

# ASEG 3D IP WORKSHOP

AUGUST 2016

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Resource Potentials

# Softwares Used

- **TQIPdB**, produced by Scientific Computing and Applications (John Paine), to edit the data and export it to UBC 3D format for inversion.
- **UBC 3DIP** inversion code.
- **3D Modeller – 3D Viewer** and Pitney Bowes Encom **Profile Analyst** for 3D visualisation of the results.

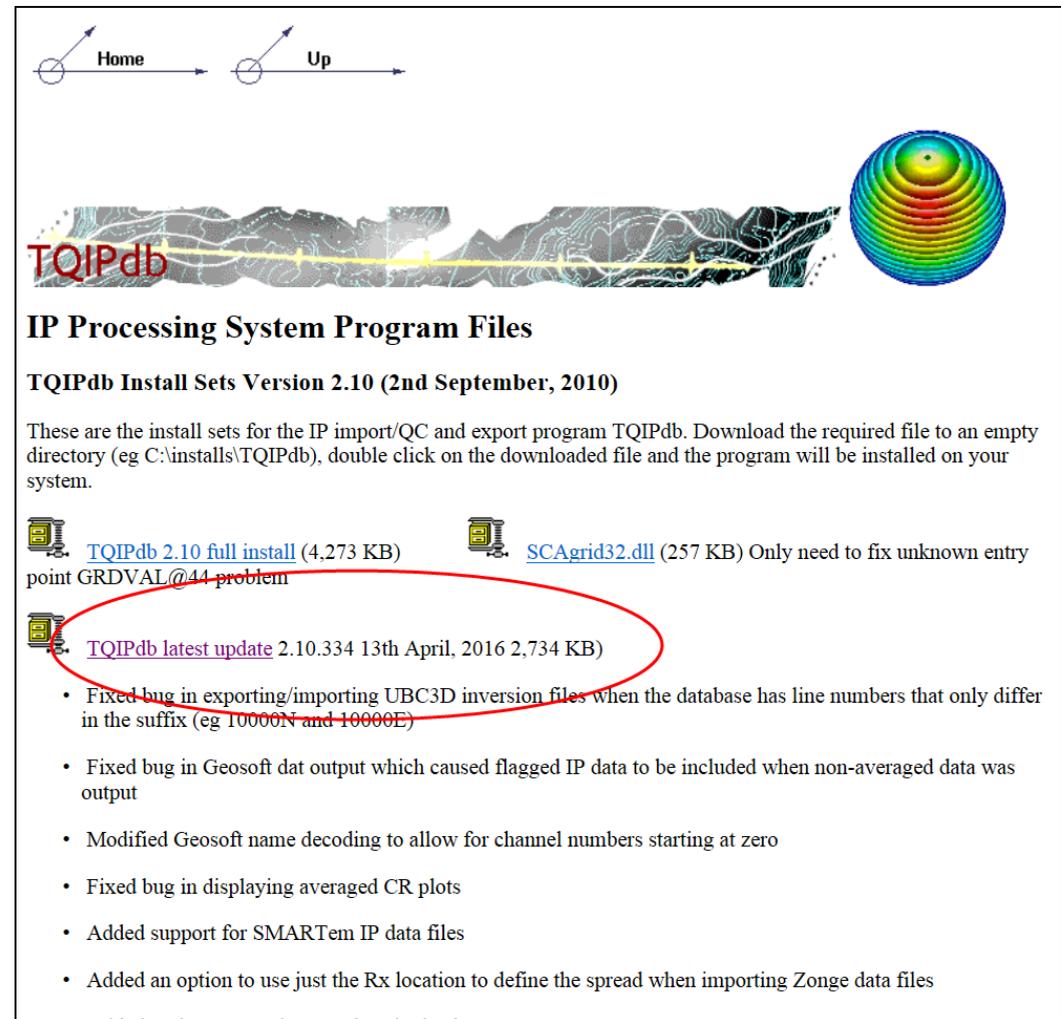
# Installed the latest version of TQIPdB

The software is updated regularly, so you need to constantly check the website for updates.

I check every time I start a job, and an update is usually available each time.

I really like this program, and that updates are made available soon after an issue is raised.

It was in about mid April that I first got a chance to have a look at the IP data.



The screenshot shows the TQIPdb website interface. At the top, there are navigation links for 'Home' and 'Up'. Below these is a banner image featuring a topographic map with a yellow line and a circular contour plot. The text 'TQIPdb' is overlaid on the map. The main content area is titled 'IP Processing System Program Files' and 'TQIPdb Install Sets Version 2.10 (2nd September, 2010)'. It contains a paragraph of instructions and a list of download links. The link for 'TQIPdb latest update 2.10.334 13th April, 2016 2,734 KB)' is circled in red. Below the links is a bulleted list of update details.

Home Up

TQIPdb

## IP Processing System Program Files

### TQIPdb Install Sets Version 2.10 (2nd September, 2010)

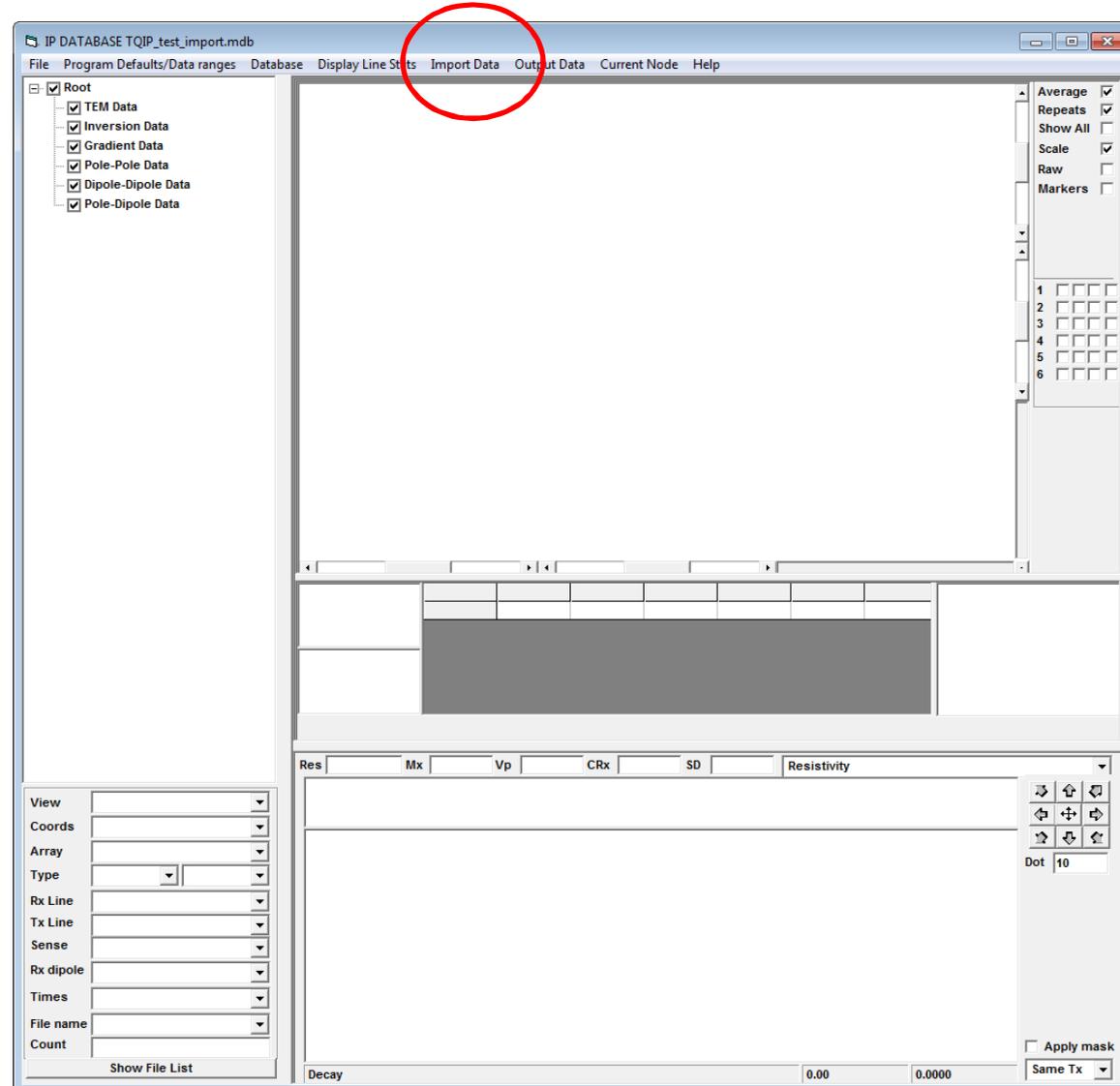
These are the install sets for the IP import/QC and export program TQIPdb. Download the required file to an empty directory (eg C:\installs\TQIPdb), double click on the downloaded file and the program will be installed on your system.

 [TQIPdb 2.10 full install](#) (4,273 KB)  [SCAgrid32.dll](#) (257 KB) Only need to fix unknown entry point GRDVAL@44 problem

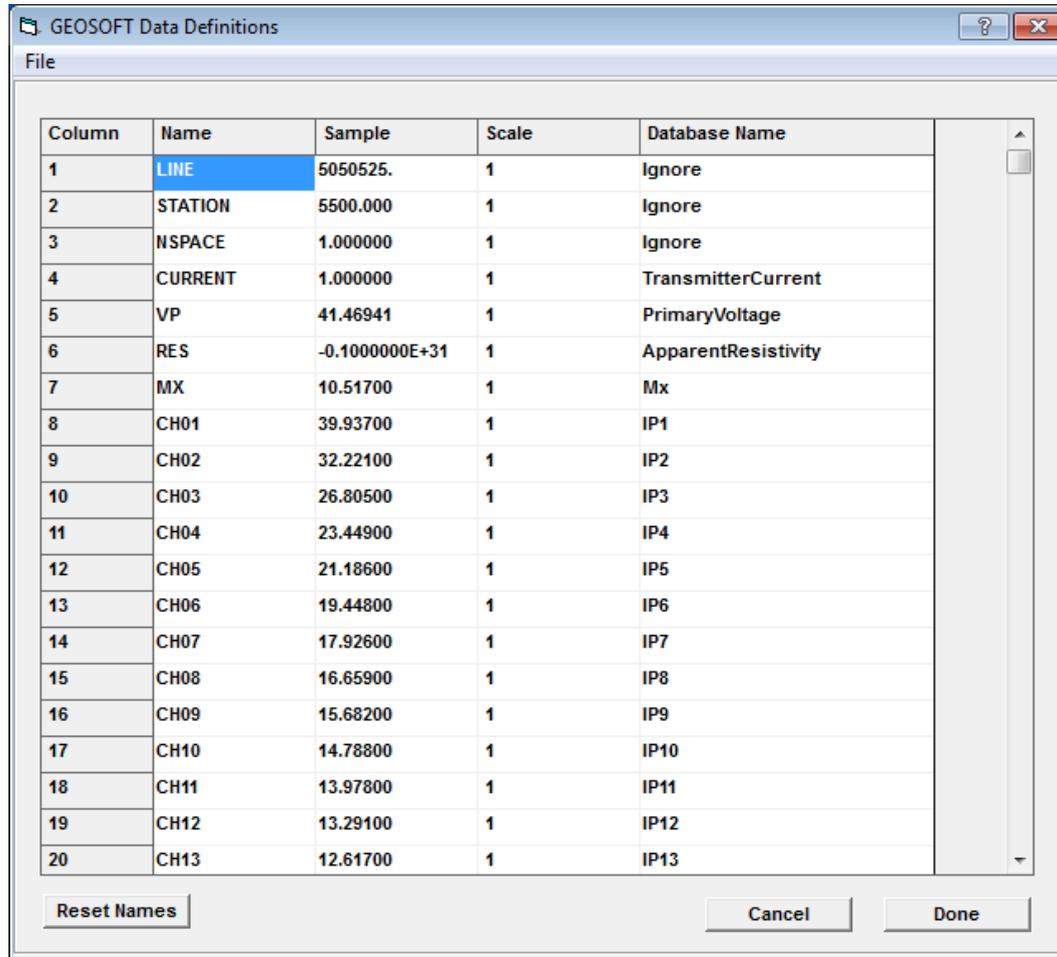
 [TQIPdb latest update](#) 2.10.334 13th April, 2016 2,734 KB)

- Fixed bug in exporting/importing UBC3D inversion files when the database has line numbers that only differ in the suffix (eg T0000N and 10000E)
- Fixed bug in Geosoft dat output which caused flagged IP data to be included when non-averaged data was output
- Modified Geosoft name decoding to allow for channel numbers starting at zero
- Fixed bug in displaying averaged CR plots
- Added support for SMARTem IP data files
- Added an option to use just the Rx location to define the spread when importing Zonge data files

# Imported the DAT file provided into TQIPdB



# Set columns names on import so that TQIPdB can recognise them



Column	Name	Sample	Scale	Database Name
1	LINE	5050525.	1	Ignore
2	STATION	5500.000	1	Ignore
3	NSPACE	1.000000	1	Ignore
4	CURRENT	1.000000	1	TransmitterCurrent
5	VP	41.46941	1	PrimaryVoltage
6	RES	-0.1000000E+31	1	ApparentResistivity
7	MX	10.51700	1	Mx
8	CH01	39.93700	1	IP1
9	CH02	32.22100	1	IP2
10	CH03	26.80500	1	IP3
11	CH04	23.44900	1	IP4
12	CH05	21.18600	1	IP5
13	CH06	19.44800	1	IP6
14	CH07	17.92600	1	IP7
15	CH08	16.65900	1	IP8
16	CH09	15.68200	1	IP9
17	CH10	14.78800	1	IP10
18	CH11	13.97800	1	IP11
19	CH12	13.29100	1	IP12
20	CH13	12.61700	1	IP13

There's often confusion on import due to the different data formats that get output from different IP receivers, and that are provided by the different contractors.

This problem is compounded as, more often than not, I am reviewing a 3D dataset where I didn't have much involvement in the survey design, data QC and monitoring.

Try to keep it simple on the import page –  
always a struggle

Import IP Data file

Scanning : D:\Client\ASEG\_IP\Data from Kim 20151231\Input Data Editing\ASEGWS\_TDIP\_Data EDIT.DAT

Tx_line	Tx2_line	Rx_line	Rx2_line	c1	c2	p1	p2	Vp	T
4450N	11687N	4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1313	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1248	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1474	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1763	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7327	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7233	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7312	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7279	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8055	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8040	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8059	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8086	1000
4450N	11687N	4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9204	1000
4450N	11687N	4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9160	1000
4450N	11687N	4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9139	1000
4450N	11687N	4250N	4250N	4450.0	4670.0	4300.0	4400.0	-19.6496	1000
4450N	11687N	4250N	4250N	4450.0	4670.0	4300.0	4400.0	-19.6452	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9872	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9932	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9905	1000
4450N	11687N	4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9905	1000

Array Type: As Defined in File

Data units: Current in Amp, Voltage in mV

Data Type: Time Domain  Ignore data not of specified type

Scale IP by Vp  Ignore data skipped by operator  Skip = 1

Tx Line Number:

Rx Line Number:

Line Direction: Station is X, Line is Y (EW line)  Select On-time

Oblique line Start station:

Downhole data: Surface data only Tx:  Rx:

Data Names:  Use name lookup Specify Geosoft Data Names

Convert Zonge chargeability values

Swap Elrec coord order  Convert Elrec normalised to raw

Ignore Zonge Tx location  Use Zonge Rx location for spread

Specify Zonge Tx dipole   Ignore Zonge N level test

Data format: Pole-dipole electrodes Gradient array Coordinate scaling

View File Scan File Import Data Export Data

Number of data: 10510 Done

File Name: ASEGWS\_TDIP\_Data EDIT.DAT

→ If in doubt, email John Paine and I usually do.

