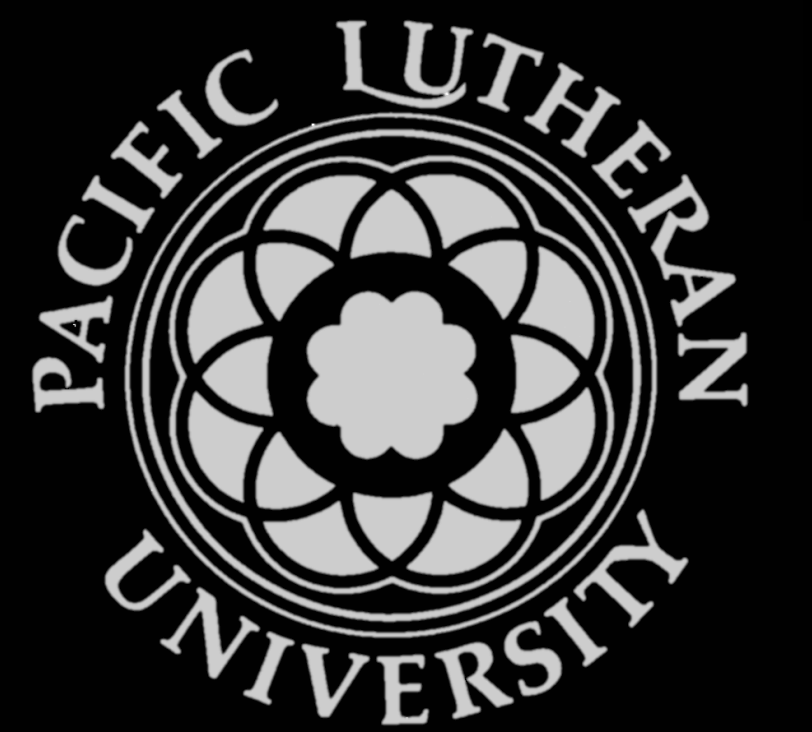


Analyzing the Intensity Profile of Saturn's Rings

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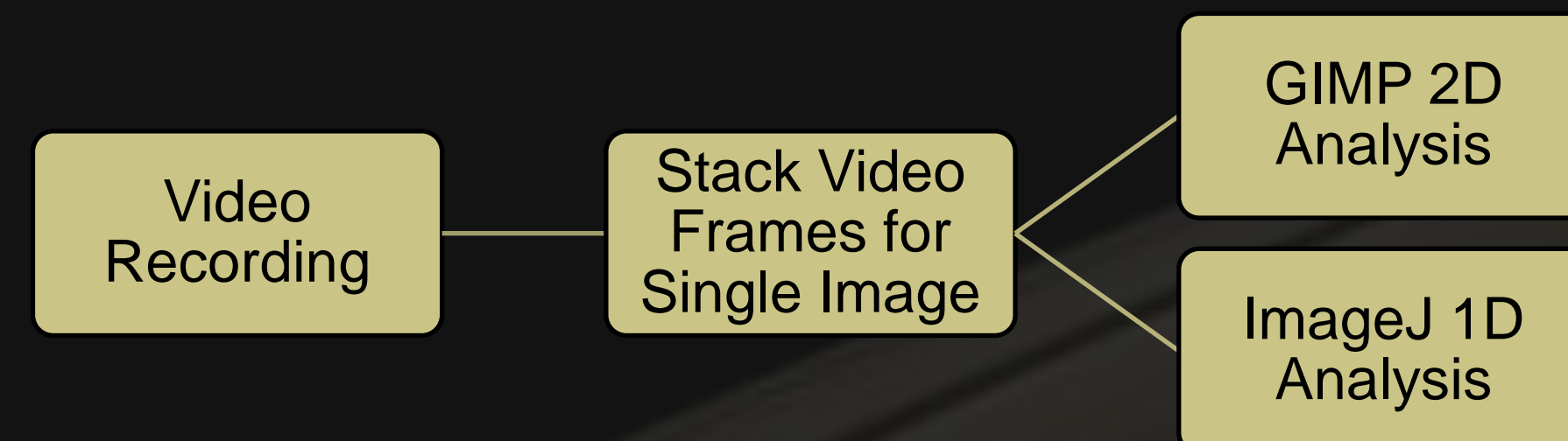


Equipment

To collect data, we made use of PLU's Keck Observatory which is equipped with a Meade LX200 16" telescope (left), Celestron Neximage Burst Planetary Imager (right), and SBIG Charged-Coupled Device camera (bottom).

