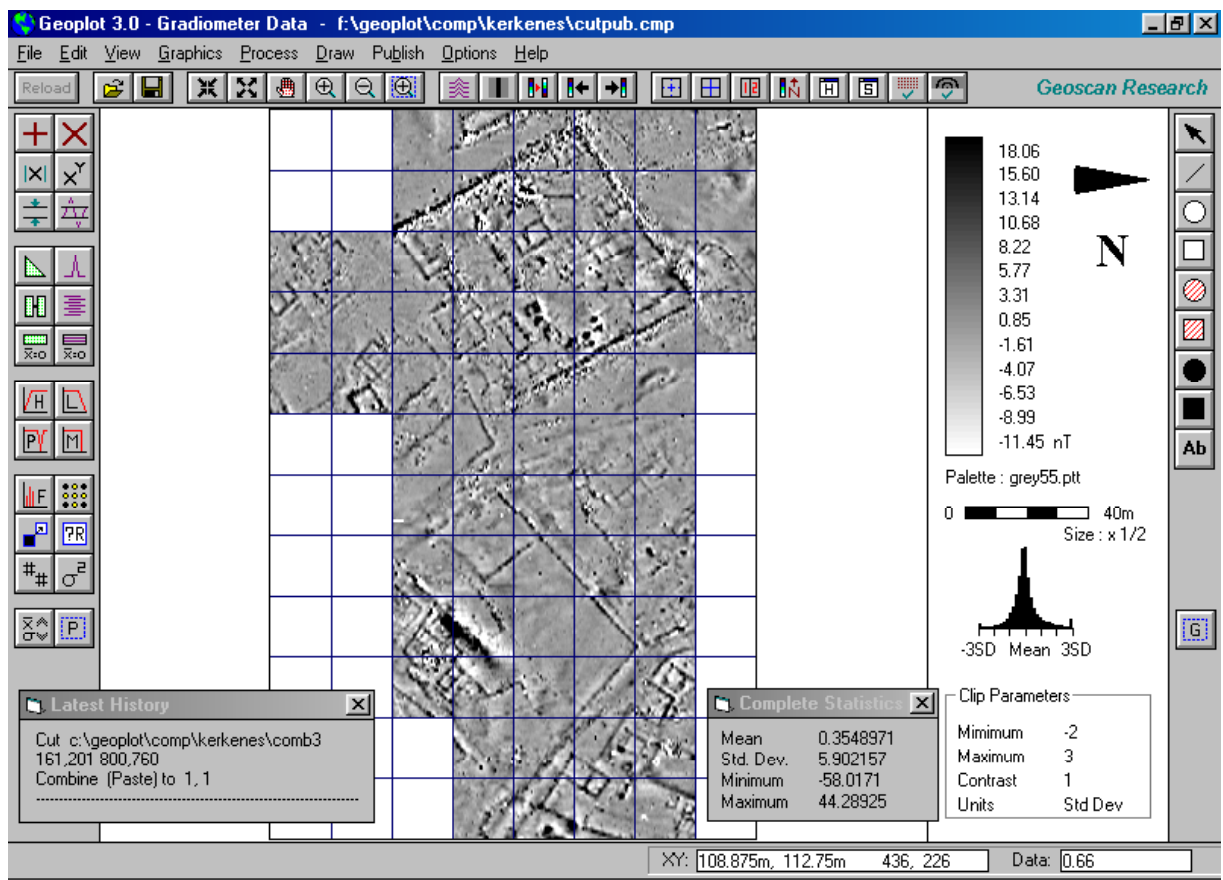


GEOPLOT

Version 3.0

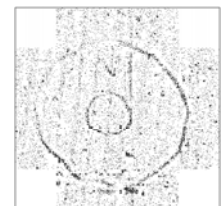
Introduction

Geoplot 3.0 is a Windows program for the processing and presentation of geophysical data collected from a variety of instruments including : resistance meters, gradiometers, magnetometers, EM instruments, magnetic susceptibility instruments. Processing facilities include : high pass, low pass, median & periodic filters, spectrum and variance analysis, despiking, interpolation, edge matching, zero mean traverse correction, destagger correction, several numeric functions and a powerful cut and combine function for combing data sets mathematically. A record of every edit and process is maintained with each data file. Graphics may be produced as shade plots (grey scale or colour), trace plots (stacked profiles or 3D), dot-density or pattern plots and may be printed out at any scale or saved as bitmaps for use in other software packages. A publishing mode is included which allows you to combine many graphics images, text, drawn objects etc. Data can be imported and exported, allowing data exchange with other software packages.



