# Shape Preferred Orientation (OCW-UN-SPO) Launeau P. 2017

Applications with tutorials

01 - Intercepts processing in grey levels of Adamello Batholith images

02 - SPO basic processing of classified images

03 - SPO processing of one classified norite of the Bushveld

04 - Intercepts processing in greyscale and classified images of Rooi Rand dykes

05 - Intercepts processing in grey levels of faults and lineaments

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This step by step application to Rooi Rand dyke swarm reprocess the image used with intercepts in grey level with a particular attention to SPO obliquity on dyke walls

Hastie, W.W., Aubourg, C., Watkeys, M.K. (2011) When an 'inverse' fabric is not inverse: an integrated AMS-SPO study in MORB-like dykes. Terra Nova 23, 49–55.

Hastie,W.W.,Watkeys,M.K., Aubourg, C. (2011) Significance of magnetic and petrofabric in Karoo-feeder dykes, northern Lebombo. Tectonophysics 513, 96–111

Hastie,W.W.,Watkeys,M.K., Aubourg, C. (2013) Characterisation of grain-size, shape and orientation of plagioclase in the Rooi Rand dyke swarm, South Africa. Tectonophysics, 583, 145–157

Hastie,W.W.,Watkeys,M.K., Aubourg, C. (2014) Magma flow in dyke swarms of the Karoo LIP: Implications for the mantle plume hypothesis. Gondwana Research 25 (2014) 736–755

XY

Geographic orientation (strike/dip)

115 / 6

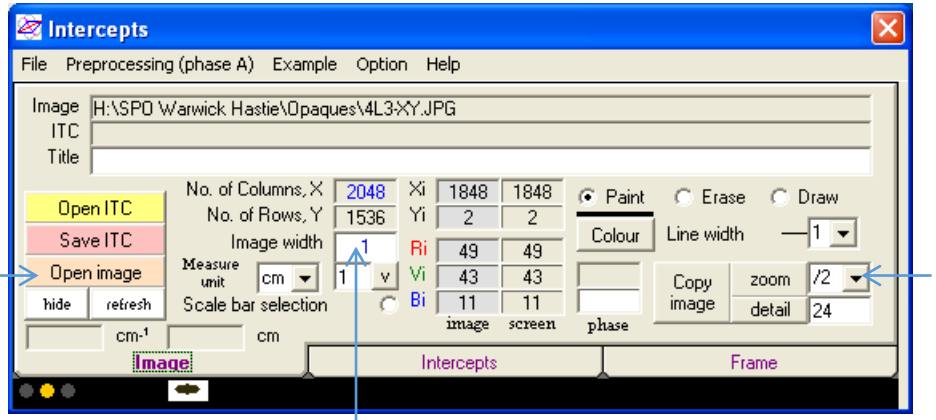
90

+90

Internal (relative) orientation:
Orientation of the strike at **90** (right)
and the dip at 90 **+90** (bottom)

Site 4L. See location in Hastie et al. 2013

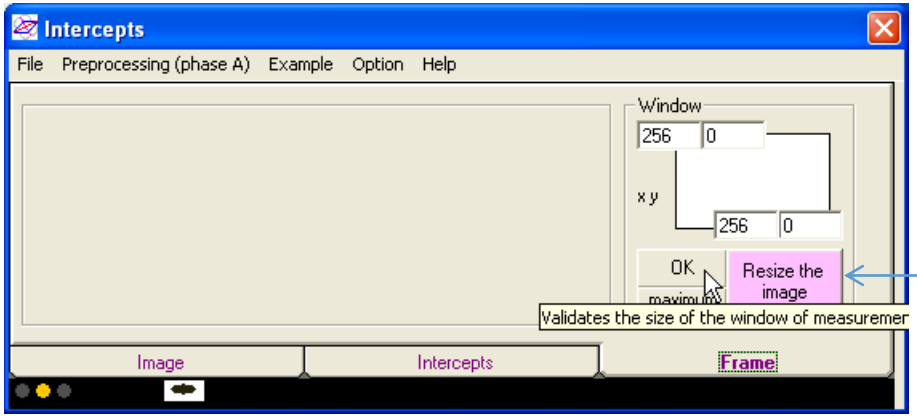
Bad lighting in corners




Open image

Set image magnification

Set scale in cm (size of the image width)




Resize the image to avoid darker corner

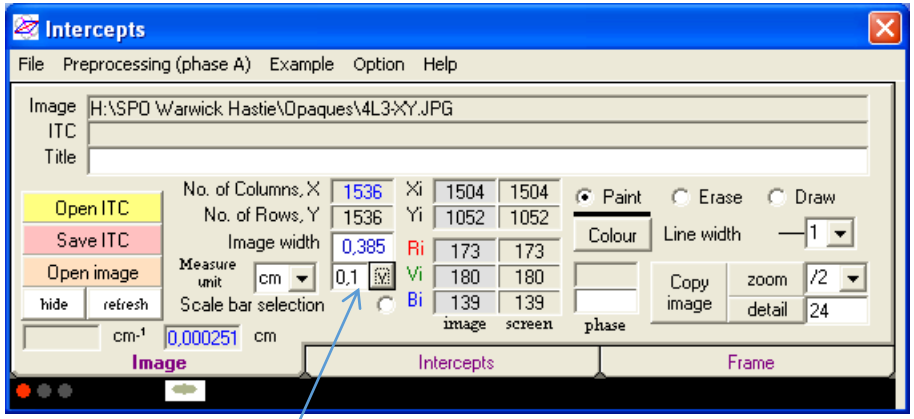
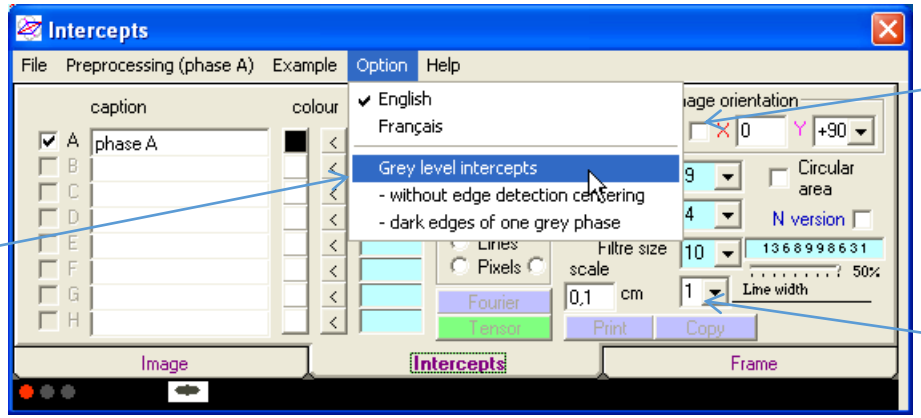



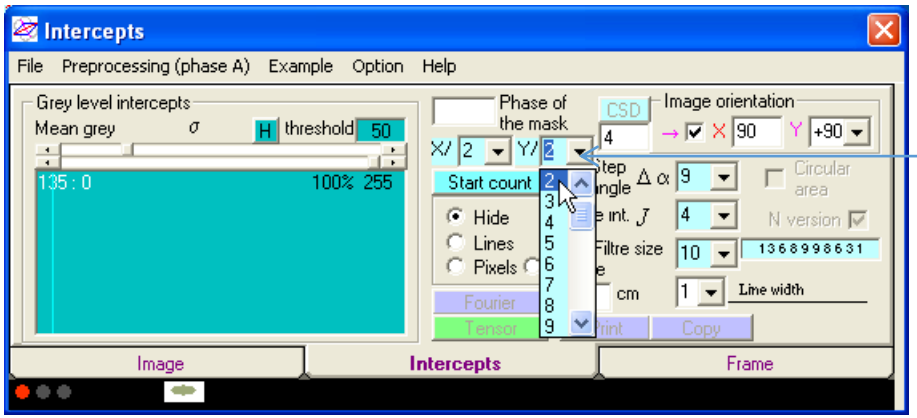

Image scale bare (click on V to print it on the image)

Select intercepts counting in grey levels

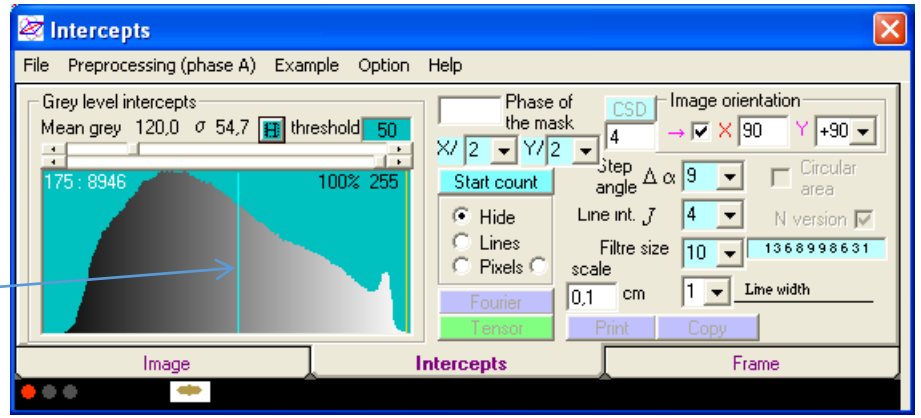



Click on image orientation, enter 90 for X and select +90 for Y

Line width of all graphics

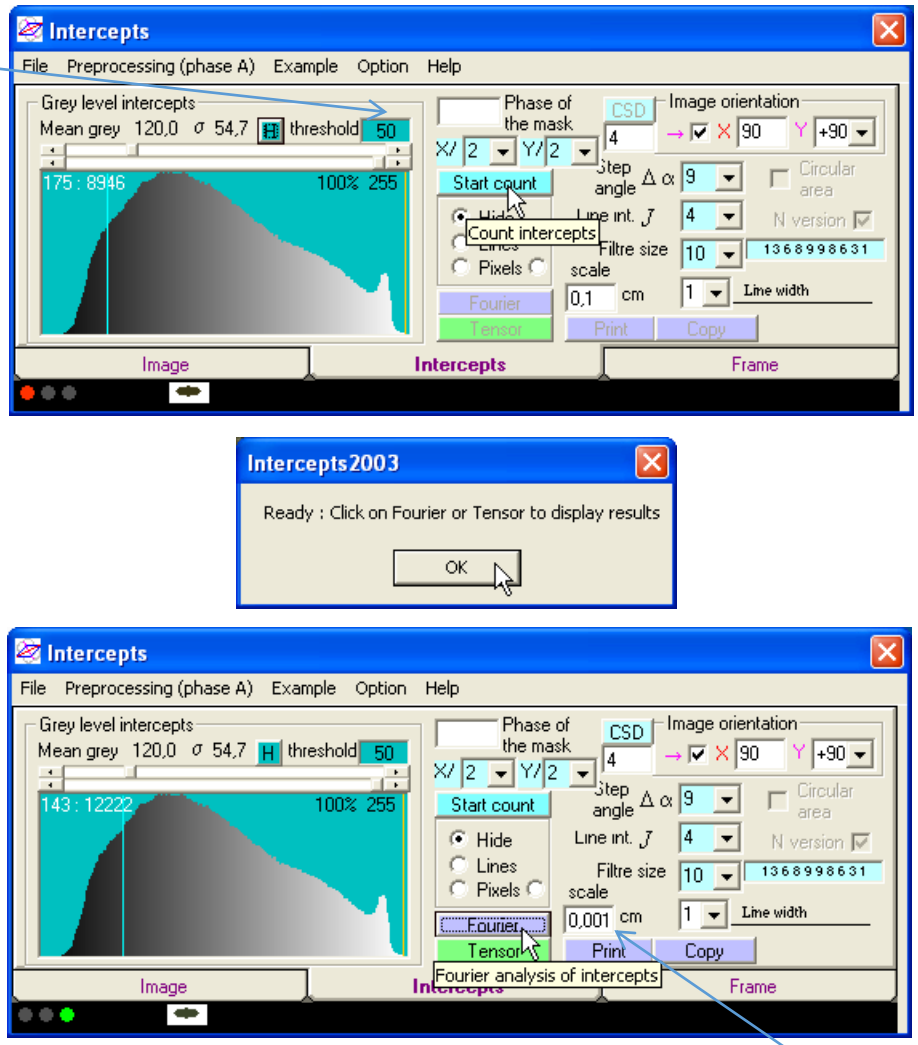



Select the number of sub-images along X and Y direction. 2 x 2 gives 4 subsets of data overlapping on each other to check results invariability by translation along X and Y directions




