



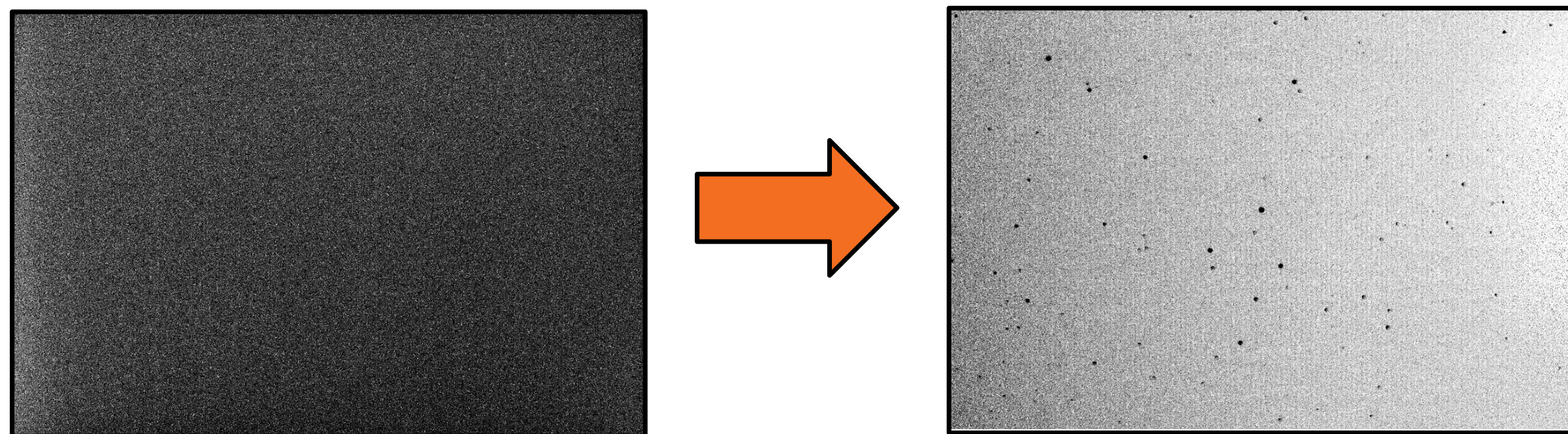
Pete Miller and Sonny Tofani

## Background

The star SZ Lyncis (or more simply SZ Lyn) is a Delta Scuti type variable pulsating star which is also a member of a binary system. Pulsating variable stars fluctuate in brightness due to changes in stellar radius as the star expands and contracts due to large concentrations of helium in the stellar atmosphere ionizing when heated.

