DATA SHEET
Issue 9

August
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GEOPLOT

Version 4.0 for Windows

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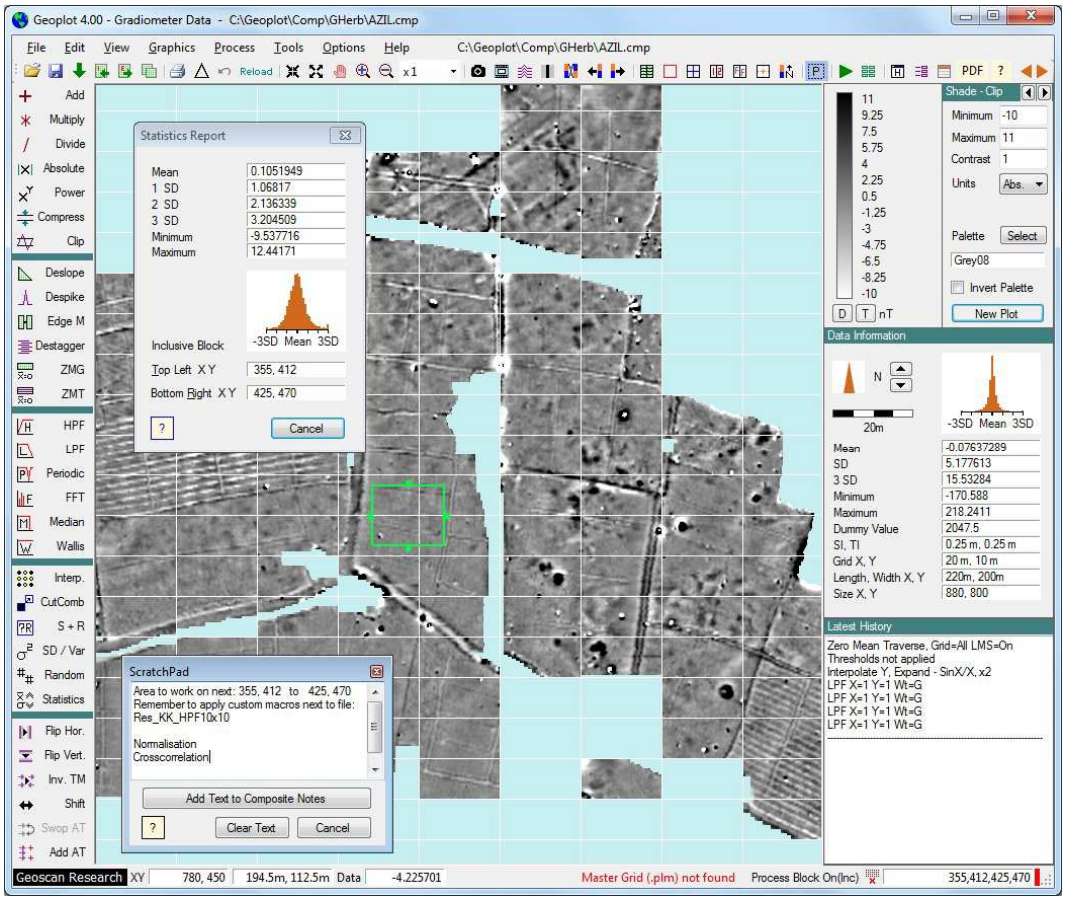

New in Geoplot 4.0

- **Runs natively on 32 or 64 bit platforms**, XP, Vista, 7, 8, 8.1, 10, 11.
- **Macro Facility** for speeding up data analysis - design your own sequence of processing steps with specified parameters and save as a single click macro (can include temporary working files).
- **Process functions extended** to include: Undo, multiple applications, easy data entry - enter value or use drop-down list of common statistics. New Tools added inc. specialised Calculator.
- **Interactive Interpretation** using Animation and variable transparency Overlays.
- **Image Threshold Tool** applies contrast & false colours to grey scale images, e.g radar, allowing extraction of more information and subsequent use in Animation as an interpretation layer.
- **Improved data Download** which includes RM85 gradiometer mode and fast baud rate support.
- **Improved data Import** with file inspection, header handling, non-uniform and GPS referenced import, LiDAR import, easier Grad601 import, Frobisher TAR-3, Frobisher DFG-1.
- **Modern Interface** with control panel on the RHS e.g. Fast selection of Shade plot palettes (new ones added), Relief plot animation, change plot type, transparency control, rotate data.
- **Customisable Interface** including extensive Options for processing and tools, preferred import and export formats, toolbar style, graphics preferences, environment colour scheme.

