Stereop 1.0 a program to plot maximum circles in an equal area stereonet

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1 Introduction

Although there are many amazing programmes to plot data on equal area stereonets (my favourite one, by Rick Allmendinger can be downloaded at: http://www.geo.cornell.edu/geology/faculty/RWA/programs/stereonet.html), I wanted to give it a shot to and learn how complex was the math for the projection. It turns out that the math is not really that complicated (Equations can be found in (1)) but nevertheless the implementation itself was a bit tricky as the plotting itself is done on gnuplot (http://www.gnuplot.info/). The program uses similar structure of my main plotting tool Pingu (https://vhub.org/tools/pingu), hence the name "Stereop".

2 Plotting commands

2.1 The Input Data

Stereop 1.0 reads the data from Vhub input window or from a text file separated by tabs or spaces.

The data set should contain three columns in which the first represent the data series to select different plotting colours, which will represent different geologically relevant groups (Figure 1). Depending on the type of data (planes of lines), the second column will correspond to the strike of the plane or the trend of a line while the third column will be the dip of the plane or the plunge of the line. The actual plot in the stereonet will be a maximum circle for a plane and a point for a line (Figure 2)

Strikes and trends should be given as Azimuth (i.e. from 0° to 360°) while plunges vary from 0° for an horizontal line up to 90° for a vertical one. For the dip direction, the program uses the right hand convention (Figure 3); i.e. dip is to the East when the strike is between 0° and 90°, to the South when the strike is between 90° and 180°, the the West when the strike is between 180° and 270° and to the North when the strike is between 270° and 360°.

There are two ways to upload data into the tool's Workspace:

- By opening a text file separated by tabs from your personal Workspace (advanced)
- By uploading using copy and paste from an text file in the Local Machine (most of the users) or entering your data manually into the data window.

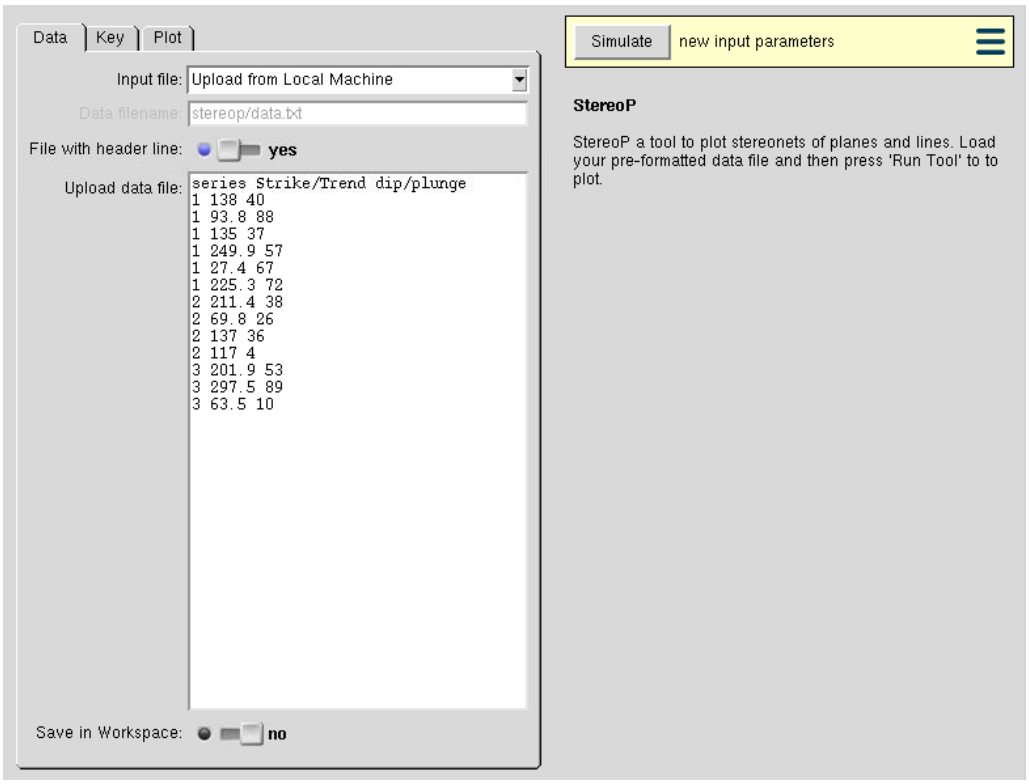

Figure 1: The data input window.

