

Step by Step Guide to using Snuffler to Process FM256 Magnetometry Surveys

This guide is based on training and notes provided by Peter Masters of Cranfield University. Some additions and amendments have been made by Jigsaw Cambridgeshire to adapt the guide for our volunteers; any errors are our own. Thanks to David Staveley for creating this free user-friendly processing software.

Snuffler is an excellent freeware alternative to commercial software packages such as *Geoplot* and *TerraSurveyor* (formerly *Archeosurveyor*) used by professionals as it offers similar features (destriping, interpolation, creating greyscale maps) and functionality (e.g. downloading data from instruments).

Installation

Snuffler can be downloaded at

<http://www.sussexarch.org.uk/geophys/snuffler.html>

1. Under 'Page Index', click on 'Download'. The current version is 1.12. Where it says 'Download the file here: [snuffler.zip](#) (5.6Mb)', click on '[snuffler.zip](#)' and select 'Save file'. Once downloaded, save the .zip file into a folder of your choice (e.g. **C:\Snuffler**) and double-click on 'snuffler.zip' to open the file. Then double click on 'setup.exe' file. A standard Windows-type installation wizard will pop-up (see right). Follow the instructions to load the program.



2. It will also ask you for the installation folder (e.g. **C:\Snuffler**). Click on 'Next' to start unpackaging the program.

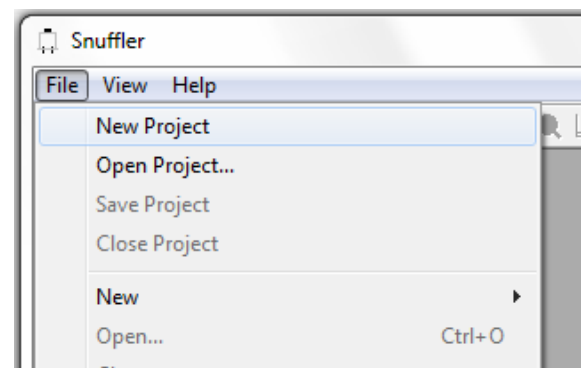
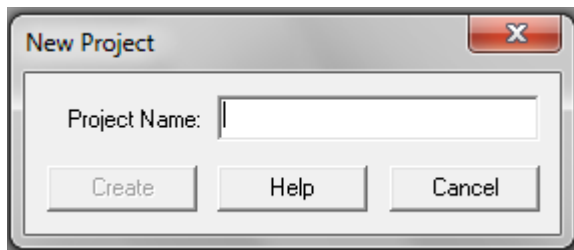
(It is important to note that Snuffler works fine running Windows XP but you might find that some functions may not work as well with Windows 7 and 8.)

3. Once the installation is complete, a Snuffler shortcut should appear on your Desktop (see right). Double click on it to run the program.



Create a Project

Once Snuffler is installed, create a new project. Go to **File>New Project** (see right). A pop-up menu will appear (see below). Name your project something memorable and click on 'Create'. Your project name will appear in the left margin in Snuffler.



Importing/Downloading Data

There are two basic ways of entering geophysics data into Snuffler. One is to **directly download** the data from the Geoscan FM256 instrument and the other is to import previously downloaded data in ASCII (.dat, .xyz, .txt) format into your project.

Method 1: Direct Downloading

1. Connect the FM256 to your computer using the Data Dump nine-pin cable. If your computer doesn't have a nine-pin cable, you may use the green USB adaptor, but it is not always possible to download using this. To ensure good results, use an old PC or laptop with a nine-pin female Comm Port, or borrow the Jigsaw laptop.
2. Turn on the FM256. We need the FM256 to be in 'Fast ASC' mode. To ensure this is selected,

press Menu on the FM256 instrument. Then select 'Setup' by pressing

Dummy
Log
3

and using the down key

Delete
↓

navigate to find 'Data Format' and then use the left and

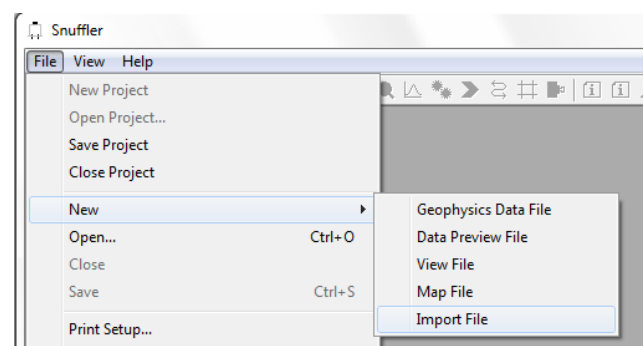
right keys to select 'Fast ASC'. Once this is selected press the

