

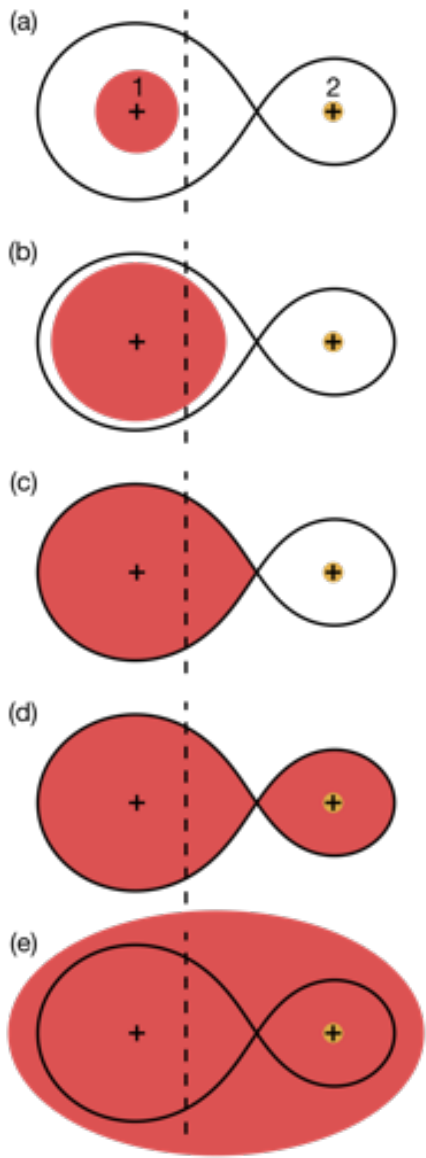


Period Changes in Eclipsing Binaries

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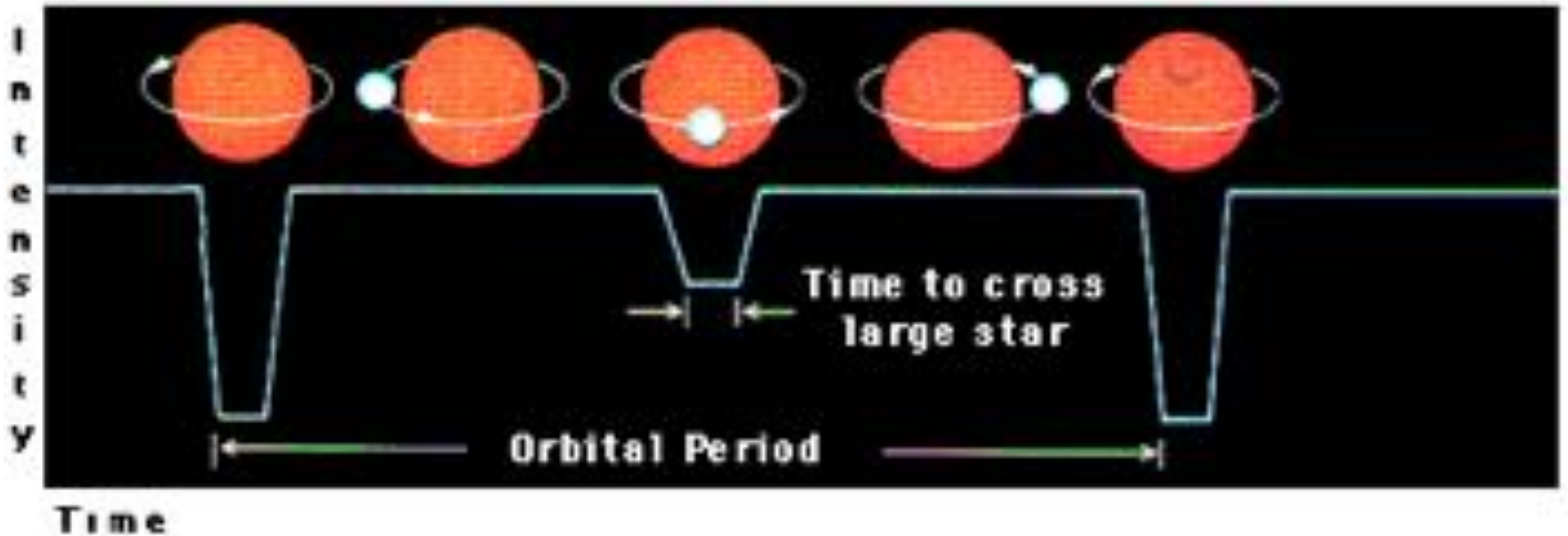
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Merging Binary Stars

