APPENDIX 4

In this appendix we present an alternative way to carry out the activities 1,4 and 1.6 of the guidebook using SalsaJ, a free software downloadable at www.euhou.net

Activity no. 1: Counting sunspots in different days
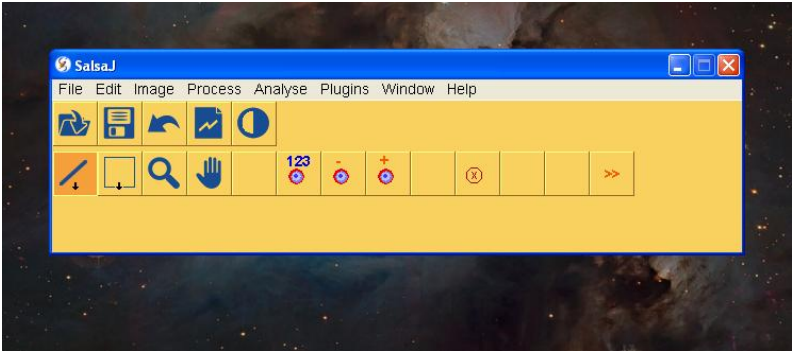

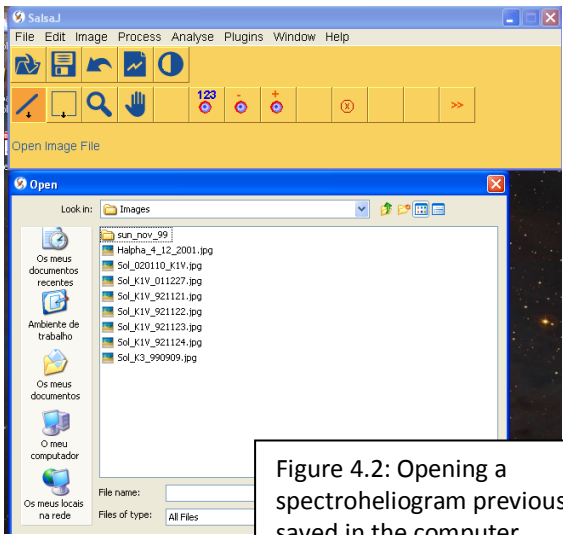Figure 4.1: working environment of SalsaJ

Figure 4.2: Opening a spectroheliogram previously saved in the computer.

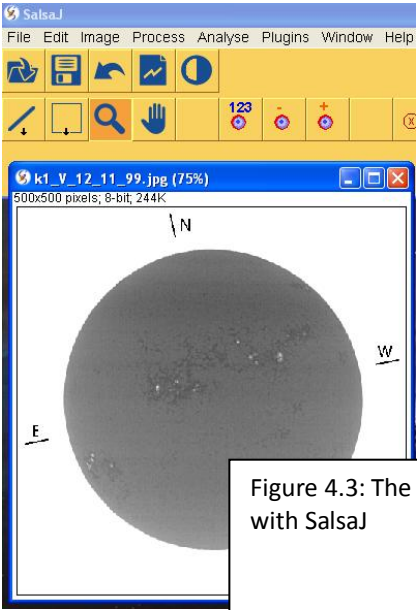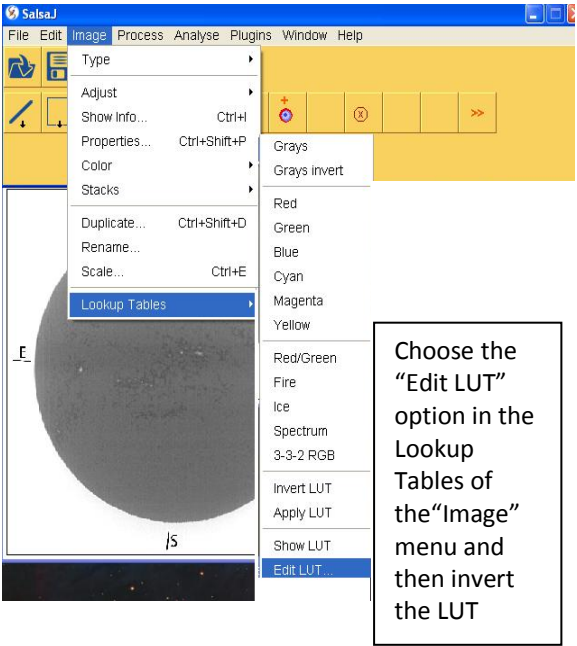Figure 4.3: The image, opened with SalsaJ

