



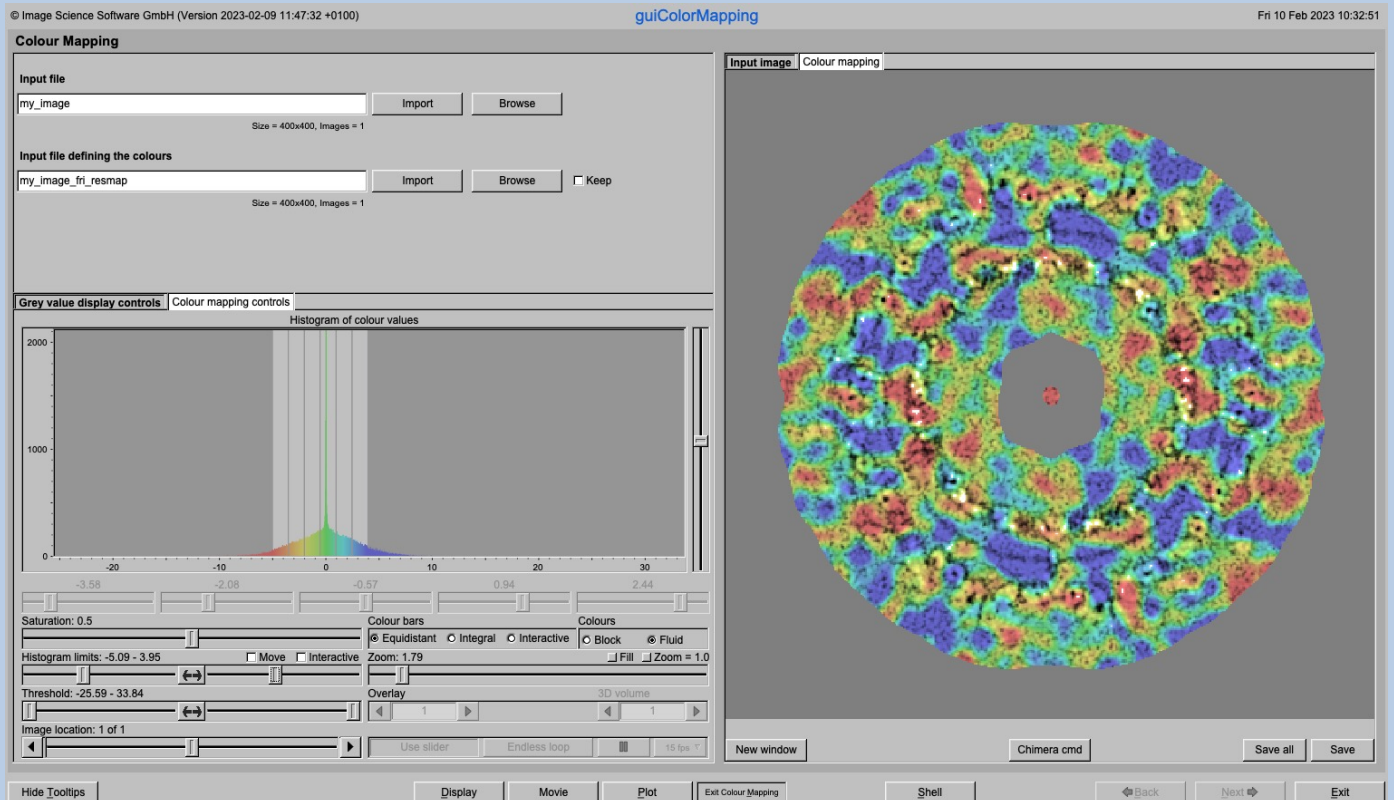
**gui** **IMAGIC**  
Colourised Display

# Colour Mapping

## A Brief Introduction

Version 10-Oct-2023  
[www.ImageScience.de](http://www.ImageScience.de)  
© Michael Schatz (Image Science)

# The IMAGIC guiColourMapping program



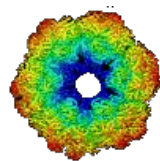
The **guiColourMapping** program visualises image / 3-D volume stored in an IMAGIC or any 3DEM formatted image file and colours this display using a colour map stored in a second input file..

This is a brief hands-on on how to use IMAGIC GUI oriented programs and how to work with **guiColourMapping**:

## CONTENT:

- IMAGIC GUI programs
  - guiColourMapping
  - Error hints
- How to use IMAGIC GUI programs  
Colourised display of images/3D volumes  
How to send us feedback





**IMAGIC**

# **GUI Programs**



# The Working Directory

If **guiColourMapping** is called from the programs list, by using an icon or in a command line the working directory will be your default system directory.


If **guiColourMapping** is called by an IMAGIC command in a terminal / command window

```
IMAGIC-COMMAND : guiColourMapping
```

As usual, any unambiguous abbreviation is allowed:

```
IMAGIC-COMMAND : guiCOLOUR
```

If you want to change this directory use the “Exit Display” button

A rectangular button with a light gray background and a dark gray border. The text "Exit Colour Mapping" is centered on the button in a dark gray font.

to navigate to the “Start” page where you can specify the working directory of **guiColourMapping**.

All output files will be stored in the working directory which you have specified on the start page.

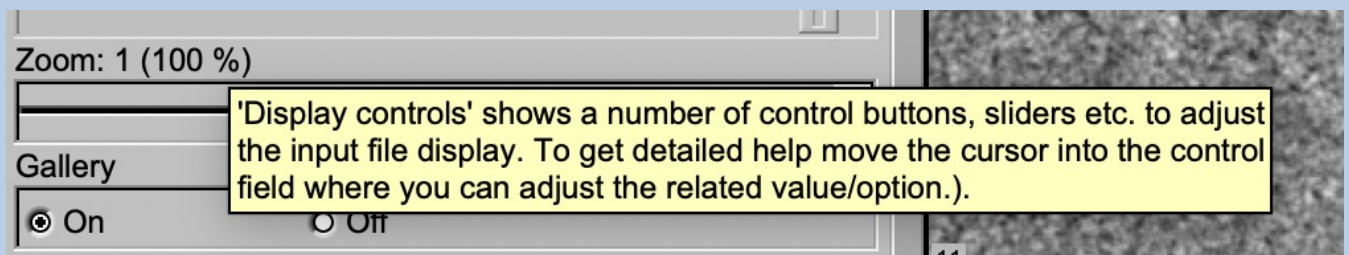
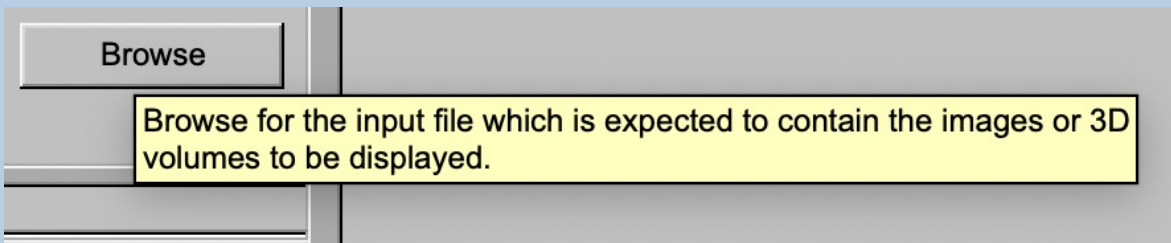
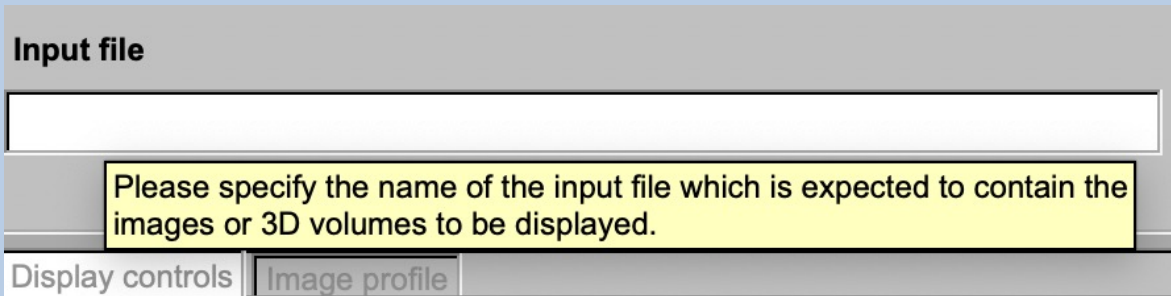
Input files can be chosen from other directories.

Click the “Display” button to return to the “Colour Mapping” page.

A rectangular button with a light gray background and a dark gray border. The text "Colour Mapping" is centered on the button in a dark gray font.

# Help

Move the cursor on (nearly) any item (questions, radio buttons, display windows...) shown on the pages and you will get context sensitive help.



# Input Files

Usually the input files on each page are output file(s) from the previous page(s) and are suggested automatically.

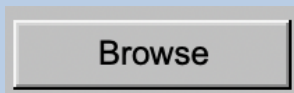
You can, of course, always use other input files names and even use other input directories.

To specify the input file you can enter the name of the file into the text field:

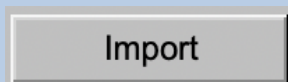


A screenshot of a GUI window. The title bar reads "Input image(s)". Below the title bar is a text input field containing the text "my\_images". To the right of the text field are two buttons: "Import" and "Browse".

Or use the “Browse” button to browse for an IMAGIC image file (see net page):.



If the input file is in an IMAGIC but a 3DEM file use the “Import” button to create an IMAGIC image file. Note that a separate “EM2EM” window will open to calculate this conversion.

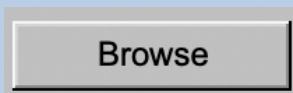


Refer to the “guiEM2EM manual” for further help.