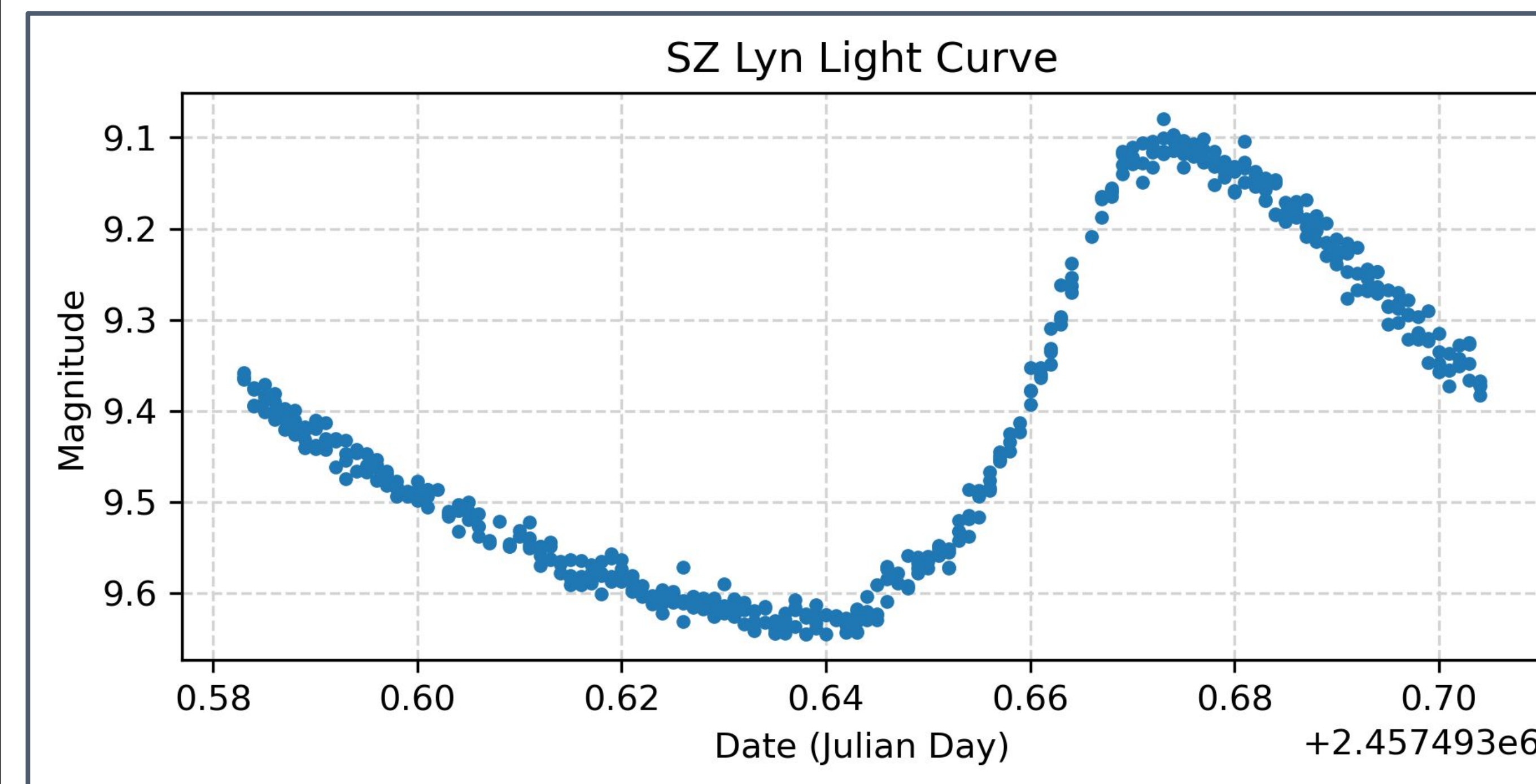
## Data Reduction

AstroimageJ was used in order to clean our raw data images collected at the RIT Observatory. Dark images were used as well as flat field images in order to produce the cleanest final image possible.



## Light Curve

We looked at the intensity coming from our target star, Sz Lyn, as well as reference stars around it, and used astroimageJ in order to get all of these intensities over nights worth of images. Using these intensities we then converted into magnitude by using one of our reference stars that had a known magnitude, resulting in the light curve:



## Determining Radius

The temperature of a star can be approximated using the difference between the B and V band magnitude (B-V).