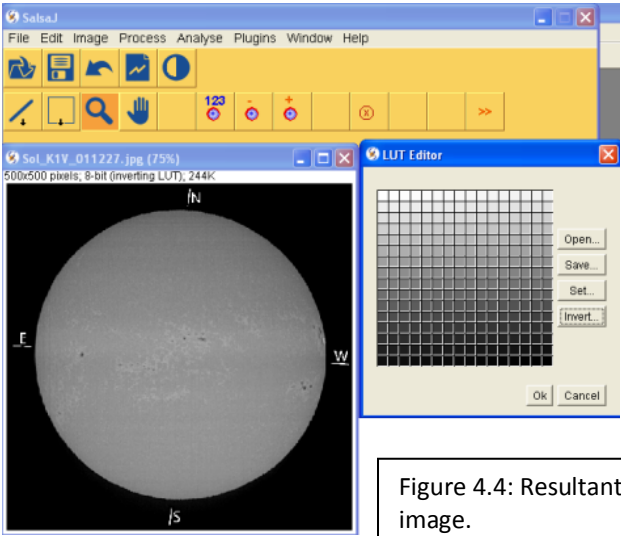Choose the "Edit LUT" option in the Lookup Tables of the"Image" menu and then invert the LUT
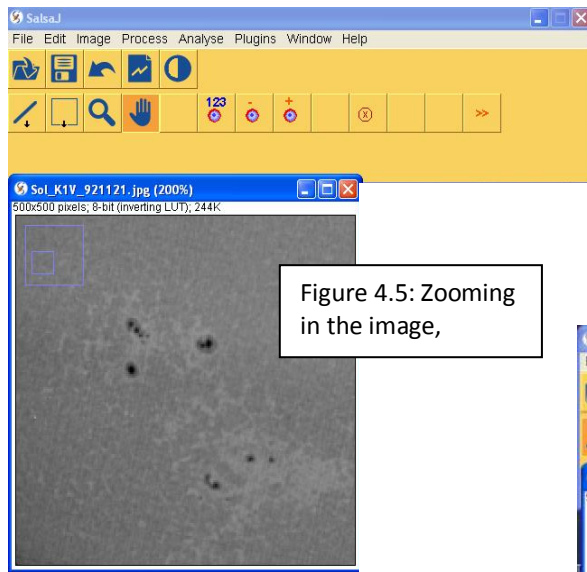

Figure 4.4: Resultant image.

The image can be zoomed in using the tool. Use the tool to select a group of sunspots and start counting the spots in the group. Be careful not to count the same group or the same sunspot twice.

Figure 4.5: Zooming in the image,

Using the (segment) tool, draw a segment across some sunspots of a certain sunspots' group, big enough to cover a bit of the image besides the sunspots area and have, this way, the opportunity to compare, the values of a sunspot and the matrix of the image (this comparison is done after drawing the plot profile of the segment)
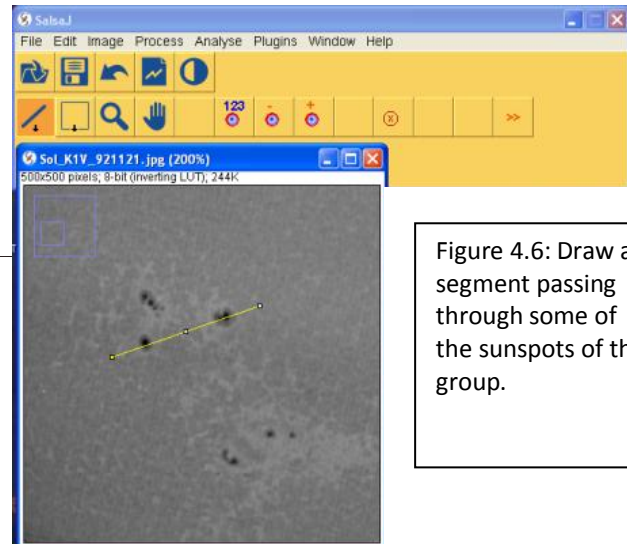

