
S3GRAF v8.1 Release Notes



S3GRAF
Version 8.1
July 2015

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1. Introduction

S3GRAF v8.1 is the latest version of the Reservoir Engineering Visualisation software from Sciencesoft Ltd. S3GRAF provides functionality to quickly and efficiently visualise and analyse reservoir simulation data from a range of simulators. Line plots of well production data (for example) and views of the simulation grid can be created. With the 3D module three-dimensional displays of simulation grid data can be generated. The HPG module permits extremely fast loading of grid geometry and vector data, especially for large datasets.

The new features to be found in the latest version of S3GRAF are outlined as follows:

Fetch on Demand for Summary/Plot data with HPG

Fetch on Demand (Only Available with the HPG module) support has been added for Summary/Plot data. This will allow users to access very large Summary/Plot data files without having to load them into memory. This option improves the time taken to load a file and the memory usage of S3GRAF.

Support for CMG 2014 updates

The internal dictionaries for CMG have been updated to reflect the changes made in the 2014 release. This includes the verbose vector names and some components of the unit systems.

Support for Petrel Well Trajectory Files

Petrel trajectory files are now supported for use with the Create RFT Data option in Standard Functions.

Support for Intersect Simulation Files

Support has been added for Eclipse compatible output from Intersect simulations.

Filtering of Grid Data Plots by User Defined Regions

The Grid Property Filtering feature has been improved to include saved User Defined Regions. Grid data can be filtered down to show only those value for cells included in the User Region.

Default X-Axis for Grid Data Plots

The default x-axis for grid data vectors to be plotted against has been changed to search for a vector defining the cell depth. This was previously the first vector written out in the dataset.

Statistics for Grid Properties

The option to view the statistical properties of a Map vector displayed on a grid has been added. This feature can generate statistics for the whole vector or only for those cells currently being displayed on a grid such a when Fence Plots are being used.

Copy and Paste Grid Display Settings

The ability to copy and selectively paste Grid Display Settings between grids has also been added. This will allow the quick recreation of a desired grid display setup.

Grid Bearing Arrow

The Grid Arrow has now been aligned with the y-axis by default as opposed to the x-axis to be in keeping with client expectations.

Apply Graph Templates to all Active Graphs Options

Graph Templates can now be applied to all active grids with one button press to quickly disseminate a specific format.

Derived Quantity Toolbar

A new toolbar has been added to allow quick and easy access to User Functions, Standard Functions and the Volumetric Calculations.

1.1. Important Notes

Mousewheel Zoom Issue with Windows 7

S3GRAF has a known issue with mousewheel zooming. We have analysed the problem in some detail and found that it is caused by a known issue within Windows 7:

<http://support.microsoft.com/kb/2752274/en-us>

Unfortunately, the only solution that will allow the mouse-wheel zooming to work consistently is to install the hotfix provided in the above link (note that at some point the hotfix will be included in a regular Windows update, at which point the problem will be resolved even if it is not possible for you to install the hotfix). We have looked for ways to work around the Windows bug, but have found that it is not possible; the bug specifically affects the data about the mousewheel rotation that is needed to infer the zoom direction. Note, though, that if all open grid display windows in S3GRAF are 'closed' to the graph list (so that their windows are removed) and then restored, this will reset the Windows hook that is causing the problem and may restore the mousewheel function (although this is not guaranteed to resolve the issue, since the new hook may also exhibit the Windows bug).

Please Note: Zooming using the right mouse button (right-dragging the mouse) provides an alternative method of zooming, which can be used even when the mousewheel problem occurs.

2. Fetch on Demand for Summary/Plot data with HPG

This option is only available with the HPG license.

S3GRAF uses a fast parse method to rapidly scan the contents of certain types of summary data files and selects the bare minimum of information required from these files. Only when a particular item is required does the software fetch the information from the file. This allows all of the results to be effectively loaded from a file without the memory overhead of storing the data. The alternative is to decide at load time which information to load from the results file.

The supported files are currently limited to H5 formatted Eclipse Summary data and VIP Plot data stored in VDBs.

The new Fetch on Demand (FoD) load option is enabled by default when an HPG license is available. The global option can be set from the *S3GRAF Options* dialog, which is accessed by clicking on the *Tools* menu and selection *Options...* and finally clicking on the HPG tab. This will present the options as seen in Figure 1.

