in degrees)

Coordinate System :

Import to the Database

Project Name :

Survey Name :

☐ Average duplicates

☐ Sort locations

...Store LINE...98400
...Store LINE...98000
...Store LINE...98200
...Store LINE...98100
...Store LINE...98300
...Store LINE...98250
...Store LINE...98350
...Store LINE...37000
...Store LINE...36800
...Store LINE...36000
...system.....creating...
...components.....creating...
...locations.....creating...
Processing Completed

< Back Cancel Help

Click “Run Import” button to start import data into the database

averaging and sorting may be carried out late once the data is imported

After processing is done, click “finish” button to complete the procedure

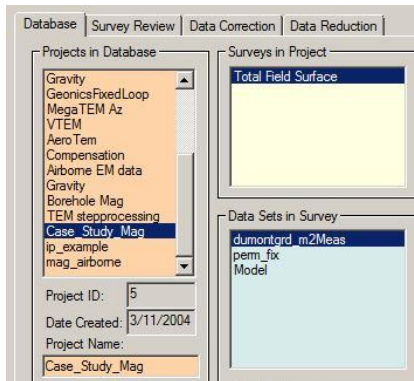
1. Import data
- 2. Examine data**
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Magnetic Inverse

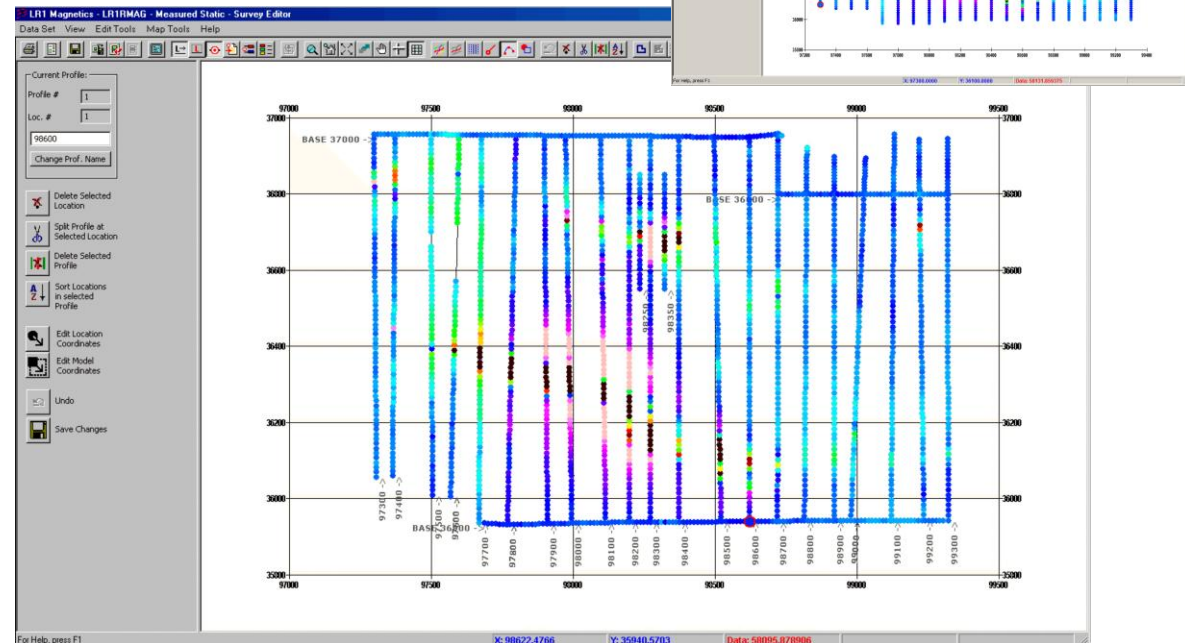
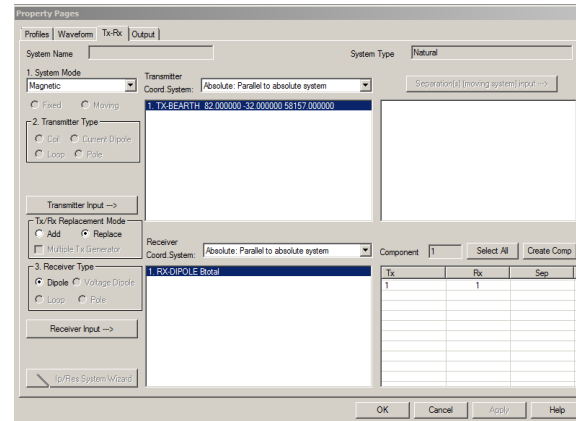
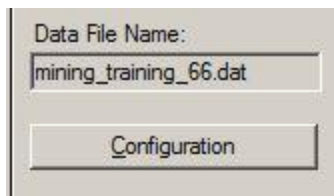
8

3. Check system configuration

1. Check database for the survey



2. Click configuration



4. Check lines and stations by clicking “Survey Editor” button

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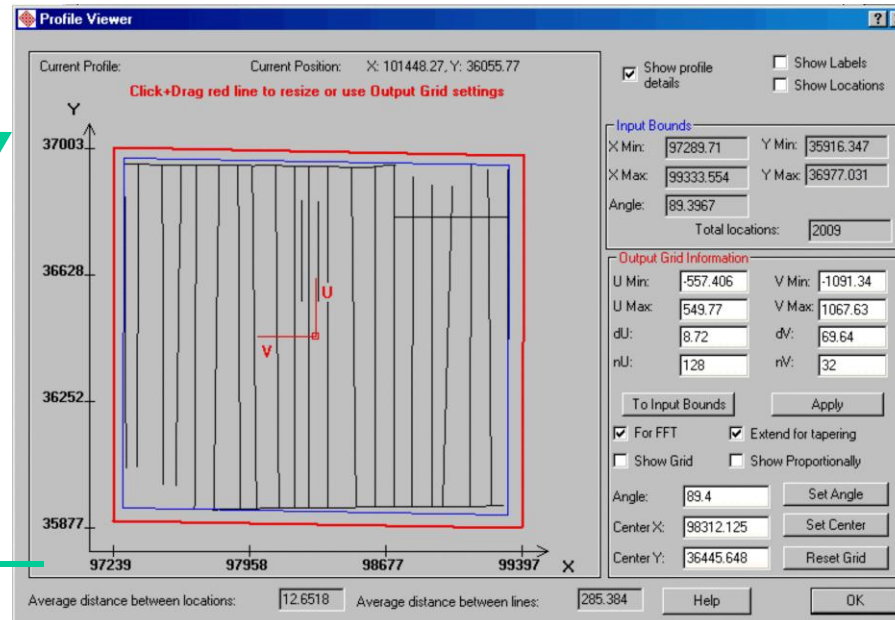
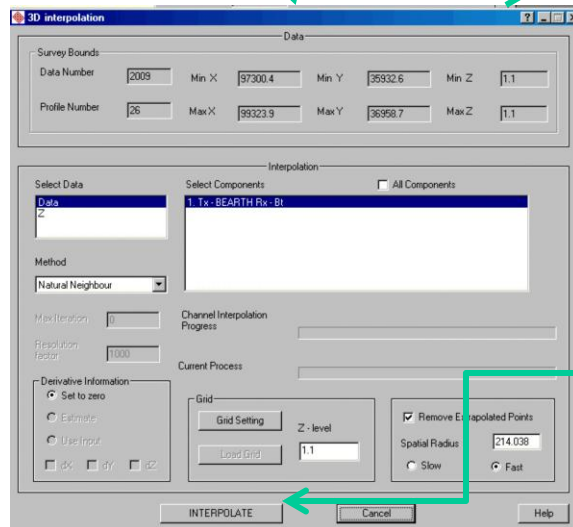
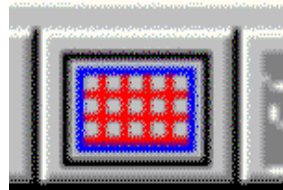


This tool is a data analyzing, editing and mapping tool.
- profiles may be deleted, modified, renamed, datapoints moved, deleted, and maps maybe underlaid or constructed

1. Import data
2. **Examine data**
gridding, processing
3. Perform initial modeling
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An important aspect of potential field analyses is done through FFT analyses by which you are able to start to understand the nature of the structure and thus better to control the inversion process.

1. Interpolate or "grid" the data. In this process, the data is interpolated onto a grid of data vertices defined by a rectangular cell.

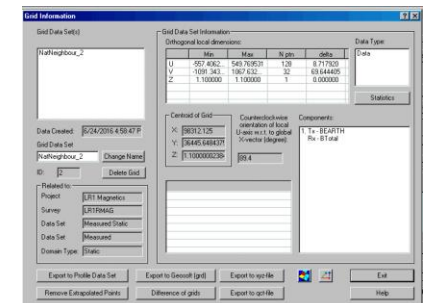


controls for defining the grid both in size and dx,dy resolution

Clicking for FFT ensures the grid is 2^n by 2^m , cells need not be square

After interpolating, the grid is attached to the dataset in the database as indicated by a check mark as here grids are stored for easy access

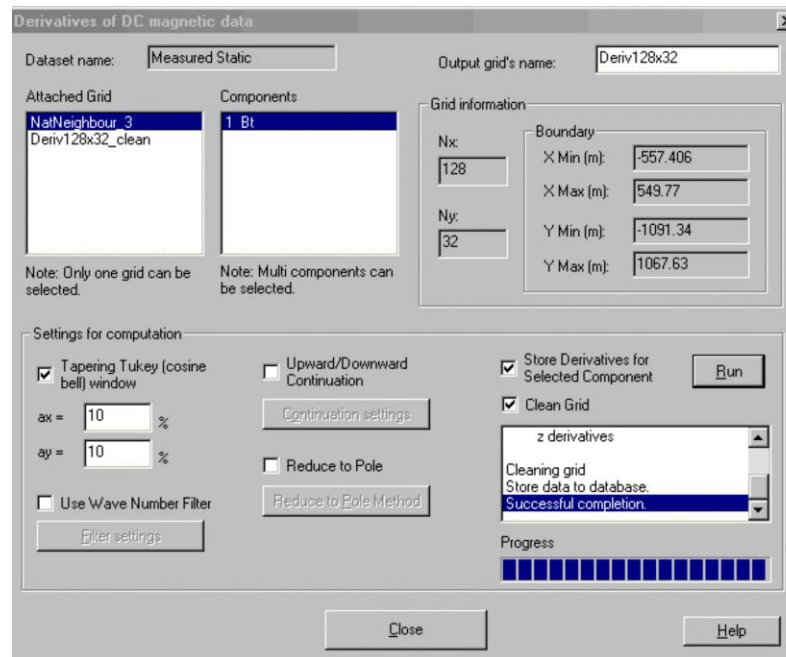
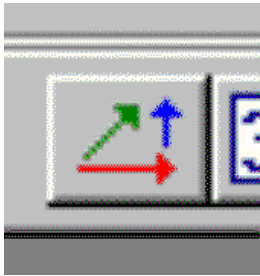
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Creating Derivatives and other FFT processing and
Their role in inversion.