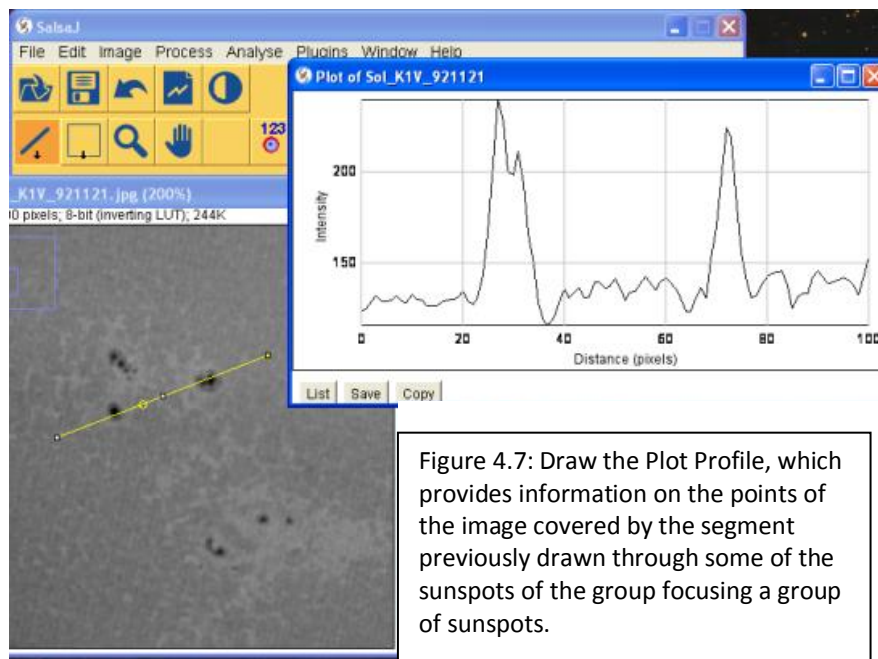Figure 4.6: Draw a segment passing through some of the sunspots of the group.

Figure 4.7: Draw the Plot Profile, which provides information on the points of the image covered by the segment previously drawn through some of the sunspots of the group focusing a group of sunspots.

Select the "Plot Profile" option of the "Analyse" menu. On this graph, the darker points of the image (covered by the segment) are represented as relative maximums. If a certain maximum is considerably superior to others immediately before and after, it is almost certain corresponding to a sunspot in the image. The other inferior maximums that reveal some homogeneity correspond to counting in the area around the spots. This comparison of values is only possible if the segment is big enough to cover points of the image corresponding to non active areas of the Sun.

NOTE: You should pay attention to the structure of a sunspot, to avoid confusing them with some eventual dark spots deposited on the spectroheliogram's photographic film throughout the years. Continue analysing the image this way until all the visible groups of sunspots have been looked at.

Activity 4: The solar rotation film

Open the four suggested images (the ones with the same or approximate dates), so that the movie reflects the Sun's rotation movement correctly.
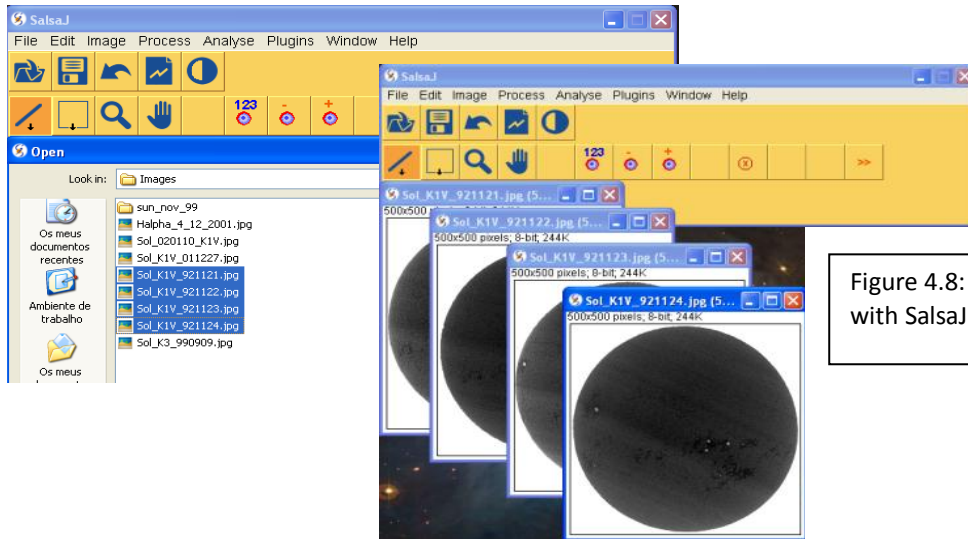

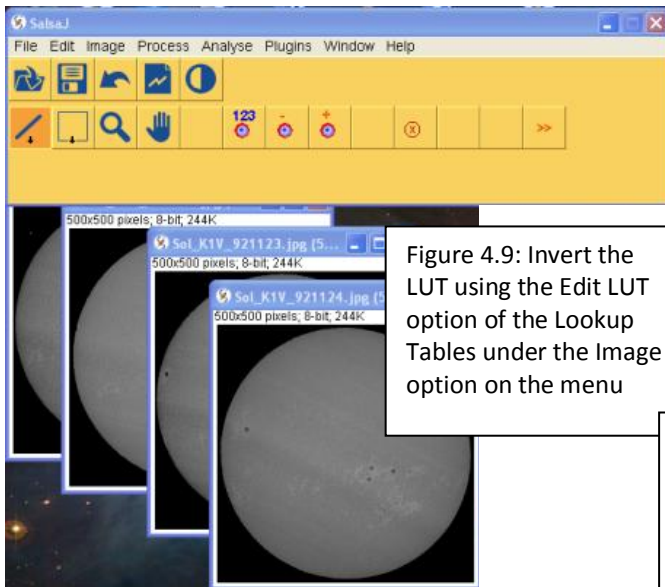Figure 4.8: The four images opened with SalsaJ