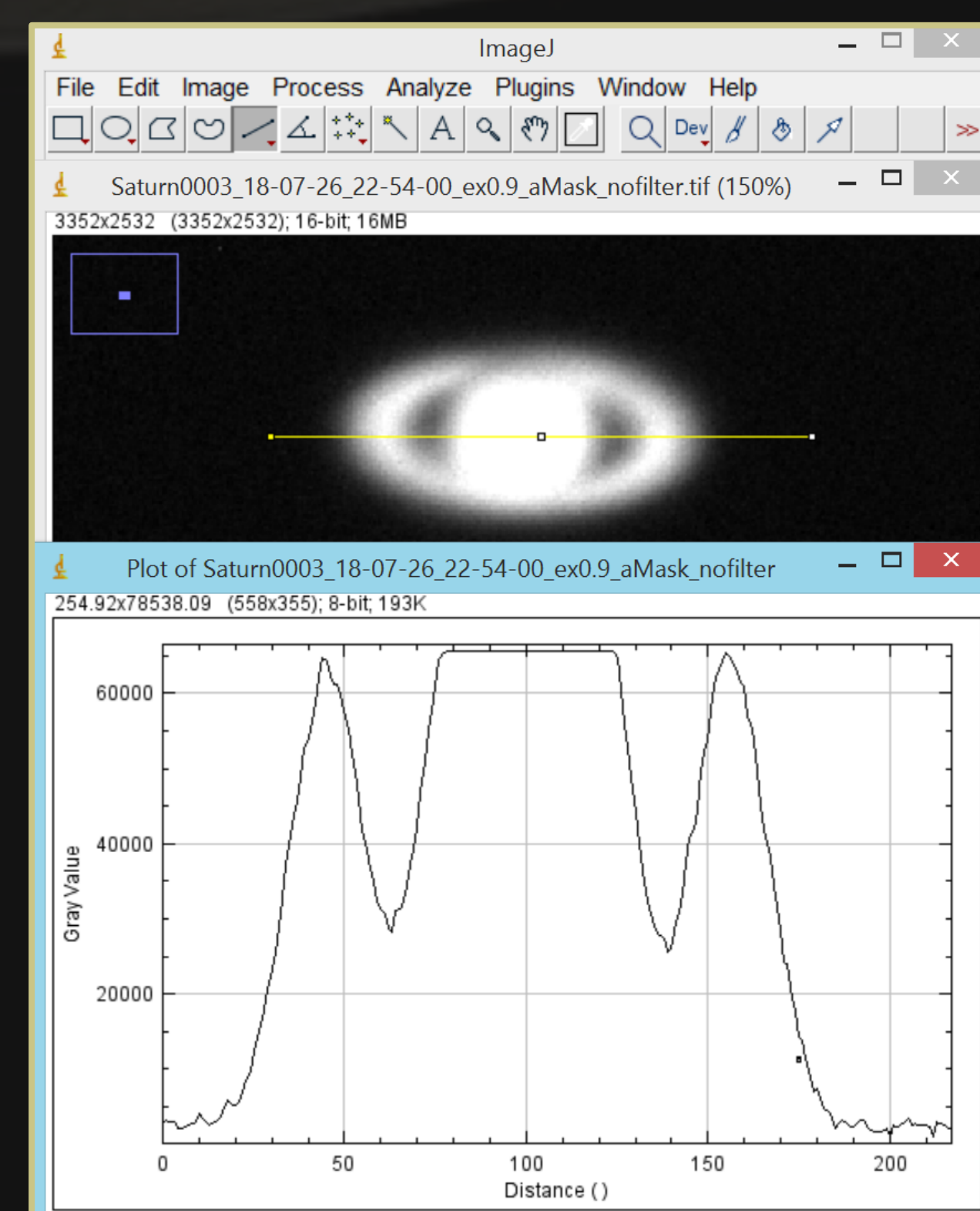


Process



ImageJ 1D Analysis

To construct a 1D analysis on the rings, we used the Plot Profile analysis tool in ImageJ to construct intensity plots.