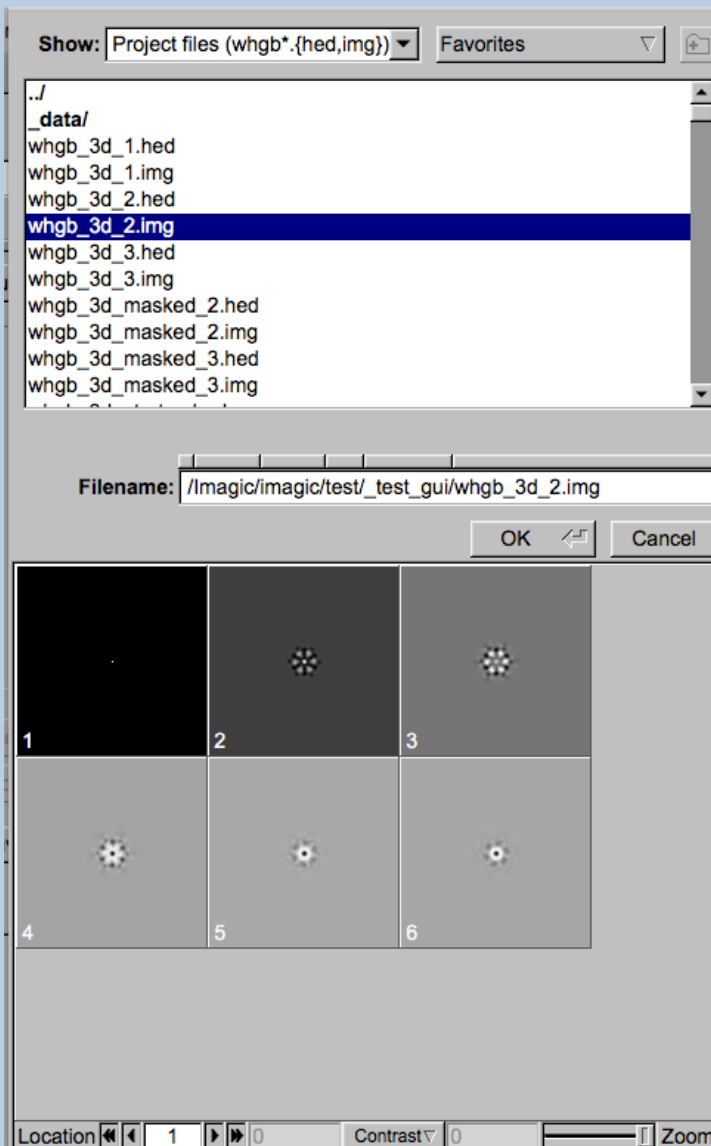


# Input File Chooser

In most of the pages you are asked for input file(s) and you will find a “Browse file” button:

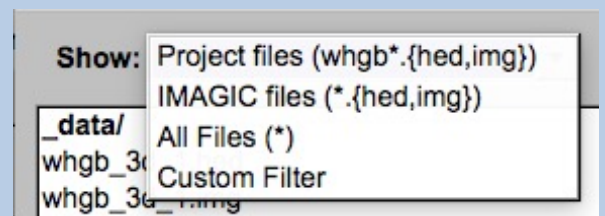


Pressing this button will open the IMAGIC file chooser:

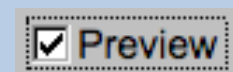


Choose the wanted file by clicking its name

You can use a pre-selection of the files shown:



If the images are in IMAGIC format you can get a pre- view of the images.

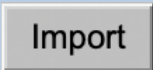


Note that you can store your directory in “Favorites”.

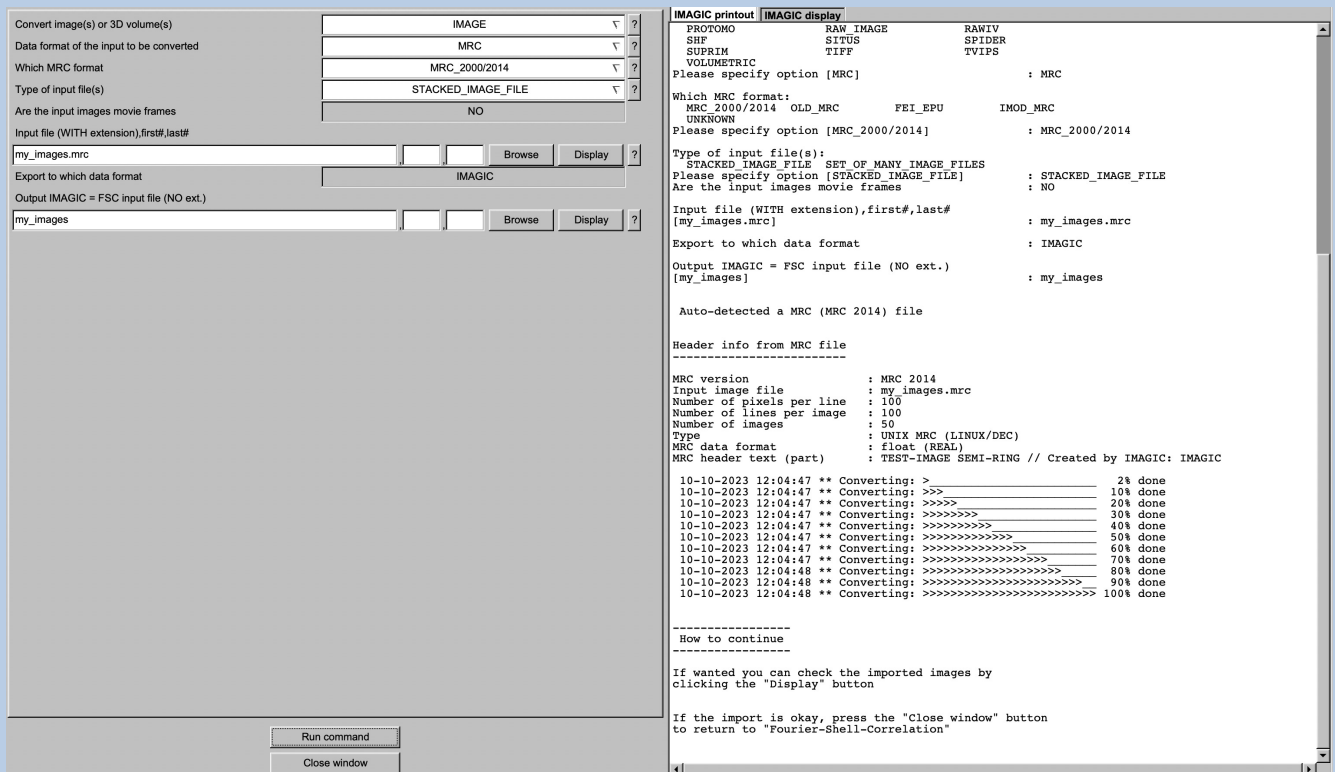


# Import Button

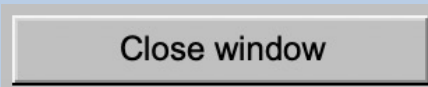
You can use the “Import” button to import the input images/3D volumes from any 3DEM format. The “Import” button which is located above the text field specifying the name of the related file.



An additional “IMAGIC EM2EM” page will open. Specify all parameters needed and click the “Run command” button to import the images / 3D volumes:



Click the “Close window” button to exit this additional window:



Refer to the **guiEM2EM** manual to get further help.





# The “Start” Page

**guiColourMapping** starts with the “Colour Mapping” page.

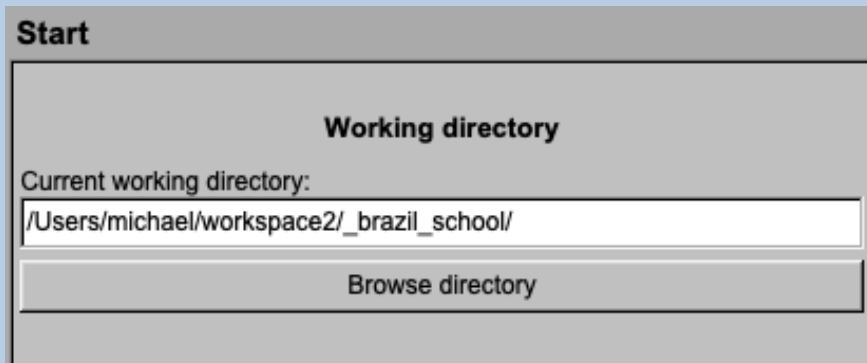
If you would like to adjust some **guiColourMapping** programs setting before importing the images use the “Exit Colour Mapping ” button to navigate to the “Start” page.

Exit Display



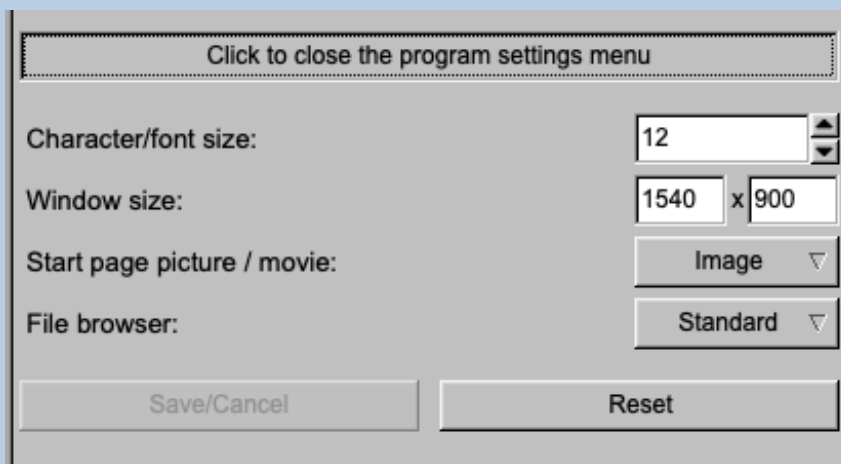
On the “Start” page you can set some program parameters:

a) the working directory

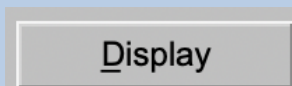


b) the size of the **guiColourMapping** program windows and/or text  
(a re-start is needed)

c) the type of file browser



Having adjusted all setting use the “Colour Mapping” button to navigate back to the “Colour Mapping” page.



