

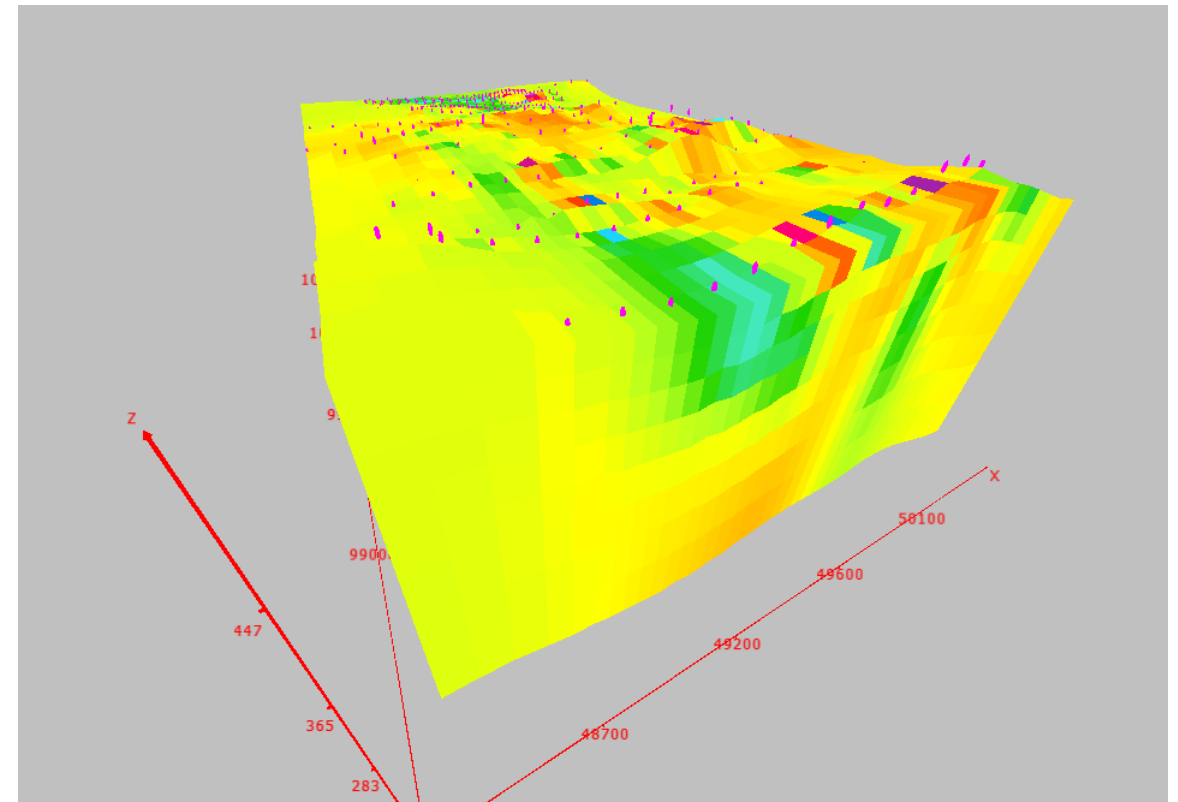
Adding topography to Res3DInv datasets

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Geophysicist



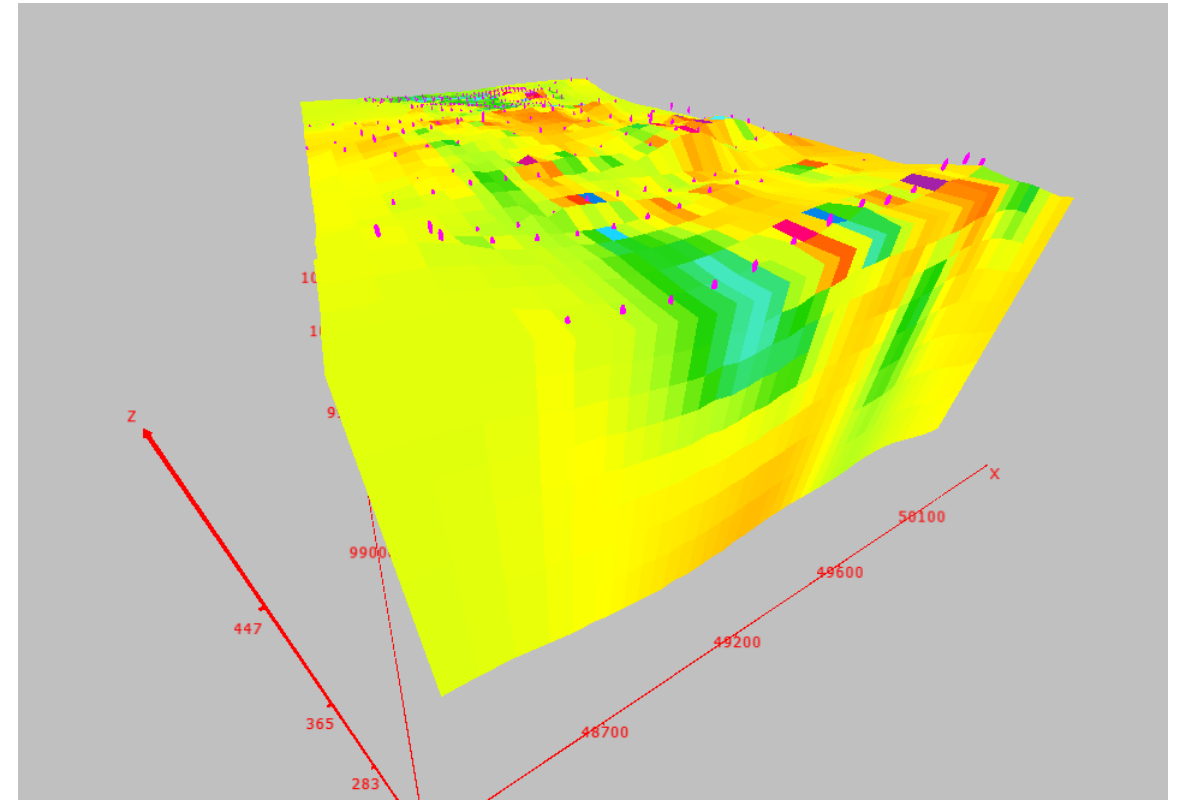
Program

- Motivation
- How to add topography to the .dat files
- Visualizing and exporting inversion results with topography

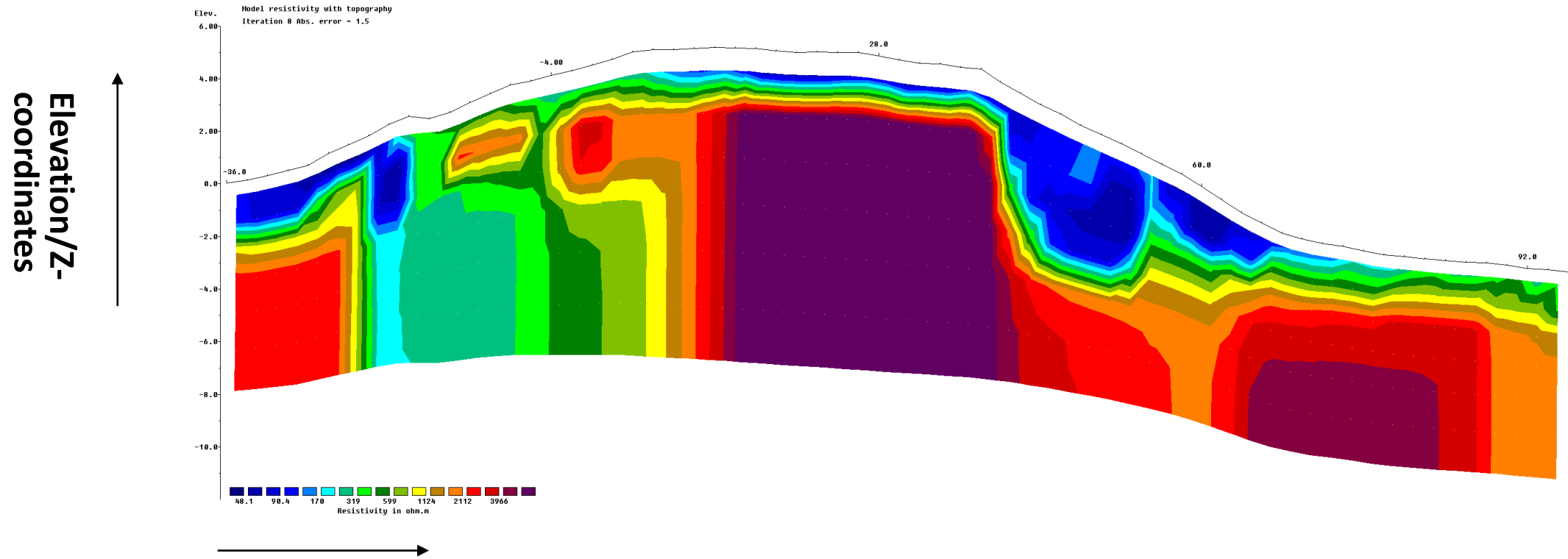


Why add topography?

- The topography is fully modelled in the forward response -> More accurate inversion results
- More accurate and easier to understand visualizations
- Easier interpretation



Coordinate systems



Profile distances/X-coordinates

Two options !

Ground distances: what you will measure with a tape measure on the ground

True horizontal distances: What you would measure on a map without accounting for topography

Many different options depending on survey layout!