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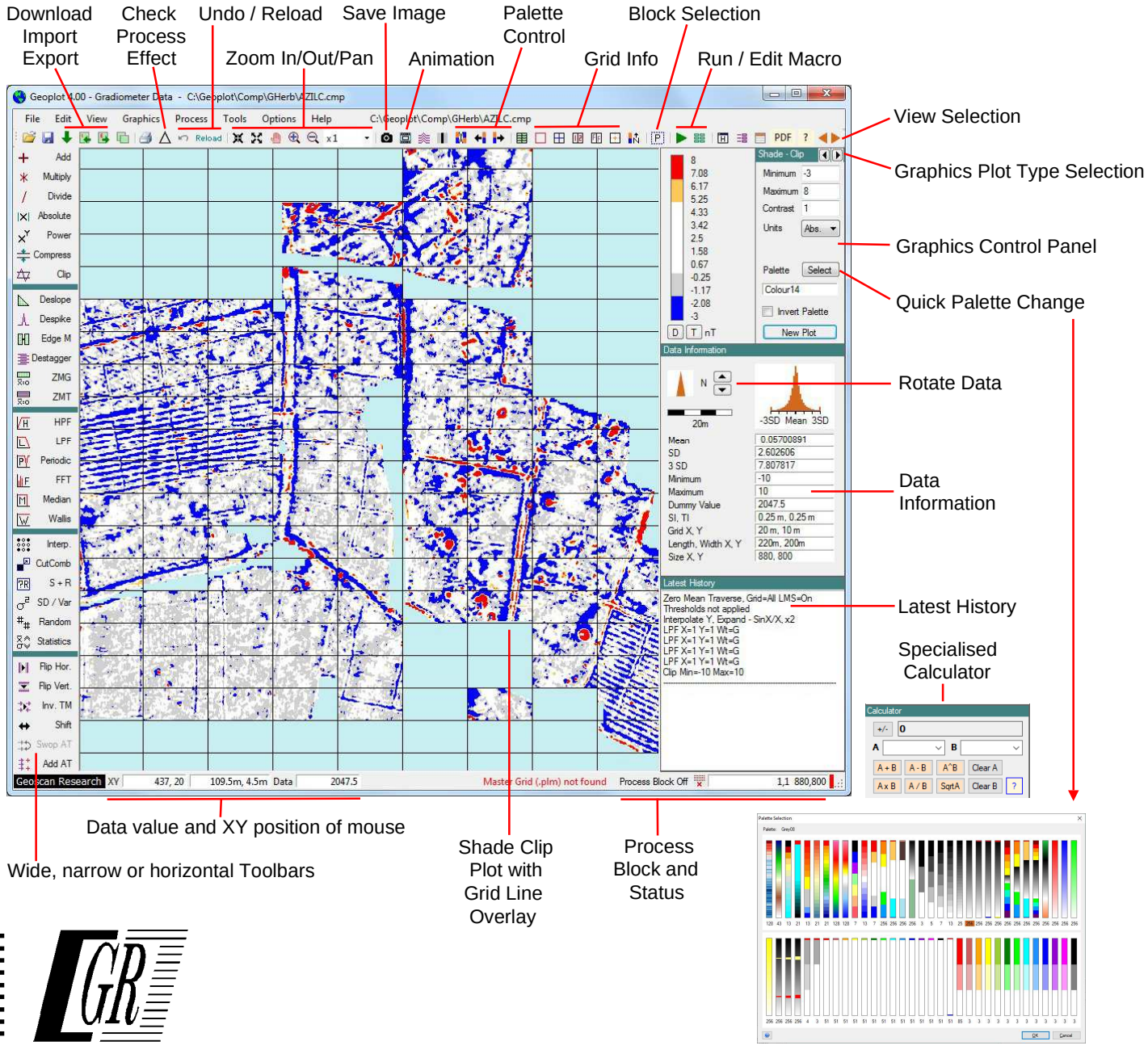
GEOPLOT

Version 4.0

New in Geoplot 4.0

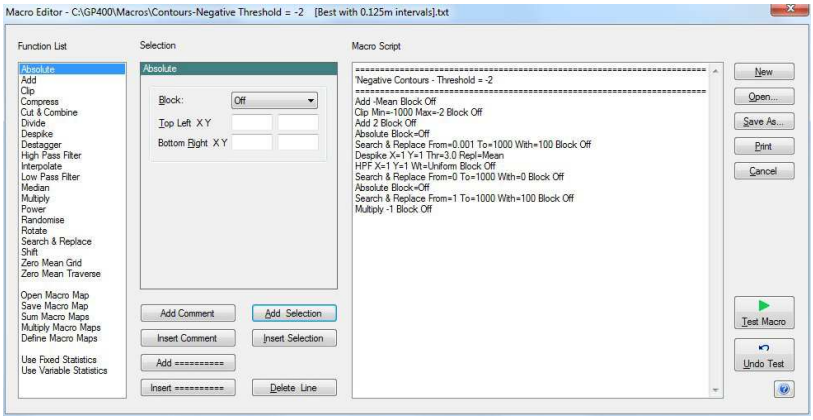
Geoplot 4.0 is a fundamental rewrite of Geoplot 3.0 which now uses the NET framework - this allows it to run natively on 32 bit and 64 bit platforms, including XP, 7, 8, 8.1 and 10. There is a modern user interface in the familiar Geoplot 3.0 format (Graphics, Data, History and File Details views). Data process functions have been extended to facilitate greater efficiency and give extra power to the user. This includes the creation of user defined processing Macros. There are improvements to data downloading, import, export, data formats, animation, plus provision of a Check Process Effect function and Scratchpad. Below you will find a taster of the final Geoplot 4 release.

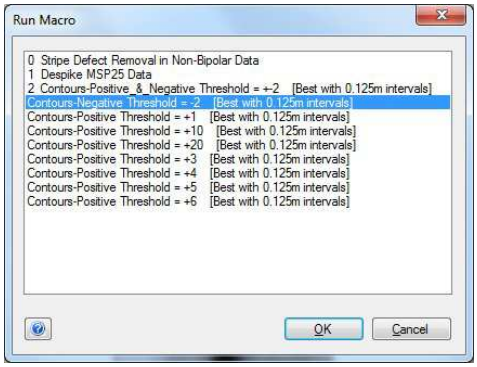
There is a new right hand panel which controls many functions, e.g. fast selection of shade plot palettes, change plot type, rotate data, etc.; you still have access to the Geoplot 3.0 style menu system as well. The panel also displays data information and latest history. Forms are designed to run on all screen sizes, from Netbooks through to Desktops and they remember their last position so you can arrange the work area to your preference. Geoplot 4.0 is highly customisable: processing and tools defaults, preferred import and export formats, toolbar style, graphics preferences, environment colour schemes, including all-white. There are new toolbar buttons for speedy access to functions, extensive local help buttons, and a new Tools menu.



