

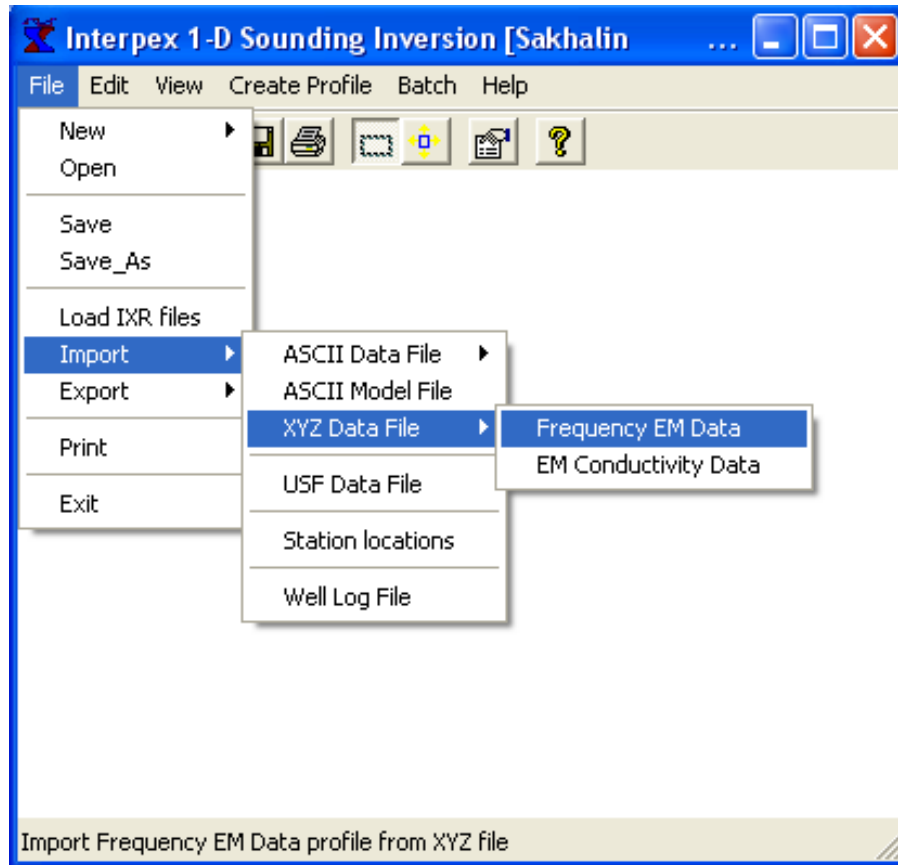
Working with GEM-2 FEM Data in IX1D v 3 – A Tutorial

Version 1.0

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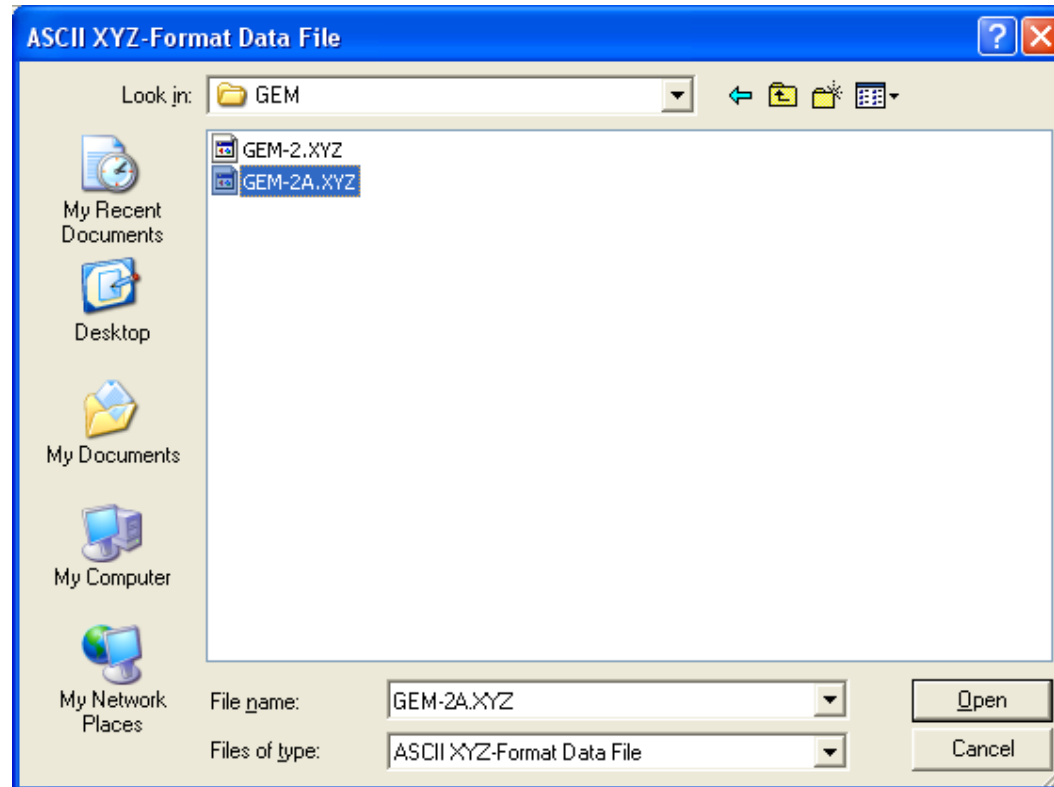
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First Load the Data



