


# Period-Changing RR Lyrae Stars in M107

DR. LAYDEN, SYMONS, HANNAH MEANS

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## M107 Description

- ▶ Globular Cluster located in the constellation Ophiuchus
- ▶ Globular clusters are dense groups of stars that stayed together after they formed in the same nebula
- ▶ Generally older than open clusters such as the Pleiades
- ▶ Discovered in 1782
- ▶ Last Messier object to be found
- ▶ 20,000 ly away from us
- ▶ Apparent magnitude of 8.9



Picture from the STScI Digital Sky Survey

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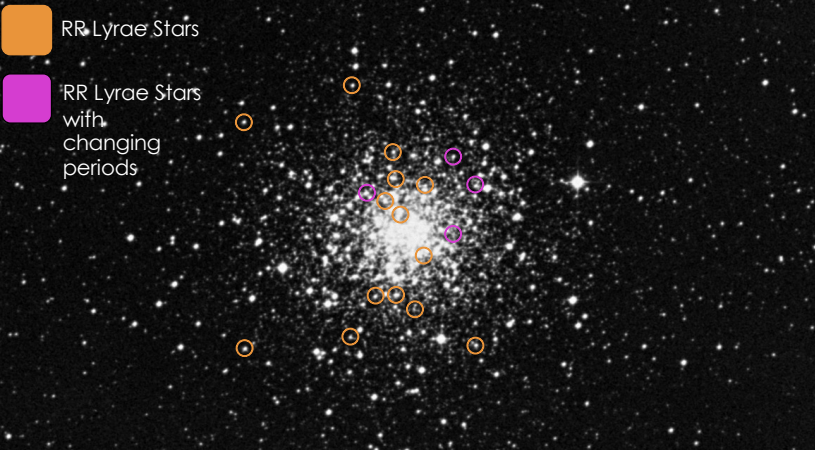


## RR Lyrae Variable Stars

- ▶ Variable stars change their brightness periodically
  - ▶ RR Lyrae are a specific type of variable stars
- ▶ Normally have periods of less than a day
- ▶ Found in the Instability Strip

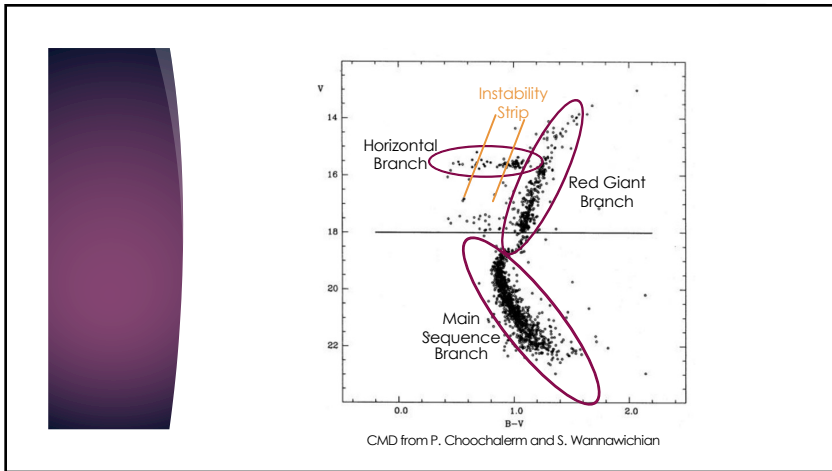
Photo from aaavso.org

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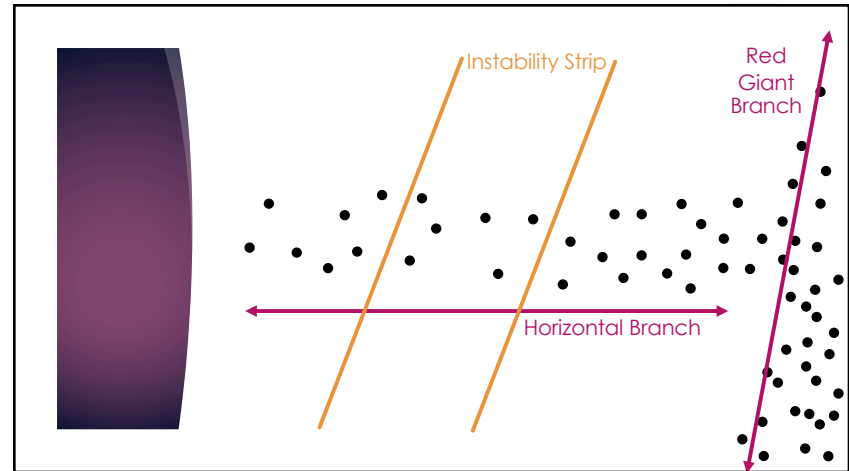