Macro Editor

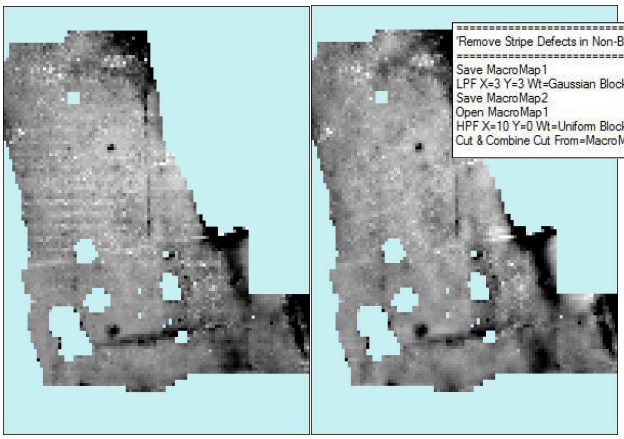
A macro editor allows users to define and save a sequence of data processing steps with specified parameters; this macro can then be run with a single mouse click to greatly speed up data analysis. Comments can be added to the macro and the definition can include temporary files for saving intermediate results; if required a macro can also allow you to enter up to 8 initial filenames. Several macros are provided including ones to generate a range of contour plots which can be overlaid on other data sets. The examples below include a specific macro to remove stripes from resistance data. User macros can be created and evaluated using the formTest and Undo buttons.



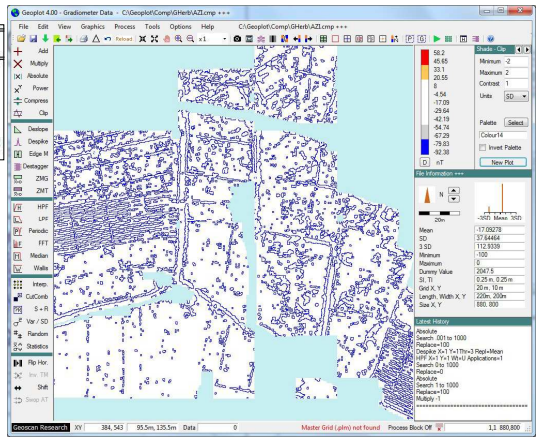


Macro Editor (left), Macro Run (above)

De-stripe Non-Bipolar Data with a Macro

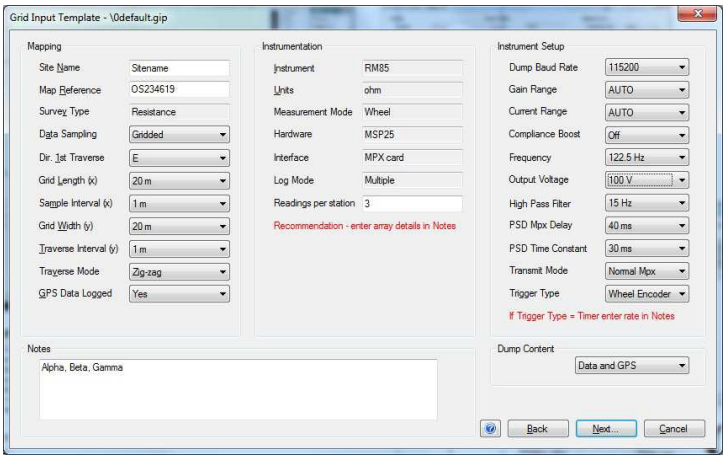


Generate Contour Plots with Macros

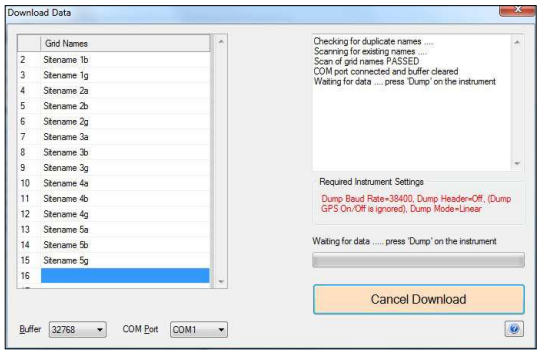


Download and Meta Data

Download now accepts data from the RM85 in both resistance and gradiometer mode. Baud rates up to 115200 are supported and there is feedback about instrument setup requirements. Data format has been extended to be more like meta data and more extensive instrument setup information is recorded for archival purposes. Most importantly, the new data file formats can still be read by Geoplot 3.0 users.



Grid sizes now also include 60m and 80m length and width, useful for MSP25 surveys. During download a status box provides feedback information.