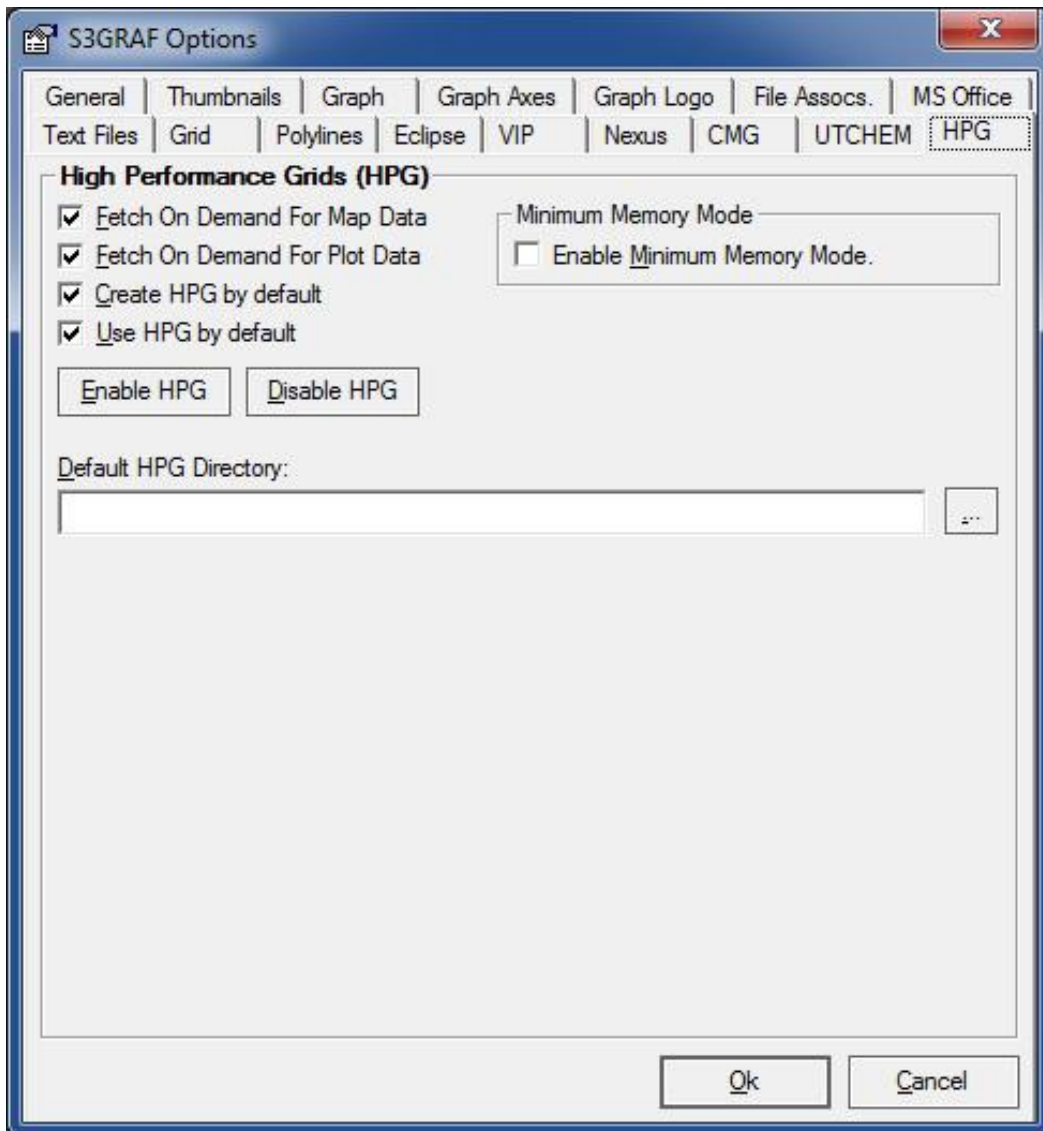


Figure 1 - HPG Global Options

The checkbox labelled *Fetch on Demand For Plot Data* will enable FoD when loading the supported summary data file types.

2.1. FoD for Eclipse Datasets

Eclipse can optionally output the summary data in an HDF format. This is performed as a post-processing step by enabling the *HDF* option. This will result in Eclipse creating a *.H5 file. In S3GRAF this can be loaded as an alternative to the *.SMSPEC/*.UNSMRY file pair (or any alternative format of summary data file; formatted/unformatted, unified/individual, etc.) and this allows FoD to be employed.

If an *.H5 file is present and an HPG license is available then the Eclipse summary load dialog will include a checkbox for enabling FoD as shown in Figure 2 with the *Use Fetch On Demand* checkbox circled in red. If this is checked then the Summary data will be loaded from the H5 otherwise the existing *.SMSPEC/*.UNSMRY files will be loaded.

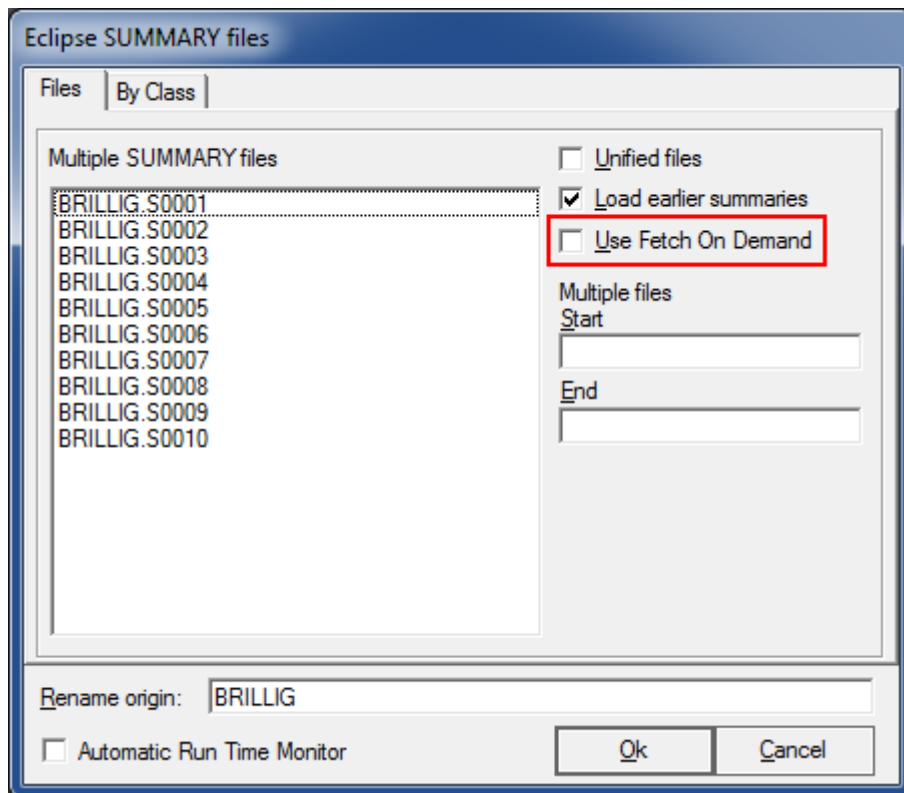


Figure 2 - Eclipse Summary Loading Dialog

Validity Checking Note

As this system provides two sets of the summary data files that can be loaded some checking is necessary to determine validity. As the H5 is produced as a post-processing step from the *.SMSPEC/*.UNSMRY the dates of these files are compared. If the H5 file was created earlier than the *.SMSPEC then the user is warned and asked whether to continue with the loading of the H5, revert to the *.SMSPEC or cancel the load. This warning is shown in Figure 3.

