

Probing Velocity Gradients in RR Lyrae Variable Stars

Professor Ron Wilhelm

University of Kentucky

In my talk I will discuss what classical pulsating variable stars are, why they pulsate and how changes in pulsation can be used to probe the physical mechanisms at work in the star's interior. I will discuss two, first-overtone RR Lyrae stars, EV Psc and LS Her. Both of these stars show multi-mode behavior which results in amplitude changes in their light curves. EV Psc has two closely spaced non-radial pulsation modes, found in the analysis of the Transiting Exoplanet Survey Satellite (TESS) light curve data. LS Her is a Blazhko star, which undergoes amplitude and phase shifts over the course of 12.7 days.

We have analyzed high resolution, echelle spectroscopy obtained at McDonald Observatory on the 2.7 meter telescope. We have developed a line bisector analysis which makes use of the averaging of seven iron absorption lines to probe the differential motion between layers in the stellar atmosphere. This velocity gradient is evaluated at each pulsation phase to determine relationships between the gradient and changes to the light curve. I will present our current results for velocity gradients, what it might mean for each star, and the future aspects of this project.