Select Import/XYZ Data File/Frequency EM Data from the File Menu

Select a GEM-2 XYZ File



GEM-2 data values are in percent, GEM-2A data values are in ppm

Select Columns to Import

XYZ File Columns

Column for Easting: 1 Column for Elevation: 0 Column for Data: 3
Column for Northing: 2 Column for Profile: 2 Columns to skip: 0 Percent
 Start Reading at Row: 2 Stop Reading at Row: 3099 ppm

/COIL SEPARATION: 1.66 METERS
/FREQUENCIES: 1050 2010 4170 8010 12090 15990 21030
LINE GEM-2-1
X Y 1050Hz_I 1050Hz_Q 2010Hz_I 2010Hz_Q 4170Hz_I 4170Hz_Q 8010Hz_I 8010Hz_Q
1,0,780.22,6472.2,2029.9,11942,6000.3,22303,14298,36992,24725,50705,34205,58487,46729,69
1,1,760.08,6295.3,1937.1,11441,5581.8,21909,13872,37477,23249,49391,33408,59306,45117,67
1,2,701.58,6066.3,1850.5,11258,5276.1,20981,13200,35596,22262,48539,31547,57211,42012,66
1,3,694.7,5774.8,1748.6,10542,4967.5,20672,12165,34037,20854,46086,29158,56367,40004,638
1,4,661.39,5590.7,1699.3,10229,4726.19281,11720,32633,19457,45504,27997,53756,37999,6362
1,5,596.69,5108,1502.9,9364.2,4130.4,17338,10004,30646,16808,40991,24223,48882,33900,586
1,6,572.97,4886.6,1451.9,8713.8,3898.4,16437,9441.4,28334,15844,38848,22246,47614,31214.5
1,7,531.13,4537.4,1367.3,8273.6,3603.8,15645,8470.9,26983,14554,36684,20010,44054,28227.5
1,8,516.46,4170.5,1272.8,7398.4,3416.6,14450,8026.1,24608,13133,32968,18496,41067,25042.4
1,9,493.15,3760.7,1213.3,6848.2,3179.4,13005,7189,22480,12058,30739,16601,36974,22337.436
1,10,463.5,3466.4,1127.7,6074.6,2885.2,11550,6449.7,19913,10597,26623,14846,32864,19737.3

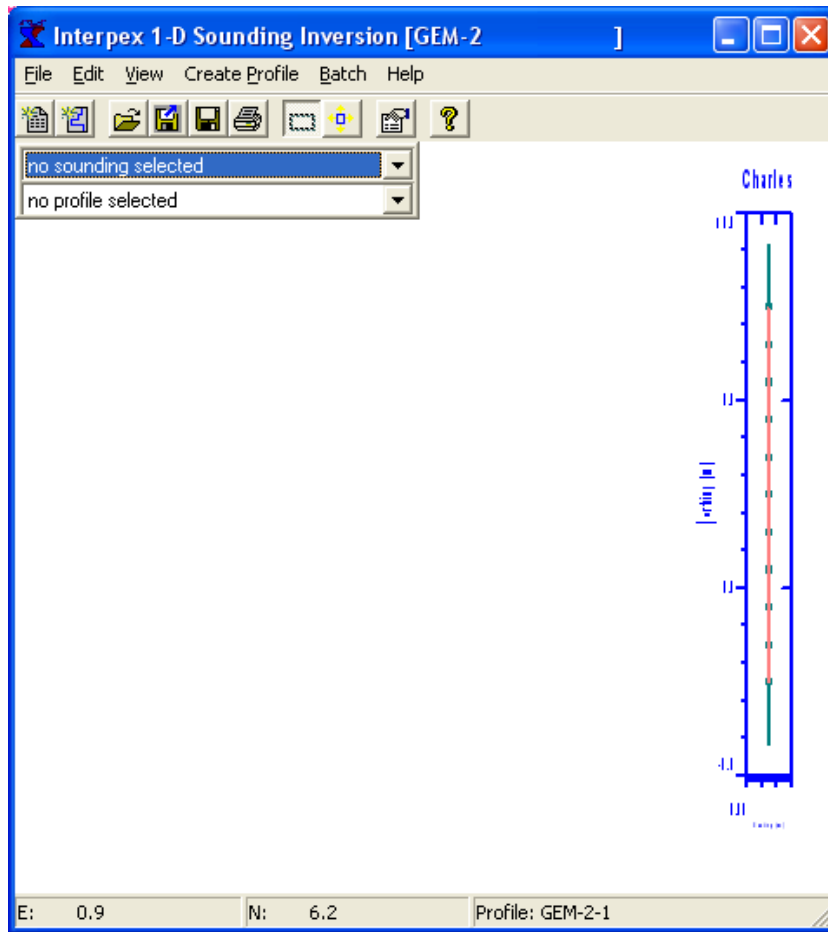
OK Cancel Set Start Row Set Stop Row

Be sure to make the correct selection for data units: Percent or ppm (parts per million).

