ZSTACK

Data Analysis for Hyperspectral X-ray Microscopy Imaging
v2.1 (5 feb 2001)

ZSTACK is a suite of IDL procedures for alignment and analysis of a series of x-ray microscopy images that have been acquired at different x-ray energies. It operates on Windows, Macintosh, and UNIX platforms using IDL v5.0 or later.

ZSTACK was written originally to satisfy my own needs for analysis of STXM spectral image stacks. The original version was based upon the original STACK code developed by Chris Jacobsen (SUNY - Stony Brook). It has expanded considerably beyond the initial scope, largely due to my analysis needs and feedback from fellow users.

In a collaborative effort with Adam Hitchcock (McMaster University), ZSTACK has been bundled into his AXIS data analysis package. ZSTACK can also be used independently of AXIS.

The development of ZSTACK has been an evolutionary process. Please notify me of any bugs, problems, comments, or suggestions for improvements or new features.

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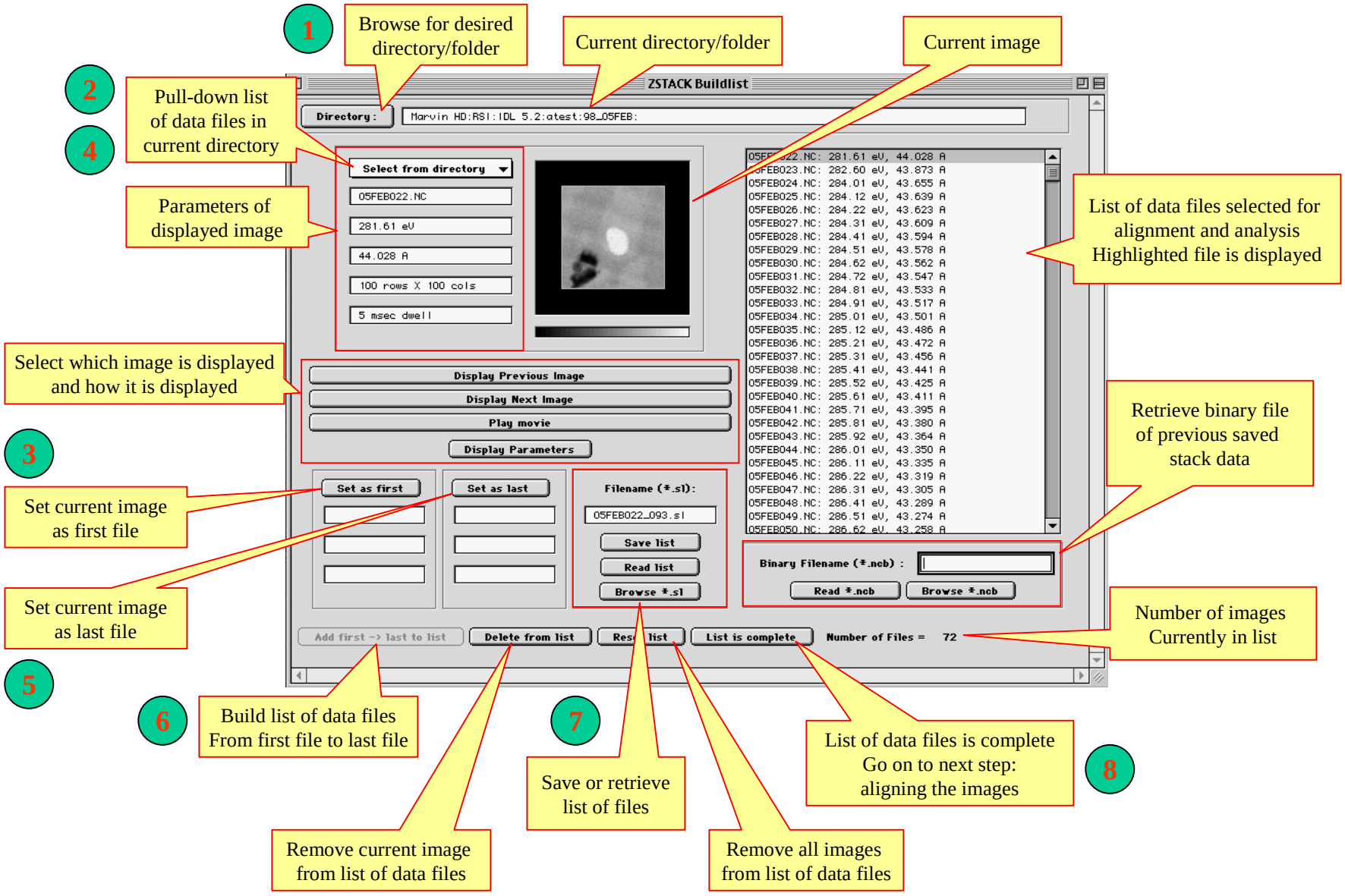
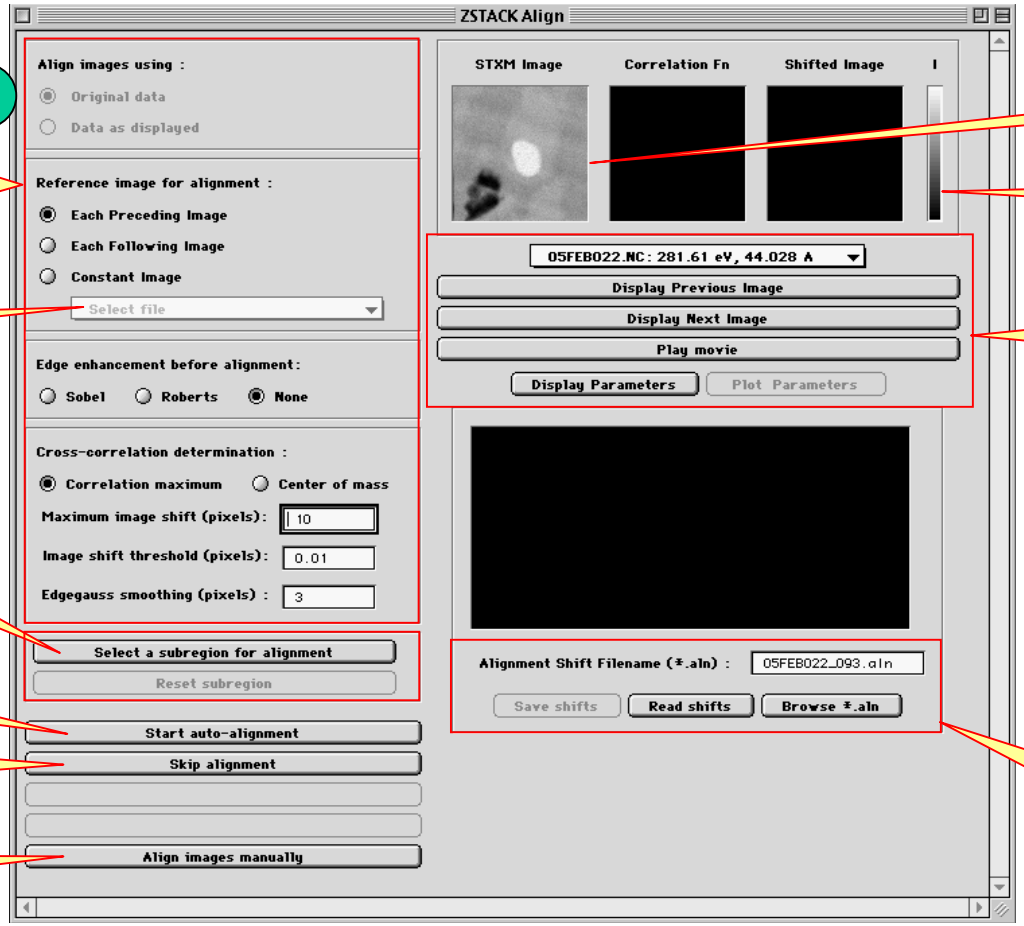
ZSTACK Buildlist



ZSTACK Align

(before alignment)



Choose the conditions for image alignment : Reference image Edge enhancement Correlation determination

