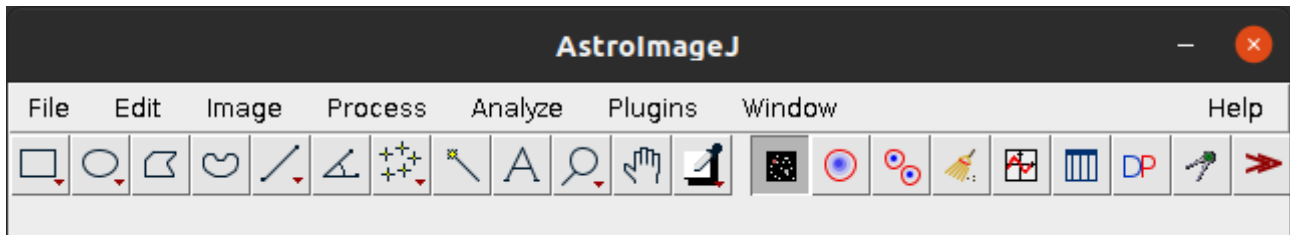


**APERTURE PHOTOMETRY  
OF A VARIABLE STAR  
USING THE  
*AstroImageJ*  
SOFTWARE**

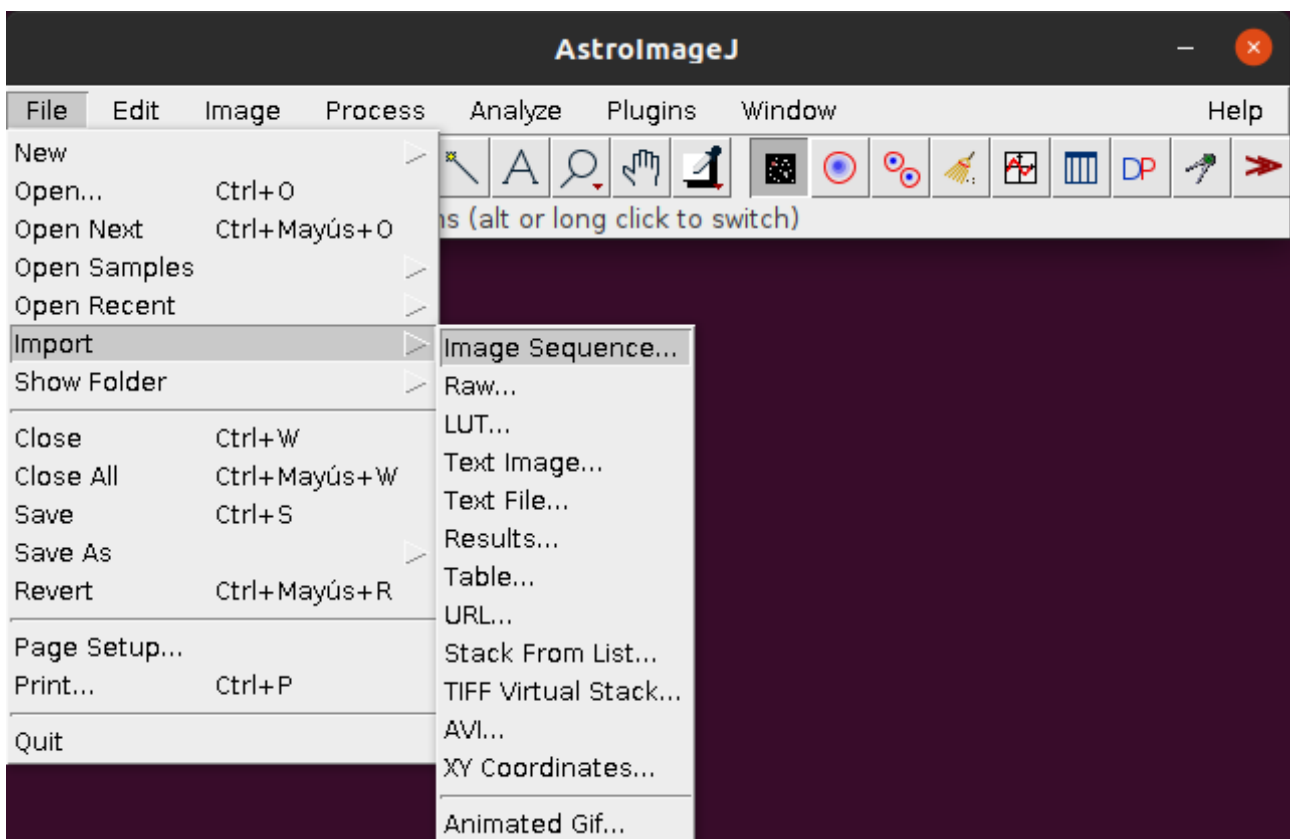
**Stelios Pyrzas**

**CEFCA, 2025**

## (1) Launch AstroImageJ



## (2) Select “File” → “Import” → “Image Sequence”



(3) On the new window that appears, click the “**Browse**” button and navigate to the folder with your **reduced** science images of your variable star. In our example, [path\_to\_data]/YZ Boo/SCIENCE/REDUCED

Your window should look like the image below:

**Import Image Sequence**

Dir:

drag and drop target

Type:

Filter:

file name filtering text (can also enclose regex in parens)

Start:

Count:

Step:

Scale:  %

Filter based on FITS header keywords and values:

(filtering not accounted for in file count and stack size below)

Keyword 1:  Value 1:

☒ AND ☐ OR

Keyword 2:  Value 2:

☒ Sort names numerically

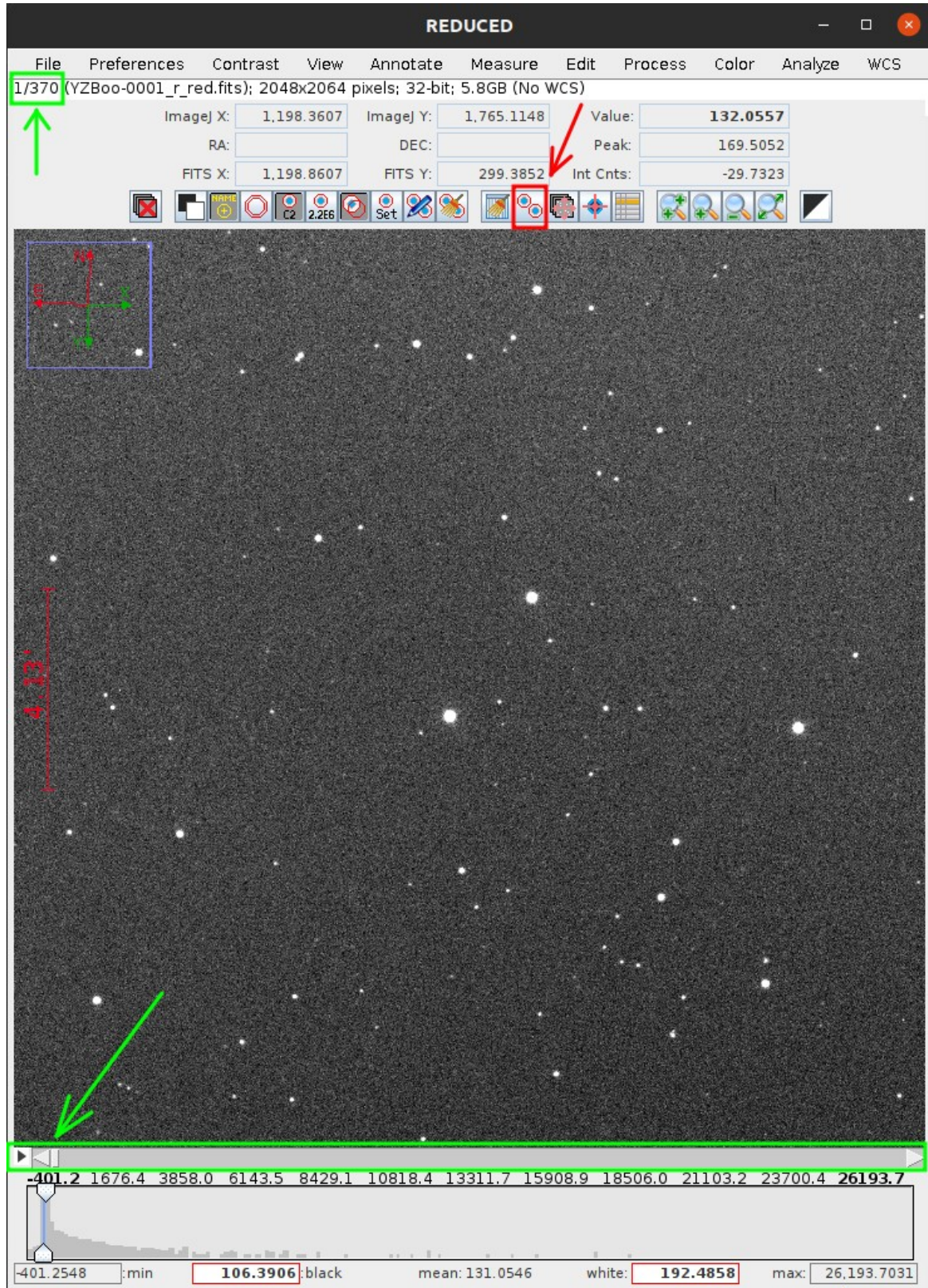
☐ Use virtual stack

☐ Open as separate images

Matched files: 376

Estimated stack size: 6357.5 MB

(4) The images will load in a new window like the one below. Notice the **numbers** highlighted on the top-left of the image (1/370): it should match the number of your science frames. Also notice the slider at the bottom. Click the “play” button on the left of the slider. When ready, press the multi-aperture button indicated by the red arrow:



(5) On the new window that opens, pay attention to the various options highlighted on the image below. Set up your window to match our example, but keep in mind, you need to provide the correct aperture and sky annuli values! When ready, press the “Place Apertures” button.

**Multi-Aperture Measurements**

Aperture Shape: Circular

First slice: 1  
Last slice: 370 *These numbers are automatic, as they are our images*

Fixed/Base radius of photometric aperture: 15  
Fixed/Base radius of inner background annulus: 22  
Fixed/Base radius of outer background annulus: 43 *These numbers should come from the radial profile plot!*

☒ Fixed Apertures as selected above  
☐ Auto Fixed Apertures from first image T1 radial profile  
☐ Auto Fixed Apertures from multi-image T1 radial profiles  
☐ Auto Variable Apertures from each image T1 radial profile  