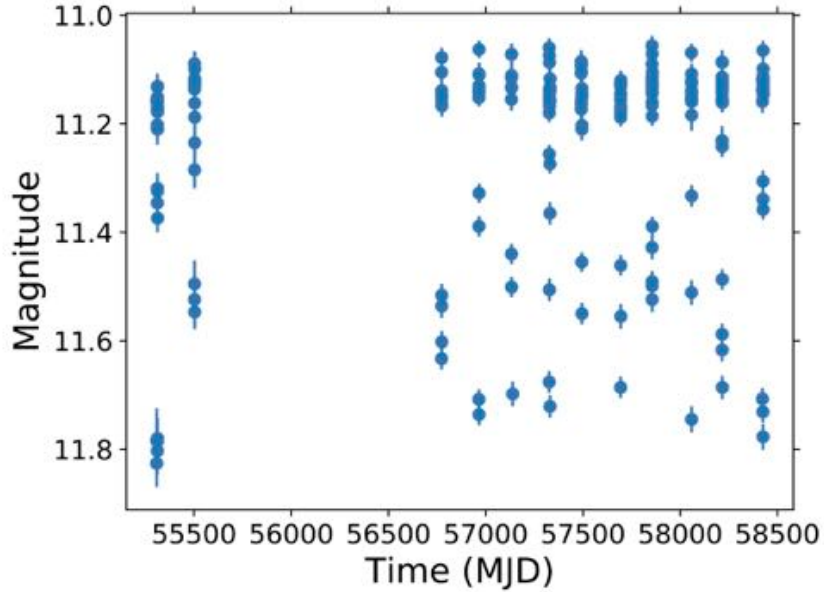
- Does the Common Envelope Stage (left) lead to Luminous Red Novae such as V838 Mon (right)?
- Short timescale makes detection difficult
- Merger preceded by period decrease (Tylenda et al. 2011)



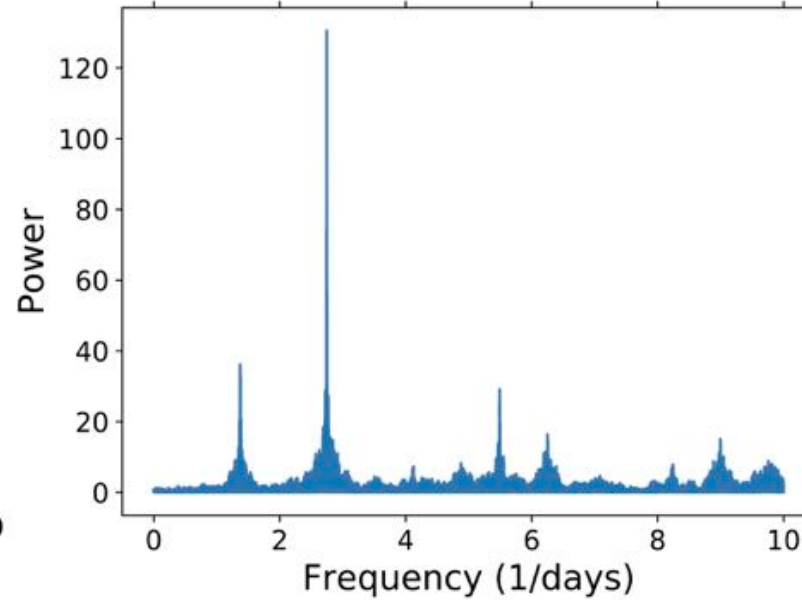
Goal: Measure the Period and Period Derivatives of Thousands of Binary Systems

How to calculate the period? Focus on Eclipsing Systems.