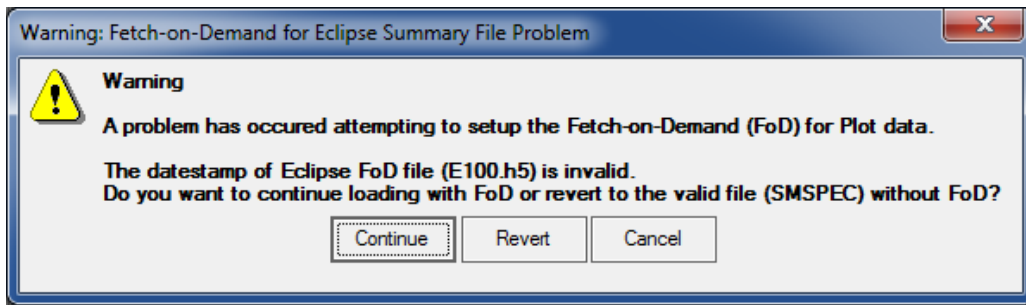


Figure 3 - H5 Validity Failure Warning Dialog

If the Eclipse load dialogs are not being used (there are options to suppress the Eclipse load dialogs in *S3GRAF Options*) or the file is being loaded via GRF then S3GRAF will assume that the *.H5 is invalid in this case and load the *.SMSPEC/*.UNSMRY summary file.

2.2. FoD for VIP VDB Datasets

A simpler situation exists for VIP VDB datasets where, if the *Fetch on Demand For Plot Data* checkbox is checked in *S3GRAF Options*, the Plot data will be available for use from the treeview via FoD.

3. Support for CMG 2014 updates

The internal dictionaries for CMG datasets have been updated in S3GRAF. This consists of some updates to the data vector names, format corrections and some internal unit conversions.

4. Support for Petrel Well Trajectory Files

Well trajectory files (*.TRJ) can be used to produce RFT data from the grid properties for the path of the well. Support for the alternative format of trajectory files produced by Petrel has been added.

Well trajectory files can be created from Petrel by exporting the Eclipse Well Connection Data and saving it as a *.TRJ file type.

The trajectory file can then be loaded into S3GRAF in the standard manner along with the rest of the data set. It will be presented as a *Data* folder in the treeview, as seen in Figure 4.

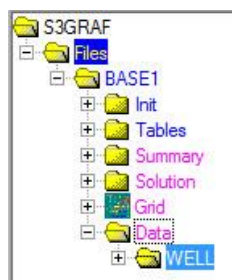


Figure 4 - Loading a *.TRJ into the Treeview

Open up the *Standard Functions* from the *Tools* menu under *Derived Quantities*, as shown in Figure 5.

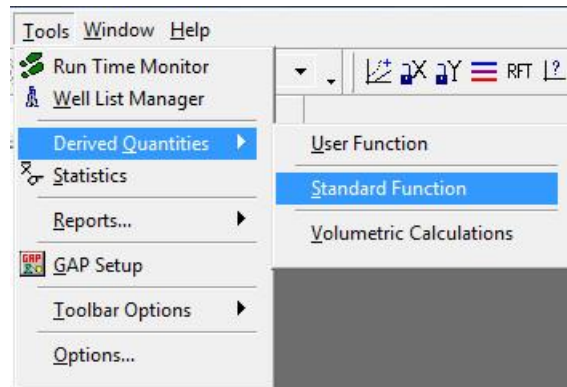


Figure 5 - Accessing Standard Functions

From the drop-down menu within the *Standard Functions* dialog select *Create RFT Data*, as shown in Figure 6.

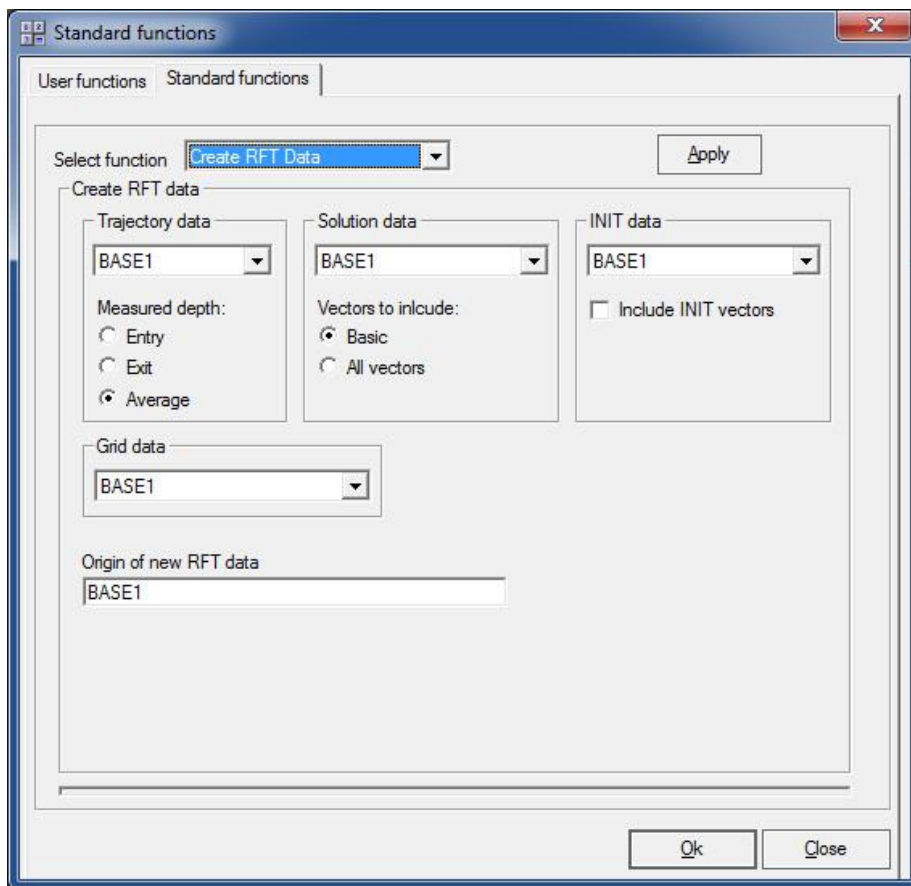


Figure 6 - Create RFT Data Dialog

The *Trajectory data* selection will use the data provided by the *.TRJ data by selecting the origin under which the trajectory file is loaded (usually the filename). After clicking *Apply* the resulting RFT data will be presented in the treeview under a *RFT* folder for the specified origin.