1. Having interpolated the data to a regular $2^N \times 2^M$ grid, we may now process derivatives and with these derivatives perform other processing functions.

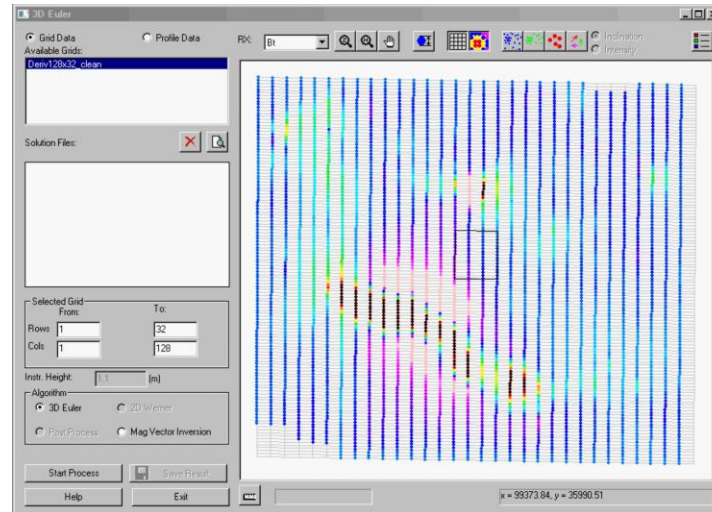
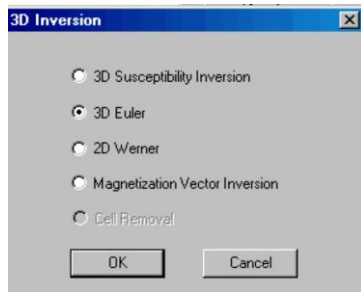


Grids which may be utilized for FFT processing are displayed in the upper left hand and the contents of these grids in the box beside. Various different processing may be carried out here, but here we simply show generation of the 3 derivatives of the total field. These derivatives may later be utilized in the inversion process in a variety of ways.

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- 2. Examine data
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Use of Derivatives in Inversion – 3 examples.

- 1. Case 1: Use the derivative grids to perform 3D Euler solutions.**

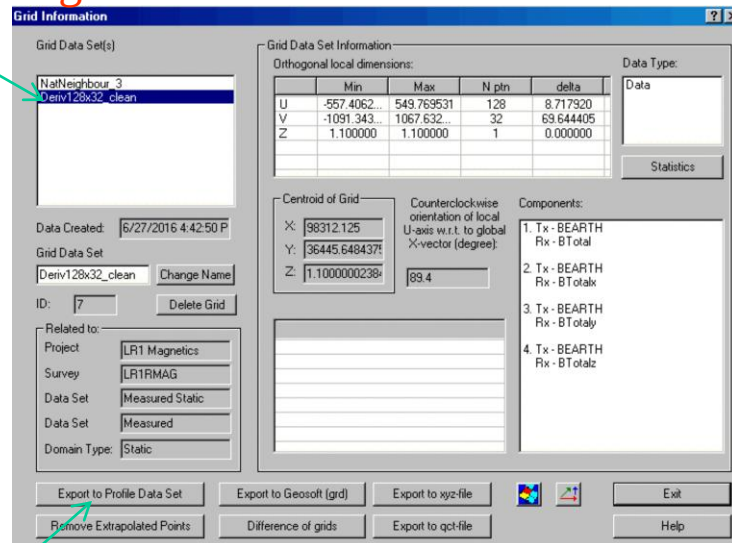


Through this interface, you may perform various aspects of the 3D Euler solutions. Results are then viewed in either GridPresentation or the Visualizer. These tools allow you to determine the types of the 3D structure as well as depth estimates.

Use of Derivatives in Inversion – 3 examples.

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1. Case 2: Export derivatives for use in 3D inversion derivative grid

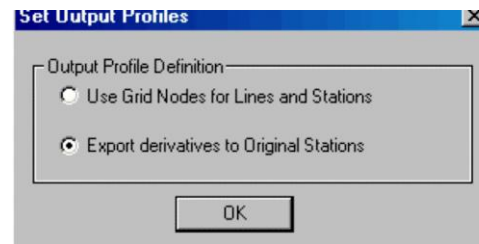


Export TMI and derivatives to a set of profiles

or

Export derivatives by interpolation to be added as additional channels to your original data.

Export derivatives .

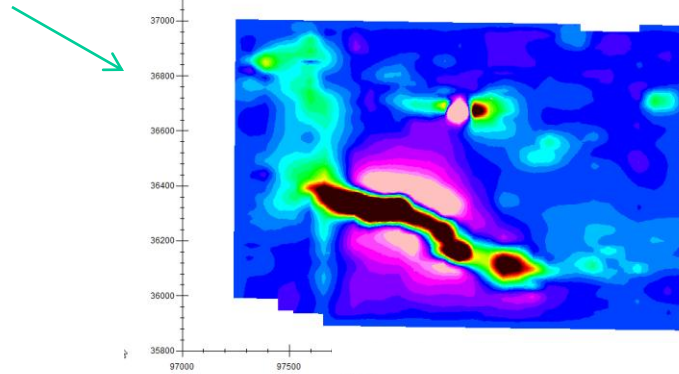


Use of Derivatives in Inversion – 3 examples.

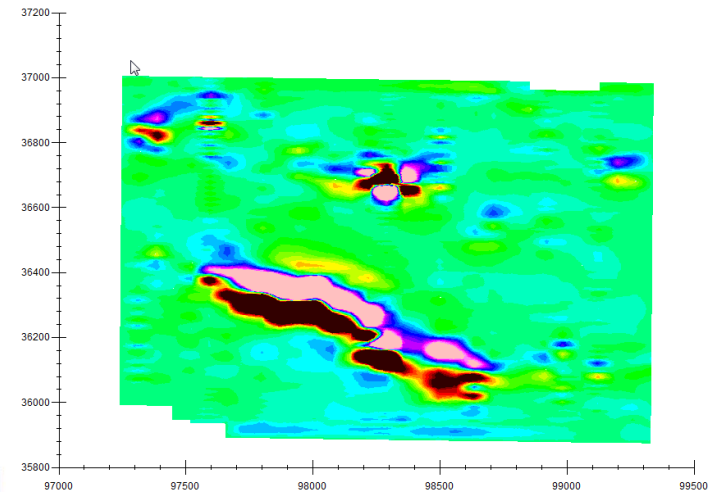
1. Import data
2. **Examine data
gridding, processing**
3. Perform initial modeling
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1. Case 3: Examination of Derivatives and Upward Continuation