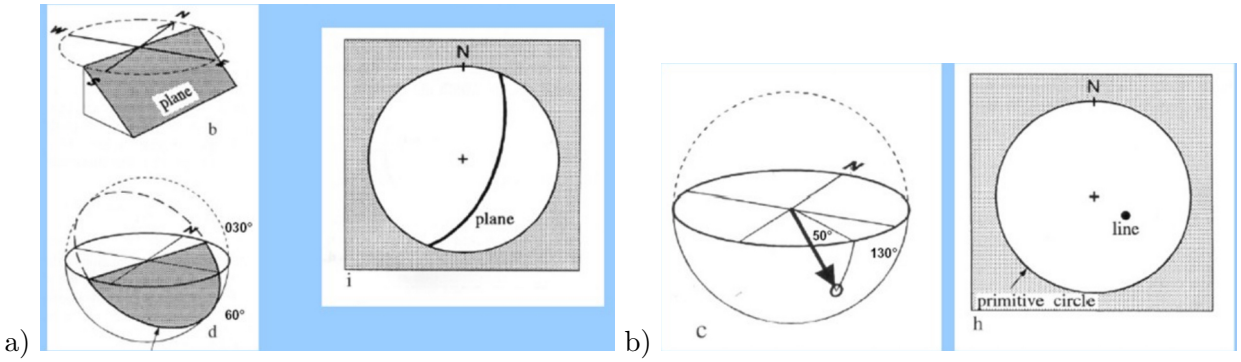

Figure 2: Projection of a) planes as Maximum circles and b) Lines as point in an equal area stereonet.

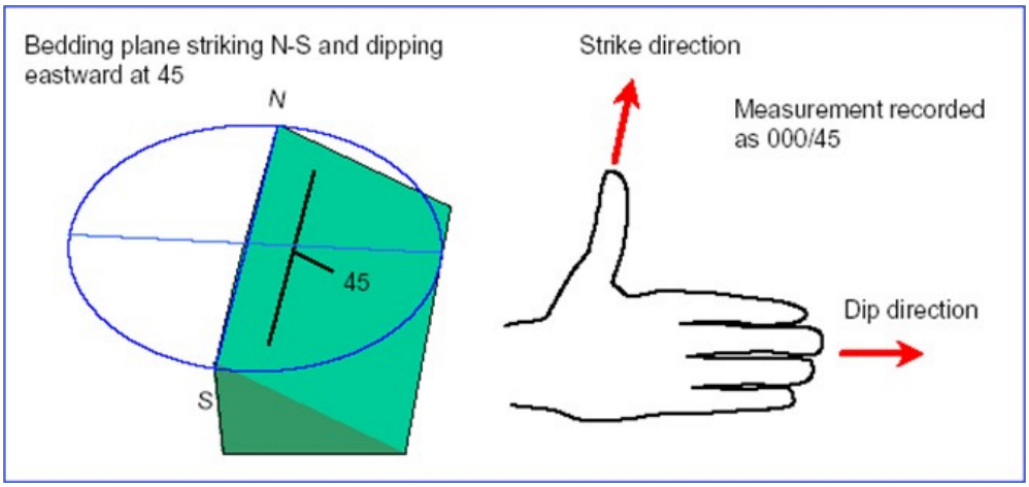

Figure 3: The right-hand rule. With a strike between 0° and 90° the dip direction is West.

Selecting between these two options is done scrolling under the Input option (Figure 1).

If you select "from worspace" you will need first to upload your (text!) file into your workspace in Vhub. This is typically done using webdav, the actual settings are beyond the scope of this tutorial. Once the data is uploaded in your Workspace, you will need to specify the relative path and name of your file (e.g. /myfolder/mydata.txt).

If you don't understand these instructions, I guess the second option is your option!

Copying Data from your Local Machine is easy; the first step is having your data in an easy location in your computer (e.g. your Desktop).

Next, select "input from the local machine" in the Input tab and do a right-click on the example table. If you are working on a Mac use "control-click" instead[1]. A new menu will appear with the option "upload file".

Clicking in this box will open a new tab in your browser with a button to Browse for the file in your Local machine. Select your file and press "Open". If everything worked, the window should have replace the default example with your uploaded data set. Under this option you can also enter your data manually into the data window or editing any of the entered values.