# The Toolbar

There is a toolbar at the bottom of each **guiColourMapping** page.

The toolbar buttons:

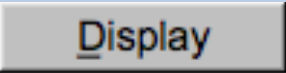


Hide Tooltips

Show or hide the context sensitive tooltips  
(the help text may sometimes disturb)

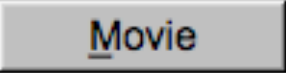


Show Tooltips



Display

Open a DISPLAY page to visualize IMAGIC images.  
Refer to **guiDISPLAY**.




Movie

Open a MOVIE page (display in an endless loop).  
Refer to **guiDISPLAY**



Plot

Open a PLOT page to show IMAGIC curves.  
Refer to **guiPLOT**



Exit Colour Mapping

Go to the “Start” page  
Go back to the “Colour Mapping” page



Colour Mapping



Shell

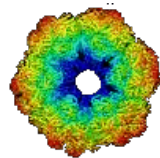
Run a shell / terminal page command



Exit

Exit **guiColourMapping**





**IMAGIC**

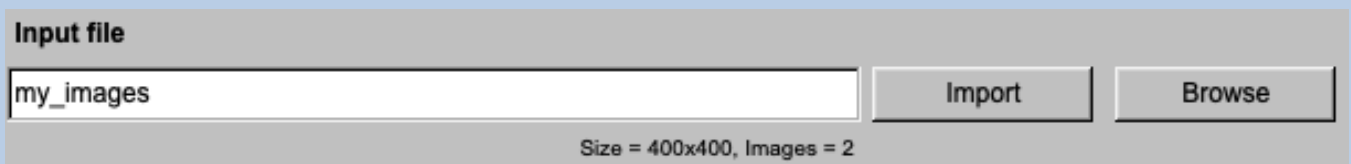
**guiColourMapping**



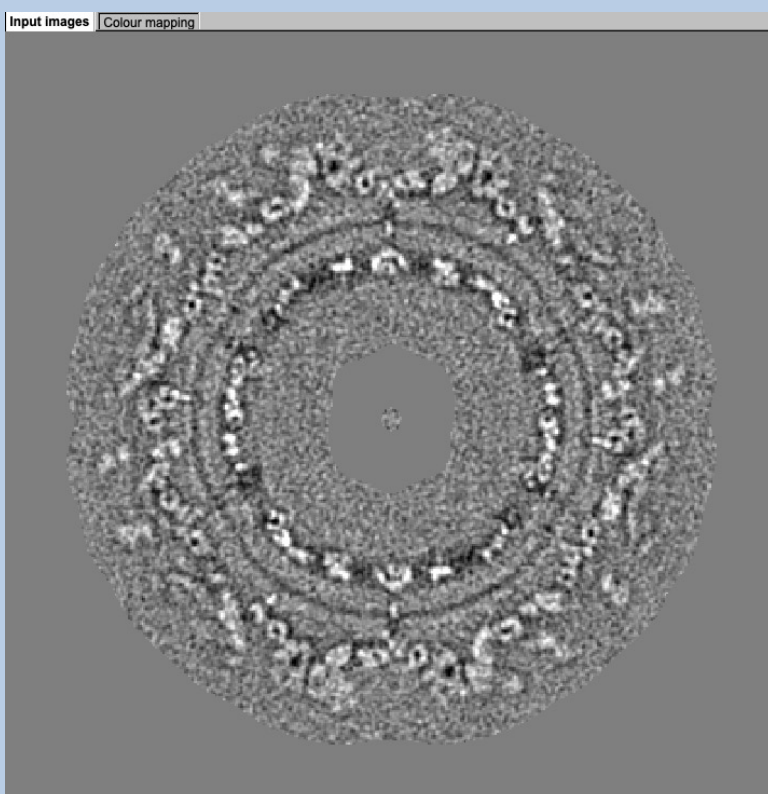
# Input to be displayed and colourised

You have to specify the file with the images / 3D volumes to be displayed and the file which contains the colour map to be used to colourise the displayed images / 3D volumes.

You can either enter the name in the text field or use the “Browse” or “Import” button. Note that the images / 3D volumes of this file will be displayed and colourised.



The image / 3D volume is displayed as as usual IMAGIC grey scale image / 3D volume on the right hand side. The name of the related display tab is “Input images” or “Input 3D volumes”



## NOTE:

Before you open the second input file with the colour map it is a good idea to adjust the image displayed on the right hand side. Use the tab on the left-hand side called “Grey value display control”. But of course, you can later still use these controls to adjust the “grey value” image / 3D volumes. Refer to the chapter “Grey Value Display Controls” for details.

The screenshot displays the IMAGIC guiDISPLAY software interface. The main window is titled "Colour Mapping" and is divided into several sections:

- Input file:** A text box contains "my\_image", with "Import" and "Browse" buttons. Below it, the text "Size = 400x400, Images = 1" is visible.
- Input file defining the colours:** A text box is empty, with "Import", "Browse", and "Keep" (checkbox) buttons.
- Grey value display controls:** This section contains a histogram titled "Histogram of global densities". The x-axis ranges from -6 to 7, and the y-axis ranges from 0 to 100. Below the histogram, the minimum value is -4.5756 and the maximum is 4.55216. There are sliders for "Grey value scaling" and "Zoom: 1.79".
- Display options:** Includes radio buttons for "Min/max", "Interactive", and "5.0 x sigma". There are also options for "Display slices from" (bottom to top, left to right, front to back) and "3D volume" (Overlay, 3D volume).
- Image location:** A slider shows "Image location: 1 of 1".
- Buttons:** "Use slider", "Endless loop", and "16 fps" are located at the bottom of the controls panel.

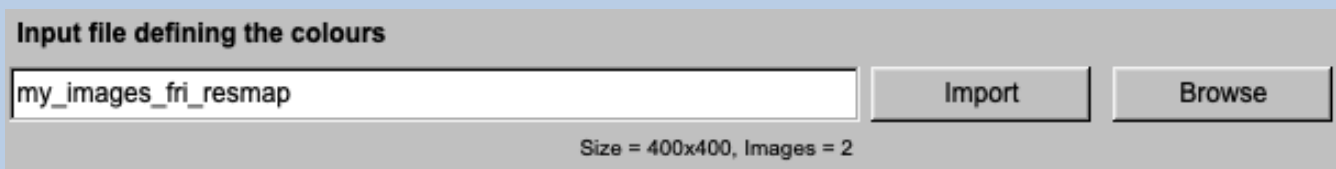
On the right side of the window, there is a large preview area titled "Input image" and "Colour mapping". It displays a circular, grayscale image of a biological specimen, likely a cross-section of a cell or tissue, showing concentric rings and internal structures.



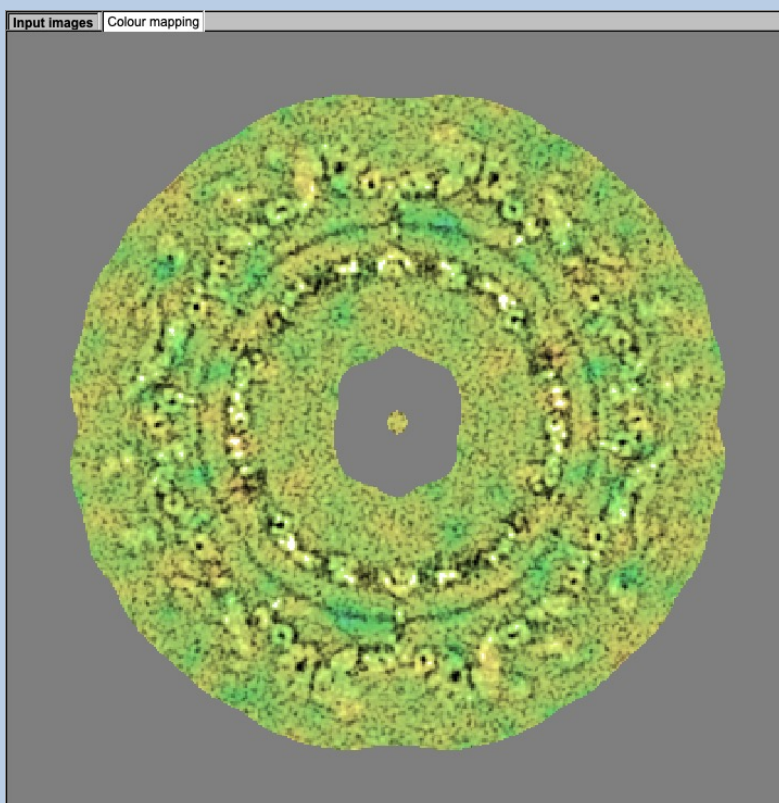
# Input Colour Map

The second input file you have to specify is the file containing the colour map to be used to visualise the images / 3D volumes in the first input file. Usually this colourmap is a (local) resolution / information map image created in guiFSC or with one of the IMAGIC commands: F-S-C , F-S-C, F-R-I or F-S-I.