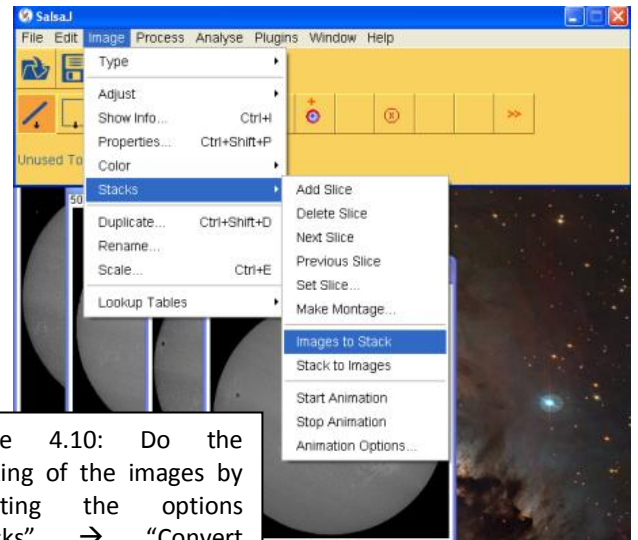Figure 4.9: Invert the LUT using the Edit LUT option of the Lookup Tables under the Image option on the menu

Figure 4.10: Do the stacking of the images by selecting the options "Stacks" → "Convert images to stack" of the "Image" menu.
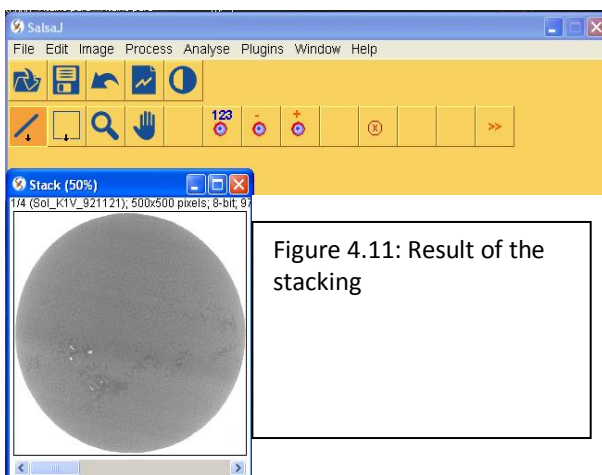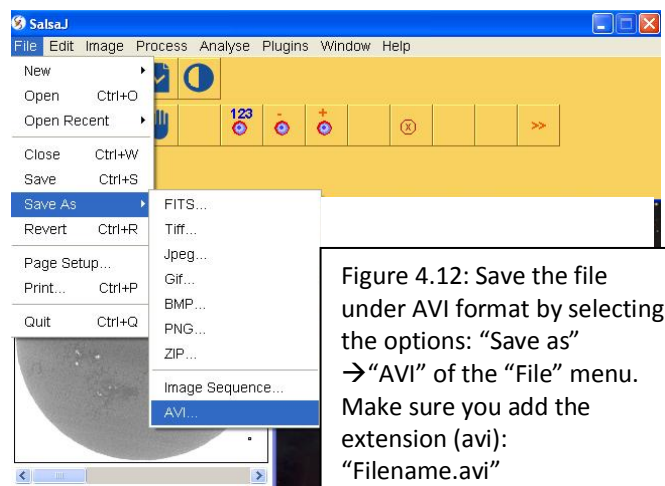

Figure 4.11: Result of the stacking

Figure 4.12: Save the file under AVI format by selecting the options: "Save as" →"AVI" of the "File" menu. Make sure you add the extension (avi): "Filename.avi"
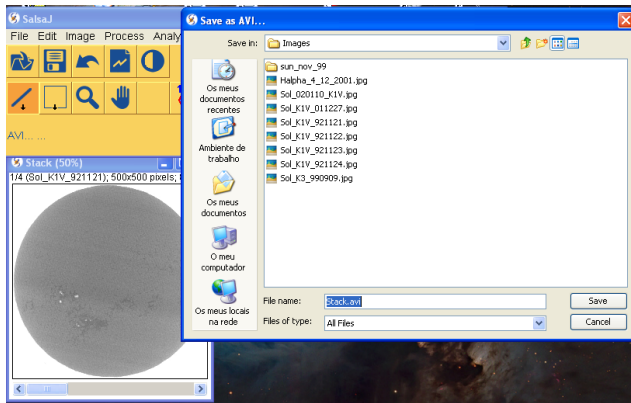
Figure 4.13: Select the folder where you want to save the file.