It is always possible to ignore some measurements (rows) simply changing the series value to a negative number (i.e. from 1 to -1 for example)

2.2 The key

It is always possible to generate a key for the plot, which is produced as an independent image. After selecting the tab "Key" and clicking "yes" under "Plot Key" option (Figure 6a). Once the Key option is activated, the windows for the labels will become active and you will be able to simply write a label for each one of your series. If you write more series than the ones labelled in your Input file, they will simply be ignored. All the available plots can have a key but not the rose diagram option for obvious reasons.

[1] In some cases "command-click"

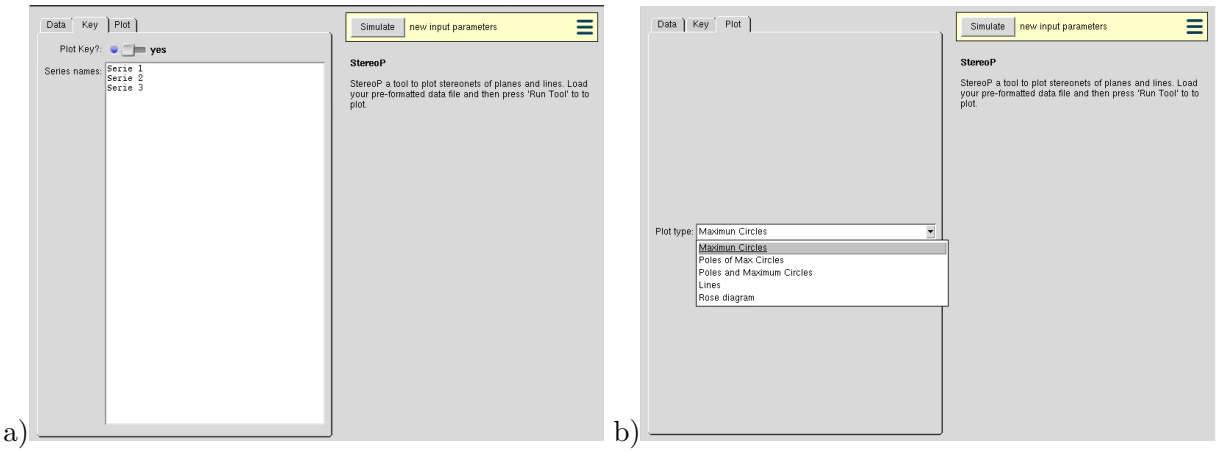

Figure 4: a) The Key Menu b) The plotting Menu

3 Plotting your data and retrieving your plot

Once the data has been uploaded and if a Key option has been selected is time to click on the Plot tab. The Plot window will give you the option of choosing one of the currently Available plots in stereop 1.0 (Figure 6b). Once the desired plot has been selected, plotting is done by clicking on the "Simulate" key on the top-right corner of the menu (Figure 6b).

To retrieve your plot, simply clicking on the scrolling menu that shows the "Output summary" will give you the option to display your plot or the key for the plot (Figure 5a). Clicking on the little green arrow in the top right corner will download the plot or the key into your local machine (Figure 5b).