- ▶ RR Lyrae Stars
- ▶ RR Lyrae Stars with changing periods

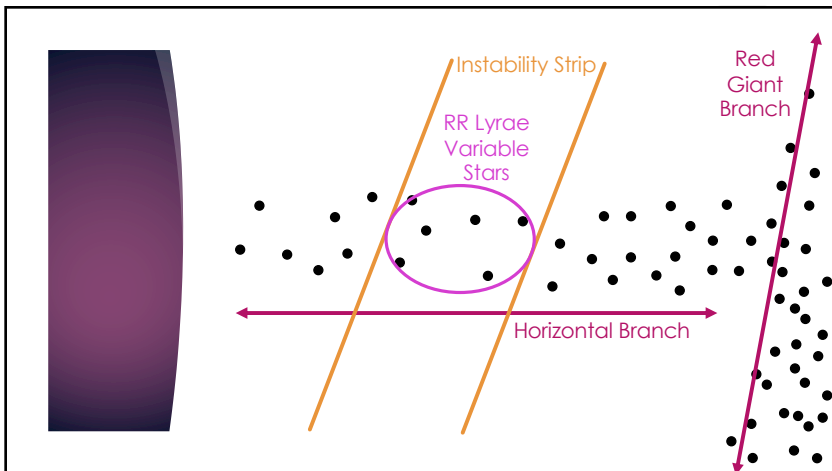
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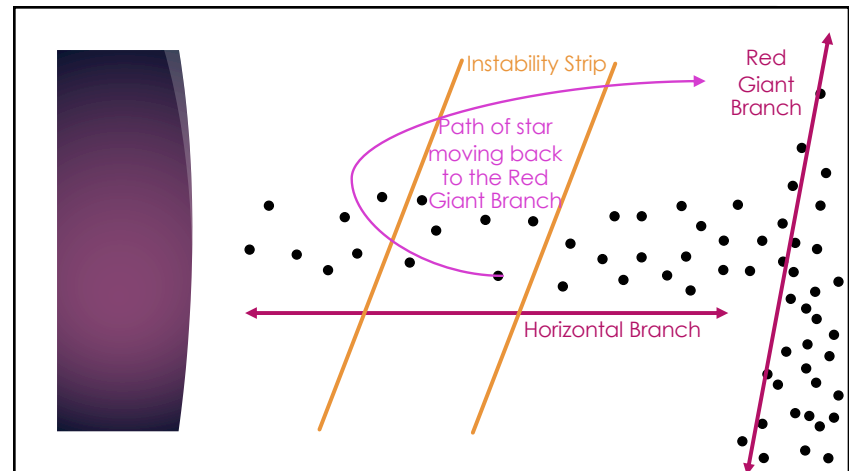
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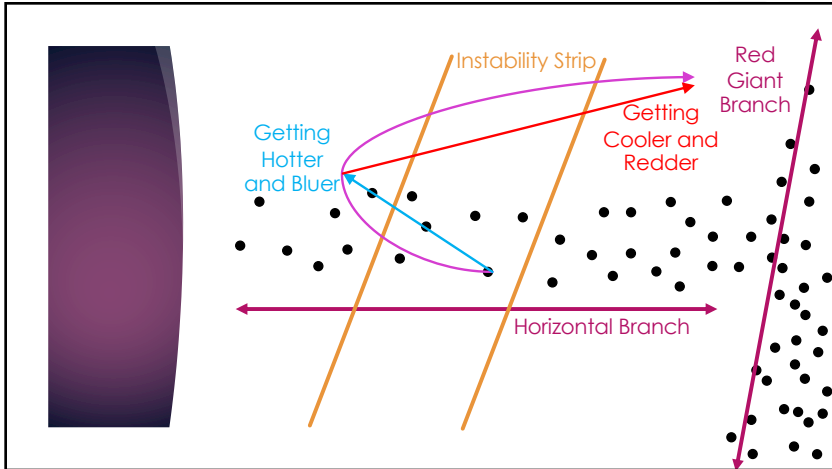
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Research Main Goal:  
Finding Beta ( $\beta$ )