Click on H button for pre histogram calculation and scan the image with the mouse pointer to visualize the corresponding grey level in the histogram

When the grey level varies from 10 to 250 a limit of boundary detection at 50 grey level is correct. Change it if there is too much or not enough boundaries



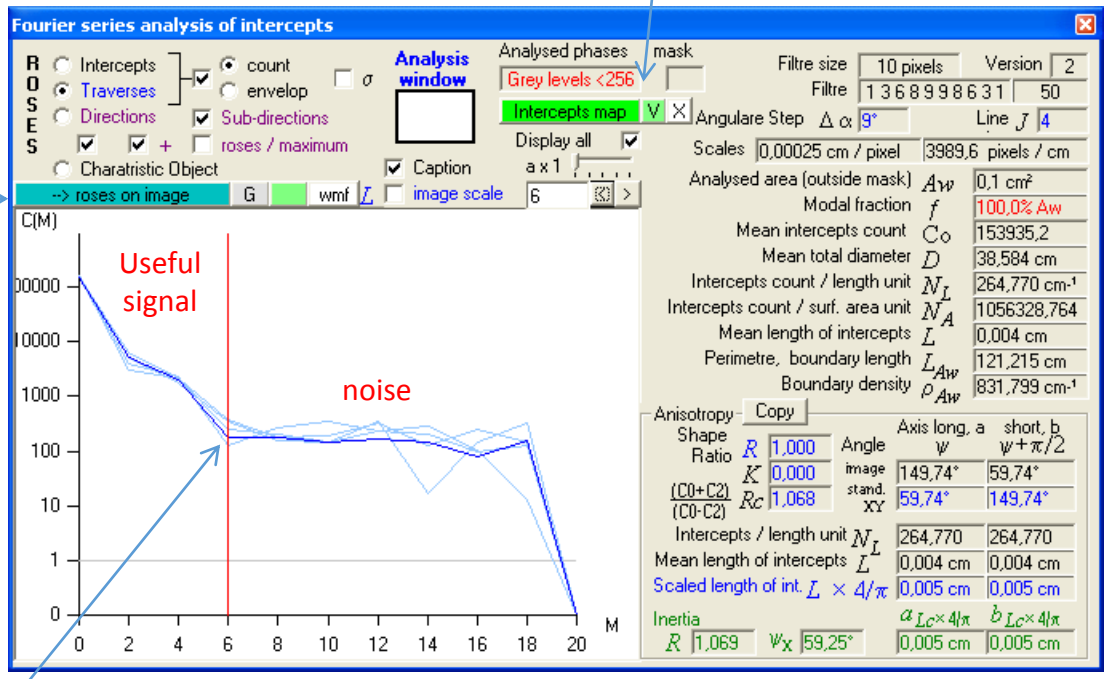

Fourier button visualizes results See 2 next slides

Enter scale bare size in graphics

All green buttons visualize the boundaries or intercepts detection on the image

Rose type selection

Draw any roses on the image

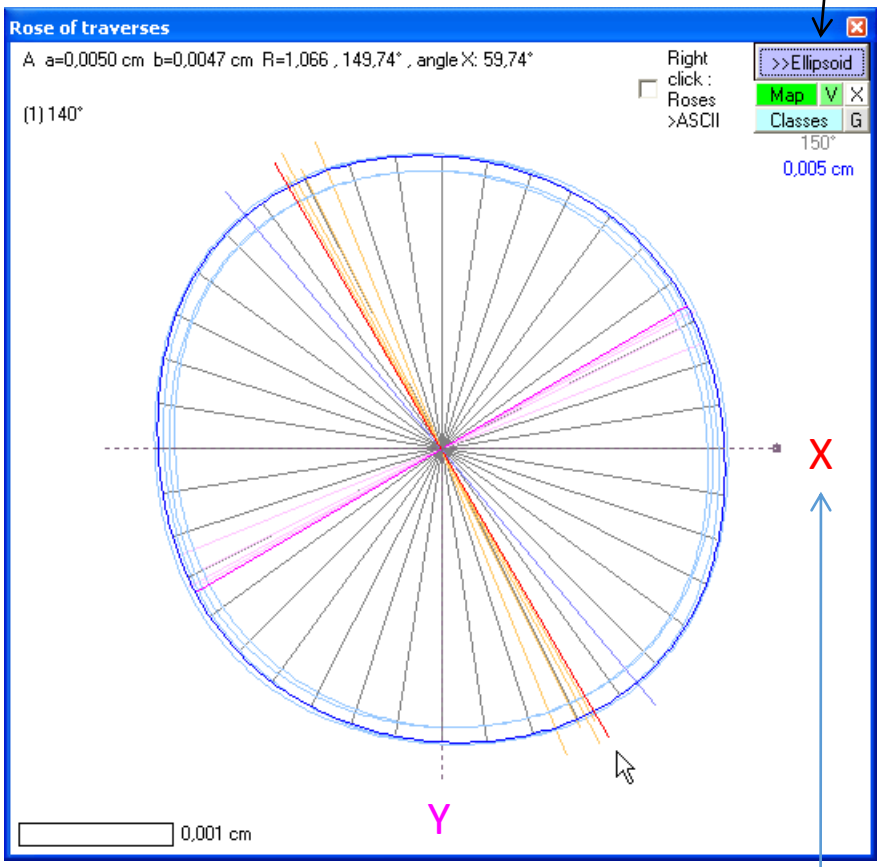


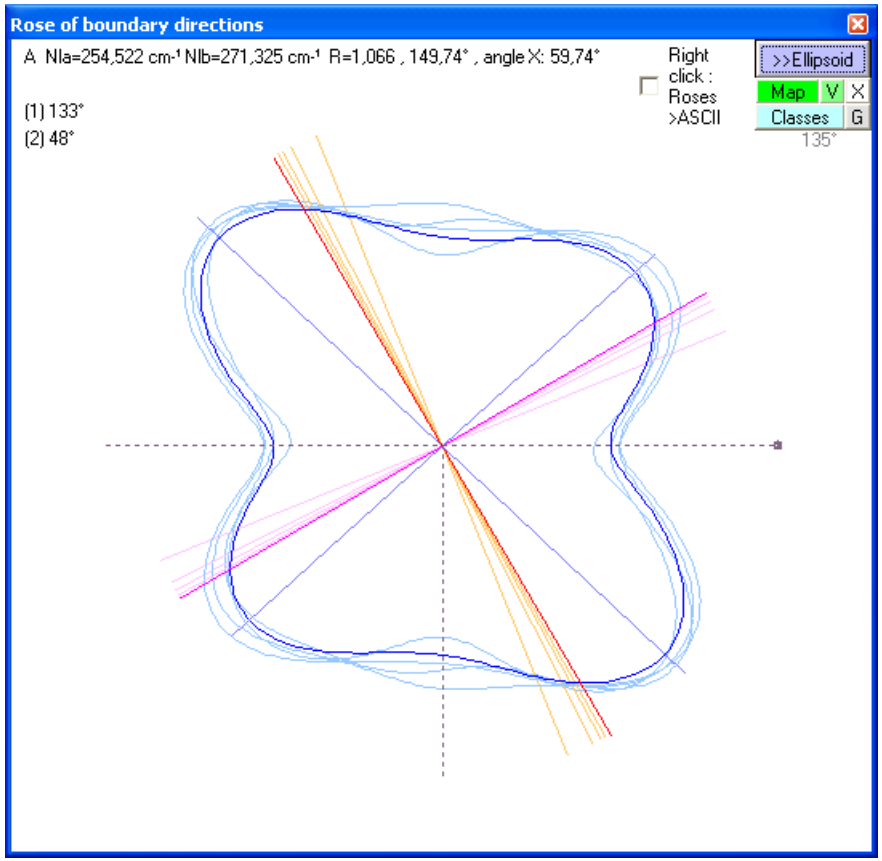

Select the level of rose diagram reconstruction without noise from the Fourier series (if the automatic detection of signal to noise threshold failed)

Click on >> Ellipsoid button to set up the data
for their transfer in the Ellipsoid program

**Traverses** or mean length intercepts
used for 3D calculation of ellipsoid

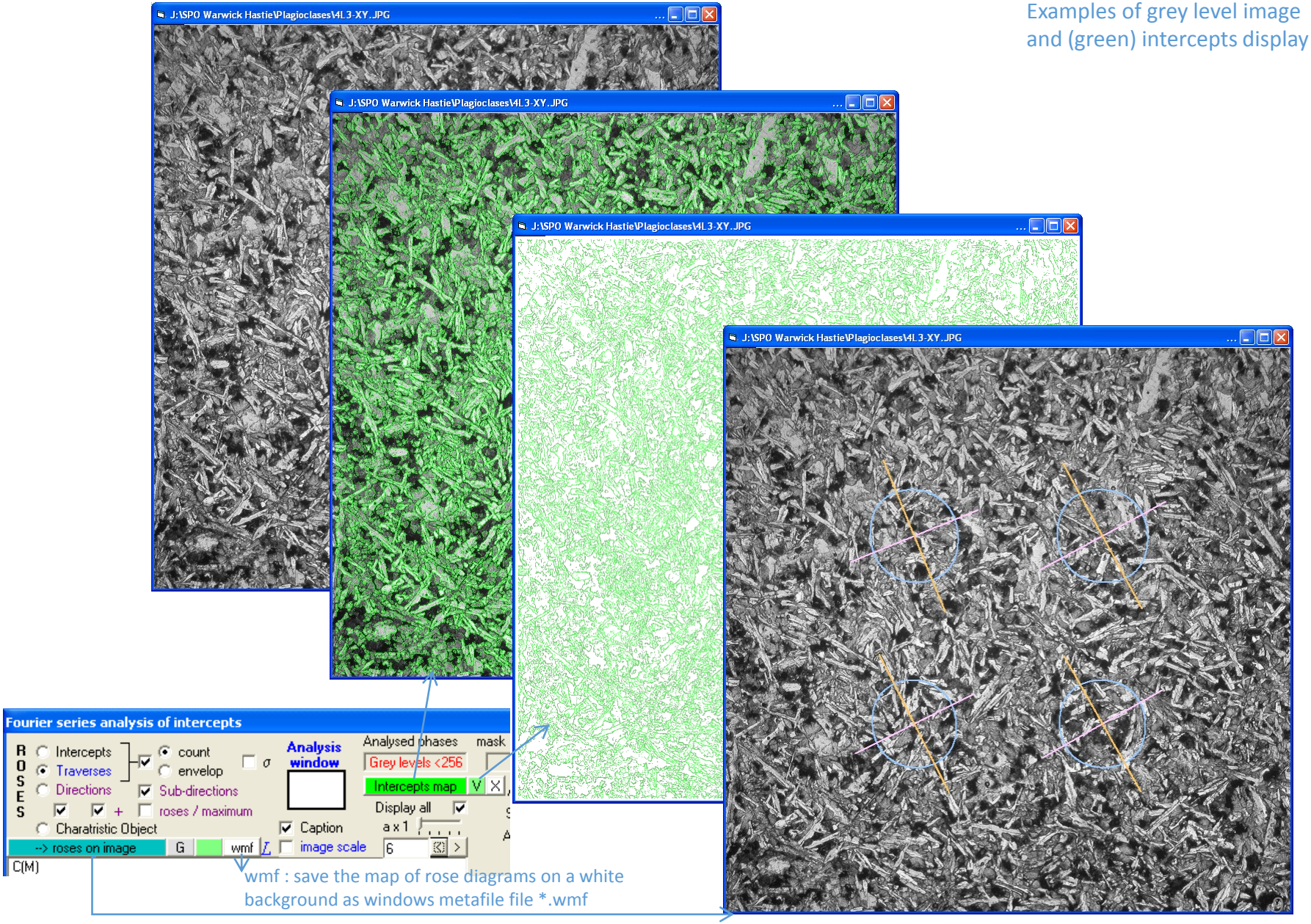
Boundary **directions** deduced from
intercepts for sub-fabric analysis