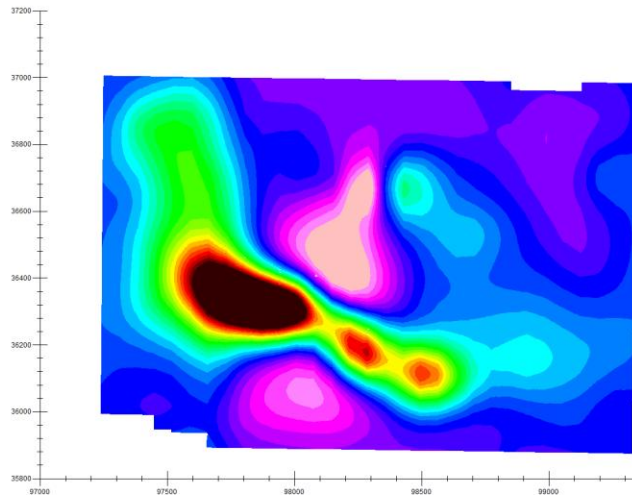
TMI grid



Inline TMI gradient



Upward Continued
TMI grid



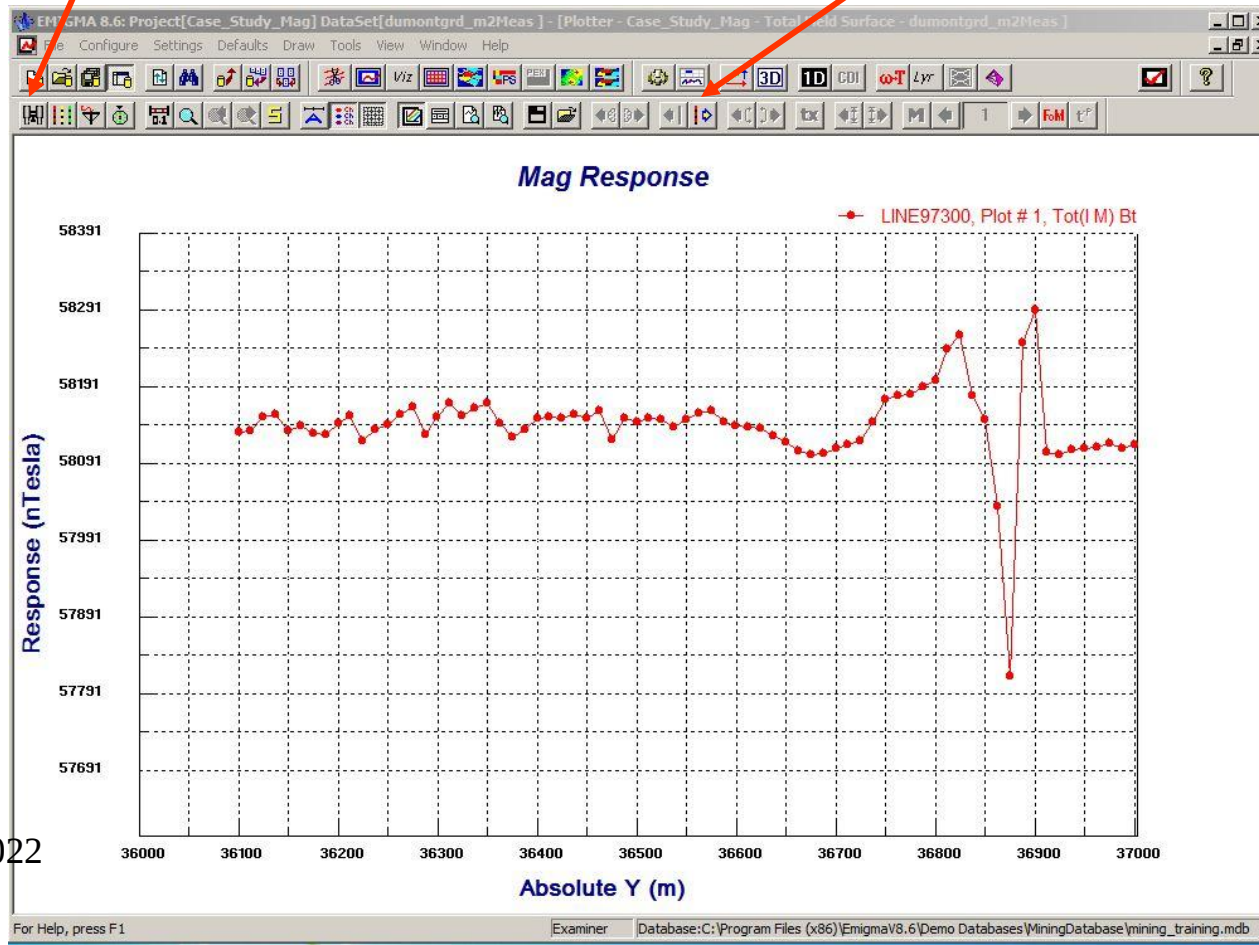
1. Import data
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Click "Plotter"...

Load data set in plotter

Toggle between profiles



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1. Import data
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Note: *Performed some initial modeling to get a “feel” of the data and estimate parameters of initial model for inversion.*

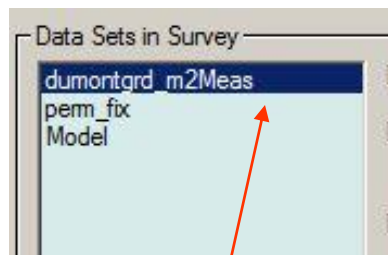
simulated data with a forward model



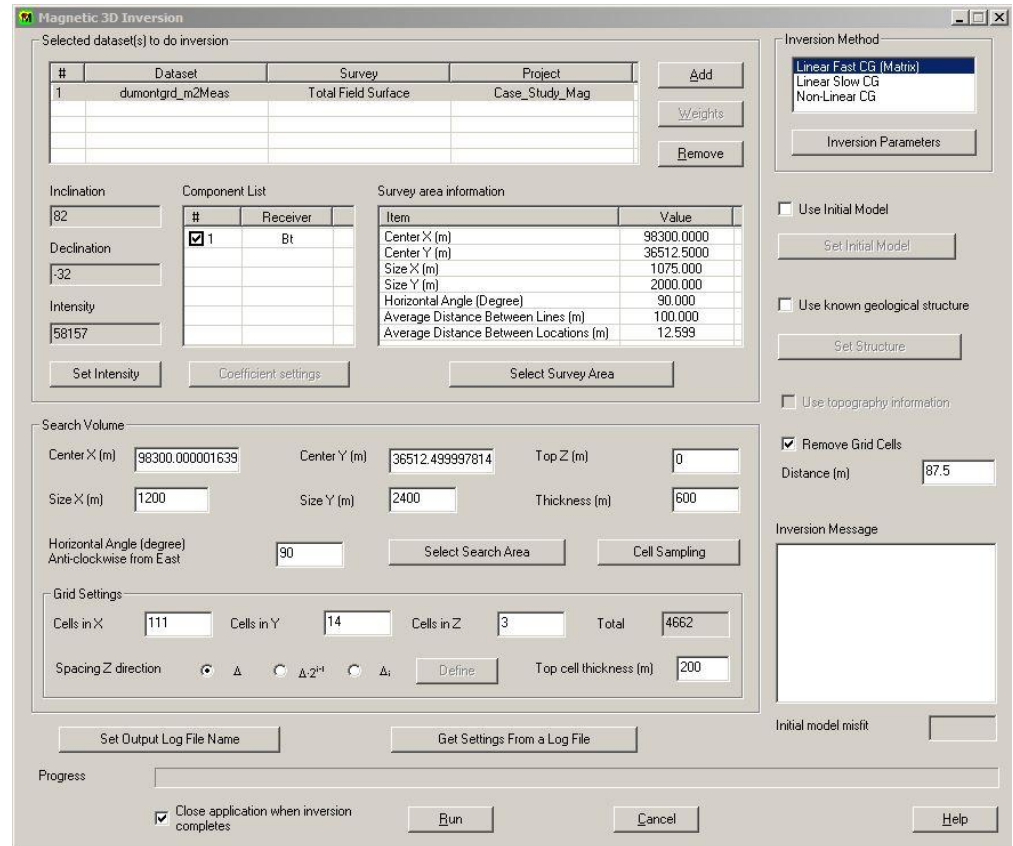
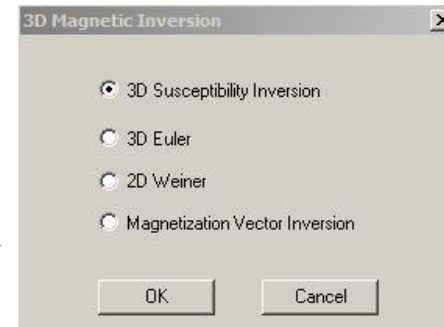
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Magnetic Inverse

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Select survey data



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1. Import data
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Magnetic Inverse

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Selected Data Sets

A dataset may be added for use in the inversion by clicking **Add**. Each dataset is given equal weight by default. This can be changed by clicking **Weights**.

Components

Components that will be used in the inversion are displayed here.

Log File

A log file is created each time an inversion is run. The name and location of the log file can be specified by clicking **Set Output Log File Name**. Click **Get Settings From a Log File** to use the settings from a previous inversion.

Use topography information

This option will be enabled if you imported your data with a gps z channel. Select this option and the gps z values will be used when performing the inversion. When loading inversion results to the visualizer, a window will appear asking to display the survey according to z or gps z. Select gps z to see the inversion results with topography.

Remove Grid Cells

Any cells that are beyond the specified **Distance** from the closest data point will be removed from the inversion result.

Geological Structure

Click **Use known geological structure** to define a structure that will apply constraints to the inversion result.

Initial model misfit

Defines how close the initial model fits the data. The closer the value is to 0, the better the fit.

Magnetic 3D Inversion

Selected dataset(s) to do inversion

#	Dataset	Survey	Project
1	Mag3DInv_FastCG	Total Field Surface	Case_Study_Mag

Add **Weights** **Remove**

Inclination: 82
Declination: -32
Intensity: 58157
Set Intensity

Component List

#	Receiver
☒ 1	Bt

Survey area information

Item	Value
Center X (m)	98300.0000
Center Y (m)	36512.5000
Size X (m)	1075.000
Size Y (m)	2000.000
Horizontal Angle (Degree)	90.000
Average Distance Between Lines (m)	100.000
Average Distance Between Locations (m)	12.599

Search Volume

Center X (m): 98300.00001639
Center Y (m): 36512.499997814
Top Z (m): 0
Size X (m): 1200
Size Y (m): 2400
Thickness (m): 600
Horizontal Angle (degree): 90
Anti-clockwise from East
Select Search Area **Cell Sampling**

Grid Settings

Cells in X: 111
Cells in Y: 30
Cells in Z: 5
Total: 16650
Spacing Z direction: ☒ Δ ☐ Δ² ☐ Δ_i **Define**
Top cell thickness (m): 120