5. Support for Intersect Simulation Files

The Intersect simulator can output data in an Eclipse compatible format. It is these files that are now supported in S3GRAF. This enables such things as support for well names longer than 8 characters.

6. Filtering of Grid Data Plots by User Defined Regions

The *Grid Property Filtering* feature allows the user to screen the grid plot data before it is plotted. Either INIT or SOLUTION grid data can be plotted but constrained to show only those cells defined as matching a value of a separate INIT integer vector, such as PVTNUM. This has now been extended to include filtering to cells within *User Defined Regions*.

User Defined Regions are subsets of grid cells defined and saved by the user. They are created from one of three features:

- **Fence Plots:** The cells displayed can be restricted by setting limits on the X, Y and Z cell range.
- **Thresholds:** The cells displayed can be restricted by only displaying cells whose value for a particular vector or vectors lies in a defined range.
- **Polylines:** The cells displayed are defined by a boundary described by a polygon whose vertices are defined by user clicks.

Each of these display features can be saved to the treeview for easy re-application and use in calculations. With this new version they can now be used to define a subset of cells when plotting grid properties on a graph.

The filter controls are presented as a toolbar, which is off by default, but can be accessed via a number of methods:

- From the menu, via *Graph -> Grid Property Filtering*, see Figure 7
- From the right-click Treeview menu as *Grid Property Filtering*, see Figure 8
- From right-clicking on an empty region of the toolbar and selecting *Grid Property Filtering*.

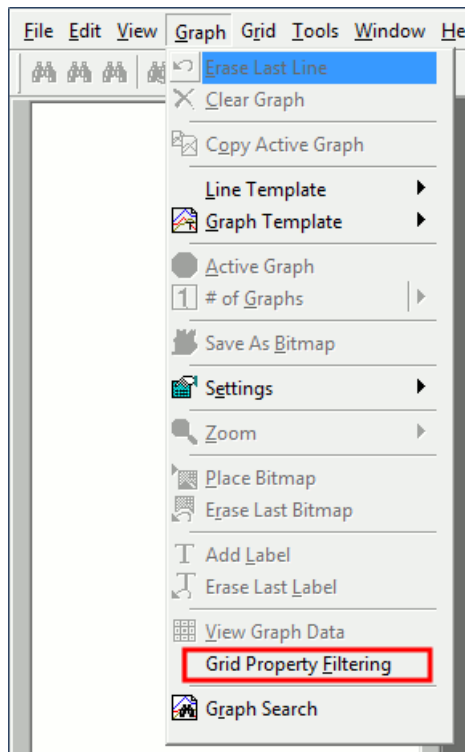


Figure 7 - Graph menu

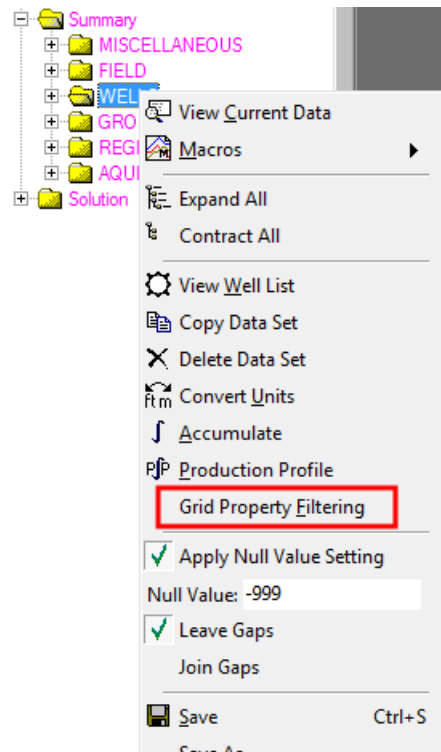



Figure 8 - Treeview Right-Click Menu

The toolbar that operates the filtering is shown, circled in red, in Figure 9. The  button toggles the enabling and disabling of the application of the filter. The first drop-down box lists the INIT vectors that can be used as a filter, whilst the second lists the applicable filter values. The drop-down list of INIT vectors now also includes any saved *User Defined Regions*. These entries are highlighted with the “*Region:*” label as seen circled in red in Figure 10 where a Fence Plot has been saved as a user region named “*CLIP1*” and is listed alongside the INIT vectors.

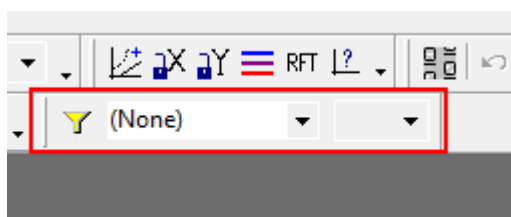


Figure 9 - Filter Toolbar

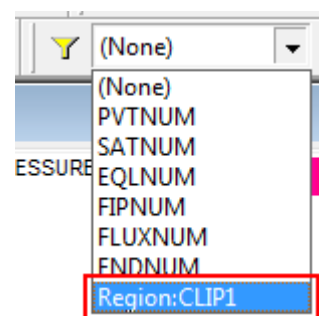


Figure 10 - User Defined Region Entry

7. Default X-Axis for Grid Data Plots

When plotting a grid data vector S3GRAF will search through the loaded data in an attempt to find a grid vector that defines the depth for each cell. The grid data vector will then be plotted

against this depth vector by default; the depth vector will define the x-axis and the grid data vector will define the y-axis. The roles will be reversed when creating a RFT-style plot.

Alternative default vectors can still be defined in the normal way.

Previously the first vector written out in the dataset was used as the default vector.

8. Statistics for Grid Properties

The statistical properties of a property can be viewed when it is displayed on a grid via the *Grid Statistics* feature. This presents basic statistical information in a separate window and can be updated live as the grid display is changed.

The feature is accessed by right-clicking on an open grid when no cell has been highlighted and selecting *Grid Statistics* as seen in Figure 11. This will present a dialog containing some statistical information about the grid property currently displayed on the active grid.