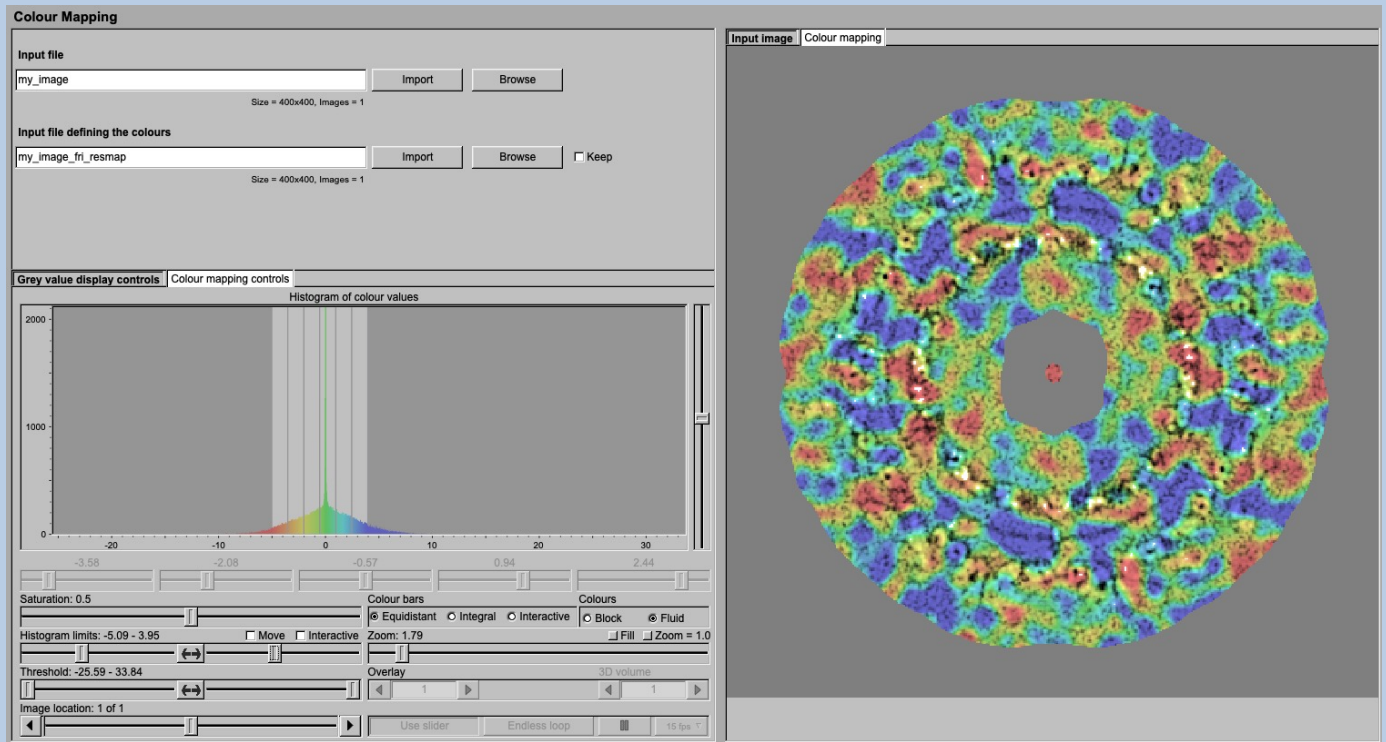
As before, you can either enter the name in the text field or use the “Browse” or “Import” button.



As soon as this file is loaded the display on the right-hand side will switch to the “Colour Mapping” display window.

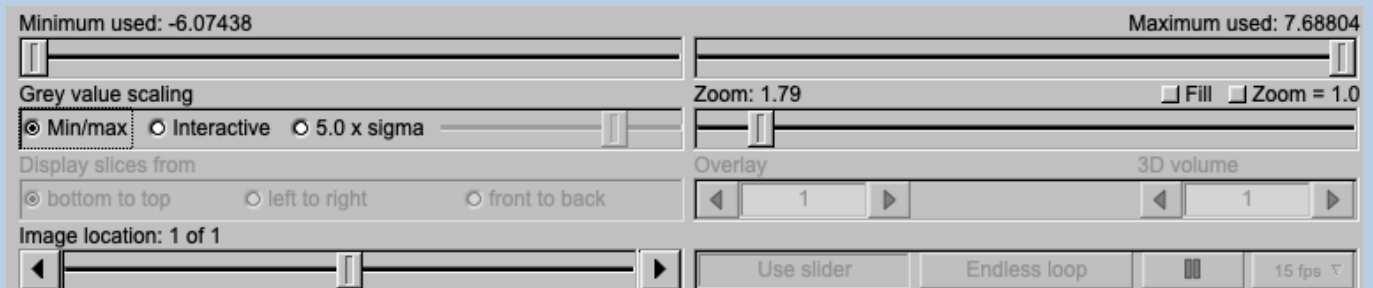


To adjust this display, especially the colours use the “Colour mapping controls” on the left-hand side. Refer to the chapter “Colour mapping Controls” for details.

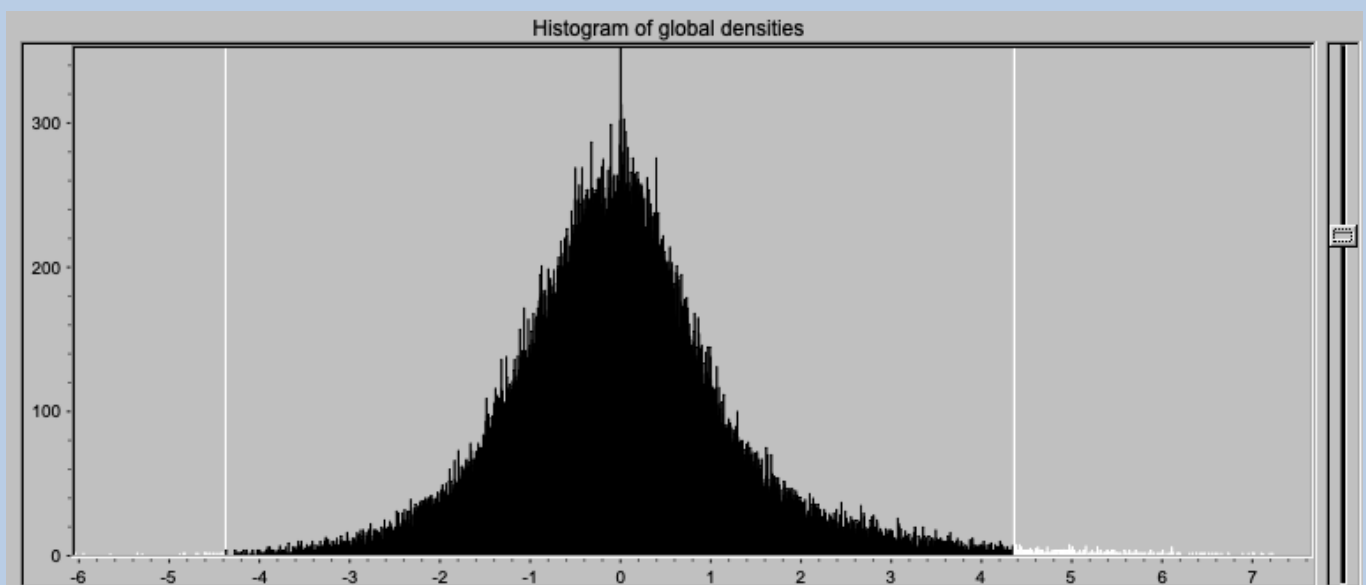




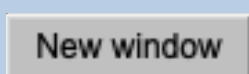
# Grey value display controls



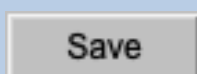
First have a look at the histogram of the input grey values to get an idea about the densities in the input images / 3D volumes. Note you can adjust the vertical scaling with the slider on the right-hand side.



As usual in GUI programs, you can enlarge this histogram window with the “New window” button and save this histogram as a JPG image clicking the “Save” button. The buttons are shown after the cursor is moved into the histogram.



Open the histogram in a larger separate display window



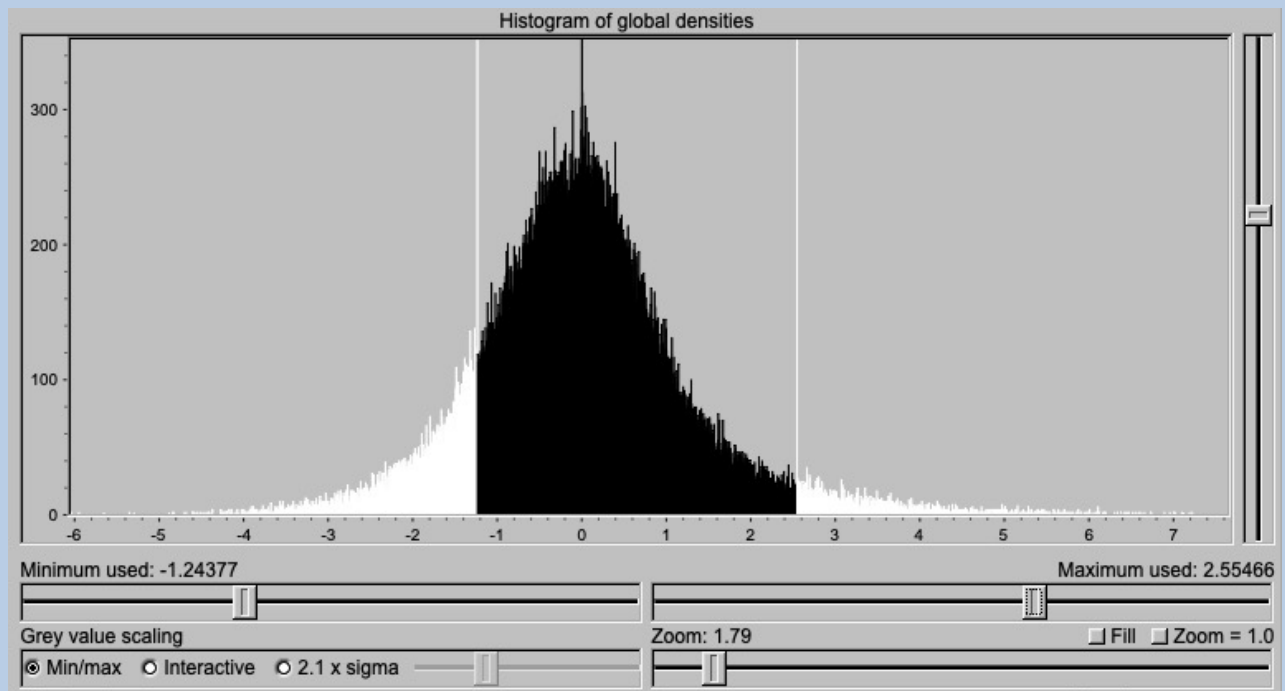
Save the current histogram display in a JPG image