Optional Operations:

In order to enhance the visible sunspots in the image, it is possible to do some changes, both in color, brightness and contrast.
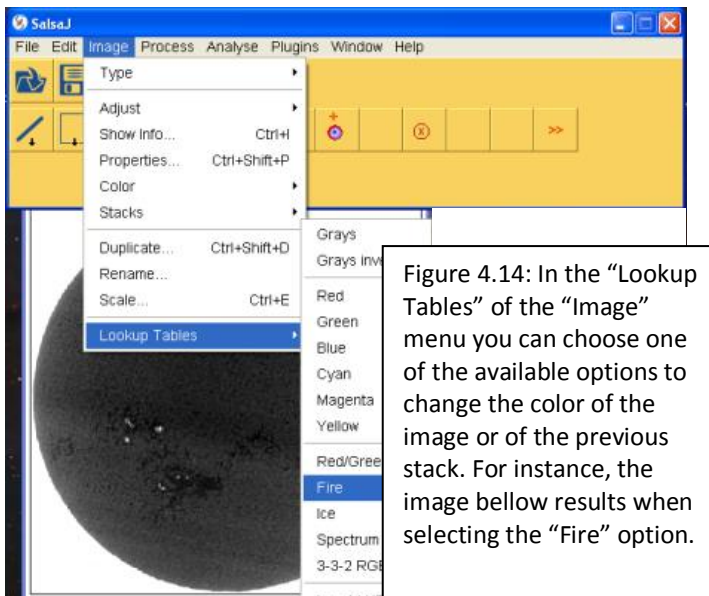

Figure 4.14: In the "Lookup Tables" of the "Image" menu you can choose one of the available options to change the color of the image or of the previous stack. For instance, the image bellow results when selecting the "Fire" option.
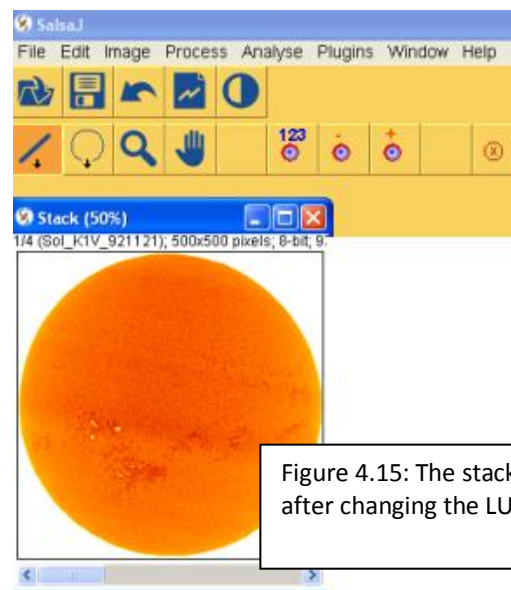

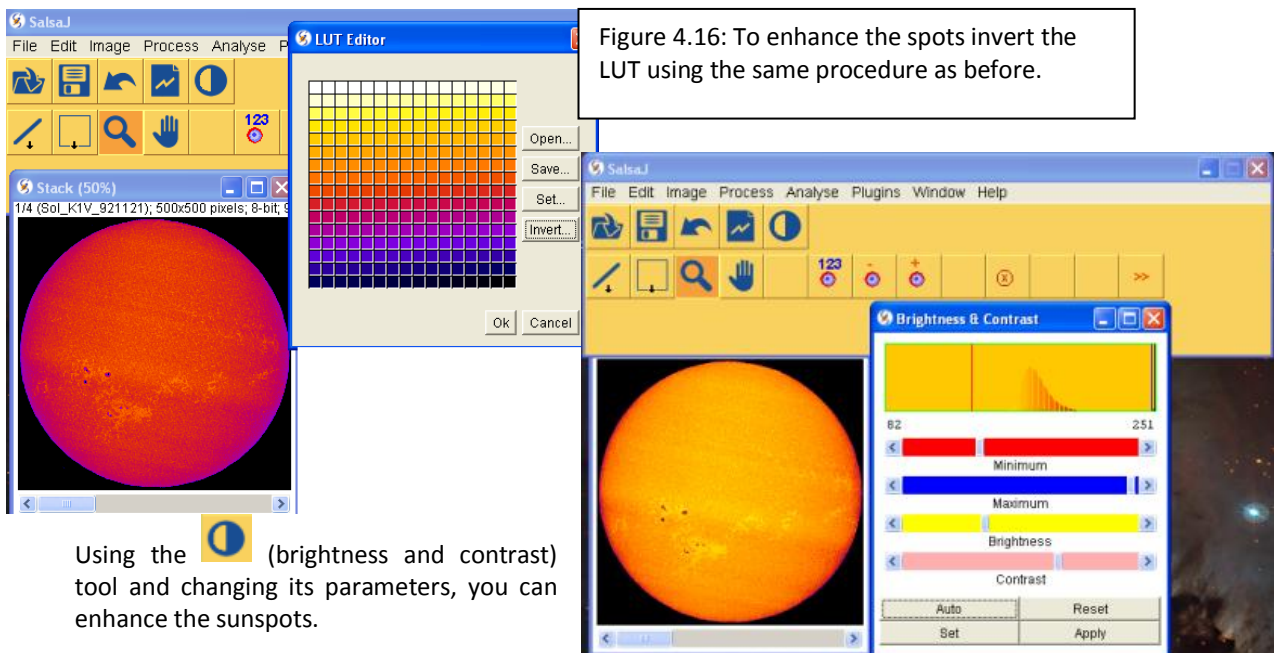Figure 4.15: The stack, after changing the LUT

