Processing IP data

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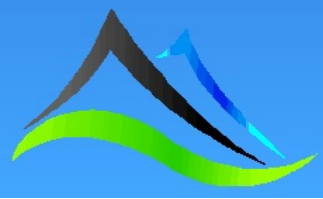
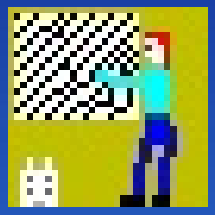
ExploreGeo

Workshop - ASEG Conference
Adelaide 2016
Complete version for distribution



Software Tools

From the Geoproc Suite

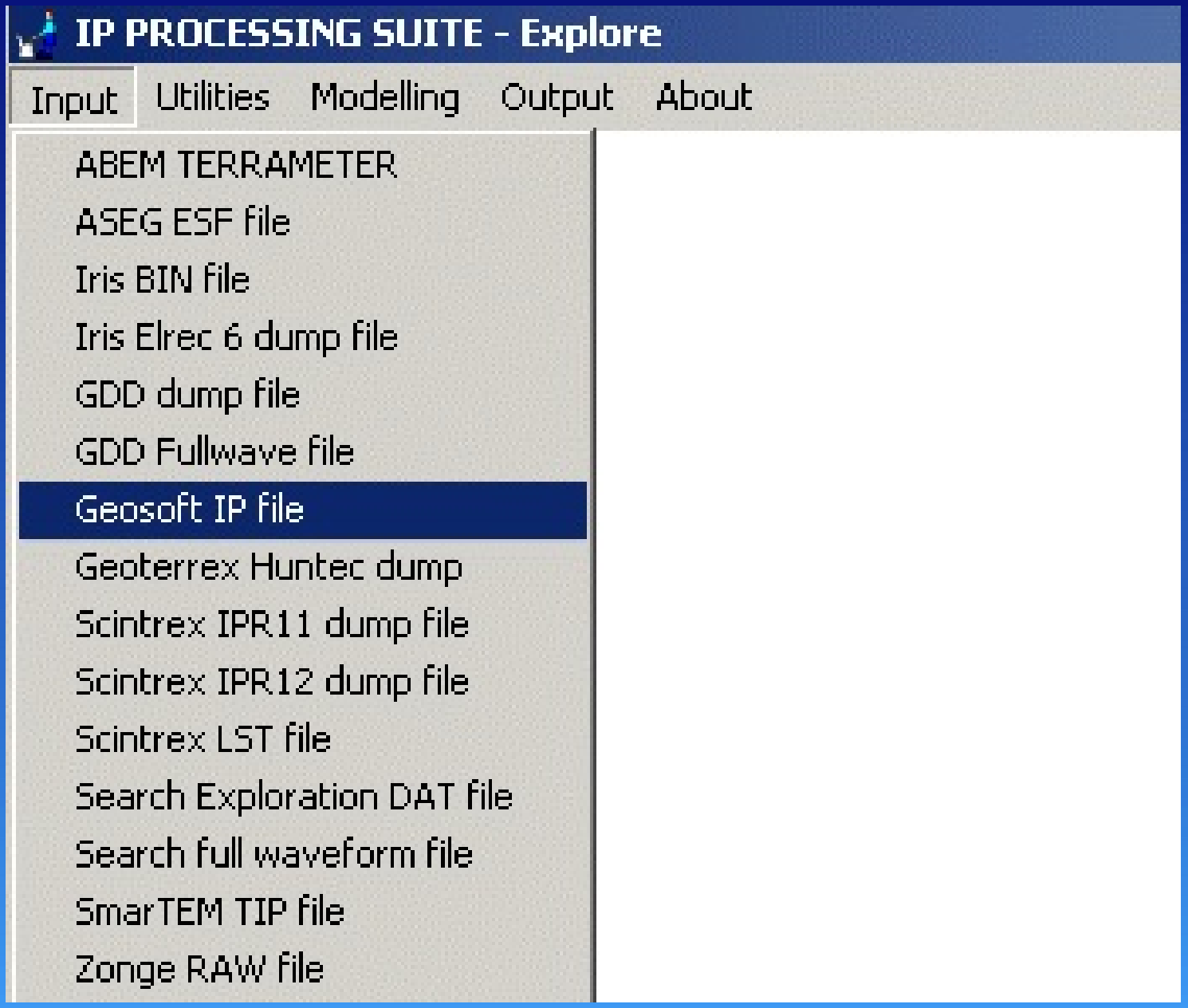


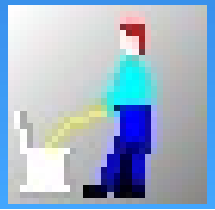
DbaseO - database creation, edit, display, filtering and gridding

IPProc - IP and resistivity specific tools

The program used for each step is indicated by the icon in the bottom left of the slide

Import the data to a database





Set known constants and metadata in database header

CREATE OR EDIT AN IP DATABASE HEADER

Input Database File: D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.BDB

Edit existing

To Edit an existing header - load database name and press "Edit existing"

Numeric Input Fields - NULL = -1.0E30

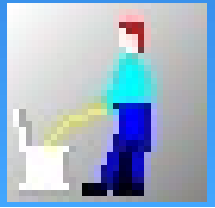
Gradient/Survey Block #	-0.10000E+31
Transmitter Serial	-0.10000E+31
Receiver Serial Number	-0.1000000E+31
Transmitter Frequency	0.97656E-01
For Gradient or Pole arrays ONLY	
Electrode C1 East	-0.1000000E+31
Electrode C1 North	-0.1000000E+31
Electrode C1 RL	-0.1000000E+31
Electrode C2/P2 East	-0.1000000E+31
Electrode C2/P2 North	-0.1000000E+31
Electrode C2/P2 RL	-0.1000000E+31
Angle clockwise from true to grid	-0.10000E+31
Magnetic declination	-0.10000E+31
Rx Dipole size or pot spacing if overlapped	100.00
For Time Domain surveys only	
Start Integration Time (mS)	-0.10000E+31
End Integration Time (mS)	-0.10000E+31

Character Input Fields - 40 characters max

Company/Client	ASEG
Region/State/Country	Unknown
Prospect/Tenement	Unknown
Contractor/Operator	GRS
Date	Unknown
Survey Type	POLE-DIPOLE
Transmitter	Zonge_GGT30?
Receiver	MIMDAS
Sensor/Electrode type	POROUS POT?
Line Direction	
Distance Units	Metres
Transmitter Cycle	2.56 sec on,2.56 sec off
Units for IP parameter	mV/V

OK

Cancel



Check the log file to ensure things looks as they should.

Each program in the suite generates its own log file storing information about who did what and when.

```
 PROGRAM IPPROC
-------------------------------------------------------------------------------

 EXECUTED ON: 13/6/2016 at 16:23:25            BY: kim

_______  LOADING AN GEOSOFT STYLE IP DAT FILE  _______

INPUT FILE IS D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.dat


_____________________________ SETTING DATABASE HEADER _____________________________

INPUT FILE IS D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.BDB


 Company    :                                                          ASEG
 Area :                                                             Unknown
 Project    :                                                       Unknown
 Operator   :                                                           GRS
 Date :                                                             Unknown
 Survey type:                                                     POLE-DIPOLE

 Transmitter:                                                   Zonge_GGT30?
 Receiver   :                                                         MIMDAS
 Sensor     :                                                   POROUS POT?
 Line direction   :
 Distance Units:                                                      Metres
 Transmitter cycle:                                 2.56 sec on,2.56 sec off
 IP Units :                                                           mV/V
 Gradient Block # :          -0.1000000E+31
 Tx serial no.    :          -0.1000000E+31
 Rx serial no.    :          -0.1000000E+31
 Tx Frequency     :           0.9765625E-01
 Start Integration:          -0.1000000E+31
 End Integration  :          -0.1000000E+31
 TN to GN angle   :          -0.1000000E+31
 mag inclination  :          -0.1000000E+31
 Survey date:                -0.1000000E+31
 Dipole Length    :            100.0000
 Tx C1 East :                -0.1000000E+31
```

More of the log file

-1.0 E + 30 is a null value and indicates that the field has not been set.

```
Tx C1 North:                -0.1000000E+31
Tx C1 Elevation  :          -0.1000000E+31
Tx C2 East :                -0.1000000E+31
Tx C2 North:                -0.1000000E+31
Tx C2 Elevation  :          -0.1000000E+31


    BINARY DATABASE
    ---------------------------

    DATABASE NAME= D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.BDB
    NO. OF FIELDS PER RECORD =    78
    FILE STATUS  = NOT SORTED
    TOTAL NO. OF RECORDS     =      10510

FIELD       LABEL                MINIMUM           MAXIMUM
-----     ------------         -------------     -------------
    1     LINE_NO.               3.000000          3.000000  <- Constant???
    2     STATION_NO.            1.000000          10510.00
    3     EASTING              FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED
    4     NORTHING             FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED
    5     ELEVATION            FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED
    6     N_VALUE                1.000000          1.000000  <- Not provided
    7     CURRENT_Amps           1.000000          1.000000  <- Constant
    8     PVOLTAGE_mV           -1574.938          1480.699  <- Negatives???
    9     ARHO_ohm-m             0.000000          1393.754  <- Zero values!
   10     CHARGE_mV/V           -3005.733          7262.524  <- Negatives
   11     CH01-25.6000 Window   -190740.8          106131.8  <- and high??
   12     CH02-76.8000 centre times -102466.9      16734.79
   13     CH03-128.000          -1312996.          6656.709
   14     CH04-179.200          -107484.0          125419.1
   15     CH05-230.400          -109780.3          53369.44
   16     CH06-281.600          -112552.1          8434.698
   17     CH07-332.800          -114782.4          34937.43
   18     CH08-384.000          -118034.9          3255.071
   19     CH09-435.200          -125745.7          41742.45
   20     CH10-486.400          -123097.3          8973.538
   21     CH11-537.600          -125004.7          11903.73
   22     CH12-588.800          -128157.8          6231.701
   23     CH13-640.000          -129747.1          32903.89
   24     CH14-691.200          -132650.2          9521.395
   25     CH15-742.400          -135302.2          5533.997
   26     CH16-793.600          -137975.4          20355.69
   27     CH17-844.800          -140063.1          11710.78
```

More of the log file!

Note that the remote electrode position was not provided in the XYZ file

28	CH18-896.000	-142645.5	2864.629
29	CH19-947.200	-145530.4	10147.79
30	CH20-998.400	-7648.567	8470.269
31	CH21-1049.60	-11204.75	21693.21
32	CH22-1100.80	-1762.226	6215.229
33	CH23-1152.00	-9060.240	7939.862
34	CH24-1203.20	-8064.289	13120.98
35	CH25-1254.40	-1995.099	10300.98
36	CH26-1305.60	-2968.821	7643.293
37	CH27-1356.80	-28954.05	1683.650
38	CH28-1408.00	-118742.4	28254.51
39	CH29-1459.20	-43852.23	3277.649
40	CH30-1510.40	-27267.25	2076.472
41	CH31-1561.60	-4363.213	2081.916
42	CH32-1612.80	-3620.641	4711.283
43	CH33-1664.00	-11967.16	17398.42
44	CH34-1715.20	-4752.774	3692.787
45	CH35-1766.40	-4127.781	1721.351
46	CH36-1817.60	-3361.507	1714.621
47	CH37-1868.80	-3041.091	3837.114
48	CH38-1920.00	-6905.501	7081.314
49	CH39-1971.20	-3767.959	2118.440
50	CH40-2022.40	-21450.82	4185.392
51	CH41-2073.60	-4994.248	9703.921
52	CH42-2124.80	-10316.94	572.1870
53	CH43-2176.00	-7955.329	53788.65
54	CH44-2227.20	-19433.59	7177.631
55	CH45-2278.40	-30633.52	1875.249
56	CH46-2329.60	-3138.860	207303.3
57	CH47-2380.80	-3707.920	7868.051
58	CH48-2432.00	-3843.482	2410.447
59	CH49-2483.20	-3842.889	7519.884
60	CH50-2534.40	-19171.49	39012.64
61	C1_EAST	4250.000	5750.000
62	C1_NORTH	4450.000	5050.000
63	C1_ELEV	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
64	C2_EAST	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
65	C2_NORTH	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
66	C2_ELEV	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
67	P1_EAST	4300.000	5700.000
68	P1_NORTH	4250.000	5250.000
69	P1_ELEV	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
70	P2_EAST	4300.000	5700.000
71	P2_NORTH	4250.000	5250.000

The last of the log file!

Values up to field 77 were read directly from the XYZ file. Field 78 was added by IPProc

71	P2_NORTH	4250.000	5250.000
72	P2_ELEV	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
73	UNLABELED	FIELD IS EMPTY OR STATS HAVE NOT BEEN COMPUTED	
74	ARERR	0.000000	0.000000
75	ERRIP	0.000000	2239.792
76	EVENT	1.000000	381.0000
77	DAU_NO	1.000000	280.0000
78	USE_FLAG	1.000000	1.000000

ASEGWS_TDIP_Data.BDB

File Edit Tools

C1_EAST	C1_NORTH	C1_ELEV	C2_EAST	C2_NORTH	C2_ELEV	P1_EAST	P1_NORTH	P1_ELEV	P2_EAS
4250.000	4450.000					4300.000	4250.000		4400.000
4250.000	4450.000					4300.000	4250.000		4400.000
4250.000	4450.000					4300.000	4250.000		4400.000
4250.000	4450.000					4300.000	4250.000		4400.000
4450.000	4450.000					4300.000	4250.000		4400.000
4450.000	4450.000					4300.000	4250.000		4400.000
4550.000	4450.000					4300.000	4250.000		4400.000
4550.000	4450.000					4300.000	4250.000		4400.000
4550.000	4450.000								4400.000
4650.000	4450.000								4400.000
4650.000	4450.000								4400.000
4650.000	4450.000								4400.000
4750.000	4450.000								4400.000
4750.000	4450.000								4400.000
4850.000	4450.000								4400.000
4850.000	4450.000								4400.000
4850.000	4450.000								4400.000
4950.000	4450.000								4400.000
4950.000	4450.000								4400.000
4950.000	4450.000								4400.000
5050.000	4450.000								4400.000
5050.000	4450.000								4400.000
5150.000	4450.000								4400.000
5150.000	4450.000					4300.000	4250.000		4400.000
5250.000	4450.000					4300.000	4250.000		4400.000
5250.000	4450.000					4300.000	4250.000		4400.000
5350.000	4450.000					4300.000	4250.000		4400.000
5350.000	4450.000					4300.000	4250.000		4400.000
5450.000	4450.000					4300.000	4250.000		4400.000
	4450.000					4300.000	4250.000		4400.000
	4450.000					4300.000	4250.000		4400.000

Set the electrode position of C2 x, y and z from the location file provided.

SEARCH AND REPLACE A VALUE OR CONDITION IN A SELECTED FIELD

To replace all numbers greater than a threshold just type ># where # is your threshold, likewise for lower than. You can also specify a comparison or replacement by another field by using >F#, <F# or just F# where F# refers to the field you want to search by or replace with. Otherwise enter the number you want to find.

Value to Find: NULL

Replacement Value: 4670

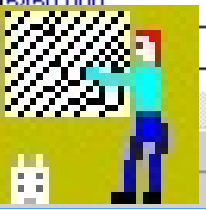
in field: C2_EAST

To search for or replace a value with null enter NULL in the Value to Find or Replacement Value field

If Value to Find uses a < or F criteria and you want to also include null values then

Tick to include Nulls in Value to find

OK Cancel



Record 1 of 10510

ASEGWS_TDIP_Data.BDB

File Edit Tools

All done. Save and exit

C1_EAST	C1_NORTH	C1_ELEV	C2_EAST	C2_NORTH	C2_ELEV	P1_EAST	P1_NORTH	P1_ELEV	P2_EAS
4250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4450.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4450.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4550.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4550.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4550.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4650.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4650.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4650.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4750.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4750.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4850.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4850.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4850.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4950.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4950.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
4950.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5050.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5050.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5150.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5150.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5250.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5350.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5350.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
5450.000	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000
	4450.000		4670.000	11687.00	550.0000	4300.000	4250.000		4400.000

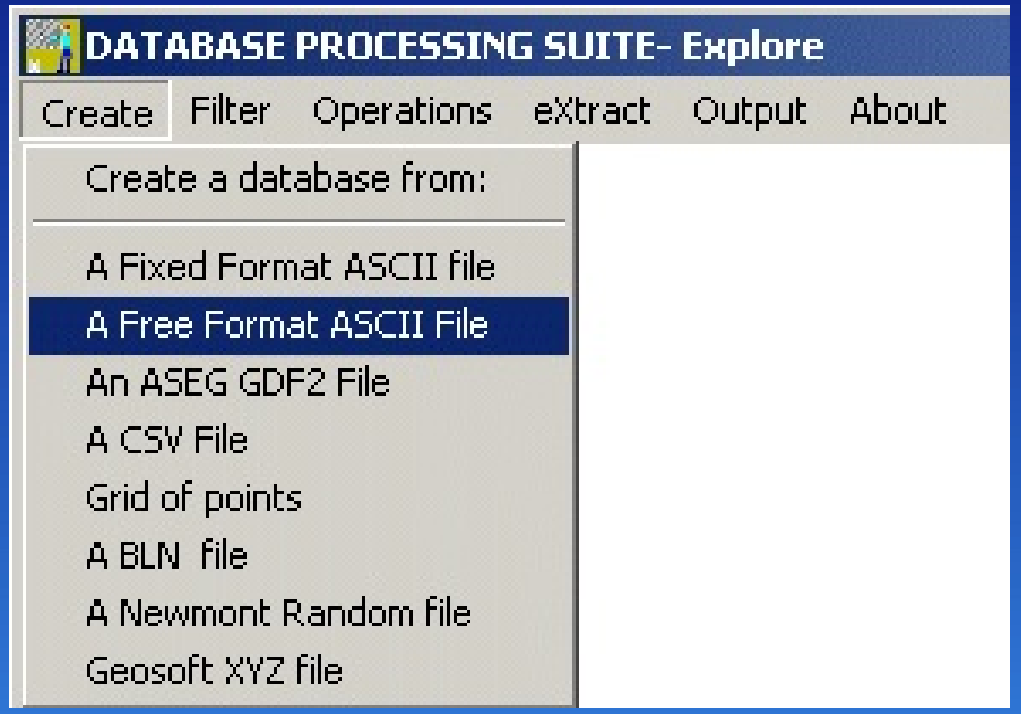
Record 1 of 10510

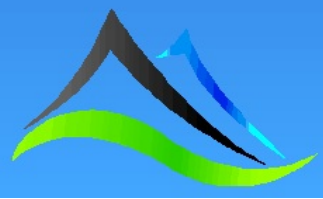
Load the supplied electrode elevations into a database

Lister - [d:\aseg_ip_ws_2016\process\ASEGWS_Grid.topo]

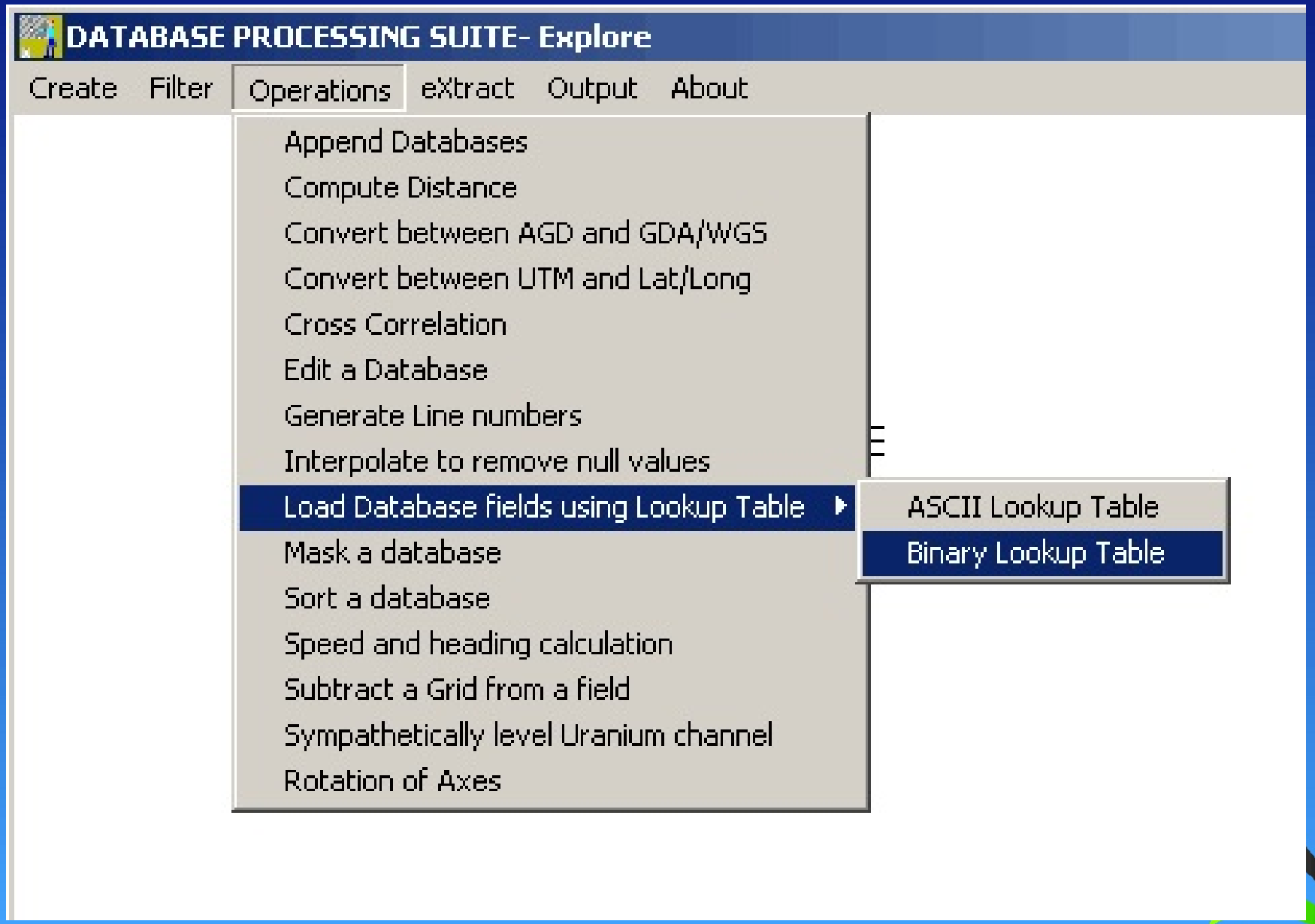
File Edit Options Encoding Help

```
186
4250.0 4250.0 537.7
4300.0 4250.0 535.6
4350.0 4250.0 536.1
4400.0 4250.0 533.4
4450.0 4250.0 532.5
4500.0 4250.0 537.0
4550.0 4250.0 542.5
4600.0 4250.0 546.9
4650.0 4250.0 549.0
4700.0 4250.0 550.2
4750.0 4250.0 552.6
4800.0 4250.0 556.7
4850.0 4250.0 560.1
4900.0 4250.0 571.6
4950.0 4250.0 577.4
5000.0 4250.0 571.6
5050.0 4250.0 569.7
5100.0 4250.0 566.3
5150.0 4250.0 568.3
5200.0 4250.0 568.0
5250.0 4250.0 564.4
5300.0 4250.0 567.3
5350.0 4250.0 566.6
5400.0 4250.0 565.6
5450.0 4250.0 564.7
5500.0 4250.0 567.8
5550.0 4250.0 572.1
5600.0 4250.0 575.2
5650.0 4250.0 579.8
5700.0 4250.0 582.7
```

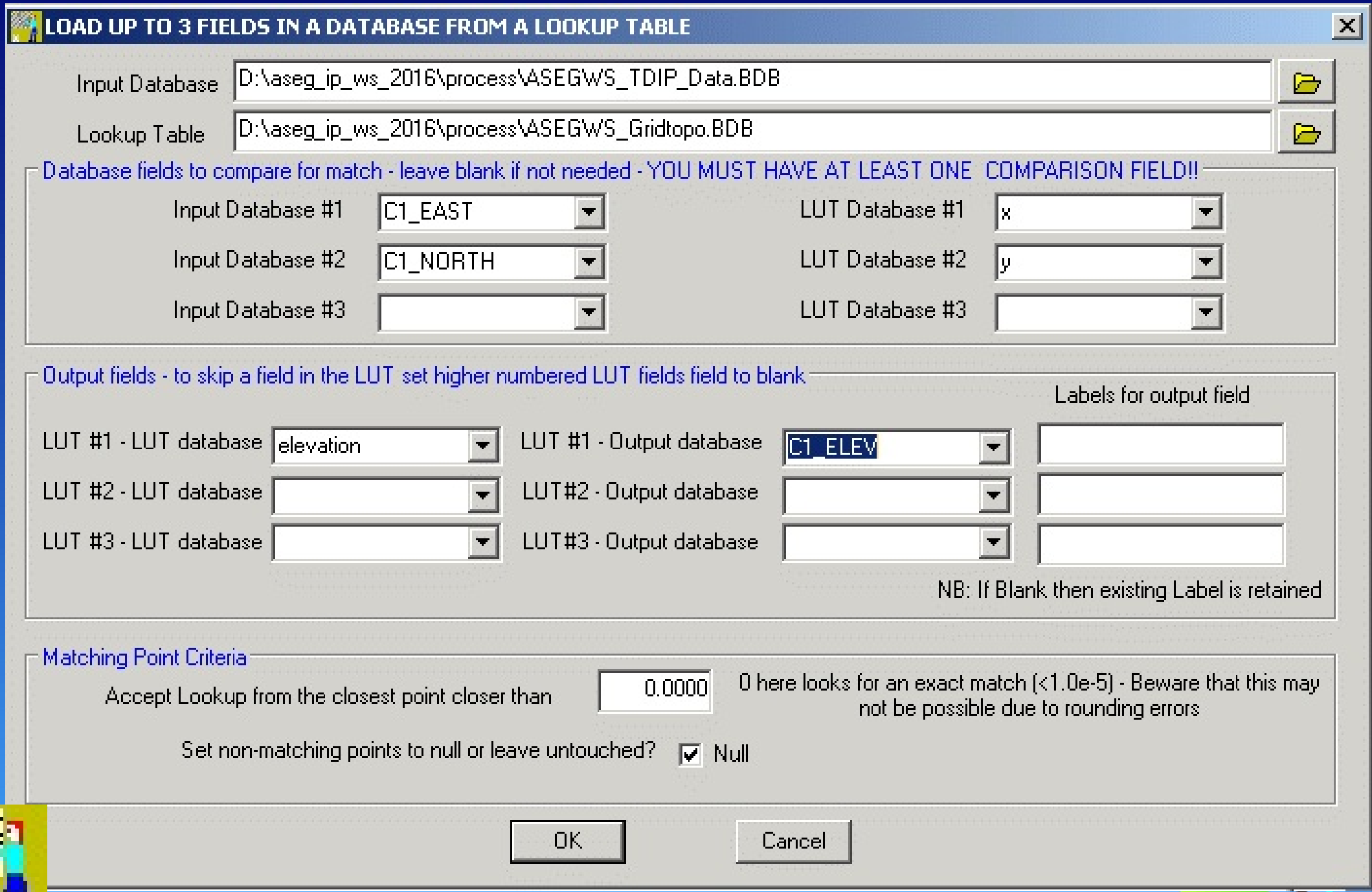




Use the electrode elevation database as a lookup table to load elevations for C1, P1 and P2



Repeat this process for each of C1, P1 and P2



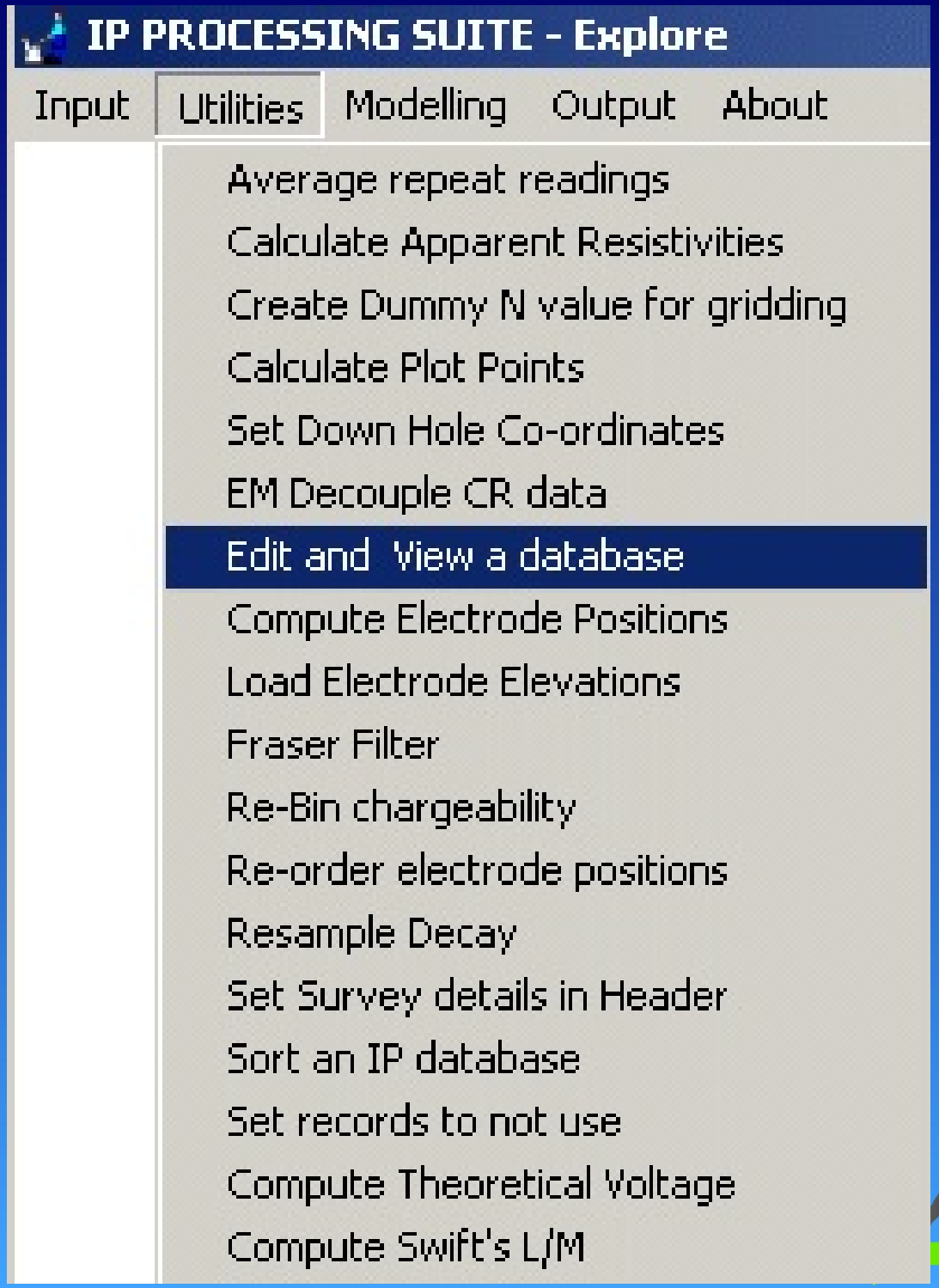
Check the log file to ensure that all electrode locations are now set and look sensible.

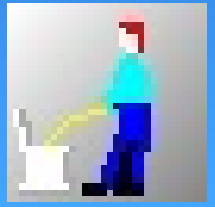
Lister - [d:\aseg_ip_ws_2016\process\DBASE0.PRT]

File Edit Options Encoding Help

49	CH39-1971.20	-3767.959	2118.440
50	CH40-2022.40	-21450.82	4185.392
51	CH41-2073.60	-4994.248	9703.921
52	CH42-2124.80	-10316.94	572.1870
53	CH43-2176.00	-7955.329	53788.65
54	CH44-2227.20	-19433.59	7177.631
55	CH45-2278.40	-30633.52	1875.249
56	CH46-2329.60	-3138.860	207303.3
57	CH47-2380.80	-3707.920	7868.051
58	CH48-2432.00	-3843.482	2410.447
59	CH49-2483.20	-3842.889	7519.884
60	CH50-2534.40	-19171.49	39012.64
61	C1_EAST	4250.000	5750.000
62	C1_NORTH	4450.000	5050.000
63	C1_ELEV	511.5000	585.0000
64	C2_EAST	4670.000	4670.000
65	C2_NORTH	11687.00	11687.00
66	C2_ELEV	550.0000	550.0000
67	P1_EAST	4300.000	5700.000
68	P1_NORTH	4250.000	5250.000
69	P1_ELEV	513.0000	592.8000
70	P2_EAST	4300.000	5700.000
71	P2_NORTH	4250.000	5250.000
72	P2_ELEV	513.0000	592.8000
73	ARERR	0.000000	0.000000
74	ERRIP	0.000000	2239.792
75	EVENT	1.000000	381.0000
76	DAU_NO	1.000000	280.0000
77	USE_FLAG	1.000000	1.000000

Open the database in IPProc.





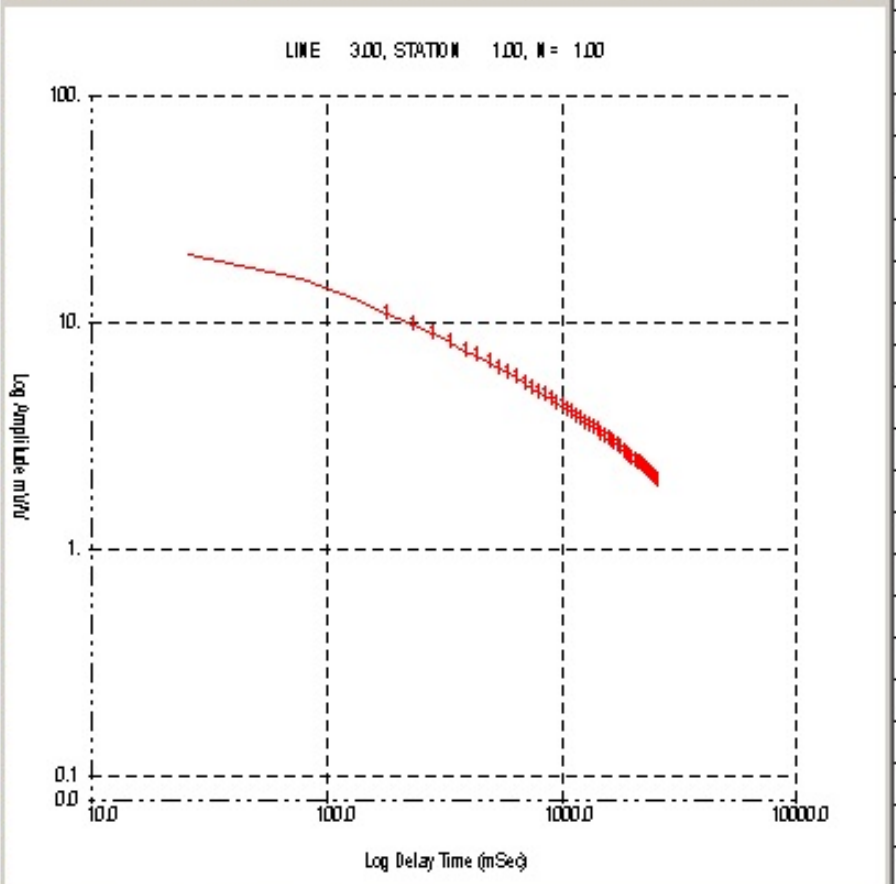
Plot the electrodes to check the layout

ASEGWS_TDIP_Data.BDB

File

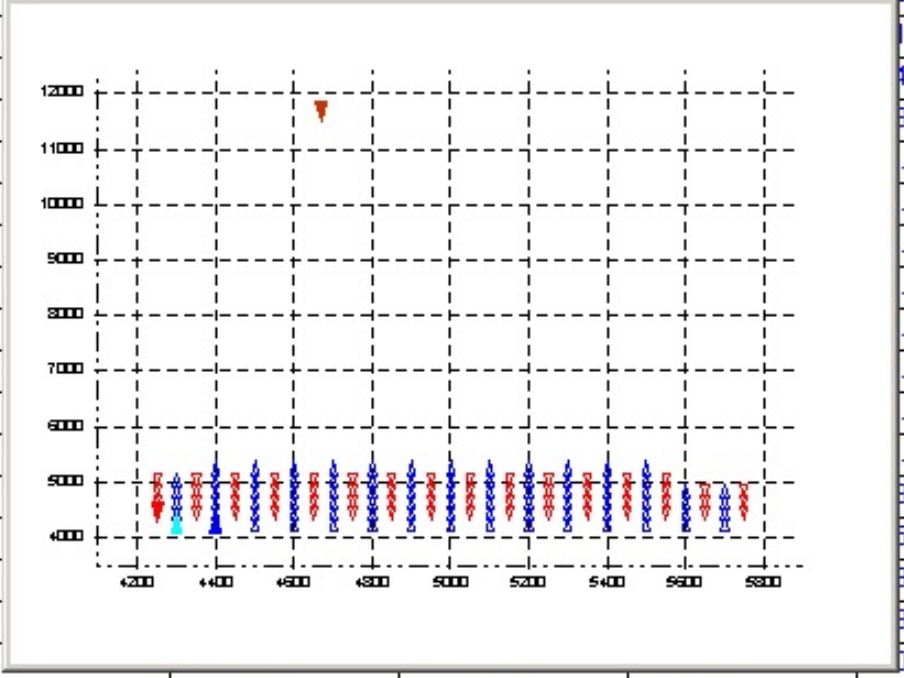
LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	CHAR
3.000000	1.000000				1.000000	1.000000	27.13126	12.78400	4.66900
3.00					1.000000	1.000000	27.12484	12.78100	4.69500
3.00					1.000000	1.000000	27.14736	12.79200	4.66000
3.00								80600	4.54800
3.00								58000	10.3700
3.00								60000	10.3400
3.00								15300	8.58500
3.00								42000	8.42100
3.00								83300	8.53900
3.00								.4740	9.98400
3.00								.4740	9.97500
3.00								.4700	9.97100
3.00								.6910	11.2810
3.00								.6710	11.1280
3.00								.8600	11.3910
3.00								.6570	11.3750
3.00								.8000	11.1880
3.00								84000	119.905
3.00								58000	122.308
3.00								83000	128.745
3.00								82400	268.661
3.00								09000	133.424
3.00					1.000000	1.000000	-8.692225	350.3510	10.1840
3.00					1.000000	1.000000	-8.692225	350.3510	10.1660
3.00					1.000000	1.000000	-7.079525	362.0470	10.4930
3.00					1.000000	1.000000	-7.078955	362.0170	10.4850
3.000000	27.00000				1.000000	1.000000	-6.166539	390.2880	10.6330
3.000000	28.00000				1.000000	1.000000	-6.166736	390.3000	10.5000
	29.00000				1.000000	1.000000	-5.114448	392.6600	10.9670
	30.00000				1.000000	1.000000	-5.112400	392.5030	10.7060
	31.00000				1.000000	1.000000	-4.124288	377.8120	11.3670

DECAY PLOT



MOUSE CLICK RETURNS CO-ORDINATES

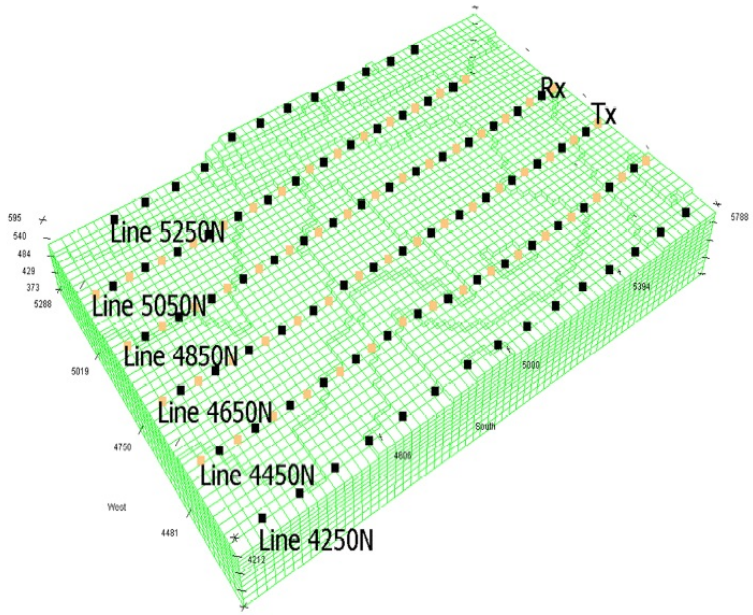
ELECTRODE MAP



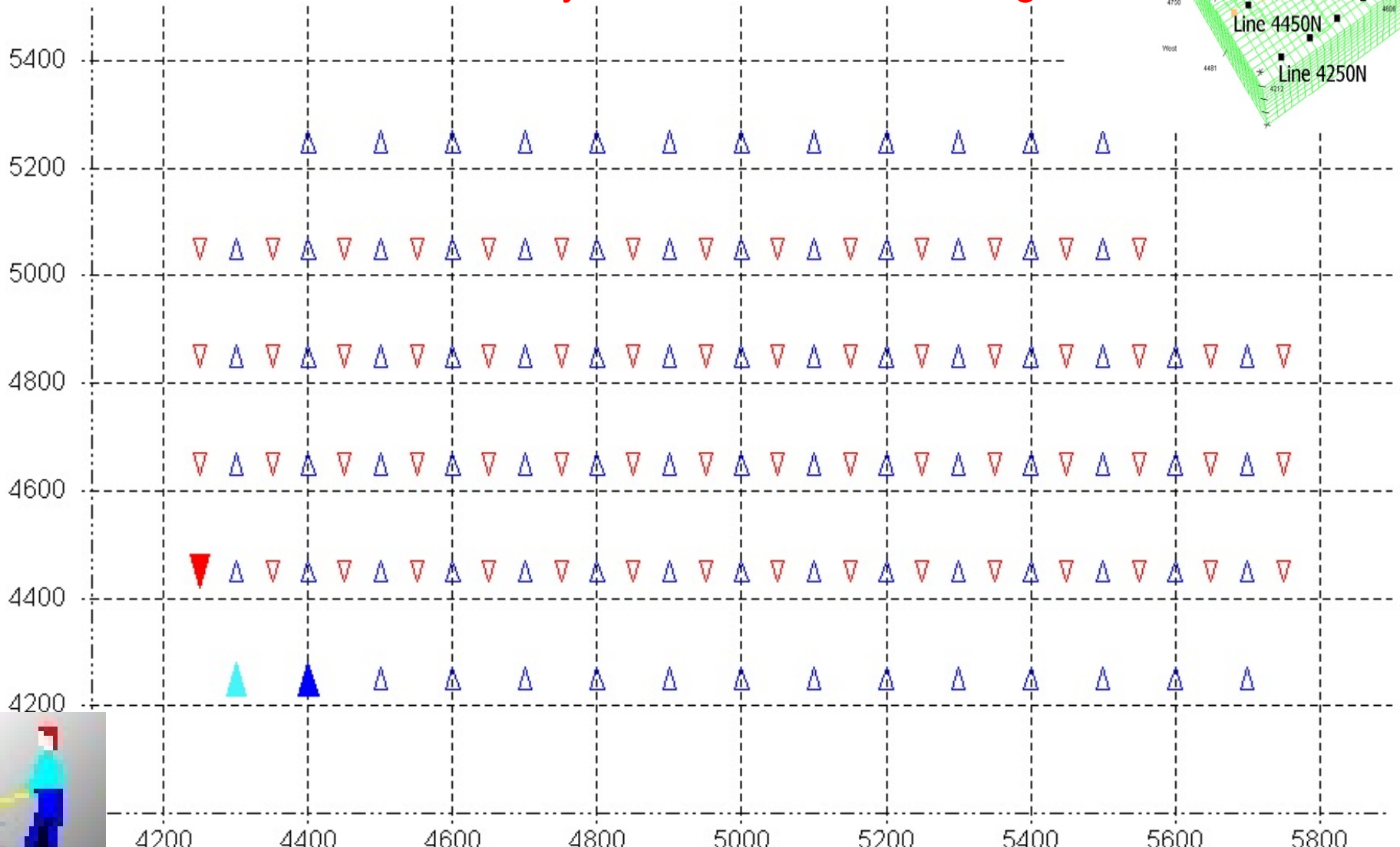
Record 1 of 10510

Layout looks like the figure provided. All good so far!