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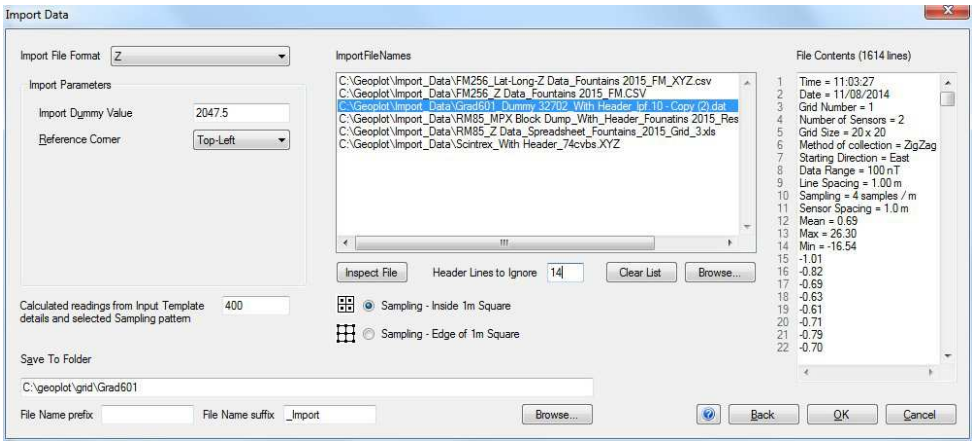
Import and Export Data

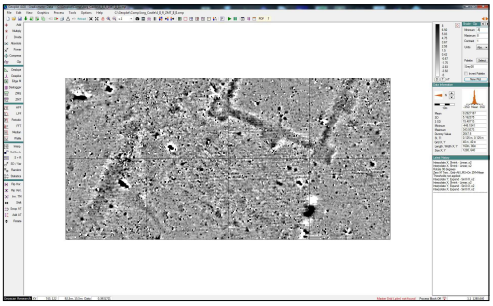
Import of batch data into Geoplot 4.0 can be made from Z, XYZ (comma, tab or space separated), spreadsheet (comma and tab separated) and Excel (.xls and .xlsx) files; note that Excel must be present on the PC for Excel import. File contents can be inspected and displayed in an information panel. The number of Header lines to be ignored from an import can be specified after file inspection and this number can be set as a default in Options. Likewise the default import dummy value can be specified in Options for routine import operations. Use of predefined templates and suitable defaults make routine data imports from instruments such as the Grad601 easy to achieve.



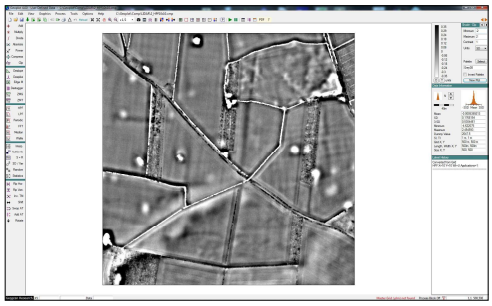
There is provision for specifying the data sampling pattern (either “inside a 1m square” or “edge of a 1m square”) to allow data to be imported which uses a different gridding system from Geoscan e.g. Foerster, CMD, Ferrex, Sensys.

Export of data can be made as Z, XYZ (comma, tab or space separated), spreadsheet (comma and tab separated), Geosoft, Surfer (ASCII) .dat files and Grass for GIS.

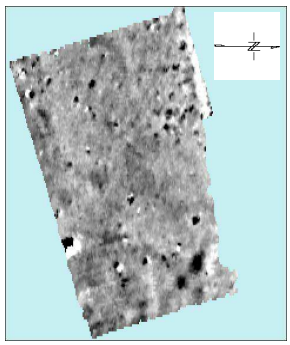
Imported data can be either gridded or non-uniform. Non-uniform import allows data to be imported from non-Geoscan instruments such as Foerster Ferex sensor arrays - see example below - here data sampling is every 10cm, traverse interval 1m. Non-uniform import also allows Northing and Easting GPS referenced data to be imported and processed to provide a GPS referenced data set - see example right. LiDAR data can be imported and processed e.g. High Pass Filter applied to reveal extra detail - see example below.