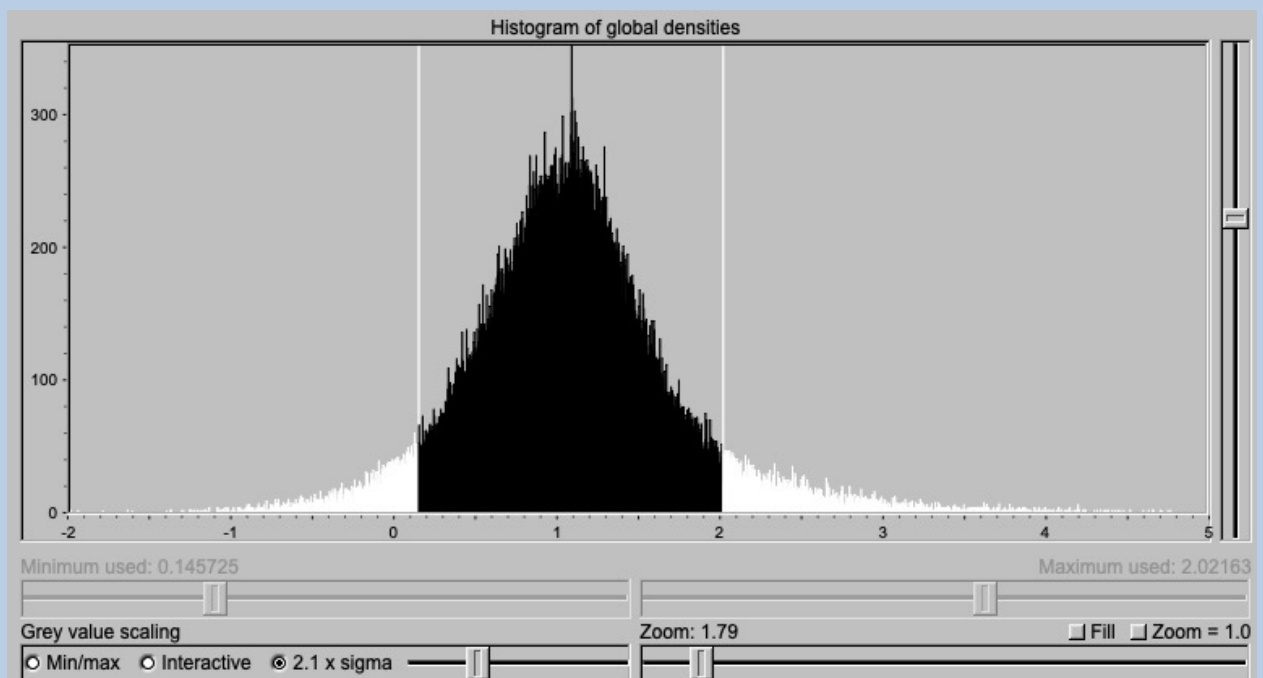
## GREY VALUE SCALING

Options are:

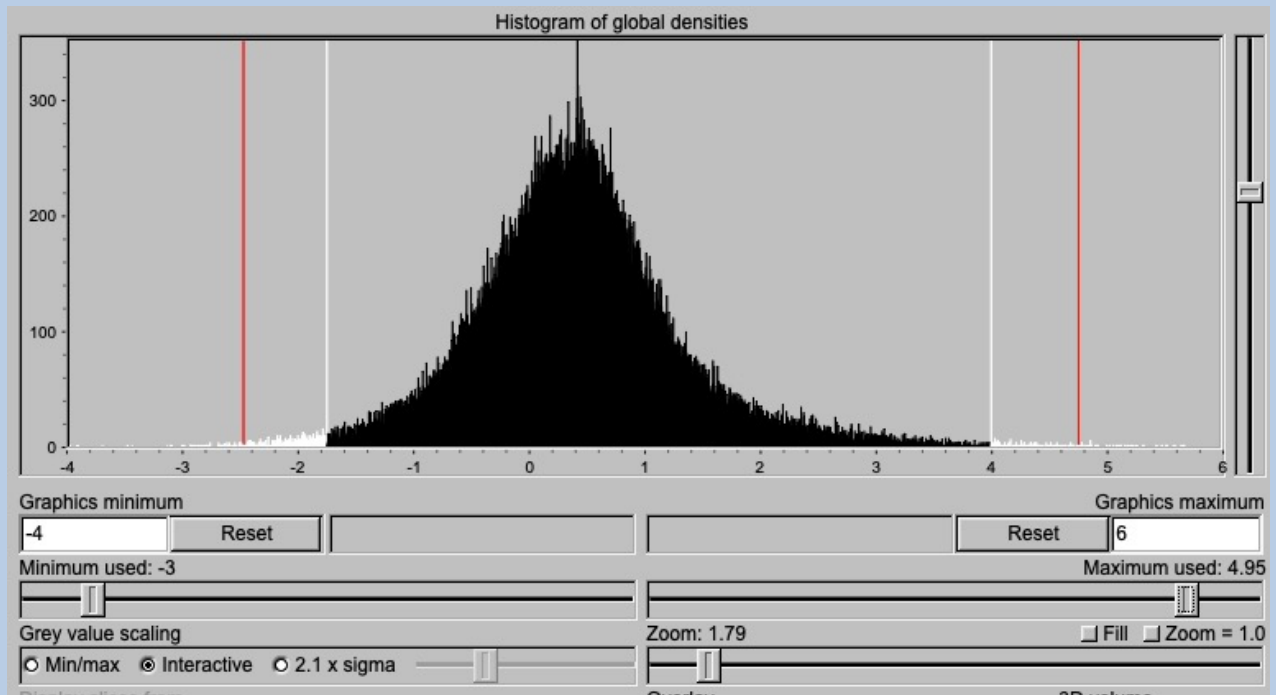
**Min/max:** Scale the grey-values to the minimum/maximum. You can change both, the minimum and maximum to be used with the related sliders



**N times sigma:** Use an amount of sigma to set the scaling limits. Use the slider to change the value of N



Interactive: Set the limits by giving numbers



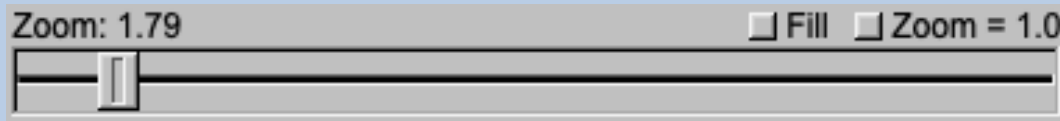
You can specify the minimum and maximum of the graphics by giving numbers. The given limits are shown as a red line. Within these limits you can adjust the display limits used by moving the related sliders.

Click the “Reset” button to re-set all “Grey value scaling” parameters you have changed.



## ZOOM:

Enlarge or reduce the displayed images. Use the slider to change the zoom factor.



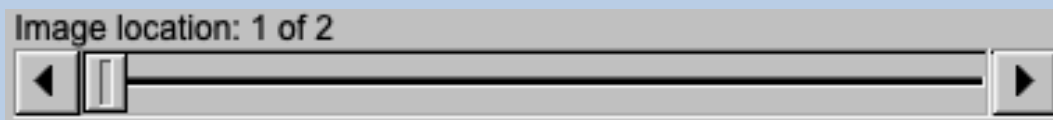
Additional options which can be clicked are

Fill:                    Fit image size to window size

Zoom = 1.0    Display the image 1:1

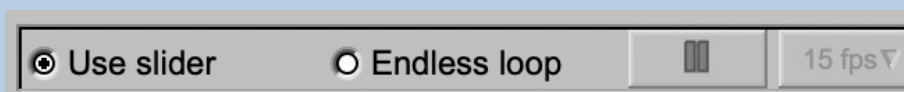
## IMAGE LOCATION – WHICH IMAGES ARE TO BE DISPLAYED:

Use the slider or the arrows to select the (first) image to be displayed in the display window on the right-hand side.



