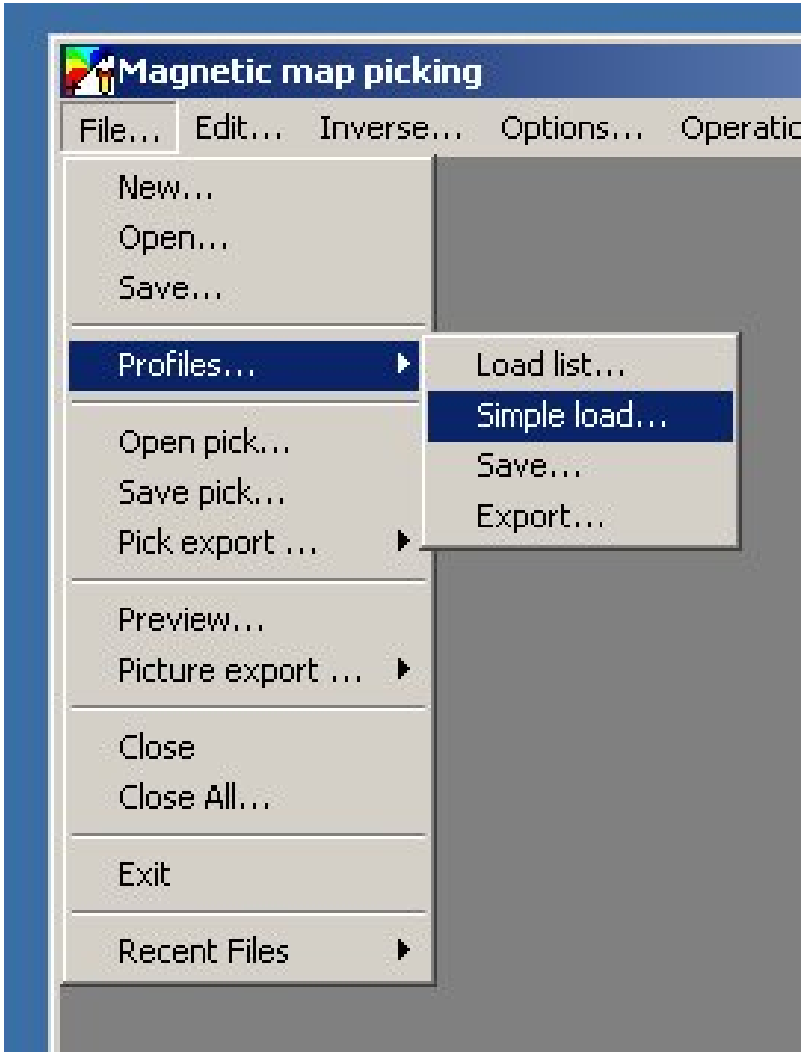
In this presentation the following topics are covered:

- Loading of field data collected using MagLog software.
- Magnetic data filtering based on Larmor signal levels.
- Location map and profile graph presentation and inspection.
- Using MagPick profile markers to locate magnetic anomalies.
- Cutting survey turns and splitting data into new line sets.
- Using MagPick robust filtering to separate local anomalies.
- Grid interpolation.
- Adjusting map color scale, coordinate and Lat/Lon grids and overall map appearance.
- Hard copy preparation using Postscript output.
- Picking positions of magnetic field maximums from the map and converting them into Excel spread sheet.

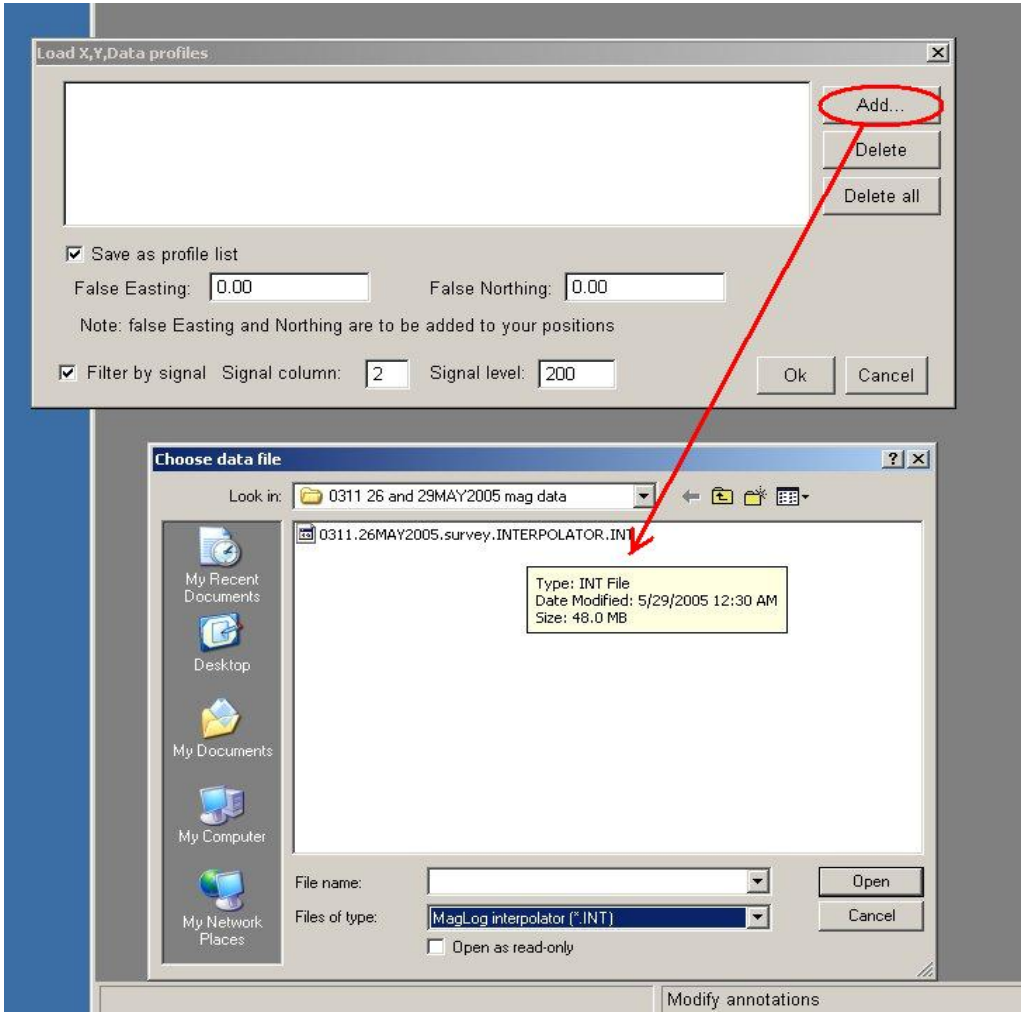
* Note: this presentation covers only very limited portion of program operation

Loading MagLog INT data file(s)



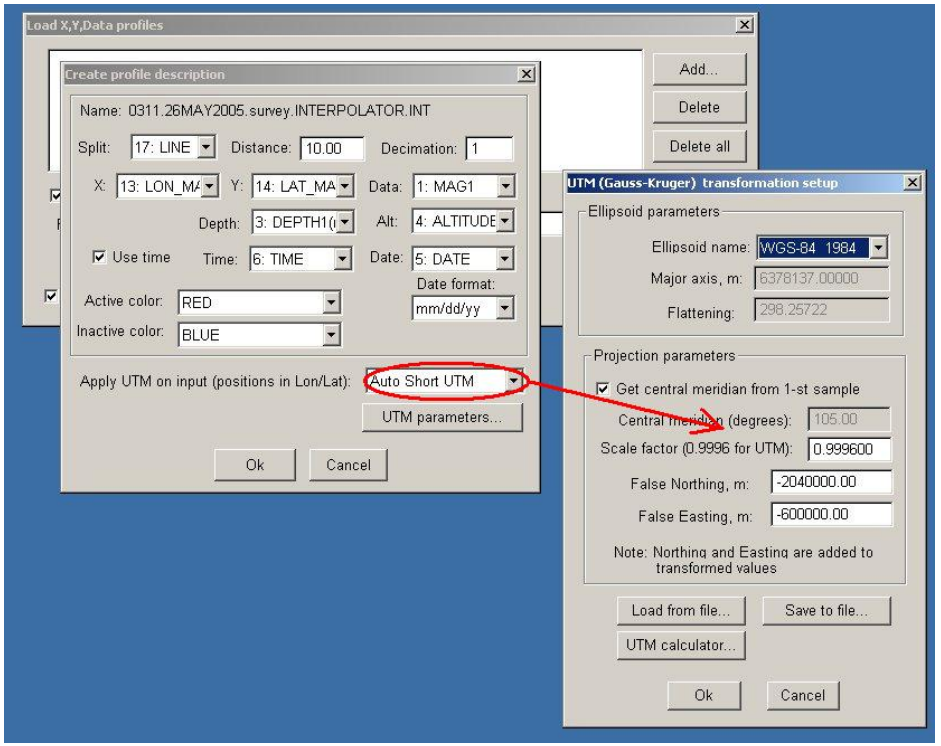
- Start Magpick
- Select File / Profiles / Simple Load

List of files to Load



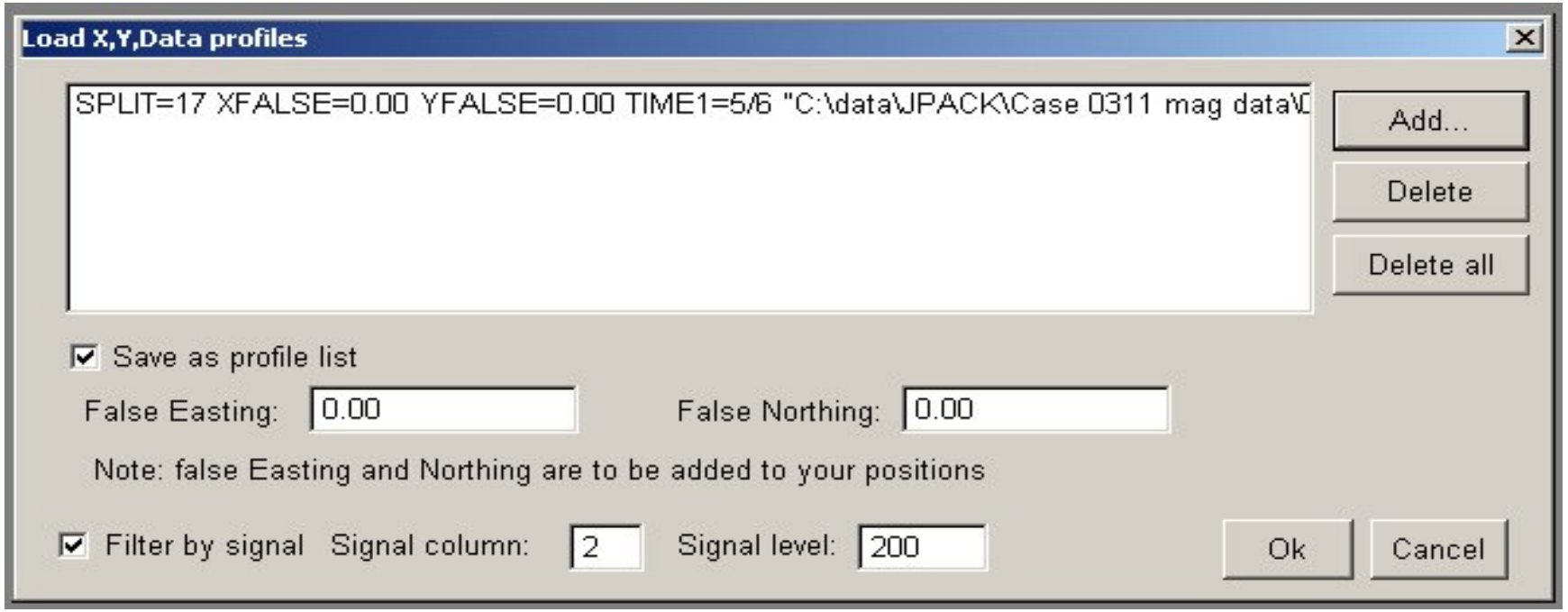
- Set check " Save as profile list"
- Check "Filter by signal"
- Set signal column (2 for one mag systems)
- Set signal threshold (200)
- Press "Add" button"
- "Choose data file" dialog appears.
- Select file you wish to load

Specify data information.



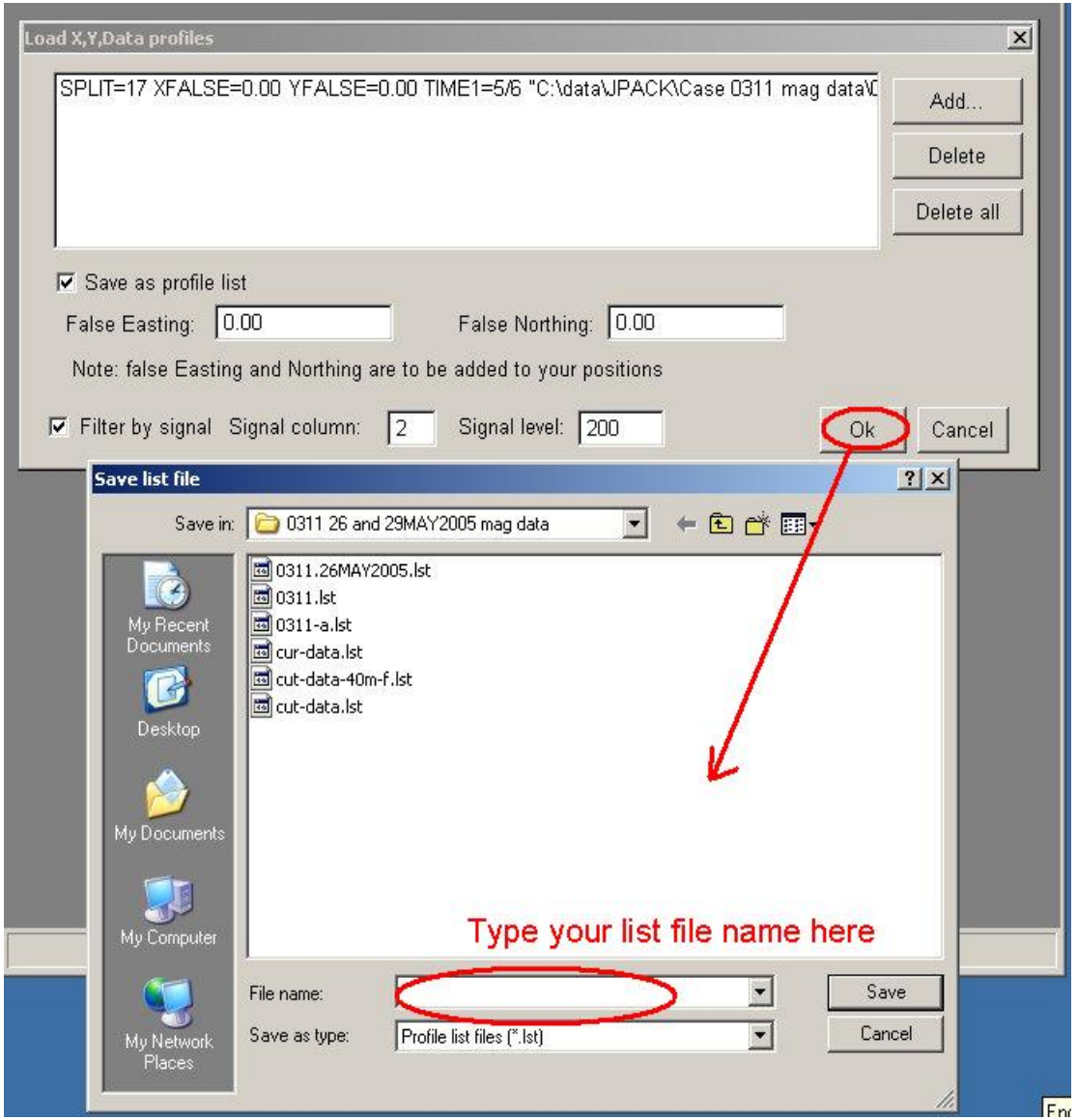
- Split data: by distance or by line column. Pick interpolator line column.
- Specify where positions and data are.
- Use depth, altitude and time if available.
- If data in Lat/Lon, select “Auto short UTM” and UTM dialog pops up.
- It is recommended to save UTM parameters for future use.

Files to be loaded are shown.



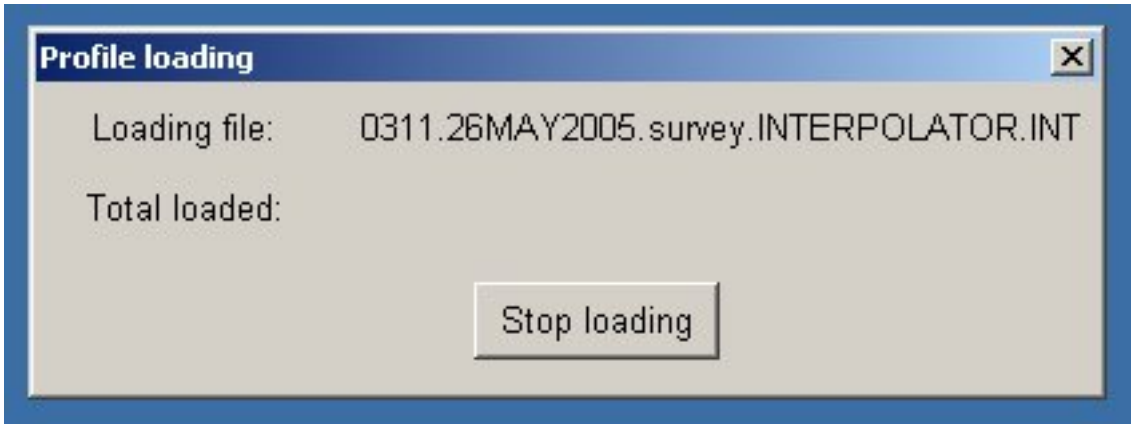
- Repeat “Add” button for each data file you wish to load.
- When complete, press “Ok”.
- Program prompts for list file to save. Assign new name and presss “Save”

Select list file name to save.



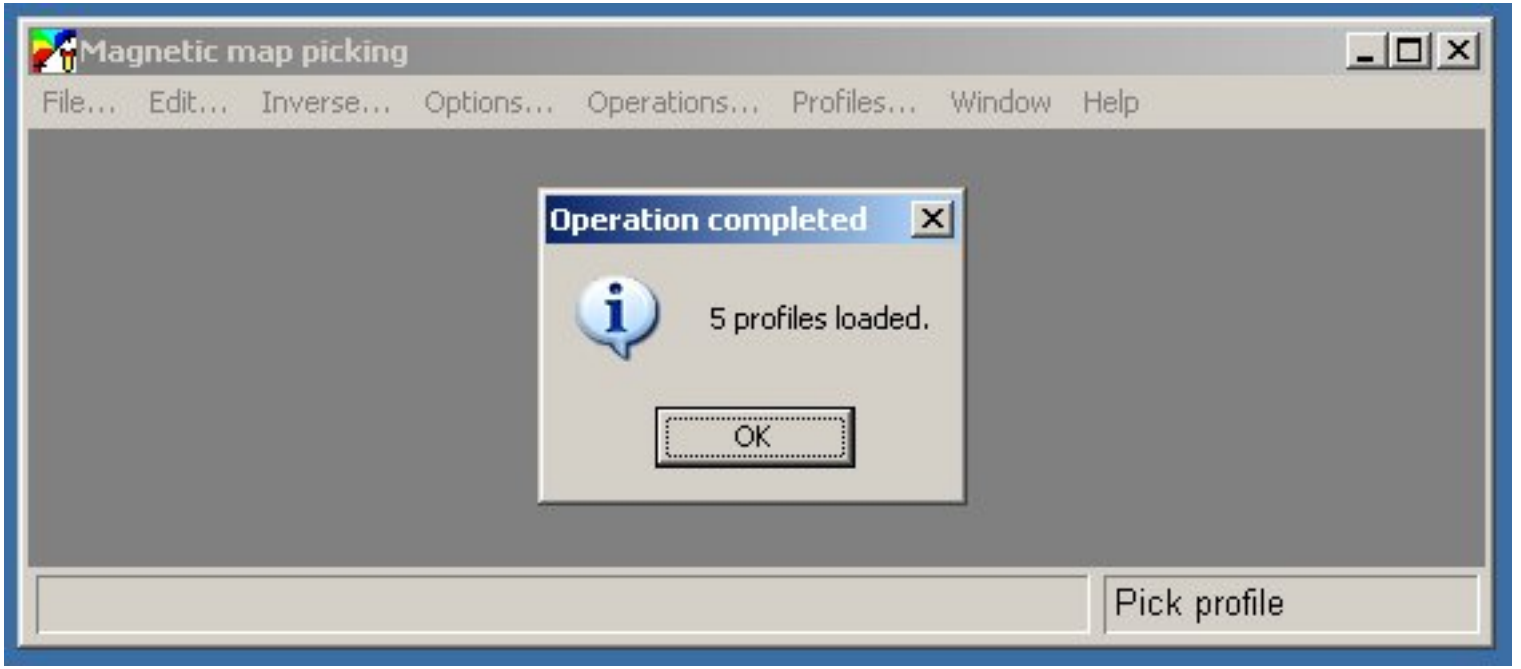
- Type new list file name here.
- Next time you need to load the same data, go to “Files / Proifiles / Load List”.

Wait while data is being loaded.



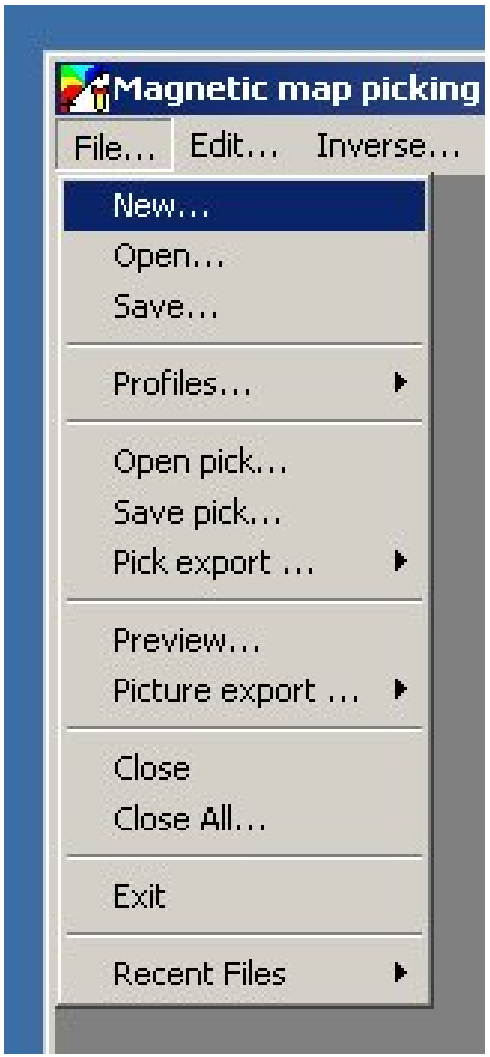
- Program shows progress loading data files.

Loading is complete.



- Program shows total number of data lines loaded.
- Note that if all survey was done as one line, this could be “1”

Now show position plot.

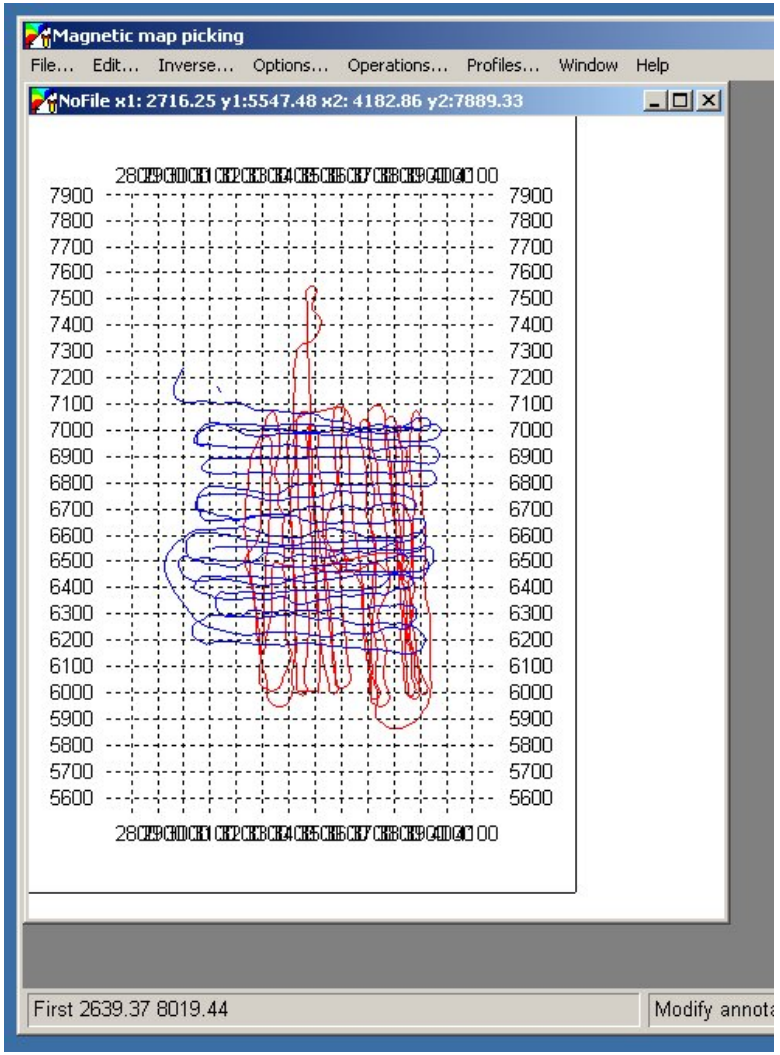


- Select “File/New”. This allows to create map or profile graph window.
- Note that Map is displayed in short UTM coordinates (meters).
- If both Map and Profiles windows are used at the same time, profile displayed is show on the map as red.

Select Map or Profile window

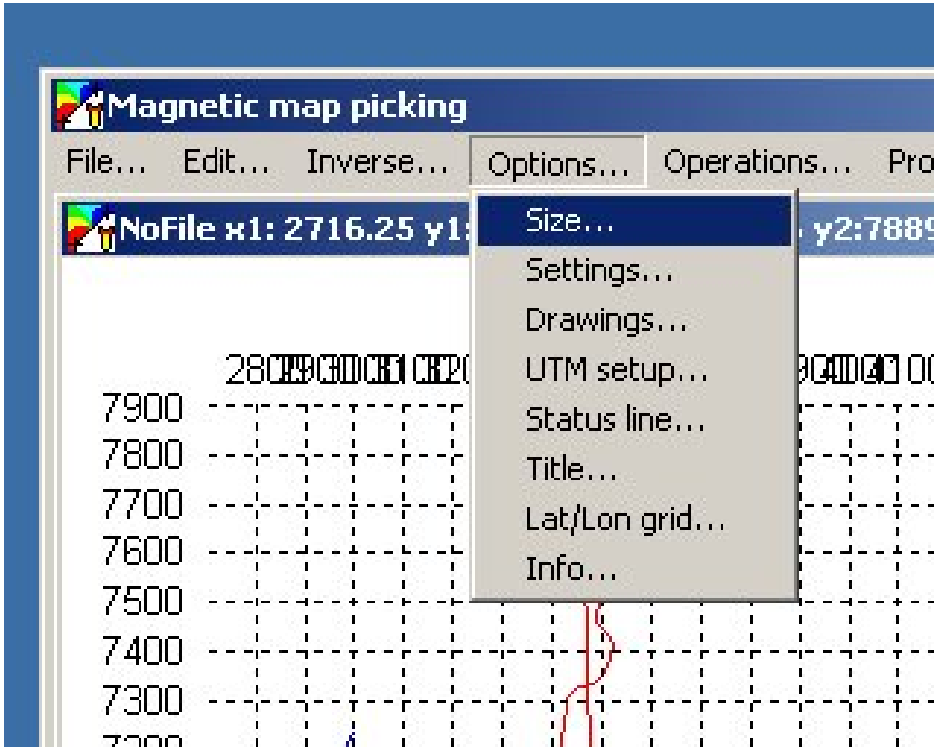
- Select the type of view you want – Map (grid) or Profile (graph plot).
- You can repeat this operation if you need multiple windows.

Position plot is displayed.



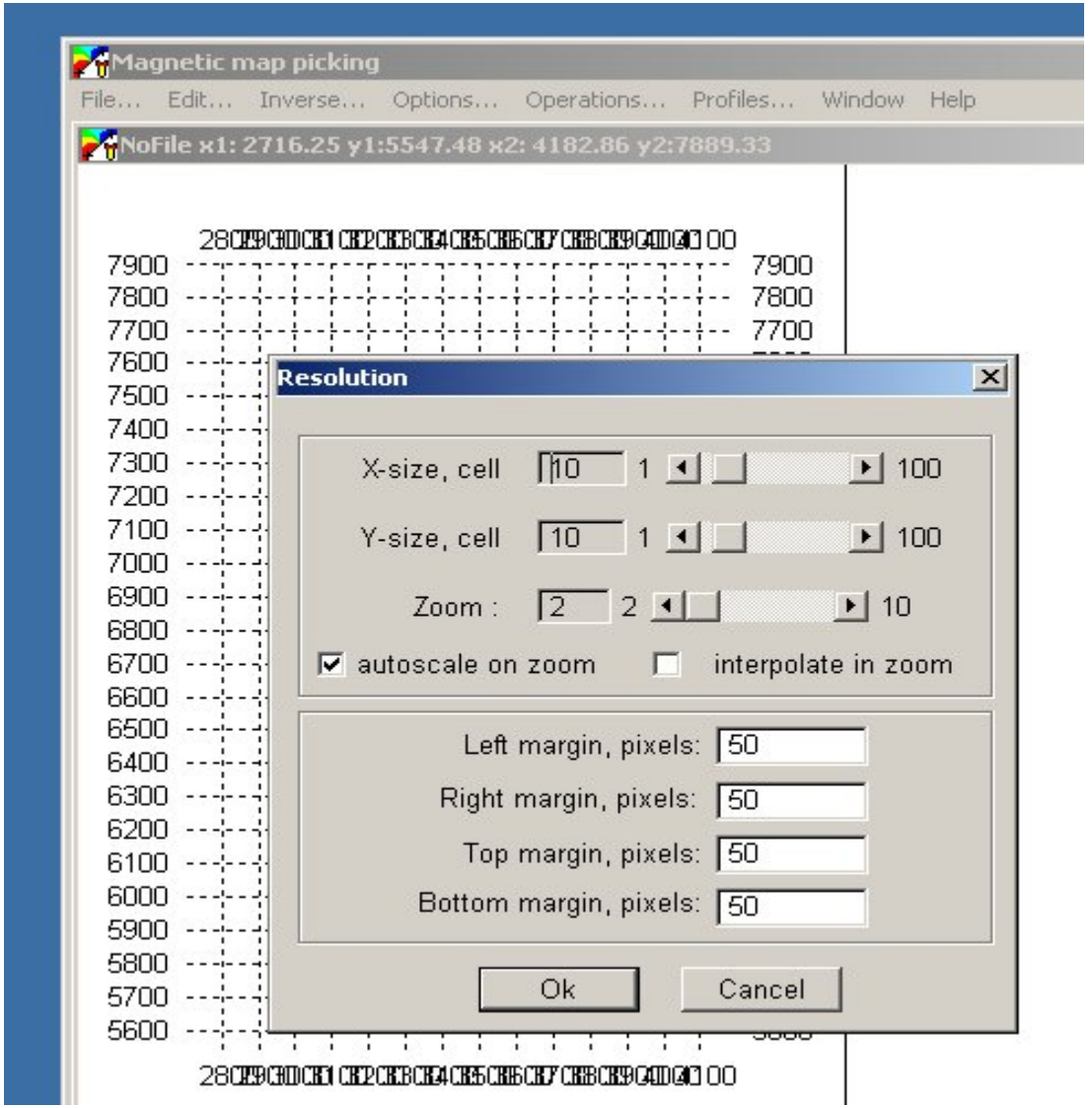
- Here is your position plot. Depending on your last program settings, it might look different.
- Red is the current active profile. You can see when you create profile view window.
- Note that coordinates are short UTM.
- Now let's adjust map parameters.

Call map view size dialog.



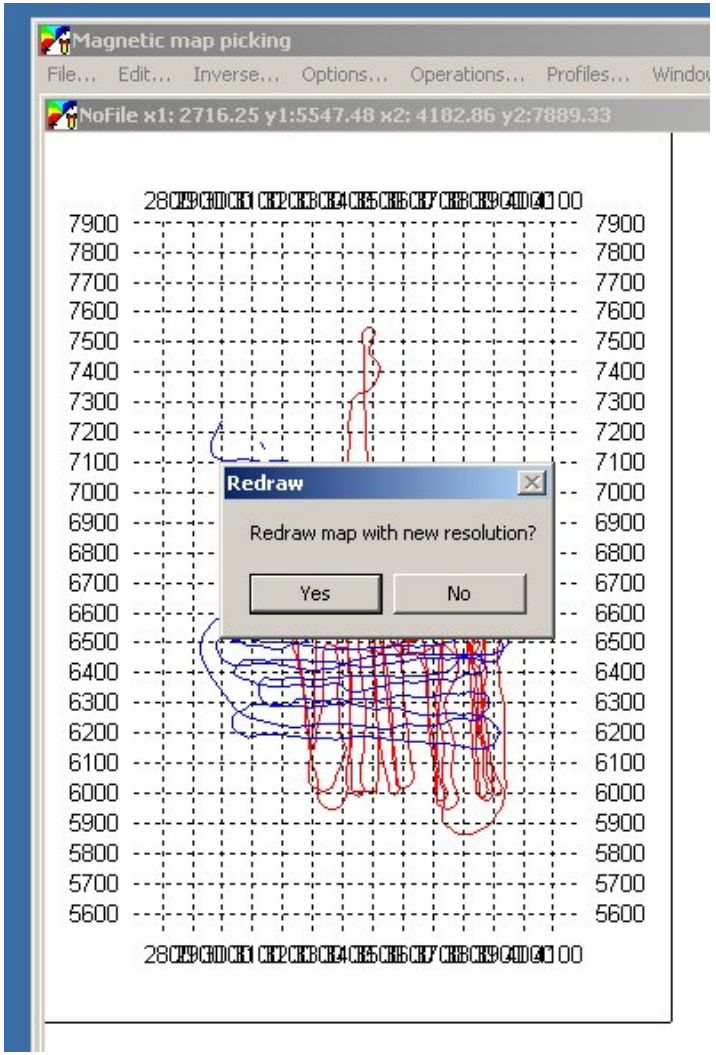
- Select “Options / Size” This allows you to change view size by changing size of virtual cells used to compose the view.

