Open Plot Project

User's Manual

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INTRODUCTION

Open Plot is a free software for structural data analysis which includes some basic 3D functionalities. Open Plot is available for Windows and Linux operating systems and, soon, for Mac O.S.

Window 2000 and higher.

- Download the Open Plot Pj.zip file, which includes the software (Open Plot Pj.exe), a collection of libraries (folder Open Plot Pj Lib) and the gs.ini file. Extract all files in the same folder.
- Download the quesa_2.0_sdk_win32.zip package, free for download at: http://sourceforge.net/projects/quesa/files/quesa/2.0/quesa_2.0_sdk_win32.zip/download. Extract Quesa.dll from the folder: /Developers/DLLs/Release/ and copy it in the folder containing Open Plot Pj.

Linux distros including GTK+ 2.8 (or higher).

- Download the Open Plot Pj.tar.gz file, which includes the software (Open Plot Pj) and the gs.ini file. Extract all files in the same folder.

Run Open Plot Project.

IMPORT DATA

Structural data can be imported from both clipboard and files or from previously saved Open Plot files.
When importing data from text files or copied from spreadsheets, the first step is to properly organise the dataset.

How to organise data

Data must be organised as follow:
Rows = elements.
Columns = element attributes.
Eventually, the first row can contain the columns header.

Numeric fields rigorously do not have to include non numeric characters.
As an example, the azimuth must be expressed as a number ranging between 0 and 360.
Expressions like N180º or N56E will return an azimuth = 0.

For a given element, when the value of an attribute is not defined the corresponding field must be empty.

Example spreadsheet with correct data organization

Data Type	**Azimuth**	**Dip**	**Pitch**	**Spacing**
Fault	123	57	24	477
Joint	345	83		35
Fault	133	48	12	

Example of spreadsheet with incorrect data organization

Data Type	**Azimuth**	**Dip**	**Pitch**	**Spacing**
Fault	123	57	24	477 **mm**
Joint	345	83	-	35
Fault	133	48	12	/

In the correct table joint has not an associated pitch value. Analogously, the second fault has not an associated spacing value.
In the Incorrect table, the character "**–**" in the pitch field of the joint will return a pitch = 0. Spacing of both faults will be set = 0, as non numeric characters are present.

If data are loaded from a text file, each row must contain the same number of fields.

Correct data organization with fields divided by commas.
Data type, azimuth, dip, Pitch, spacing
Fault,123,57,24,477
Joint,345,83,,35
Fault,133,48,12,
Data in the Joint row will be read as follow: Data type=Joint; Azimuth=345; Dip = 83; Pitch = EMPTY (two commas with no character in between); spacing = 35. Analogously, for the second fault, data will be read as follows: Data type=Fault; Azimuth=133; Dip =48; Pitch = 12, Spacing = EMPTY.

Incorrect data organization
Data type, azimuth, dip, Pitch, spacing
Fault,123,57,24,477
Joint,345,83,35
Fault,133,48,12
Data in the Joint row will be read as follow: Data type=Joint; Azimuth=345; Dip = 83; Pitch = 35. The character after 35 is an “enter”. This implies that the joint row is characterised by 4 fields, while the first fault is characterised by 5 fields. Due to this the software will stop reading the file (eventually it will crash). Analogously, for the second fault data will be loaded as follows: Data type=Fault; Azimuth=133; Dip =48; Pitch = 12; the character after 12 is an “enter” and the software will stop reading.

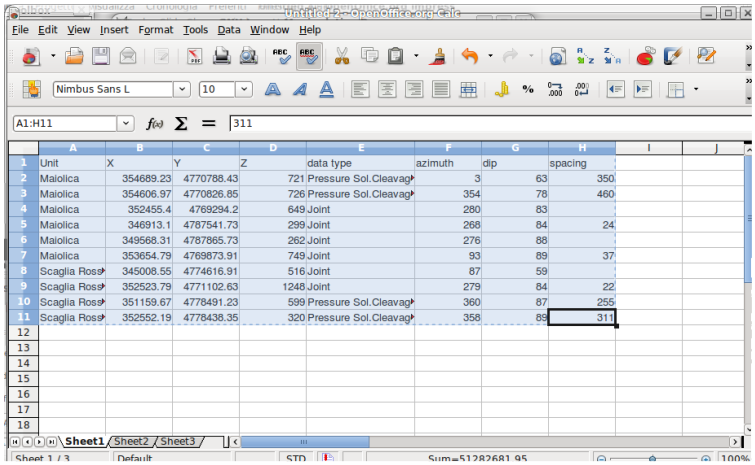
Faults sense of slip
During data import, fault slickenline can be imported as both pitch or slickenline azimuth. Regardless of this, if at least one of these two field is not empty, the software will compute the values of: slickenlines pitch and azimuth and of rotax (slip normal) azimuth and dip. If not present in the imported dataset, these fields are automatically added.

In the field defining the fault's sense of slip, English nomenclature must be adopted.
A fault is considered:
- Normal when the first two letters are *NO* or *NR*
- Reverse, when the first two letters are *RE* or *RV*
- Left-lateral, when the first two letters are *LE* or *LL*
- Right-lateral, when the first two letters are *RI* or *RL*

This check is not case sensitive.
In all the other cases the sense of slip is considered undetermined

Import from Clipboard

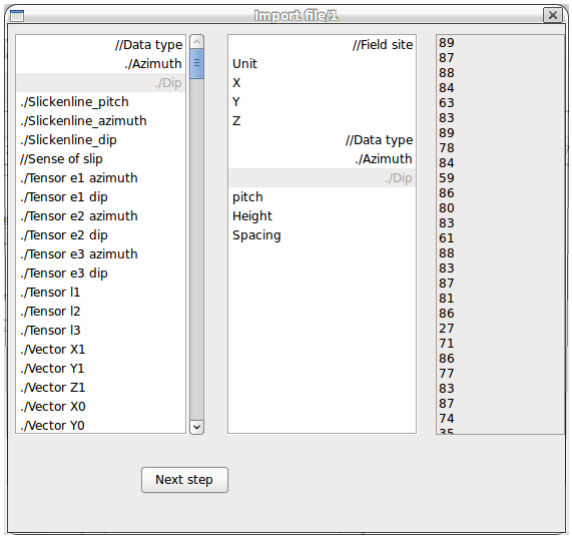
This allows to import data copied from a spreadsheet. Open the spreadsheet and copy the selection containing data.



From the main window of Open Plot select:

File → Import from Clipboard

If data are correctly loaded it will be asked if data include an header (if it is the case it is assumed that the column header locates in the first row).

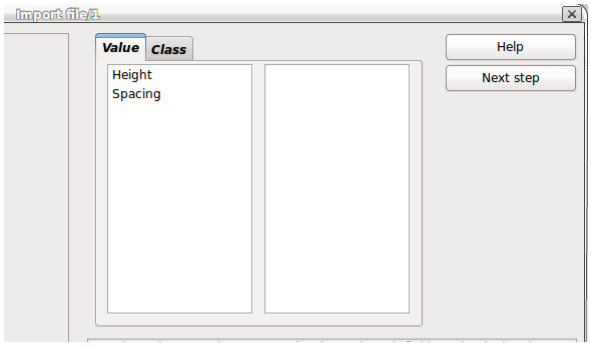


A new window will open up.

In the first and second list-boxes on the left are listed the “software defined” and the “user defined” fields, respectively. In the third list-box are listed the values associated with the selected “user defined” field.

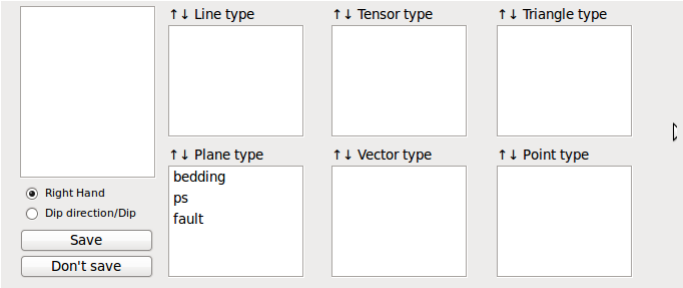
When possible, select the “user defined” field and double click the corresponding “software defined” field. This substitutes in the header the “user defined” field name with the “software defined” field name.

When all the possible substitutions have been done click “Next step”.



The window will enlarge and it will be asked to specify for each unassigned field if it is a Value field (numeric field, like spacing, aperture) or a Class field (alphanumeric field, like author, year...)

Double-click on the unassigned fields to “assign” them and then click “Next step”.



In the new window it will be asked to specify, for each element in the "Data type" field, if it is a Line, a Plane, a Tensor, a Vector or a Triangle.

Select/multiselect the element/s and, holding the keyboard space bar pressed, drag the element/s in the corresponding type list-box.

If planar elements are present, it must be specified if the azimuth field correspond to the plane dip direction or to the plane strike.

In this window, a given type list-box is enabled only if loaded elements include fields that are required by that type:

To define a Line and a Plane the azimuth and dip fields must exist.

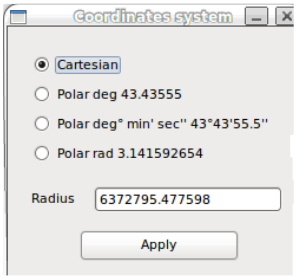
To define a Tensor the azimuth and dip fields of the three eigenvectors must exist (the eigenvalues are optional).

To define a Vector the three coordinates of the starting and ending points must exist.

To define a Triangle the three coordinates of the three points must exist.

Notice that for Vectors and Triangles the software will automatically compute the azimuth and dip values.

Finally you can decide to save the data as *.stv file or continue without saving.



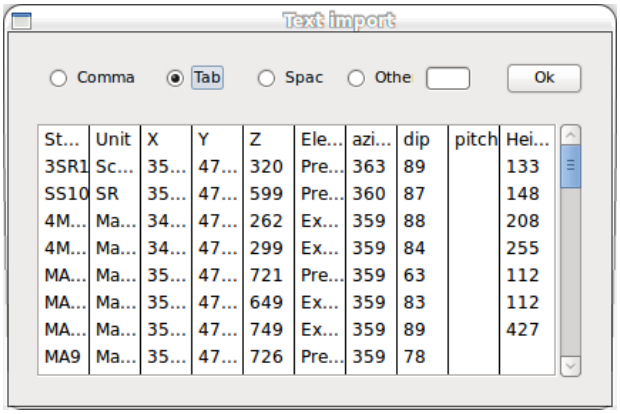
If coordinates have been loaded, it will be asked to specify if the X,Y and Z coordinates are in Polar or Cartesian system. In the first case, it must be also introduced the Sphere Radius. ***In this early version, only a limited suite of operations are fully supported for Polar coordinates***

Import from file

The procedure is the same as described in the Import from clipboard, with the exception of the following initial steps.

From the main window of Open Plot select: File → Import from File and select the file.

In many Linux distros the OpenDialog could not correctly work. If it is the case from the main window of Open Plot select: File → Drawing options. A new window will open. Select the **Plot Option tab** and activate the **Linux Dialog Problem** option (placed at the bottom of the list).



Import from File needs the separator definition, which have to be specified in this window that will automatically open.

Open Open Plot files

Loaded data, data created within the software and other imported 3D objects can be saved in both *.stv (data file) and *.spj (project file) format and then read back.
These two format are identical, with the only exception that images can be saved in *.spj format.

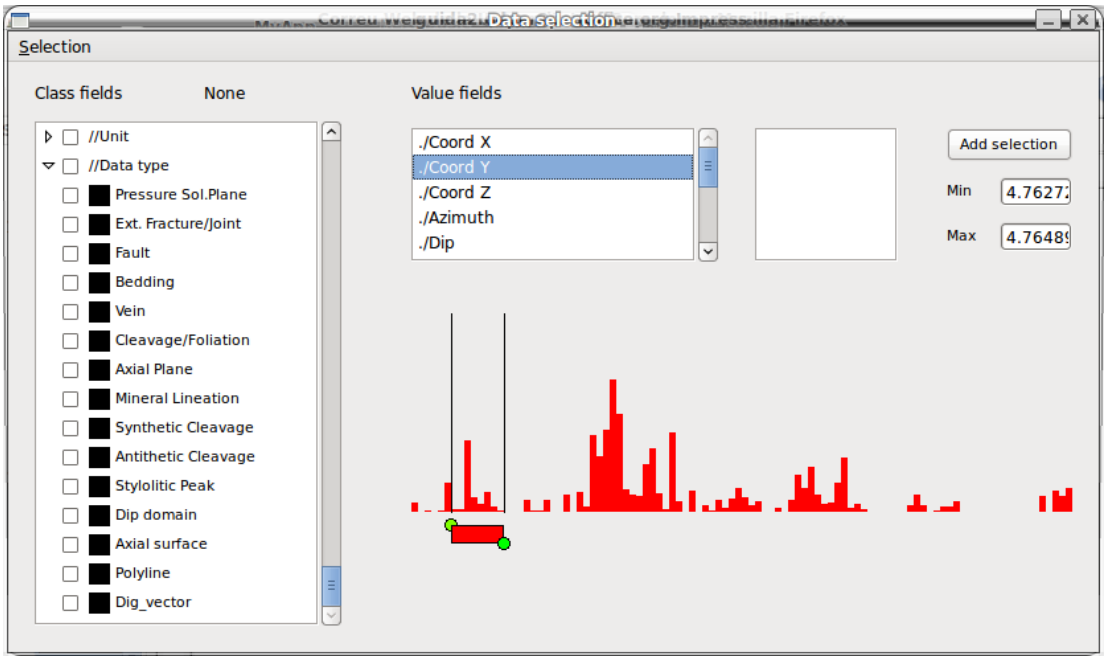
To open a previously saved file, from the main window of Open Plot select:
File → Open data file (*.stv file).
File → Open project (*.spj file).

