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



Magnetic Inverse

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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 in 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 IRGF 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.

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1. Import data

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

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/Longtitude.

Raw Data Formats	Other Sources	C QCT format	XYZ ASCII format	
	Data Groups C EM IP/Resistivity DC Magnetics (ground, marine or airborne) - vector, TMI or gradient Gravity (ground, marine or airborne) - scalar or tensor Scintrex Magnetic Ground (XYZ++ format) Geosoft Grid File (Potential Field) Generic Borehole (magnetics and gravity) - vector, TMI Crone (Borehole (magnetic) - vector)	File View : // GRID X GRID Y M UINE 98600 98622.48 35940.57 3 98622.49 35953.2 36 98622.51 35965.82 33 98622.52 35978.45 36 ✓ Data Setting UTM_X: UTM_Y: Z :(Altitude)	Select one line as the header line AGDATA MAGDATA(SENSOR2) M6000 58095.88 U12.5 58099.81 M6025 58079.42 U33.5 58045.75 GRID_X GRID_Y GRID_Y C meters fee L L titude / Longitude (degr	Set Header Lin Load Header L tet et
	L3	GPS_Z: (m) Gucial : Line Label	Y Latitude : Y Longitude :	-
ct data file	OK Cancel Help	dinate	< Back	Cancel H

Click "Next" button to proceed to the next step

- 2. Examine data
- 3. Perform initial modeling
- 4. Perform 3D magnetic inversions

LINE

•

Units

5. Check model and create plots

Select column name for magnetic data

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

Select unit for imported data

X GRID X GRID Y MAGDATA MAGDATA(SENSOR2) 98600 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 8622.56 36016.34 36075 57948.79 J. 98622.58 36028.96 36087.5 58312.7 - Magnetic Field · Derivative of Btotal BTotal Multiple Sensors GRID_X -🗖 In-Line MAGDATA(SENSOR2) Sensor1 • Cross-Line GRID_X -GRID_X -Sensor2 Vertical -GRID_X GRID X -☐ Sensor3 **v** GRID_X □ Sensor4 Vectors -GRID_X □ Sensor5 GRID_X ∇ ☐ In-Line GRID_X -☐ Sensor6 Cross-Line GRID X $\overline{\mathbf{v}}$ Vertical GRID X nT •

< Back

Next >

Cancel

Help

Magnetic Inverse

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12/13/2022 lick "Next" button

- 2. Examine data
- 3. Perform initial modeling
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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.



Next >

Cancel

Help

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12/13/2022 Click "Next" button

1. Import data

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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

Total Number of Profiles: 26	Total Number of Locations: 2009
Profiles and Locations Inclination/Declination/Intensity Settin	r-Modifu Profile(s)
Options © Determine from data file or Latitude/Longitude user input	C User input for Inclination, Declination, Intensity
Parameters (Average values from data file) 74.1 Latitude (deg)	© N C S 2000 Year
61.65 Longitude (deg) 0 100 Height above mean set	a level (m)
Reset Parameters	Coordinate Frame
Reset Values Process	GRF Values 84.2665 Inclination downward from horizontal (deg) -52.155 Declination East of North (deg)
Cancel SET	56326.1 Intensity (nT)
	< Back Finish Cancel He

12/13/2022 Click "Next" button

- 2. Examine data
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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 procedur/a 3/2022

	Inclination downward from horizontal (in degrees)	75
	East of North (in degrees)	20
	Intensity (in nT)	52500
	Central Meridian (in degrees)	0
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	Store LINE98350 Store LINE	
	Store LINE36800	
Bun Import		
-		

+> Finish

Cancel

Help

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2. Examine data

- 3. Perform initial modeling
- 4. Perform 3D magnetic inversions
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1. Check database for the survey

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VTEM	
Aero Tem Compensation	
Airborne EM data	
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mag_airborne	Model
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Project ID: 5	- Model

2. Click configuration

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nining	training_66.dat	
	Configuration	

Magnetic Inverse ofiles Waveform Tx-Rx Output 8 Sustem Tune Natural Absolute: Parallel to absolute system 3. Check system configuration ransmitter input ----Coord System: Absolute: Parallel to absolute system • Comp Receiver Input ange Nod Harre Solic Hulle of Solic Hulle of Solic Hulle of Frontis ок | Cancel A Serilacation 5 원목語 85 《업汉카신十冊 위원비/ [^ 티 의 치 세쇄 티트 🔳 🕒 💵 🤞 BASE 3700 S Edit Location Coordinates Edit Model Coordinate ≝⊇ Undo Save Changes

4. Check lines and stations by clicking "Survey Editor" button 3

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

Import data Examine data gridding, processing

- 3. Perform initial modeling
- 4. Perform 3D magnetic inversions
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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.