1

Pull-down list of data files

Define a sub-region in the image to use for alignment

2

Start the auto-alignment of the images

3

Skip aligning the images Go on to extracting spectra

Align the images manually

Raw STXM image

Color bar for images

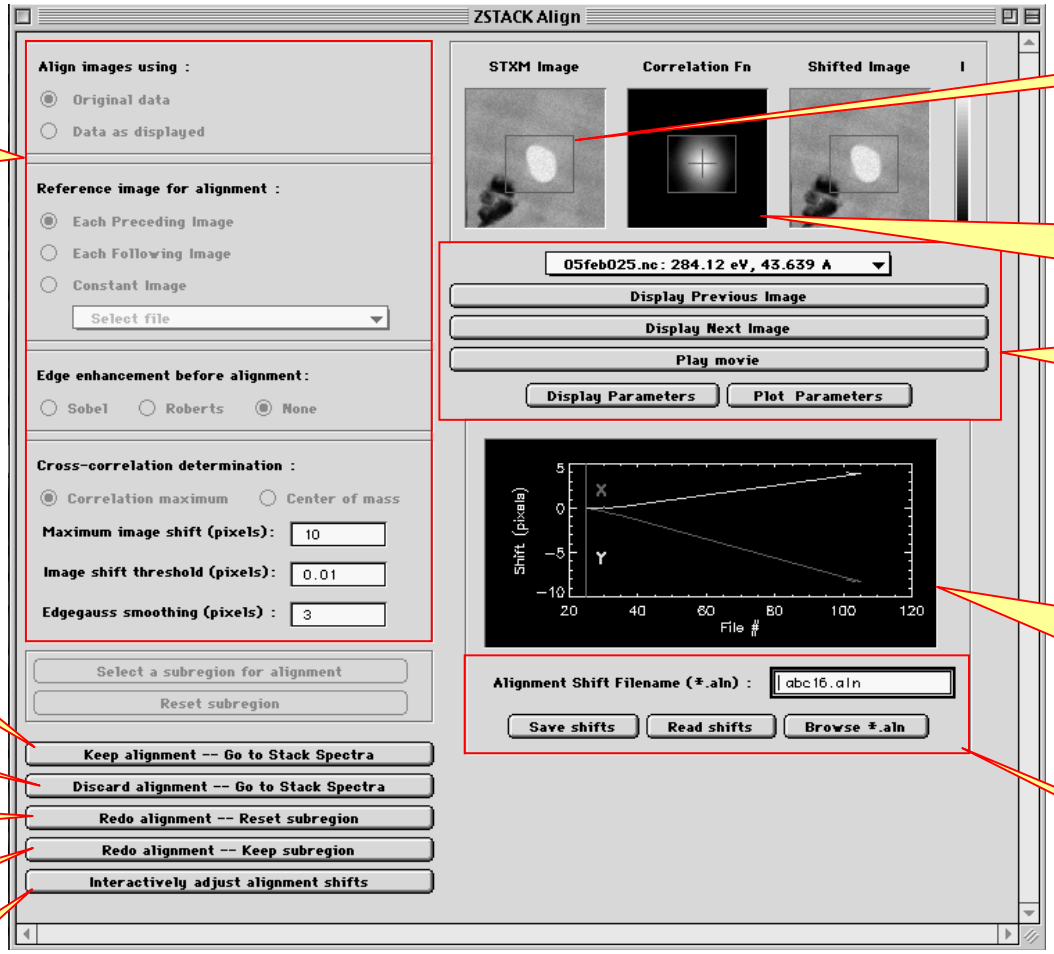
Select which image is displayed and how it is displayed

Retrieve existing alignment shifts

After alignment shifts are retrieved from a saved file, this dialog window will be updated to show alignment shifts, alignment parameters, and shifted images

ZSTACK Align

(after alignment)



This now displays the conditions which were used to obtain current alignment

Subregion used for alignment

Correlation function crosshairs:
red for center of corr'n image
blue for maximum position
Red box is edge of corr'n image

Select which image is displayed and how it is displayed

Plot of alignment shifts
Cursor position corresponds to current image and can be moved by clicking mouse in the plot