- **Topography in separate list at end of file – if you only learn one, make it this one!**
- **Special format for rectangular grids**
- **Special format for trapezoidal grids**
- **Special format for surveys with point electrodes**

Topography in separate list

Works for all .dat fil formats, except for the trapezoidal grid fomatl

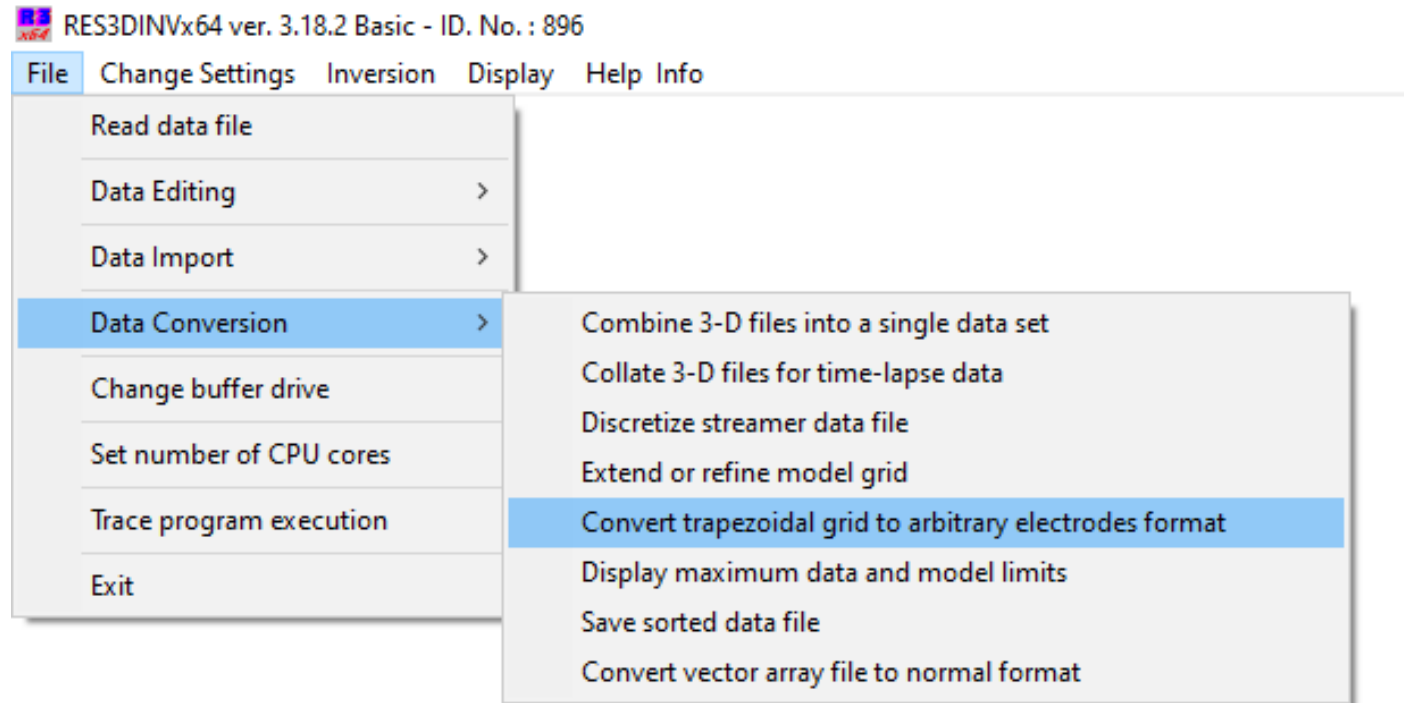
```
7263 7.000 10.000 9.000 10.000 124.2900
7264 7.000 10.000 10.000 10.000 120.3522
7265 8.000 10.000 9.000 10.000 115.0855
7266 8.000 10.000 10.000 10.000 113.3131
7267 9.000 10.000 10.000 10.000 102.7262
7268 Topography Header
7269 2 Flag for surface (2) or true horizontal distances (1)
7270 Topography in unstructured list Header
7271 Number of topography data points Header
7272 121 Number of topography points
7273 Topography data points (index,x,y,z) Header
7274 1 0.0 0.0 0.00 Topography data lines: index, X-coordinate,, Y-coordinate Z-coordinate
7275 2 1.0 0.0 0.00
7276 3 2.0 0.0 0.00

7391 118 7.0 10.0 -0.50
7392 119 8.0 10.0 0.00
7393 120 9.0 10.0 0.00
7394 121 10.0 10.0 0.00
7395 0 End of file
7396 0
7397 0
```