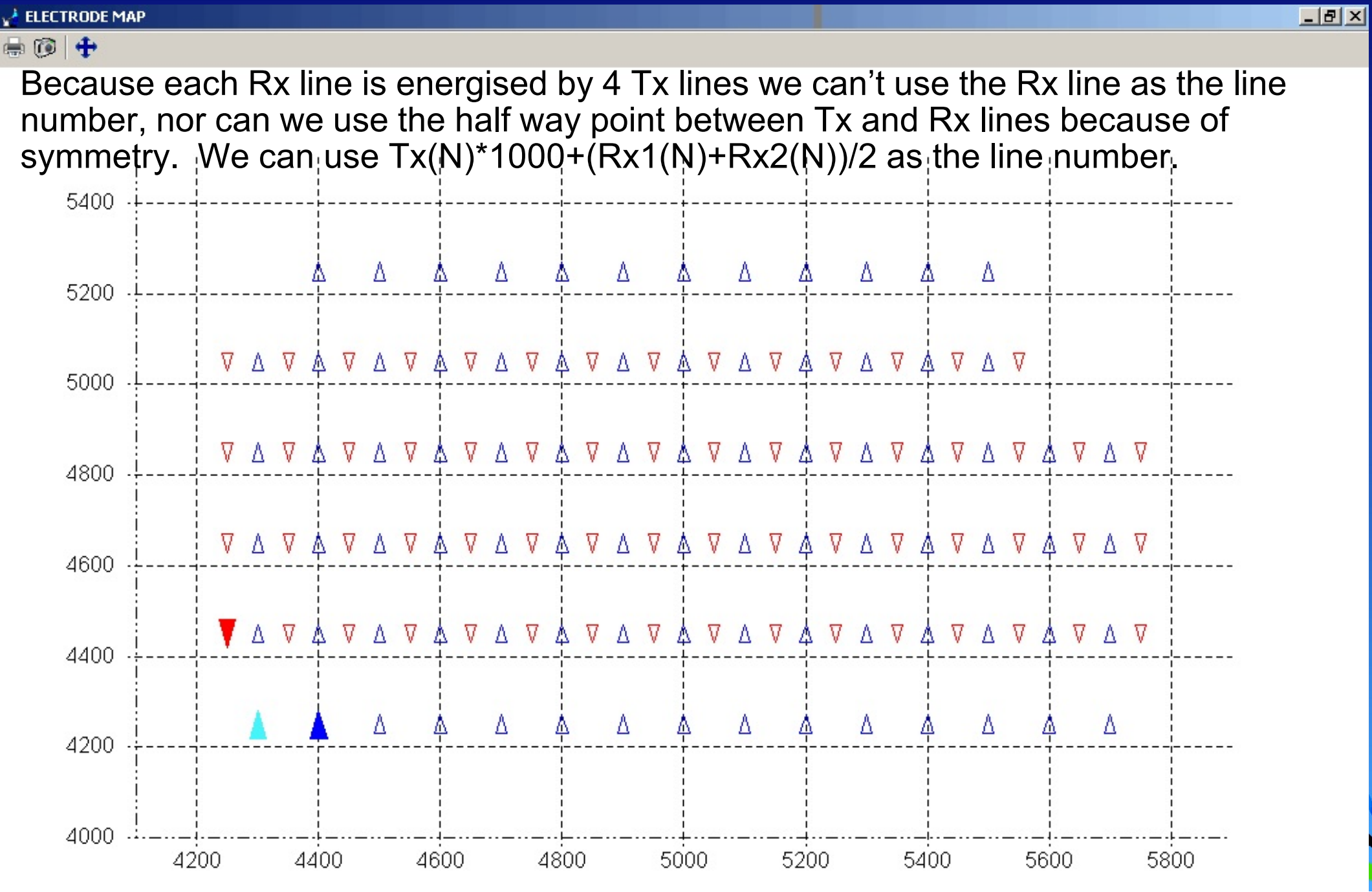
ELECTRODE MAP



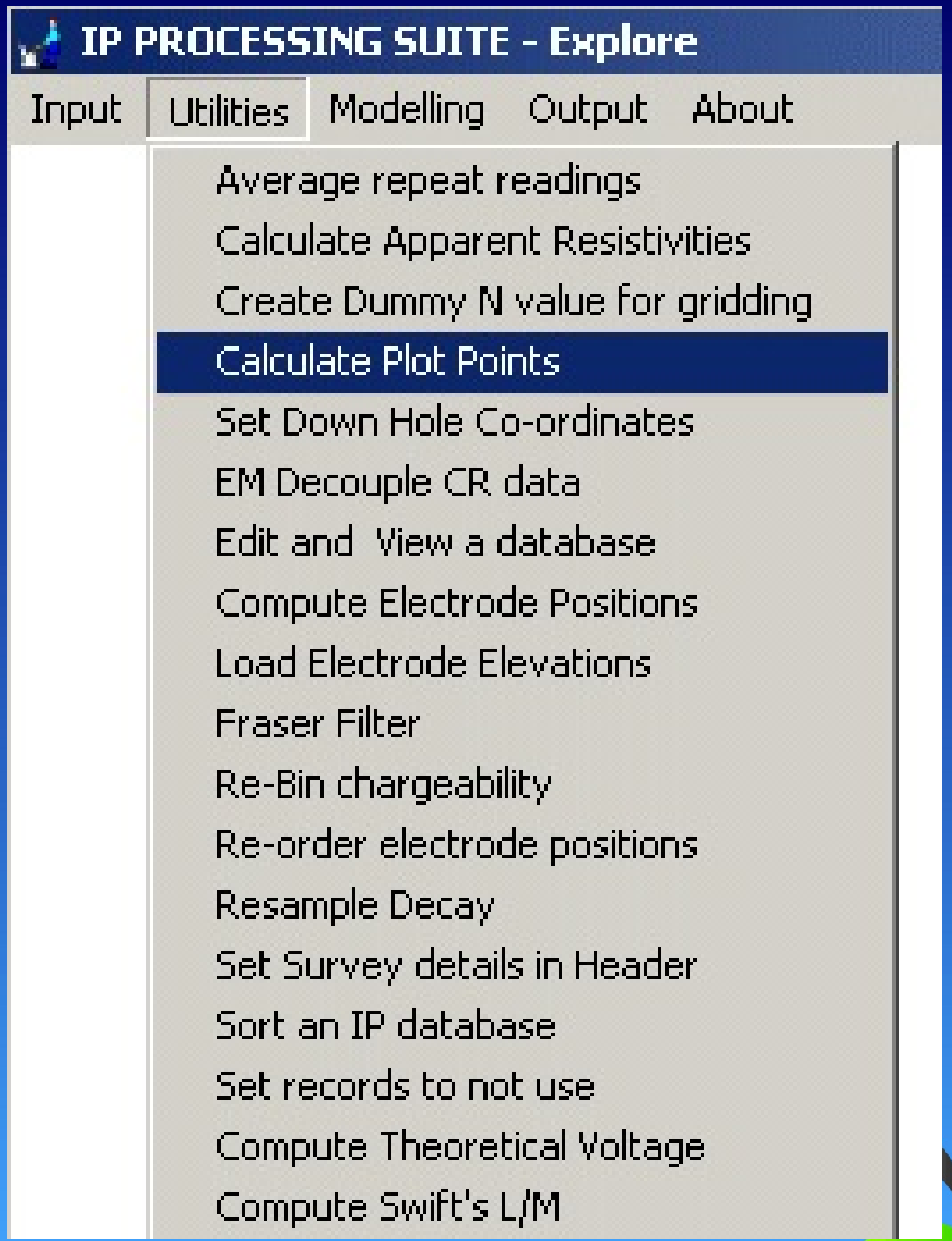
Blue = Rx, Red = Tx, filled symbols = selected reading

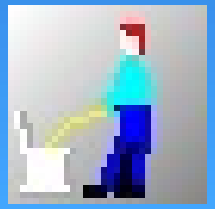


Now we need to calculate plot points.



Use IPProc to compute the plot points (Line, Station and n value) recognising that the line number will be wrong and will need to be computed separately





Don’t include the remote in the calculation

CALCULATE THE PLOT POINT

This routine computes the plot position by taking the average of the entered fields. For more complex cases you will have to calculate this manually

Input Database File: D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.BDB

NB: Database should be standard IP format

Fields holding Electrode line positions

For remote electrodes or to ignore a field set the corresponding field to blank

C1: C1_NORTH C2: <- Increment remaining fields by 3 P1: P1_NORTH P2: P2_NORTH

Fields holding Electrode station positions

For remote electrodes or to ignore a field set the corresponding field to blank

C1: C1_EAST C2: <- Increment remaining fields by 3 P1: P1_EAST P2: P2_EAST

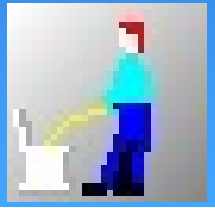
Optionally re-compute the n value

☑ Also compute a new n value?

The same effective plot point can be computed by reciprocating the potential and current electrodes. If the electrodes use the same positions this is valid, if not then you should give n a sign so that the two halves of the array plot either side of the zero line on the pseudosection. Note that ticking this box changes the definition of n slightly so that n=0 implies the Tx and Rx dipoles have the same centre not offet by one dipole spacing as is the normal interpretation.

☑ Give n a sign?

OK Cancel



Now compute the line number

ASEGWS_TDIP_Data.BDB

File Edit Tools

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	CHARGE_
4350.000	4300.000				-1.000000	1.000000	27.13126	12.78400	4.669000
4350.000	4300.000				-1.000000	1.000000	27.12484	12.78100	4.695000
4350.000	4300.000				-1.000000	1.000000	27.14736	12.79200	4.660000
4350.000	4300.000				-1.000000	1.000000	27.17633	12.80600	4.548000
4350.000	4400.000				1.000000	1.000000	-19.64517	9.258000	10.37000
4350.000	4400.000				1.000000	1.000000	-19.64956	9.260000	10.34000
4350.000	4450.000				2.000000	1.000000	-25.09632	59.15300	8.585000
4350.000	4450.000							59.42000	8.421000
4350.000	4450.000							59.33300	8.539000
4350.000	4500.000							110.4740	9.984000
4350.000	4500.000							110.4740	9.975000
4350.000	4500.000							110.4700	9.971000
4350.000	4550.000							168.6910	11.28100
4350.000	4550.000							168.6710	11.12800
4350.000	4600.000							186.8600	11.39100
4350.000	4600.000							186.6570	11.37500
4350.000	4600.000							186.8000	11.18800
4350.000	4650.000							6.234000	119.9050
4350.000	4650.000							6.758000	122.3080
4350.000	4650.000							7.293000	128.7450
4350.000	4700.000							68.82400	268.6610
4350.000	4700.000							3.109000	133.4240
4350.000	4750.000							350.3510	10.18400
4350.000	4750.000							350.3510	10.16600
4350.000	4800.000				9.000000	1.000000	-7.079525	362.0470	10.49300
4350.000	4800.000				9.000000	1.000000	-7.078955	362.0170	10.48500
4350.000	4850.000				10.00000	1.000000	-6.166539	390.2880	10.63300
4350.000	4850.000				10.00000	1.000000	-6.166736	390.3000	10.50000
4350.000	4900.000				11.00000	1.000000	-5.114448	392.6600	10.96700
4350.000	4900.000				11.00000	1.000000	-5.112400	392.5030	10.70600
4350.000	4950.000				12.00000	1.000000	-4.124288	377.8120	11.36700

APPLY A FUNCTION TO THE DATABASE

Carry out simple arithmetic on the database. More complex maths is better handled by BDOPERATE

Variable 2 can be a numerical value or another field in the database. If you want it to be another field preceed the field number with an F. e.g. F23+23.6 adds 23.6 to Field 23, F23-F15 subtracts Field 15 from Field 23.

NOTE: The trigonometric functions expect angles to be in radians. All functions have their standard FORTRAN meaning

Function

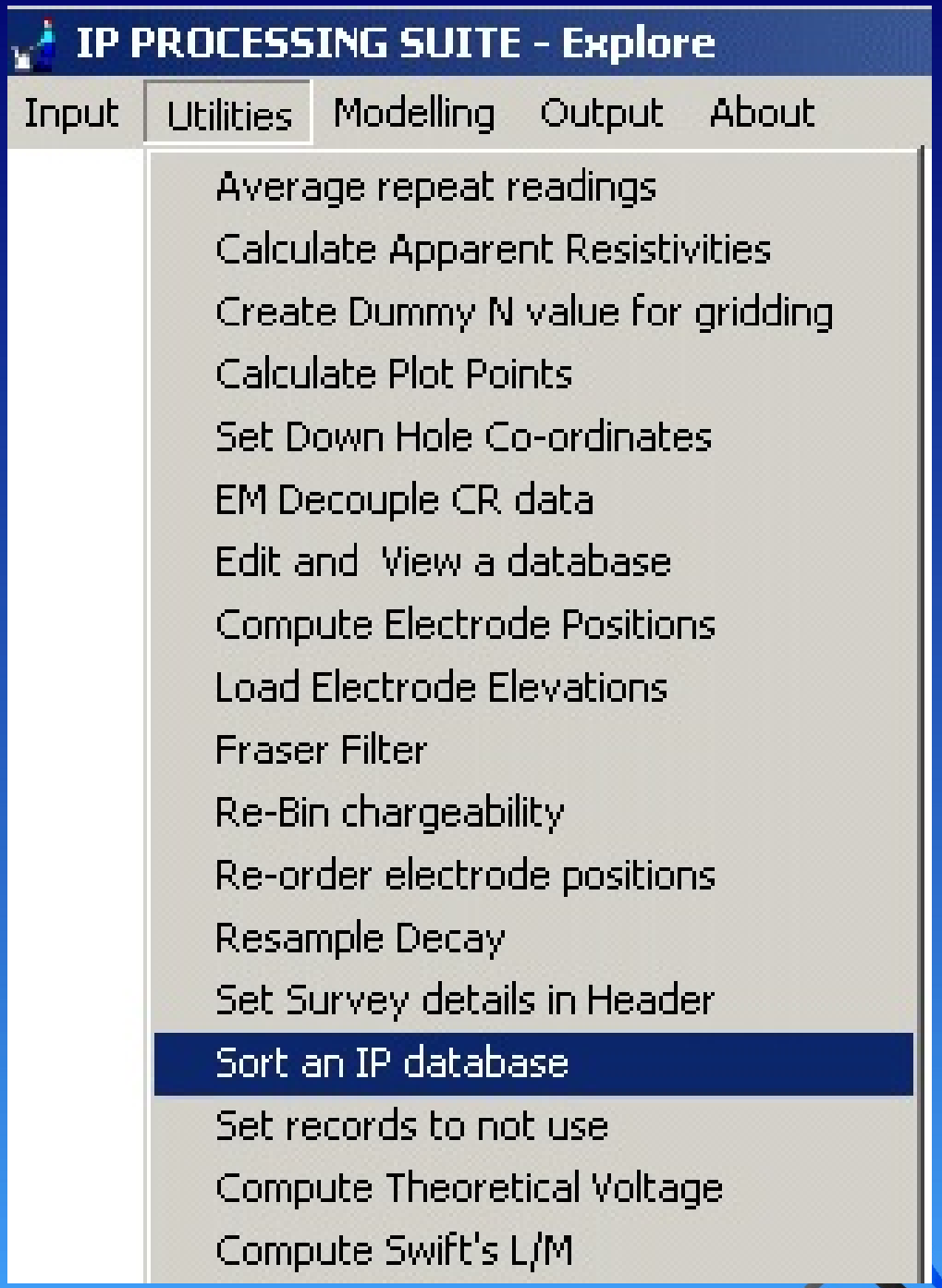
	Variable 1	Operator	Variable 2	Output to
F	C1_NORTH	*	1000	F LINE_NO.

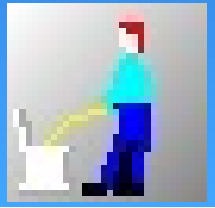
Apply to Null Values ☐

OK Cancel

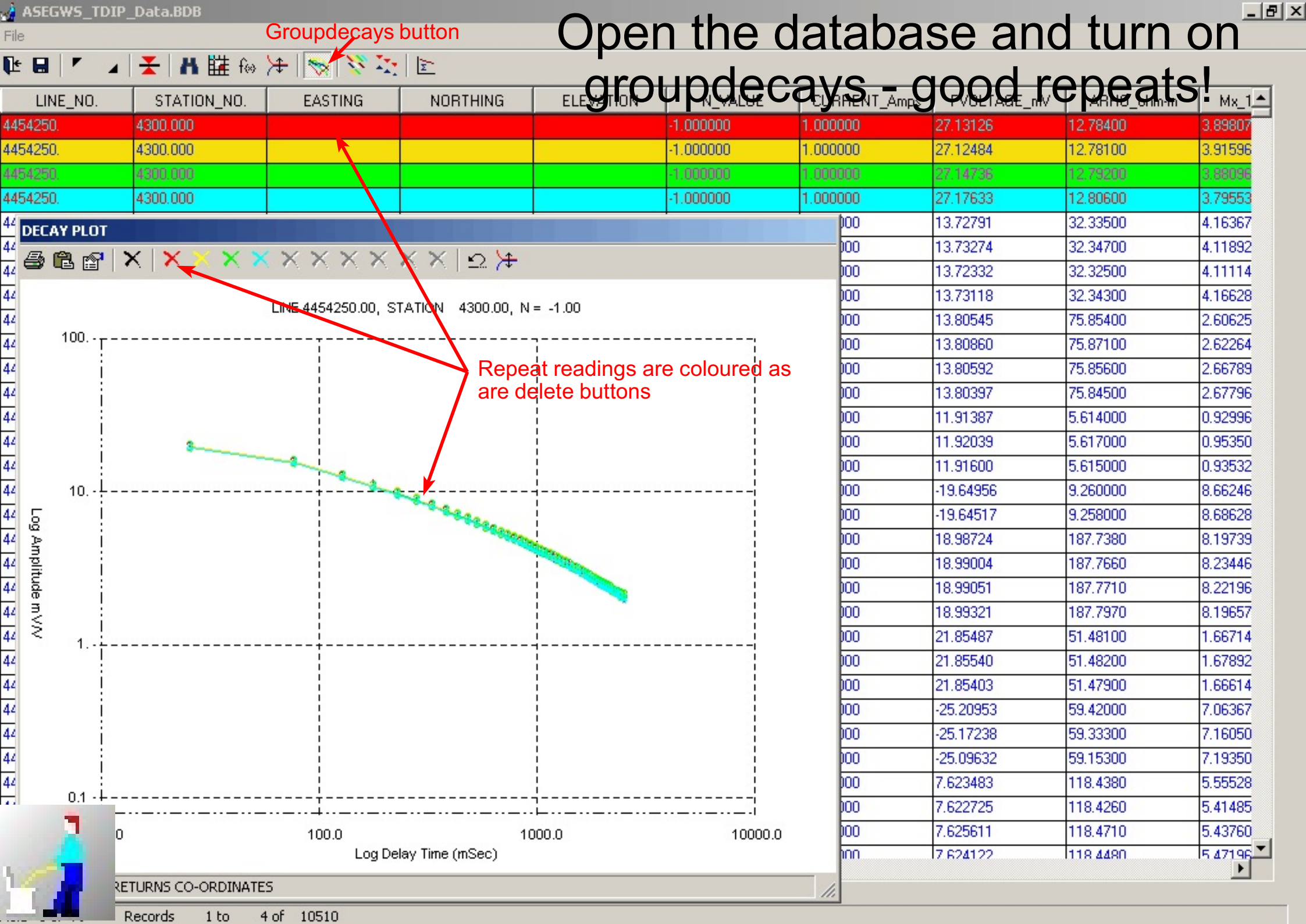
Record 1 of 10510

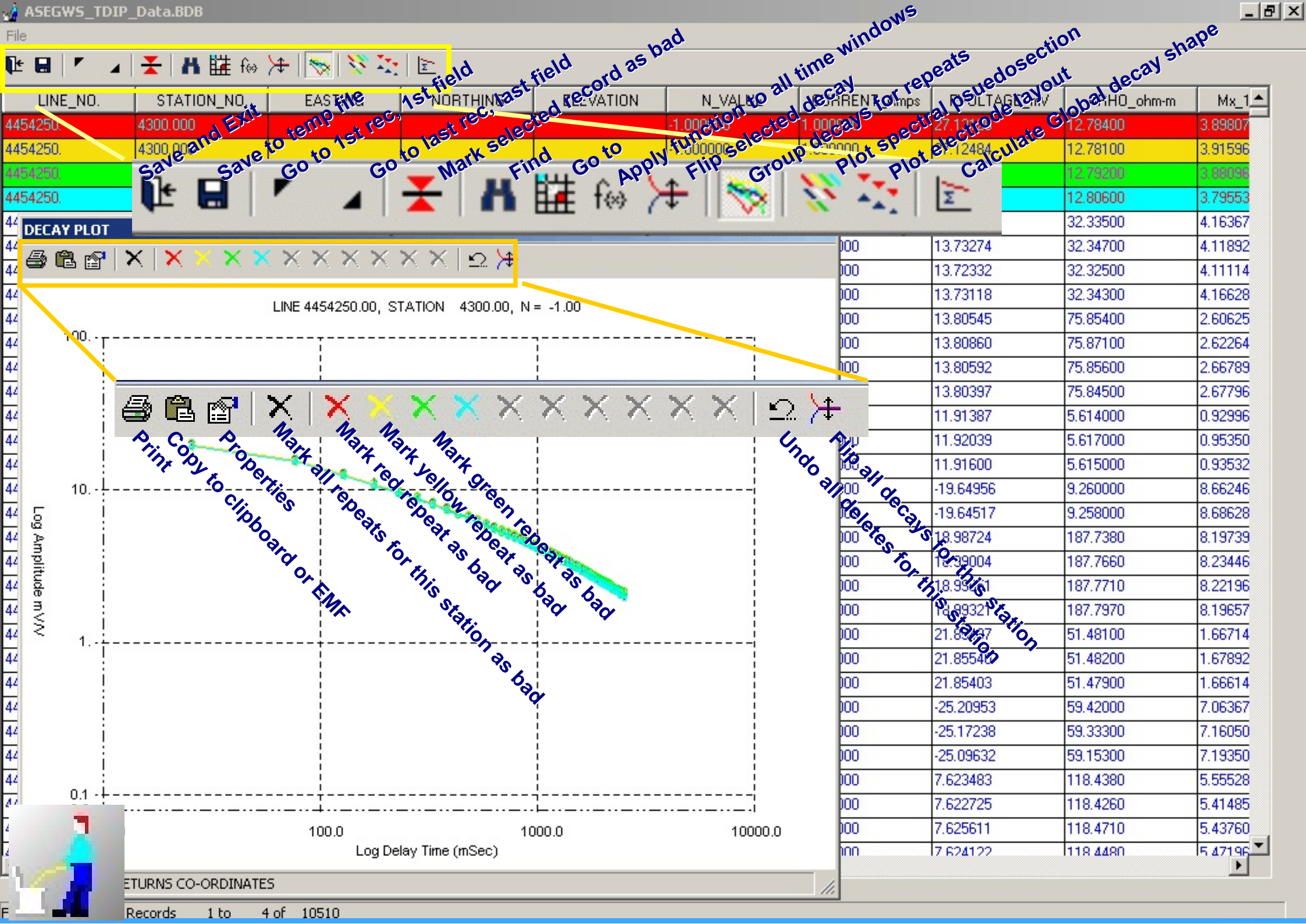
Now sort the database so that repeat readings are together





Open the database and turn on groupdecays - good repeats!




ASEGWS_TDIP_Data.BDB
File
Save and Exit
Save to temp file
Go to 1st rec, 1st field
Go to last rec, last field
Mark selected record as bad
Find
Go to
Apply function to all time windows
Flip selected decay
Group decays for repeats
Plot spectral psuedosection
Plot electrode layout
Calculate Global decay shape
LINE_NO.
STATION_NO.
EASTING
NORTHING
ELEVATION
N_VALUE
CURRENT_amps
VOLTAGE_mV
RHO_ohm-m
Mx_1
DECAY PLOT
LINE 4454250.00, STATION 4300.00, N = -1.00
Print
Copy to clipboard or EMF
Properties
Mark all repeats for this station as bad
Mark red repeat as bad
Mark yellow repeat as bad
Mark green repeat as bad
Undo all deletes for this station
Flip all decays for this station
Log Amplitude mV/V
Log Delay Time (mSec)
100.0
1000.0
10000.0
RETURNS CO-ORDINATES
Records 1 to 4 of 10510

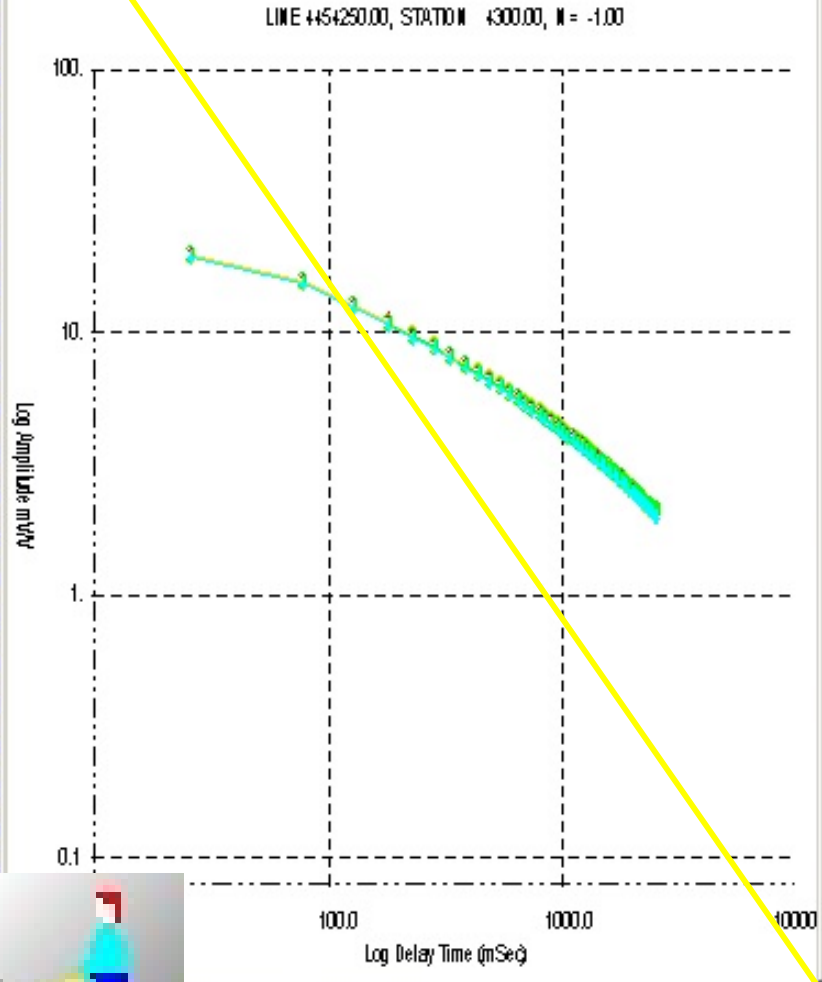
Set the decay plot properties

ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454250.	4300.000				-1.000000	1.000000	27.13126	12.78400	3.89807
4454250.	4300.000				-1.000000	1.000000	27.12484	12.78100	3.91596
4454250.	4300.000				-1.000000	1.000000	27.14736	12.79200	3.88096
4454250.	4300.000				-1.000000	1.000000	27.17633	12.80600	3.79553
44					-2.000000	1.000000	13.72791	32.33500	4.16367
44							73274	32.34700	4.11892
44							72332	32.32500	4.11114
44							73118	32.34300	4.16628
44							30545	75.85400	2.60625
44							30860	75.87100	2.62264
44							30592	75.85600	2.66789
44							30397	75.84500	2.67796
44							31387	5.614000	0.92996
44							32039	5.617000	0.95350
44							31600	5.615000	0.93532
44							64956	9.260000	8.66246
44							64517	9.258000	8.68628
44							38724	187.7380	8.19739
44							39004	187.7660	8.23446
44							39051	187.7710	8.22196
44							39321	187.7970	8.19657
44							35487	51.48100	1.66714
44							35540	51.48200	1.67892
44							35403	51.47900	1.66614
44							20953	59.42000	7.06367
44							17238	59.33300	7.16050
44							09632	59.15300	7.19350
44							23483	118.4380	5.55528
44							22725	118.4260	5.41485
44							25611	118.4710	5.43760
44							24122	118.4480	5.47196

DECAY PLOT



Change plot properties

Graph Type: Log-Log

Currently only has meaning for Time domain

Show global median decay for these data? ☐

Plot a line for average/median for this repeat? None

Percentile for Median: 50

Ignore negative chargeabilities in calculating median/average ☑

The Average/Median is only plotted in group plot mode

Visible Warnings

Threshold for low Vp warning: 0.10000

A Vp below this will result in magenta grid lines

For Time Domain

Threshold for bad chargeability: 1000.0

A chargeability above this will result in green grid lines

For Frequency Domain

Threshold for bad phase contour interval: 10.000

A phase interval above this will result in green grid lines

Close

ETURNS CO-ORDINATES

Records 1 to 4 of 10510

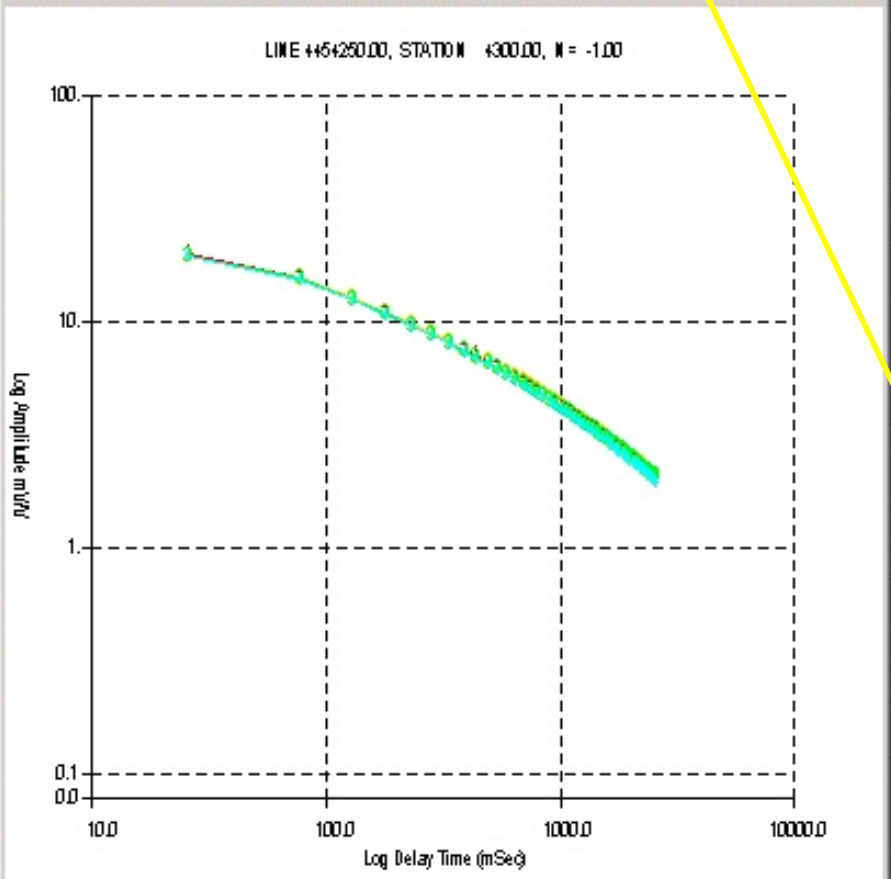
Plot a spectral psuedosection

ASEGWS_TDIP_Data.BDB

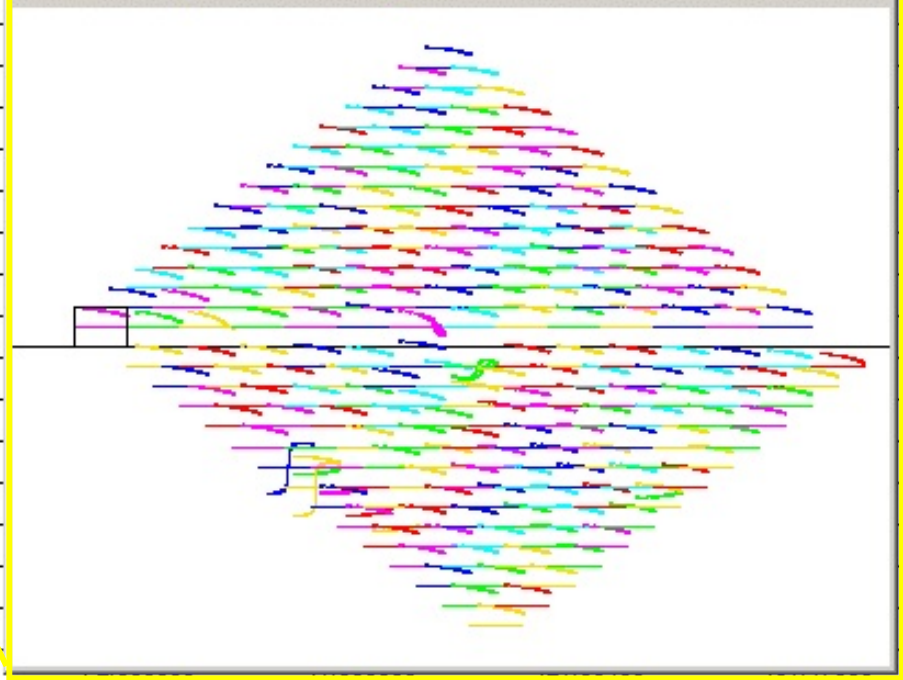
File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454250.	4300.000				-1.000000	1.000000	27.13126	12.78400	3.89807
4454250.	4300.000				-1.000000	1.000000	27.12484	12.78100	3.91596
4454250.	4300.000				-1.000000	1.000000	27.14736	12.79200	3.88096
4454250.	4300.000				-1.000000	1.000000	27.17633	12.80600	3.79553
4454250.	4350.000				-2.000000	1.000000	13.72791	32.33500	4.16367
									4.11892
									4.11114
									4.16628
									2.60625
									2.62264
									2.66789
									2.67796
									0.92996
									0.95350
									0.93532
									8.66246
									8.68628
									8.19739
									8.23446
									8.22196
									8.19657
									1.66714
									1.67892
									1.66614
					2.000000	1.000000	-25.20953	59.42000	7.06367
					2.000000	1.000000	-25.17238	59.33300	7.16050
					2.000000	1.000000	-25.09632	59.15300	7.19350
					-5.000000	1.000000	7.623483	118.4380	5.55528
					-5.000000	1.000000	7.622725	118.4260	5.41485
					-5.000000	1.000000	7.625611	118.4710	5.43760
	4500.000				-5.000000	1.000000	7.624122	118.4480	5.47196

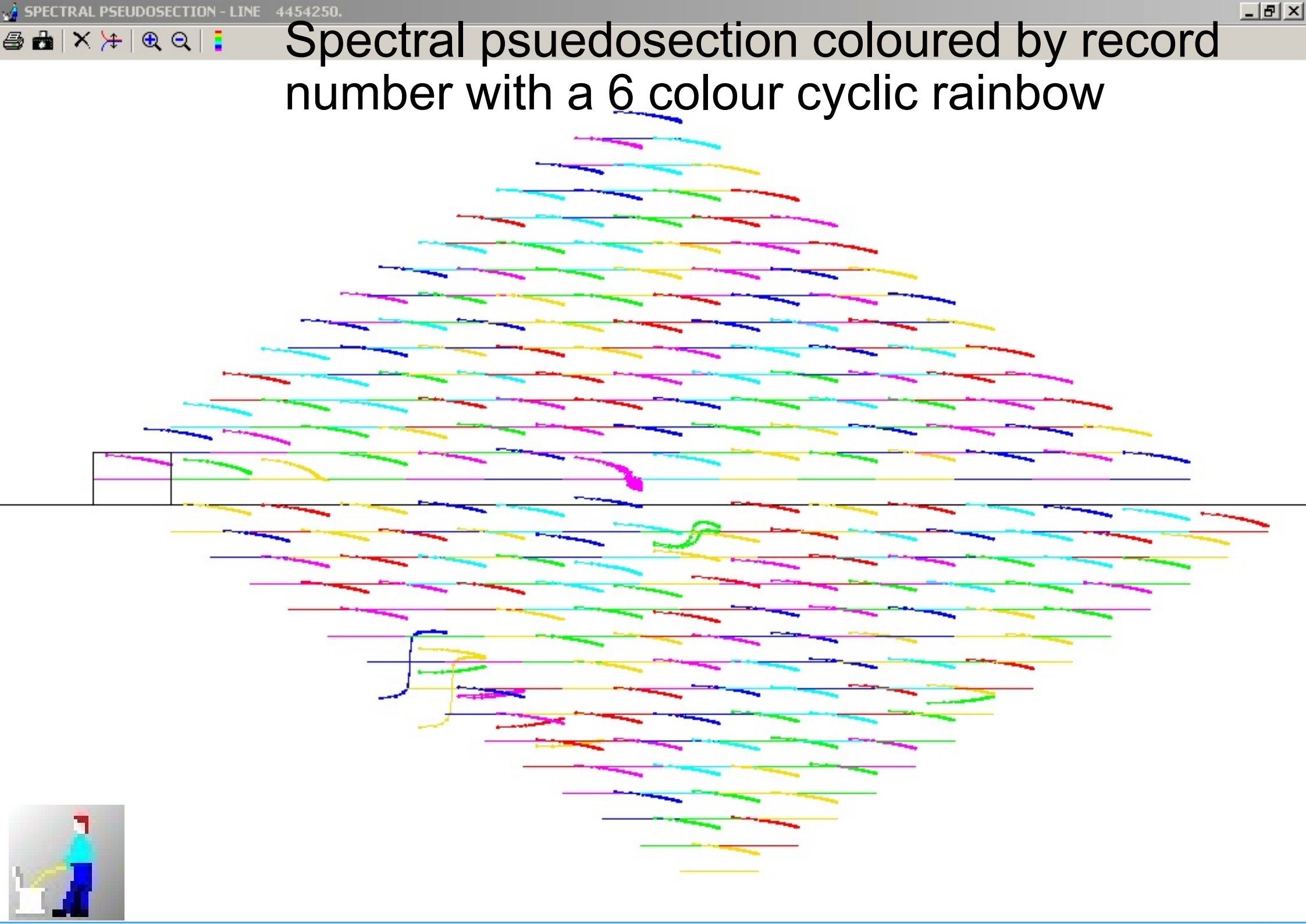
DECAY PLOT



SPECTRAL PSEUDOSECTION - LINE 4454250.

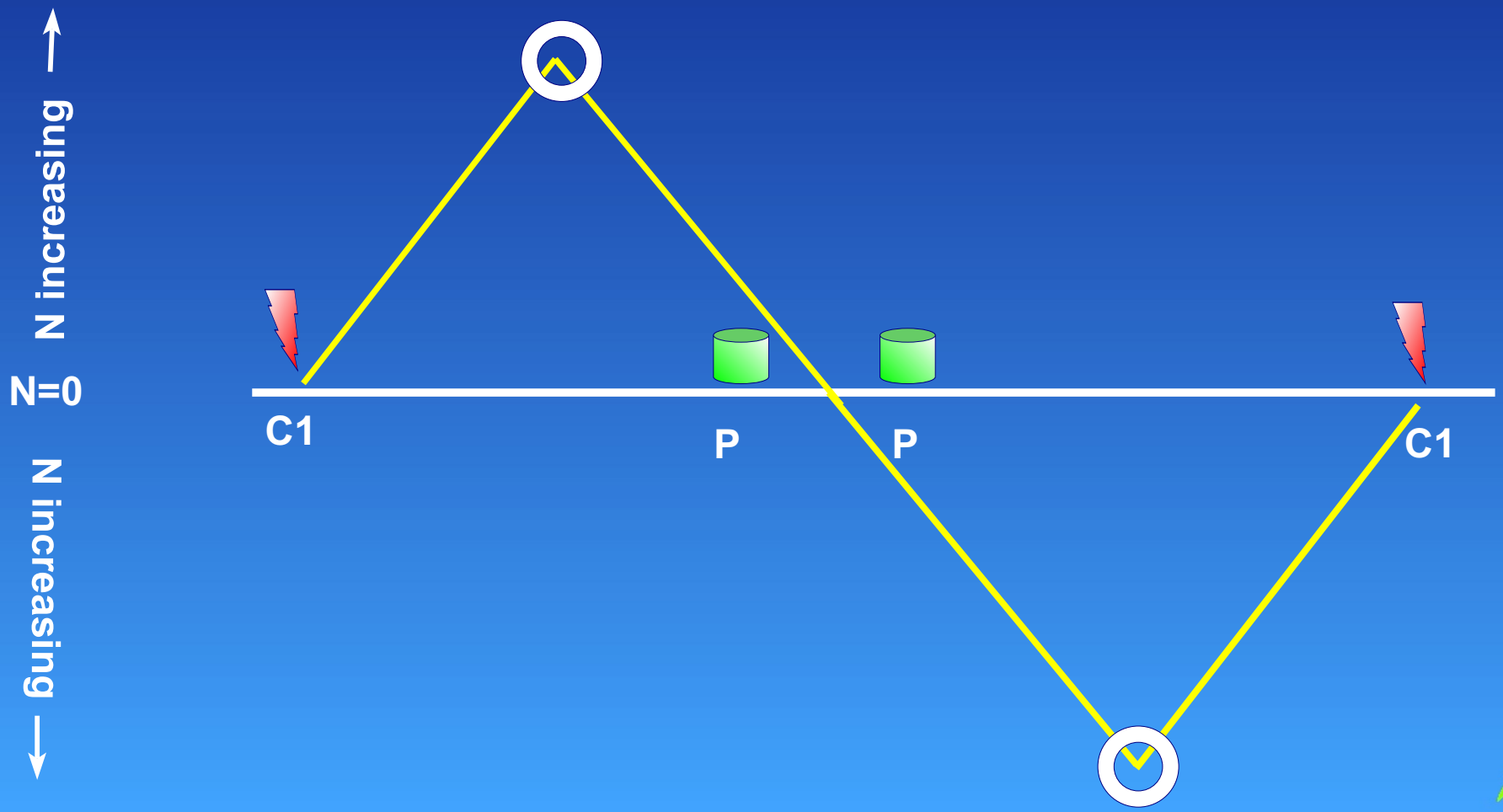


Records 1 to 4 of 10510

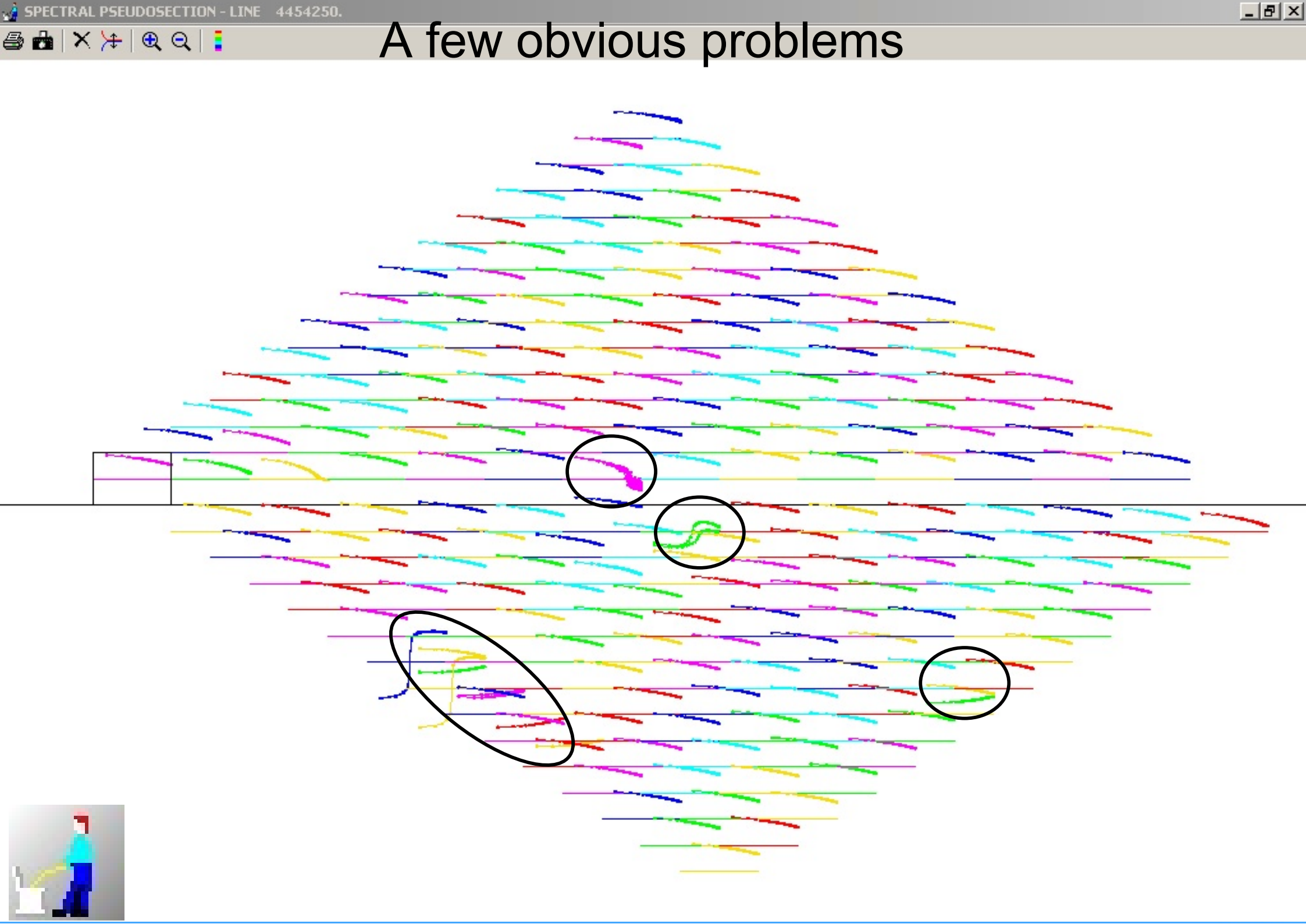

SPECTRAL PSEUDOSECTION - LINE 4454250.
Spectral psuedosection coloured by record number with a 6 colour cyclic rainbow

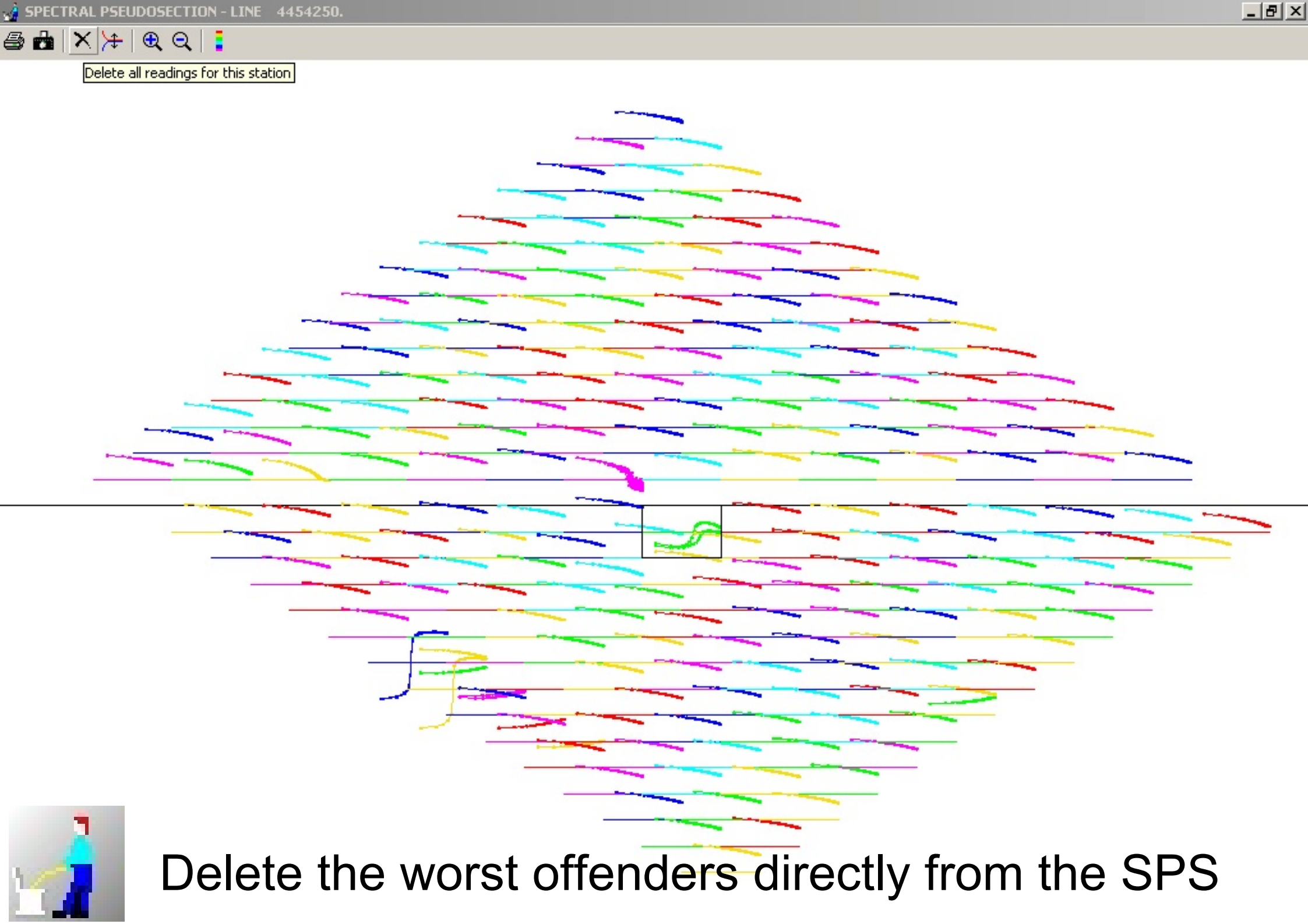
Plotting Convention

Because the lines are offset reciprocal station numbers do not mean the same plot point can be used.