1D analysis of Saturn image taken on July 26th of 2018 with no filter and 0.09s exposure. Graph reflects intensity as a function of position.

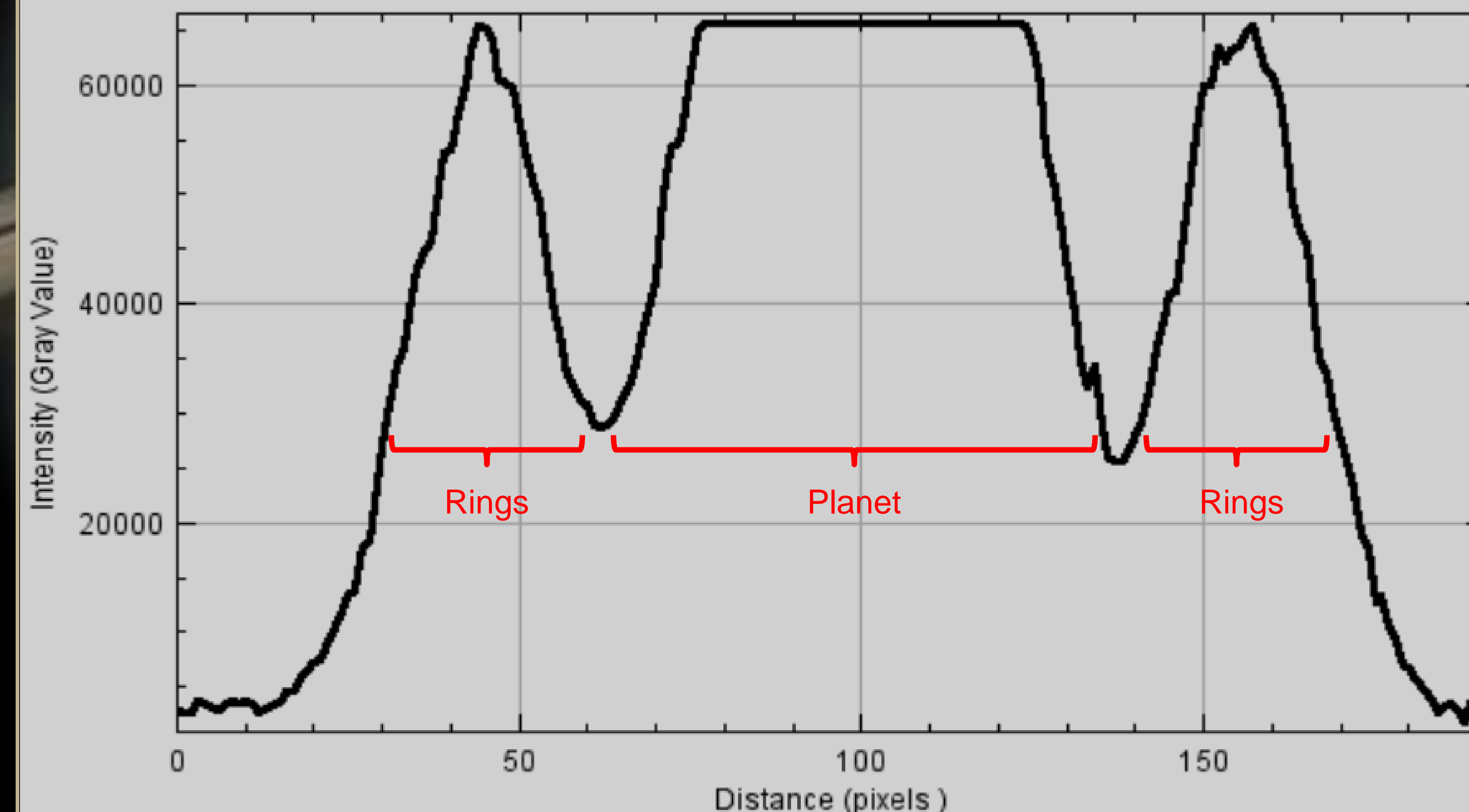
Abstract

Saturn's rings are composed of particles of ice and dust that are thought to be remnants of comets, asteroids, or moons that collided in orbit around the planet. Since these rings are not single structures, their particles feature non-uniform spacing. The intensity of the rings increases as you approach the B ring from either direction (with the exceptions of the Cassini Division, Encke, and Keeler gaps). Our research focused on determining the rate at which these intensities increase and decrease to estimate how the ring density varies throughout the ring system.