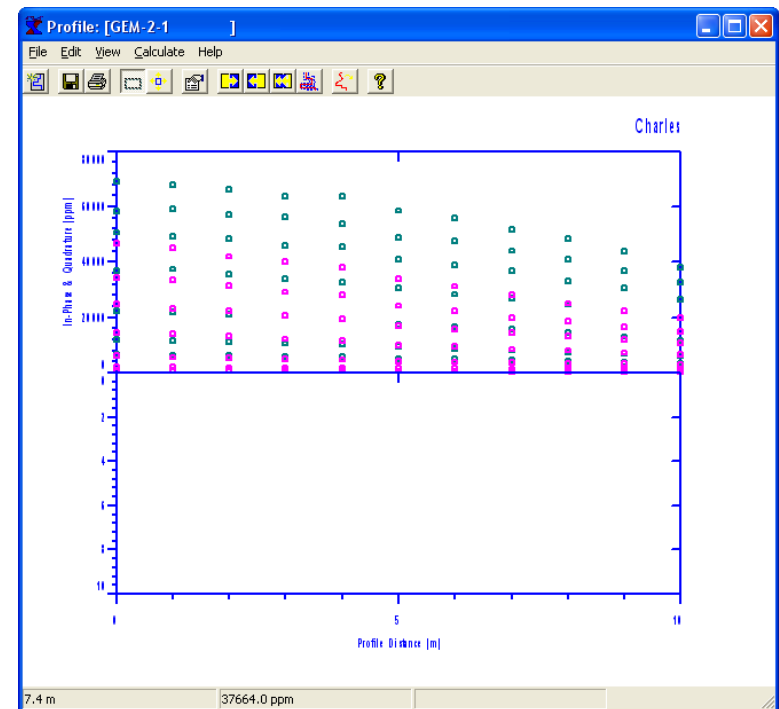
Note that for Percent, data values will be on the order of 1-10 or so, while for ppm, the data values will be on the order of tens of thousands.

Columns in data file consist of East, North and Data. Profile (station) coordinate is the same as Northing. There are no elevation data. Note that three lines have been added to define coil separation, frequencies and to trigger data read via the LINE keyword. These lines are necessary to read the file.

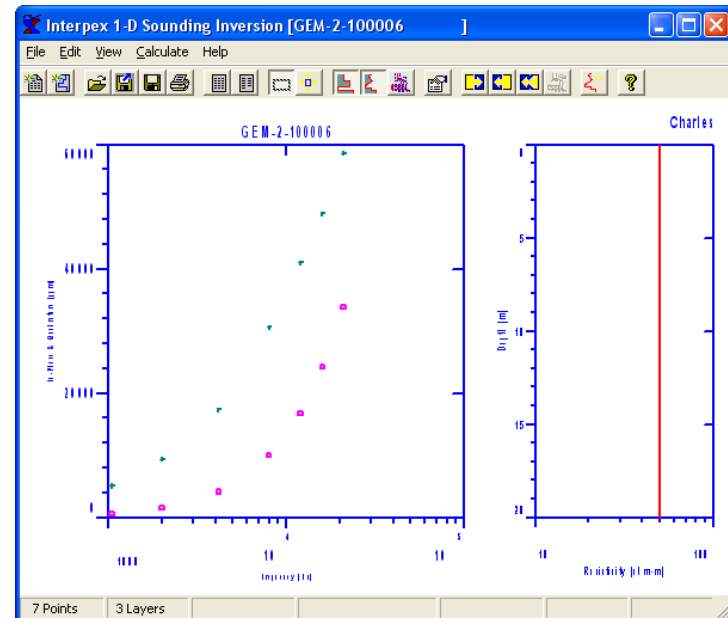
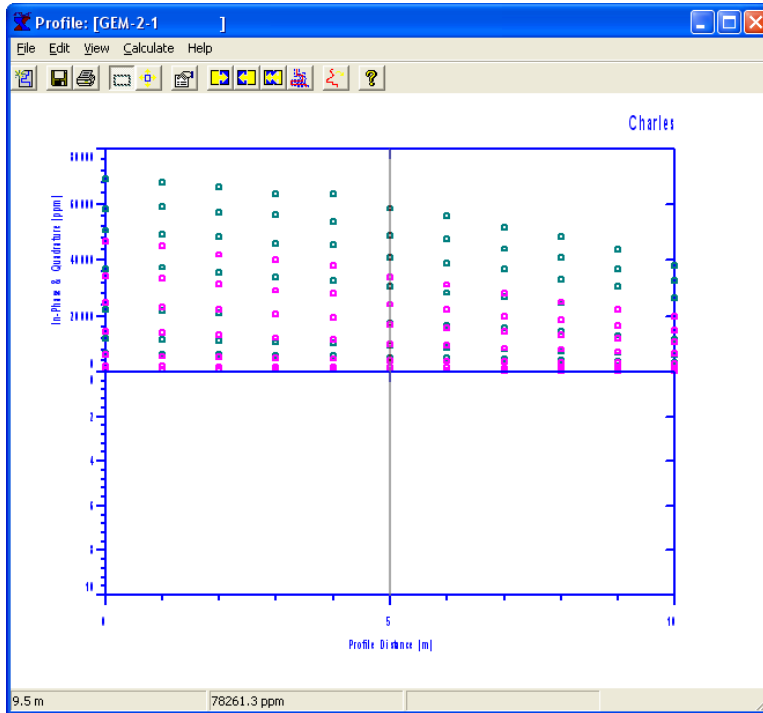
Select the Profile for Display



