Constraining the structure and physics of core helium burning stars with mixed modes

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Abstract

In stellar evolution calculations the core helium burning phase is a large source of uncertainty. This is primarily due to the treatment of convection and whether or not partial mixing, or "semiconvection" eventually surrounds the helium burning core. Asteroseismology of red clump stars offers a unique insight into the structure of these stars because the pattern of the oscillation modes of mixed p and g character is strongly dependent on the properties of the core. In preliminary comparisons there appears to be a discrepancy between the computed mixed mode period spacing in standard stellar models and what is inferred from observations. This suggests a problem with either stellar evolution models or the way asymptotic mixed-mode period spacings are deduced from observations. Using the Monash University stellar evolution code and the Aarhus adiabatic pulsation package we investigate both of these possibilities. In particular, we explore the gamut of physical uncertainties in the models along with the effect of semiconvection on mixed-mode pulsation spectra.

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