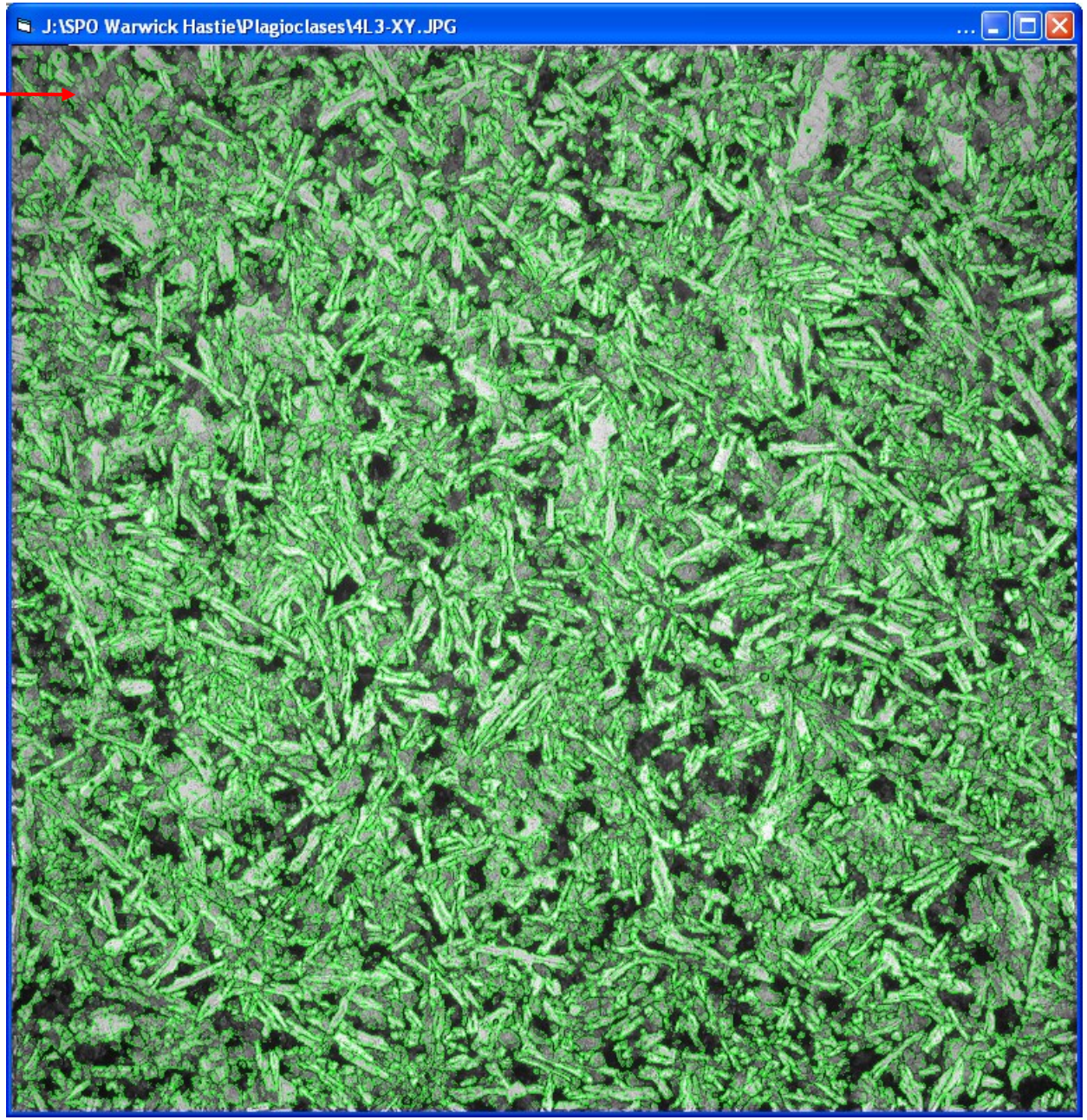



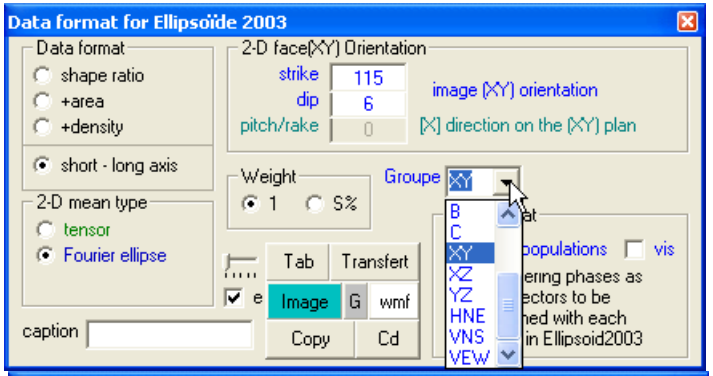

Check the orientation before transferring the data

Examples of grey level image and (green) intercepts display

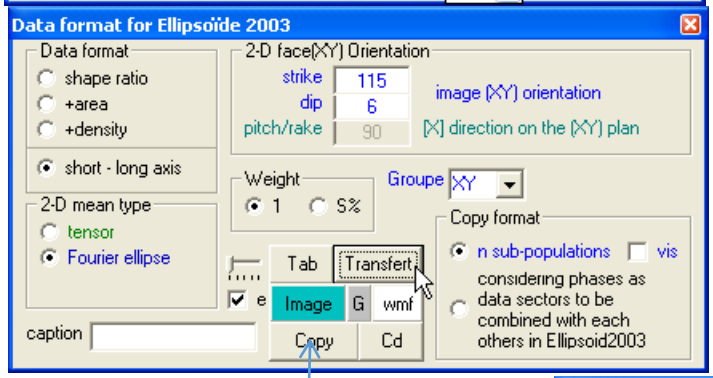


The attenuation of the contrast in the image corner distorts the results which explain the importance of image resizing in p. 4

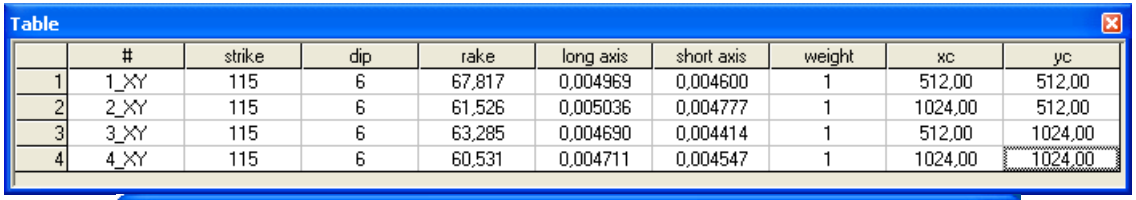




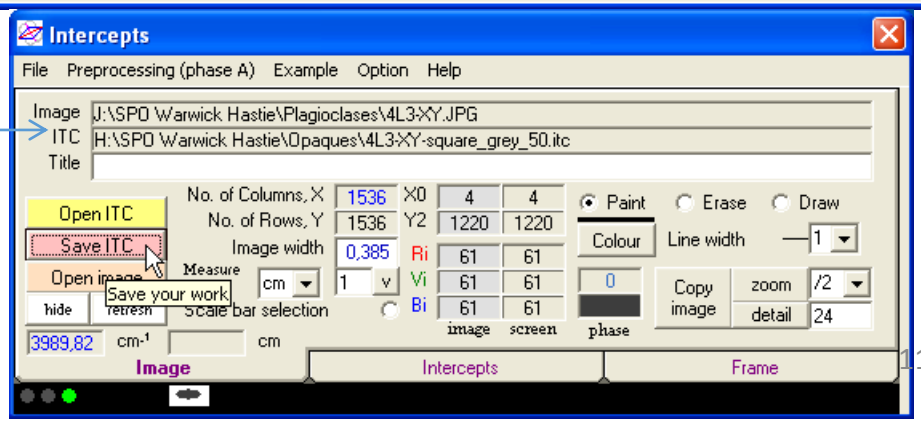

Enter strike, dip and select the image section type necessary for Ellipsoid2003



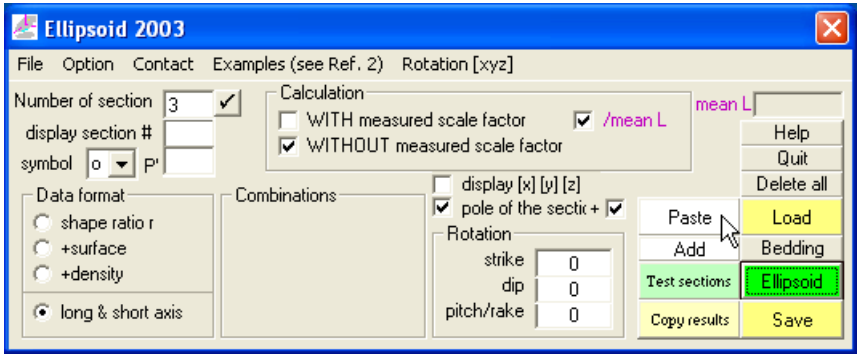

Click on Transfer to visualize the table of results

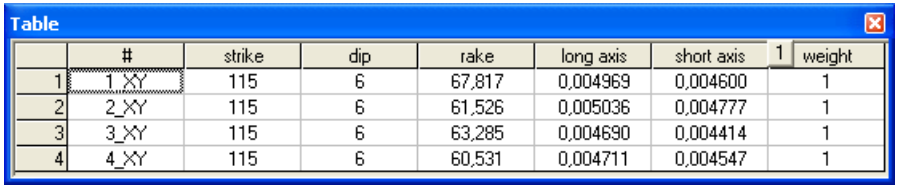



Save your work
and then click on Copy to send the data
in the clipboard of your system