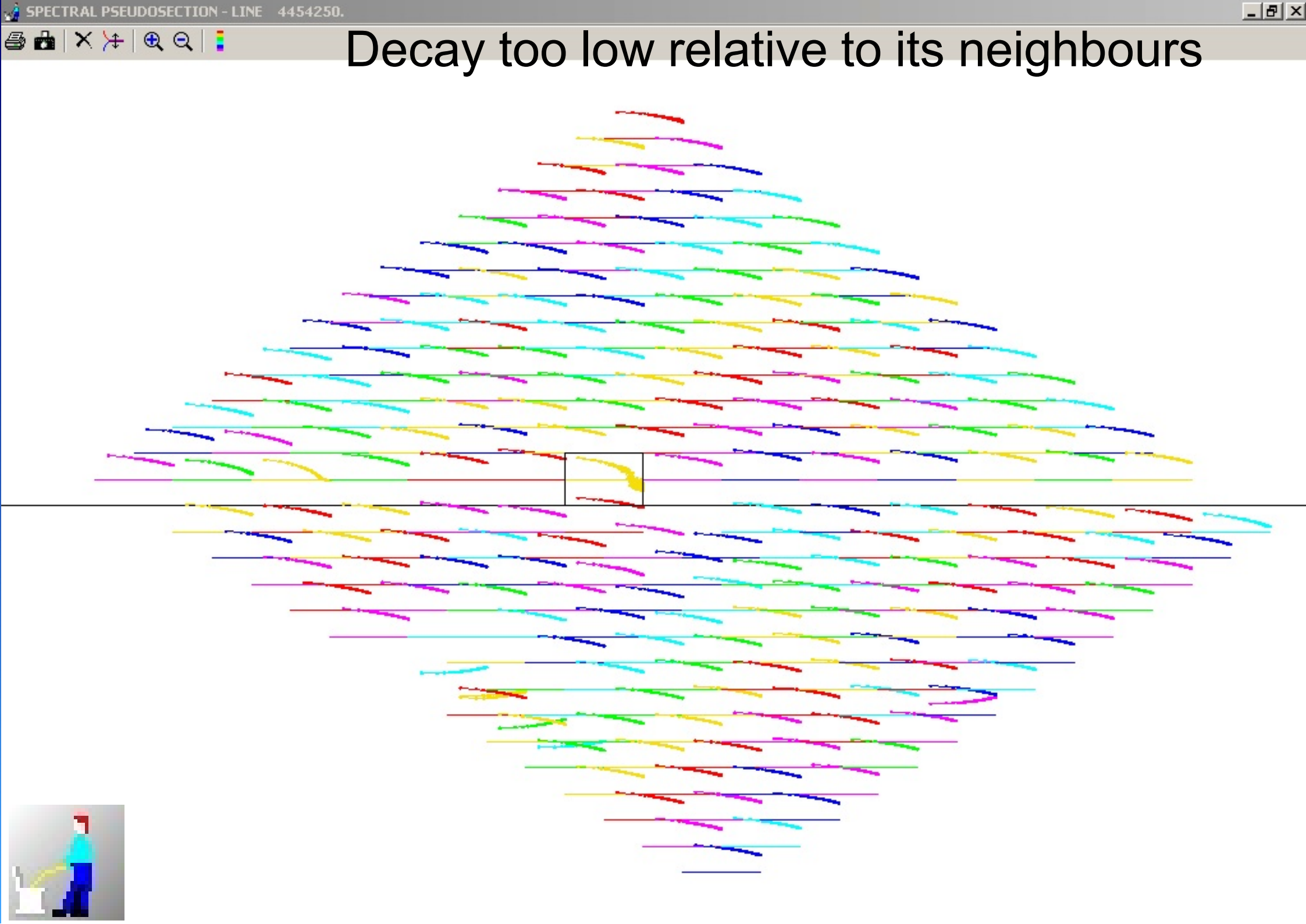


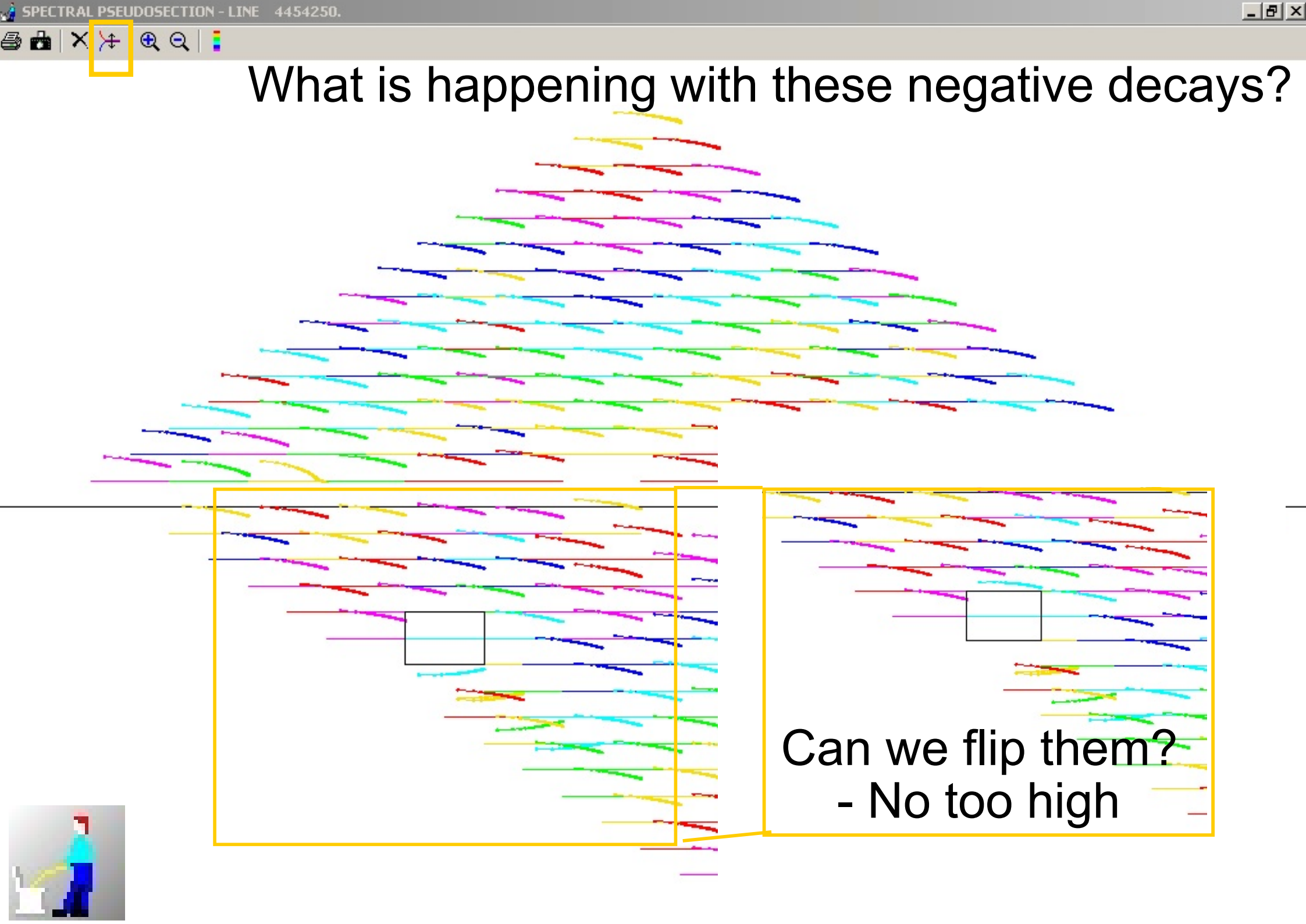
A few obvious problems

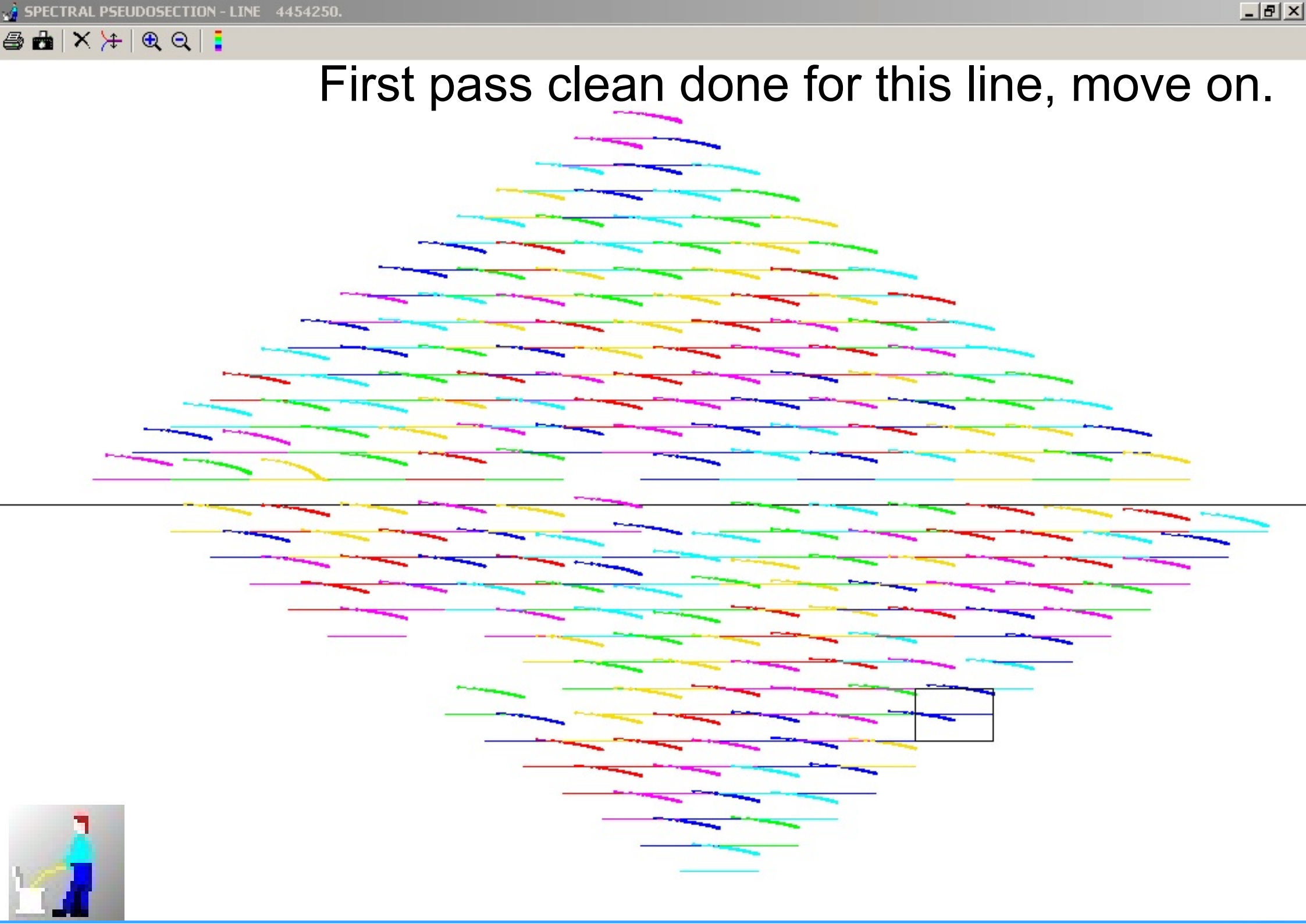


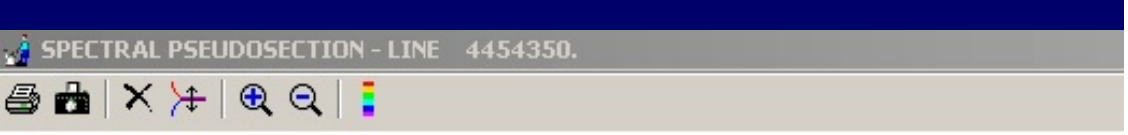


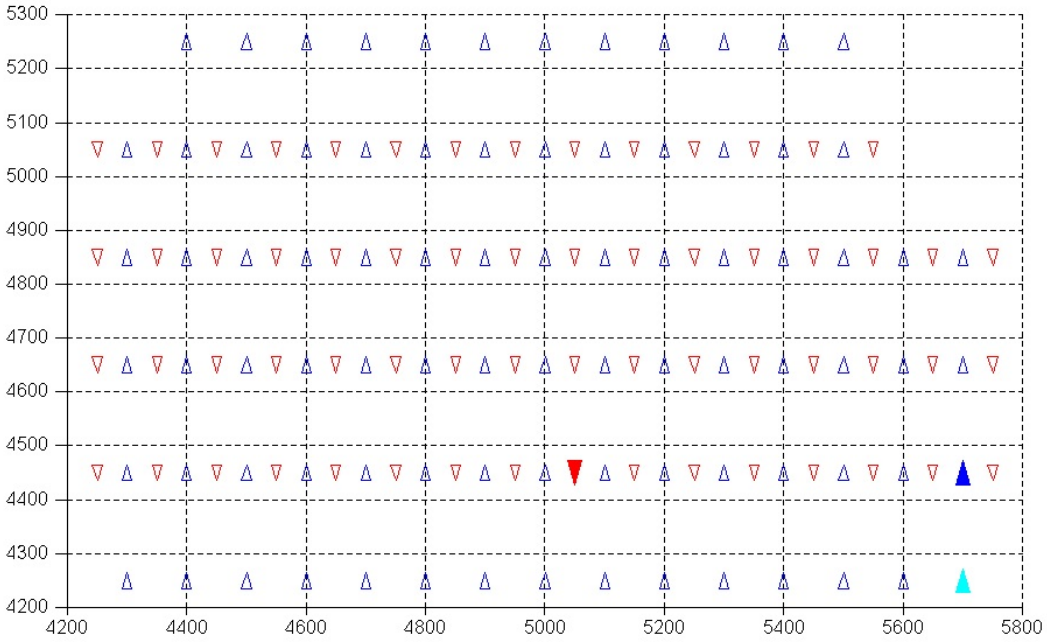
Delete the worst offenders directly from the SPS

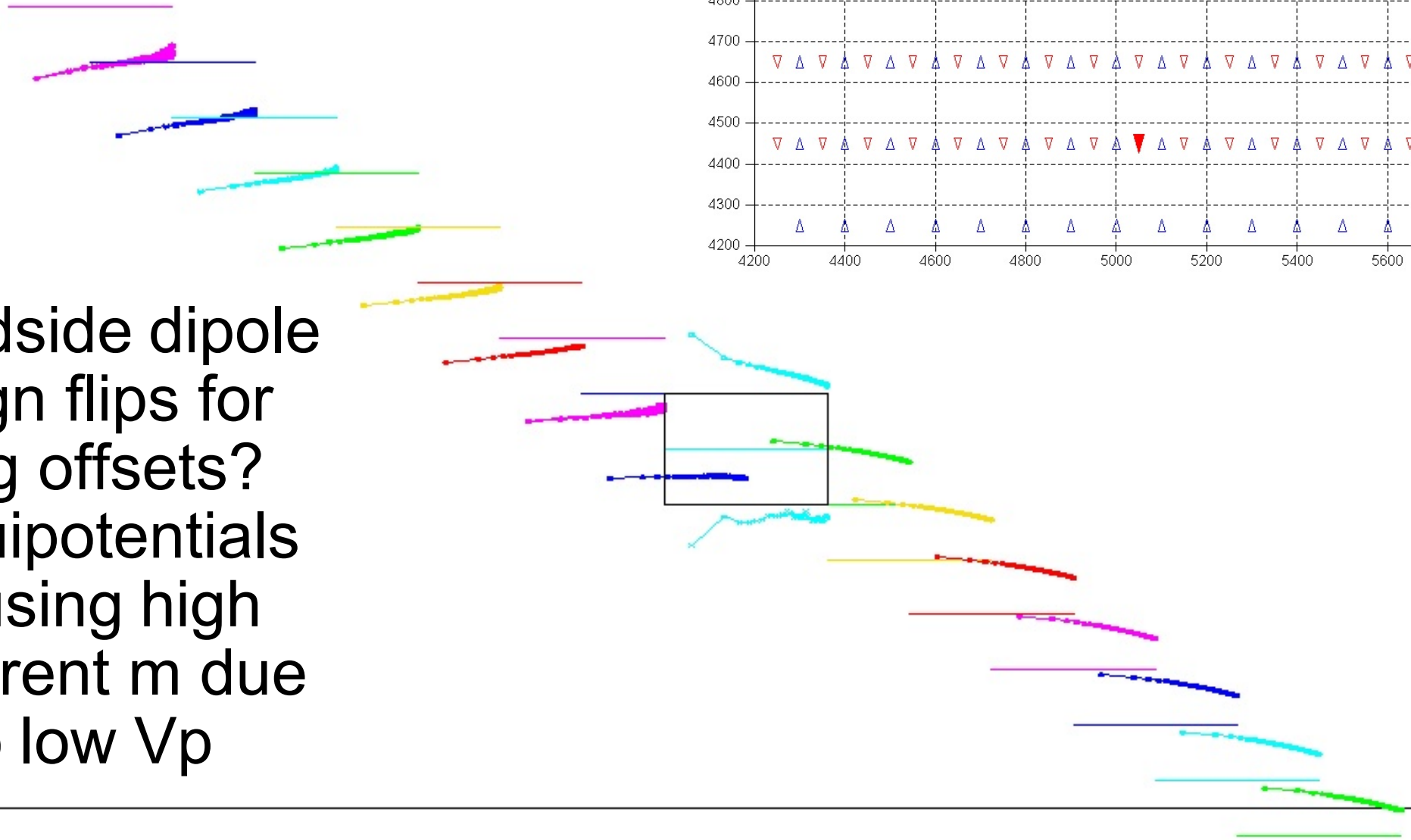

SPECTRAL PSEUDOSECTION - LINE 4454250.
Decay too low relative to its neighbours


SPECTRAL PSEUDOSECTION - LINE 4454250.
What is happening with these negative decays?
Can we flip them?
- No too high

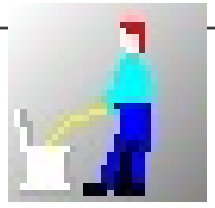

SPECTRAL PSEUDOSECTION - LINE 4454250.
First pass clean done for this line, move on.







Broadside dipole
- sign flips for long offsets?
- equipotentials causing high apparent m due to low Vp

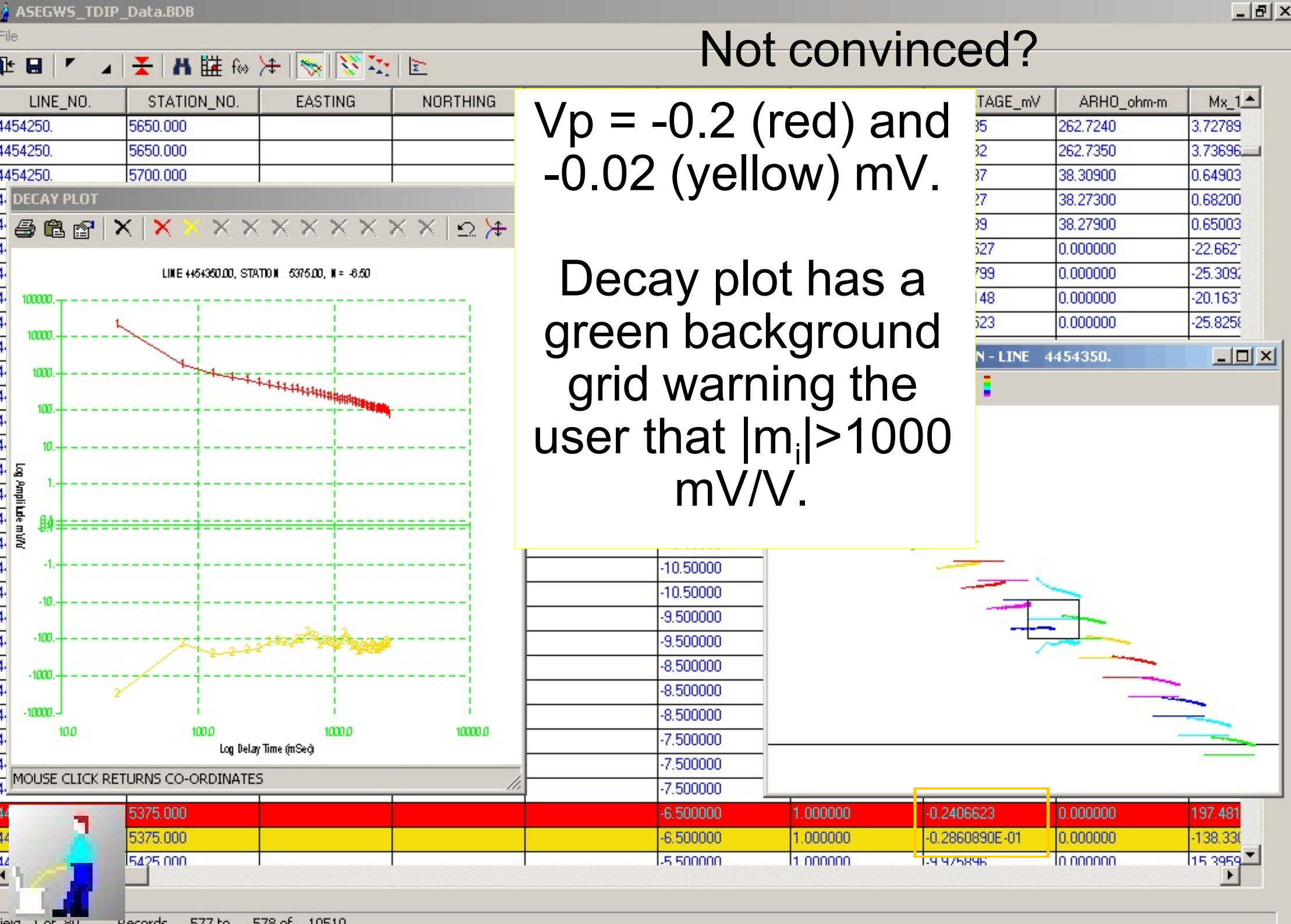


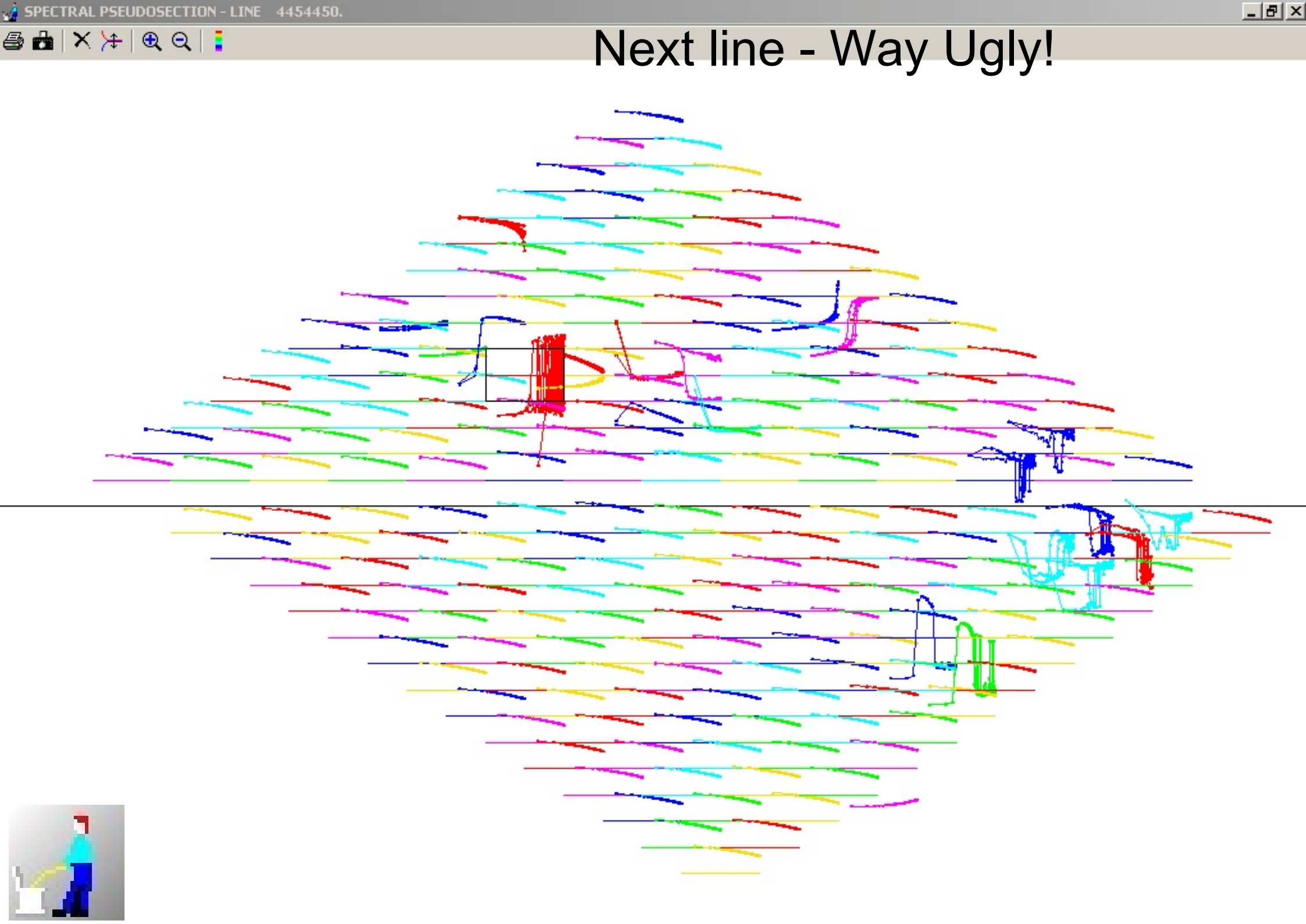
Delete all.

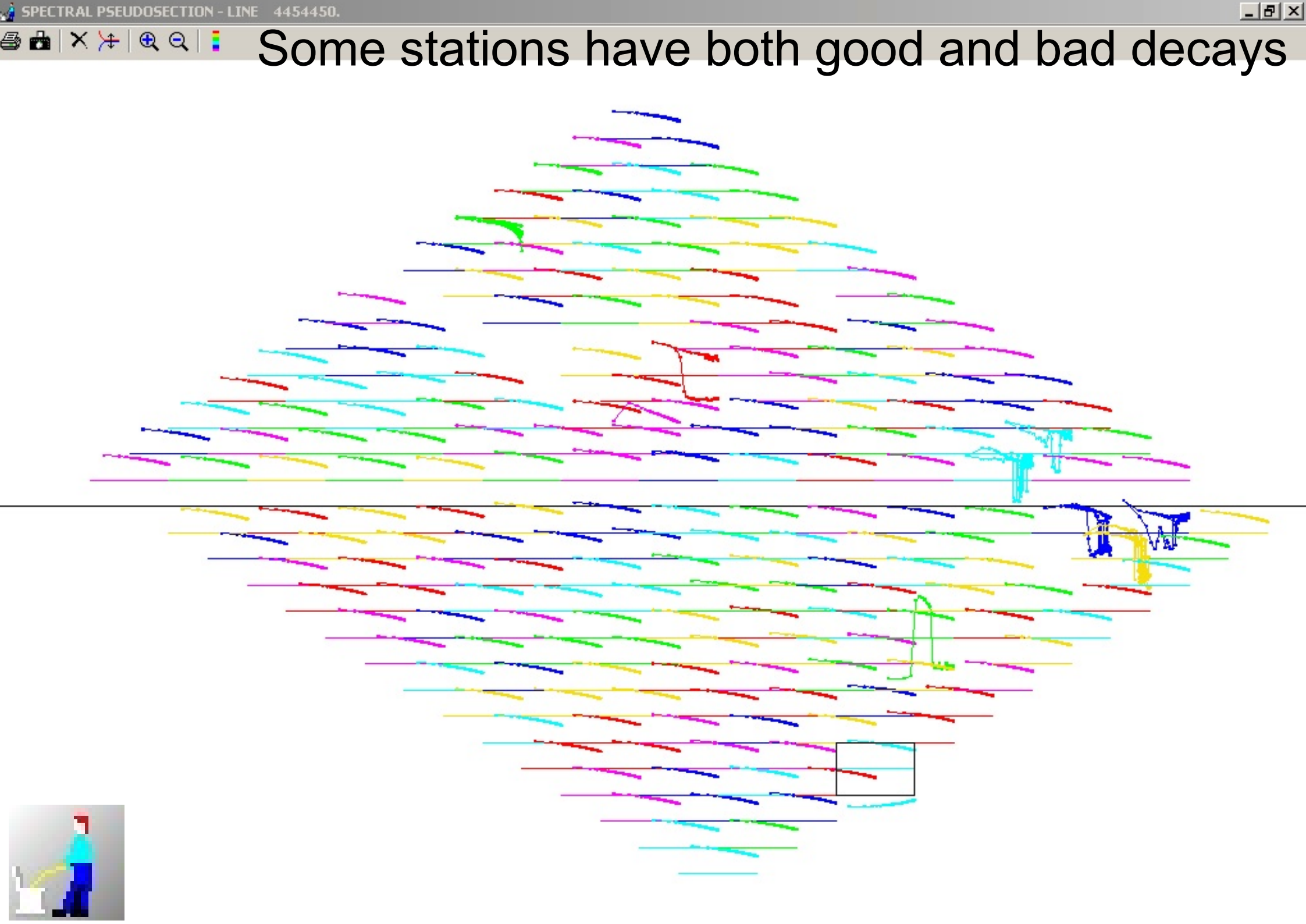
Not convinced?

Vp = -0.2 (red) and -0.02 (yellow) mV.

Decay plot has a green background grid warning the user that $|m_i|>1000$ mV/V.




SPECTRAL PSEUDOSECTION - LINE 4454450.
Next line - Way Ugly!


SPECTRAL PSEUDOSECTION - LINE 4454450.
Some stations have both good and bad decays

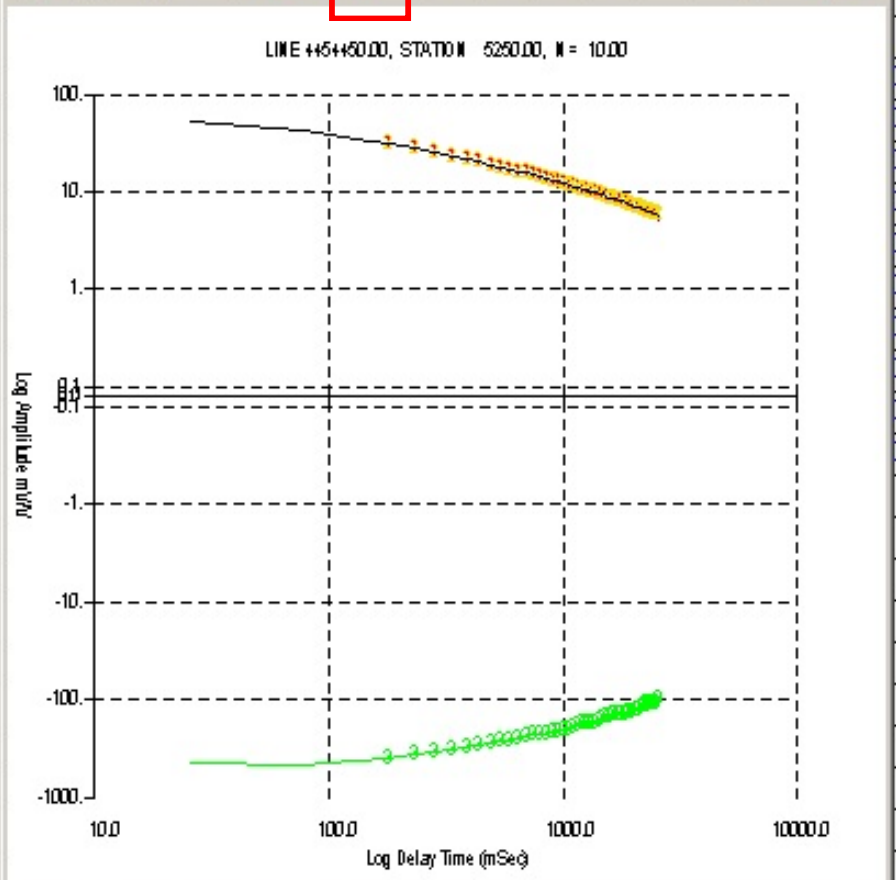
ASEGWS_TDIP_Data.BDB

File

Delete the green repeat with low Vp

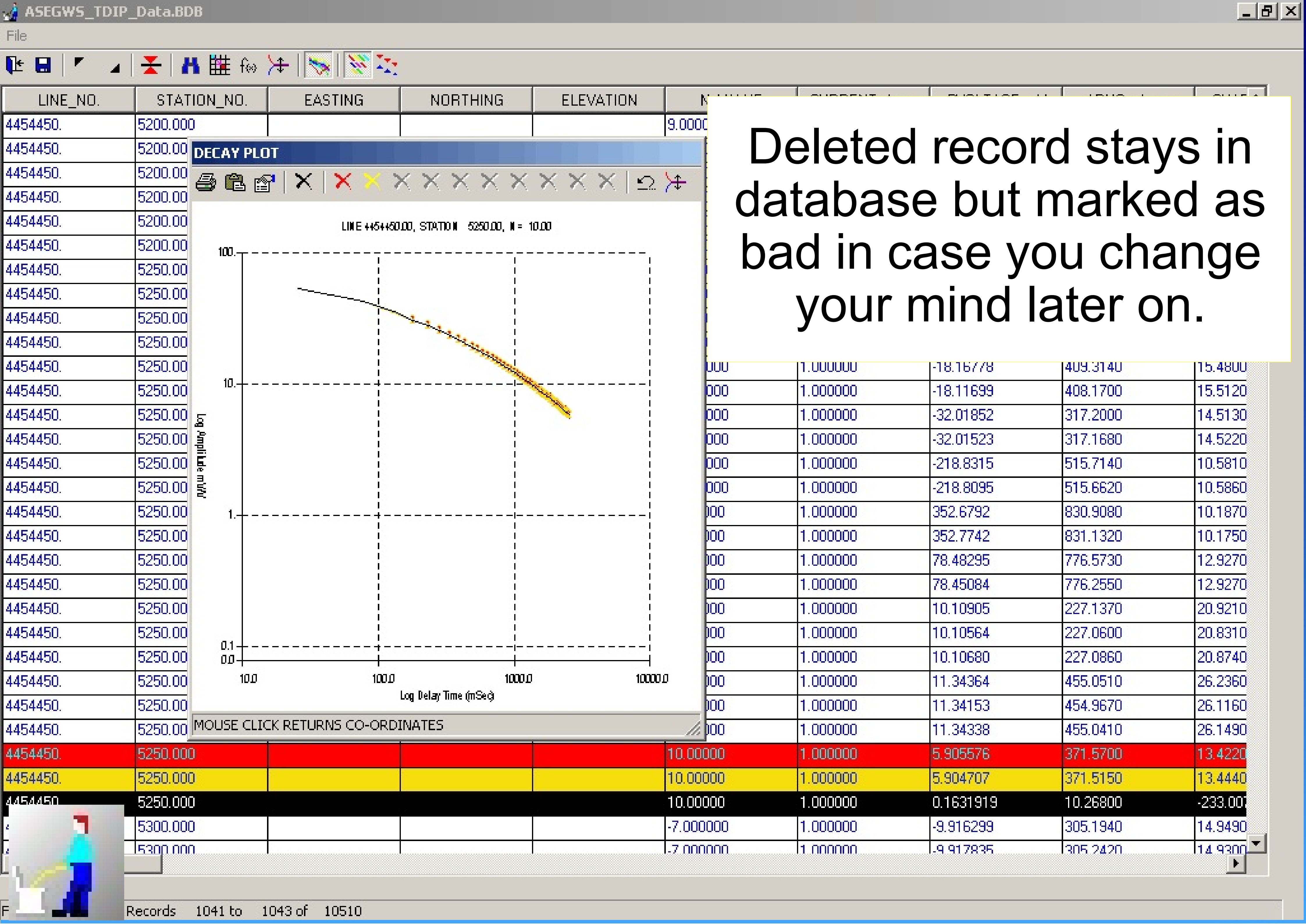
LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	CHAR
4454450.	5200.000				9.000000	1.000000	7.002965	356.4250	13.2120
4454450.	5200.000				9.000000	1.000000	7.002535	356.4030	13.1190
4454450.	5200.000					1.000000	7.004272	356.4910	13.2190
4454450.	5200.000					1.000000	3.633564	277.4880	11.0390
4454450.	5200.000					1.000000	3.633038	277.4480	11.1490
4454450.	5200.000					1.000000	3.633465	277.4800	10.9460
4454450.	5250.000					1.000000	-7.233067	291.5380	13.4910
4454450.	5250.000					1.000000	-7.210464	290.6270	13.0160
4454450.	5250.000					1.000000	-7.236880	291.6910	13.6680
4454450.	5250.000					1.000000	-18.11720	408.1740	15.5100
4454450.	5250.000					1.000000	-18.16778	409.3140	15.4800
4454450.	5250.000					1.000000	-18.11699	408.1700	15.5120
4454450.	5250.000					1.000000	-32.01852	317.2000	14.5130
4454450.	5250.000					1.000000	-32.01523	317.1680	14.5220
4454450.	5250.000					1.000000	-218.8315	515.7140	10.5810
4454450.	5250.000					1.000000	-218.8095	515.6620	10.5860
4454450.	5250.000					1.000000	352.6792	830.9080	10.1870
4454450.	5250.000					1.000000	352.7742	831.1320	10.1750
4454450.	5250.000					1.000000	78.48295	776.5730	12.9270
4454450.	5250.000					1.000000	78.45084	776.2550	12.9270
4454450.	5250.000					1.000000	10.10905	227.1370	20.9210
4454450.	5250.000					1.000000	10.10564	227.0600	20.8310
4454450.	5250.000					1.000000	10.10680	227.0860	20.8740
4454450.	5250.000					1.000000	11.34364	455.0510	26.2360
4454450.	5250.000					1.000000	11.34153	454.9670	26.1160
4454450.	5250.000					1.000000	11.34338	455.0410	26.1490
4454450.	5250.000					1.000000	5.905576	371.5700	13.4220
4454450.	5250.000				10.00000	1.000000	5.904707	371.5150	13.4440
[illegible]	5250.000				10.00000	1.000000	0.1631919	10.26800	-233.00
[illegible]	5300.000				-7.000000	1.000000	-9.916299	305.1940	14.9490
[illegible]	5300.000				[illegible]	1.000000	-9.917835	305.2420	14.9300

DECAY PLOT

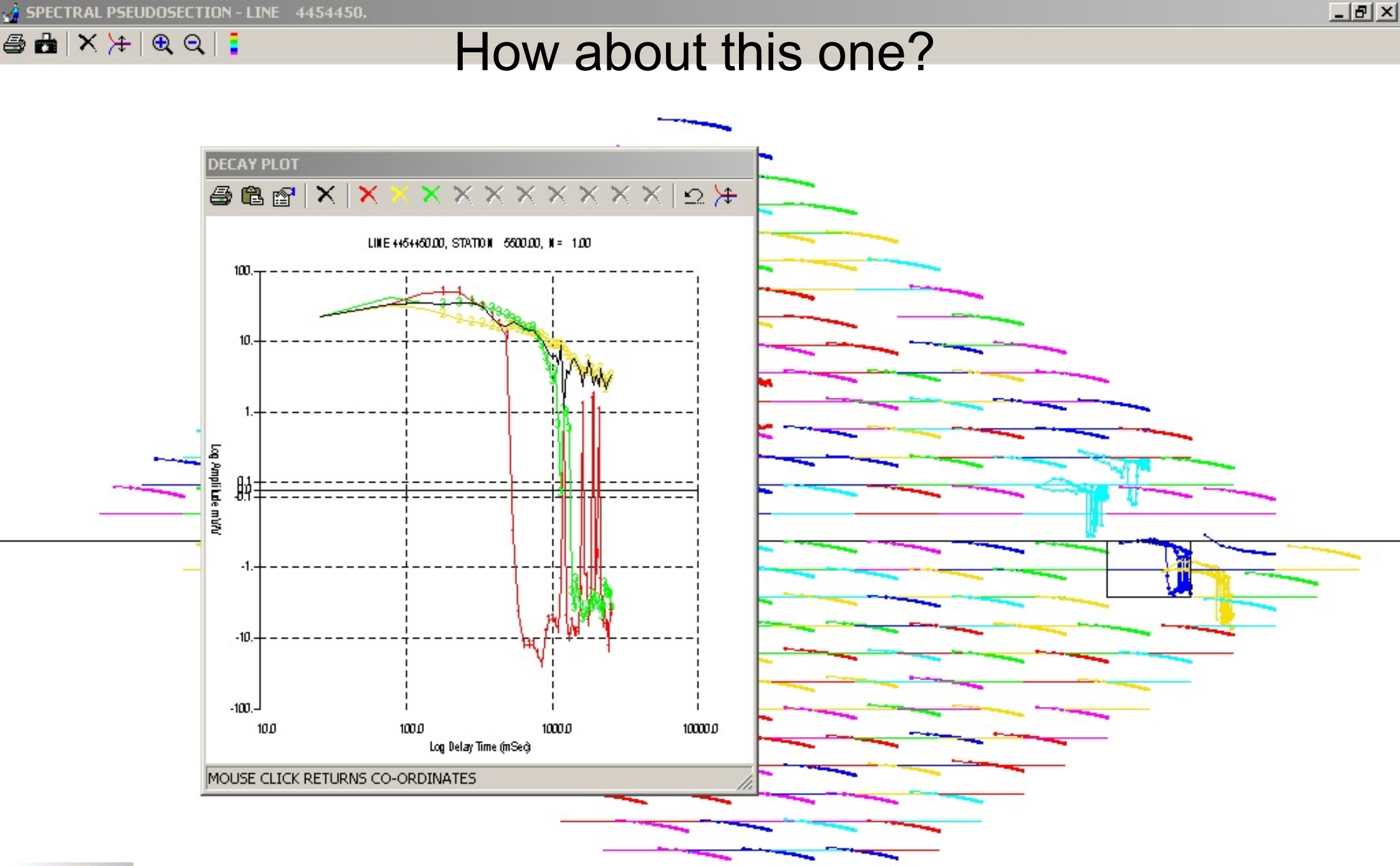


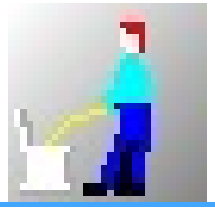
MOUSE CLICK RETURNS CO-ORDINATES

Records 783 to 785 of 10510


Deleted record stays in database but marked as bad in case you change your mind later on.
ASEGWS_TDIP_Data.BDB
File
LINE_NO.
STATION_NO.
EASTING
NORTHING
ELEVATION
DECAY PLOT
LINE 4454450.00, STATION 5250.00, N = 10.00
Log Amplitude mV/V
Log Delay Time (mSec)
MOUSE CLICK RETURNS CO-ORDINATES
Records 1041 to 1043 of 10510

How about this one?





Overall looks about the right amplitude just a bit noisy at late time?

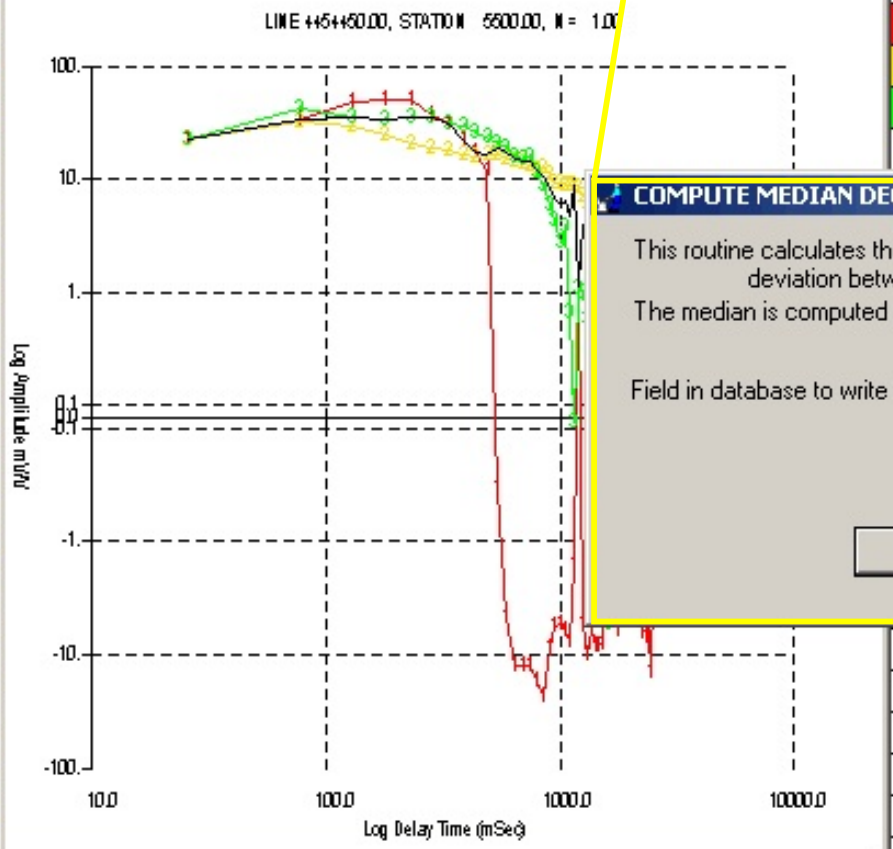
Lets add another QC tool -Decay shape

ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454450.	5450.000				6.000000	1.000000	54.76141	1229.044	11.5675
4454450.	5450.000				6.000000	1.000000	54.68039	1227.226	11.5337
4454450.	5500.000				-3.000000	1.000000	-105.9168	582.8060	8.43896
4.					-3.000000	1.000000	-106.1240	583.9460	8.34746
4.					-1.000000	1.000000	-986.6940	464.9980	5.00753
4.					-1.000000	1.000000	-987.8239	465.5300	4.99239
4.					1.000000	1.000000	887.3687	418.1410	-6.1701
4.					1.000000	1.000000	967.1888	455.7530	8.08921
4.					1.000000	1.000000	940.6027	443.2260	3.10007
4.					3.000000	1.000000	234.5869	1289.099	3.10021
4.							8.9890	873.6750	7.94525
4.							4.0152	956.2460	7.88325
4.							.08567	980.0960	10.4146
4.							.03406	979.2940	10.4063
4.							.94624	977.9300	10.4500
4.							25.7030	531.9950	5.99418
4.							25.9297	532.5290	5.94218
4.							6.5763	745.7220	3.27264
4.							0.0298	376.9640	14.0851
4.							6.0446	673.8020	1.60489
4.							.87773	977.6630	8.12635
4.					4.000000	1.000000	98.95442	978.4220	8.04407
4.					4.000000	1.000000	98.86314	977.5190	8.08646
4.					-1.000000	1.000000	-824.5699	388.5980	3.16010
4.					-1.000000	1.000000	-824.5735	388.6000	3.15767
4.					-1.000000	1.000000	-824.3843	388.5100	3.13717
4.					1.000000	1.000000	825.0284	388.7610	0.80549
4.					1.000000	1.000000	761.6530	358.8980	2.73396
4454450	5600.000				1.000000	1.000000	773.9316	364.6840	3.50628
	5600.000				3.000000	1.000000	170.1472	934.8690	5.22117
	5600.000				3.000000	1.000000	169.7395	932.6290	5.23482

DECAY PLOT



MOUSE CLICK RETURNS CO-ORDINATES

COMPUTE MEDIAN DECAY SHAPE AND FIT STATISTICS

This routine calculates the median decay shape for the database then writes the standard deviation between that and each reading to a field in the database.
The median is computed using only decays flagged as OK to use but the SD is computed on all decays.