☐ Auto Variable Apertures from each image T1 FWHM

Normalized flux cutoff threshold: 0.02 {0 < cutoff < 1 ; default = 0.010}  
Normalized flux cutoff threshold: 0.01 {0 < cutoff < 1 ; default = 0.010}  
Normalized flux cutoff threshold: 0.01 {0 < cutoff < 1 ; default = 0.010}  
FWHM factor: 1.2

☒ Place all new apertures  
☐ Place first previously used aperture  
☐ Place 6 previously used apertures  
☐ Place 6 imported apertures

☐ Use RA/Dec to locate aperture positions  
☐ T1 is moving object  
☐ Use single step mode (1-click to set first aperture location in each image)  
☐ Allow aperture changes between slices in single step mode (right click to advance image)

☒ Auto comparison stars ☒ Enable log ☐ Show peaks  
Smoothing Filter Radius: 3.5 pixels

☒ Auto Thresholds  
Base Aperture: 1 Max. Peak Value: 23,574.33 Min. Peak Value: 202.47  
Max. Comp. Brightness %: 150.0 Min. Comp. Brightness %: 50.0  
Weight of Distance: 51 vs Brightness Max. Comp. Stars: 12

☒ Centroid apertures (initial setting) ☐ Halt processing on WCS or centroid error  
☒ Remove stars from background ☐ Assume background is a plane

☐ Prompt to enter ref star apparent magnitude (required if target star apparent mag is desired)  
☒ Update plot while running ☒ Show help panel during aperture selection  
☒ Update image display while running