Launch Ellipsoid2003 and paste the first data

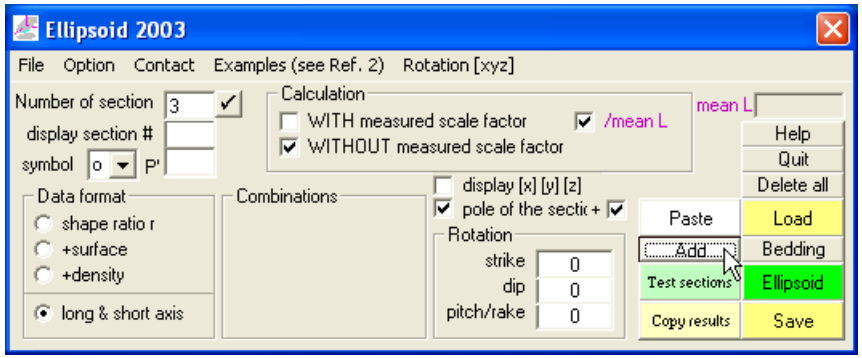


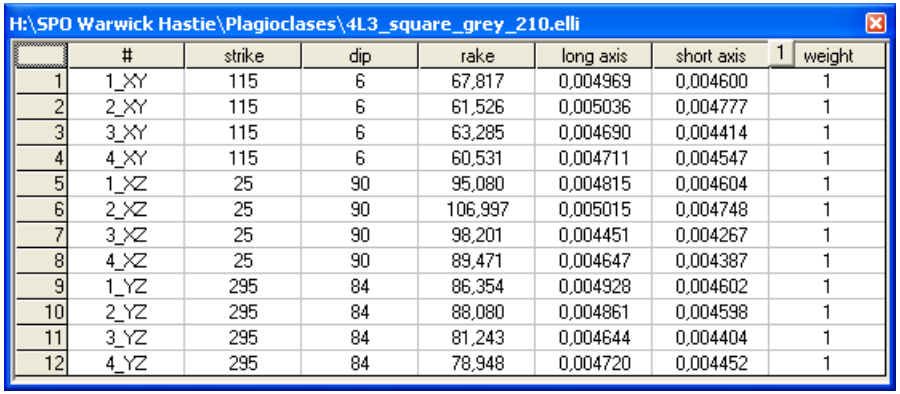



Table

| | # | strike | dip | rake | long axis | short axis | 1 | weight |
|---|---|---|---|---|---|---|---|---|
| 1 | 1_XY | 115 | 6 | 67,817 | 0,004969 | 0,004600 | | 1 |
| 2 | 2_XY | 115 | 6 | 61,526 | 0,005036 | 0,004777 | | 1 |
| 3 | 3_XY | 115 | 6 | 63,285 | 0,004690 | 0,004414 | | 1 |
| 4 | 4_XY | 115 | 6 | 60,531 | 0,004711 | 0,004547 | | 1 |

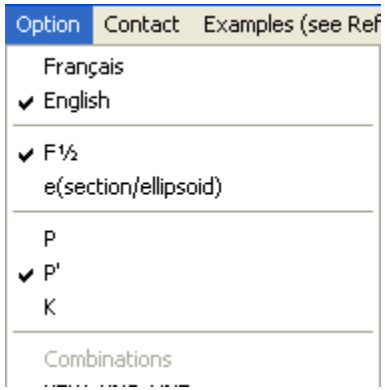
Click on Add for XZ and YZ images



H:\SPO Warwick Hastie\Plagioclases\4L3_square_grey_210.elli

| | # | strike | dip | rake | long axis | short axis | 1 | weight |
|---|---|---|---|---|---|---|---|---|
| 1 | 1_XY | 115 | 6 | 67,817 | 0,004969 | 0,004600 | | 1 |
| 2 | 2_XY | 115 | 6 | 61,526 | 0,005036 | 0,004777 | | 1 |
| 3 | 3_XY | 115 | 6 | 63,285 | 0,004690 | 0,004414 | | 1 |
| 4 | 4_XY | 115 | 6 | 60,531 | 0,004711 | 0,004547 | | 1 |
| 5 | 1_XZ | 25 | 90 | 95,080 | 0,004815 | 0,004604 | | 1 |
| 6 | 2_XZ | 25 | 90 | 106,997 | 0,005015 | 0,004748 | | 1 |
| 7 | 3_XZ | 25 | 90 | 98,201 | 0,004451 | 0,004267 | | 1 |
| 8 | 4_XZ | 25 | 90 | 89,471 | 0,004647 | 0,004387 | | 1 |
| 9 | 1_YZ | 295 | 84 | 86,354 | 0,004928 | 0,004602 | | 1 |
| 10 | 2_YZ | 295 | 84 | 88,080 | 0,004861 | 0,004598 | | 1 |
| 11 | 3_YZ | 295 | 84 | 81,243 | 0,004644 | 0,004404 | | 1 |
| 12 | 4_YZ | 295 | 84 | 78,948 | 0,004720 | 0,004452 | | 1 |




XY XZ YZ

Use Option to select the type of image combination for 3D calculation (# last 2 letters)

First display after one click on the green button
Ellipsoid if the combination between XY, XZ YZ images as been selected before

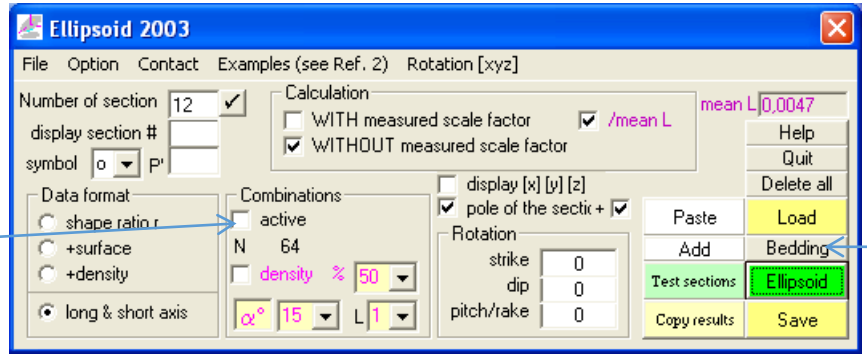
Click here for combination calculation

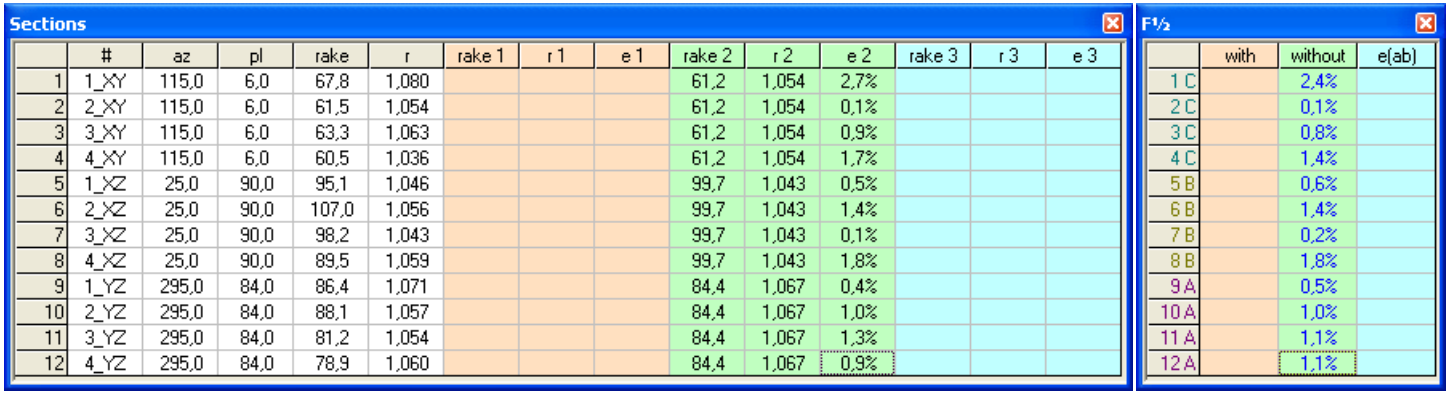
Enter dyke wall orientation

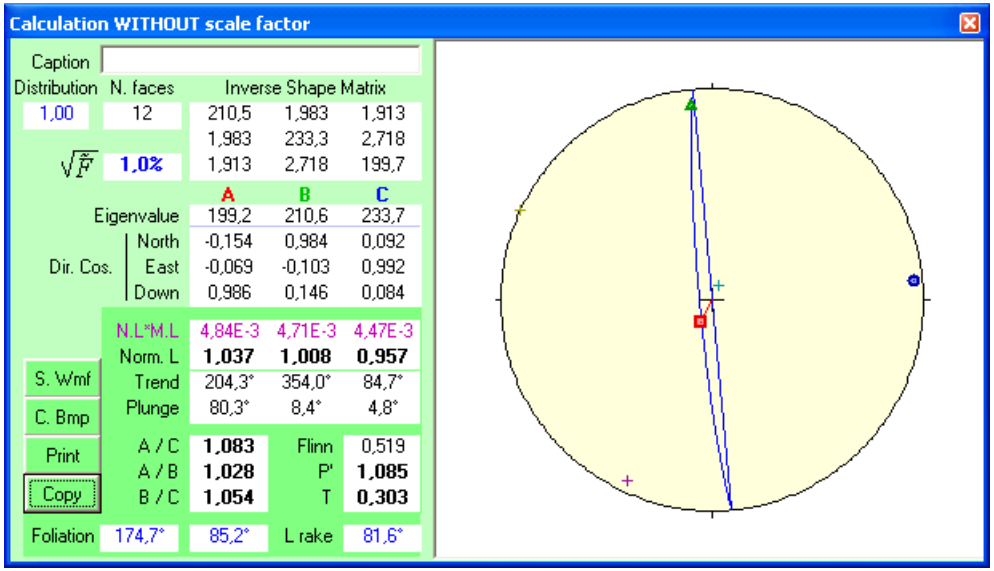
Results for each sub-image and error parameter F

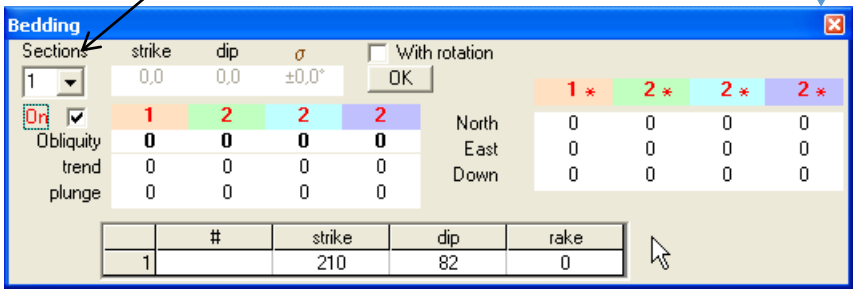
Used for computing a plane from 2 or more lines of intersection given by strike dip rake

Type orientation of the bedding or dyke wall directly here if it is known
(rake is used for intersections combinations)