Setting map size



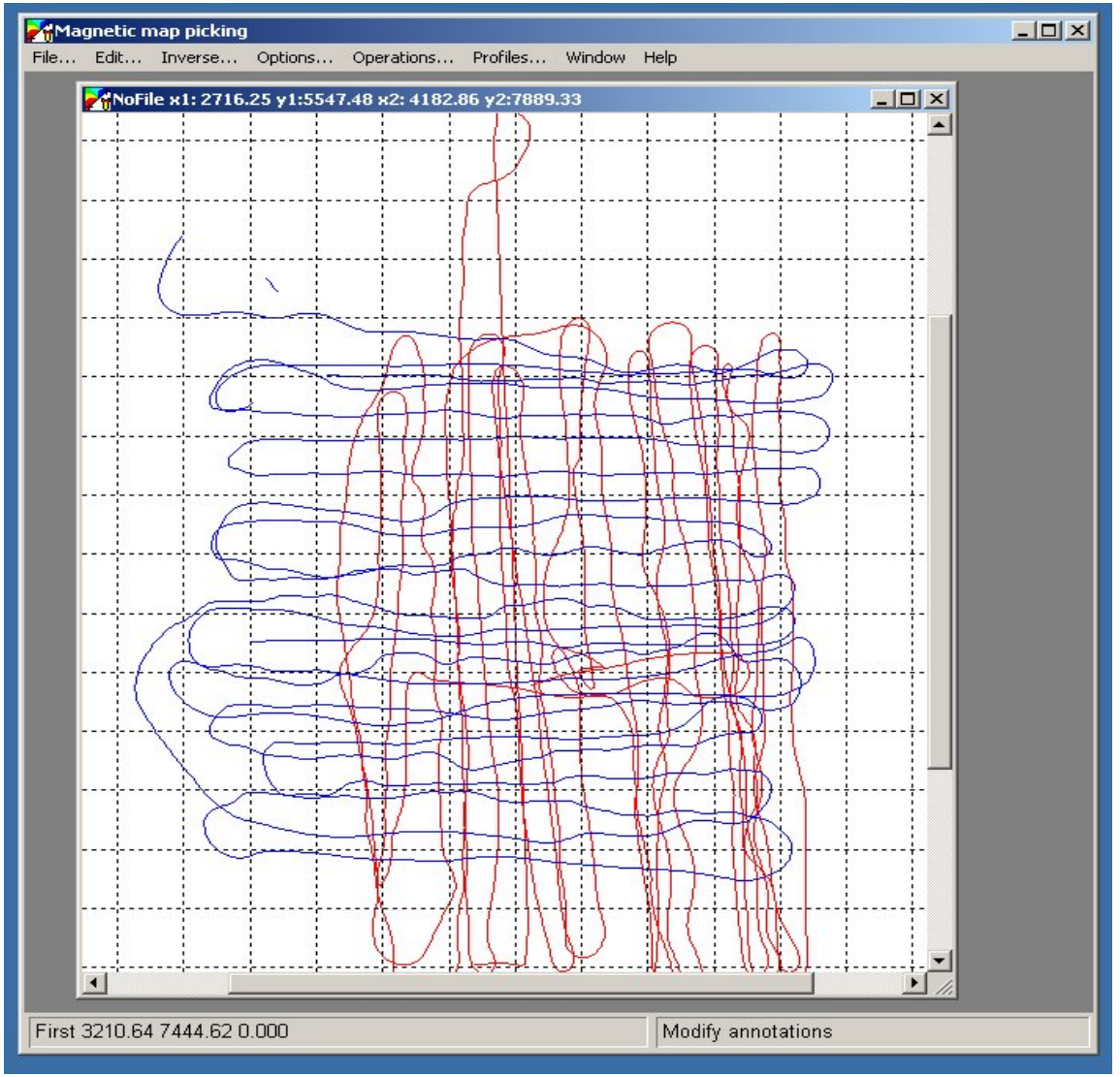
- Increase X, Y cell sizes. Keep both the same to avoid different scales along X and Y.
- Select default zoom level you want to use when you zoom parts of the map.
- Set amount of white space around the map (in pixels)

Redraw the map with new size.



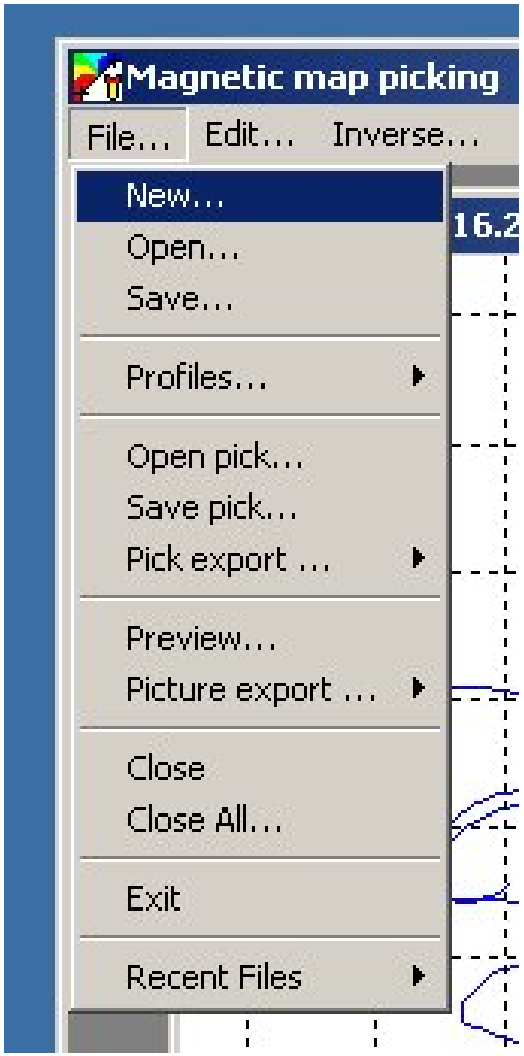
- Just answer “Yes” here to apply your new map view parameters.

Map displayed with new size.



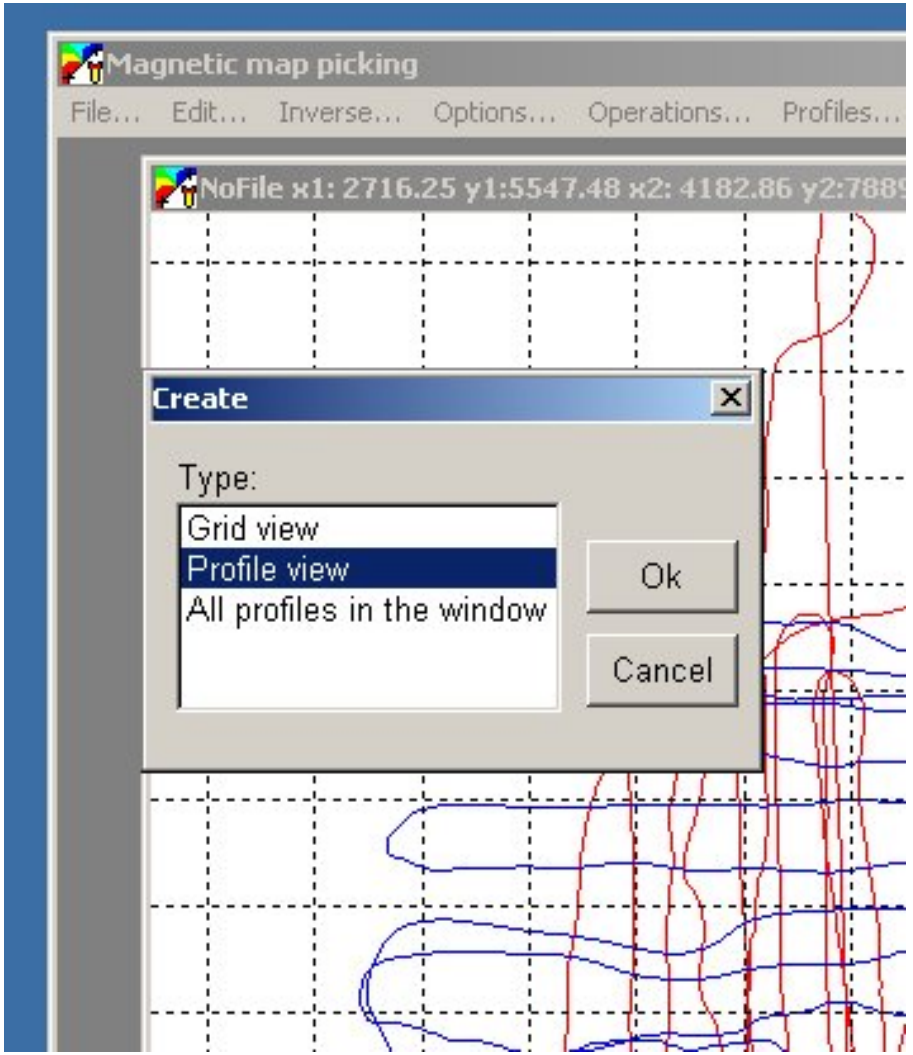
- Map now is bigger. Use scroll bars to access different parts of the map.
- Dragging mouse with while holding middle button scrolls the map as well.

Now create profile view.



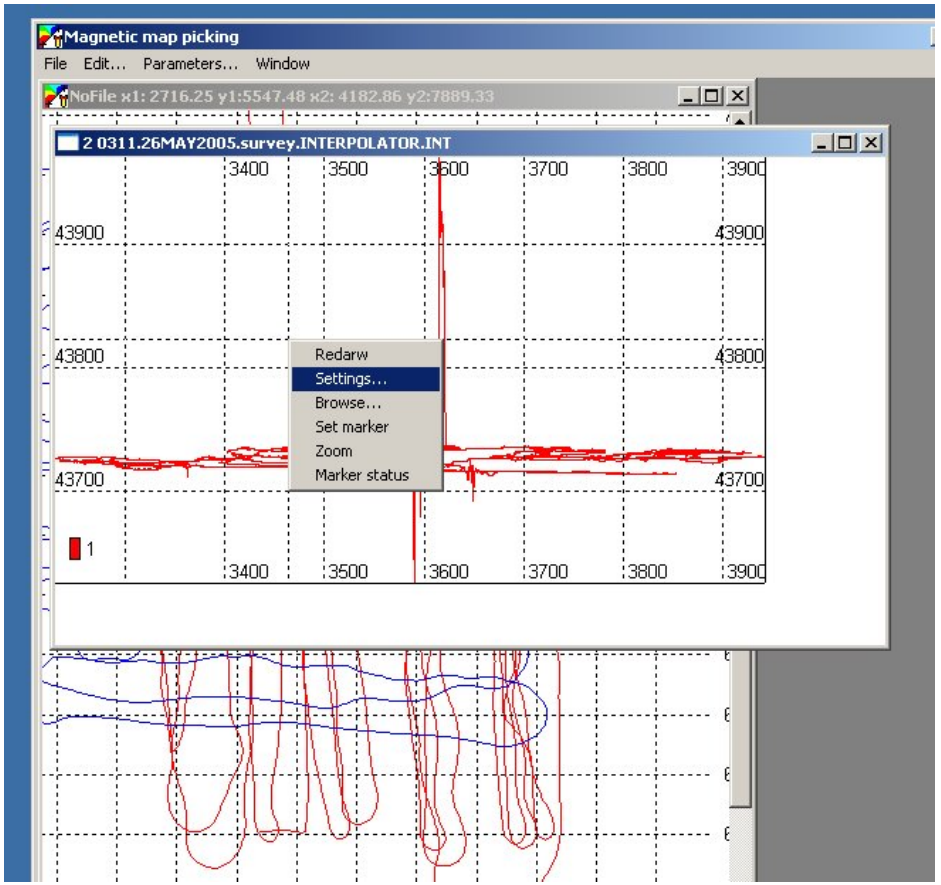
- Now let's create profile view window. Select “File / New” and then select “Profile view”

Creating new profile window.



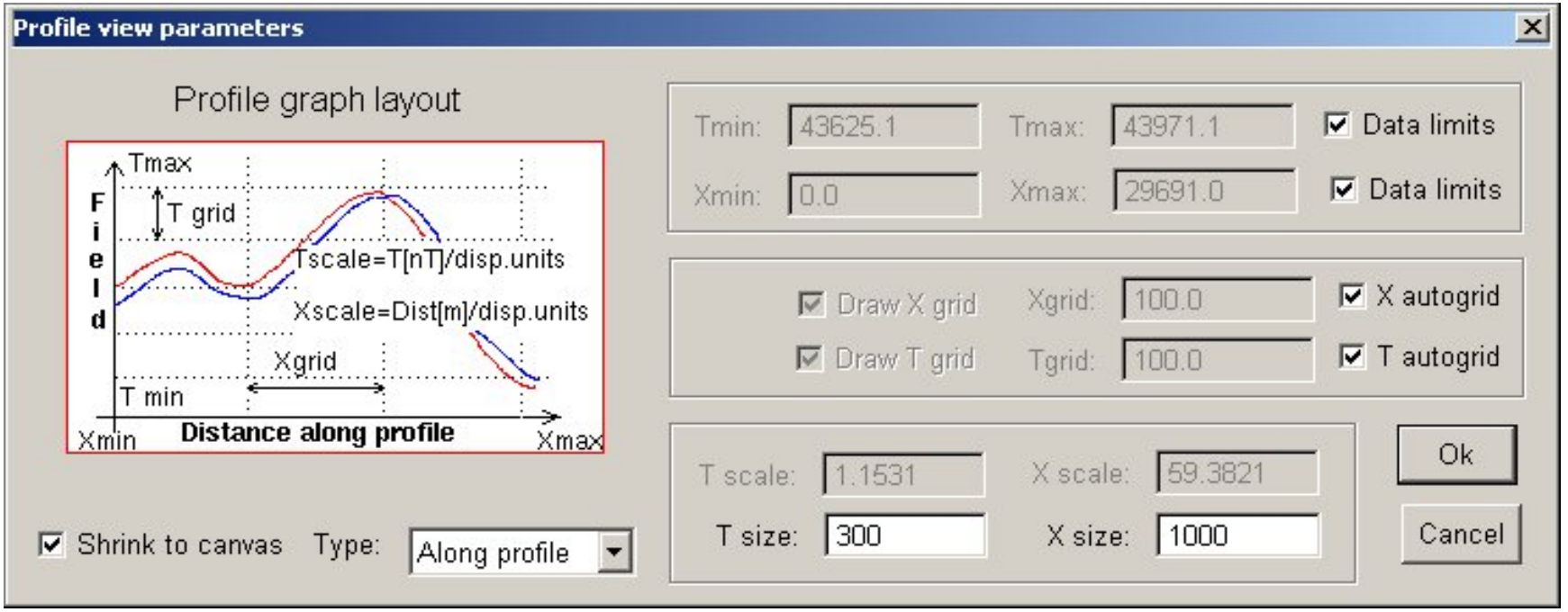
- Selecting “Profile view” creates windows where you can see one profile at a time. This profile is highlighted in red on the map.
- Selecting “All profiles in the window” creates profile view where you can see all profiles on the map at the same time. This is typically used for profile based inversion.

New profile view is created.



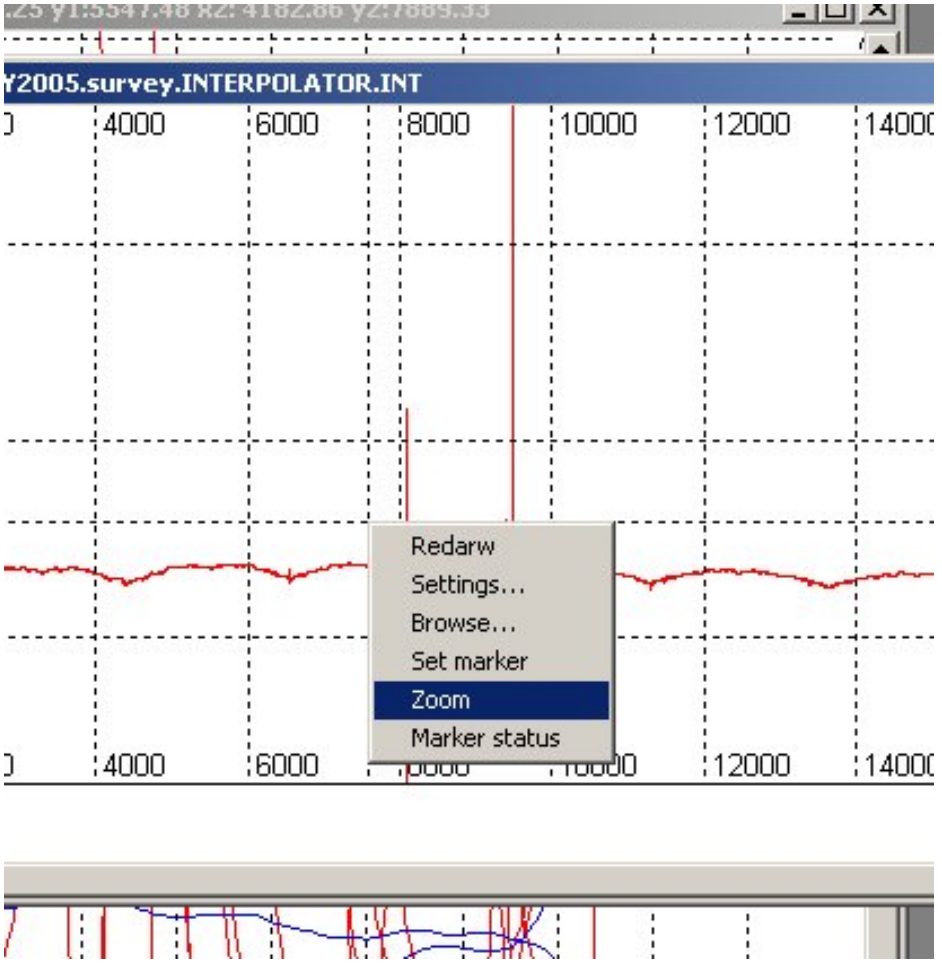
- Here is new Profile Window display.
- By default, graph is displayed as function of X coordinate.
- To adjust view settings, right click mouse and select “Settings” or use “Edit / Settings” from the menu bar.

Selecting graph parameters



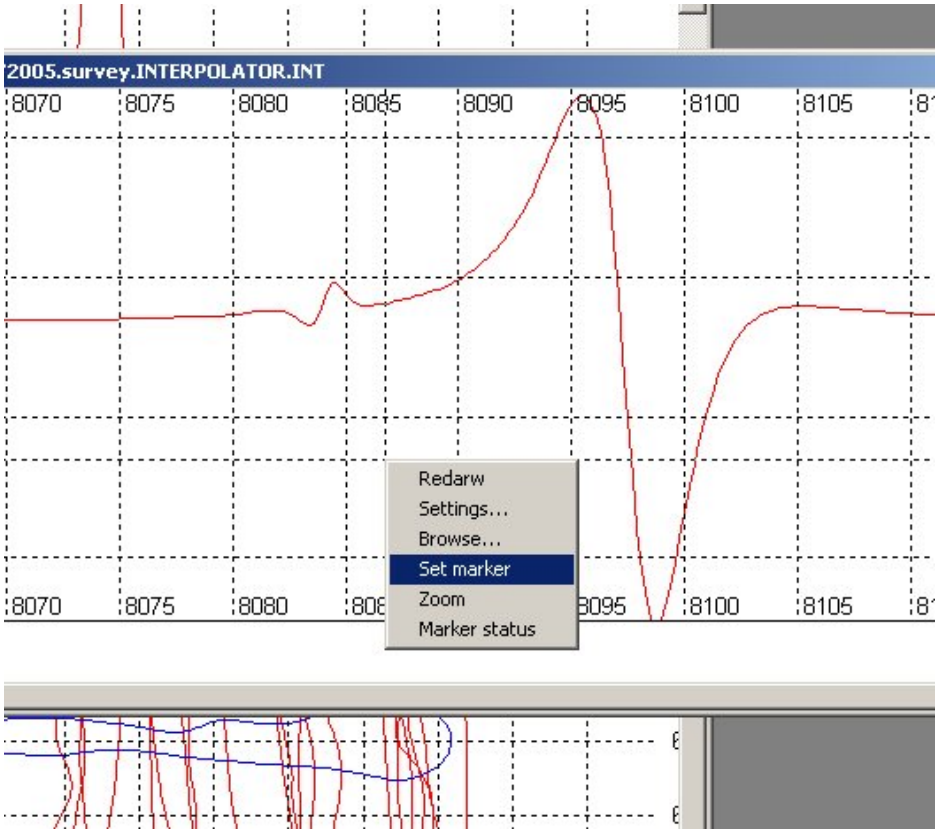
- Select what horizontal axis should be: X, Y, distance along profile or time
- Select canvas size in pixels for vertical (T-size) and horizontal (X size:) dimensions.

Zooming in profile data.



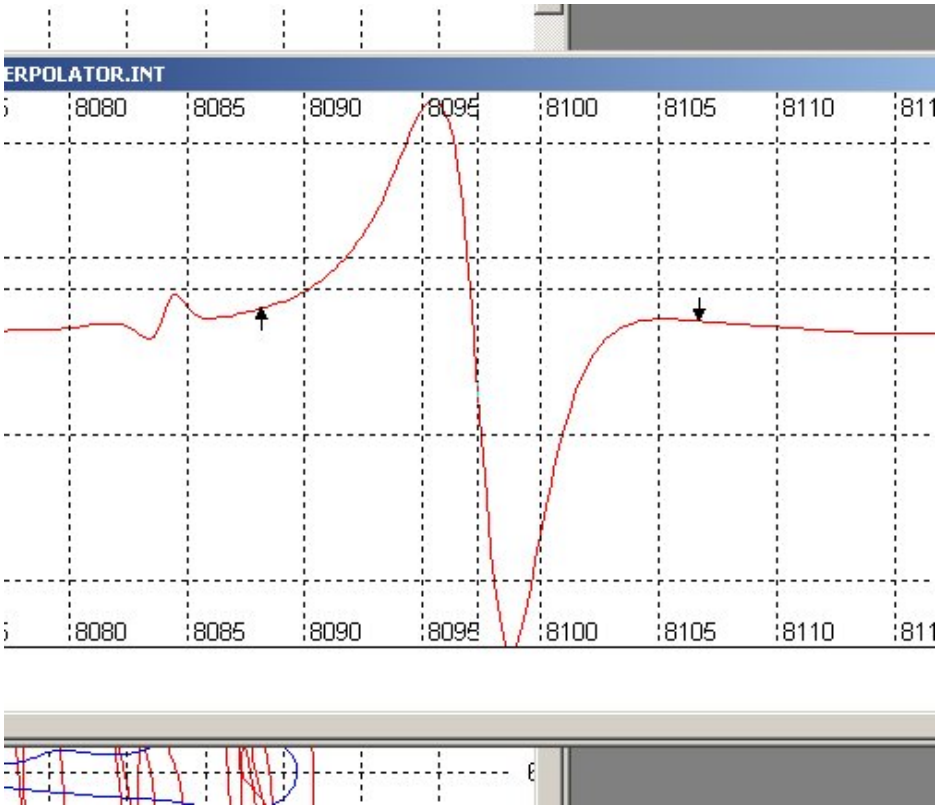
- Use context or main menu and select “Zoom” note how mouse cursor changes its shape.
- Press left mouse and drag to select area of interest. Release when complete.
- Program will present data in the zoomed window only.
- To restore original scale, select “Redraw”

Setting markers.



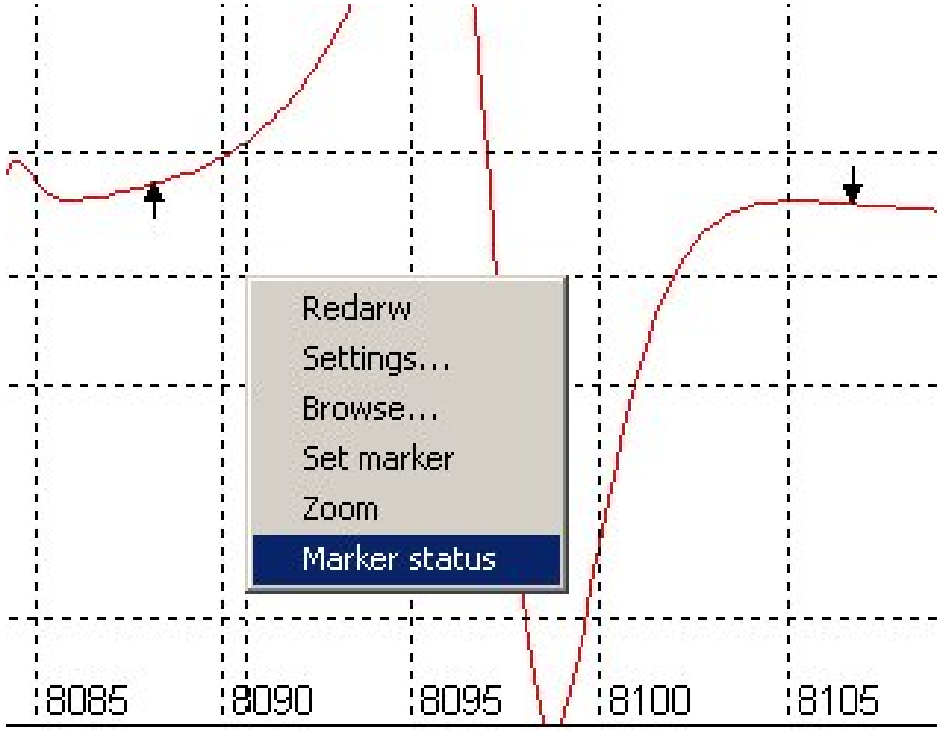
- Here a portion of the zoomed field is presented. Use context menu and select “Set Marker” Note mouse cursor changes.
- There are only two possible markers in the program: Up and Down arrows.
- When you set markers again, previous markers are erased.

Two markers show on the plot.



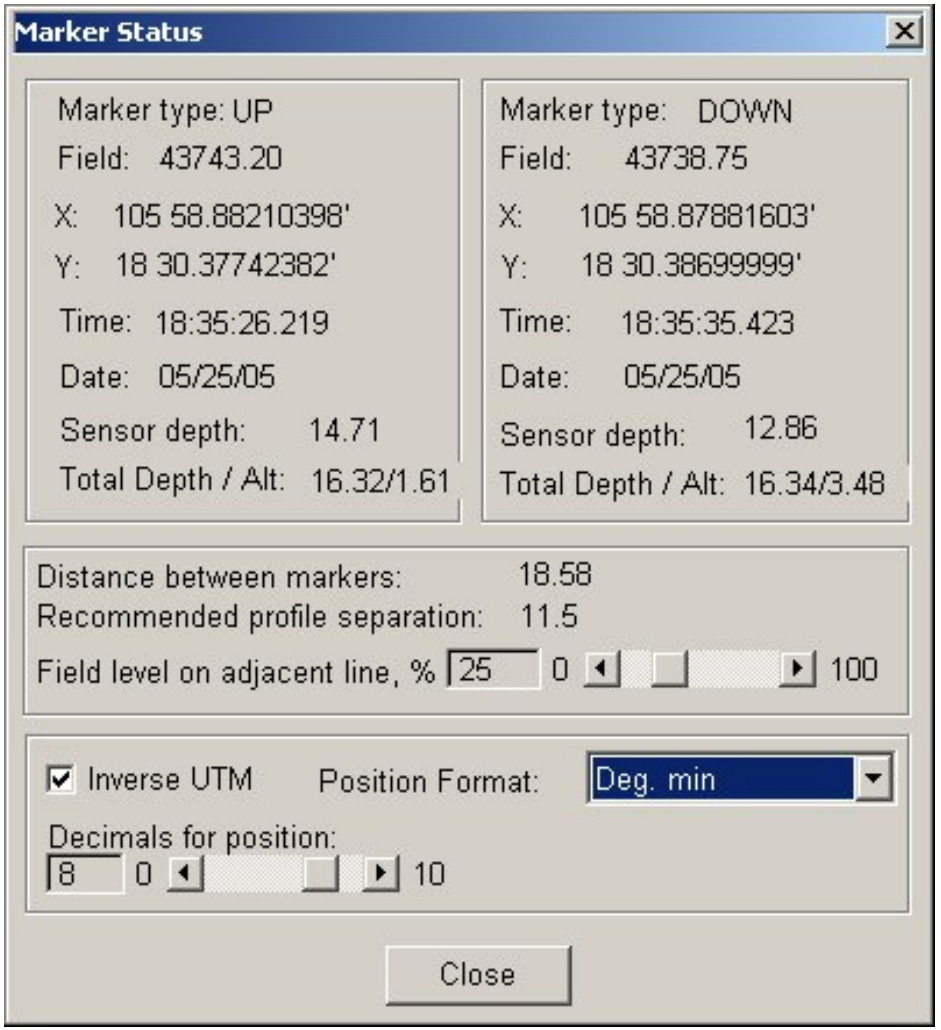
- Here you can see two markers on the plot. You only can set marker on the graph itself and only at the actual location of the data sample.
- If now you would try to set marker again, “Up” arrow disappears and moves into the new place you selected.
- The same happens with 'Down” arrow when you try to set marker again.

Getting information on markers.



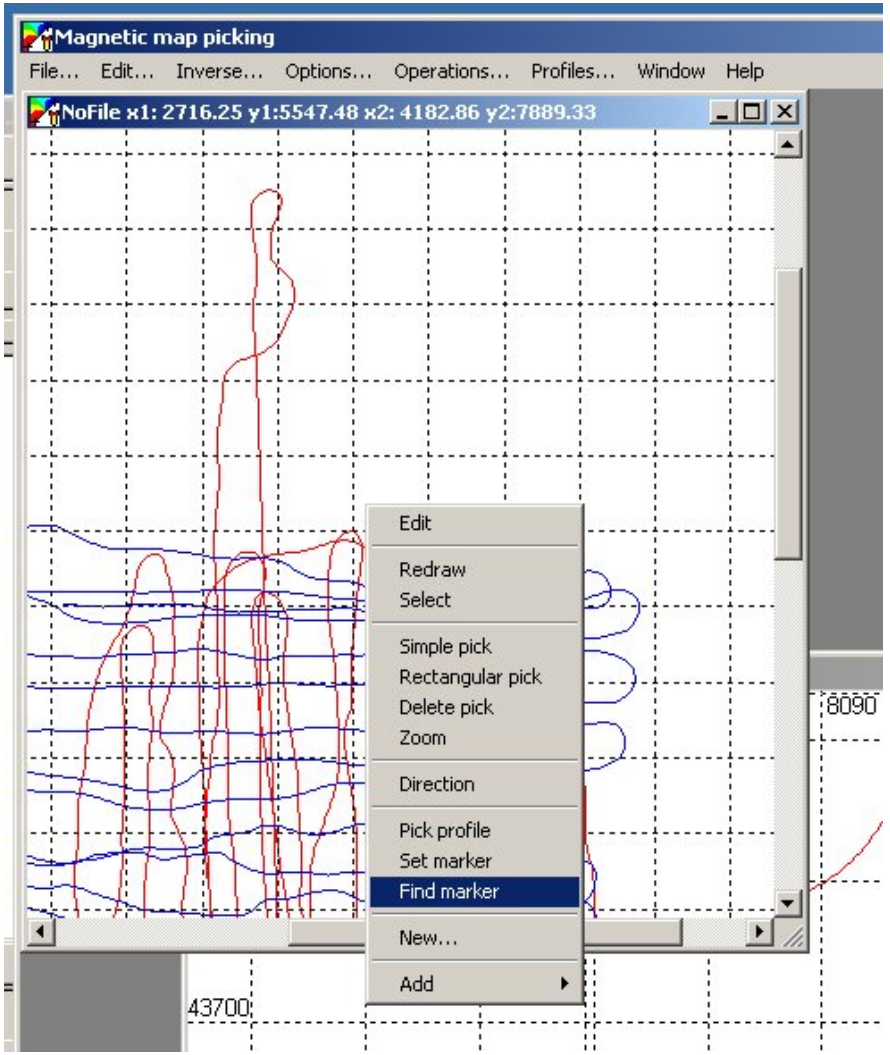
- You can obtain information on data at marker's location by selecting “Marker status” from context menu.

Marker status information



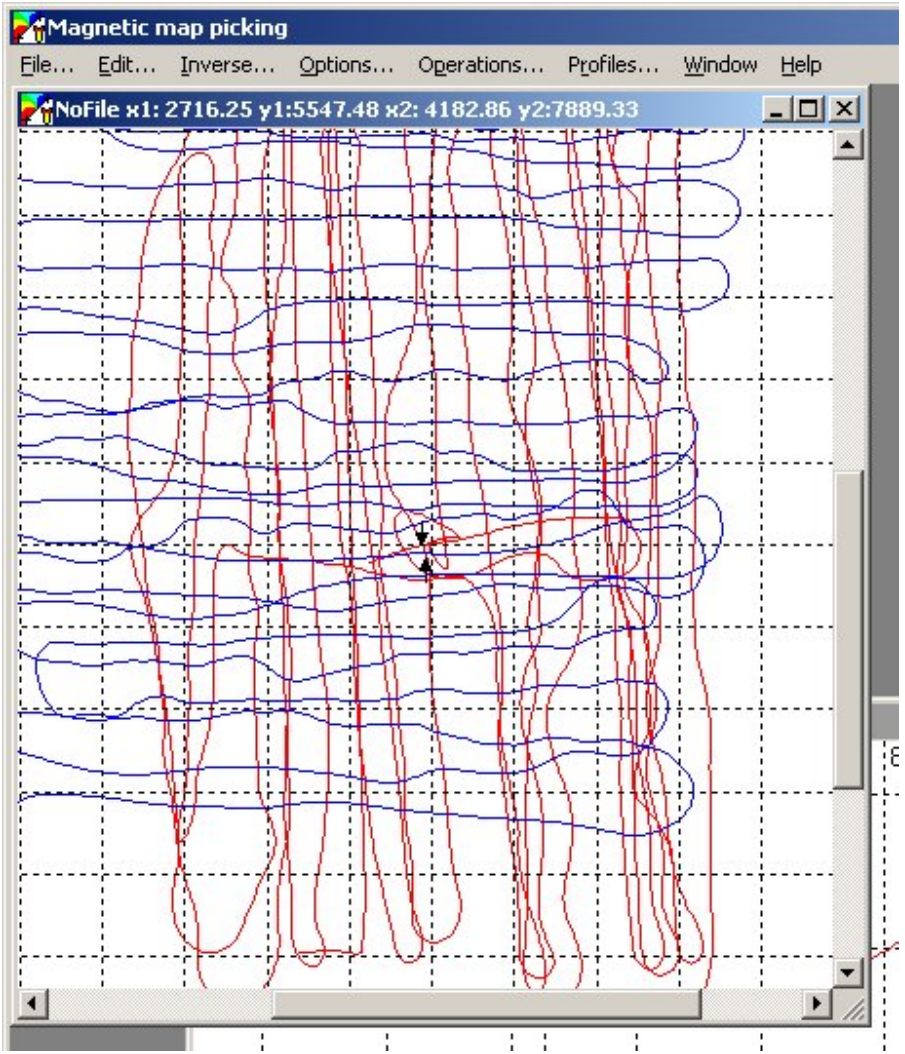
- Here is the dialog which shows information on both markers.
- You can adjust position format or display Lat/Lon.
- You can estimate recommended profile separation if markers are set at half of amplitude of magnetic anomaly of interest.

Finding marker on the map.