SELECT DATA

Once data have been loaded, you can select a subdataset.

From the main window select:

Data → Selection. This window will open.



In the list-box on the left all the class fields are listed.

Clicking the closure/disclosure triangle near to the class field will show/hide all the Values of the class.

Click the check-box to select/deselect a given value. When, for a given Class Field, all the Values are unchecked, it implies that all the Values are automatically selected.

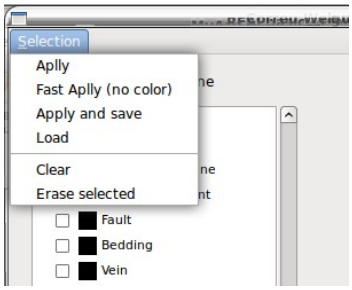
You can also assign a colour to a Value by clicking the Colour-box.

In the second list-box are listed all the Values fields. When clicking on a given Value field the corresponding histogram will be shown (red bars in the figure above).

To select a range move/resize the red rectangle below the histogram and click the “Add selection” button or manually define the range in the Min/Max edit-fields and click “Add selection”.

This allows to create multiple selections for one or more Value fields. Clicking on a given Value field will display all the associated selections ranges in the third list-box.

To remove a selection for a value field just select it in the third list-box and press “Canc” on the keyboard.



Once a Selection has been created, you can apply it.

Selection → Apply:

Applies the selection and the colour code. In this case it must be specified which Class field controls the colour code (click the check-box of the Class field).

Selection → Fast apply: Applies the selection without colour information.

Selection → Apply and save: Applies the selection and the colour code and save the selection.

Selection → Load: Loads and applies a saved selection.

Selection → Clear. Deactivates all the selections and restore the dataset to the original (all the data are selected).

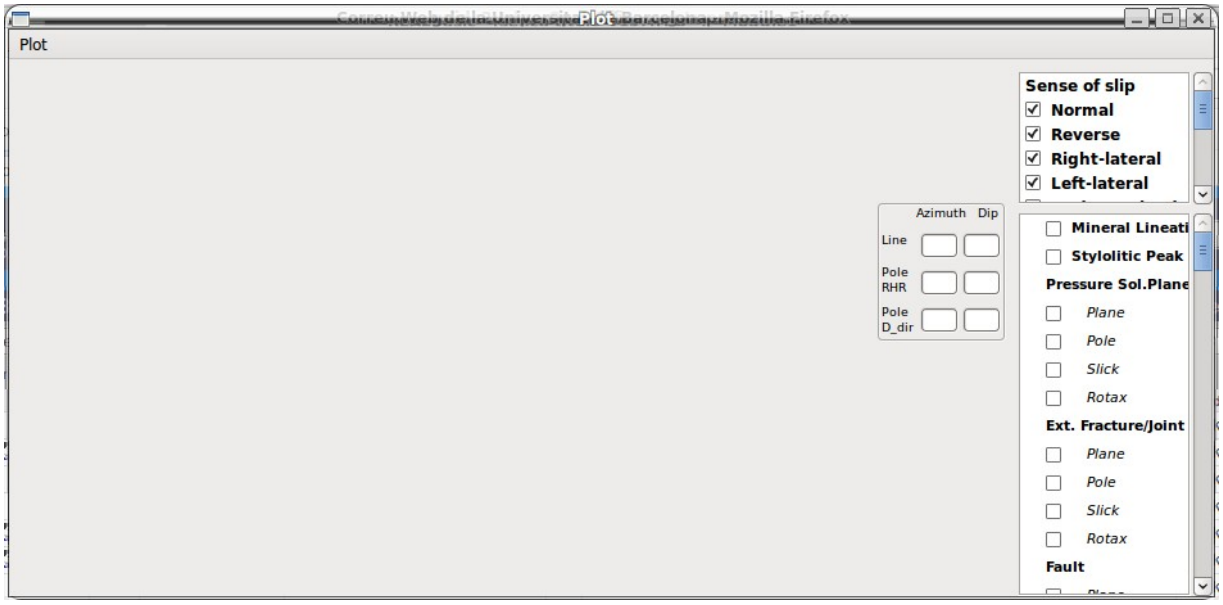
Selection → Erase: Erases the selected data.

PLOT DATA

Stereoplot

Select: Plot → Stereoplot

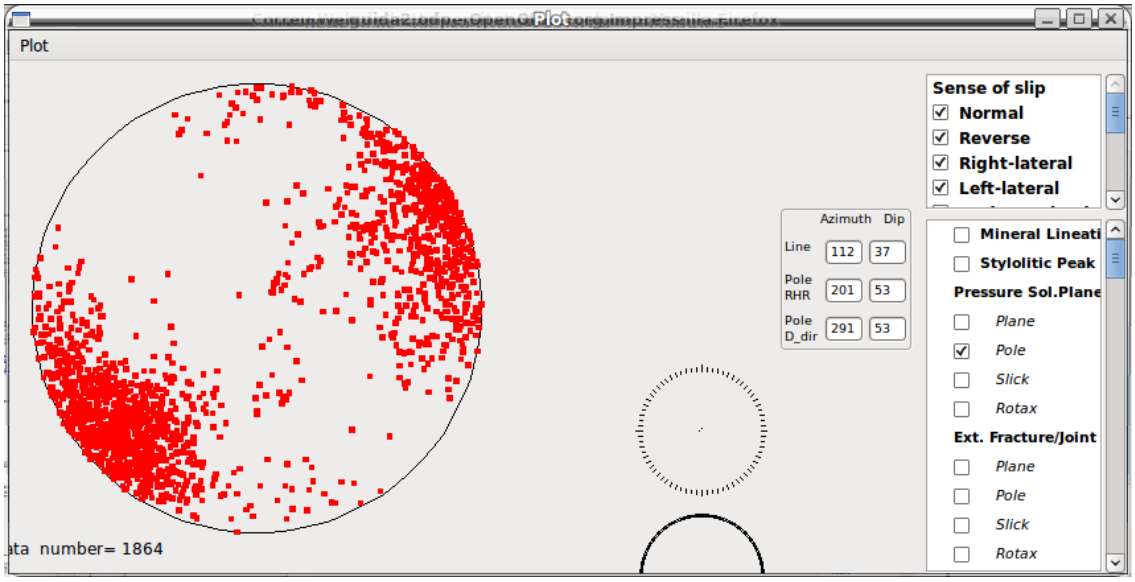
All the selected data are sent to this window.



In the two list-boxes on the right you can select data according to their type and sense of slip, and can specify which attribute will be plotted for each element.

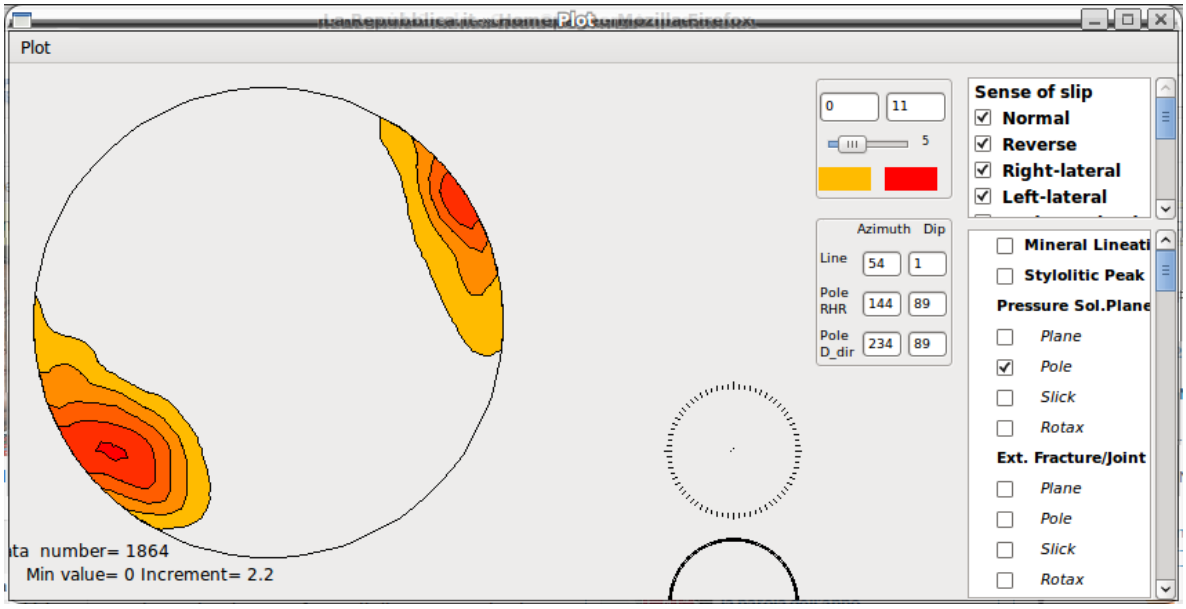
Plot → Stereoplot:

Plot data in stereographic equal-area projection.



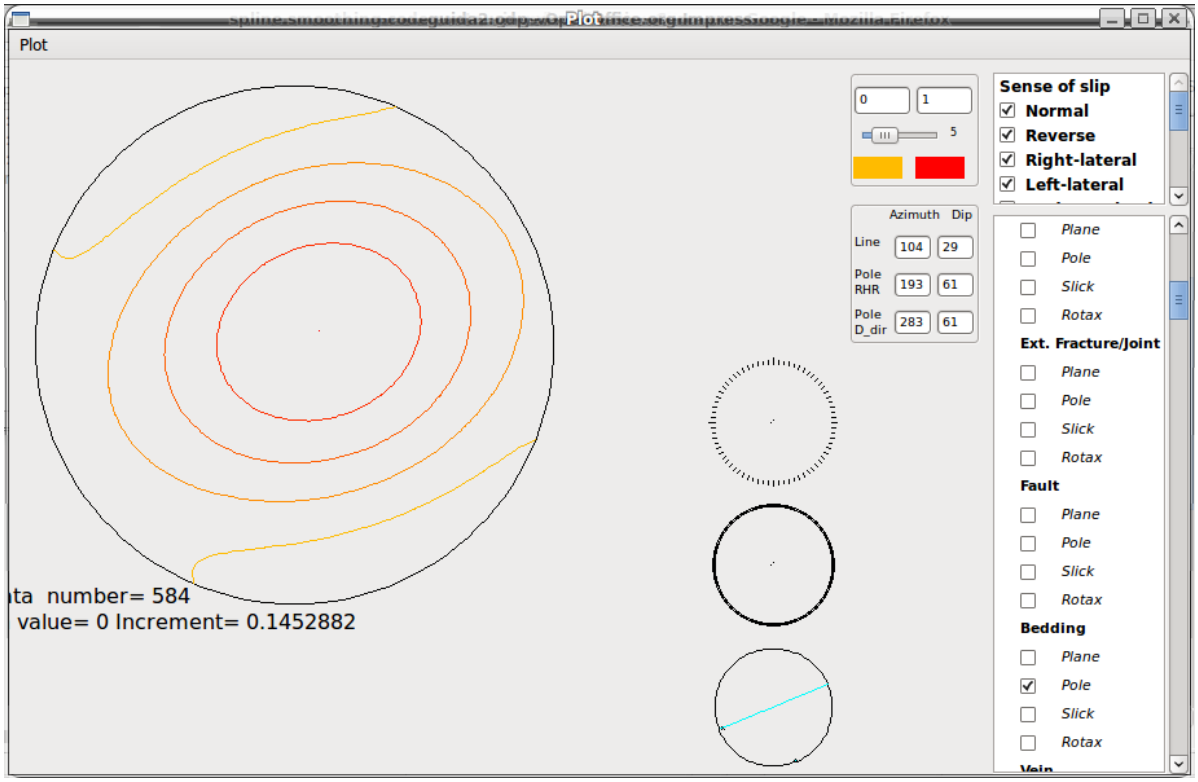
Plot → Contouring:

Plot data contour in stereographic equal-area projection. Data contour can be computed using classical Kalsbeek method (Plot → Contouring → Kalsbeek) or using a Gaussian data smoothing procedure (Plot → Contouring → Gaussian Smooth), which produces more “smoothed” contours.