CLICK 'PLACE APERTURES' AND SELECT APERTURE LOCATIONS WITH LEFT CLICKS.  
THEN RIGHT CLICK or <ENTER> TO BEGIN PROCESSING.  
(to abort aperture selection or processing, press <ESC>)

Aperture Settings Cancel Place Apertures



REDUCED (V) (35.4%)

File Preferences Contrast View Annotate Measure Edit Process Color Analyze WCS

370/370 (YZBoo-0370\_r\_red.fits); 2048x2064 pixels; 32-bit; 5.8GB (No WCS)

ImageJ X: 784.2204 ImageJ Y: 1,416.1102 Value: 101.8280

RA: DEC: Peak: 140.6685

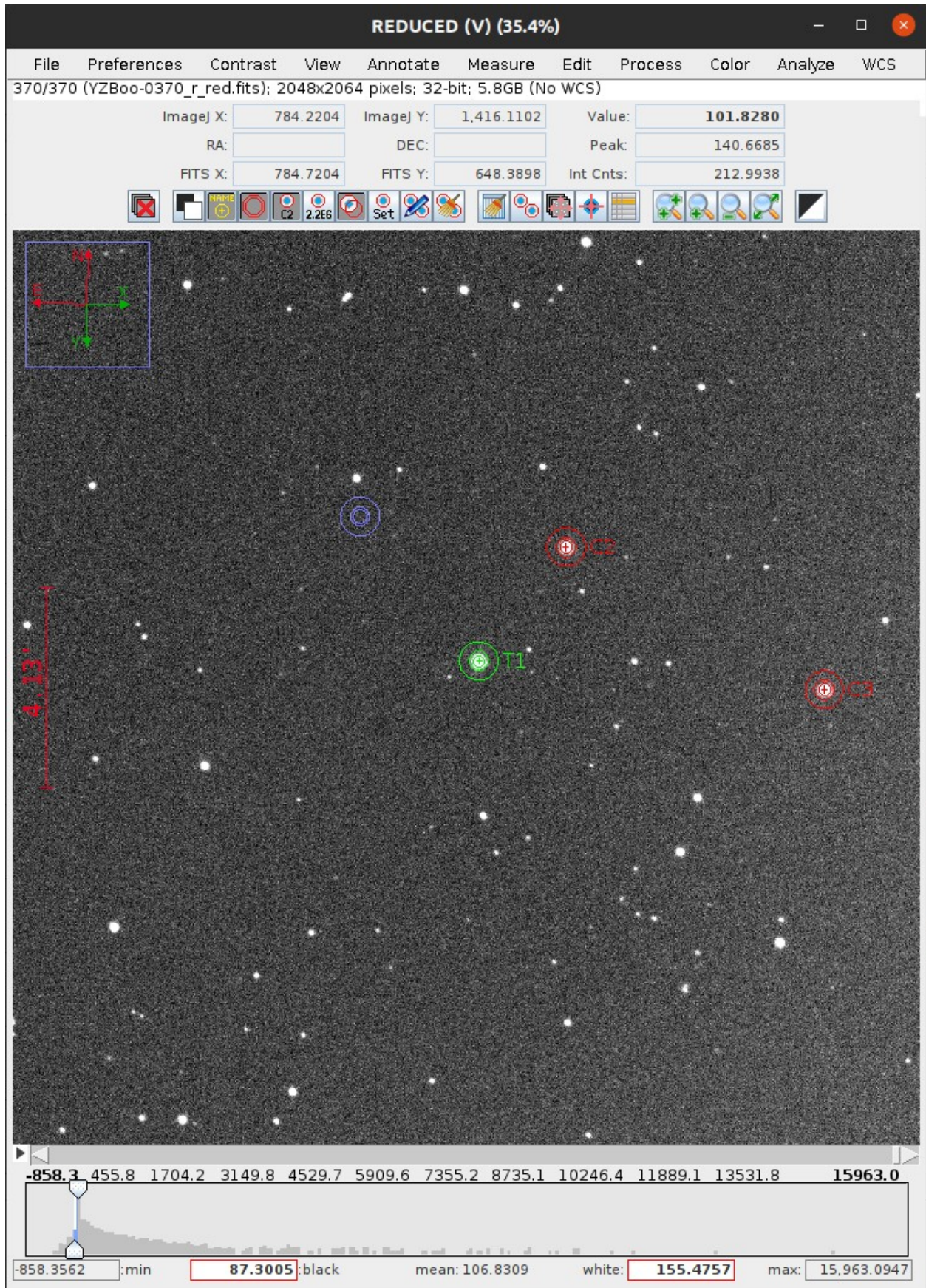
FITS X: 784.7204 FITS Y: 648.3898 Int Cnts: 212.9938