$\beta$  - The change in period of RR Lyrae Variable stars

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Research Main Goal:  
Finding Beta ( $\beta$ )

$-\beta$

Getting Hotter and Bluer

Periods are shrinking

$\beta$

Getting Cooler and Redder

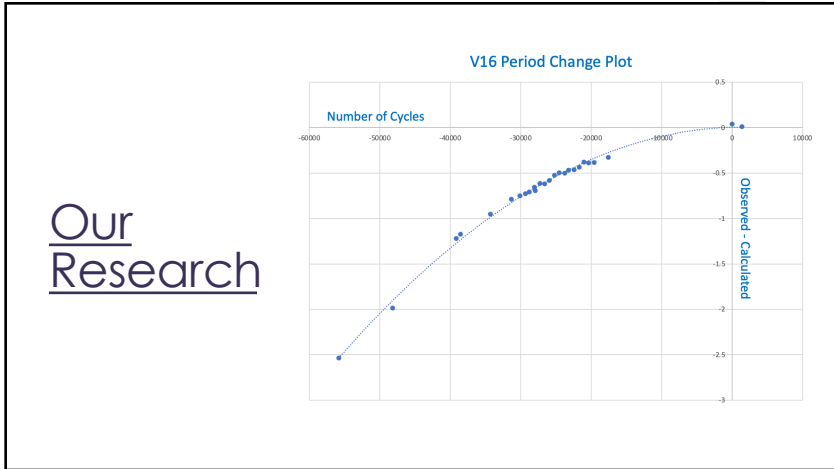
Periods are growing

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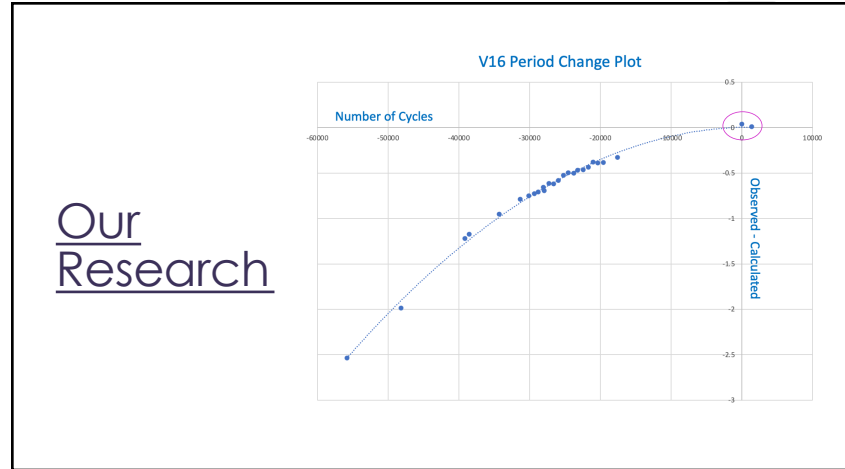
$$\beta = \frac{2A}{P_o}$$