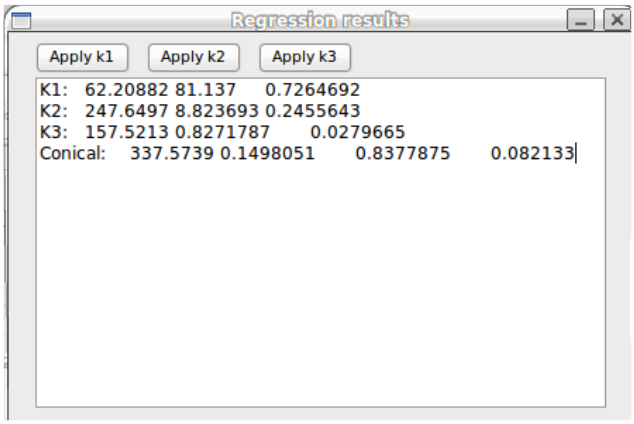
Plot → Data Regression:

Applies a tensorial analysis and a conical regression to the selected data.



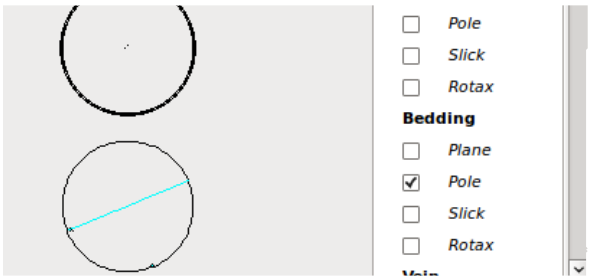
The Regression results are displayed in a new window. They include eigenvectors azimuth and dip and the corresponding eigenvalues, and cone axis azimuth, dip and conical angle.

The three buttons in this window allow to assign azimuth and dip of a given eigenvector to the selected dataset (notice that in this case selected data includes not only the plotted one, but all the selected data). The aim of this is discussed in the 3D section.

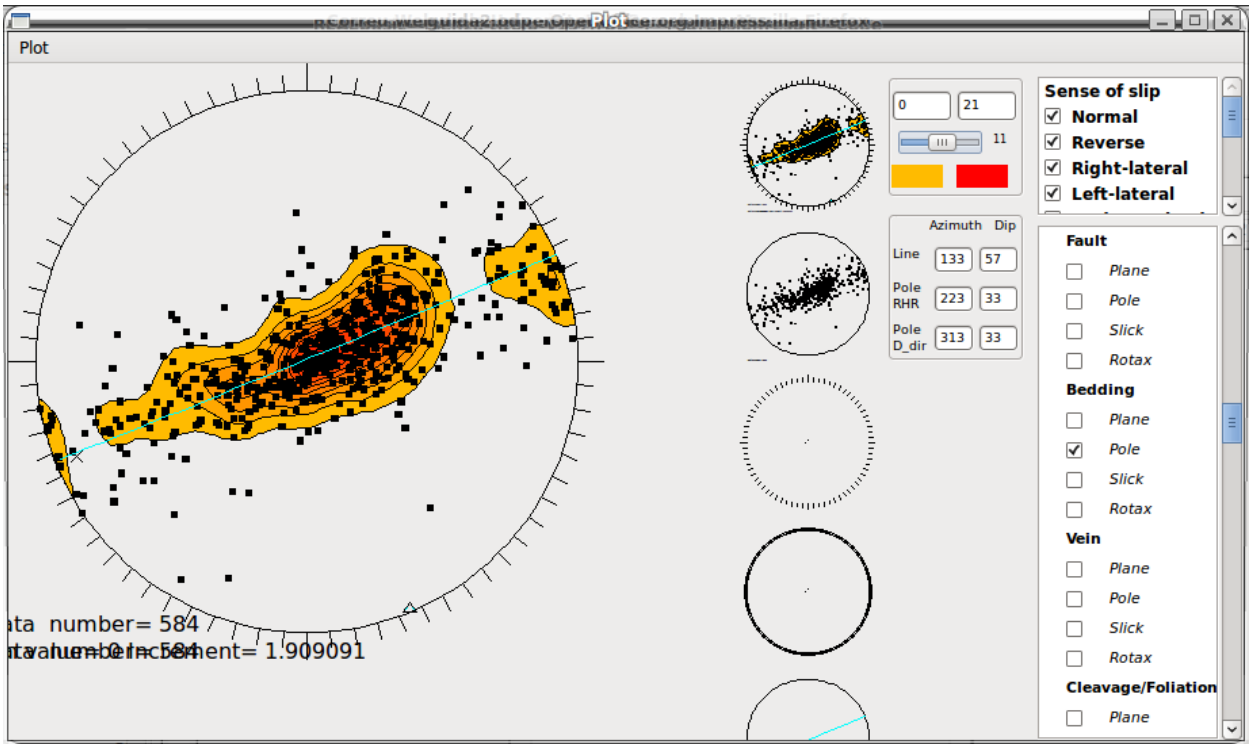


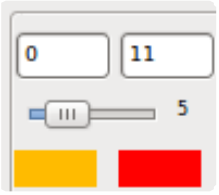
Stereoplots overlay:

Eigenvectors and conical regression are also displayed in a small stereoplot at the bottom of the window. To visualise it drag it in the main stereoplot.



The main stereoplot can also be stored in small stereoplots on the right side of the window. Stored stereoplot can be dragged in the main stereoplot. This allows to overly contourings, stereoplots and regressions, as in the example below.





In this portion of the window can be modified the colour code for contour fill, the minimum and maximum values and the number of intervals. Just modify the value and press “Enter” to redraw.

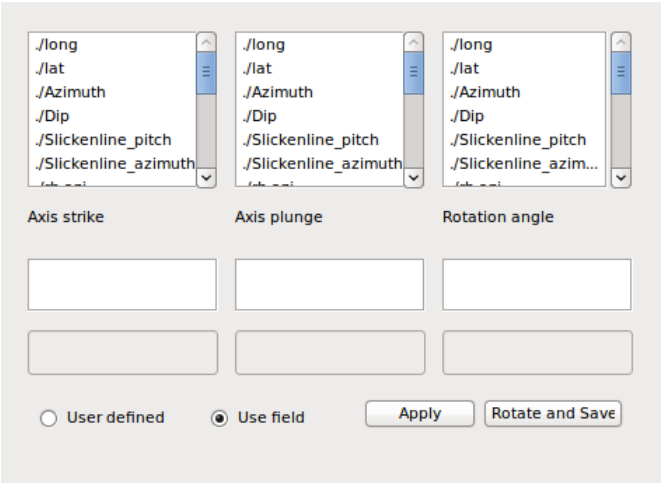
The size and stroke of many drawing features can be customised by modifying their values in the window that appears when clicking in the main window File → Drawing options.

Plot → Fill contours:

When this option is activated contours are filled.

Plot → Rotated data:

When this option is activated data are projected in their rotated orientation. A rotation axis must be defined. To achieve this, in the main window, select Rotate Data.



In the window that will open it must be defined the rotation axis.

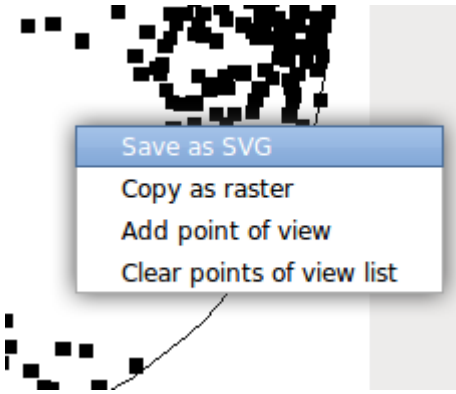
When “user defined” option is activated it must be specified the azimuth, the plunge and the rotation angle, which apply to the entire dataset.

When “use field” option is activated, double click in the three list-boxes to define which field, of each datum, will be used to define the rotation parameters. This option allows, for example, to rotate each datum according to its reference bedding. The strike of bedding is the rotation axis strike, the rotation axis plunge is 0 (leave the corresponding field empty), the bedding dip is the rotation angle. It is important to remark that to rotate data around a reference bedding, the reference bedding azimuth MUST be introduced as strike of the bedding, NOT as dip direction.

The rotation axis must be specified before plotting data (eventually close the Plot window, define rotation parameters and the click Plot → Stereoplot again).

Rotation parameters can be used to plot rotated data in the Plot window or to rotate data and save the rotated dataset.

A pop-up menu appears when right clicking within the stereonet, displaying 4 options.



Save as SVG: Save the main stereoplot in Scalar Vector Graphics format. This is a vectorial format that can be read by the most part of Windows and Linux softwares for vectorial graphic.

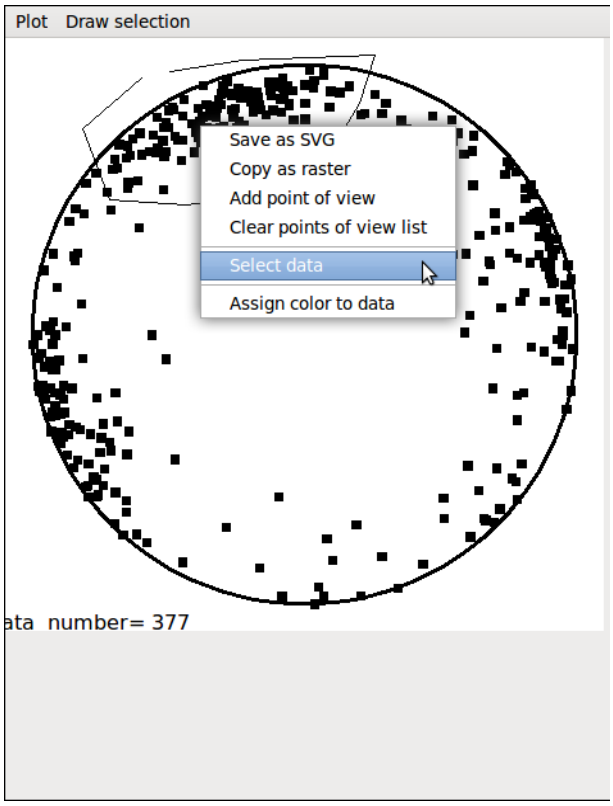
In order to save file as SVG, in the drawing options window (Main window → drawing Options) it must be checked the SVG writing option.

Copy as raster: Copies the main stereonet as a raster image in the clipboard, which can be pasted in drawing software.

Add point of view: Stores a direction (corresponding to the mouse position within the stereonet). The stored directions can be used in the 3D window and their purposes are discussed later. Notice that every time data regression is applied, the maximun and minimum eigenvectors directions are also stored.

Clear points of view list:

Removes all the stored directions.



In the stereoplot window can be also selected a sub-portion of the dataset. From the menu select: Draw selection → activate selection drawing. Draw a selection containing data you want to select and then right-click with the mouse.

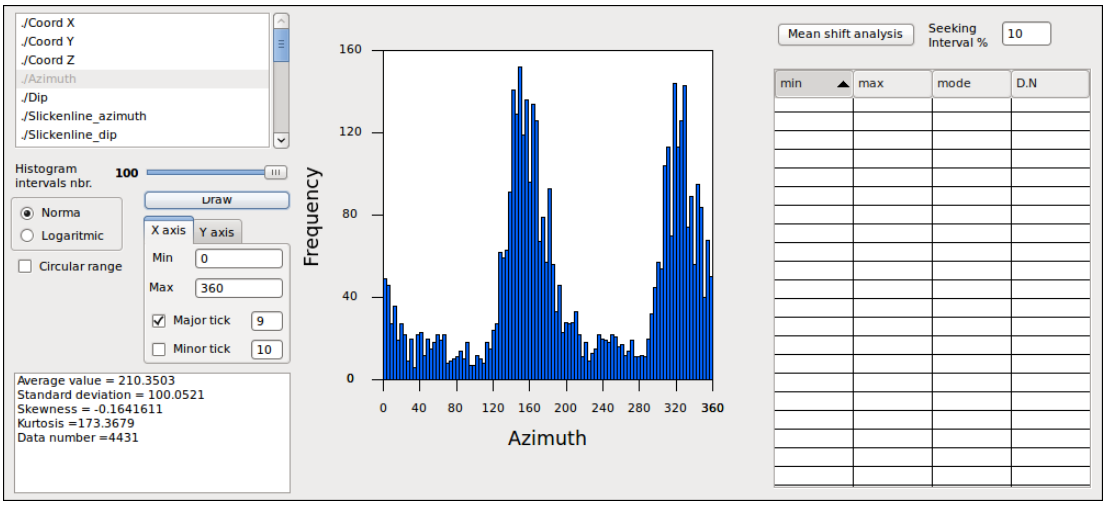
Two new options are displayed in the pop-up menu, which allow to assign a colour or select the data. Notice that to re-plot data you have to exit and then, from the main menu, re-select:

Plot → Stereoplot.

