

# PHAPS 1.1 Manual

(PHase maPS)

Some of the steps are still somewhat sluggish. I am currently working on these to speed up the process. There are currently a bit too many buttons to press. These will be also reduced in the next iteration of the program. Please read also the accompanying paper Hezel (2010), which is also provided on the website.

If you experience any difficulties or have any suggestions, please contact me using the email: [info@cosmoprograms.com](mailto:info@cosmoprograms.com).

## element map input

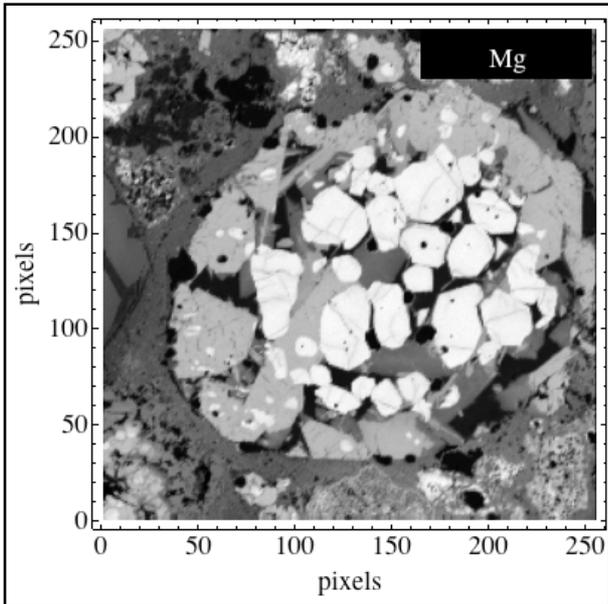
*image1* and *image2* are the two input cells for the element maps. Each input file need to be a text file that contains the element intensities as a 2x2 matrix. If the input file contains a header, this can ignored by typing in the number of header lines in the *headerlines* cell. You need to click on *Load maps* to load the maps into PHAPS and *Show maps* to display them in the right window.

```
Dataset Comment :
Comment :
Analysis Date : 27/08/2008 15:08:55
Project Name : Damonic Hezel
Sample Name : Kainsaz
Pha Parameters :
  Bias   Gain   Dtime  BLin   Wind   Mode
Sp1(Cr Ka) 1305  803   3     560   1724  Inte
Sp2(Na Ka) 1313  2501  3     560   2840  Inte
Sp3(Ti Ka) 1887  1061  3     560   2540  Inte
Sp4(Ni Ka) 1298  355   3     953   2252  Inte
Sp5(Mn Ka) 1895  1181  3     560   1906  Inte
EDS: Mg Ka
EDS: Al Ka
EDS: Si Ka
EDS: S Ka
EDS: Ca Ka
EDS: Fe Ka
Peak Position : Sp1 26173, Sp2 46359, Sp3 31417, Sp4 41177, Sp5 24025
Start : X = 12501 Y = 26555 Z = 363
Stop :
Dwell Time : 0.2 Sec
Acquisition type : Stage Grid
Step Number : 256
Line Number : 256
Beam Size : 0 µm
Step Size : 2.

Y Unit : cts
Image : Mg Ka Eds

5632  5521  5744  4478  4259  4471  4224  2020  2444  3688  1051
      225   197   393  1606  2699  4086  3930  4730  4757  4660
      2829  2836  2524  3003  2955  3041  2996  2436  1905  984
      2013  836  1121  1441  1443  1593  1626  1669  985  1175
      1666  1550  1473  1607  1647  1618  1548  1613  1698  1735
      1887  1889  1875  1880  1817  1929  1879  1885  1913  1980
      750   756  1476  1898  1886  1838  1834  1856  1971  1601
      2324  2267  2175  2197  2289  2199  2290  2290  2294  2285
      1540  1028  1787  1586  1539  2056  1882  1956  1849  1898
      1689  3297  4005  5234  6461  6704  6725  6724  6322  5293
```