Point at the profile line displayed on the map and click it to display the profile data

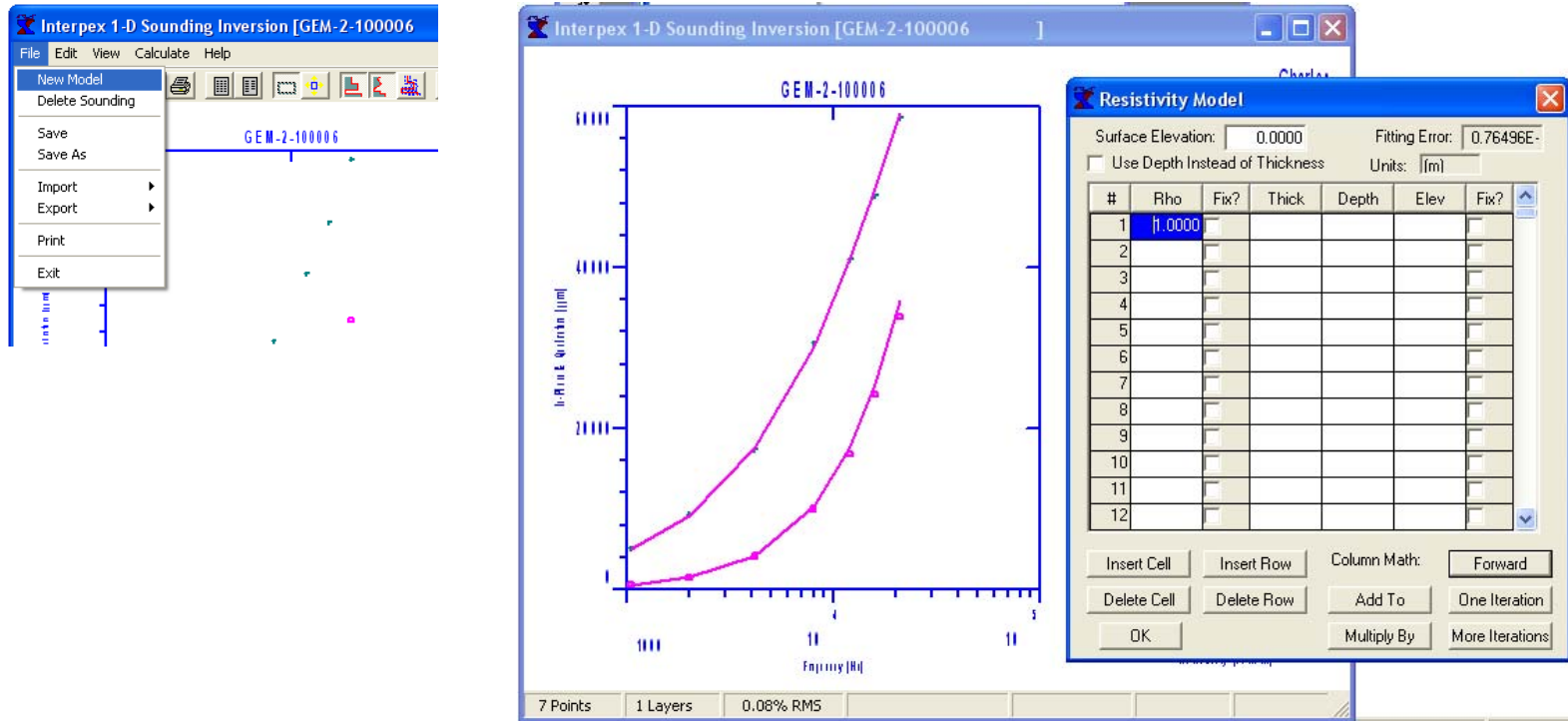


Select a Sounding from Profile



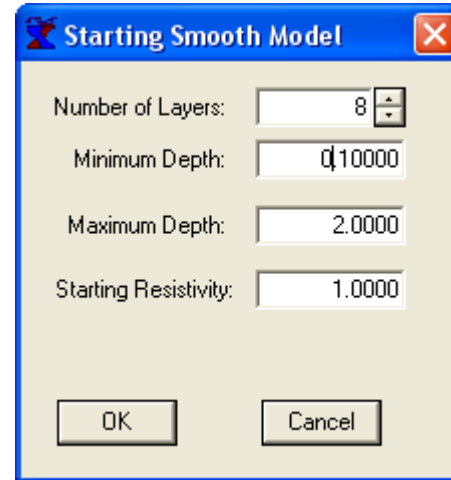
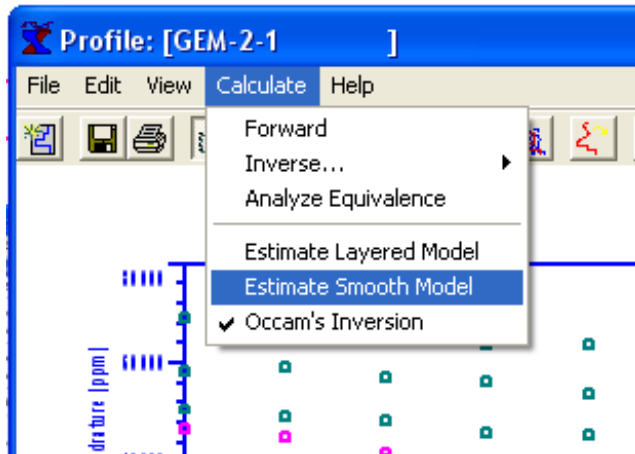
Point at a sounding (say, the center one) and click to select it for display and interpretation

Determine Approximate Resistivity