Field in database to write Standard Deviation to. UNLABELED

Label for this field? SD_FROM_MED

OK Cancel

Records 1117 to 1119 of 10510

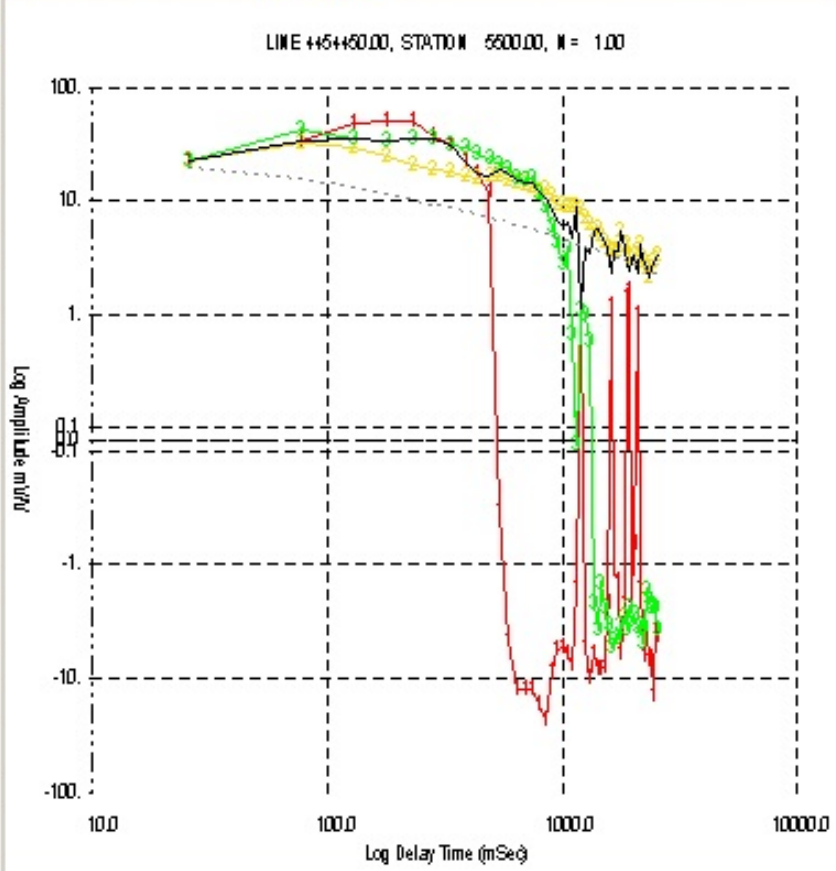
Global decay shape added to decay plot - grey dotted line

ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	NVALUE	CURRENT_Amps	VOLTAGE_mV	ARHO_ohmm	ERR_1
4454450.	5500.000				-1.000000	1.000000	-986.6940	464.9980	5.00753
4454450.					-1.000000	1.000000	-987.8239	465.5300	4.99239
4454450.					1.000000	1.000000	887.3687	418.1410	-6.17017
4454450.					1.000000	1.000000	967.1888	455.7530	8.08921
4454450.					1.000000	1.000000	940.6027	443.2260	3.10007
4454450.					3.000000	1.000000	234.5869	1289.099	3.10021
4454450.					3.000000	1.000000	158.9890	873.6750	7.94525
4454450.					3.000000	1.000000	174.0152	956.2460	7.88325
4454450.					5.000000	1.000000	63.08567	980.0960	10.4146
4454450.					5.000000	1.000000	63.03406	979.2940	10.4063
4454450.					5.000000	1.000000	62.94624	977.9300	10.4500
4454450.					-2.000000	1.000000	-225.7030	531.9950	5.99418
4454450.					-2.000000	1.000000	-225.9297	532.5290	5.94218
4454450.					2.000000	1.000000	316.5763	745.7220	3.27264
4454450.					2.000000	1.000000	160.0298	376.9640	14.0851
4454450.					2.000000	1.000000	286.0446	673.8020	1.60489
4454450.					4.000000	1.000000	98.87773	977.6630	8.12635
4454450.					4.000000	1.000000	98.95442	978.4220	8.04407
4454450.					4.000000	1.000000	98.86314	977.5190	8.08646
4454450.					-1.000000	1.000000	-824.5699	388.5980	3.16010
4454450.					-1.000000	1.000000	-824.5735	388.6000	3.15767
4454450.					-1.000000	1.000000	-824.3843	388.5100	3.13717
4454450.					1.000000	1.000000	825.0284	388.7610	0.80549
4454450.					1.000000	1.000000	761.6530	358.8980	2.73396
4454450.					1.000000	1.000000	773.9316	364.6840	3.50628
4454450.					3.000000	1.000000	170.1472	934.8690	5.22117
4454450.	5600.000				3.000000	1.000000	169.7395	932.6290	5.23482
4454450.	5600.000				3.000000	1.000000	169.8054	932.9910	5.18114
	5650.000				2.000000	1.000000	262.5941	618.5290	2.96250
	5650.000				2.000000	1.000000	262.6165	618.5820	2.92932
	5650.000				2.000000	1.000000	262.6936	618.7630	2.92446

DECAY PLOT



MOUSE CLICK RETURNS CO-ORDINATES

Records 1117 to 1119 of 10510

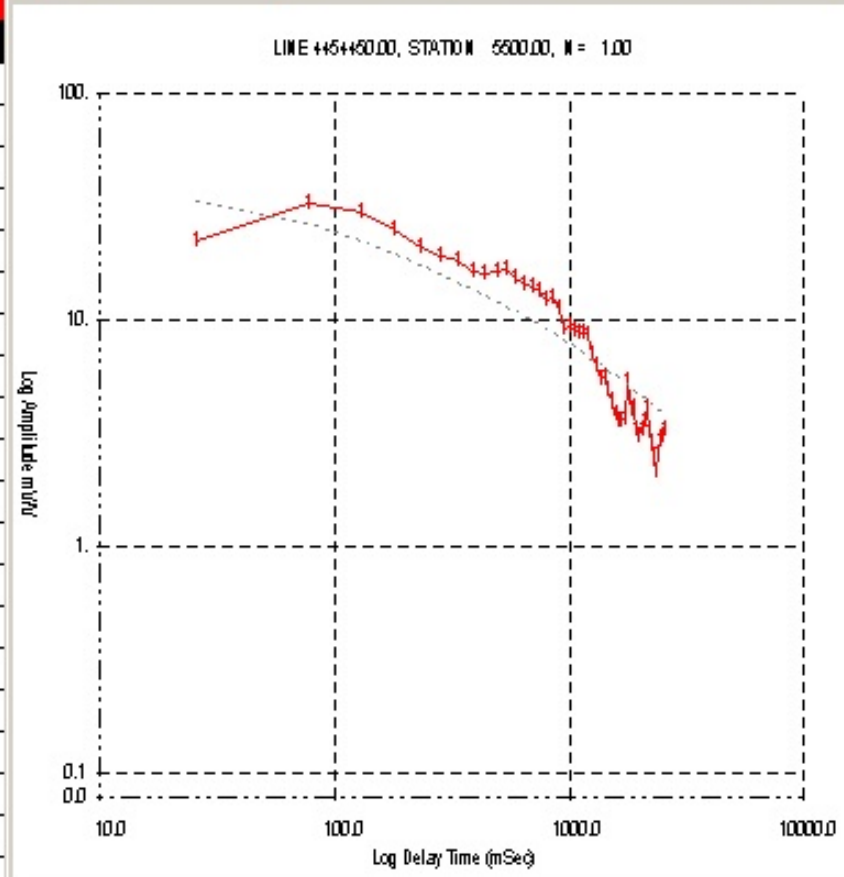
ASEGWS_TDIP_Data.BDB

File

Delete two bad readings. Shape now better.

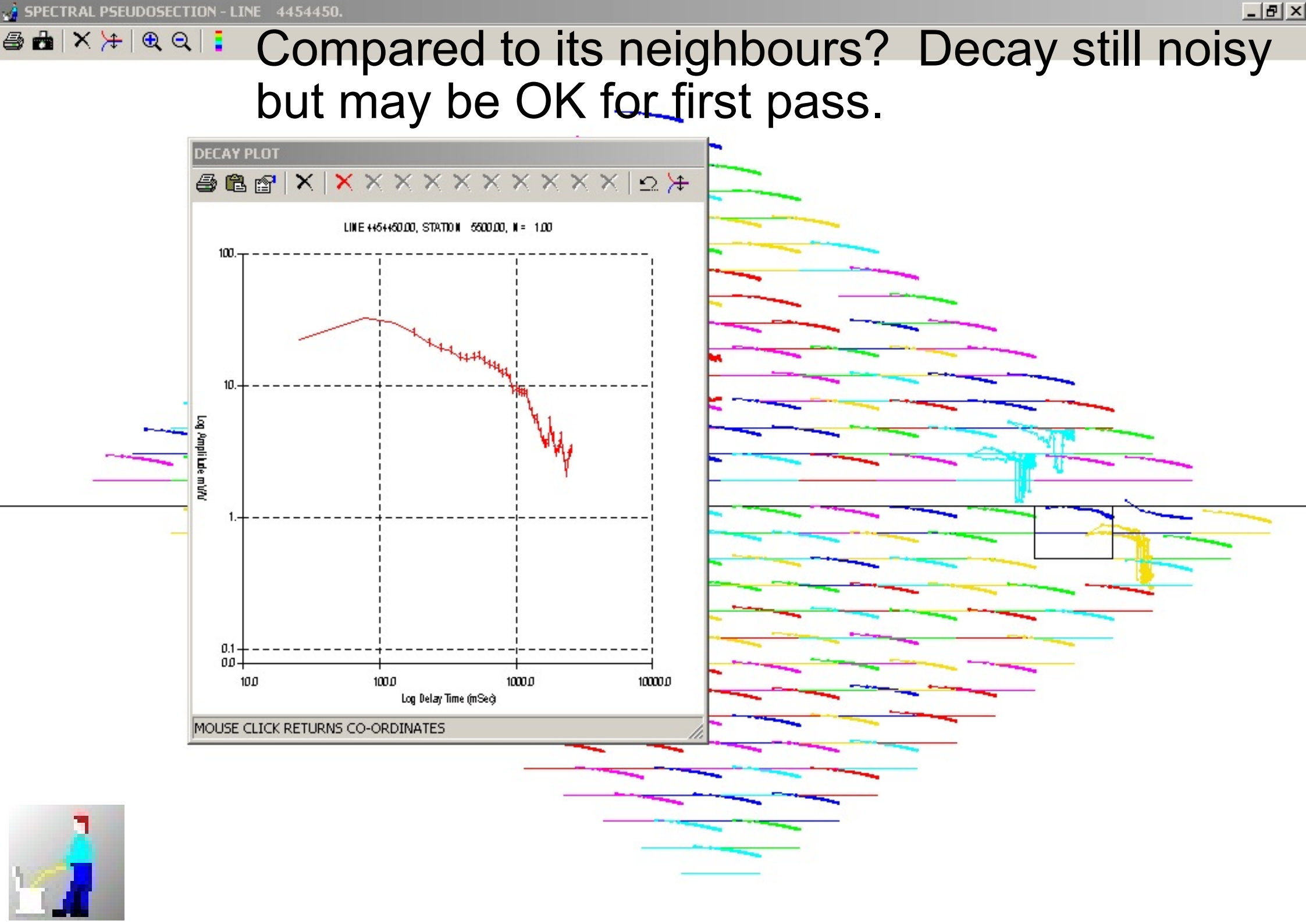
LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	VOLTAGE_mV	APPRO_ohm-m	Mx_1
4454450.	5500.000				-1.000000	1.000000	-986.6940	464.9980	5.00753
4454450.					-1.000000	1.000000	-987.8239	465.5300	4.99239
4454450.					1.000000	1.000000	887.3687	418.1410	-6.17017
4454450.					1.000000	1.000000	967.1888	455.7530	8.08921
4454450.					1.000000	1.000000	940.6027	443.2260	3.10007
4454450.					3.000000	1.000000	234.5869	1289.099	3.10021
4454450.					3.000000	1.000000	158.9890	873.6750	7.94525
4454450.					3.000000	1.000000	174.0152	956.2460	7.88325
4454450.					5.000000	1.000000	63.08567	980.0960	10.4146
4454450.					5.000000	1.000000	63.03406	979.2940	10.4063
4454450.					5.000000	1.000000	62.94624	977.9300	10.4500
4454450.					-2.000000	1.000000	-225.7030	531.9950	5.99418
4454450.					-2.000000	1.000000	-225.9297	532.5290	5.94218
4454450.					2.000000	1.000000	316.5763	745.7220	3.27264
4454450.					2.000000	1.000000	160.0298	376.9640	14.0851
4454450.					2.000000	1.000000	286.0446	673.8020	1.60489
4454450.					4.000000	1.000000	98.87773	977.6630	8.12635
4454450.					4.000000	1.000000	98.95442	978.4220	8.04407
4454450.					4.000000	1.000000	98.86314	977.5190	8.08646
4454450.					-1.000000	1.000000	-824.5699	388.5980	3.16010
4454450.					-1.000000	1.000000	-824.5735	388.6000	3.15767
4454450.					-1.000000	1.000000	-824.3843	388.5100	3.13717
4454450.					1.000000	1.000000	825.0284	388.7610	0.80549
4454450.					1.000000	1.000000	761.6530	358.8980	2.73396
4454450.					1.000000	1.000000	773.9316	364.6840	3.50628
4454450.					3.000000	1.000000	170.1472	934.8690	5.22117
4454450.	5600.000				3.000000	1.000000	169.7395	932.6290	5.23482
4454450.	5600.000				3.000000	1.000000	169.8054	932.9910	5.18114
[illegible]	5650.000				2.000000	1.000000	262.5941	618.5290	2.96250
[illegible]	5650.000				2.000000	1.000000	262.6165	618.5820	2.92932
[illegible]	5650.000				2.000000	1.000000	262.6936	618.7630	2.92446

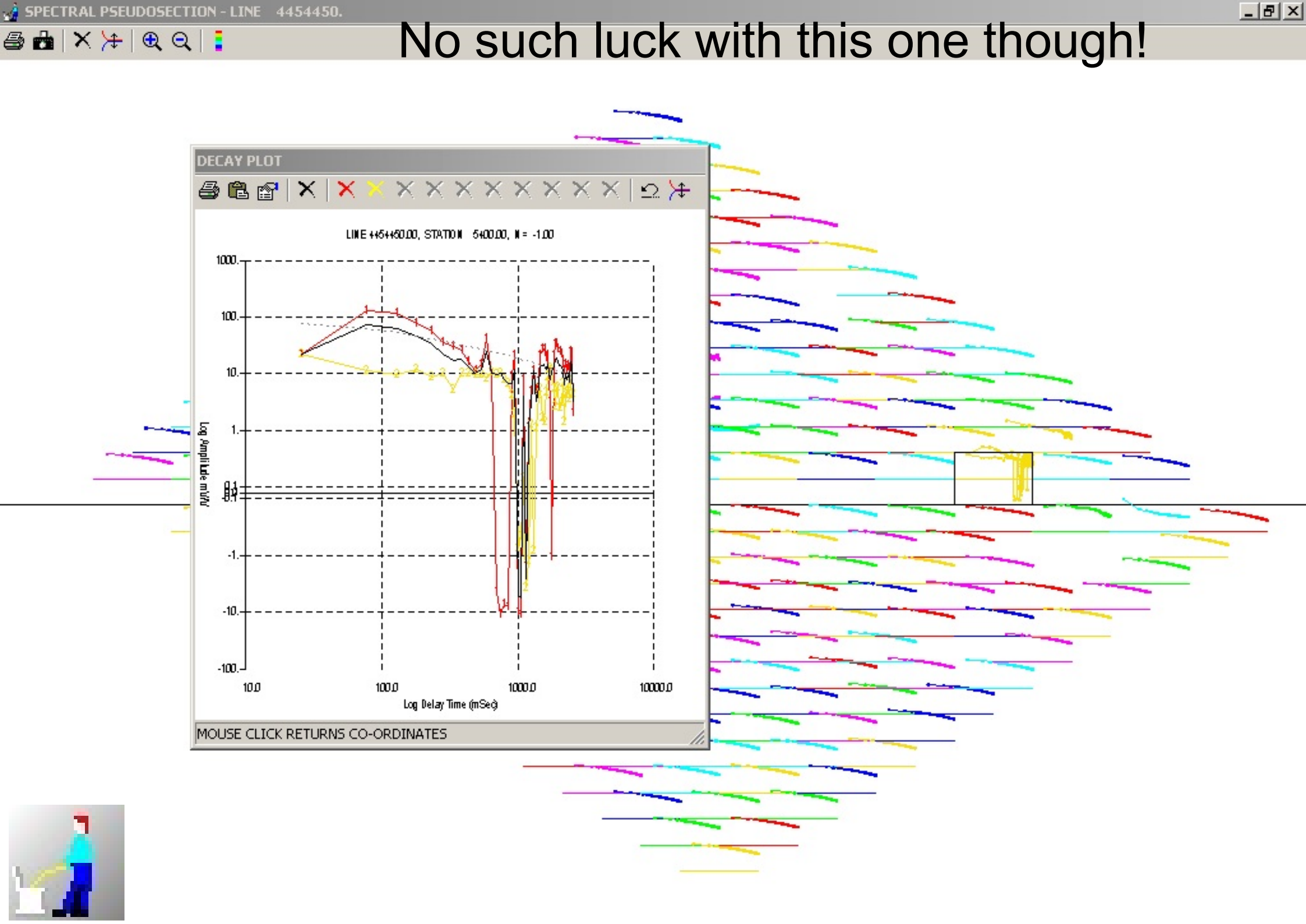
DECAY PLOT



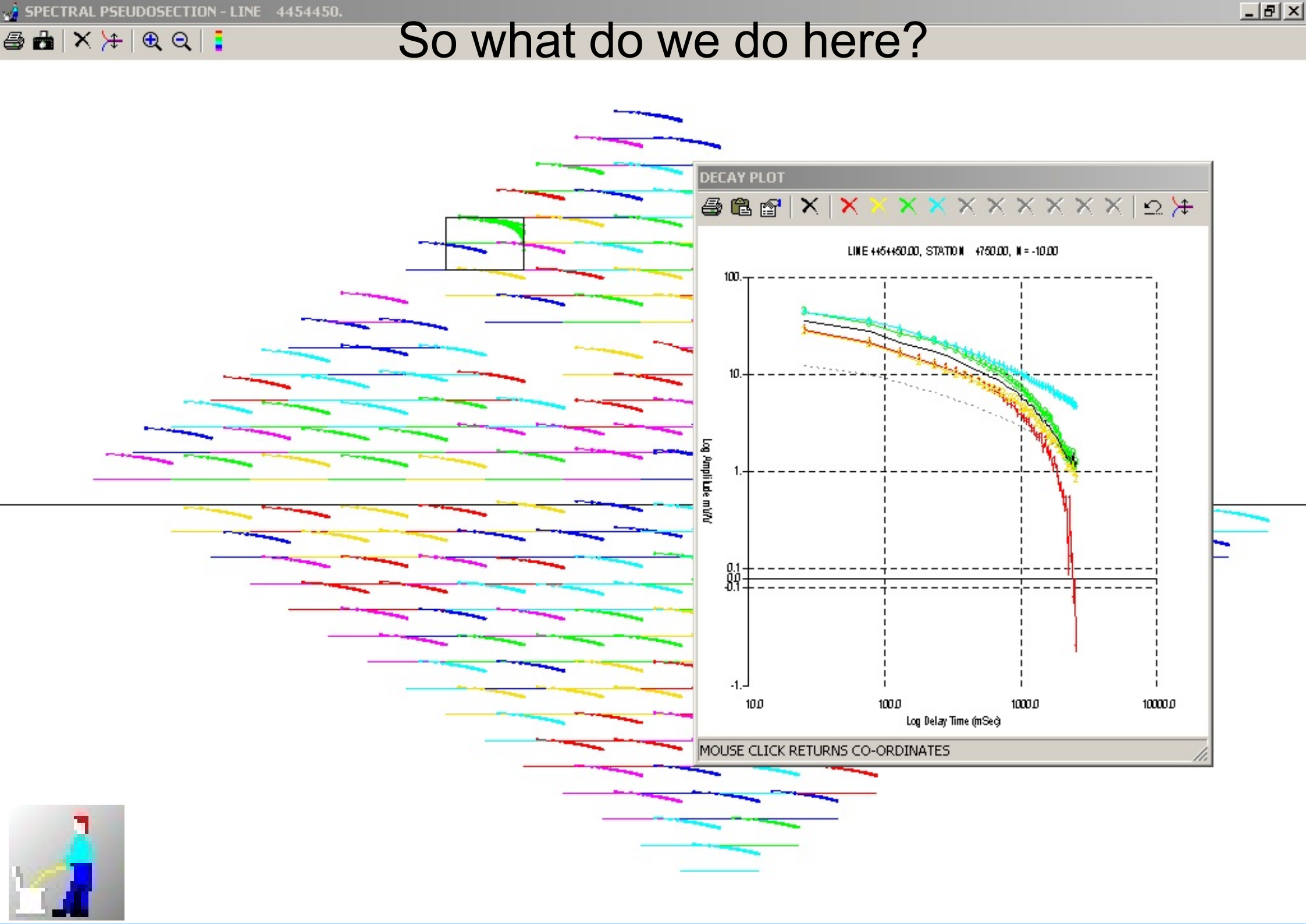
MOUSE CLICK RETURNS CO-ORDINATES

Records 1117 to 1119 of 10510


SPECTRAL PSEUDOSECTION - LINE 4454450.
Compared to its neighbours? Decay still noisy but may be OK for first pass.
DECAY PLOT
LINE 4454450.00, STATION 5600.00, N = 1.00
100.
10.
1.
0.1
0.0
Log Amplitude mV/V
10.0
100.0
1000.0
10000.0
Log Delay Time (mSec)
MOUSE CLICK RETURNS CO-ORDINATES


SPECTRAL PSEUDOSECTION - LINE 4454450.
No such luck with this one though!
DECAY PLOT
LINE 4454450.00, STATION 5400.00, N = -1.00
1000.
100.
10.
1.
0.1
-0.1
-1.
-10.
-100.
Log Amplitude mV/V
10.0
100.0
1000.0
10000.0
Log Delay Time (mSec)
MOUSE CLICK RETURNS CO-ORDINATES

So what do we do here?



ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454450.	4700.000				7.000000	1.000000	14.75984	454.2640	8.31603
4454450.	4750.000				-10.00000	1.000000	-7.957104	500.6490	3.22907
4454450.	4750.000				-10.00000	1.000000	-7.994446	502.9980	4.03464
					-10.00000	1.000000	-7.992810	502.8950	6.03653
					-10.00000	1.000000	-5.389071	339.0720	9.13396
					-8.000000	1.000000	-10.57604	424.2590	8.36693

Not a zero level estimate problem -plot in linear space.

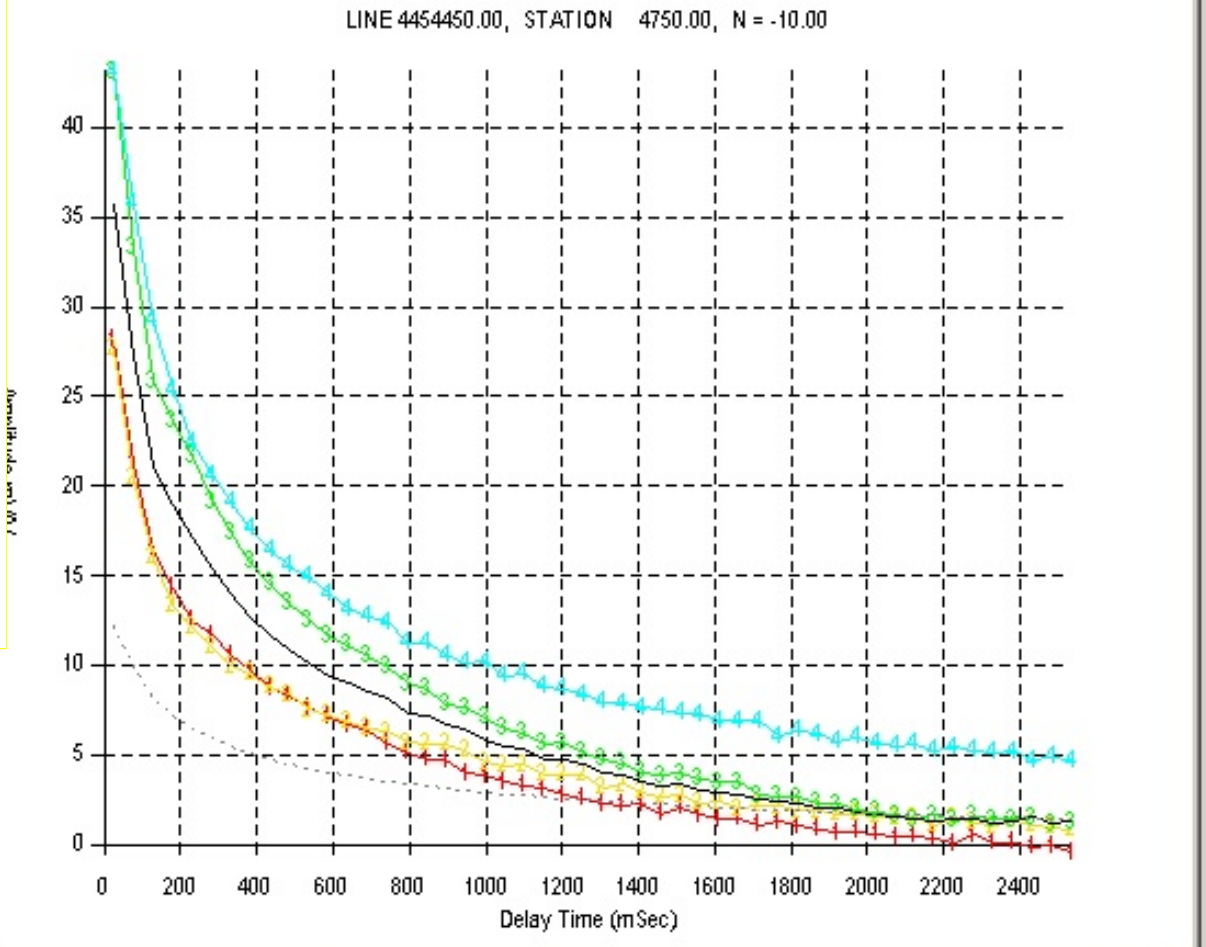
Vp looks OK.

Not sure what the source is but let's match the global shape and make it look like its neighbours.

4454450.	4750.000								
4454450.	4800.000								
4454450.	4800.000								
4454450	4800.000								
	4800.000								
	4800.000								

Records 717 to 720 of 10510

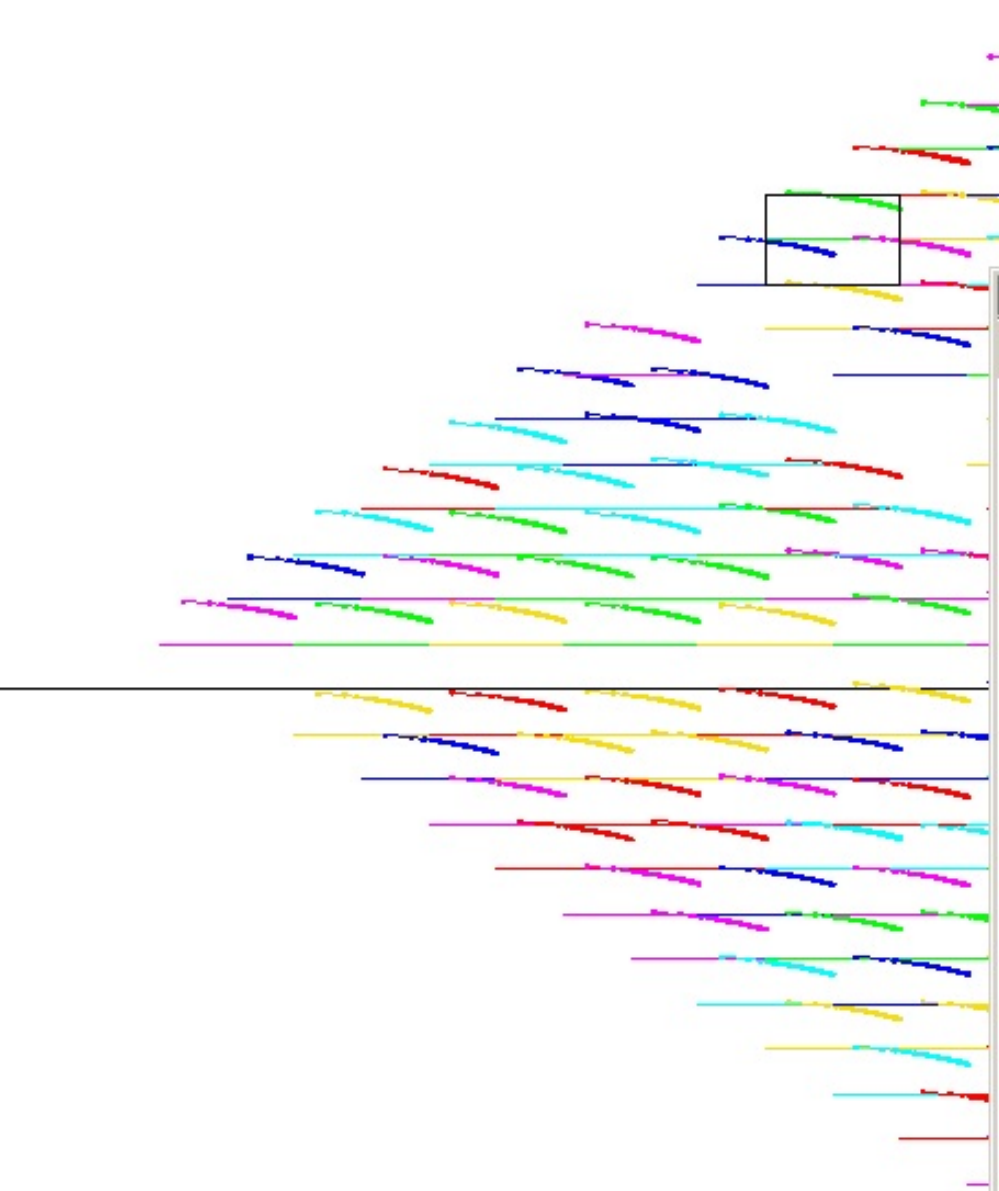
ECAY PLOT



MOUSE CLICK RETURNS CO-ORDINATES

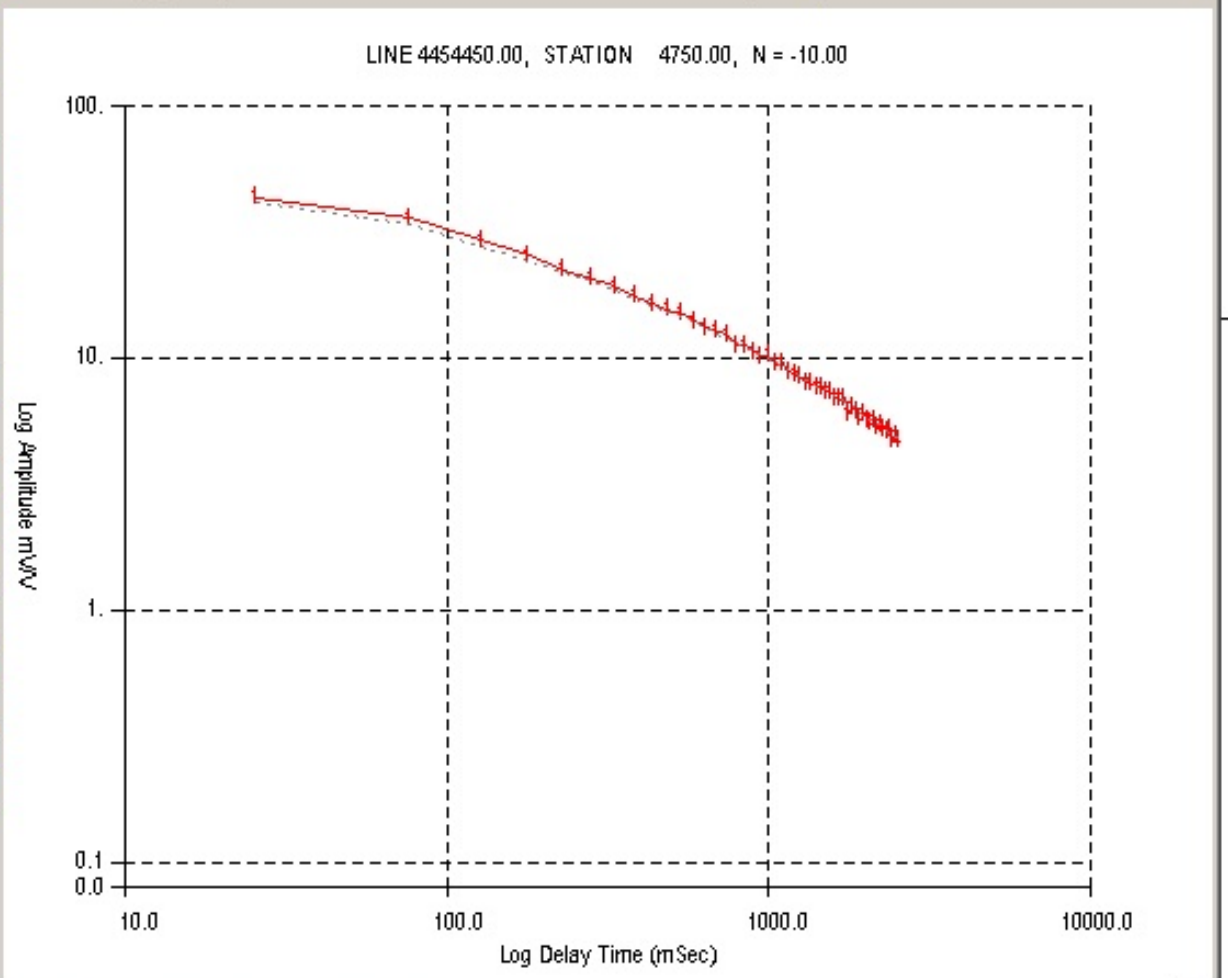
SPECTRAL PSEUDOSECTION - LINE 4454450.

Looks OK for a first pass, move on

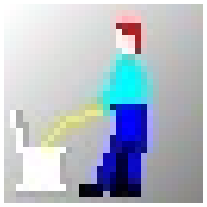


DECAY PLOT

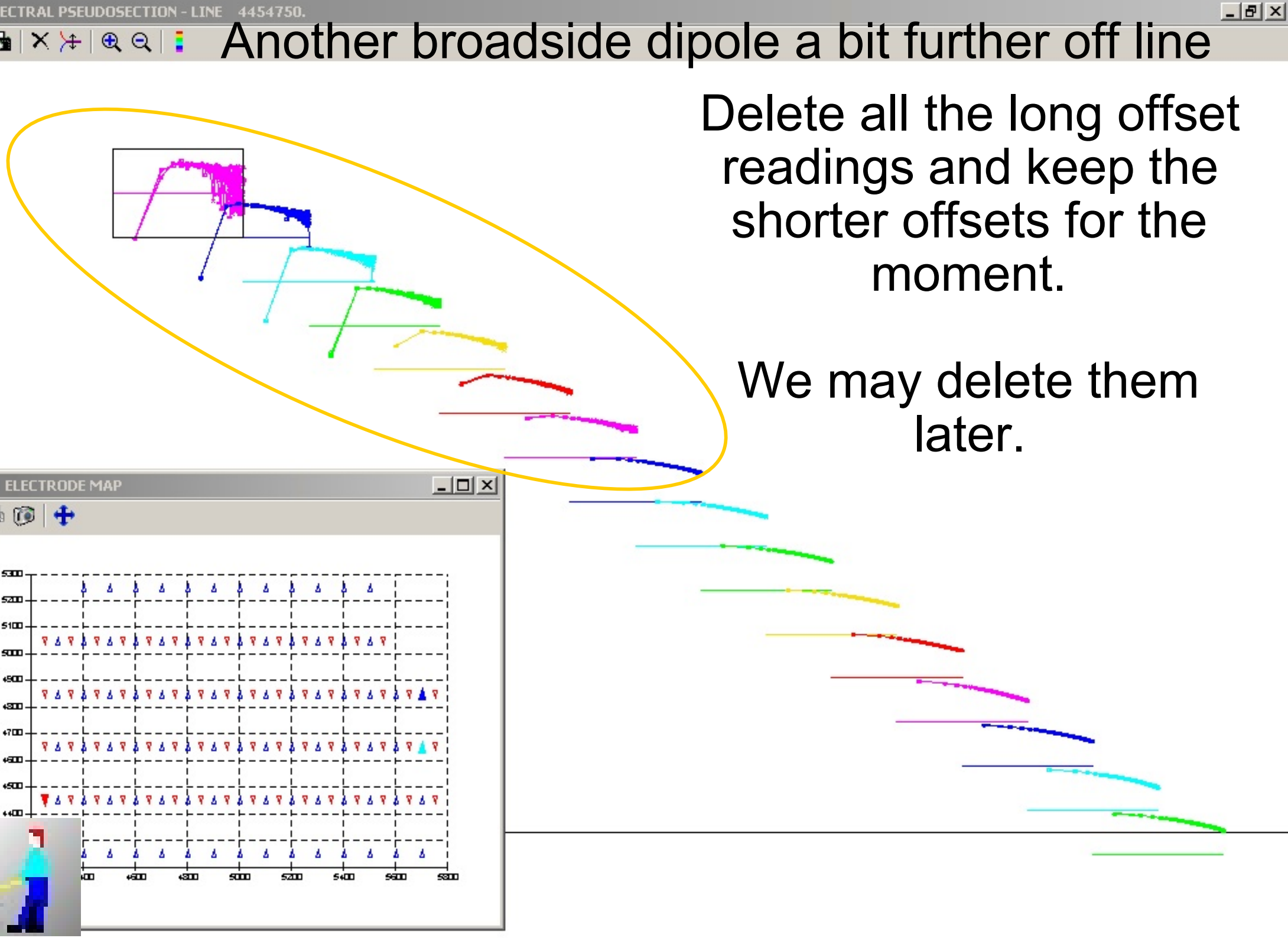
LINE 4454450.00, STATION 4750.00, N = -10.00



MOUSE CLICK RETURNS CO-ORDINATES

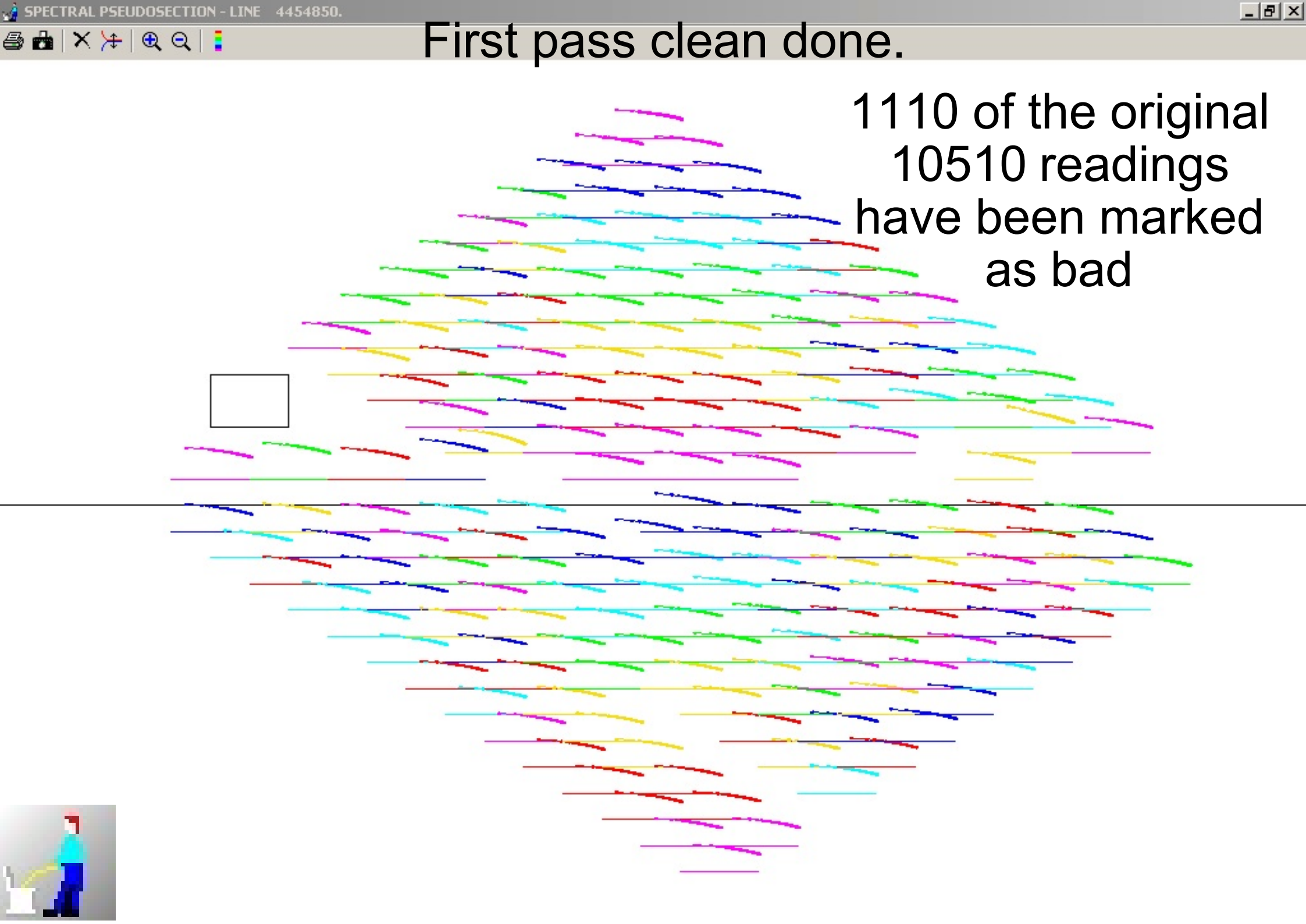


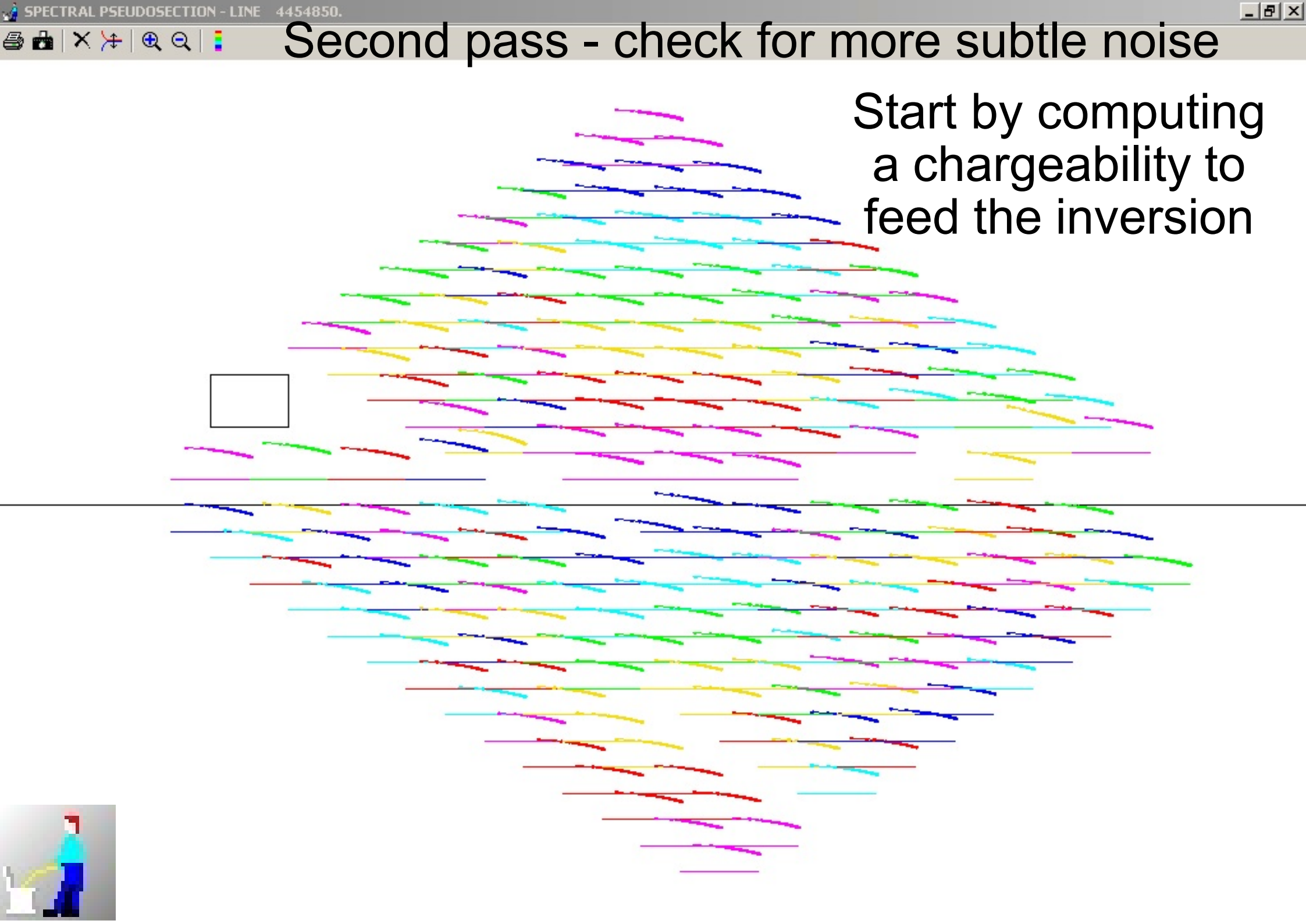
Another broadside dipole a bit further off line



Delete all the long offset readings and keep the shorter offsets for the moment.

We may delete them later.