Dump
End Menu

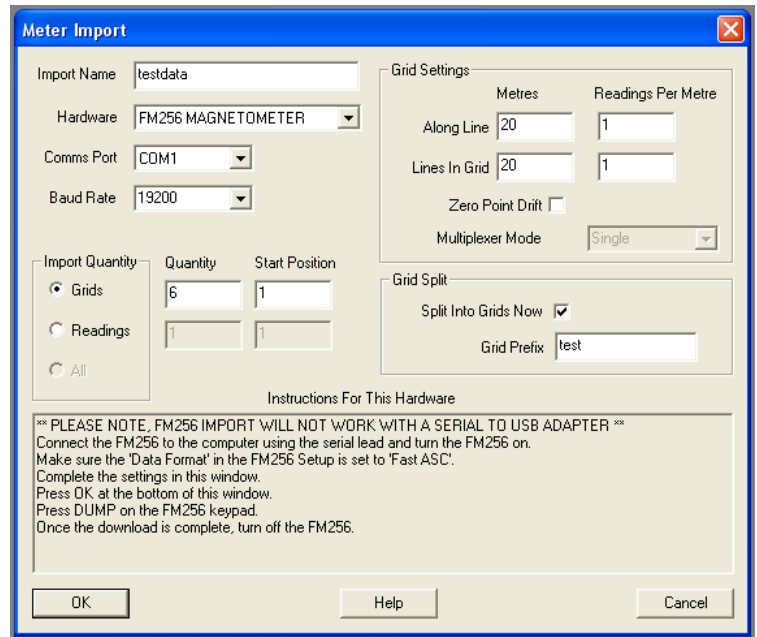
button twice

3. Back in Snuffler, select **File>New>Import file** (see right).

The 'Meter Import' menu will appear (see right). Select the following:

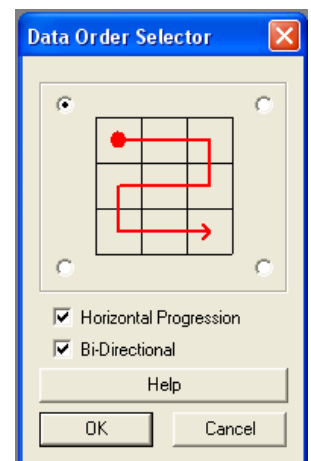


- **Import Name:** give a slightly different name to above, e.g. testdata.
- **Hardware:** 'FM256 MAGNETOMETER'.
- **Comms Port:** this refers to the port in the computer into which you connected your FM256 Data Dump cable. Select the Comms Port, e.g. COM1. If you don't know which port it is, you may be able to check this in the Device Manager on a Windows OS. Alternatively, use trial and error – if it doesn't download with COM1, try COM2 etc.
- **Grid Split:** check the 'Split into Grids Now' box to avoid data mix-ups later on.
- **Grid Prefix:** file name again e.g. 'test'.



Follow the instructions at the bottom of the 'Meter Import' box to complete download.

