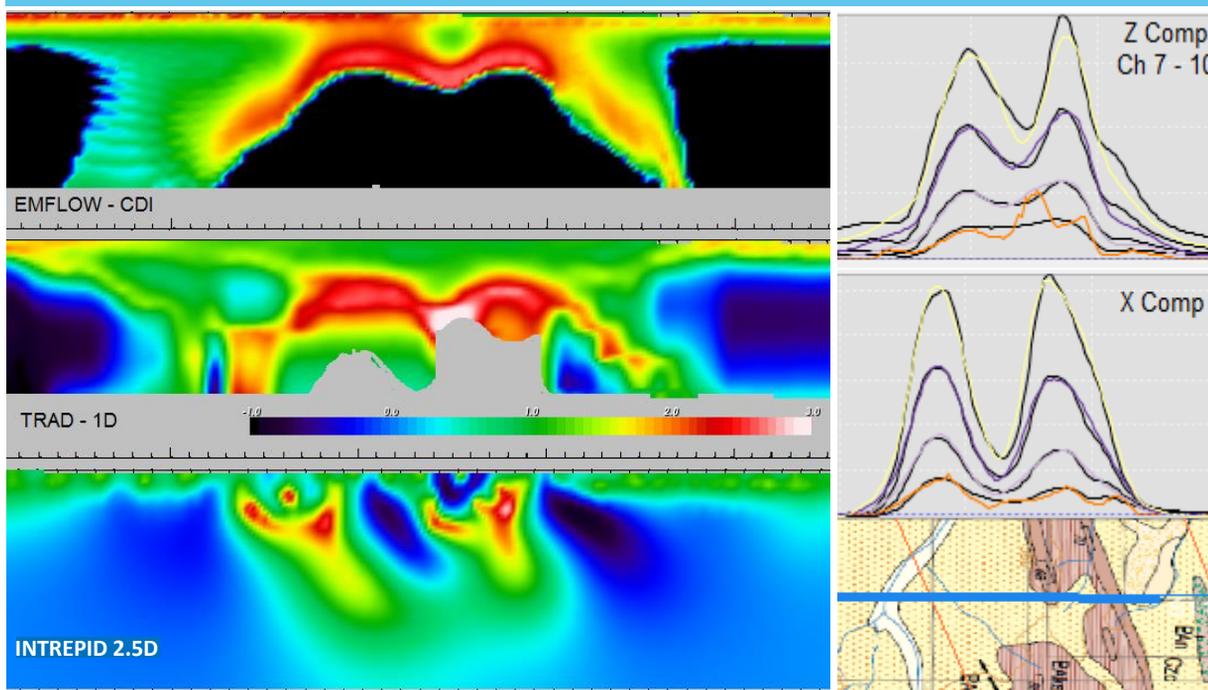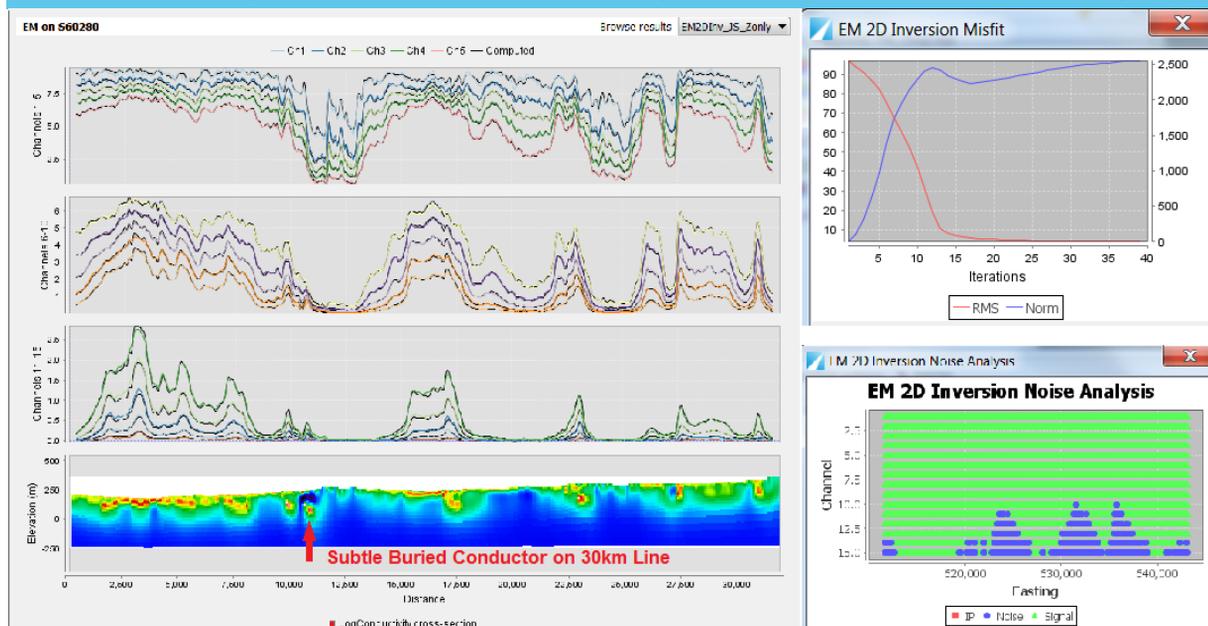# Intrepid Airborne EM 2.5D Inversion

