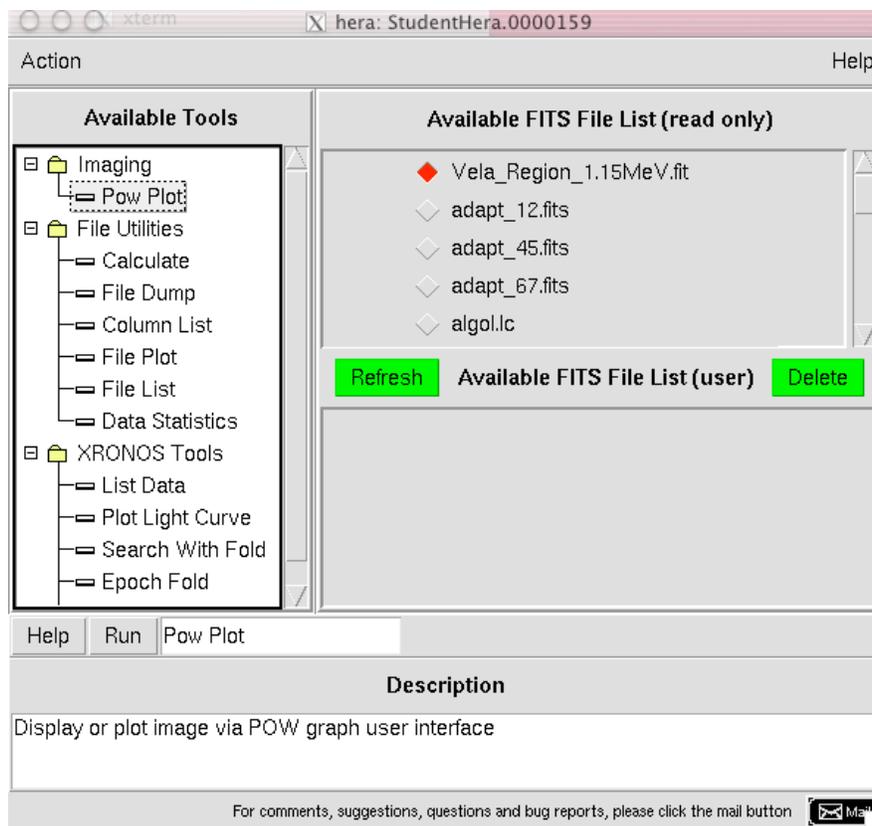


STUDENT HERA TUTORIAL DIRECTIONS

- Follow along with these directions and you will be introduced to the features of Hera that will be used in the independent practice section of the activity

1. Open Student Hera

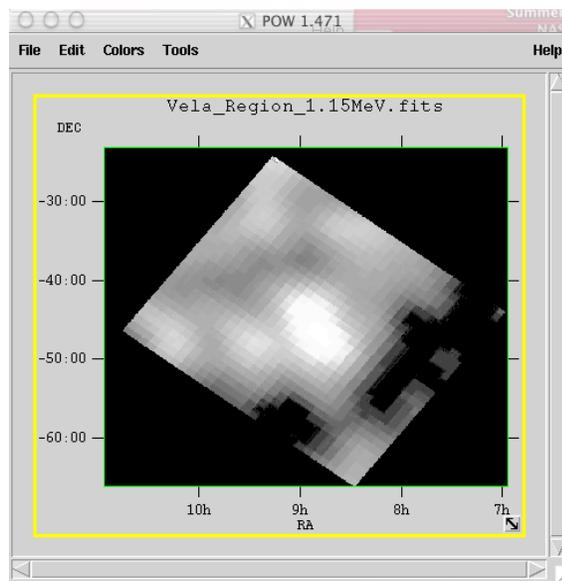
- a. Student Hera will ask for log in, hit the “login” button
- b. A screen like below should appear:



2. Go to the “Available Tools” area

- a. Click on “imaging tool” folder
- b. Click on Pow Plot

3. Go to the “Available FITS File List (read only)”
 - a. Choose the “Rosat.25KeV” file by clicking on the diamond to the left of image name
 - b. The diamond next to the file will be highlighted in red when selected
4. Click on the “Run” button
 - a. “Pow Plot” should appear in the white box to the right of “Run” button
5. Image will pop up in new window like the one below



- a. This is how any image file can be opened in Hera

**NOW THAT YOU HAVE THIS IMAGE OPEN ,
CONTINUE ON TO FIND OUT WHAT
ELSE CAN BE DONE TO MANIPULATE THE IMAGE**

MANIPULATING HERA IMAGES

IMPORTANT: For the image files being used the only available tool that will produce anything is the *Pow Plot Tool*. Do not use any of the *File Utilities* or *XRONOS Tools*; they are for another type of activity.