Save or retrieve alignment shifts

Keep current alignment

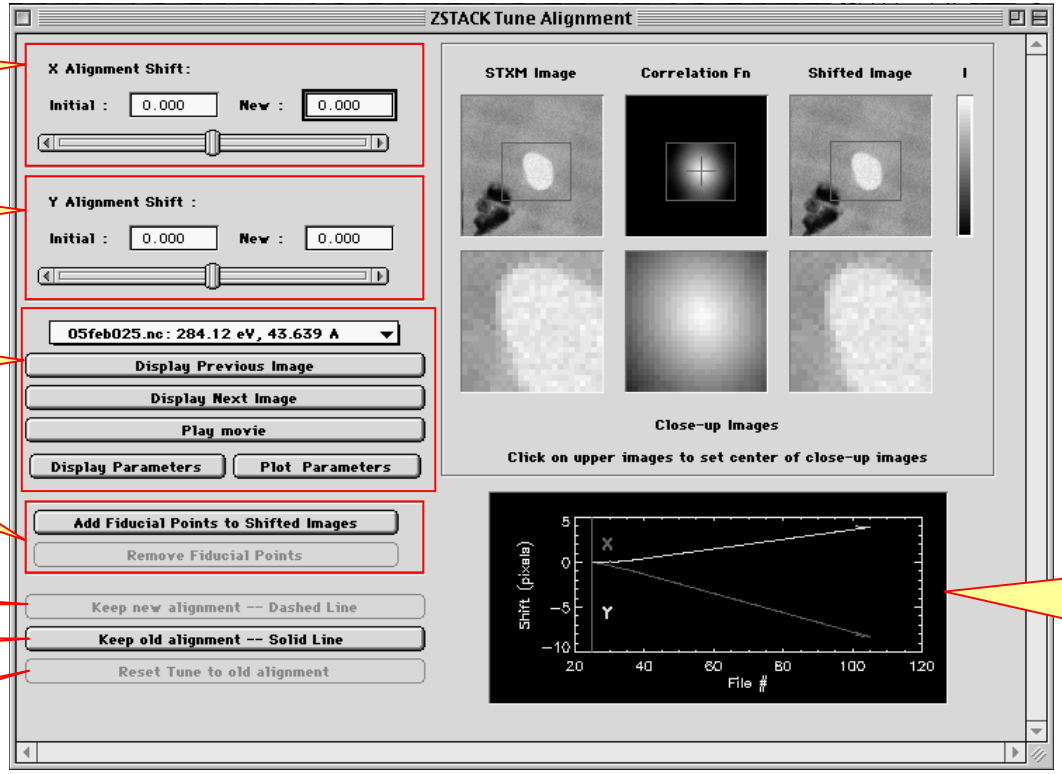
Skip the alignment

Redo the alignment erasing the subregion

Redo the alignment keeping the subregion

Manually adjust the alignment

ZSTACK Tune



Adjust the x shift using either the "New" text box or the slide bar

Adjust the y shift using either the "New" text box or the slide bar

Select which image is displayed and how it is displayed

Add fiducial points or shapes to close-up of shifted images

Keep new alignment

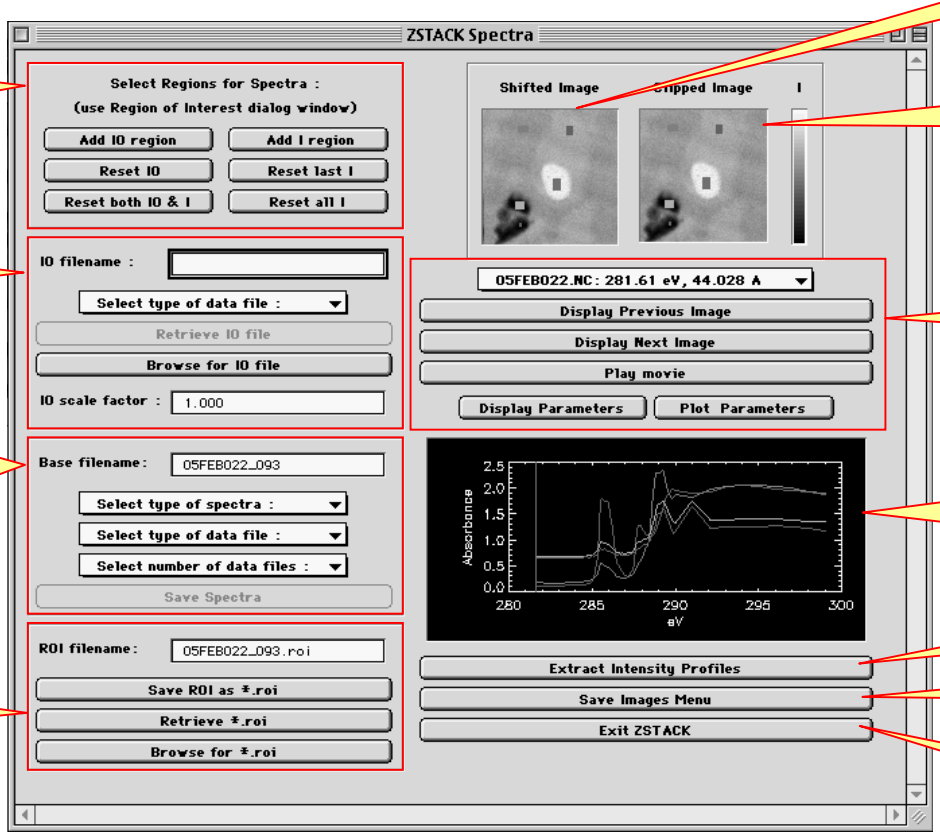
Keep old alignment

Reset to old alignment

Plot of alignment shifts
Cursor position corresponds to current image and can be moved by clicking mouse in the plot

By placing some fiducial points in the close-up of the shifted images, the quality of the alignment can be inspected while playing theimages as a movie

ZSTACK Spectra