*Input file for one element map, including a 39 line long header.*

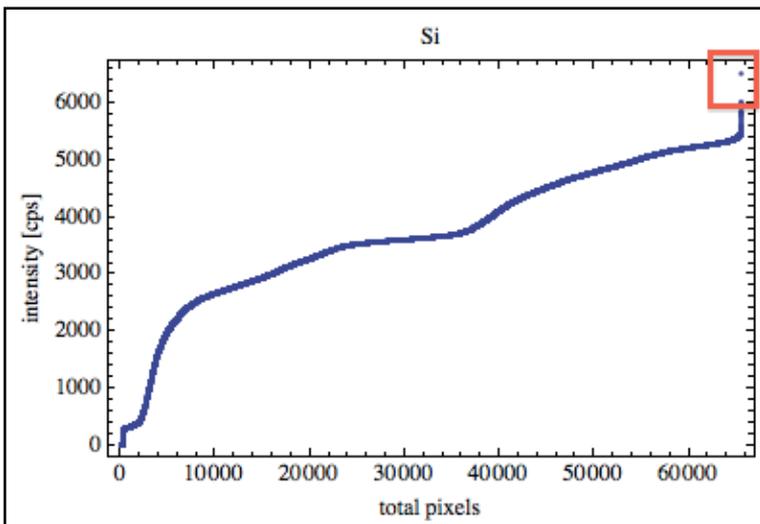


The example Mg element map.

### pixel intensity plots

There might be few pixels with unusual high intensities. These will squeeze all other pixels into only few bins in the subsequent histogram and make the interpretation of these difficult. This step allows to ignore the pixels with unusual high intensities. The pixel intensity diagrams plot the number of pixels of same intensities on the y-axis and the intensity on the x-axis.

The *Load pixel intensity plot* and then *Show pixel intensity plot* buttons need to be pressed to bring up these plots.



Pixel intensity plot. Few pixels with unusual high intensities indicated.

The few pixels with unusual high intensities are indicated in the diagram above. To ignore these, the box *cutoff a* must be ticked and the intensity be given in the *at limit* cell. The *Load pixel intensity plot* needs to be pressed again to take effect of the desired changes. The *Show pixel intensity plot* buttons need to be pressed to show the modified plots.

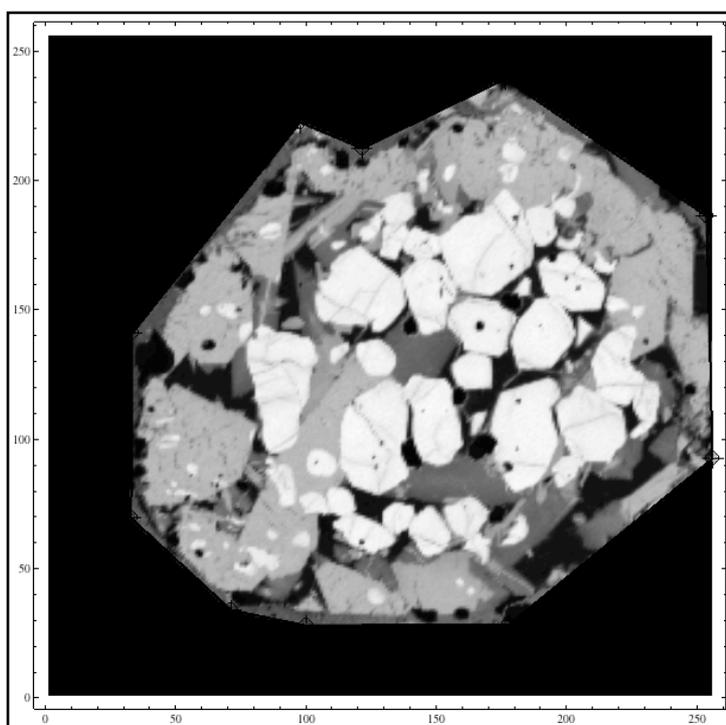
### cutout object

This feature is required only if modal abundances of a certain object within the map are of interest. This feature can be ignored when modal abundances of the entire map are desired.

A polygon is used to cut out the object of interest. The number of edges for the polygon needs to be input first. Then the *Load cutoutoutpoints* button needs to be pressed and the cutout tool box be ticked. The points in the lower left corner can then be moved around and placed around the desired object. This is a bit a slow process in the current version, but is the next thing to be fixed for the next version.

When the polygon is in place, the buttons *cutout object* needs to be pressed. If you want to see the result, press the *Show cutout object* button.

Untick the *cutout tool* box when finished, otherwise the subsequent *histogram tool* won't work.