Questions

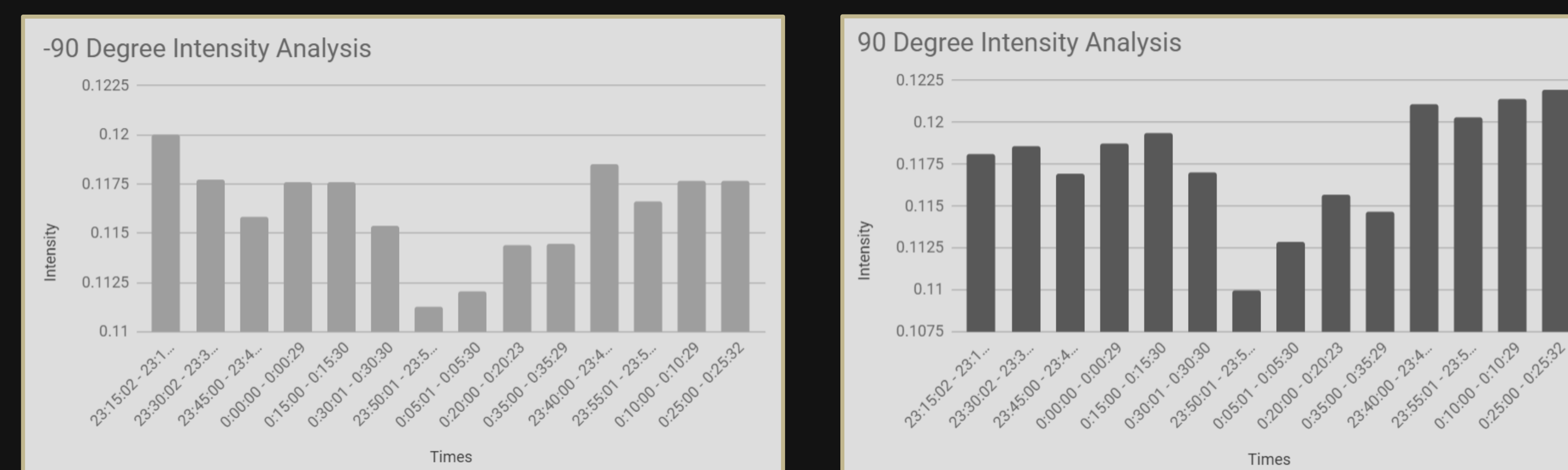
- How opaque are the rings of Saturn?
- Are the particles in a uniform spread and do they reflect light uniformly?
- How does the intensity of light change throughout the ring system?

1D Analysis Results



1D Intensity Analysis plot of Saturn image taken on July 26th at 10:54pm with 0.09 second exposure time and no filter. Note: the planet is overexposed in the photo but the rings are our primary focus.

