

# RR Lyrae Metallicities from CSTAR Data

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# What is CSTAR?



- Chinese Small Telescope ARray
- Located in Antarctica
- Four Telescopes
- Ideal Observing Conditions

# Data Collection

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- Problems with the filters - Only  $i$ -band data 2008, 2010
- $g$  and  $r$  band data from 2009 observing season
- Small mirror size produced some scattering in the data
- Long continuous data collection makes this data set desirable

# RR Lyrae Variable Stars

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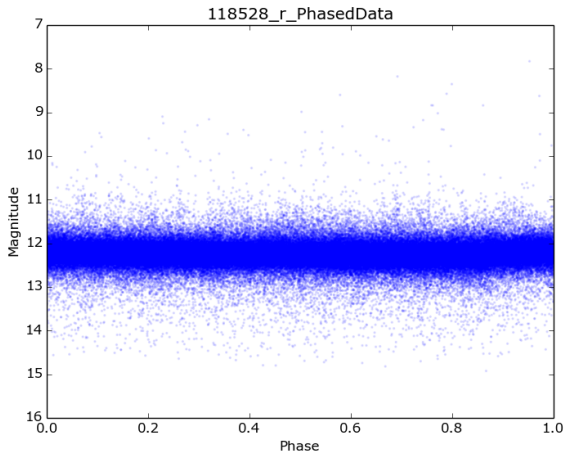
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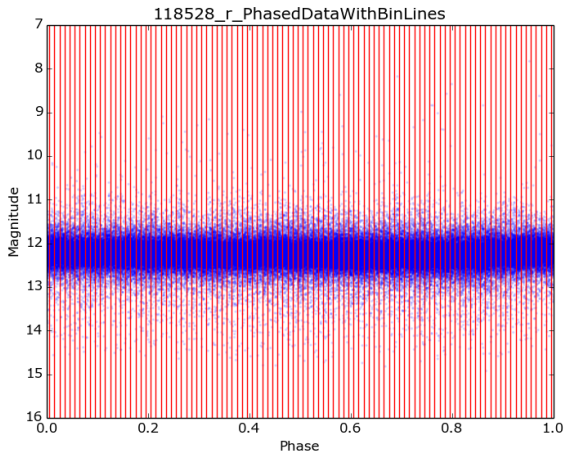
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- 7 in the CSTAR Data, 2 Non-Blazkho

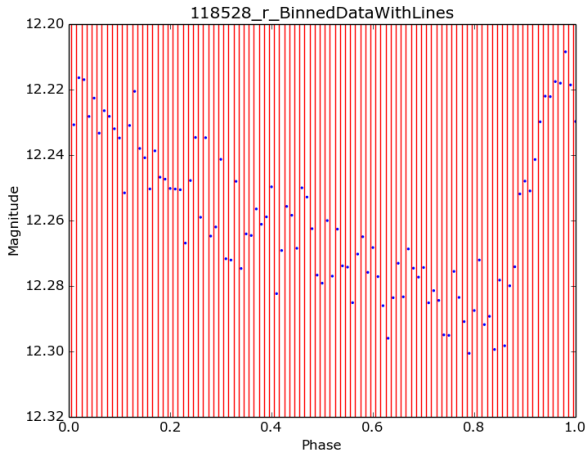
## Phased Data for 118528 in the r band



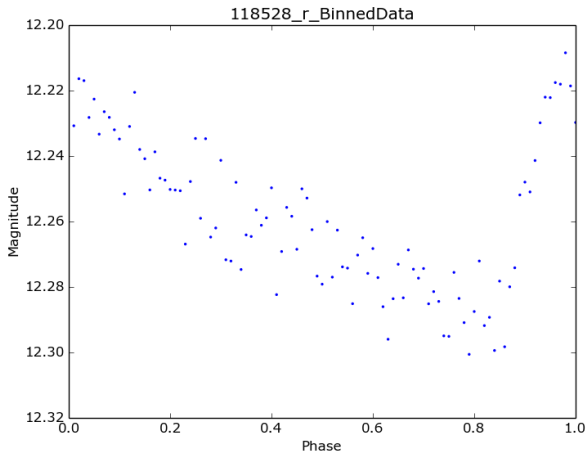
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$$[Fe/H] = 0.313\phi_{31} - 3.65P - 0.493A_g - 0.66 \quad \text{g-band}$$

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(Oluseyi et al. 2012)



# Fourier Analysis and Binning

- A method of interpolating periodic functions
- Approximate as a sum of sin terms
- Results were compared for different numbers of bins

$$f(t) = A_0 + \sum_{k=1}^{\infty} A_k \sin(k\omega t + \phi_k)$$

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- Periods were given in the Data set
- Amplitudes were calculated by subtracting the maximum and minimum magnitudes

# Metallicity for 118528

Fit order versus Binning Number (Zinn and West Scale)

118258 g-band	3rd Order Fit	5th Order Fit	7th Order Fit
50 Bins	-1.46	-1.46	-1.46
75 Bins	-1.47	-1.47	-1.47
100 Bins	-1.47	-1.47	-1.47

118258 r-band	3rd Order Fit	5th Order Fit	7th Order Fit
50 Bins	-1.42	-1.42	-1.42
75 Bins	-1.43	-1.43	-1.43
100 Bins	-1.43	-1.43	-1.43

# Metallicity for 134610

Fit order versus Binning Number (Zinn and West Scale)

134610 g-band	3rd Order Fit	5th Order Fit	7th Order Fit
50 Bins	-2.08	-2.08	-2.08
75 Bins	-2.09	-2.09	-2.09
100 Bins	-2.08	-2.08	-2.08

134610 r-band	3rd Order Fit	5th Order Fit	7th Order Fit
50 Bins	-1.91	-1.91	-1.91
75 Bins	-1.95	-1.95	-1.95
100 Bins	-1.95	-1.95	-1.95



## Expected Values

- The values we expect for metallicities of these stars on the Zinn & West scale range from about -1.9 to -1.4 (Sarka 2014)
- Our measured values are

star id	g-band	r-band
118528	-1.47	-1.43
134610	-2.08	-1.95

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- Since we have data taken in several different wavelengths, we should be able to form color light curves

## Acknowledgements

Thank you for all the support from Shashi Kanbur, Shivam Arora, Sukanta Deb and Harinder Singh.

Also thanks to SUNY Oswego, University of Delhi, and the Indo-US Science and Technology Forum.



# References

- **SIMULATED LSST SURVEY OF RR LYRAE STARS THROUGHOUT THE LOCAL GROUP**; *The Astronomical Journal*, July 2012, *Hakeem M. Oluseyi, Andrew C. Becker, Christopher Culliton, et al.*
- **Characteristics of bright ab-type RR Lyrae stars from the ASAS and WASP surveys**; arXiv:1409.5234, September 2014, *M. Sarika*