

Section 3: Parts I-L (Notes and Journal Answers)

The data: preparing, understanding, using, and interpreting

Part I - Preparing the Data

Once the data is downloaded and the spreadsheet is open, it should look something like this:

| e_id | id | time | jd | mjd | ra_hours | dec_degs | x | y | telescope | filter | exp_mag | mag_error | flux | flux_error | pm_sky | pm_epoch | pm_pos_angle_1 |
|------|-------|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|--------|--------------|----------------|-------------|-------------|-----------|-----------------|----------------|
| 64 | SRC10 | 2008-11-11 23:0 | 2454782.711 | 54782.2113 | 23.02406573 | 2.07588326 | 431.9058322 | 337.9982168 | Red | 20 | 10.50690377 | 0.003142067456 | 125391.6121 | 363.402772 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 64 | SRC12 | 2008-11-11 23:0 | 2454782.711 | 54782.2113 | 23.03140363 | 2.109600856 | 910.0132859 | 652.4549719 | Red | 20 | 10.83272046 | 0.003679665684 | 92884.19309 | 315.3533599 | | 2008-11-11 20:1 | |
| 57 | SRC10 | 2008-11-11 17:5 | 2454782.497 | 54781.99725 | 23.02406573 | 2.07588326 | 910.9898443 | 431.7587667 | Red | 20 | 10.19504022 | 0.002819311343 | 167114.4125 | 434.506832 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 57 | SRC12 | 2008-11-11 17:5 | 2454782.497 | 54781.99725 | 23.03140363 | 2.109600856 | 199.5772022 | 233.3355026 | Red | 20 | 10.56154211 | 0.003413489061 | 119237.5797 | 375.4653309 | | 2008-11-11 20:1 | |
| 58 | SRC10 | 2008-11-11 18:4 | 2454782.532 | 54782.03192 | 23.02406573 | 2.07588326 | 128.6992038 | 530.7409809 | Red | 20 | 10.62482515 | 0.003270829448 | 112496.3782 | 339.3812485 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 58 | SRC12 | 2008-11-11 18:4 | 2454782.532 | 54782.03192 | 23.03140363 | 2.109600856 | 803.3137709 | 747.1681799 | Red | 20 | 10.56102743 | 0.003174224664 | 119294.1166 | 349.2748919 | | 2008-11-11 20:1 | |
| 59 | SRC10 | 2008-11-11 19:2 | 2454782.562 | 54782.06213 | 23.02406573 | 2.07588326 | 172.7526159 | 514.2556888 | Red | 20 | 10.9013197 | 0.003725910291 | 87197.11483 | 299.7475108 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 59 | SRC12 | 2008-11-11 19:2 | 2454782.562 | 54782.06213 | 23.03140363 | 2.109600856 | 814.9823741 | 747.0758817 | Red | 20 | 10.55809177 | 0.00317066445 | 119617.1055 | 349.8271723 | | 2008-11-11 20:1 | |
| 60 | SRC10 | 2008-11-11 20:1 | 2454782.592 | 54782.09212 | 23.02406573 | 2.07588326 | 213.0639661 | 496.9755159 | Red | 20 | 10.25765492 | 0.00275569336 | 157749.5134 | 400.8905817 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 60 | SRC12 | 2008-11-11 20:1 | 2454782.592 | 54782.09212 | 23.03140363 | 2.109600856 | 822.6771143 | 746.2090634 | Red | 20 | 10.54813699 | 0.003157243233 | 120718.8802 | 351.552768 | | 2008-11-11 20:1 | |
| 61 | SRC10 | 2008-11-11 21:0 | 2454782.628 | 54782.12763 | 23.02406573 | 2.07588326 | 190.1452207 | 478.1145158 | Red | 20 | 10.34813334 | 0.002879535781 | 145002.8909 | 385.0799043 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 61 | SRC12 | 2008-11-11 21:0 | 2454782.628 | 54782.12763 | 23.03140363 | 2.109600856 | 761.2609987 | 746.5965907 | Red | 20 | 10.5878594 | 0.003222187133 | 116382.112 | 345.9053426 | | 2008-11-11 20:1 | |
| 62 | SRC10 | 2008-11-11 21:4 | 2454782.657 | 54782.1572 | 23.02406573 | 2.07588326 | 282.5069793 | 448.4981158 | Red | 20 | 11.03660279 | 0.003996622224 | 76981.94517 | 283.8946637 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 62 | SRC12 | 2008-11-11 21:4 | 2454782.657 | 54782.1572 | 23.03140363 | 2.109600856 | 821.3318631 | 733.1728489 | Red | 20 | 10.62274899 | 0.003283136614 | 112701.6824 | 341.3122111 | | 2008-11-11 20:1 | |
| 63 | SRC10 | 2008-11-11 22:3 | 2454782.688 | 54782.18795 | 23.02406573 | 2.07588326 | 301.3417955 | 408.9967943 | Red | 20 | 10.749566975 | 0.003505852077 | 100277.1766 | 324.3192476 | 0.0000022 | 2008-11-11 18:4 | 117.518355 |
| 63 | SRC12 | 2008-11-11 22:3 | 2454782.688 | 54782.18795 | 23.03140363 | 2.109600856 | 805.9670005 | 710.3981518 | Red | 20 | 10.71032287 | 0.003440802081 | 103968.2777 | 330.008073 | | 2008-11-11 20:1 | |

