PHYSICS & CHEMISTRY

DNL / 2NDE

THEME 1 : ASTRONOMY

Session 3 : Using Photographs of an Exoplanet Transit

Using Photographs of an Exoplanet Transit

Objectives:

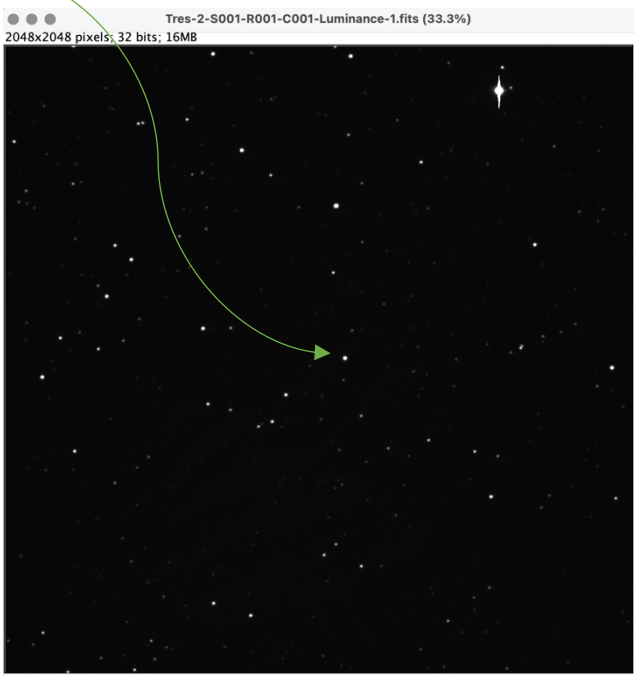
- Analyze photographs
- Draw the graph: Brightness = f(Time)
- Use the SalsaJ software

Instructions:

1. Open the SalsaJ software.
2. Click on "Open image file".

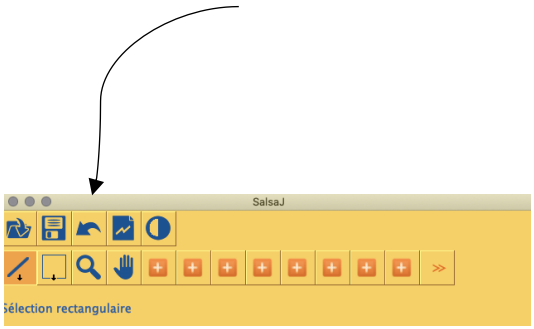
3. Select the first image from the folder that contains the photographs of the studied star.

4. Check, using the Aladin Sky Atlas website (https://aladin.u-strasbg.fr/AladinLite/), that the star TrES-2 is really the star in the center of the image.

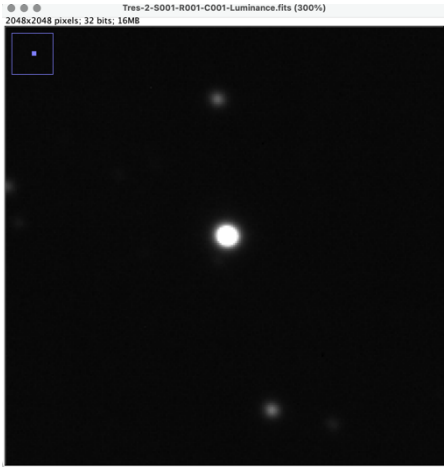


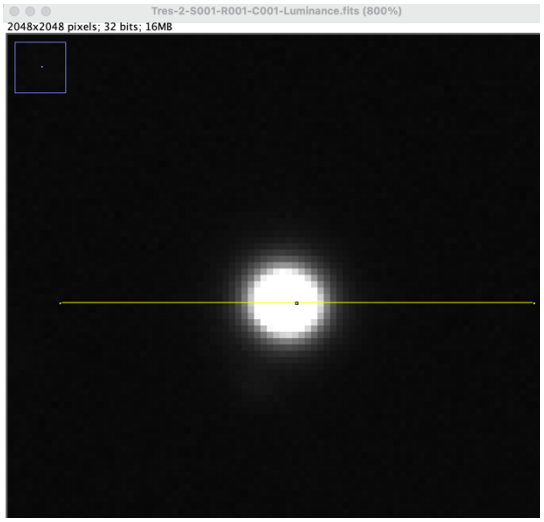
5. Use the "Zoom" tool to enlarge the image as much as possible on TrES-2

   (Left click to zoom in, right click to zoom out)



6. Choose "Straight selection" in the SalsaJ toolbar. Draw a line across the entire image, passing through the center of the star.





7. In the SalsaJ menu bar, click on "Analyze" then "Plot Profile".

- Determine the minimum number of pixels that includes all the light intensity of the star.
- Write down the value chosen by the whole class:

  Manual star radius: 40

8. In the SalsaJ menu bar, click on "Analyze" then "Photometry Settings".

- Enter the value of the "manual star radius" you found in question 7.
- Enter the following value for the **"manual sky radius": 60**

We will call:

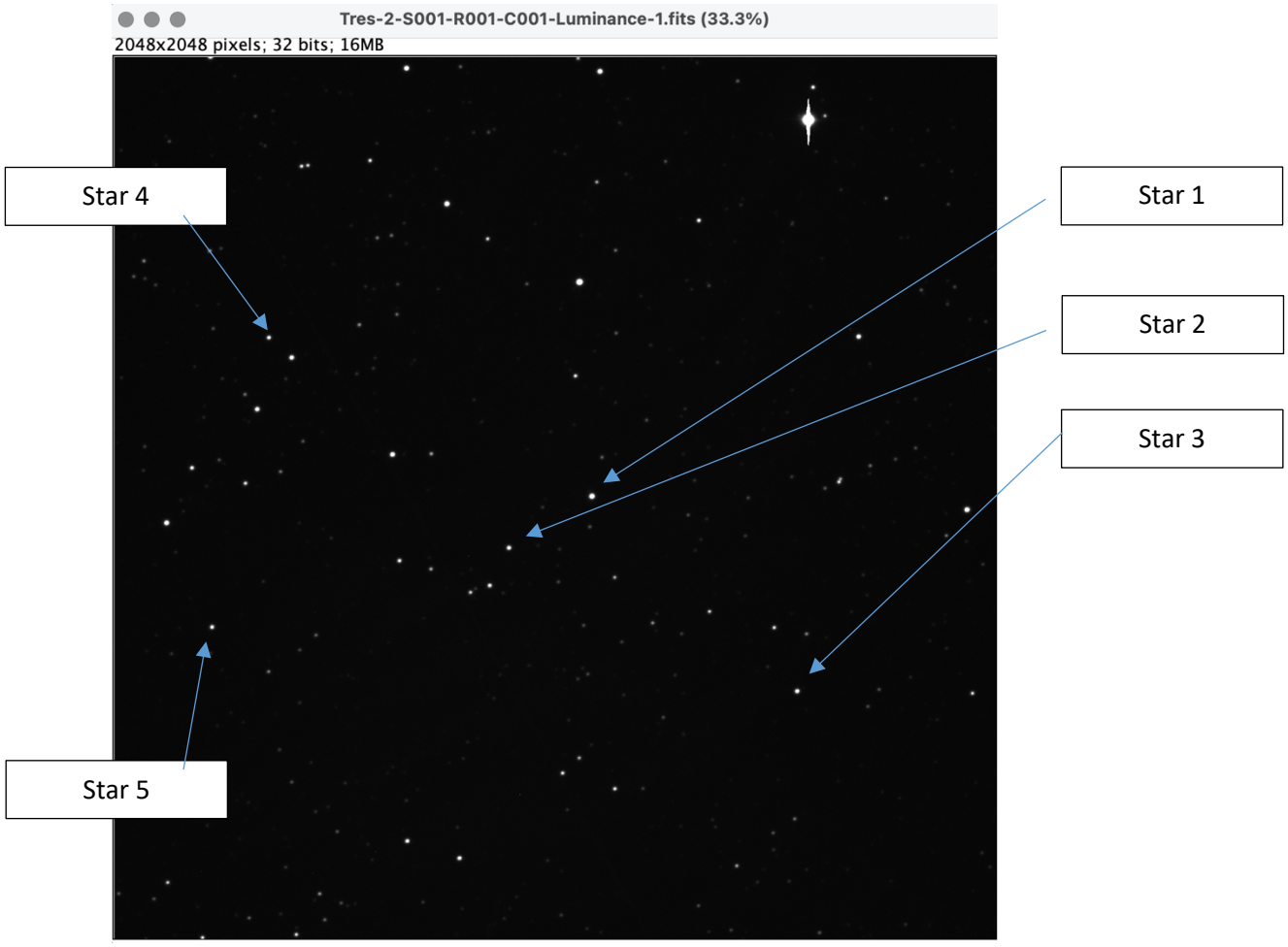
- Star 1: TRES-2
- Stars 2,3,4,5 : the next four stars

9. In the SalsaJ menu bar, click on "Analyze" then "Photometry".

For all the photographs your group analyzes, always click in this order: Star 1, Star 2, Star 3, Star 4, Star 5.

Notes:

- To find the Time: Images > Information > Universal Time



Write down the results in a shared Excel spreadsheet on your team's website:

	Image	X	Y	Intensité étoile (L_1)	Rayon étoile	Intensité ciel	Rayon ciel
Star 1	Tres-2-S001-R001-C001-Luminance.fits	1109	1019	3185921	40	1997	60
Star 2	Tres-2-S001-R001-C001-Luminance.fits	916	1139	1377676	40	1995	60
Star 3	Tres-2-S001-R001-C001-Luminance.fits	1585	1472	1559934	40	1966	60
Star 4	Tres-2-S001-R001-C001-Luminance.fits	359	651	1057123	40	1956	60
Star 5	Tres-2-S001-R001-C001-Luminance.fits	226	1323	1067316	40	1969	60

10. On Office 365 (XXXXXXXXXXX), open the Excel file "TrES-2-photometry".
    - Fill in the columns: Time, L1, L2, L3, L4, L5 (brightness of stars 1, 2, 3, 4 and 5).
    - Once all groups have filled in the table, copy the values into a new tab in the Excel
    - Build the graph showing L = f(time) with $L = \frac{L_1}{L_2+L_3+L_4+L_5}$

11. Conclusion: Did we detect an exoplanet transit?!

Next step: Create a report in any format you want (text, story, comic, movie, cartoon, drawing, etc.).

It must include these steps:

- Present the objective
- Clearly and briefly explain the steps you did
- Present the graph you got
- Interpret the graph and conclude about the detection of an exoplanet
- Use correct and precise vocabulary, and present your work in an original way that anyone can understand! You will present your work in front of the class.