Environment

Geoplot 3.0 retains all the functionality of the previous DOS version but adds the flexibility and convenience of a Windows environment. For example you can still navigate using the keyboard, menus and shortcut keys alone, essential for field use when a mouse or other pointing device is hard to use. However, the new Windows version brings the extra versatility of a mouse pointer and fast access to commonly used features using the new toolbars for process functions, graphics and drawing. You can identify data values by scanning the mouse over a graphics plot or select new graphics or process areas using the mouse. A typical opening screen consists of : a standard menu at the top, a horizontal toolbar just underneath which gives fast access to common



menu items, a process toolbar to the left, a drawing toolbar to the right, status bar at the bottom, and floating full statistics and latest history forms which can be invaluable aids for processing data. The View menu lets you turn toolbars etc on and off, though some control is also replicated on the horizontal toolbar.

There are four views you can have of opened data : graphics view, data view, history view and file details view. You can easily swap between views using the View menu or function keys. A fifth view, publish, is available for creating a published presentation of your graphics plots. A hard-copy can be made of all the views using the File menu. There is extensive control in the Options menu over how Geoplot operates and your preferred defaults for different views and forms. For example default plotting parameters, and default numeric resolution in the data view can be set. You can define what your preferred view is when you load new data and also if previous plotting parameters or default ones are to be used. Many other options can be defined.

Data is handled in grid, master grid or composite format. A master grid defines how the individual grids lie in relationship to one another and can be used to combine individual grid data files into one file called a composite. Grids and composite files have associated with them an edit and process history respectively, as well as dimensional and other file information details. Input templates, which document data collection details and user comments, make data input rapid and easy to accomplish, and can avoid errors in the field. Files can optionally be date stamped when input, in either European or USA format, but date stamping can be turned off to avoid Year 2000 problems on older computers where the BIOS or RTC functions provide misleading information.

Data may be downloaded from Geoscan instruments via the RS232 port, manually input via the keyboard or imported via batch file transfer. Raw grid data downloaded from instruments is write-protected, preventing loss of data whilst in Geoplot. Imported data can be stored in grid or composite data format and a variety of input formats are recognised, including ASCII, XYZ and spreadsheet, so that data from instruments other than those made by Geoscan Research can be handled. Data can also be batch exported in a variety of formats including plain ASCII, XYZ (comma, space or tab separated), Geosoft, Surfer grid files (ASCII and binary) and Grass for GIS. Generating direct Surfer grid files within Geoplot can save considerable time when using Surfer's facilities.

Usually you will use SVGA screen resolution or higher for desktop work but the forms have been designed for VGA use too, which can be extremely useful for data download in poor lighting conditions or where older laptop computers with VGA LCD's are to be used.

The file menu also has facilities for : combining several composites into one large composite, creating blank composites for complex data manipulation, merging FM256 dual gradiometer data, merging multiplexed parallel 0.5m/single 1.0m Twin data and generation of stacked pseudo-sections from expanding Twin array data sets.

Whenever an edit or process function is applied to data the default is to immediately update the current view, be it graphics, data, history or file details. The floating history and statistics forms are updated too. You can, if you wish, turn off automatic graphics update. The Edit menu allows you to Flip Horizontal, Invert Traverse mode and directly change grid data. The Edit menu also allows you to change the North direction, change the Units and rotate both grids and composites. You can additionally document the recorded edits and processes by adding, inserting or deleting comments in the file history.