# Check the calculated AppRes and Mx – compare to values in the raw data file

Import IP Data file

\Data\Data from Kim 20151231\Input Data Editing\ASEGWS\_TDIP\_Data EDIT.DAT

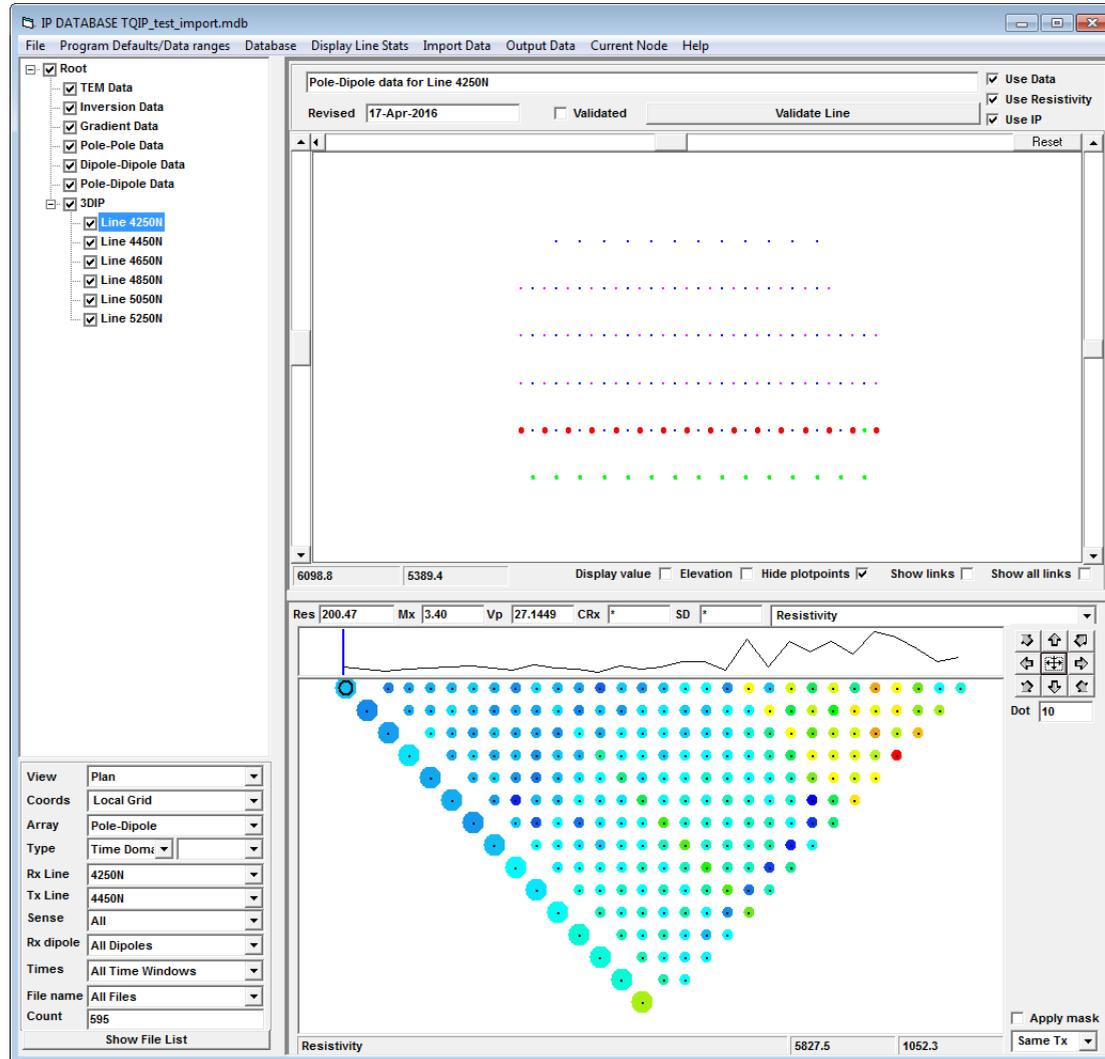
Rx_line	Rx2_line	c1	c2	p1	p2	Vp	TxI	AppRes	Mx
4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1313	1000.0	200.4	3.42
4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1248	1000.0	200.3	3.44
4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1474	1000.0	200.5	3.41
4250N	4250N	4250.0	4670.0	4300.0	4400.0	27.1763	1000.0	200.7	3.33
4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7327	1000.0	98.4	3.61
4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7233	1000.0	98.4	3.60
4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7312	1000.0	98.4	3.66
4250N	4250N	4250.0	4670.0	4400.0	4500.0	13.7279	1000.0	98.4	3.65
4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8055	1000.0	134.9	2.26
4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8040	1000.0	134.9	2.33
4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8059	1000.0	134.9	2.31
4250N	4250N	4250.0	4670.0	4500.0	4600.0	13.8086	1000.0	135.0	2.27
4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9204	1000.0	88.0	0.80
4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9160	1000.0	88.0	0.78
4250N	4250N	4350.0	4670.0	4400.0	4500.0	11.9139	1000.0	88.0	0.77
4250N	4250N	4450.0	4670.0	4300.0	4400.0	-19.6496	1000.0	145.1	7.58
4250N	4250N	4450.0	4670.0	4300.0	4400.0	-19.6452	1000.0	145.1	7.60
4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9872	1000.0	265.1	7.16
4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9932	1000.0	265.2	7.16
4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9905	1000.0	265.2	7.18
4250N	4250N	4250.0	4670.0	4600.0	4700.0	18.9900	1000.0	265.1	7.20

Array Type: As Defined in File  
Data units: Current in Amp, Voltage in mV  
Data Type: Time Domain  
Tx Line Number:   
Rx Line Number:   
Line Direction: Station is X, Line is Y (EW line)  
Downhole data: Surface data only  
Data Names: Use name lookup  
Data format: Pole-dipole electrodes  
Time Windows: ASEG\_3DIP  
Mx Start (ms): 510, Mx End (ms): 2540  
File Name: ASEGWS\_TDIP\_Data EDIT.DAT

# Checking the calculated AppRes and Mx, and making some preliminary observations of the raw data

- The imported resistivity and chargeability values seem OK compared to the raw data file.
- The resistivity ranges between about 40-50 ohm-m at shallow N-levels in the west, up to about 1,500 ohm-m in the east. This is a fairly significant range of resistivity.
- The western part of survey is generally more conductive and eastern part is generally more resistive.
- There doesn't appear to be a highly conductive cover, as the lowest resistivity values in the western part of the survey area seem typical of a weakly to moderately conductive regolith cover.
- There's generally elevated chargeability above 10 msec, and anomalous responses are generally 15-25 msec.
- I would call the background chargeability value about 5 msec, but we just don't see much of it because of the broad zone of elevated chargeability through the centre of the survey area.

# Survey stations seem to be imported into TQIP OK

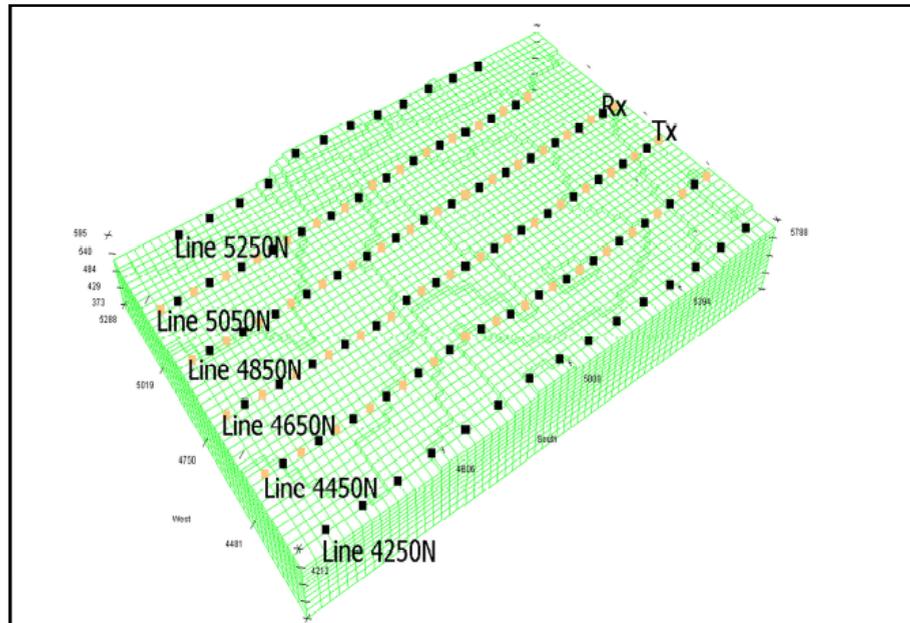


But it's difficult to be totally sure because it's difficult to know which station markers are transmitters or receivers.

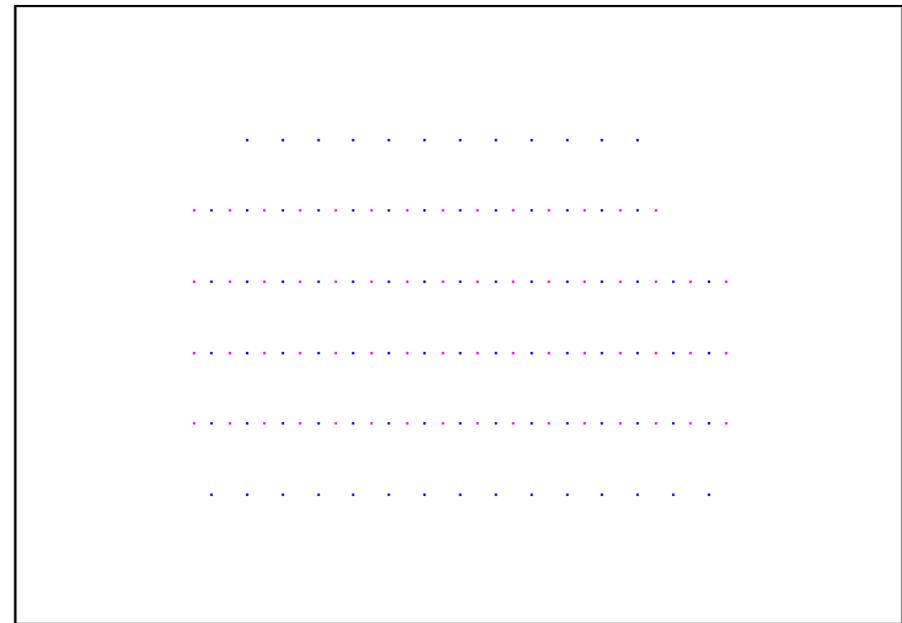
It just takes a bit of time to flick back and forth between the map view and data window to determine if the data has been imported OK.

# Checking Tx-Rx Locations

Location map provided



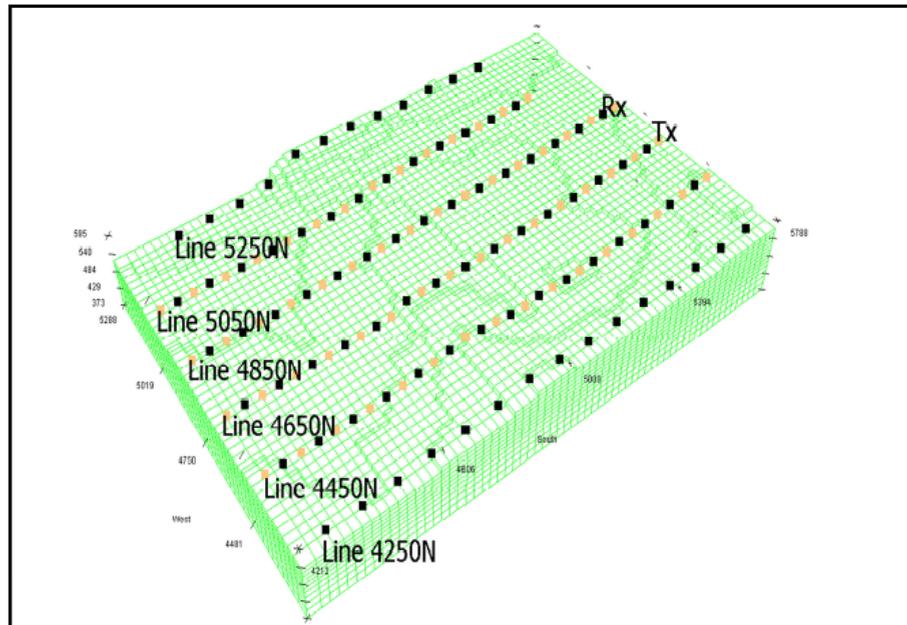
There is a similar pattern in TQIPdB



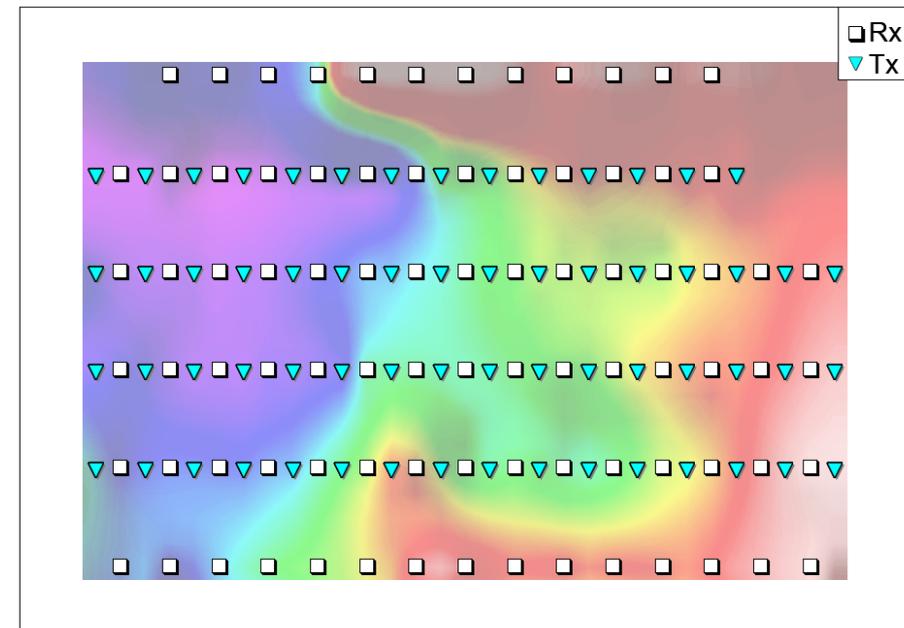
**Tx = transmitter**  
**Rx = receiver**

# Checking Tx-Rx Locations

Location map provided



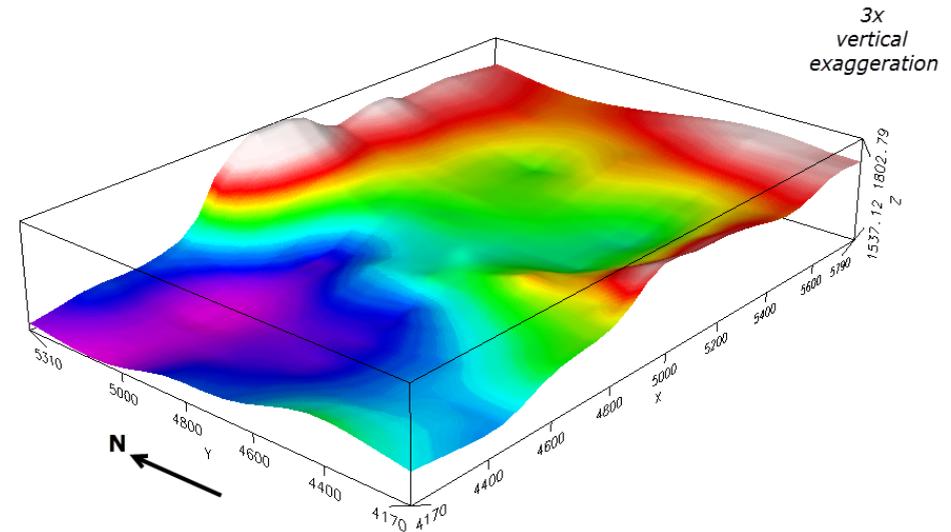
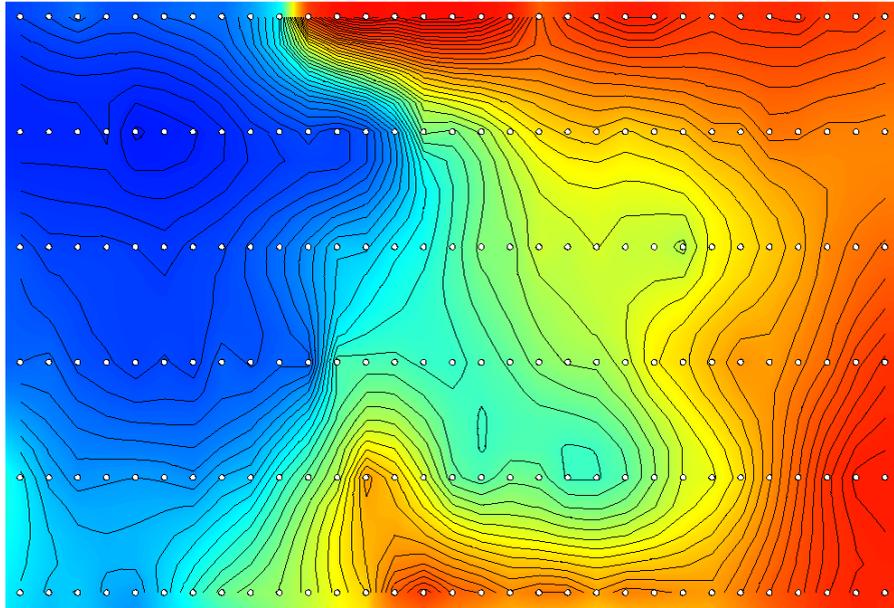
Locations exported from TQIPdB and then overlain on the topo grid



→ 6 receiver lines oriented E-W, with 200m line spacing and 100m station spacing.