Define regions in image to extract spectra using Region of Interest dialog

If desired, retrieve an I0 spectrum (raw data, *.spc, *.xas)

Save extracted spectra as single beam, % transmittance, or absorbance in *.spc, *.xas, or *.gif format with all spectra in a single file or one file for each spectrum

Add fiducial points or shapes to close-up of shifted images

Images shifted after alignment

Shifted images clipped of edges where there is no longer any data due to shifting

Select which image is displayed and how it is displayed

Plot of spectra
Cursor position corresponds to current image and can be moved by clicking mouse in the plot

Get intensity vs position

Save images

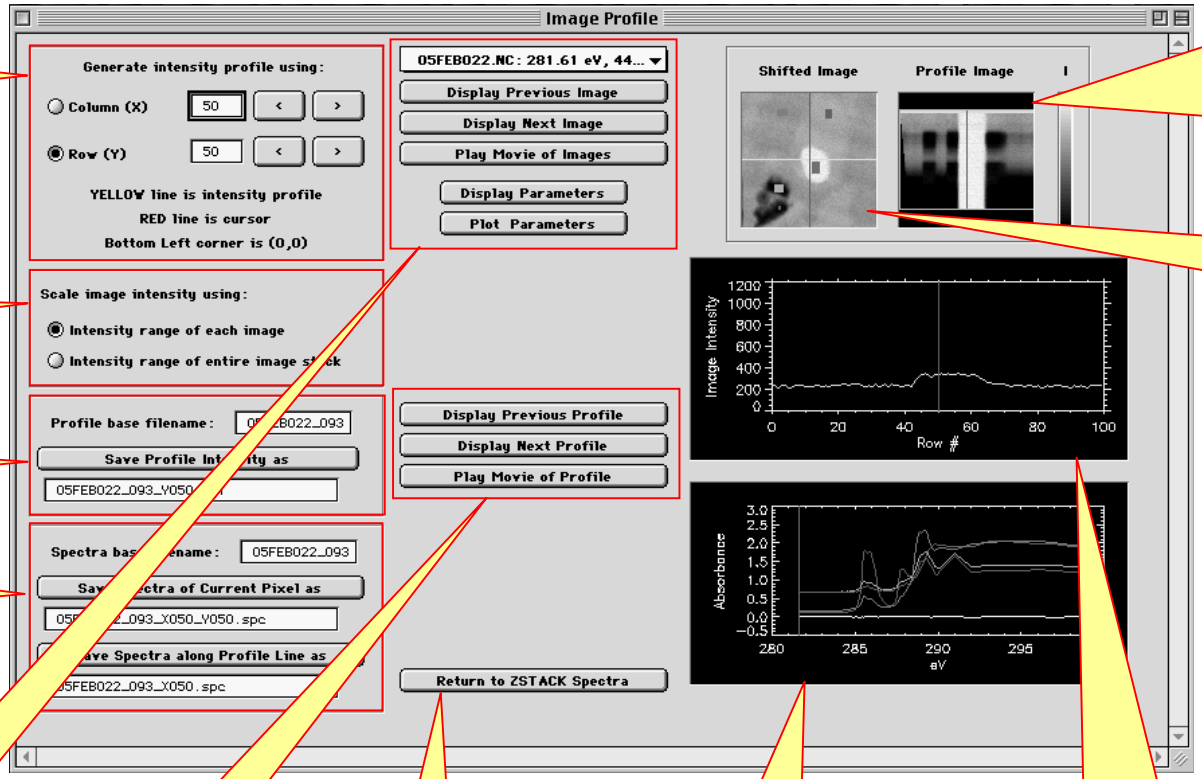
Finished ? Quit here

Fourteen separate regions of interest can be specified, yielding fourteen I spectra.
In addition, a region of interest can be specified in an empty region of the sample to yield an I0 spectrum.