Intrepid Geophysics is proud to launch a new 2.5D Airborne EM inversion service, allowing improved levels of geological insight from new and existing Airborne EM surveys.

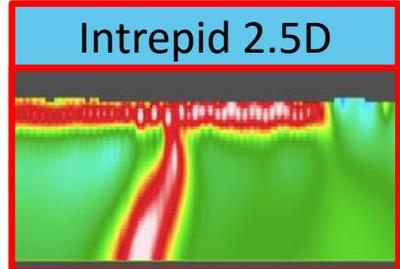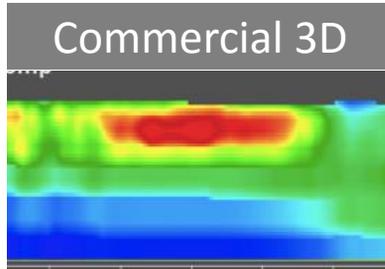## Improve Geological Mapping (Folded Shale Horizon)

Locate Deep Anomalies at Survey Scale (30km line example)
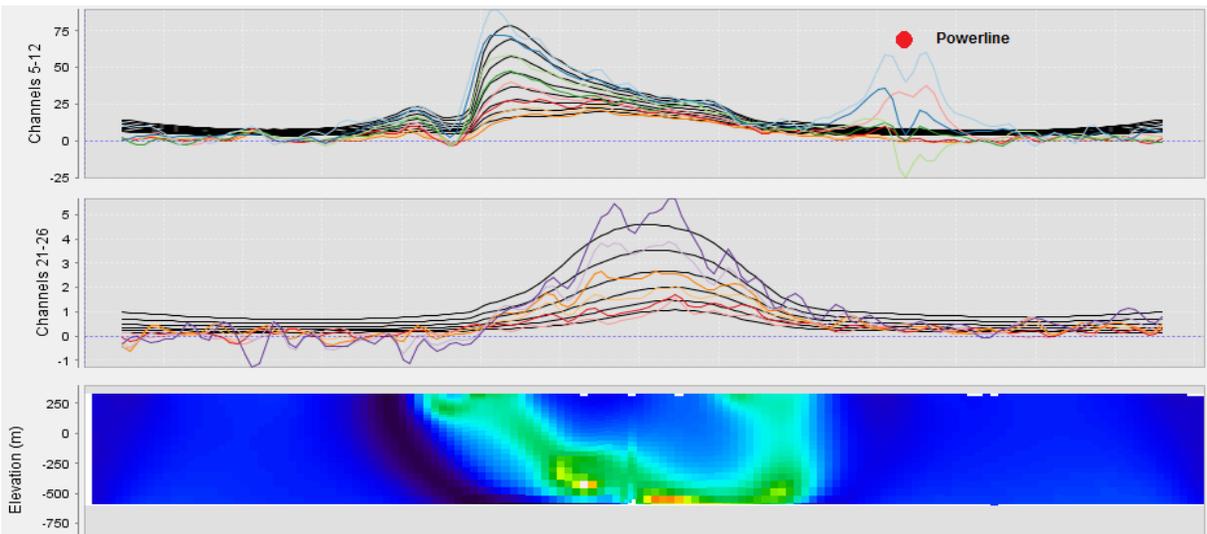
Intrepid Airborne EM 2.5D Inversion