→ Therefore, we might expect some generally N-S oriented model sources in the chargeability and resistivity inversion results.

# Checking supplied topo grid - looks OK

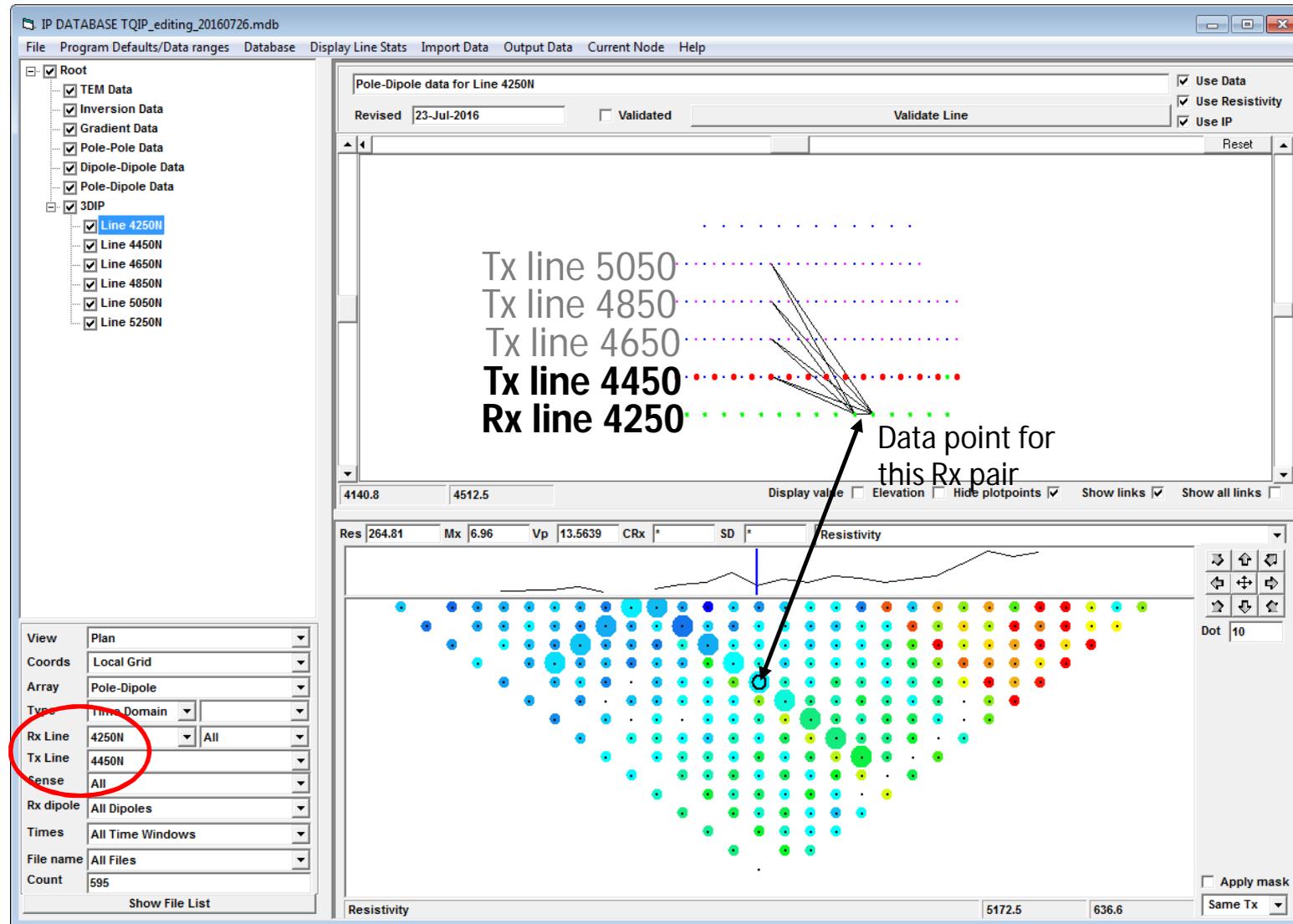


- Topo ranges from 510m in the west, to 595m in the east, a range of 85m.
- The topographic variation is not too severe.
- Just wonder where it is (?)

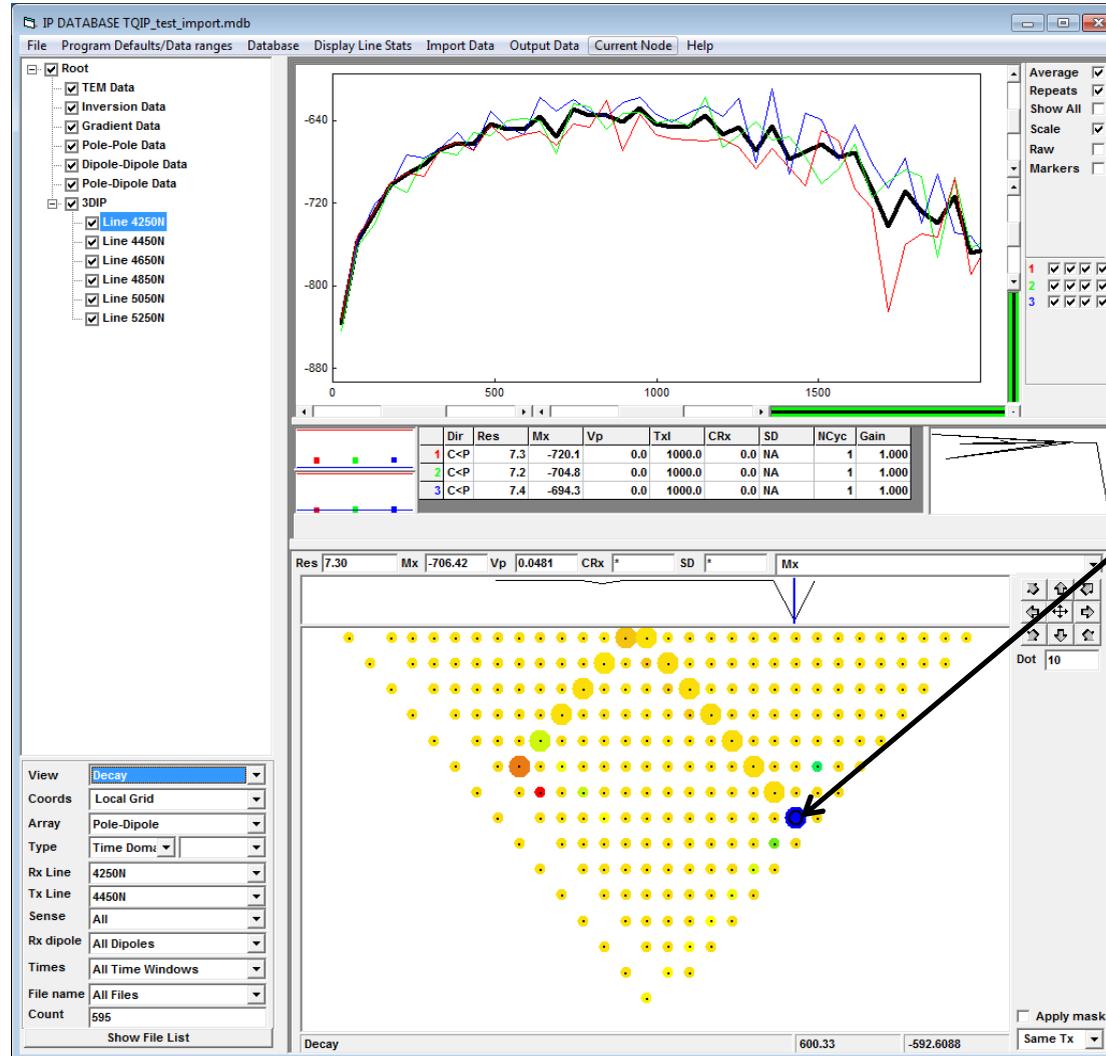
# Survey Configuration

- 6 receiver lines oriented E-W, with 200m line spacing and 100m station spacing.
- Each receiver line has readings from 4 separate transmitter lines, so there are 24 different Tx-Rx line combinations, which can each be viewed in TQIPdB as a pseudosection of observed data points.
- For the four central Rx lines, there was a Tx line along the same local northing. So this data, with common Tx-Rx line, would be closer to a standard pole-dipole survey.

# Survey Configuration



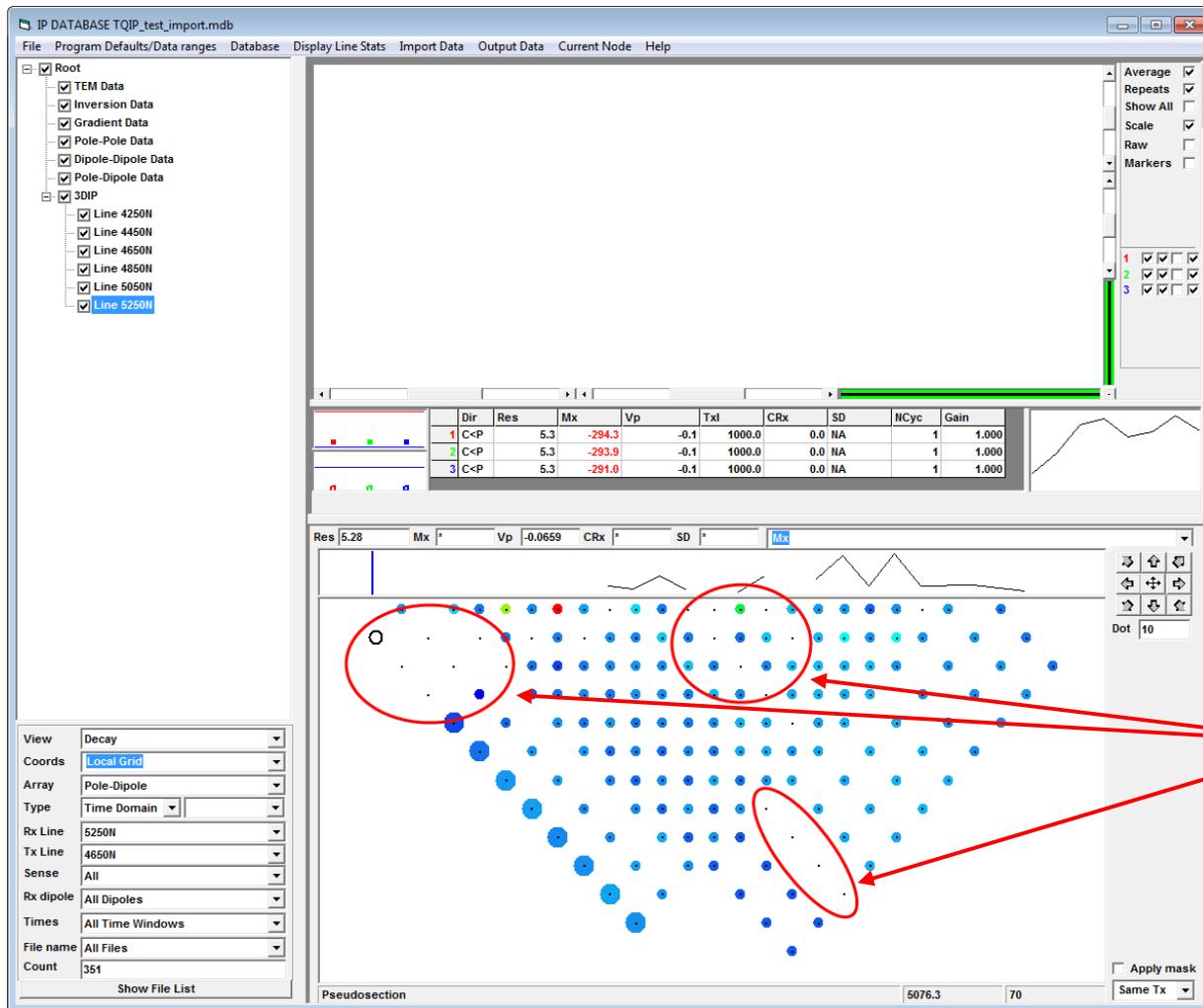
# Data editing - started by going through the data, point by point, and line by line, to remove spurious readings



Null this data point for all 3 readings – Mx only.

Mx = -700 msec

# Decided to apply a negative Mx threshold to data – normally wouldn't but I was short on spare time



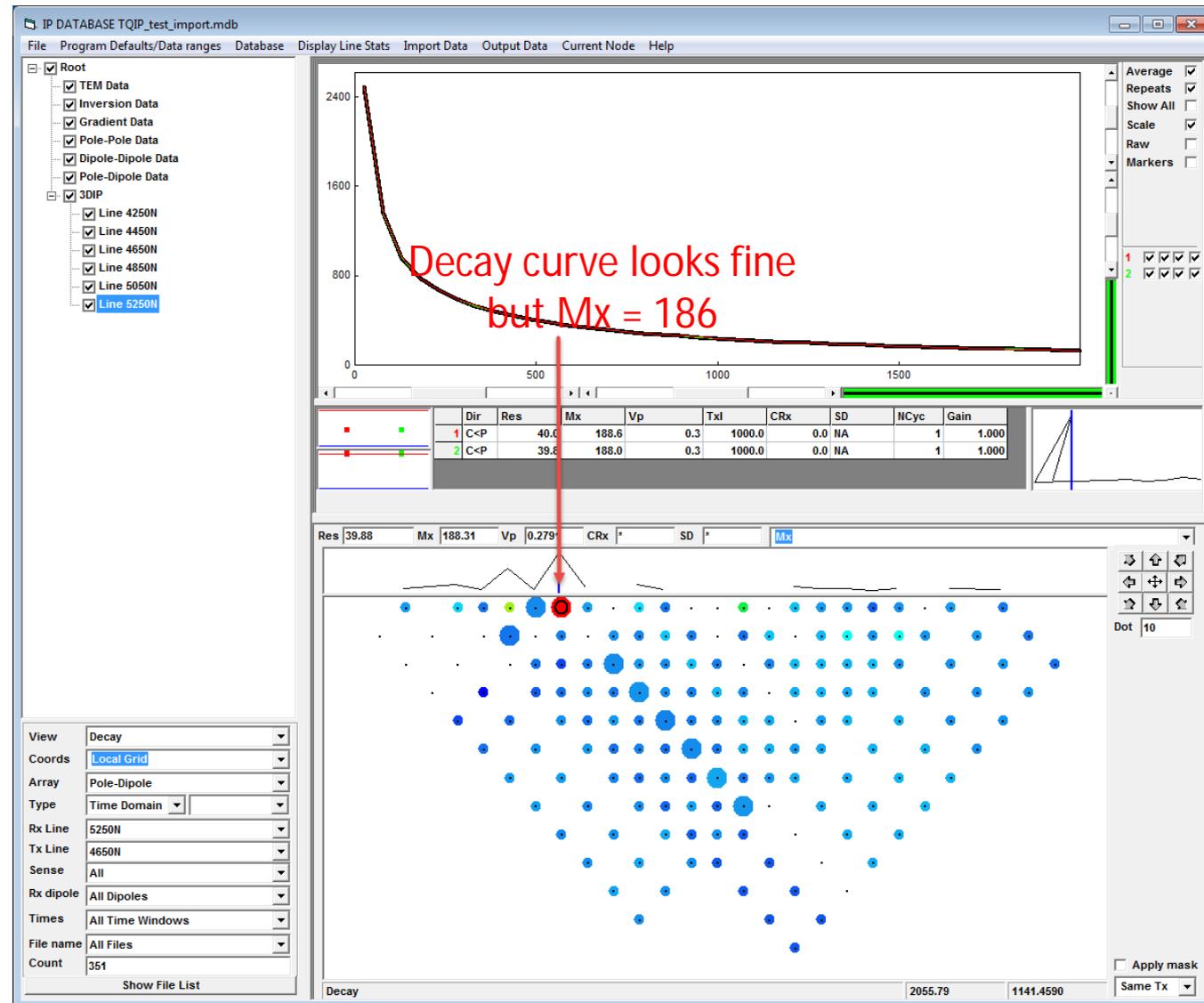
A fair amount of data is removed on some lines, but there is still adequate data points in section to resolve anomalies.

Do need to be careful not to remove too much data, such that the inversion process becomes unstable.

