Bisector Analysis of EV Pisces

Laura Mangrum, TTU Physics

EV Pisces is an RR Lyrae 1st overtone pulsating star potentially having transverse waves across the surface. Our goal from this project is to find evidence of these nonradial mode transverse waves by looking for interference between the radial modes and non-radial modes. Using bisector data analysis of EV Pisces spectra data from the MacDonald Observatory, we analyzed 7 different FeI absorption lines over the course of 5 nights. Each night included ~20 separate observations covering most of the pulsation phase. Bisector analysis of absorption lines allows measurement of velocity gradients in the star's atmospheric layers.

The center core of an absorption line represents light emitted from the upper most layer, and the wings of the absorption line are formed from light emitted from lower layers. We smoothed and filtered the spectra lines to reduce noise and removed cosmic rays. Plotting the average line velocities of the bisectors over line depth for each spectra file gives us insight to the behavior of the upper atmospheric layers in EV Pisces over time. Focusing on nights 1 and 5, we see a noticeable difference where by night 5, the layers are moving more coherently. We suspect this is due to transverse waves having less of an impact, which is also seen in the simultaneous TESS light curve data as a damping out of the transverse wave on night 5.