Color of the region of interest in the images corresponds to the same color spectrum

Region of Interest

ZSTACK Profile



Adjust position of cursor and profile axis

Save intensity profile

Save spectra of current pixel

Save spectra of each pixel along profile axis

Map of intensity as a function of x-ray energy and position along the profile axis

Cursor position and x-ray energy can be moved by clicking mouse in the plot

Cursor position can be moved by clicking mouse in the image

Color of the region of interest in the images corresponds to the same color spectrum

The profile axis is the yellow line in both the shifted image and the profile image. The intensity along this line is plotted as the profile intensity.

Red cursor in profile plot corresponds to position of red line in both the shifted image and the profile image

Select which image is displayed and how it is displayed

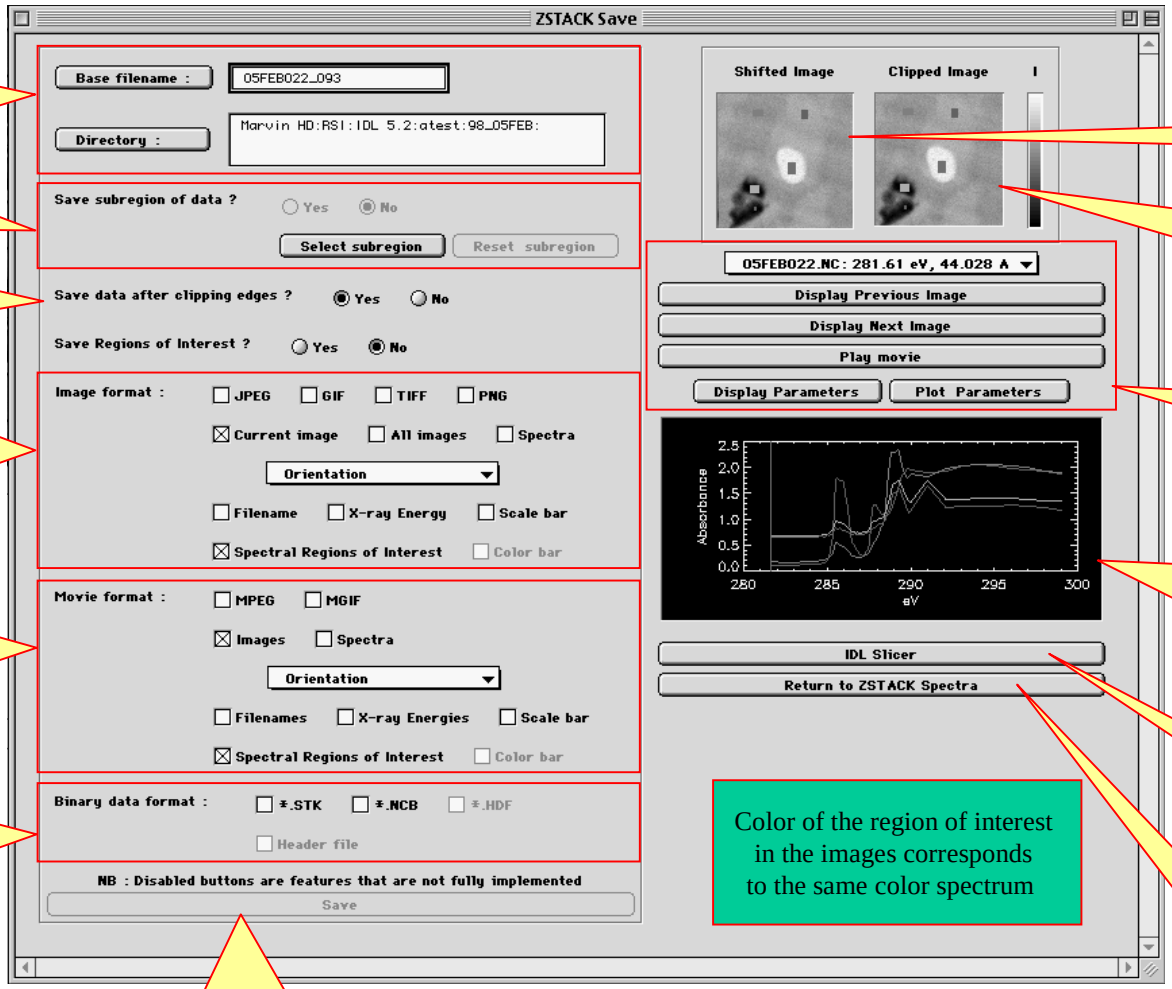
Select which profile is displayed and how it is displayed