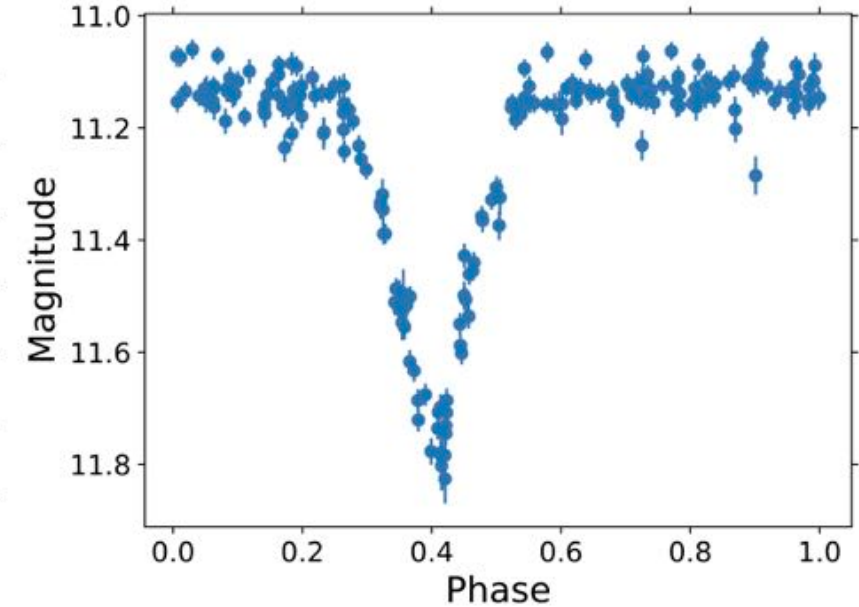
WISE Light Curve



Periodogram



Folded Light Curve

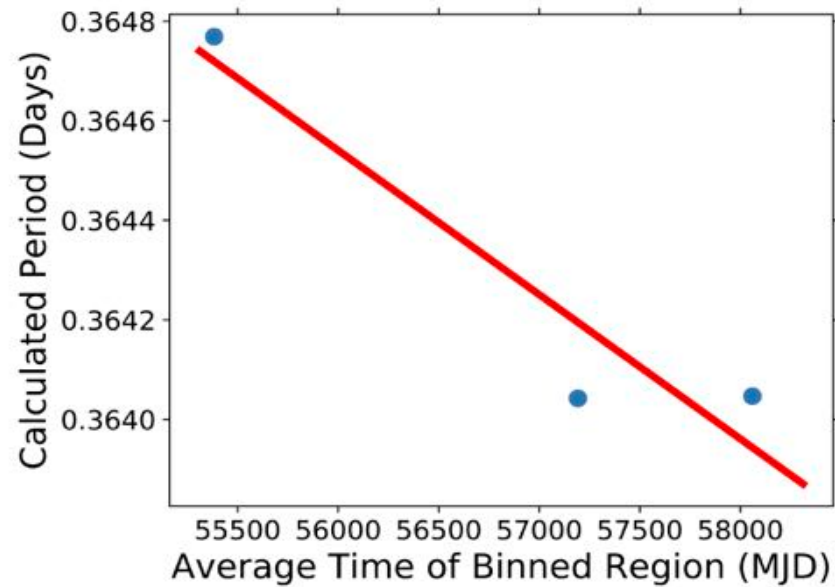
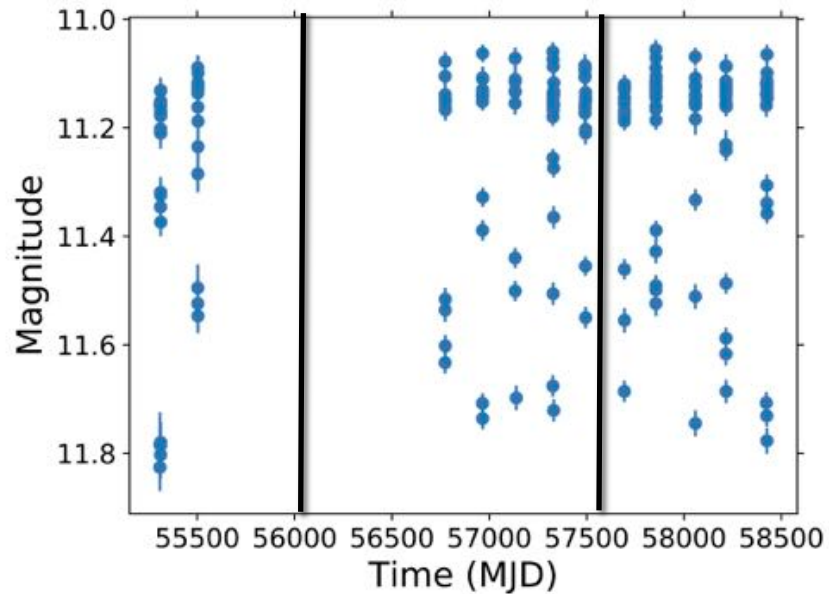


Example: NW Draco

Calculated Frequency: ≈ 2.75 1/days

Calculated Period: ≈ 0.36 days

Estimating Period Derivatives



- What about error bars? Is this period change significant?
- Once we have a solid understanding of error, the next step is to scale this up to thousands of sources.

Calculated Period Change:
 $\approx -2.90e-7$ days/day

Summary

- Project Goal: Measure the period and period derivatives of thousands of binary star systems
- Why is this interesting?
 - Rapid stages of binary star evolution are poorly understood and may help to understand transients such as Luminous Red Novae
 - Identifying binary systems with changing periods provides an opportunity to identify promising systems for further study
- Method: Divide the data into different epochs and use periodograms to calculate the period in each epoch. Then see if there is significant period change between epochs.
- Challenges: Understanding the periodogram and possible sources of error.

Hertzsprung-Russell Diagram

- Brightness vs. Temperature
- As stars age, they change positions
- Some stages of evolution are poorly understood