Set Output Log File Name **Get Settings From a Log File**

Progress

☒ Close application when inversion completes **Run** **Cancel** **Help**

Inversion Method

☒ Linear Fast CG (Matrix)
☐ Linear Slow CG
☐ Non-Linear CG

Inversion Parameters

☒ Use Initial Model **Set Initial Model**

☐ Use known geological structure **Set Structure**

☐ Use topography information

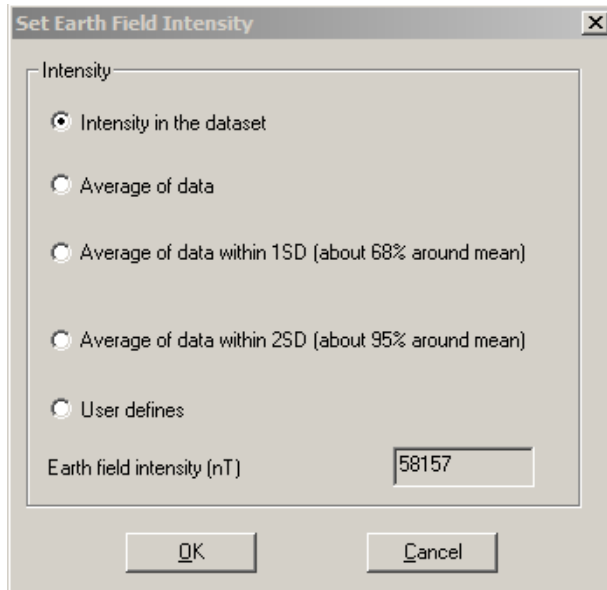
☒ Remove Grid Cells
Distance (m): 87.5

Inversion Message

Initial model misfit

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Earth's Background Field

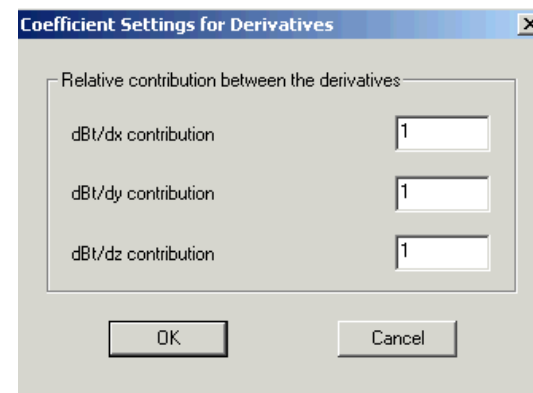
You can choose between various methods to obtain a value for the background field by clicking **Set Intensity**. **Intensity in the dataset** - uses the value defined in the selected survey.

Average of data - the value will be calculated from the data. The amount of data values used for the calculation depends on the option chosen.

User define - simply enter a new value in the field intensity box.

Coefficient settings

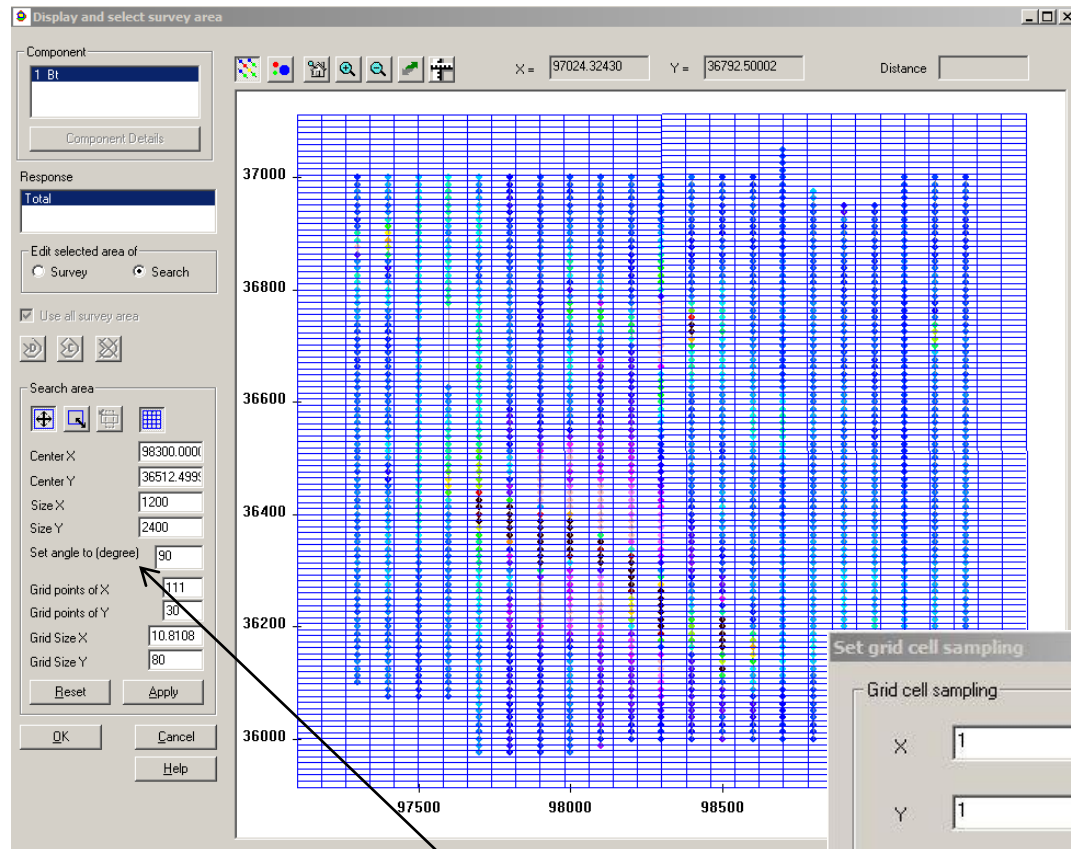
This button will be enabled when gradient data is available and more than one derivative has been selected (not in this example). It launches the following window where a weight can be assigned to each available derivative.



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Clicking either the **Select Search Area** or **Select Survey Area** buttons launches the same window. But search area means the area of data which the inversion algorithm works on, while survey area is the whole part of the imported data.



If change the value in “Set angle to (degree)” box, the angle between search area and survey area will be changed accordingly

Survey Area

Click the Select survey area button to launch the graphical tool which enables you to specify the data points that will be used in the inversion calculations.

Search Volume

The default parameters in the **Search Volume** section will create a grid that covers the entire survey. You can modify the search area parameters by entering new values or by using the graphical tool

Cell Sampling

Grid cells defined in **Search Volume** can be divided into smaller units when calculate the simulated data by clicking **Cell Sampling**. Type your values in the **X**, **Y** and **Z** boxes to specify the number of samples in the X, Y and Z directions

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Grid Cell Settings (along grid axis)

Cells in X	187	Cells in Y	29	Cells in Z	25	Total	135575
Cell Size X	10	Cell Size Y	100	Top cell thickness (m)	36		

Spacing Z direction: ☒ Δ ☐ $\Delta \cdot 2^{i-1}$ ☐ Δ_i

Edit the search grid cell thickness

Note: Depth displayed here is relative to the ground level.

Total thickness: 900 Top Depth: 0

Total thickness after modification: 858 0

Search grid cell thickness

Index	Thickness	Bottom Depth
1	10.0000	-10.0000
2	10.0000	-20.0000
3	10.0000	-30.0000
4	36.0000	-66.0000
5	36.0000	-102.0000
6	36.0000	-138.0000
7	36.0000	-174.0000
8	36.0000	-210.0000
9	36.0000	-246.0000
10	36.0000	-282.0000
11	36.0000	-318.0000
12	36.0000	-354.0000

Thickness (m): 10 Insert Index: 1

Note: Multiple thickness items can be selected.

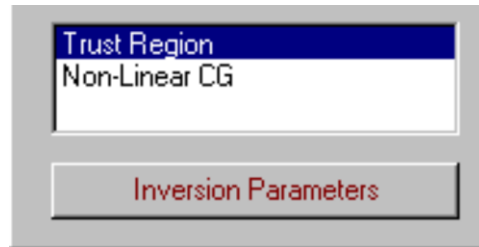
Grid Settings

Confirm the number and layout of grid points to be used in the inversion in the **Grid Settings** area. The points will be evenly spaced in the x and y directions. Choose Δ for evenly spaced points in the z direction or $\Delta \cdot 2^{i-1}$ for exponentially spaced points. You may specify a custom spacing by selecting Δ_i . Your custom settings can be later modified by clicking **Define**.

Editing the Grid Cell Thickness

The interface displays the total thicknesses before and after editing as well as the topmost z value. The cell sizes are listed in the **Search grid cell thickness** section.

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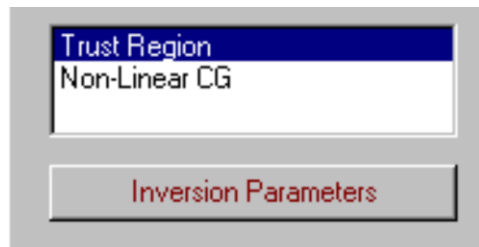
Inversion Methods

There are two inversion methods to choose from. Set parameters for your chosen technique by clicking the Inversion Parameters button.

Trust Region - Faster than Non-Linear CG and has better handling of model constraints. It is a constrained minimization technique and can efficiently process large number of data points and inversion grid cells.

Non-Linear CG - General concept is to start with an initial guess and go looking for the best fitting model by minimizing a given function using an iteration process. It is a unconstrained minimization technique with the constraints on the interface applied as a post-process.