SPECTRAL PSEUDOSECTION - LINE 4454850.
First pass clean done.
1110 of the original
10510 readings
have been marked
as bad


SPECTRAL PSEUDOSECTION - LINE 4454850.
Second pass - check for more subtle noise
Start by computing a chargeability to feed the inversion

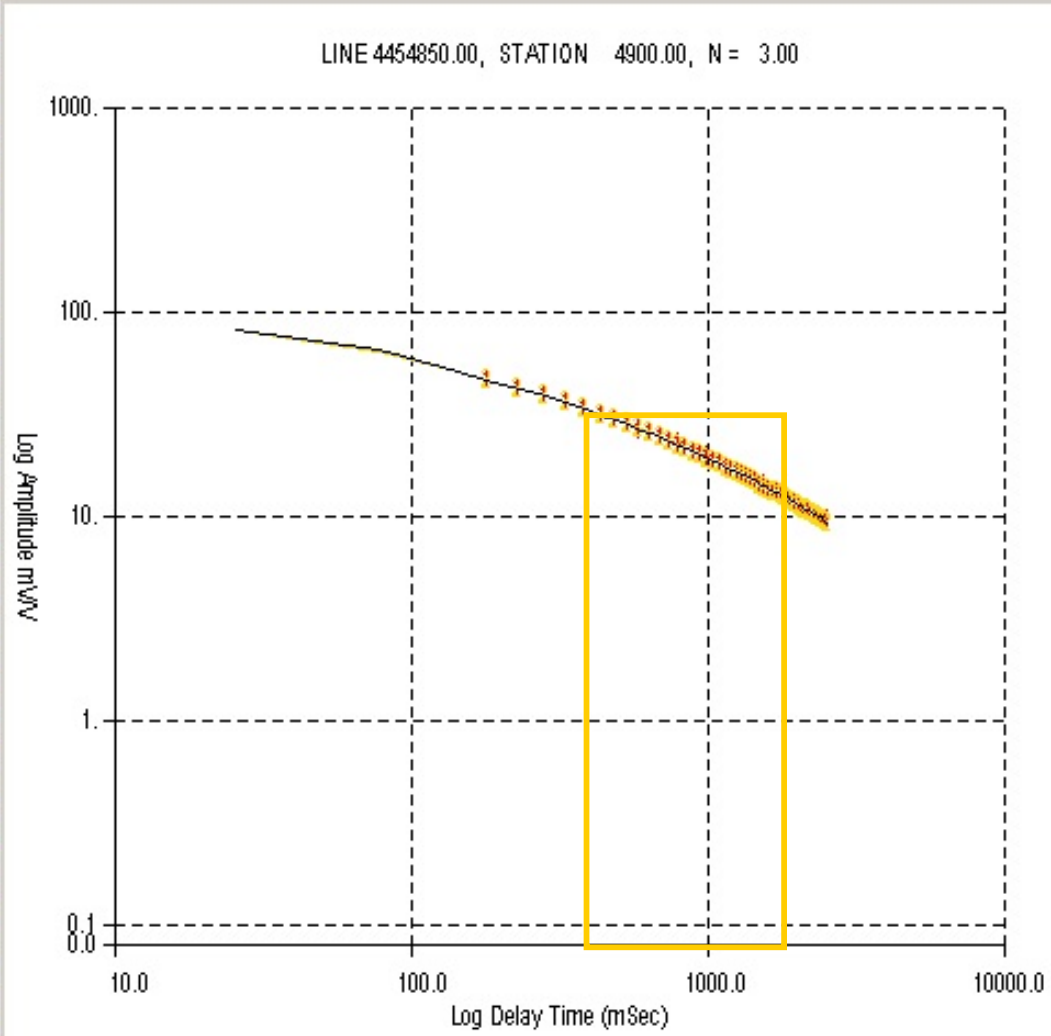
Select an integration window free of noise

ASEGWS_TDIP_Data.BDB

File

CH30-1510.40	CH31-1561.60	CH32-1612.80	CH33-1664.00	CH34-1715.20	CH35-1766.40	CH36-1817.60	CH37-1868.80	CH38-1920.00	CH3
9.212000	8.987000	8.763000	8.506000	8.350000	8.141000	7.987000	7.745000	7.631000	7.43300
8.966					3000	7.645000	7.629000	7.284000	7.23600
8.969					9000	7.658000	7.582000	7.425000	7.25700
9.409					2000	8.097000	7.988000	7.745000	7.58500
9.444					4000	8.105000	7.978000	7.742000	7.59200
8.214					6000	7.194000	7.013000	6.883000	6.64300
8.447					7000	7.260000	7.135000	6.863000	6.77000
16.06					8500	12.89000	12.70400	11.85700	12.3960
14.68					4200	12.89900	12.03600	12.18900	12.0990
16.08					9700	12.98700	13.71800	12.99200	11.6970
15.59					4400	13.62200	13.20500	13.51000	12.1160
20.95					2900	18.48600	17.06900	18.15700	16.8580
21.02					5500	18.11400	18.12000	17.45300	16.8100
20.63					8400	18.00600	16.87100	17.00600	16.5560
11.84					5100	10.30800	9.942000	9.532000	9.65500
11.65					7100	10.26200	9.909000	9.795000	9.57700
7.652					1000	6.720000	6.646000	6.348000	6.28300
7.800					9000	6.828000	6.470000	6.531000	6.27900
7.685					1000	6.745000	6.473000	6.450000	6.16100
9.545					6000	8.284000	8.055000	7.915000	7.60900
9.581					4000	8.268000	8.009000	7.899000	7.66000
9.008					8000	7.650000	7.483000	7.243000	7.14300
8.886					5000	7.558000	7.409000	7.272000	7.08500
4.754					7000	4.126000	3.962000	4.056000	4.12600
5.009					9000	4.162000	4.094000	3.912000	3.94300
4.734					6000	4.083000	3.752000	3.811000	3.72600
331.8					7900	267.0120	258.7610	250.4920	243.936
331.0					4810	266.6210	258.4480	250.0040	243.468
					9800	267.3700	258.8580	250.6990	242.146
					8600	12.33800	12.08400	11.85000	11.4810
	13.91500	13.55900	13.21300	12.94200	12.61800	12.38800	12.04200	11.85200	11.5430

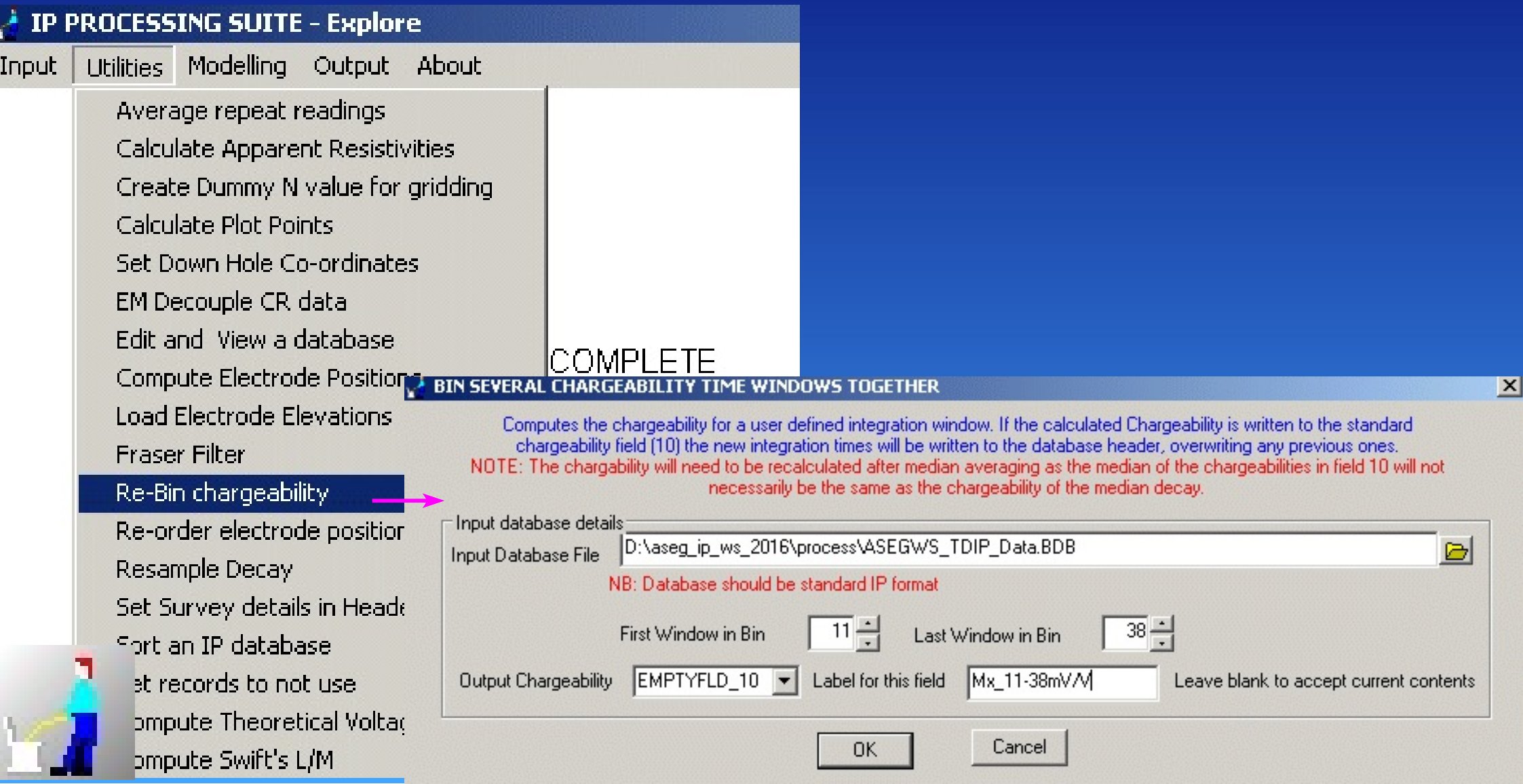
DECAY PLOT



CK RETURNS CO-ORDINATES

Records 1991 to 1992 of 10510

Re-Bin the chargeability

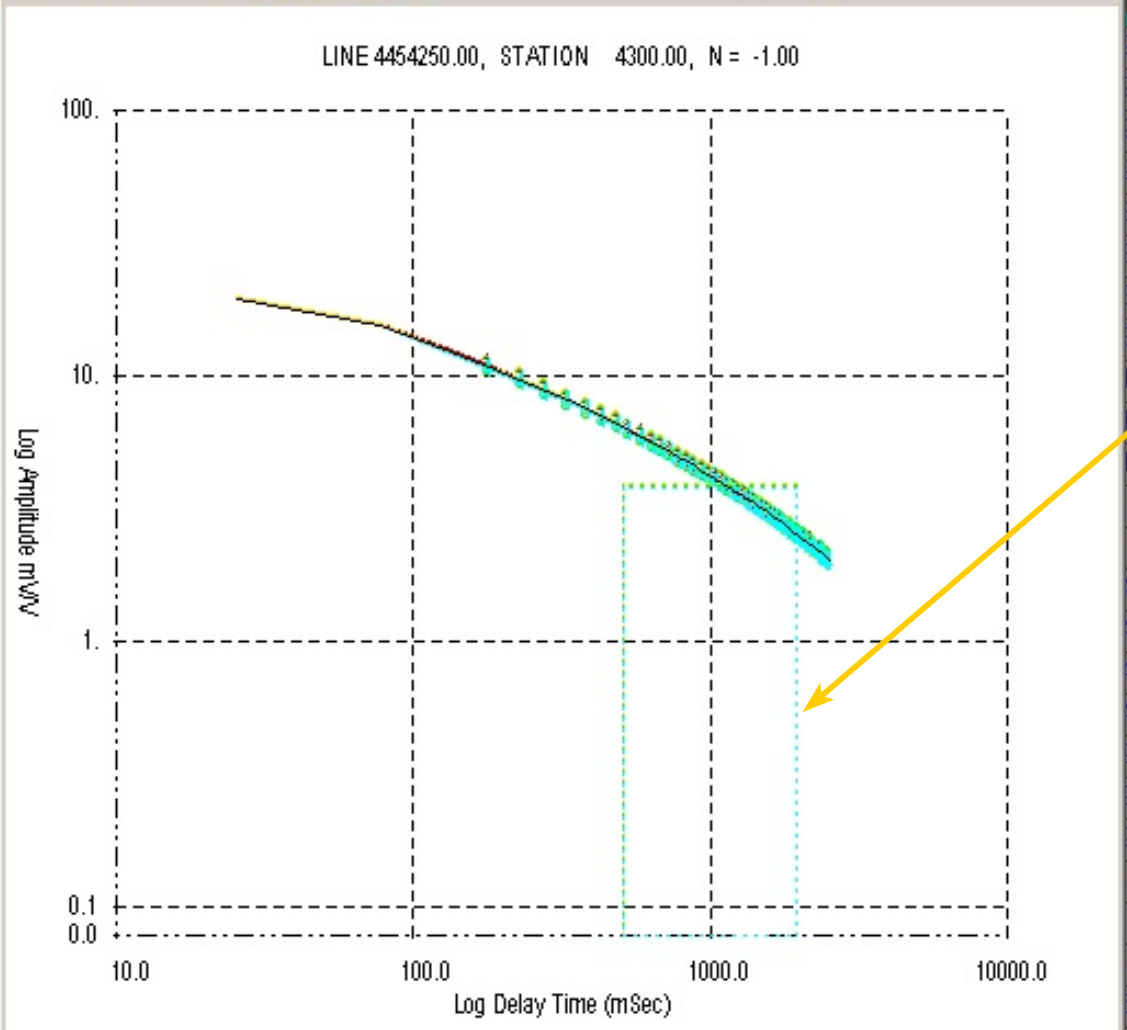


ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454250.	4300.000				-1.000000	1.000000	27.13126	12.78400	3.89807
44					.000000	1.000000	27.12484	12.78100	3.91596
44					.000000	1.000000	27.14736	12.79200	3.88096
44					.000000	1.000000	27.17633	12.80600	3.79553
44					2.000000	1.000000	13.72791	32.33500	4.16367
44					.000000	1.000000	11.91600	5.615000	0.93532
44					.000000	1.000000	-19.64956	9.260000	8.66246
44					.000000	1.000000	-19.64517	9.258000	8.68628
44					4.000000	1.000000	18.98724	187.7380	8.19739
44					4.000000	1.000000	18.99004	187.7660	8.23446
44					4.000000	1.000000	18.99051	187.7710	8.22196
44					4.000000	1.000000	18.99321	187.7970	8.19657
44					2.000000	1.000000	21.85487	51.48100	1.66714
44					2.000000	1.000000	21.85540	51.48200	1.67892
44					2.000000	1.000000	21.85403	51.47900	1.66614
44					.000000	1.000000	-25.20953	59.42000	7.06367
44					.000000	1.000000	-25.17238	59.33300	7.16050
44					.000000	1.000000	-25.09632	59.15300	7.19350
44					5.000000	1.000000	7.623483	118.4380	5.55528
44					5.000000	1.000000	7.622725	118.4260	5.41485
44					5.000000	1.000000	7.625611	118.4710	5.43760
	4500.000				-5.000000	1.000000	7.624122	118.4480	5.47196

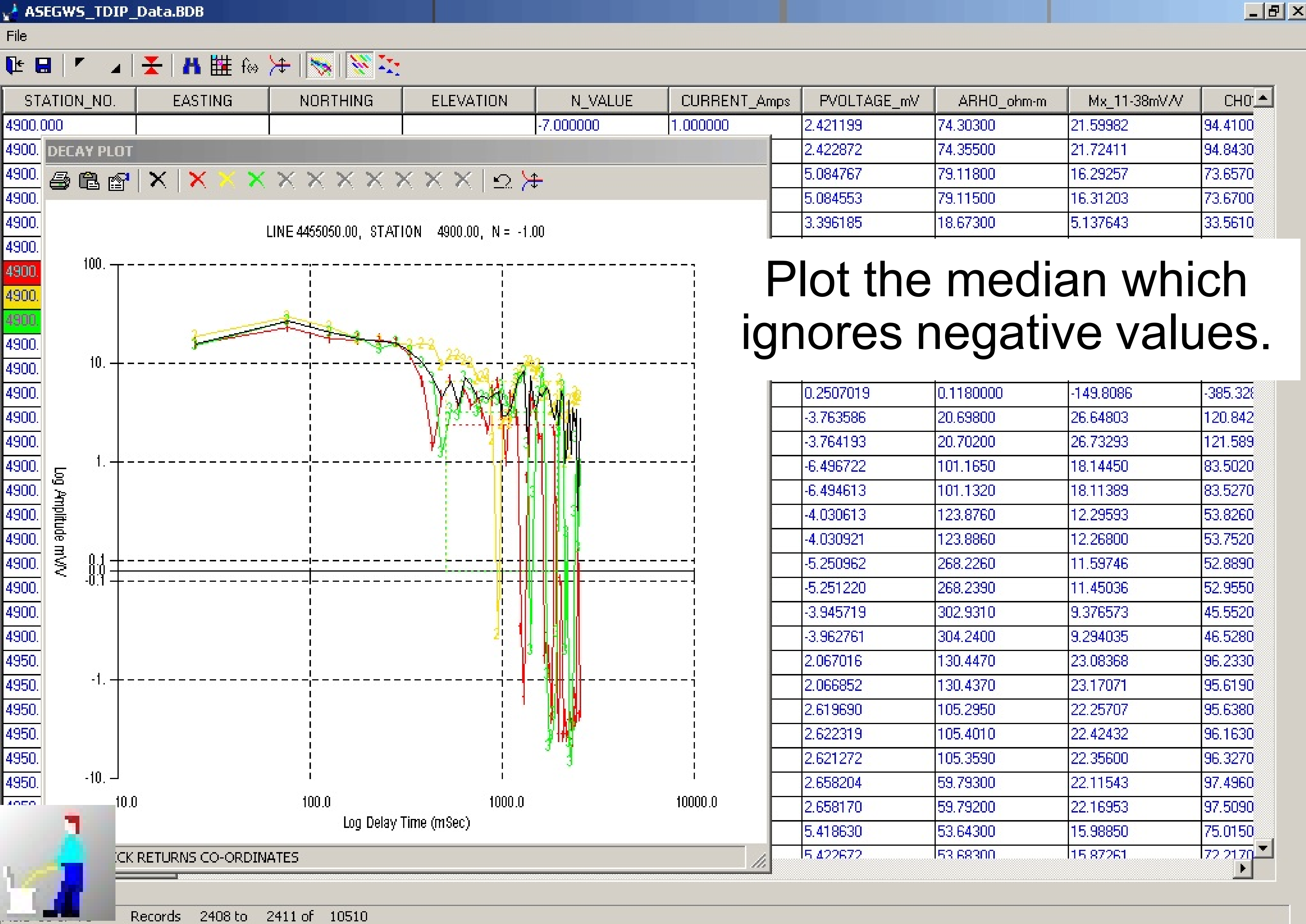
DECAY PLOT



RETURNS CO-ORDINATES

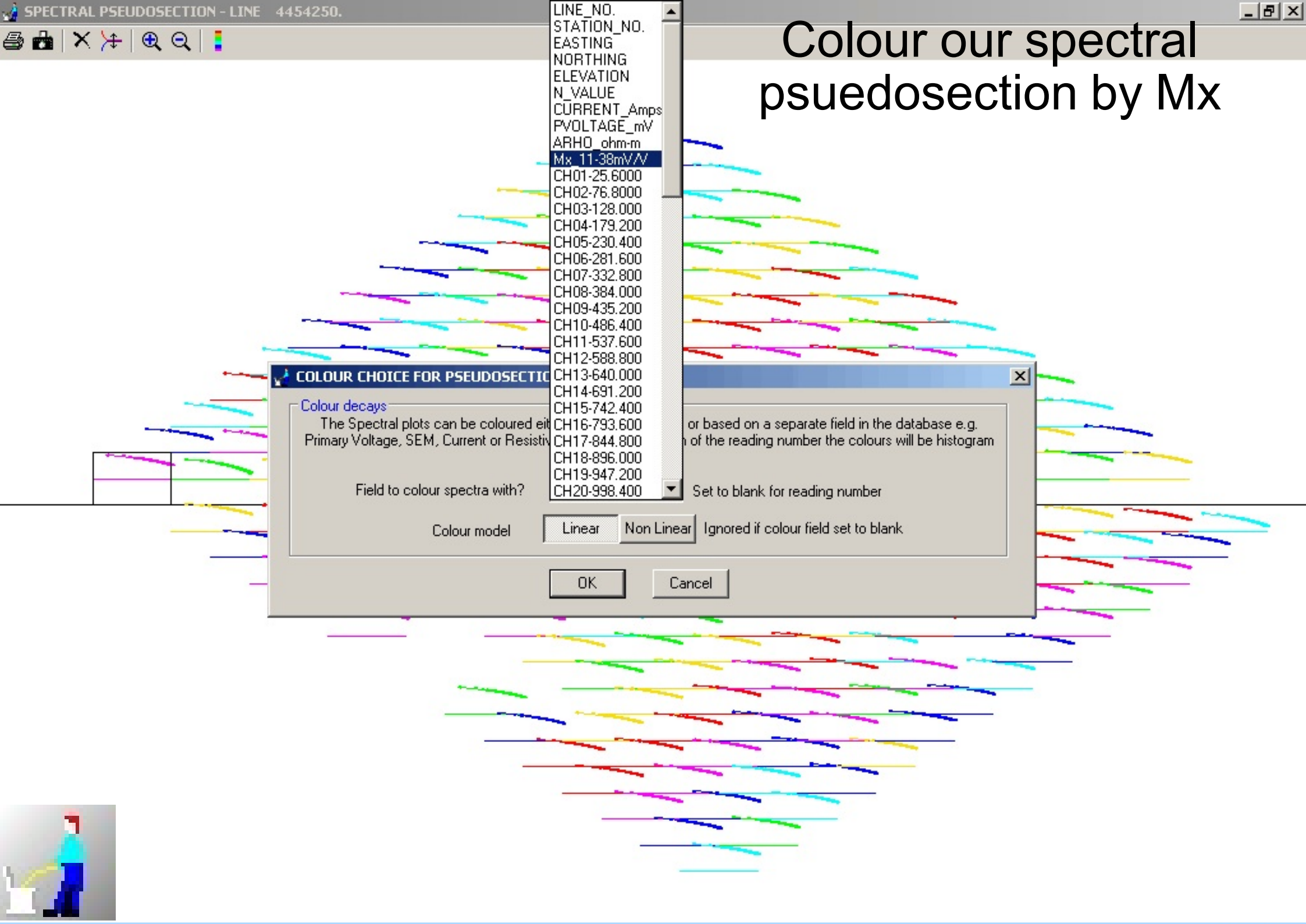
Integration window and Mx now shown in decay plots in the editor

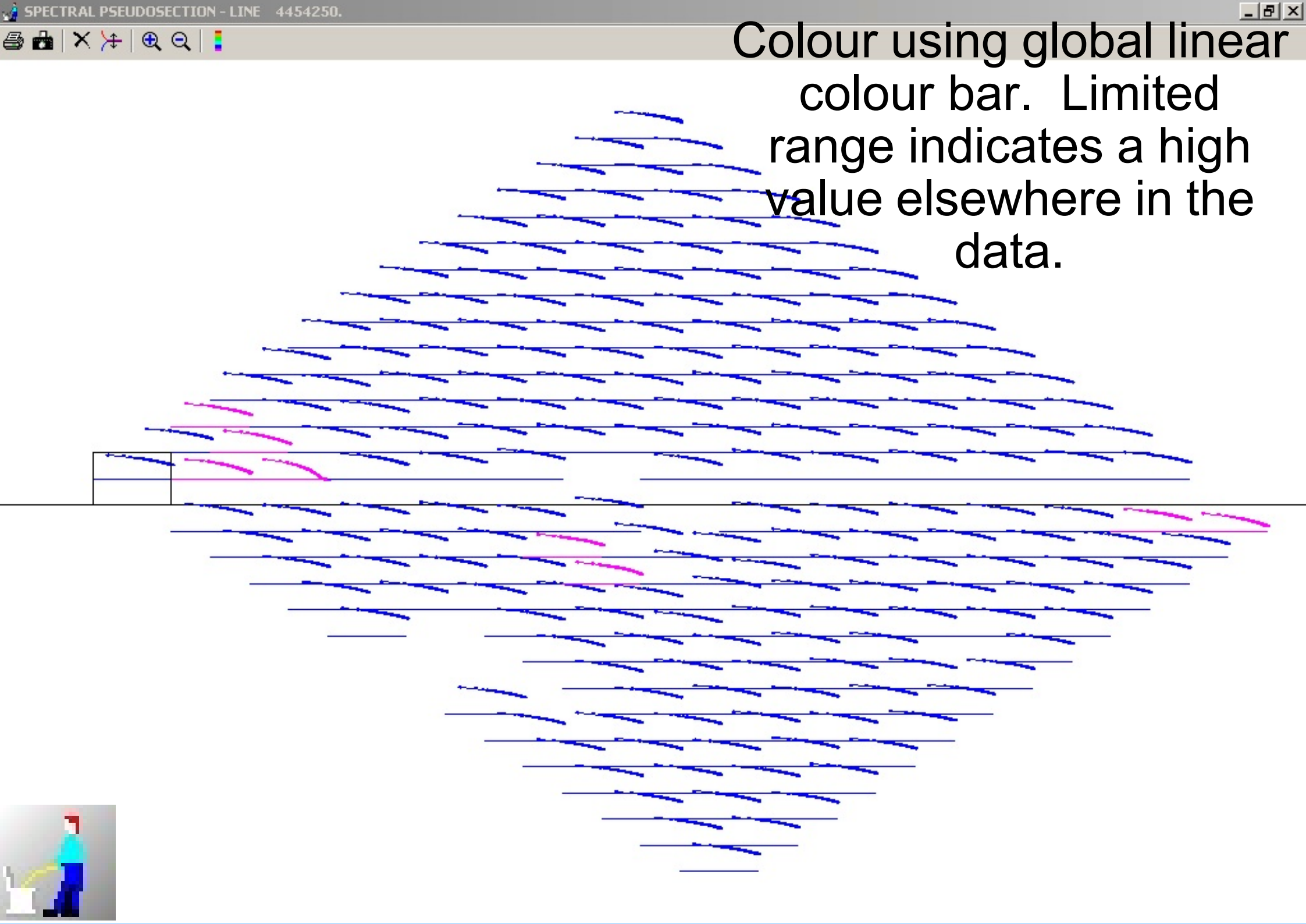
Records 1 to 4 of 10510

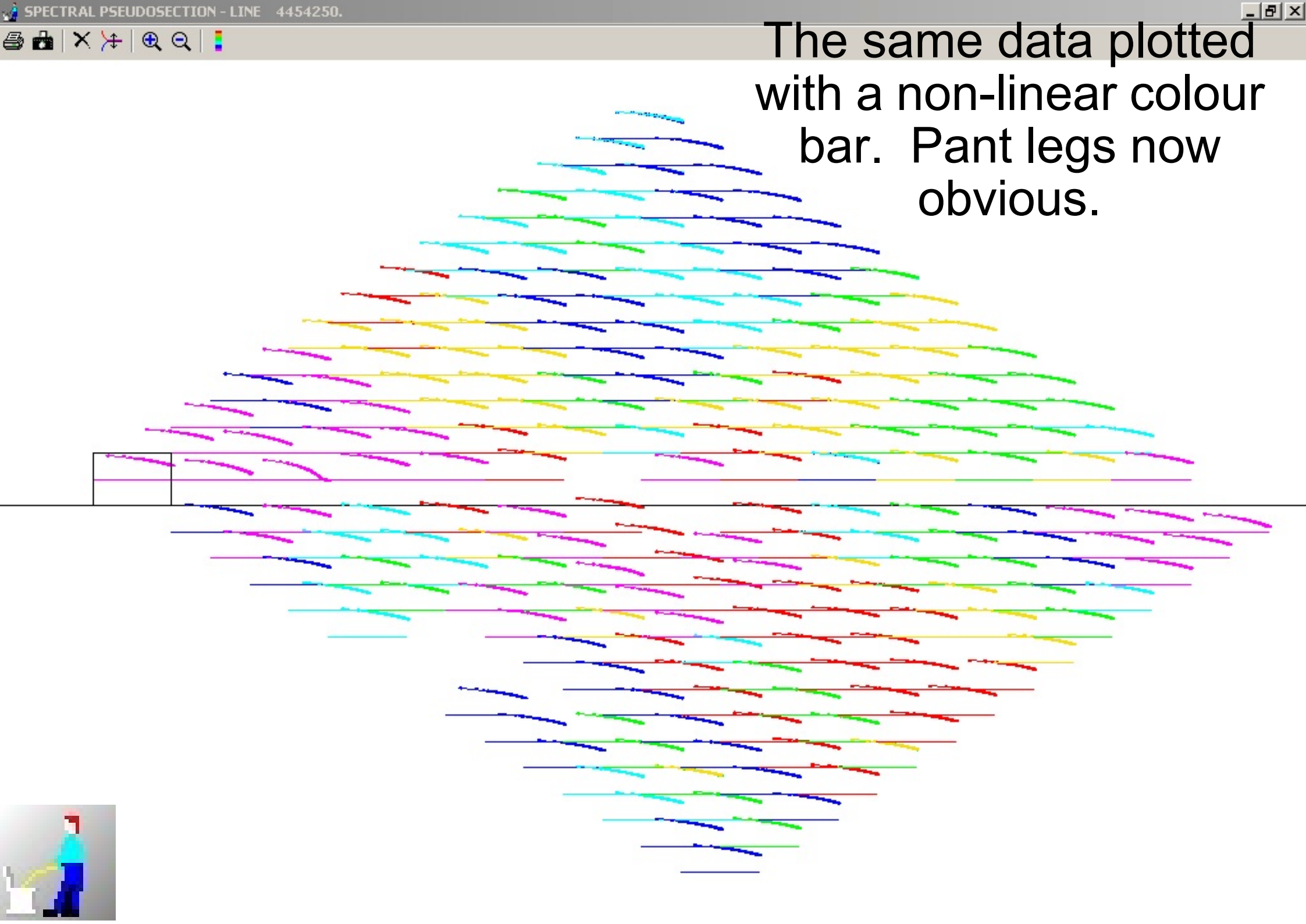


Plot the median which ignores negative values.

Colour our spectral psuedosection by Mx




SPECTRAL PSEUDOSECTION - LINE 4454250.
Colour using global linear colour bar. Limited range indicates a high value elsewhere in the data.


SPECTRAL PSEUDOSECTION - LINE 4454250.
The same data plotted with a non-linear colour bar. Pant legs now obvious.

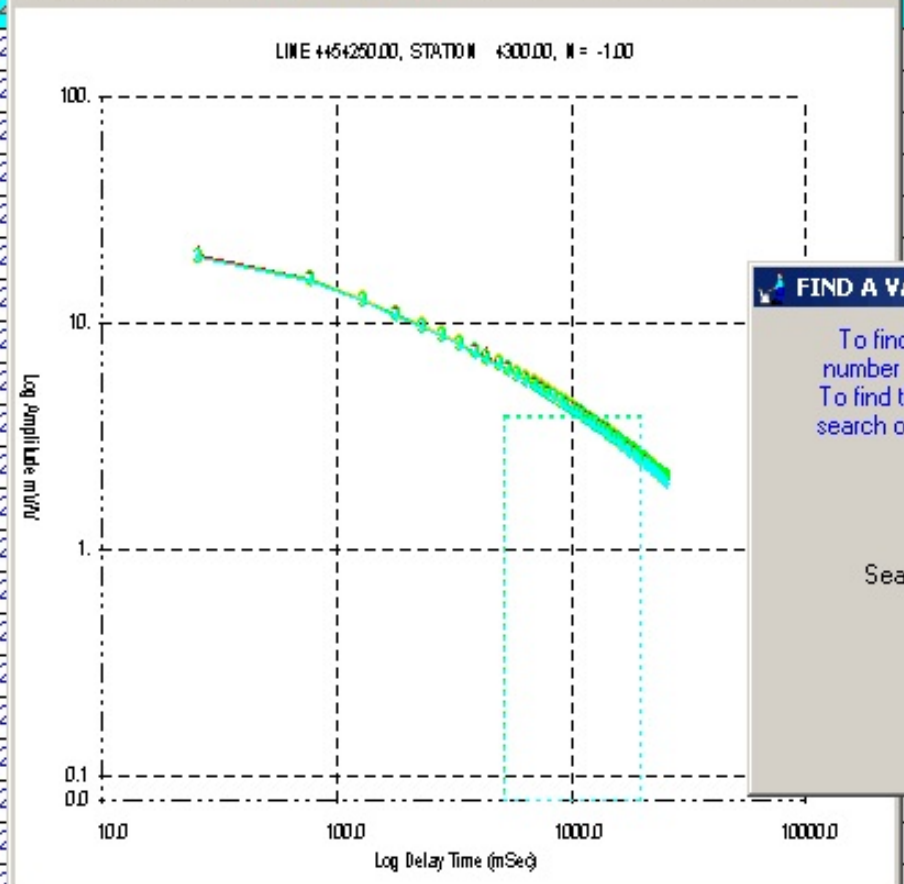
Find the maximum Mx value

ASEGWS_TDIP_Data.BDB

File

LINE_NO.	STATION_NO.	EASTING	NORTHING	ELEVATION	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Mx_1
4454250.	4300.000				-1.000000	1.000000	27.13126	12.78400	3.89807
44542					-1.000000	1.000000	27.12484	12.78100	3.91596
44542					-1.000000	1.000000	27.14736	12.79200	3.88096
44542					-1.000000	1.000000	27.17633	12.80600	3.79553
44542					-2.000000	1.000000	13.72791	32.33500	4.16367
44542					-2.000000	1.000000	13.73274	32.34700	4.11892
44542					-2.000000	1.000000	13.72332	32.32500	4.11114
44542					-2.000000	1.000000	13.73118	32.34300	4.16628
44542					-3.000000	1.000000	13.80545	75.85400	2.60625
44542					-3.000000	1.000000	13.80860	75.87100	2.62264
44542								0	2.66789
44542								0	2.67796
44542								0	0.92996
44542								0	0.95350
44542								0	0.93532
44542								0	8.66246
44542								0	8.68628
44542								0	8.19739
44542								0	8.23446
44542								0	8.22196
44542								0	8.19657
44542								0	1.66714
44542								0	1.67892
44542					-2.000000	1.000000	21.85403	51.47900	1.66614
44542					2.000000	1.000000	-25.20953	59.42000	7.06367
44542					2.000000	1.000000	-25.17238	59.33300	7.16050
4454250.	4450.000				2.000000	1.000000	-25.09632	59.15300	7.19350
4454250.	4500.000				-5.000000	1.000000	7.623483	118.4380	5.55528
	4500.000				-5.000000	1.000000	7.622725	118.4260	5.41485
	4500.000				-5.000000	1.000000	7.625611	118.4710	5.43760
	4500.000				-5.000000	1.000000	7.624122	118.4480	5.47196

DECAY PLOT



MOUSE CLICK RETURNS CO-ORDINATES

FIND A VALUE OR CONDITION IN A SELECTED FIELD

To find the Maximum or Minimum just type in MAX or MIN in the value field. To find the next number greater than a threshold just type >## where ## is your threshold, likewise for lower than. To find the next null value enter NULL, otherwise enter the number you want to find. By default search only considers readings not marked as bad, this can be made global by ignoring the Use Flag.

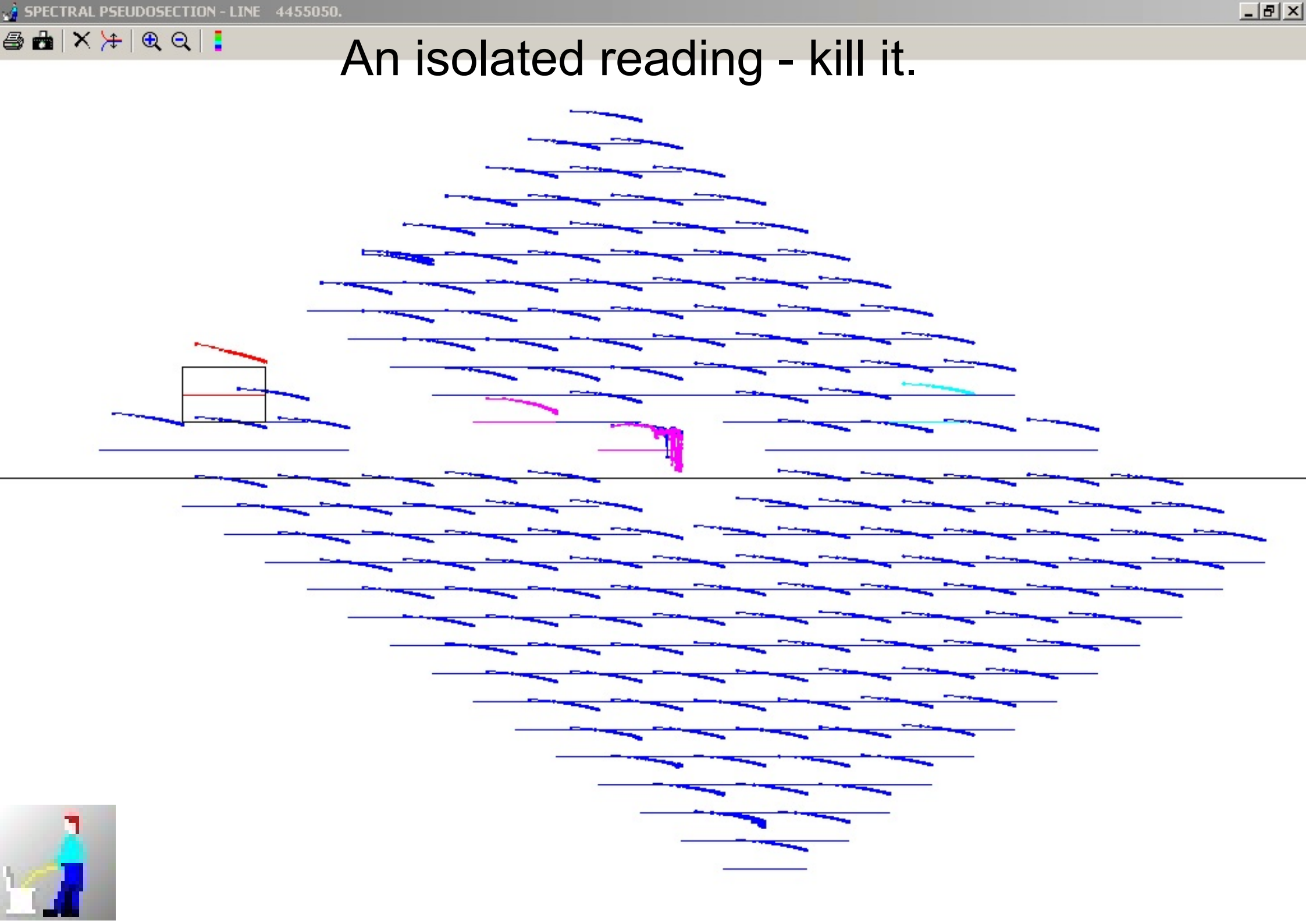
Value to Find: MAX in field: Mx_1:38mV/V

Search direction within the chosen field: All | Forward | Backward

Ignore Use Flag?

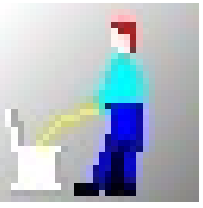
OK Cancel

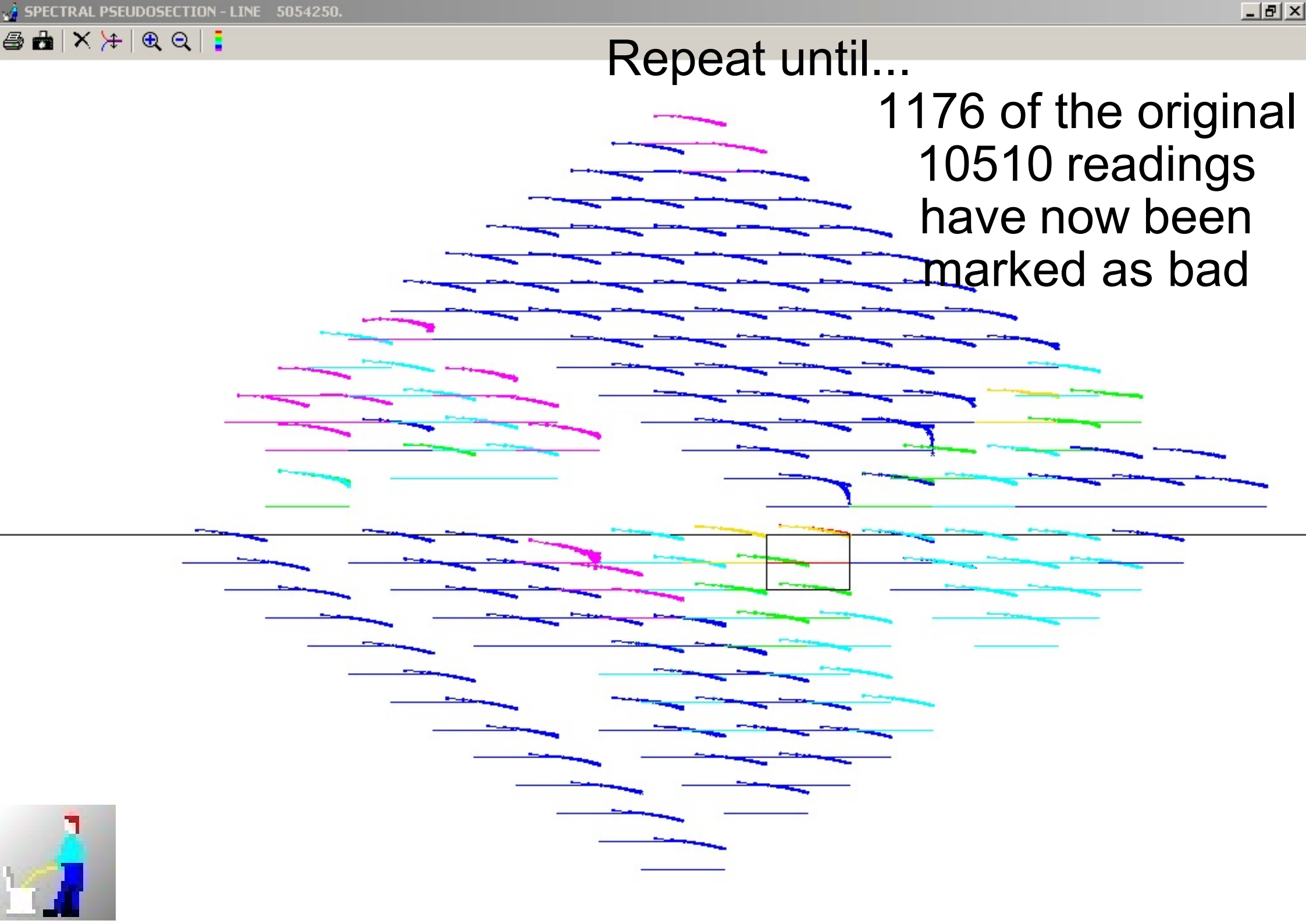
Records 1 to 4 of 10510


SPECTRAL PSEUDOSECTION - LINE 4455050.
An isolated reading - kill it.

SPECTRAL PSEUDOSECTION - LINE 4455050.

Still no colour range - find next highest.




SPECTRAL PSEUDOSECTION - LINE 5054250.
Repeat until...
1176 of the original
10510 readings
have now been
marked as bad

Average repeat readings

IP PROCESSING SUITE - Explore

Input | Utilities | Modelling | Output | About

- Average repeat readings
- Calculate Apparent Resistivities
- Create Dummy N value for gridding
- Calculate Plot Points
- Set Down Hole Co-ordinates
- EM Decouple CR data
- Edit and View a database
- Compute Electrode Positions
- Load Electrode Elevations
- Fraser Filter
- Re-Bin chargeability
- Re-order electrode positions
- Resample Decay
- Set Survey details in Header
- Sort an IP database
- Set records to not use
- Compute Theoretical Voltage
- Compute Swift's L/M

AVERAGE REPEAT READINGS IN AN IP DATABASE

NB: Database must be sorted first

Input Database File: D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data.BDB

Output Database File: D:\aseg_ip_ws_2016\process\ASEGWS_TDIP_Data_MAV.BDB

Averaging Parameters

Method to merge repeat readings? Average | Median Percentile for Median: 50

For readings with mixed positive and negative Vp, switch sign of the least common? ☑

Time Domain only

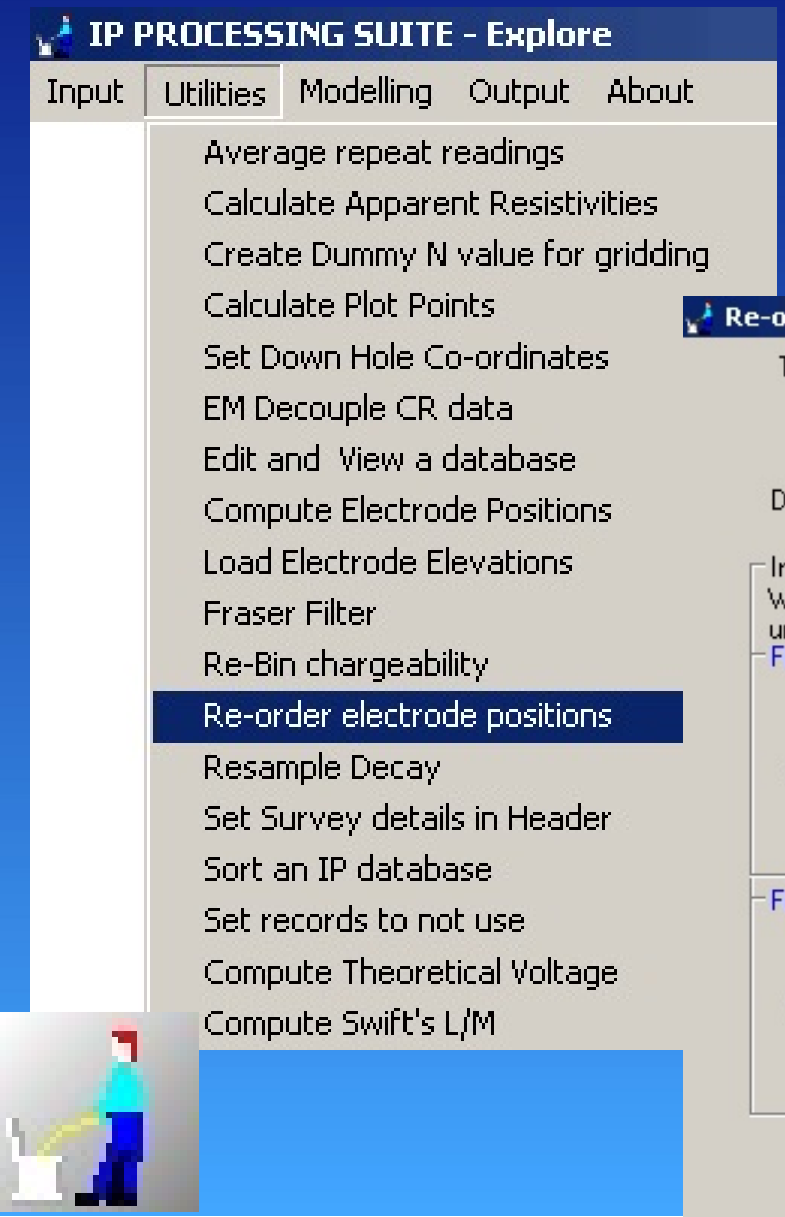
Ignore negative chargeabilities in calculating median/average ☑

Note that if all chargeability values for a particular window are negative this switch will be ignored for that window .

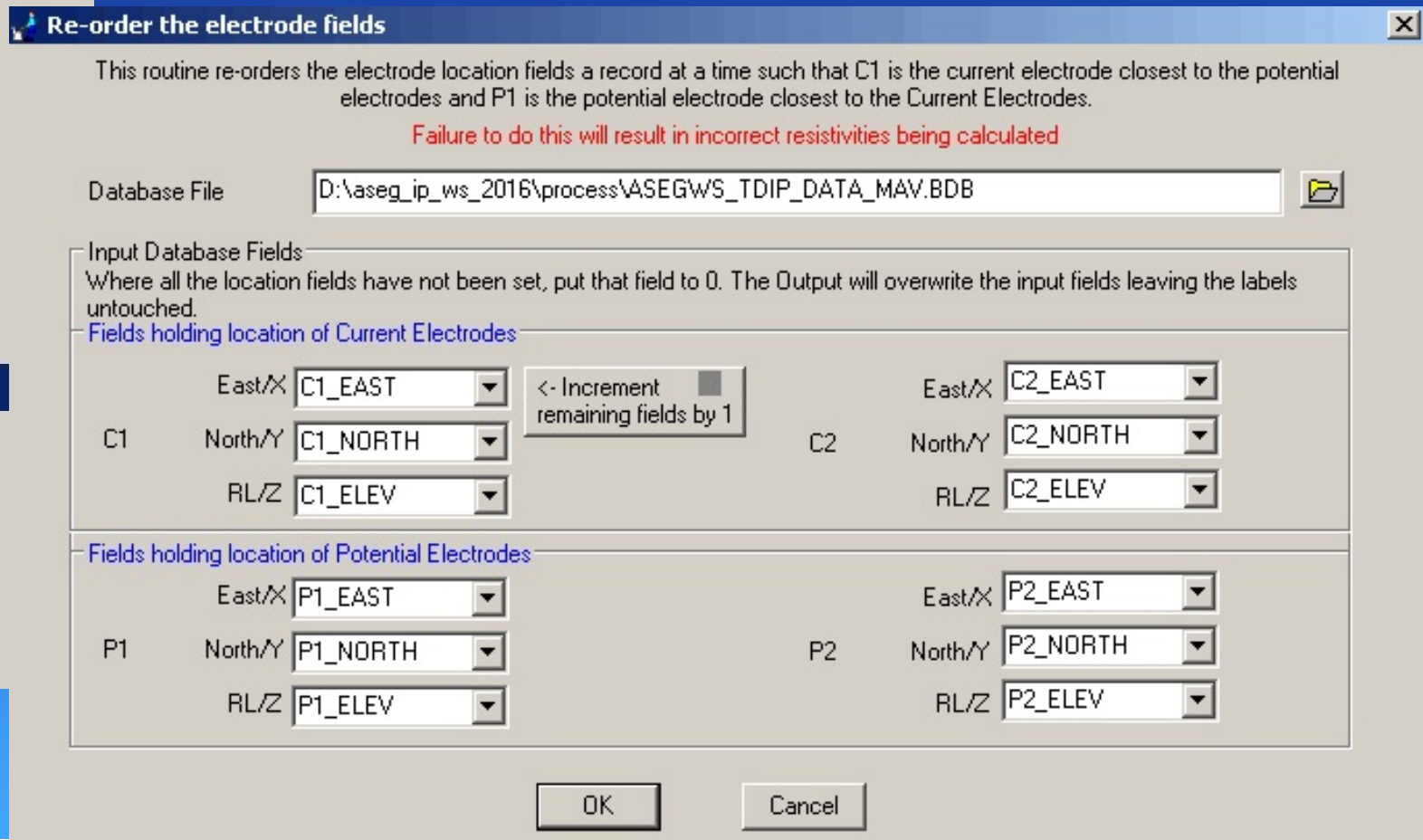
WARNING! If your data base has electrode positions set and the operator has taken repeats or overlaps with the current and potential electrodes reversed, averaging will result in an incorrect answer for these fields. For standard arrays you can recover from this by using IPPROC to recompute the electrode positions. For non-standard arrays talk to me about a solution!