Foerster Ferex data at 10cm sampling



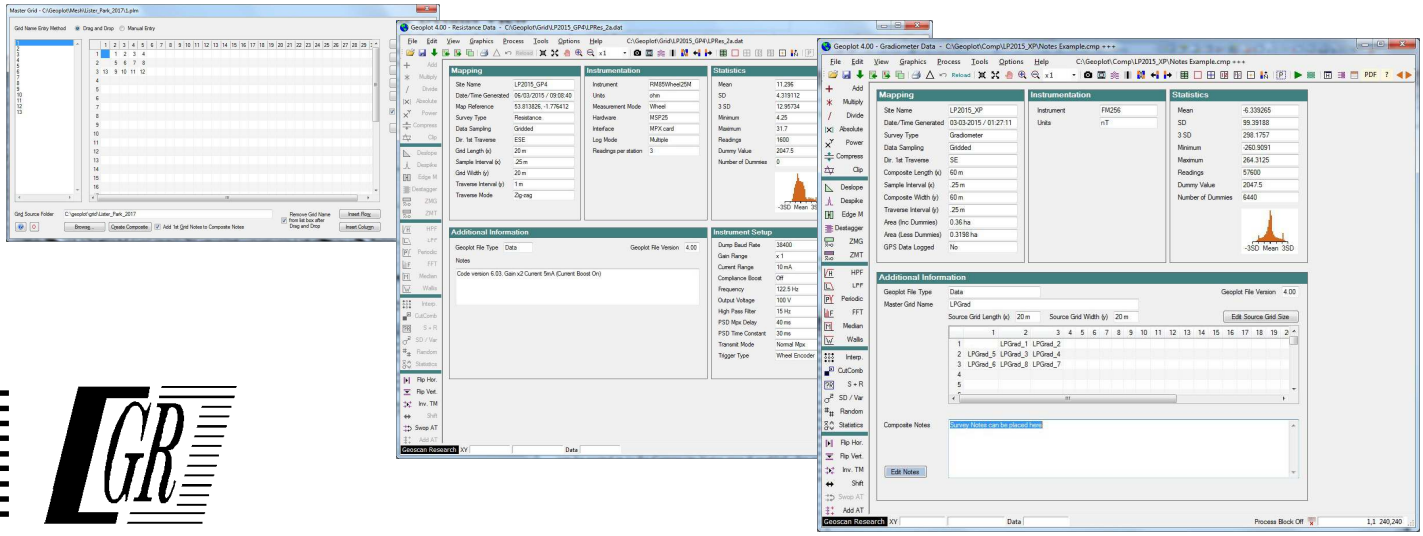
LiDAR 2m data High Pass Filtered



GPS referenced FGM650 data, processed and plotted in Geoplot 4.0. Data plotted at -3 +5 nT

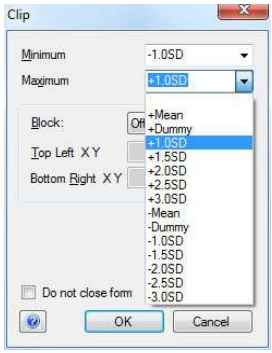
MasterGrid and File Details View

Downloaded or Imported grids can be assembled into a composite using a MasterGrid - files names can be entered manually or using Drag and Drop. The Grid File Details view gives comprehensive information about mapping parameters, instrument setup and statistics. The Composite File Details view shows mapping parameters, instrumentation, statistics plus MasterGrid information and enables notes to be stored as a text file with each composite; these can record, for example, unusual aspects of the survey or unusual processing used.



Process Function and Tools Improvements

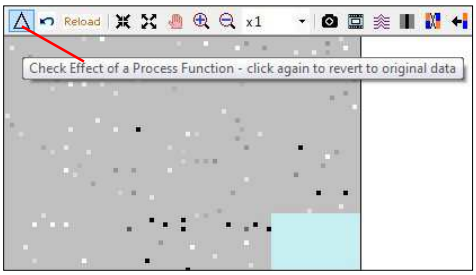
An Undo facility has been added. Default process parameters can be defined in Options. The functionality of some process functions has been extended, e.g. you can quickly perform a multiple number of Low Pass Filter operations at 1x1 which is useful for smoothing data without losing crispness; Destagger can now be applied either to all grids individually or the whole composite.



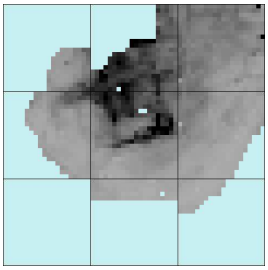
When appropriate, many parameters can be entered as a straightforward numerical value or you can instead use a drop-down list of existing map statistics for speedy parameter entry, including +/- Mean, +/- Dummy, +/- SD levels (see the Clip function, right, as an example). The process area selection rectangle (user defined colour) can be drawn with the mouse at an arbitrary size or the rectangle can be snapped to the survey grid lines. This makes grid based process area selection much faster. You can keep process forms showing by setting the Form Close option - useful for some repetitive functions such as Despike and Interpolate.

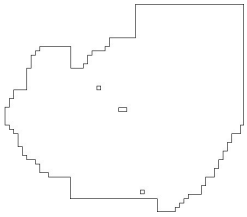
Once a process has been applied the effect of that last process function can be displayed by clicking on the triangle icon (horizontal toolbar) and the display will show the difference. In the example below this shows the spikes removed by Despike; click the triangle symbol again to restore the processed data. Checking data in this way is important for avoiding over-processing of the data. The latest process history is shown at the bottom of the right hand control panel; a floating, re-sizeable history form is also available.

New Tools are available to ease data handling: one click convert Grid to Composite and Composite to Grid tools, GPS Gap Fill Tool used for completing imported non-uniform GPS referenced data - see example opposite. The Create Survey Perimeter Outline Tool generates an outline of the survey area (transparent if required) which is useful for generating interpretations and reports, example below.



Example of checking the effect of a process function

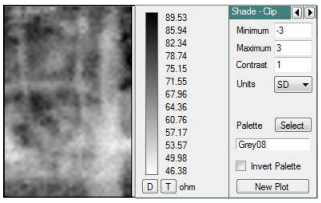


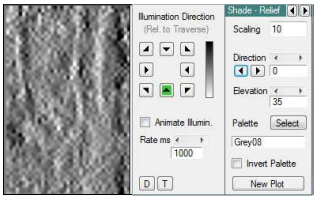


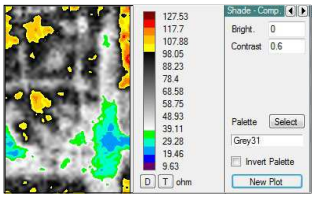
Create Survey Perimeter Outline example

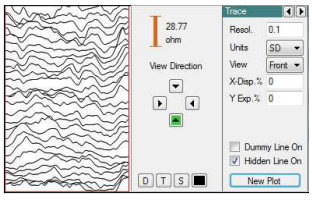
Graphics View

Four different graphics views of the data are available: Clip, Relief, Compress and Trace. You can cycle through the views by clicking on the left and right arrows in the top right hand corner. Each view can have a palette independent of the others. The palettes can be cycled through or inverted using buttons on the horizontal toolbar. A specific palette can be selected using the Quick Palette Change button. The palettes provided cater for presentation, data analysis and interpretation. You can quickly revert to your default plotting parameters using the 'D' button. A variety of control buttons are available for each view - for example Relief plots can be animated if required and the line colour in trace plots can be quickly changed. Survey grid lines, grid numbers and grid file names can be superimposed on graphics plots; user grid lines can be defined and superimposed on graphic plots.