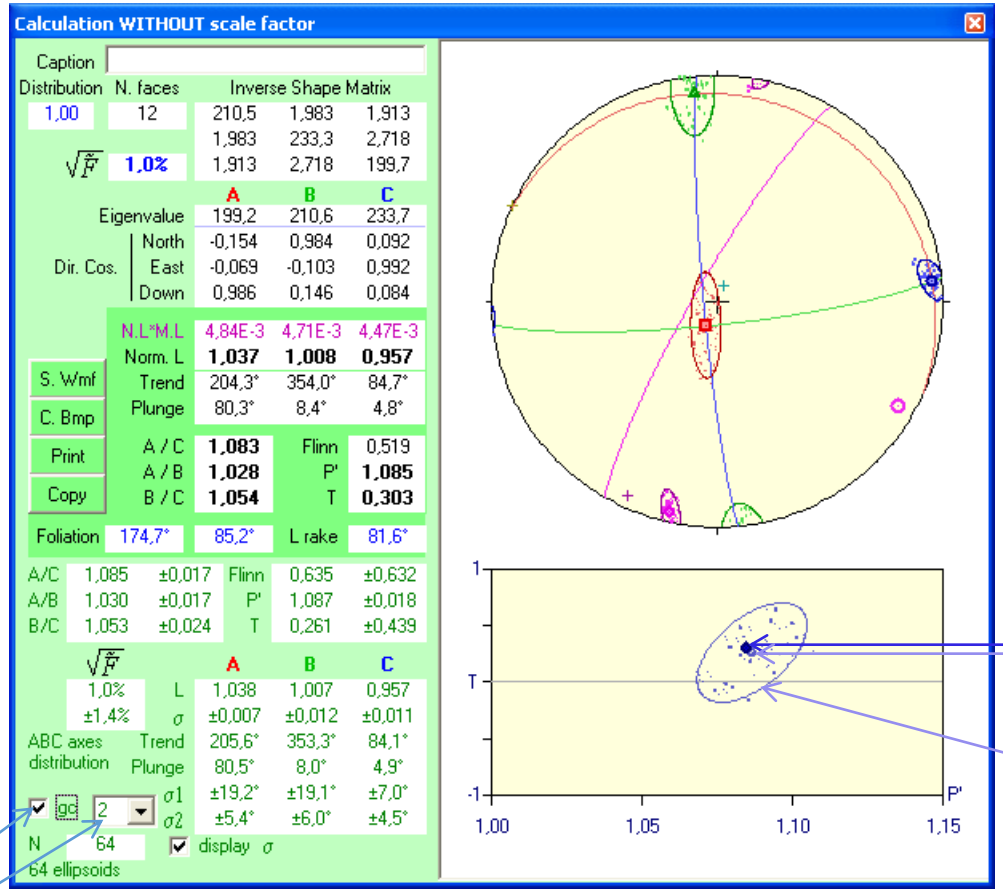


Second display with all parametrizations




Main results of the whole data

Mean results of the sub-images data

For great circle display

Standard deviation selection

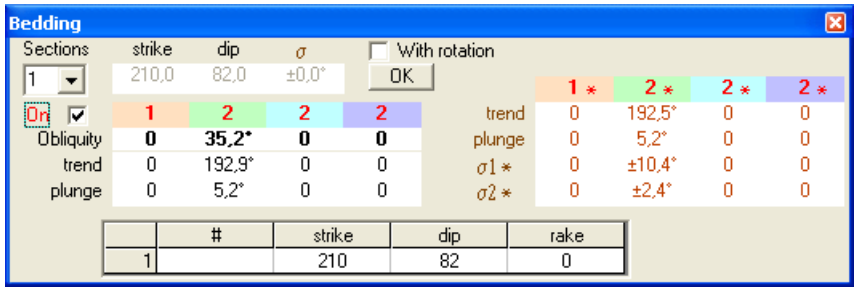
Long axis A is red
Short axis C is blue
Intermediate axis B is green
Bisector between SPO and wall is magenta

Standard deviation ellipses are set by default at 2 sigma

Graphics are exportable as:
- Windows Metafile [S. Wmf]
- Bitmap in clipboard [C. Bmp]
- Ascii data in clipboard[Copy]

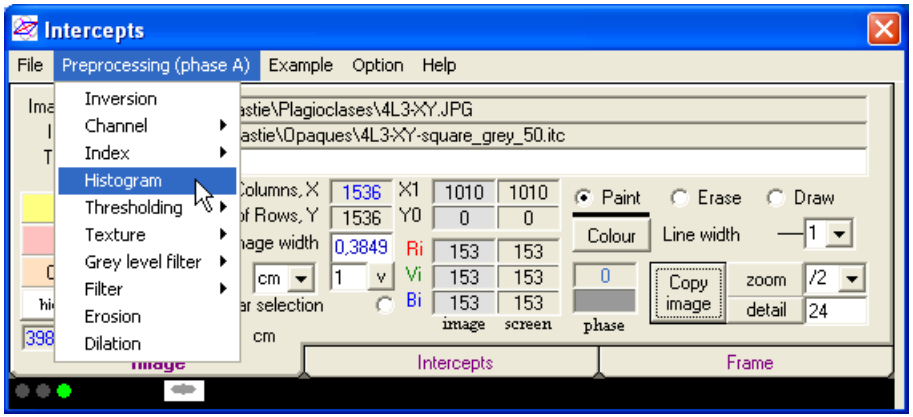
Main (P',T) calculated at one time
Mean (P',T) of 64 sub-images results
close to each other characterize accurate results with a precision estimation given by the standard deviation ellipse of sub-mages data

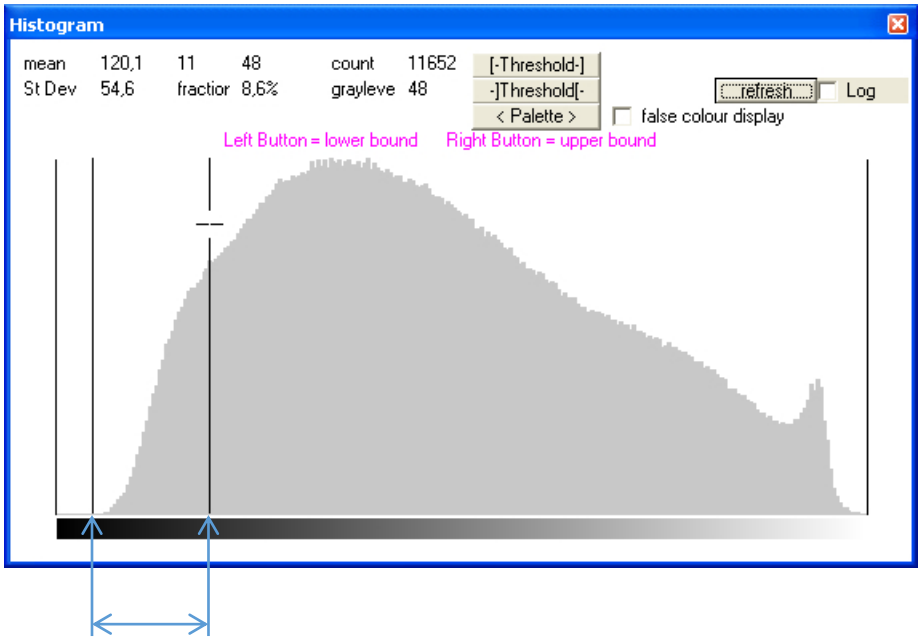
Obliquity between SPO foliation and dyke wall with orientation of its bisector (main results)




Bisector statistics

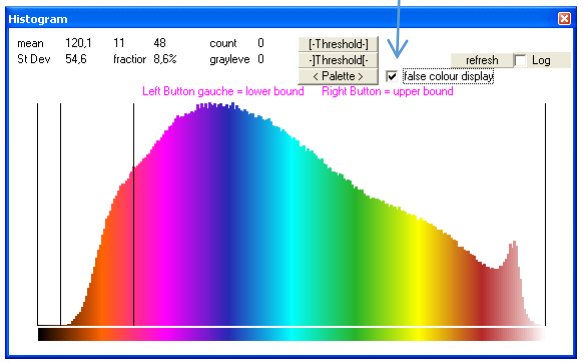
Extraction of the opaque grains by grey level histogram thresholding