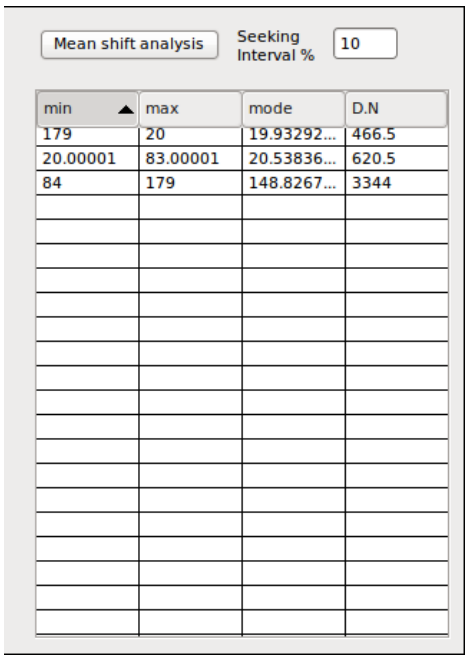
Frequency analysis

Select: Plot → Frequency analysis

All the selected data are sent to this window.



In the list-box on top-left are listed all the Value fields. Select a field and the corresponding histogram will be drawn. Statistical attributes will be listed on the lower-left border of the window. These include the average value, the standard deviation, the skewness, the kurtosis and data number. In the case of circular data are displayed only the circular mean, the circular standard deviation and the data number. You can specify X and Y limits, if the data are logarithmic or circular and, in this case, if you want to analyse the semi-circular range. The number of intervals can be set by moving the slide-bar. Data can be saved as SVG (mouse right click), provided “SVG writing” is allowed in the in the drawing options (Main window File – > Drawing Options).



The clustering of the population can be analysed with the mean shift analysis. Input parameter is the seeking interval (or smoothing radius), expressed as a percentage of the X-interval

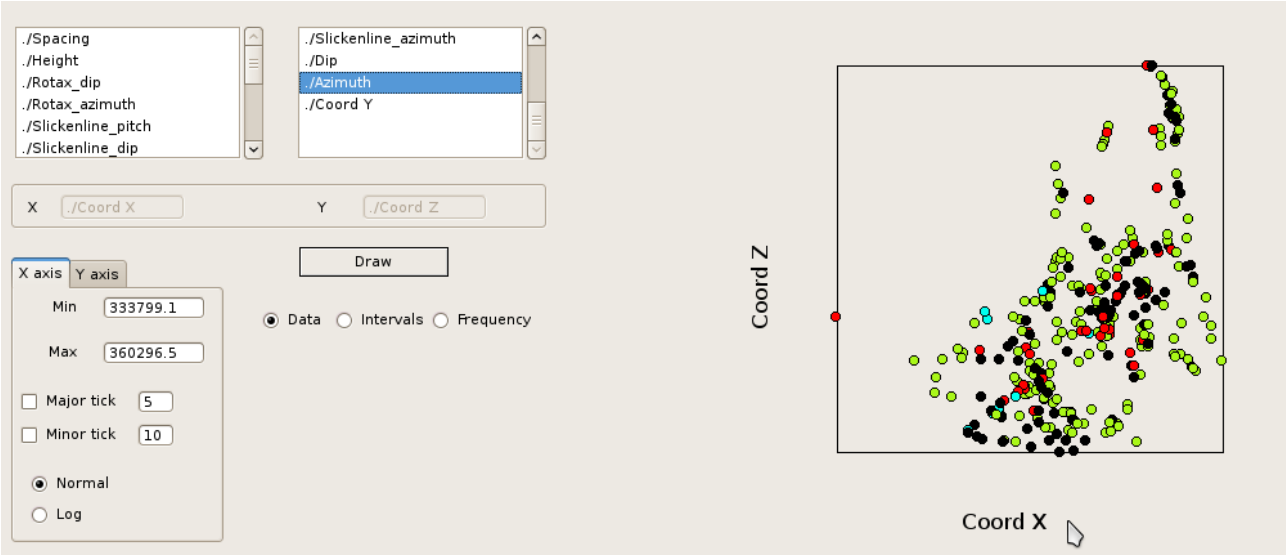
Results of mean shift analysis are listed in the list-box on the right side of the window and include, for each sub-population, the boundaries, the mode and the data number.

These can be copied by right-clicking the list-box.

Scatter plot

Select: Plot → 2D Scatterplot

All the selected data are sent to this window.

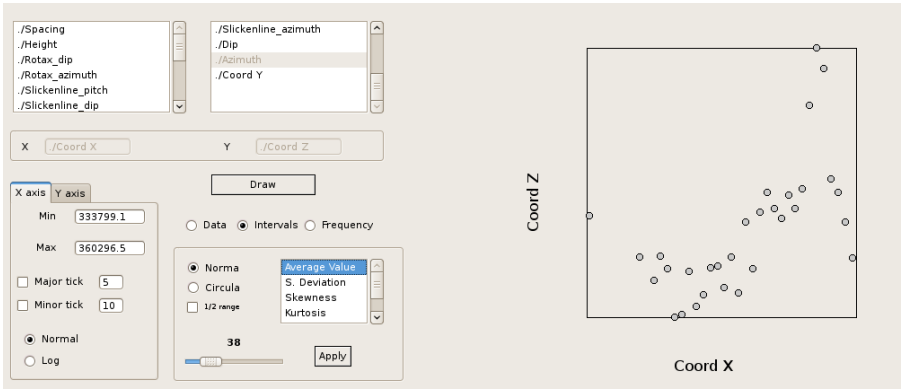


Select the X and Y axes from the list-boxes on top-left (double click the field) and a scatterplot will be drawn.

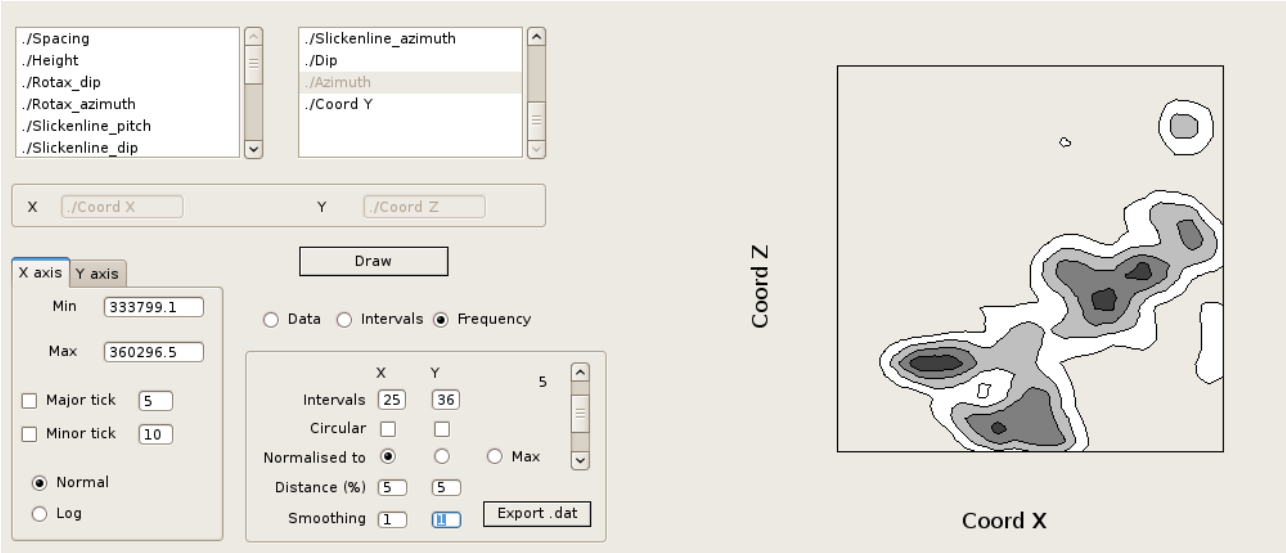
There are three options for plotting data.

- Data option: plots a scatterplot. The size of point can be customised in the Drawing options (Plot options tab: scatterplot circle width and stroke).

- Interval option: divides the X axis in a number of interval defined by the slide-bar value. Define if Y-values are normal or circular and then click “Apply”. For each X-interval are computed the average value, the standard deviation and, for non circular data, the skewness and the kurtosis of the Y field. Select the parameter to be plotted, eventually change the Y scale, and then click “draw”.



- Frequency option: draws frequency contours.

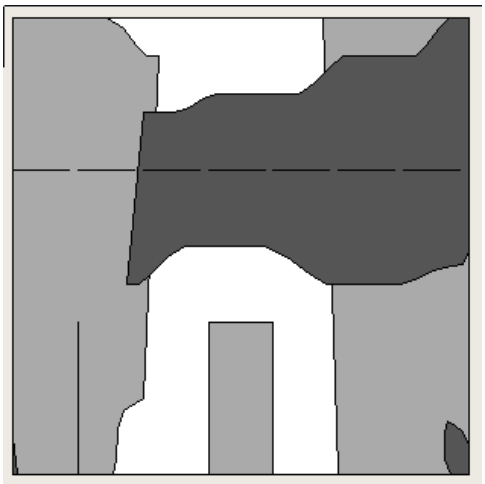


To draw contours you have to specify:

- The grid size (Y and X intervals).
- If Y and/or Y values are circular
- If data have to be normalised to the relative maximum in the corresponding X or Y interval or to the absolute maximum of the grid.
- The distance parameter, i.e. the distance between a datum and the cell's centre
- The smoothing (i.e.the number of nearest cells on which perform the smoothing)
- The number of contours

Once the contouring has been drawn, it can be also exported as *.dat file.

There is a still unresolved bug in the contour routine and, in rare cases, contours are incorrect (like in the example on the right). Just change the number of contours or slightly modify the Distance parameter (e.g. if distance is 4, set it to 4.001).



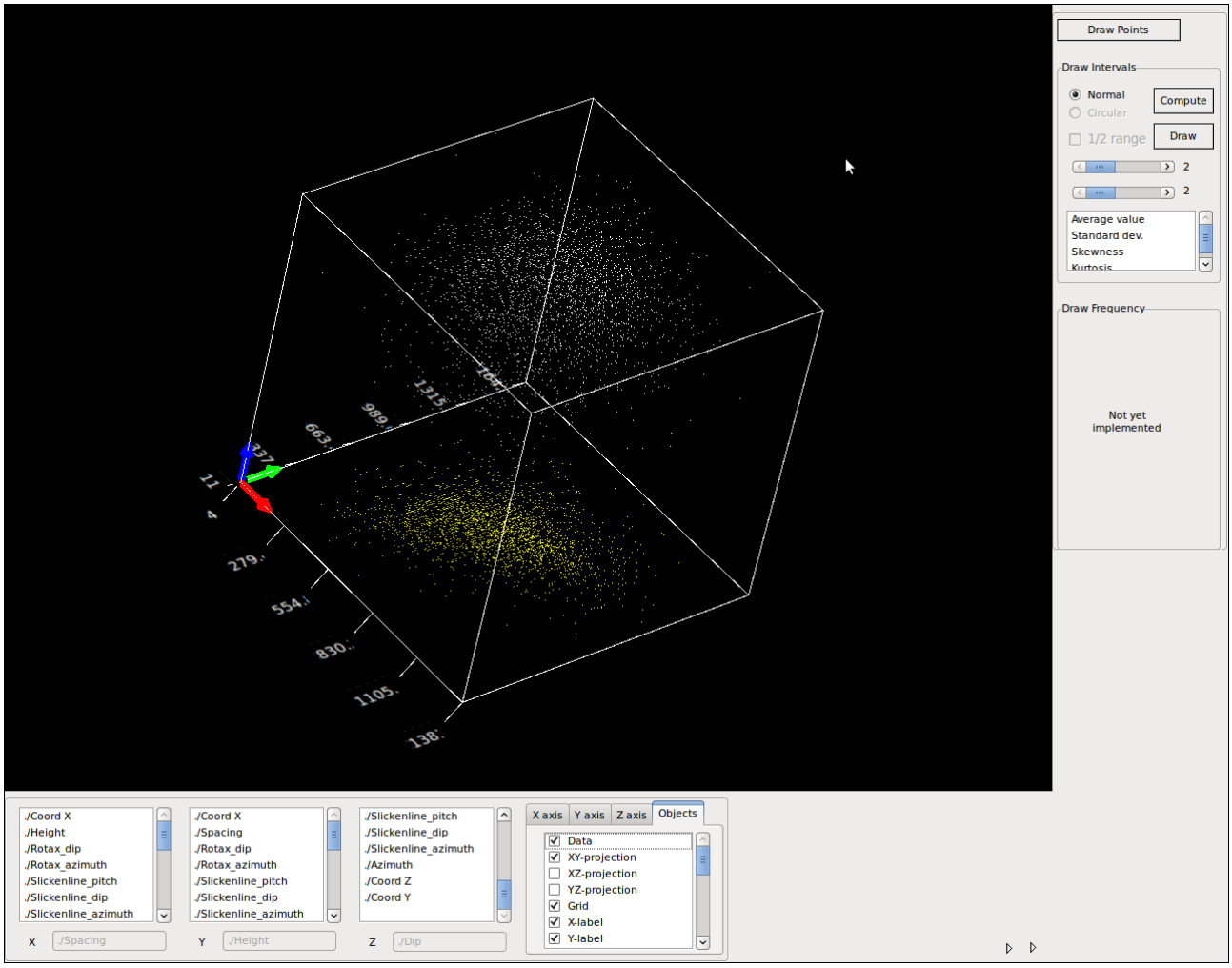
Right-click within the graph.