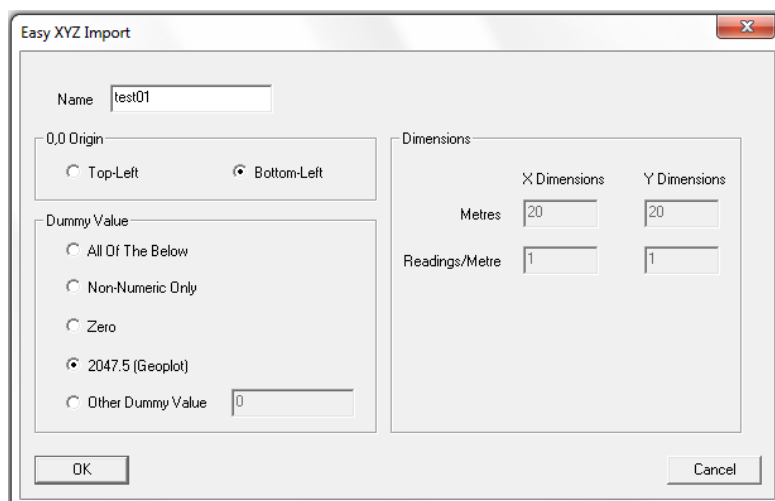
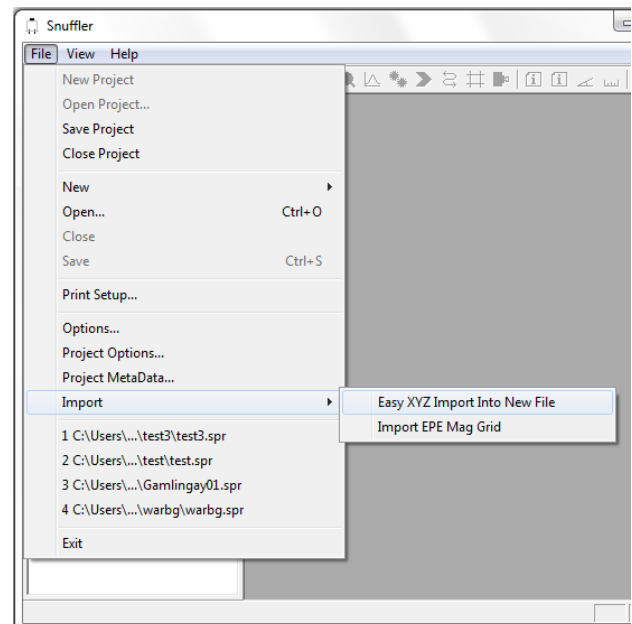
4. If download has been successful a Data Order Selector box appears (see right). Untick 'horizontal progression' and it should go up and down from bottom left.
5. Turn off the FM256.



Method 2: Importing Previously Downloaded Data

It is best to directly download your data directly from the FM256 before you return the equipment. However, Snuffler can process data from imported files (e.g. if you ask Jigsaw to download the data into Geoplot, we can send you the data files to process in Snuffler).

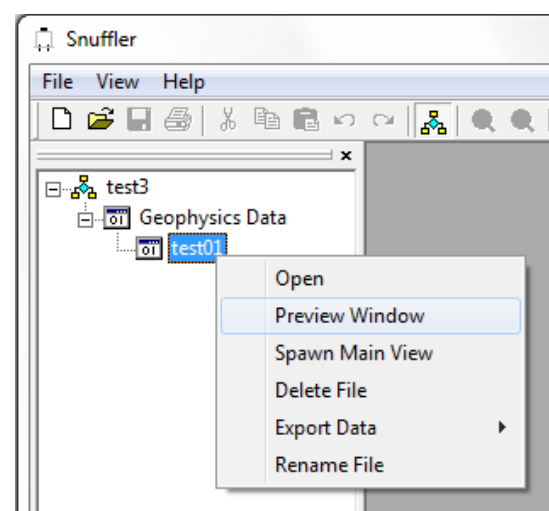
1. Make sure the files you want to upload are in the correct folder. Save the .xyz or .dat file as 20x20 not 80x20 (4 readings/m) in Geoplot. Import .xyz data into Snuffler by putting it into Program Files (x86)/Snuffler folder.
2. **File>Import>Easy XYZ Import Into New File** (see right). Navigate to the folder your files are stored in and select your first file. A new box appears (see below):



Select:
Origin: 'Bottom-Left'
Dummy value: 2047.5 (Geoplot)

3. Continue in this vein until all the required files have been entered into your project.

Creating a Composite

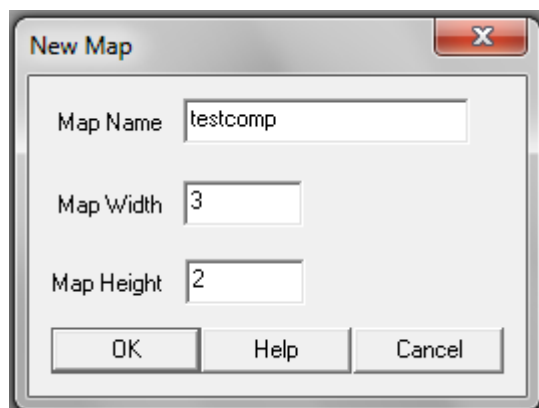


Once your data has been incorporated into your Snuffler project you can preview each grid. To the left of your file name you will find a '+' sign. Click on this, and the title 'Geophysics Data' appears. Click on the '+' sign next to this as well, and the file names of each of the grids uploaded are listed. Right-hand click on the name of the grid you wish to preview, and select '**Preview Window**' (see right). A sneak preview of your grid will appear.