*The object of interest cut out using a 10 edge polygon.*

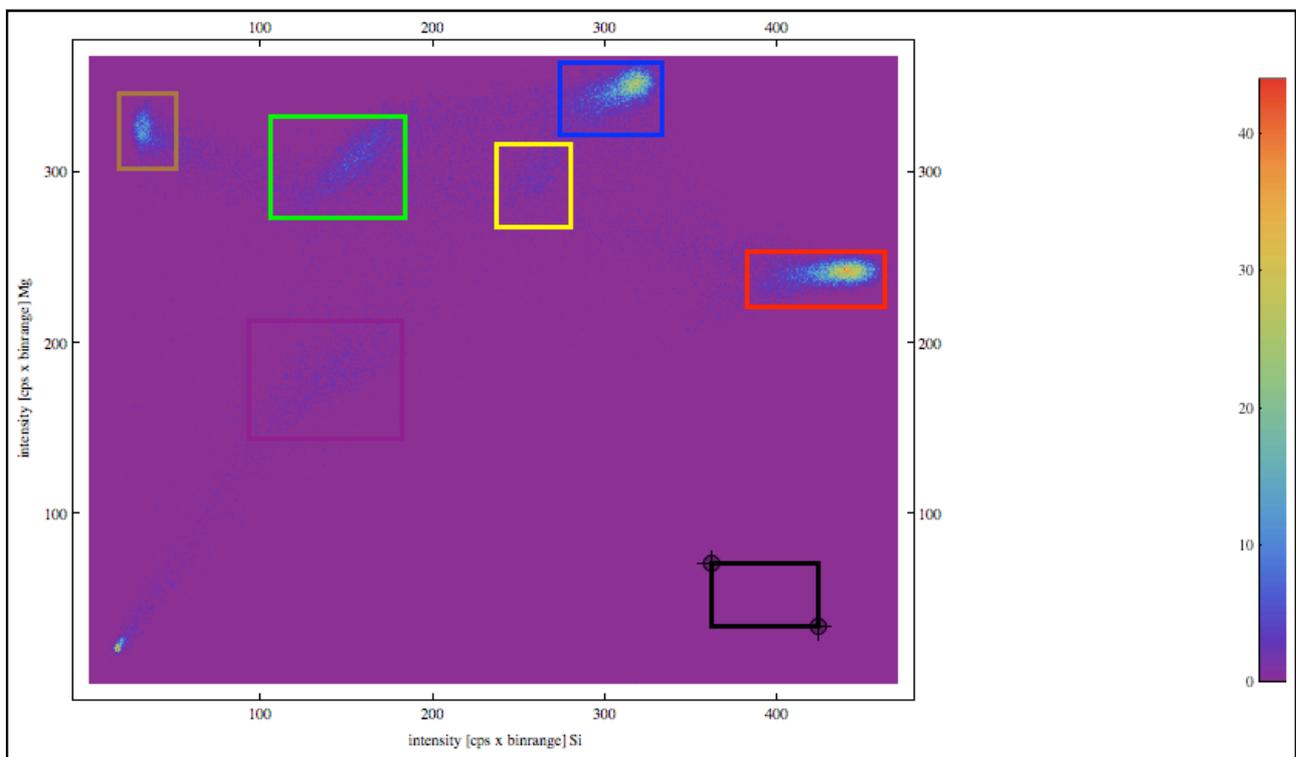
### histogram

The histogram is a plot of the two element abundances on the x- and y-axis. Similar intensity pairs point on the same point in the x-y-space. The number of similar intensity pairs is colour coded and the colour code is given in the side bar.

It is advisable to bin the element intensities: this reduces the calculation of the histogram significantly and the histogram peaks are more pronounced. The size of the bins can be input in the *binrange* cell.

Then press the *Make histogram* and *Point reset* buttons and tick the *activate histogram & box tool* box, this will bring up the histogram. The intensity hotspots represent individual phases of the element maps. The black rectangle with two active edges is the selection tool to place rectangles across intensity hotspots. The intensity pairs within the selected rectangles will later be used to produce the phase map. Moving the black rectangle across a phase hotspot and pressing the *Load* button will place a coloured rectangle across the intensity hotspot (maybe you need to move the black rectangle to see it). If the rectangle is incorrectly placed, adjust the black rectangle and press *Load* again. If you want to place another rectangle, tick another *rectangle* number place the black rectangle across the desired intensity hotspot and press *Load* again. A new rectangle of another colour will be placed across the intensity hotspot (again, maybe you need to move the black rectangle to see it). It is possible to place a total of 6 rectangles.

Untick the *activate histogram & box tool* box when finished, otherwise the phase map cannot be displayed.



6 boxes placed across 6 phase hotspots. Binrange 15.