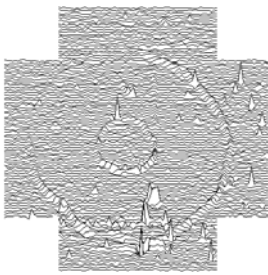
	1	2	3	4
1	-0.2	0.1	1.1	-0.1
2	2.7	-1.2	-1.4	2.7
3	2.4	1.7	-0.4	1.2
4	2.5	2.6	0.2	4.0
5	1.1	1.2	-0.8	-1.5
6	-0.8	-0.3	-2.5	1.7
7	-0.9	-1.3	-2.8	-3.0
8	-1.4	-3.3	-5.8	-0.4
9	-0.6	-0.7	-4.1	-4.0
10	-3.4	-2.8	-0.7	-1.3
11	-0.3	-1.4	-0.3	-1.1
12	2.3	0.4	0.3	0.5
13	3.5	2.9	-0.1	0.5
14	3.0	0.8	-0.6	-0.5
15	2.9	3.4	1.7	-0.2
16	4.8	1.3	-1.4	-2.4
17	1.6	1.0	-0.5	1.6
18	0.5	-1.2	1.2	1.1
19	0.6	-1.0	1.6	4.8
20	3.3	5.4	5.5	3.5
21	5.9	5.5	7.3	2.3
22	4.2	4.1	3.4	0.9
23	0.7	0.3	1.8	1.7

Data view

```

=====
Assemble data for pseudo-section
=====
Dspk. X=1 Y=1 Thr=3 Repl=Mean
Em4T Em4L Em3T Em4B Em3B
Dspk. X=1 Y=1 Thr=3 Repl=Mean
Em2L
HPF X=10 Y=10 Wt=G
Search -1000 to 1000
Replace=0
Cut c:\geoplot\comp\rwrox\1kehmc
1,1 80,60
Combine (Add) to 1, 1
Cut c:\geoplot\comp\rwrox\1kehmc
81,1 160,60
Combine (Add) to 1, 1
Cut c:\geoplot\comp\rwrox\1kehmc
161,1 240,60
Combine (Add) to 1, 1
Cut c:\geoplot\comp\rwrox\1kehmc
1,61 80,120
Combine (Add) to 1, 1
=====
Smooth data for presentation
=====
Interpolate Y, Expand x2, SinX/X
Interpolate Y, Expand x2, SinX/X
  
```

History view



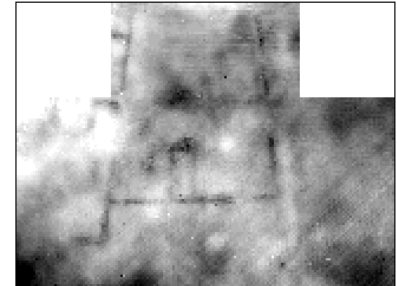
GEOPLOT

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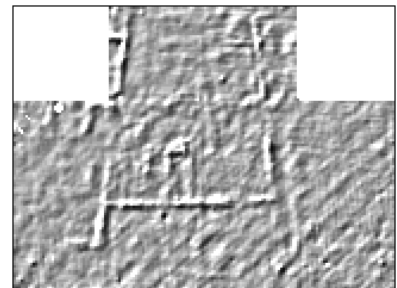
Graphics

Four graphics presentation types are provided : shade, trace, dot-density and pattern. Shade plots can have between 2 and 234 different shades of grey or colour. Trace plots represent data by a series of line graphs side by side. The data may be viewed from all four sides, and the trace angles adjusted to give a 3D style view. Dot-density and pattern plots represent data values by the number of dots within a cell plotted either randomly or in a systematic way. Plotting parameters can be entered in standard, clip, compress or relief mode, with default settings being defined in Graphics Options. Relief plots (artificial sun) are particularly effective at removing background resistance variations and present an almost photographic style quality (see adjacent figures). You can select a smaller portion of a graphics plot for display either by entering co-ordinates in the graphics parameter form or by selecting an area with the mouse. Plotting size varies between x 5 and x 1/32, providing a large dynamic range. You can magnify, reduce, zoom in or out at a point and pan in a graphics plot using either buttons on the toolbar or shortcut keys. A special toolbar button allows you to magnify x2 a small localised area of a plot (see figure).

A range of shade palettes are supplied and you can create and edit your own (see page opposite). Each palette comprises one or more flooded regions and individual colour bands can also be superimposed anywhere on the palette. When in graphics view you can change the palette either by using the palette tools (next palette, previous palette, invert palette) or by bringing up the graphics parameter form. You can quickly display the Shade and Trace parameters forms by clicking on two special icons on the horizontal toolbar, or by choosing from the Graphics menu as normal.