In order to view all the data in one view a composite needs to be created:

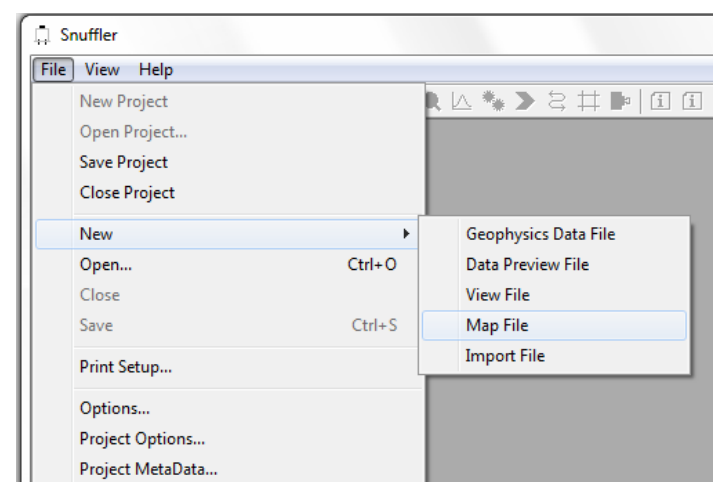
1. Go to **File>New>Map File** (see right).

The 'New Map' box appears (see below):



The 'New Map' dialog box has the following fields and buttons:

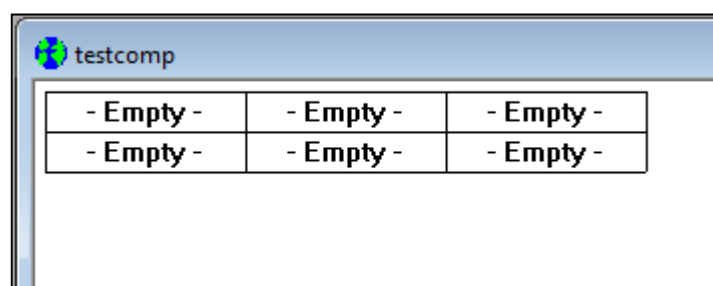
- Map Name:** testcomp
- Map Width:** 3
- Map Height:** 2
- Buttons:** OK, Help, Cancel



- **Map Name:** e.g. 'testcomp'.
- **Map Width and Map Height:** this refers to the layout and number of the grids you surveyed. For example, the diagram on the right represents the Map Width: 3 and Map Height: 2.

1	2	3
6	5	4

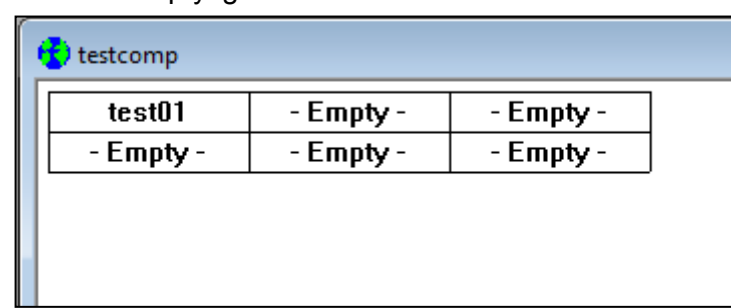
Press 'OK'. The following box appears:



The 'testcomp' map window shows a 2x3 grid of empty cells:

- Empty -	- Empty -	- Empty -
- Empty -	- Empty -	- Empty -

2. Now you need to attribute each grid to its proper location. Left-hand click on one of the 'Empty' grids. A 'Select Data Source'