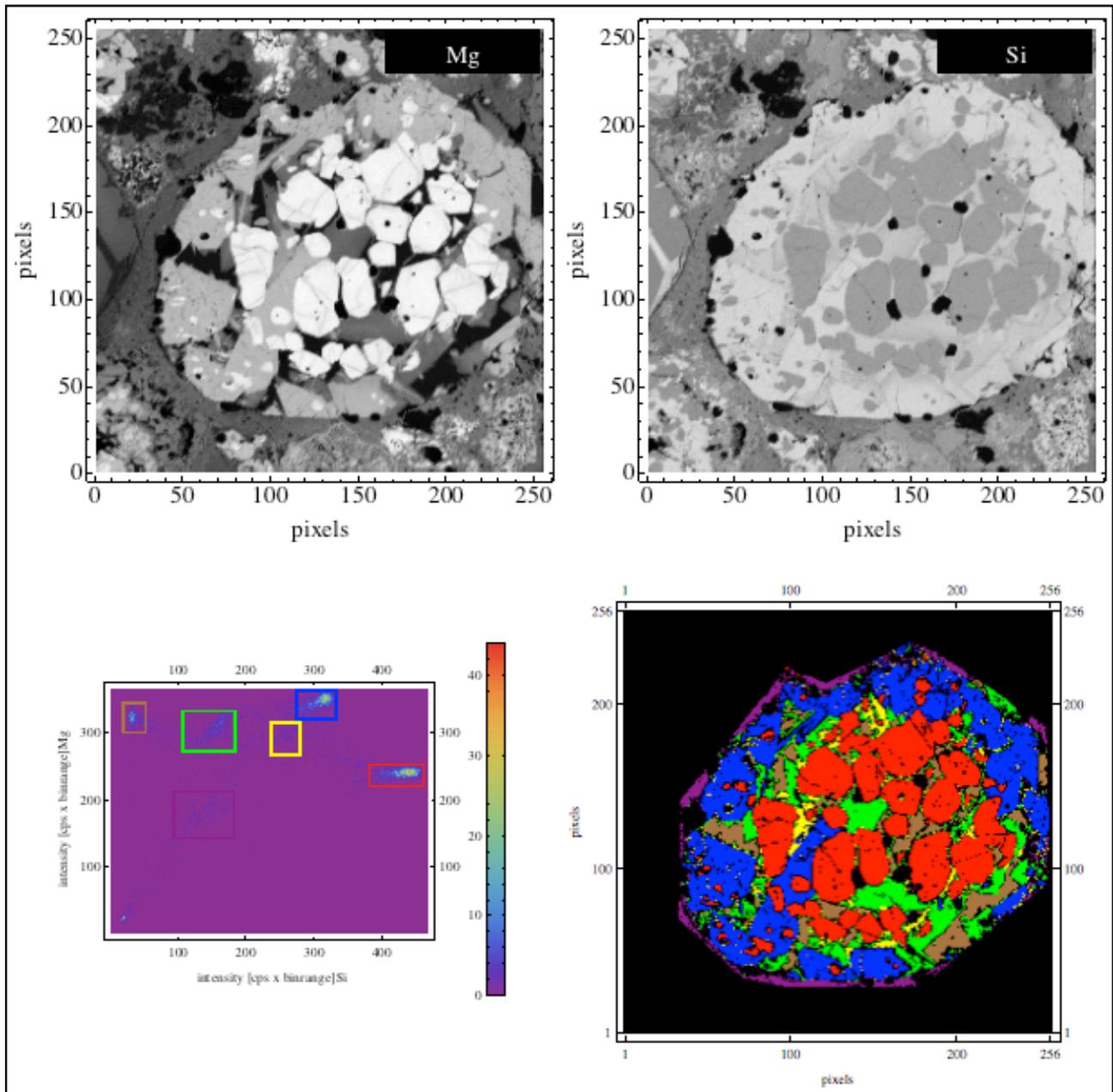
### background correction

There might be a number of intensity pairs inside the placed rectangles that are scattered around the intensity hotspots and that do not belong to the phases represented by the phase hotspots. These intensity pairs can be regarded as some kind of 'background noise' and usually represent mix analyses, analyses close to cracks, etc. (cf. Hezel, 2010). Each of those intensity pairs generally occur only once or twice. The 'background correction' feature allows to exclude all intensity pairs below a certain frequency, called the *lowerlevel*. Hence, only intensity pairs that occur more often than the *lowerlevel* within the rectangles are used to produce the phase map. This *lowerlevel* can be

defined for each rectangle separately. After input of all *lowerlevels*, the *Load lowerlevel* button must be pressed.

### results

Press the *Produce phase map* and *Print results* button to display the modal abundances. Pressing the *Show all* button will bring up the element maps, the histogram and the phase map.



*Final output.*