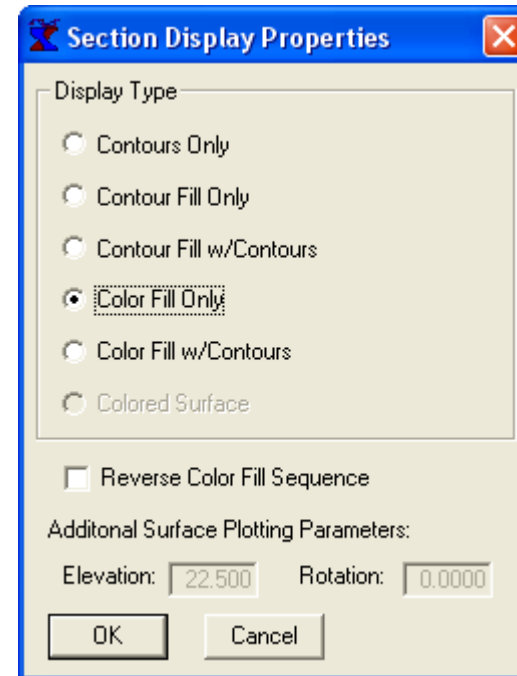
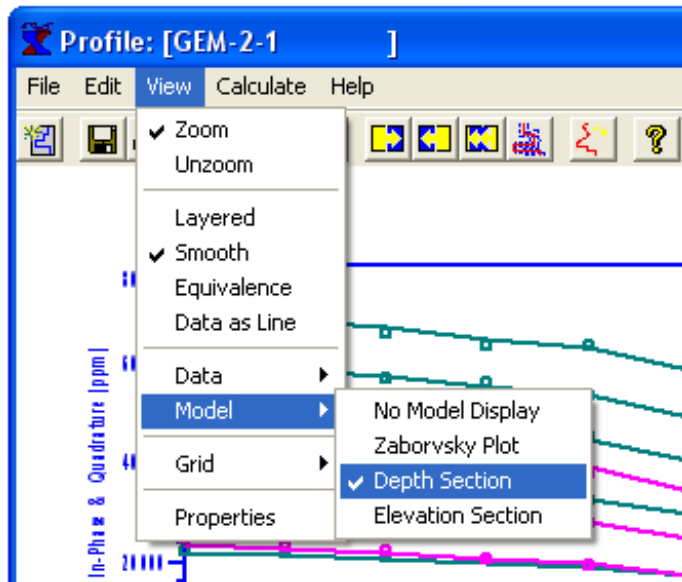
Use File/New Model and try different resistivity values for a homogeneous (one-layer) earth, until you have something which fits fairly closely. Remember this value, close the Sounding window and go back to the profile window. In this case, the resistivity estimate is 1 Ohm-m.