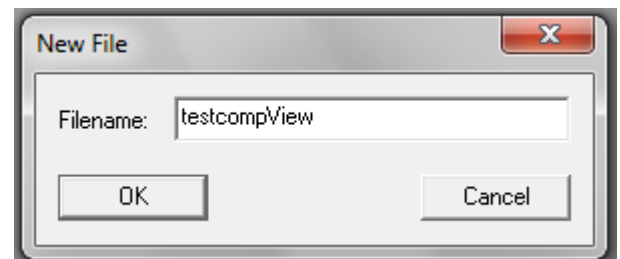


The 'testcomp' map window shows the first cell of the grid populated with 'test01':

test01	- Empty -	- Empty -
- Empty -	- Empty -	- Empty -

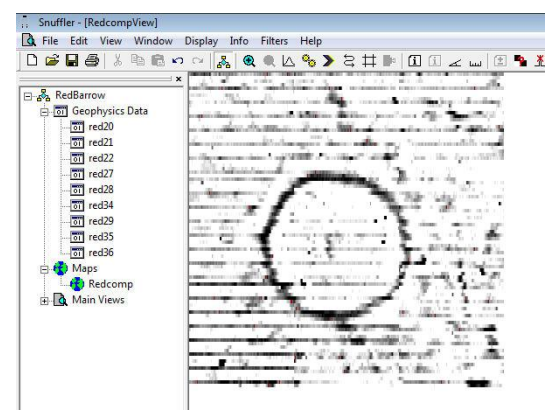
box appears. Select a filename to fill this box according to the order you surveyed the grids in, e.g. see below.

3. Once the grids have been configured into their correct positions you can close the Composite file (the program will ask you whether to save the file – select 'Yes').
4. Click on the '+' sign next to 'Maps', right-hand click on the composite filename (e.g. 'testcomp') and select 'Spawn Main View'. Give it a new filename, e.g. testcompView (see right) and click 'OK'.



You should now be able to view all your data.

Processing the Data

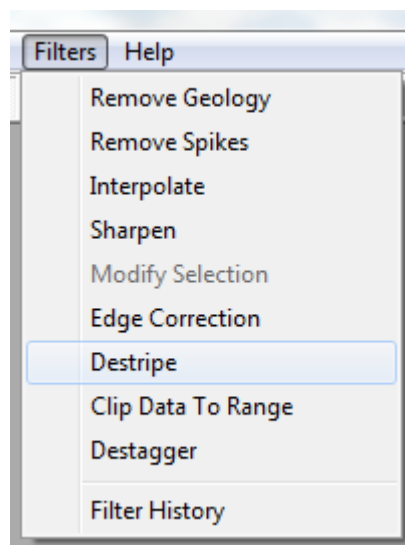


Your raw data will look something like the image (right). Due to the fact that raw magnetic data usually suffers from several defects that originate from the physical principles of the method, several basic steps (filters) need to be undertaken in order to create a clear and functional visualization of the acquired data. The sequence and parameters of these filters is important as too much processing can lead to either the obscuring of factual data or of creating new, false anomalies.

Destripping

The first defect that is visible on the greyscale plot is the heading error that is caused by bad adjustment of the gradiometer and also by temperature shifts that cause the sensors to change their zero base point. A destripping (alternatively Zero Mean Traverse) algorithm may be used in order to remove this defect:

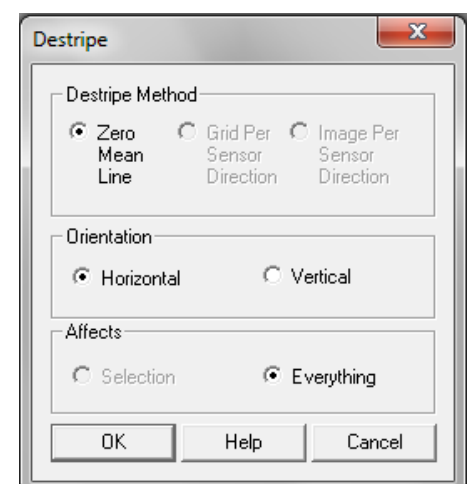
Go to **Filters>Destripe**



A 'Destripe' box will appear (see right).

For 'orientation', select 'horizontal' if the stripes are horizontal (as in the example above), and select 'vertical' if the stripes are vertical.

Click 'OK'. The worst of the stripes should have been removed from your data.