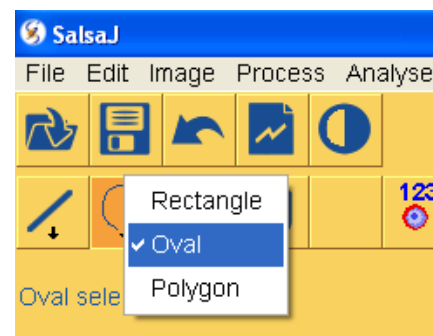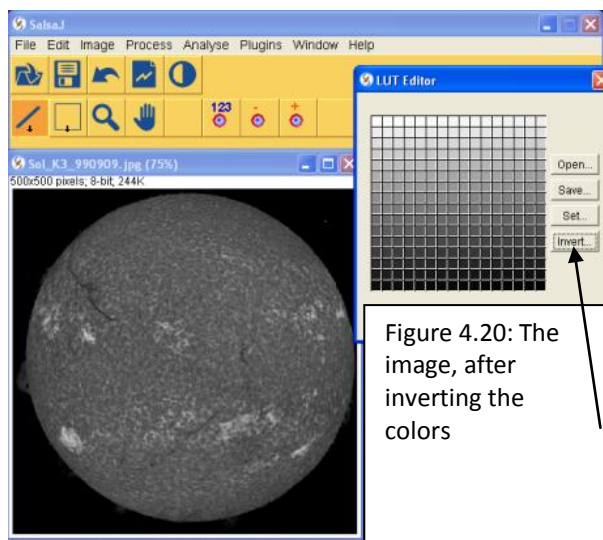Figure 4.16: To enhance the spots invert the LUT using the same procedure as before.
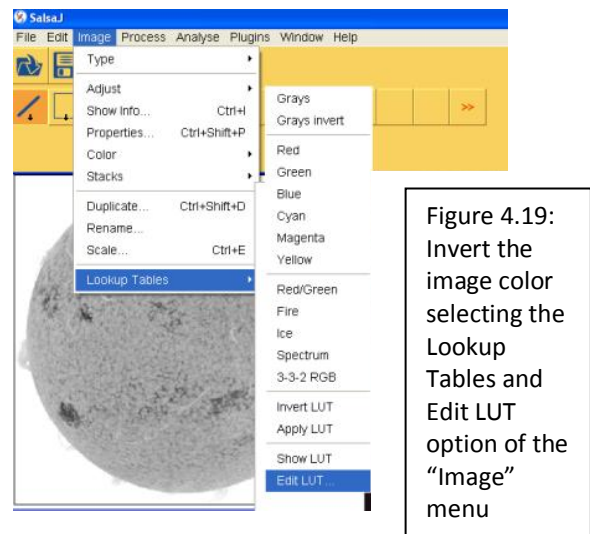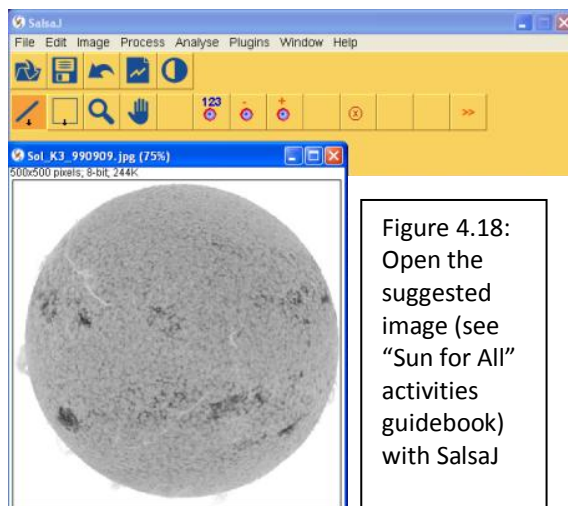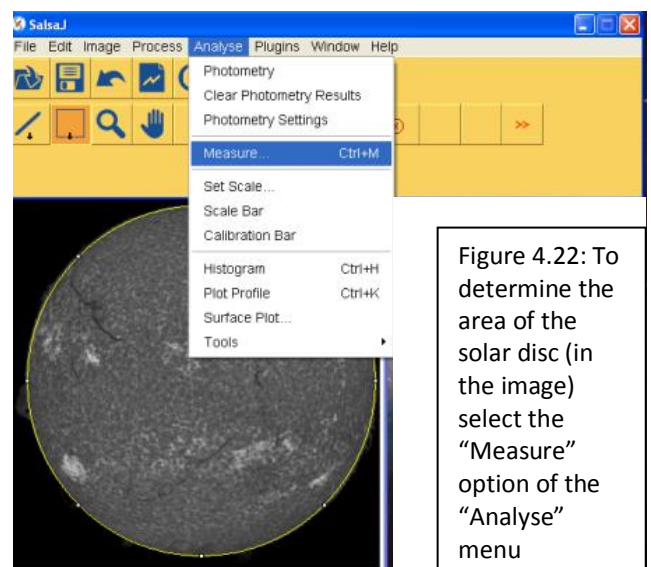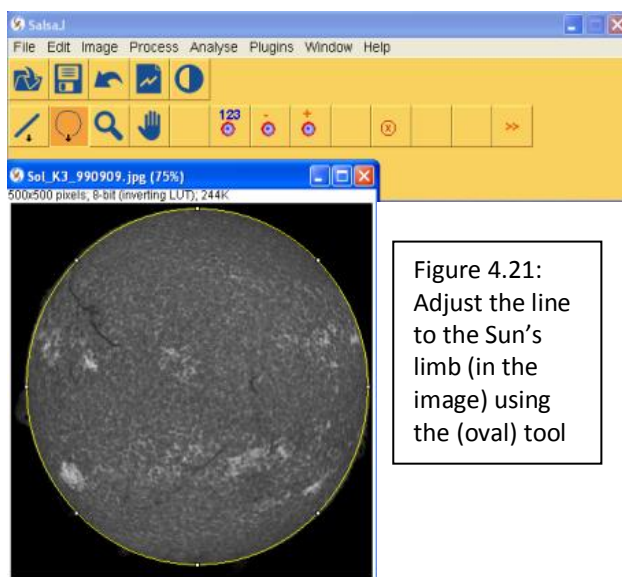