Copy to clipboard: copies the X and Y values of plotted data

Save as SVG: save the plot in *.svg format (if SVG writing is enabled).

Select: Plot → 3D Scatterplot

All the selected data are sent to this window.



The functionalities of the 3D Scatter plot are similar to those of the 2D, with the exception that in this version of Open Plot, many of them are not yet implemented.

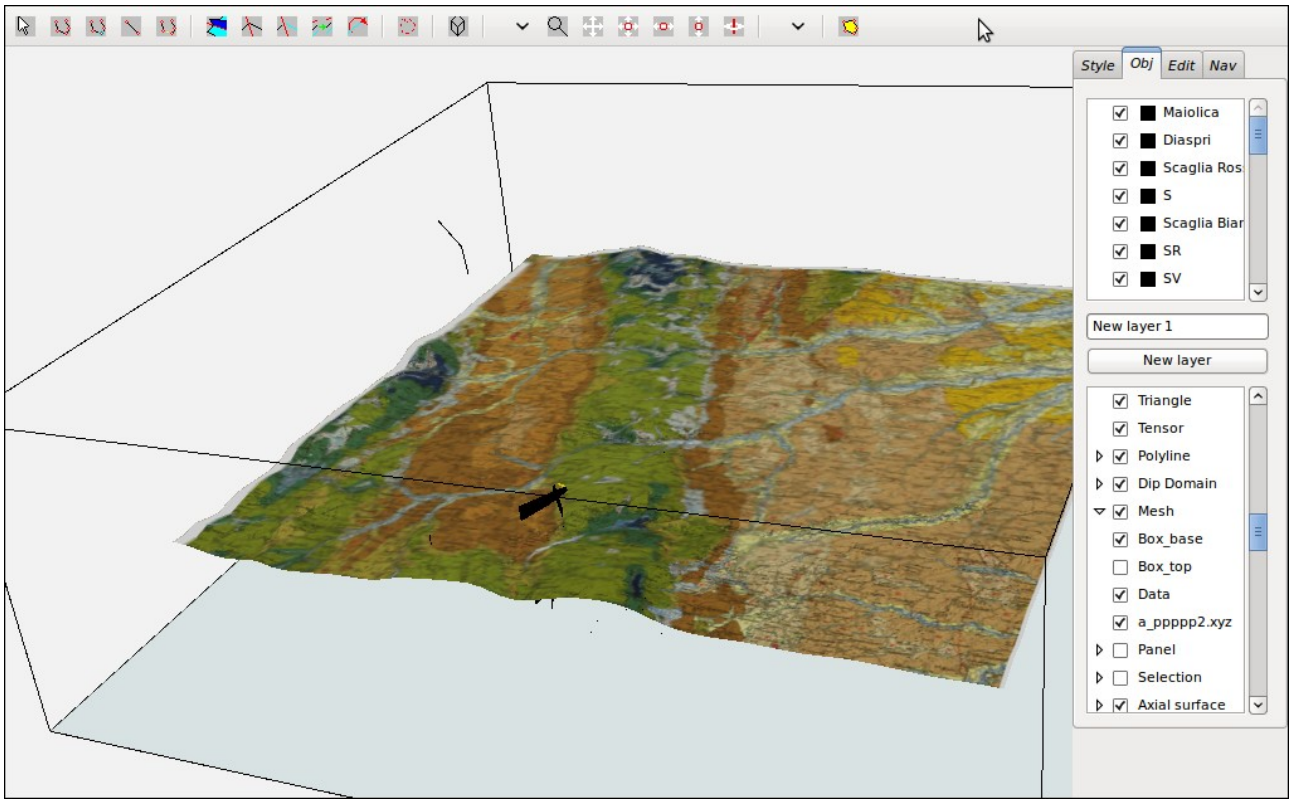
To zoom or rotate the plot hold pressed Shift + Ctrl (zoom) or Ctrl (rotate) and drag the mouse.

MANAGE DATA IN 3D

3D view window

From the main window select: Plot → 3D view

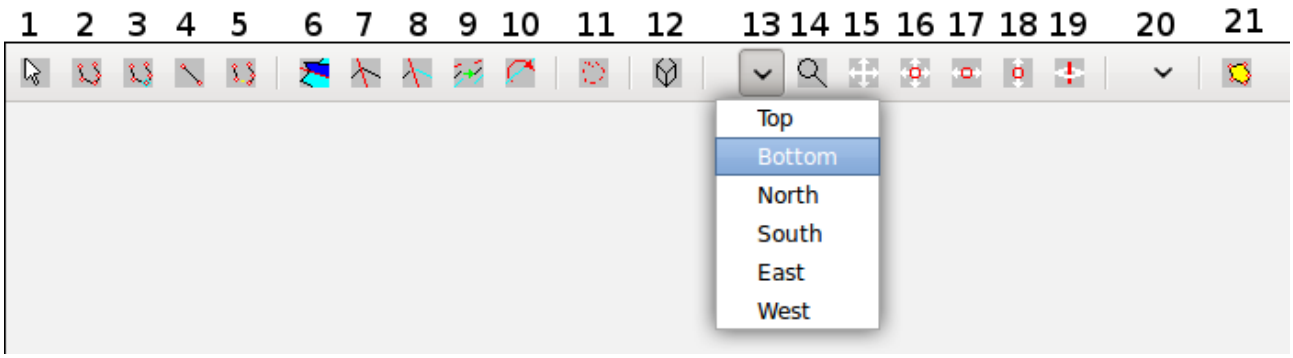
All the selected data will be displayed in the 3D space, provided coordinates information exist.



Navigation

Camera Position

The default view is from Top and can be changed by selecting different points of view from the drop-down menu in the 3D window (button N13).



Zoom

Press button 1 and then, holding Ctrl, Shift and the mouse left button, move the mouse up and down to zoom in and out. Alternatively, press button N 14 and, holding pressed the mouse left button, move the mouse up and down. In this second case, to deactivate zooming press button N 1.

Move camera

Press button 1 and then, holding Shift and the mouse left button, move the mouse. Alternatively, press button N 15 and, holding the mouse left button, move the mouse up and down. In this second case, to deactivate moving press button N 1.

Rotate camera around a point

1 – Rotate around a point in the centre of the scene. Press button 1 and then, holding “Ctrl” and the mouse left button, move the mouse. Alternatively, press button N 16 and, holding the mouse left button, move the mouse

2 – Rotate around a vertical axis lying in the centre of the scene. Press button N 17 and, holding the mouse left button, move the mouse left and right.

3 – Rotate around an horizontal axis lying in the centre of the scene. Press button N 18 and, holding the mouse left button, move the mouse up and down.

For options 1 to 3 the position of point/axis around which camera rotates can be moved forward/backward by holding the Ctrl button and moving the mouse wheel.

4 - Rotate around a point defined by the user. Press button N 19 and, holding the mouse left button, move the mouse. The point around which camera rotates is the point clicked by the user, which is repositioned in the centre of the scene. If the user clicks in the empty space, rotation is performed around the centre of the dataset.

3D Objects

Open Plot allows visualising and managing loaded data in 3D.

Other 3D objects can be loaded/created, including:

Dip domain: Polygon with nodes lying along the same plane

These elements can be created only within the software, can be saved in both *.stv and *.spj format and read back, and exported as 3D surface in *.DXF format.

Dip domains have associated azimuth and dip values and can be plotted in stereoplot.

Polyline

This element can be created within the software, can be saved in both *.stv and *.spj format and read back, can be exported in *.DXF format, imported from *.DXF file, imported from both clipboard and file. Azimuth and dip of polylines can be plotted in stereoplot in two ways:

MODE I: it is computed the azimuth and plunge of each segment.

MODE II: it is computed the azimuth and dip of the segment connecting a node with the centre of mass.

Panel: vertical polygon with nodes lying at two fixed elevations.

These elements can be created only within the software, can be saved in a *.stv and *.spj format and read back. Panels cannot be exported. Images can be draped on panel. Data can be projected along the panel.

Selection: closed panel.

These elements can be created only within the software, can be saved in a *.stv and *.spj format and read back. Selections cannot be exported. Selections allow to select data that are included within the selection.

Mesh:

These elements cannot be directly created within the software and can be saved only in *.spj format. Can be exported in *.DXF format and imported from different file types. Georeferenced images can be draped on meshs.

Image list:

A list of images with an assigned position. These elements can be created only within the software, can be saved in *.spj format and read back. They cannot be exported. To avoid file size increase, the loaded images are re-sampled and transformed in JPG format.

Map

Georeferenced images that can be draped on meshes. These can be saved only in *.spj format.

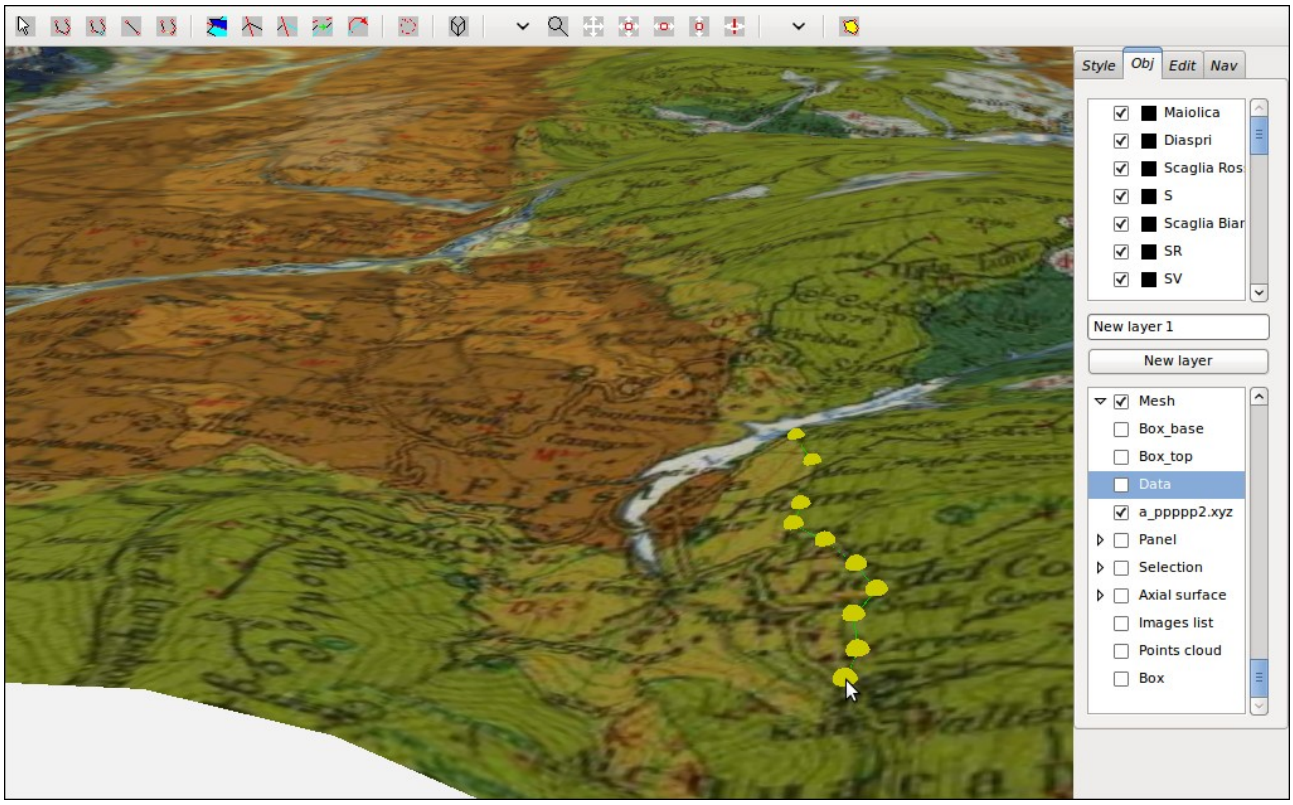
Texture

Images that can be draped on panels. These can be saved only in *.spj format.