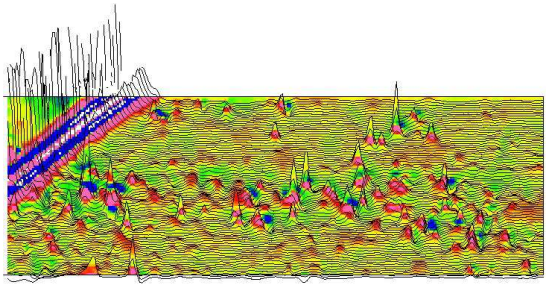




Shade and Trace plot combination

Images can be saved as jpg, bmp, png, tif and gif for use in publications - this includes any off screen areas, so the image can be saved at high magnification / resolution. A control button is available to make dummy readings transparent in the saved image.

Trace plots can have a shade plot placed underneath the lines to help in further understanding the data image.



GEOPLOT

Version 4.0

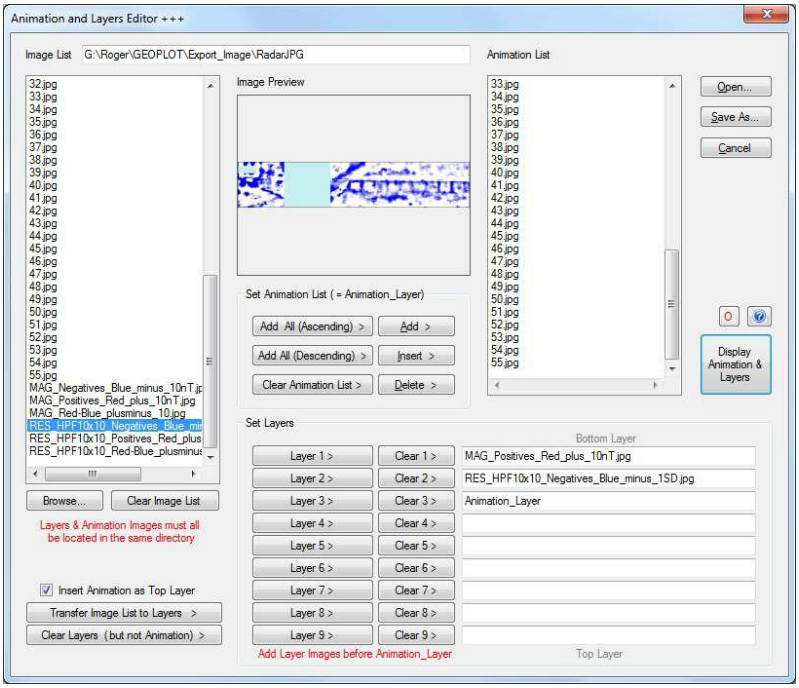
Scratchpad

The ScratchPad can be used to make notes during a Geoplot session - the form can be resized and repositioned. Any text is saved when Geoplot is exited and is then reloaded when the program restarts to act as a reminder. Tab and Enter may be used. Closing or Cancelling the form does not lose any information - use the Clear button to delete all the text. You can use the 'Add Text to Comp Notes' button to save the text with composite file notes.

Examples of use include noting block statistics (click on Statistics Form value to place in Clipboard then paste into the Scratchpad) or noting block coordinates ready for entering into Cut and Combine - values can be copied and pasted. The name of the current file loaded can be copied and pasted here from the menu bar. Reminders for present or future processing steps can be recorded. Process History can be copied here. Any ScratchPad text can be pasted in to the Composite Notes area if enabled - for example recording the logic behind specific steps taken to correct unusual survey defects.

Interactive Survey Interpretation using Animation and Overlays

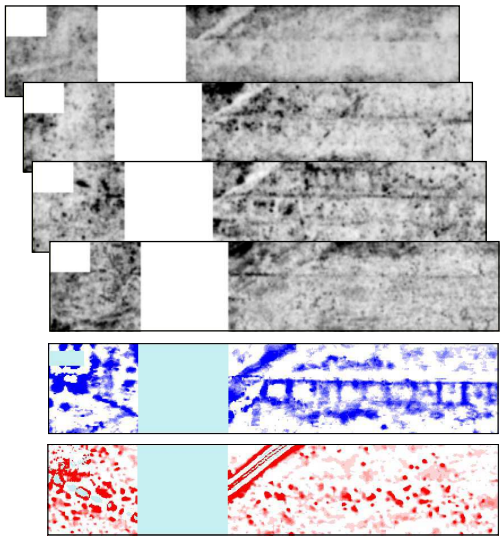
Interactive study of multi-method survey data results in a more complete and reliable archaeological interpretation. The Animation and Overlay Tool provides this capability. The Animation component is primarily in support of a sequence of GPR time slice data though it can also be used to compare different survey methods, such as resistance, magnetics and EM. The overlay component supports static data. The animation can be paused at any convenient point, run forwards or backwards either continuously or in single steps. The opacity of any selected overlay image can be interactively adjusted to help in understanding data sets, their spatial relationship, complementary nature and to develop an interpretation from a variety of sources - including resistance, magnetics, GPR, LiDAR, topography, EM etc. Images can be .jpg, .bmp, .png, .gif, or .tif in any combination. Up to 9 images can be selected for overlay on the animation and each image can be turned on or off and its ordering position relative to other layers changed. The display form supports transparency (.png, .tif) so any transparent areas defined will show layers behind. All pre-processing and graphics creation can be done within Geoplot using the Processing and Save Graphic Image capability.