DUPLICATING IMAGES:

Duplicating an image is a great way to manipulate one image while being able to compare it to the original data graph. It allows you to see how you are manipulating the image and if what you are doing is allowing you to observe anything new.

1. Open an image
 - a. Go to the "Edit" toolbar
 - b. Choose "Duplicate Graph"
 - c. The new duplicate image will appear to the right of the original.

OPENING MULTIPLE IMAGES:

Opening multiple images is helpful so that one image can be compared to another. This way you can compare one energy level image to another energy level.

1. Open one image and move it to the side
 - a. Go back to the original Hera menu
 - b. Select a new image to open, choose Pow Plot as the tool, and click run.
 - c. The new image will appear to the right of the original one in the new window.

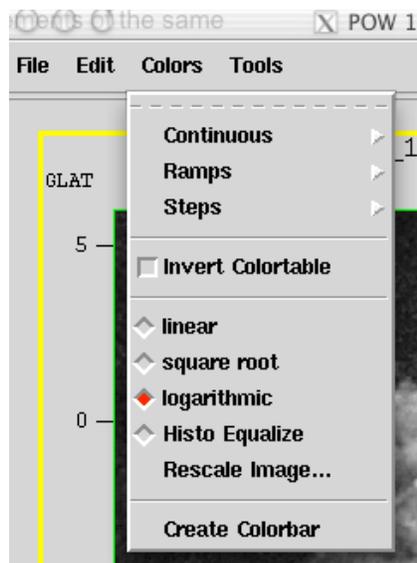
CHANGING THE SCALE OF THE IMAGE

Changing the scale of the image adjusts the way that the data is displayed. This will cause slight variations in the visibility of items in the image, thus allowing you to see more or less. There are four scales you can choose from:

- **Linear:** a method of displaying the data with graduated increments of the same size
- **Logarithmic Scale:** A method of displaying data (in powers of ten) to yield maximum range while keeping resolution at the low end of the scale
- **Square Root:** this method performs contrast manipulation using a Square-root transfer-function. It first normalizes the Histogram for the image. The resulting image is transformed by replacing each pixel value by another value using a table. The table has the shape of a square-root curve. It will compress the displayed brightness at the bright end of the scale, while expanding those at the dark end.
- **Histo-equalized:** Histogram equalization (Histo-Equalized) scales the image data so that each bin contains roughly the same number of pixels.

1. With an image open, go to the “colors” button at the top of the window.

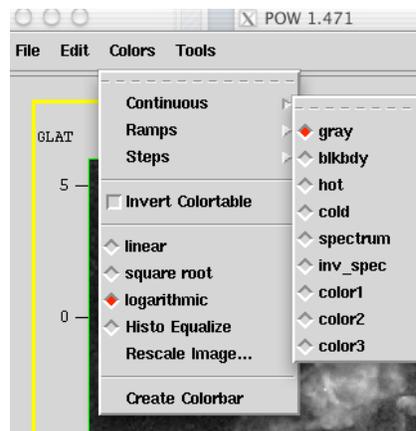
a. Scroll down and you will see the choices as shown below:



- b. Choose the type of scale that you want the image to have and click the diamond to the left.
- c. When selected the diamond will highlight in red.
- d. The image will instantly change and stay in that scale until you change it to a different scale.

HOW TO ADJUST IMAGE COLORS:

1. With an image open, go to the “colors” toolbar at the top of the page.
There are 3 menus in which you can adjust the colors
 - a. Continuous
 - b. Ramps
 - c. Steps
2. When you select one of the menus you will be given many options such as the ones below.



3. You can try many different combinations from the various menus to produce different results.
4. This is what you will do to manipulate all of the “fits” images in order to see if there is anything in the image that was not seen in the visible range.

NOW ITS TIME TO EXPLORE THE IMAGES!
OPEN EACH OF THE “FITS” FILES AND SEE IF YOU CAN
DETECT ANYTHING IN THE SUPERNOVA REMNANTS THAT
YOU DID NOT DETECT BEFORE.

Good Luck!