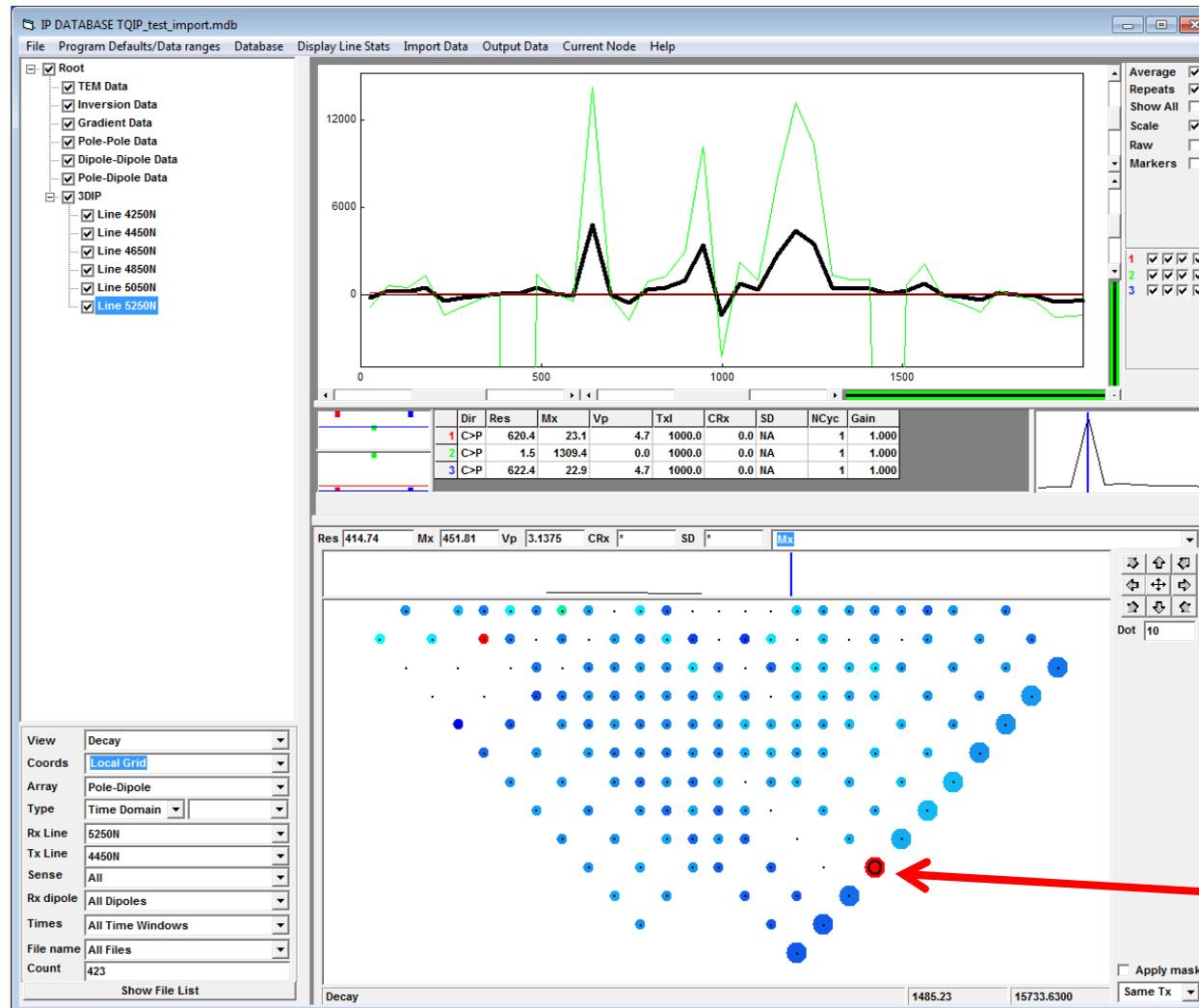
Areas with negative Mx values removed. These are mostly very low resistivity zones with very low Vp.

→ Most are considered likely to be isolated zones of EM coupling and weird responses from cultural features. Some may be real features e.g. fault zone?

# Removed very high outlier Mx readings

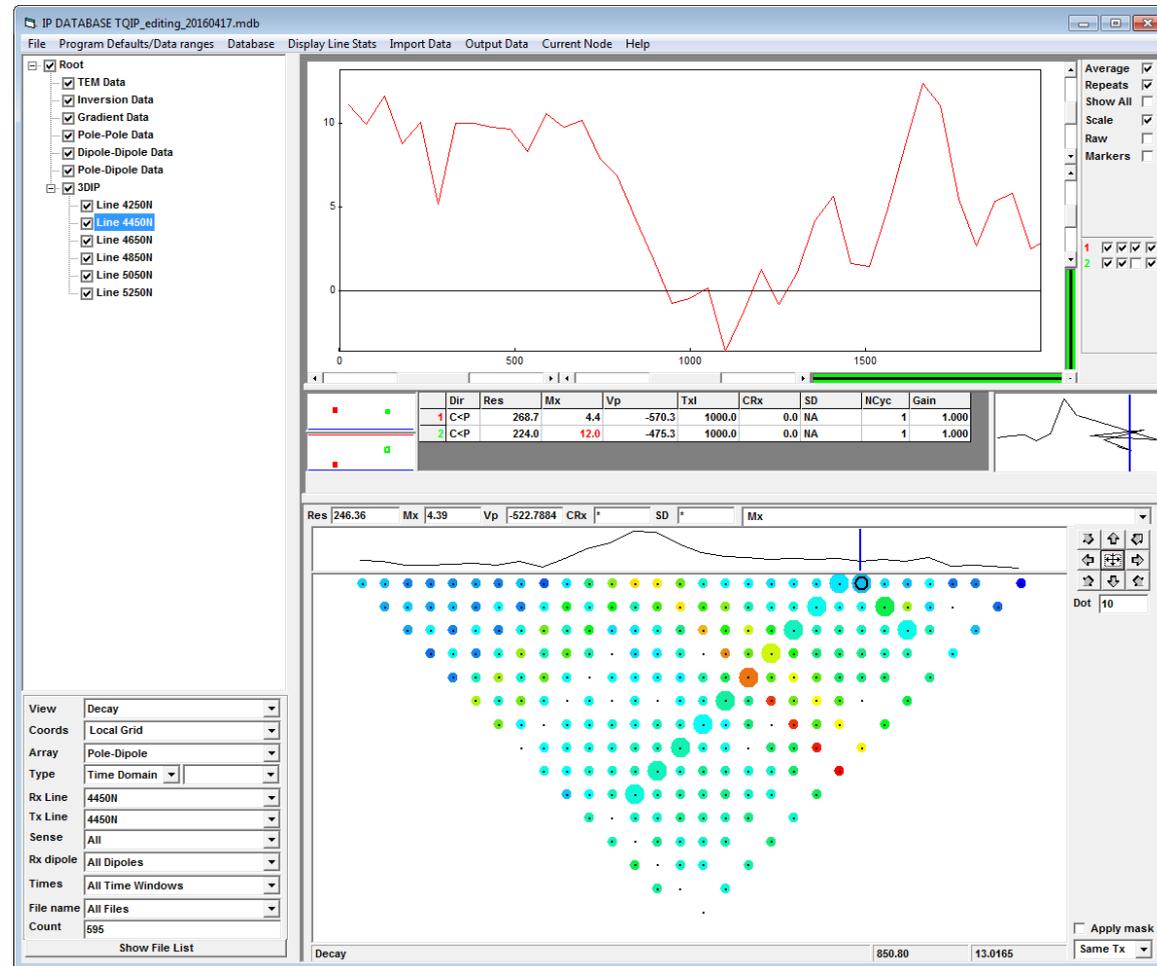


# Removed very noisy decays causing outliers

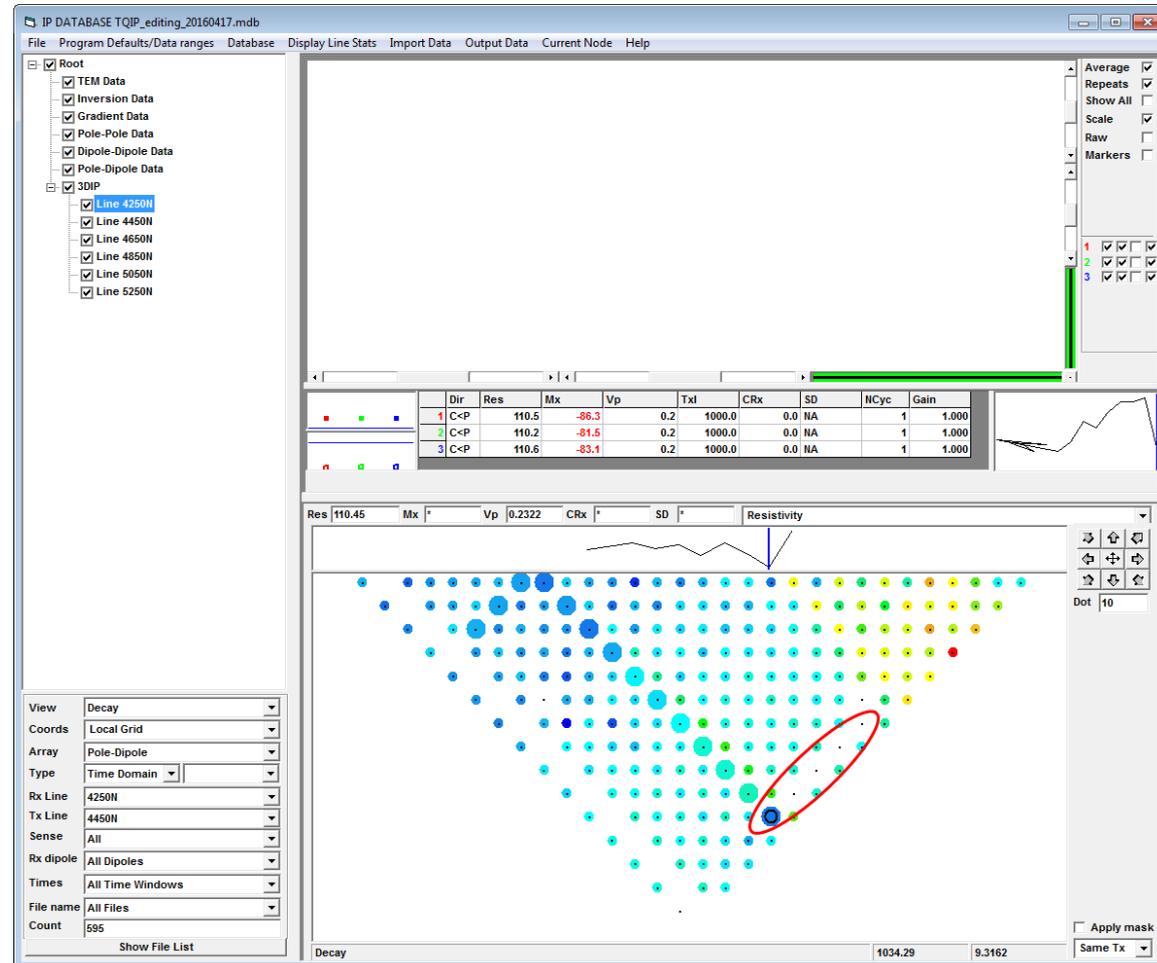


>1,000 msec

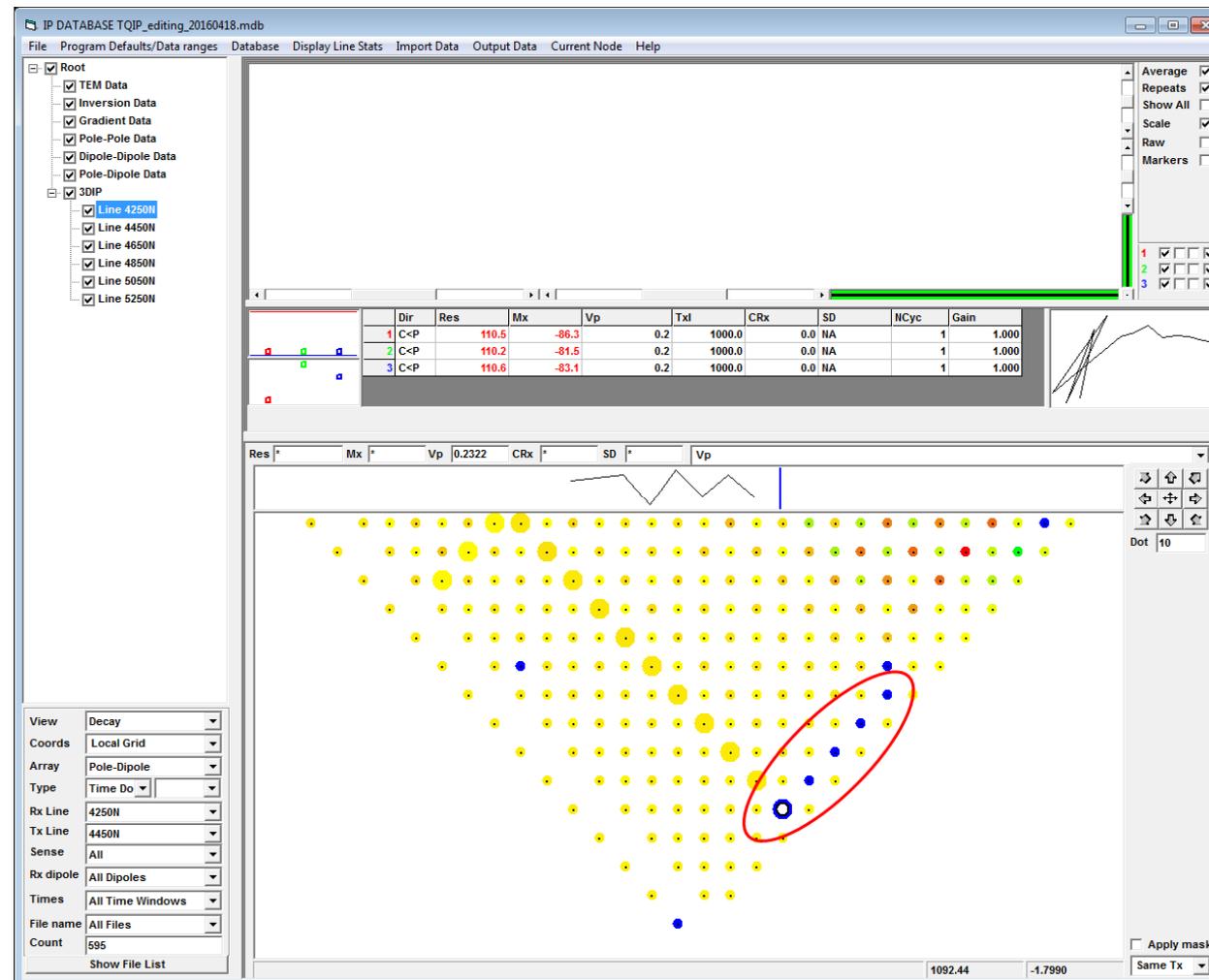
Sometimes leave poor data points in if they are not causing a drama – if the calculated resistivity and chargeability make sense compared to surrounding data points in section



# Removed outlier resistivity data points where low Vp e.g. <1 mV



Check data again for poor readings where low Vp – all had already been removed by the Mx threshold



Early 2016 – Already getting anxious and needed to see some preliminary 3D models – output the inversion input files from TQIPdB

The screenshot shows the 'IP Data output' window with the following settings:

- Output Location:** d: [DATAPART1]
- Directory Name:** inv\_test1
- Time Windows:** \*ASEG\_3DIP
- Mx Start (ms):** 510.000
- Mx End (ms):** 2540.000
- Inversion Errors:**
  - Voltage % error: 5
  - IP % error: 5
  - Voltage error floor (mV): 1
  - IP error floor: 1
  - Use voltage to define error (selected)
  - Use resistivity to define error (unselected)
  - Use geometric factor for Vp sign (checked)
- Lateral Weighting:**
  - Create lateral weighting files: unselected
  - Res: 4,4,2,1
  - IP: 4,4,2,1
- Format:** UBC IP3D
- Buttons:** Data Selection, Area Selection, UBC DCIP3D Options, Output Data, Done

# Setting default inversion parameters

The screenshot displays the 'IP Data output' software window, which is used for configuring inversion parameters. The interface is organized into several sections:

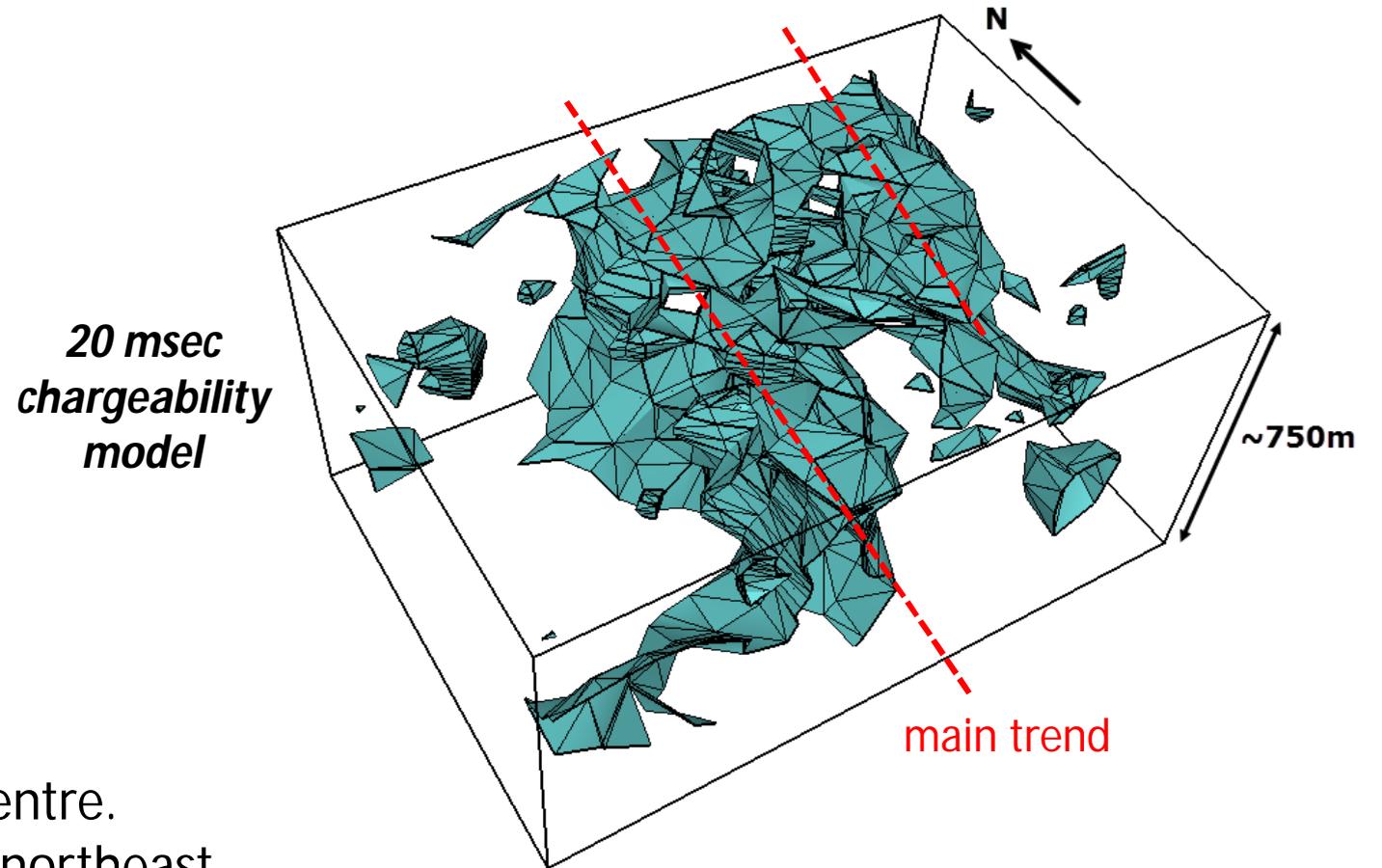
- File:** Observed Data File (v3d.obs), Mesh File (3dip.mesh), Method (dcinv3d selected), and Topo File (NULL).
- Iteration and Regularization:** Max Iterations (30), Regularization Mode (Line Search), and Chi Factor (1).
- Initial Model:** Conductivity (0.01) and Resistivity (100) using 'Use Value'.
- Reference Model:** Conductivity (0.0010) and Resistivity (1000) using 'Use Value'.
- Length Scales:** Method (Length), East (5000), North (5000), and Depth (5000).
- Wavelet Compression:** Default selected, Tol (1), and eps (0.02).
- Weight Matrix:** Default selected.
- Version dependent parameters:** Version (Version 2.1) and an option to 'Store sensitivity in memory'.

At the bottom, there are tabs for 'Output File Location', 'Data Selection', 'Area Selection', and 'UBC DCIP3D Options'. The 'Format' is set to 'UBC IP3D', and there are buttons for 'Number output', 'Output Data', and 'Done'.

# Setting inversion parameters

- Just let the UBC 3DIP batch file run with default parameters.
- Let the UBC DCIP3D conductivity inversion run to convergence, which occurred after 12 iterations.
- Used the resulting conductivity model in the running the sensitivity matrix calculation.
- Let the chargeability inversion run through.
- Had a quick look at results using 3D Modeller – 3D Viewer.

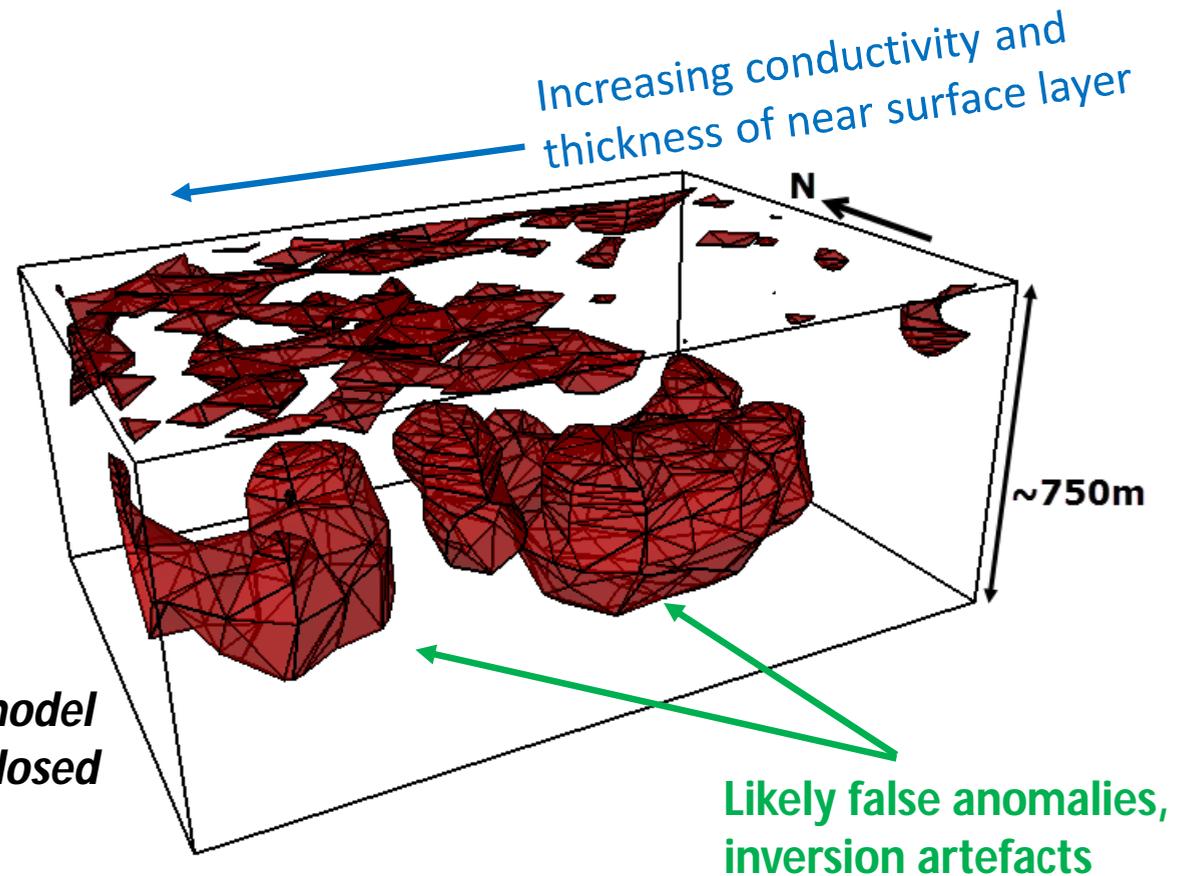
# First trial default inversions – Chargeability 3D Model



- Shikes!
- Early results were poor.
- There's something through the centre.
- And something through the east-northeast.
- I believe in these general trends, but the model results are scattered and extend too deep in some places e.g. a shallow and noisy chargeability response in the south and centre of the grid.

# First trial default inversions – Conductivity 3D Model

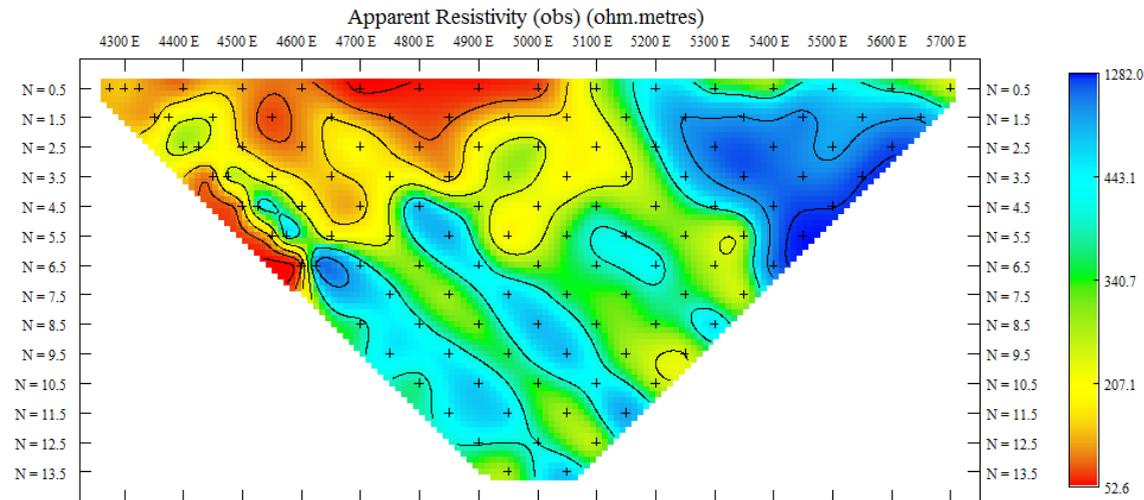
- The near surface layer increases in conductivity and thickness to the west, as expected, but the results in general are ugly.
- Likely false deeper conductivity model bodies → inversion artefacts resulting from errors in the raw data and poor inversion parameters that don't match the degree of error still present in the edited data.



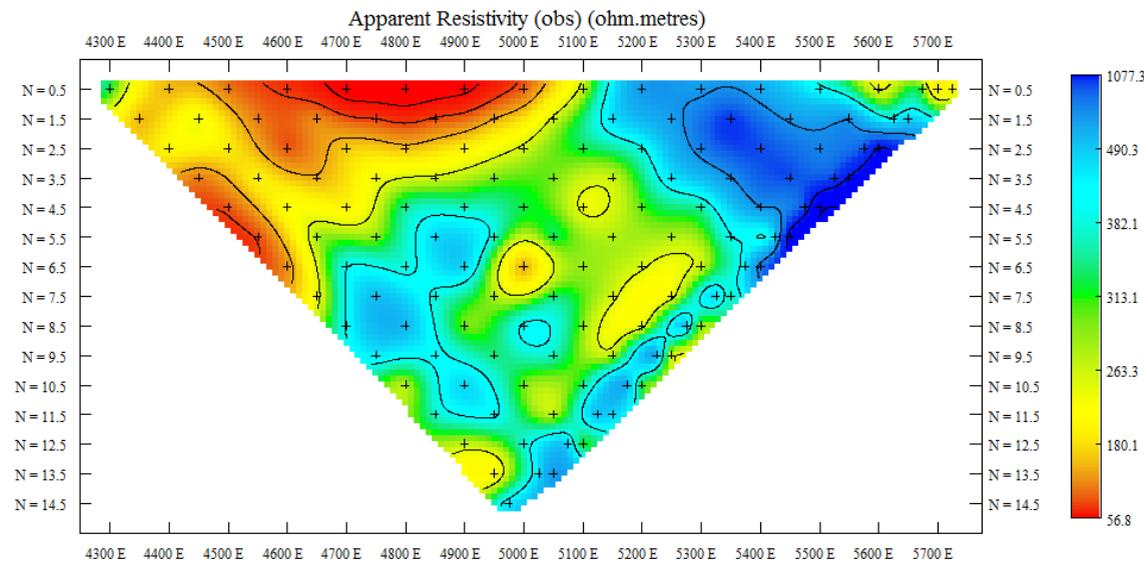
*50 ohm-m model, where model values <50 ohm-m are enclosed by the isosurfaces*

**Likely false anomalies, inversion artefacts**

# Check of the raw data to assess the preliminary conductivity inversion model results

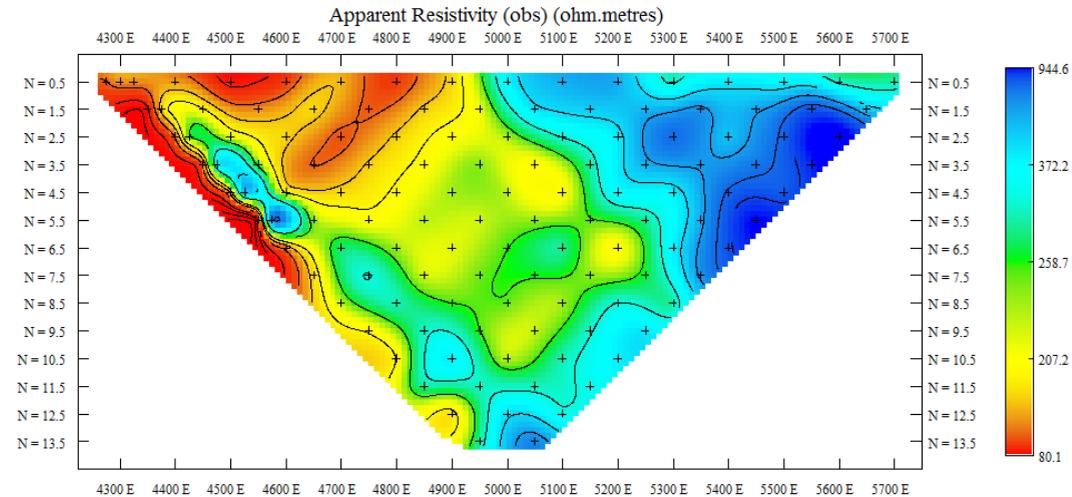


**Tx 4450N and Rx 4450N**

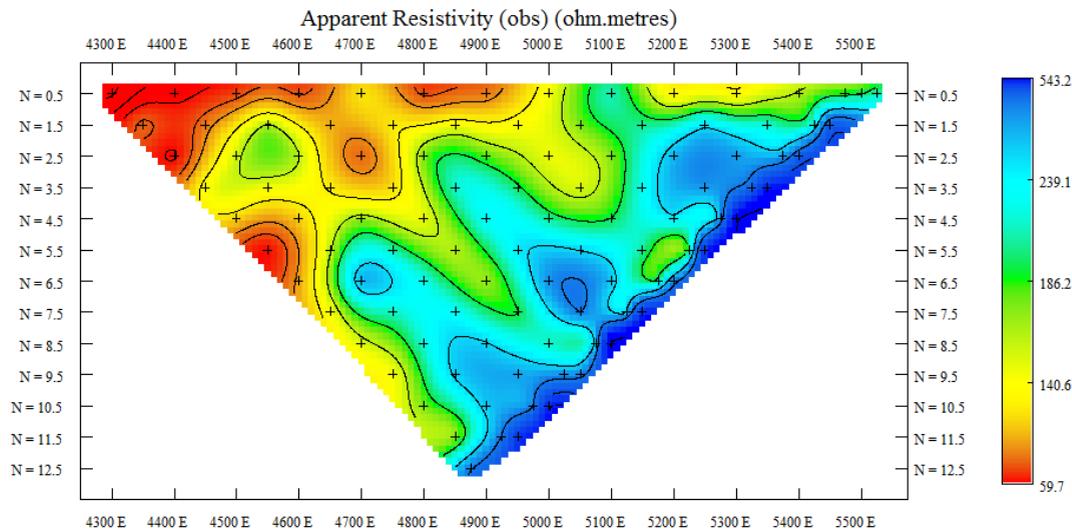


**Tx 4650N and Rx 4650N**

# Check of the raw data to assess the preliminary conductivity inversion model results



**Tx 4850N and Rx 4850N**



**Tx 5050N and Rx 5050N**

# Summary of raw data conductivity check

- There is nothing really standing out in the raw resistivity data to suggest that the deeper conductivity sources produced in the initial trial inversions are valid.
- Poor 3D model results have been produced from the trial inversions because of poor starting and reference models, and because there was still a lot of error present in the edited dataset.
- My simple understanding of the chi factor is that if we have a lot of error in the data, then we will likely need to increase the chi factor, so that the inversion doesn't work too hard to fit all of the smaller deviations in the dataset that are caused by error.
- Conversely, if we have a dataset with low error, then we can keep the chi factor low (1 or less).
- The edited dataset still has a fair amount of error/noise.