V16 Period Change Plot

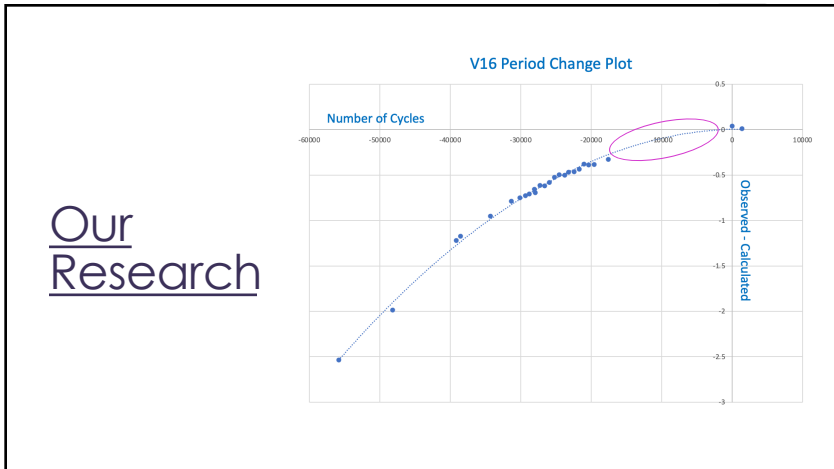
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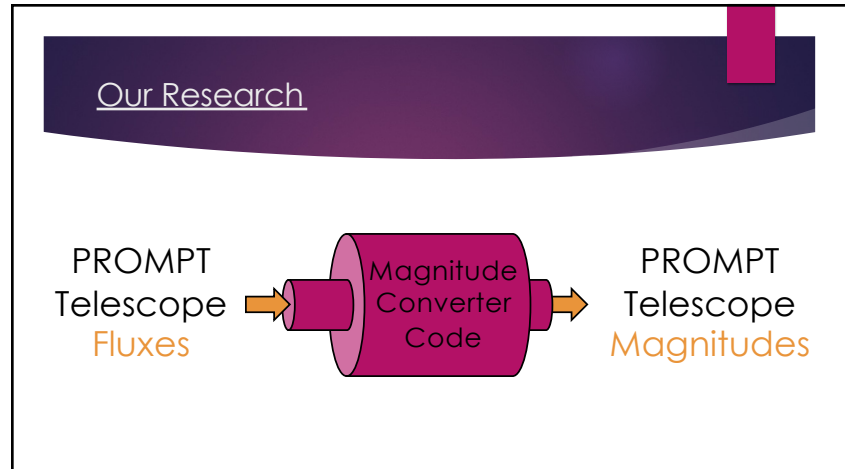
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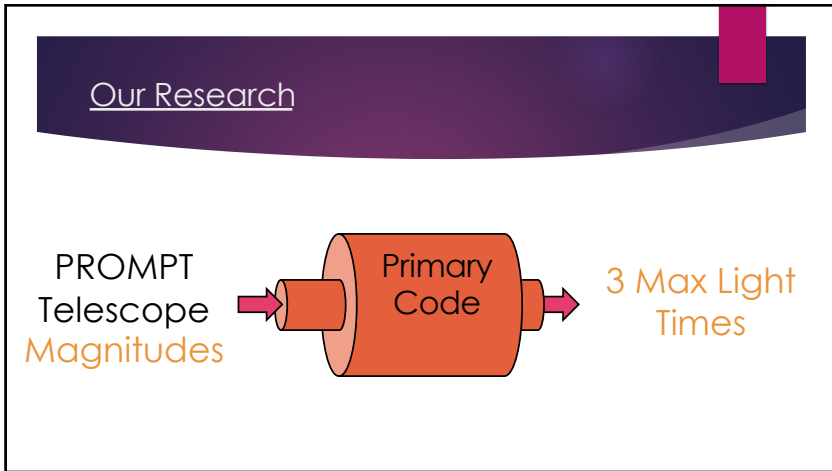
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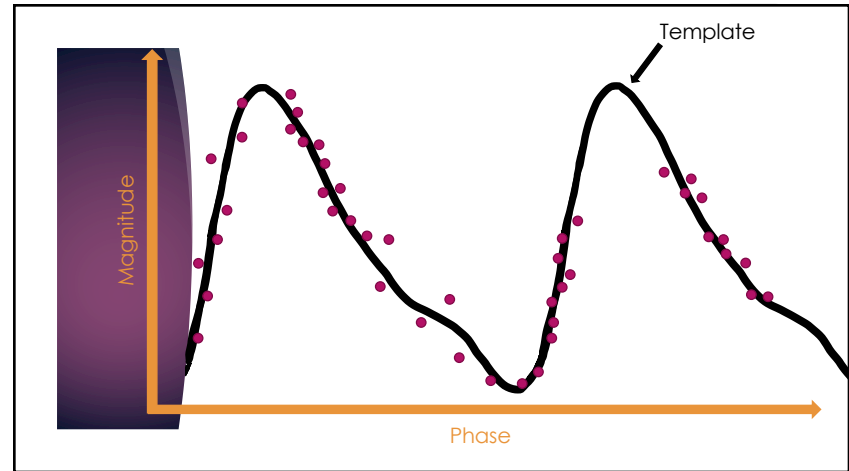
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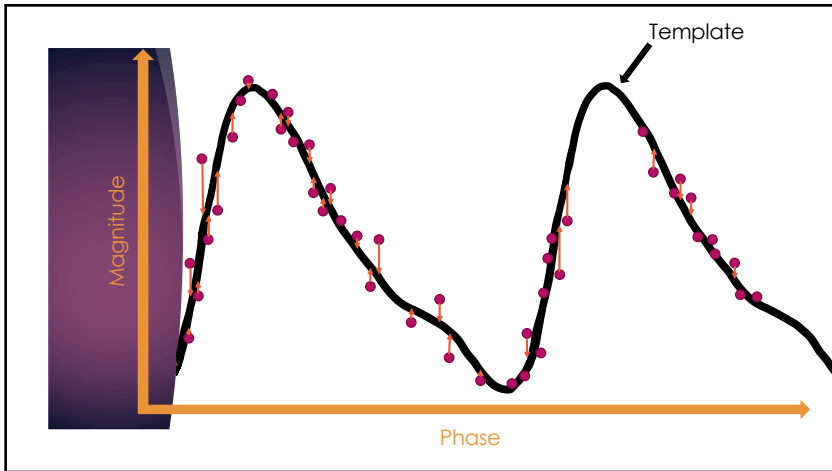