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



After interpolating, the grid is attached to the dataset in the database as indicated by a check mark as here grids $\frac{12}{13}/2022$ are stored for easy access



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Import data Examine data gridding, processing

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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 x 2^M grid, we may now processing derivatives and with these derivatives perform other processing functions.



erivatives of DC magnetic	: data				×
Dataset name: Measured	Static	Output grid's nam	e: De	iv128x32	
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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.

2. Examine data gridding, processing

- 3. Perform initial modeling
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Case 1: Use the derivative grids to perform 3D Euler solutions. 1.



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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2. Examine data gridding, processing

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

derivative grid Grid Information ? × Grid Data Set(s) - Grid Data Set Information Orthogonal local dimensions: Data Type: NatNeighbour_3 Deriv128x32_clear Min Max N ptn delta Data -557.4062. 549.769531 128 32 8.717920 69.644405 1091 343 1067.632. 1.100000 1.100000 0.000000 Statistics - Centroid of Grid-Counterclockwise Components: orientation of local Data Created: 6/27/2016 4:42:50 P X: 98312.125 Tx - BEARTH Rx - BTotal U-axis w.r.t. to global X-vector (degree): Y: 36445.648437 Grid Data Set Z: 1.100000238 2. Tx - BEARTH Deriv128x32_clean Change Name 89.4 Rx - BTotalx ID: Delete Grid 3. Tx - BEARTH Rx - BTotaly - Related Project LR1 Magnetics 4. Tx - BEARTH Rx - BTotalz LR1RMAG Survey Measured Static Data Set Measured Data Set Domain Type: Static Export to Profile Data Set Export to Geosoft (grd) 2 Exit Export to xyz-file Remove Extrapolated Points Difference of grids Export to gct-file Help Set Uutout Profiles

Export derivatives.

Use of Derivatives in Inversion – 3 examples.

Export TMI and derivatives to a set of profiles

or

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

atput Profile Definition ————	
Use Grid Nodes for Lines and Stations	
 Export derivatives to Original Stations 	
04	



5. Check model and create plots

1. Case 3: Examination of Derivatives and Upward Continuation



Use of Derivatives in Inversion – 3 examples.



Import data
 Examine data
 Perform initial modeling
 Perform 3D magnetic inversions
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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





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

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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.

2. Examine data

- 3. Perform initial modeling
- 4. Perform 3D magnetic inversions
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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 anailable derivative.

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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 for Derivatives	×
Relative contribution between the de	rivatives
dBt/dx contribution	1
dBt/dy contribution	1
dBt/dz contribution	1
ОК	Cancel

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- 1. Import data
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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

X

Cancel

0K

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

 Import data Examine data Derform initial modeling 						Magr	netic Inverse 20
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	Cell Size X	10	Cell Size Y	100	Top cell thickn	iess (m)	36
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Note: Multiple	thickness items can be selec	sted.					
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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.



Trust Region Non-Linear CG	
Inversion Parameters	

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.

Trust Region Non-Linear CG	
Inversion Parameters	

d= F 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

$$H_{ext}(\mathbf{r}) = \int G(\mathbf{r},\mathbf{r'}) J(\mathbf{r'}) d\mathbf{r'}$$
$$J(\mathbf{r'}) = (\mathbf{m}(\mathbf{r'}) - \mathbf{m}_0) H_{ins}(\mathbf{r'}) = \chi(\mathbf{r'}) H_{ins}(\mathbf{r'})$$



Inversion Parameters

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

 $\phi_{\rm m}({\rm m})$ - model misfit

$\lambda\,$ - Lagrangian multiplier - regularization weight

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Trust Region Technique

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

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

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

 α_I - weighting factors w(z) - depth weighting

2. Examine data

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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/13/2022 Upon completion of iteration, X values greater than Xmaz will be set equal to Xmax

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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.