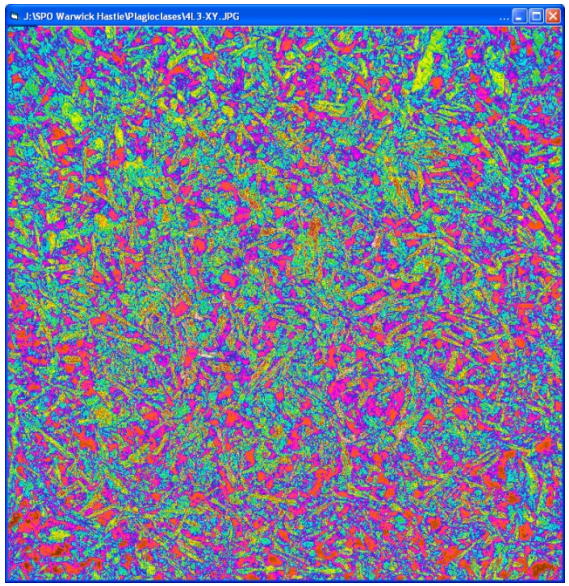


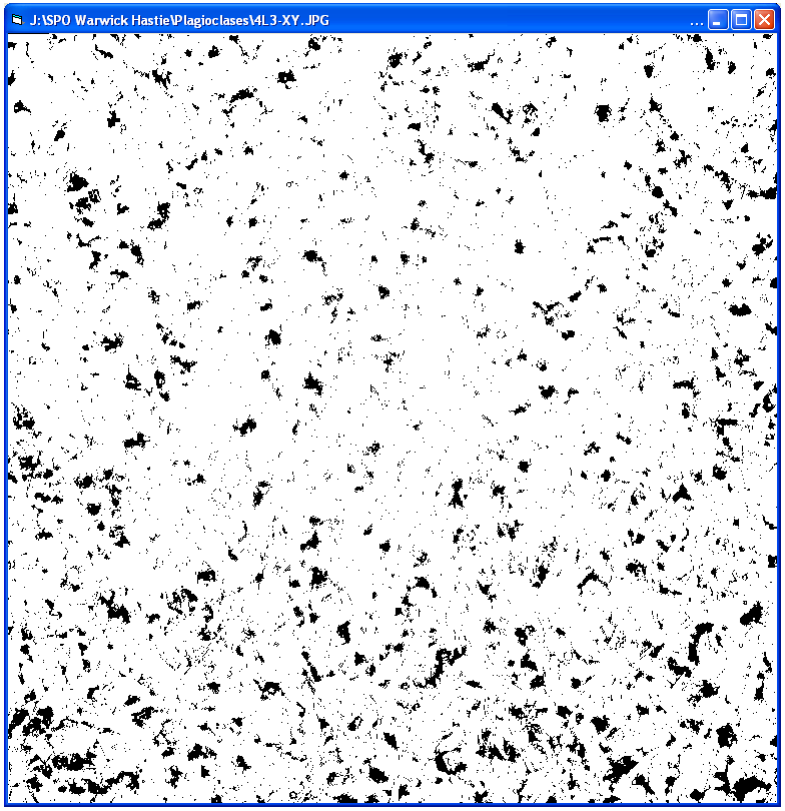



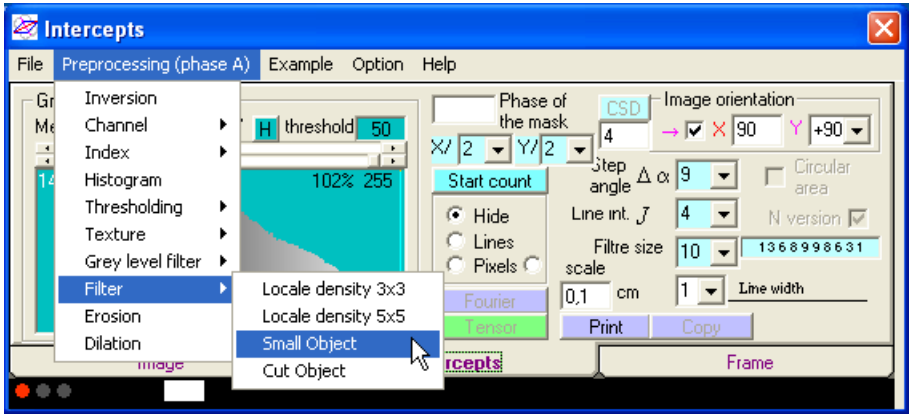

Selection of the opaque grains

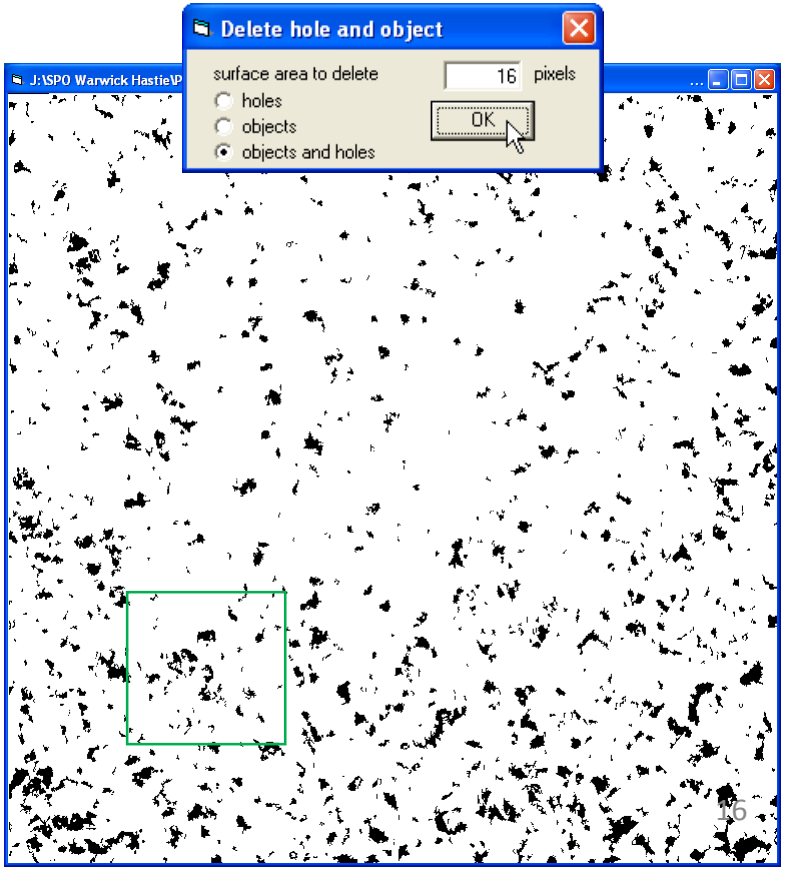
Color table helping setting the best threshold values





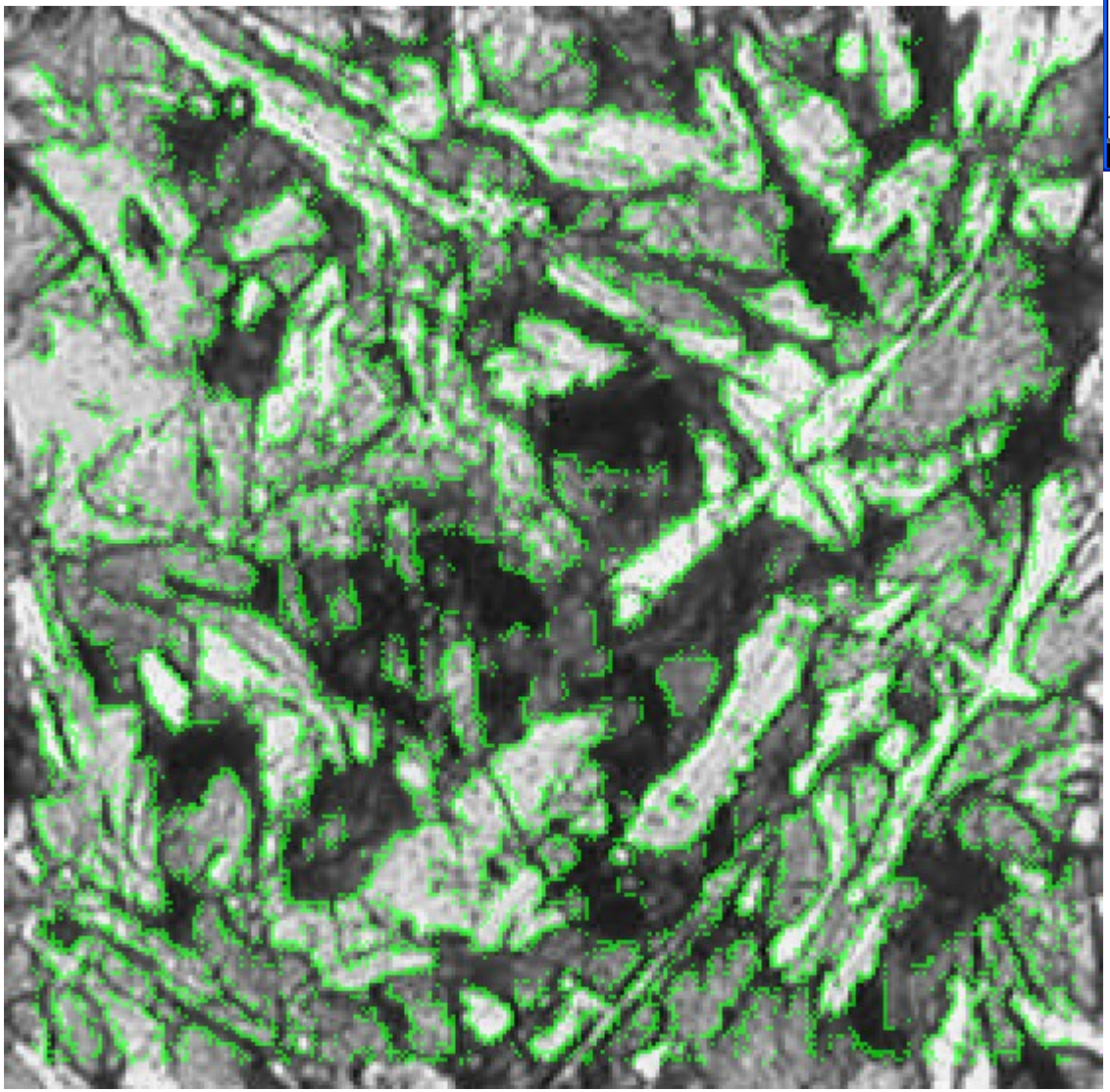



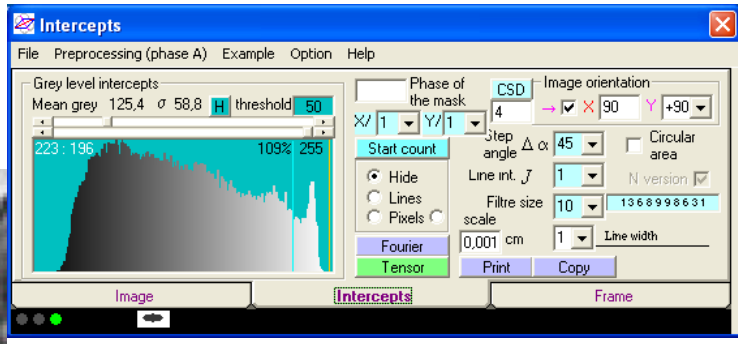



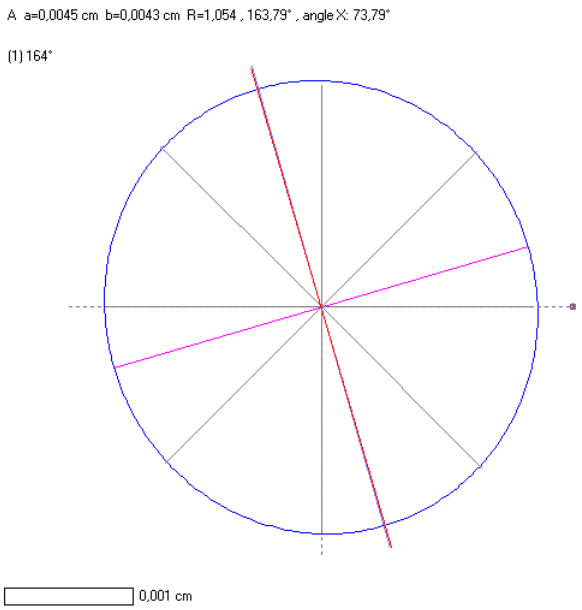

Smaller grains and holes lower than 16 pixels can be removed by using Filter Small Object

The next page focus on this small area (green square) to outline the effect of each setting on classified images (opaque minerals black other white)

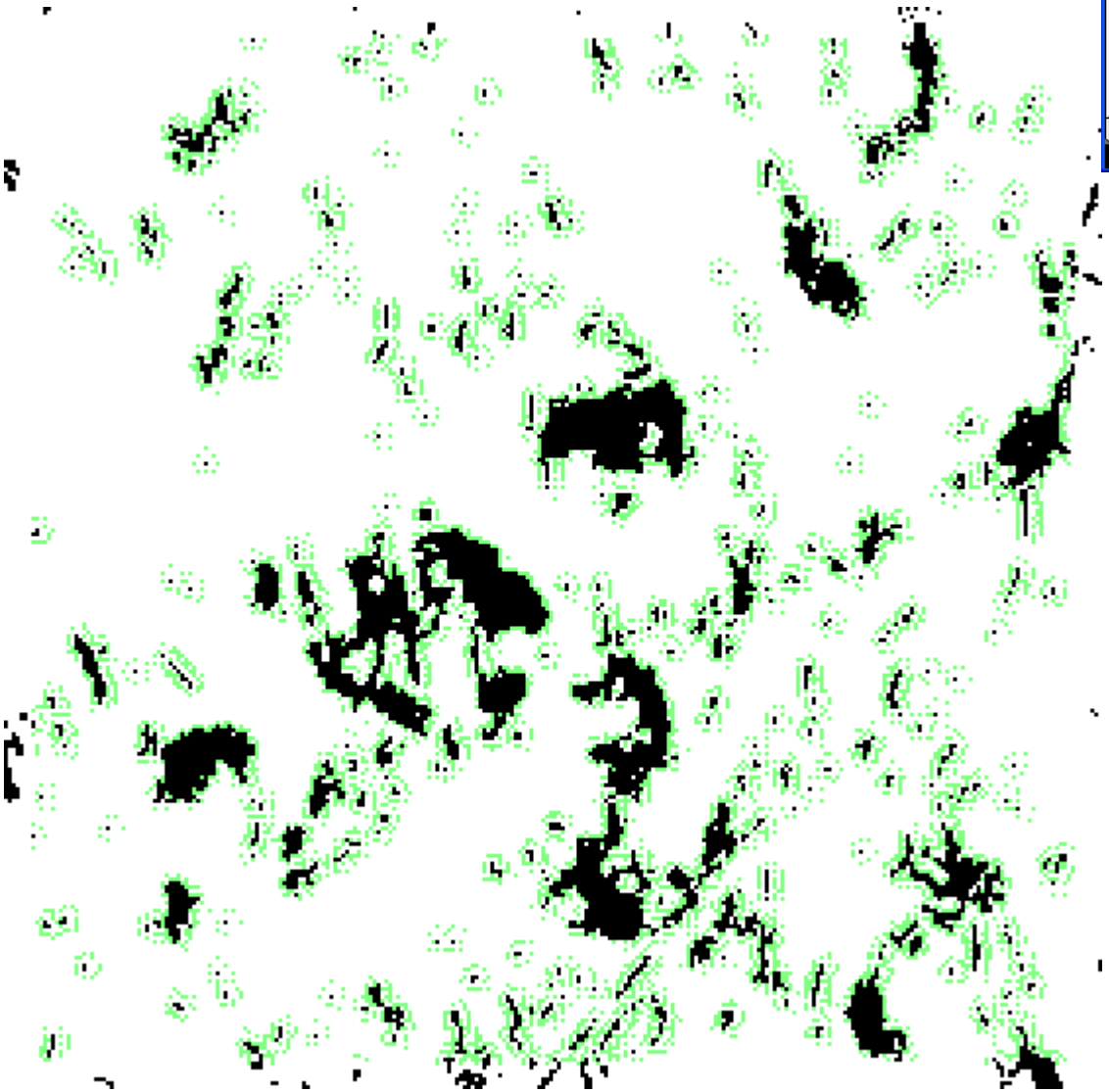
This example count intercepts in grey levels with a boundary detection for each local contrast greater than 50 grey levels