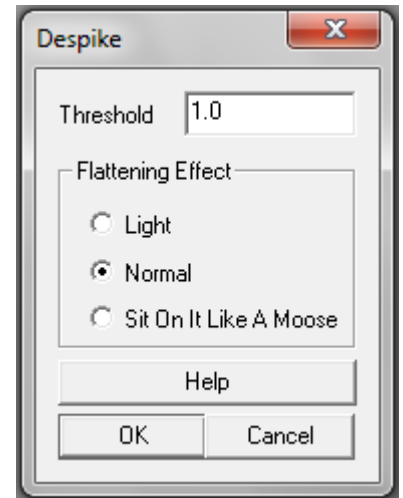


Despiking

Another algorithm that can make the visualization clearer is the "Despike" filter that removes small dipolar anomalies that are caused by ferrous detritus in the topsoil and also by bad instrument-handling during measurements. The application of this filter requires the input of

a threshold and type of flattening effect. Caution is advised as too much filtration in this case will cause a great amount of false data to be incorporated into the plot.

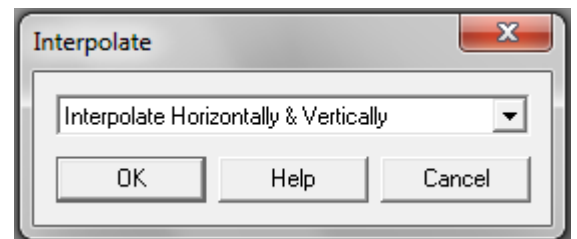
Go to **Filters> Remove Spikes**. The 'Despike' box appears (right). Experiment with the settings. 'Sit on it like a moose' means 'heavy despiking' so select this option if you suspect the instrument wasn't handled well (e.g. in first or second time the operator used the FM256), or if there was a high magnetic content in the topsoil.



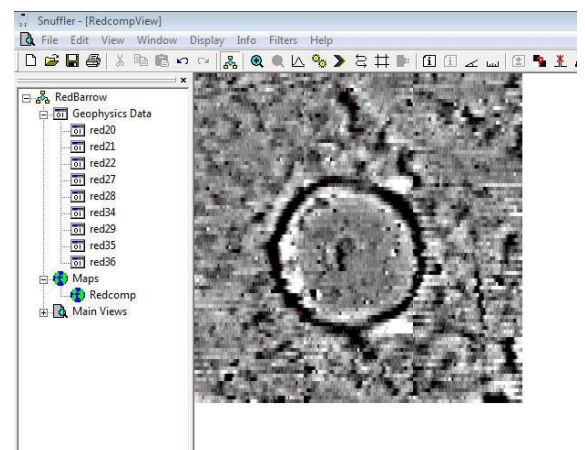
Interpolation

Now data defects have been removed, the dataset can now be interpolated: new data is added to give it a smoother look.

Go to **Filters>Interpolate**. The 'Interpolate' box appears (right). Choose 'Interpolate Horizontally and Vertically' and click 'OK'.

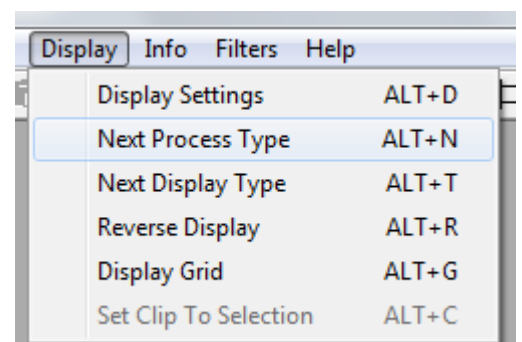


Your data should now look smoother and more processed, as in the image (right):



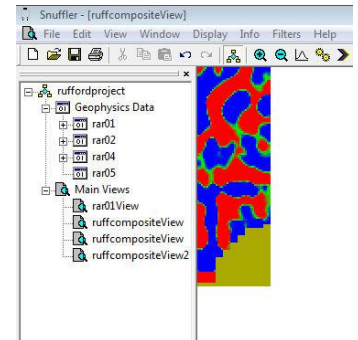
Contrast & Colour Manipulation

Snuffler offers a few basic display types and processes. These can be switched on by selecting the following:



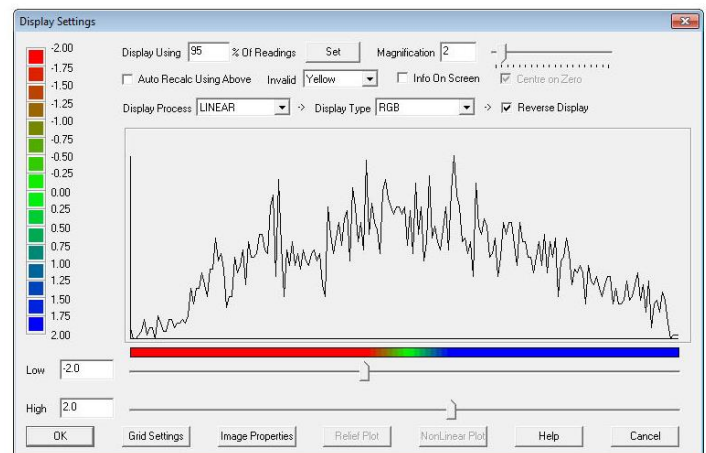
1. Select **Display>Next Process Type** (see right). This changes the type of visualization type from dot density to relief map. If you repeatedly select Display>Next Process Type you can scroll through the different available views.

2. Select **Display>Next Display Type**. This changes the colour palette used to visualize data. Again, if you repeatedly select Display>Next Display Type you can scroll through the different available views, e.g. see right.



3. Another thing that can be done in order to adjust the display type to your needs is the contrast manipulation of the data.

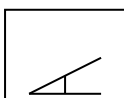
Select **Display>Display Settings**. The 'Display Settings' box appears (see right):



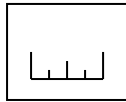
Snuffler by default uses the 'Auto Recalc Using Above' option. You can turn this off by unticking the box next to it, and entering your own range of data to compare the results. E.g. enter **Low: -10** and **High: 10** and note the different level of information that is now visible on your magnetic map. You can also choose the Display Process and Display Type directly from this menu.

Exploring data: measuring distances & angles

Snuffler also provides basic measurement tools for further interpreting the data. These can be accessed from the icons on the toolbar.



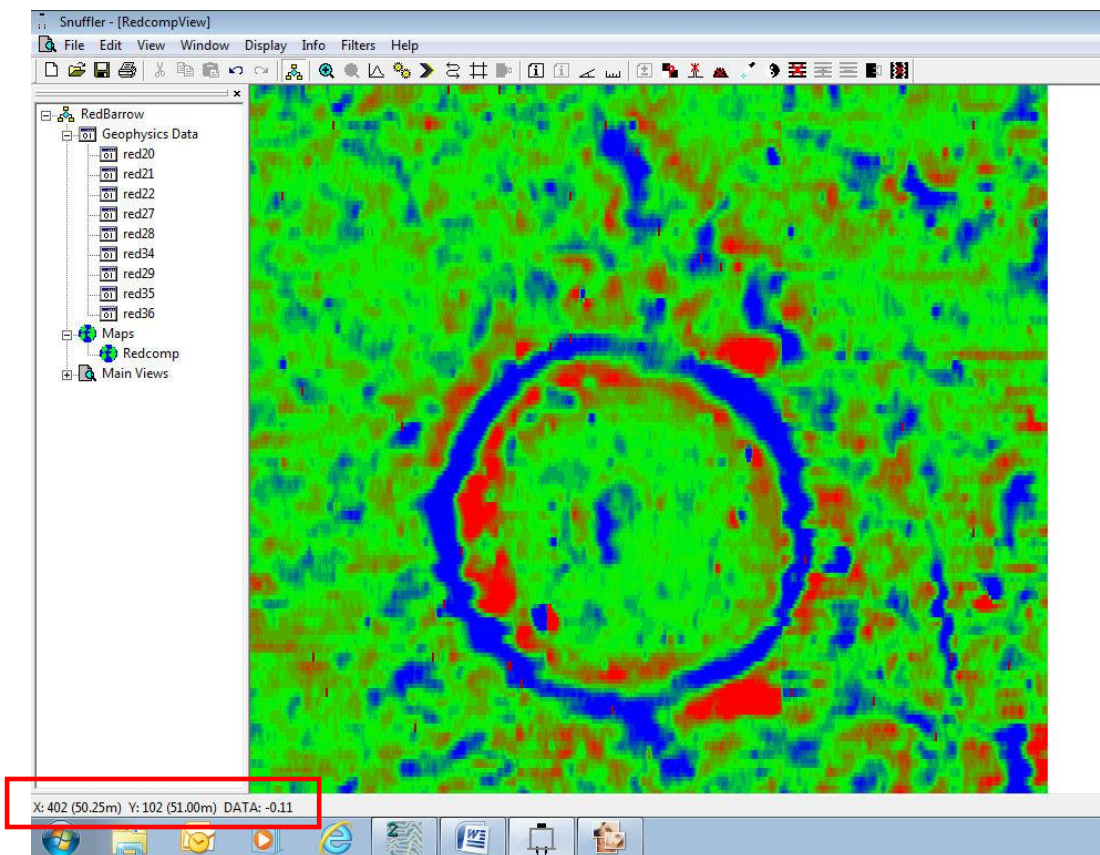
Measure Angle icon. Select this and then click on two points on the data which you wish to measure the angle between.