# Outcomes of the work completed so far

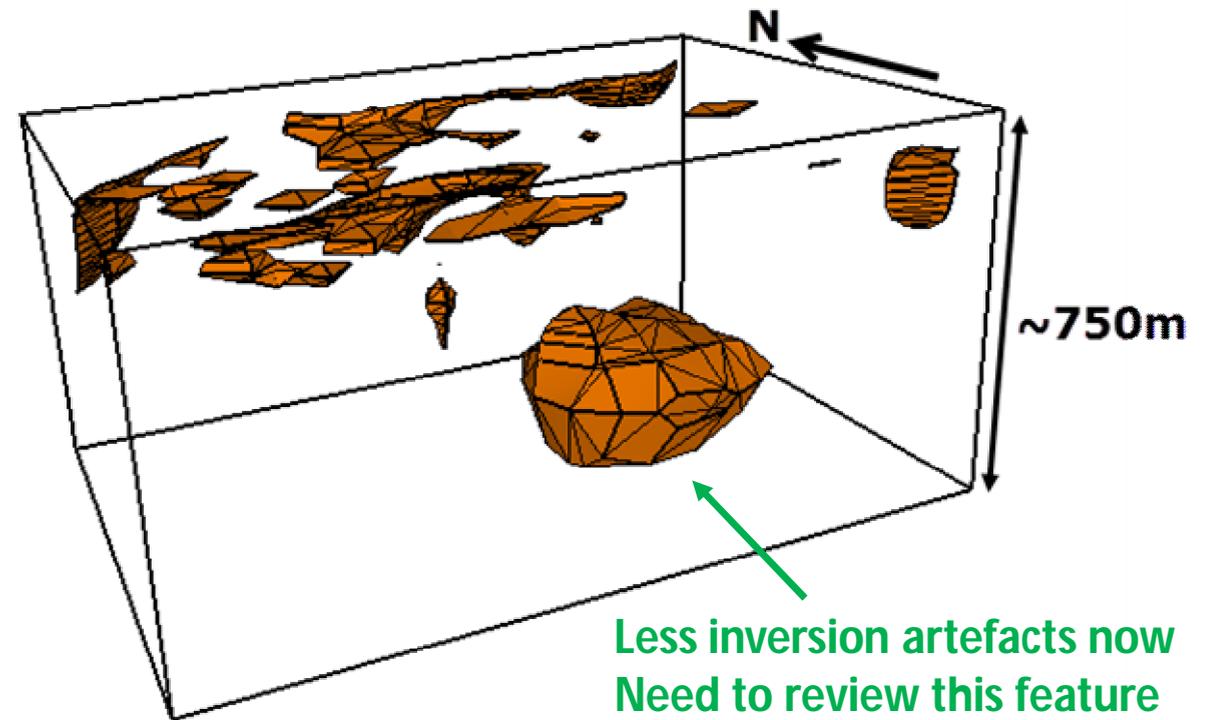
- The inversion models don't look very good at this stage, but there is clearly a chargeable source trending N-S through the centre of the area, possibly through the east to northeast as well.
- The conductivity inversion model is confirming a general near surface trend interpreted from the raw data, but the model results are ugly, and typical of an inversion process that is pushed too far and is over fitting the small deviations (error) in the raw data.
- I need to knuckle down, spend some time to re-edit the data, and focus on running some better inversions.

# Revised trial inversion

- I just re-ran the sensitivity matrix calculation again using an earlier iteration of the conductivity inversion model, where there is much less variation in the model, and then re-ran the chargeability inversion.
- So I used the conductivity inversion iteration number 6 out of 12, and then ran the sensitivity matrix and chargeability inversion based on the interim conductivity model.
- I have seen this work well on a couple of other projects.

# Revised trial inversion - conductivity

- The near surface layer is still behaving as expected, but the model results still look ugly.
- There are less inversion artefacts at depth in the revised trial inversion.

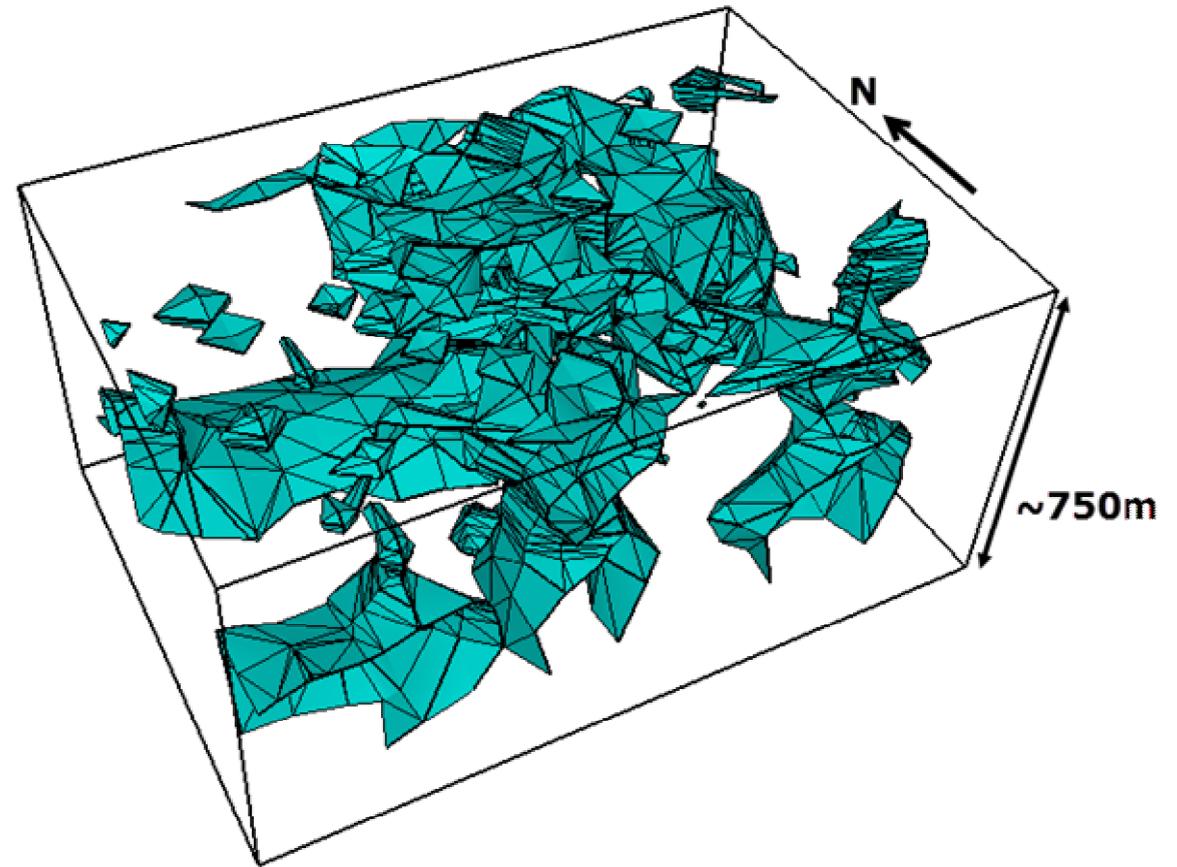


*50 ohm-m resistivity model,  
where model values <50 ohm-m  
are enclosed by the isosurfaces*

Less inversion artefacts now  
Need to review this feature  
in the raw data again

# Revised trial inversion - chargeability

- The chargeability inversion model still doesn't look very good.
- Back to the drawing board.



# Final Inversions Late July

- Re-crunched the raw data to edit out quite a few more resistivity data points.
- Took the approach of working on getting a smoother conductivity inversion model first, calculating the sensitivity matrix from this model, and then changing various inversion model parameters for the chargeability inversion.
- Used better starting and reference models e.g. conductivity starting model 50 ohm-m and reference model 250 ohm-m, and chargeability starting model 5-15 msec and reference model 20-25 msec. Higher than normal starting and reference chargeability values were required to get the inversion model result to match expectations, based on anomalies observed in the raw data.
- A better conductivity inversion model was achieved by better starting and reference models, plus using a higher Chifact 5, so that the inversion didn't run for as long before it was happy with the misfit.
- Incorporated the topo grid.

# Inversion Processing

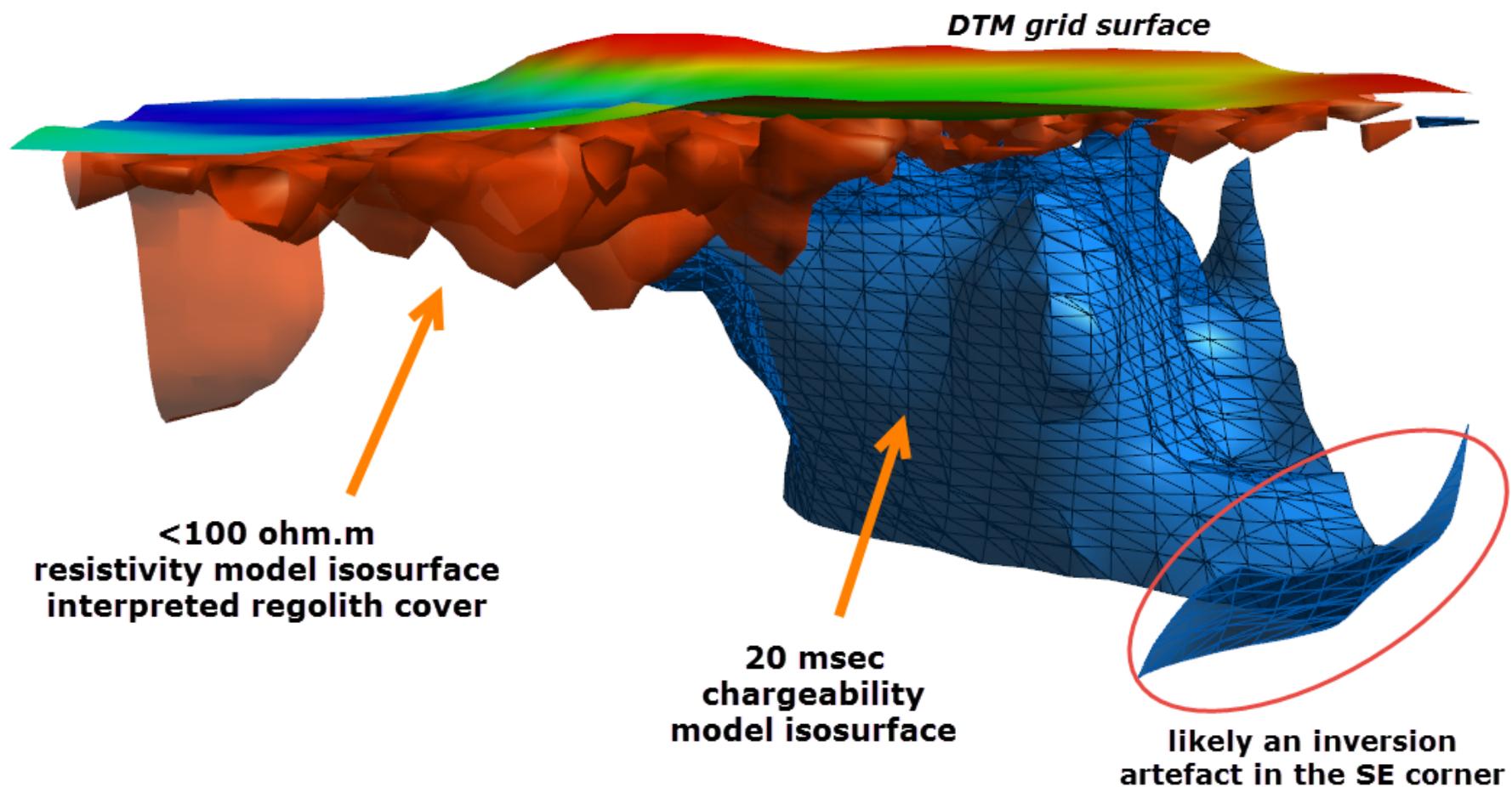
- Once set on a reasonable conductivity model, I trialed many alternative chargeability inversions using different variations of chi fact, starting and reference models, smoothing parameters/length scales → trying to remove likely model artefacts, add a bit of structure, and improve the relative amplitude of model features.
- An Excel spreadsheet was setup to record parameters used for each inversion. I worked through changing chi fact 1 – 2 - 5 – 10, then back to 5. Then changed the chargeability starting and reference models, with chi fact at 2. And so on.
- At least 20 new trial inversions were completed.

# Chargeability Inversion Processing Summary

- Starting chargeability model 15 msec.
- Reference chargeability model 25 msec.
- Trying to push the inversion result to higher values, as in the raw data.
- Chi factor = 2, because chi factor = 5 was too smooth, and chi factor = 1 contained too many model artefacts.
- Favoured length scales 100m (E), 100m (N), 150-300m (Z) to force a bit more vertical structure.