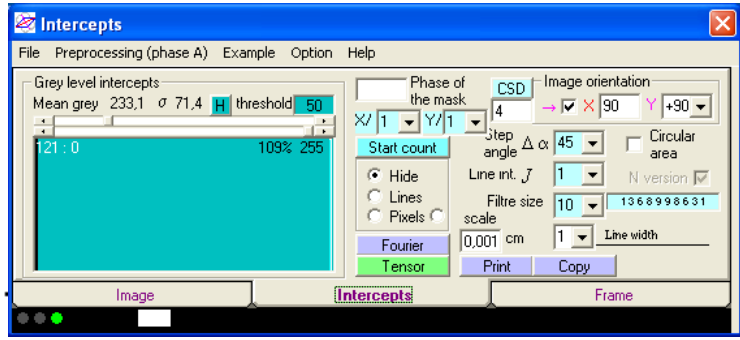


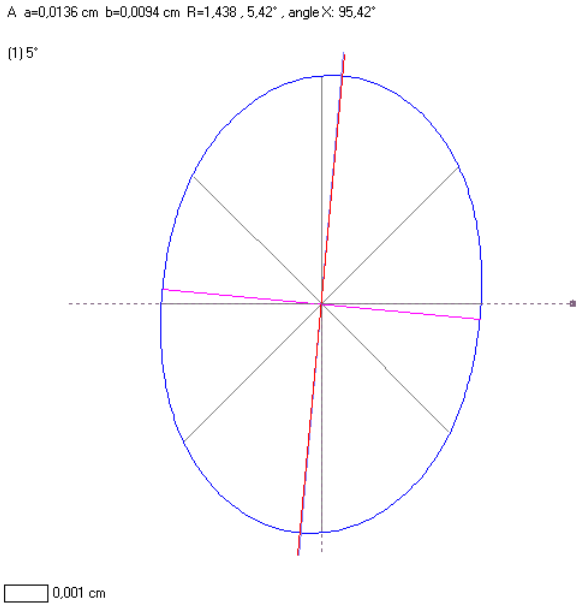


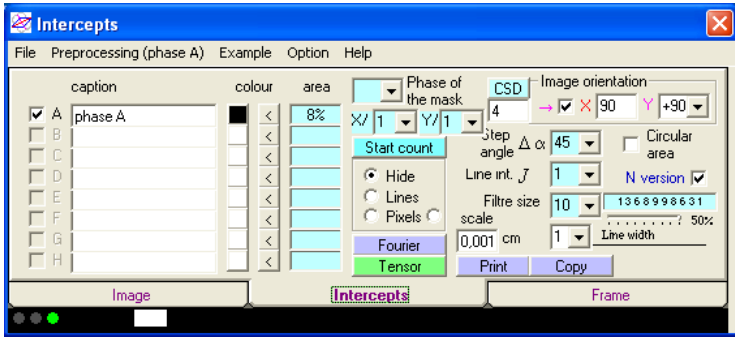
This example count intercepts in grey levels right after thresholding