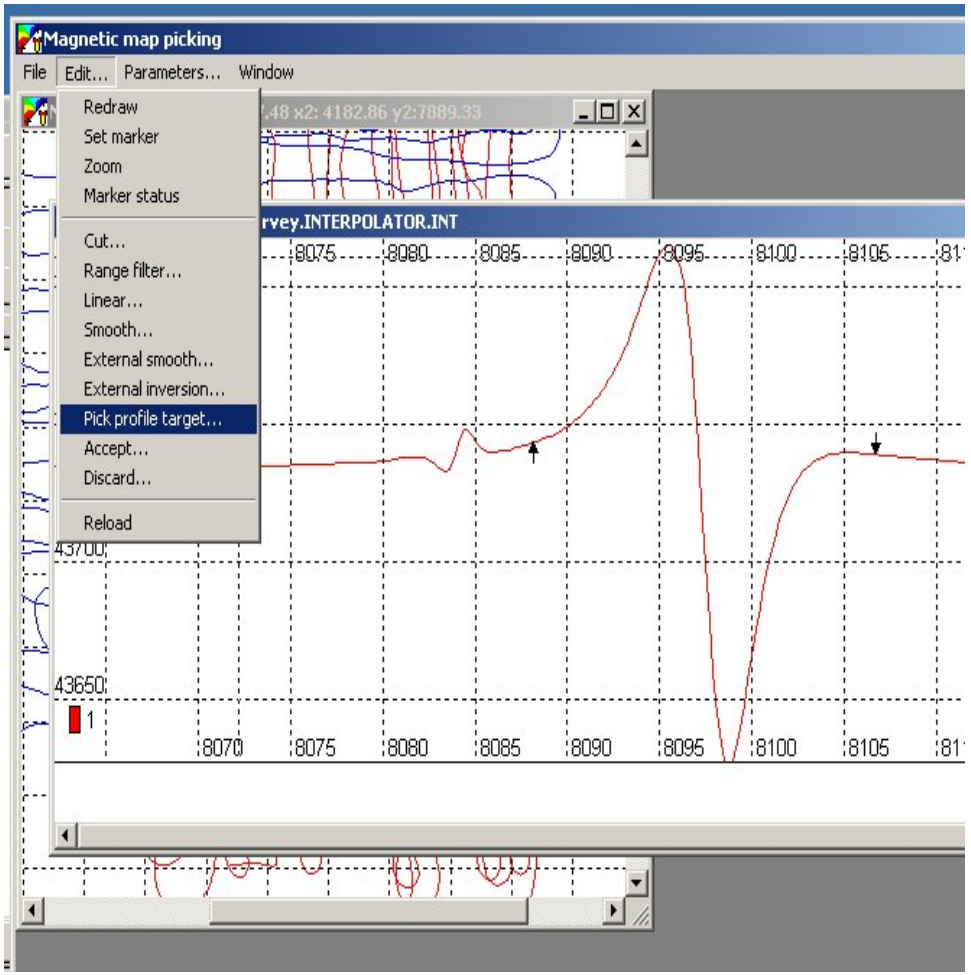
- Now activate map window again. If you don't see your markers, select “Find marker” from context menu.
- This will scroll map view so UP marker is in the middle of the window.

Marker in the middle of the map.



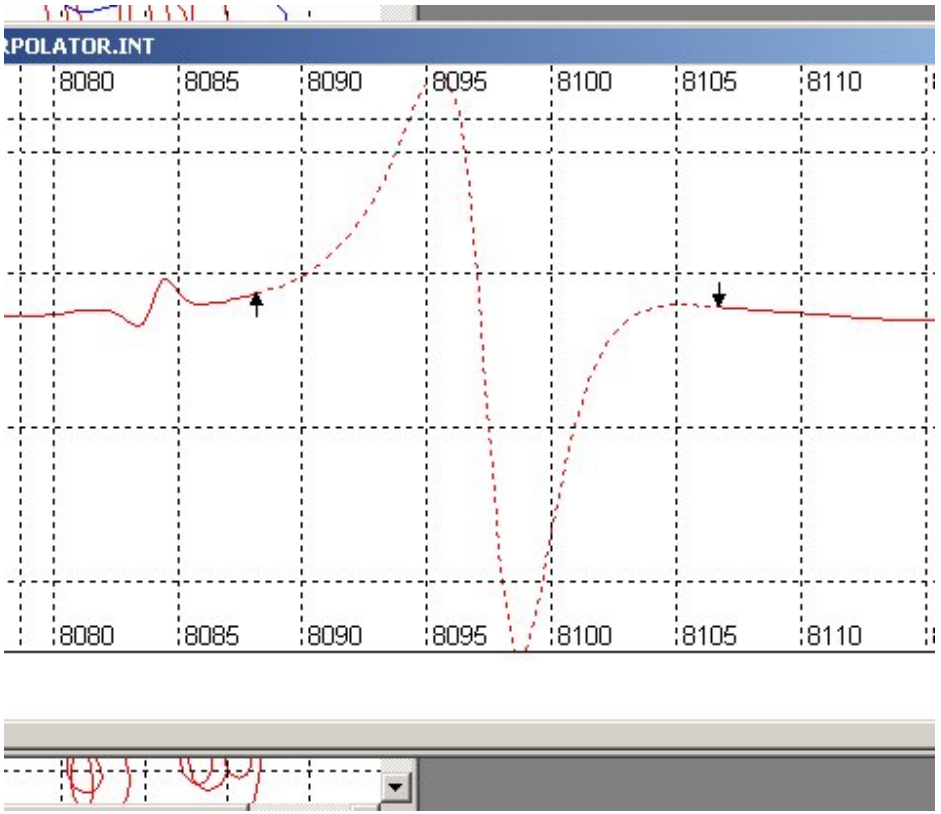
- Here you can see how program scrolled map window so you can easily find the marker.

Adding marker location to the list



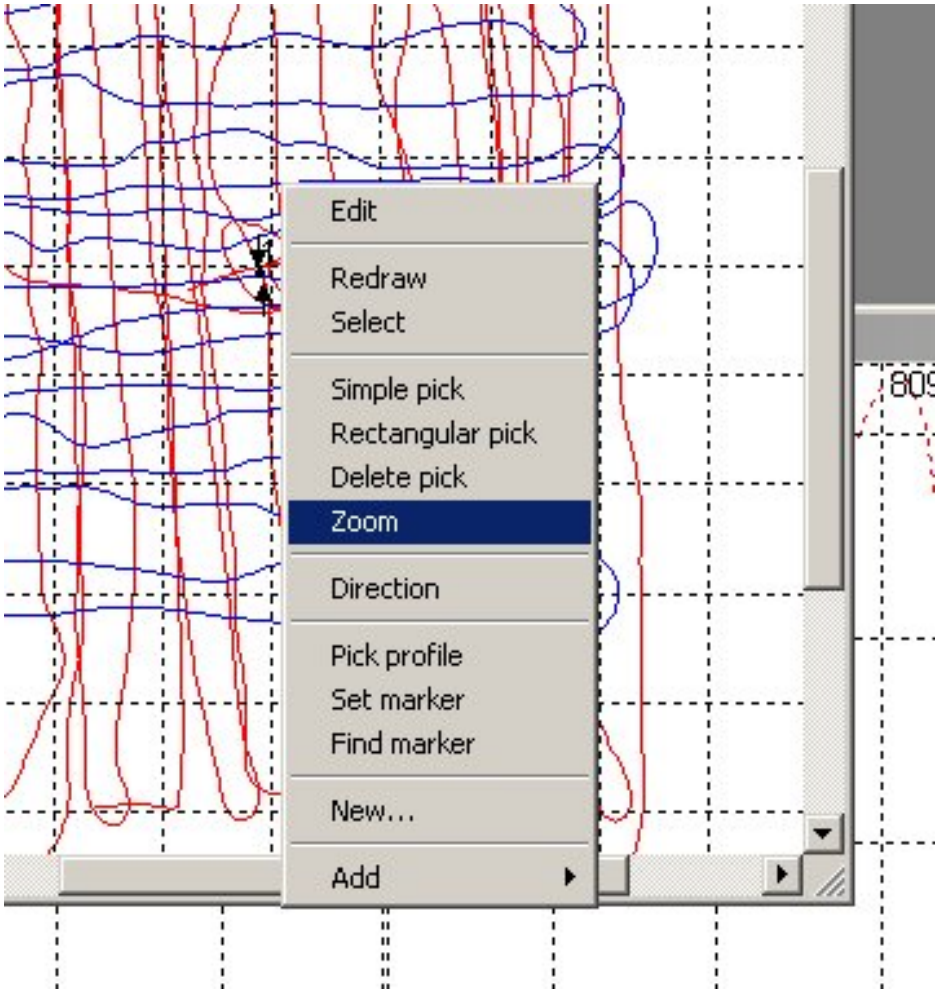
- You can convert your markers locations into the target file you wish to save.
- Activate profile view and select “Pick Profile Target” or press Ctrl Z”.
- Program computes middle point between markers and uses it as target location.
- This is very primitive but useful way of data interpretation.

Picking target from profile.



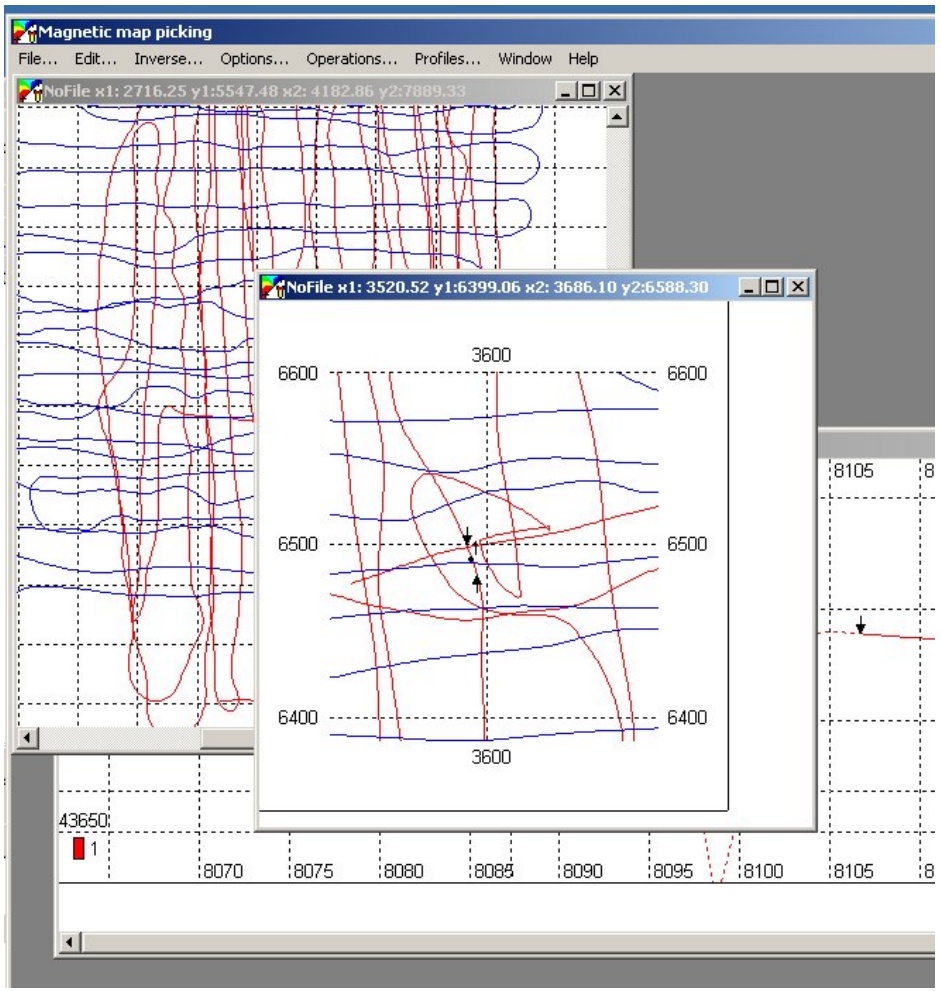
- After target is picked, field changes into dashed line between markers.
- Note that MagPick does not display previously picked targets on the profile.

See target location on the map.



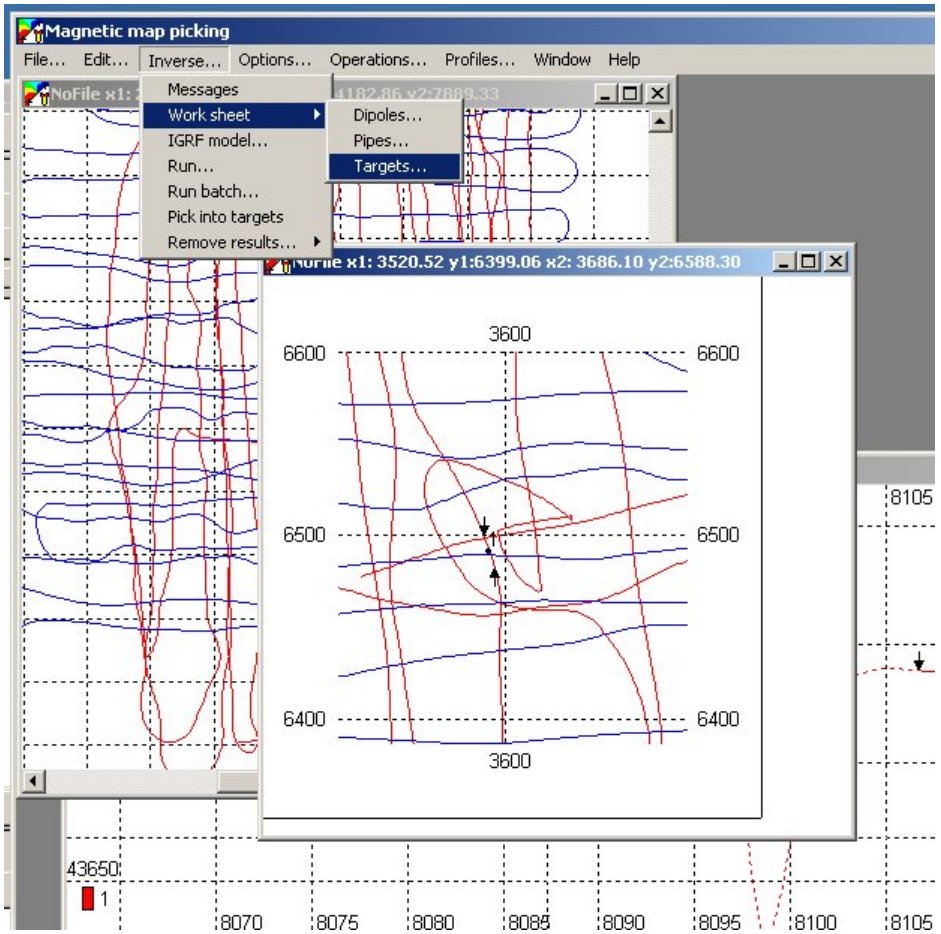
- Go to the map window and find the marker. Select “Zoom” from context menu.
- Note that mouse cursor changes its shape. Hold left button and drag a square around area of interest.
- Release the button. New map window will pop up and show zoomed area.

View part of the map zoomed



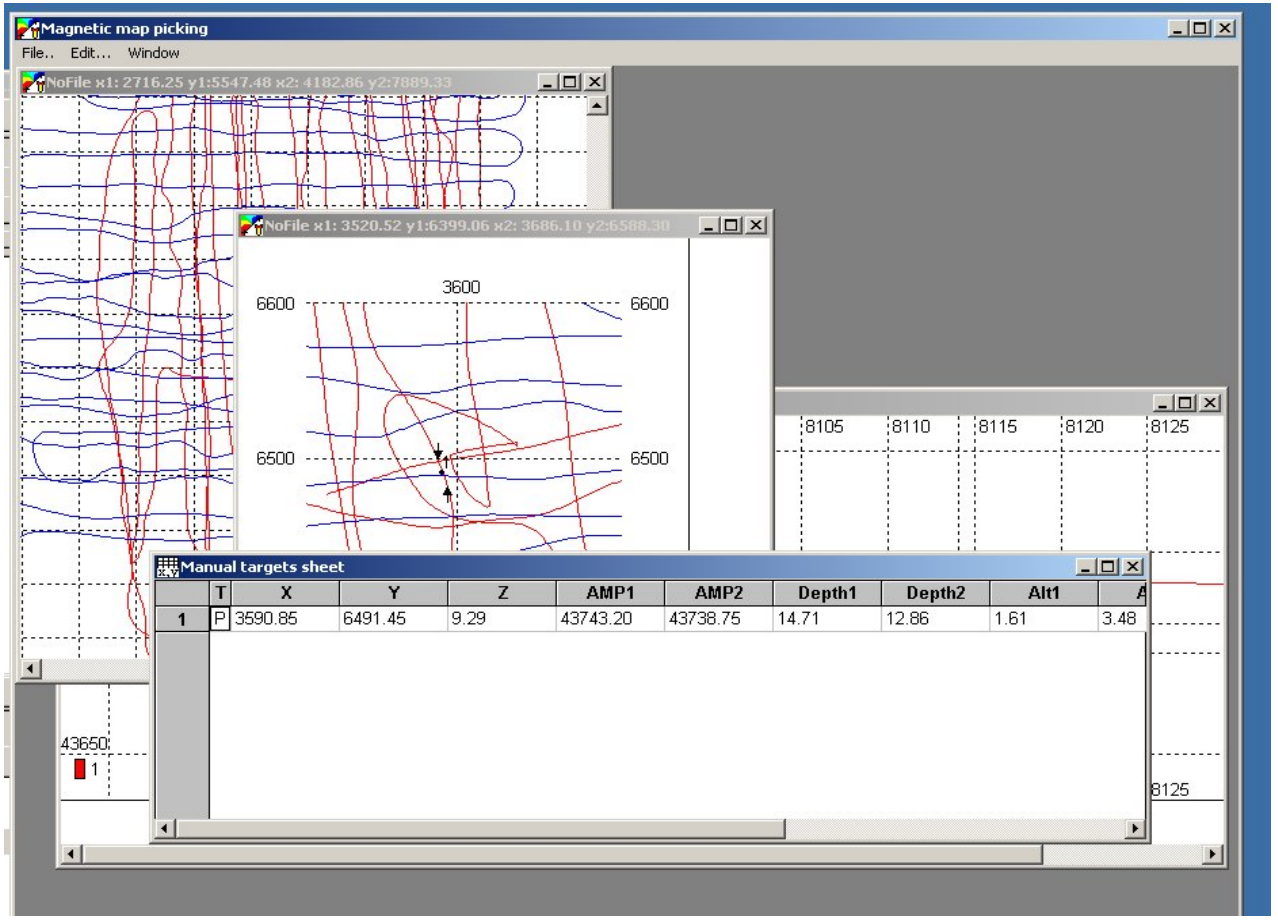
- Here you can see part of you map zoomed in a separate window.
- Note the “Up” and “Down” markers on the profile line.
- Note that target location is marked with a dot and number.
- You can close this window when you don't need to view it anymore.

Presenting targets in work sheet.



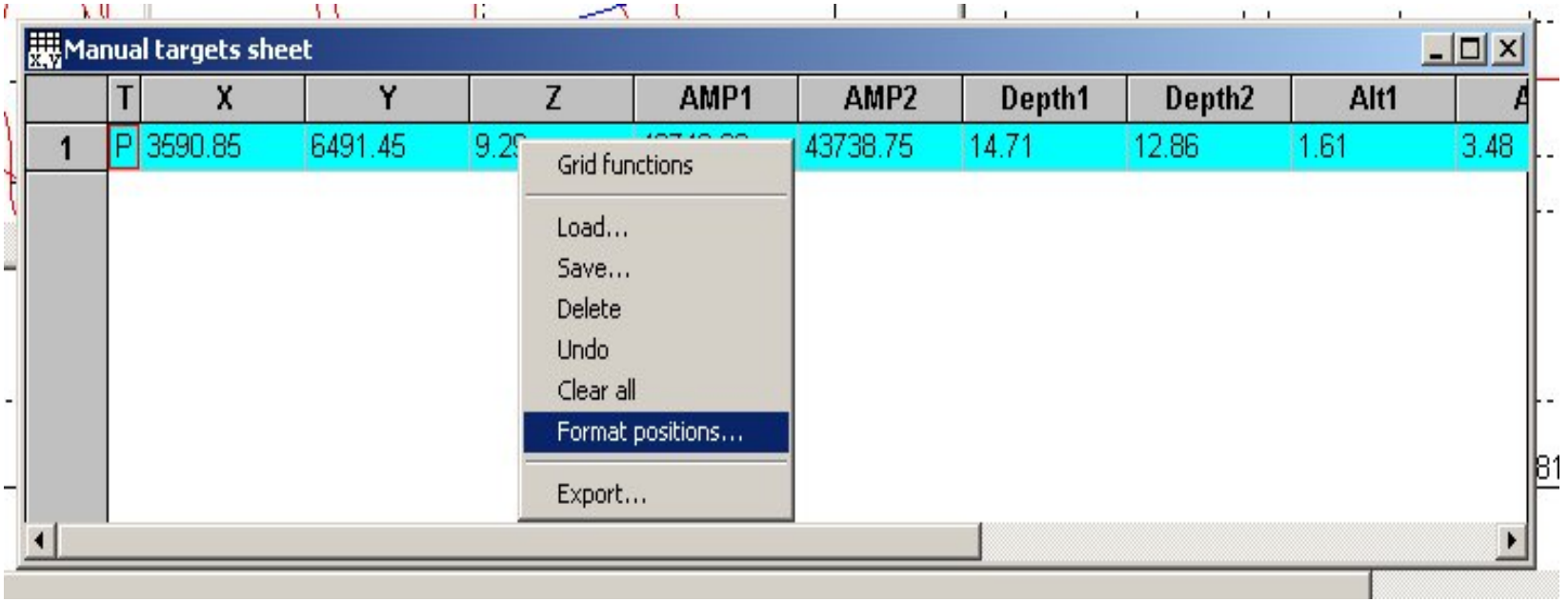
- From any of the map windows, go to the “Inverse / Work sheet / Targets” menu. This calls worksheet window with hand picked targets (as opposed to the targets obtained by inversion)

Work sheet on the screen.



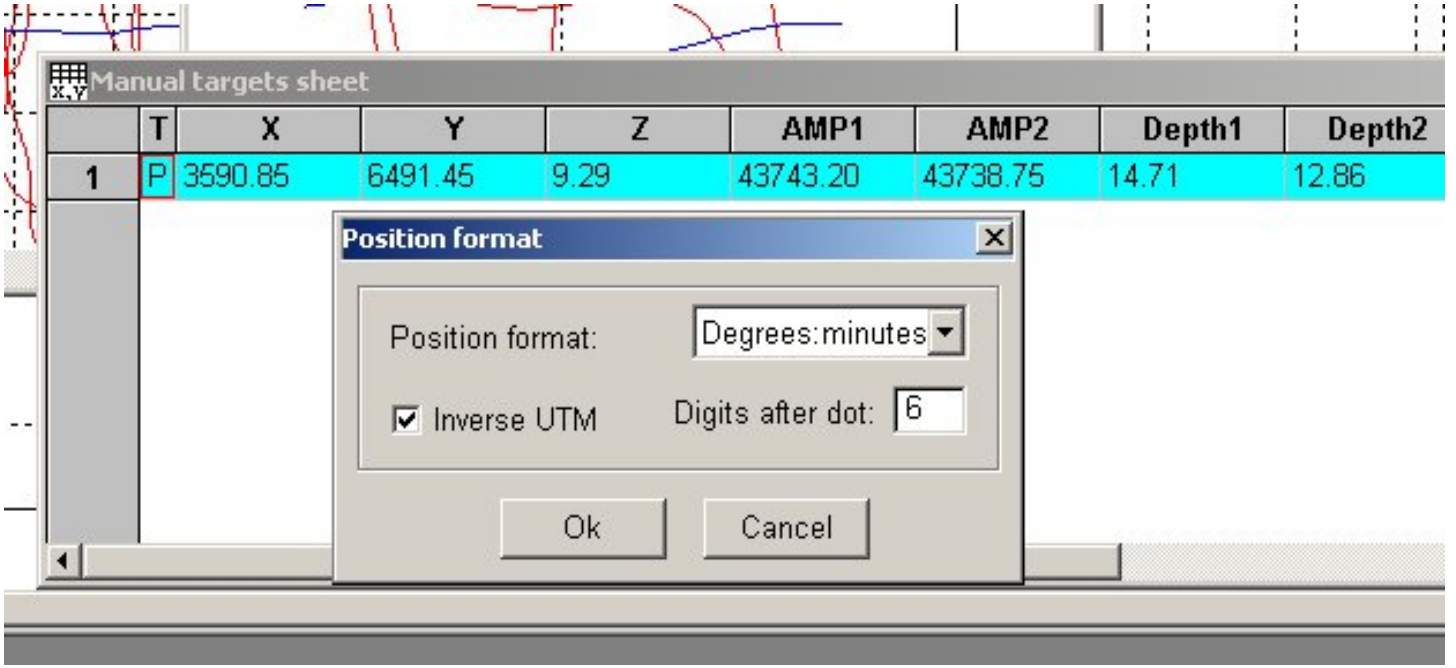
- Here is the work sheet window. It shows both locations and parameters of the targets.

Formating work sheet positions.



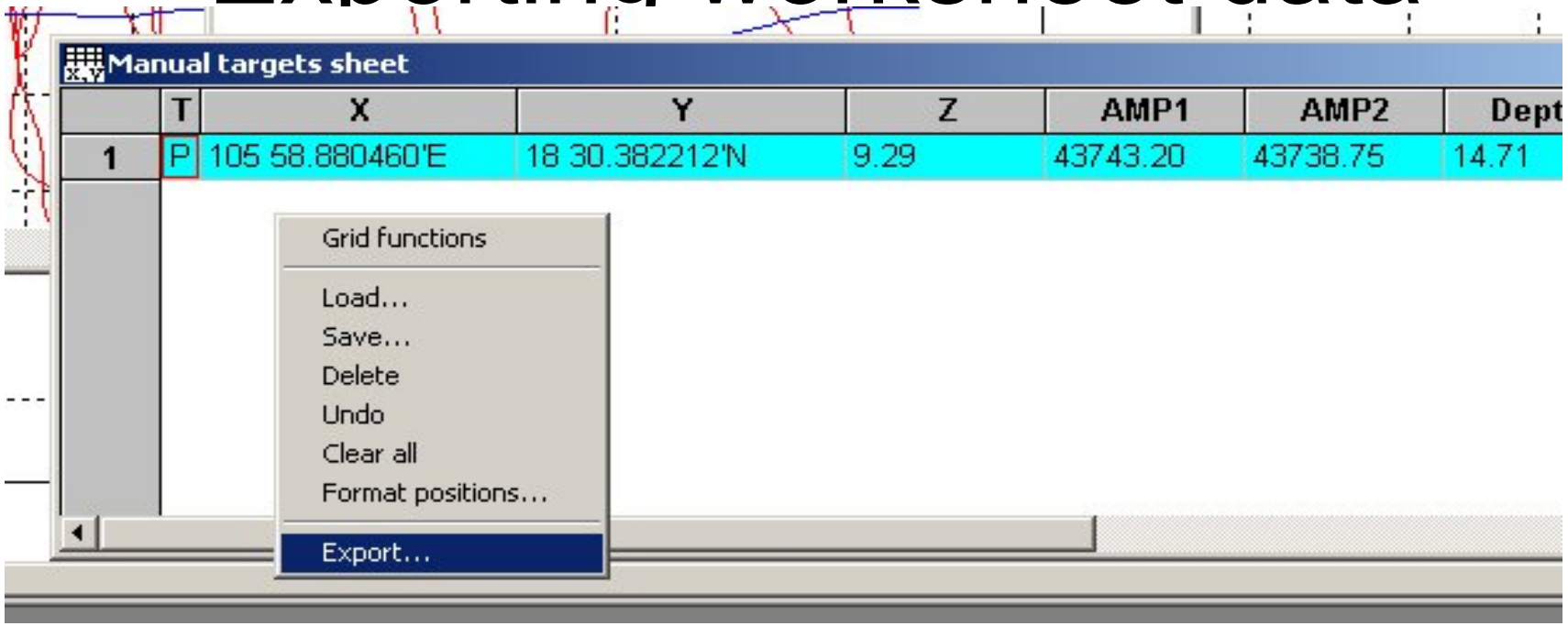
- Use context menu (right mouse click) to manipulate worksheet.
- You can format positions to shot UTM or Lat/Lon degrees and minutes.

Formatting work sheet positions



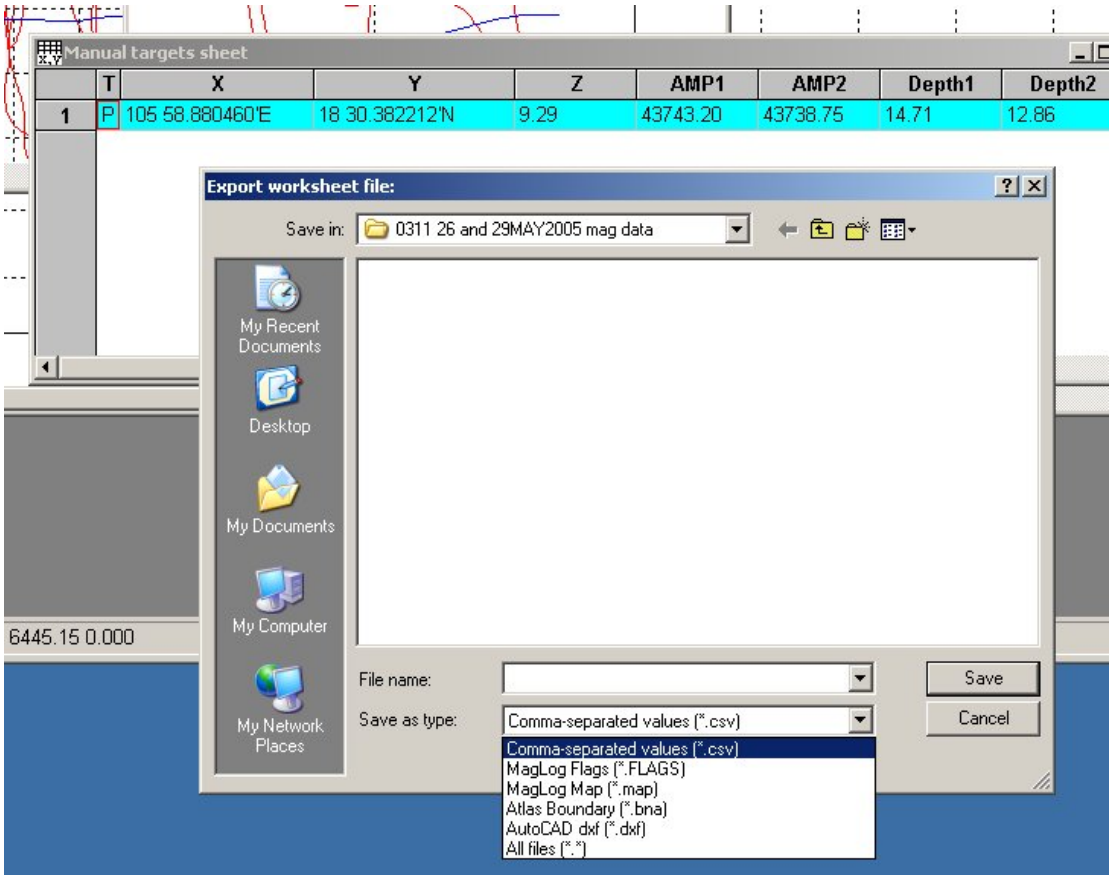
- Here is dialog to format work sheet positions.
- Check “Inverse UTM” if you wish to see Lat/Lon
- Select “Degrees and minutes”
- Enter number of decimal places you wish to have for minutes.

Exporting worksheet data



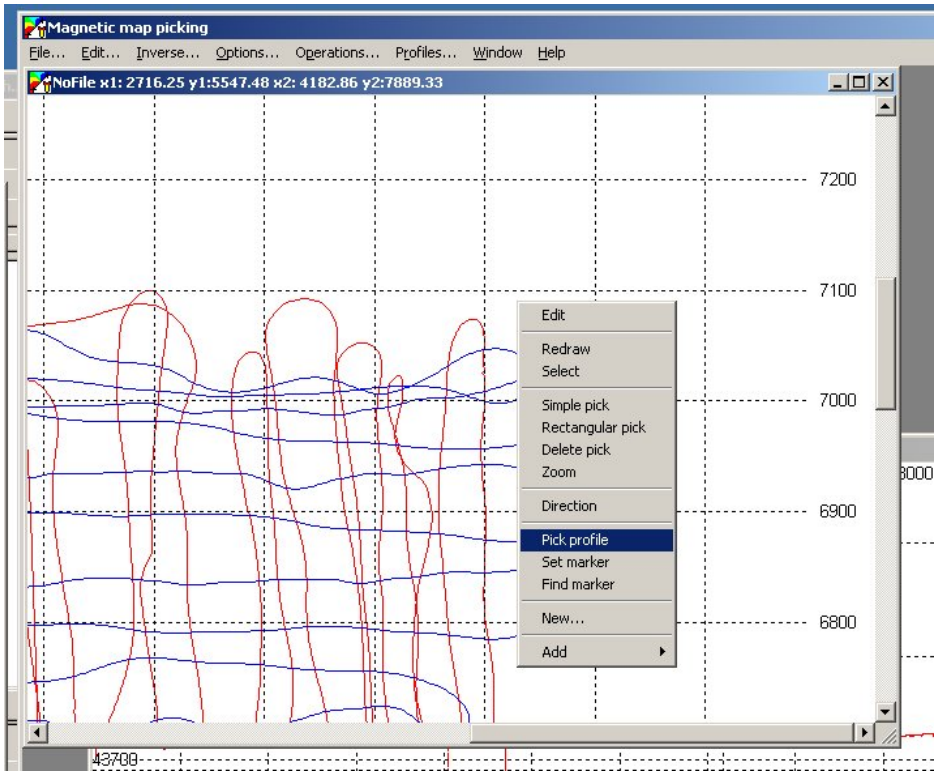
- Use context menu to access export functions.
- Work sheet can be exported into CSV (comma separated values) to view in Excel Spread sheet.
- Work sheet also can be exported to be used as flags or survey plan in MagLog software.

Select worksheet export format



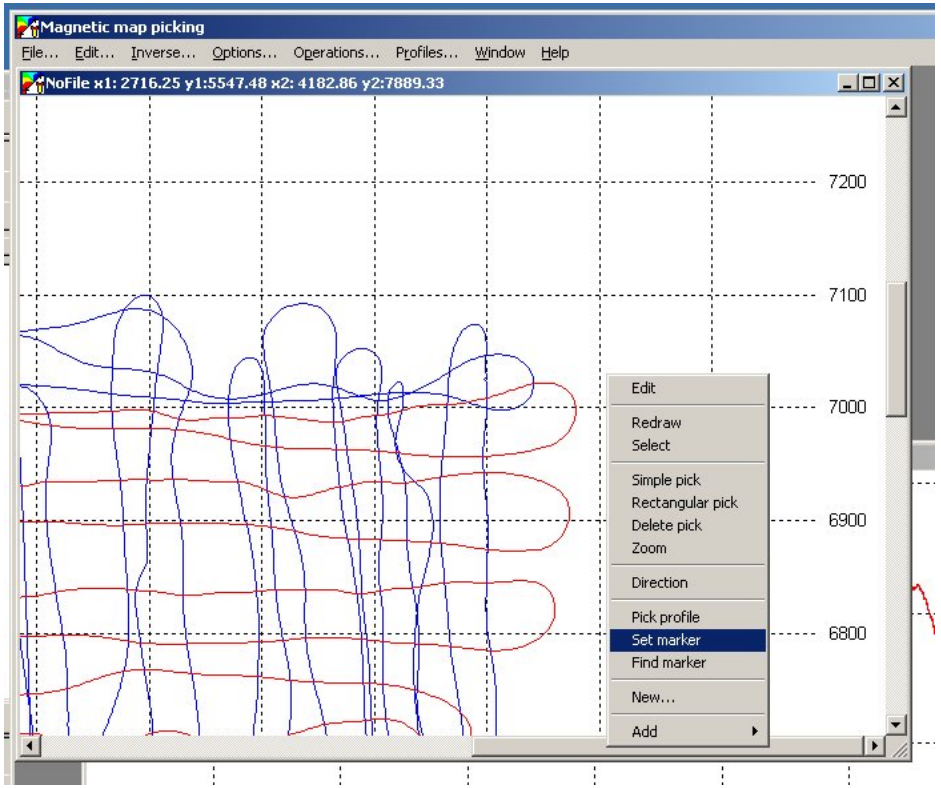
- Select export format by selecting file name extension in this dialog.
- If CSV is selected, Excel is launched automatically upon saving of the file (see below).