Finished ? Return to ZSTACK Spectra

Plot of spectra Cursor position corresponds to current image and can be moved by clicking mouse in the plot

Plot of intensity along profile axis Cursor position corresponds to current position along profile axis and can be moved by clicking mouse in the plot

ZSTACK Save



Specify base filename and directory to save files

Select a subregion of image to save

Trim images to eliminate edges clipped off during alignment

Save images in a variety of formats, optionally including spectra, roi, and legend info

Save images as a movie, optionally including spectra, roi, and legend info

Save image stack as a binary data file

Images shifted after alignment

Shifted images trimmed of edges clipped during alignment

Select which image is displayed and how it is displayed

Plot of spectra Cursor position corresponds to current image and can be moved by clicking mouse in the plot

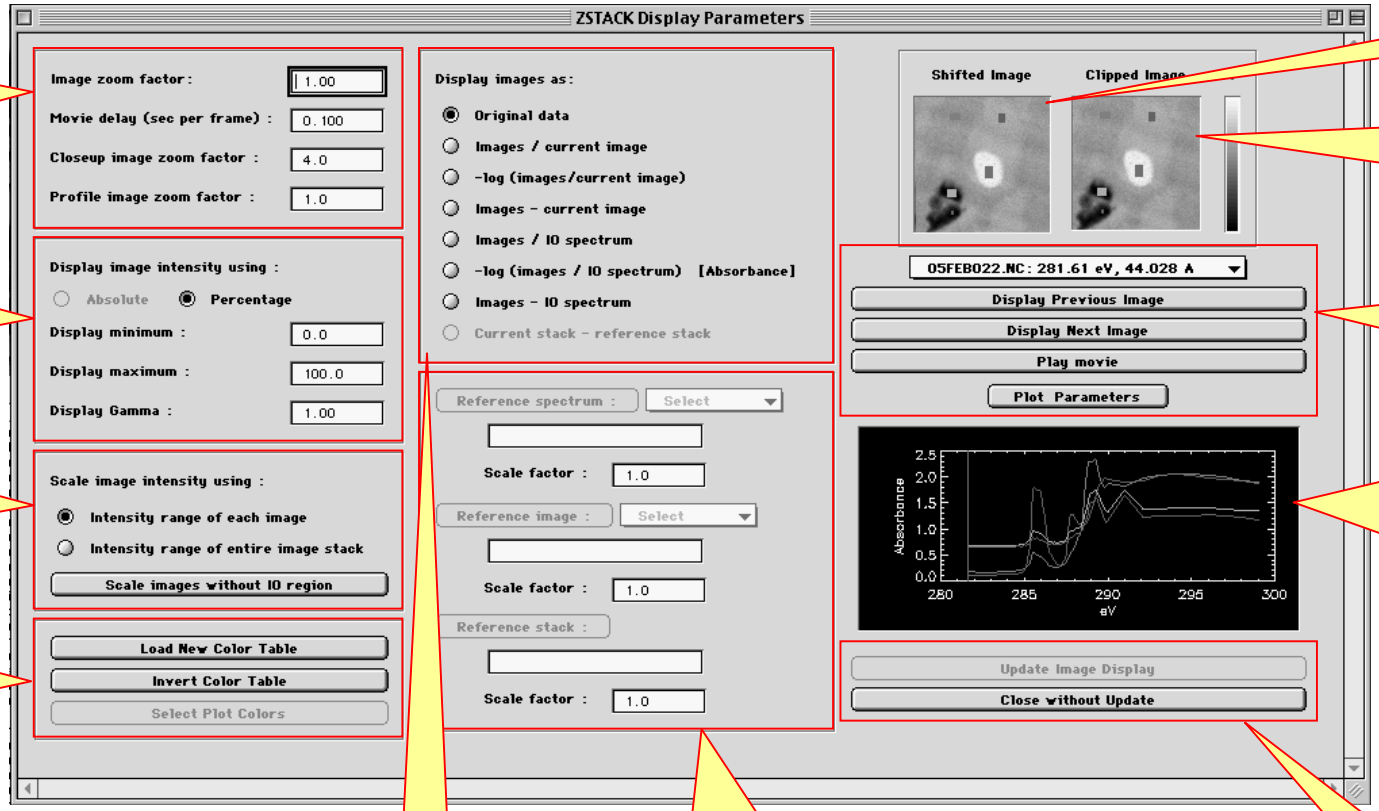
Process data using IDL Slicer3

Color of the region of interest in the images corresponds to the same color spectrum

After specifying ALL the options above, Click here to save everything (images, movies, binaries) at one time.

