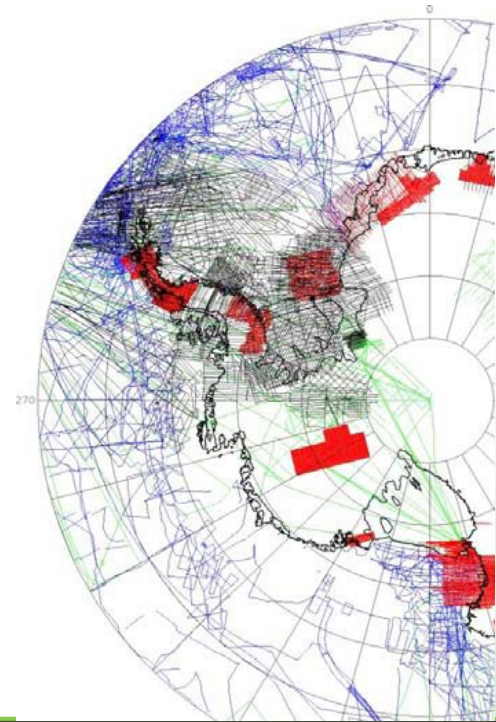


# Processing & Interpretation of Marine UXO Surveys

Nigel Halsall – Geosoft Solutions Consultant



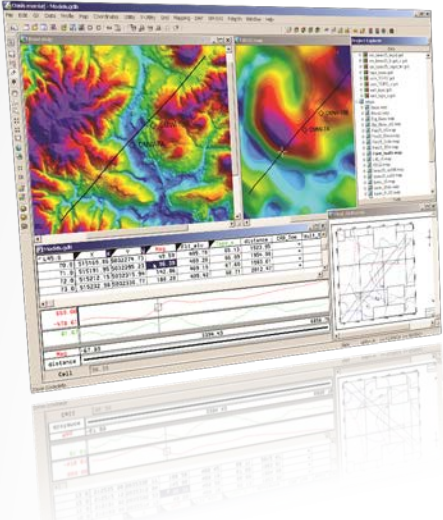
# Geosoft Offices



## Our customers:

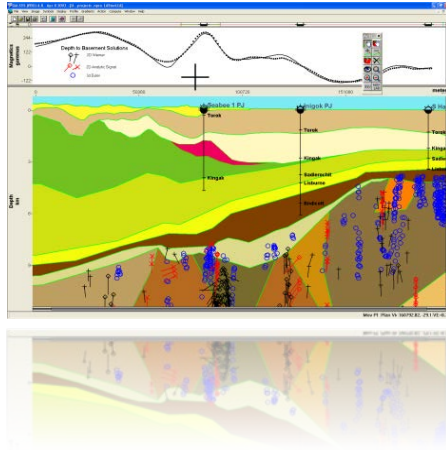
- Mineral exploration
- Oil and gas
- UXO
- Environmental, others
- 5000+ clients
- 250+ UXO clients