Cutting profiles



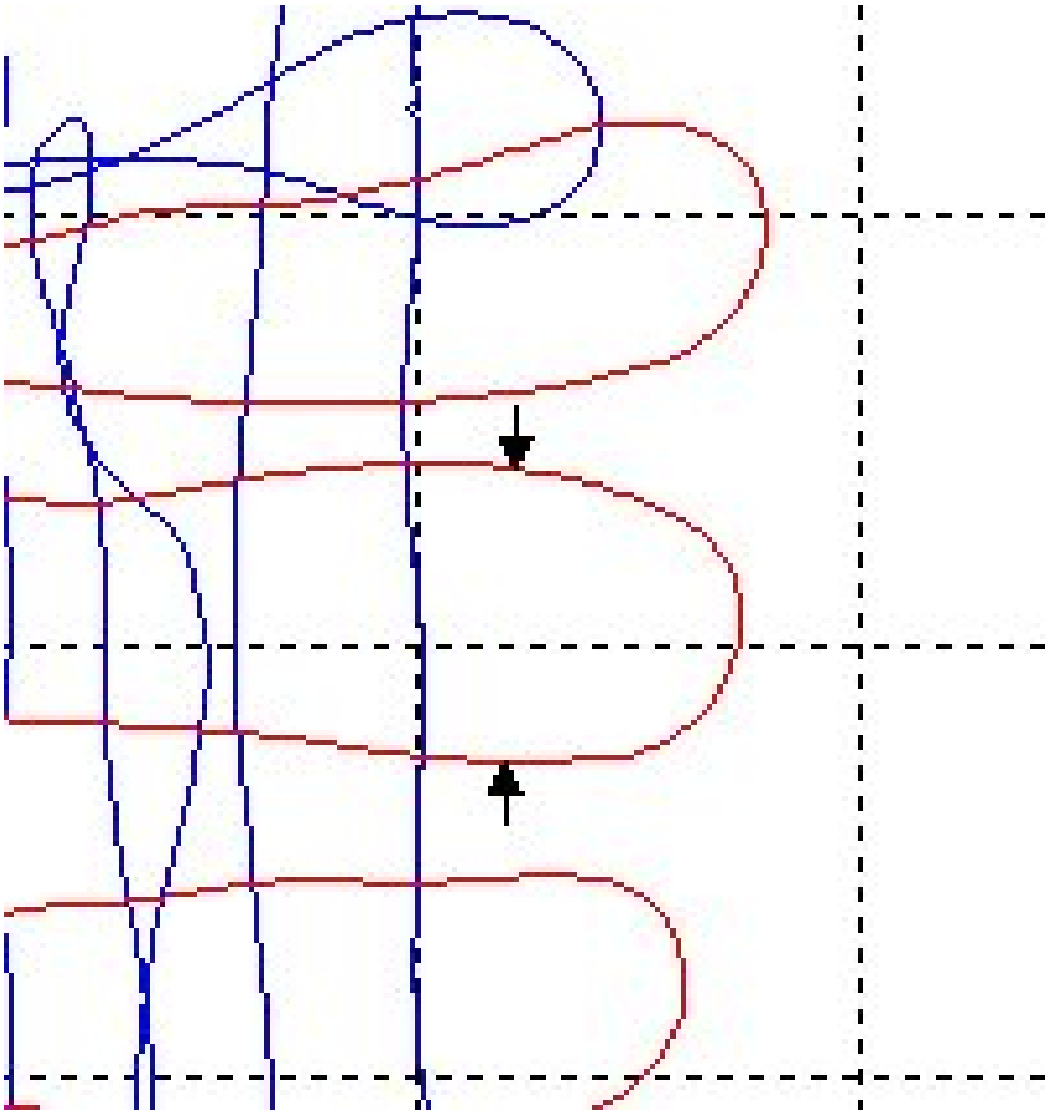
- Here we demonstrate how to cut turns using MagPick. The Profile view window should also already be open.
- Select “Pick profile” from context menu. Note mouse cursor shape.
- Pick profile of interest.
- Select “Set marker” from context menu.
- Set markers where you want to cut.

Select “Set marker”

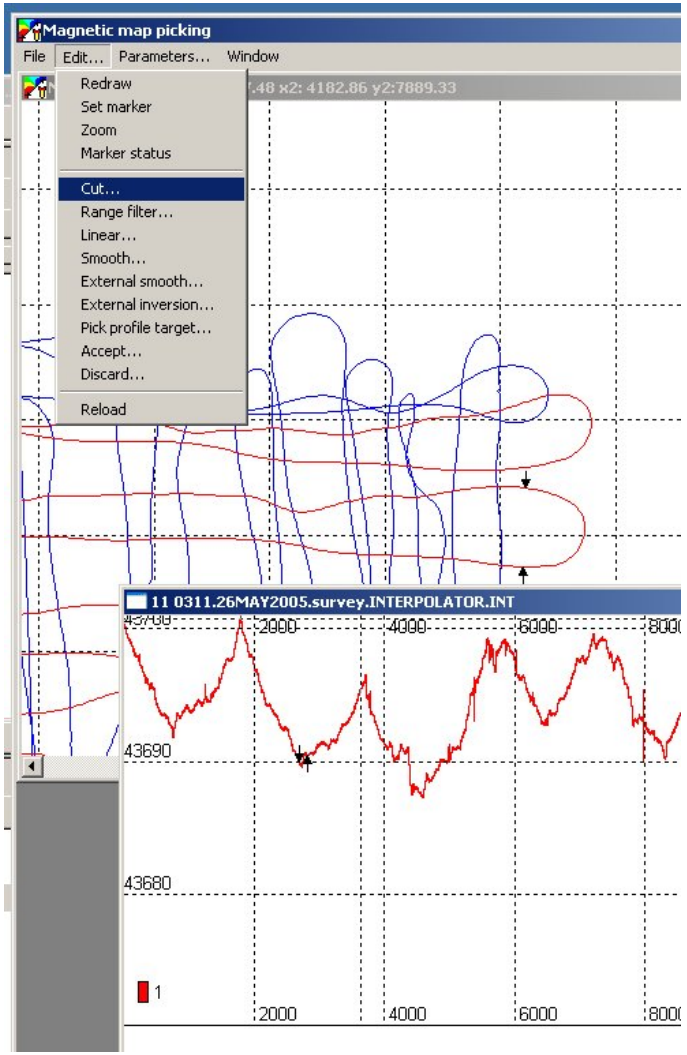


- Select “Set Marker” from context menu.

Set markers where you want to cut.

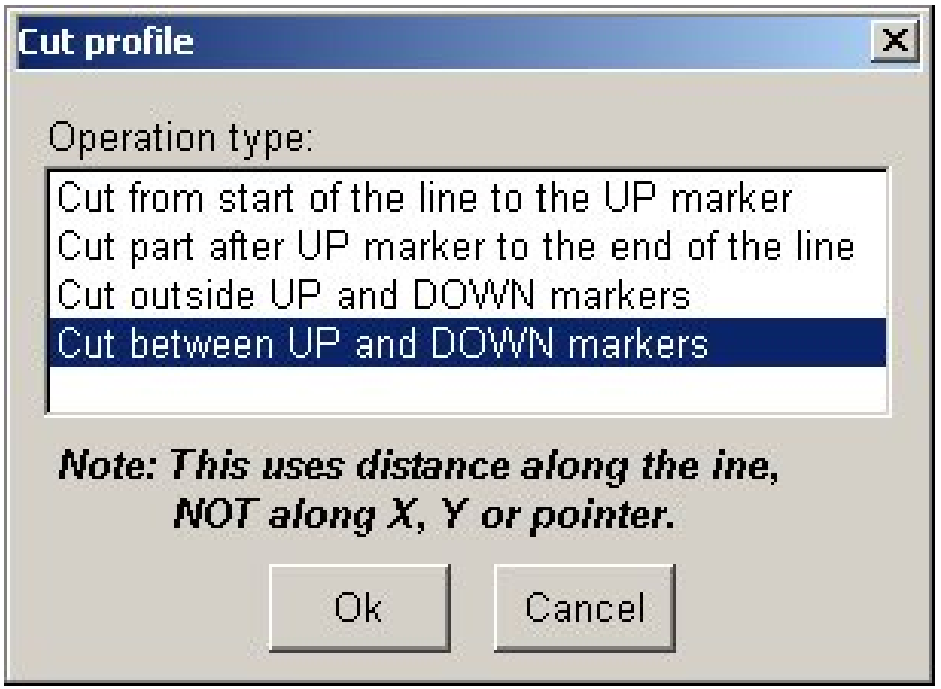


Activate profile window.



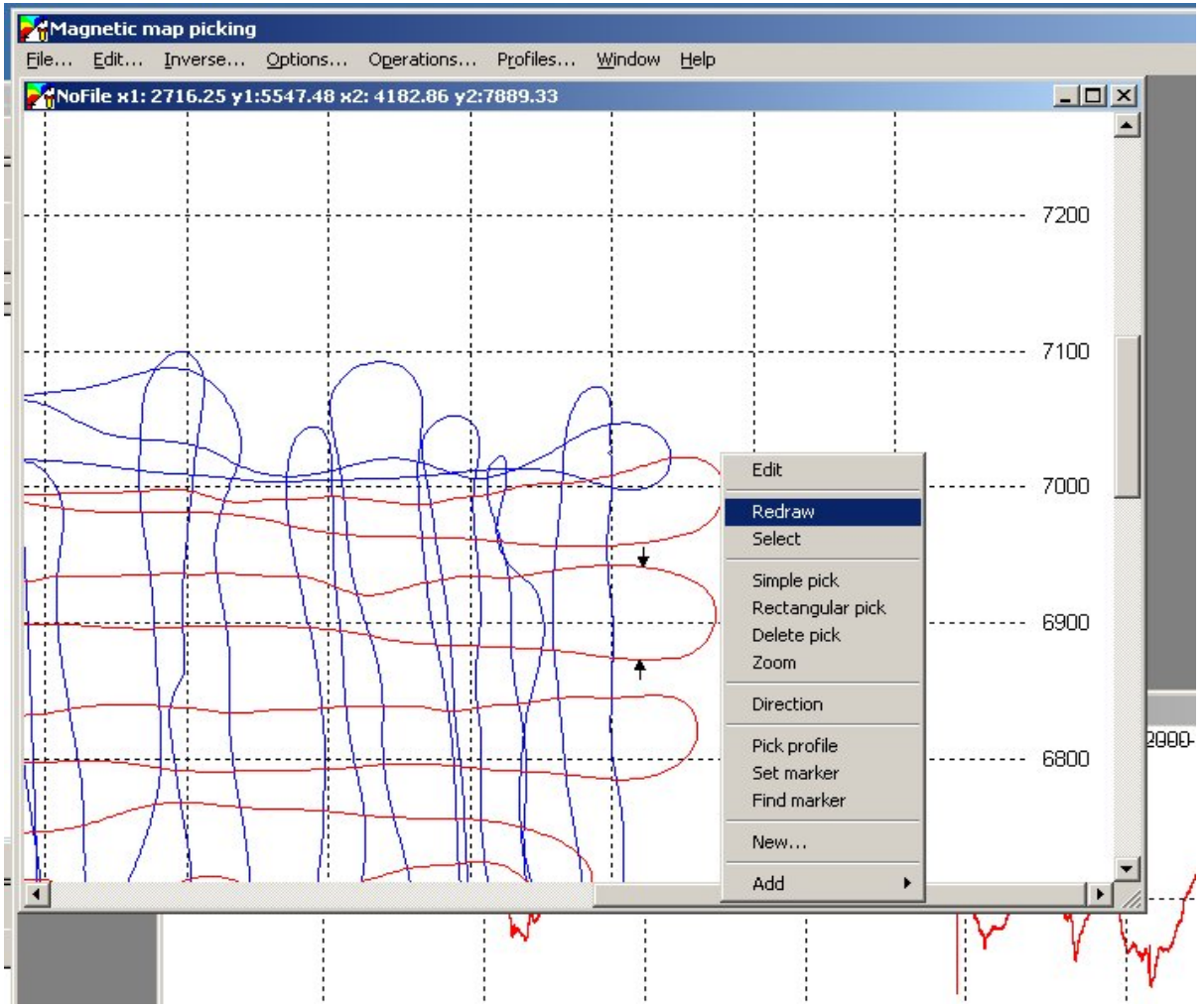
- You can actually cut only from profile window.
- Activate profile window by clicking on it.
- Select menu item “Edit / Cut”

Select what you want to cut.



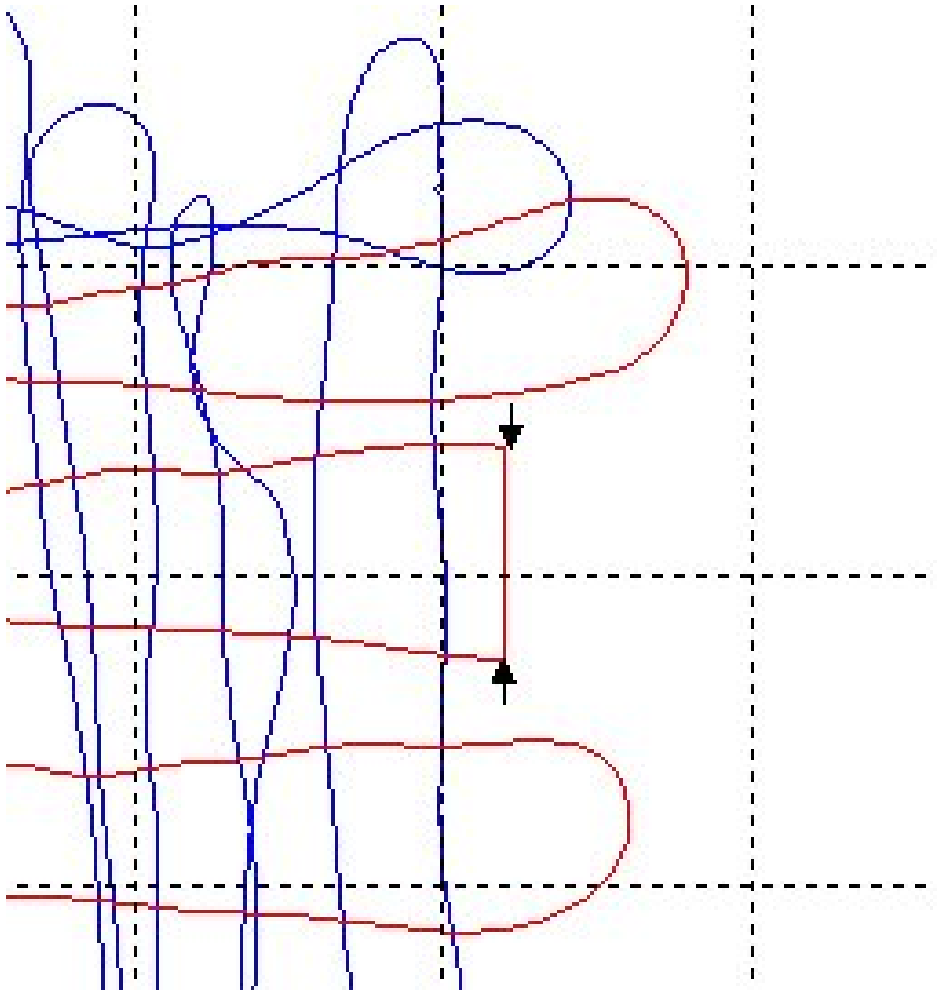
- Select “Cut between UP and DOWN” markers.
- This will remove all data between these markers.
- Program will redraw profile view for you.
- If you want to see result of cut on the map, activate map window again and redraw it.

Redraw the picture to the changes.



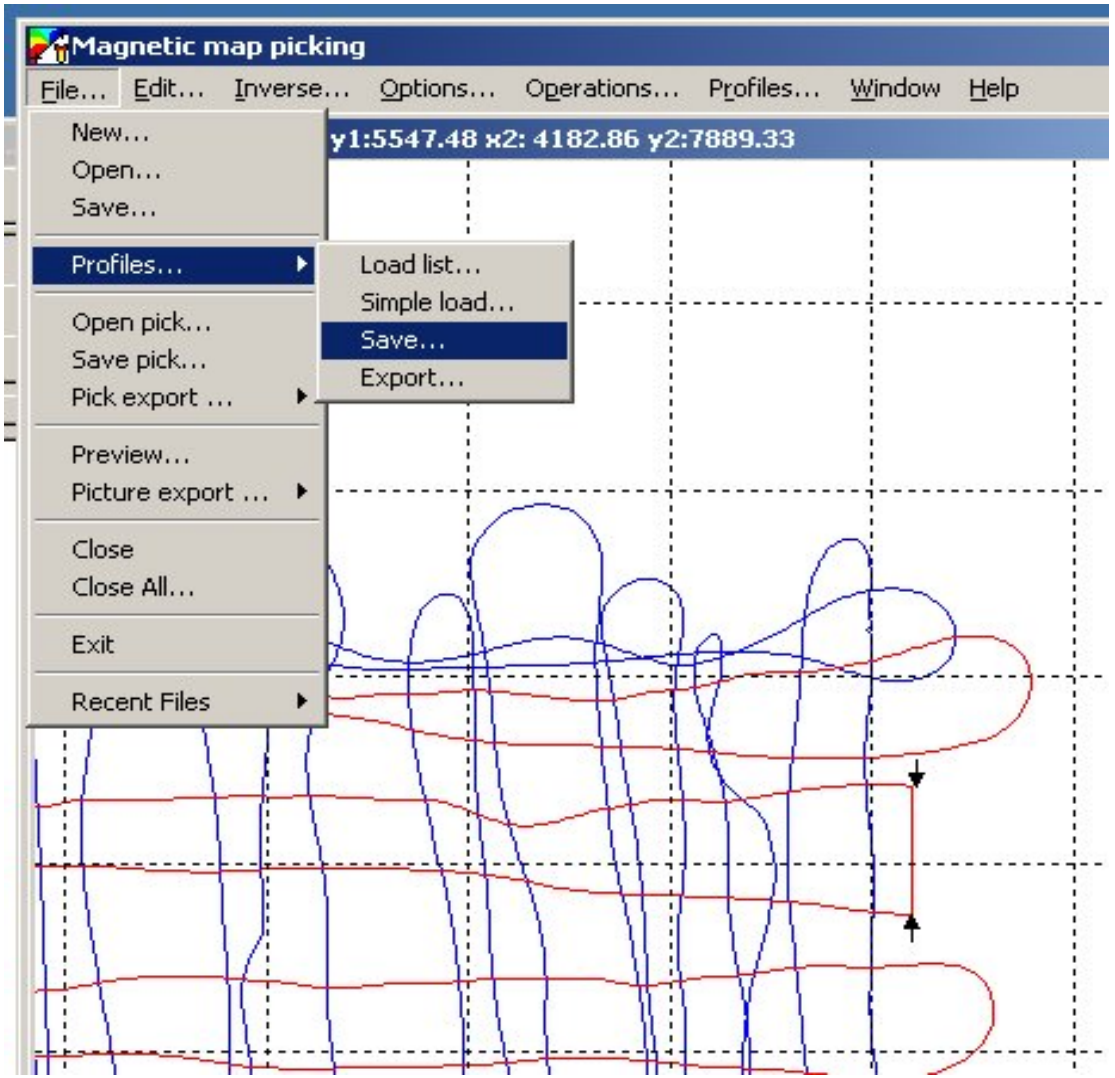
- Select “Redraw” fro context menu to the changes.
- Note that you don't have to redraw the map after each cut.

See changes in on the map.



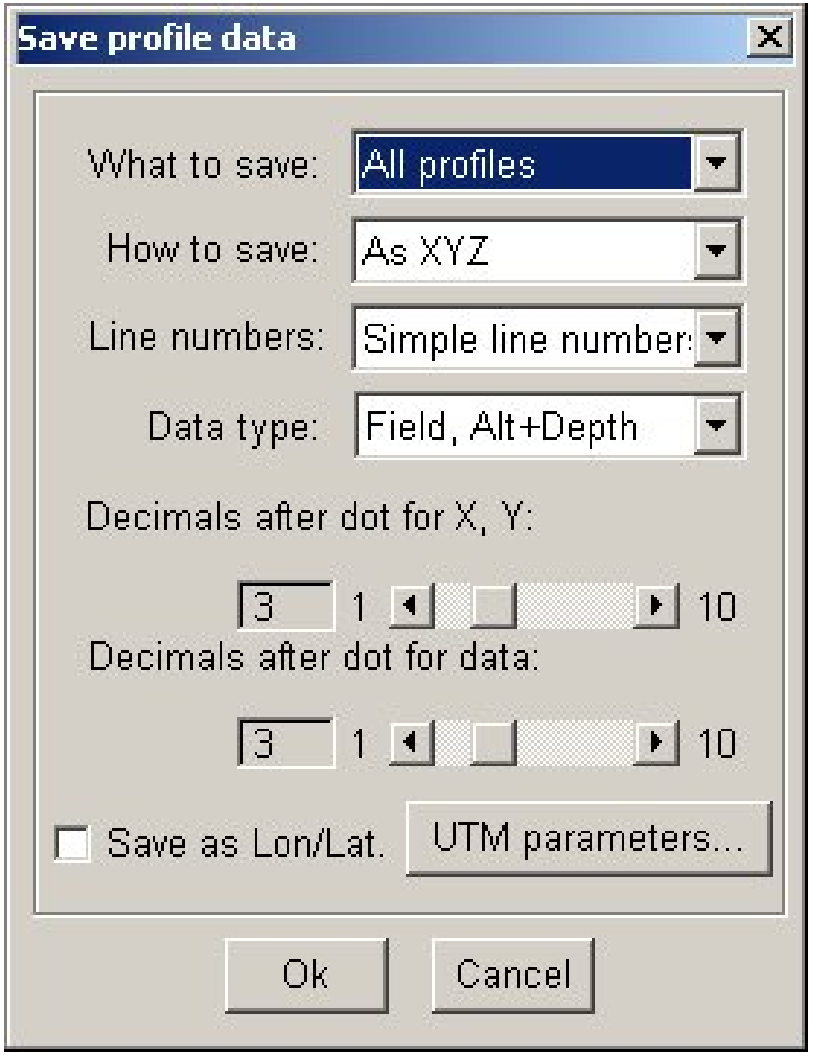
- You can see here how map has changes after the cut.

Saving profiles.



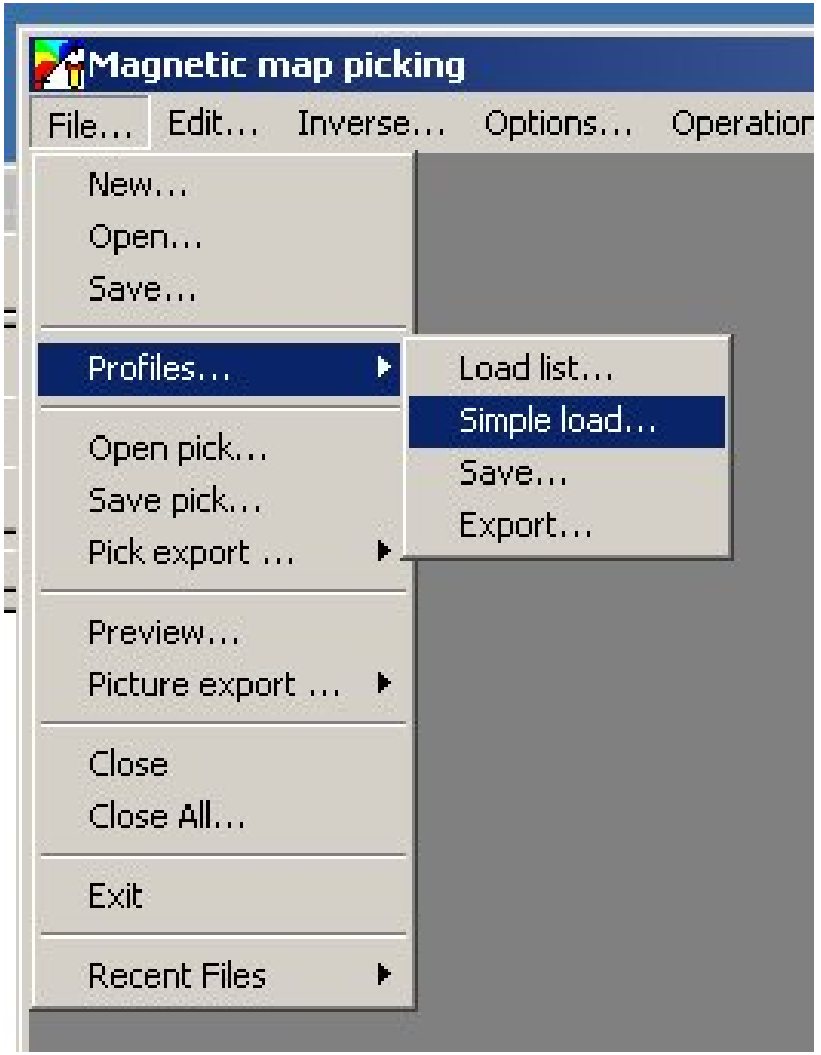
- After you complete cutting the data, save you profiles.
- Select “File / Profiles / Save”
- The idea is the following: save data and re-load them again using gaps in position as new line indication.

Profile save dialog



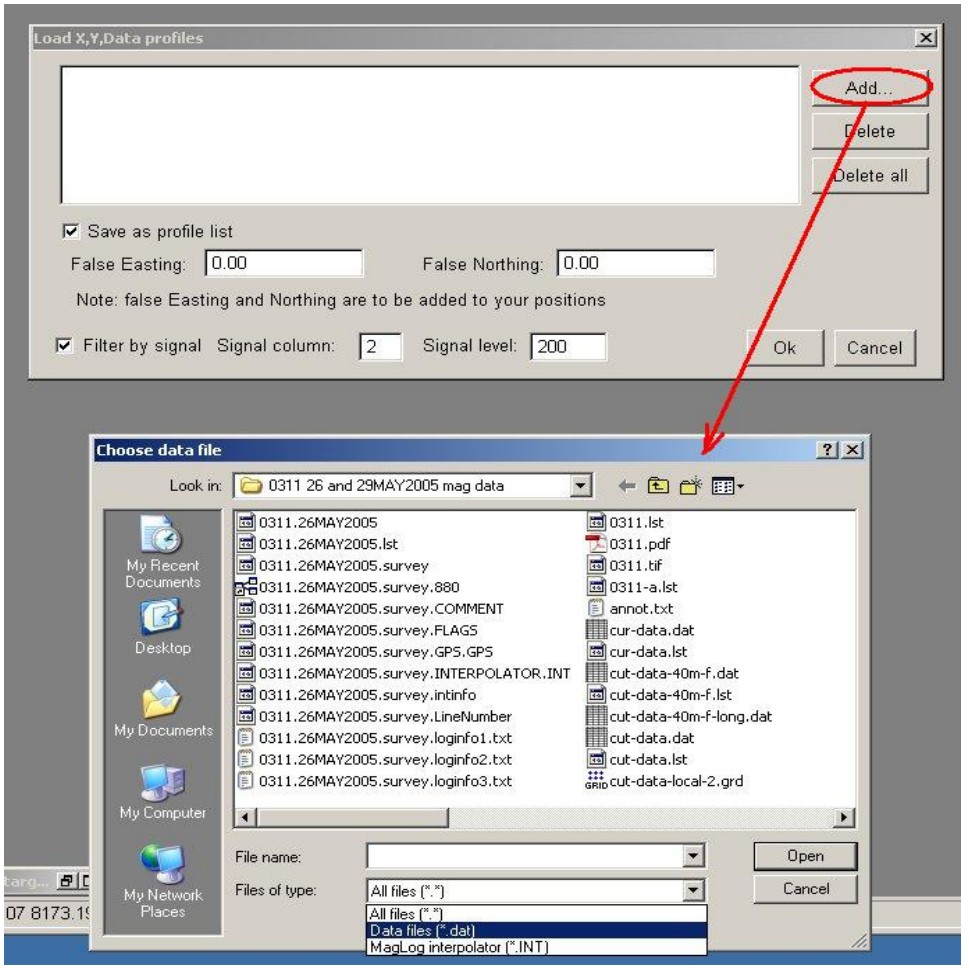
- Here you specify how you want your data to be saved
- You save all the profiles, X, Y, sensor depth, altitude and measured field, as well as total water column depth (altimeter + depth sensor)
- You save your positions in short UTM format.
- You might want to save you position in Lat / Lon (decimal degrees)

Now reload your data again



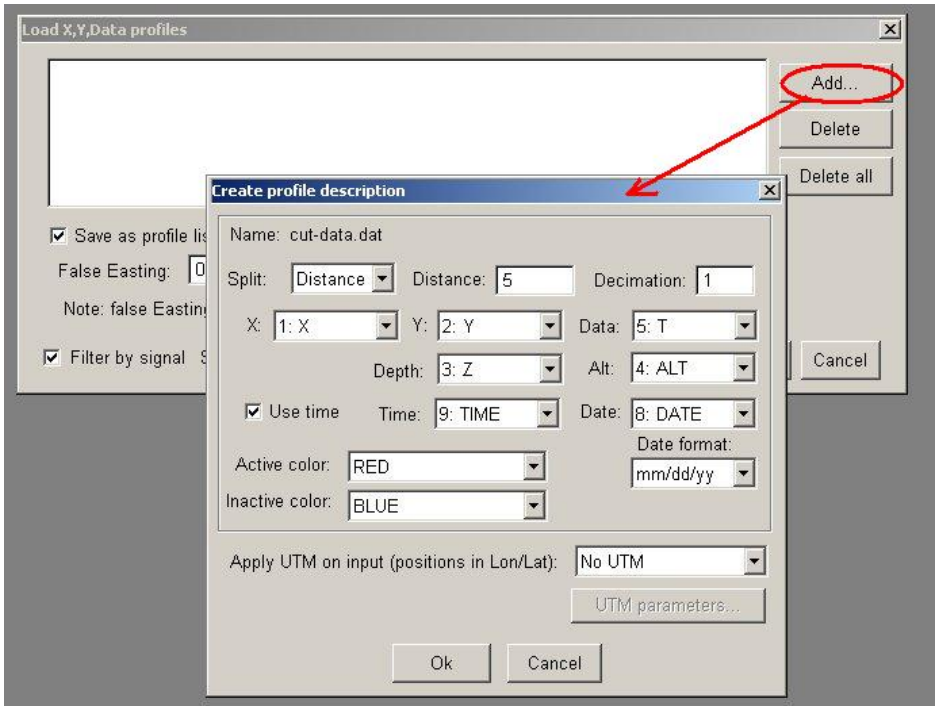
- After you successfully saved your data, re-load them in the program.
- While reloading, request data split by distance. This will create new lines.
- Newly loaded data does not have turns.
- Go to “File / Profiles / Simple load ...” as it was done at the very beginning.

Select data file to load.



- Set check “ Save as profile list”
- Check “Filter by signal”
- Set signal column (2 for one mag systems)
- Set signal threshold (200)
- Press “Add” button”
- “Choose data file” dialog appears.
- Select file you just saved.

Specify columns to load

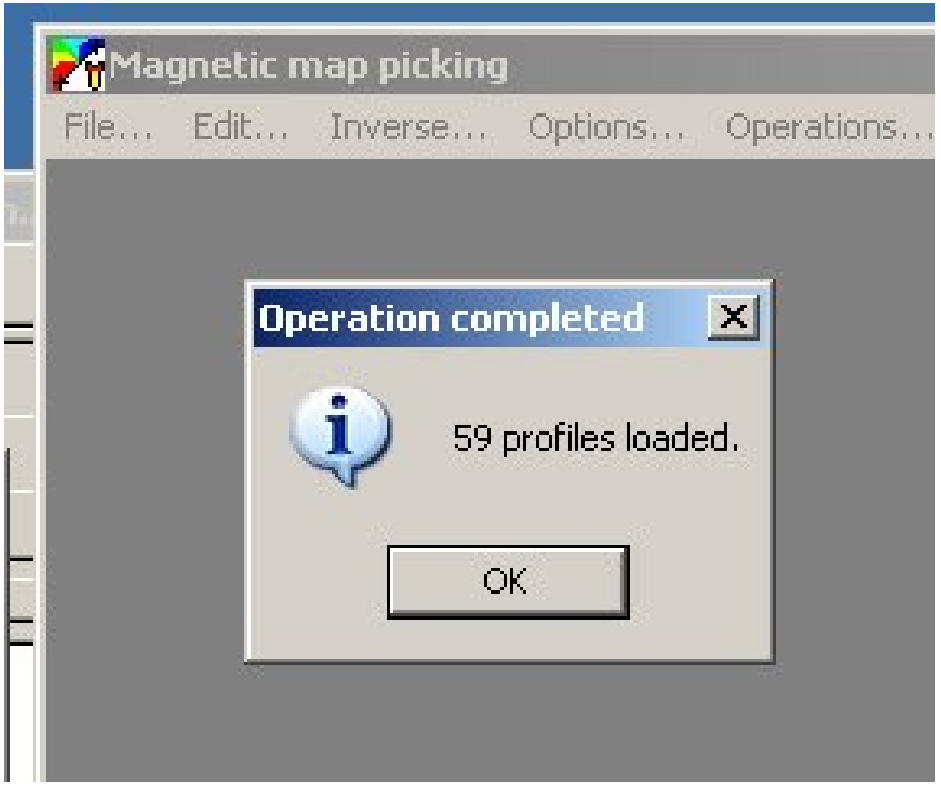


- Specify columns you wish to load.
- Note that column names and numbers are different from original file.
- Set “Split: Distance” and set “Distance: 5”
- When program sees gap in the positions more than 5 m it assigns new line.
- Note that “No UTM is selected. This is because data was saved in short UTM

Actual loading starts

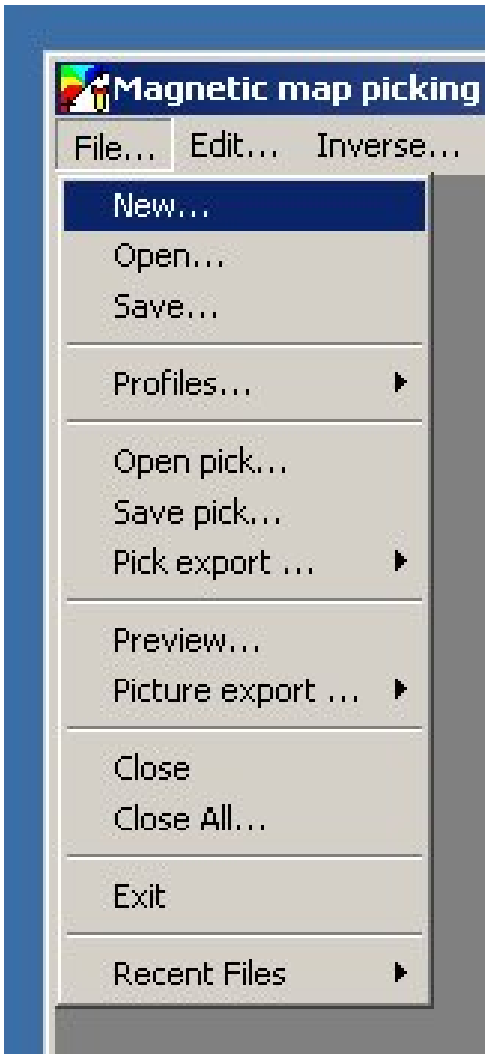
- Complete your “Simple Load” dialog as earlier.
- Save profile list file.
- When actual loading starts, program asks what you want to do: append new data to the previously loaded or discard old data?
- Answer “No”. This will remove old profiles from memory and load only new ones.

Profile loading is complete.



- After program completes loading, you can see that many more profiles are there.
- Proceed as before from this point.

Now show position plot.