Last 3 data lines

Last topography data lines

Converting trapezoidal to general array format



Special format for rectangular grids

```
1 2 BLOCKS (with topography)
2 11 } 11 Grid lines in each direction
3 11 }
4 1.00
5 1.00
6 2
7 7260
8 0.000 0.000 1.000 0.000 103.0997
9 0.000 0.000 2.000 0.000 114.3002
10 0.000 0.000 3.000 0.000 121.8460
11 0.000 0.000 4.000 0.000 116.9145
12 0.000 0.000 5.000 0.000 101.9447
13 0.000 0.000 6.000 0.000 92.0474
...
7263 7.000 10.000 9.000 10.000 124.2985
7264 7.000 10.000 10.000 10.000 120.3522
7265 8.000 10.000 9.000 10.000 115.0855
7266 8.000 10.000 10.000 10.000 113.3131
7267 9.000 10.000 10.000 10.000 102.7262
7268 Topography Topography header
7269 2 Flag for surface (1) or true horizontal distances (2)
7270 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7271 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7272 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7273 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7274 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7275 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7276 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7277 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7278 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7279 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7280 0.00 0.00 0.00 -0.50 -1.00 -1.50 -1.00 -0.50 0.00 0.00 0.00
7281 0 End of file
7282 0
7283 0
```

11 by 11 Grid containing topography for all electrode locations

Special format for trapezoidal grids

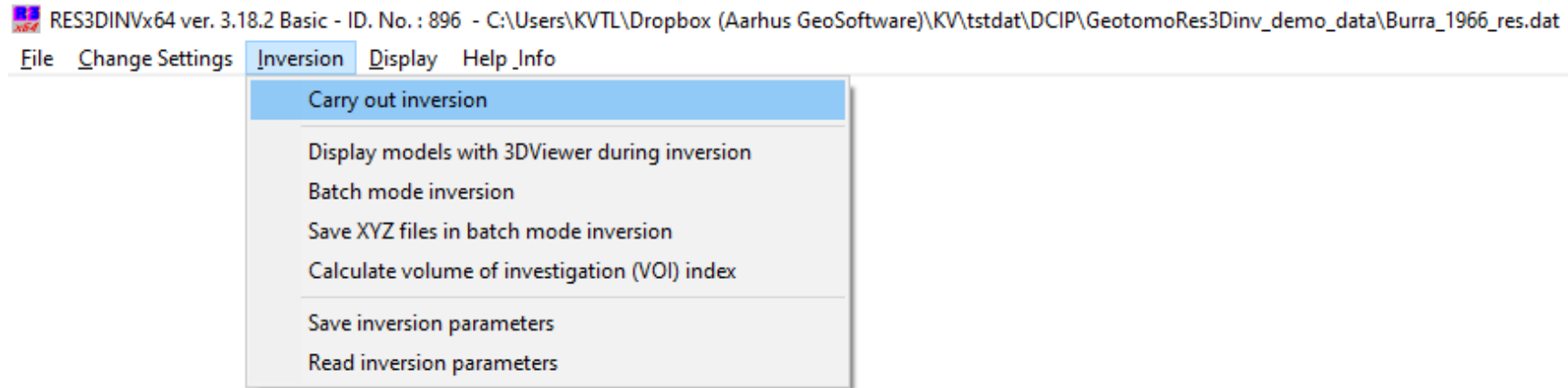
```
1 2 BLOCKS with Shifted Y lines
2 14
3 14
4 Trapezoidal Grid used
5 Location of electrodes given line by line
6 Line 1
7 0.0,0.0,0.0 Location of each electrode: X-coordinate, Y-coordinate, Z-coordinate
8 3.0,0.0,0.0
9 6.0,0.0,0.0
10 9.0,0.0,0.0
11 12.0,1.0,0.0
12 15.0,1.0,0.0
13 18.0,1.0,0.0
14 21.0,0.0,0.0
15 24.0,0.0,0.0
16 27.0,0.0,0.0
17 30.0,0.0,0.0
18 33.0,0.0,0.0
19 36.0,0.0,0.0
20 39.0,0.0,0.0
21 Line 2
22 0.0,3.0,0.0
23 3.0,3.0,0.0
24 6.0,3.0,0.0
25 9.0,3.0,0.0
26 12.0,4.0,0.0
27 15.0,4.0,0.0
28 18.0,4.0,0.0
29 21.0,3.0,0.0
30 24.0,3.0,0.0
31 27.0,3.0,0.0
32 30.0,3.0,0.0
33 33.0,3.0,0.0
34 36.0,3.0,0.0
35 39.0,3.0,0.0
36 Line 3
37 0.0,6.0,0.0
```