If a cell has been selected on the grid the alternative *Cell Selection Options* menu will pop up, so deselect the cell by clicking on the background first.

This option is also available from the *Grid* menu, as seen in Figure 11.

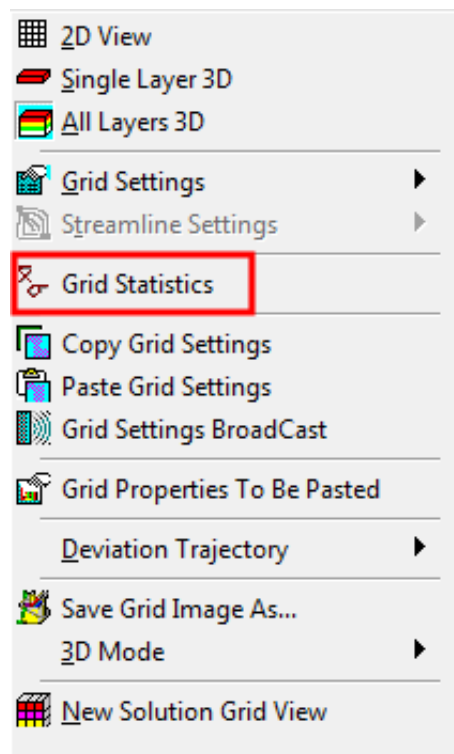


Figure 11 - Grid Menu

Upon activation the Grid Statistics dialog is presented, as the example in Figure 12 shows.

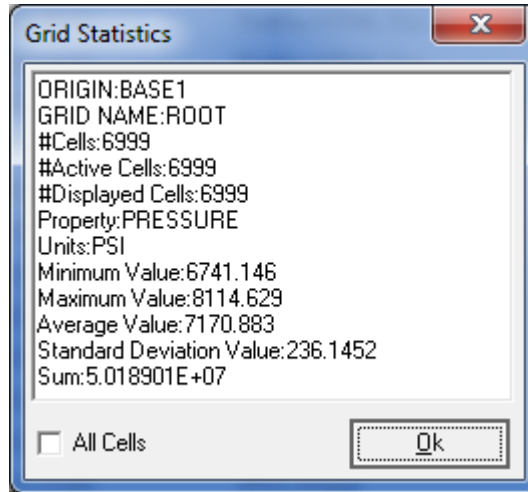


Figure 12 - Grid Statistics Dialog

This dialog presents a number of statistics for the currently displayed property. The information presented only applies to the currently visible cells. This information is updated dynamically as the grid display changes. It will also change to reflect the currently selected, open grid display window, i.e. if you select another grid window, this statistics display form will update to suit.

Various *Grid Display Settings* that alter which cells are shown/visible will control which cells the calculated statistics are based. This includes features such as *Fence Plots* and *Thresholds*.

There is an *All Cells* check box which is used to toggle the statistical information between all the active cells for a grid and only those visible. To close this form click on *Ok*.

The property information reported is outlined as the follows:

| Property | Description |
|---------------------------------|--|
| Origin | Name of the dataset case/origin |
| Grid Name | Name of the grid that is being displayed, e.g. Root, or LGR name |
| #Cells | Total number of cells in the loaded model (the total will include inactive cells if they have been loaded) |
| #Active Cells | Total number of active cells in the loaded model |
| #Displayed Cells | Number of displayed active cells in the current display |
| Property | Property currently being displayed |
| Units | Units for the property |
| Minimum Value | The minimum value of the property for the currently displayed cells |
| Maximum Value | The maximum value of the property for the currently displayed cells |
| Average Value | The average value of the property for the currently displayed cells |
| Standard Deviation Value | The standard deviation of the property for the currently displayed cells |
| Sum | The total sum of the values of the property for the currently displayed cells |

9. Copy and Paste Grid Display Settings

This feature enables the user to copy and paste the *Grid Display Settings* from one grid display to another. The list of *Grid Display Settings* is presented in the *Grid* menu as shown in Figure 13:

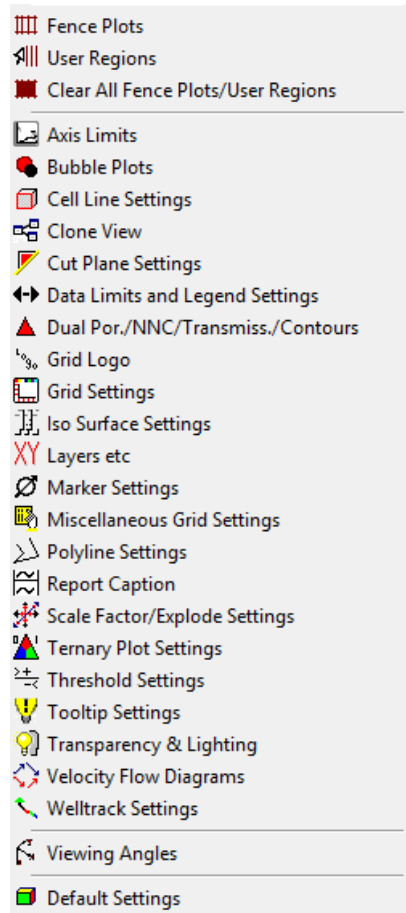


Figure 13 – Grid Display Settings Menu

All display settings can be copied from a single grid and then selectively pasted to another grid or grids. This allows the quick reproduction of particular grid display either to produce a reference display or as a default style.

The Copy and Paste options are accessible by right-clicking on an open grid when no cell has been highlighted. If a cell has been selected on the grid and data has been displayed the alternative Cell Selection Options menu will pop up, so deselect the cell by clicking on the background first.

This option is also available from the Grid menu, as shown in Figure 14.