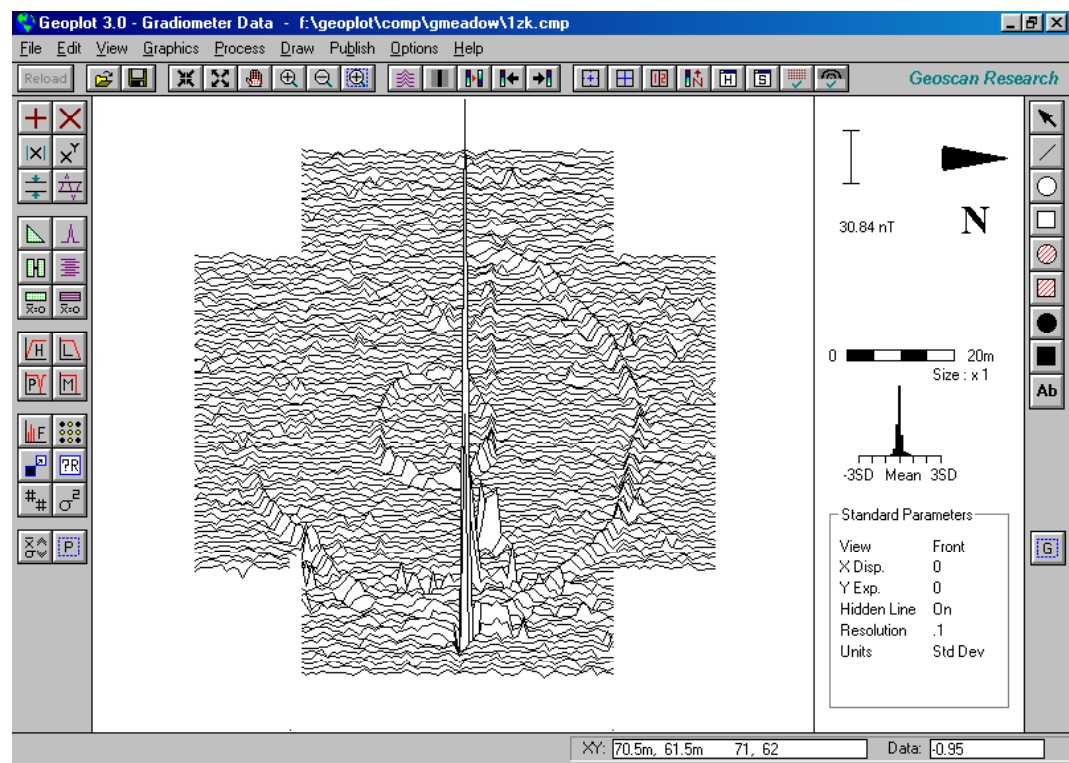
Shade plot - Clip parameters



Shade plot - Relief parameters



Localised x2 Magnification shade plot

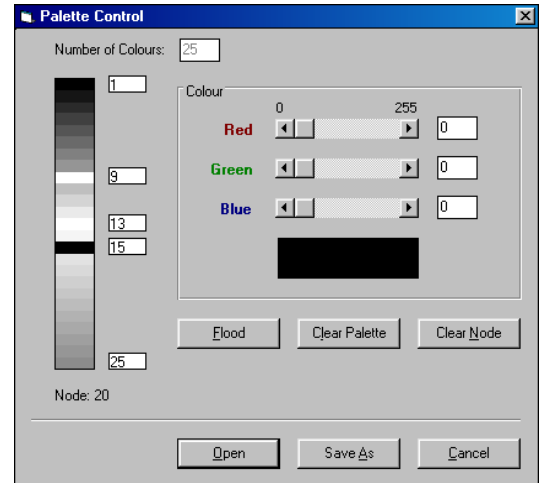


Trace plot - hidden line on



Grid lines and numbers can optionally be superimposed on graphics plots, as well as your own user defined grid. As you move the mouse over a graphics plot its x, y co-ordinates are reported on the status bar (in both metres and reading units), along with the data value at that point. You can set any colour you like for the graphics screen background, dummy values etc. using the Graphics Options. Plot details can optionally be displayed on the right-hand side of the screen which includes palette or trace scale-bar, distance scale-bar, plotting parameters, direction of first traverse and histogram. The resolution of the numbers on the palette scale-bar can be controlled using the Graphics Options form. If you apply the Spectrum process to the data the plot details on the right-hand side will change to show spectrum units and the co-ordinates reported on the status bar, as the mouse moves, will show x position and frequency, instead of x and y co-ordinates.