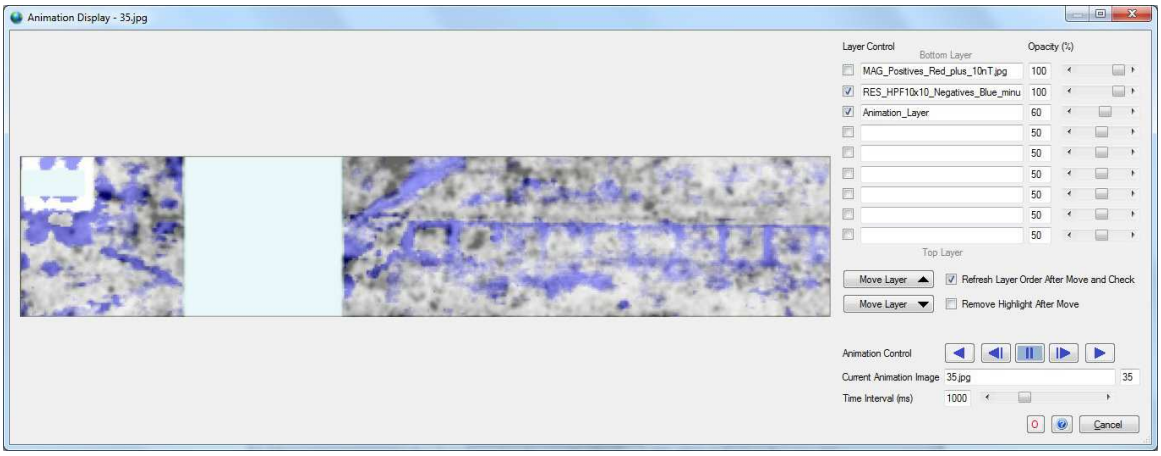


Animation and Overlay Editor

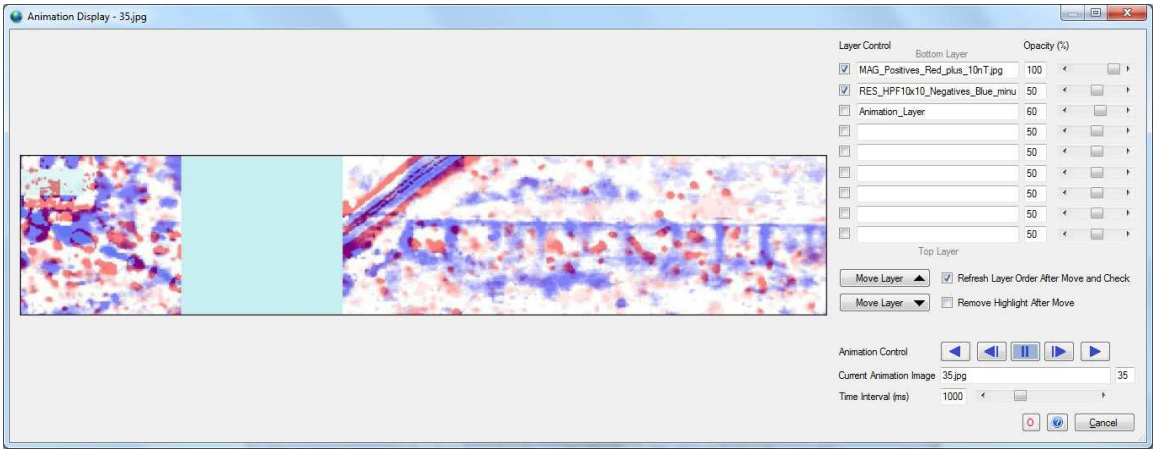
Spanish Mission Settlement Example

In the first example, above opposite right, the (greyscale) GPR animation has been stopped at 80cm and (blue) low resistance data (high pass filtered, negatives only) has been overlaid by the radar data at 60% opacity to show the relationship between likely foundation stones and adobe wall material (some of the individual layers available are shown to the right). In the second example, above right, the GPR animation has been discarded and the same negative resistance data is superimposed over the magnetic (red) positive data, to show where hearths and iron artefacts may exist inside and outside the rooms. By interactively adjusting the layers that are visible, their opacity and order, a deeper understanding of the site and individual features is possible.