Finished ? Return to ZSTACK Spectra

ZSTACK Display



Modify zoom Factors and movie play rate

Modify intensity range for images

Modify scale range for images

Modify color scale for images

Images shifted after alignment

Shifted images trimmed of edges clipped during alignment

Select which image is displayed and how it is displayed

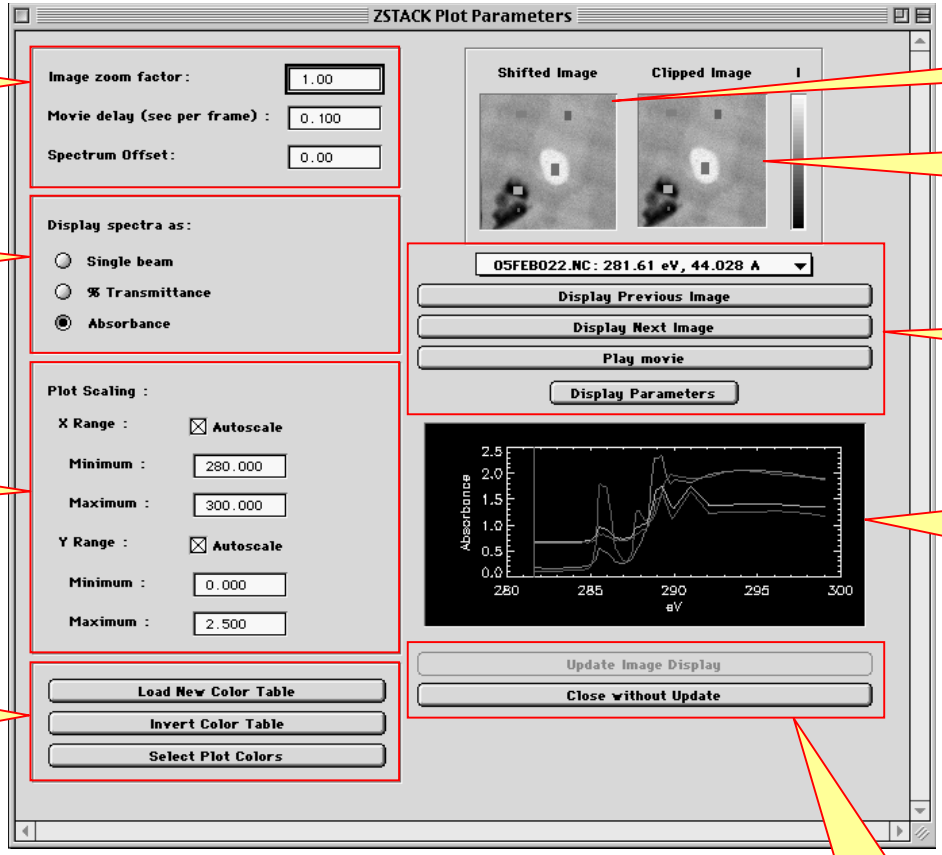
Plot of spectra Cursor position corresponds to current image and can be moved by clicking mouse in the plot

Modify type of image displayed

Future feature: Define reference spectrum, Image, or image stack For subtraction or ratio

Finished ? Update or Discard changes

ZSTACK Plot



Modify
zoom factor
movie play rate
spectrum offset

Modify options to display spectra

Modify
scale range
for spectra

Modify
color scale
for images
AND
plot colors

Images shifted after alignment

Shifted images trimmed of edges clipped during alignment

Select which image is displayed and how it is displayed

Plot of spectra
Cursor position corresponds to current image and can be moved by clicking mouse in the plot

Finished ?
Update or
Discard changes