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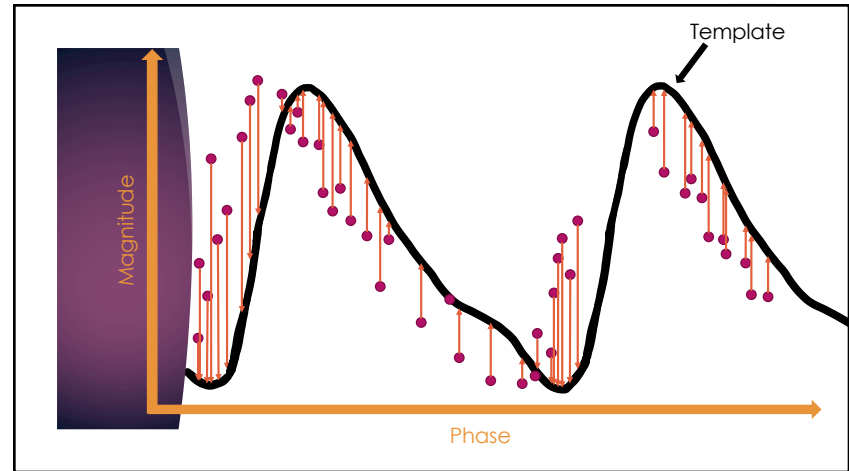
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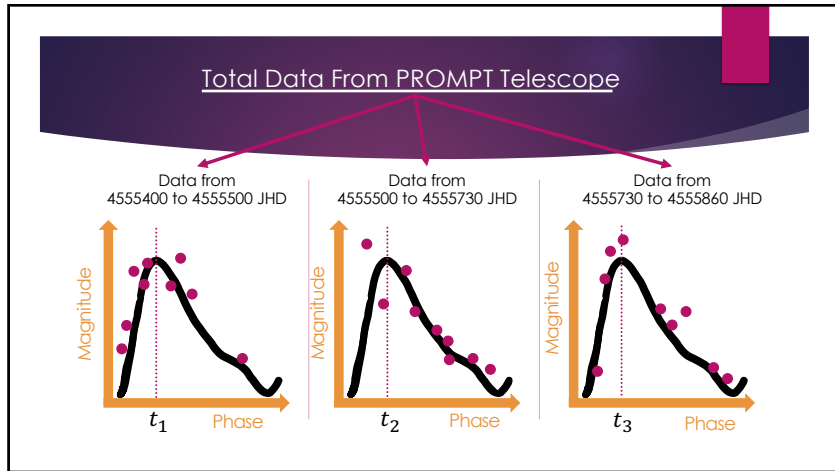
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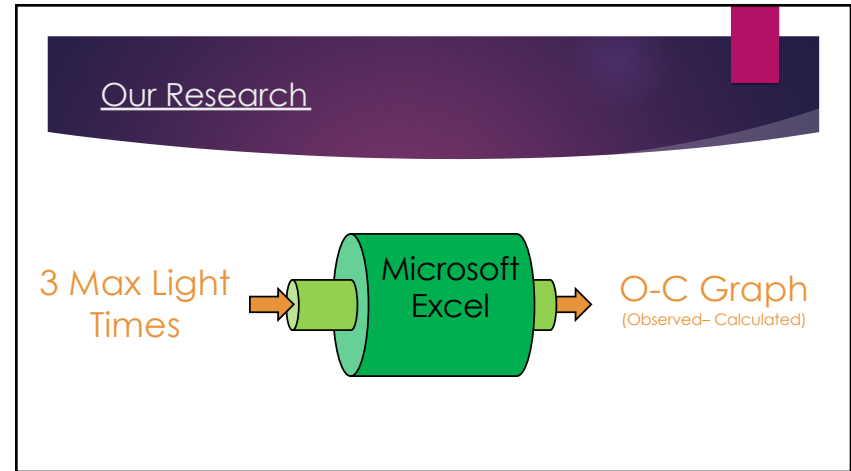
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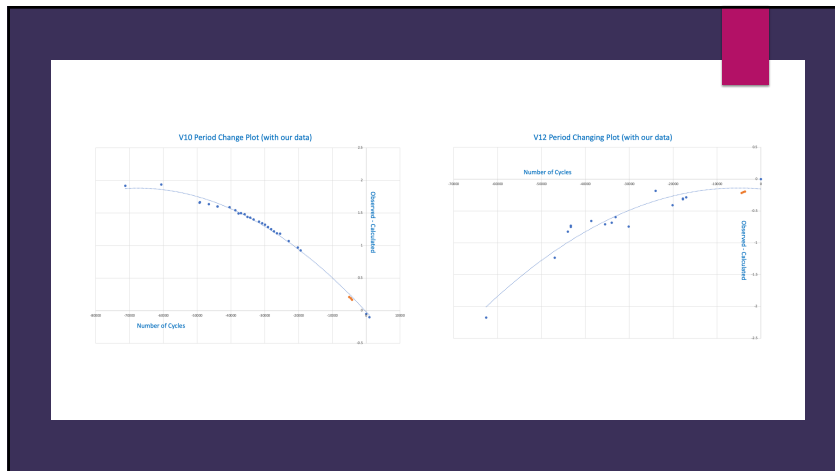