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Name	ID		Name	ID	Name		D Mod	el Name
around Mag	32		Total Field Surface	141	perm_fix	5	28	
Air Mag	29	_	Inversion and Filtering	142	3DInv_TrustRegion	1	506 Trus	st_3779
Vear Surface - Mag	15	_	Exported Grid	143	3DInv_TrustRegion	1	507 Trus	t_10102
Vear Surface - Shell B6	14				3DInv_TrustRegion	1	509 Trus	t_38502
Vear Surface - Concrete	13				Model target	2	341 Mod	el target
Jase_Study_Mag	39	-						
(•							
				[[ma]	[ma]	[m]	l [m]
			(m)	(m)	(0)	(00)	0.0	6.0
irget	Prism	0.1	(m) 98100.0000	(m) 36312.0000	-0.5000	800.000	400.000	40.000
irget	Prism	0.1	(m) 98100.0000	(m) 36312.0000	-0.5000	800.000	400.000	40.000
irget	Prism	0.1	(m) 98100.0000	(m) 36312.0000	-0.5000	800.000	400.000	40.000
irget	Prism	0.1	(m) 98100.0000	(m) 36312.0000	-0.5000	800.000	400.000	40.000
arget	Prism	0.1	(m) 98100.0000	(m) 36312.0000	-0.5000	800.000	400.000	40.000

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 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

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5. Check model and create plots

Magnetic 3D Inversio	on				
- Selected dataset(s) to d	o inversion				Inversion Method
# Da 1 dumontgr	taset d_m2Meas	Survey Total Field Surface	Project Case_Study_Mag	<u>A</u> dd <u>W</u> eights	Linear Fast CG (Matrix) Linear Slow CG Non-Linear CG
Inclination	Component List	Survey area in	formation	<u>R</u> emove	Inversion Parameters
82	# Receive	r Item		Value	🔽 Use Initial Model
Declination	☑ 1 Bt	Center X (m) Center Y (m) Size X (m) Size Y (m)		98300.0000 36512.5000 1075.000 2000.000	Set Initial Model
Intensity 58157		Horizontal Ar Average Dist Average Dist	ngle (Degree) ance Between Lines (m) ance Between Locations (m)	90.000 100.000 12.599	Use known geological structure
Set Intensity	Coefficient settin	gs	Select Survey Area	a	Set Structure
- Search Volume					Use topography information
Center X (m) 98300	.000001639 C	enter Y (m) 36512.499	397814 Top Z (m)	0	Remove Grid Cells
Size X (m) 1200	s	, ize Y (m) 2400	Thickness (m)	581.25	Distance (m)
Horizontal Angle (degre					Inversion Message
Anti-clockwise from Ea	st 90	Selec	t Search Area	Cell Sampling	Prepare data Start inversion.
Cells in X	Cells in Y	30 Cells in	Z 5 To	tal 16650	# Grid Cells 16650 Getting Initial Model
Spacing Z direction	O A O A	2 ⁱ⁺¹ Ο Δ _i De	fine Top cell thickr	ness (m) 18.75	
Set Output Li	og File Name	Ge	t Settings From a Log File		Initial model misfit
Progress					
Г	Close application when it completes	nversion	In	<u>C</u> ancel	<u>H</u> elp

12/13/2022 After settings are done, press **<u>R</u>un** button to start the inversion process.