# Wide range of gravity and magnetic mapping, modelling and interpretation solutions.



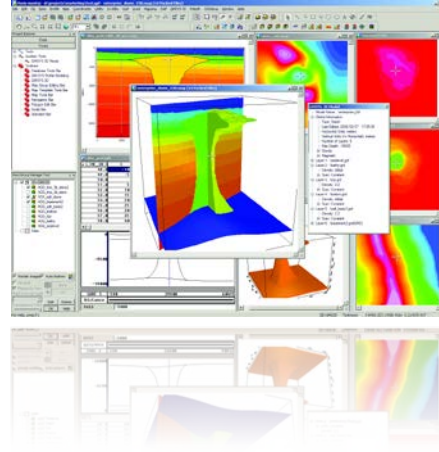
 **GEOSOF**  
**Oasis montaj**

Gravity and magnetic  
mapping and processing



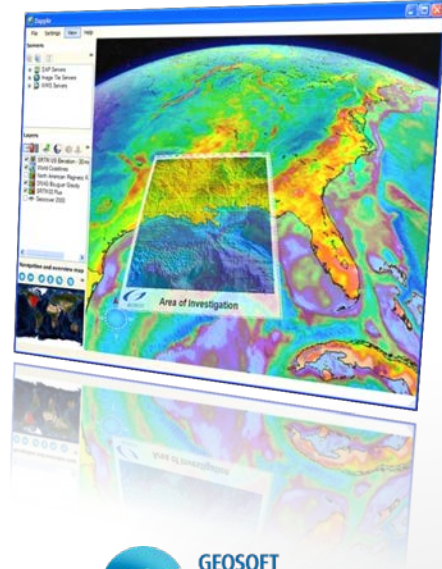
 **GEOSOF**  
**GM-SYS Profile**

Modelling and  
interpretation



 **GEOSOF**  
**GM-SYS 3D**

3D modeling and  
interpretation

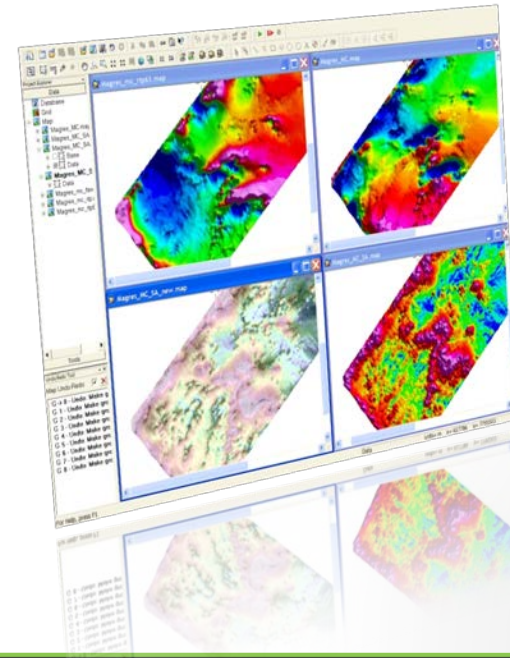


 **GEOSOF**  
**DAP**

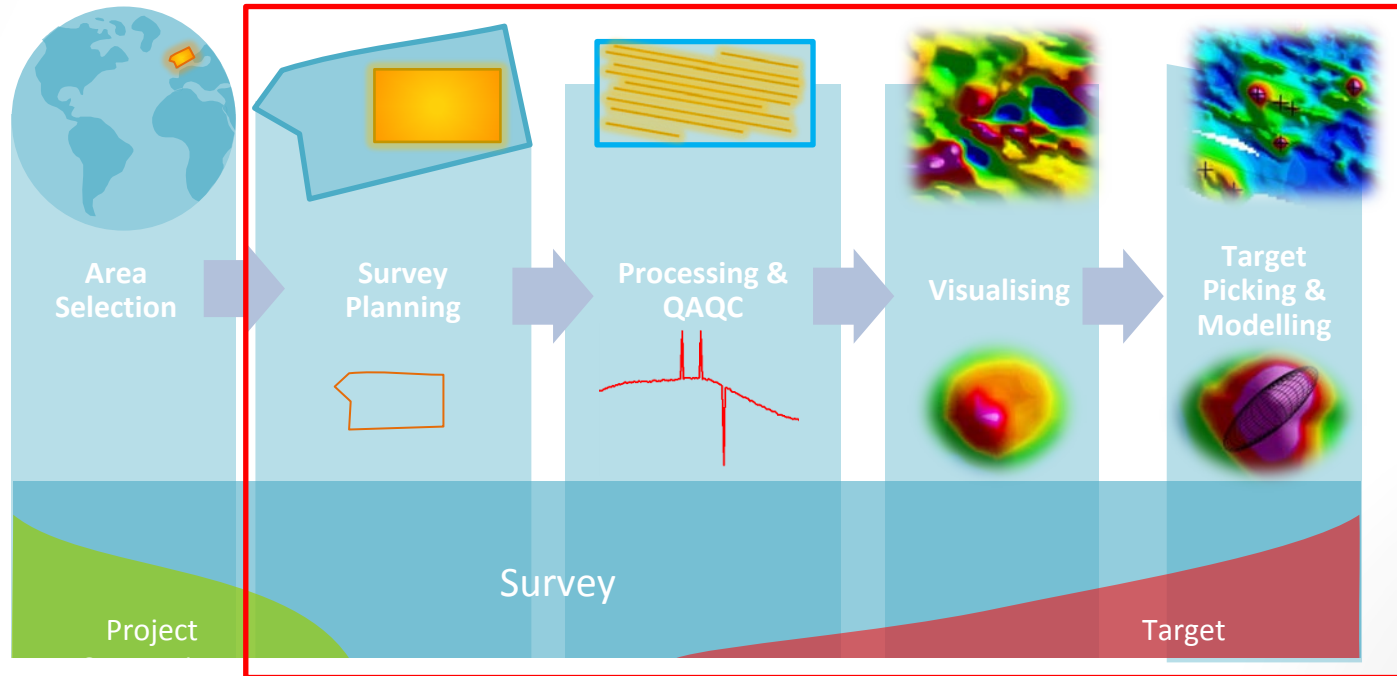
Data management

# Agenda

- Geosoft Software
- Processing Marine Magnetic Data in Geosoft
- Planning Challenges
- Data Processing Challenges
- Target Picking Challenges
- Depth Estimations & Modelling



