PHOTOMETRIC ANALYSIS OF RR LYRAE V494 SCO

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INTRODUCTION

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ABSTRACT

In this paper, we are presenting photometric analysis of a RR Lyrae type of variable star. These stars have low metallicity with mass and size like the Sun. They have a relatively low period about 0.2-1 day, makes them one of the most useful stars for exploring groups of stars that are similar to each other in terms of age and chemical composition. We are studying the RR Lyrae star “V494 Sco” located in the southern hemisphere with coordinates (265.2016, -31.5426). We are using the data from Las Cumbres Observatory (LCO) which has network of robotic telescopes located across different parts of the world. The data we are using are from SBIG (0.4 m) telescopes which has four different filters, B (blue), V (visual), I (infrared), and Z (PAN-STARRS). We have used advanced photometric techniques developed by Dr. Michael Fitzgerald & his team as a part of solar sibling project to study the light curves of V494 Sco. Results shows that this star has a variability period of 0.4271±0.00028 days using the standard deviation method. Further analysis of our data can provide us information on intrinsic and extrinsic variables of this star.

RR LYRAE STARS

- Periodic variable stars found in globular clusters
- Used as standard candles to measure galactic distances in globular clusters
- RR Lyrae Stars have a low metallicity and are at the end of their life and reside on the horizontal branch of the HR diagram
- The luminosity of the star changes over time called period luminosity

RESEARCH OBJECTIVES

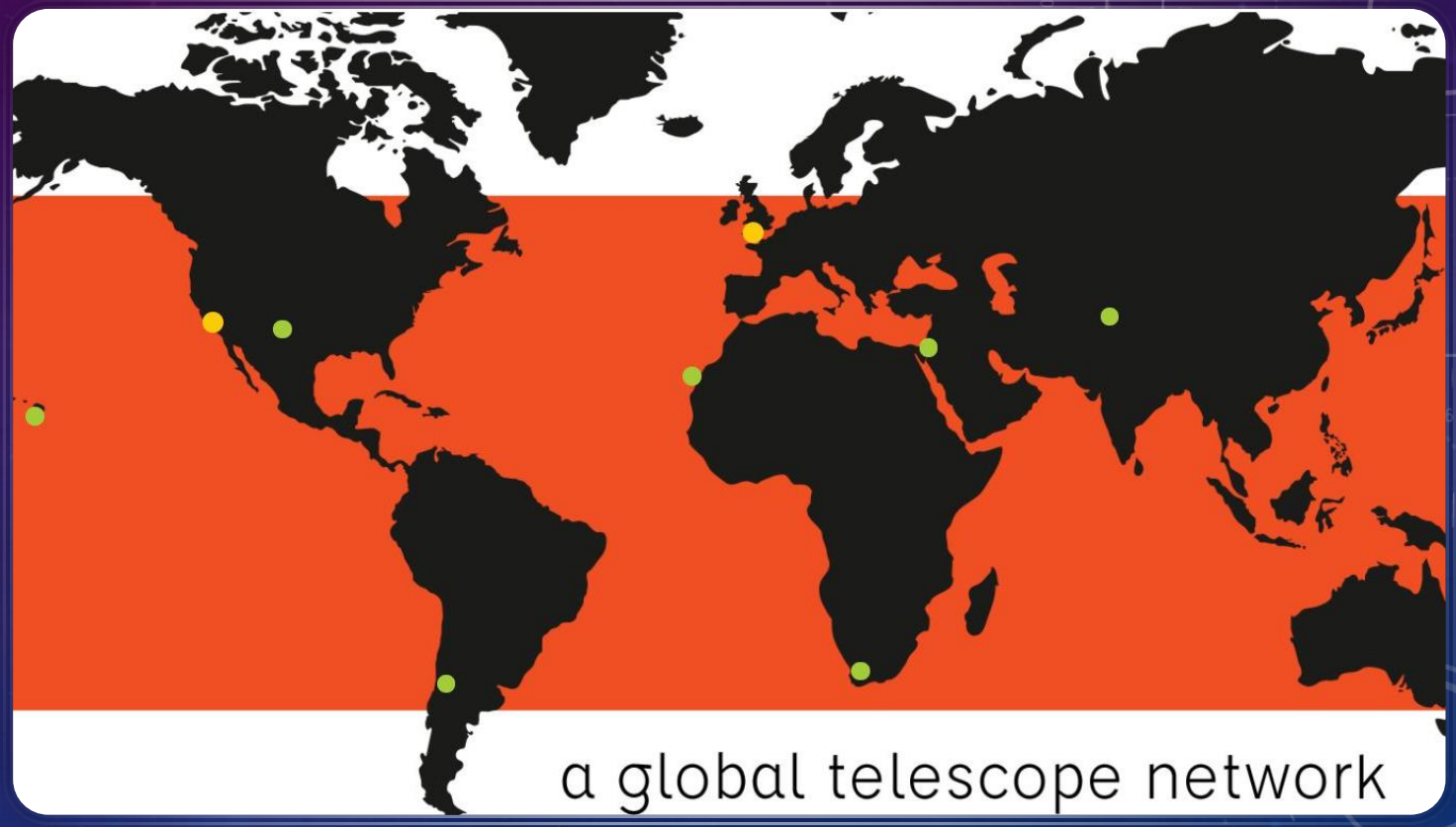
- The research goals are to study the variable star V494 Sco
- Find the light curve of V494 Sco to find the distance using GAIA, average what type of variable star V494 Sco is, and luminosity
- Does the photometry methods used yield a light curve that is comparable to the theoretical
- What information is provided from studying the star with different filters