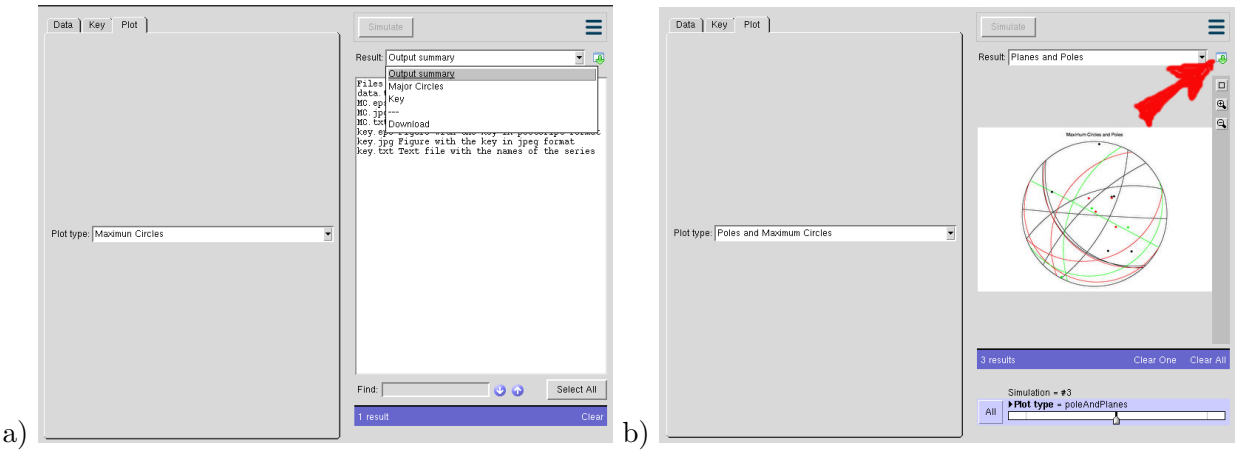

Figure 5: a) The Output summary and selecting the plot. b) After the plot have been selected, click on the top-right download symbol, here marked with a red arrow.