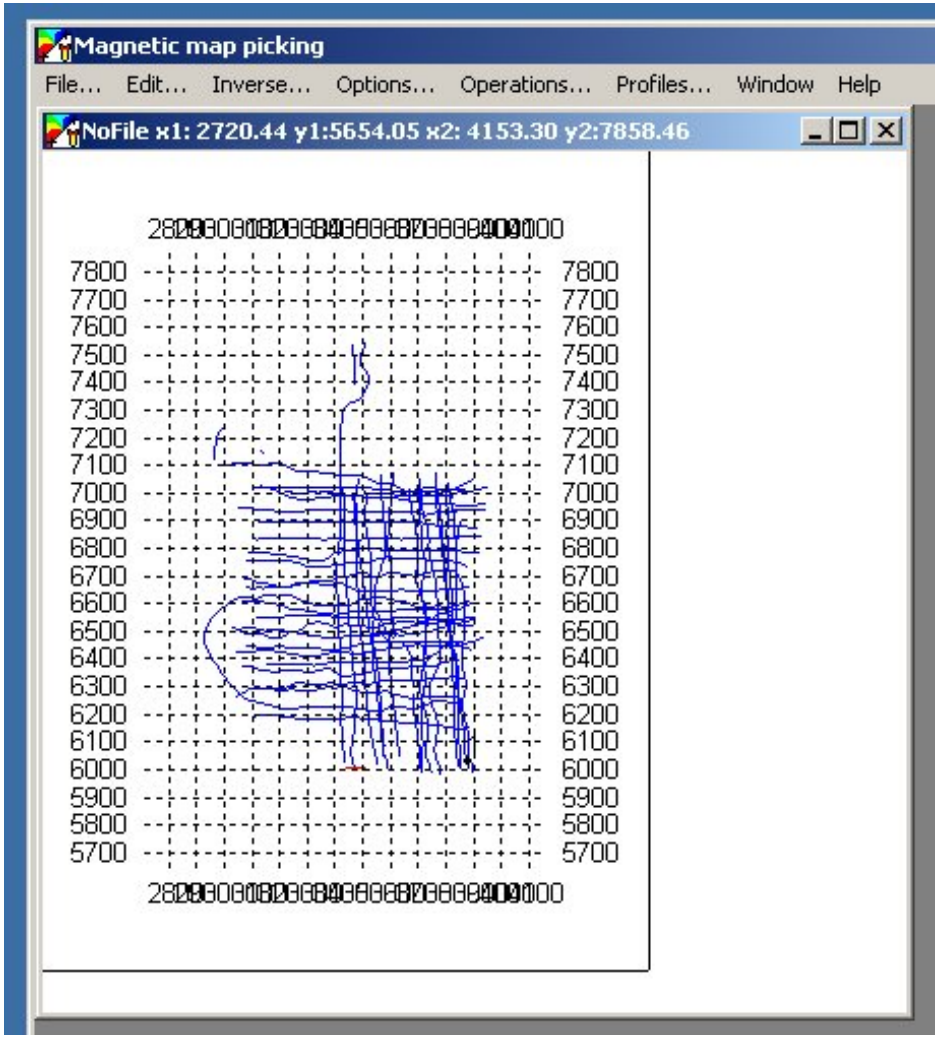


- Select “File/New”. This allows to create map or profile graph window.
- Note that Map is displayed in short UTM coordinates (meters).
- If both Map and Profiles windows are used at the same time, profile displayed is show on the map as red.

Select Map or Profile window

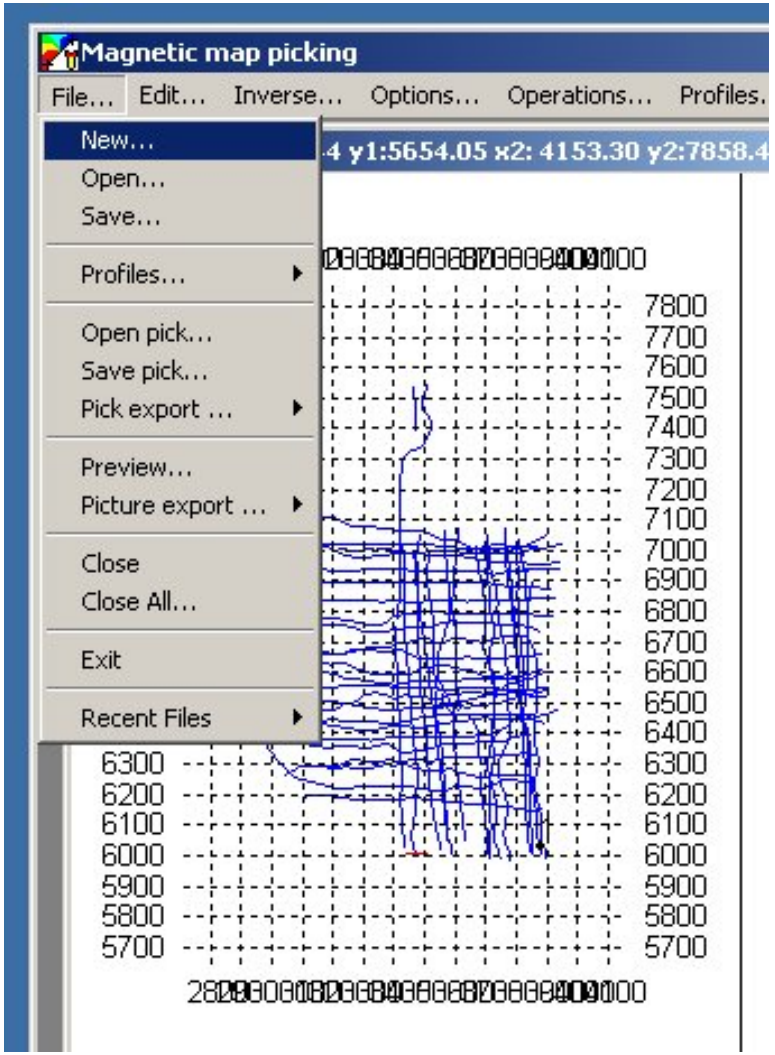
- Select what type of view you want – Map (grid) or Profile (graph plot).
- You can repeat this operation if you need multiple windows.

New map window



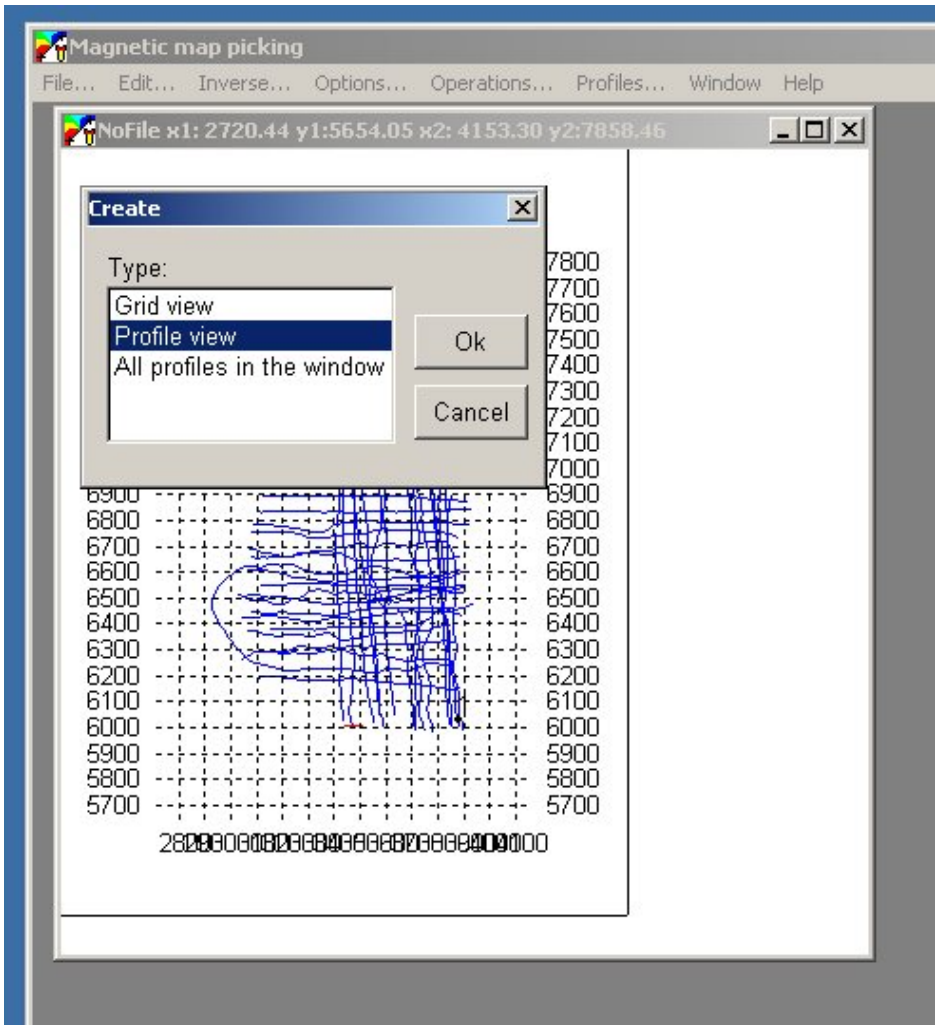
- Now you can see that all turns you cut are gone.
- Splitting into lines by distance can result into very short lines; you may remove them if you see them

Create profile view.



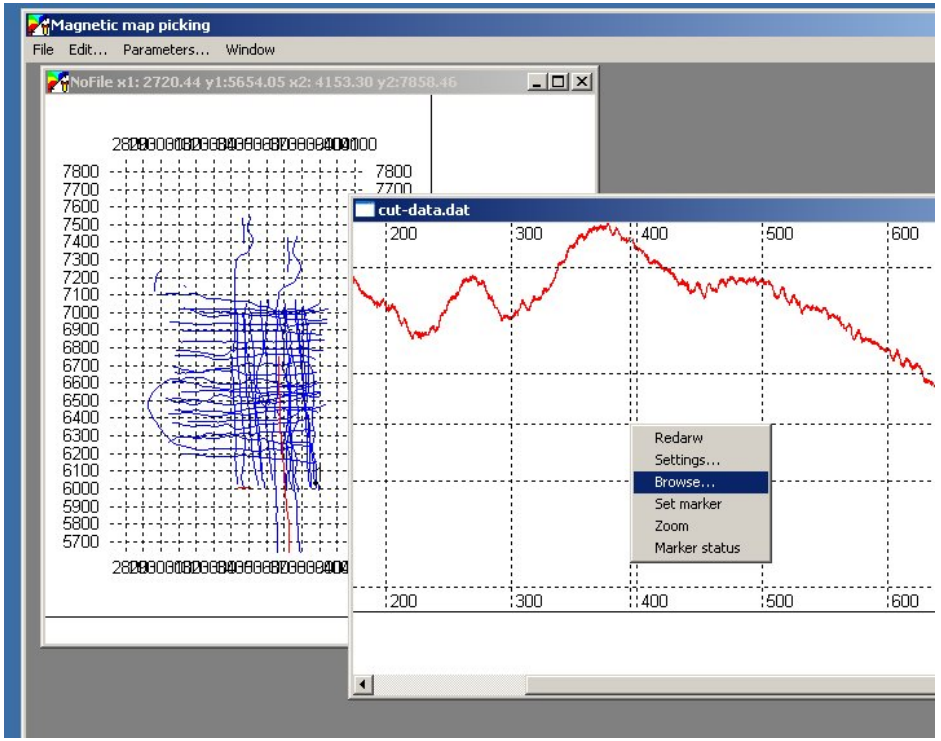
- Select “File / New” to create profile view window.
- New profile view will show current active profile (red).
- You can use profile profile view window to browse through the profile data.

Select “Profile view”



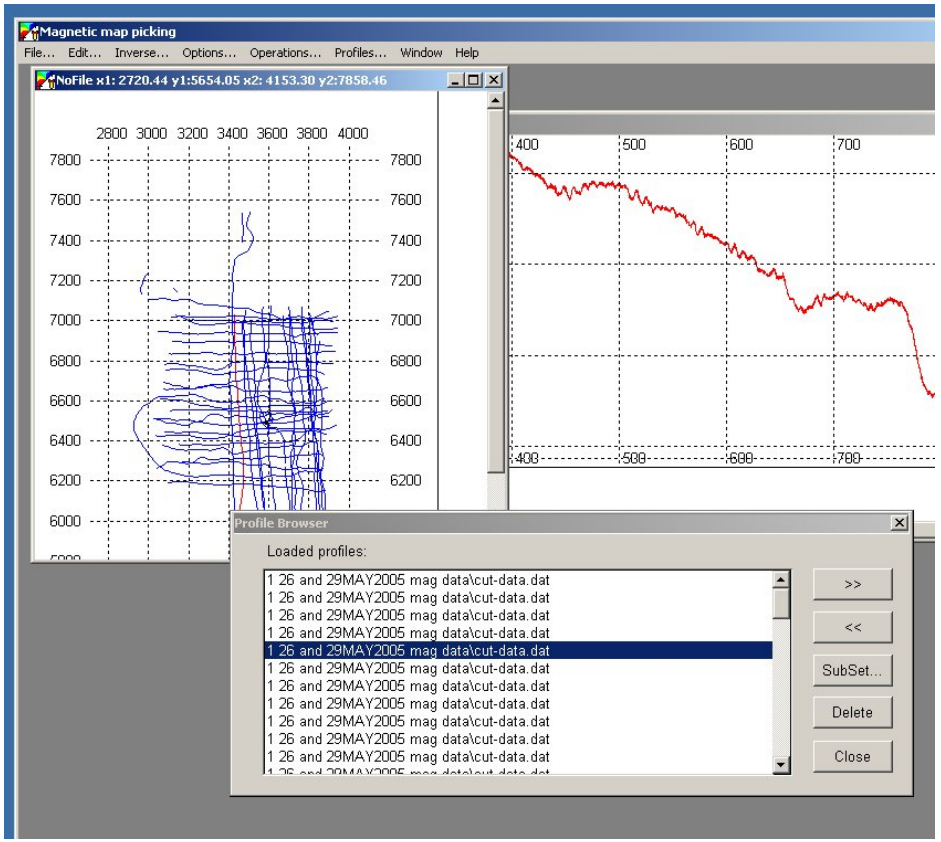
- This creates a new profile view window.

Browsing through the profile data.



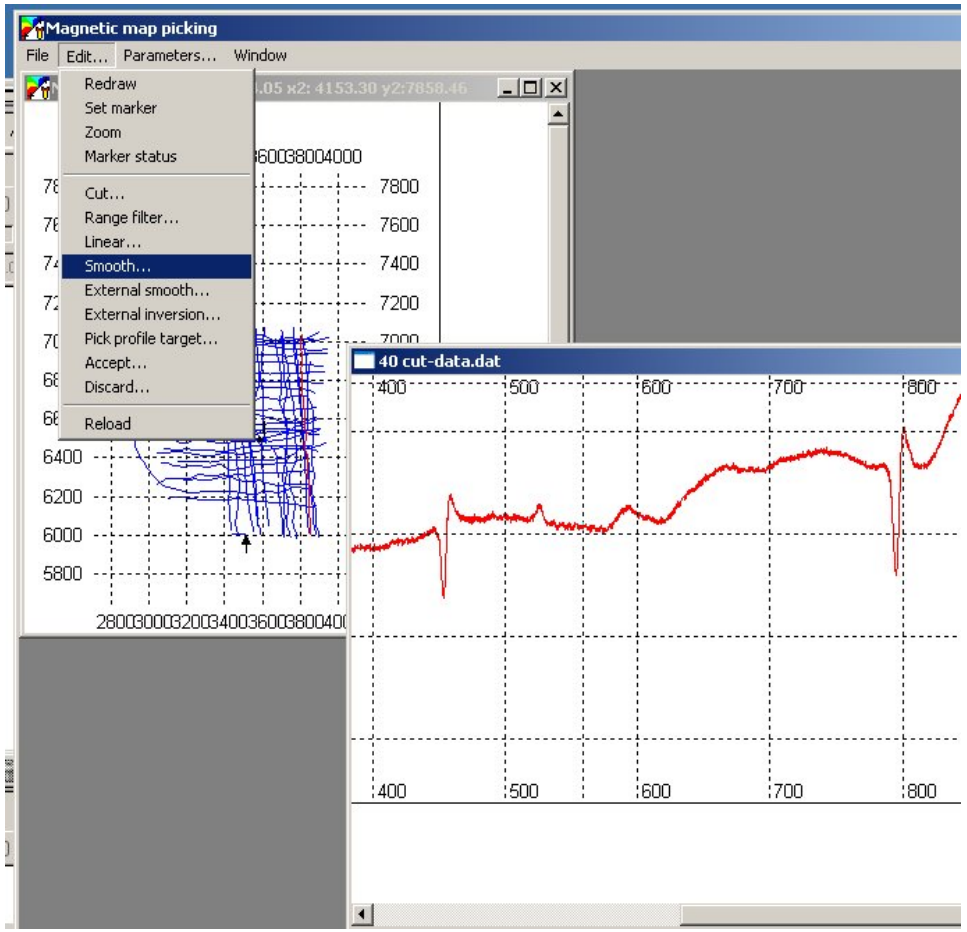
- After you adjust profile view using “Setting” dialog, select “Browse” from the menu.
- This will bring modaless dialog to browse through all available profiles.

Browser dialog.



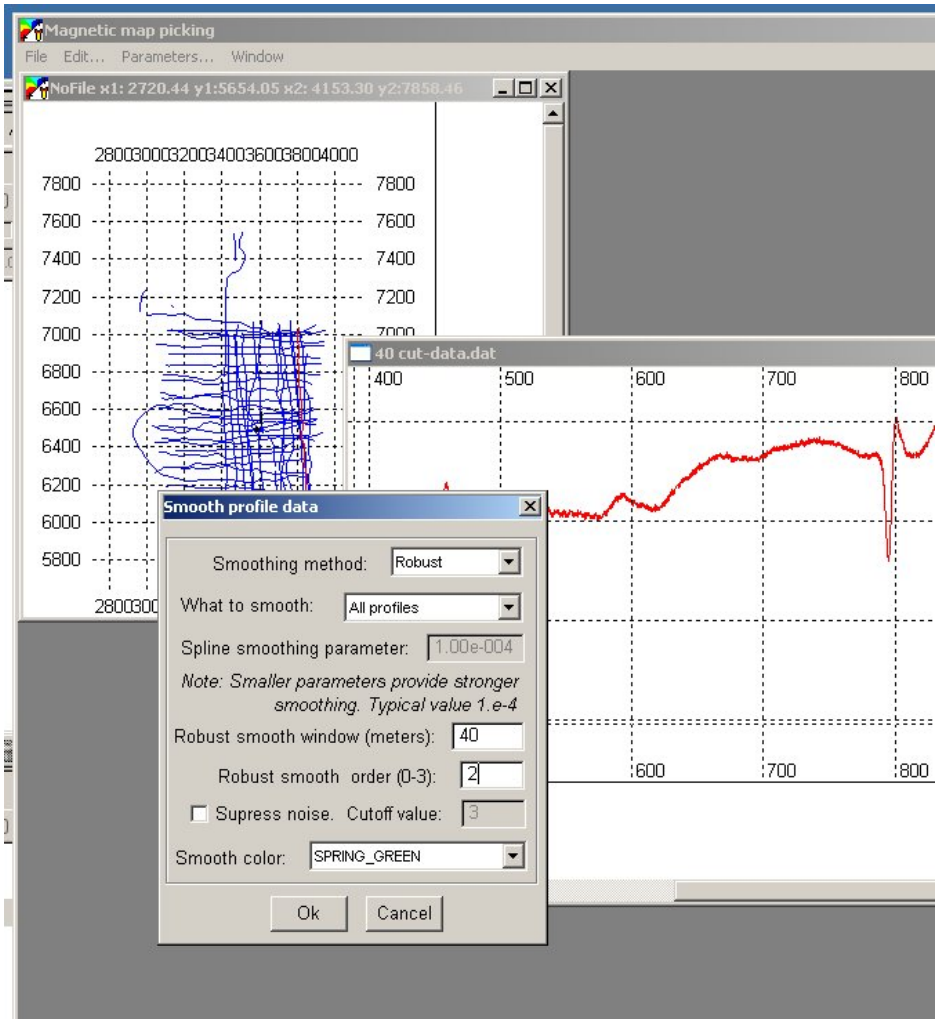
- Use >> and << to navigate the list.
- Currently selected profile is shown on the graph and highlighted in red on the map.
- You can use “Delete” button to delete profile. Cation! You can not currently undo this action.

Filtering local component of the data



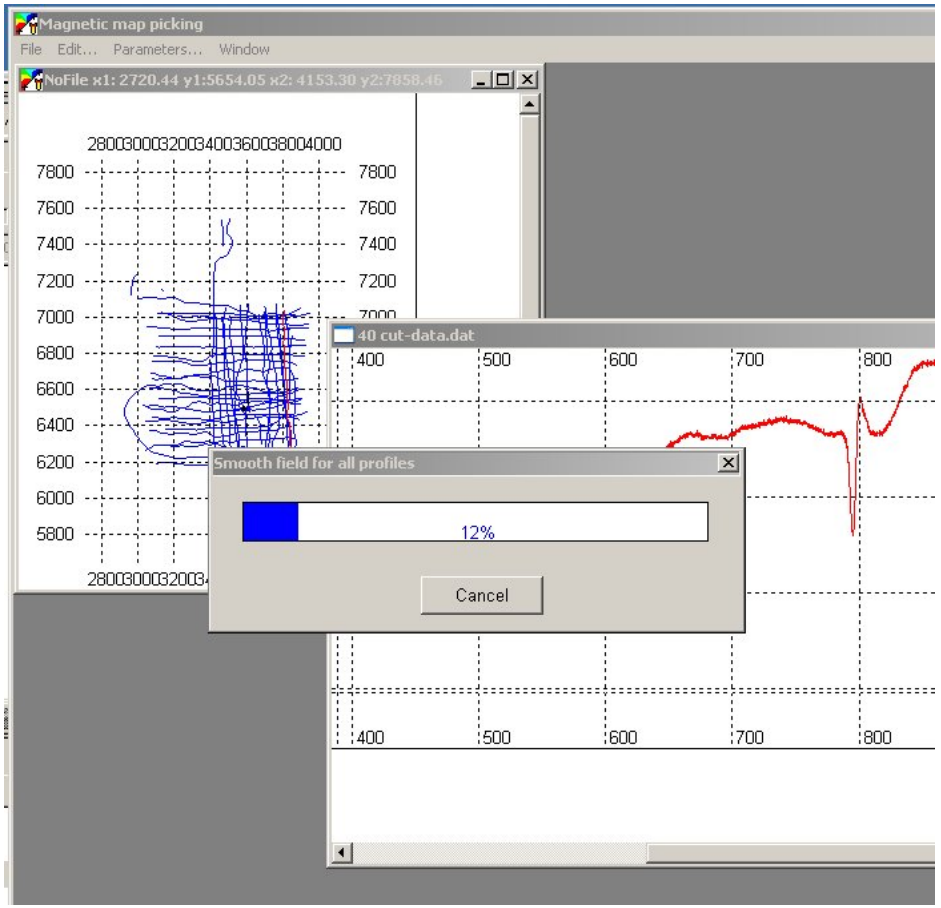
- For magnetic search operations geological magnetic field is considered noise. Besides this, diurnal variation is present.
- You need to filter these out to produce a useful map. On the red curve, you might want to keep only sharp magnetic anomalies.
- MagPick provides different options to filter the data.
- Select “Edit / Smooth” menu item to proceed.

Smooth dialog.



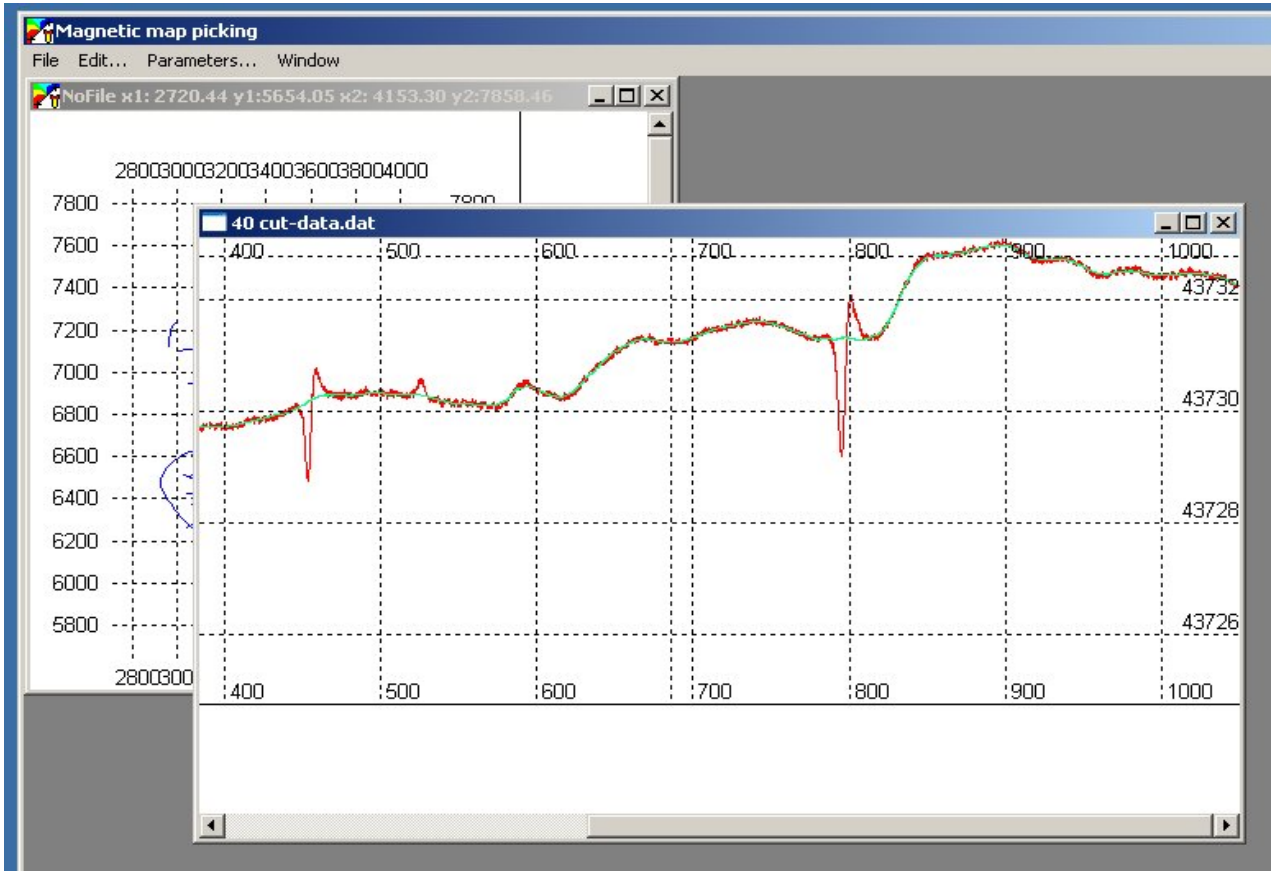
- “Robust” smoothing may be the best.
- Select what to smooth – active or all profiles.
- Select window size. This is spatial window. Anomalies shorter than this windows are to be separated.
- You can use ideas about you possible target depth and magnetometer altitude.
- You will have to try a few options to get optimal results.

Smoothing in progress



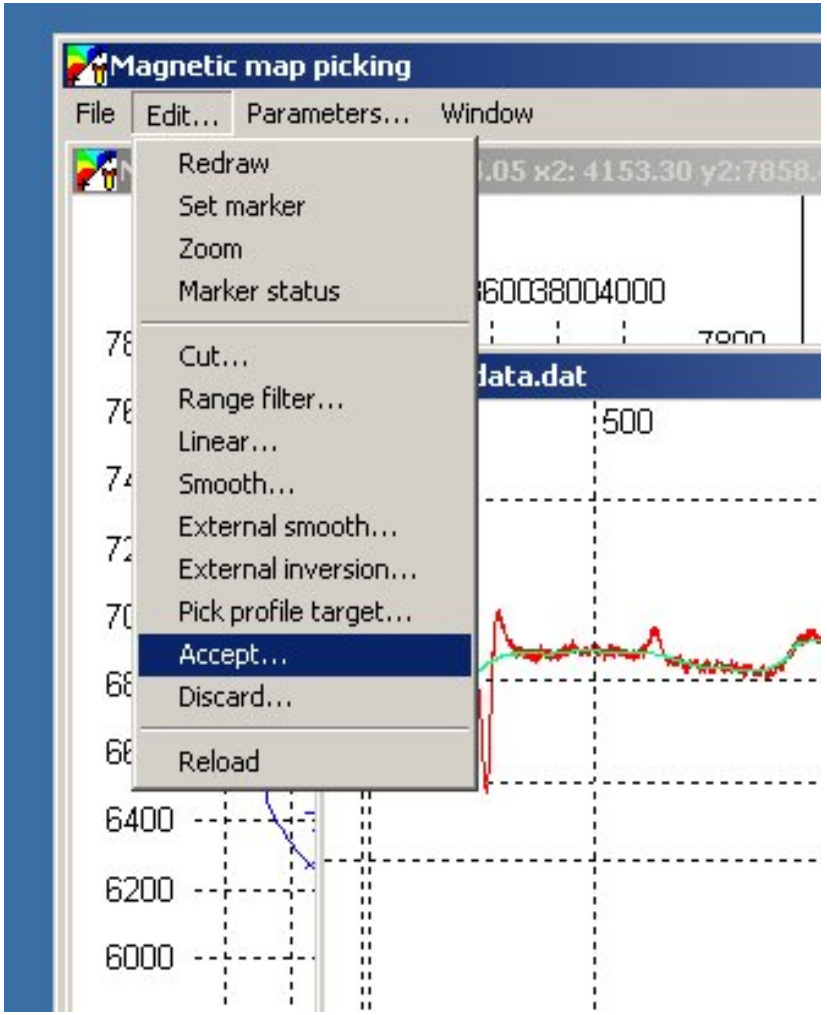
- Here is program filters the data.
- Depending on data amount and PC horsepower, it can take from few seconds to few hours.
- Be patient and wait till task is complete.
- If you need to cancel, than keep in mind that only part of the profiles will have been filtered.

Preview smoothing results



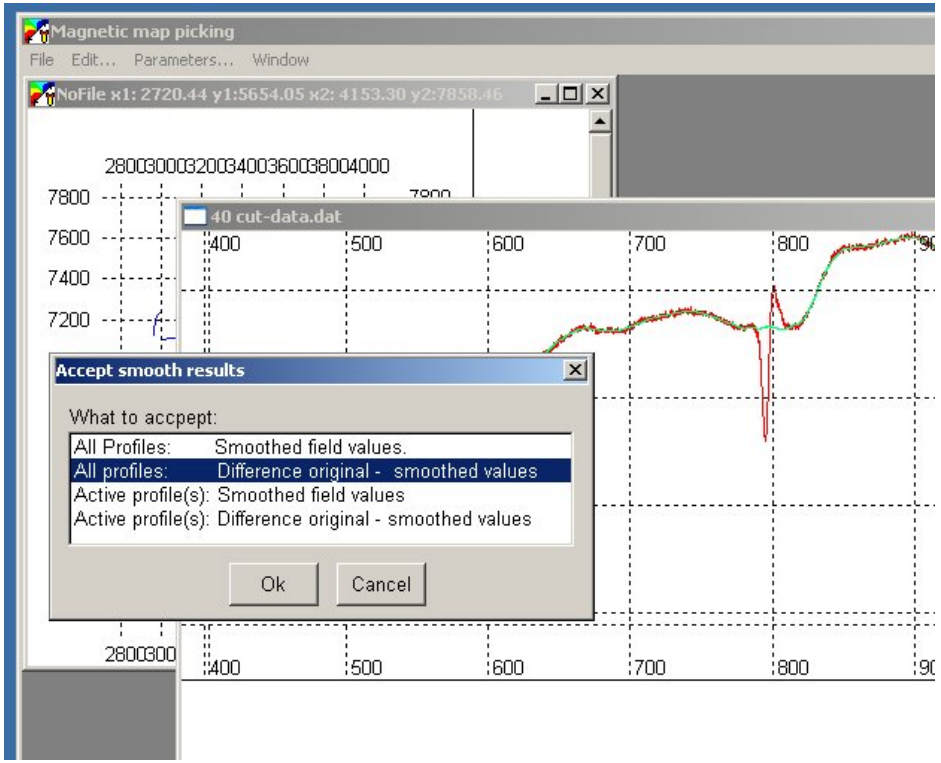
- After computation is complete, you can preview the results before accepting them.
- Green line is result of smoothing. This example represents a good case.

Accept smoothing result.



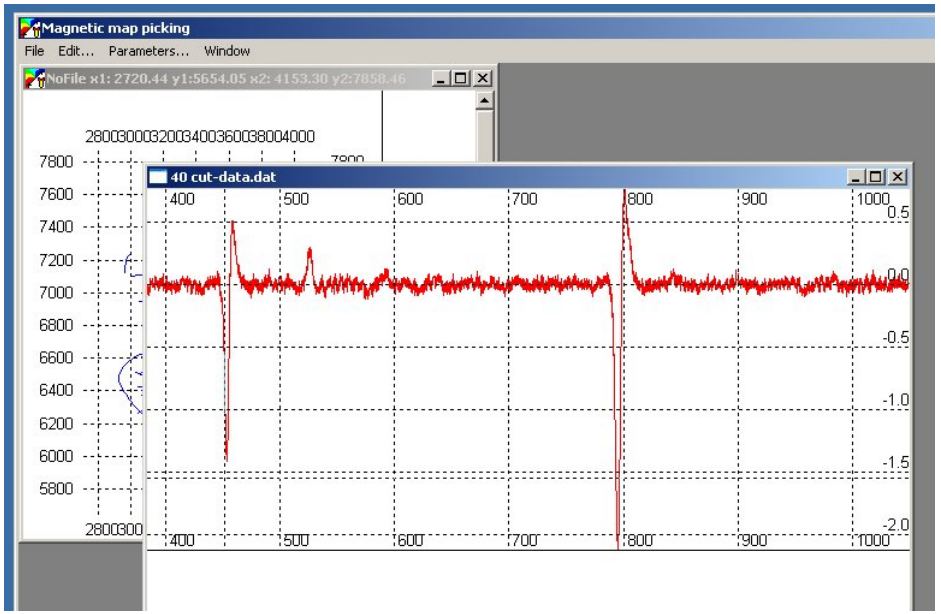
- After you examined your profile data (using “Browse” function) and are satisfied with the results, select “Edit / Accept...” menu.
- This will allow you to replace data with result of smoothing (green) or with difference between original and smoothed curves (red minus green).

Selecting what to accept.



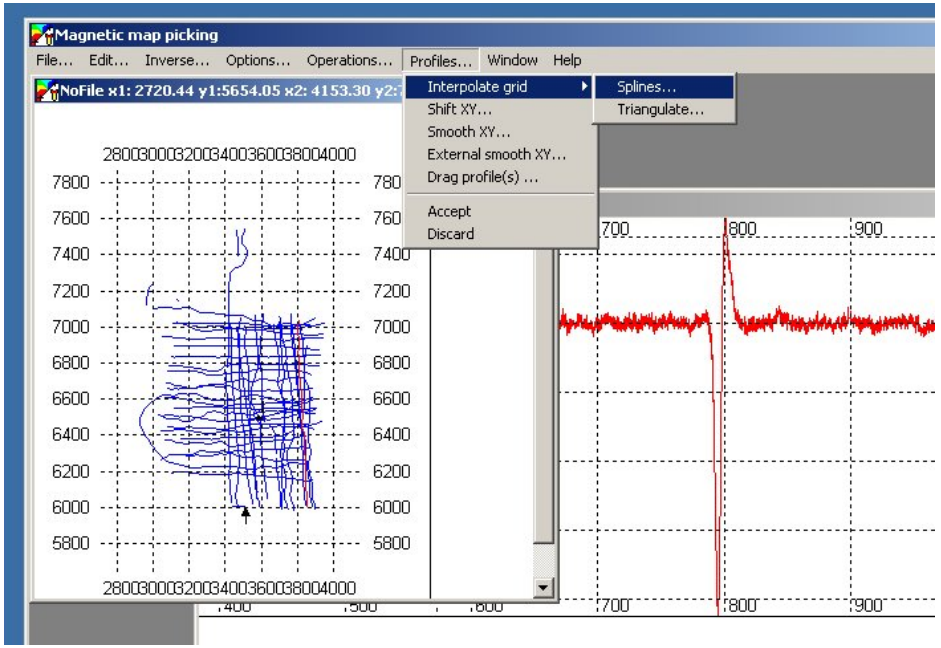
- For all the profiles, select: Difference: original – smoothed value.
- This will compute this difference and replace all the data.