Using the (brightness and contrast) tool and changing its parameters, you can enhance the sunspots.

Figure 4.17: The image, after changing the brightness and contrast parameters.

Activity 6: Computing of the real size of a prominence

Figure 4.18: Open the suggested image (see "Sun for All" activities guidebook) with SalsaJ

Figure 4.19: Invert the image color selecting the Lookup Tables and Edit LUT option of the "Image" menu

Figure 4.20: The image, after inverting the colors

With the right button of the mouse select the oval shape

Figure 4.21: Adjust the line to the Sun's limb (in the image) using the (oval) tool

Figure 4.22: To determine the area of the solar disc (in the image) select the "Measure" option of the "Analyse" menu
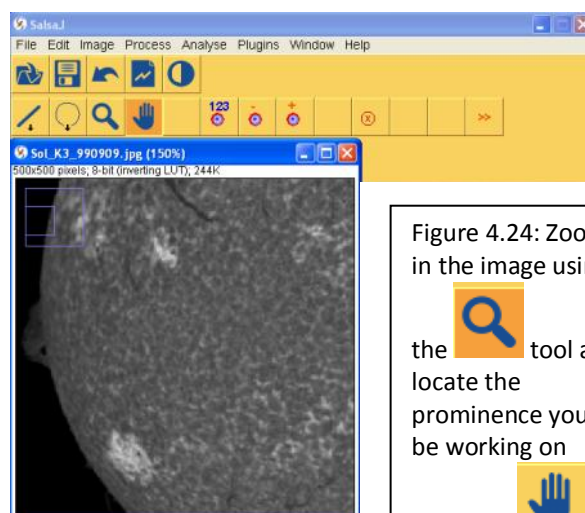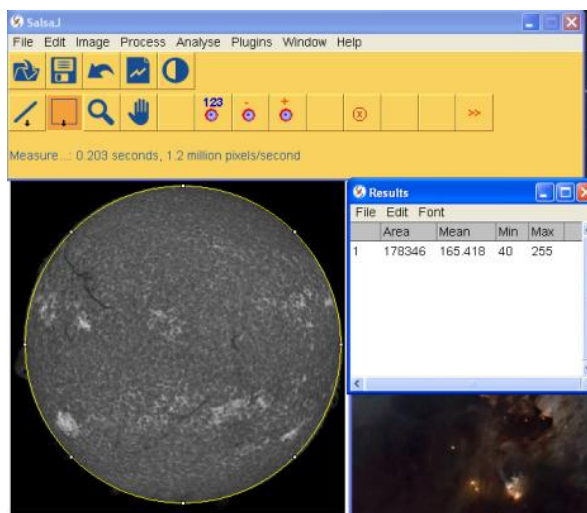