Steeply Dipping Targets

Traditional 1D

Commercial 3D

Intrepid 2.5D

Deep Targets (Syncline at 700m+)

2.5D Conductivity Sections with Drill Holes

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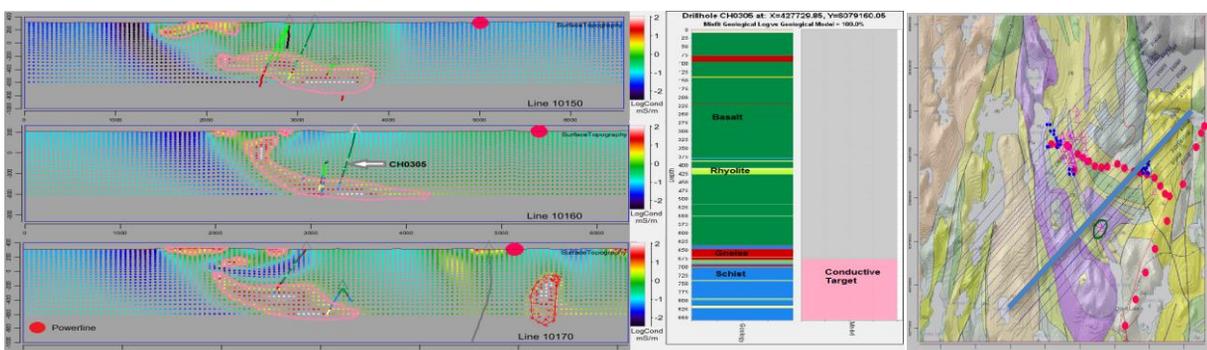
Intrepid Airborne EM 2.5D Inversion

What is it?

Our 2.5D inversion algorithm assumes 2D geology and a 3D source (hence "2.5D"). This provides more "geologically reasonable" inversions compared with most methods available today and provides the geologist a much more useful starting point for geological modelling.

Where is it useful?

The approach we take is most useful where the survey is flown across strike and there is geological complexity (folding, faulting, intrusions etc). For predominantly 1D geology our 2.5D inversion can still enhance detail with fewer artifacts than most 1D inversions and may resolve deeper features by virtue of its high sensitivity inversion solver.

Sample applications include:
- Paleochannel mapping
- Aquifer modelling
- Mineral exploration

Why is it different?

- Superior imaging of 2D geology
- Unique approach to extracting anomalies at depth
- Very efficient, so can be applied for entire surveys
- High resolution
- Inversion quality parameters – residuals and noise assessment
- Low cost way to extract more geological insight from new and existing datasets
- Optional ability to provide geological constraints as an input

How does the service work?

You provide the data from the Airborne EM contractor and we invert it using our state of the art 2.5D inversion algorithms on our hardware. We then provide you with digital datasets of the inverted data, the forward modelled profiles and noise assessment (so that you can assess the quality of the inversion).

There are very few additional inputs required. You can optionally provide geological constraints, but generally we start with a half space resistivity derived from a fast initial apparent resistivity estimate.

We are currently equipped to handle several thousand line km of data per day so turnaround on all but the biggest jobs is quite quick provided we have good quality input data.

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Intrepid Airborne EM 2.5D Inversion FAQs

Q: What systems do you support?