## DISPLAY OR MOVIE:

Images can be displayed using the slider (usual display)



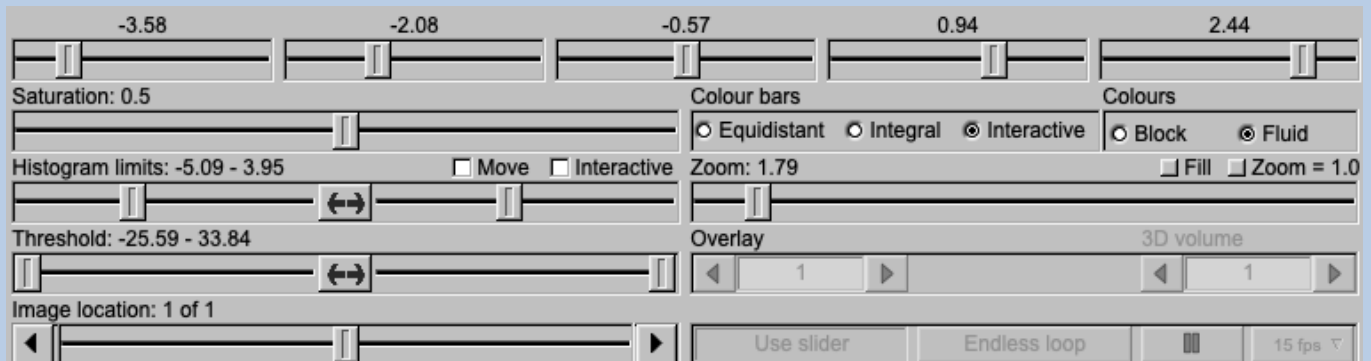
or in an endless loop (movie):



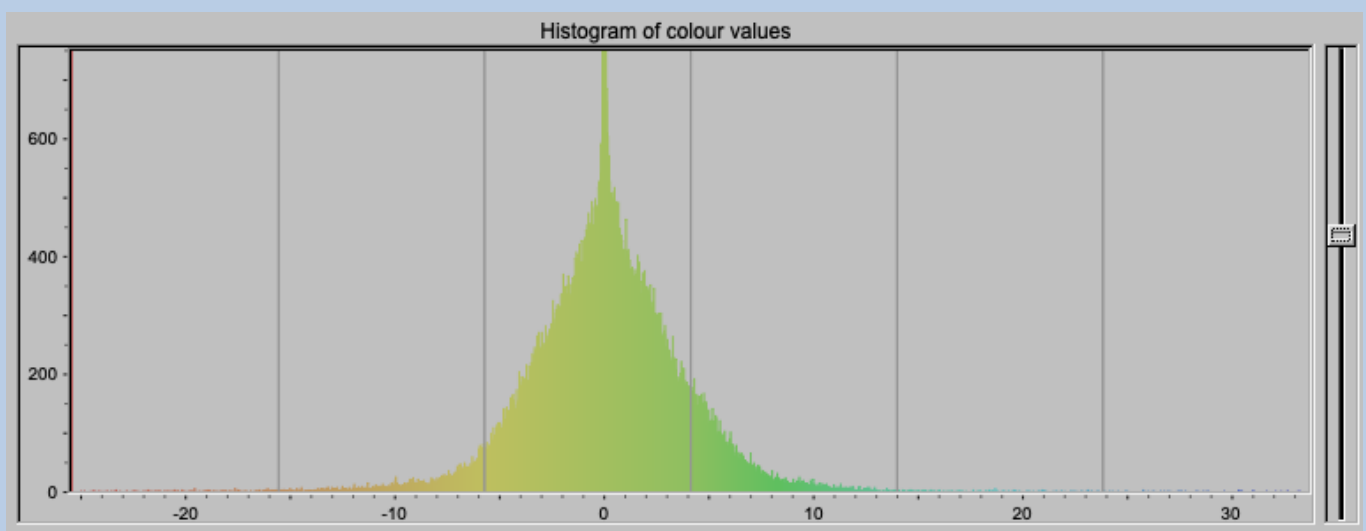
The movie can be stopped by clicking , the speed of the movie can be adjusted using the button “fps” (frames per second) .



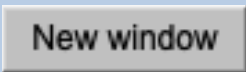
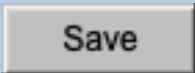
# Colour Mapping Controls



First have a look at the histogram of colour values to get an idea about the input colour distribution. Note you can adjust the vertical scaling with the slider on the right-hand side.



As usual in GUI programs, you can enlarge this histogram window with the “New window” button and save this histogram as a JPG image clicking the “Save” button. The buttons are shown after the cursor is moved into the histogram.

-  Open the histogram in a larger separate display window
-  Save the current histogram display in a JPG image



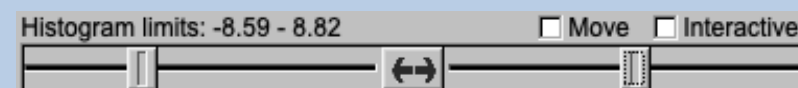
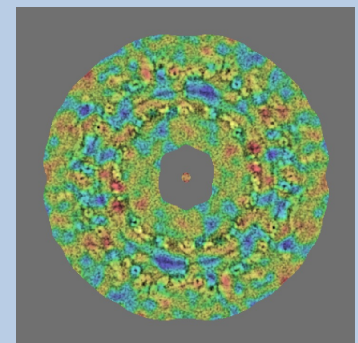
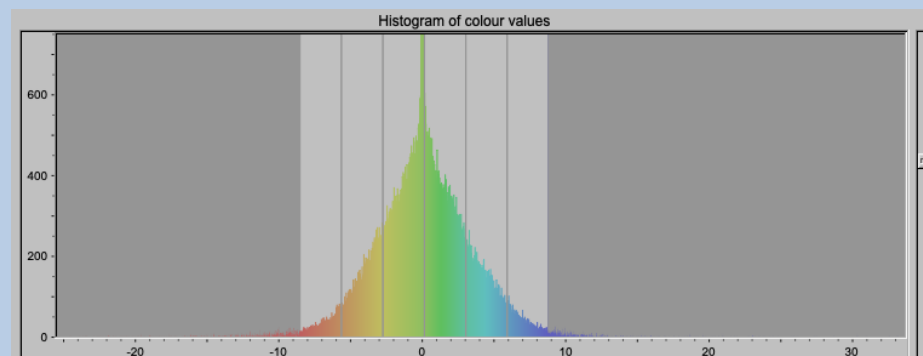
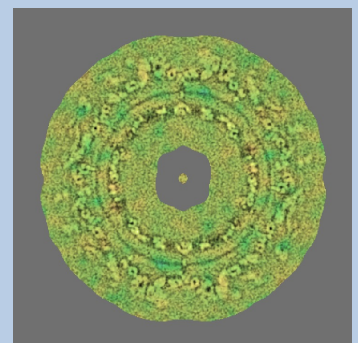
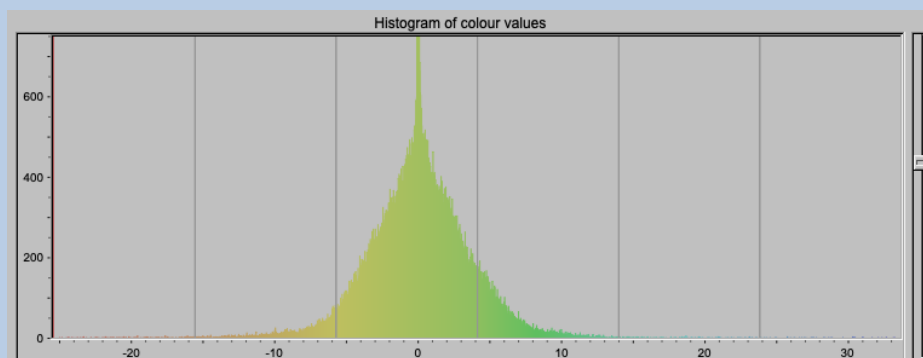
## SATURATION

Adjust the (colour) saturation using the slider




## HISTOGRAM LIMITS

Use the two sliders to adjust between which colour values the colour palette is to be used.



The arrow buttons between the two sliders can be clicked for zooming:

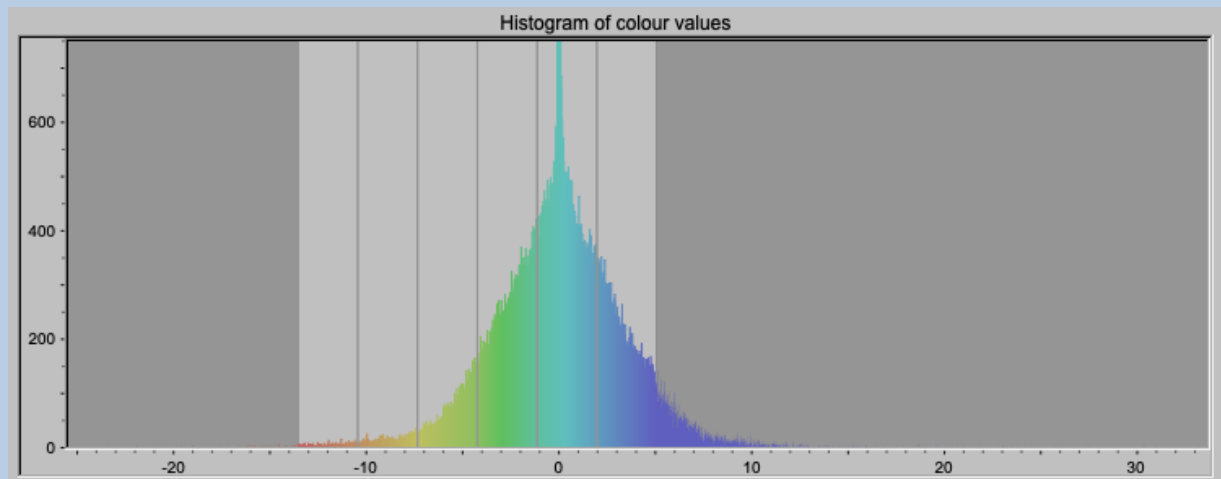
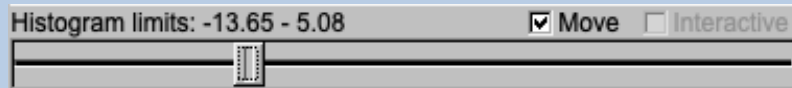
 Zoom into the histogram