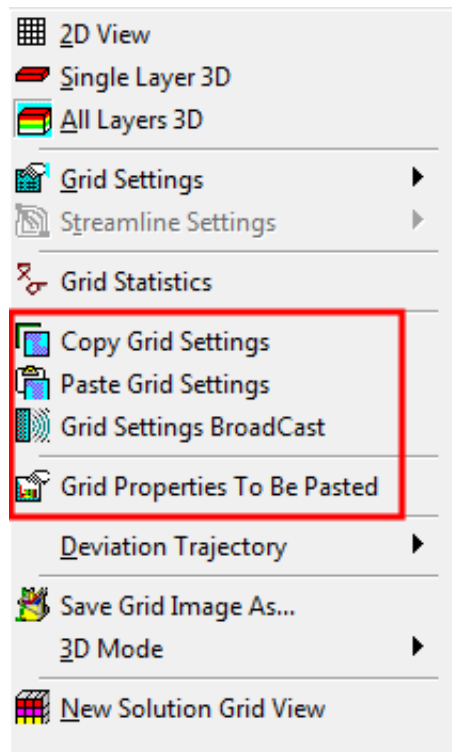


Figure 14 - Grid Menu

Copy Grid Settings

Copies the current grid settings into the internal store. These settings are preserved until this button is clicked again.

Paste Grid Settings

This uses the settings stored and applies only the values which are set by the Grid Paste Settings dialog. Be aware that the some of the settings will not be apparent, or will appear strange if some of the settings are not appropriate with regard to data and geometry, etc. as they may be specific to that model.

Grids Settings Broadcast

These settings allow the application of a copy of grid settings to be pasted to multiple grids in a single operation. This button displays the dialog, as seen in Figure 15, with choices as to which grid windows to apply settings to.

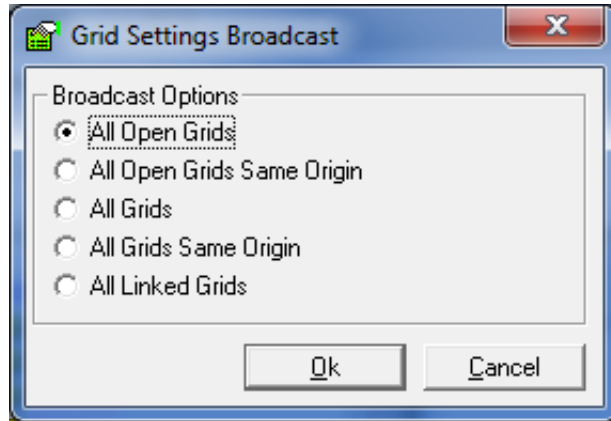


Figure 15 - Grid Settings Broadcast Dialog

The multi-paste (Broadcast) options are outlined as follows:

| Option | Application of Paste |
|--------------------------------------|---|
| All Open Grids | Applies settings to all grid windows which are open. |
| All Open Grids Same Origin | Applies to all open grid windows which have the same origin. |
| All Grids Applies | Applies to all grid windows, open or not, however closed grid windows must be checked in the Graph List. |
| All Grids Same Origin Applies | Applies to all grid windows with the same origin as the grid that has been copied from, open or not, however closed grid windows must be checked in the Graph List. |
| All Linked Grids Applies | Applies to all grid windows which are linked to the grid that has been copied from. |

Some options will be unavailable depending on whether multiple Origins are displayed, or grids are linked, etc.



Grid Properties to be Pasted

The grid settings that are pasted are controlled from the *Grid Settings to Paste* options dialog. These are accessed from the grid display right-click menu or the *Grid* menu (as seen previously in Figure 14). Selecting this option will present the Grid Settings to Paste dialog as shown in Figure 16.

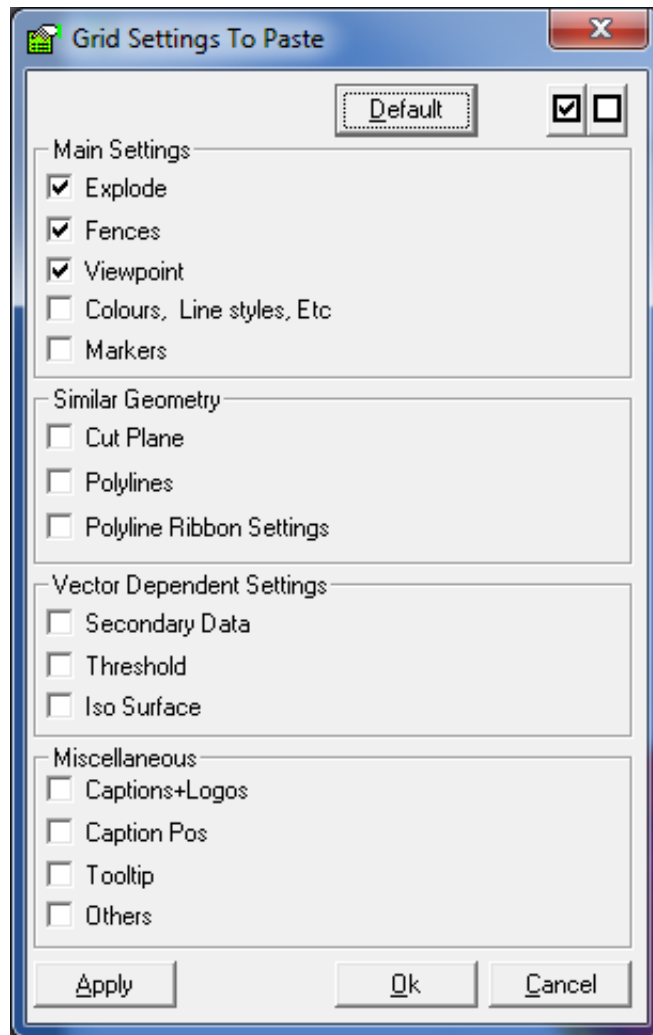


Figure 16 - Grid Settings to be Pasted Dialog

These checkboxes dictate which properties and settings will be applied to another grid from the properties which were saved. The various display settings are collected into groups:

Main Settings

These are the non-geometric or non-data specific settings which are the same for all grids.

Similar Geometry

These are the items which are dependent on similar sized grids in X, Y, Z terms to have any meaning.

Vector Dependent Settings

These settings rely on there being identical Map data vectors available to be used.

Miscellaneous

These are the items which are not reliant on the grid details.