Final results of the filtering.



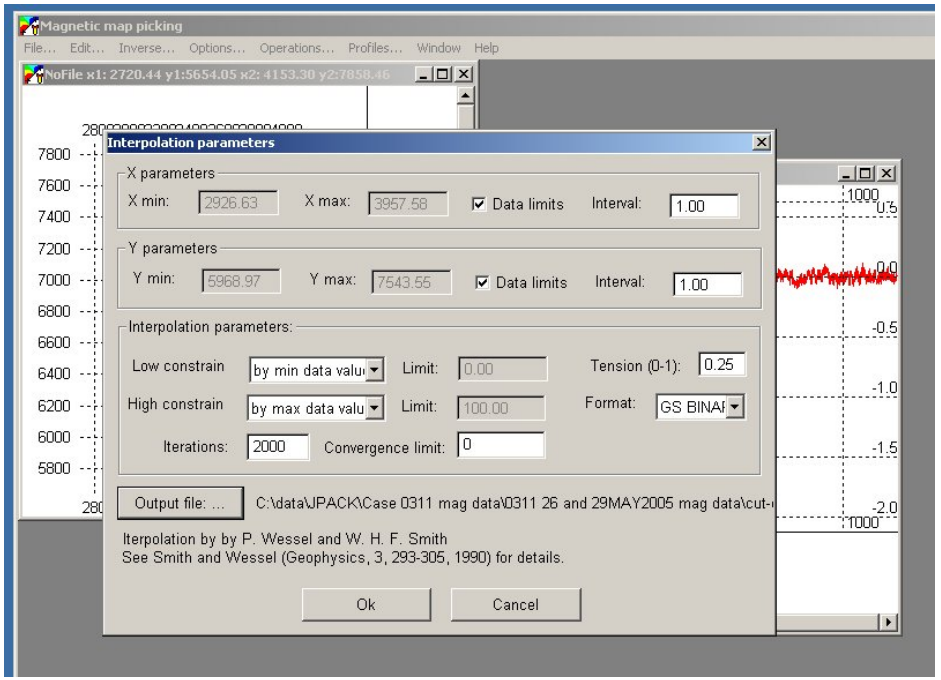
- You can see here that all background geological field is gone, and local anomalies are highlighted.
- Note that data is now noisier that it use to be. This is a drawback of high pass filter.
- Note that data are now centered around zero.
- They do not require diurnal correction any more and can be used for the map.

Interpolate map (grid).



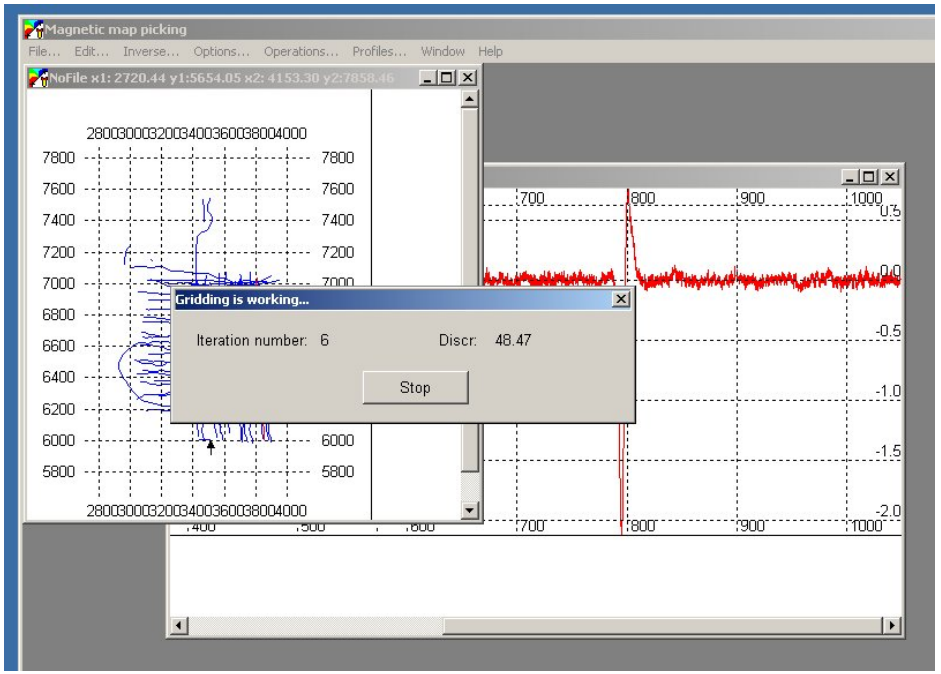
- Activate map window and select “Profiles / Interpolate / Splines. This is build-in magpick gridding.
- Note that you can save filtered data and use other software (such as Golden Software “Surfer”) to grid the data.

Select gridding parameters.



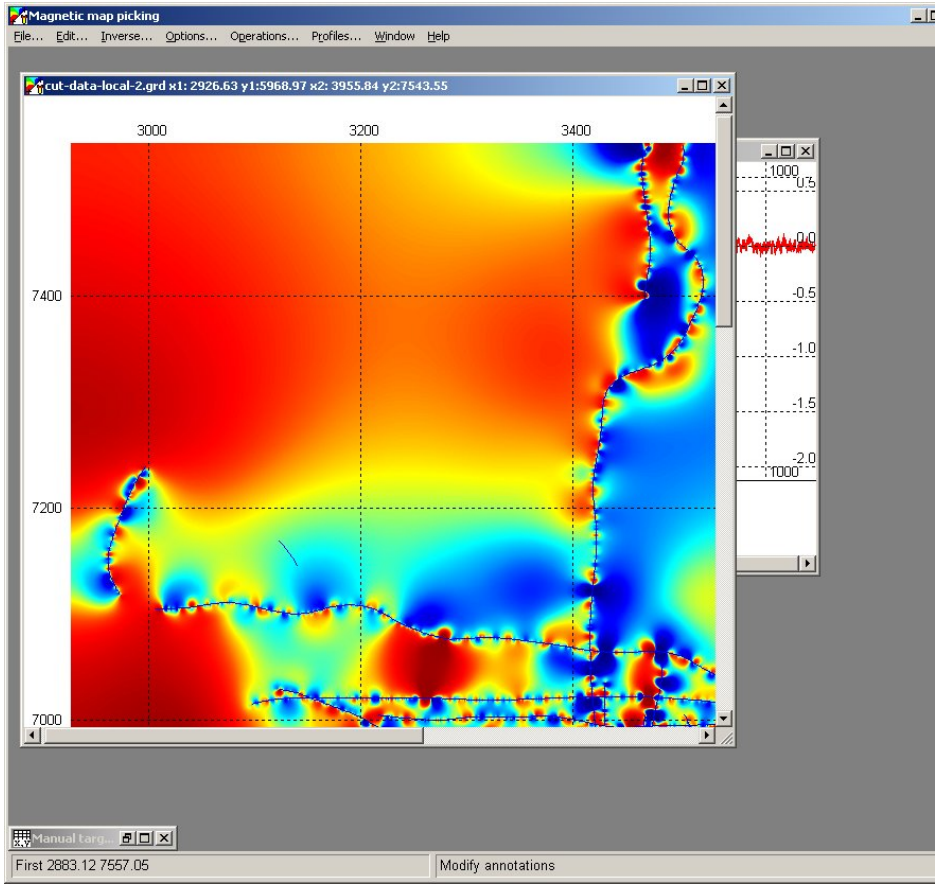
- Select cell size in meters.
- Select XY limits.
- Select output file name.
- See article for details on interpolation method.

Gridding in in progress



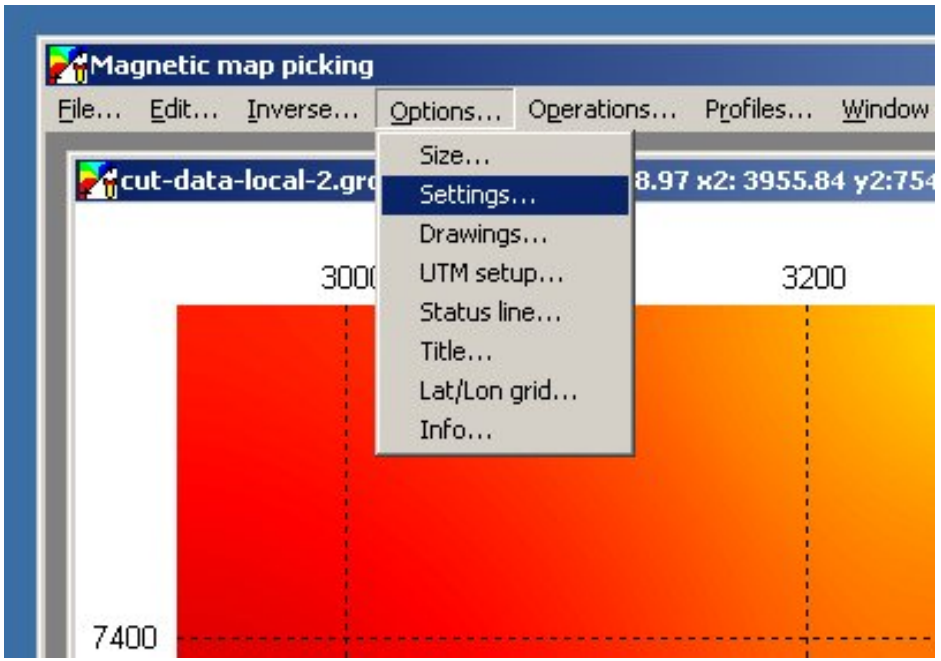
- Depending on data amount and grid size, it can take between few minutes to few hours. Be patient.
- After gridding is completed, map is loaded into current map window.

Grid is loaded.



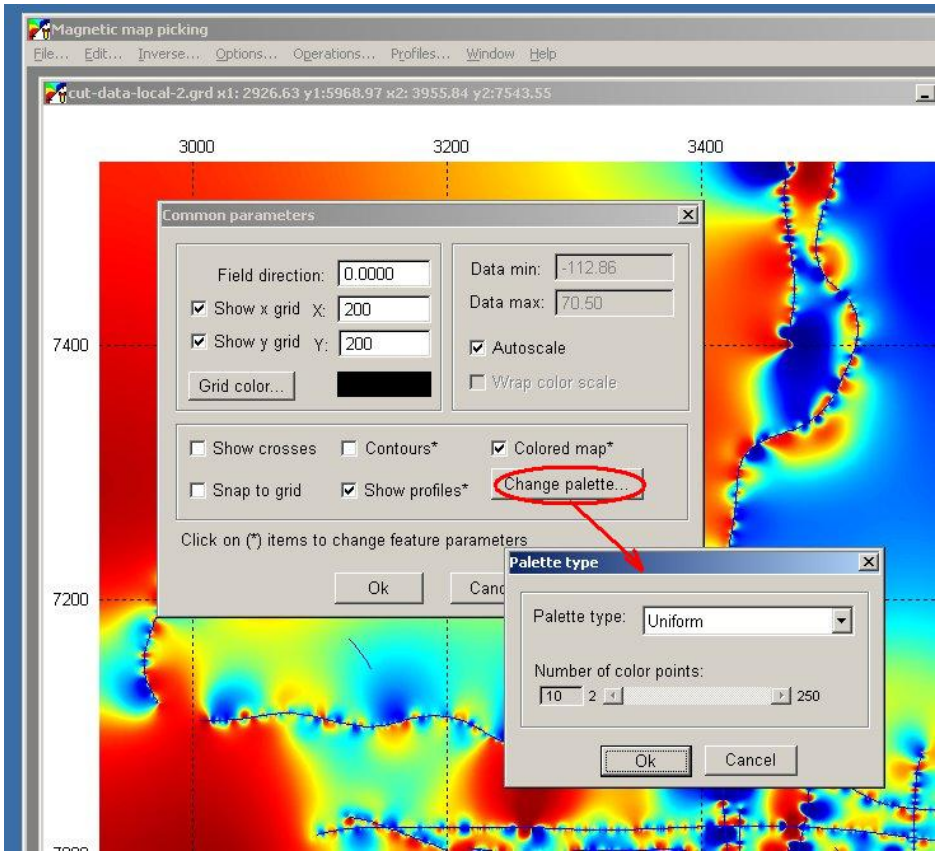
- Here you can see grid loaded and plotted with contours
- This might be not what user wants.
- Need to adjust color scale, coordinate grid lines, etc.
- Go to “Options / Settings” menu item

Changing map appearance.



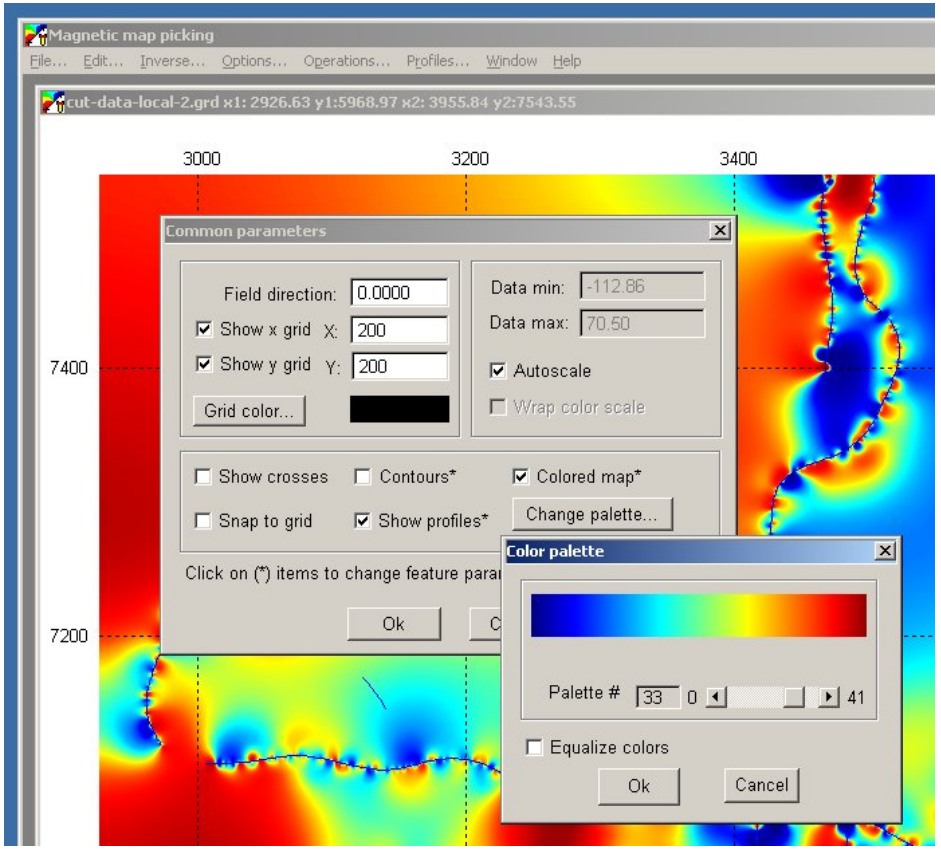
- Select “Options / Settings” to change map presentation parameters.
- The following dialog allows you to plot or remove color map, plot contours, select color scale, plot or remove profile locations, plot or remove stack plot.

Adjust map parameters



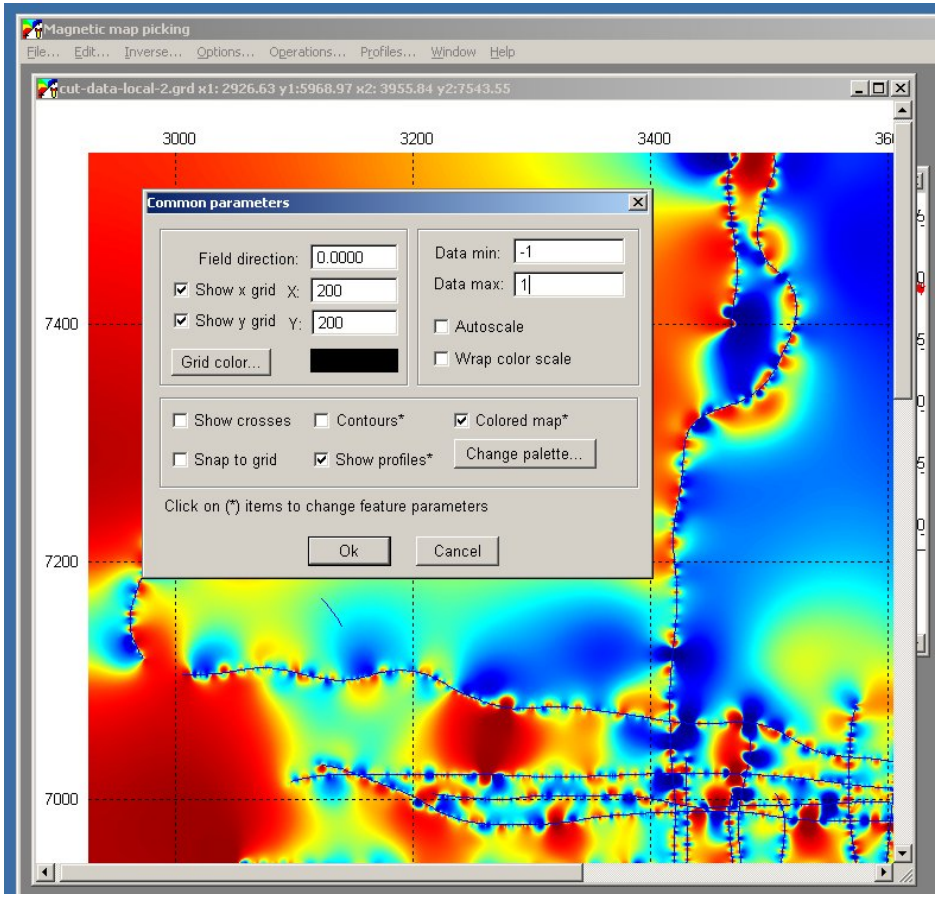
- Set appropriate coordinate grid spacing, in meters.
- Note that check boxes marked with * call additional dialogs when selected.
- Press “Change Palette”
- Select “Uniform”

Select Palette by Number



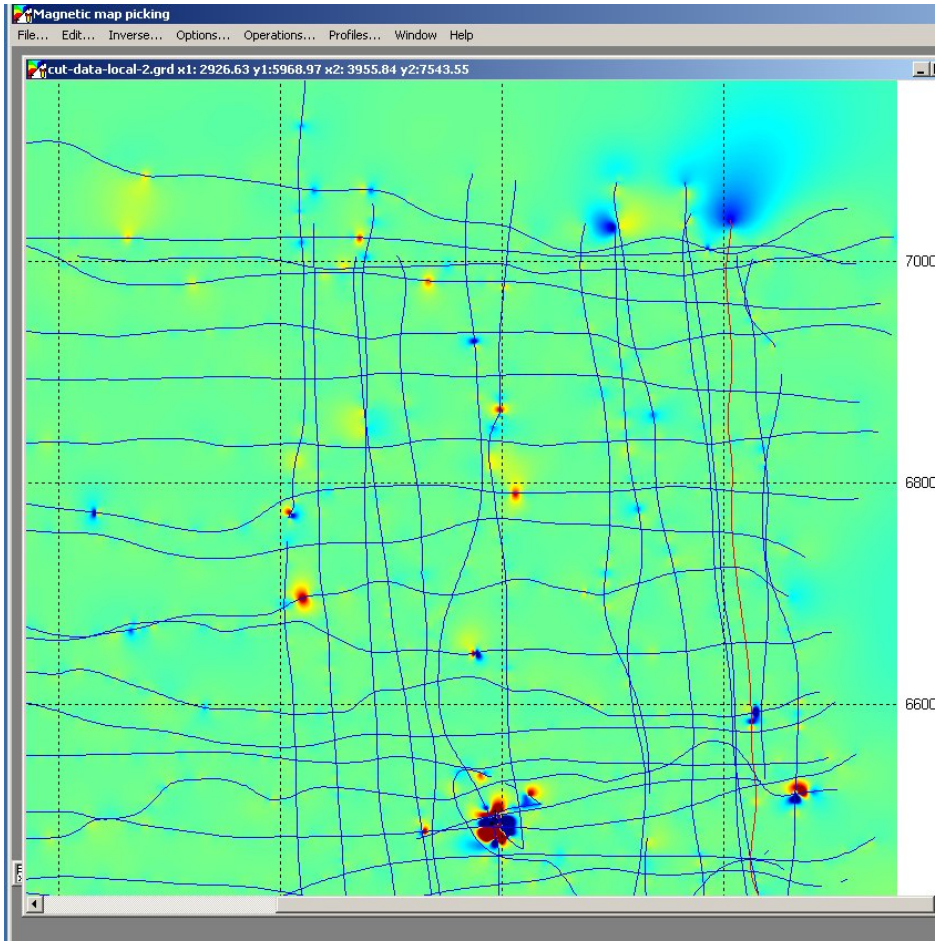
- Use slider to preview and select color scheme you like. Number 33 is recommended
- Uncheck “Equalize colors” box. In many cases it is very useful, but in some not.
- Press “Ok” button to return to the “Common parameters” dialog.

Select data range.



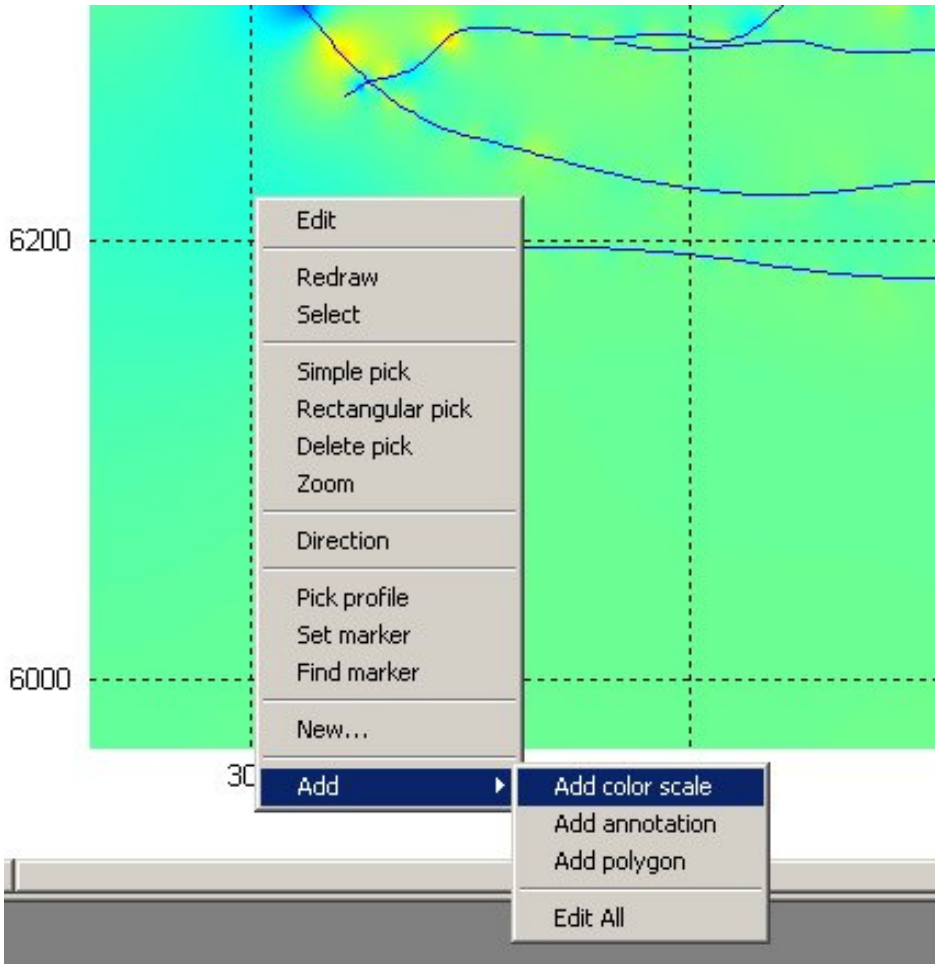
- Uncheck “Autoscale”
- Enter “Data min” and “Data max” values. You may try few times to find appropriate scale.
- Press “Ok” button

Map plotted with new colors.



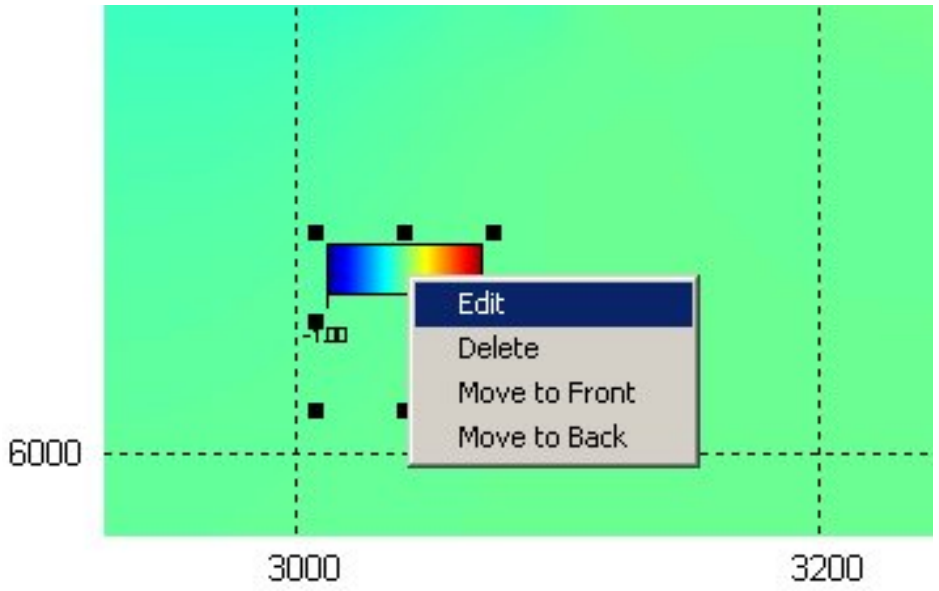
- Here is map plotted with new colors.
- Local anomalies are seen much better now.
- Let's add color scale to the map for presentation purposes.

Adding color scale



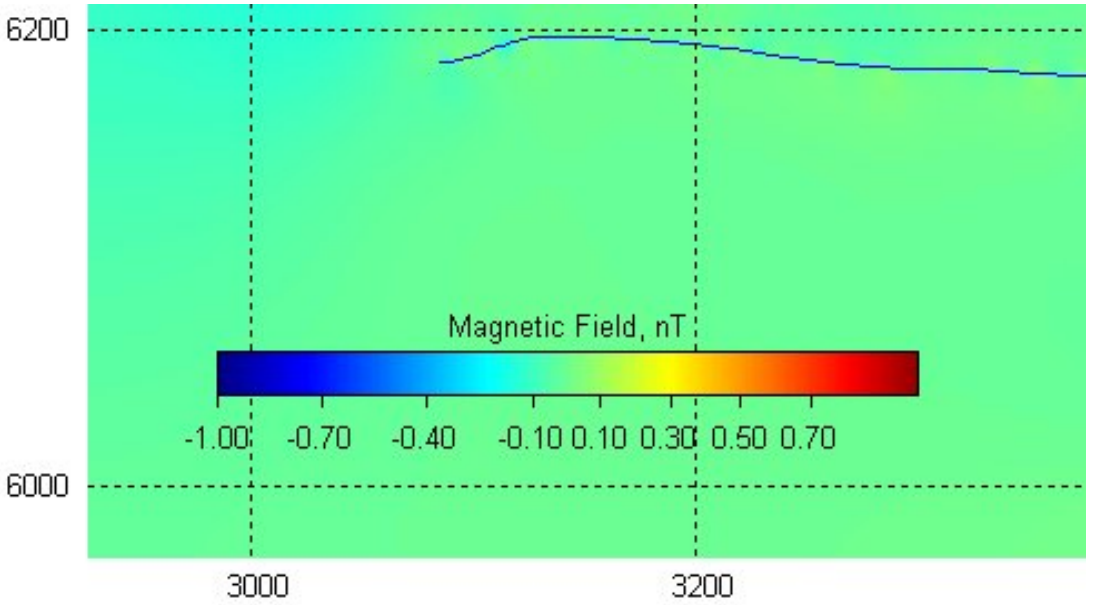
- From the context menu, select “Add / Add color scale”. This adds color scale to the plot at the mouse location.
- Use mouse to select and adjust color scale (stretch it as needed).
- Select and then right click on the scale to define its parameters (next slide)

Adjusting color scale



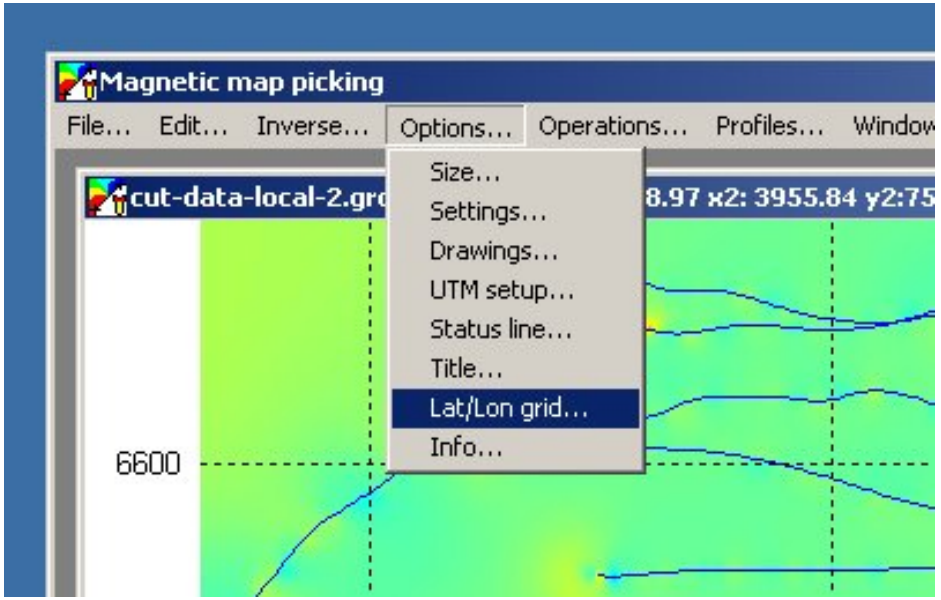
- Left click on the color scale to select it. Note that square handles will appear.
- Use handles and left button to adjust size.
- Right click on the scale to call context menu.
- Select “Edit” menu item.

Final color scale



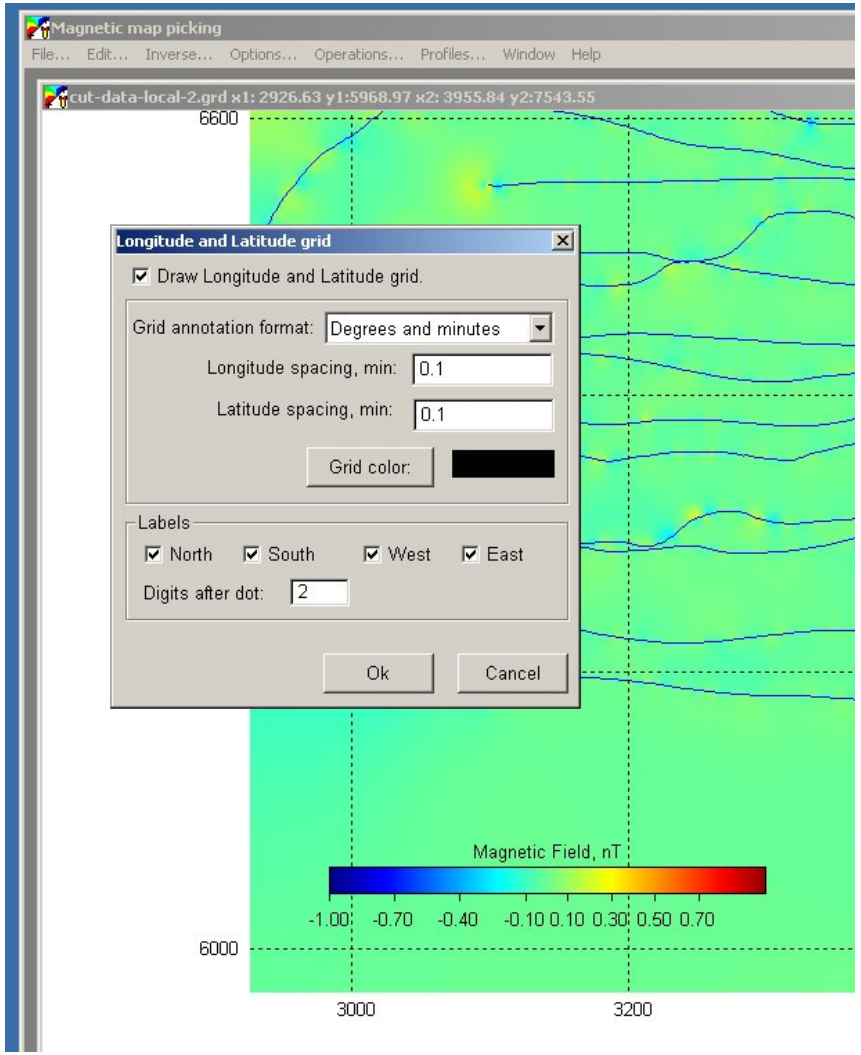
- Adjusted color scale

Adding Lat/Lon grid to the map.