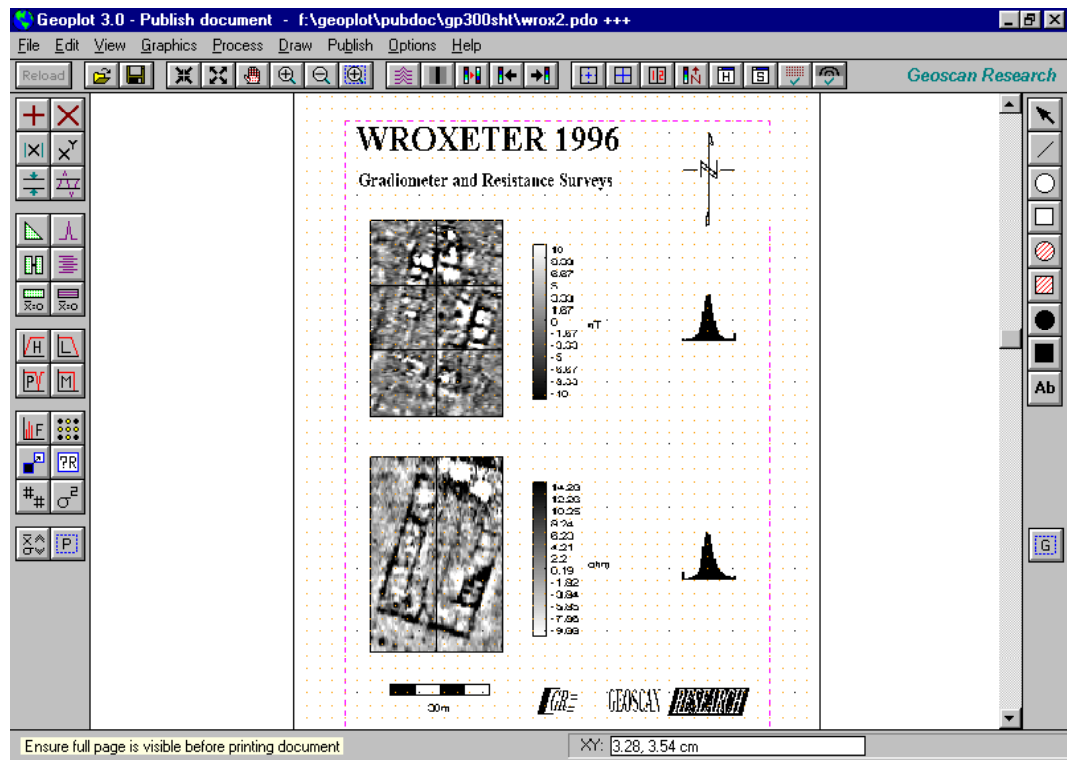
A default style printout of a graphics plot can be made to any scale or print size using the File menu. You can choose whether you want to : (a) plot the whole data set, (b) a specific block, or (c) just what you see on screen. Graphics plots, palette scale-bars, north symbols histograms and distance scale-bars can also be saved to files. These can subsequently be imported into the publish view, at a specific scale, for publishing. Alternatively, you can use the saved bit-map for importing into other Windows packages.



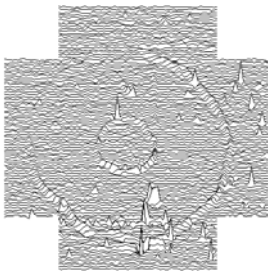
Form for defining shade palettes

Publishing

Once you have processed your data and set the graphics plotting parameters you can save this image, along with scale bars, north direction and histogram for use in the publishing mode. This mode allows you to tailor the printout to your own requirements, rather than using the default presentation of the standard graphics view, allowing you, for example, to choose a border and add text in various fonts and sizes, select a north direction symbol. Images may be positioned, rotated and scaled to your liking. More than one image can be incorporated in the document, for example images from different sites, different graphics types (eg shade and trace plots) and even your own logo. The published graphics image is not just a screen grab with limited resolution, but a properly regenerated plot showing full detail on large size printers.