 Show the full histogram

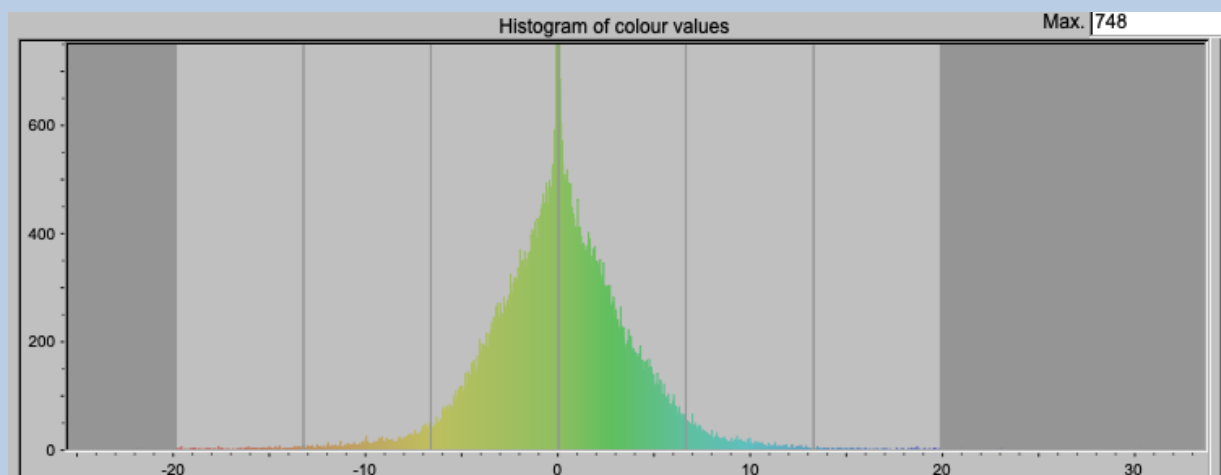
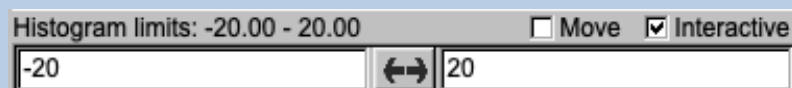


There are two options you can choose by clicking the related button

The “Move” option allows to keep the specified colour area but move it through the colour histogram :



The “Interactive” option allows to specify the limits by numbers:

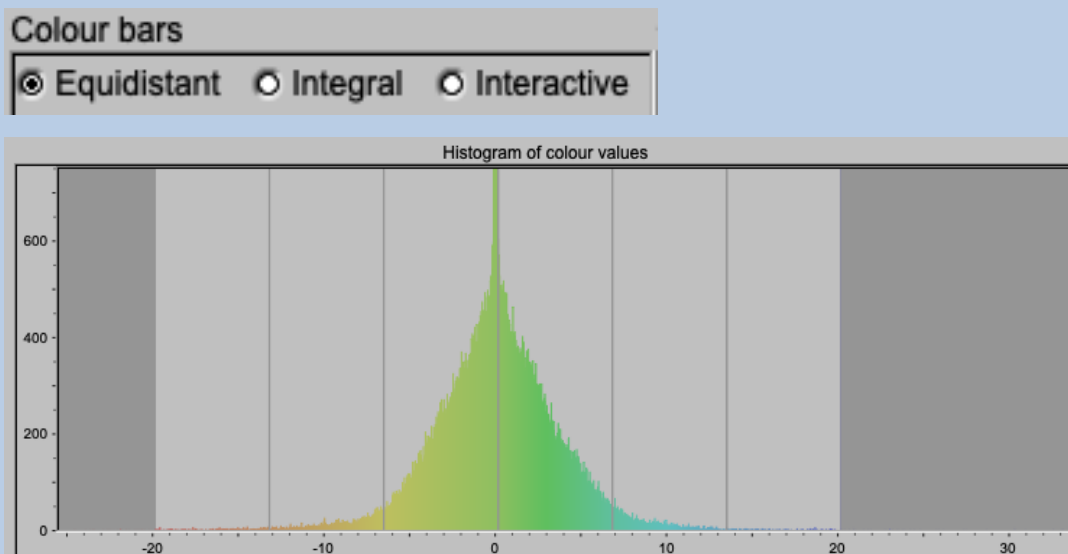


## COLOUR BARS

### Options on how to use the colours palette

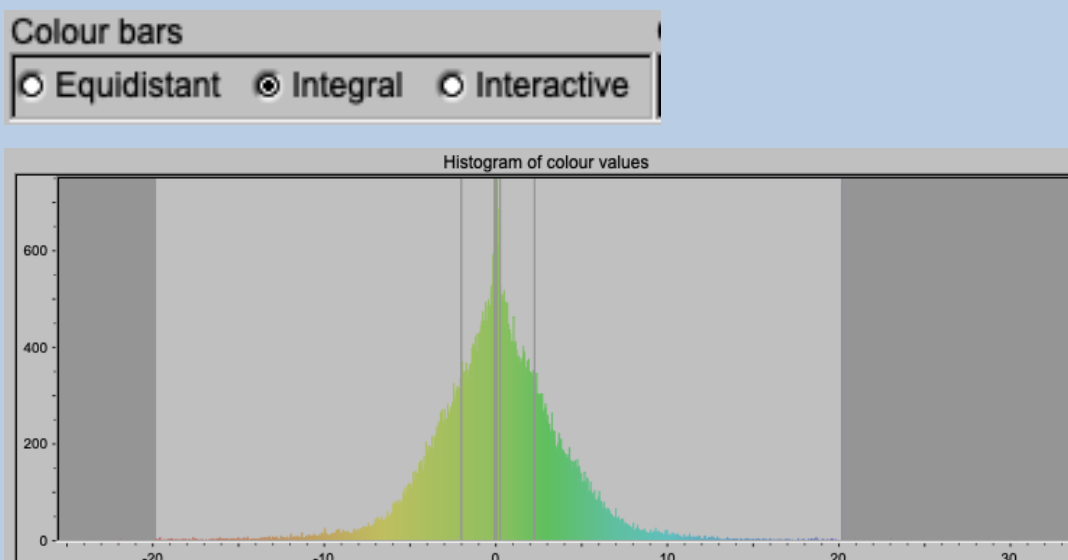
#### Equidistant:

The colour palette is used linearly. The colour palette is used in a linear way from red to dark blue which means that the distance between each two neighbouring colour bars in the histogram (i.e. the number of histogram bins) is the same:



#### Integral:

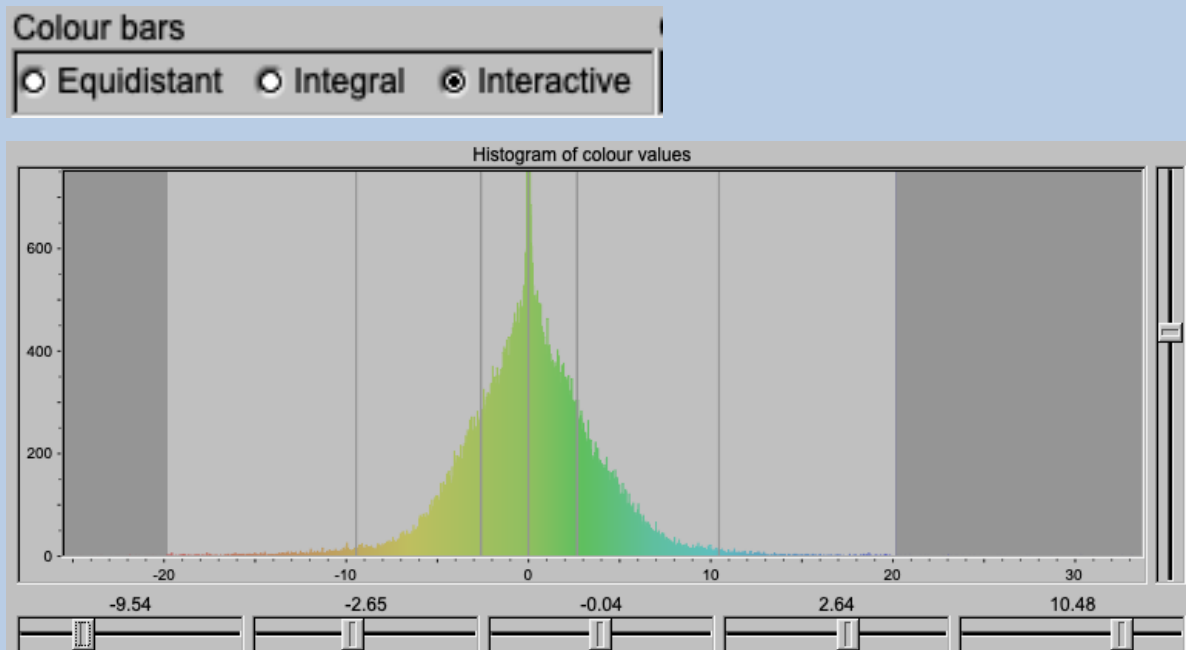
The five colour bars are set so that the sum of histogram values in the histogram area between each two neighbouring colour bars is the same. This means that in a histogram area with a lot of pixels/voxels having similar colour values the colour palette is squeezed together:





Interactive:

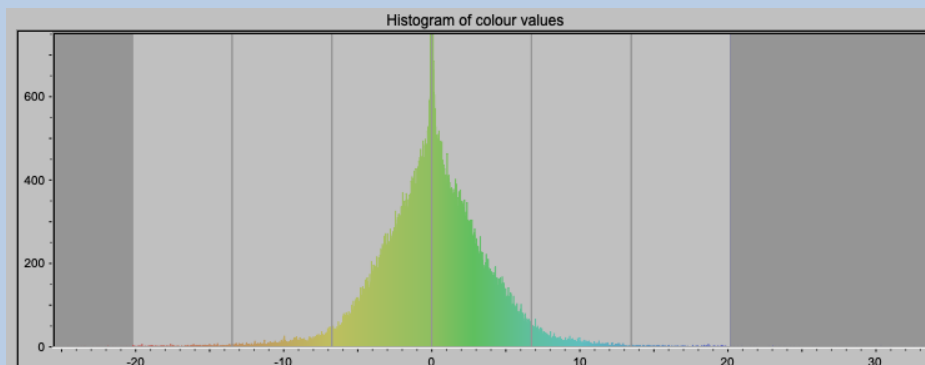
Use the five sliders to set the The five colour bars.