# Processing Marine Magnetic Data in Geosoft



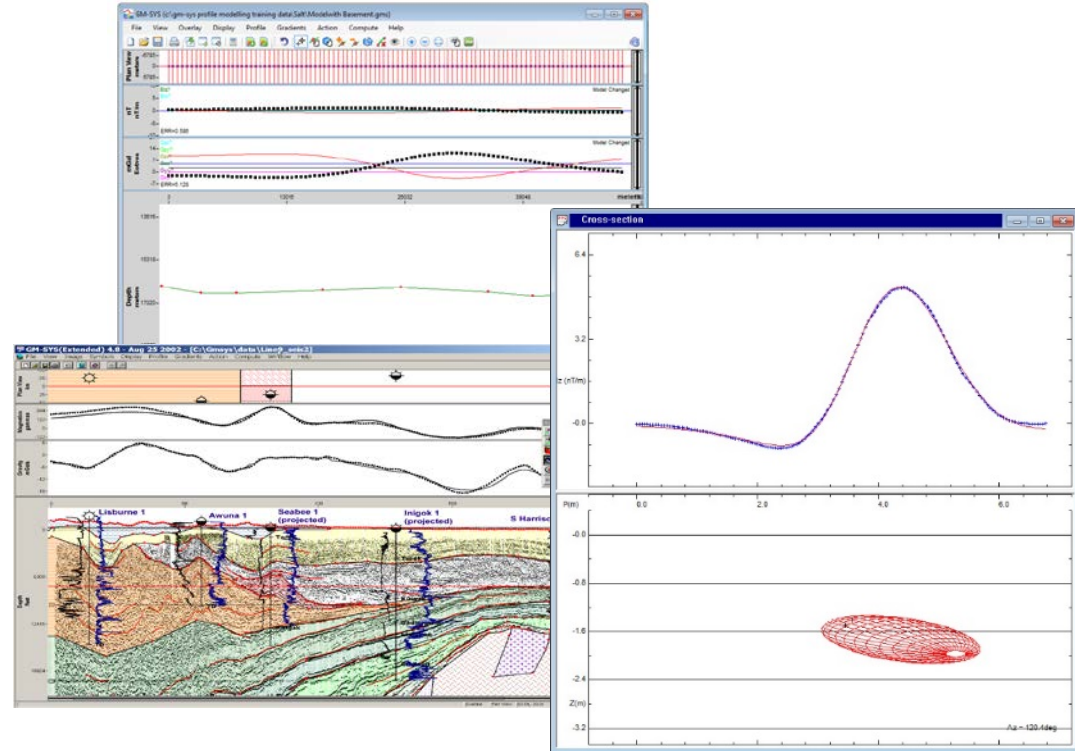
The exploration process starts with a large area and with each step we add new information, helping identify potential target locations.

# Planning Challenges

Q) Is my survey design optimal?

Q) What am I looking for?