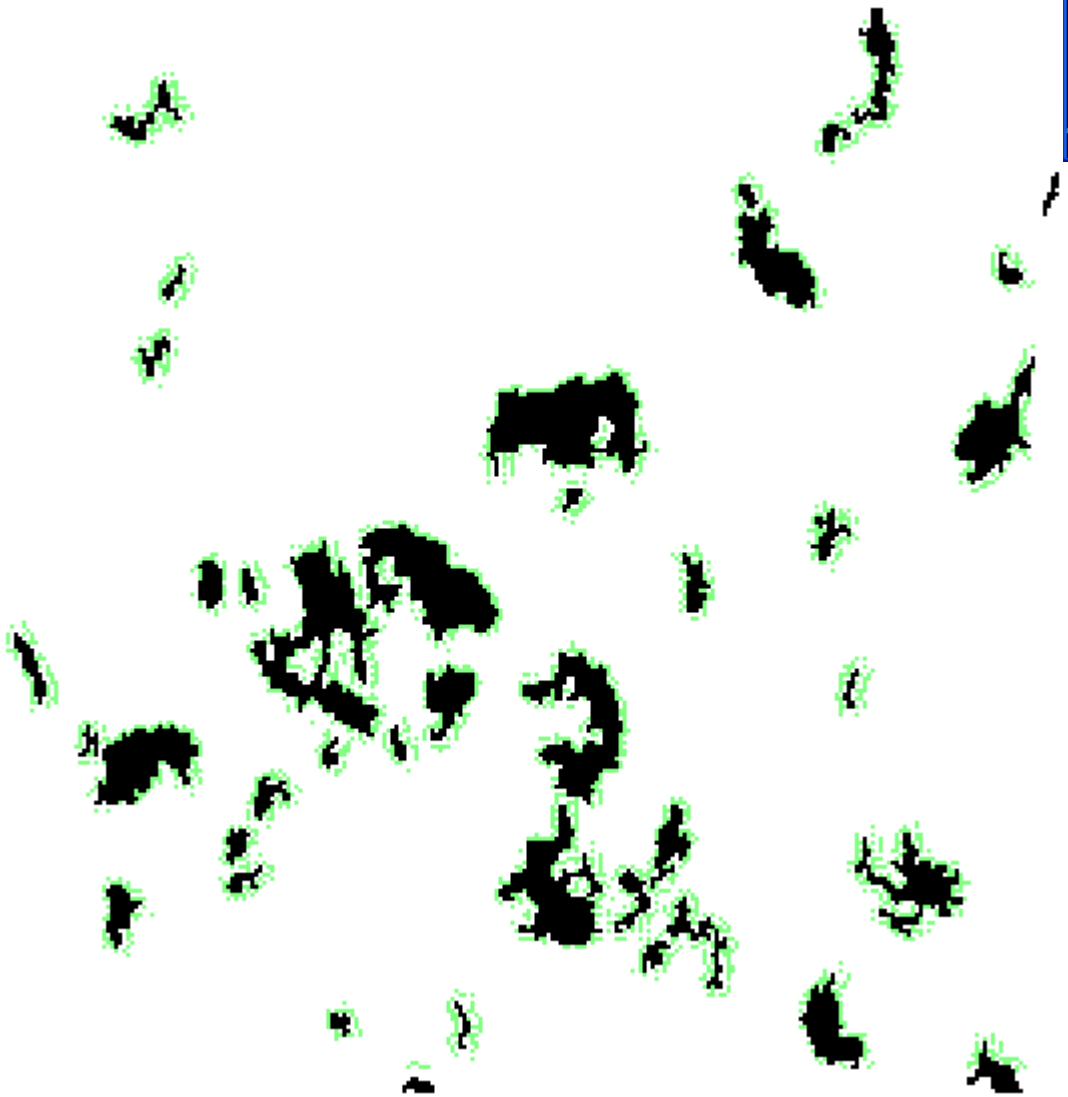


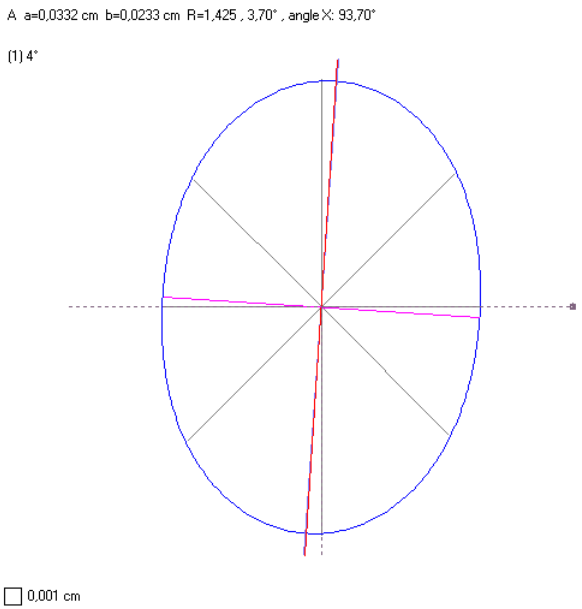


This example count intercepts in grey levels small holes and objects filtering

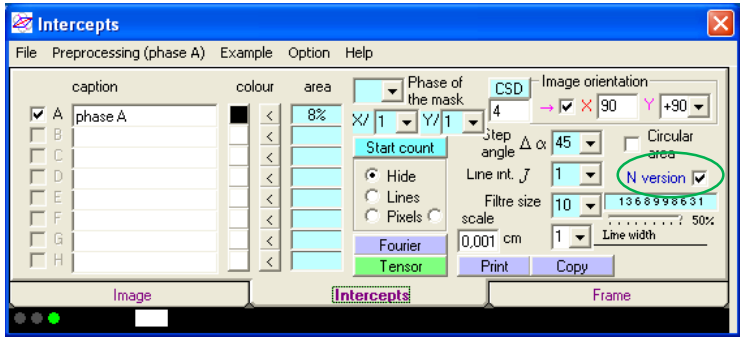


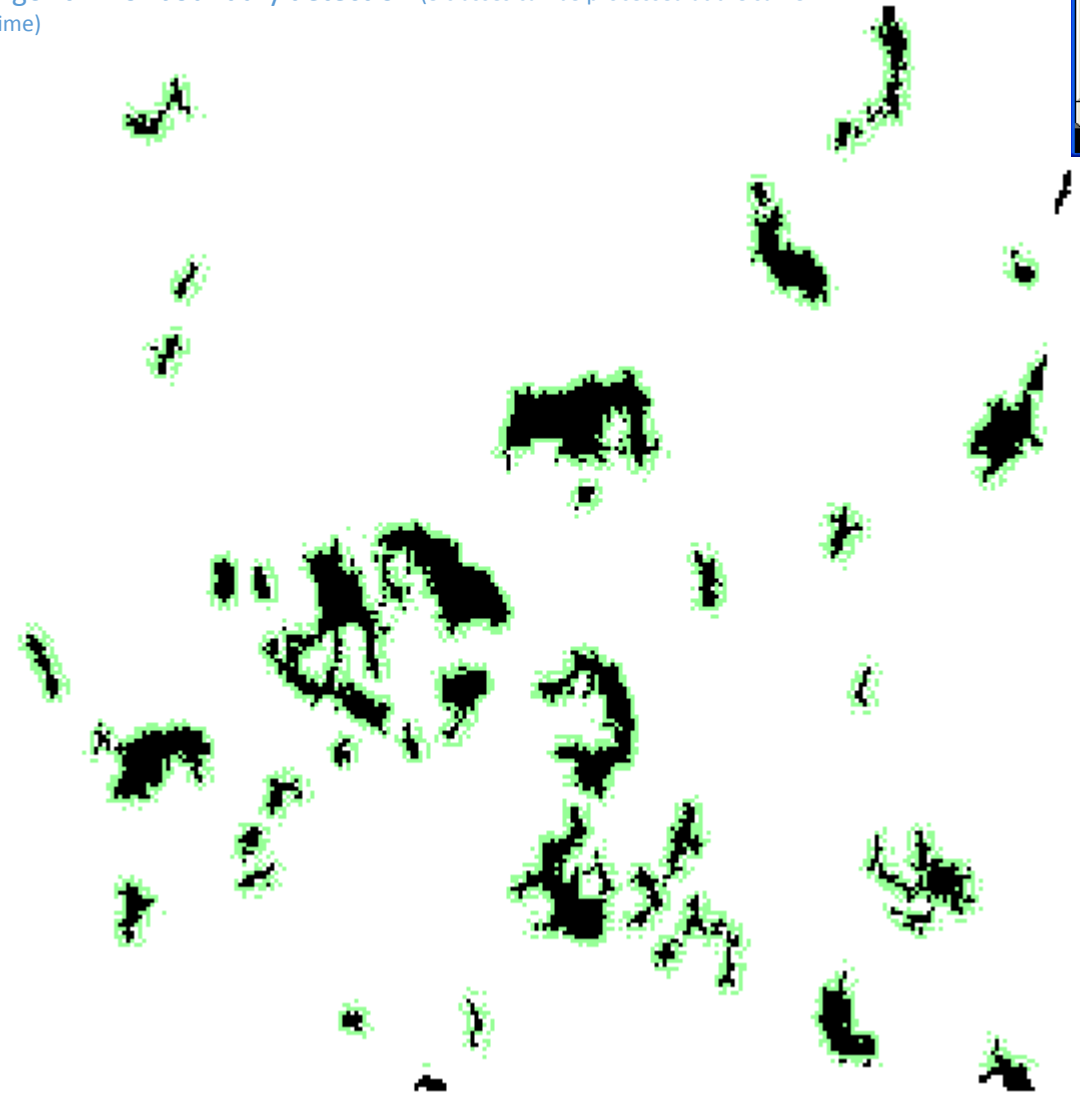



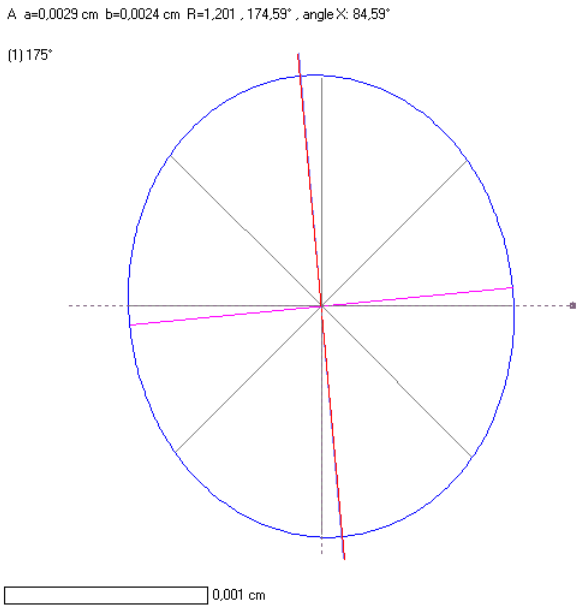



This setting detect all small digitations of grains and aggregates boundaries

This example count intercepts in binary mode (remove gray scale selection in option see slide 3) for each class with the new grey scale algorithm of boundary detection (8 classes can be processed at the same time)

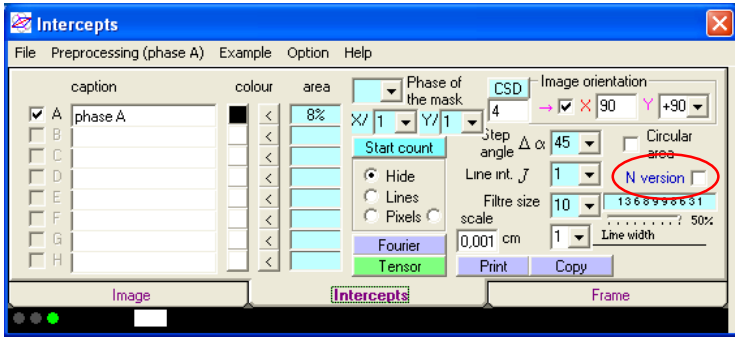


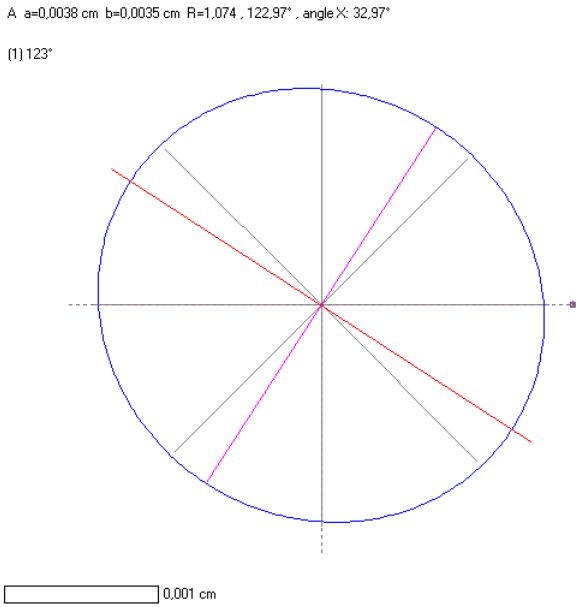






This setting also detect all small digitations of grains and aggregates boundaries in binary mode

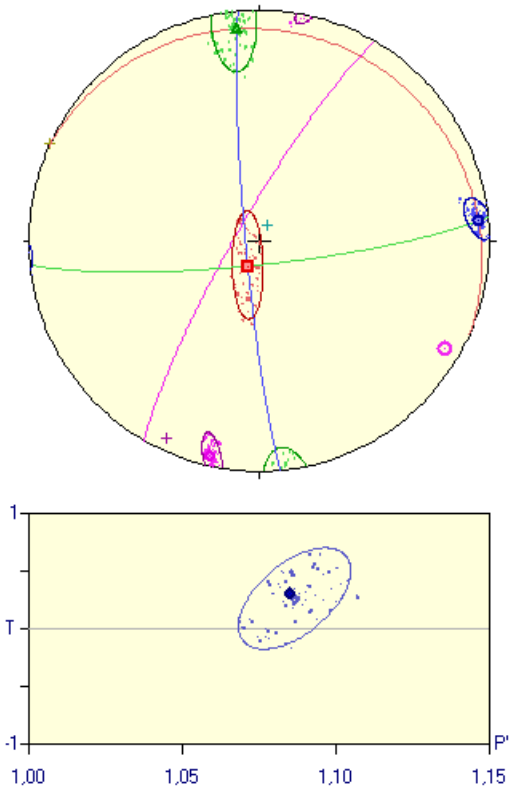
This example count intercepts in binary mode for each class with the old algorithm of phase boundary detection (8 classes can be processed at the same time)



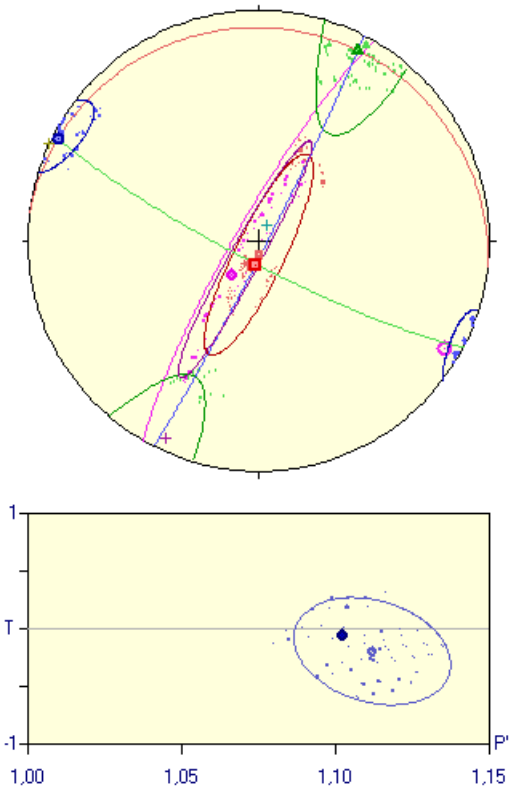

This setting do not detect the smallest digitations of grains and aggregates boundaries which are seen as noise and removed when thinner than 4 pixels

Greyscale intercepts analysis of the whole greyscale image



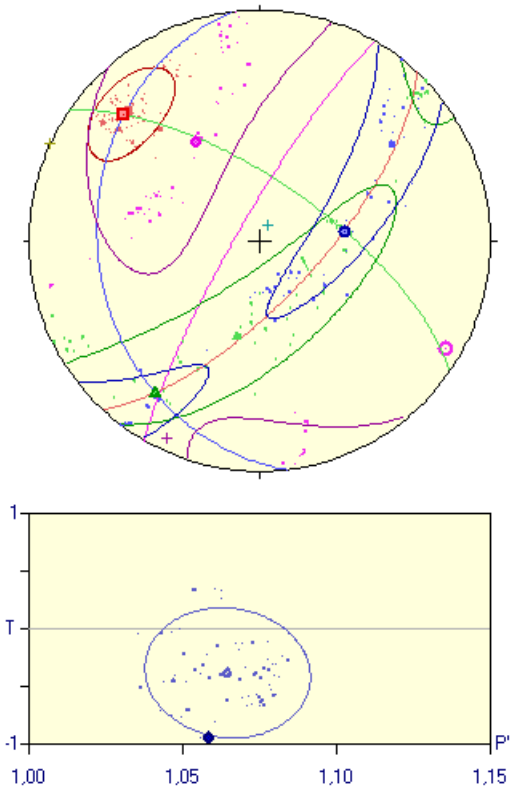

It gives the whole SPO of the rock (mainly plagioclase)

Greyscale intercepts analysis of the opaque grains with greyscale algorithm




It gives the SPO of the finest grains forming larger opaque aggregates

Intercepts analysis of the opaque grains with classified image and binary algorithm




It gives the SPO of the main surface area weight of opaque aggregates