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The objective function

Assumes that the forward function can be linearized.

$$\mathbf{d} = \mathbf{F} \mathbf{m}$$

d: vector of N dimension

F: matrix of N×M dimension

m: vector of M-dimension

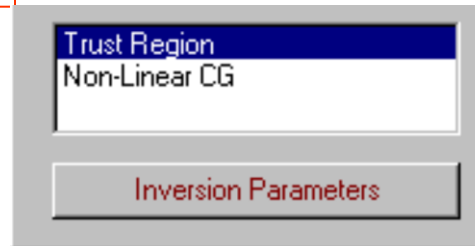
N: number of observation

M: number of inversion grid cells

$$H_{\text{ext}}(\mathbf{r}) = \int G(\mathbf{r}, \mathbf{r}') J(\mathbf{r}') d\mathbf{r}'$$

$$J(\mathbf{r}') = (m(\mathbf{r}') - m_0) H_{\text{ins}}(\mathbf{r}') = \chi(\mathbf{r}') H_{\text{ins}}(\mathbf{r}')$$

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Trust Region Technique

- fast convergence rate
- constrained
- can efficiently process large number of data points and cells

Constrained Trust Region Technique

At an iterate, when a region around is defined, a quadratic model within this region is checked for an adequate representation of the objective function. If a notable decrease of the objective function can be achieved within the region, then the model is believed to be a good representation of the original objective function and the region is expanded. If the improvement is too subtle, then the model is not to be believed as a good representation of the original objective function within that region and the region is contracted.

$$\phi(m) = \lambda \phi_d(m) + \phi_m(m)$$

$\phi(m)$ - functional to be minimized

$\phi_d(m)$ - data misfit

$\phi_m(m)$ - model misfit

λ - Lagrangian multiplier - regularization weight

Smooth model misfit function

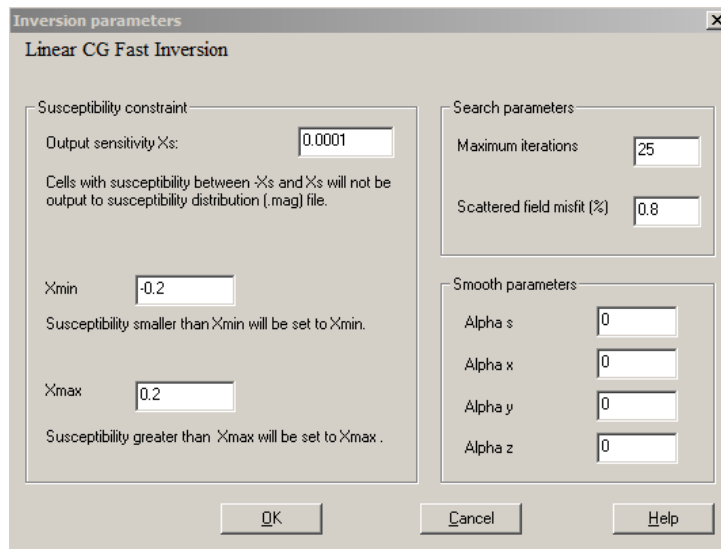
$$\phi_m(m) = \alpha_0 \int w^2(z) [m(r) - m^0(r)]^2 dv +$$

$$\sum_{i=x,y,z} \alpha_i \int [w(z) \nabla_i (m(r) - m^0(r))]^2 dv$$

α_i - weighting factors

$w(z)$ - depth weighting

1. Import data
2. Examine data
3. Perform initial modeling
- 4. Perform 3D magnetic inversions**
5. Check model and create plots



Constraint of Susceptibility

Output Sensitivity Cells with susceptibility $|D|$ (close to 0 - where the user defines how close) are constrained or thrown out after each iteration. will not be output to the susceptibility distribution (.grv) files

Xmin Upon completion of iteration, X values less than Xmin will be set equal to Xmin

Xmax Upon completion of iteration, X values greater than Xmax will be set equal to Xmax

Search Parameters

Maximum Iterations

User defines the number of iterations the program will run to generate the final solution. In general the default (25 for Linear Fast CG and about 15 for the others) is sufficient for the inversion.

Scattered field misfit

Defines the “stop” criteria for an iteration when the difference between the measured and simulated scattered field falls within a certain percentage of the measured value.

Smooth parameters

Larger values will increase the smoothness of the inversion result. **Alpha s** decreases the range of all the susceptibility values. **Alpha x, y and z** decreases the difference between the susceptibility of two neighboring cells in the x, y and z directions respectively.

1. Import data
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Initial Model

Click the checkbox labeled **Use Initial Model** to specify an initial model. Return to the initial model window by clicking the **Set Initial Model** button.

The starting model is described by a list of prisms with various properties in the box labeled **Initial Model**.

Import a model

Project

Name	ID
Ground Mag	32
Air Mag	29
Near Surface - Mag	15
Near Surface - Shell B6	14
Near Surface - Concrete	13
Case_Study_Mag	39

Survey

Name	ID
Total Field Surface	141
Inversion and Filtering	142
Exported Grid	143

Dataset

Note: Only the datasets that have model are listed.

Name	ID	Model Name
perm_fix	528	
3DInv_TrustRegion	1606	Trust_3779
3DInv_TrustRegion	1607	Trust_10102
3DInv_TrustRegion	1609	Trust_38502
Model target	2841	Model target

Anomalies

Total Number of Anomalies: 1

Name	Type	k (SI)	Top X (m)	Top Y (m)	Top Z (m)	Strike Length (m)	Dip Extent (m)	Thickness (m)
target	Prism	0.1	98100.0000	36312.0000	-0.5000	800.000	400.000	40.000

Note: Select the anomalies in the list to import.

OK Cancel

import a model from another data set in the current database

Click **Import a model**.

Select the project, survey, and data set with the desired model. Click **OK** and the model will appear in the **Initial Model**.

1. Import data
2. Examine data
3. Perform initial modeling
- 4. Perform 3D magnetic inversions**
5. Check model and create plots

Magnetic 3D Inversion

Selected dataset(s) to do inversion

#	Dataset	Survey	Project
1	dumontgrd_m2Meas	Total Field Surface	Case_Study_Mag

Inclination: 82
Declination: -32
Intensity: 58157

Component List

#	Receiver
1	Bt

Survey area information

Item	Value
Center X (m)	98300.0000
Center Y (m)	36512.5000
Size X (m)	1075.000
Size Y (m)	2000.000
Horizontal Angle (Degree)	90.000
Average Distance Between Lines (m)	100.000
Average Distance Between Locations (m)	12.599

Search Volume

Center X (m): 98300.00001639
Center Y (m): 36512.499997814
Top Z (m): 0
Size X (m): 1200
Size Y (m): 2400
Thickness (m): 581.25
Horizontal Angle (degree) Anti-clockwise from East: 90

Grid Settings

Cells in X: 111
Cells in Y: 30
Cells in Z: 5
Total: 16650
Spacing Z direction: ☐ Δ ☒ Δ^2 ☐ Δ_1
Top cell thickness (m): 18.75

Inversion Method

Linear Fast CG (Matrix)
Linear Slow CG
Non-Linear CG

Use Initial Model ☒
Set Initial Model
Use known geological structure ☐
Set Structure
Use topography information ☐
Remove Grid Cells ☒
Distance (m): 87.5

Inversion Message

Prepare data ...
Start inversion.
Data utilized in inversion is 1665
Grid Cells 16650
Getting Initial Model.....

Initial model misfit

Progress

Close application when inversion completes ☐

Run Cancel Help

12/13/2022 After settings are done, press **Run** button to start the inversion process.

1. Import data
2. Examine data
3. Perform initial modeling
- 4. Perform 3D magnetic inversions**
5. Check model and create plots

Executing the Inversion

Magnetic 3D Inversion

Selected dataset(s) to do inversion

#	Dataset	Survey	Project
1	dumontgrd_m2Meas	Total Field Surface	Case_Study_Mag

Add Weights Remove

Inclination: 82
Declination: -32
Intensity: 58157
Set Intensity Coefficient settings

Component List

#	Receiver
1	Bt

Survey area information

Item	Value
Center X (m)	98300.0000
Center Y (m)	36512.5000
Size X (m)	1075.000
Size Y (m)	2000.000
Horizontal Angle (Degree)	90.000
Average Distance Between Lines (m)	100.000
Average Distance Between Locations (m)	12.599

Select Survey Area

Search Volume

Center X (m): 98300.00001639 Center Y (m): 36512.499997814 Top Z (m): 0
Size X (m): 1200 Size Y (m): 2400 Thickness (m): 581.25
Horizontal Angle (degree) Anti-clockwise from East: 90
Select Search Area Cell Sampling

Grid Settings

Cells in X: 111 Cells in Y: 30 Cells in Z: 5 Total: 16650
Spacing Z direction: ☐ Δ ☐ Δ^2 ☒ Δ_1 Define Top cell thickness (m): 18.75

Set Output Log File Name Get Settings From a Log File

Inversion Method

Linear Fast CG (Matrix)
Linear Slow CG
Non-Linear CG
Inversion Parameters

☒ Use Initial Model Set Initial Model
☐ Use known geological structure Set Structure
☐ Use topography information
☒ Remove Grid Cells Distance (m): 87.5

Inversion Message

Least Squares Misfit	48.3700
Iteration 6	
Data Misfit	84.12%
Least Squares Misfit	39.7569
Iteration 7	
Data Misfit	80.25%
Least Squares Misfit	38.1925
Iteration 8	
Data Misfit	81.65%
Least Squares Misfit	37.5046

Initial model misfit: 191.89%

Progress: 12/13/2022

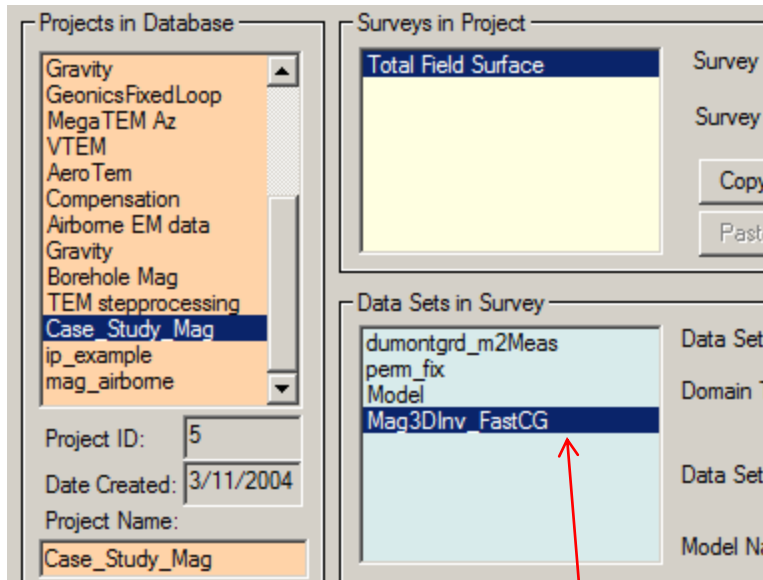
☐ Close application when inversion completes Run Cancel Help

The right window (in white) shows each data point's progress.

The "Progress" bar shows the total progress of this inversion.