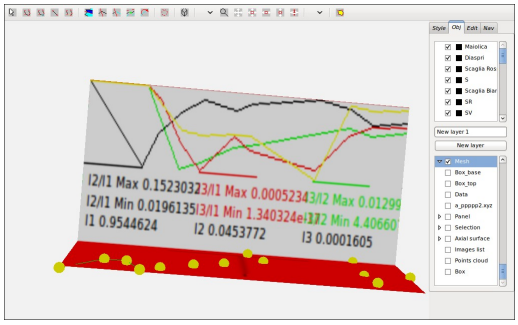
Draw, load and edit 3D object

Drawing objects using polyline tool

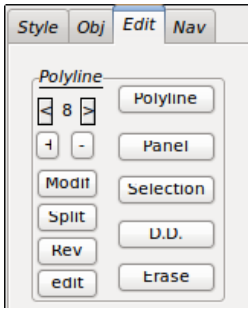
Press button 2 and click with the mouse left button on the non-empty space.



Press “Esc” to remove the last added point. A yellow sphere is drawn for each node. The size of this sphere is not scale-dependent and must be manually set in the drawing options → 3D options → points in 3D view.

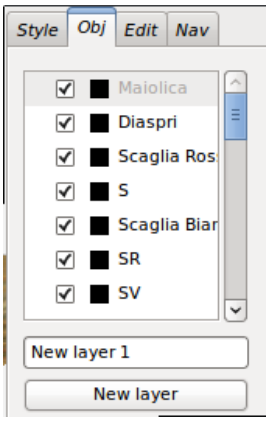


If, in the drawing options → 3D option, the dip domain from polyline option is activated (value = 1), while drawing a polyline the best-fit plane will be automatically drawn, including a white panel on which are plotted the quality of fit, for each point.



Once you have finished drawing the polyline, click on the edit tab.

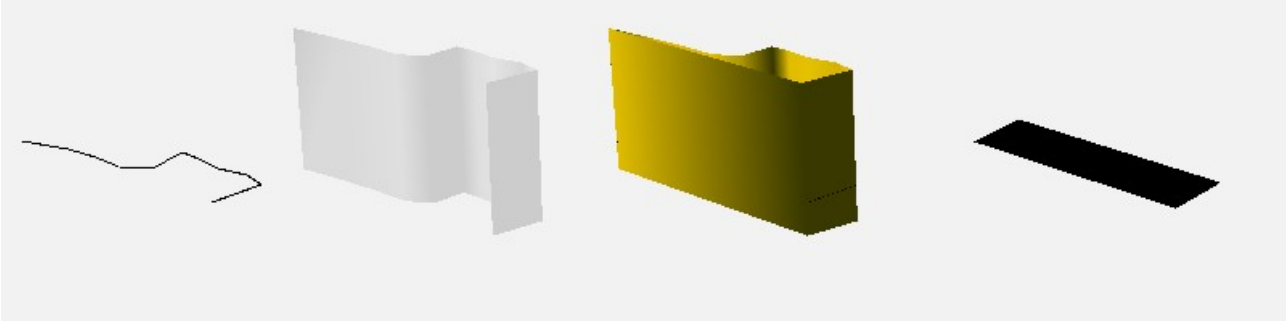
Press the “Polyline” button. The polyline will be added to the dataset. The Unit selected in the upper list-box of the Object panel will be assigned to the polyline.



Press the “Panel” button and a panel, passing trough the drawn nodes, will be created.

Press “Selection” button and a selection, passing trough the drawn nodes (the first and last ones will be linked), will be created.

Press D.D. Button and the best-fit Dip Domain will be created.



Panels, Dip domains and Selections can be created also from existing polylines. To do this press button N1, select the polyline, go to the edit panel, press button 3 and press Panel/Selection/D.D. Button.

Polyline

The procedure for drawing a polyline has been previously discussed.

Polyline can be imported from *.dxf files:

Main window → Objects → Import DXF

Polyline can be imported from a text file:

Main window → Objects → Import Polyline → Import from file

Polyline can be pasted from the Clipboard:

Main window → Objects → Import Polyline → Import from Clipboard

In the last two cases the file/copied data must be organised in three columns, without header, including the X, Y and Z coordinates of each node. In both cases it will be asked to specify the Unit of the imported polyline.

When a polyline is selected in the 3D view (press button N1 and then click on the polyline) and button N3 has been pressed, you can modify the polyline. Go to the edit tab

- Select a node using the small arrows buttons and reposition the point by clicking with the mouse left button on a non-empty position and then press the “modify” button.
- Select a node and split the polyline.
- Select and remove a node.
- Select a node and add a new node.
- Flip the node order.
- Clicking the edit button will show a list-box with the nodes coordinates. These can by copied (mouse right-click). New nodes can be pasted in this window (the old one will be overwritten).
- Erase the polyline

Dip Domain and Axial surface

Dip Domains can be created from polylines, added by using points of view defined in the stereoplot window, added by using the “Polyline to dip Domain analysis”.

The procedure for creating Dip domains from polylines has been previously discussed.

Creating a dip domain from a stored Point of View includes two steps:

1. Go in the stereoplot window and right-click with the mouse in the position corresponding to the pole of the desired plane (a plot must exist). From the pop-up menu select Add point of view. Notice also that each time a tensorial analysis is performed, the directions of eigenvectors associated with the maximum and minimum eigenvalues are stored.
2. In the 3D window right-click in the position where the dip domain must be created. If stored directions exists, in the pop-up menu select add Dip domain and select the value from the list of the stored directions.

The Unit of the new dip domain is that selected in the upper list-box of the Object panel.

Polyline to dip Domain analysis

Press button 11 and then select/deselect polyline/s. On the keyboard press Y to start the analysis on the nodes of the selected polylines.

The software will seek for the bigger dip domain satisfying the conditions defined in the drawing options/Planar regression. These includes:

- Maximum value of the minimum eigenvalue.
- Maximum value of the ratio between the maximum and medium eigenvalues.
- Minimum number of points
- Maximum distance of points from the centre of the dip domain.
- Minimum seeking radius. This parameter (expressed as %) set the tolerance to “empty” Dip Domain. In other words, avoids the creation of dip domain which include only points located far from the centre of the dip domain.

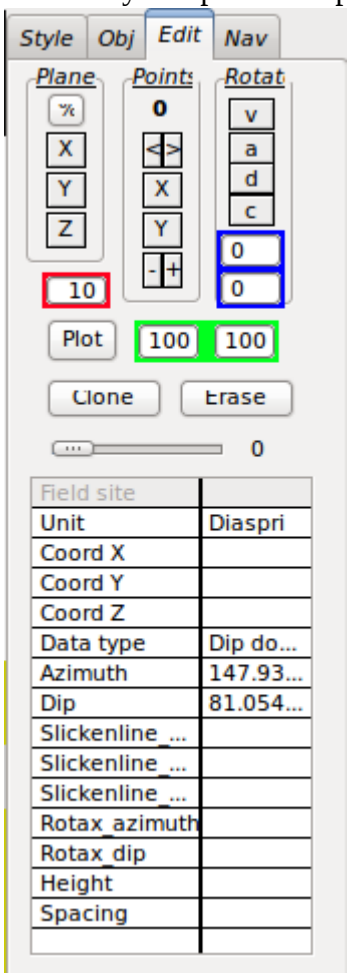
Once the bigger dip domain is found, nodes included in this domain are extracted from the dataset. This procedure is recursively applied until domains accomplishing for the setted conditions are found.

The Unit of the new dip domain is that selected in the upper list-box of the object panel.

Drawing options/Planar regression includes others three options

Dip Domain evaluation allows the visualization of regression results (significantly increases the computational speed). In particular this allows to plot, for each dip domain, data that project on the dip domain, with a distance from the domain defined by the Upper and Lower distances.

To modify a Dip Domain press button N1, select the dip domain and go to the edit panel.



In the lower portion of the tab are listed the attributes of the Dip Domain.

In the upper portion there are three group-boxes:

Plane:

%: Resizes the panel.

X, Y, Z: Move the the panel along its strike, dip direction, normal direction..

For these operation the % and the amount of displacement are defined in the red box.

Points:

< and >: Select a node of the Dip Dpmain.

X and Y: displace the node along the domain strike and dip direction.

- and +:add and remove a node

Rotate:

Rotate the plane (the angle is defied in the red box) around the vertical axis (V); the strike direction (A), dip direction (D) and around a user defined direction (C) (in this case azimuth and plunge must be introduced in the blue boxes).

In the central portion of the tab the “plot” button draws a stereoplot including all the selected data that project on the dip domain, whose distance from the domain is lower that that introduced in the green boxes.

Clone and Erase buttons clone and erase the selected dip domain.

The slide-bar set the transparency of the dip domain. This option, which increases memory usage, properly works only on Windows O.S.

Axial surfaces are a particular class of dip domain, whose functionality is discussed later.

Panels

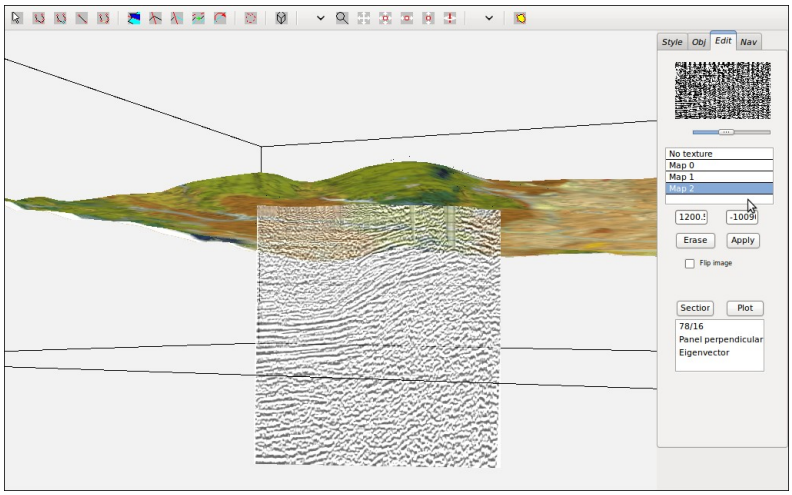
The procedure for creating a panel from polyline has been previously discussed.

Similarly to polylines, panels can be imported from both text file and clipboard:

Main window → Objects → Import Panel → Import from file/Import from Clipboard

When a new panel is created, the Upper and lower Z coordinates of the panel are automatically defined and correspond to the upper and lower Z coordinates of the dataset.

To edit or perform operations press button N 1 and then select the panel.



In the upper part of the tab are listed the textures that can be applied to the panel. The first option is “No texture”. Select it and press Apply button. A simple colour will be applied.

In the same list box are listed all the loaded textures, select the desired one and click apply. Slide-bar allows to set texture transparency.

Notice that when a file is saved in *.stv format, images are not saved. Images (including textures) are saved only in *.spj format. In this case the association between the panel and the texture is saved too.

To change the upper and lower Z coordinates of the panel use the boxes below the upper list-box

To erase a panel click the Erase button.

Section button project data onto the panel, in particular a new picture is created (you will be also asked to save it as *.svg file), where elements apparent dip and plotted.

Plot button projects data onto the panel. Data are send to the scatterplot window, adding along-panel X and Z coordinates.

For both section and plot, projection direction must be defined. The default is perpendicular to panel, directions stored in the point of view list can be used (in this case the projection direction is the same for each datum). A third option is to project data using a saved eigenvector direction (See stereoplot section). In this case, in fact, different data can have associated different eigenvectors.

Selections

The procedure for creating a selection from polyline has been previously discussed.

To edit or perform operations press button N 1 and then select the selection.

In the Edit tab you can erase the selection or apply it. In the second case, all the data having X and Y coordinated within the selection will be selected.

Selections can be saved in both *.stv and *. spj format.