Special format for surveys with point electrodes

```
E 1 1966_Res_data_all_final_nodtm.BDB
2 37 Number of X and Y grid lines
3 50
4 Nonuniform grid
5 x-location of grid-lines
6 48300 48400 48500 48600 48675 48750 48800 48850 48900 48950 Location of each X grid line
7 49000 49050 49100 49150 49200 49250 49300 49350 49400 49450
8 49500 49550 49600 49650 49700 49750 49800 49850 49900 49950
9 50000 50050 50125 50200 50300 50400 50500
10 y-location of grid-lines
11 98250 98350 98450 98550 98650 98750 98850 98950 99050 99150 Location of each Y grid line
12 99250 99350 99450 99550 99650 99750 99850 99950 100050 100150
13 100250 100350 100450 100550 100650 100725 100800 100850 100900 100950 101000
14 101050 101100 101150 101200 101250 101300 101350 101400 101450 101500
15 101550 101600 101650 101700 101750 101800 101850 101900 101950
16 11
17 0
18 Type of data (0=apparent resistivity,1=resistance)
19 0
20 Point Electrodes outside grid present Header for point electrodes
21 Number of point electrodes
22 1218
23 Compressed format used for point electrodes coordinates
24 1 48860.02 98251.06 483.0757 Point electrode information: index, X-coordinate, Y-coordinate,
25 2 48933.47 98257.91 479.8773 elevation/topography
26 3 48951.55 98251.06 478.7271
27 4 48984.83 98271.55 477.7546
28 5 49008.12 98271.55 477.0950
29 6 49056.48 98265.41 481.2366
30 7 49073.02 98280.86 477.0503
31 8 49104.64 98280.86 477.3997
32 9 49127.94 98278.99 478.4919
33 10 49156.23 98278.99 479.5769
34 11 49180.44 98274.66 486.5527
35 12 49224.45 98277.13 482.6164
36 13 49252.74 98282.72 484.6414
```