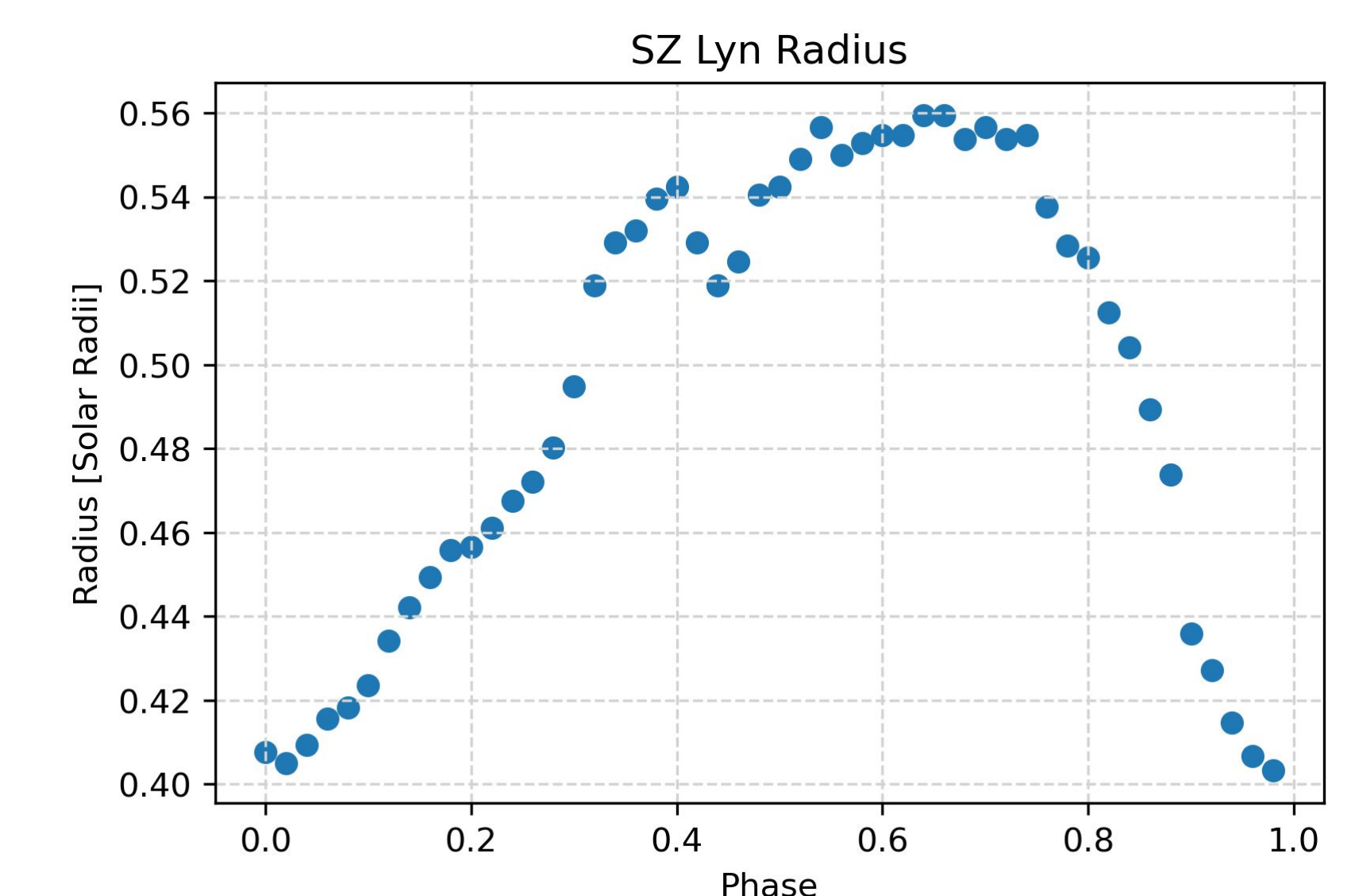
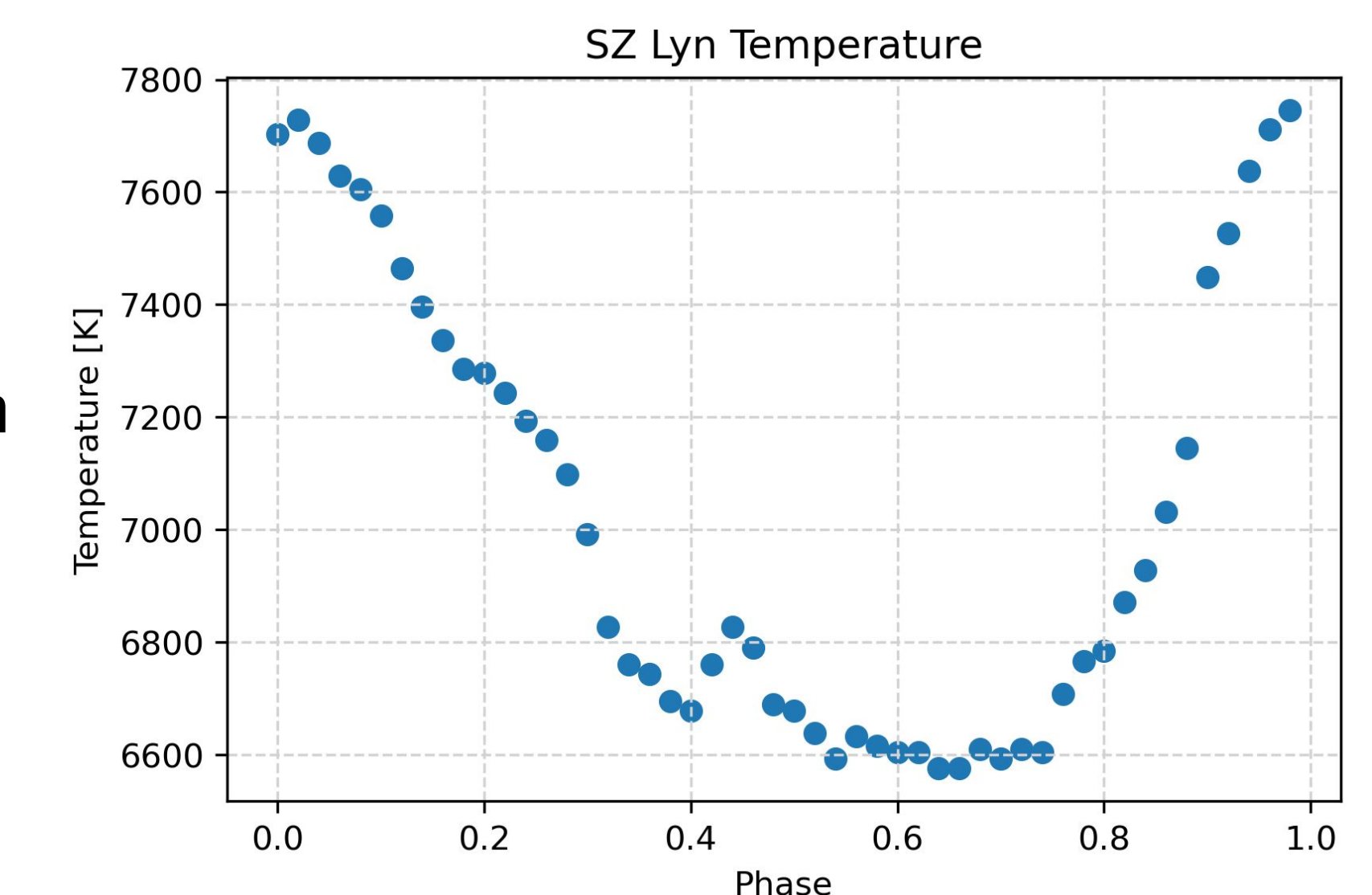
$$T = \frac{5601 \text{ K}}{(B - V + 0.4)^{2/3}}$$