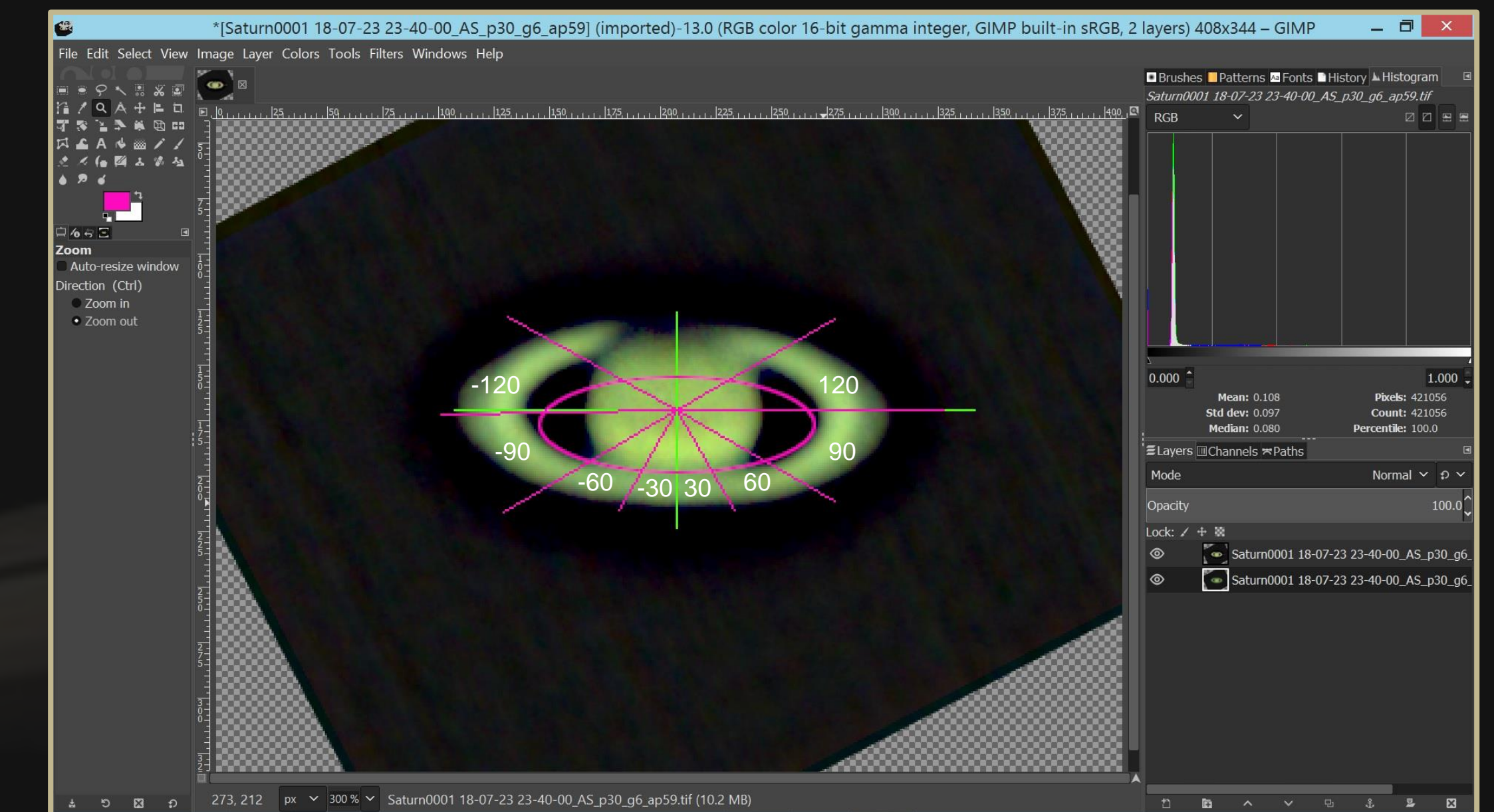
2D Analysis Results



A -90 (left) and 90 (right) degree time vs. intensity plot for data collected between July 16th and July 24th of 2018 on 15 minute intervals through the nights.

GIMP 2D Analysis

We collected 2D intensity analysis data through GIMP. The rings were divided into slices on 30 degree intervals about the center point of the planet.



2D image analysis done on a stacked Saturn image that was taken on July 23rd of 2018 with an exposure of 1/250s.

Recording, Stacking, and Processing



A frame listed as the best by AutoStakkert! program in a video of 498 frames on July 11th of 2018.



The resulting stacked image from the same video that included the frame above.



Same image as the one above but processed through Registax program. Cannot be used for data collection.

Acknowledgements

Kimberly Belmes, Matthew Hacker, Pacific Lutheran University Division of Natural Sciences, Pacific Lutheran University Physics Department, Natural Science Undergraduate Research Program, Murdock Trust



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Background image taken from: <https://veja.abril.com.br/ciencia/nasa-investiga-a-mudanca-de-cor-do-polo-norte-de-saturno/>