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Topic 2:
Tidally Perturbed Modes in Eclipsing Binaries

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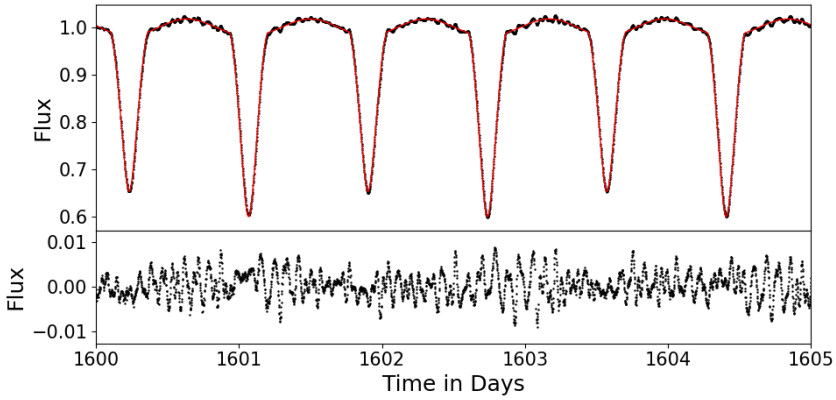
Work focus: *In this master thesis you will work on the analysis of pulsating eclipsing binaries. The goal of this work is to refine the template of amplitude change in such systems and apply it to data obtained by the space telescopes Kepler and TESS.*

Our sun is the best understood star in the universe. Other than the sun, stars often exist in multiple systems among which binaries are the most common. This is especially true for intermediate mass stars which cross the instability strip and become unstable to stellar pulsations. In such stars, parts of the star contract while other parts expand, leading to changes in the radiated luminosity and hence the observed flux.

Stellar pulsations are well understood and readily described for single stars. If a star is part of a binary however, multiple effects arise, that complicate the matter. Depending on the geometric properties of the binary system, the influence of the secondary star can among others induce stellar pulsations or perturb the self-excited pulsation modes. This master thesis focuses on a novel approach for the analysis of eclipsing binaries (systems of two stars that periodically cover parts of each other, blocking the observed flux) showing evidence for such perturbed modes.



The Figure on the left shows the TESS light curve of the eclipsing binary RS Cha (black points) and a binary model (red line) in the upper panel. The lower panel shows the residuum, the pulsations of both components.

The QR Code on the right takes you to an animation showing the components of this system and the corresponding light curve that hides tidally perturbed modes. The space telescopes Kepler and TESS have observed a handful of similar objects, all of which are waiting for further analysis.

In your master thesis you will create different templates for amplitude variations of pulsations in eclipsing binaries. A major aspect will be the statistical testing of these templates to see which one is best suited for the analysis.
You will use the identified template for the analysis of multiple systems showing evidence for tidally perturbed modes observed by the space telescopes Kepler and TESS. With this analysis we will be able to investigate the physics behind tidally perturbed modes at a new level!

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