4.13"

T1

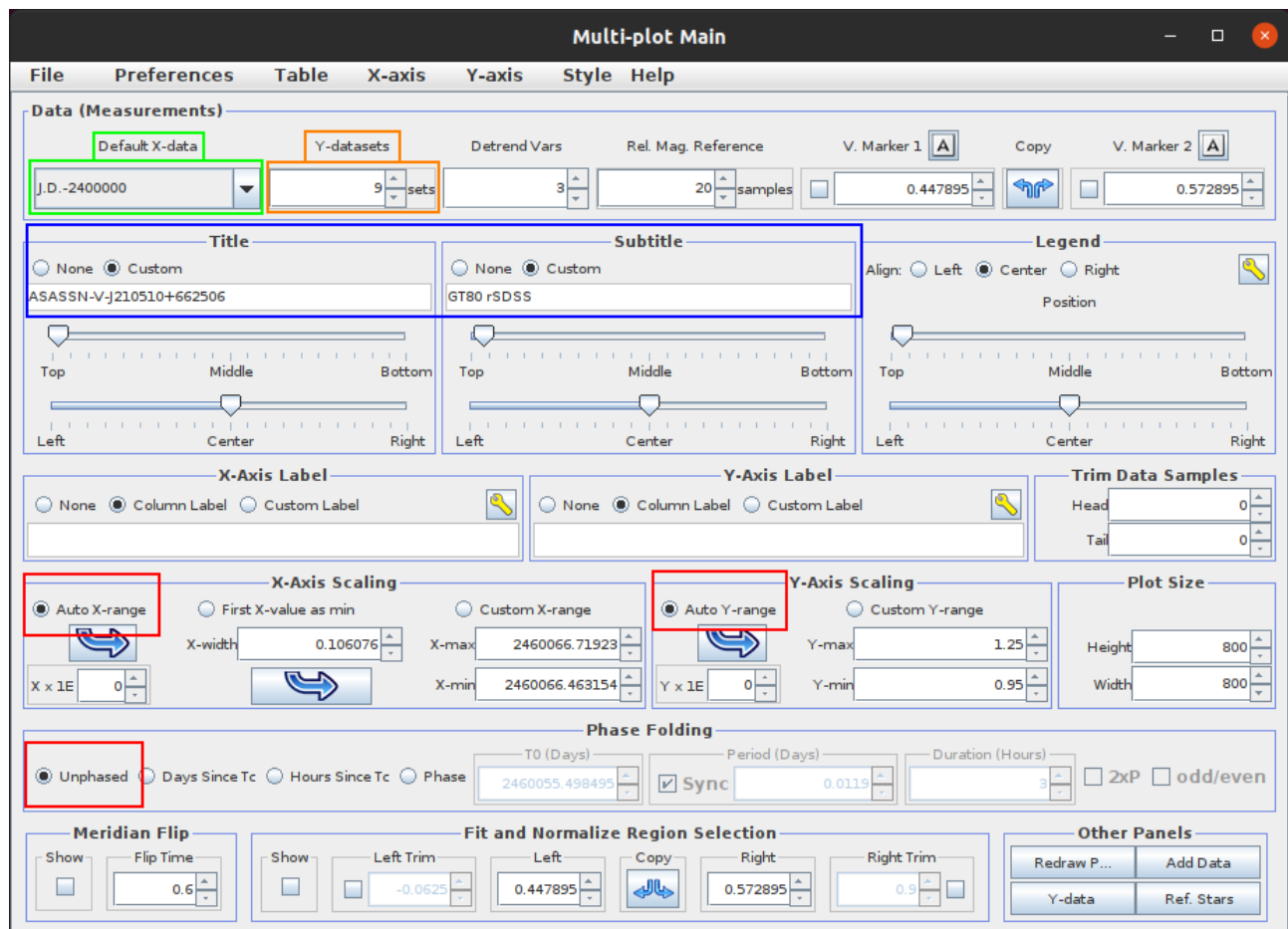
-858.3 455.8 1704.2 3149.8 4529.7 5909.6 7355.2 8735.1 10246.4 11889.1 13531.8 15963.0