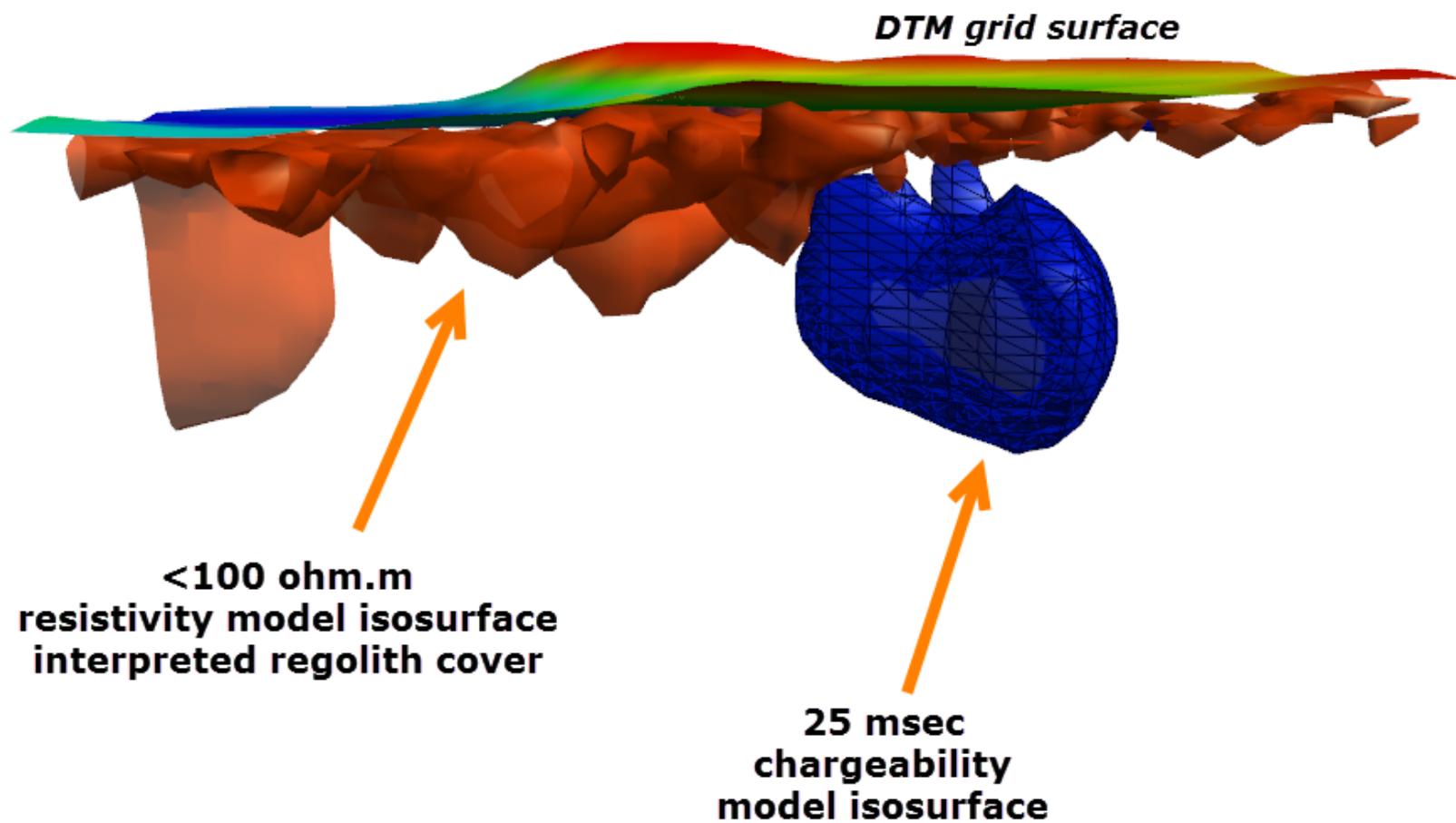
# Latest Results

**View Looking North  
Vertical exaggeration 1.2**

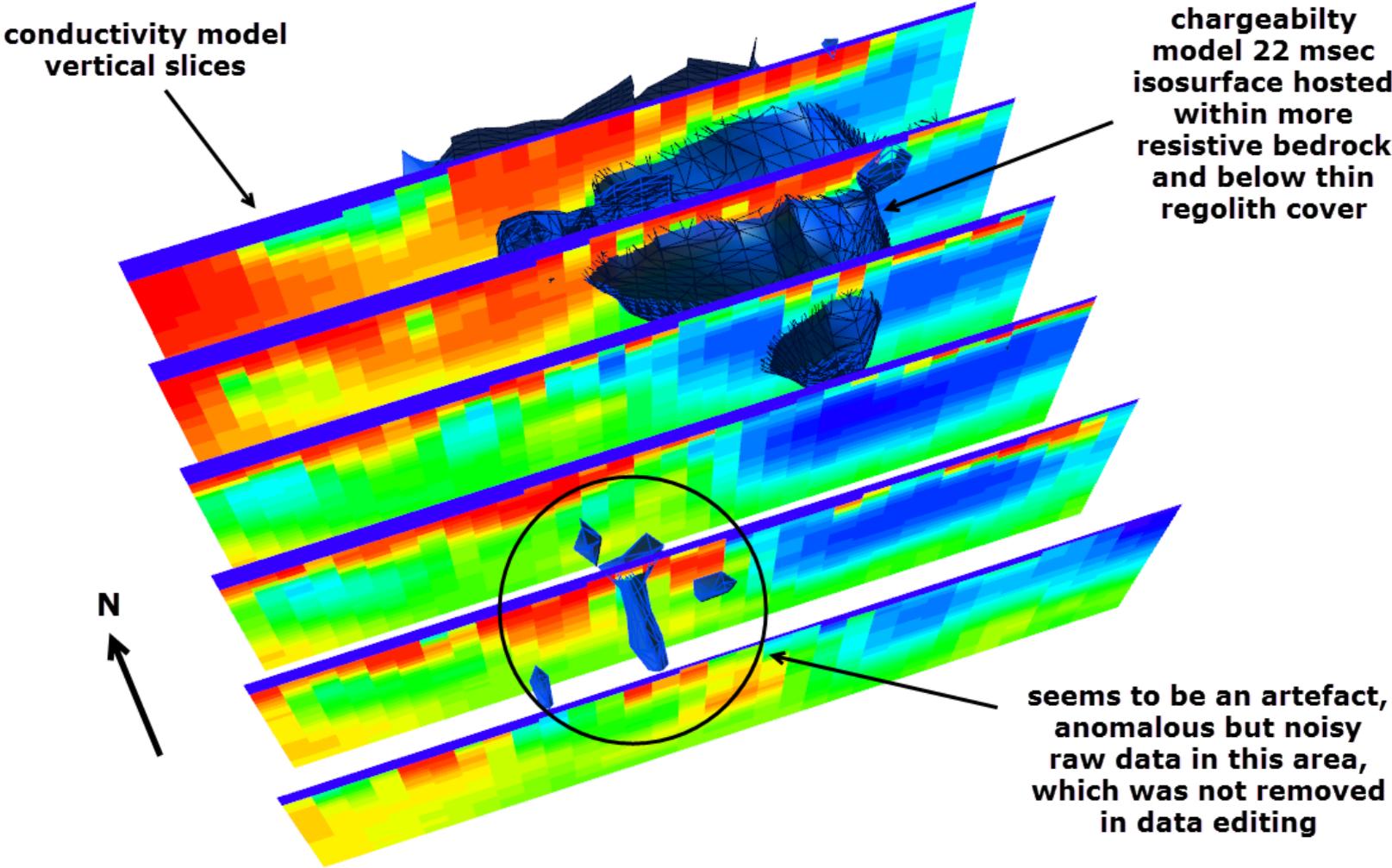


# Latest Results

**View Looking North  
Vertical exaggeration 1.2**



# Latest Results



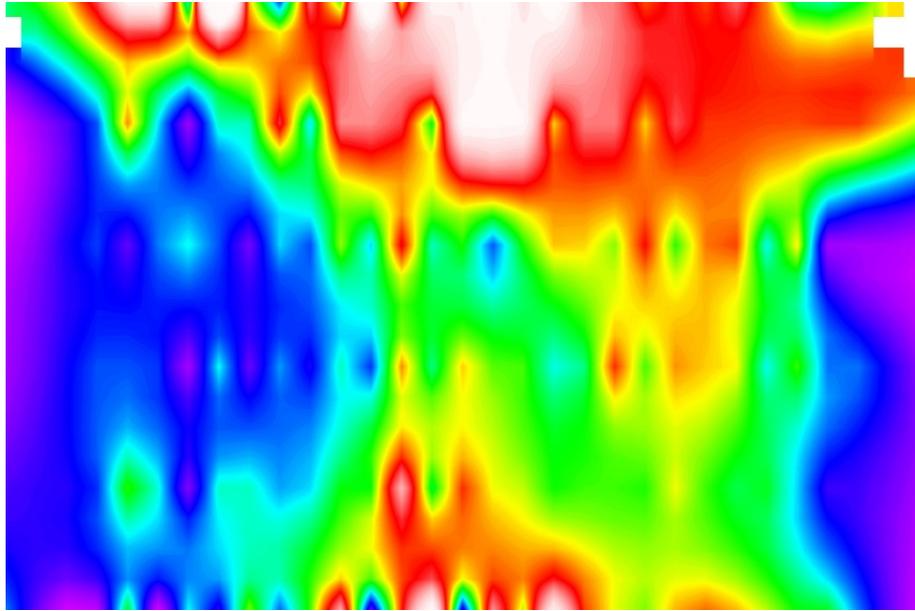
# Checking the validity of the inversion models (without any geological data)

- Not something that I would normally do with 3D IP data. It's difficult, I don't yet understand how to do it properly, and I would prefer to use geological input, which is usually available.
- Initially tried gridding all N-level data → technically incorrect, as all data measured at a receiver pair were assumed to be all on the same receiver line, whereas in reality they would sit somewhere in between the Tx and Rx line, depending on which Tx electrode was being used for that reading.
- So this gridding would be averaging data from near to far Tx offsets from the receiver line, so it's a very crude method of checking the data, but it's still worth looking at...

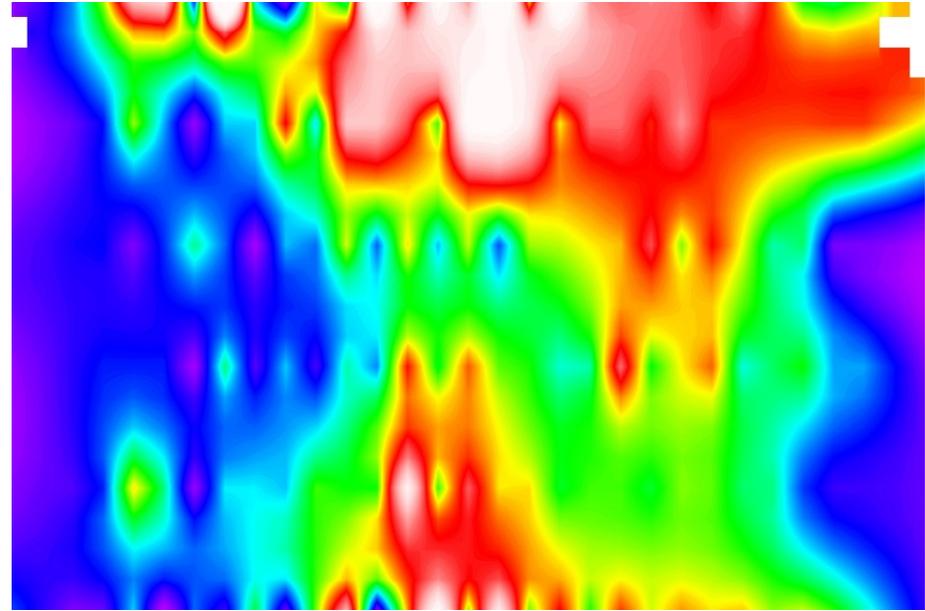
# N-level comparisons

## Chargeability N-Level 0.5

**Observed**



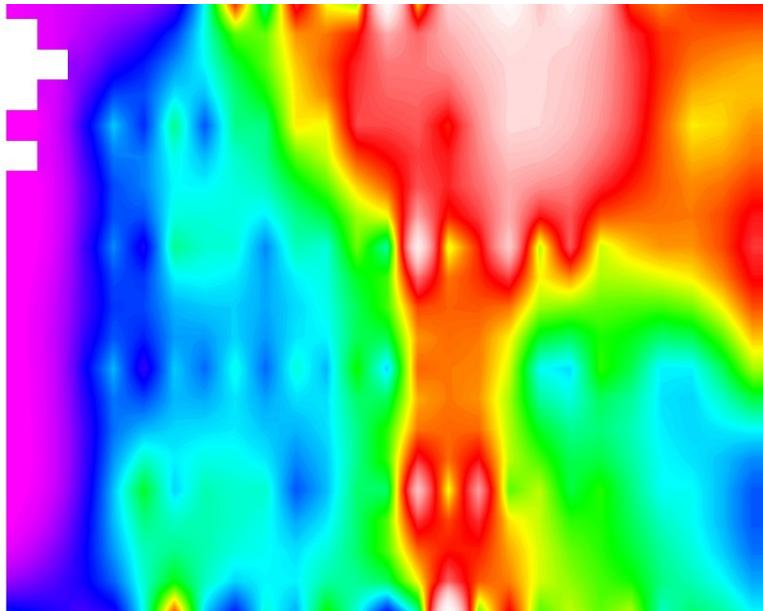
**Modelled**



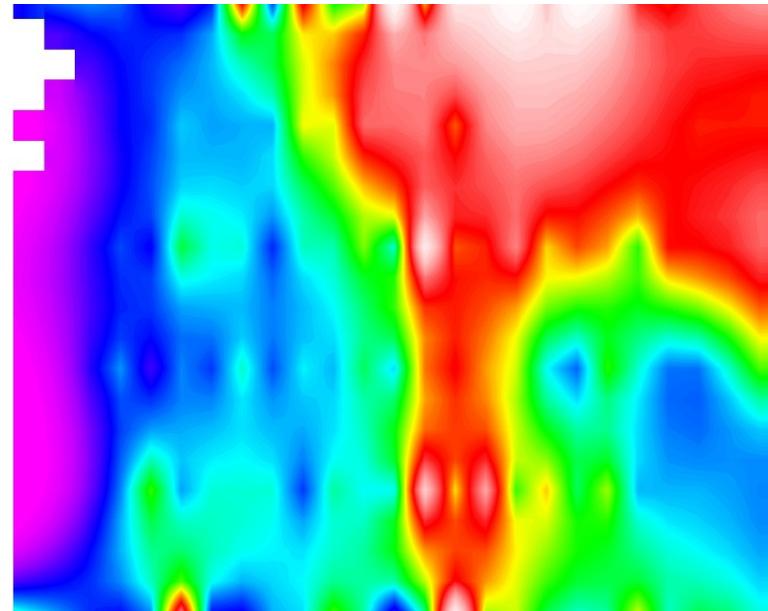
# N-level comparisons

## Chargeability N-Level 3.5

**Observed**



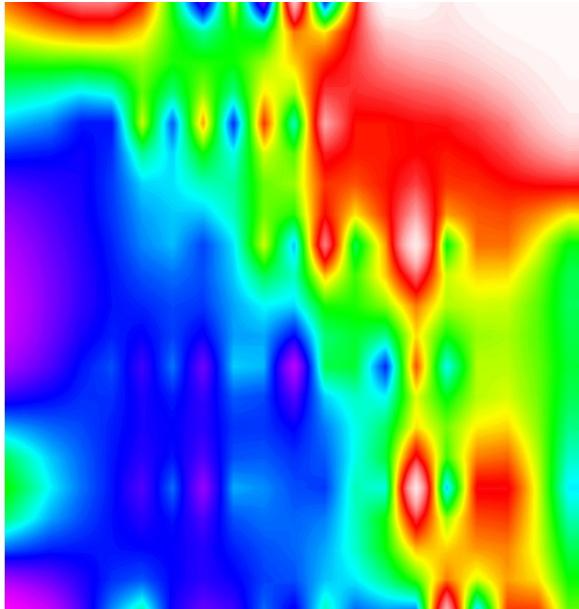
**Modelled**



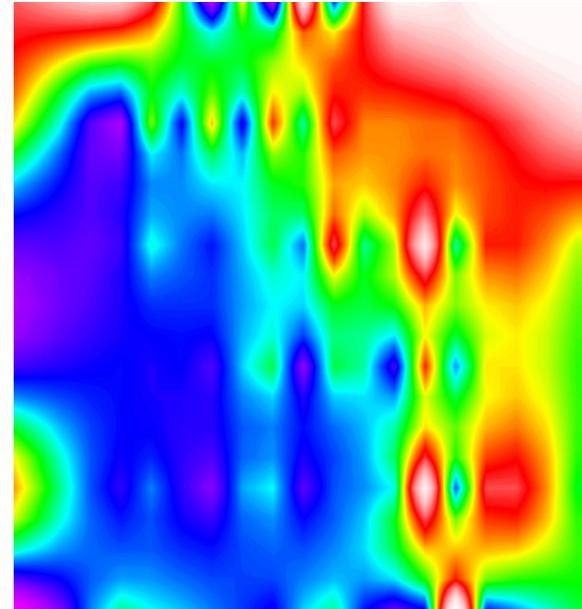
# N-level comparisons

## Chargeability N-Level 6.5

**Observed**

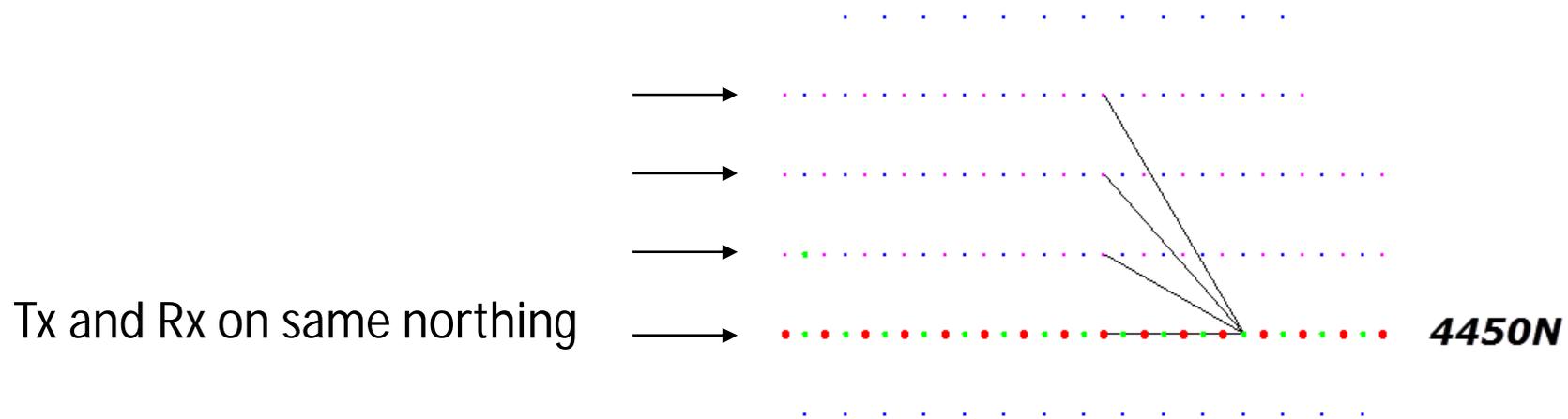


**Modelled**



# Further N-level comparisons

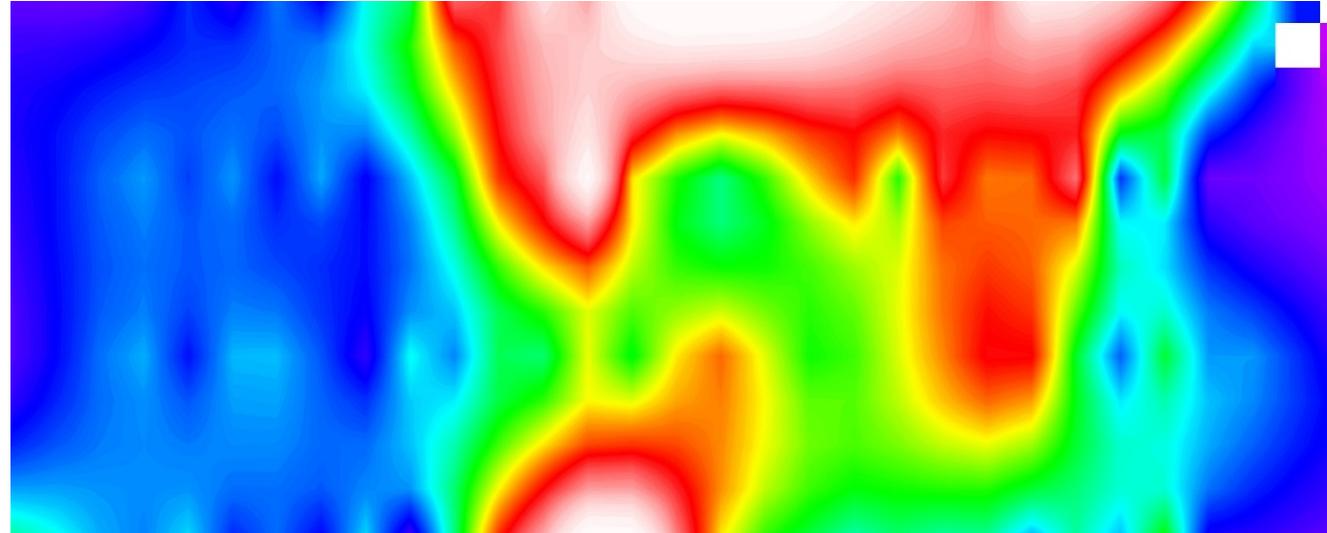
- The central survey lines: 4450, 4650, 4850 and 5050, each have data recorded with the Tx along the same line as the Rx.
- So I gridded the coincident Tx-Rx line N-level observed and modelled data for these survey lines only.