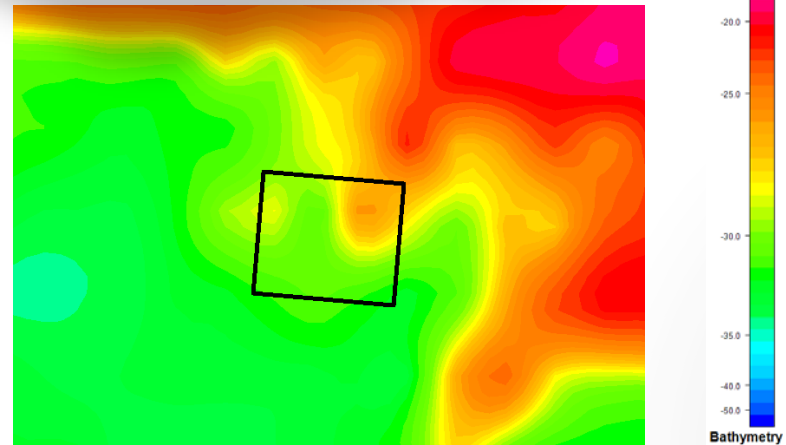
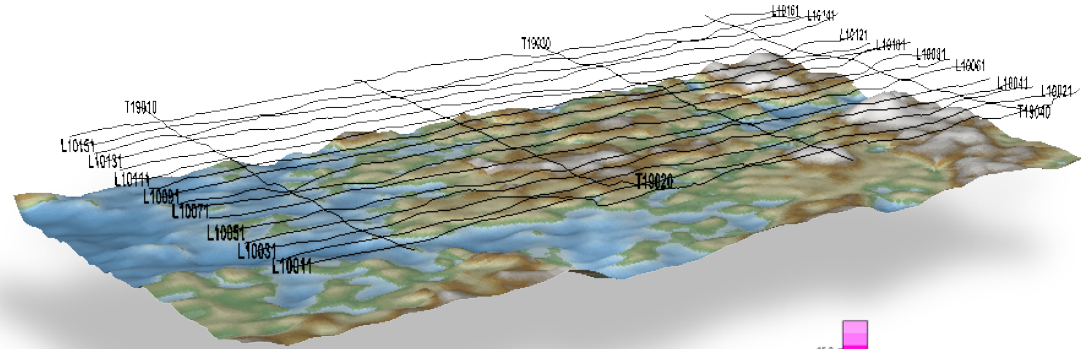
- Forward Modelling
- PotentQ
  - Ellipsoid Target
- GM-SYS
  - Layered Model Building, 2D & 3D





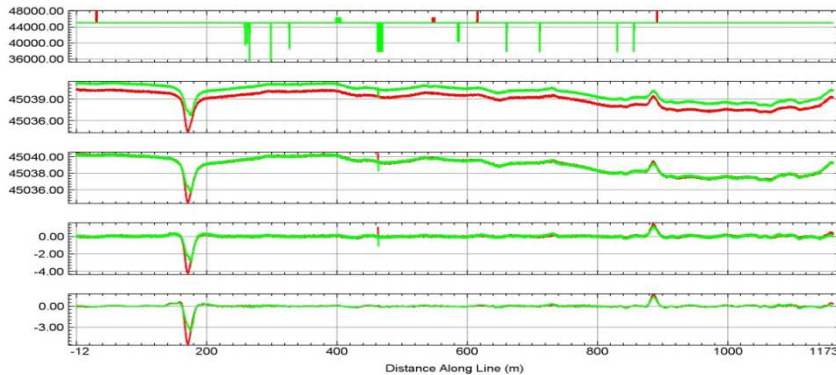
# Planning

- Airborne Planning Tools
  - Design Survey
  - Altitude Drap
  - Deposit Response



# Processing Challenges

- How can I correct my navigation...
- I have unwanted noise spikes...
- How can I compare multiple sensors...
- My survey has a noisy Background...
  - Geology, Structures, Utilities
- Sensor altitudes influence my magnetics...



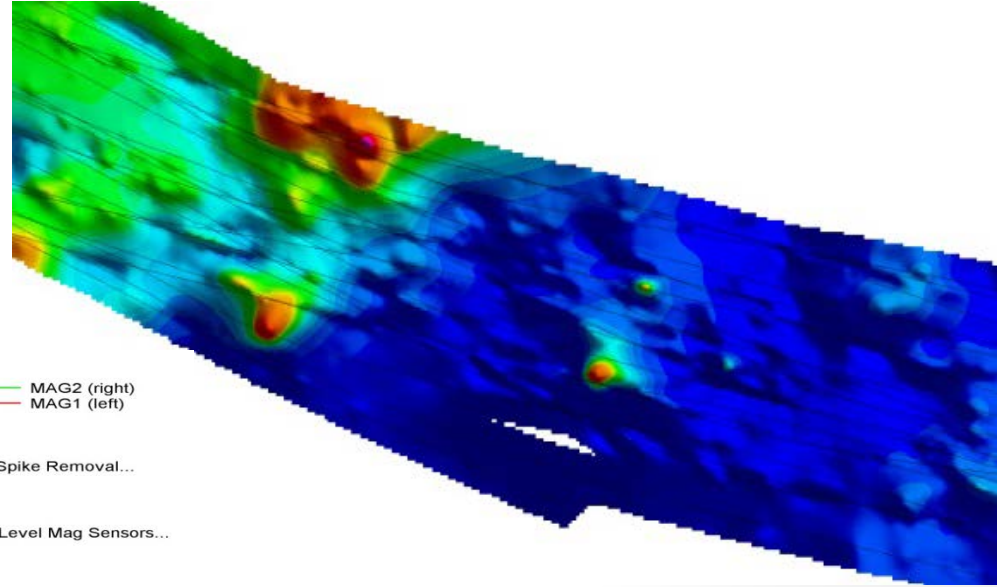
MAG2 (right)  
MAG1 (left)

Spike Removal...