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

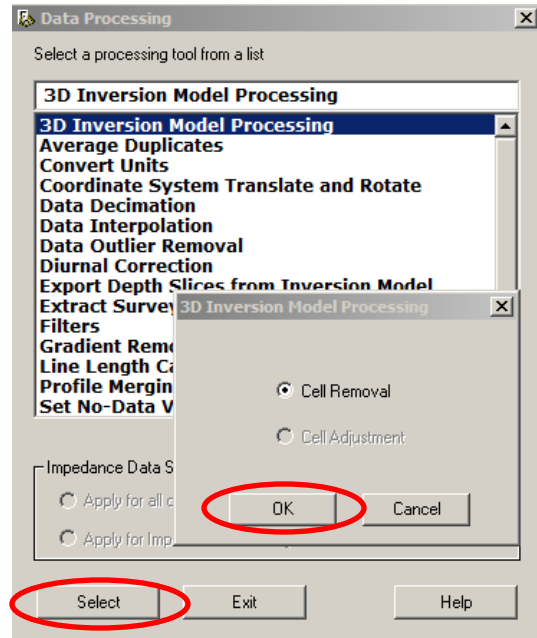


In each survey, there will be several data sets after modeling, inversion and processing. In this case, we have two forward models and one inversion model. Each forward model has a new data set containing the simulated data under the model. Similarly, each inversion contains a new dataset containing the simulated data set under the inversion model (for each point) and attached to that data set is the inversion model.

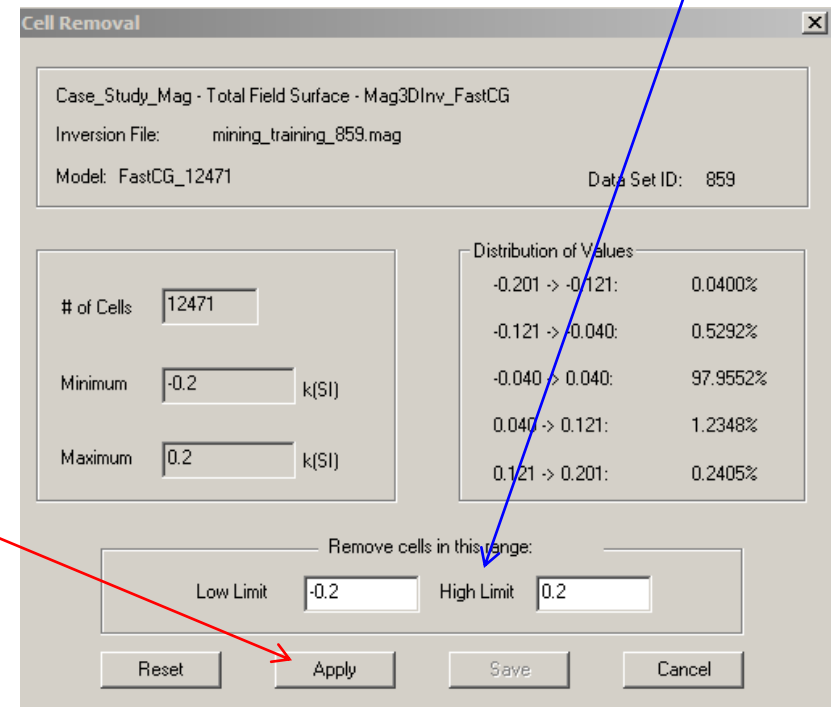
Our 3D gravity inversion model dataset

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
5. **Check model and create plots**

Inversion Evaluation



Users can use “3D Inversion Model Processing” tool to remove cells in inverted model. Follow the routine shown in this page and arrive “Cell Removal” dialog. Choose the removal range of cells: “Low Limit” and “High Limit” (any cell within this range will be removed)



Click “Apply” button when it is done

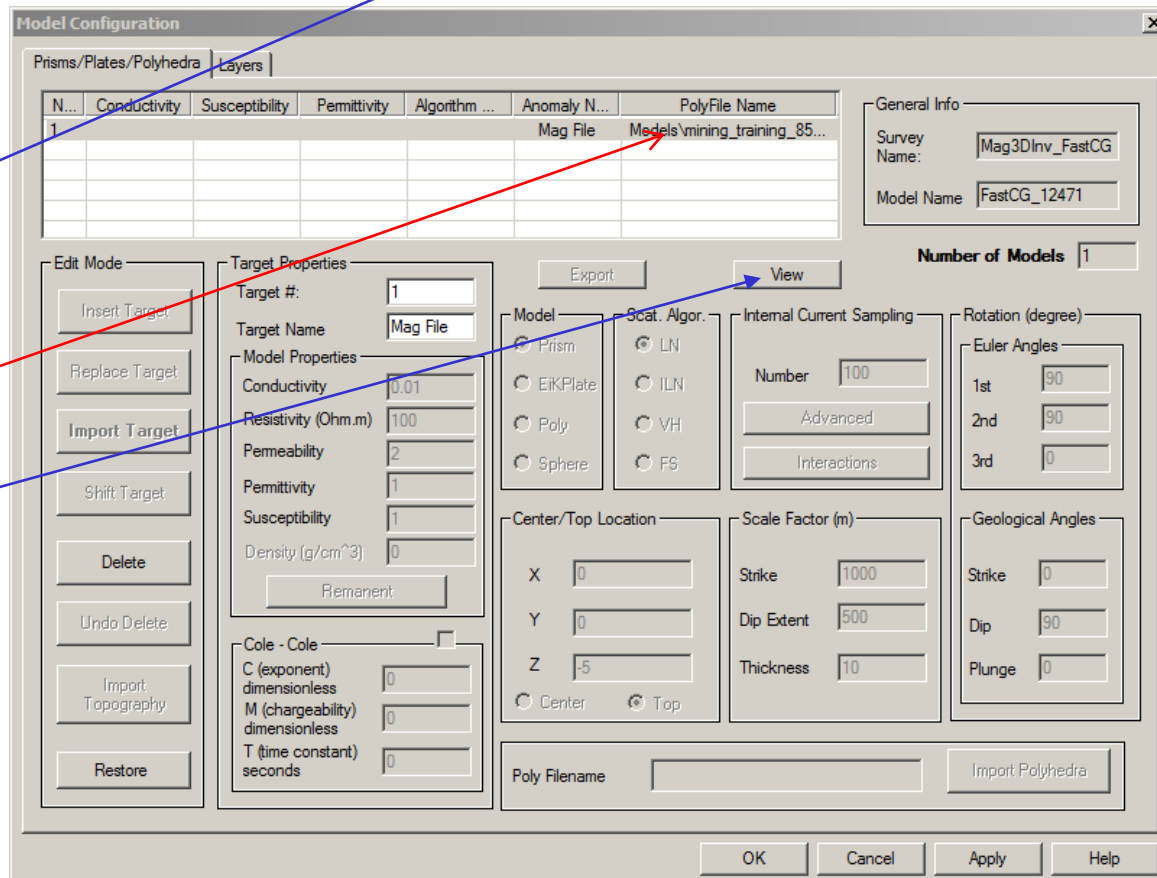
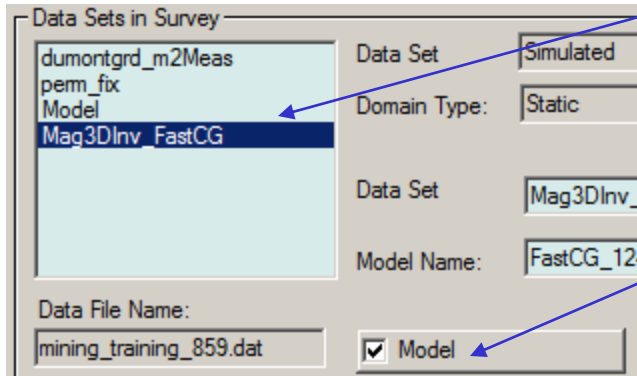
Therefore, users can reduce the range of model either before inversion (by Select Search Area) or after inversion (by Cell Removal)

12/13/2022

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
5. Check model and create plots

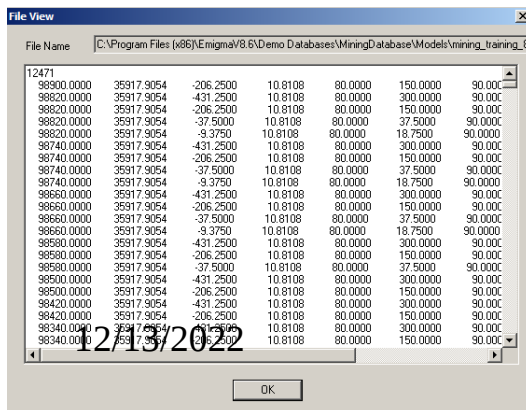
Inversion Evaluation

An inversion is selected. You will note the “Model” button is checked. If the “Model” button is clicked...