The next step is to add a column next to the last column which contains data. Please follow the instructions on the SJS site. (Section 3, Part I)

c) You can copy this formula for the rest of the column, but you must copy the calculated cell and the blank cell below it. Paste this into the rest of the column. Delta mag should show up in every other row for a total of 8 numbers.

The last column should look like this:

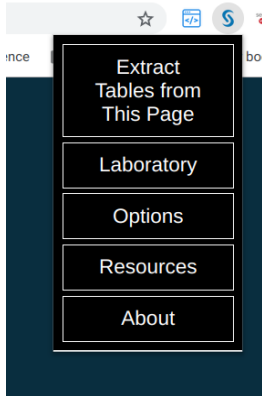
| | T |
|-------------|----------------|
| e_delta mag | |
| 55 | 0.325816683 |
| | |
| 55 | 0.366501886 |
| | |
| 55 | -0.06379772923 |
| | |
| 55 | -0.3432279344 |
| | |
| 55 | 0.2904820745 |
| | |
| 55 | 0.2387260669 |
| | |
| 55 | -0.4138537962 |
| | |
| 55 | -0.03924688053 |
| | |

Save this spreadsheet!

NEXT:

SAS Graphics Accelerator

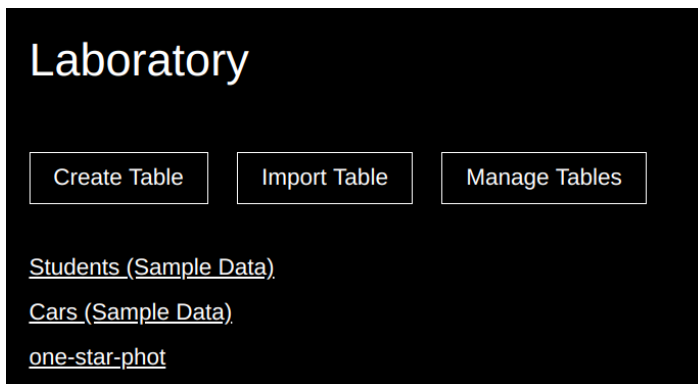
Follow the instructions on the SJS site for installing this extension. Once you have installed and clicked on the SAS extension, you will see this dropdown menu:



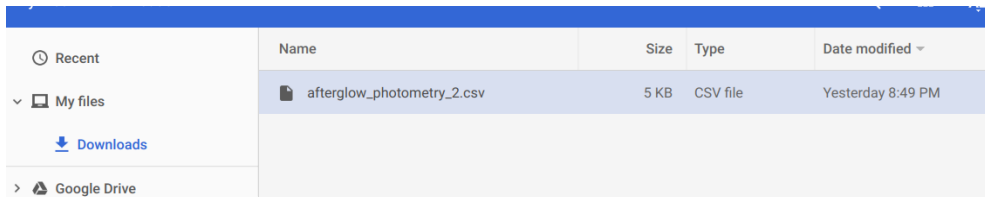
**Click on “Laboratory.”
Next you will see this screen: click on Tables**