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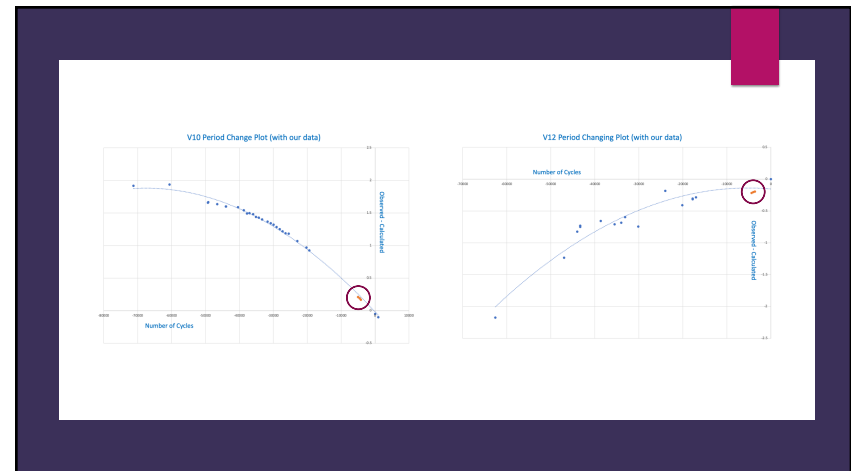
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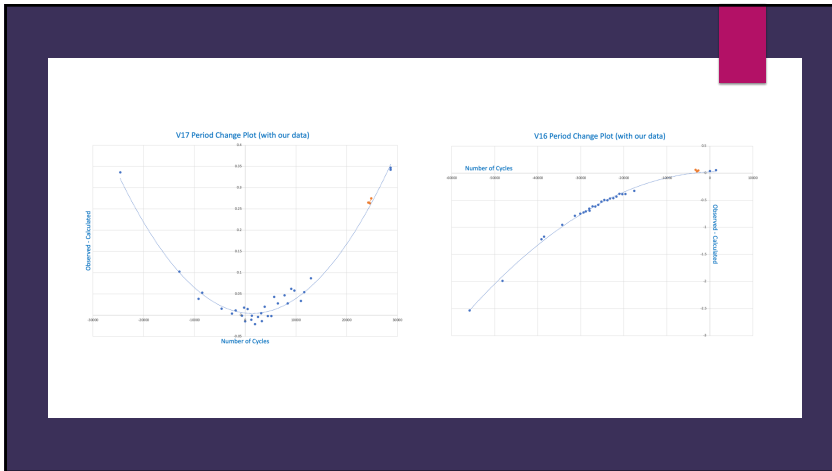
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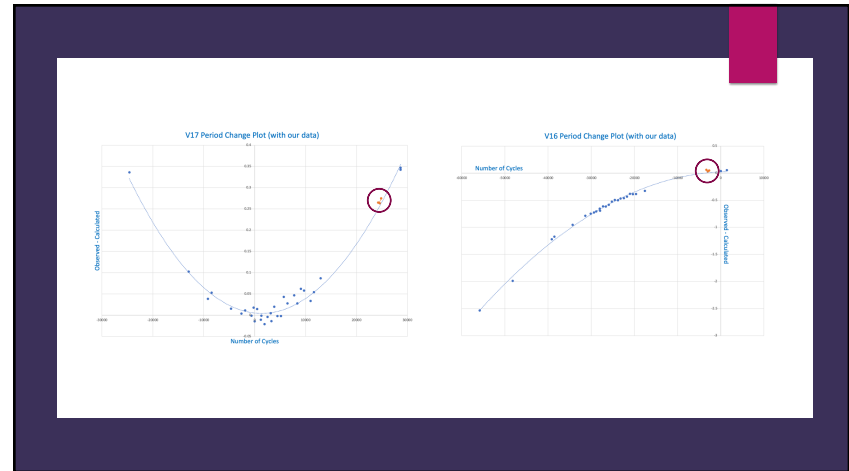
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Research Main Goal:  
Finding Beta ( $\beta$ )