Defaults

The default settings are to only paste the *Explode and Scaling* settings, *Fence Plots* and the Grid *Viewpoint*. The system can be reset to this default by clicking on the **Default** button

10. Grid Bearing Arrow

Previously the grid arrow was orientated along the x-axis, in the positive direction. With this version the system default has been changed to align the grid bearing arrow with the y-axis. This has been done to be more in keeping with industry expectations for the grid arrow.

The default has been changed but this can be changed by accessing the system options from the *Tools* menu and selecting *Options*. The global system setting can be altered from the *Grid* tab, as shown in Figure 17, by unchecking the option circled in red.

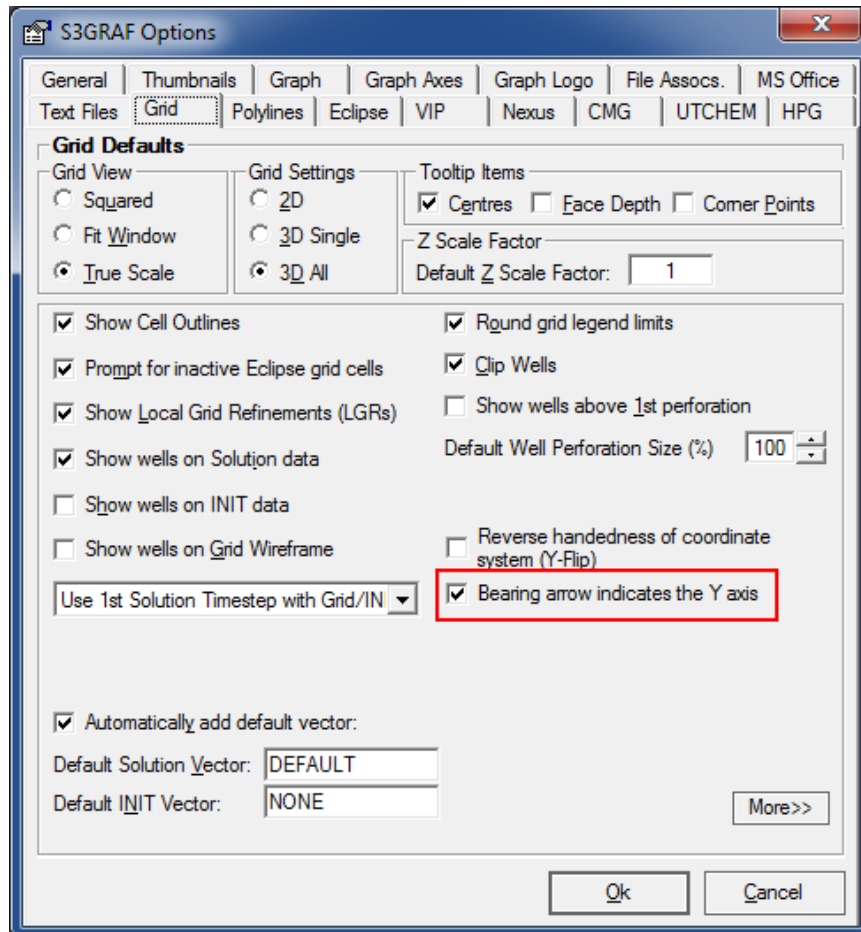


Figure 17 - S3GRAF Options dialog

The bearing can also be changed on a grid-by-grid basis though the *Miscellaneous Grid Settings* of the *Grid Settings* accessed by double-clicking on a grid or through the *Grid* menu. The setting can be seen in Figure 18, also circled in red.

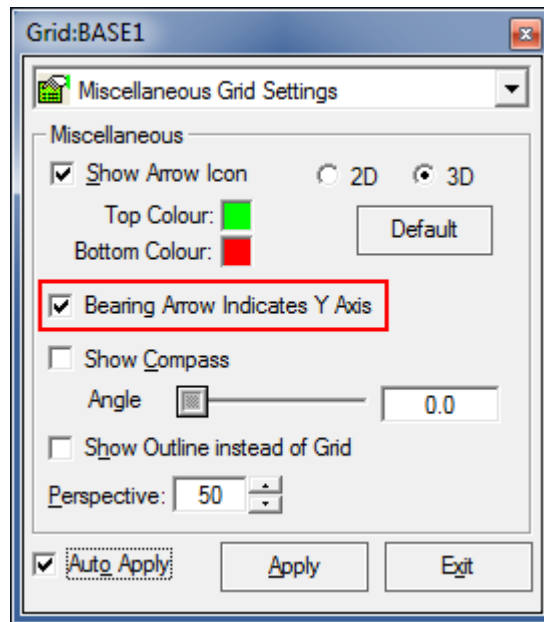


Figure 18 - Miscellaneous Grid Settings Dialog

11. Apply Graph Templates to all Active Graphs Options

A new option has been added to the Graph Template controls that allows the user to apply the selected Template to all active graphs rather than having to perform it on a graph-by-graph basis.

Within the *Graph* menu item the *Graph Template* sub-menu includes the *Apply to all graphs* item, as shown circled in red in Figure 19. This will apply the template selected by the *Template* drop down menu to all the graphs present in the display area. It will not apply them to graphs that have been closed to the Graph List.