Level Mag Sensors...

Background Removal

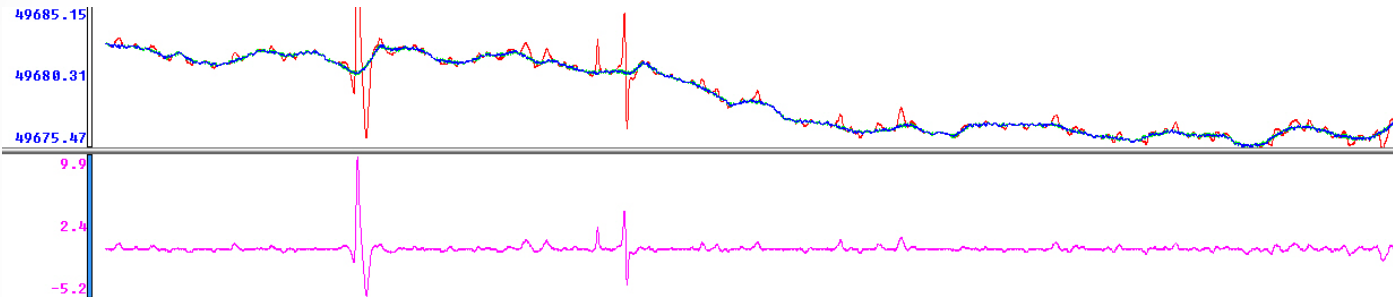
Altitude Corrections...





# Background Removal

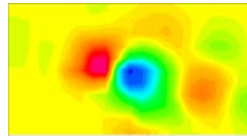
- Diurnal Drift, Geology & Heading
  - Removed as part of background
- Instrument Latency, Lag, Path and Sensor Corrections
  - optional steps if corrections have not applied during survey



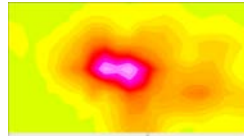
- ❖ High Pass
- ❖ Low Pass
- ❖ Band Pass
- ❖ Non-Linear
- ❖ Convolution
- ❖ Rolling Statistics
- ❖ Polynomial
- ❖ B-Spline

# Analytical Signal

With anomaly complexities to consider, shape, orientation, magnetization.  
We can simplify a complex signal using Analytical Signal



Total Field



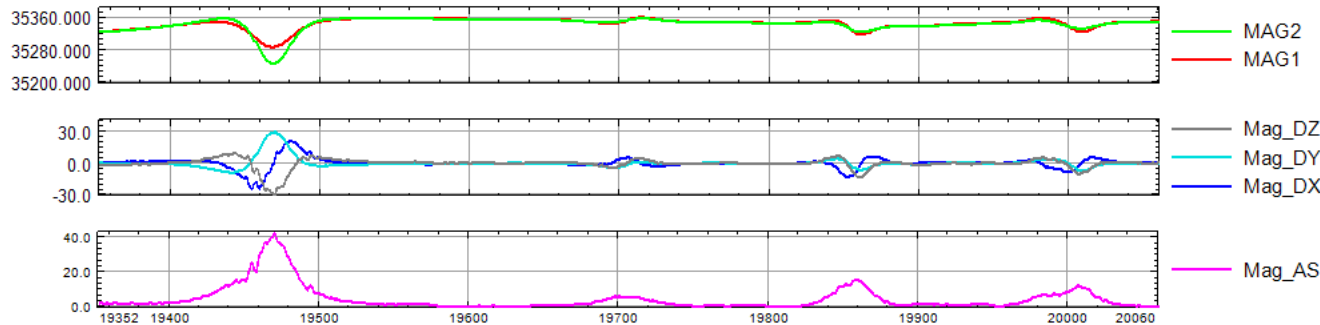
Analytical Signal

$$|A(x, y)| = \sqrt{\left(\frac{dT}{dx}\right)^2 + \left(\frac{dT}{dy}\right)^2 + \left(\frac{dT}{dz}\right)^2}$$

where:

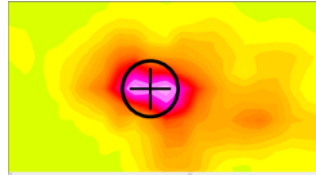
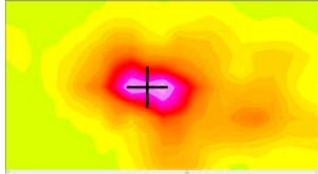
$A(x, y)$  is the amplitude of the analytic signal at  $(x, y)$

$T$  is the observed magnetic field at  $(x, y)$

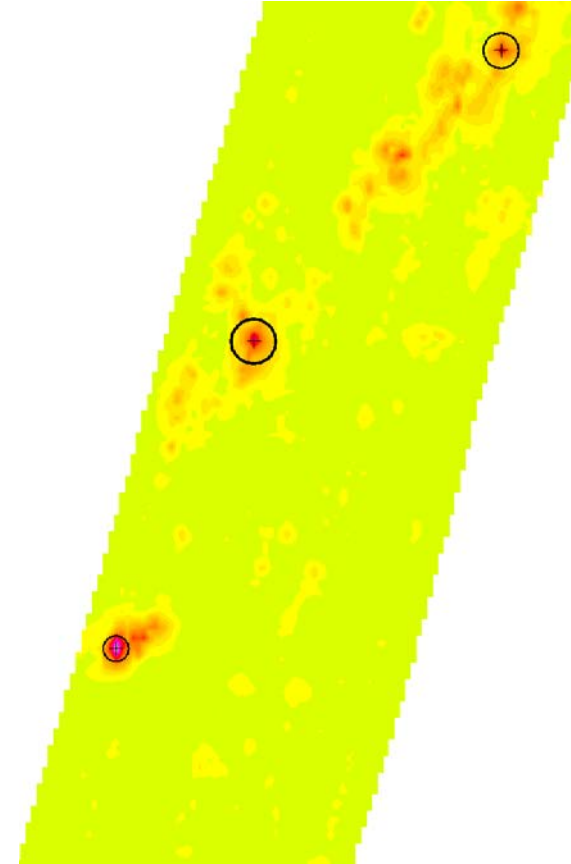


# Automated Target Picking

- Blakely
- Magnetic Sizes
  - Inflection Points

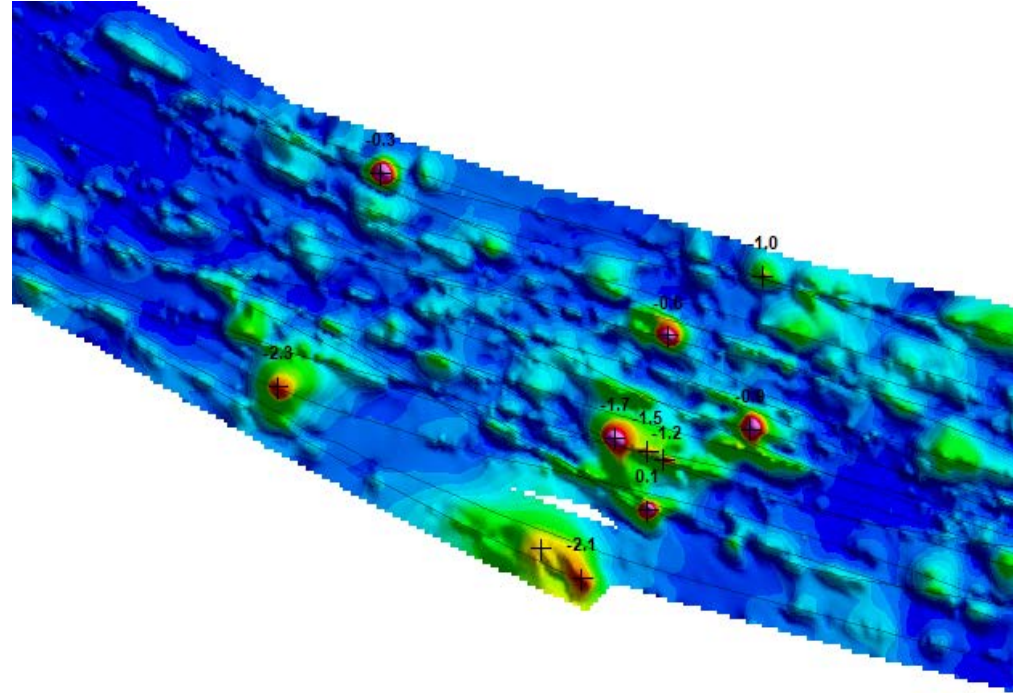
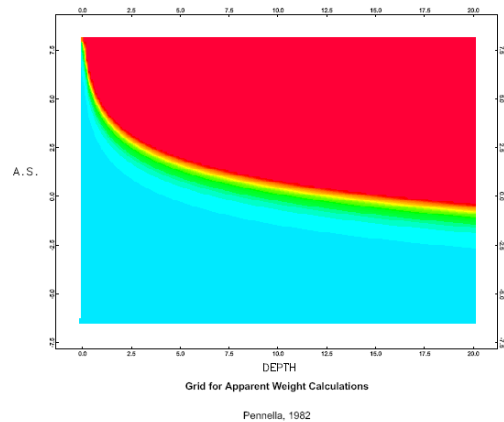