Publishing View



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Processing

Processing includes a comprehensive range of functions for manipulation of all data types, together with specific routines to correct for data collection artefacts such as edge matching and drift correction. Some functions are designed specifically for Geoscan Research instrumentation but all may be equally applied to other instrumentation data sets. Mathematically, any real bipolar or monopolar two dimensional data array may be processed.

A processing tutorial is included in the instruction manual, together with "QuickStart" cards which guide you through the processing sequence appropriate for each data type. Both assist new users in becoming an adept and competent processor with a minimum of effort, and help to prevent inappropriate processing of the data.

Processing functions can be applied to the complete data set or any specific rectangular area, known as a block. You can specify a block either by entering co-ordinates in a form or, by selecting the area using the mouse. This block remains operational until turned off. You can select process functions and process area from the menu, or more conveniently from the process toolbar.

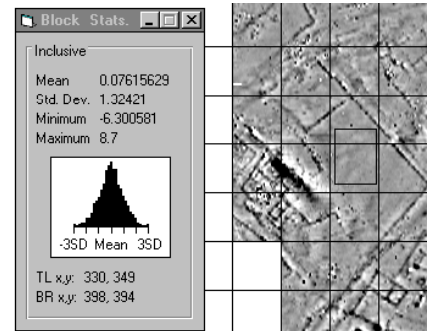
Processing history is stored with each data file. This records function applied, the chosen parameters and co-ordinates of any selected block, giving full traceability. A floating form, "Latest History" shows the last four processes applied and you can instantly switch to the history view to see a full listing of all processes. The process history shows a dotted dividing line between those processes that have been saved and any new functions that have been applied but not saved. History comments can be added, inserted or deleted when the history view is shown. Functions include :

Numeric Functions

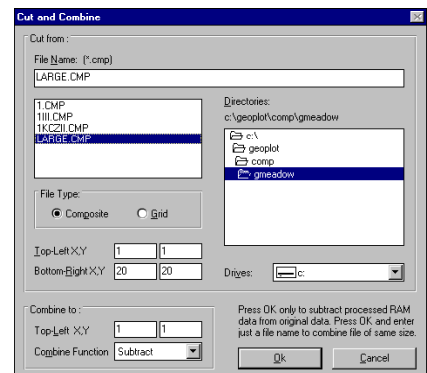
Add, Multiply, Absolute, Power, Clip, Compress, Search and Replace, Randomise are general purpose numeric tools with a variety of applications. Some examples follow though they are by no means limited to these. The Add function can be used to edit a single data point or bias a block of data. Multiply can be used to normalise data or convert resistance to resistivity. Absolute can be useful in the generation of magnetic-resistance correlation plots. Power can be used to convert resistivity to conductivity. Clip can be used to limit data to specified maximum and minimum values for improving graphical presentation and also forms a useful pre-process procedure for many other functions. Compress can be used to fit data within the dynamic range of a display device or printer, allowing both large and small magnitude features to be visible at the same time. Search and Replace can be used, in conjunction with Clip, to convert regions strongly perturbed by nearby iron fences, pipelines etc. into dummy regions, allowing other statistical functions to perform correctly. Randomise may be used for introducing a controlled amount of noise so that surveys performed at different times or with different instruments visually match.

Cut and Combine

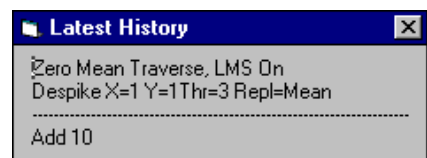
This function provides Cut and Paste, Add, Subtract and Multiply operations between two data sets (grid and composite). This can be applied between any block of source data and positioned at any location in the other data set. Applications include merging data sets, splitting data sets, generation of correlation plots between data sets etc. Another powerful application is to examine the effect of a process function (by subtracting the original data set), thereby ensuring that the process function has been applied with the correct parameters (see figures on opposite page).



Block Statistics report form, with block outlined on the shade plot



Cut and Combine form



Floating "Latest History" form



Deslope

Removes a linear trend within a data set. It is typically used to correct for drift in gradiometer data where the use of the Zero Mean Traverse function is inappropriate.

