

## **A SEARCH FOR HYBRID GAMMA DORADUS/DELTA SCUTI PULSATING VARIABLE STARS**

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The delta Scuti and gamma Doradus variables are main sequence (core hydrogen-burning) stars with masses somewhat larger than the sun (1.2 to 2.5 solar masses). The gamma Dor stars, having cooler effective temperatures, are pulsating in nonradial gravity modes with periods of near one day, whereas the delta Sct stars are radial and nonradial p-mode pulsators with periods of order one hour. Because of the near one-day periods of gamma Dor stars, satellite observations over a few weeks are preferred to ground-based single sites or networks to find multiple periods in these stars.

Theoretically, gamma Dor and delta Sct pulsations would not be expected to co-exist. The gamma Dor g-mode pulsations are explained by a convective blocking mechanism that produces pulsation driving at the base of an envelope convection zone extending to temperatures of several hundred thousand Kelvin. The delta Sct p-mode pulsations are explained by driving in the helium ionization region in the envelope at about 50,000 K by increased opacity in this layer regulating radiation diffusion (the kappa effect). The kappa effect should not operate in the convection zones of gamma Dor stars, as convection instead of radiation is efficiently transporting the star's energy outward.

Nevertheless, about half of the gamma Dor stars lie just within the theoretical delta Sct instability strip, and a few hybrid gamma Dor and delta Sct pulsators have been reported. Rowe et al. (2006) report on BD+18 4914, a hybrid pulsator discovered by space-based photometry using the MOST spacecraft.

We propose to observe several stars accessible by Kepler with effective temperatures and abundances near the boundary of these two variable star types that are promising candidates for hybrid pulsators. With a year of photometric monitoring, a number of p- and g-mode frequencies that are ubiquitously predicted in main-sequence A-F stars could be determined. With enough modes, we could use asteroseismology to provide constraints on the internal structure of these stars, and learn more about how these two types of pulsations could coexist. It is likely that asteroseismology of such stars will lead us to a better understanding of the physics of time-dependent convection, opacities, and helium and element diffusive settling.