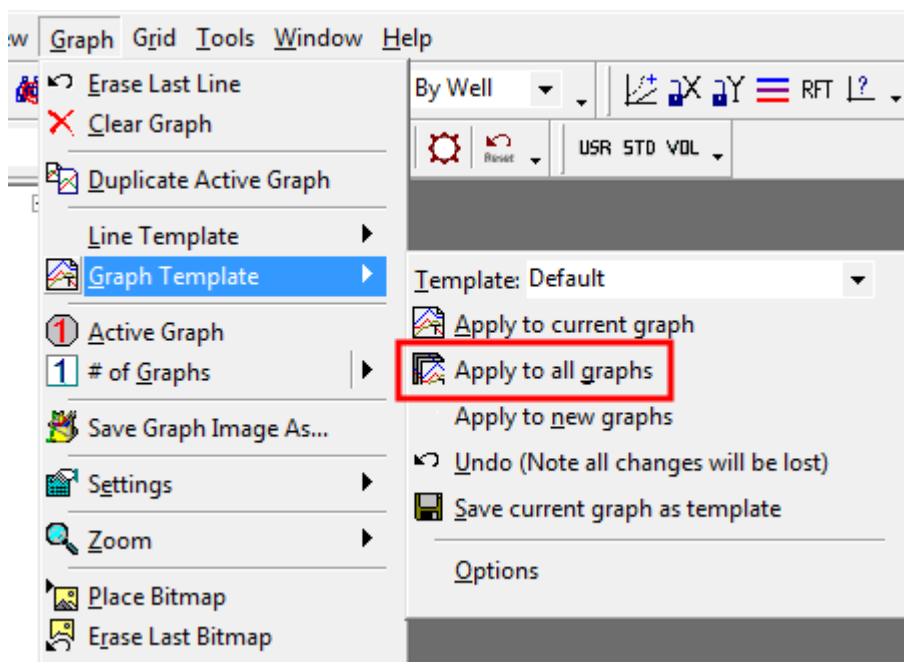


Figure 19 - Graph Template Sub-Menu

This application cannot be undone by the *Undo* option in the *Graph Template* sub-menu.

12. Derived Quantity Toolbar

To allow quick access to some of the analysis tools in S3GRAF a new toolbar has been added. This allows the user to launch the following features with a single click:

| | | |
|------------|--------------------------------|---|
| USR | <i>User Functions</i> | User defined calculations based in the loaded data |
| STD | <i>Standard Functions</i> | Set of predefined functions to calculate or extract commonly requested data |
| VOL | <i>Volumetric Calculations</i> | Volumetric calculations of grid properties, weighted by Pore Volume |

The new toolbar is shown in Figure 20, circled in red.

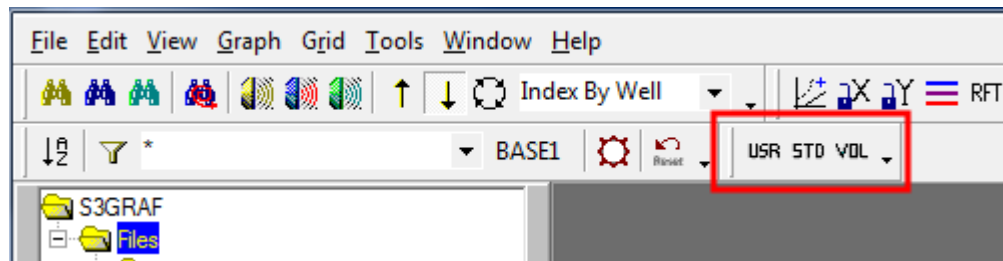


Figure 20 - Derived Quantities Toolbar

The tools would normally be accessed from the *Tools* menu within the *Derived Quantities* sub-menu.

13. Bug Fixes

A list of bug fixes and functionality improvements are shown below:

- **Readers:**
 - Improved memory usage when loading CMG datasets
 - Correct unit conversion is now applied when reading CMG table data
 - Minor issues with the Eclipse H5 reader corrected
 - Reading of GSG files improved
 - An issue with interpreting localised UTCHEM grids has been corrected
 - The UTCHEM load dialog will always be presented as part of the load operation
 - VIP/Nexus RFT entries with a single completion are now read correctly
 - Support for Nexus RFT file format that includes Measured Depth added
- **Analysis:**
 - The Target field of the Derived Quantity dialog updates correctly for INIT data vectors
 - Line Analysis of Petrel EGRIDs now handles inactive cells correctly
 - Layer Analysis now works correctly with Dual Porosity datasets
 - Corrected minor issue with some Standard Calculations

- Issues with Standard Calculations for CMG data have been resolved
- Create RFT Data Standard Calculation now handles null values
- Create RFT Data Standard Calculation can now use Minimum Memory Mode
- Create RFT Data now works with VIP datasets and multiple, separate Eclipse Solution files
- An issue with Volumetric Calculations for UTCHEM models using Threshold regions has been corrected
- Several issues with recreating Volumetric Calculations via GRF have been fixed
- The handling of multiple loaded datasets and Volumetric Calculation has been corrected
- The Accumulate/PPR function handles the data start date and the averaging start date correctly
- **Line Plots:**
 - Line plots with multiple lines now correctly update with broadcasting when sharing axes
 - Axes labels now consistently use upper case
 - Better fidelity for reading values from a grid with the inspection tool
 - Corrected some issues with the default x-axis choice for various data types
 - The Number of Graphs per Page button can now be used directly
 - Anomalous behaviour with join/connect option for handling null values corrected
- **Grids:**
 - Long wellnames are now supported for grid displays for VIP/Nexus
 - An issue drawing some radial LGRs has been resolved
 - Issues with the display of Ribbon View have been corrected
 - Corrected the display and updating of the Ribbon View when using VIP datasets
 - Clicking on wellhead markers when drawing a polyline is no longer an issue
 - User Defined Regions now operate correctly with LGRs.
 - An issue with zooming and transmissibility lines on a 2D grid has been fixed
 - Issues with the display and performance of 2D non-neighbouring connections has been corrected
 - Secondary Data selection now works as expected with Clone View
 - An issue with the Threshold controls for multiple definition lines has been corrected
 - An issue calculating the relative sizes of Bubble Plots has been fixed
 - Zooming with linked grids now behaves as expected
 - Wells are now displayed correctly for an INIT grid display for the selected SOLUTION timestep
- **Miscellaneous:**
 - Images for reports are now created correctly from GRF
 - Export as Eclipse now correctly handles NEXUS PVR data
 - Export as Eclipse output of INIT time vectors is correct
 - Export as Eclipse now correctly outputs the UNRST file header
 - Toolbar customisation is now preserved correctly
 - An issue viewing data in a spreadsheet after well vector sorting has been resolved
 - Vector selection in the Graph Search dialog issue has been fixed
 - GRFs now correctly recreate well label position offsets
 - GRFs now recreate plots based on user data
 - Minimum Memory Mode performance has been improved
 - Options added to improve network loading