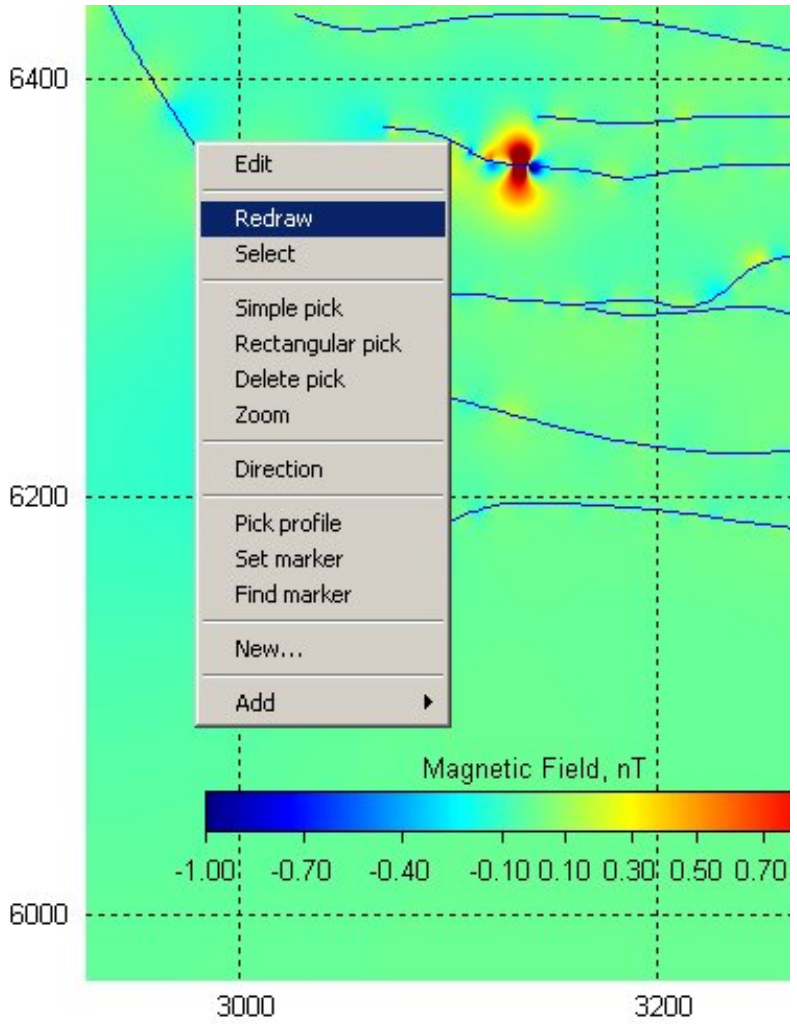
- Select map window.
- Select “Options / Lat/Lon grid...” menu.
- Note: for Lat/Lon grid to be correct, you need correct UTM settings. If you are working with different areas and keep data in short UTM, you may need to load correct UTM parameters for your current area (menu Options / UTM setup)

Lat/Lon grid dialog



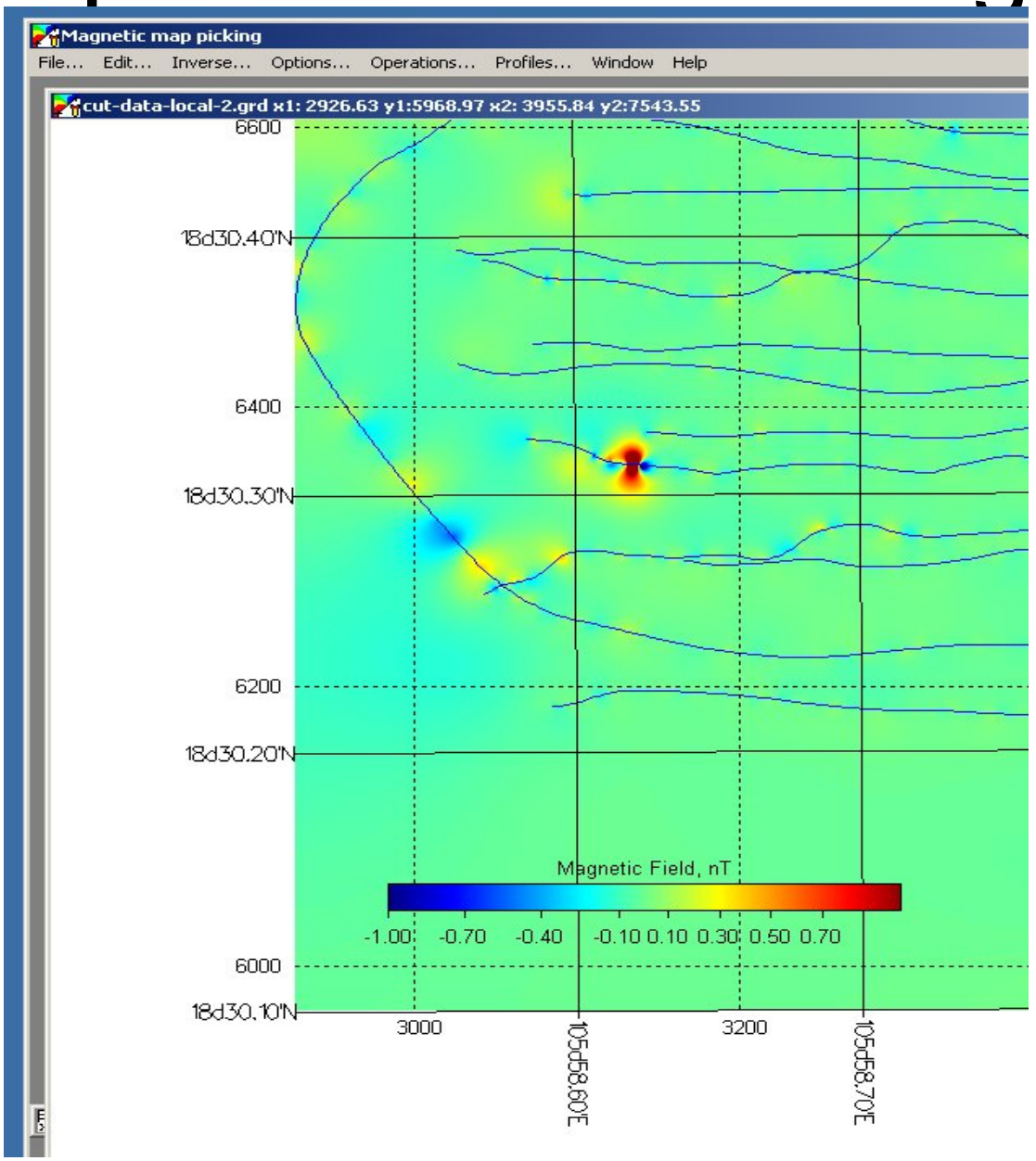
- Check “Draw Lat/Lon grid” if you want grid to appear.
- Select annotation format (decimal degrees, deg. And minutes, deg., min., seconds)
- Set appropriate spacing. You may need to try few times to get what you want.
- Select color.
- Select what part of the frame to label.
- Select decimal places.

Redraw map to see the grid

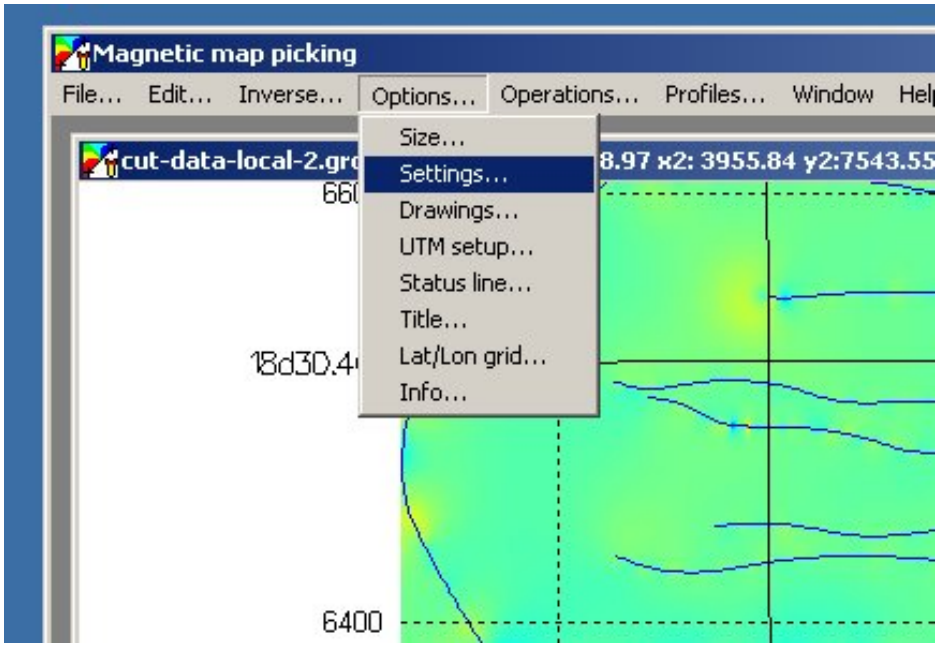


- Right click on the map to call context menu.
- Select “Redraw”

Map with Lat/Lon the grid

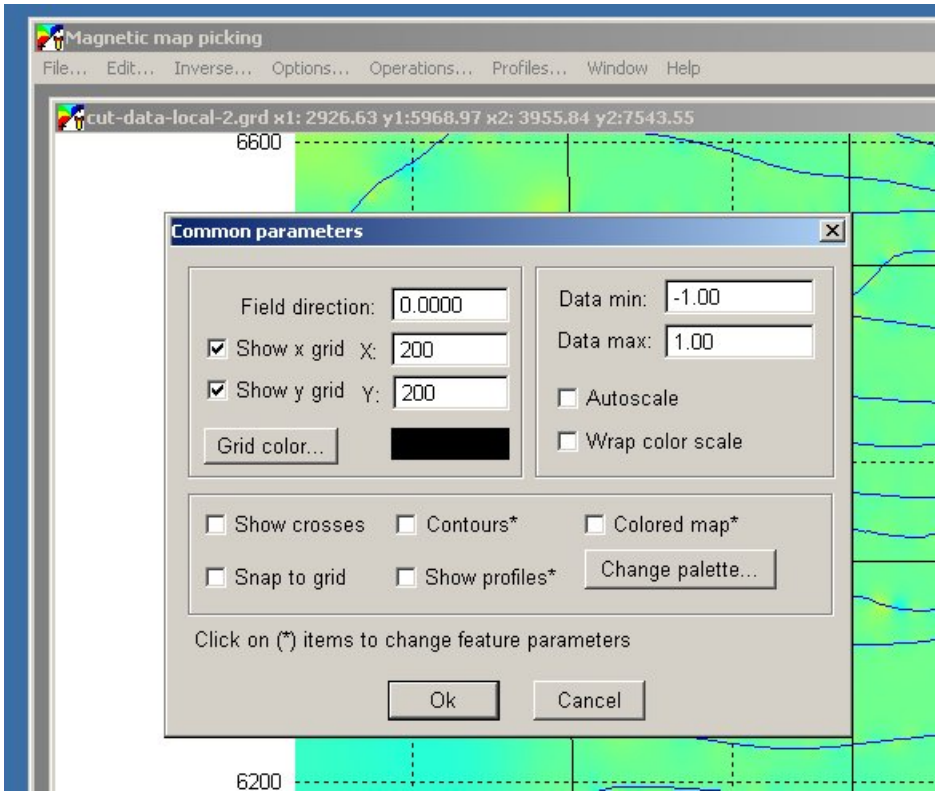


Let's prepare hard copy.



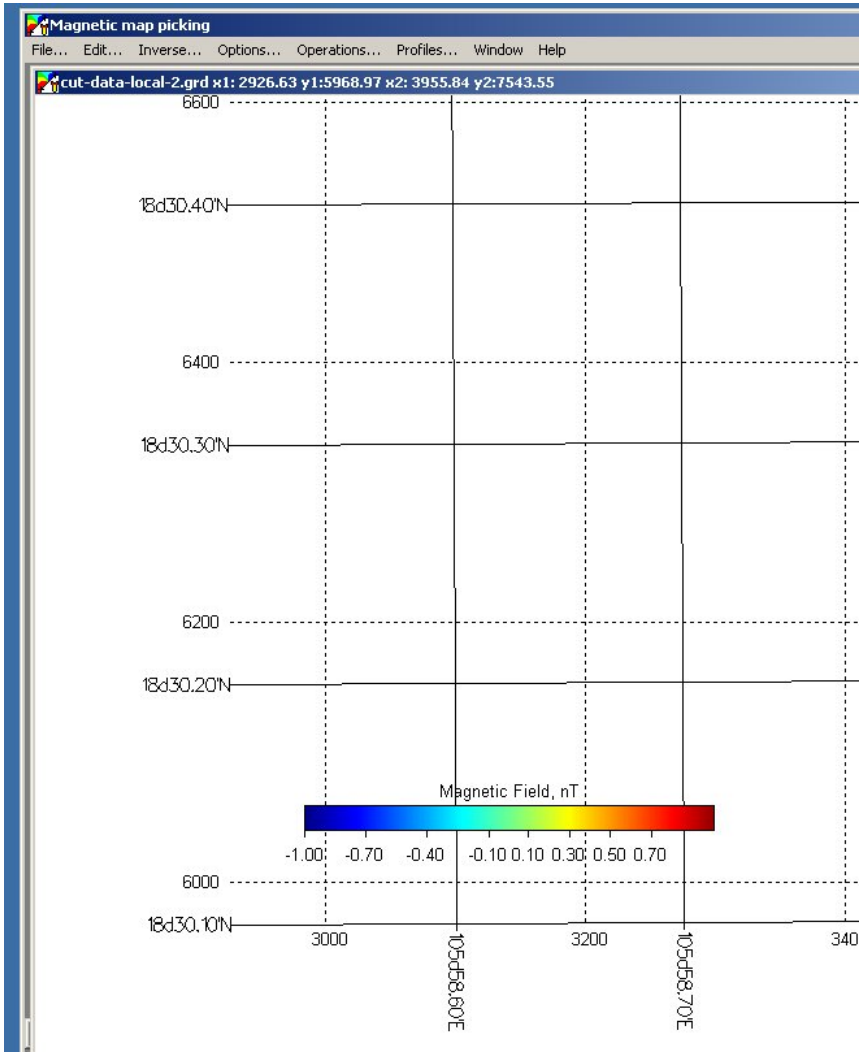
- To create decent hardcopy, MagPick relies on Ghostscript / Ghostview free Postscript interpreter.
- You will need few tries to make output. To speedup procedure, let's first temporally remove colored map from the window.
- Select “Options / Settings” menu

Remove complex plots



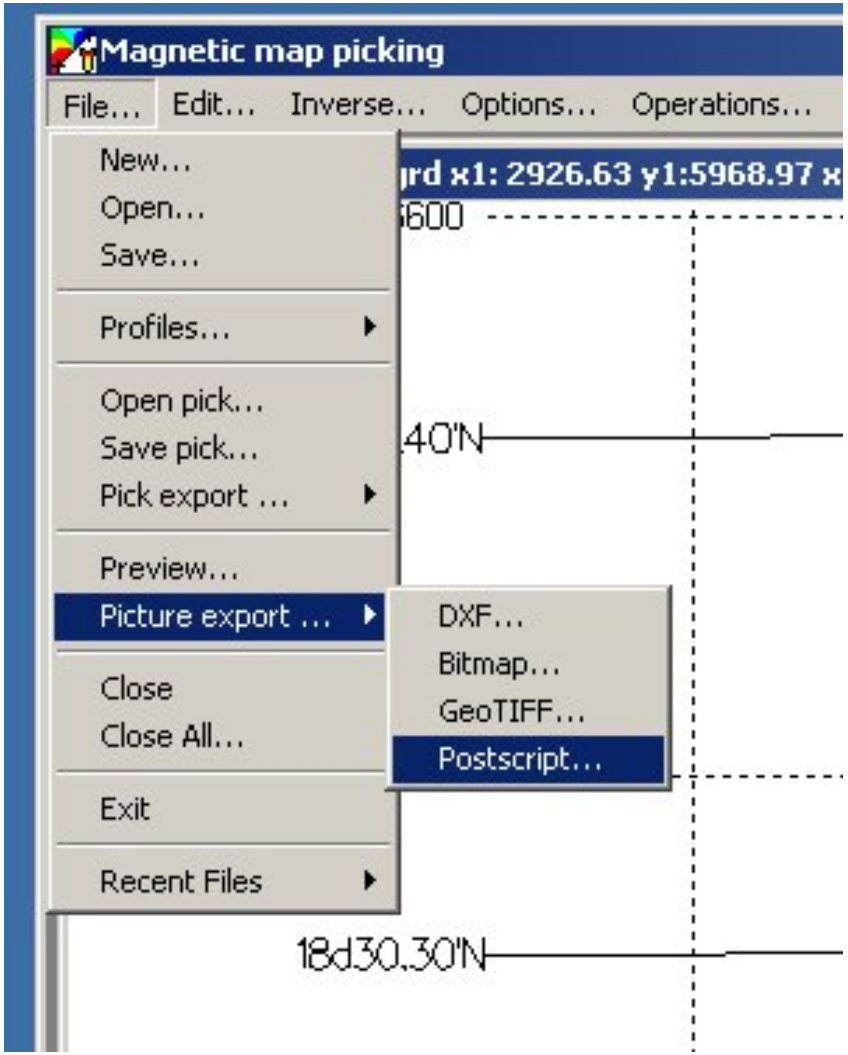
- Uncheck “Contours”
- Unckeck “Colored map”
- Uncheck “Show profiles”
- This leaves coordinate and Lat/Lon grids and color scale alone.

Empty grid



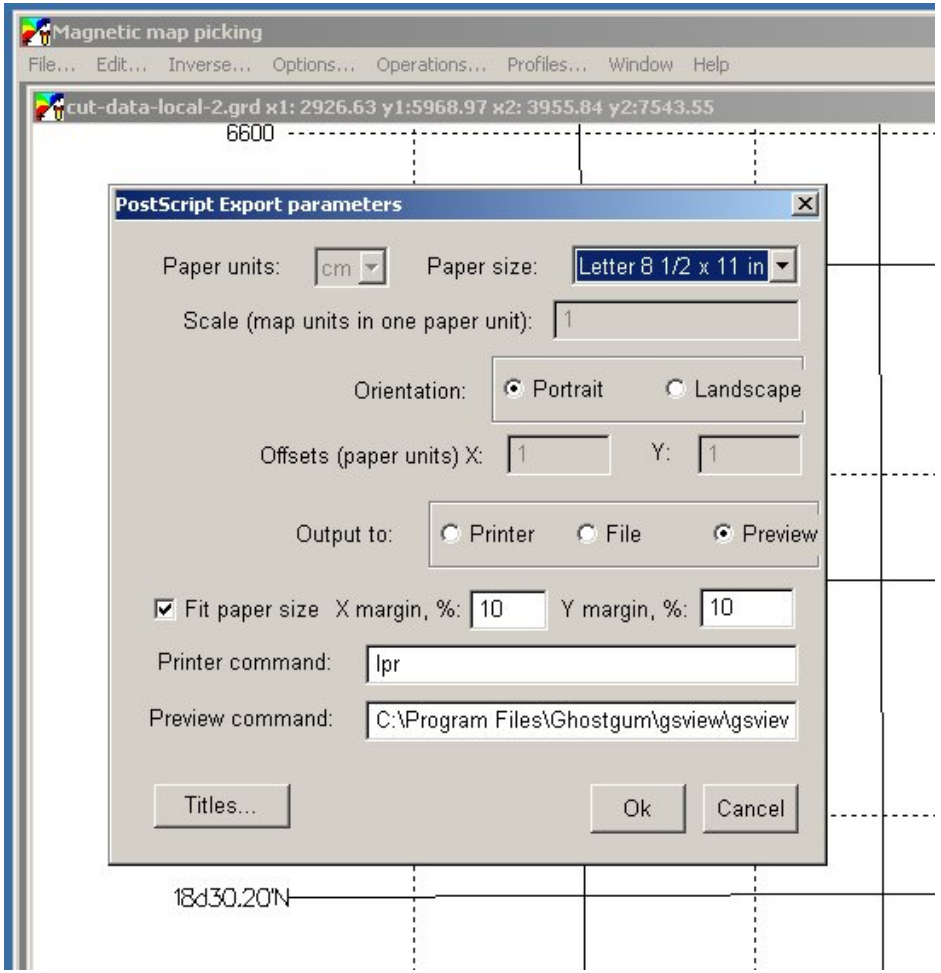
- Here is an empty grid ready to be plotted.
- When we are satisfied with paper layout and scale, we then re-enable all elements to make final output.
- We can convert output to PDF format using Ghostview (below)

Selecting output format



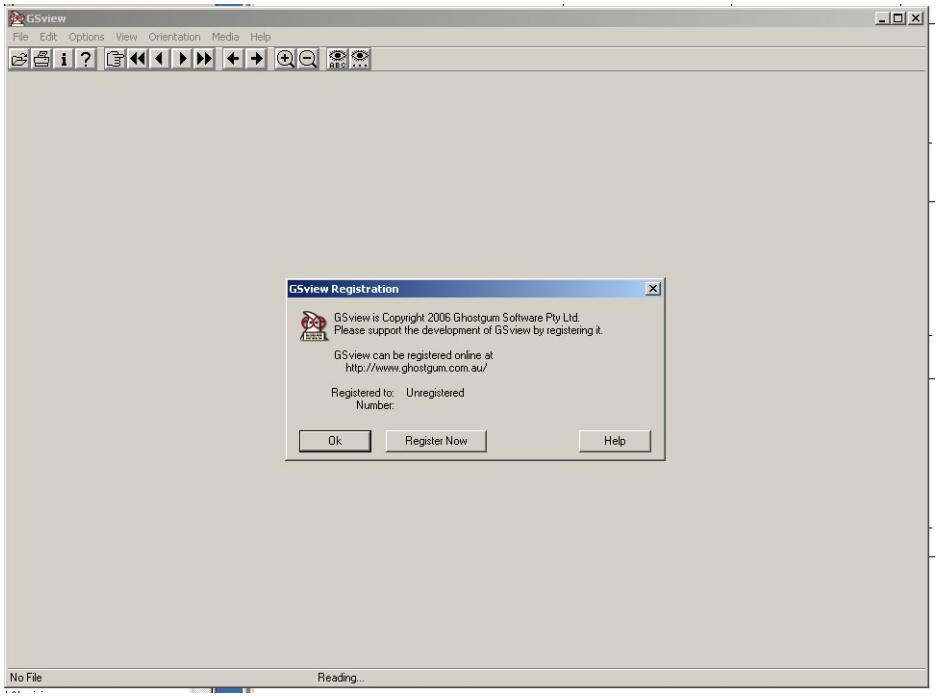
- Picture can be exported into the following formats:
- DXF (UTM or Lat/Lon)
- Bitmap (BMP) Just a window dump.
- GeoTIFF. Compressed format with ability to georefernce. Also screen dump.
- Postscript – vector format can be converted to PDF.
- Select “Postscript”

Postscript setup dialog



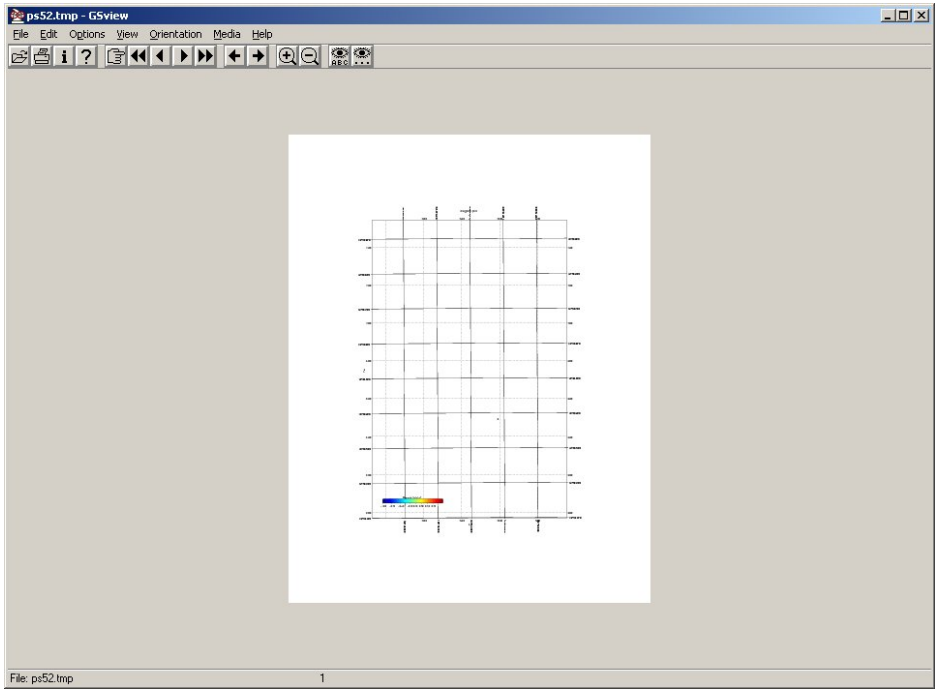
- Use this dialog to setup page layout and scale. Note that paper size is not related to your printer.
- If “Fit paper size” is not checked, you can set appropriate hard copy scale, such as 10 m = 1 cm on paper.
- “Preview” calls external program (gsview) to preview the result.

Gsview pops up.



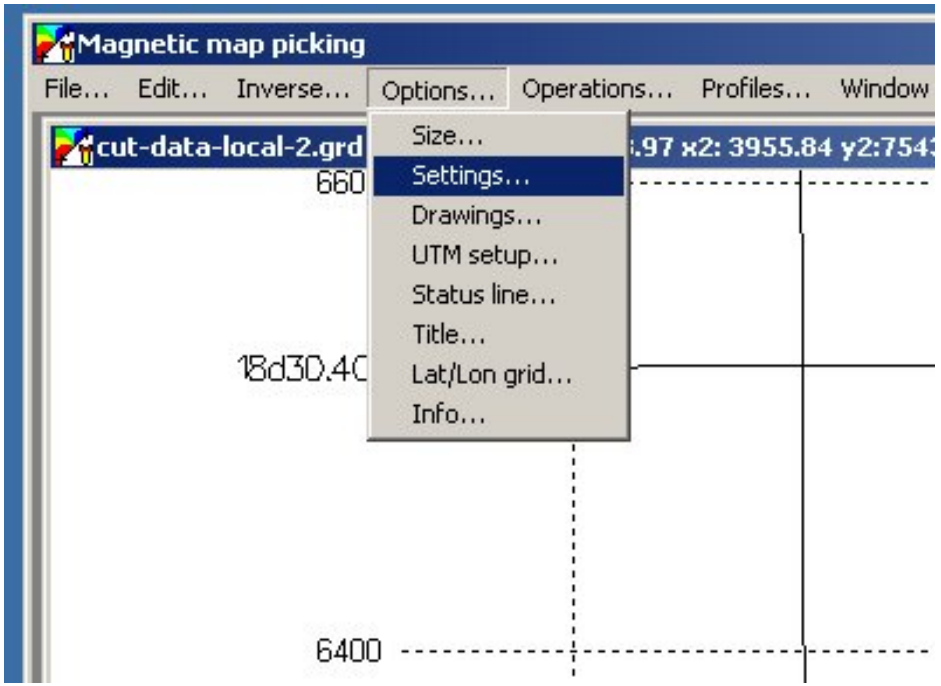
- This is startup screen of external program, Gsview.
- It is unlimited shareware (use to be free). You may get rid of nagging screen by paying a $50 fee. Otherwise, program is fully functional.
- Press “Ok” to proceed

Preview of your page



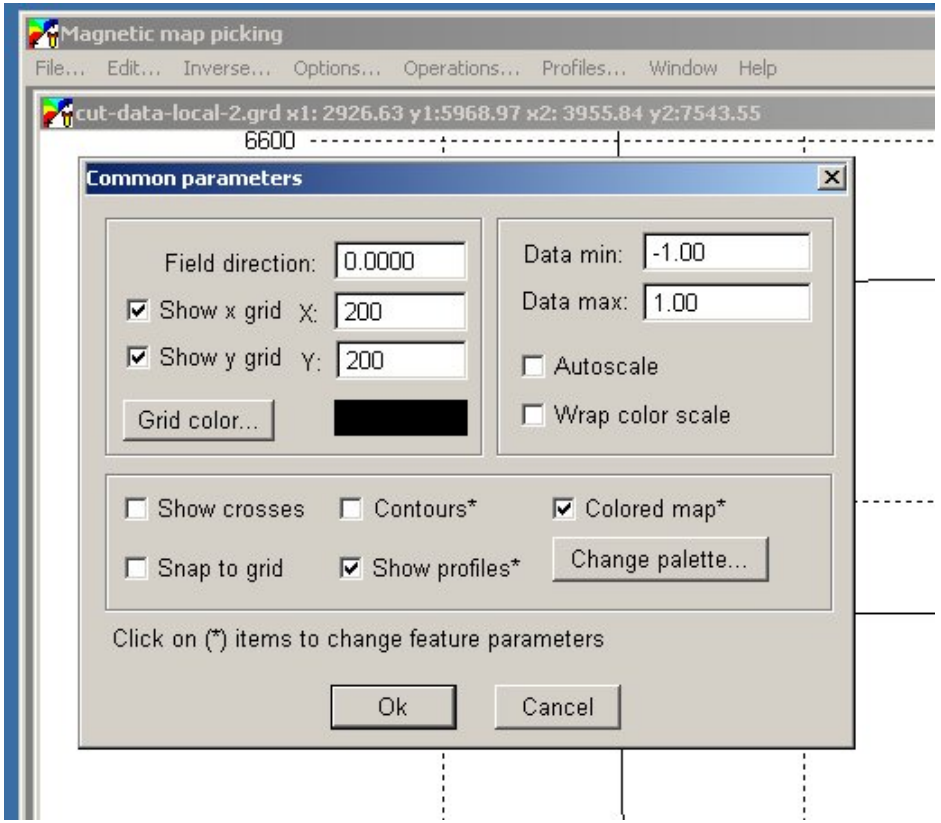
- Here is preview of your page
- Use menu to select paper size.
- Use zoom buttons to see it better.
- Use “measure” function to find distances on paper (in points, mm, inches).
- Refer to the complete Gsview manual for details.
- Close the program when you are done.

Putting color map back.



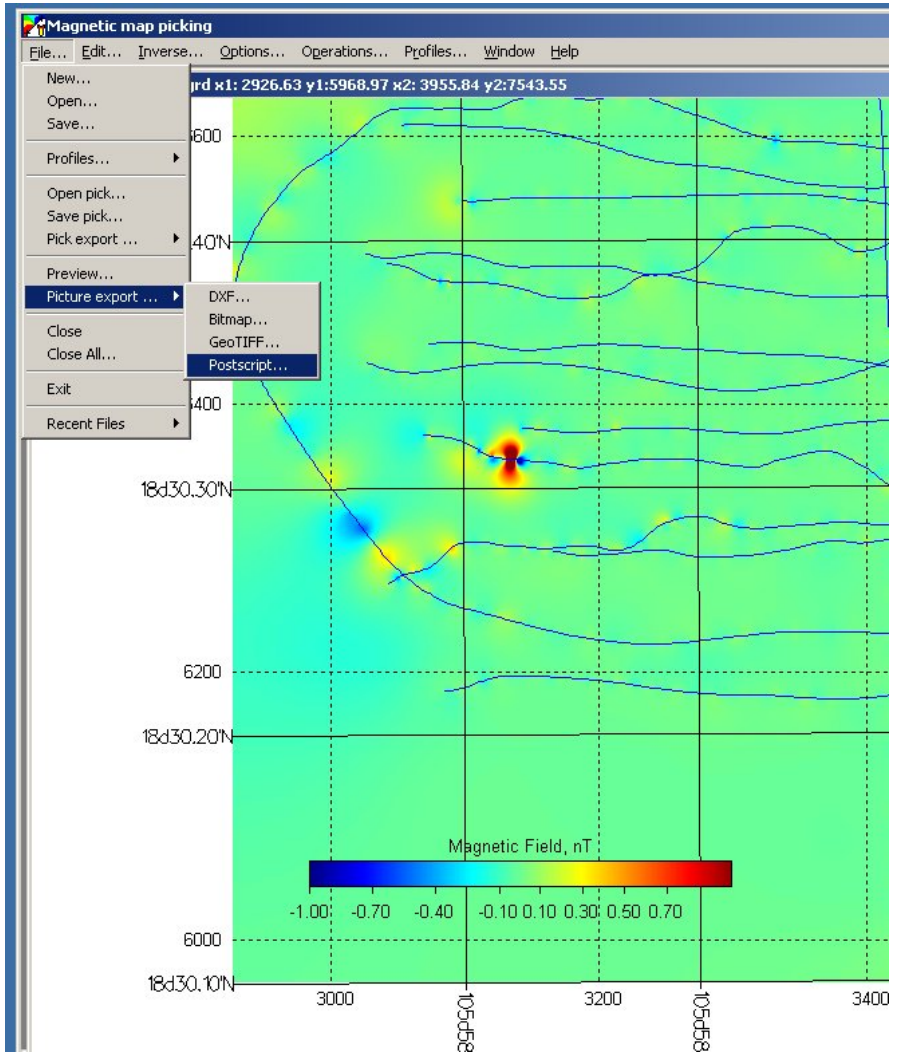
- Let's assume we are satisfied with paper layout. Close Gsview and proceed back to MagPick.
- Select menu “Options / Settings”. Put all that you need back.

Show profiles and color map



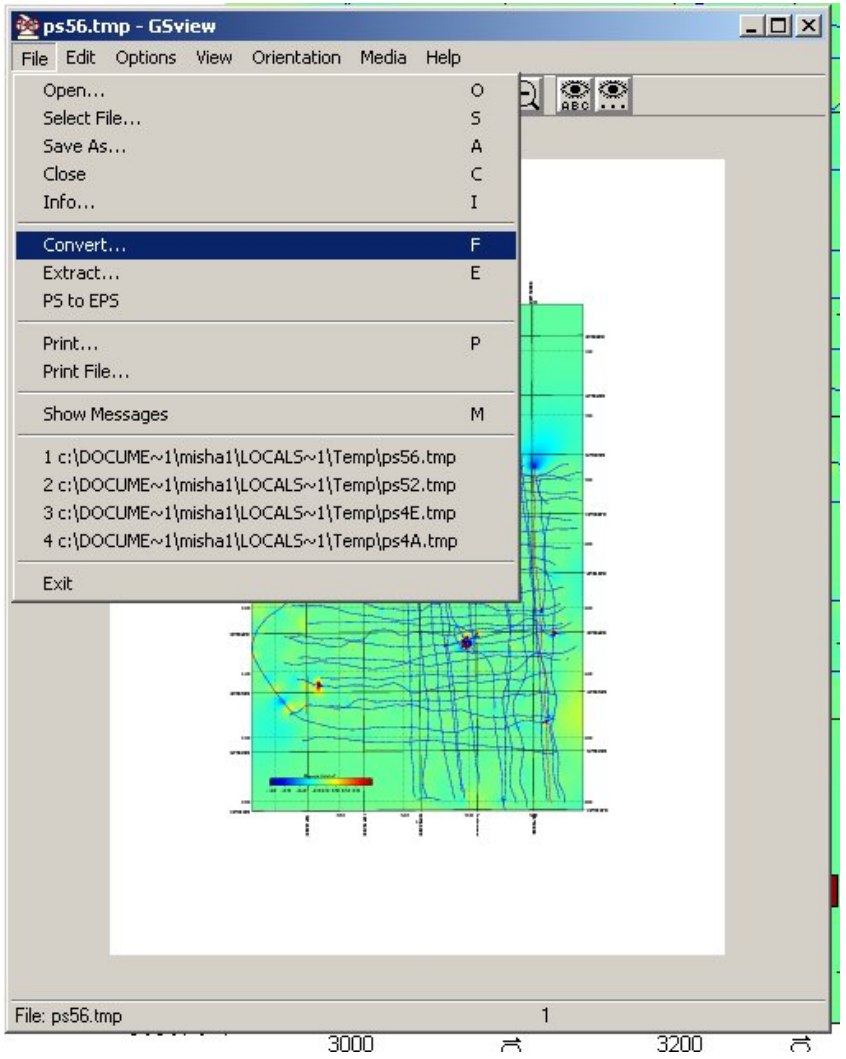
- Check “Show profiles” if you want have then in final printout.
- Check “Colored map” if you want it in final printout.
- Click Ok to get back to the map window.