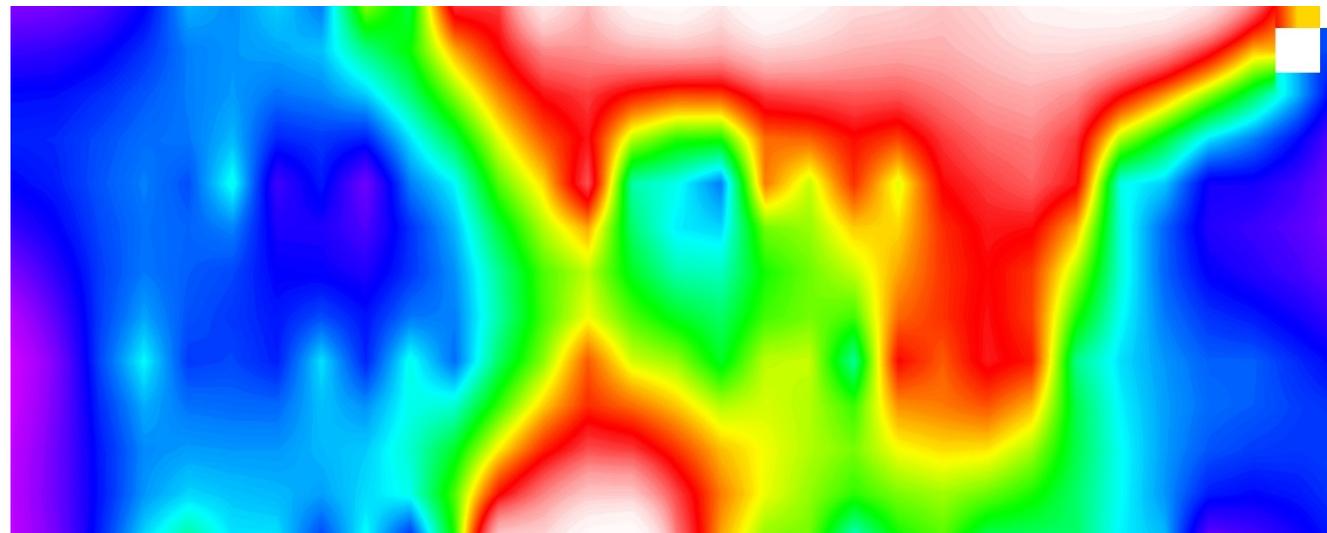
# N-level comparisons for the 4 central Rx lines only

## Chargeability N-Level 0.5

Observed



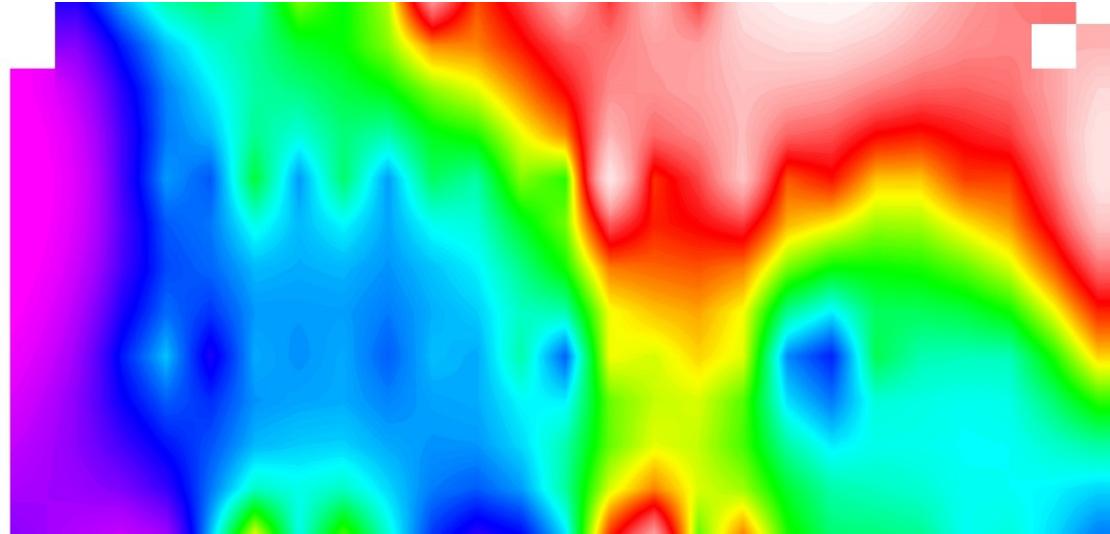
Modelled



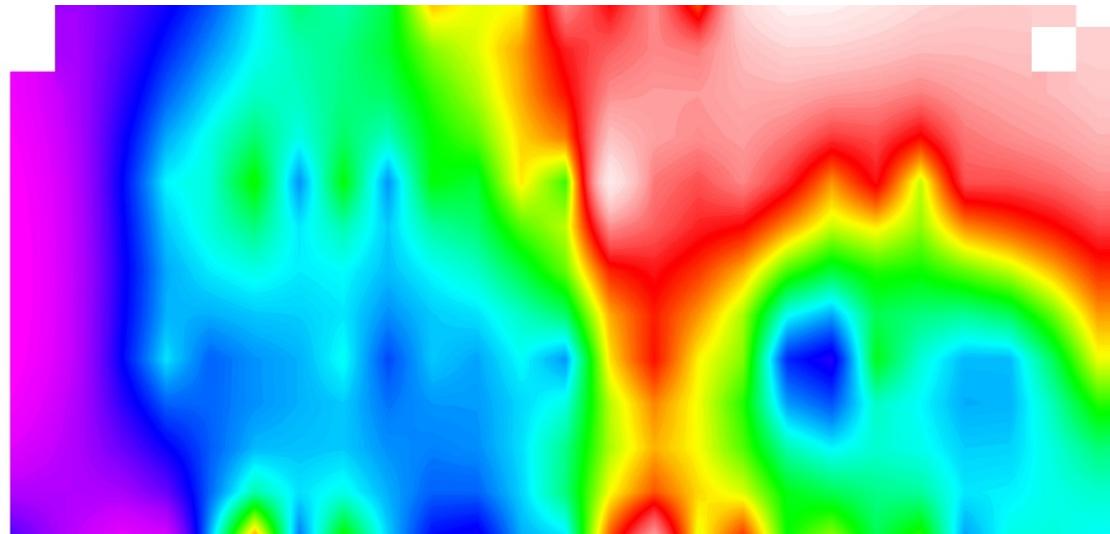
# N-level comparisons for the 4 central Rx lines only

## Chargeability N-Level 3.5

Observed



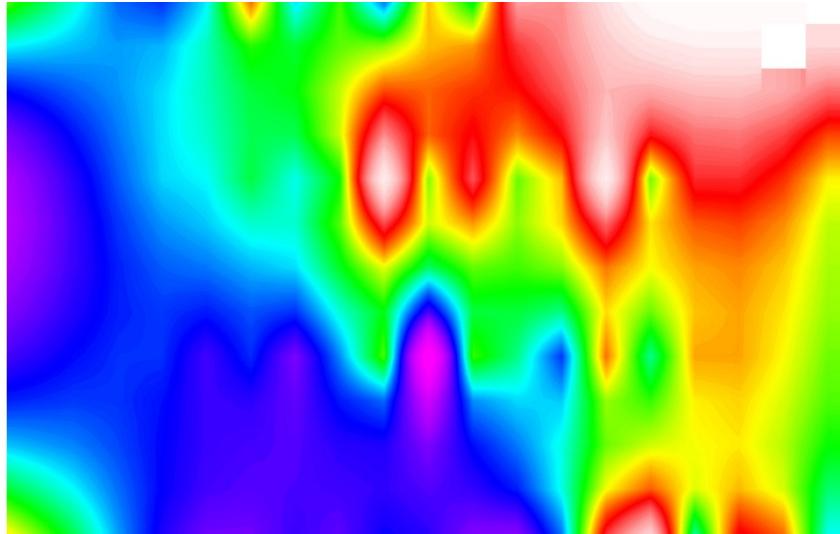
Modelled



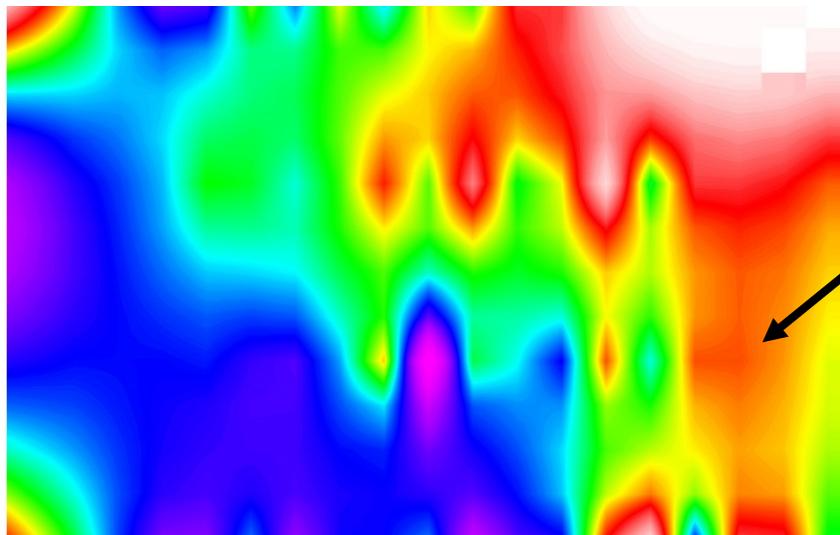
# N-level comparisons for the 4 central Rx lines only

## Chargeability N-Level 6.5

Observed



Modelled



The inversion model may be extending this anomaly too far to the south.

# Summary of N-level Comparisons

- Crude N-level comparisons of the observed and modelled (back calculated) raw data have been shown here, but they're better than nothing and simple to understand.
- The inversion model may be over extending chargeability anomalies in some places e.g. eastern side.
- The central southern chargeability response looks to be strike limited and only shallow. I don't trust this anomaly based on the raw data, but am trying not to over edit the data.
- The stronger and bigger chargeability response is to the north and east of centre.
- It's very difficult to predict model sources from the raw data, unlike PDIP or DDIP.
- Geological input is necessary to validate and refine 3D IP inversions.

# Importing forward model/predicted data back into TQIPdB

- I haven't known how to do this until recently → assistance from John Paine.
- I reviewed a few data points on each line and the observed and predicted data looks comparable. However, it's too slow to evaluate each point, and then it is difficult to know at which stage you would decide the data needs to be reprocessed i.e. 20 bad data point comparisons?
- I understand sections could be created for each Tx-Rx line, but then there are 24 sections that need to be reviewed, and once again it would be difficult to determine where to draw the line on what is a successful inversion or not.

# Importing forward model/predicted data back into TQIPdB

The screenshot displays the TQIPdB software interface for editing data. The window title is "IP DATABASE TQIP\_editing\_20160726.mdb". The menu bar includes "File", "Program Defaults/Data ranges", "Database", "Display Line Stats", "Import Data", "Output Data", "Current Node", and "Help".

**Left Panel (Tree View):**

- Root
  - TEM Data
  - Inversion Data
  - Gradient Data
  - Pole-Pole Data
  - Dipole-Dipole Data
  - Pole-Dipole Data
  - 3DIP
    - Line 4250N
    - Line 4450N
    - Line 4650N
    - Line 4850N
    - Line 5050N
    - Line 5250N

**Main Panel (Data Entry):**

Line : 4450N Plot Point : 4825.0 N : 125.0 Num repeats: 3  
Time windows: ASEG\_3DIP  
Data File : ASEGWS\_TDIP\_Data EDIT.DAT

Use Data		Use Resistivity		Use IP	
Reading Date	17-Apr-2016	Reading Time	20:36:40		
Detrend method	NA	Telluric method	NA		
Tx Line	4450N 11687N	Rx Line	4450N 4450N		
C1	4950.0 280.0	P1	4600.0 100.0		
C2	4670.0	P2	4700.0		
Tx I	1000.0	Component			
Vp	24.9356	SP	-9999.00		
NCyc	1	StdDev	-9999.0000		
Res Obs	137.09	Mx Obs	5.43		
Res Model	138.36	Mx Model	5.92		
Res Target Error	0.0000	Mx Target Error	-9999.0000		
Res Error / Z	-9999.00 / -9999.00	Mx Z error	-9999.00 / -9999.00		

**Buttons:** Edit coords, Recalc Res, Delete Repeat, Scale all decays, Flip decay, Recalc Mx, Clear decay edits, Clear all decay edits

**Bottom Panel (Resistivity Plot):**

Res: 137.09 Mx: 5.42 Vp: 24.9356 CRx: \* SD: \* Resistivity

The plot shows a grid of resistivity data points. A vertical line is drawn at approximately 4825.0 N. The resistivity values are color-coded, with a scale from 4833.8 to -26.8. The plot is titled "Resistivity" and includes a "Dot" count of 10.

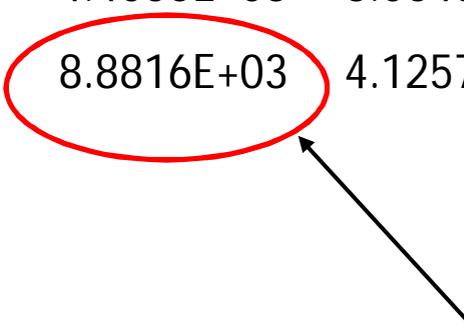
**View Panel (Bottom Left):**

- View: Data
- Coords: Local Grid
- Array: Pole-Dipole
- Type: Time Domain
- Rx Line: 4450N All
- Tx Line: 4450N
- Sense: All
- Rx dipole: All Dipoles
- Times: All Time Windows
- File name: All Files
- Count: 595
- Show File List

# Quick review of inversion misfit values

	<b>Misfit</b>	<b>Model Norm</b>	<b>Multiplier</b>
Initial default inversions	4.4988E+03	1.3914E+08	4.6573E-06
Revised inversion	4.4055E+03	3.0645E+08	1.7153E-06
Final inversion	8.8816E+03	4.1257E+07	2.3236E-04

Best inversion has the worst misfit!



# My 3D IP data editing and inversion modelling approaches

- Up until now, I have preferred to null poor data and go without it, when editing 3D IP data, as I don't yet have a good understanding of where the poor data comes from, and I don't like to alter raw data too much e.g. correcting for EM coupling.
- I usually undertake 3D IP inversion processing with less attention to the inversion misfit results or error analysis, than what I would do with 2D IP inversion processing, as I think it is often more practical and more useful to compare 3D inversion model results with existing geological data, and then consider - is this inversion model valid or do I need to go back and re-crunch it?

# My 3D IP data editing and inversion modelling approaches

- Each of the 3D IP survey datasets that I have dealt with have been for projects where there is already a lot of other project data that can be used to constrain the inversion process, or rather, adjust inversion parameters to get a better match to geology e.g. change inversion smoothing bias to force either horizontal or vertical model features.
- Having a fair bit of sulphide mineralisation already confirmed underground, and already having completed a few successful IP traverses (DDIP or PDIP) over it, actually seems to be a prerequisite for getting a client to consider approving the huge cost of a detailed 3DIP survey.

# Final Comments

- Thanks!
- So far, I have really only dealt with a handful of **3D** IP datasets, and only one where our consulting group was involved in the survey planning – MIMDAS at the Bentley VMS deposit, South of Jaguar and Teutonic Bore, for Jabiru Metals Ltd.
- Other small consulting jobs undertaken have been either reviewing historical data or giving a 2<sup>nd</sup> opinion on a confusing dataset that didn't really match the geo's expectations.