PHOTOMETRY

- Photometry can be used from engineering the lighting in a building to studying stars.
- Photometry is used to monitor the brightness of a star.
- This is used to create a light curve of the star.
- Light curves of certain types of stars are distinct.
- Knowing the light curve of a star shows what kind of star being studied.
- The photometry used is called relative photometry.
- In this research B, V, I, and Z filters were used.

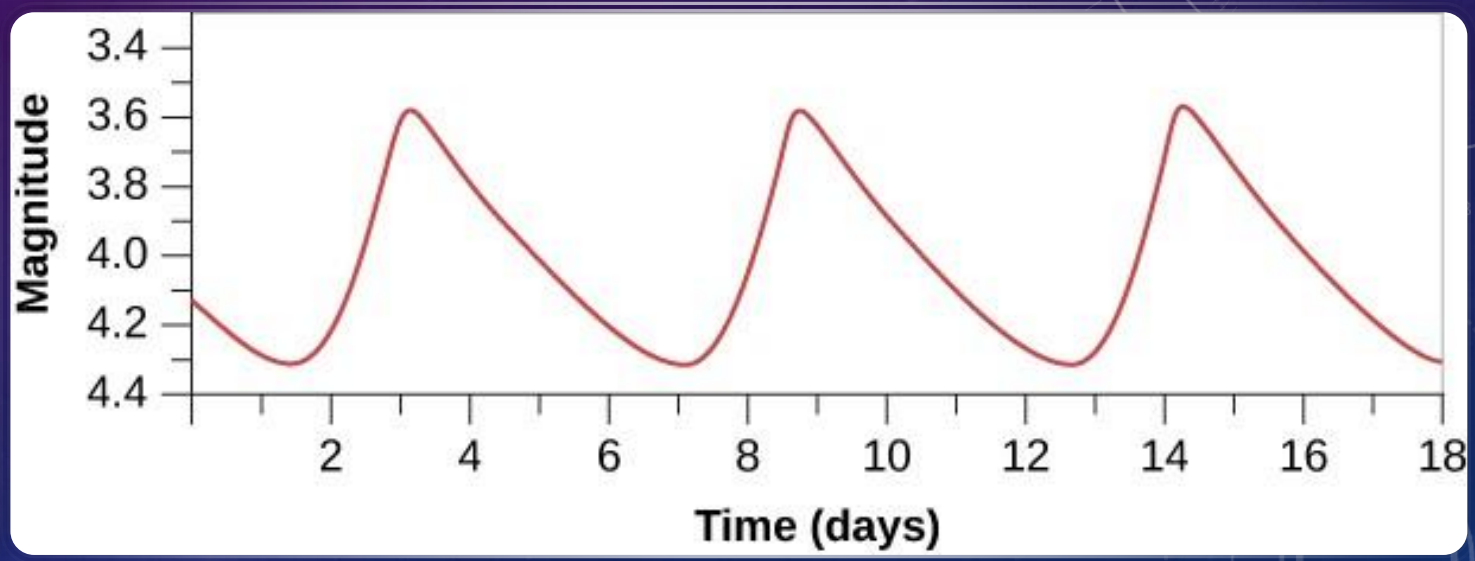
LAS COMBRES OBSERVATORY

- Las Combres Observatory (LCO) is a series of robotic telescopes around the world
- The telescopes are easily accessible, and data can be requested online



LIGHT CURVES

- Shows the how the brightness of an object changes over time
- How the star varies determines the way the variable star pulsates
- Magnitude System is used to measure the brightness of the star