A: In general, we support any time or frequency domain system provided we have a documented system configuration. For systems we haven't yet encountered there may be a small additional setup fee. We have processed data from the following systems/contractors to date:

- SkyTEM
- VTEM
- DigHEM/RESOLVE
- SPECTREM
- HeliGEOTEM
- AEROTEM
- TEMPEST
- GEOTEM
- NRG XCite

Q: What data do I need to provide?

A: We need the database from the contractor (Geosoft gdb or Ascii line xyz or ASEG GDF) and the following details typically provided in the contractor's report:

- Database field descriptions
- Transmitter waveform and frequency, ontime/offtime
- Peak moment (NIA)
- Receiver gate times (actual measurement times – start/end or centre/width)
- Receiver filter specifications if applied i.e. SkyTEM
- System geometry and details of any applied corrections
- DTM and Laser transmitter clearance where possible

Q: What outputs do you provide?

A: By default, we will provide:

- 3D finite element point meshes (csv) and images of log conductivity (geotiff, png)
- Predicted line data in Geosoft gdb, ASCII csv or ASEG-GDF format
- Report describing inversion and mesh setup parameters
- Quality of inversion data, including:
    - Original vs. predicted (modelled) data
    - Misfit and Model Norm evolution graph
    - Time gate noise thresholds (csv) and data clip plot for each 5km line segment
    - Inversions on closely spaced lines can be interpolated to 3D voxet using kriging methods
- Licensed users of GeoModeller can receive results in project form

We can provide other outputs if required.

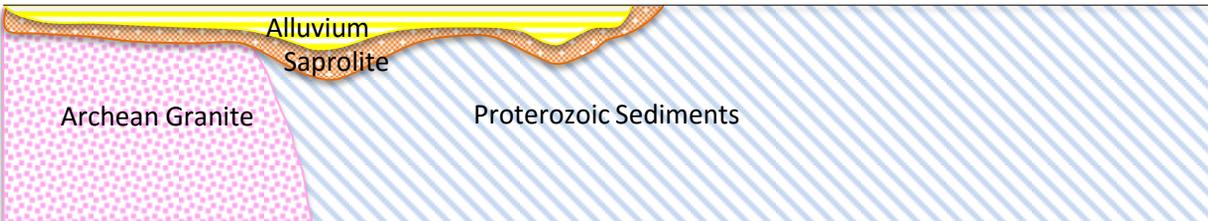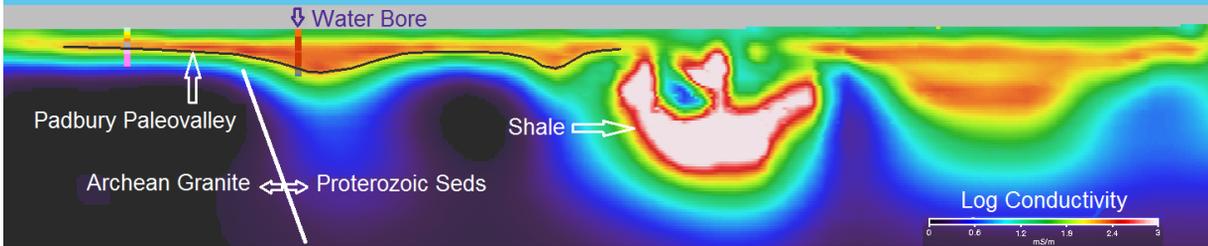**Q: How big a dataset can you process?**

A: We have carefully designed and optimised the algorithm to allow survey scale processing (tens of thousands of line km) at high resolution. The inversion processing time scales linearly with line length and processing workload can easily be shared across many CPUs and servers.

Q: How long does it take to process?

A: We aim to turnaround 500-1000km per day per client with typically a day or so of setup time at the beginning and QC at the end of the job. We are happy to provide interim results if required.

Intrepid Airborne EM 2.5D Inversion

Managing Water Resources

Water Bore

Padbury Paleovalley

Shale

Archean Granite ⟷ Proterozoic Seds

Log Conductivity

Alluvium
Saprolite

Archean Granite

Proterozoic Sediments

Managing Water Resources – Fine Detail & Faults

2.5D Inversion

fault

Log Conductivity   mS/m

1D Inversion

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