Despike

Automatically locates and removes random spurious readings present in resistance data and locates and removes random "iron spikes" often present in gradiometer data.

Destagger

Corrects for displacement of anomalies caused by alternate zig-zag traverses which are sometimes observable in gradiometer data.

Edge Match

Used to remove grid edge discontinuities which may be present in Twin electrode resistance surveys as a result of improper placement of the remote probes.

High Pass Filter

Used to remove low frequency, large scale spatial detail, typically a slowly changing geological "background" response commonly found in resistance surveys.

Interpolate

Increases or decreases the number of data points in a survey (linear or sinx/x method). Increasing the number of data points can be used to create a smoother appearance to the data. Interpolate can also be used to make the sample and traverse intervals of differently sampled composites match, prior to combining them.

Low Pass Filter

Removes high frequency, small scale spatial detail, useful for smoothing data or for enhancing larger weak features.

Median Filter

Automatically locates and removes spurious readings present in survey data and smoothes the data at the same time. Most useful for high sample density data.

Periodic Defect Filter

Used to remove periodic features which may be present in the soil (eg plough marks) or which may be introduced as defects during gradiometer data collection.

Spectrum

Analyses the frequency spectrum of the data, splitting it into Amplitude, Phase, Real or Imaginary components. The Amplitude spectrum can be used to identify periodic defects in gradiometer data which can then be removed with the Periodic Defect filter.

Statistics

Statistical analysis of any block of data in a data set : localised mean, standard deviation, minimum, maximum and localised histogram (this is additional to the floating statistics report for the whole data set). Statistics can help determine appropriate parameters for other process functions. The report form can be positioned anywhere on screen or minimised and can be retained whilst a new data set is loaded, for statistics comparisons.

Standard Deviation or Variance Map

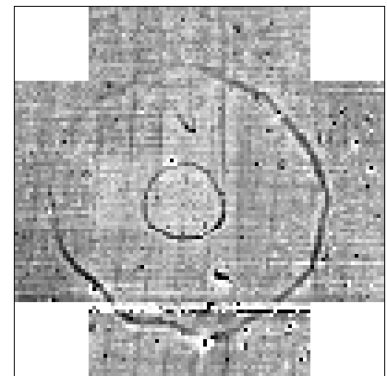
Replaces the data set by either the local variance or local standard deviation. A graphics plot of this new data set indicates areas of statistically different activity.

Zero Mean Grid

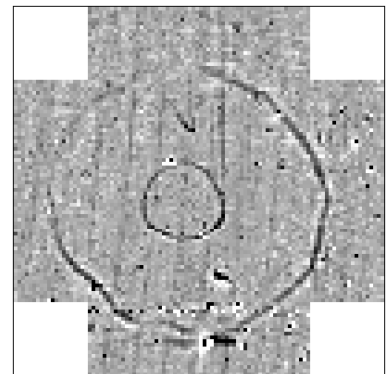
Sets the background mean of each grid within a composite to zero. It is useful for removing grid edge discontinuities often found in gradiometer or similar bipolar data.

Zero Mean Traverse

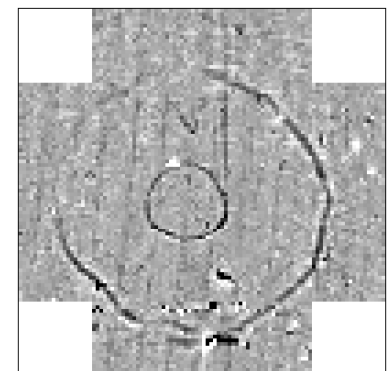
Sets the background mean of each traverse within a grid to zero. It is useful for removing striping effects in the traverse direction which can occur in gradiometer data. This also has the effect of removing grid edge discontinuities at the same time (see adjacent figures).