Estimate Smooth Model



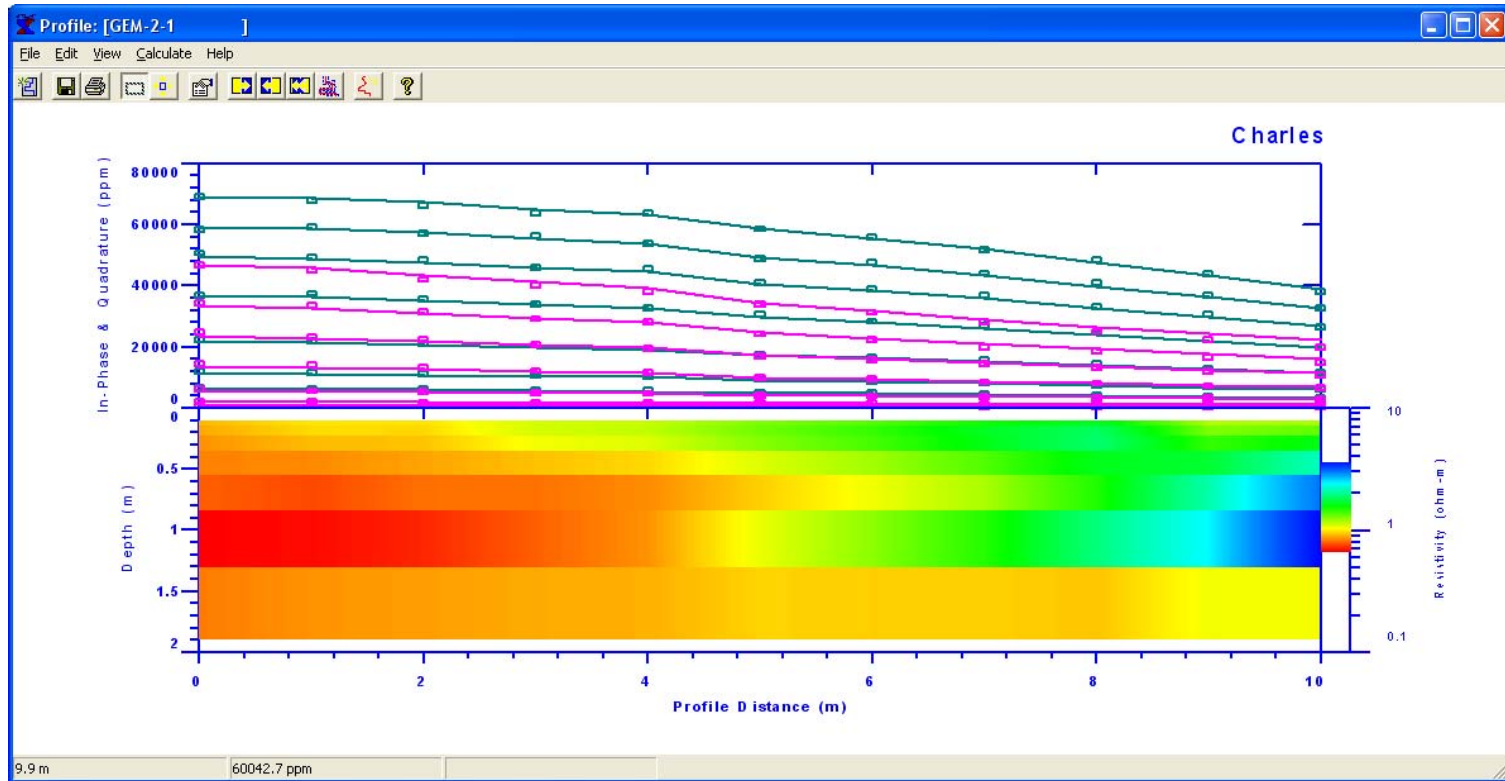
Use the Calculate/Estimate Smooth Model command to start smooth model estimation. Pick a reasonable number of layers, say one for each data pair. For a coil spacing of 1.66 m, depth range from 0.1 to 2 m would be reasonable. Use the starting resistivity determined from the experiment on the single sounding, in this case 1 Ohm-m.

Adjust Display for Results



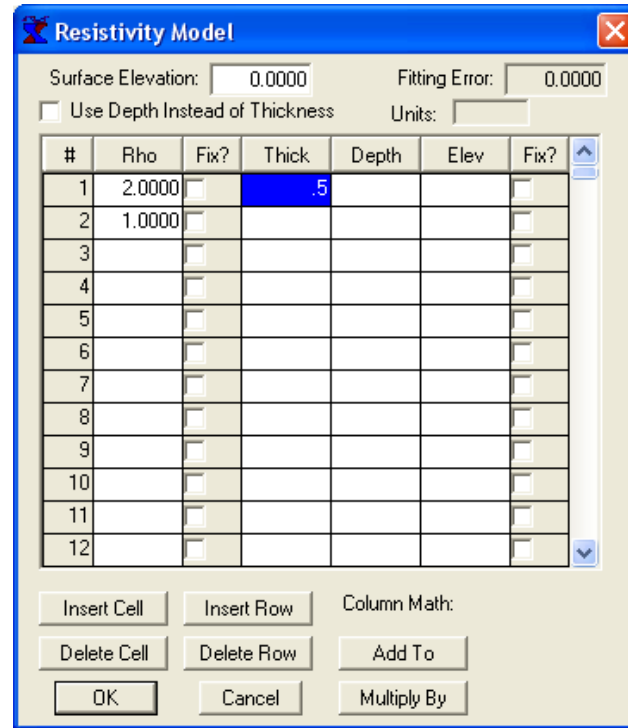
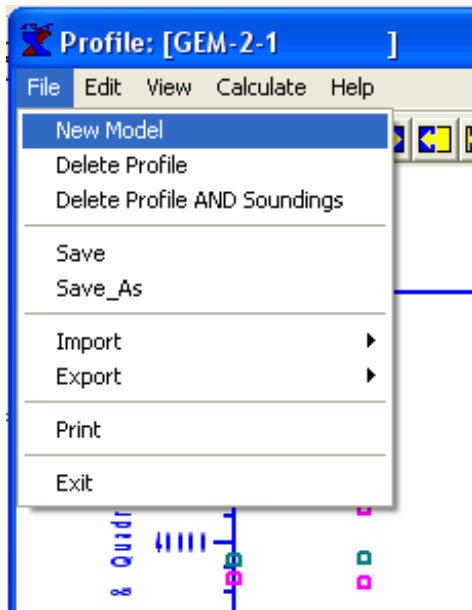
When the smooth modeling is finished, the display needs to be adjusted to display the appropriate smooth model. On the Profile display, be sure the View/Layered option is unchecked and that the View/Smooth is checked. Use View/Model/Depth Section and select Color Fill Only. Finally use the zoom feature or View/Properties to scale the display to your liking.