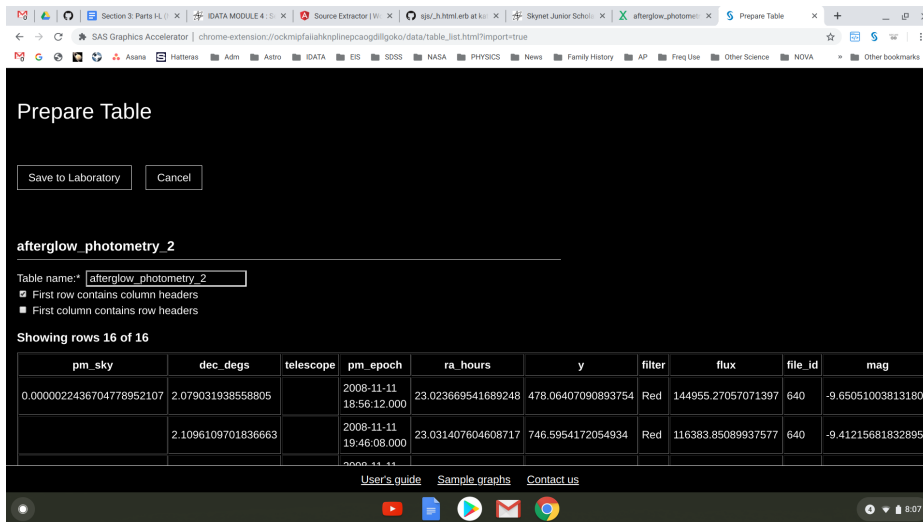
Next, Click on “Import Table”



On my chromebook, the choices for importing shows up in the “Downloads” file:



Once you have found the file and select import



As the instructions on the SJS site say, change the name if you would like. Note how easy it is to move across the table. The meaning of some of the data is explained in the next part, Part J.

Part J - Understanding the Data

This section gives some good information on the data contained in the columns.

Part K - Using the Data

Using the SAS extension allows one to sonify the data. This should be done by all group members. Then anyone who would like to use another platform (like excel graphing) can try it that way.

The first step is to filter the data: Follow the steps on the SJS site

The file_id column (identifies the image) has evenly spaced numbers that we can use. BUT, there are two of each number (recall, one for the asteroid and one for the standard star).

We will filter the data and get rid of the double numbers, allowing us to use the file_id column as one of our axis. Follow the steps below:

1. Find the column titled id(it is not the same as file_id!). It contains SRC0, SRC3, SRC0, SRC3, etc(the SRC stands for source code), or some set of repeating numbers.

Click on the box below the column name(row 2). It says "character".

| | id | mag | exp |
|---|-----------|-----|-----|
| | Character | | Num |
| 0 | SRC0 | | |
| 7 | SRC3 | | |
| 0 | SRC0 | | |
| 5 | SRC3 | | |
| 3 | SRC0 | | |

This opens a pop-up box titled "column properties".

Column Properties

Column label:

Column type:

Note: 16 of 16 rows match the selected type.
 This column contains categorical data.

Filter Column

Scroll down inside the box until you get to "Filter Column".

5. The next box is titled "Value". Type one of the numbers that occurs after the SRC into this box, and then click on "OK". This keeps all the rows with id value of SRC followed by the number you picked. This eliminates the double numbers in the file_id column. You should now have only 8 rows.

B. Creating the Graph

1. Move back to the left of the page so that you see the choices above the table.
2. Click on “Create Table from Filtered Data”.

Table: afterglow_photometry_2-1 - Sheet1

Return to Laboratory Download Table Properties Remove All Filters

Create Graph from Filtered Data Create Map from Filtered Data Manage Graphs and Maps

A new page shows up.

Create Graph

Cancel

Chart type:

- Bar chart
- Box plot
- Bubble plot
- Histogram
- Line chart

3. Scroll down in the box under “Chart Type” until you see “Series Plot”. Click that.

4. Below the chart type is the x axis variable and y axis variable. The x axis is chosen for you: file_id. You must choose the y axis. Scroll down under the y axis until you see delta mag. Click th

X axis variable: file_id

X axis label: file_id

Y axis variable: mag_error, exp_length, jd, mjd, Delta Mag

Y axis summary statistic: (none), Mean, Sum

Y axis label: Delta Mag

Title: Series plot showing Delta Mag by

Footnote: Filtered by id.