Meshes

Triangular meshes can only be imported. These element can be loaded as both “active” (Main window – > import mesh + triangles) and “inactive” (Main window – > import mesh or imported *.DXF files).

For active meshes each triangle will be loaded and can be edited/selected/plotted/erased. Active meshes are saved in both *.stv and *.spj format.

Inactive meshes are not editable and can be saved only in *.spj format.

In the 3D window, press button N1, select the mesh. In the list-box of the edit tab, you can apply a colour code defined by the Z coordinate or drape a georeferenced image on the mesh.

The association between the mesh and the georeferenced images is saved only in *.spj format.

Image list

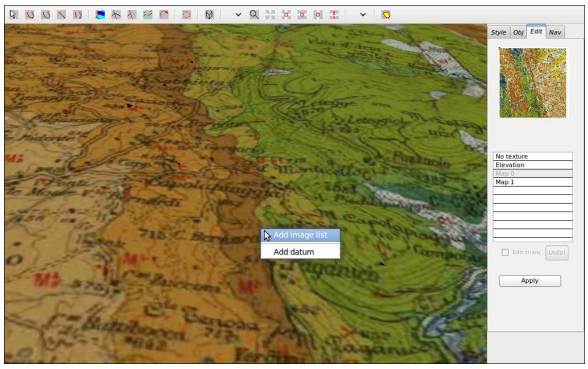


Photo can be loaded and then saved in *.spj format. Right click, in the 3D view window, at the desired location.

Insert and erase images and draw on them.

Map

Maps are georeferenced images that can be draped on both meshes and top_box and bottom_box . To load a map in the main window select:objects → load map.

In the window that will open up load the map and georeference it (for JPG files with associated *.jgv file, coordinates are automatically loaded).

Texture

Textures are non georeferenced images that can be draped on panels. To load a map in the main window select:objects → load texture.

In the window that will open up right-click on the list-box and load an the image.

Maps, textures and inactive meshes can be erased by selecting, in the main window: Object → erase objects

Additional functionalities of the 3D view window includes:

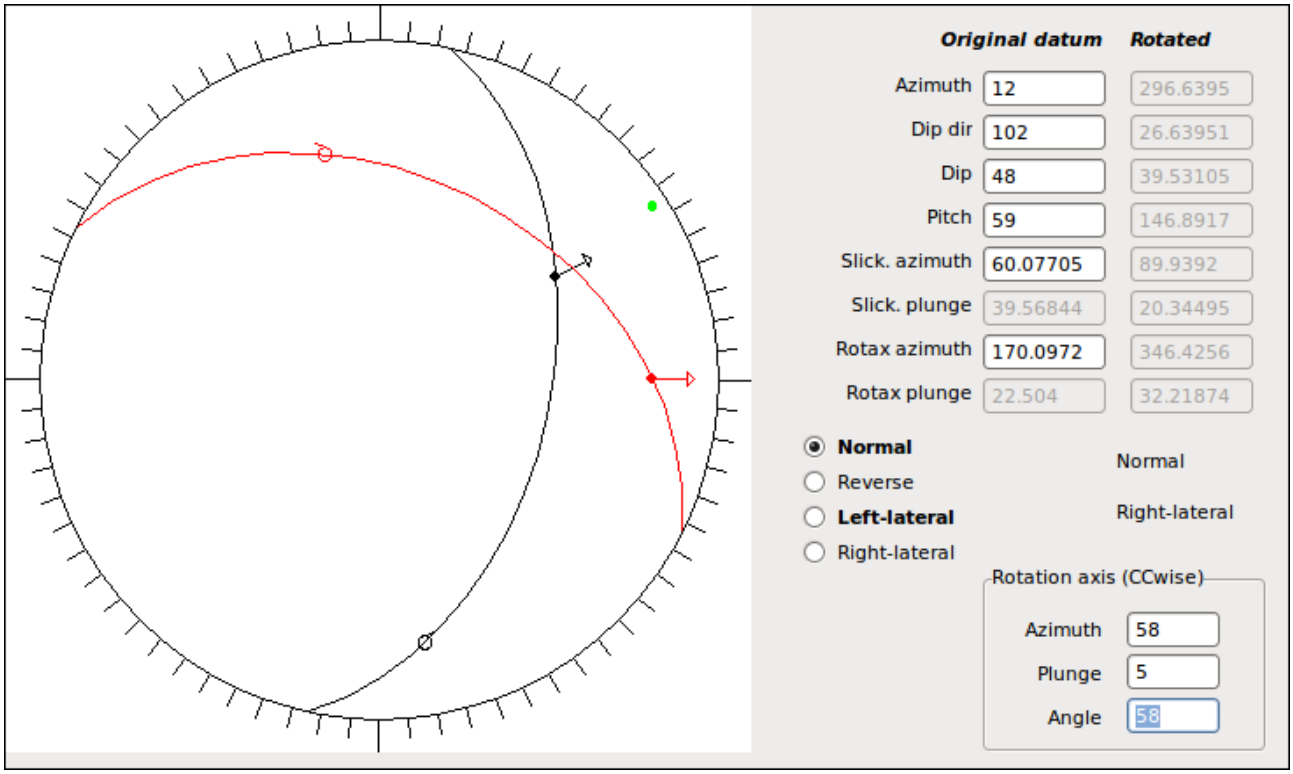
- Draw vectors: click button N 4 and then click on the positions corresponding to the starting and ending points of the vector.
- Join two polylines: click button N5, select two polylines and press Y.
- Divide a dip domain: click button N6, select two dip domains (or one dip domain and an axial surface) and press Y. If these domains intersect the first one will be divided in two parts along the intersection with the second domain.
- Create axial surfaces: click button N7, select two dip domains and then press Y. Two axial surfaces bisecting the dip domains pair will be created.
- Reflect planes: click button N8, select dip domains and one axial surface. The selected planes will be reflected (the original are not erased) according to the axial surface.
- Move planes: click button N9, select dip domains and, holding the tab key, move the planes.
- Rotate planes: click button N10, select dip domains and axial surfaces. Holding Ctrl key, click on a point in the non empty space and move the mouse holding pressed the left button, the planes will rotate around that point.
- Re-define the data boundary: click button N12.
- Define a temporary selection: click button N21 and draw a polygon. Right-click with the mouse and select one of the following options.
    - Send to stereoplot: Send data within the polygon to the stereoplot window
    - Send to Frequency analysis: Send data within the polygon to the frequency analysis window
    - Select: Select data within the polygon and re-plot the 3D view.
    - Assign colour: Define a colour for data within the selection.

UTILITIES

These are small utilities that do not require data loading.

Elements rotation

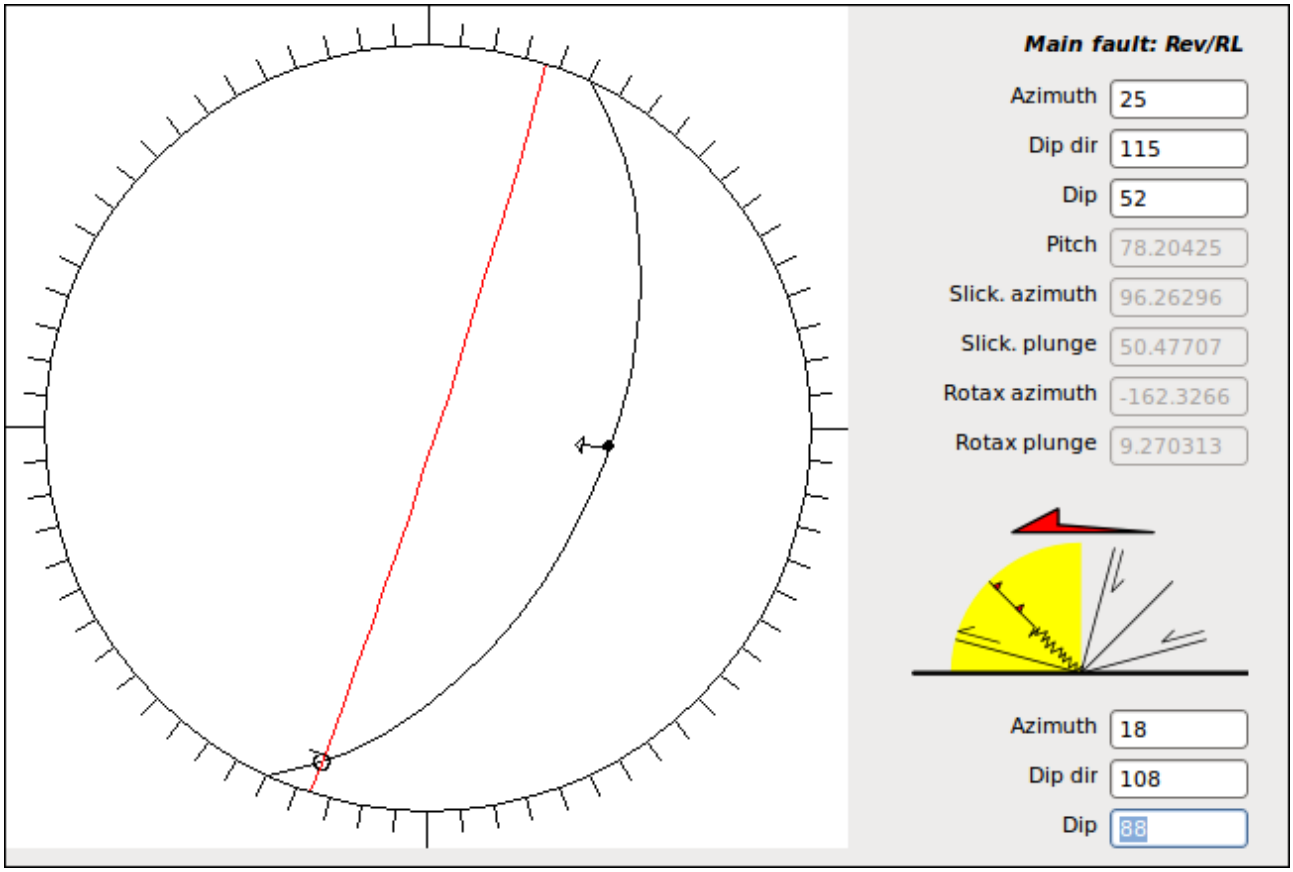
From the main menu select: Utilities → Element rotation



Insert fault data. Fault pitch is computed from slikenlines azimuth and vice-versa. If a rotation axis is provided, rotated fault data (including the sense of slip) are computed.

Slickenlines from Riedel elements

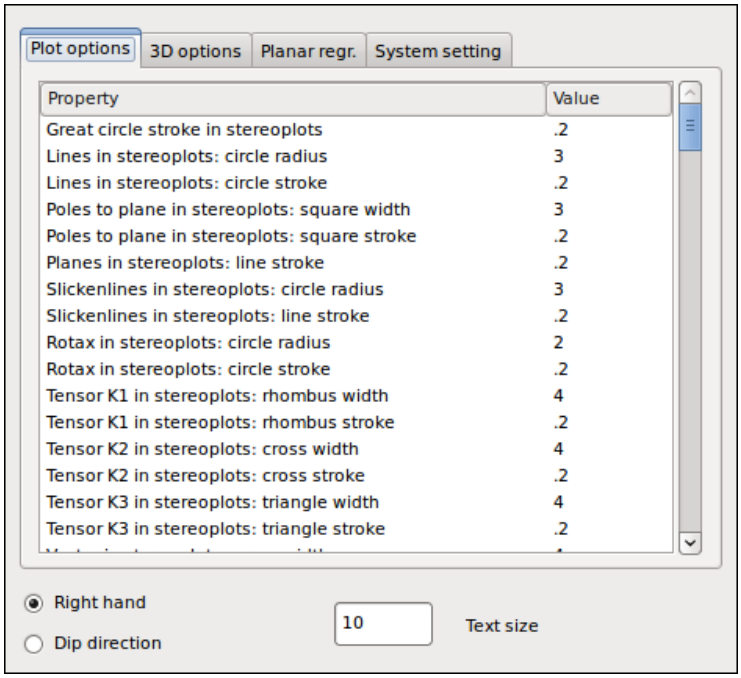
From the main menu select: Utilities → Slickenlines from Riedel elements.



Insert fault and fault-related element attitudes, select the Riedel's element type, and both fault's slip direction and sense will be computed.

DRAWING OPTIONS

In the main window select: File → drawing options.



In this window can be set drawing parameters and other options.