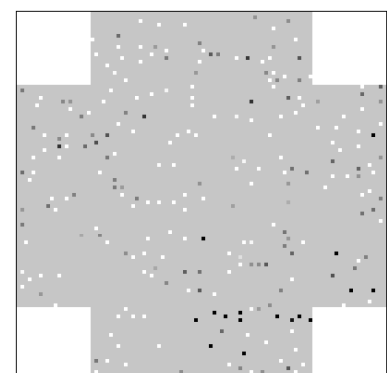
Raw Gradiometer Data



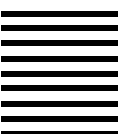
Zero Mean Traverse Corrected



Despiked



Spikes Identified



GEOPLOT

Version 3.0 for Windows

Hardware Requirements

Operating system should be one of the following : Windows 3.1, 3.11, 95, 98, ME, NT4, 2000 or XP. Minimum recommended hardware is a Pentium II class processor, cpu speed 266 Mhz or faster, with SVGA display or better for desktop work. Geoplot 3.0 will also work on PC's as slow as a 486 DX2 40Mhz processor so an older laptop computer with VGA display running Windows 3.1, for example, could be used for downloading data in the field. An RS232 communication port is required if data is to be downloaded from instruments into Geoplot 3.0 - if there is only a USB port available then a USB to serial port adapter may be used. A 3.5 inch floppy disk drive (built-in or external USB) may also be required - see below.

Geoplot 3.0 consists of three items: (a) CD with installation code, (b) comprehensive instruction manual with tutorial and (c) software protection - this is provided as either a USB or LPT hardware dongle, or a software authorisation. USB dongles will be supplied unless an alternative is requested. The software authorisation is transferred to your hard disk from a floppy disk or can be transferred to another PC via the floppy disk.

Single, Network or Educational Versions

Geoplot is normally supplied for one user operating on a stand-alone PC or a network. Multiple user versions (5 and 10) are available for use on client-server network systems. A multiple user (25) educational version, with restricted functionality, is available for use on client-server networks. Functions that are disabled are : New Input Template, Open Input Template, Download Data, Keyboard Input, Import Data, Export Data and Create Pseudo-sections. There are no other restrictions.

Upgrades and Support

Geoplot is undergoing constant improvement and refinement - the latest version may be downloaded from our website. Future upgrades will include interfaces to new instruments, together with new processing and presentation facilities. If there are specific facilities not mentioned above that users would like to be included in future versions then we would be happy to consider suggestions. A charge will be made for upgrades. **Full technical support is provided free of charge.**

Compatibility with earlier versions

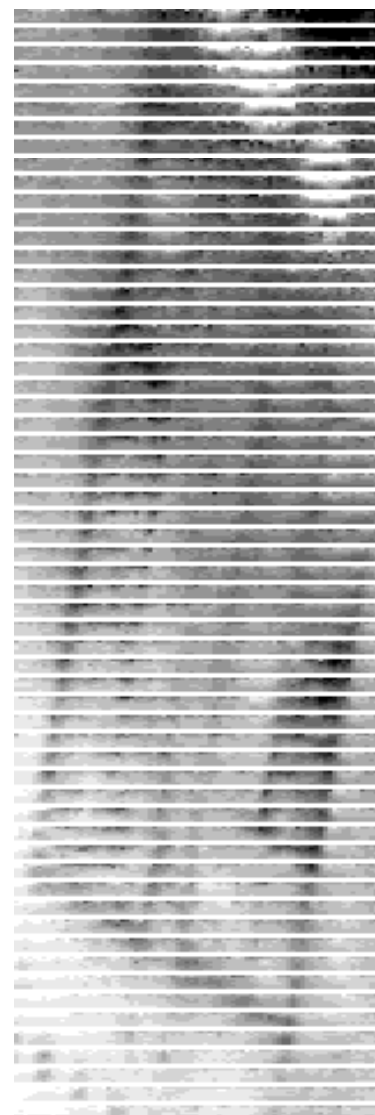
Grid data, composite data and master grids (meshes) generated using earlier versions may be used directly with Geoplot 3.0. However, version 3.0 data is not backward compatible with version 1.2. Version 3.0 data may be read by version 2.0 but the resulting layout on the file information and history forms may not be as normal. Input templates generated with earlier versions are not compatible.

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Website : www.geoscan-research.co.uk



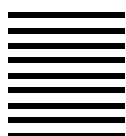
Stacked Pseudo-sections

Warranty

This program and accompanying instruction manual are supplied "as is", without warranty as to their performance, merchantability, or fitness for any particular purpose. The entire risk as to the results and performance is assumed by the user. All specifications subject to change without notice.

Acknowledgements for use of data

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Dr. L. Somers



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