Measure Distance icon. Select this and then click on two points on the data which you wish to measure the distance between.

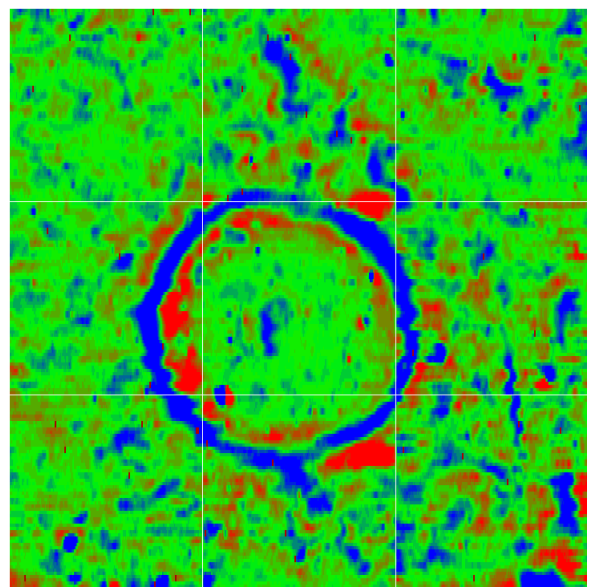
You may find it useful to use the **Increase Mag** (zoom in) and **Decrease Mag** (zoom out) buttons to calculate angles and distances between points more accurately.

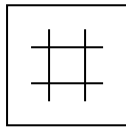
Another very helpful feature in Snuffler is the ability to see the coordinates and geophysical signal of the place currently below the cursor. This is shown in the lower left corner of the window (see below, marked by the red rectangle). As you move the cursor around over the image the different readings will be shown.



Adding grid lines

To enhance interpretation, you may find it useful to add the original grid lines to your data. This can be achieved by clicking on the 'Display Grid' icon (see below). Your data should now have grid lines as shown in the image (right).





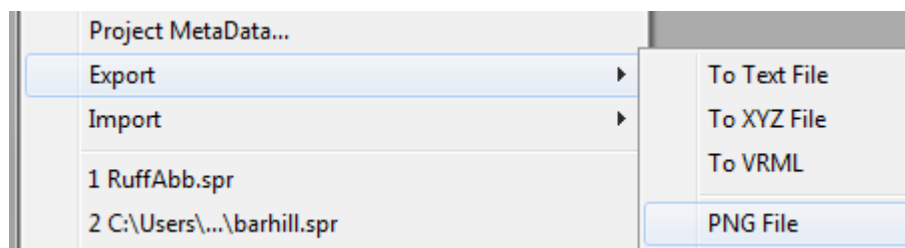
Display Grid icon

Raster Exportation & Further Possibilities

Unfortunately in its current form Snuffler does not possess features that allow for the construction of a useful print plot nor has it any drawing/vectorization tools. Fortunately there is other freeware and *open source* software available such as QuantumGIS (QGIS) that used in conjunction with Snuffler allow for a fully professional & georeferenced plot to be created.

In order to transfer our filtered data into third party software a raster of the acquired geophysical image needs to be exported. Snuffler currently only supports the .png format.

Go to **File>Export>PNG File** (see below)



A 'Save As' box appears. Give your file a suitable name and click 'Save'. The saved file can now be imported into graphics software programs such as QGIS or printed and distributed in this form.