The star's temperature ranges from 7745 to 6576 Kelvin.

Radius, in solar radii, is determined using the equation

$$\frac{R}{R_{\odot}} = \left(\frac{T_{\odot}}{T}\right)^2 (2.51^{M_{\odot} - M})^{1/2}$$

Where  $R$  is the radius,  $T$  is the temperature and  $M$  is the mass.



This radius was found to be between 0.559 and 0.403 solar radii.

## Determining Distance

Determining the distance to the star is done simply by using the parallax found in the Gaia database and the equation:

$$d = \frac{1}{\text{Parallax}}$$

This gives us a distance of  $520 \pm 30$  parsecs

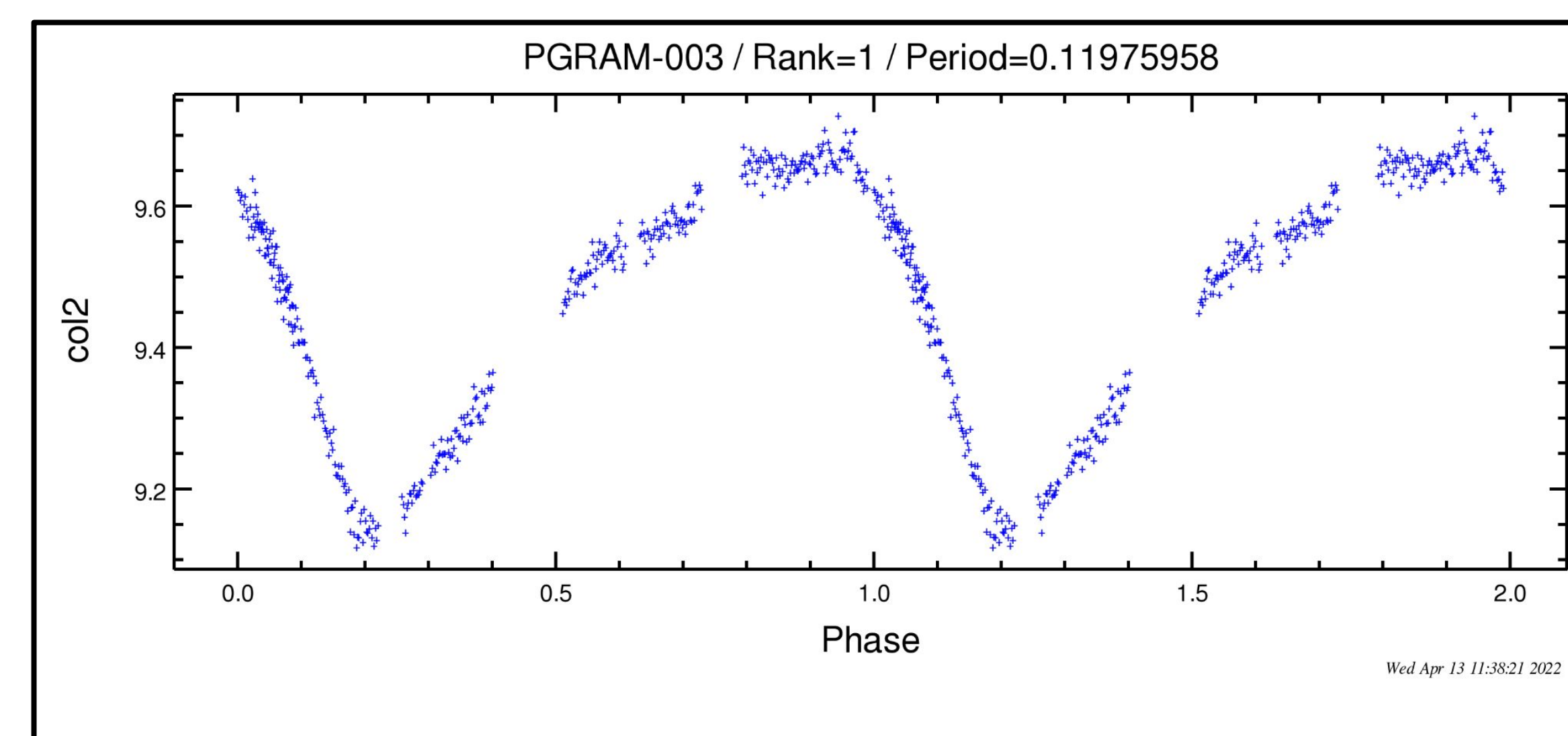
This distance can be used along with the determined magnitude to find the absolute magnitude:

$$\text{Absolute Magnitude} = \text{Magnitude} - 5 \log_{10}(d) + 5$$

The maximum absolute magnitude is then  $1.05 \pm 0.03$ .

## Determining Period

Using the NASA Exoplanet Archive periodogram tool, we can then find the most likely period of the pulsation from this data:



Period was found to be about 0.12 days or 2.9 hours

## Conclusions

The determined values are as follows:

- The distance to the star is  $520 \pm 30$  parsecs
- The maximum absolute magnitude is  $1.05 \pm 0.03$
- The period of the brightness oscillations is 0.12 days
- The radius ranges between 0.559 and 0.403 solar radii
- The temperature ranges from 7745 to 6576 Kelvin

## Works Cited

- <https://exoplanetarchive.ipac.caltech.edu/cgi-bin/Pgram/nph-pgram>
- <https://articles.adsabs.harvard.edu/pdf/1976PASP...88..164M>
- <https://articles.adsabs.harvard.edu/pdf/1975AJ....80..48B>
- <https://articles.adsabs.harvard.edu/pdf/1968AJ....73...29B>
- <http://astro.physics.uiowa.edu/ITU/labs/professional-labs/photometry-of-a-globular/part-2-finding-temperature.html>