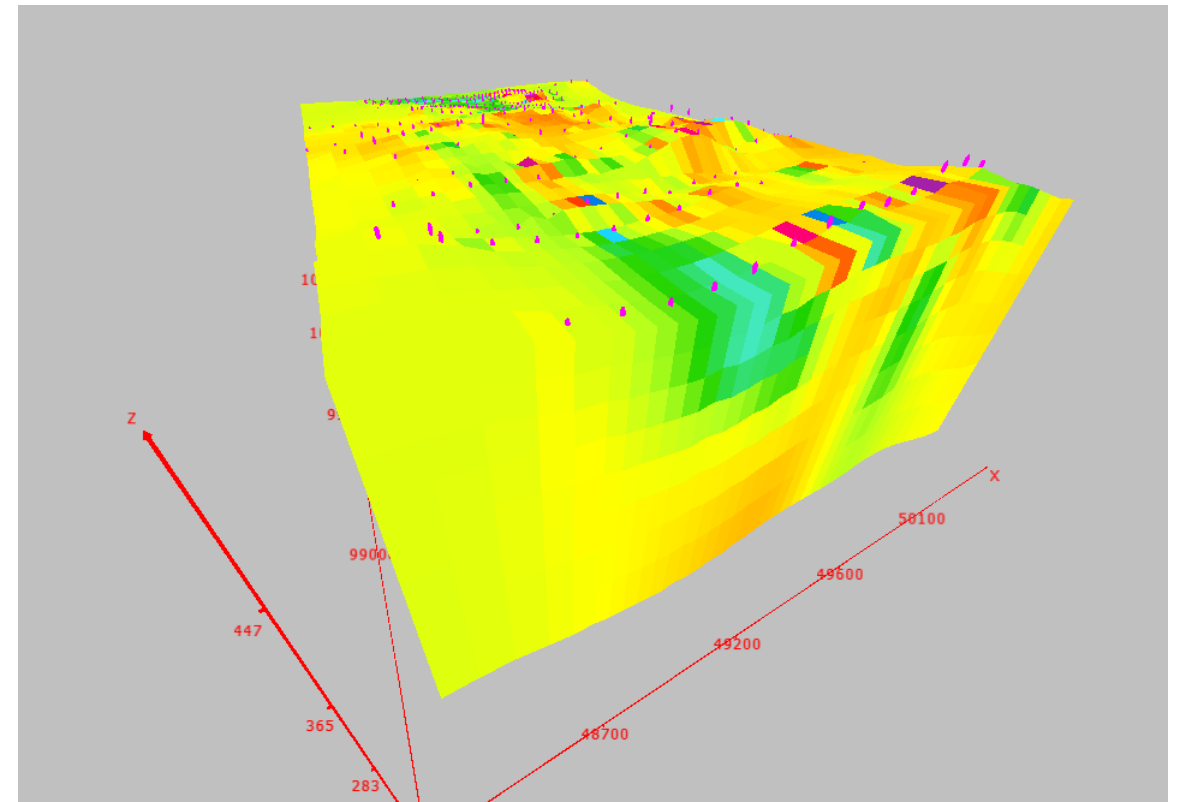
Running an inversion with topography

Is exactly like running a regular inversion

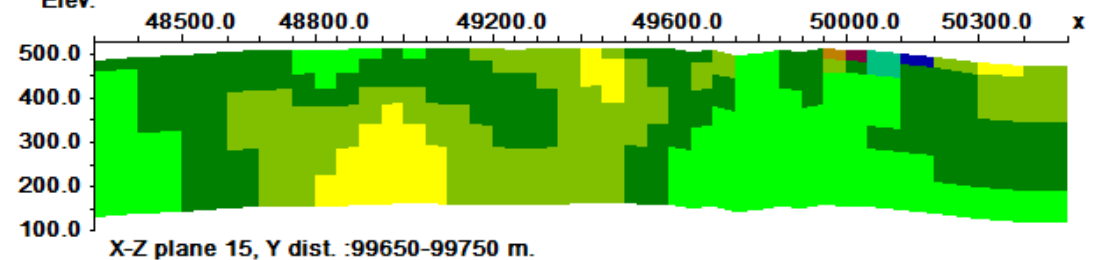
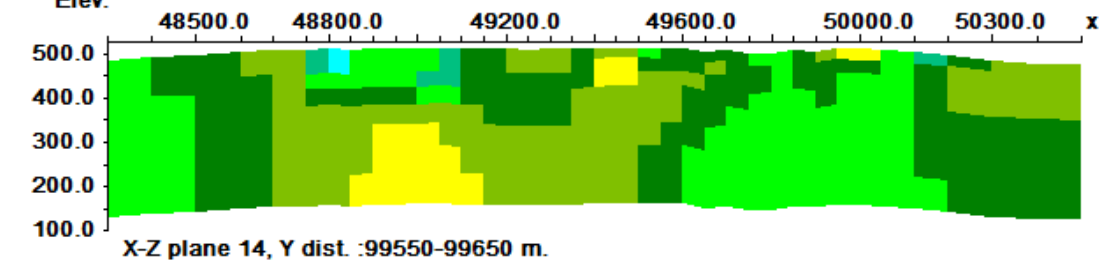