View Final Smooth Section



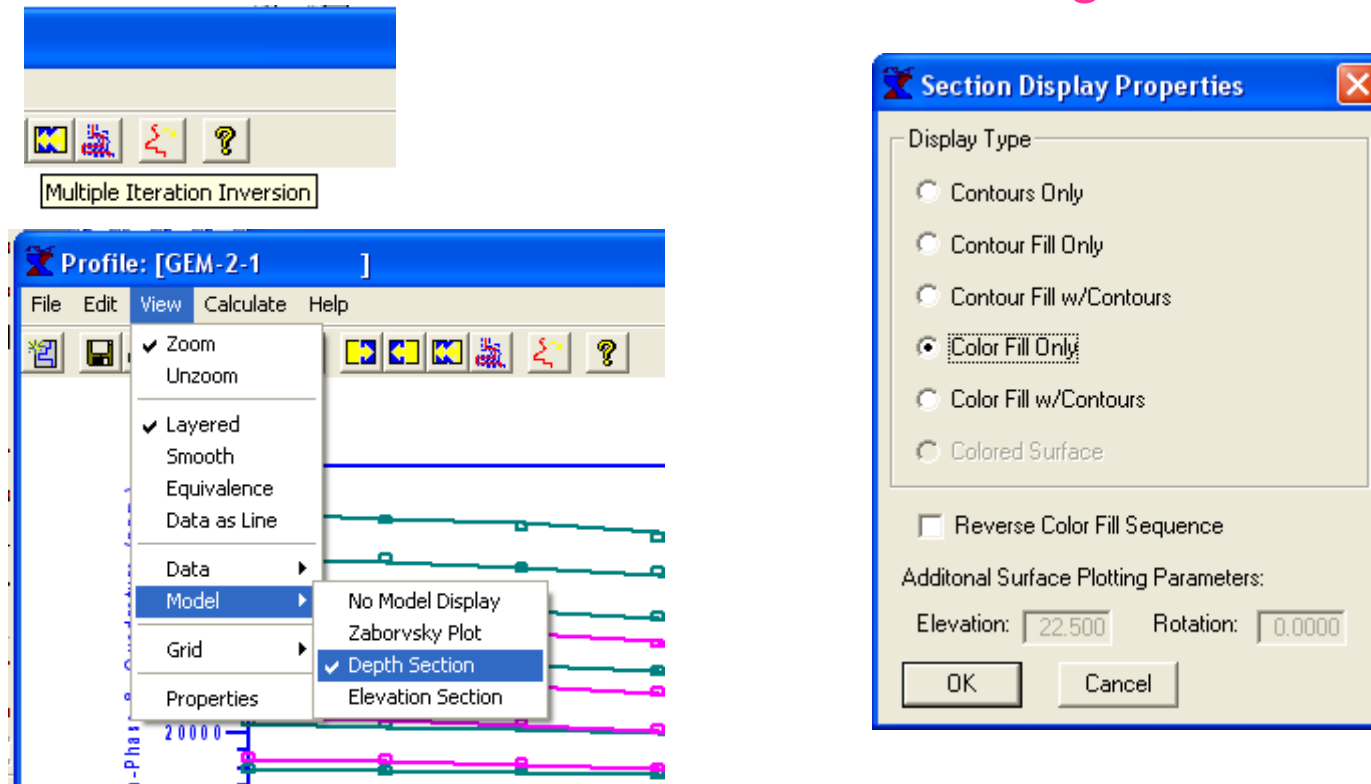
The smooth inversion is only one way to interpret the data. However, it is a good starting point layered modeling. We can start the layered modeling by looking at some of the smooth inversion results.