- Database Profile Picking
  - Amplitudes & Anomaly Half-Widths



# Depths – Euler Deconvolution

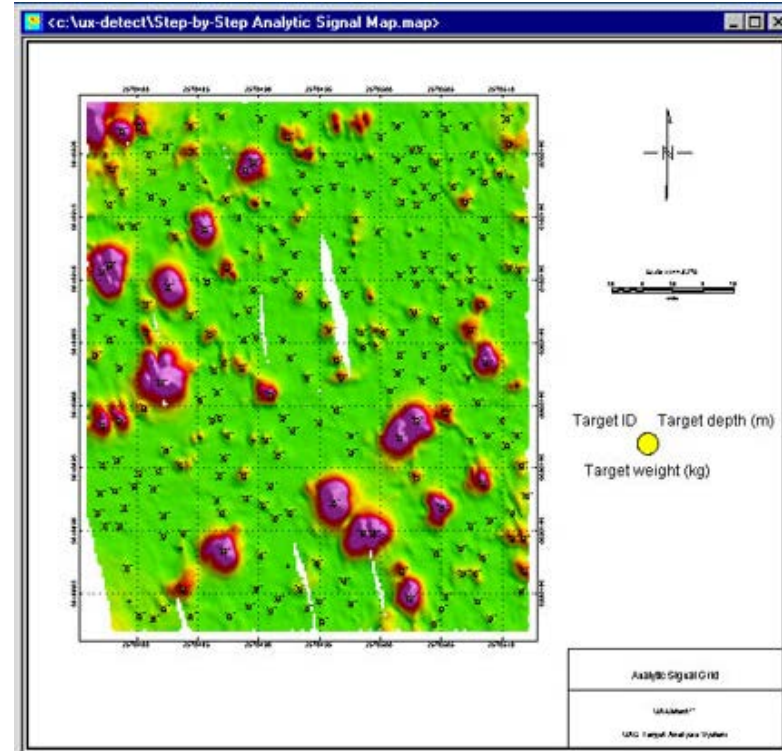
- Use Euler Deconvolution to Calculate Target Depths
- Calculating Weights using Depths
- Panella, 1982 Converted to UXOKG.grd