-858.3562 :min 87.3005 :black mean: 106.8309 white: 155.4757 max: 15,963.0947



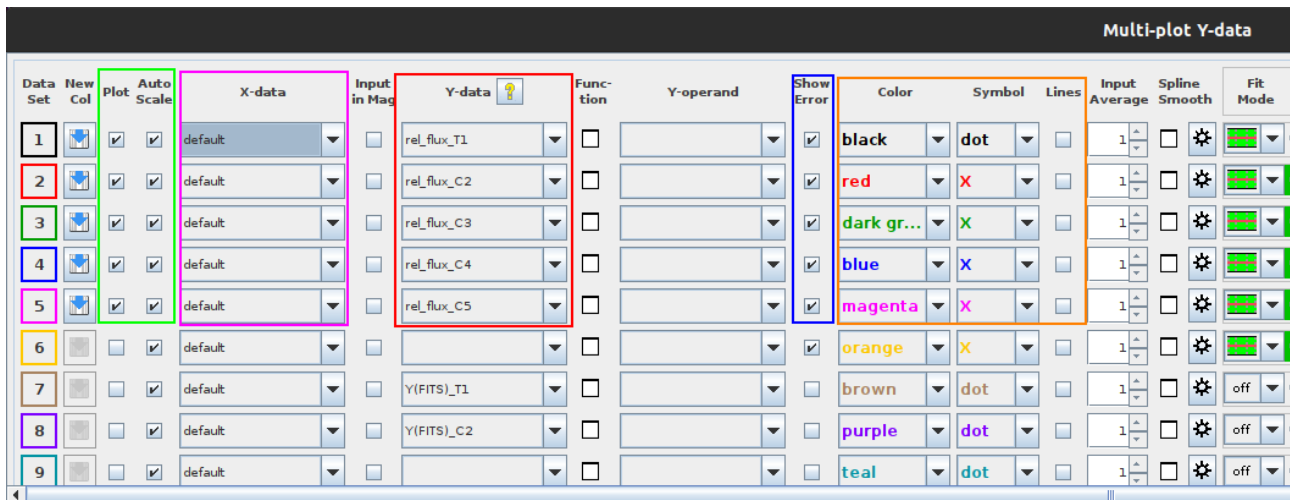
(7) When photometry runs, a lot of windows will open automatically.

To make your plot look better, various options can be found on the “Multi-plot Main” window:

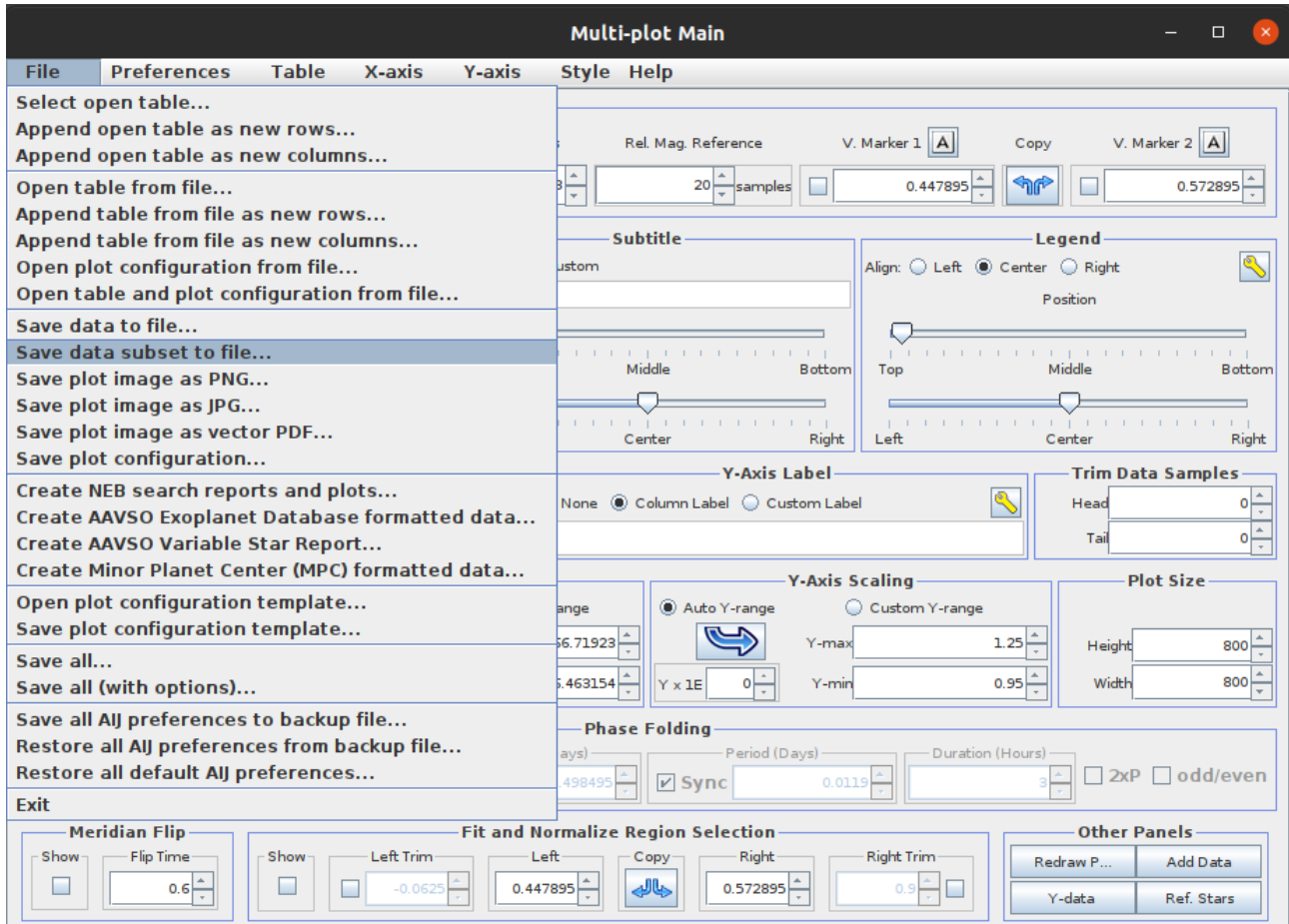


- If you want to include more comparison stars, change the number of **Y-datasets**.
- You can play around with the “**Title**” & “**Subtitle**” options.
- For the X- and Y-range limits, either leave the “Auto...” option selected (as shown in the image above) or experiment with the “Custom...” range options in the corresponding panels.

(8) Other plot options can be found on the “Multi-plot Y-Data” window. For example, you can select which stars to plot (**Plot**), change the color and symbol of the light curve plots, include errorbars (**Show Error**) etc



(9) To save your light curve for further analysis, find the “Multi-plot Main” window and select “File” → “Save data subset to file”





(10) In the new window that opens, select your options as shown in the image below:

Save data subset

Select datasets in the order (left to right) desired in the output file.  
No column will be output for blank selections.

Number of data selection boxes (next time): 

3

	Column	Enabled
01:	JD UTC	<input checked="" type="checkbox"/>
02:	rel flux T1	<input checked="" type="checkbox"/>
03:	rel flux err T1	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Save column headings	<input checked="" type="checkbox"/> Comment headings with '#'
<input type="checkbox"/>	Save row numbers	<input type="checkbox"/> Save row labels

Cancel

OK