OK Cancel

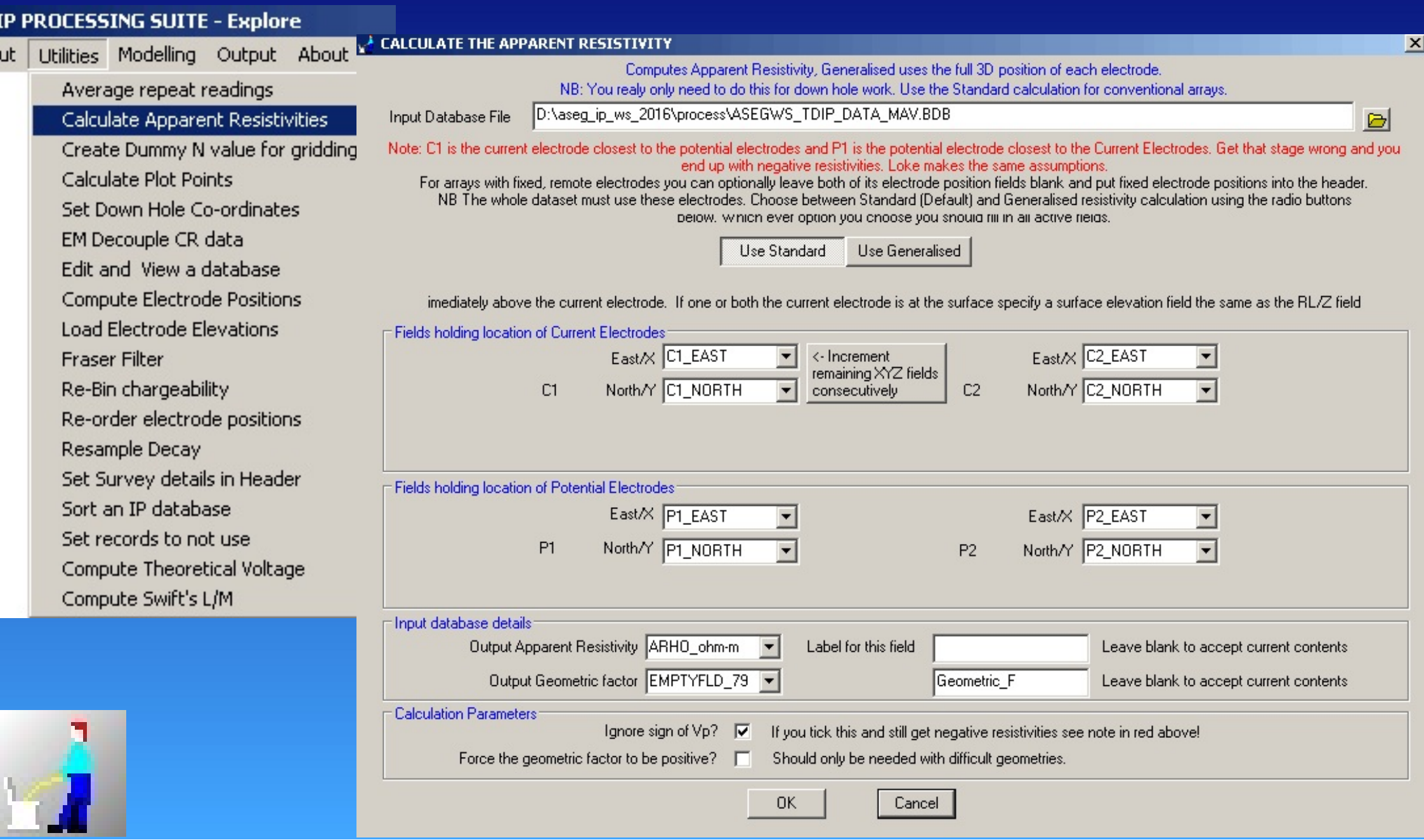
Re-Bin the chargeability and re-calculate the apparent resistivity



Start by re-ordering the electrodes so that the Geometric factor will always be positive

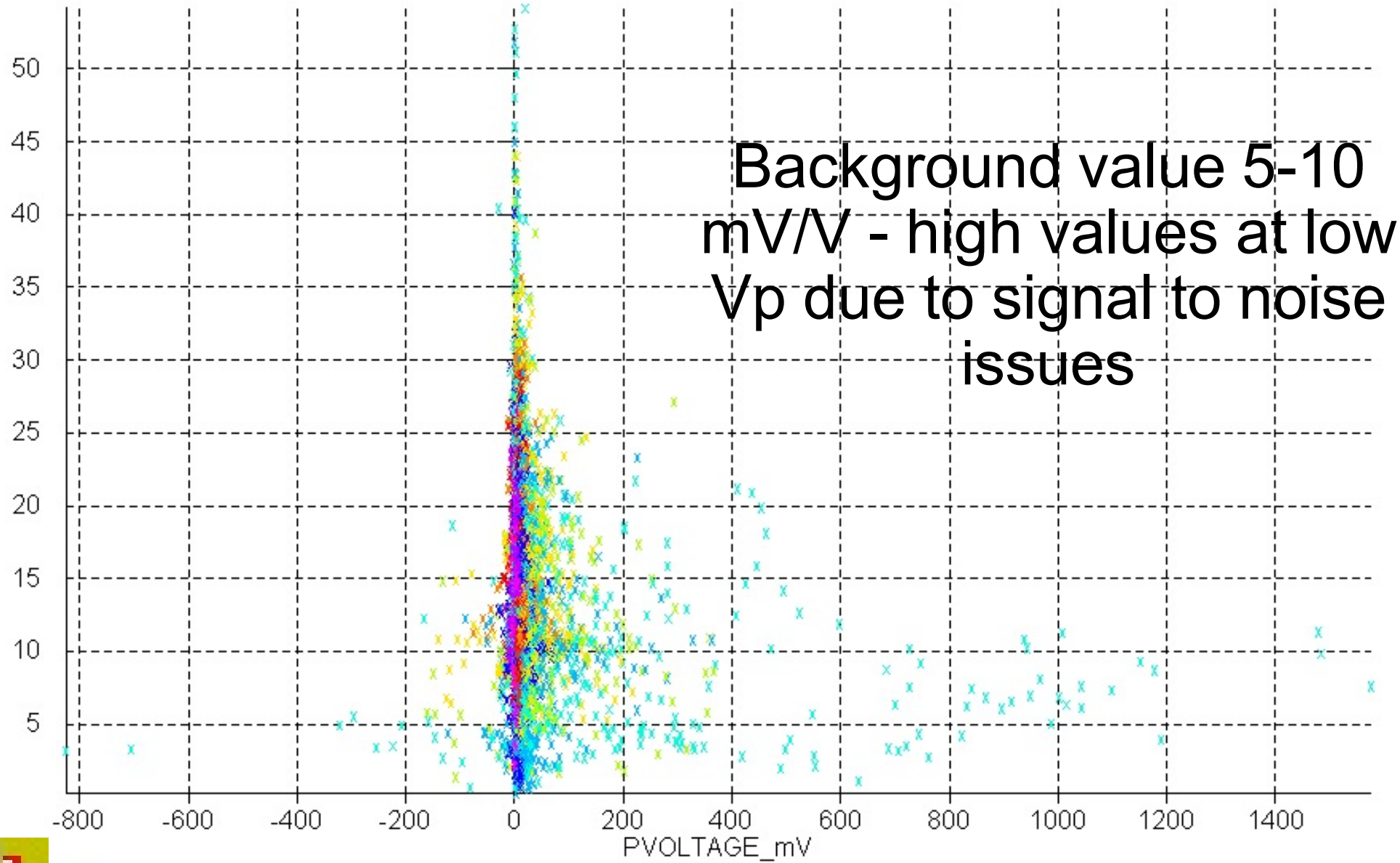


Then compute the apparent resistivity



ASEGWS_TDIP_DATA_MAV.BDB

Plot Vp vs Mx
colour by N value

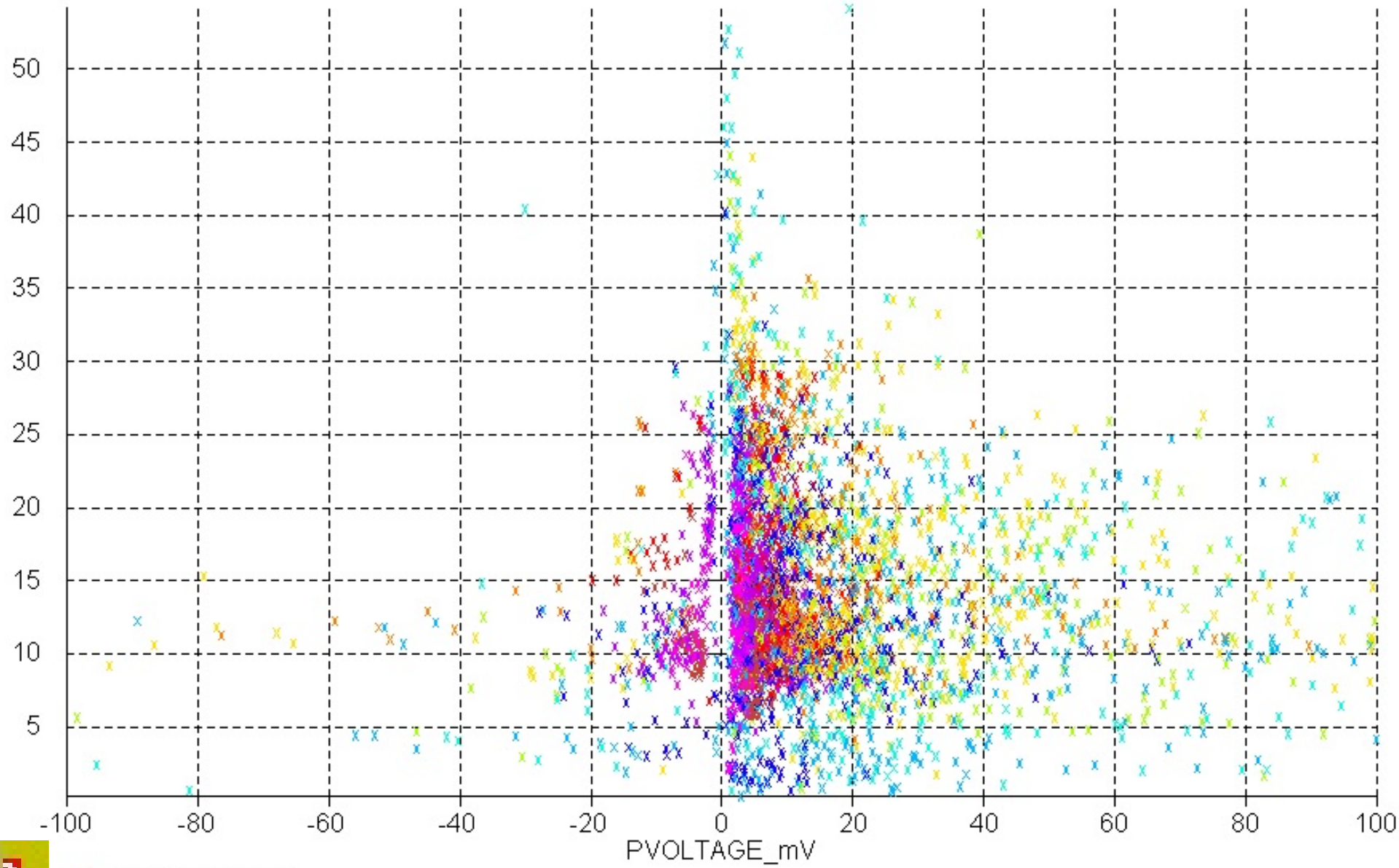


Background value 5-10 mV/V - high values at low Vp due to signal to noise issues

URNS CO-ORDINATES

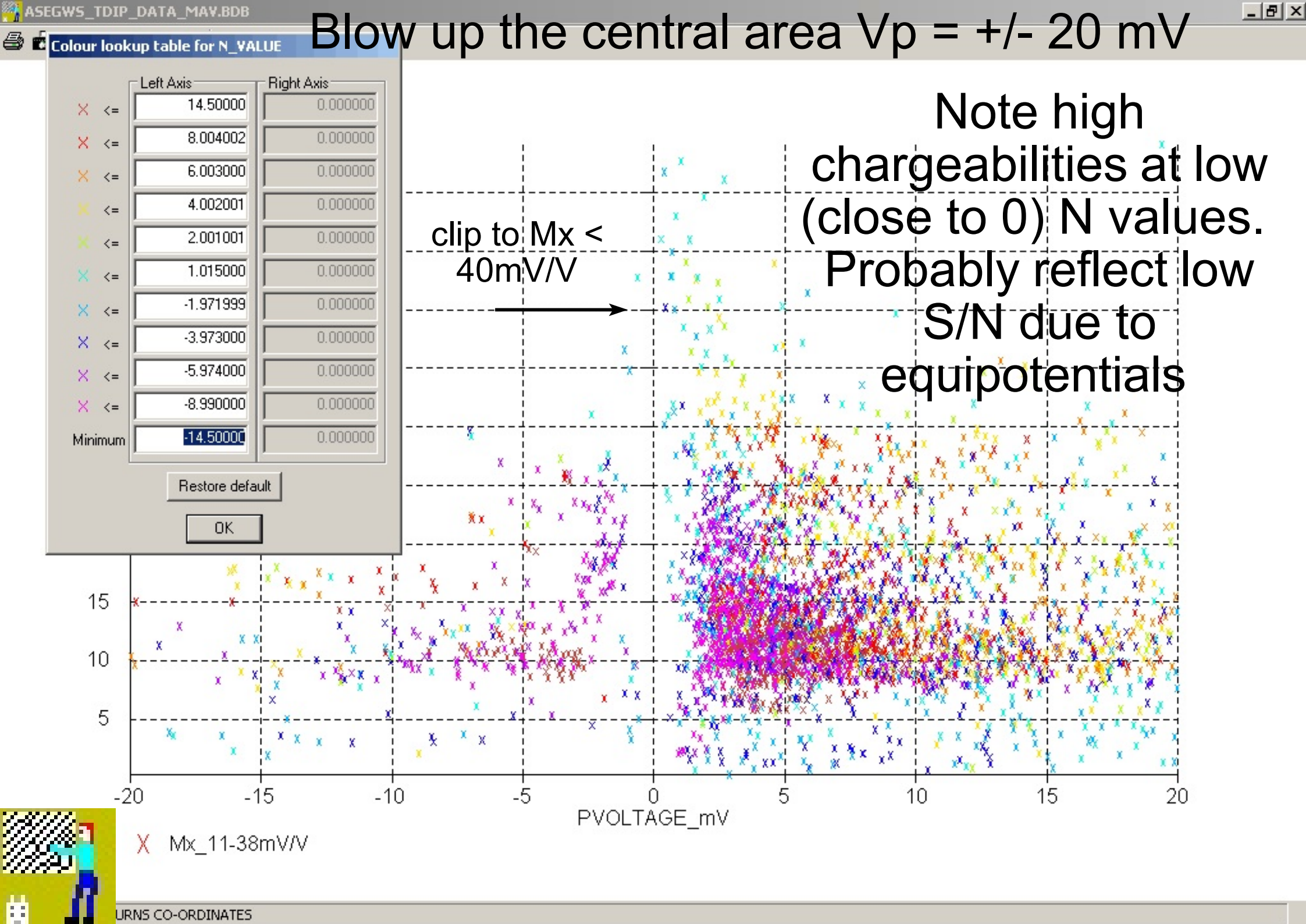
ASEGWS_TDIP_DATA_MAV.BDB

Blow up the central area Vp = +/- 100 mV

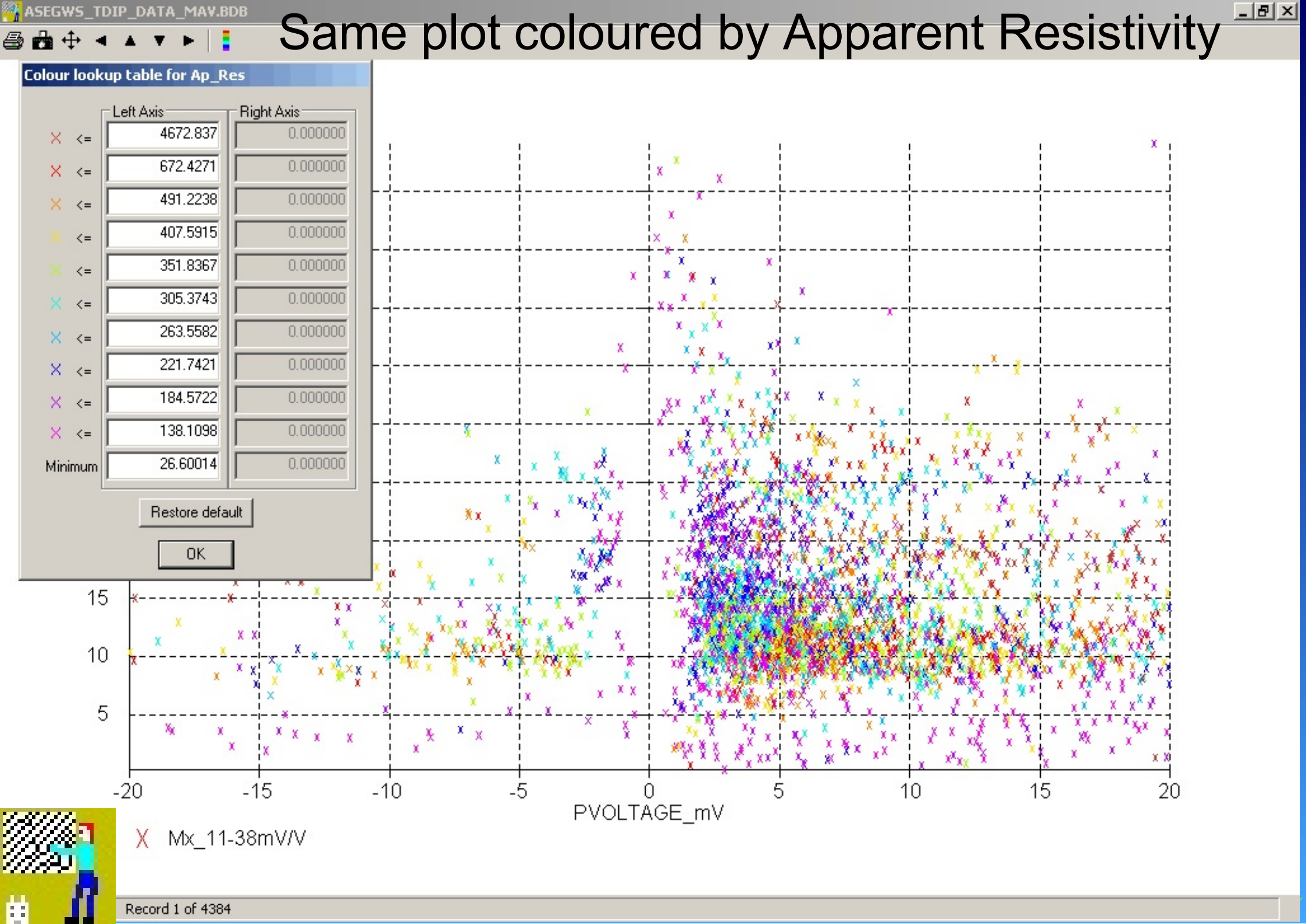


Record 1 of 4384

Blow up the central area Vp = +/- 20 mV

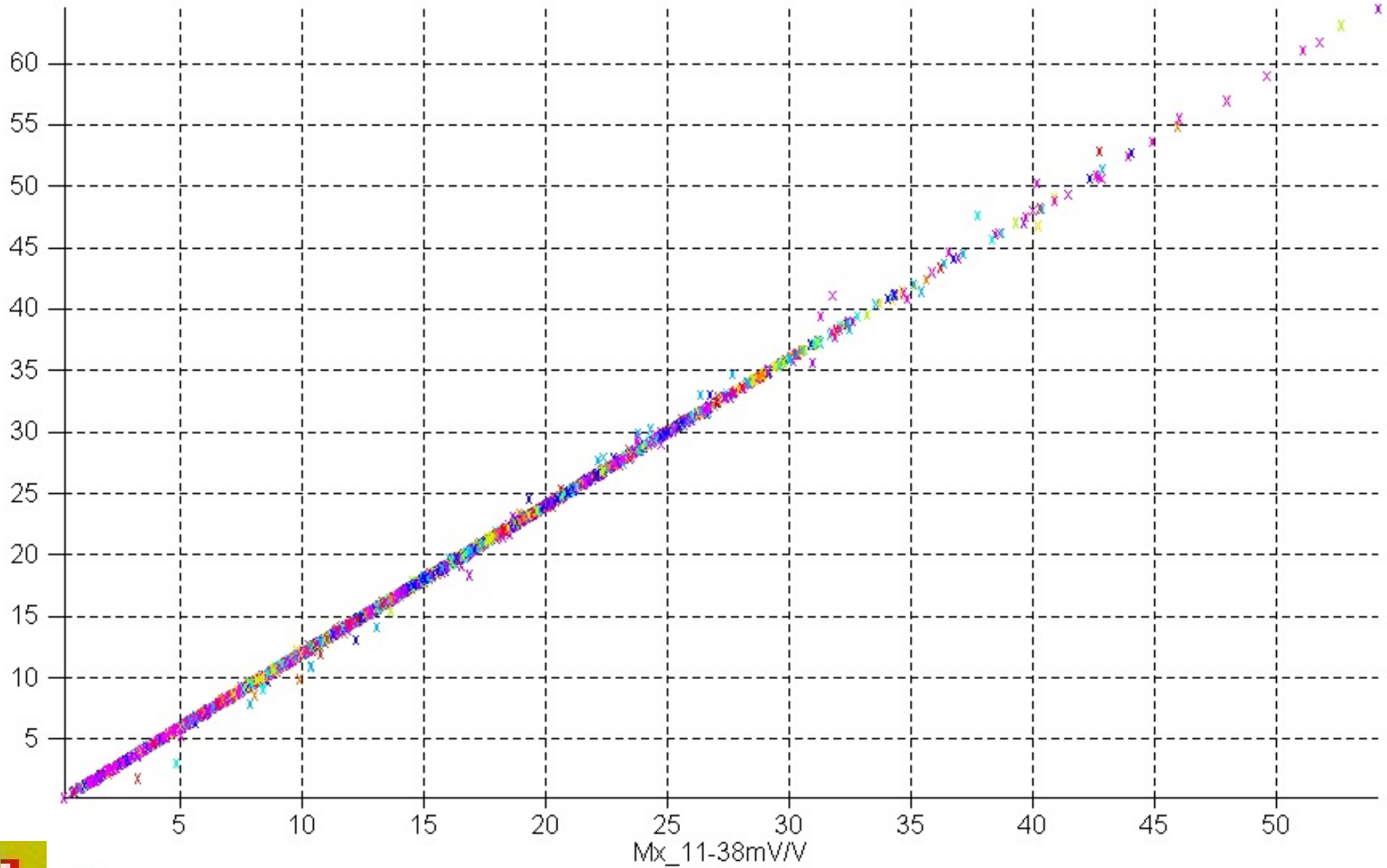


Same plot coloured by Apparent Resistivity



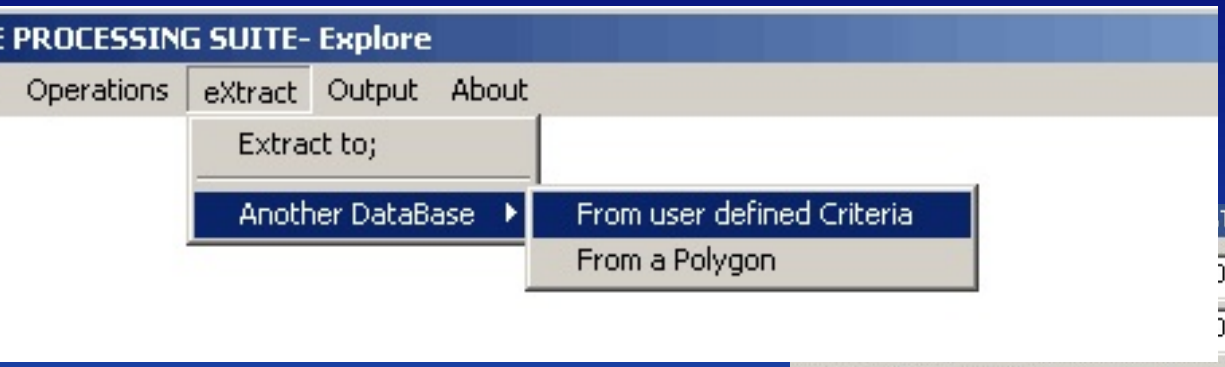
ASEGWS_TDIP_DATA_MAV.BDB

Compare rebinned Mx with supplied MIMDAS m value. Coloured by Ap Res.



URNS CO-ORDINATES

Clip high Mx values from database



TABASE

016\process\ASEGWS_TDIP_DATA_MAV.BDB

016\process\ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB

The output database can be based on inclusion or exclusion from the following criteria. Database field menus left blank will be ignored

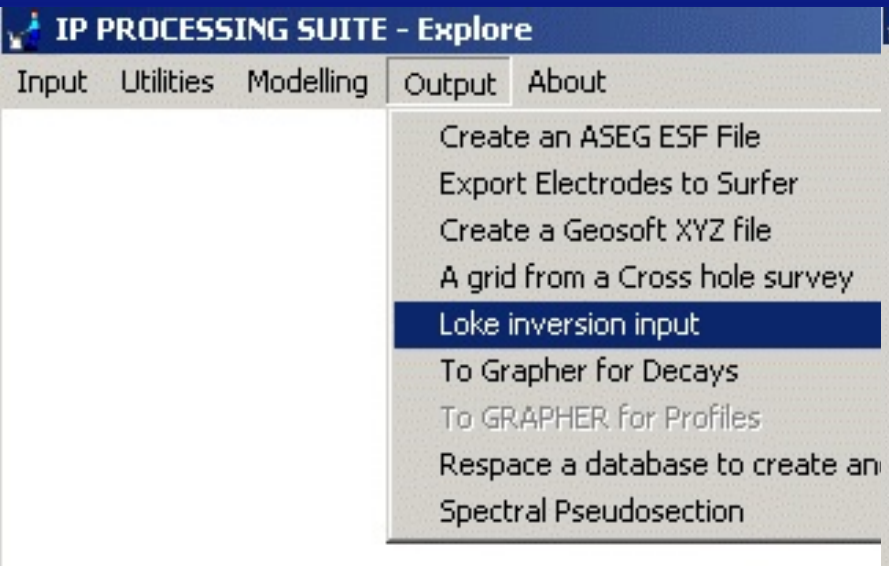
Criteria

Field in Database	Minimum Value	Maximum Value	True if inside or ouside this range?
Mx_11-38mV/V	0.000000	40	Inside / Outside
AND / OR			
	0.000000	0.000000	Inside / Outside
AND / OR			
	0.000000	0.000000	Inside / Outside
AND / OR			
	0.000000	0.000000	Inside / Outside
AND / OR			
	0.000000	0.000000	Inside / Outside

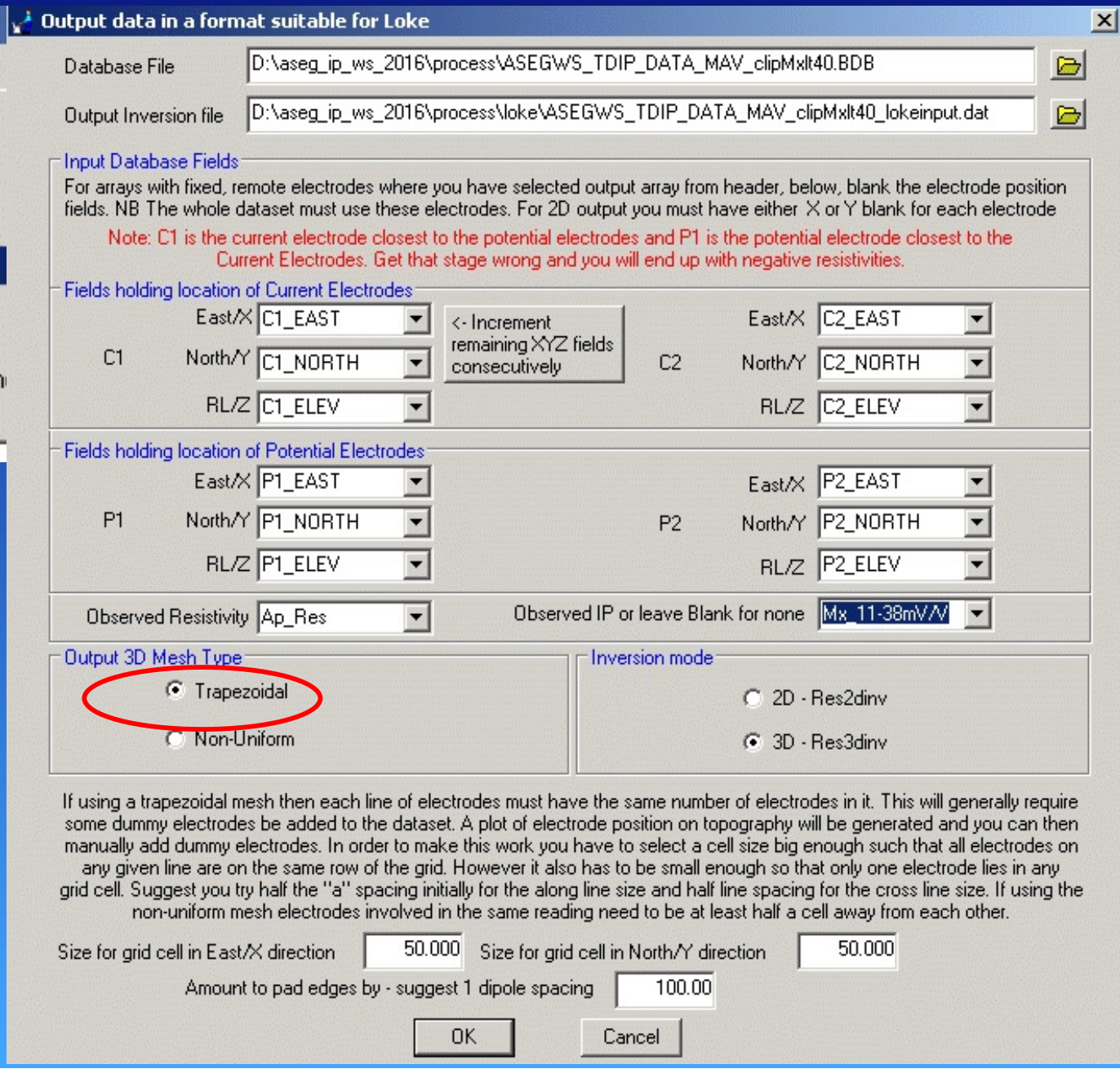
What do you want to do with points that match this criteria? Keep / Discard

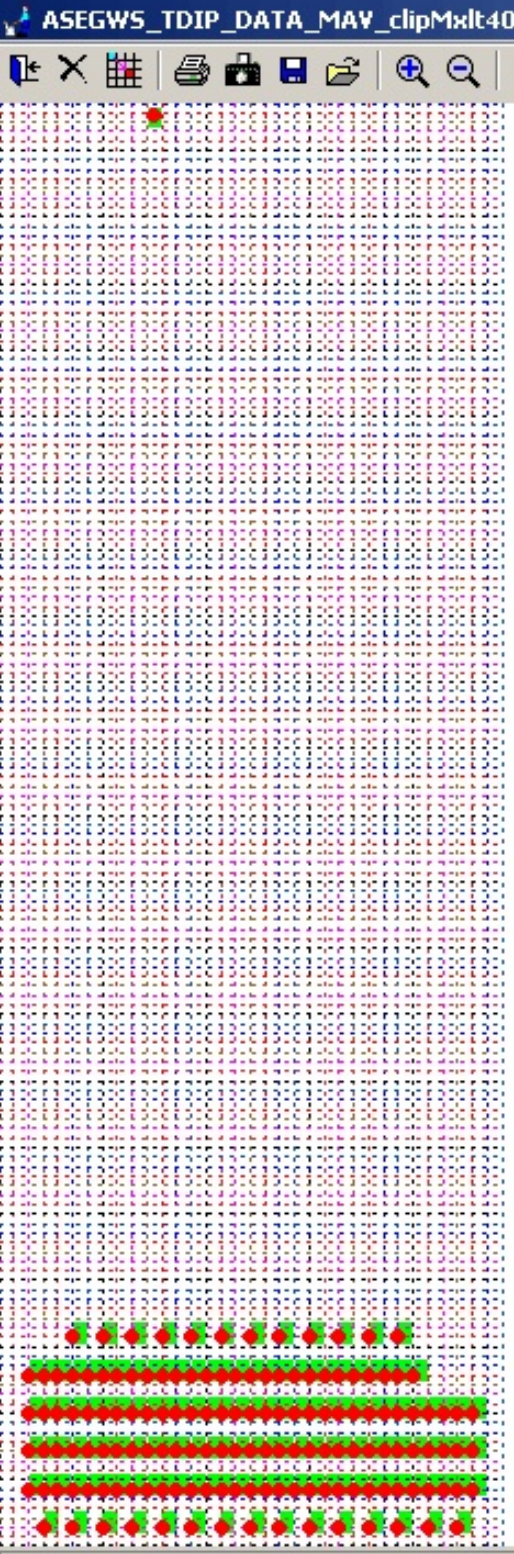
OK Cancel

Generate Inversion Input file



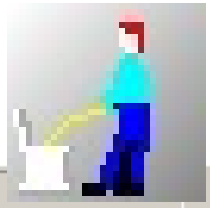
Trapezoidal mesh. Takes a bit more time and care needs to be taken to avoid creating voxels that are not close to rectangular but otherwise provides a more accurate answer

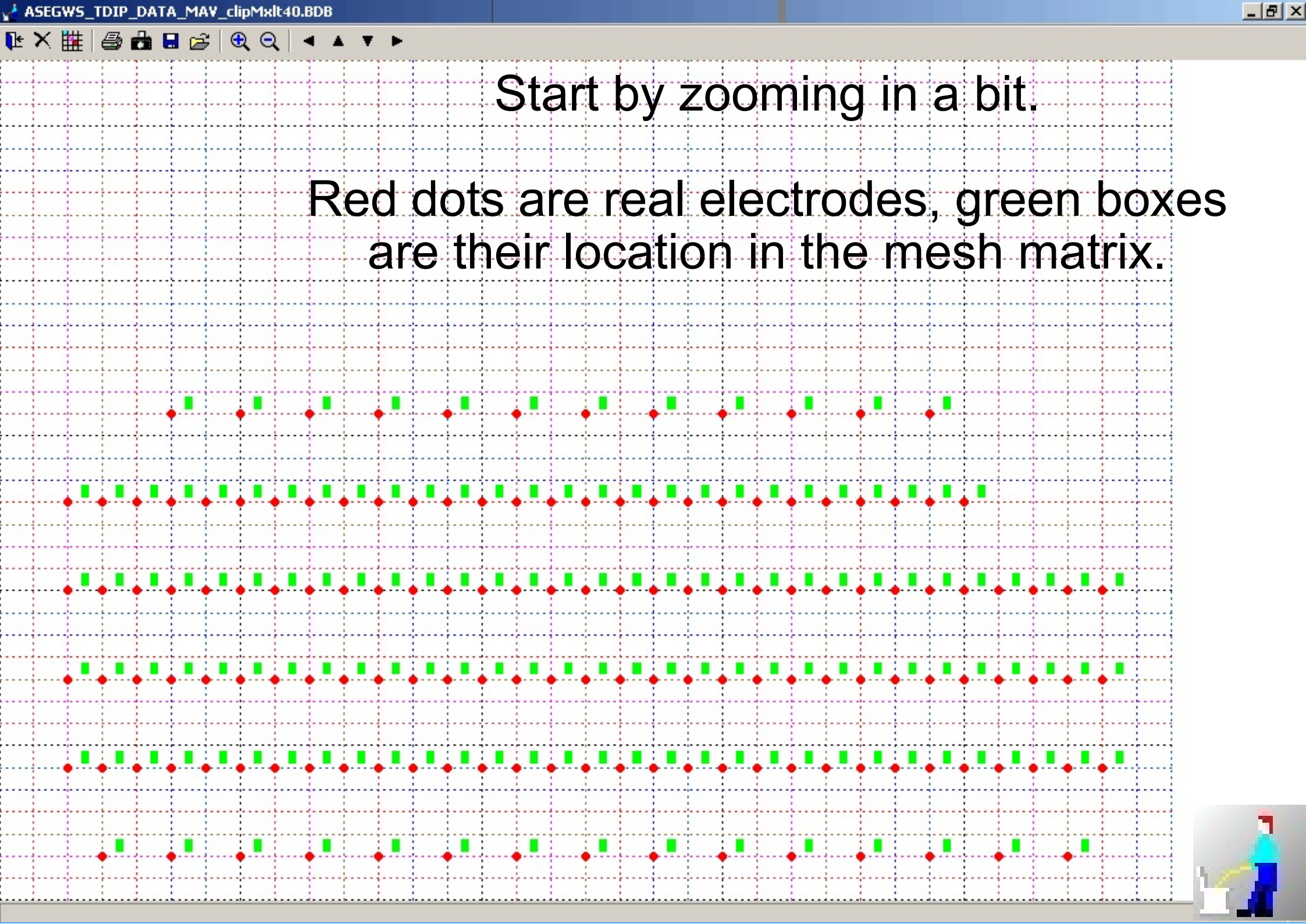


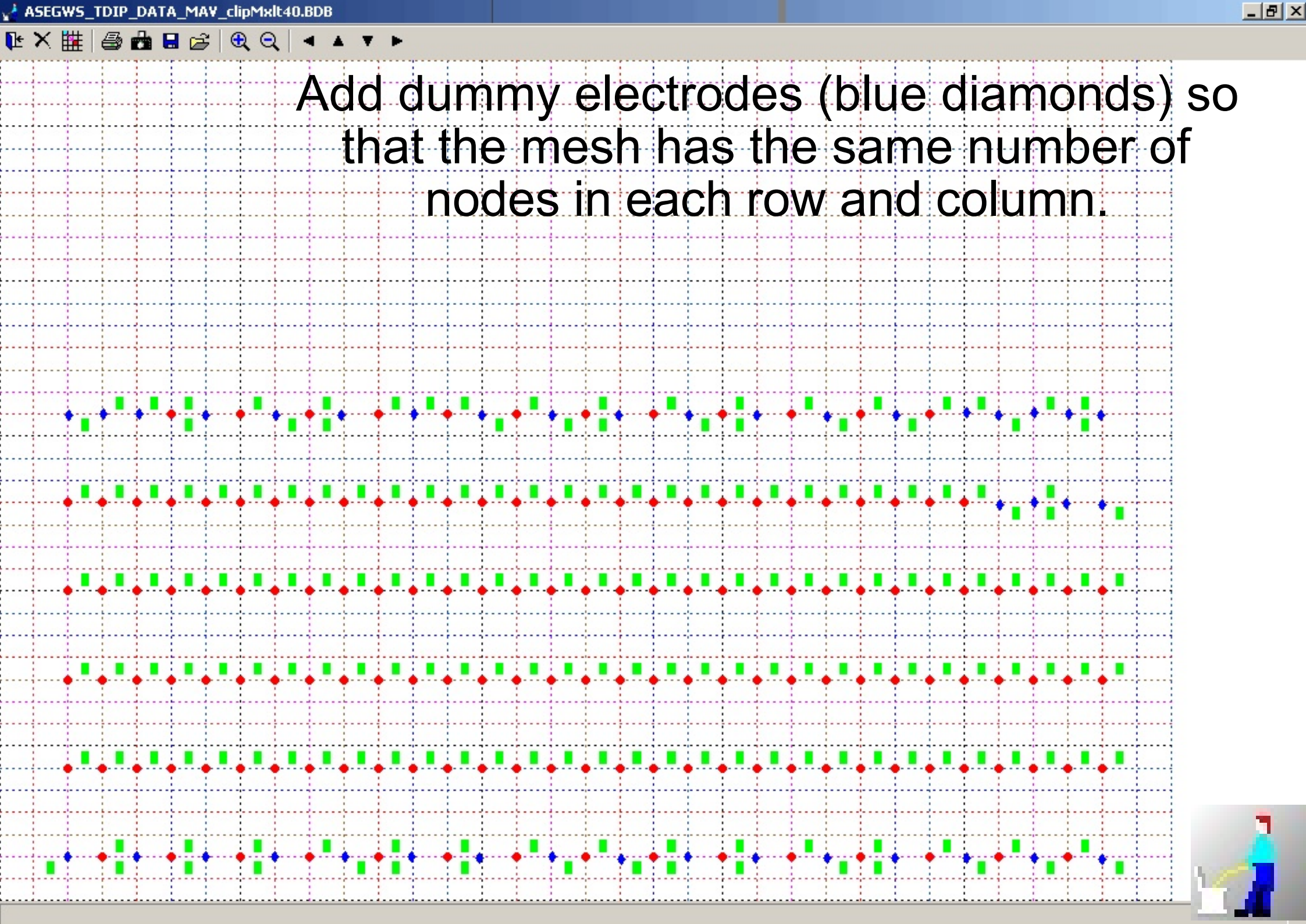


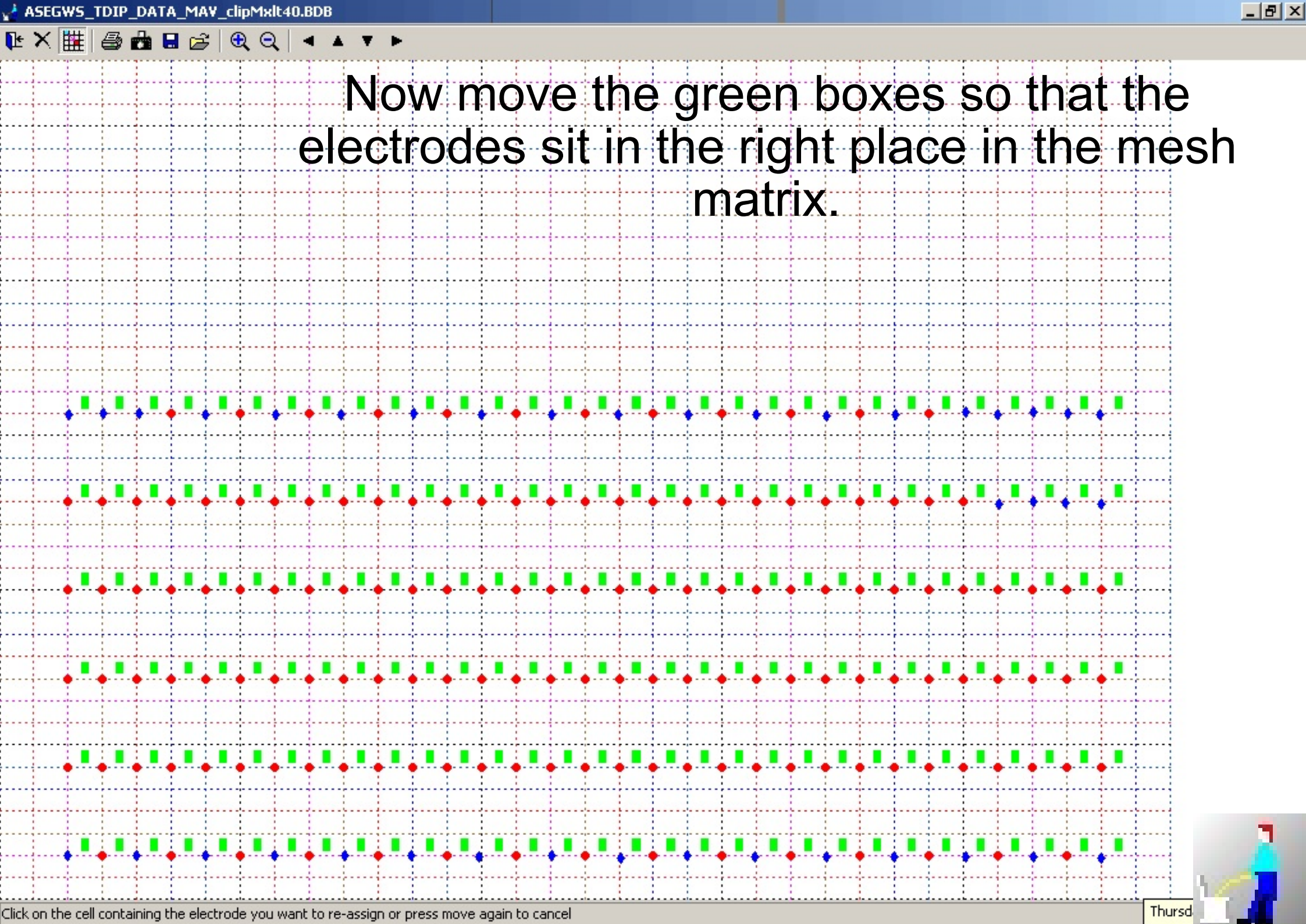
Dot painting showing electrodes.

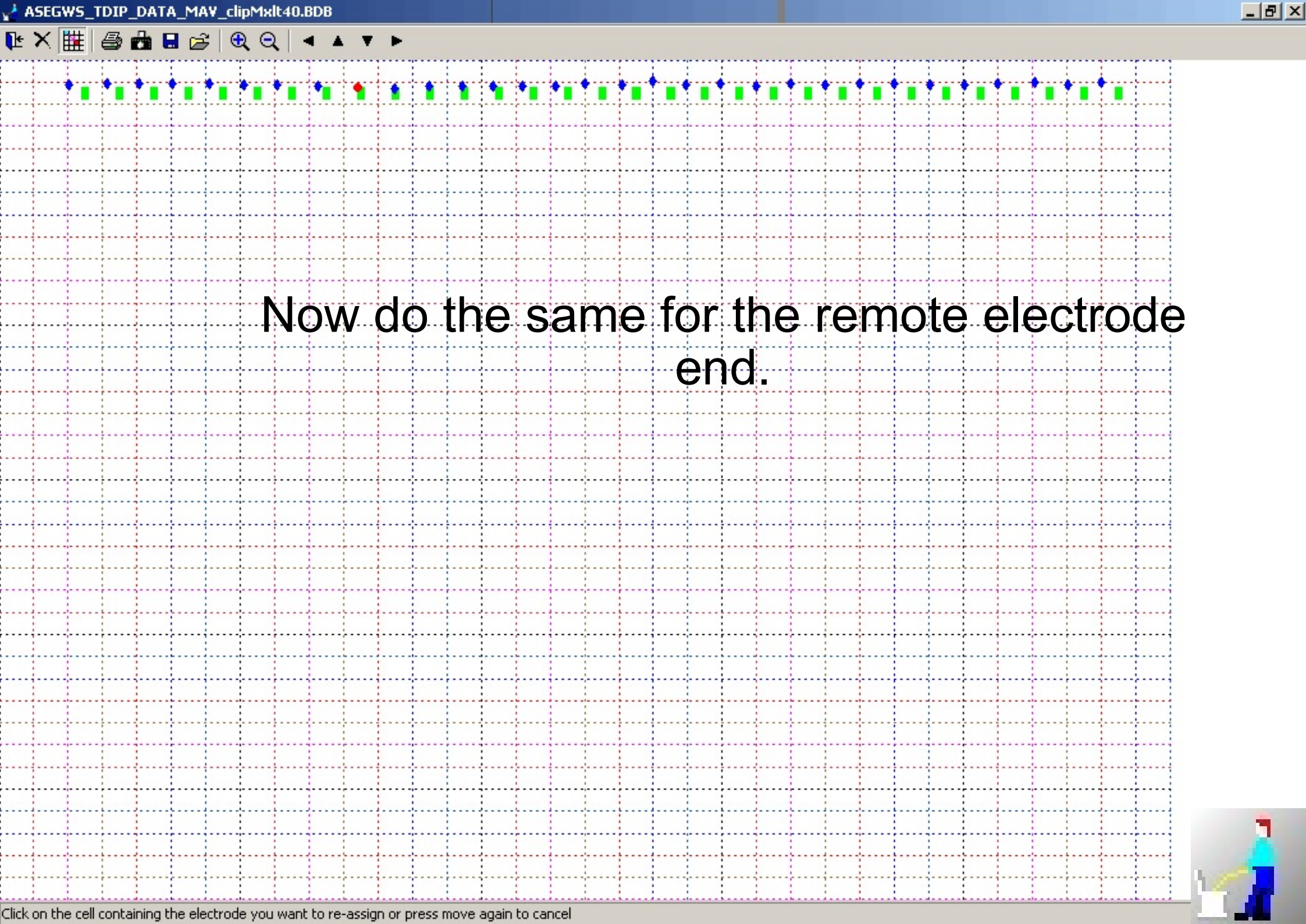
Add dummies to generate a trapezoidal mesh

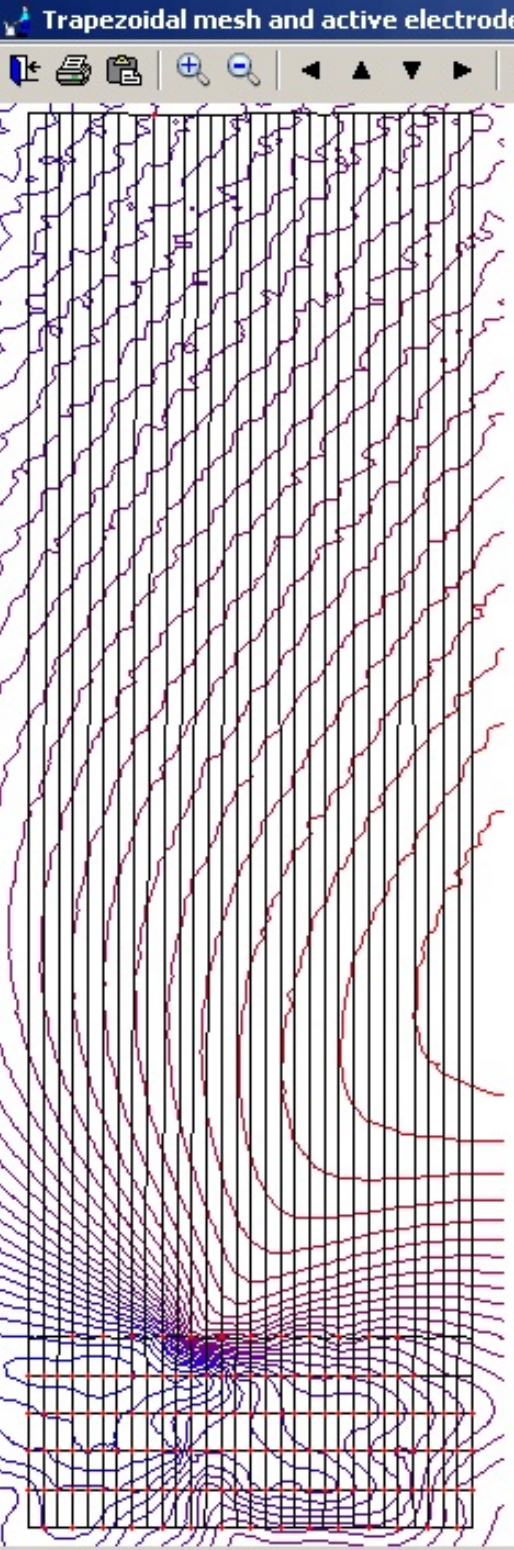



ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB
Start by zooming in a bit.
Red dots are real electrodes, green boxes are their location in the mesh matrix.


ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB
Add dummy electrodes (blue diamonds) so that the mesh has the same number of nodes in each row and column.


ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB
Now move the green boxes so that the electrodes sit in the right place in the mesh matrix.
Click on the cell containing the electrode you want to re-assign or press move again to cancel
Thursd


ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB
Now do the same for the remote electrode end.
Click on the cell containing the electrode you want to re-assign or press move again to cancel

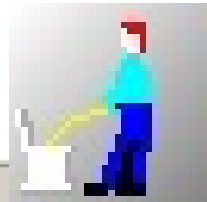


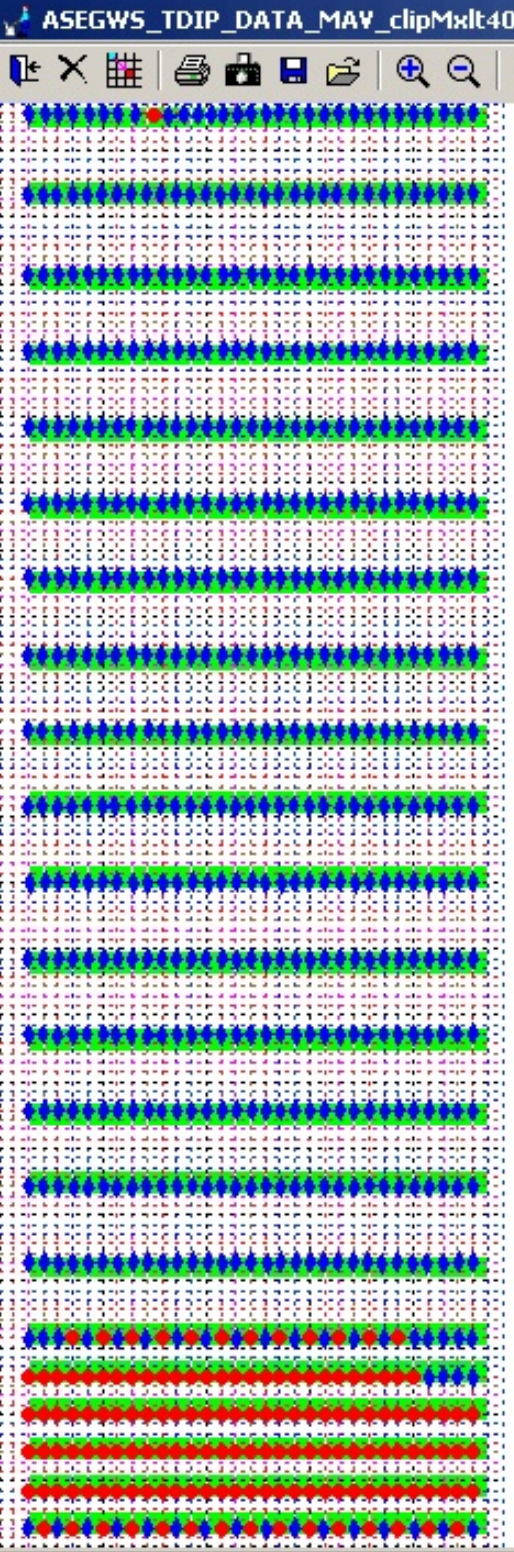
Check to see what the mesh looks like.

Contours are elevation gridded from real electrode elevations in the database. 5m intervals

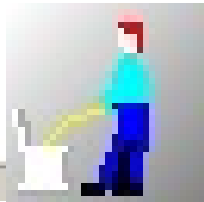
Bottom looks OK but look at the aspect ratio and voxel size change in the gap between the survey area and the remote.

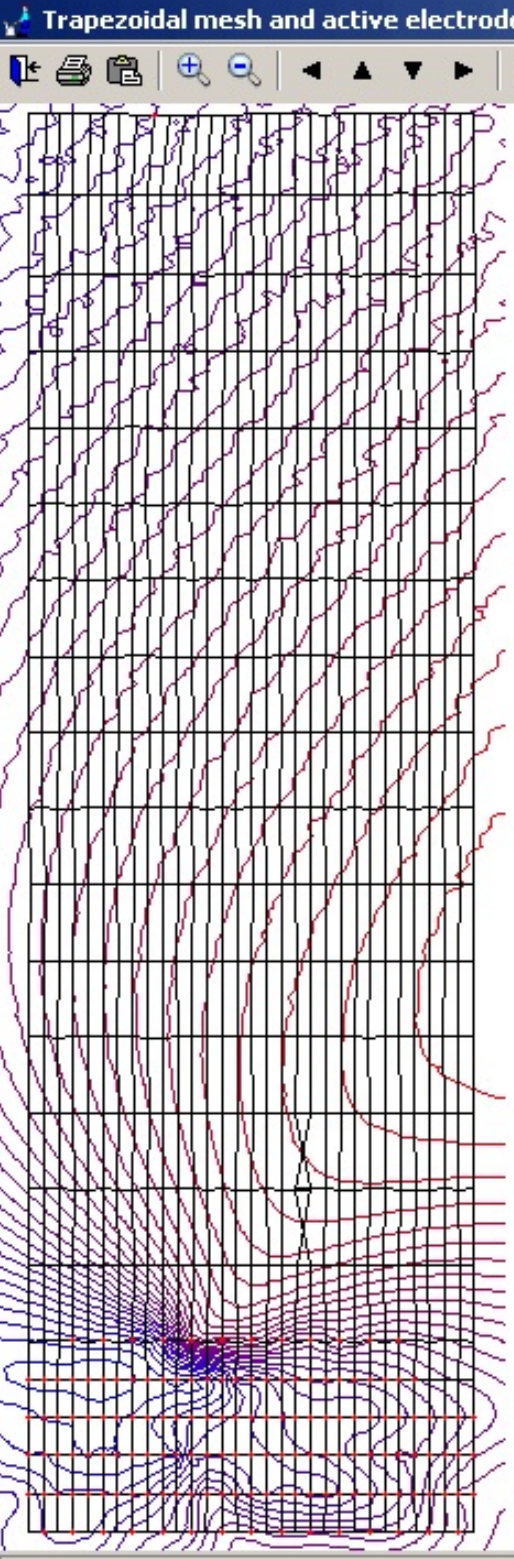
Need to add dummies - increase the voxel NS dimension at less than or equal to 2:1 and keep aspect ratio < 10:1





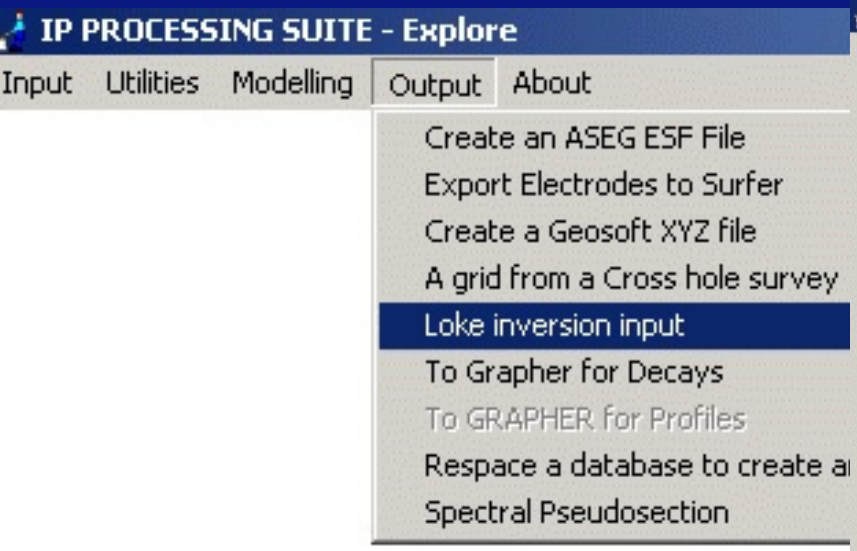
Add dummies to fill the gap



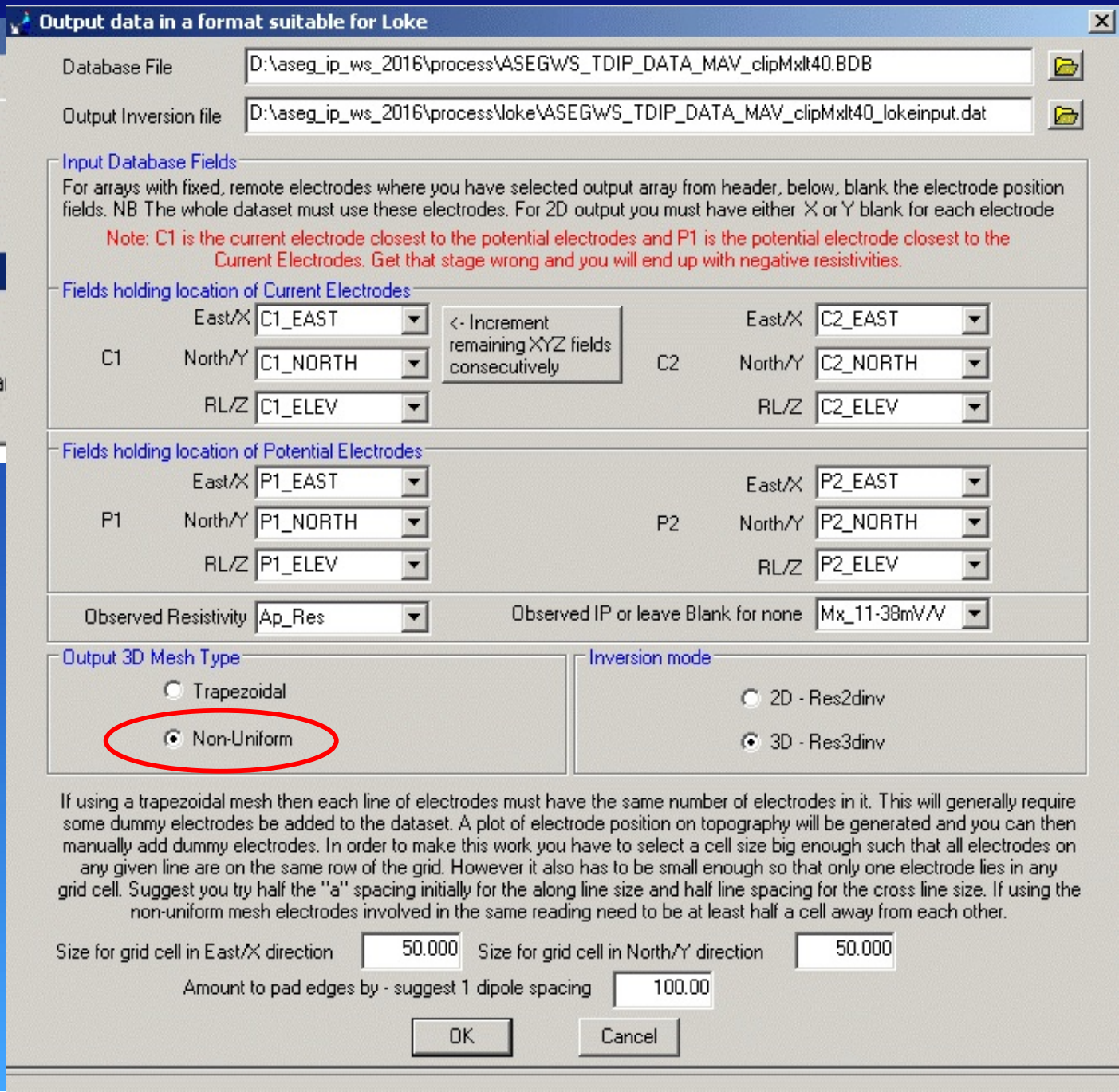


Final input trapezoidal mesh

Non-Uniform mesh



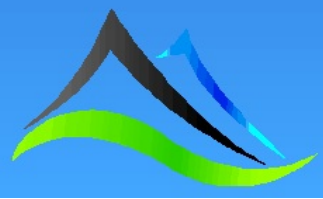
No dot painting, fully automatic. Electrodes do not have to sit on mesh nodes. Can be inaccurate if the voxel size is too large and electrodes end up too far away from nodes.



Run the inversion

Using Res3dInv x64

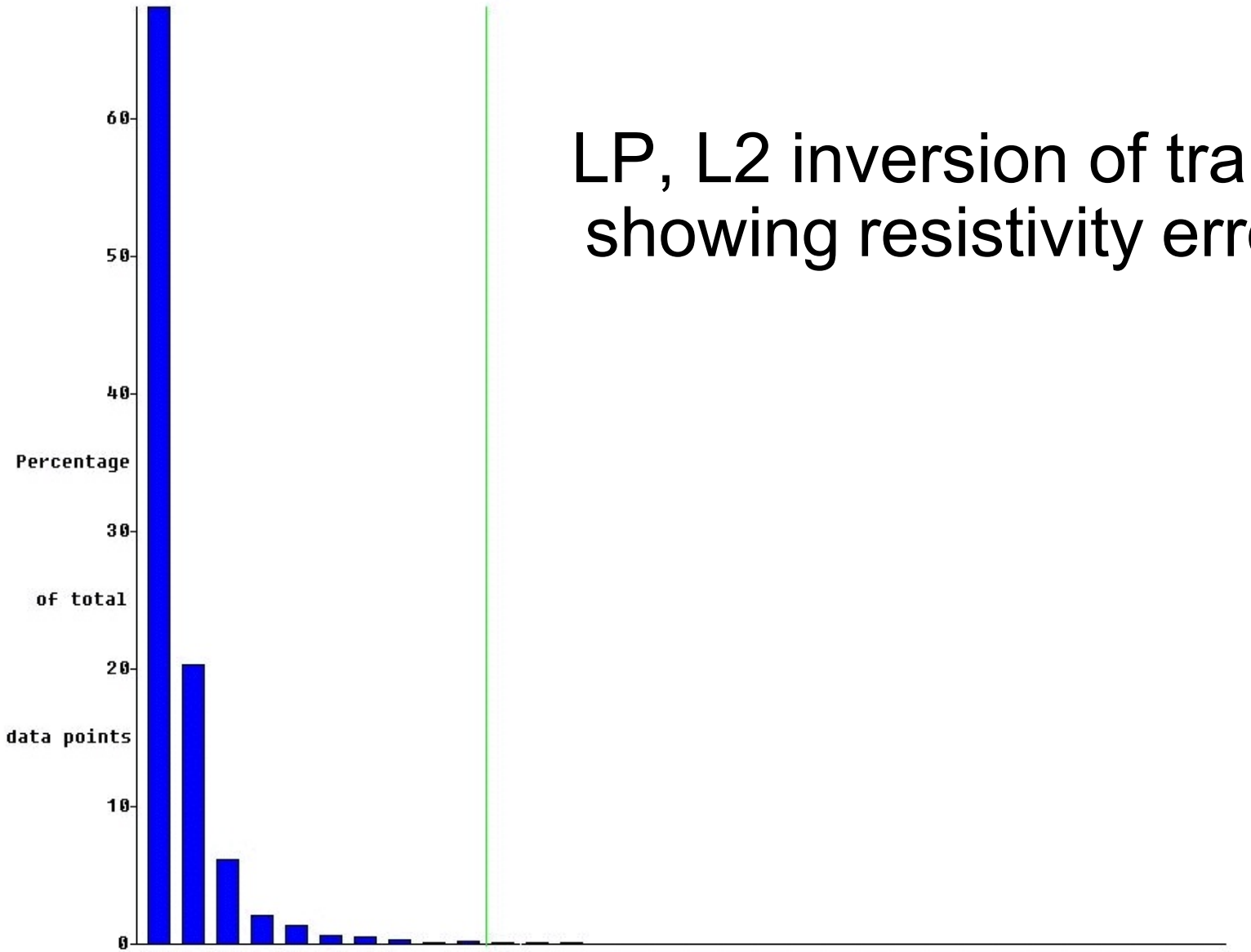
Invert using Linear Perturbation and Complex non-linear IP calculations and L1 and L2 norm misfit calculations. Allow the program to remove an extra 32 points with excessive geometric factors or extreme resistivity likely to produce errors.



RES3DINVx64 ver. 3.11.09 Professional - ID. No. : K4-FCF4A0F8-06F0 - RMS Error Analysis Window

Exit

ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB



LP, L2 inversion of trapezoidal mesh showing resistivity error distribution.

App. resis. % error	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300
Number of points 2945	266	58	21	5	4	3	1	1	0	0	0	0	0	0	0

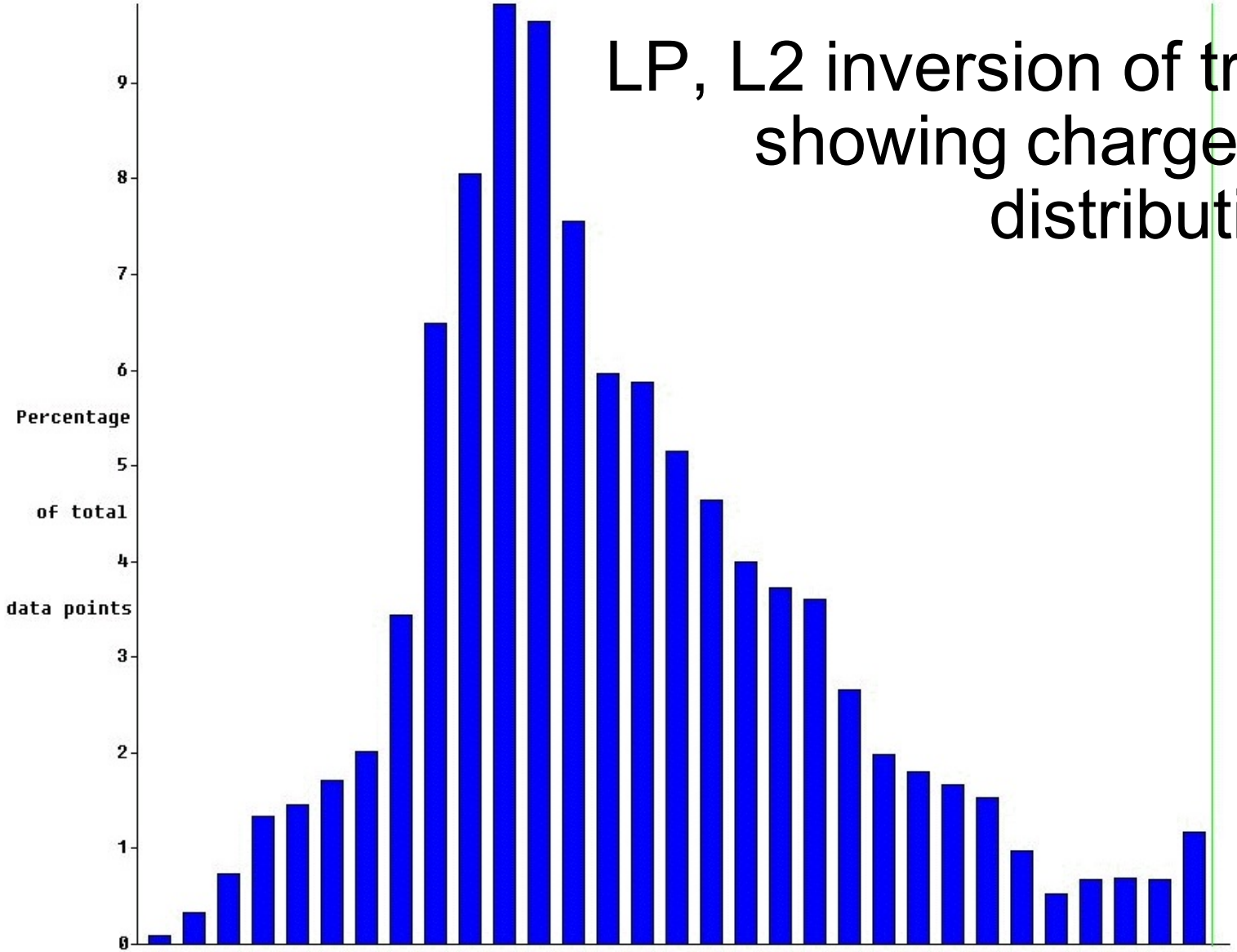
Total number of datum points is 4326
Number of data points selected is 4310
Maximum error 167.7. Maximum error selected 100.0.
Minimum value 0.00.

Use the left and right arrows keys to move the green data selection line.

RES3DINVx64 ver. 3.11.09 Professional - ID. No. : K4-FCF4A0F8-06F0 - RMS Error Analysis Window

Exit

ASEGWS_TDIP_DATA_MAV_clipMxlt40.BDB

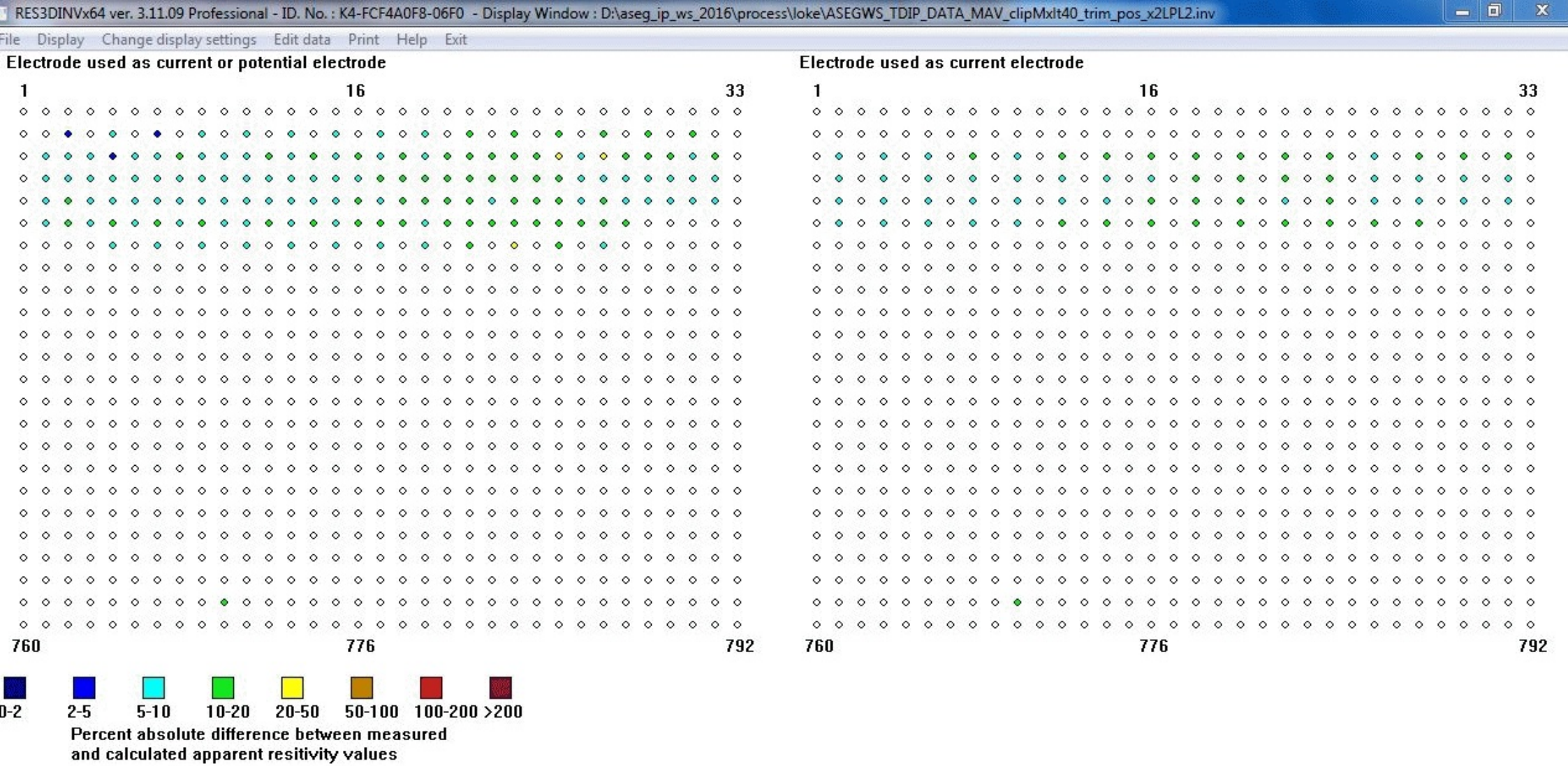


LP, L2 inversion of trapezoidal mesh showing chargeability error distribution.

App. IP misfit	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
Number of points	4	32	63	87	281	425	327	254	201	161	115	78	66	23	30	51

Total number of datum points is 4326
Number of data points selected is 4326
Maximum error 36.9. Maximum error selected 36.9.
Minimum value 0.04.

Use the left and right arrows keys to move the green data selection line.



LP, L2 inversion of trapezoidal mesh showing bad electrode locations

Lister - [\\T5500\d\aseg_ip_ws_2016\process\loke\ASEGWS_TDIP_DATA_MAV_clipMxlt40_trim_pos_x2LPL2_it4.xyz]

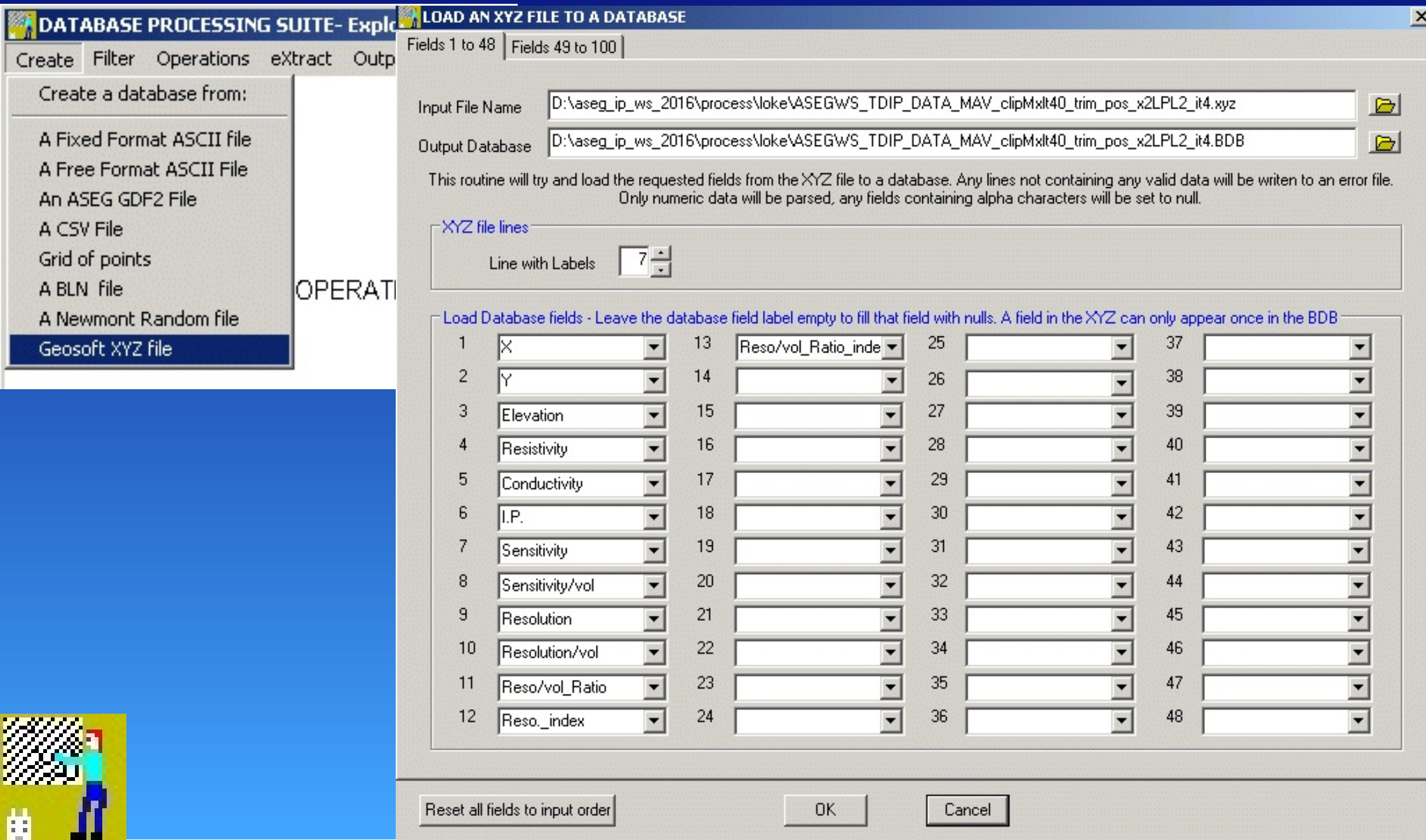
File Edit Options Encoding Help   90 %

```
8829   5600.061   11696.530   -670.122   5600.061   11796.530   -670.122   5653.870   11799.420   -666.122
8830   5653.870   11699.420   -666.122   5653.870   11799.420   -666.122   5702.110   11793.641   -668.622
8831   5702.110   11693.641   -668.622   5702.110   11793.641   -668.622   5750.360   11799.420   -664.122
8832   5750.360   11699.420   -664.122   5750.360   11799.420   -664.122   5850.360   11799.420   -664.122

/This section has the measured and calculated apparent resistivity values
/ No.    CURRENT ELECTRODE 1       CURRENT ELECTRODE 2       POTENTIAL ELECTRODE 1      POTENTIAL ELECTRODE 2      O
/Elec.     XC1         YC1          XC2         YC2           XP1          YP1           XP2          YP2          A
  4    4250.000,    4450.000     4670.000,   11687.000     4400.000,    4250.000     4500.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     4500.000,    4250.000     4600.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     4600.000,    4250.000     4700.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     4700.000,    4250.000     4800.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     4800.000,    4250.000     4900.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     4900.000,    4250.000     5000.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     5000.000,    4250.000     5100.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     5100.000,    4250.000     5200.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     5200.000,    4250.000     5300.000,    4250.000
  4    4250.000,    4450.000     4670.000,   11687.000     5300.000,    4250.000     5400.000,    4250.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    42[illegible]                                                                              [illegible]0.000
  4    4250.000,    4450.000     4670.000,   11687.000     5000.000,    4650.000     5100.000,    4650.000
  4    4250.000,    4450.000     4670.000,   11687.000     5100.000,    4650.000     5200.000,    4650.000
  4    4250.000,    4450.000     4670.000,   11687.000     5200.000,    4650.000     5300.000,    4650.000
  4    4250.000     4450.000     4670.000    11687.000     5300.000     4650.000     5400.000     4650.000
```

The xyz file exported from Res3Dinv has 4 blocks. The first two give model values for the centres and edges of each voxel, the third gives the same information in a different format while the last block contains the observed and calculated data. Extract this block to a separate xyz file and delete the third block.

Load the xyz files into a database



Compute the log of the resistivity to use for gridding

ASEGWS_TDIP_DATA_MAV_clipMxlt40_trim_pos_x2LPL2_it4.BDB

File Edit Tools

X	Y	Elevation	Resistivity	Conductivity	I.P.	Sensitivity	Sensitivity(V)	Resolution	Resolutic
4199.270	4199.770	511.9690	98.08400	0.1019500E-01	4.037000	7.422400	0.7928400E-01	0.3590200	0.2398900E-
4274.635	4199.885	510.9800	72.45800	0.1380100E-01	2.366000	5.801300	0.4605000	0.4182900	0.2076900
4324.730	4199.885	509.2060	59.89500	0.1669600E-01	2.806000	4.508400	0.3670600	0.4686600	0.2386800
4374.730	4199.885	508.1060	104.1560	0.9601000E-02	6.736000	9.940500	0.7920400	0.6132800	0.3056600
4424.830	4199.885	508.2850	33.73900	0.2963900E-01	6.599000	9.327900	0.7563900	0.7969400	0.4042400
4474.830	4199.885	510.0850	223.2570	0.4479100E-02	8.303000	4.573900	0.3658900	0.4997200	0.2500500
4524.930	4199.885	513.8910	66.22600	0.1510000E-01	8.504000	8.500600	0.6865500	0.8398000	0.4242600
4574.930	4199.885	518.9410	72.61700	0.1377100E-01	7.140000	14.54500	1.168100	0.8654700	0.4347900
4625.955	4199.885	522						0.3281700	0.1592500
4675.955	4199.885	523						0.1558200	0.8161700E-
4724.195	4199.885	525						0.8761500	0.4560800
4774.195	4199.885	528						0.7819400	0.3816400
4823.370	4198.440	535						0.8962200	0.4829900
4873.370	4198.440	542						0.8631500	0.4082300
4926.250	4199.885	546						0.7160100	0.3435400
4976.250	4199.885	546						0.6615800	0.3508400
5026.345	4196.995	544						0.9092600	0.4346800
5076.345	4196.995	541						0.8064900	0.4294000
5124.590	4199.885	540						0.6057900	0.3102800
5174.590	4199.885	541						0.5976700	0.2962400
5223.760	4198.440	542						0.5460400	0.2894400
5273.760	4198.440	541						0.5377600	0.2581100
5325.715	4198.440	541						0.9516900	0.4661200
5375.715	4198.440	540						0.8813100	0.4570600
5424.885	4198.440	540.2220	140.2490	0.7130200E-02	5.025000	19.64900	1.589800	0.9223300	0.4668000
5474.885	4198.440	541.3220	214.5480	0.4661000E-02	10.22000	18.81400	1.508300	0.9117800	0.4572400
5526.840	4198.440	543.8460	332.9530	0.3003400E-02	5.682000	18.99200	1.424700	0.9030200	0.4237400
5576.840	4198.440	547.5460	52.43300	0.1907200E-01	7.158000	20.00400	1.739000	0.9192700	0.4999100
5626.010	4198.440	551.5650	300.4430	0.3328400E-02	7.253000	13.16100	1.018800	0.5881800	0.2848100
	4198.440	555.3150	167.6720	0.5964000E-02	6.222000	7.736600	0.6493300	0.3003100	0.1576600
	4196.995	558.5850	25.57300	0.3910500E-01	4.341000	17.89400	1.430800	0.7437700	0.3720200

APPLY A FUNCTION TO THE DATABASE

Carry out simple arithmetic on the database. More complex maths is better handled by BDOPERATE

Variable 2 can be a numerical value or another field in the database. If you want it to be another field preceed the field number with an F. e.g. F23+23.6 adds 23.6 to Field 23, F23-F15 subtracts Field 15 from Field 23.

NOTE: The trigonometric functions expect angles to be in radians. All functions have their standard FORTRAN meaning

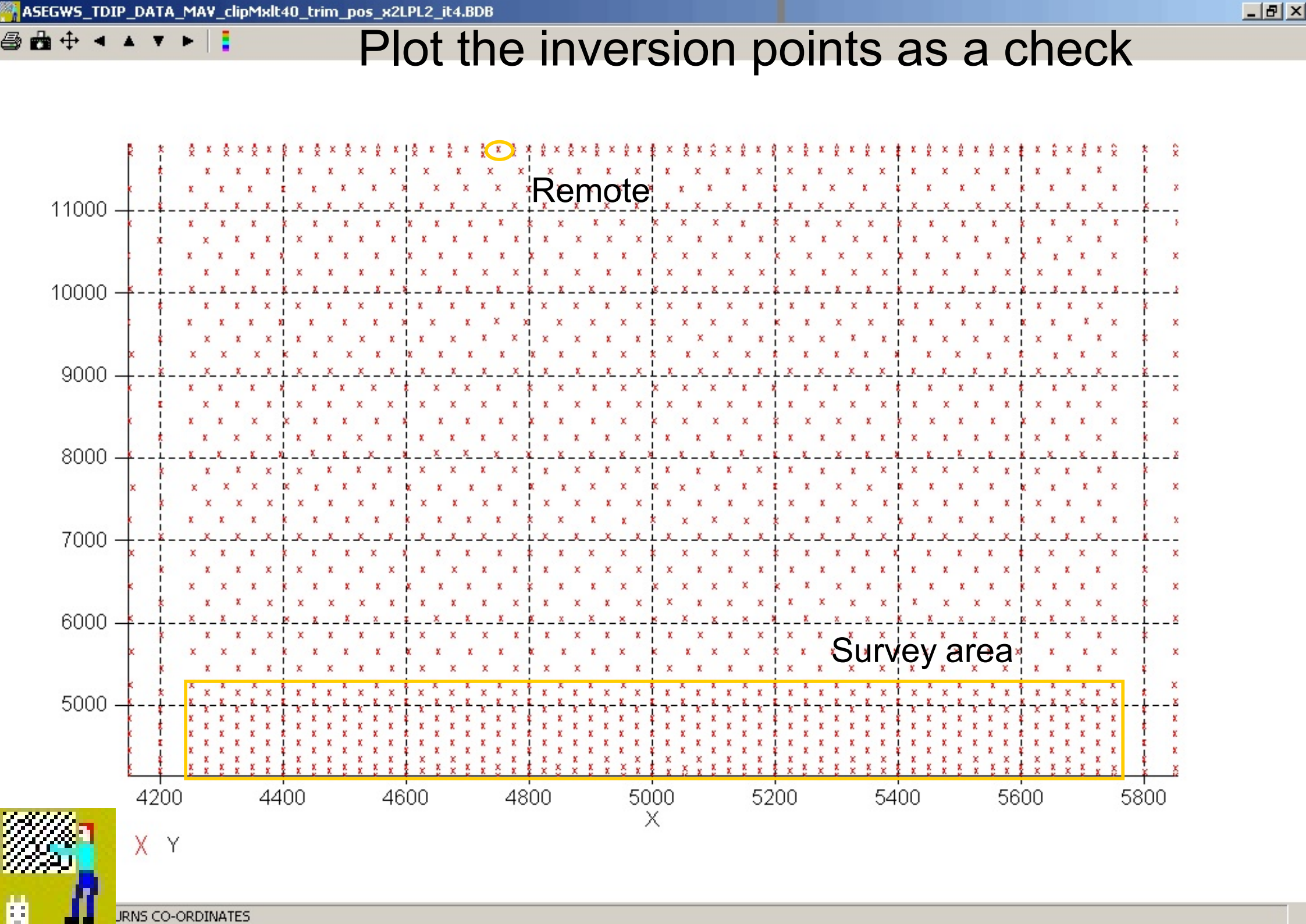
Function

	Variable 1	Operator	Variable 2	Output to
F	Resistivity	LOG		F EMPTYFLD_14

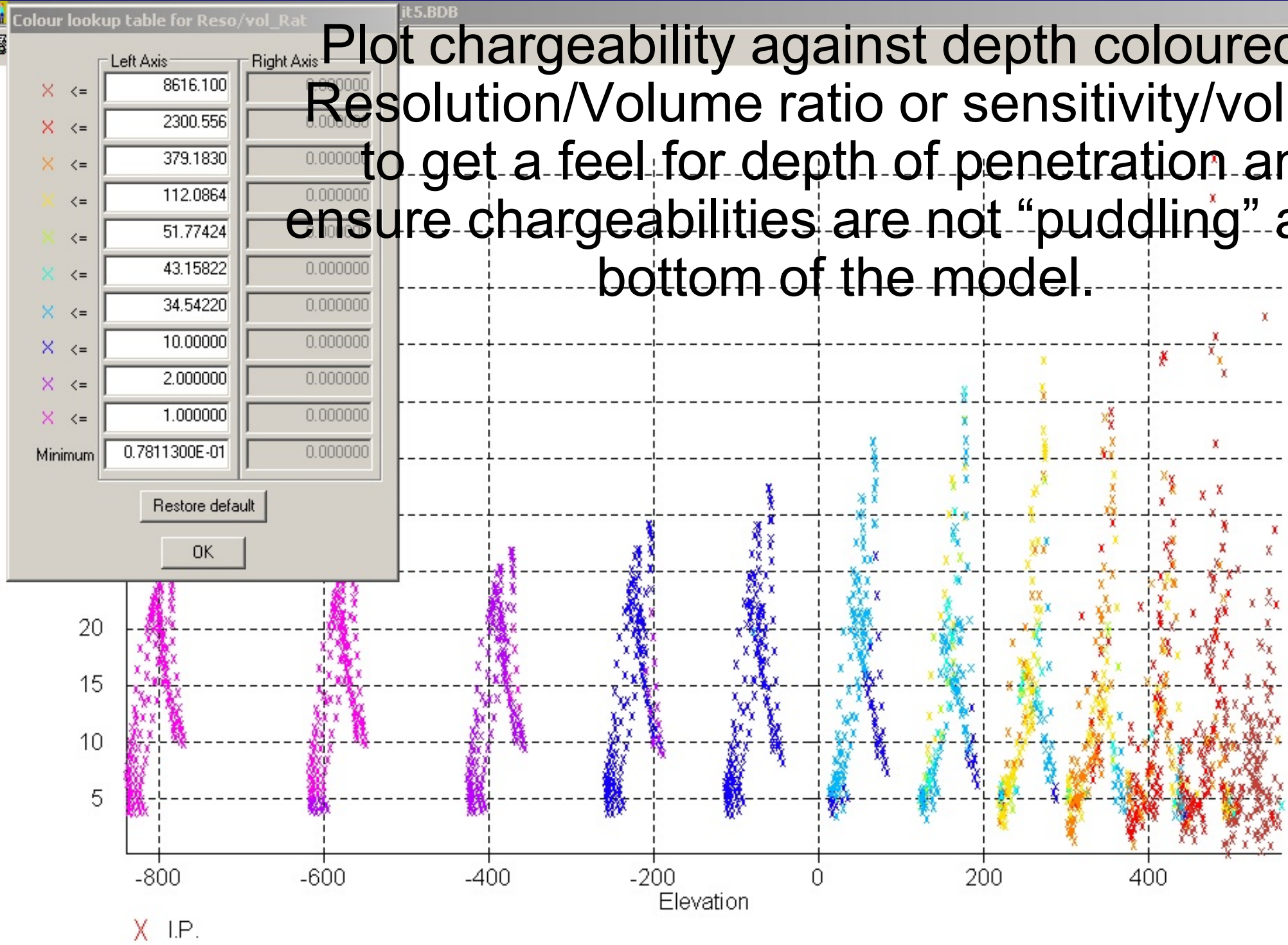
Apply to Null Values ☐

OK Cancel

Record 2 of 18336


ASEGWS_TDIP_DATA_MAV_clipMxlt40_trim_pos_x2LPL2_it4.BDB
Plot the inversion points as a check
Remote
Survey area
11000
10000
9000
8000
7000
6000
5000
4200
4400
4600
4800
5000
5200
5400
5600
5800
X
X Y
URNS CO-ORDINATES

Plot chargeability against depth coloured by Resolution/Volume ratio or sensitivity/volume to get a feel for depth of penetration and ensure chargeabilities are not “puddling” at the bottom of the model.



Compute 3D plot points for the forward model results

IP PROCESSING SUITE - Explore

Input Utilities Modelling Output About

Calculate a Geosection

Compute plot points from Loke foward

2D Inversion of data

CALCULATE 3D PLOTPOINTS FOR A LOKE FORWARD MODEL FILE

This routine computes a 3d pseudosection plot point for the forward model output from Res3Dinv. Because the line number is not passed to Res3D and may not always be resolved from the electrode positions each reading is treated as its own 3D point.

Input Database File: D:\aseg_ip_ws_2016\process\loke\ASEGWS_TDIP_DATA_MAV_clipMxlt40_trim_pos_x2LPL2_it4_obsc

Fields holding Electrode positions

For remote electrodes or to ignore a field set the corresponding field to blank

C1X	XC1	<- Increment remaining fields by 2	P1X	XP1	
C1Y	YC1		P1Y	YP1	
C2X	XC2		P2X	XP2	
C2Y	YC2		P2Y	YP2	

Dipole size for pseudosection N?