Magnetic Inverse 26

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

Executing the Inversion

					Linear Fast CG (Matrix)	
_#	Dataset umontgrd_m2Meas T	Survey	Project Case_Study_Mag	Add Weights Bernove	Linear Slow CG Non-Linear CG Inversion Parameters	
Inclination 82 Declination -32 Intensity 58157	Component List # Receiver 1 Bt	Survey area info Item Center X (m) Center Y (m) Size X (m) Size Y (m) Horizontal Ang Average Distar Average Distar	rmation c c (Degree) cce Between Lines (m) ice Between Locations (m)	Value 18300,0000 18512,5000 1075,000 2000,000 90,000 100,000 12,599	Use Initial Model Set Initial Model Use known geological structure Set Structure	
Set Intensi earch Volume Center X (m)	Coefficient setting 98300.000001639 Ce	enter Y (m) 36512.49999	Select Survey Area		Use topography information Remove Grid Cells Distance (m) 87.5	The right window (in white) shows each data point's
size X (m) Horizontal Angl Anti-clockwise Grid Settings – Cells in X	Ir cells in Y	Select :	Finickness (m)	1 Sampling	Inversion Message Least Squares Misfit 48.3700 Iteration 6 Data Misfit 84,12% Least Squares Misfit 39.7569 Iteration 7 Data Misfit 80.25%	progress.
Spacing Z dire	ection O A O A2	g ^{et} [©] Δ _i Defin Get (Top cell thickness (m) 18.75	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%	The "Progress" bas shows the total progress of this

- 1. Import data
- 2. Examine data
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Surveys in Project Projects in Database -Survey Total Field Surface Gravity ٠ GeonicsFixedLoop MegaTEM Az Survey VTEM AeroTem Copy Compensation Airborne EM data Gravity Borehole Mag Data Sets in Survey TEM stepprocessing Case Study Mag Data Set dumontgrd_m2Meas ip example perm_fix mag_airborne Domain 1 Model Mag3DInv FastCG Project ID: Date Created: 3/11/2004 Data Set Project Name: Model Na Case_Study_Mag

Our 3D gravity inversion model dataset

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.

Magnetic Inverse 28



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

🔈 Data Processing Select a processing tool from a list **3D Inversion Model Processing 3D Inversion Model Processing** Average Duplicates Convert Units Coordinate System Translate and Rotate Data Decimation Data Interpolation Data Outlier Removal Diurnal Correction Export Depth Slices from Inversion Model Extract Survey 3D Inversio × Filters Gradient Rem Line Length Ca Profile Mergin Cell Removal Set No-Data V C Cell Adjustment -Impedance Data S C Apply for all c 0K Cancel C Apply for Imp Select Exit Help

Click "Apply" button when it is done

Therefore, users can reduce the range of model either before inversion (by Select Search Area) or after 12/13/2022 inversion (by Cell Removal)

Inversion Evaluation



X

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) /

Model: FastCG_12471		Data Set	ID: 859
		Distribution of Values	
II. (0. II. 12471		-0.201 -> -0/121:	0.0400%
# of Cells 12471		-0.121 -> 0.040:	0.5292%
Minimum -0.2 k	<(SI)	-0.040 > 0.040:	97.9552%
		0.040 -> 0.121:	1.2348%
Maximum 0.2 k	<(SI)	0.121 -> 0.201:	0.2405%
	 Remove cells in 	this range:	



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

Inversion Evaluation

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



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Magnetic Inverse 31

- 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.

Magnetic Inverse

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- 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.

Magnetic Inverse

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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.

Magnetic Inverse

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.oad Data Set					×
?	Do you want to	compare with oth	er Data Sets?		
Yes	No	Load Settings	Cancel	Help	

Select "Yes", when this dialog appears

12/13/2022

2. Examine data

3. Perform initial modeling

4. Perform 3D magnetic inversions

5. Check model and create plots

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

Inversion Evaluation

Magnetic Inverse 35

Select the data sets required for comparison and then click "Load"

vey Selection						
roject: Case_Stud	ly_Mag		Surv	vey: Total Field Surface		
ata Sets in Survey	r.	2		Selected Data Sets to	plot:	2
Name	Model Name	Туре	Data Units:	Name	Model Name	Туре
erm_fix 1odel		S S	nTesla	Mag3DInv_FastCG dumontgrd_m2Me	FastCG_12471	S M
			Add to>			
			Add All to>			
			< Remove from			
			C Show IMPEDANCE Data S	ets in Survey		
.oading					La	ad
Loaded	0 of 2				Ca	ncel
Loaded	0 of 2				Ca	nce



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

Inversion Evaluation

Magnetic Inverse 36

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



Mag Response

Select for the 2nd plot on measured data

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

Inversion Evaluation

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.