Figure 4.24: Zoom in the image using the 🔍 tool and locate the prominence you'll be working on using the ✋ tool.
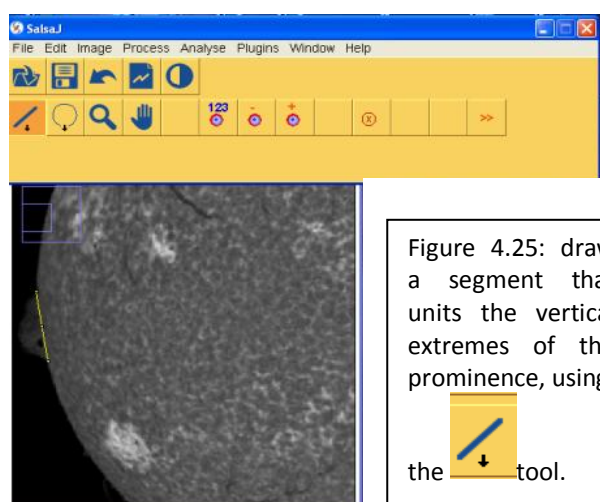

Figure 4.25: draw a segment that units the vertical extremes of the prominence, using the ✏ tool.
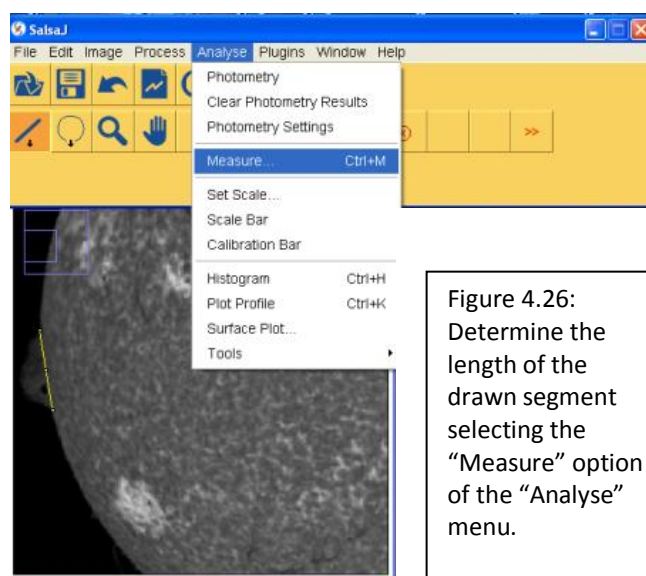

Figure 4.26: Determine the length of the drawn segment selecting the "Measure" option of the "Analyse" menu.
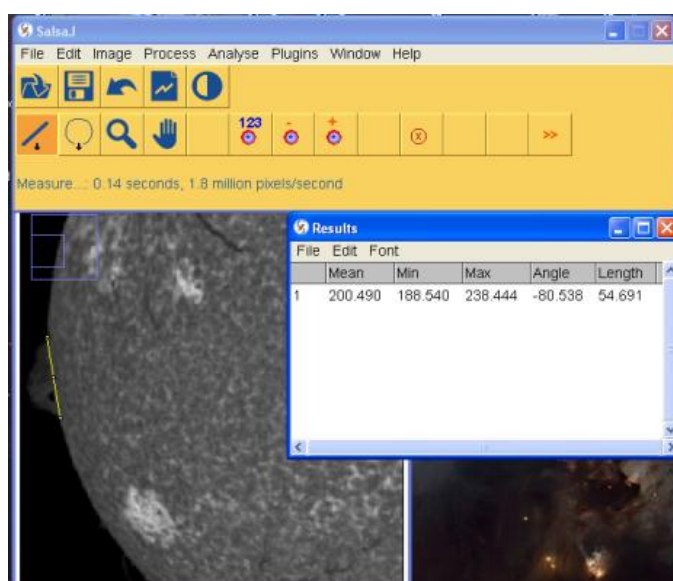

Figure 4.27: Resultant measurement.

Using the area of the solar disc (in the image), previously computed, and the vertical length of the prominence represented in the image, students can easily determine the real vertical dimension of the prominence (using proportion relations and
Knowing that Radius of the Sun =690 000 km). Proceed in similar way to determine the real horizontal dimension of the prominence.