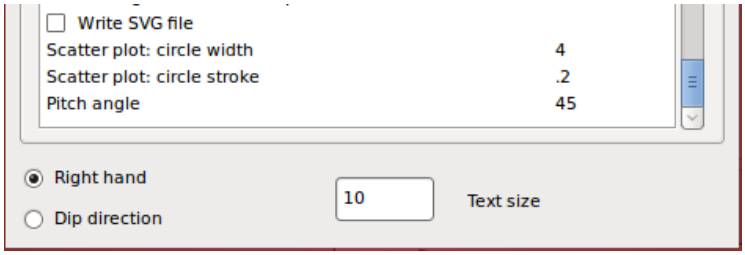
The window is organised in four tab: Plot options, 3D options; Planar regression, System setting

On the bottom, right-hand/dip direction option-button define if, when a datum is selected in the 3D window, its azimuth is displayed as RH or dip-direction.

Text size allows to set the size of text in all the controls of the software. The text size is set each time a window is open. Accordingly, to make effective the change the windows must be re-loaded.

In the Plot options tab, the size and line-stroke of symbols used in the stereoplot window can be modified.

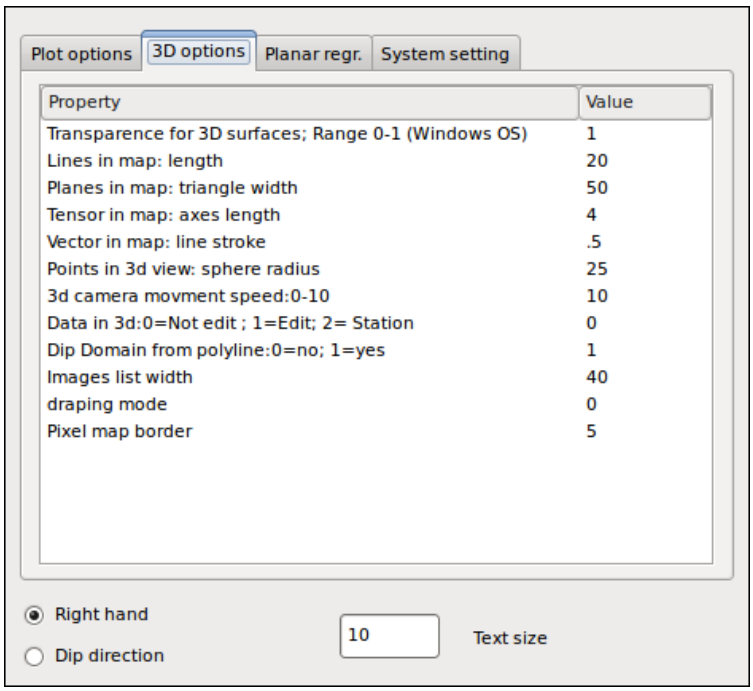
In this tab, the last four options are:



Write SVG file. When active each time a plot is drawn a svg file is stored, which can be eventually saved. This option is memory-consuming when a lot of data are plotted (as an example > 1000 planes in stereoplot). Deactivate this option if you wish to increase the computational speed and do not wish to save the plot.

Scatterplot circle width and stroke. Set the dimentions of circle used in 2D scatterplot.

Pitch angle. Define the boundaries (i.e. pitch angle; 180-pitch angle) between dip-slip and strike slip kinematic when data are rotated and fault kinematics is recomputed. As an example, if the pitch angle is set to 35, when rotating a fault if the “rotated” pitch of the fault is <35 or > 145, the kinematics will be right-lateral/left lateral.



In the 3D options tab can set options for used in the 3D view window.

Transparency for 3D surface set the initial transparency of dip domains (this option is, however, depreciated and will be soon erased).

Points, lines, planes and tensor dimensions set the size of these objects in the 3D window.

3D camera speed set the rotation/shift/zoom speed.

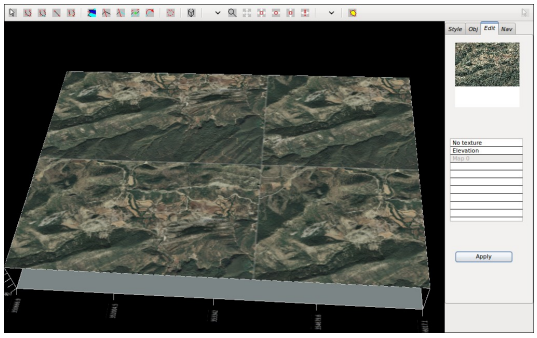
Data in 3D has three options:

(0=no edit) data are visualised but are not editable, the entire dataset is treated as a mesh (named data) and, in the 3D view window, can be shown/hide by clicking it in the Objects tab; (1= Edit) data are visualised and are editable, information associated with each datum is displayed in the edit tab (this option reduce the rendering speed); (2=station) data are visualised as a sphere (its radius is defined by the option points in 3d view), whose location is that of the field site.

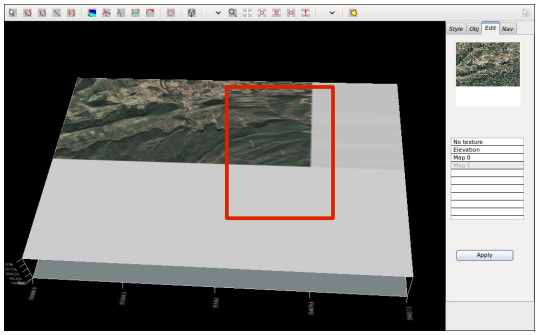
Dip domain from polyline. If this value is set = 1, while drawing a polyline in the 3D view the best-fit plane will be automatically drawn, including a white panel on which are plotted the quality of fit, for each point.

Images list width. Set the size of the rhombus used to display the position of the images list.

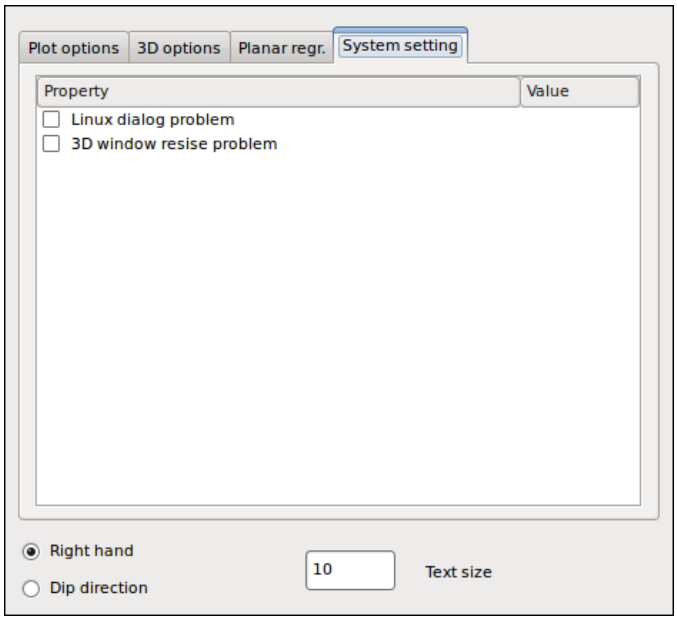
Draping mode and pixel map border. Each time a map is loaded, a border is added, whose size is defined by the pixel map border. This is used to avoid a problem that exists when an image is draped on a mesh which is greater than the map, and that results in the repetition of the image on the mesh. By enlarging the pixel map border and setting the draping mode = 1 this repetition should be avoided.



However, draping mode = 1 is still under development and when this option is activated the result should be carefully evaluated, to avoid “errors” like in the picture to the right.



The planar regression tab includes parameters used in the Polyline to dip Domain analysis.



Finally, in the system setting tab two options are present. These relate with two problems encountered in linux and windows O.S, respectively.

Linux dialog problem activate an alternative open/save file window if the “normal” window takes long times to activate (problem encountered in Ubuntu version lower than 9.04).

3D window resize problem relate to a problem that may occur when resizing the 3D view window. The draw is not correctly resized. The activation of this option should solve the problem. This, however, increases the rendering time (only when the window is resized/maximised).

STV AND SPJ FILES FORMAT

stv format

When data are correctly loaded, these can be saved in *.stv format.

It is a text file including strings.

The first line is used to check if the file is really an stv file, and includes the string "tav_ro_ba". If data position is in polar coordinates, the first line is "tav_ro_ba#sphere radius", where shere radius is the radius of the sphere (e.g. 6.372795e+6).

The second and third lines include the number of rows and columns of the dataset, respectively. The data matrix indexes are 0 based, so that the number of rows and columns is, actually, rows+1 and columns+1.

In each row the data are divide by the "tab" character [chr(9)].

The first row includes the columns header. The header (i.e. the field) includes at the beginning two reserved characters: "**./**" or "**//**", indicating that the column includes numeric and alphanumeric characters, respectively.

Columns number is that of "visible" fields (i.e. those imported) + 10 "reserved" columns.

The first reserved column includes the colour of the element, expressed as "**&RRGGBB**", where RR is the RGB value of Red in hexadecimal, GG is the value Green in hexadecimal, and BB is the value of Blue in hexadecimal.

The second reserved column is filled only for Dip Domain and Axial Surfaces. It contains three versors, corresponding to the strike, dip direction and normal of the plane. These are stored in the form of a string S, being S ="s1.x#s1.y#s1.z/s2.x#s2.y#s2.z/s3.x#s3.y#s3.z. To get this datum, past the string in a spreadsheet and then apply "text to columns" function twice. The first time use "/" as separator, the second use "#".

The third reserved column is, again, filled only for Dip Domains and Axial surfaces. It includes triangulation parameters. Triangles are written as:
"t1.p1#t1.p2#t1.p2/t2.p1#t2.p2#t2.p3/...../tn.p1#tn.p2#tn.p3

The fourth and fifth reserved columns "store" strike and plunge of directions eventually applied during regression analysis.

The sixth reserved column is filled only for dip domains, axial surfaces, polylines, panels and selections. It includes the array of points of these elements, written in the same way of dip domain versors (i.e. x1#y1#z1/x2#y2#z2/.....xn#yn#zn

The seventh and eighth reserved columns are used to select/deselect data.

For a deselected datum the field value is =”**deselecionado&deselezionato**”

For a selected datum the field value is =”**selecionado&selezionato**”

The ninth reserved column is, again, filled only for dip domains. It includes the transparency value (ranging between 0 and 1) that will be applied in the 3D view.

The tenth reserved column indicate the element type

Line is “linea”

Plane is “Piano”

Vector is “vettore”

Tensor is “tensore”

Triangle is “triangolo”

Polyline is “polyline”

Selection is “selection”

Panel is “panel”

Dip domain is “DD”

Axial surface is “AS”

Point is “punto”

These declarations, when read by the software, are case-sensitive and shouldn't be manually modified. Also because when an unknown element is found, software crashing could occur. The most part of these declaration are not in English language to discourage the direct typing in this column.

Once an stv file have been imported in a spreadsheet, data/fields can be modified,erased or added, the entire dataset can be copied (remember to include the “tav_ro_ba” header) and pasted in the software, that will recognise the format and will not ask you to pass through the import procedure.

It is important to remark that:

- If you are adding a column, remember that the column header must be specified, including the “./” and “//” characters. As an example, if you wish to add a column which includes the ratio between fracture spacing and height, add the column, add the values and then, in the row including columns header, add “./SdivH”
- If you are adding a datum, remember to fill the tenth reserved column (i.e. element type)
- In all the cases, when the number of rows or columns have been changed, the second and third lines (including rows and columns numbers) must be updated. These number are 0-based and accordingly, correspond to the number of columns-1, and to the number of row-1 (including the header row).
- Always check the spreadsheet cells format. As an example, if a numeric column is formatted in the spreadsheet as “Date”, when the dataset is pasted back in the software an error will occur.

data, simple and complex 3D objects can be saved in spj format. The structure of the file is, in its first part, identical to that of a stv file. In the second part are written meshes and images. The last ones are written in binary format and, accordingly, spj files cannot be easily read.

After the header, the number of rows and columns of data, and the data, are written meshes and images (maps and textures).

Once a spj file has been loaded, included data can be saved as stv file. On the other hand, as new stv file can be loaded, without affecting the meshes and images, that will continue to be present.

UNDER DEVELOPMENT

There are many functionalities not yet fully implemented in this first release of Open Plot project and many bugs are not yet fully resolved. These are listed below, sorted by importance.

- Exported DXF files are not yet “recognised” by few software.
- Many functionalities of the 3D View window are not implemented for data having Lat/long coordinate system.
- In the stereoplot window, filled contours with holes are not yet “resolved”.
- Frequency contours are not yet implemented in the 3D Scatter plot.
- The aspect of many objects in the 3D View can change when data are plotted as editable or not editable, and many object are represented with shapes that have to be “improved”. As an example, tensor are represented as spheres.
- Dataset cannot be directly created within the software.
- The appearance of objects in the stereoplot window is not yet fully customisable.
- Possibly more.....