4 Currently available plots

4.1 Maximum Circles

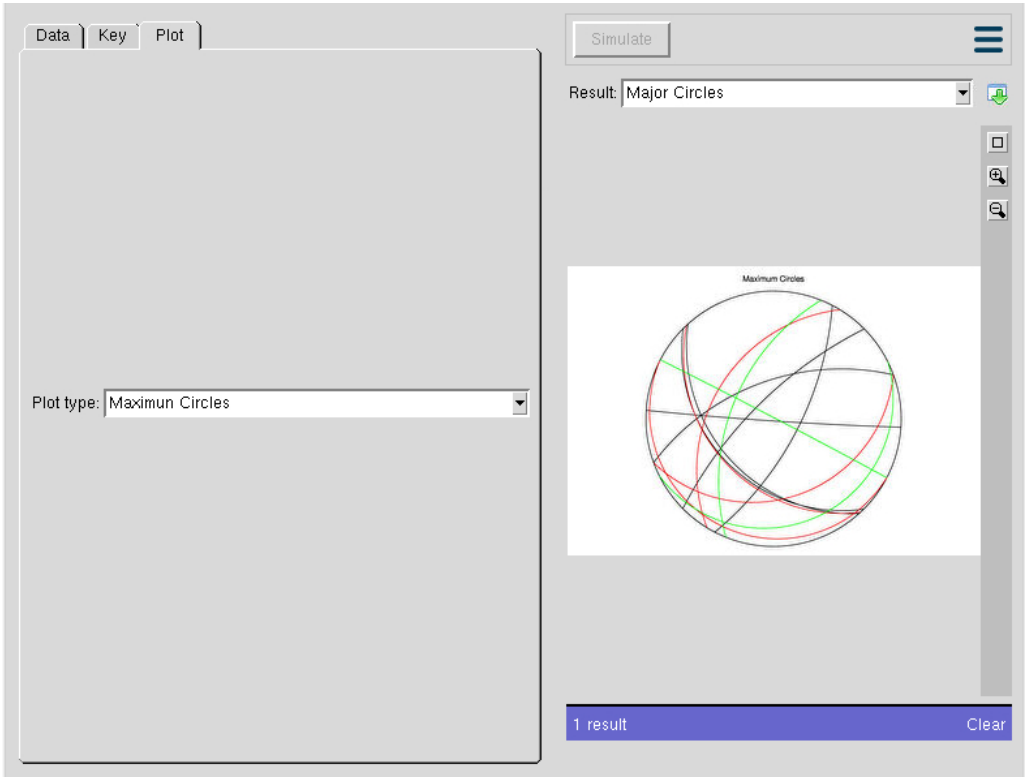

Figure 6: The plot of the maximum circles

4.2 Lines

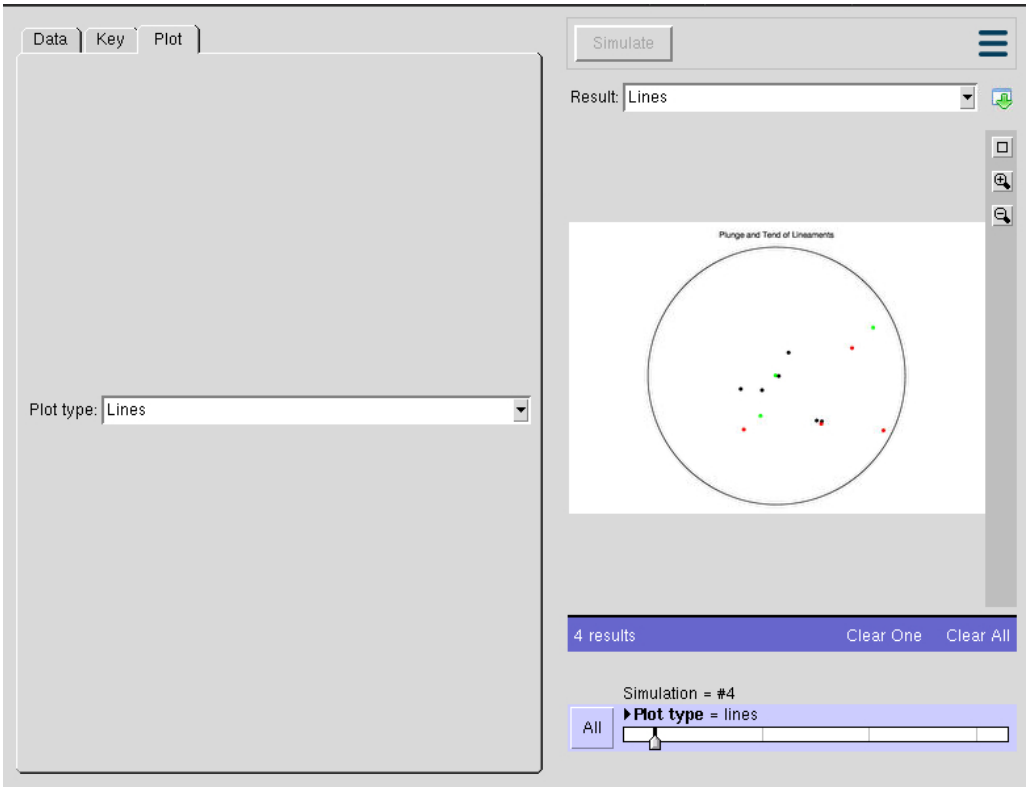

Figure 7: The plot of the lines

4.3 Poles of the Maximum Circles

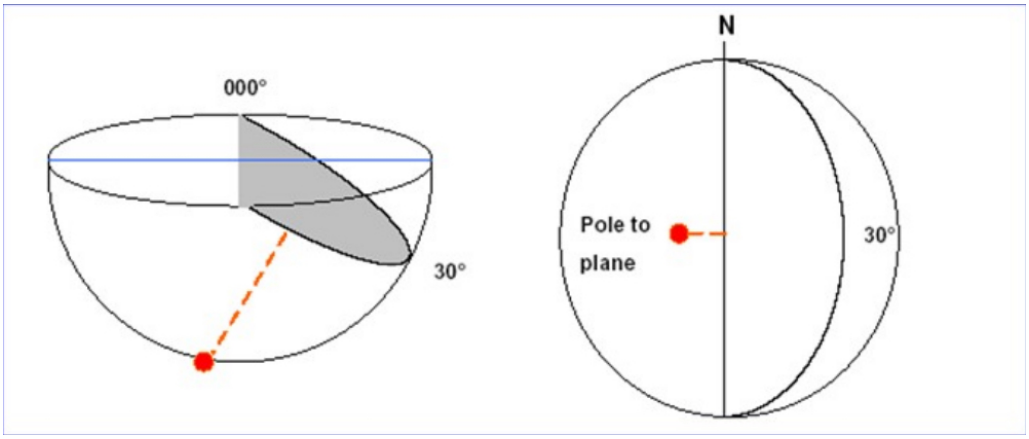

Figure 8: The pole of a maximum circle is the line perpendicular to it. In the stereonet the plane is represented as a maximum circle and its pole as a point.

a) b)