# Targets Analysis

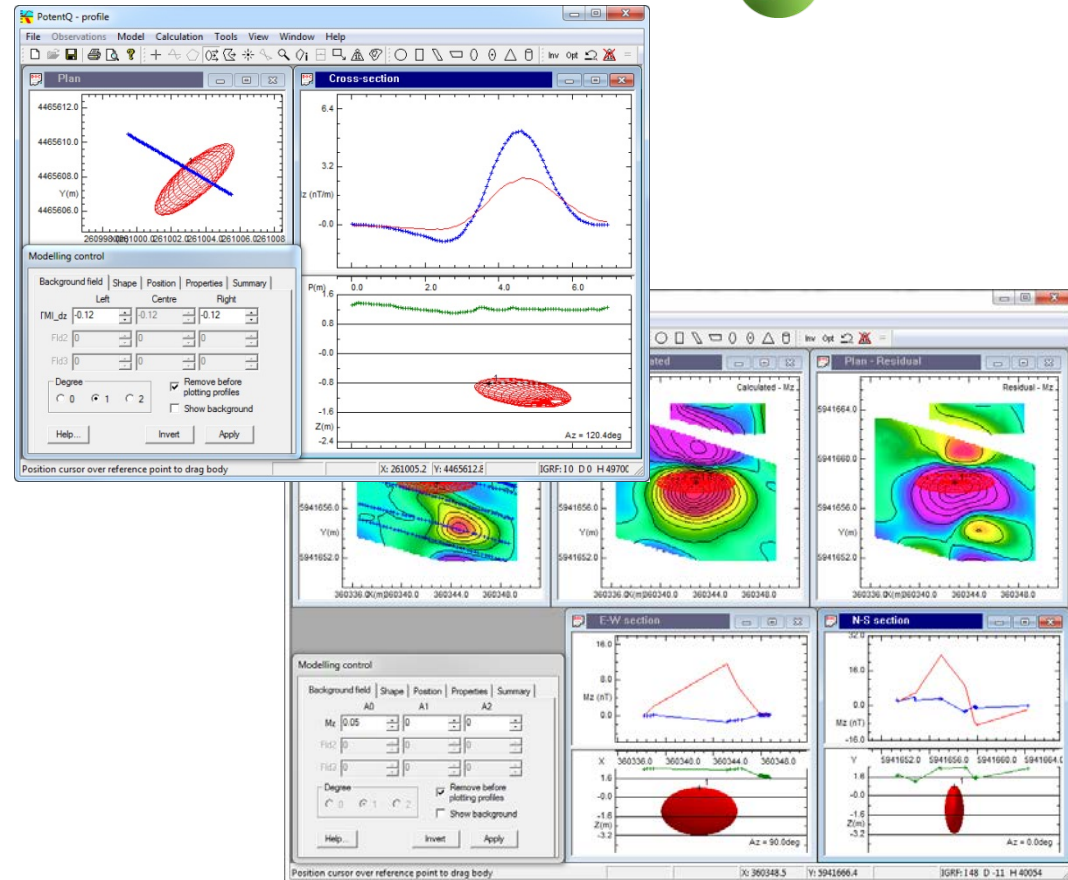
How do I manage my picked targets?

- Refine Lists
- Add Additional Data
  - Utilities (import dxfs)
  - Sidescan (geotiffs/grids)
- Additional Modelling
- Depth Error from Euler



# Modelling Tools

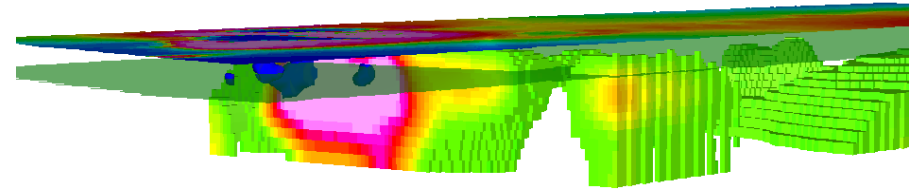
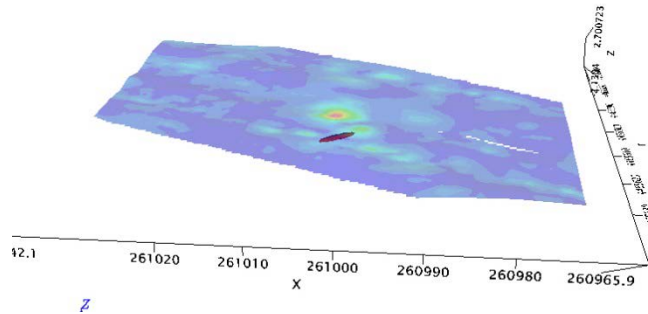
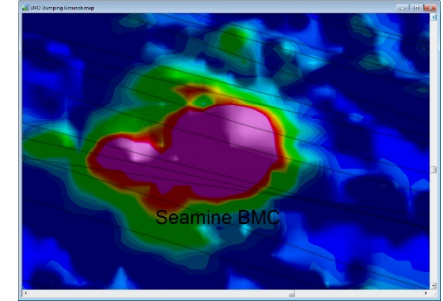
- PotentQ
  - Rapid semi-automatic modelling
  - Forward and Inverse
  - Multiple Datasets
  - Interactive Control





# VOXI Inversion Modelling

- 3D Inversion
- Magnetics, Gravity, & EM
- Outputs 3D Voxels of Susceptibility
- Introduce Constraints
- Shipwrecks?



# Thank you

We love to hear from our customers, so if you have any questions, e-mail us at [explore@geosoft.com](mailto:explore@geosoft.com) or visit [www.geosoft.com](http://www.geosoft.com).