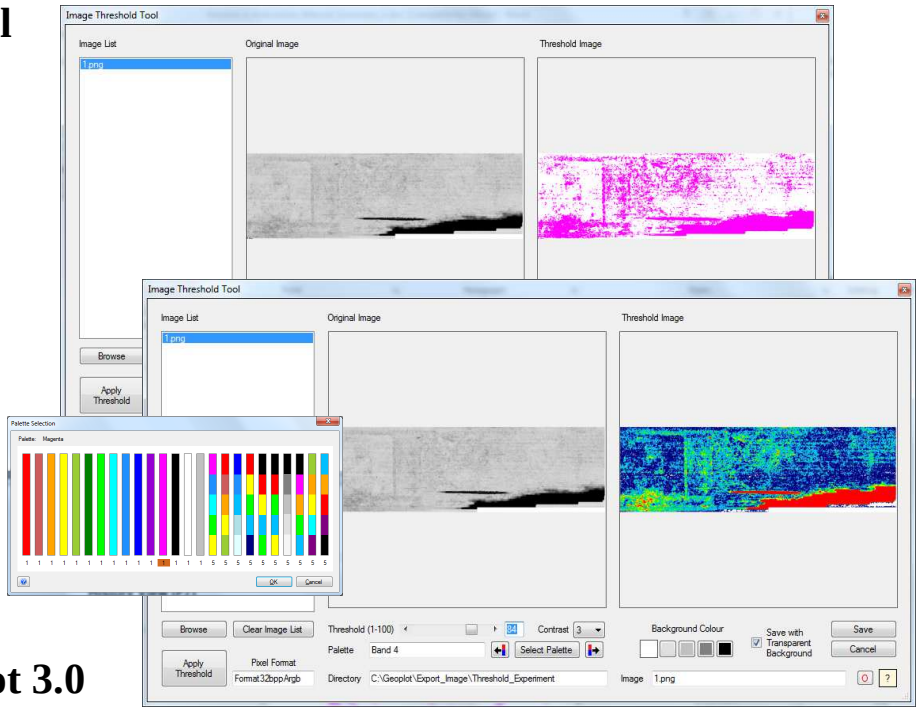


Animation and Layer display showing Spanish Mission resistance data (blue) over radar data paused at 80 cm (grey). The form is re-sizeable to suit user requirements and the aspect ratio of the data.



Animation and Layer display showing Spanish Mission resistance data (blue) and magnetic data (red)

Image Threshold Tool



An Image Threshold Tool allows you to extract more information from an image, usually a low contrast grey scale, by setting a threshold level above which image information is displayed using a chosen palette colour, whilst below that level that part of the image will be typically white, with optional transparency. This tool is useful for applying to radar images and the thresholded image can be subsequently used in the Animation as an interpretation layer. It can be used to give false colour to grey images as well, when variable contrast can also be applied. Typically, information at different radar depths can be displayed with different colours and overlain in the Animation tool for presentation.

Upgrade from Geoplot 3.0

Geoplor 3.0 licences that are protected by a USB dongle can be upgraded to Geoplot 4.0. This is done remotely by emailing a link to an executable file that updates a specific dongle so it can run both Geoplot 3.0 and 4.0. Other types of protection cannot be upgraded.

GEOPLOT

Version 4.0

GEOPLOT

Process and Tools Functions

Numeric Functions - Add, Multiply, Divide, Absolute, Power, Clip, Compress, Search and Replace, Randomise - general purpose numeric tools.

Cut and Combine - Function that provides Cut and Paste, Add, Subtract and Multiply operations between two data sets (grid and composite). Can be applied between any block of source data and positioned at any location in the other data set. Applications include merging and splitting data sets, correlation plot generation.

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

Despike - 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. Can be applied to all grids individually, the whole composite or individual lines. Destagger can be applied to blocks of lines for sensor array data.

Edge Match - Used to remove grid edge discontinuities which may be present in Twin array 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 found in resistance surveys.

Interpolate - Increases or decreases the number of data points in a survey (linear or sinx/x). 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 and also when used in macros.

Periodic Defect Filter - Removes periodic features which may be present in the soil (eg plough marks) or which may be introduced as defects in gradiometer data

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.

Wallis Filter - Provides histogram equalisation that emphasises low value readings and compresses high value readings.

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.

Rotate Data - Rotate data in 90 degree steps to correctly orientate or allow direction dependant process functions to be applied.

Flip Data Horizontal and Vertical, Invert Traverse Mode and Swop Adjacent Traverses - Tools to correct for different data collection strategies or incorrect download settings. Flip creates a mirror image of the data. Invert Traverse Mode corrects for improper settings of the zig-zag / parallel download parameter. Swop Adjacent Traverses corrects for inappropriate resistance survey multiplexer wiring.

Shift Data - Shifts composite data in the X or Y direction, useful for aligning different data sets which were collected with an offset.

Add Alternate Traverses - Used with gradiometer data to add (or subtract) a number from alternate traverses. This acts as an alternative to using Zero Mean Traverse, altering the data much less, thus reducing the chance of losing features running parallel with the traverse direction.

Run and Edit Macros - Macros are detailed earlier - they allow users to define and save a sequence of data processing and tool steps with specified parameters as a macro; this macro can then be run with a single mouse click to greatly speed up data analysis.

Merge Composites - Used to combine resistance and gradiometer data sets which have data collected in an interleaving fashion.

Create Blank Composite - Used to create a blank data set or canvas for use with Cut and Combine, useful for combining multiple data sets.

Stripe Defect Removal in Non-Bipolar Data - An example macro that is also embedded in the Tools menu and is commonly used to remove stripe defects in resistance data, something Zero Mean Traverse is not designed for.

Create Survey Perimeter Outline - generates an outline of the survey area (transparent if required) which is useful for generating interpretations and reports.

One Click Convert Tools - Save a Grid as a Composite, save a Composite as a Grid.

GPS Gap Fill - Used for completing imported non-uniform GPS referenced data.

Calculator - Specialised application using one-click copy and paste saving several keyboard clicks compared to using the Windows Calculator.

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Northamptonshire Archaeology Unit (MOLA)
GSB Prospection. Archaeophysics,
Jorg Fassbinder

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