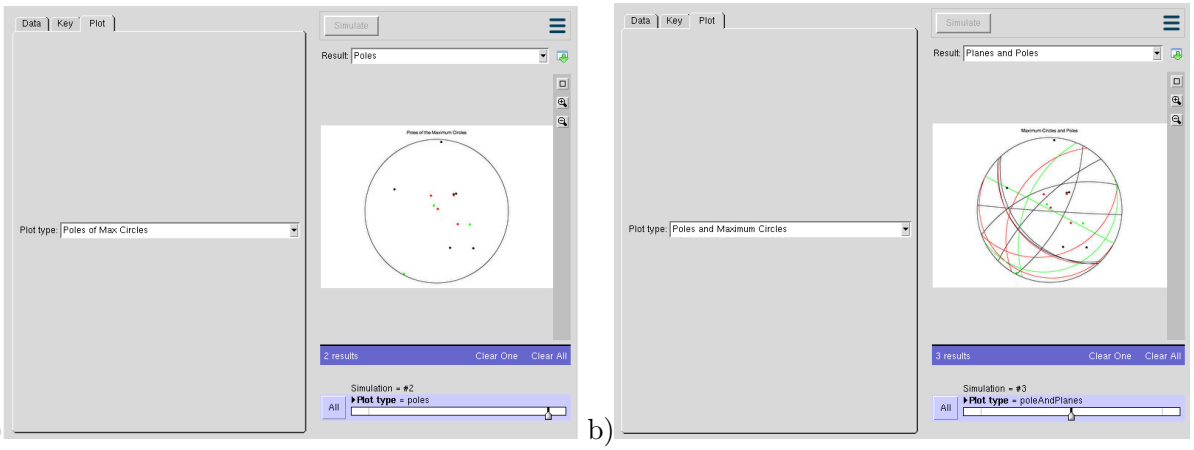

Figure 9: Stereoplot can plot a) the poles and b) the poles with the maximum circles.

4.4 Rose Diagram

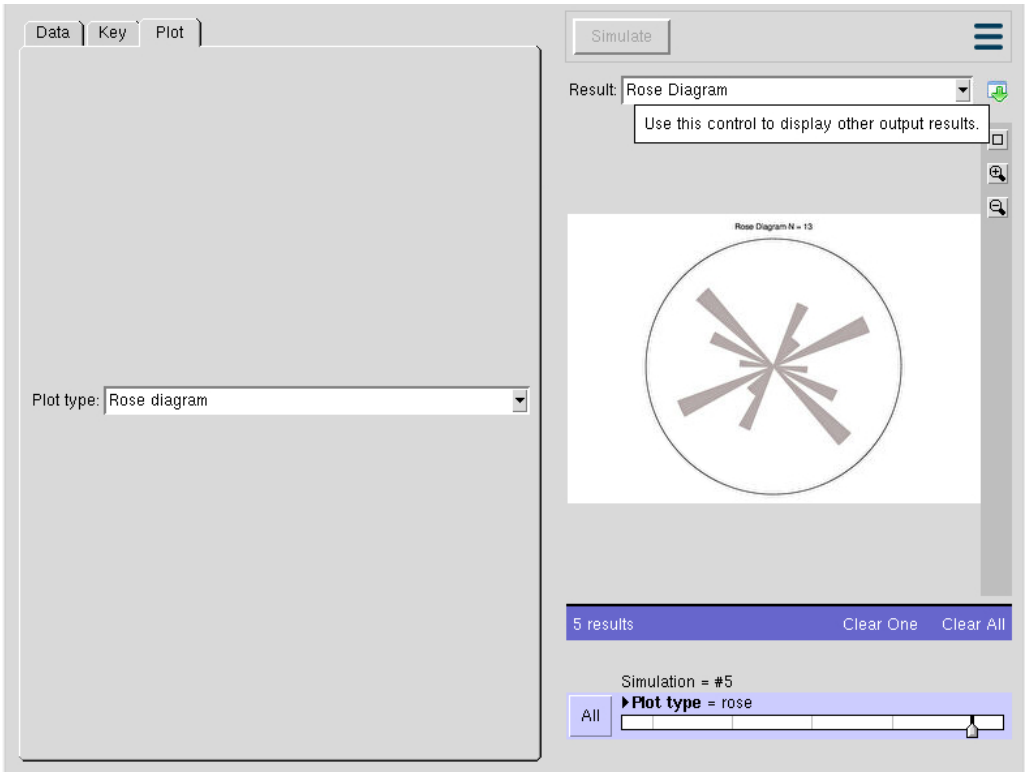

Figure 10: The Rose diagram of the data

References

[1] Allmendinger, R.W., Cardozo, N., Fisher, D. 2012. Structural Geology Algorithms: Vectors and Tensors. Cambridge University Press.