Go to the picture export again



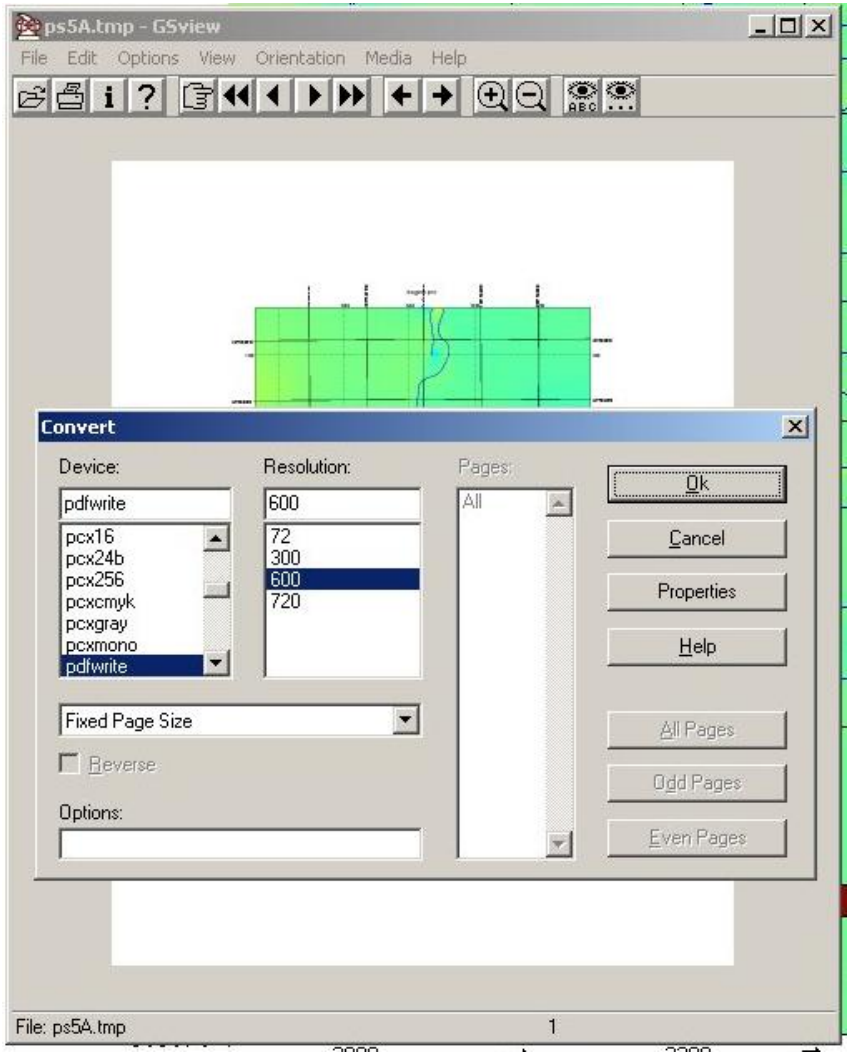
- Now go to the menu “File / Picture Export / Postscript” again.
- Press “Ok” to proceed to the Gsview screen. It can take longer this time because of the graphics

Convert picture to PDF.



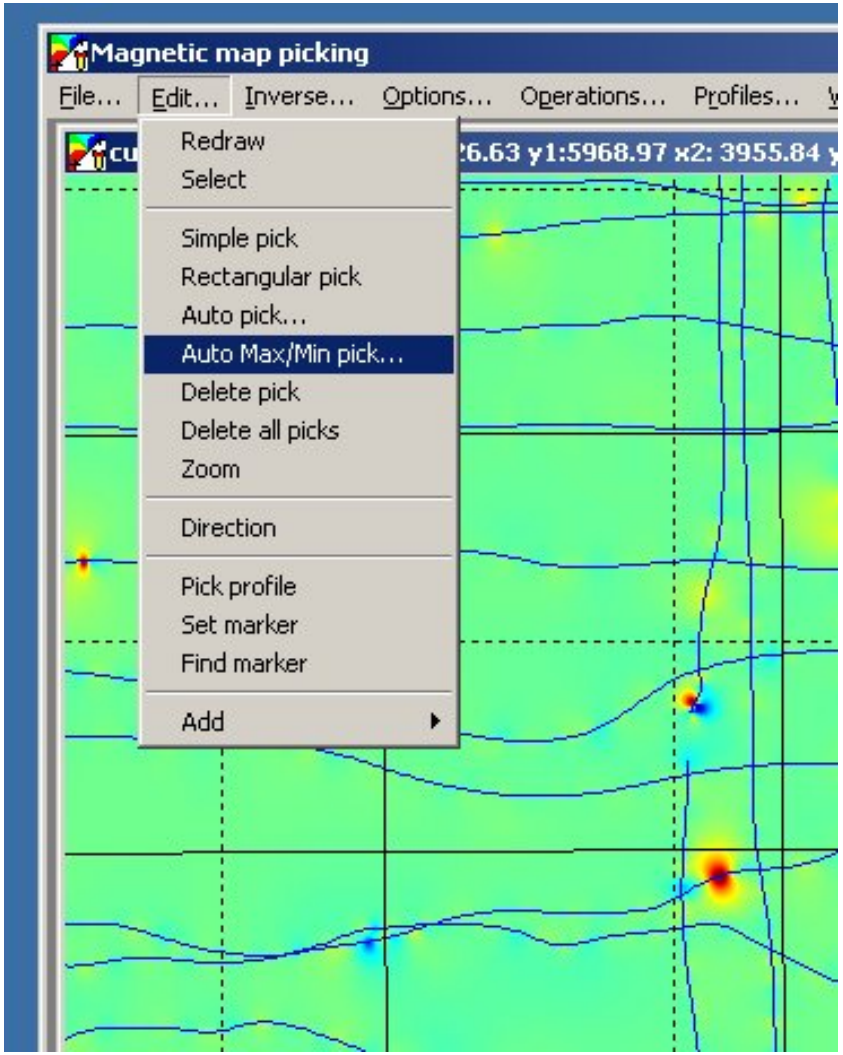
- In Gsview program, select “File / Convert” item.

Select format to convert.



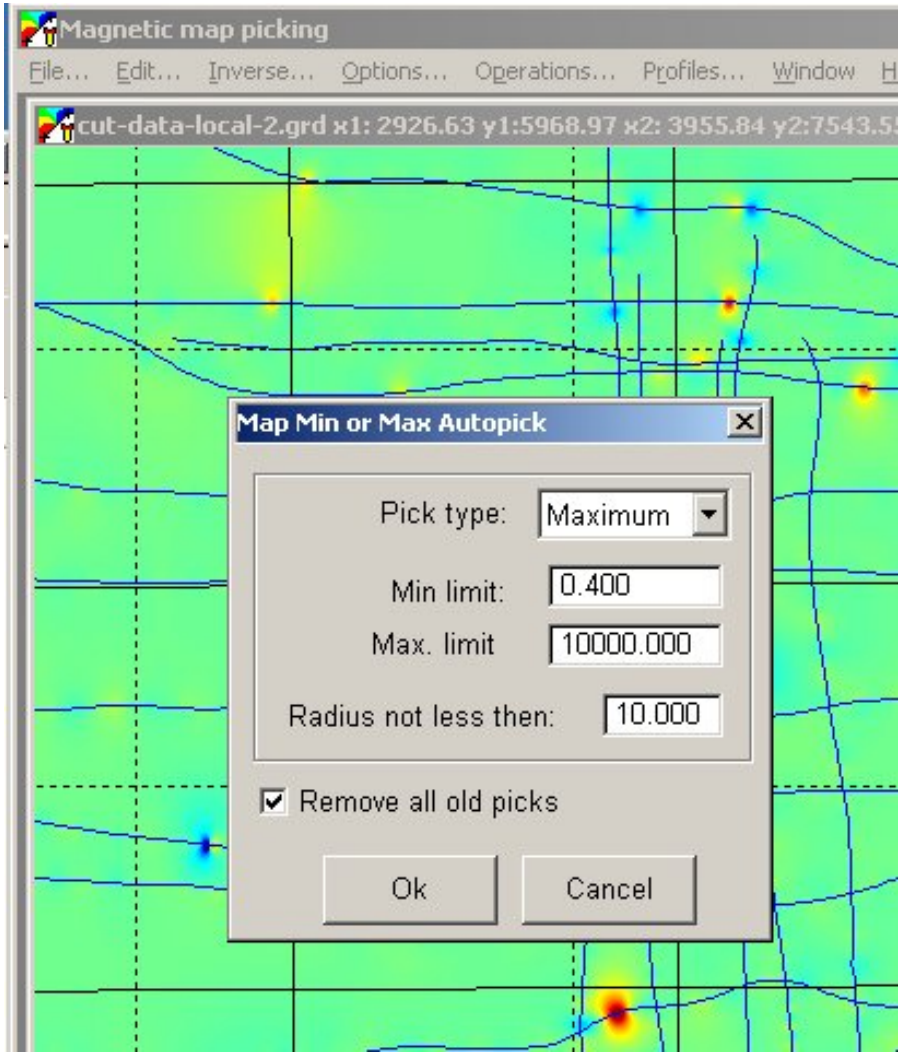
- Select “Device” pdfwrite
- Select “Resolution” 600
- Press “Ok” to proceed.
- In the File selection specify full name, including extension PDF.
- You can use Acrobat Reader to read and print PDF files.

Finding Min/Max points on the map.



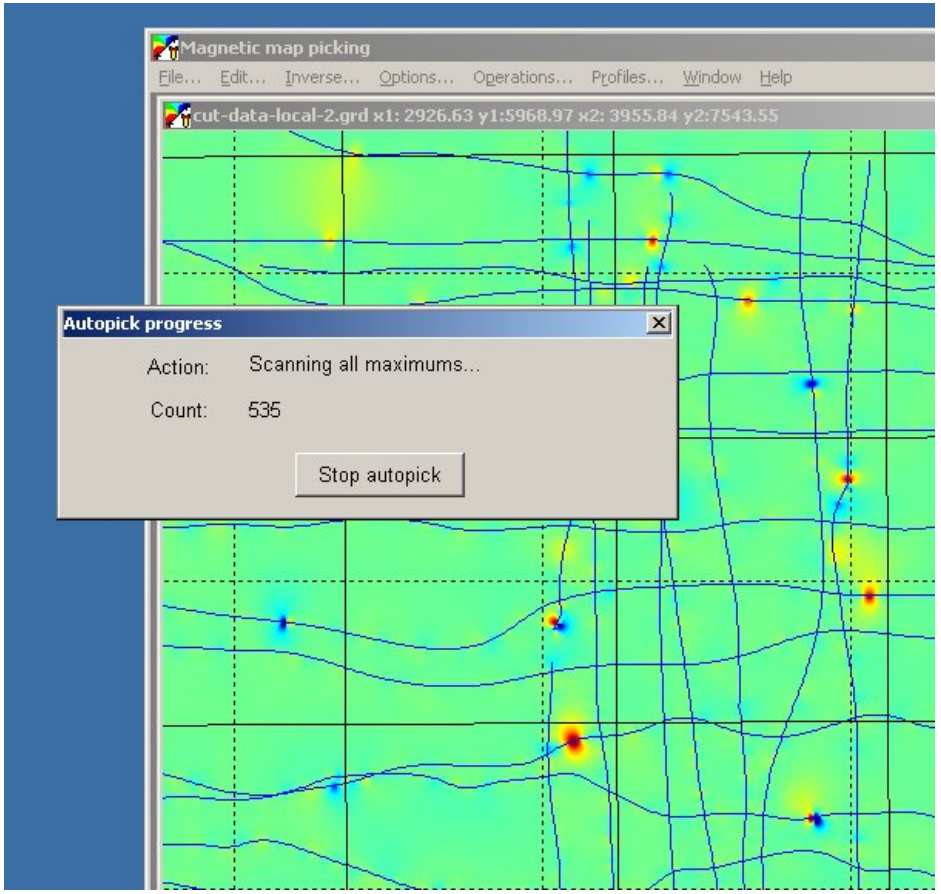
- Now back to targets. It would be nice to obtain positions of all peaks on the map.
- MagPick has an option for this, called “Auto Max/Min peak.”
- Select Auto Max/Min Pick from the “Edit” menu.
- You have to pick minimums and maximums in two steps.

Picking max. points



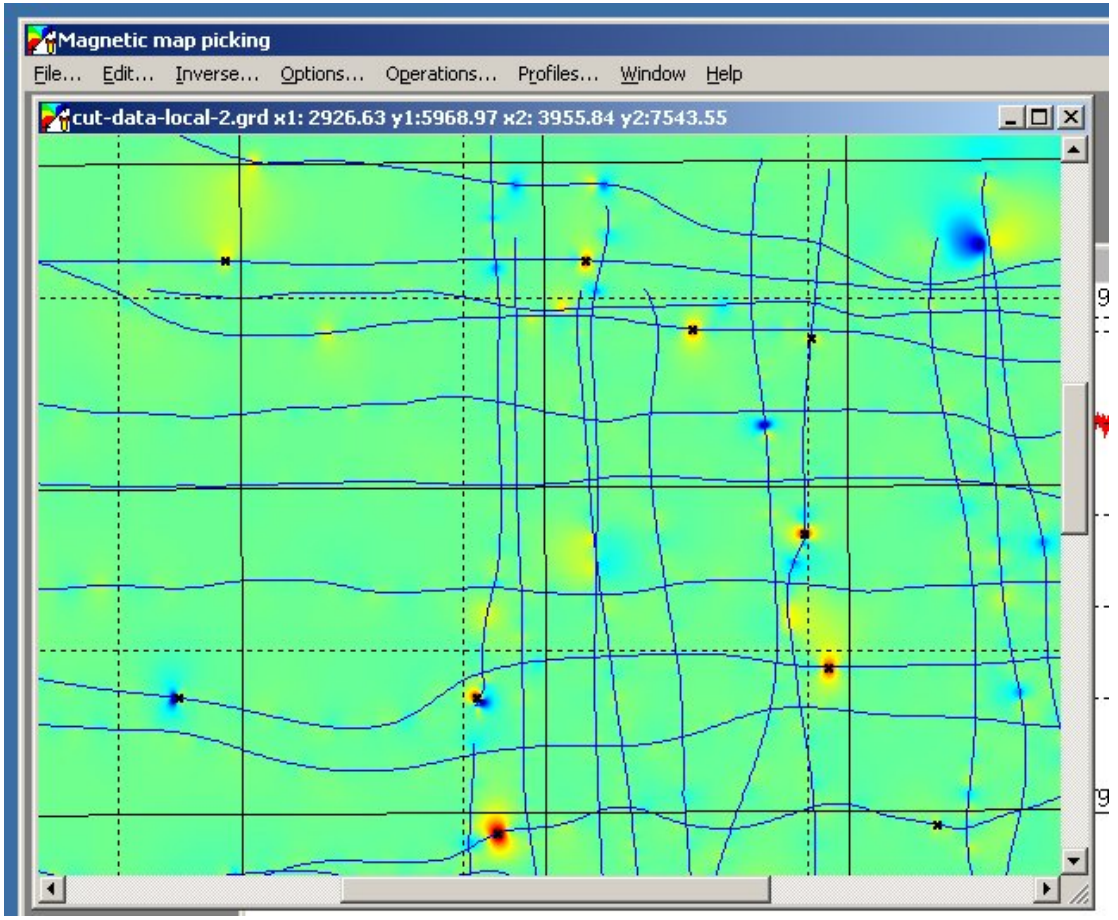
- Select Pick type – Maximum.
- Select minimum value to be picked – all below 0.4 nT are ignored in this example.
- Select max. limit. All above 10000 are ignored in this example.
- Set a radius to reduce duplicate picks. 10 m is in this example.
- Remove any old picks, if any present. Programs asks to save these into a separate file prior to removal.

Auto picking in progress.



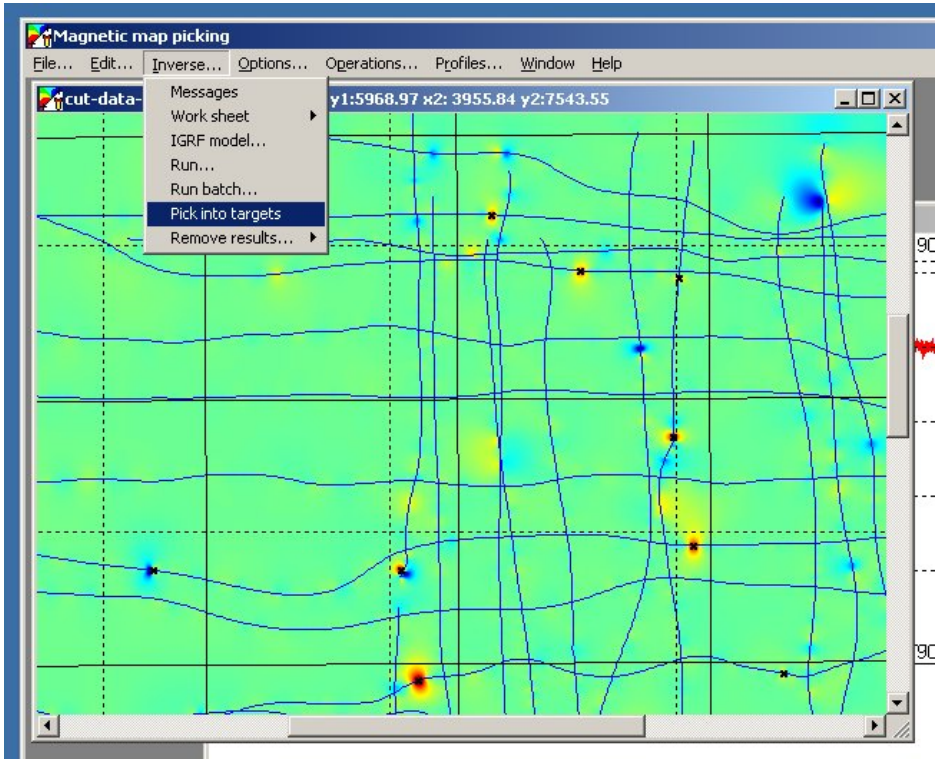
- This typically does not take long. Be patient anyway.

Picking results.



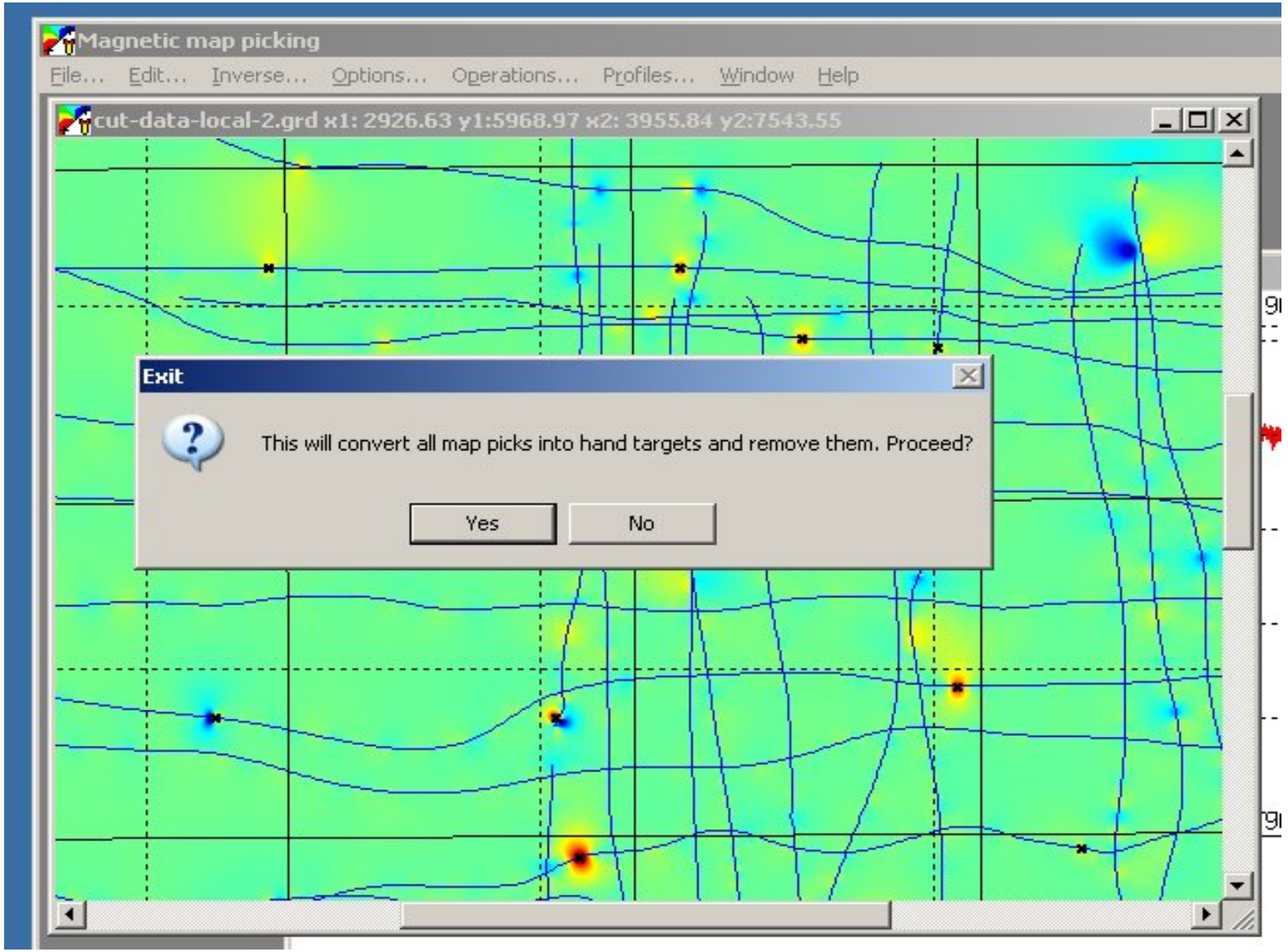
- Small black crosses are picks. If you don't see them, go to Options / Settings and make sure “Show crosses” is set.
- You can add them to the target work sheet.

Converting to targets.

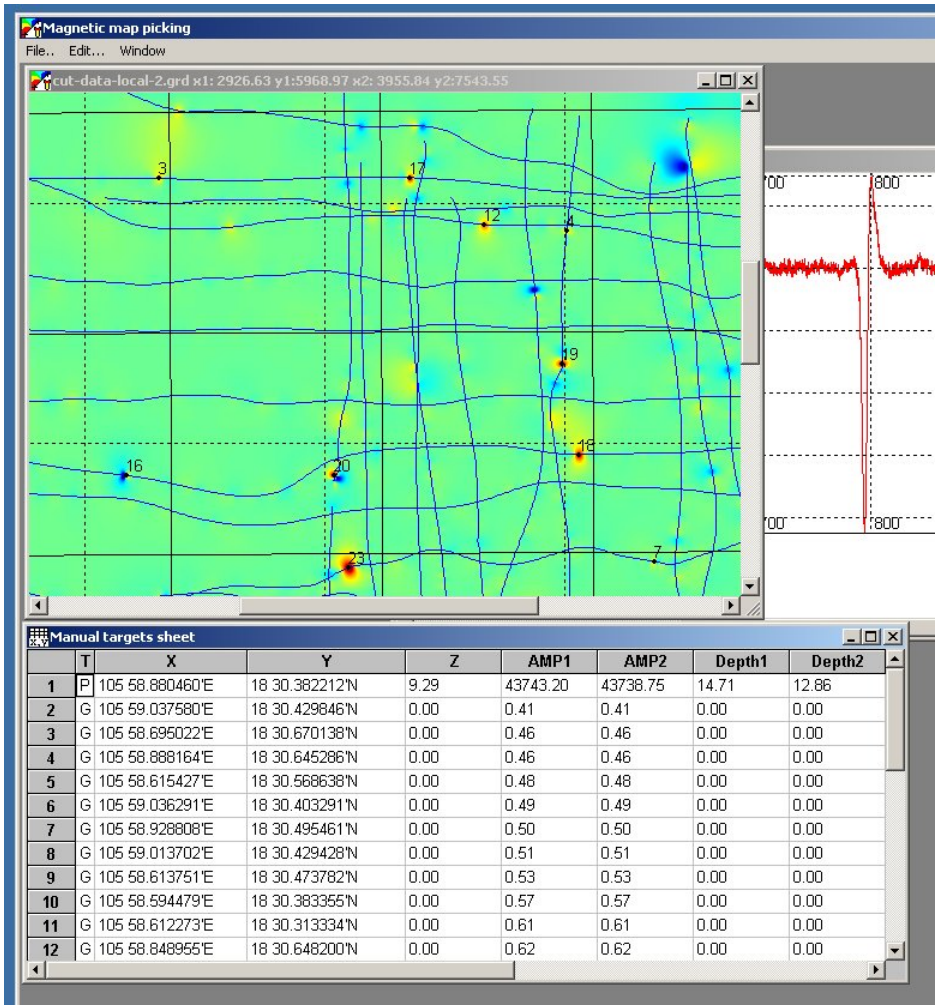


- Select “Inversion / Pick into targets” menu.
- This will convert all the picks on the map into targets, add them to the worksheet and remove them from the map.
- You will be prompted to save picks into separate file prior to removal.

Proceed with pick to target conversion?



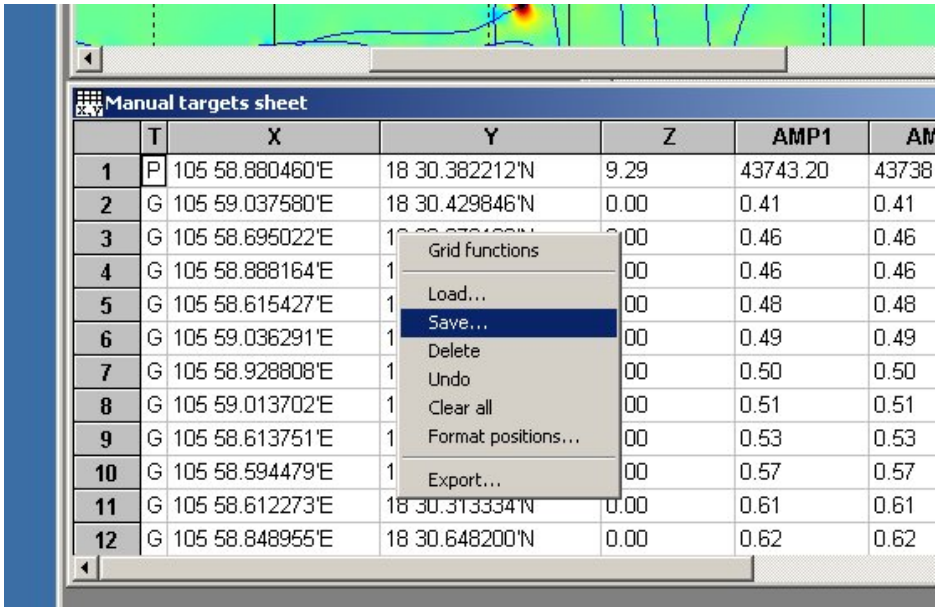
Results of conversion



	T	X	Y	Z	AMP1	AMP2	Depth1	Depth2
1	P	105 58.880460'E	18 30.382212'N	9.29	43743.20	43738.75	14.71	12.86
2	G	105 59.037580'E	18 30.429846'N	0.00	0.41	0.41	0.00	0.00
3	G	105 58.695022'E	18 30.670138'N	0.00	0.46	0.46	0.00	0.00
4	G	105 58.888164'E	18 30.645286'N	0.00	0.46	0.46	0.00	0.00
5	G	105 58.615427'E	18 30.568638'N	0.00	0.48	0.48	0.00	0.00
6	G	105 59.036291'E	18 30.403291'N	0.00	0.49	0.49	0.00	0.00
7	G	105 58.928808'E	18 30.495461'N	0.00	0.50	0.50	0.00	0.00
8	G	105 59.013702'E	18 30.429428'N	0.00	0.51	0.51	0.00	0.00
9	G	105 58.613751'E	18 30.473782'N	0.00	0.53	0.53	0.00	0.00
10	G	105 58.594479'E	18 30.383355'N	0.00	0.57	0.57	0.00	0.00
11	G	105 58.612273'E	18 30.313334'N	0.00	0.61	0.61	0.00	0.00
12	G	105 58.848955'E	18 30.648200'N	0.00	0.62	0.62	0.00	0.00

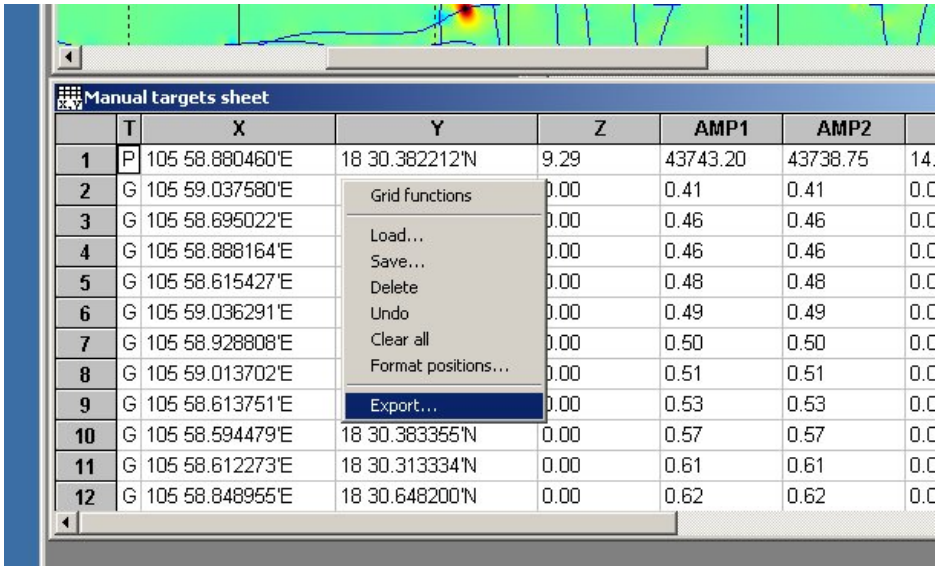
- Black crosses are now gone from the map.
- New targets are added into the worksheet.
- They are marked with “G” - grid.
- They may not have some information as profiles picked targets are, such as depth, time, amplitudes, etc.

Saving worksheet into file



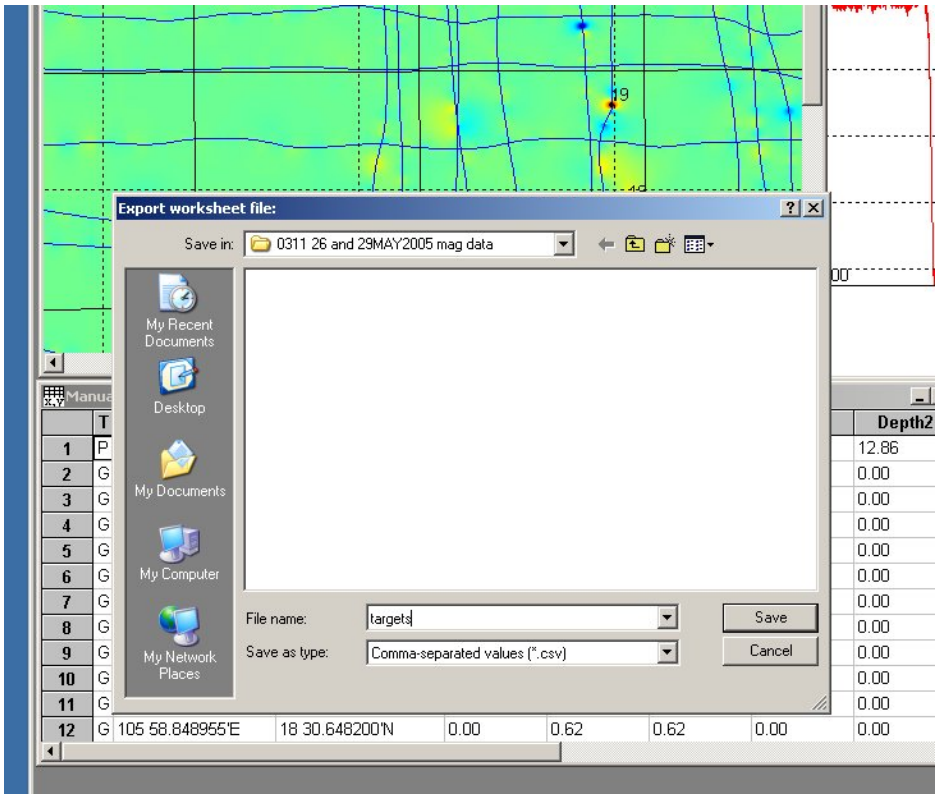
- Use context menu on the worksheet and select “Save”.
- You are prompted for file name.
- Save data into this file.
- MagPick uses proprietary ASCII format to store this data.
- To load data into some standard spreadsheet application, use Export into CSV.

Exporting worksheet into CSV



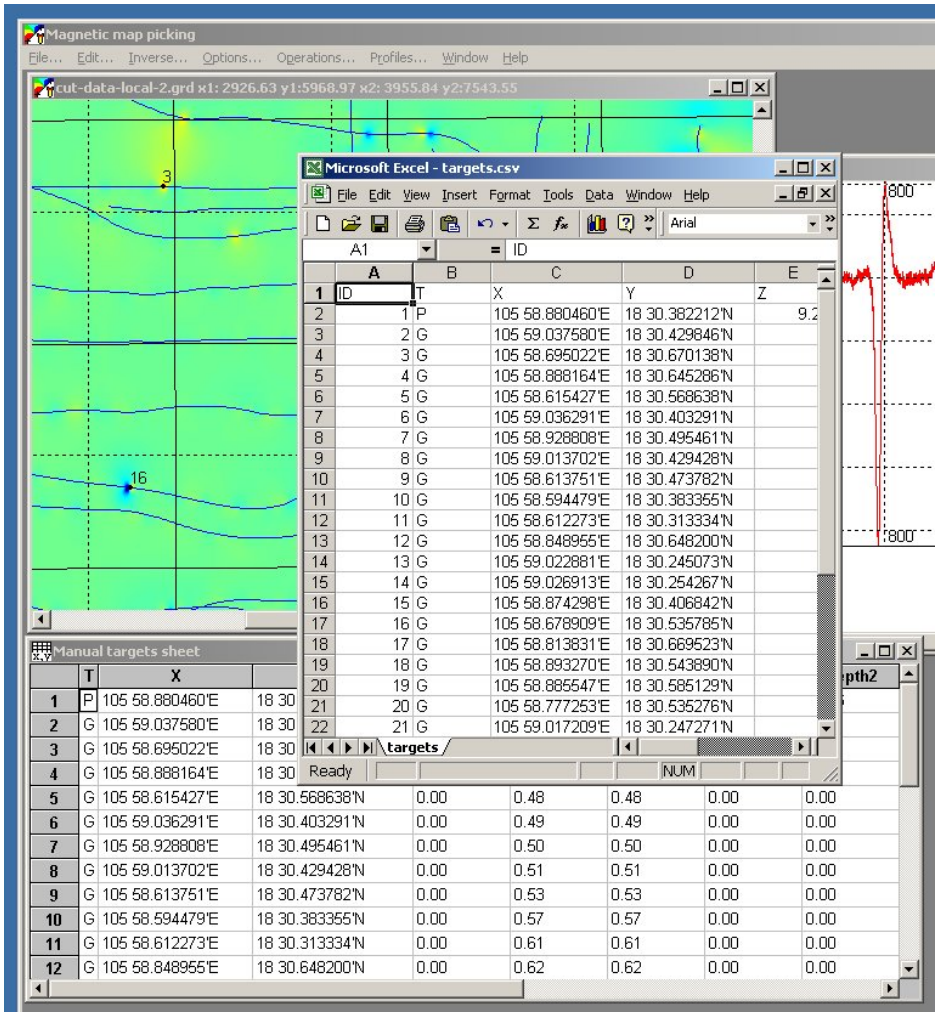
- Adjust position format in worksheet the same way you want it appear in the spreadsheet application.
- From context menu, select “Export”.

Selecting CSV file for export.



- In the file selection dialog, select “Comma separated values” option.
- Assign new or pick existing CSV file.
- Upon saving into file, MagPick calls your default application to handle CSV files. It could me Microsoft Excel or Open Office spread sheet application.

Excel launched by MagPick.



- Here is Excel window launched by MagPick.
- Adjust Excel spread sheet as you desire.
- Save it into Excel XLS file if you wish.

Add an Outline