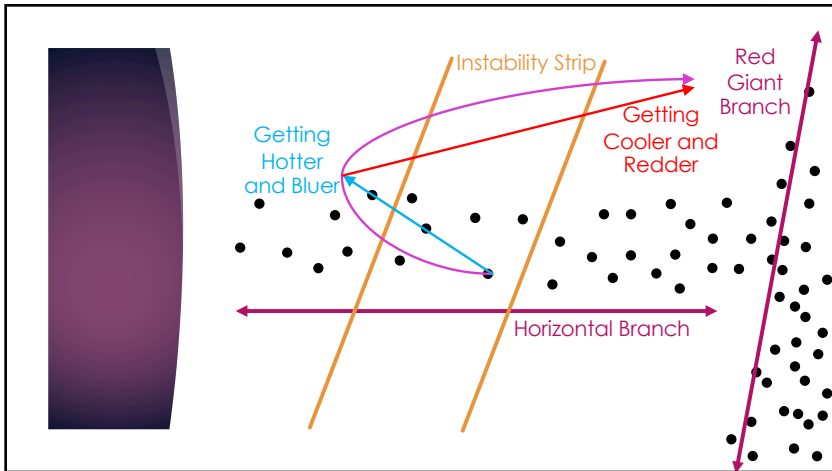
$\beta$  - The change in period of RR Lyrae Variable stars