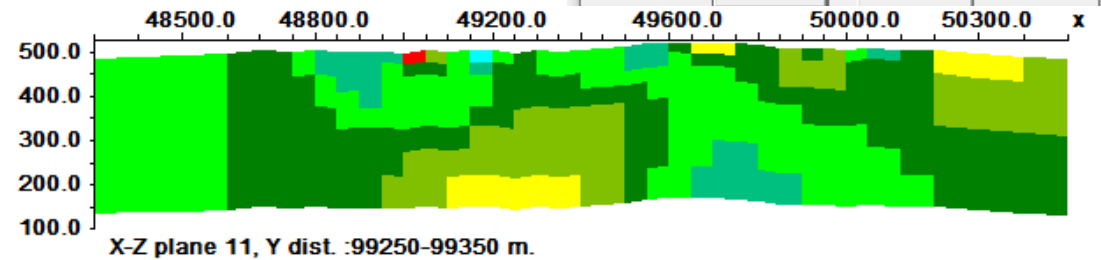
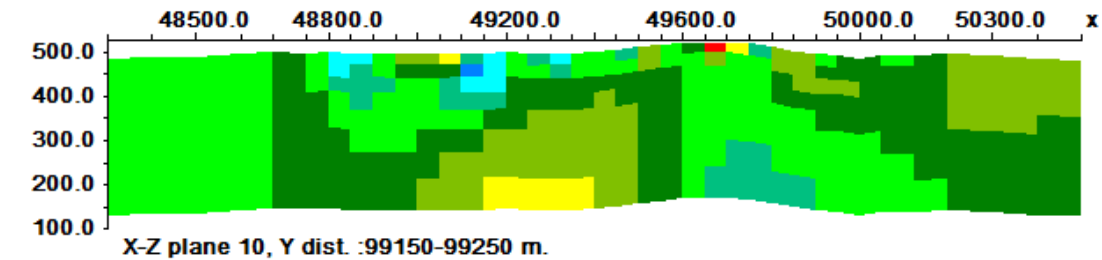
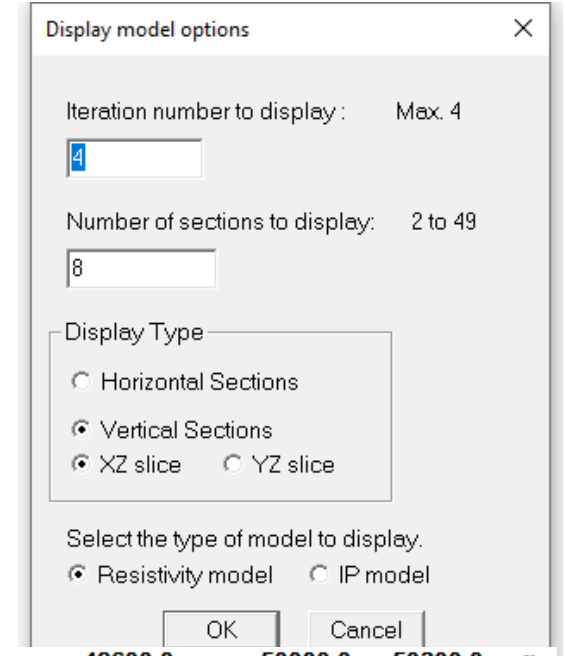
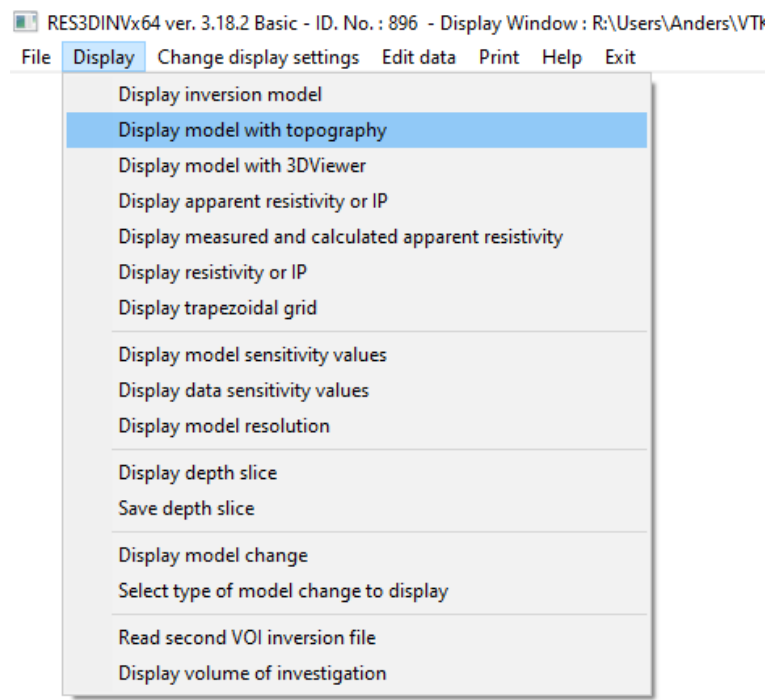
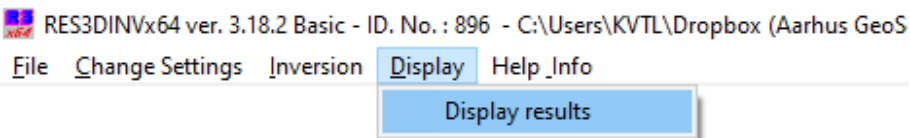