Starting Layered Model



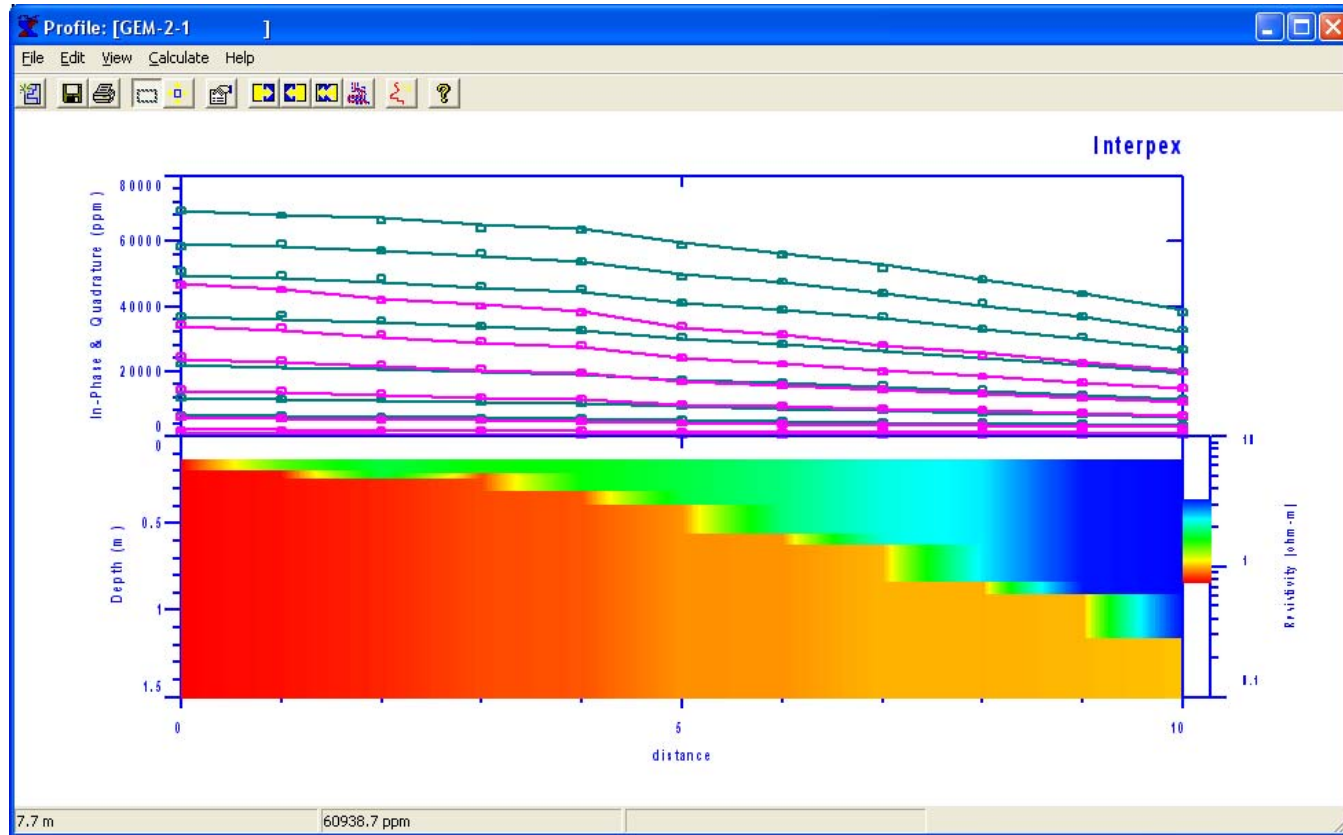
One way to make a starting model for the Layered inversion is to use File/New Model in the Profile window. Then enter the starting model in the Resistivity model dialog. In this case we have selected a model with 2 Ohm-m over 1 Ohm-m, 0.5 m thick.

Perform Inversion & Adjust Display



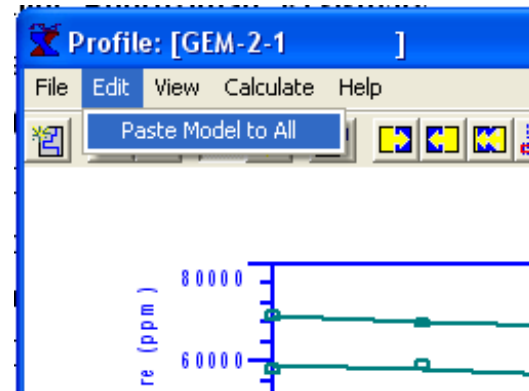
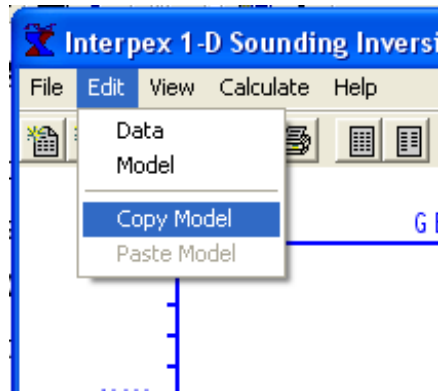
Once the model is stored, use the Calculate/Inverse/Multiple Iterations or the equivalent toolbar button several times until the results stabilize. Be sure to check View/Layered, uncheck View/Smooth and be sure the Depth Section is selected for display as before.

View Final Layered Model



This display shows the final results for two layers. Feel free to also try 3-layer models. More than 3 layers is not generally useful for this kind of data. Fixing one or more parameters may sometimes be useful.

Copy/Paste Layered Model



A third way to devise a starting layered model is to open a sounding and experiment with a layered model. When a good fit is found for a “typical” sounding, use this to develop a model where the thicknesses or depths are well estimated and ball-park estimates of the resistivities are used. Then use the Edit/Copy Model in the Sounding window, close the sounding window, and use the Edit/Paste Model to All in the Profile window. Use the Calculate/Inverse/Multiple Iterations or the equivalent toolbar button several times until the results stabilize, as we did before.