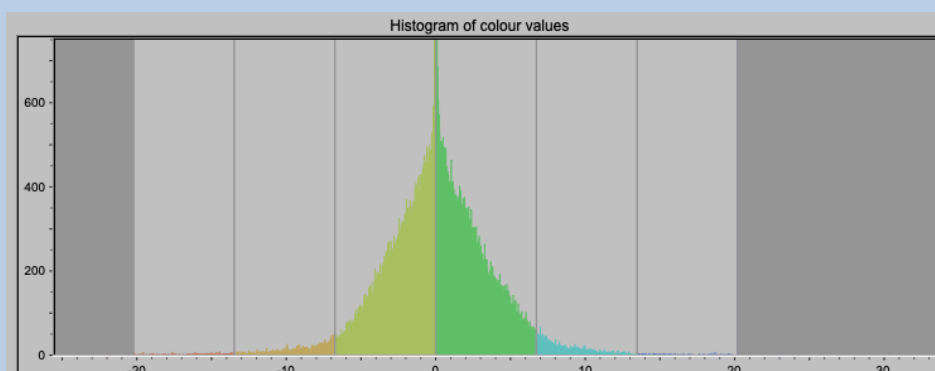
## COLOURS

Options on how to set the colours between colour bars

Fluid: The colours are changing continuously.

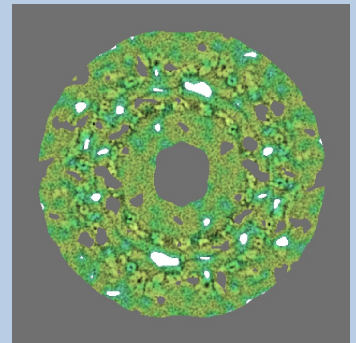
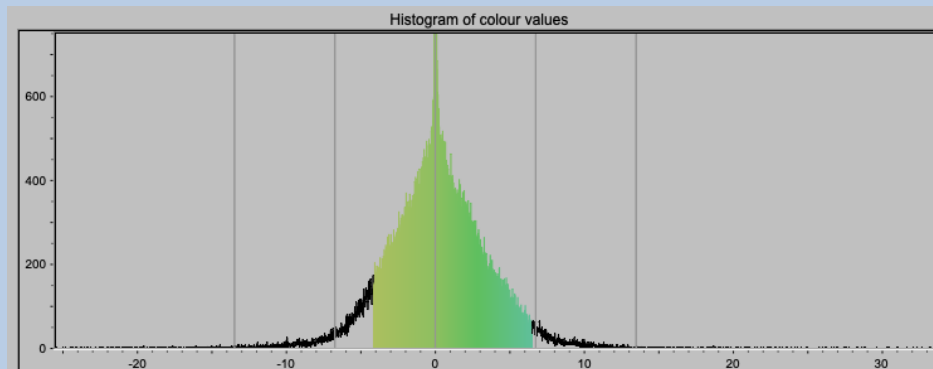


Block: Fixed / solid colour between two colour bars.



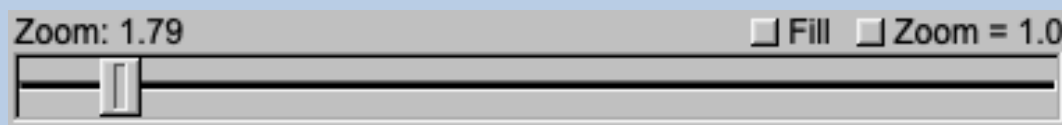
## THRESHOLD

You can adjust the range of colours to be displayed by moving the two threshold sliders. Colours below the lower limit will be displayed grey, colours above the upper limit will be displayed white.



## ZOOM:

Enlarge or reduce the displayed images. Use the slider to change the zoom factor.



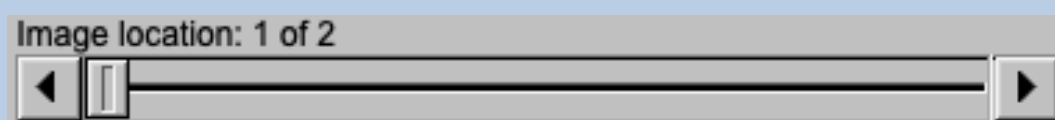
Additional options which can be clicked are

Fill: Fit image size to window size

Zoom = 1.0 Display the image 1:1

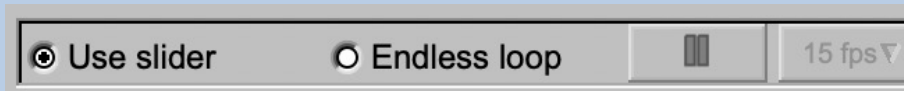
## IMAGE LOCATION – WHICH IMAGES ARE TO BE DISPLAYED:

Use the slider or the arrows to select the (first) image to be displayed in the display window on the right-hand side.

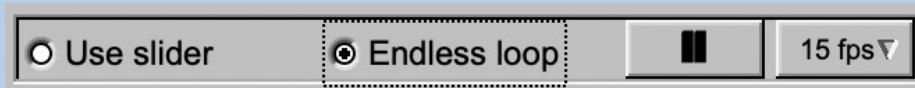


## DISPLAY OR MOVIE:

Images can be displayed using the slider (usual display)



or in an endless loop (movie):

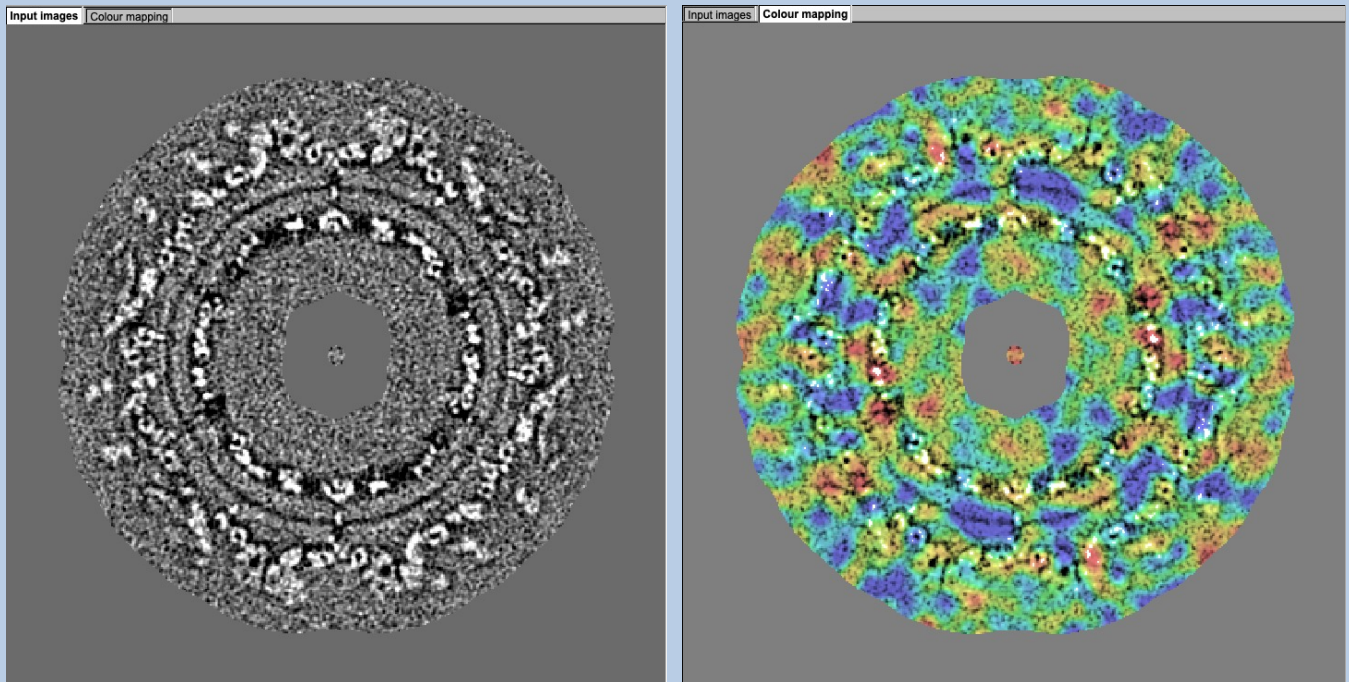


The movie can be stopped by clicking , the speed of the movie can be adjusted using the button “fps” (frames per second)  .


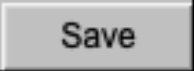
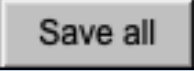


# Display Windows

The image(s) are displayed in the display windows at the right hand side. Click the related tab to get the wanted display window.



Moving the cursor into the display window there are a few options:

- |   |  |
|---|--|
|  | Open the display window a larger separate display window |
|  | Save the current displayed image in a JPG image          |
|  | Save the whole window in a JPG image                     |

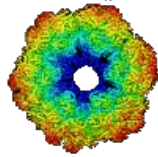


# Dimensions

In the previous pages colour mapping was described for images.

But input can also be 3D volume(s) file. In this case the pages are modified for three dimensions but the content and the use of the pages are the same or similar.





**IMAGIC**

**guiColourMapping**

Feedback / Error hints

We intensively tested the **guiColorMapping** program and tried to find all possible errors and inconsistencies. But the program is very complex and still in progress. So you may still find some problems.

We are happy to get feed-back. Please send your comments, error hints etc. to

[imagic@ImageScience.de](mailto:imagic@ImageScience.de)

THANK YOU VERY MUCH.



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