METHODS

Data collected by LCO observatory over two weeks

Order new set of data

Low/High counts

Pictures arrive in google drive

Test images using Fits Liberator

Organize sek data into filters B,I,V,Z

Acceptable counts

Use python to process data

Use Aladin a picture to find the coordinates of the star

METHODS CONTINUED

Stars are filtered out according to the brightness

The variability of the stars are then measured

The variable stars are then put on a standard scale

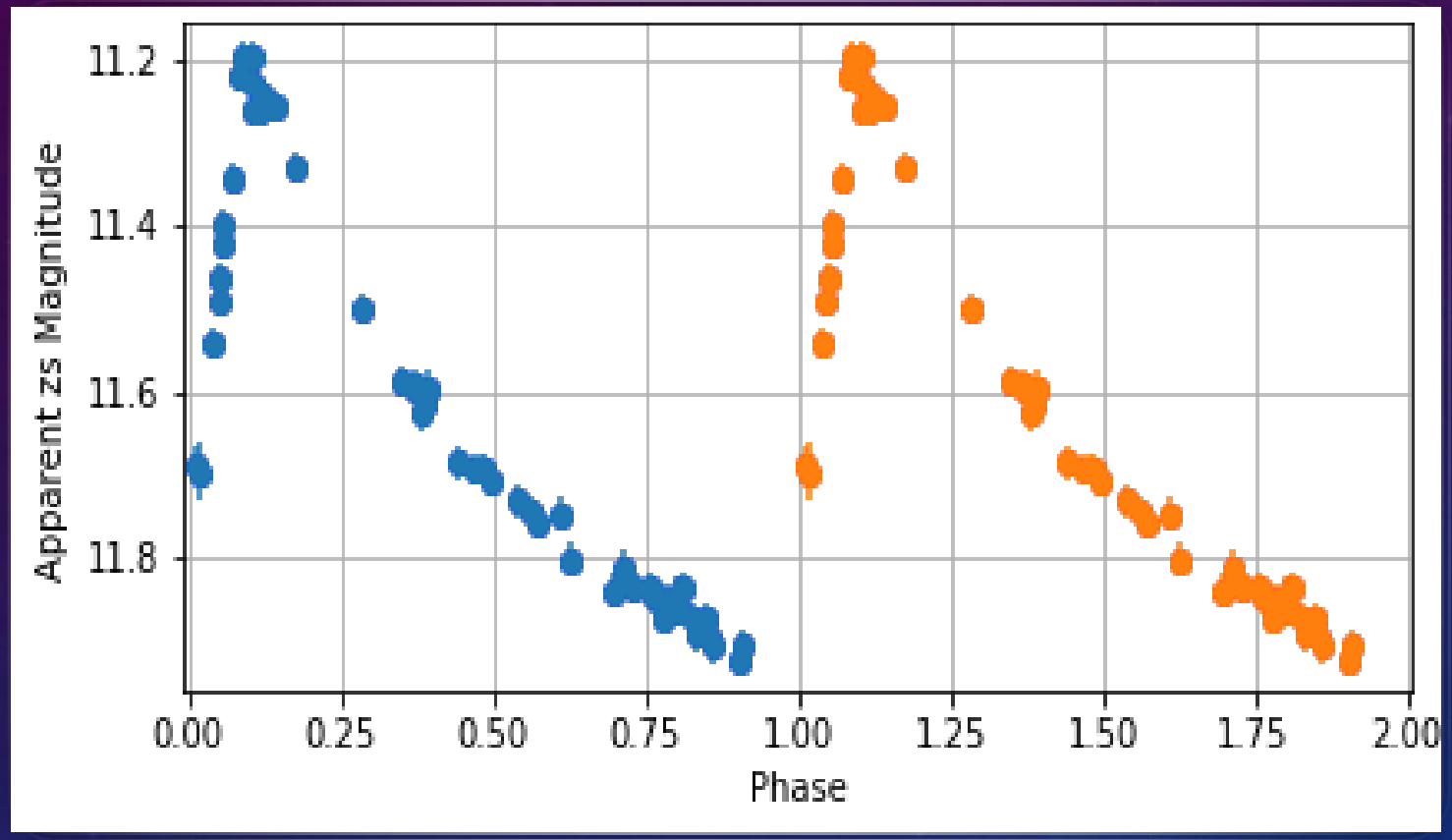
Plot the variable and construct the catalogs

The period of the star is calculated through trial and error.

Final plots are then outputted using the period and the calibrated brightness of the stars

GLOBULAR CLUSTERS

- Globular cluster are very old because they take a long time to form.
- This means RR Lyrae stars in more common in Globular Clusters.
- RR Lyrae can be used to find the distances and bigness of clusters



DATA

- This figure shows the light curve for the Z filter in luminosity, or apparent magnitude, vs phase of V494 Sco
- The luminosity from the start of the phase to about 0.125 of the phases the luminosity increases and peaks. After this point it steadily decreases until its luminosity is at its lowest
- The luminosity spikes again and slowly decrease which closely relate to the theoretical light curve of an RR Lyrae type ab star

CONCLUSION

- - Initial analysis shows the period of the star is 0.98909 days and the distance calculated using GAIA is 834±29 parsecs

- - This research is on-going and more data is currently being gathered for further analysis

REFERENCES

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