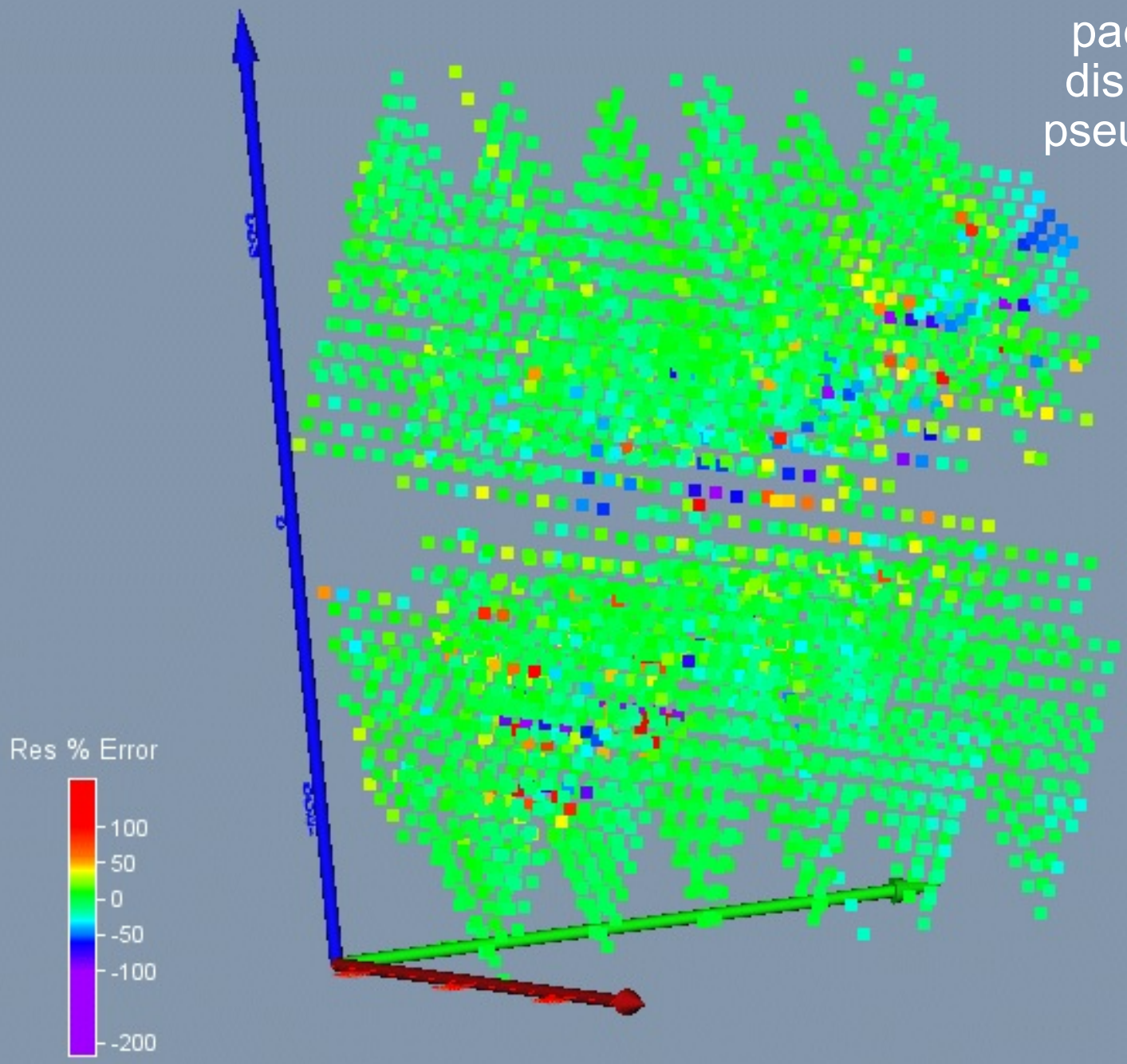
What is the dipole size for this plot? 100.00

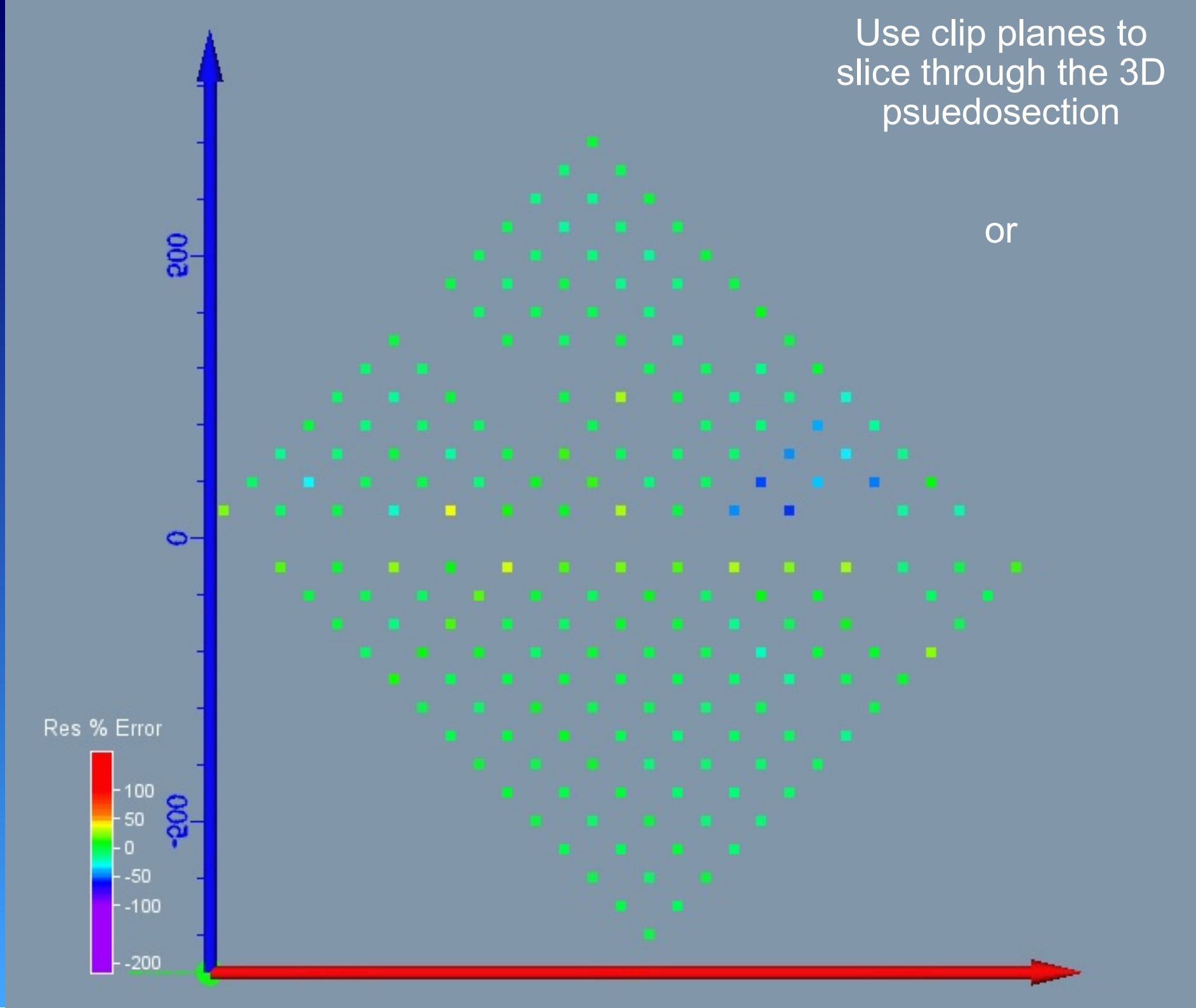
Output Fields

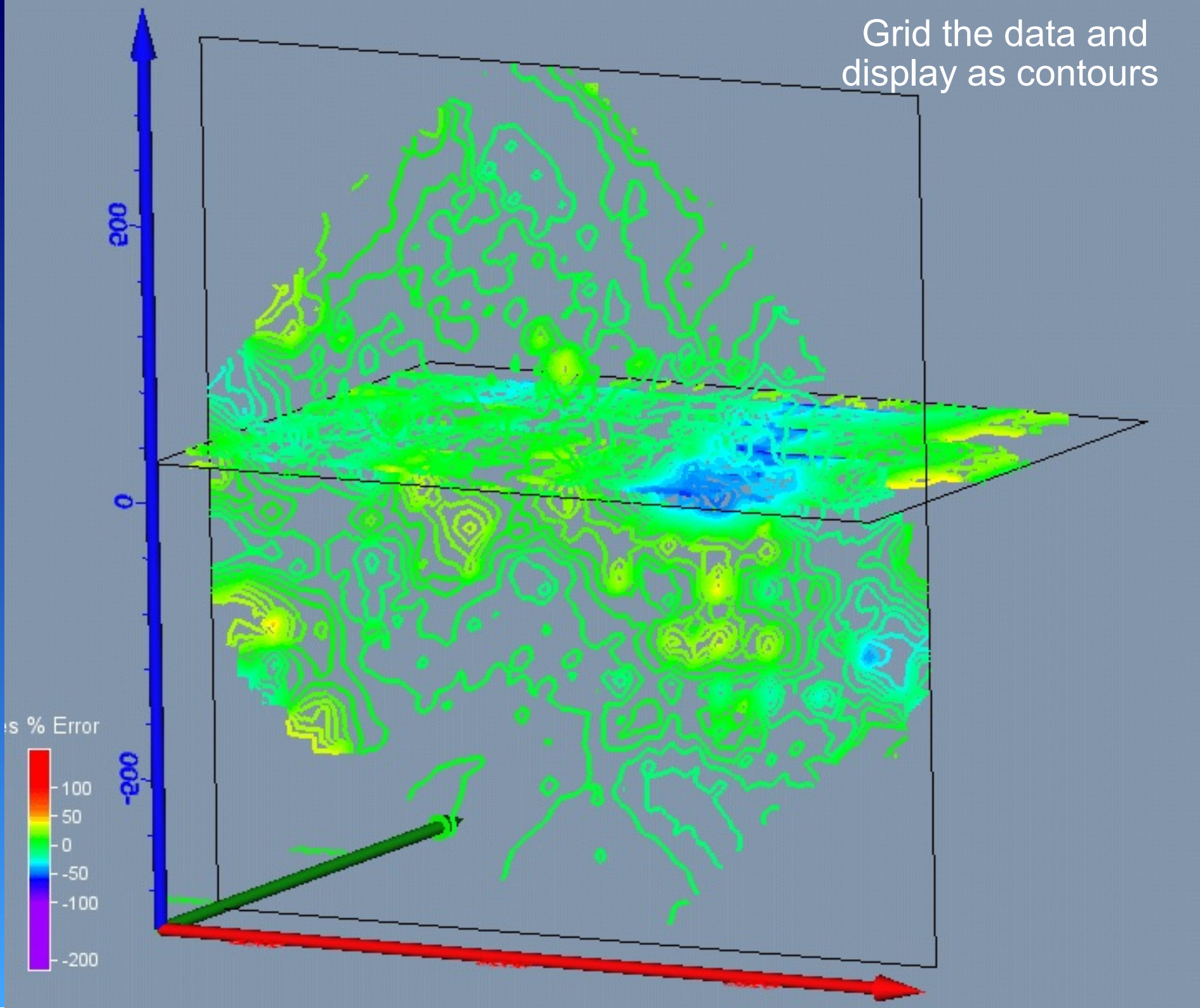
Field for plot point X	EMPTYFLD_17	Label	PlotPt_X	Leave blank to retain current contents
Field for plot point Y	EMPTYFLD_18	Label	PlotPt_Y	
Field for plot point N	EMPTYFLD_19	Label	PlotPt_N	

OK Cancel

Export the 3D plot points and errors to a 3D display package and display as 3D pseudosections

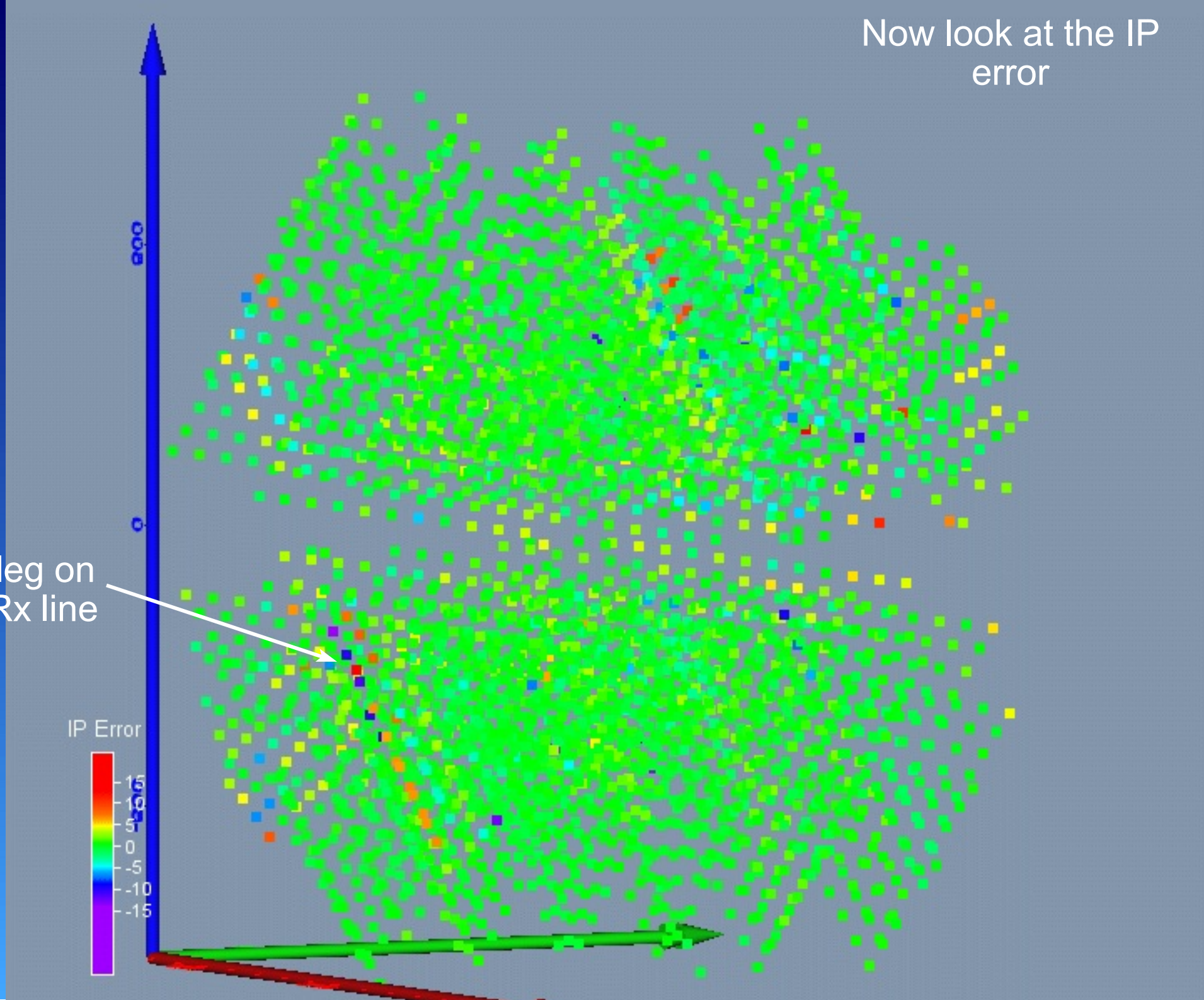


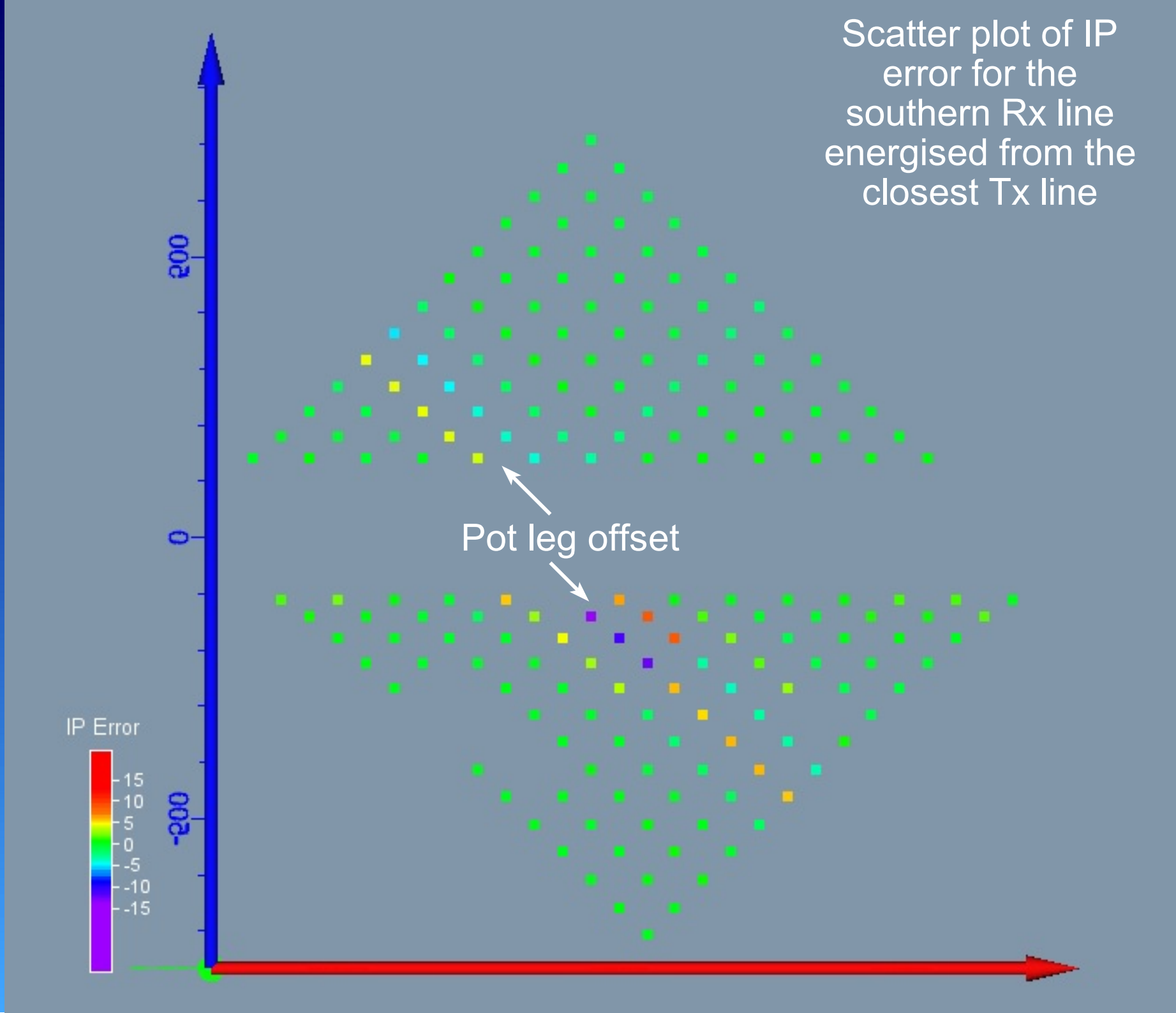

Use clip planes to slice through the 3D psuedosection
or
200
0
-200
Res % Error
100
50
0
-50
-100
-200


Grid the data and
display as contours
200
0
-200
s % Error
100
50
0
-50
-100
-200

Now look at the IP error

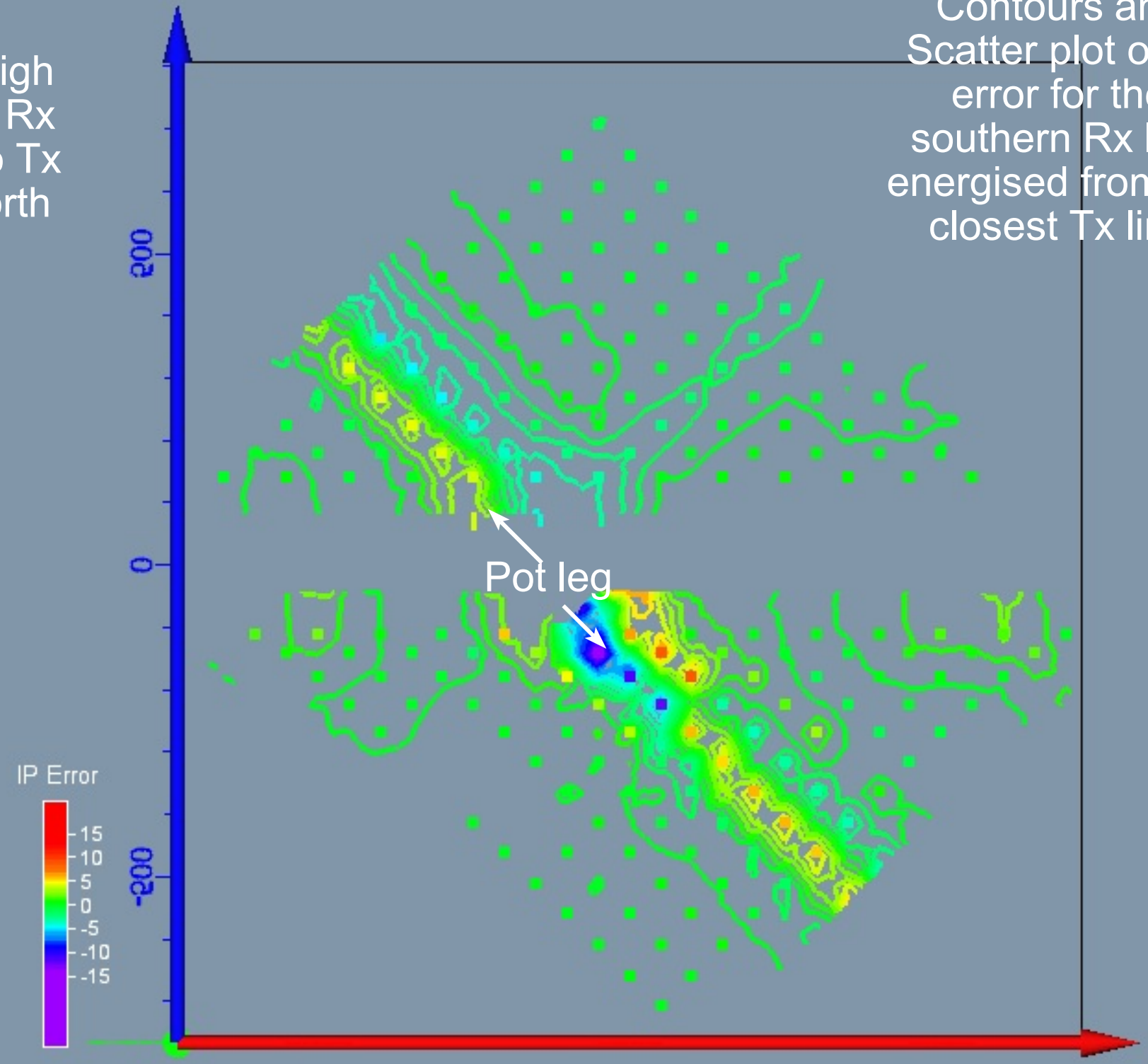
Note bad leg on southern Rx line

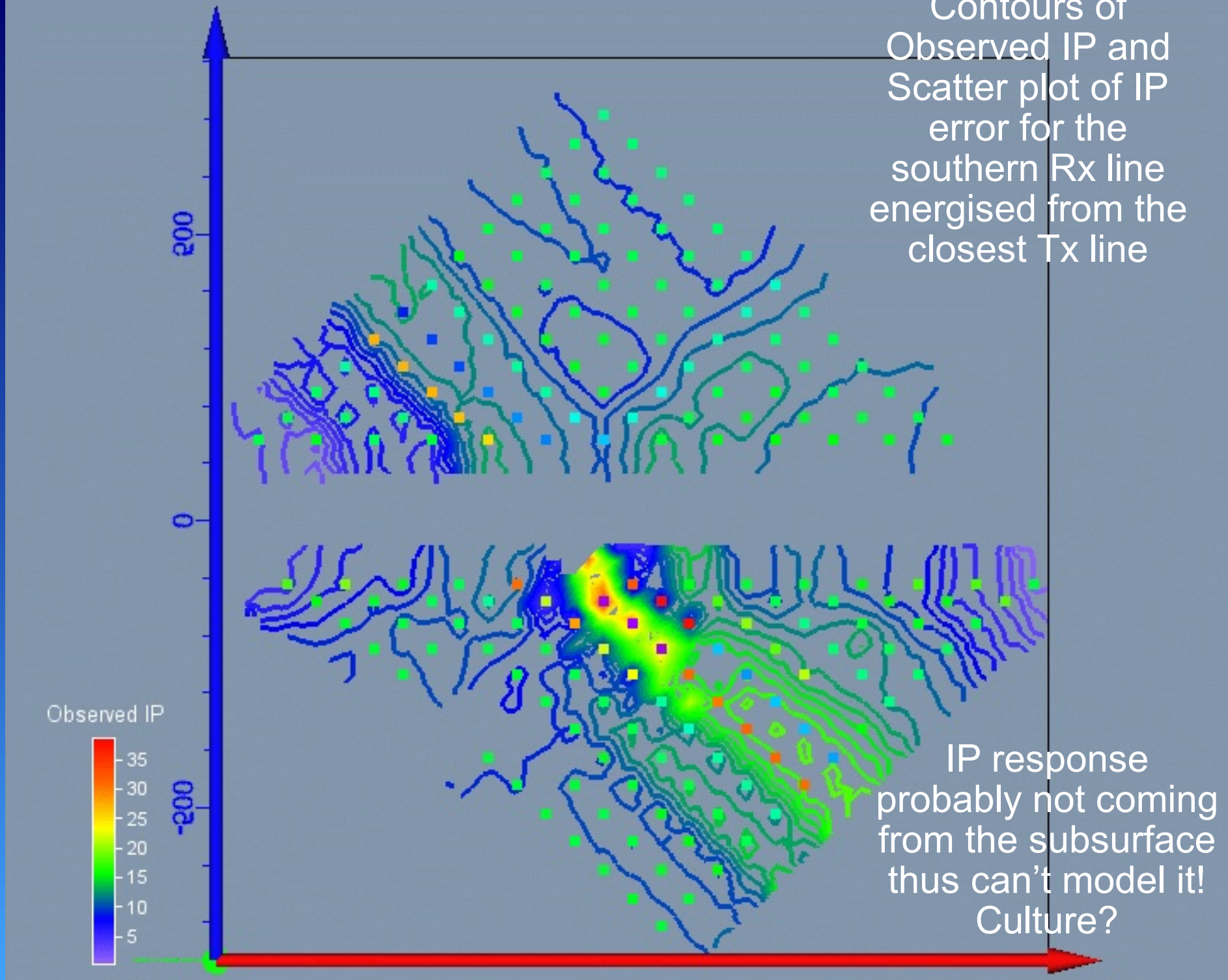



Scatter plot of IP error for the southern Rx line energised from the closest Tx line
200
0
-200
Pot leg offset
IP Error
15
10
5
0
-5
-10
-15

This leg has high misfits for this Rx line for the two Tx lines to the north

Contours and Scatter plot of IP error for the southern Rx line energised from the closest Tx line





Contours of Observed IP and Scatter plot of IP error for the southern Rx line energised from the closest Tx line

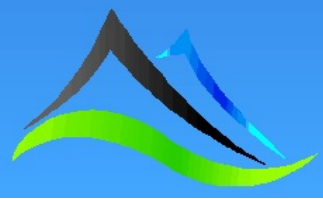
IP response probably not coming from the subsurface thus can't model it! Culture?

Inversion results

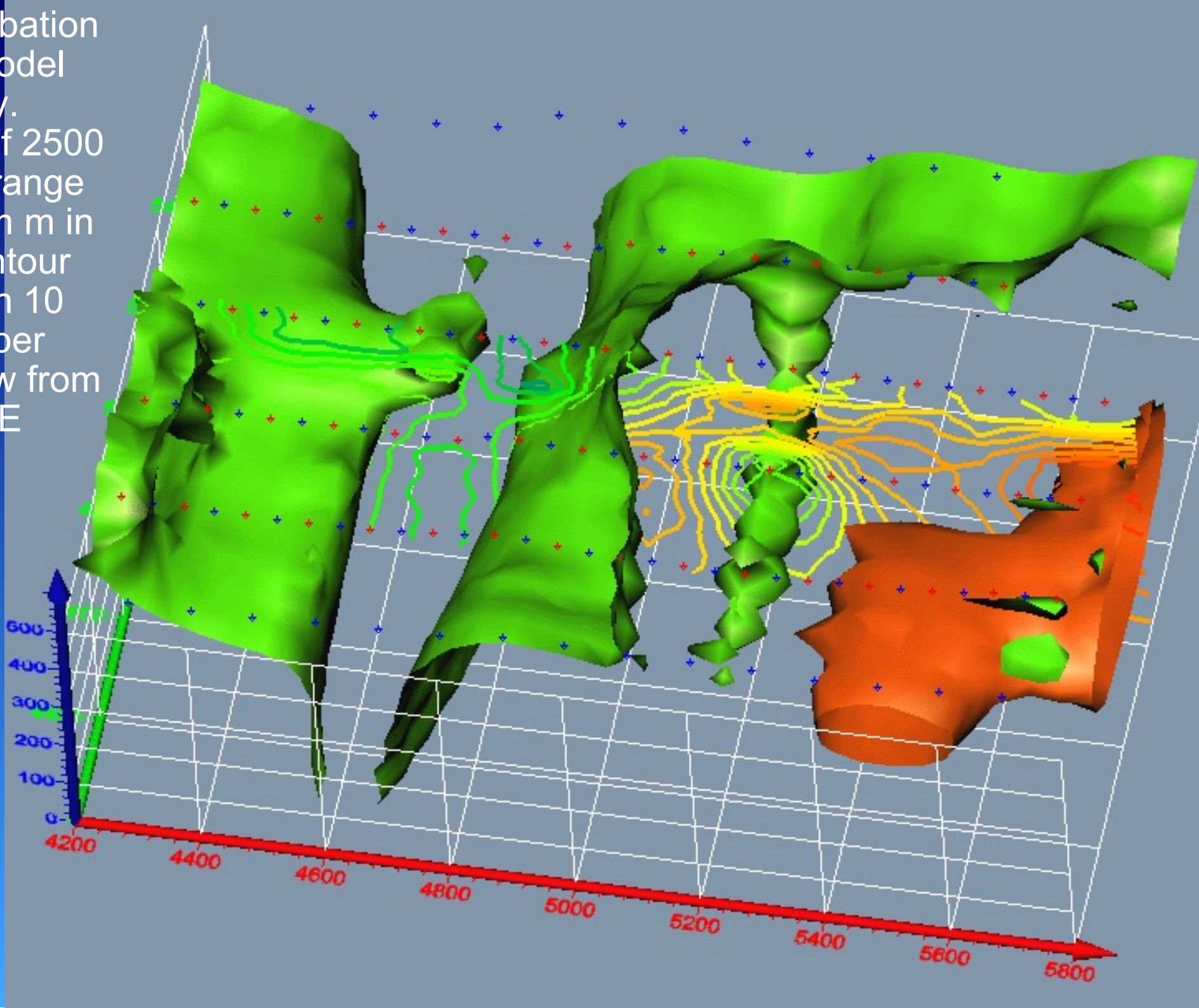
Inversions run

- Linear Perturbation L1 Norm Trapezoidal mesh 50m x 200m voxels
- Linear Perturbation L2 Norm Trapezoidal mesh 50m x 200m voxels
- Complex non-linear L1 Norm Trapezoidal mesh 50m x 200m voxels
- Complex non-linear L2 Norm Trapezoidal mesh 50m x 200m voxels
- Linear Perturbation L2 Norm Non uniform mesh 50m x 200m voxels
- Linear Perturbation L2 Norm Trapezoidal mesh 50m x 100m voxels

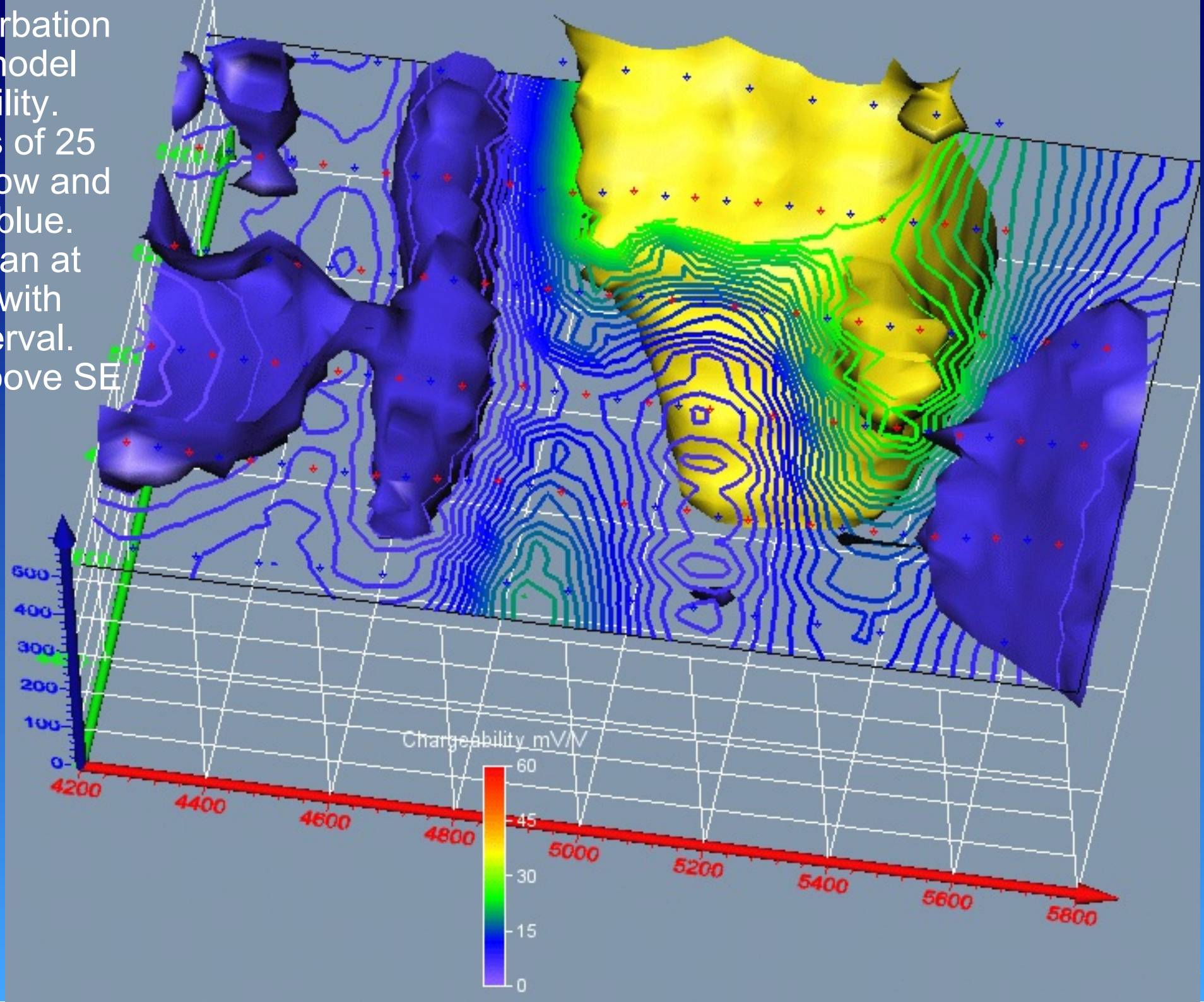
In the believable area all inversions produced similar results +/- ½ dipole - main differences are at depth and can not be trusted. Selected LPL2 200 x 50 as the best to display



Linear Perturbation L2 norm model resistivity. Isosurfaces of 2500 Ohm m in orange and 250 Ohm m in green. Contour section with 10 contours per decade. View from above SE

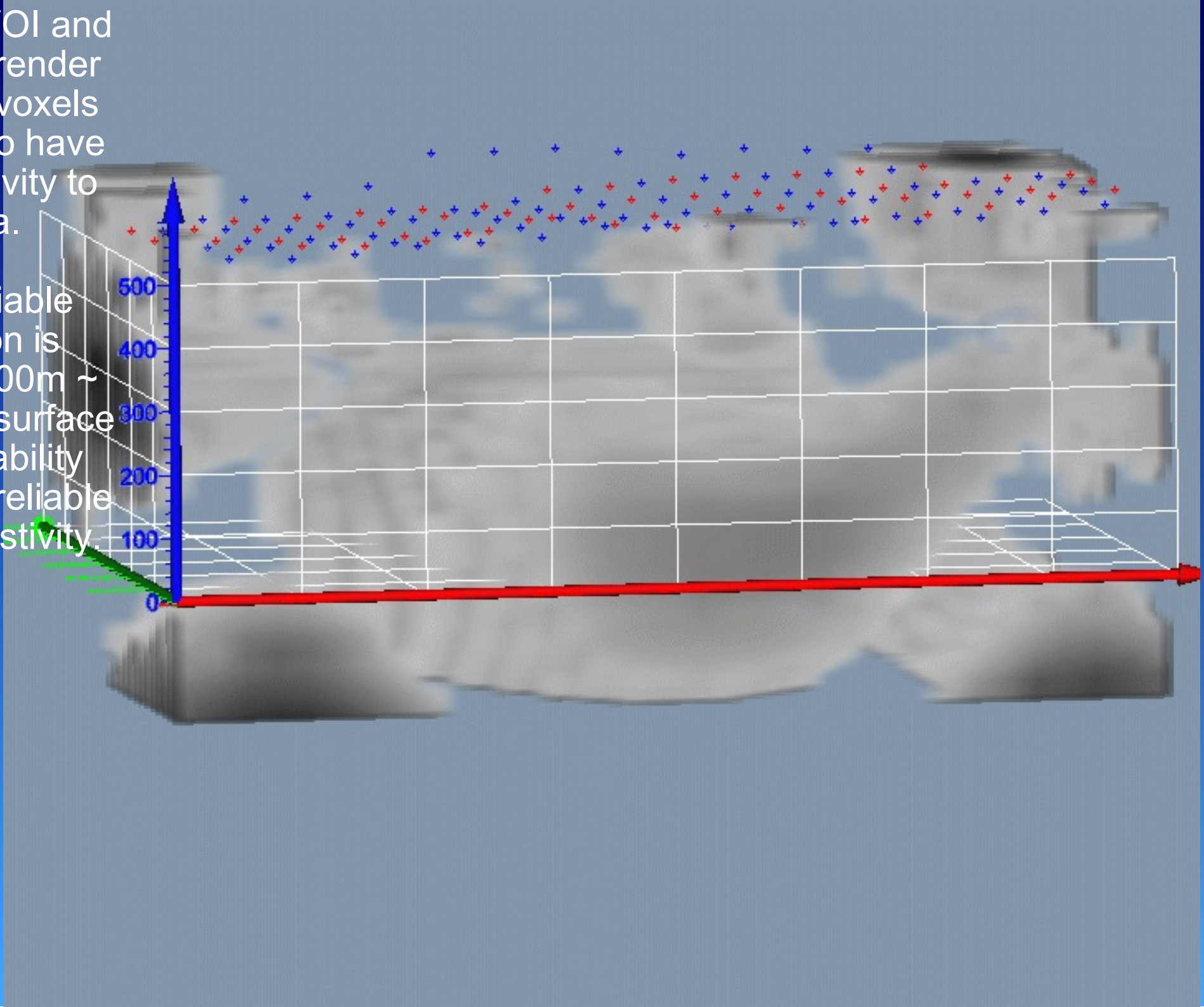


Linear Perturbation L2 norm model chargeability. Isosurfaces of 25 mV/V in yellow and 5 mV/V in blue. Contour plan at RL400m with 1mV/V interval. View from above SE



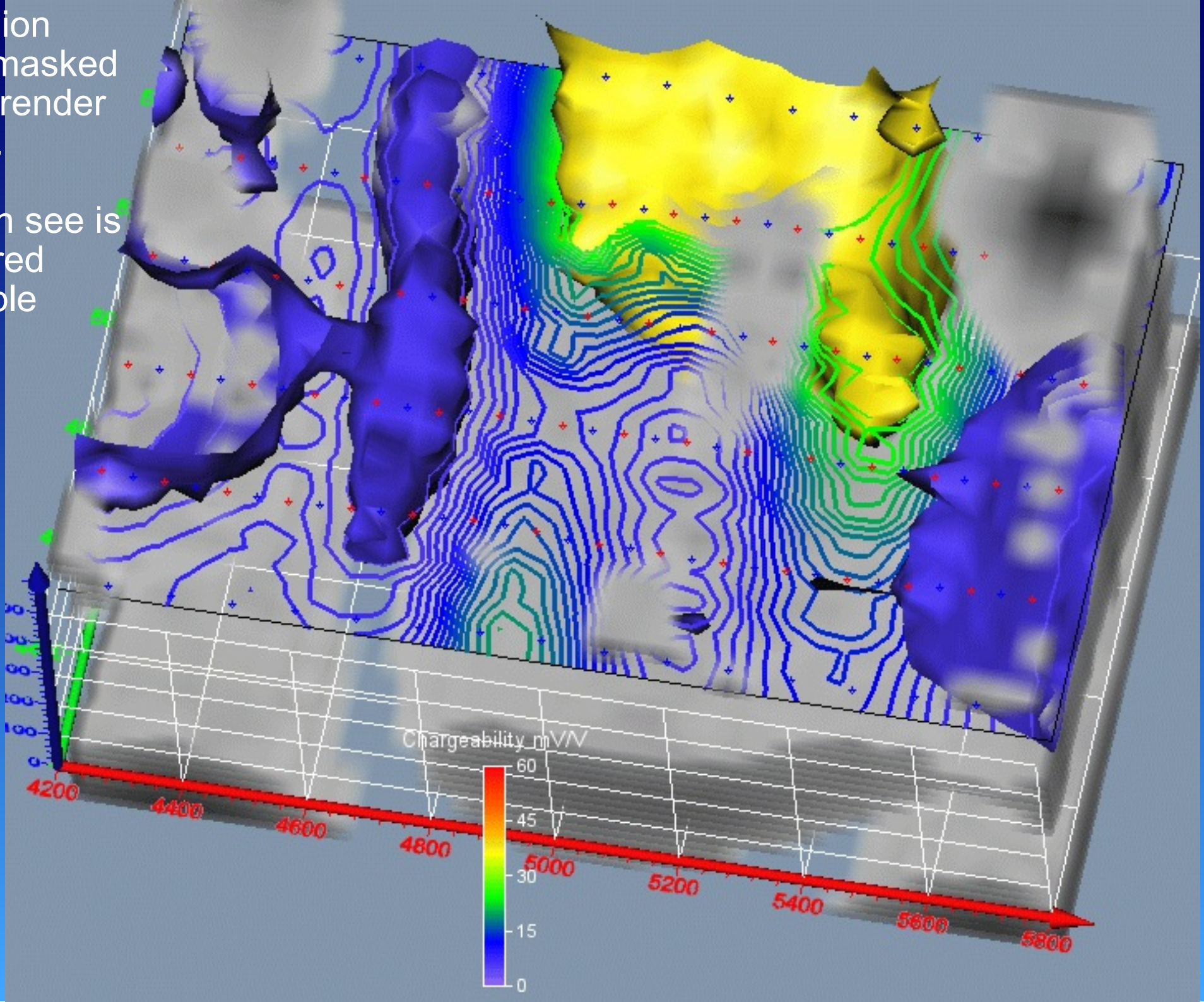
Compute a VOI and plot as a volrender masking all voxels considered to have a low sensitivity to the data.

Limit of reliable penetration is around RL300m ~ 275m below surface the chargeability may be less reliable than the resistivity.



IP inversion isosurfaces masked with VOI volrender cloud.

What you can see is considered believable



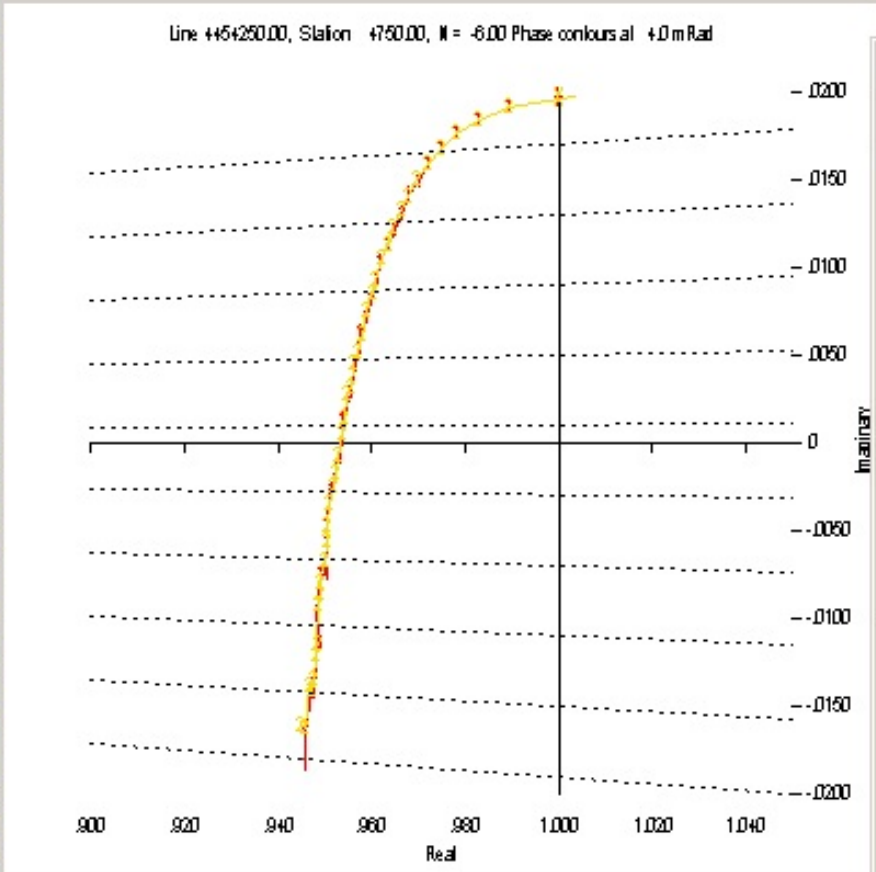
ASEGWS_CRIP_Data.BDB

File

Same process for CR data for anyone preferring that to Time domain

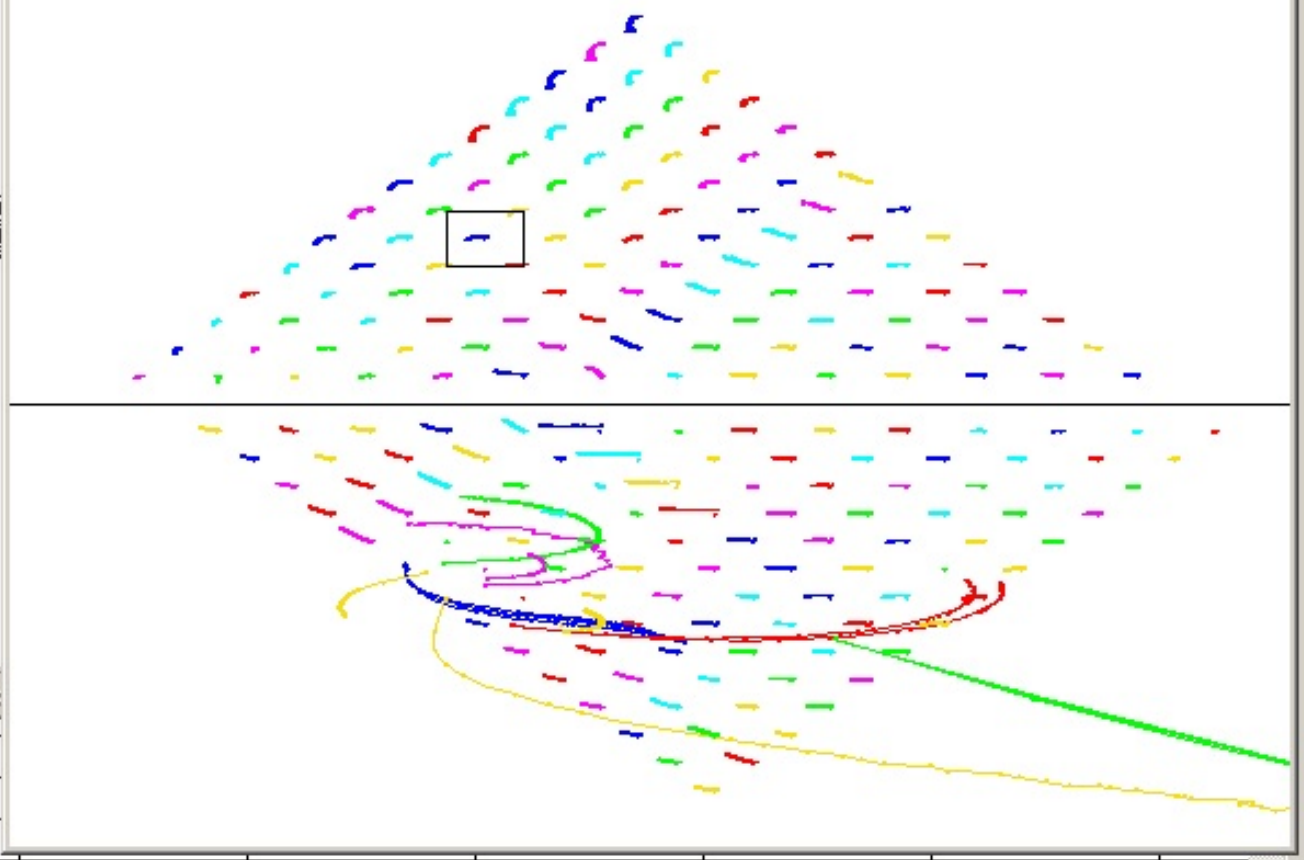
LINE_NO.	STATION_NO.	EASTING	NORTHING	USE_FLAG	N_VALUE	CURRENT_Amps	PVOLTAGE_mV	ARHO_ohm-m	Z3DC
4454250	4750.000	4250.000		1.000000	-6.000000	1.000000	7.446043	167.3030	19.7214
4				1.000000	-6.000000	1.000000	7.442998	167.2340	19.7151
4				1.000000	-4.000000	1.000000	8.167863	80.81900	18.9806
4				1.000000	-4.000000	1.000000	8.167094	80.81200	19.0961

PHASOR PLOT - Filled Symbol = 3 pt decoupled value



MOUSE CLICK RETURNS CO-ORDINATES

SPECTRAL PSEUDOSECTION - LINE 4454250.



4454250.	4800.000	4250.000							
4454250.	4800.000	4250.000							
4454250	4800.000	4250.000							
	4800.000	4250.000		1.000000	-5.000000	1.000000	9.951757	154.7890	18.5750
	4800.000	4250.000		1.000000	-3.000000	1.000000	11.17420	61.42900	18.3675

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