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Research Main Goal:  
Finding Beta ( $\beta$ )

<b>V10</b>		<b>V12</b>	
Paper Beta	Our Beta	Paper Beta	Our Beta
-0.714 $\pm 0.039$	-0.753	-0.756 $\pm 0.168$	-0.883
<b>V17</b>		<b>V16</b>	
Paper Beta	Our Beta	Paper Beta	Our Beta
0.624 $\pm 0.021$	0.616	-1.088 $\pm 0.045$	-1.036

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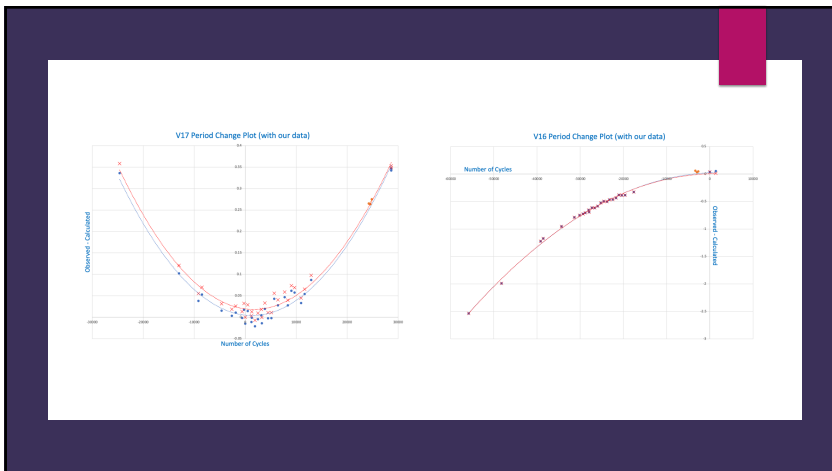


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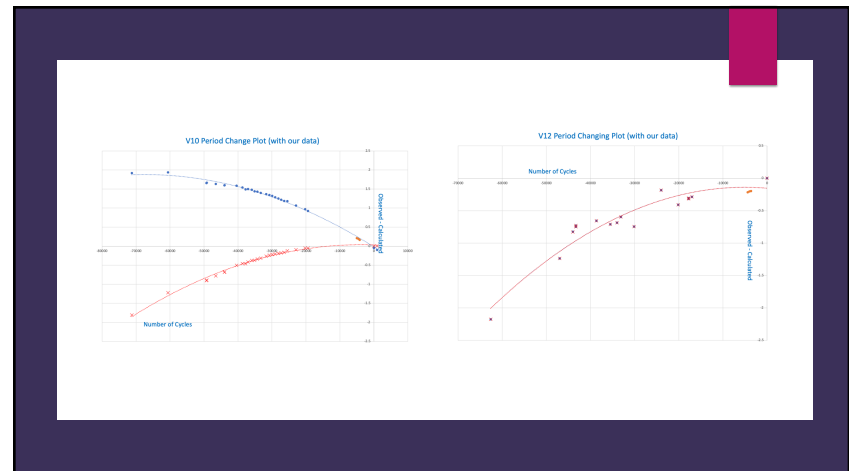
Sources:

- Arellano Ferro A, Rosenzweig P, Luna A, Essam A, Deras D, Muneer S, Michel R. Period changes in the RR Lyrae stars of NGC 6171 (M107), *Astron. Nachr./AN*, 2018;339:158-167. <https://doi.org/10.1002/asna.201813409>.
- M107 Image from the STScI Digital Sky Survey
- Variable star example image from <https://www.aavso.org/variables-what-are-they-why-observe-them>
- M107 CMD from P. Choochalem and S. Wannawichian paper (PDF by Siam Physics Conference 2016)
- M107 Information from Nasa.gov
- RR Lyrae star info from hyperphysics (Georgia State University)

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