The model will be saved as a “Mag File” with its name and folder shown in the “PolyFile Name” column of the table

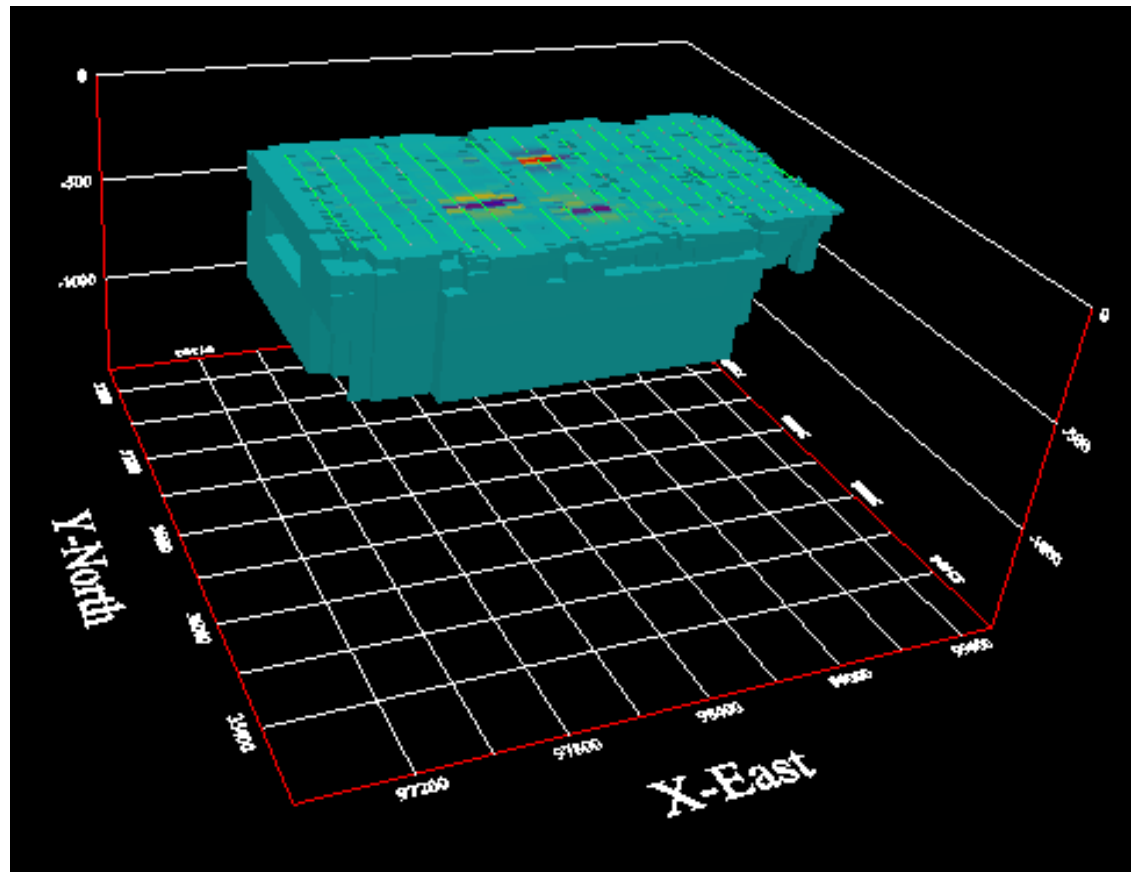
Click “View” button to open this file...



1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

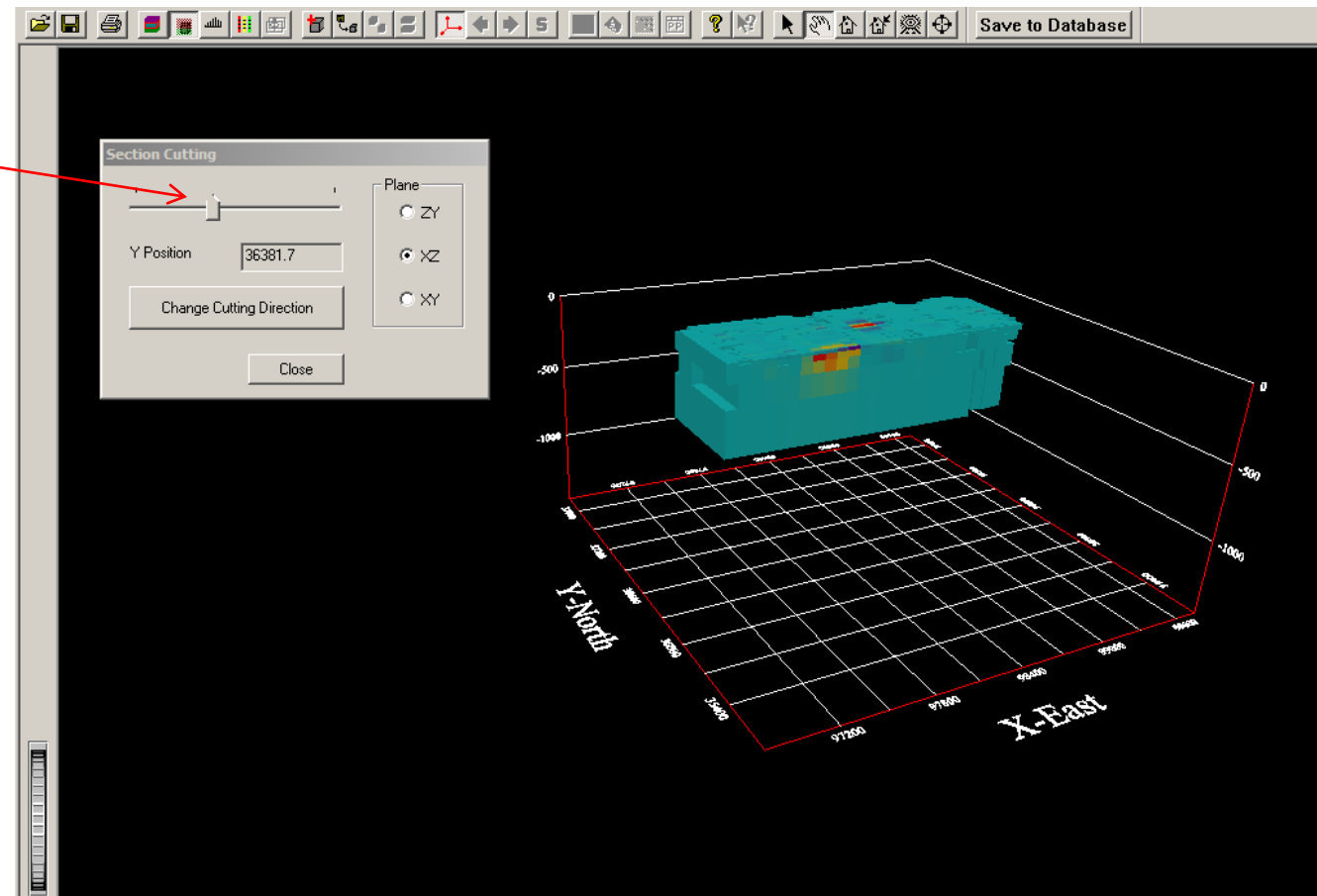
Click  button to open Visualizer tool to view the inverted 3D model...



1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

Select from menu “Model -> Mag/Grv/Res File -> mag/grv/res Cutting” to open the Section Cutting tool.



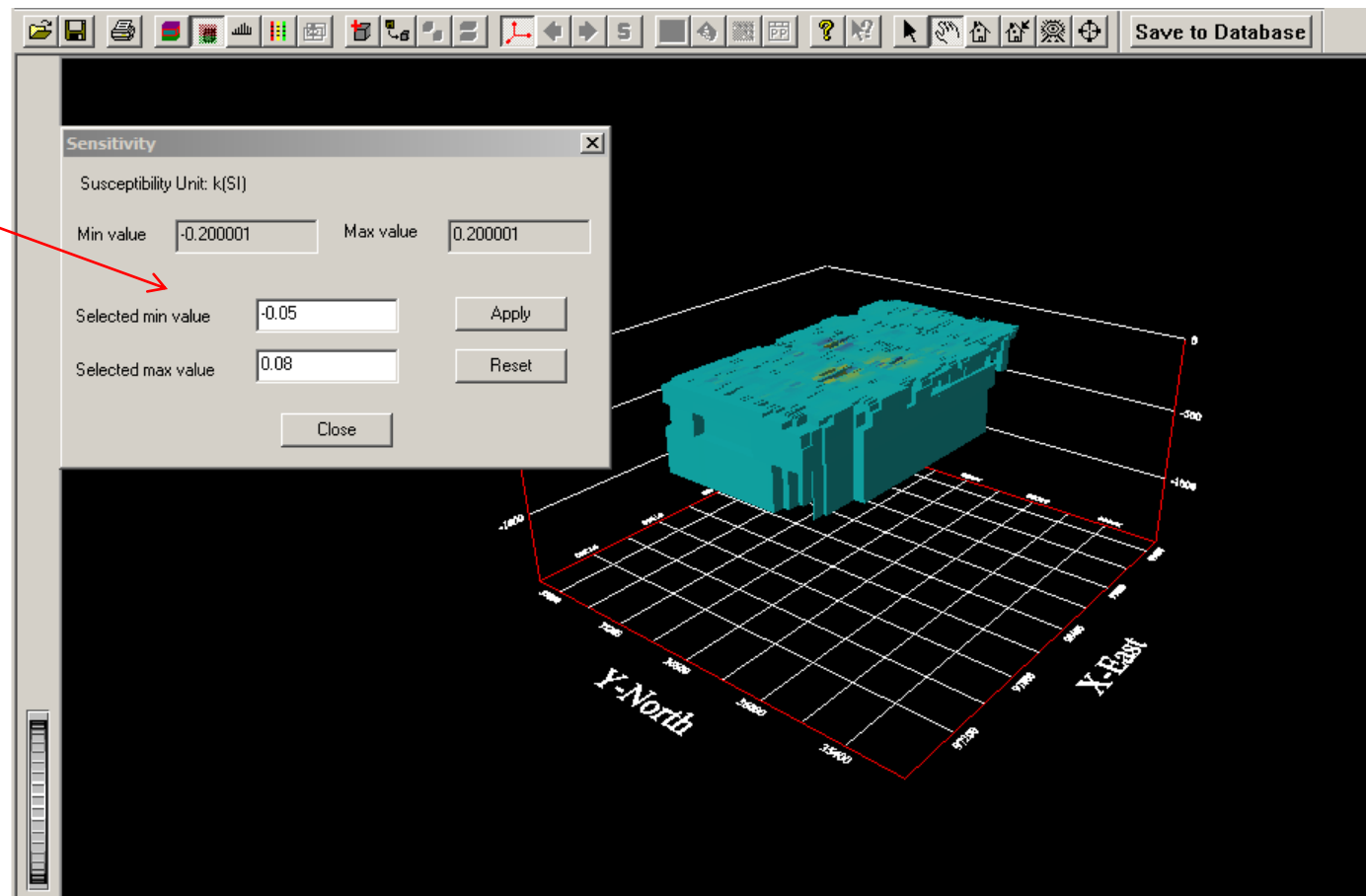
By adjusting the bar...