Visualizing and exporting inversion results with topography

- Classic build in visualization
- Visualization in 3D viewer
- Export for visualization in other programs



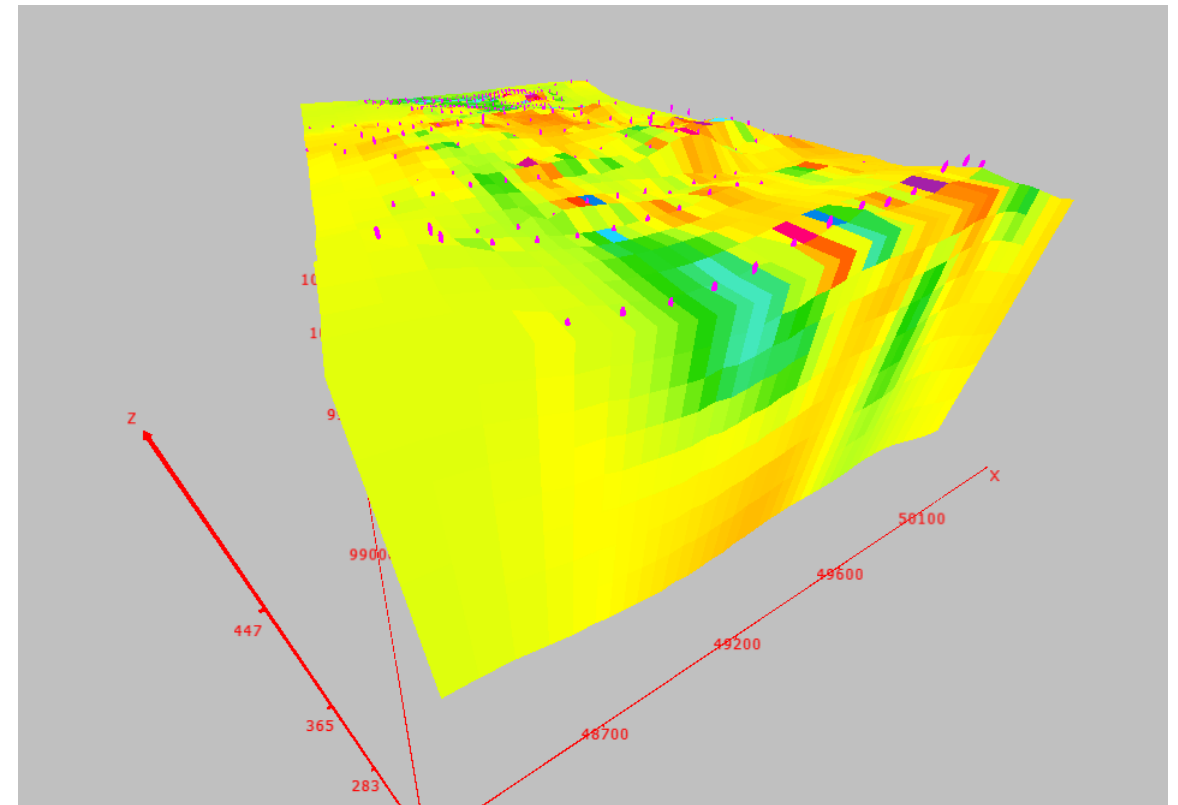
Classic build in visualization



X Unit Electrode Spacing 50.0m. Y Unit Electrode Spacing 50.0m. Iteration 4 - data misfit 11.0%

Visualization in 3D viewer

- Live demo!



Export for visualization in other programs

```

1 /Name of survey line is 1966_IP_data_all_final_nodtm.BDB
2 /Number of blocks is 14112
3 /Results for iteration 4
4 /The x, y and z coordinates the centres of the model blocks, and
5 /the resistivity, conductivity and IP value of each block is given below.
6 /The I.P. is given in terms of Percent Frequency Effect with units in %
7 /
8 /      X              Y              Elevation    Resistivity    Conductivity    I. P.
9 48350.0000  98300.0000  498.0921    78.0237       0.012817       0.9312
10 48450.0000  98300.0000  496.2501    77.4654       0.012909       0.9750
11 48550.0000  98300.0000  490.6038    78.3246       0.012767       1.051
12 48637.5000  98300.0000  482.8150    90.6875       0.011027       1.241
13 48712.5000  98300.0000  478.1996    71.4942       0.013987       1.095
14 48775.0000  98300.0000  474.8938    69.6839       0.014351       1.181
15 48825.0000  98300.0000  471.4896    54.0520       0.018501       1.058
16 48875.0000  98300.0000  469.1854    46.1332       0.021676       1.197
17 48925.0000  98300.0000  466.9939    36.8043       0.027171       1.376
18 48975.0000  98300.0000  465.3968    26.2511       0.038094       1.531
19 49025.0000  98300.0000  465.9678    22.3539       0.044735       1.537
20 49075.0000  98300.0000  466.1528    18.2205       0.054883       1.982
21 49125.0000  98300.0000  466.2152    16.1321       0.061988       1.960
22 49175.0000  98300.0000  469.6369    19.2623       0.051915       1.780
23 49225.0000  98300.0000  472.0463    49.2114       0.020320       1.488
24 49275.0000  98300.0000  476.6610    64.9709       0.015392       1.348
25 49325.0000  98300.0000  480.9317    212.7277      0.0047008      1.203
26 49375.0000  98300.0000  482.7738    413.8167      0.0024165      1.202
27 49425.0000  98300.0000  487.3830    84.9816       0.011767       1.645
28 49475.0000  98300.0000  490.0945    17.5093       0.057113       1.639
29 49525.0000  98300.0000  493.1746    22.2833       0.044877       1.678
30 49575.0000  98300.0000  494.3861    62.1920       0.016079       2.464
31 49625.0000  98300.0000  492.8252    122.4661      0.0081655      2.534
32 49675.0000  98300.0000  492.9211    173.3137      0.0057699      1.974
33 49725.0000  98300.0000  493.2687    160.3539      0.0062362      1.531
34 49775.0000  98300.0000  495.1201    136.4403      0.0073292      1.279
35 49825.0000  98300.0000  497.4661    237.3000      0.0042141      1.033
36 49875.0000  98300.0000  501.5447    313.0403      0.0031945      0.7681
37 49925.0000  98300.0000  505.1929    359.4535      0.0027820      0.8664
38 49975.0000  98300.0000  505.7242    137.9133      0.0072509      1.051

```

RES3DINVx64 ver. 3.18.2 Basic - ID. No. : 896 - Display Window : R:\Users\Anders\VTK-files\test-inv-files\1966_IP.inv

File Display Change display settings Edit data Print Help Exit

- Read file with inversion results
- Model Export**
 - Export model to XYZ format
 - Export model to XYZ format (without topography)
 - Export model to CTech CSV format
 - Export model to Slicer/Dicer format
 - Export model to Slicer/Dicer format with topography
 - Export model to Paraview VTK ASCII format
 - Export model to Voxler XYZC format
 - Export data to Voxler XYZC format
 - Save model with global coordinates

Select iteration number

You can choose the model values from one of the inversion iterations to save into a file. The total number of iterations is 4

Select iteration number :

OK Cancel

Thank you for listening!