Submit Cancel

5. Scroll down to the bottom to the very left and click “Submit”. This will take you back to the Table page.

6. Find the box below the button choices at the top. The box is a light green outline with the name of the graph inside it. Click this to open the sonified graph.

Table: afterglow_photometry_

Return to Laboratory Download Table Prop

Create Graph from Filtered Data Create Map from


[Series plot showing Delta Mag by file_id](#)

[Series plot showing Delta Mag by file_id](#)

Showing filtered rows 8 of 8

7. Once the new window opens, explore the graph by using the right and left arrows on your keyboard.

Settings Help



X = 1167

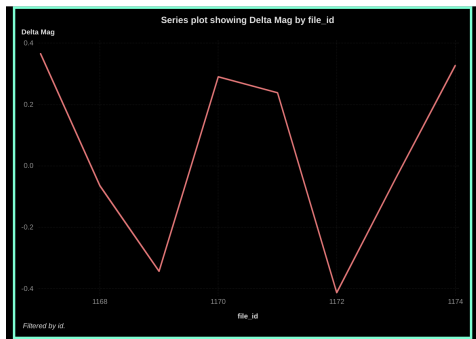
Y = 0.366008794

Series plot showing Delta Mag by file_id Data

Part L - Interpreting the Data

Please follow the instructions on the SJS site for the interpretation.

The graph should look like the light curve made with the potato model. You can make a visual graph from the above page by scrolling toward the bottom of the page and clicking on the hot link for "View, download, and share a visualization of this series plot. It will look like this:



3. On the table, find the corresponding modified julian date(mjd) in column 18 for the two 'x' values you read off the graph in step 1 above. (When you scroll over the graph, you can read the point values.)

4. Subtract the smaller number from the larger number. Record the number.

5. This number represents the time for one half a rotation. Therefore, multiply it by 2.

6. Let's convert it to hours. Do this by multiplying the answer from #5 by 24 hours.

How close did you come to the accepted answer? How could you find this accepted answer?

The accepted answer is 5.385 hours.

NOTES:

- 1. Excel or Google sheets work just fine for those with vision.**
- 2. If you would like to use more data, download the Kleopatra dense sample folder to Afterglow Access. Photometer this data as you did before. You can still use the SAS graphics accelerator to sonify the data in the light curve.**

Credits: **Innovators Developing Accessible Tools for Astronomy (IDATA)**, officially known as *Research Supporting Multisensory Engagement by Blind, Visually Impaired, and Sighted Students to Advance Integrated Learning of Astronomy and Computer Science*, and the resulting curricular resources, Afterglow Access software, and project research were made possible with support from the U.S. National Science Foundation's STEM+C program (Award 1640131). IDATA institutional collaborators include AUI, GLAS Education, Linder Research & Development Inc., Logos Consulting Group, TERC, University of Nevada – Las Vegas, University of North Carolina at Chapel Hill, and Universidad Diego Portales. Individual consultants on the project include Kathy Gustavson and Alexandra Dean Grossi. IDATA Teacher collaborators in the U.S. include Amanda Allen, Jacqueline Barge, Holly Bensel, Neal Boys, Tim Fahlberg, Kristin Grender, David Lockett, Matthew McCutcheon, Caroline Odden, Michael Prokosch, Kara Rowbotham, Rick Sanchez, and Barbara Stachelski. IDATA Student collaborators in the U.S. include Evan Blad, Naleah Boys, Ellen Butler, Jayden Dimas, Riley Kappell, Joseph Murphy, Logan Ruby, Alex Scerba, Charlize Sentosa, Meg Sorensen, Remy Streichenberger, Trevor Warren, and others. IDATA Undergraduate Mentors include Tia Bertz, Katya Gozman, Chris Mathews, Kendall Mehling, Andrea Salazar, Ben Shafer, Alex Traub, and Sophia Vlahakis. Special thanks to the IDATA external advisors including Nic Bonne, Al Harper, Sue Ann Heatherly, Russ Laher, Luisa Rebull, Ed Summers, and Kathryn Williamson,