User can view sections of the 3D model from XY, XZ and ZY planes with any penetration depth

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

Select from menu “Model -> Mag/Grv/Res File -> Sensitivity” to open the Section Cutting tool.



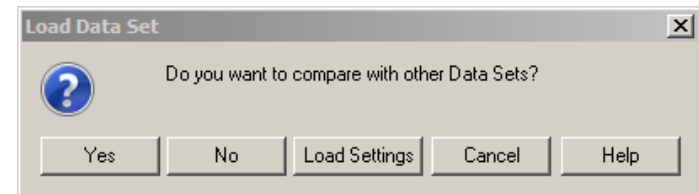
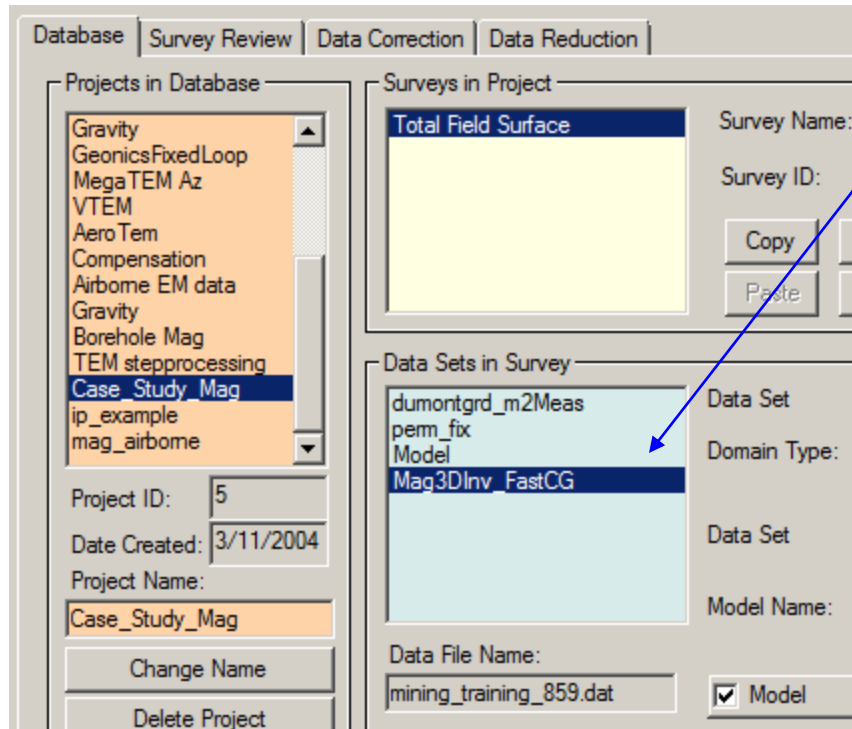
By adjusting minimum value and maximum value shown in the figure...

The model in this figure will only exhibit cells with values specified in this range

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

To assess how well the inversion model fits the data at each station, select the inversion data set and then select the plotter.



Select “Yes”, when this dialog appears

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

Magnetic Inverse

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Select the data sets required for comparison and then click “Load”

Survey Selection

Project: Case_Study_Mag Survey: Total Field Surface

Data Sets in Survey: 2 Selected Data Sets to plot: 2

Name	Model Name	Type
perm_fix		S
Model		S

Data Units: nTesla

Add to --> Add All to --> <-- Remove from

Name	Model Name	Type
Mag3DInv_FastCG	FastCG_12471	S
dumontgrd_m2Me...		M

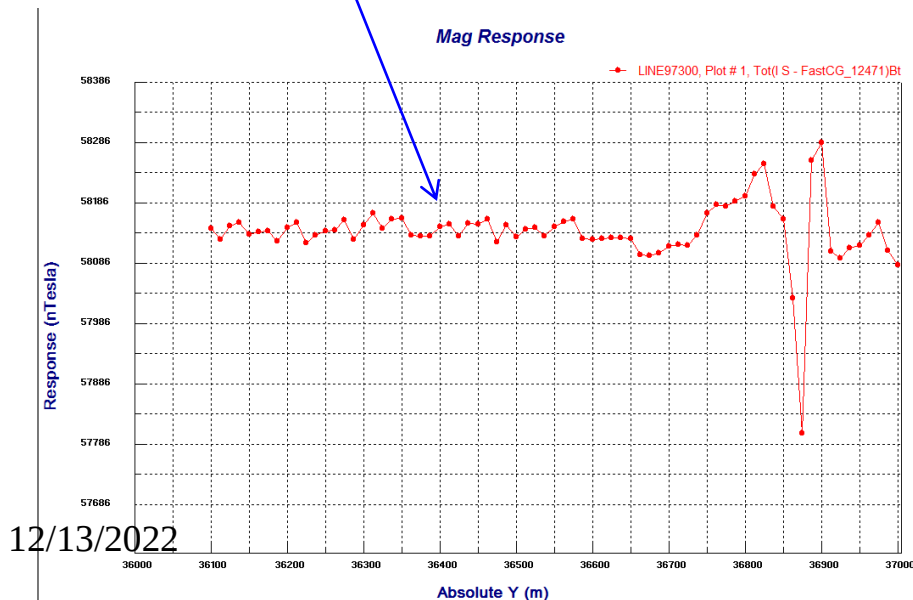
☐ Show IMPEDANCE Data Sets in Survey

Loading: _____

Loaded 0 of 2

Load Cancel

All selected data sets are then loaded to the Plotter application and the plot appears showing the simulated data of the first profile.



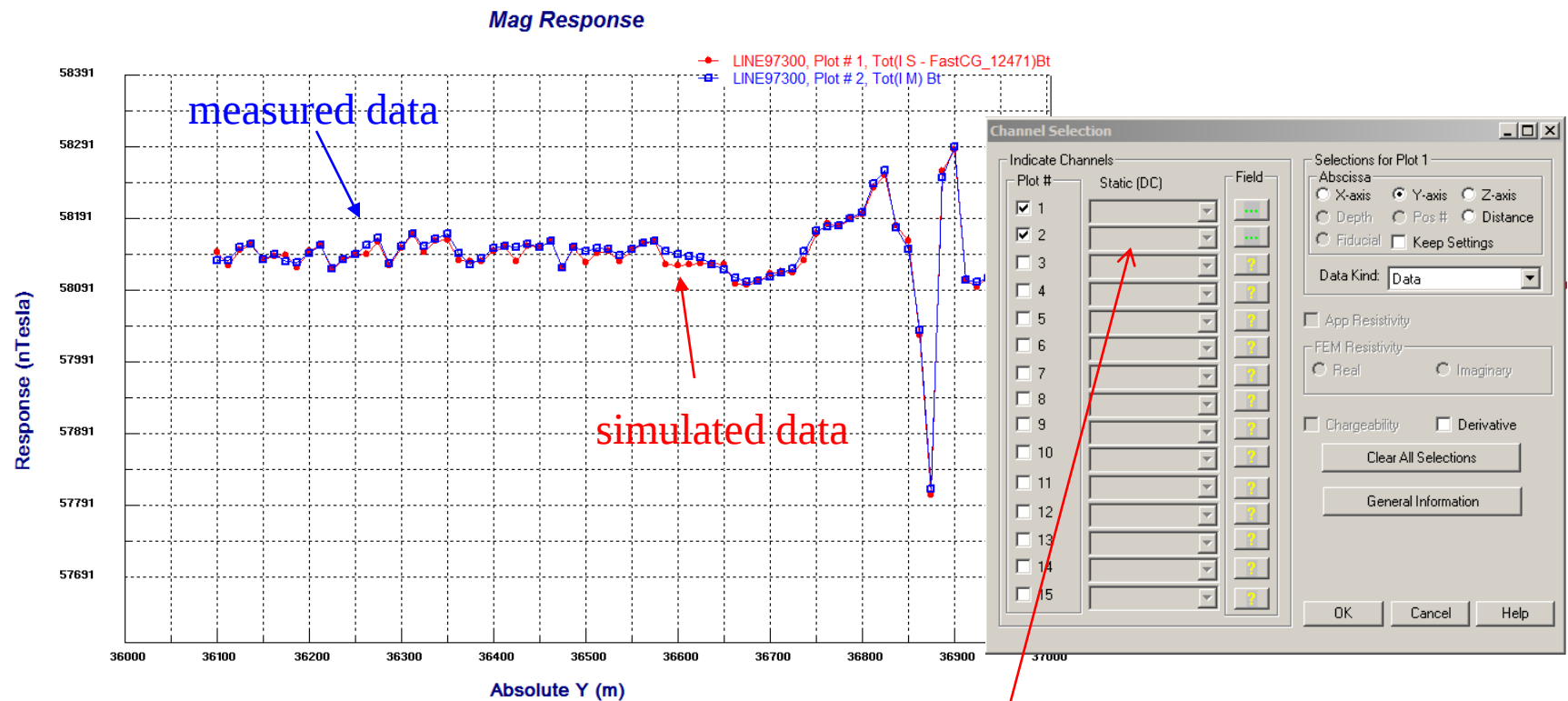
1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
5. **Check model and create plots**

Inversion Evaluation

Magnetic Inverse

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The user may select other data sets to plot by simply double clicking on the plot



Select for the 2nd plot on measured data

1. Import data
2. Examine data
3. Perform initial modeling
4. Perform 3D magnetic inversions
- 5. Check model and create plots**

Inversion Evaluation

Magnetic Inverse

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Multiple plots can be shown for various inversions and models in “Static” mode. The user may step through different profiles by simply clicking the arrow.

