USING NON-SINUSOIDAL LIGHT CURVES TO MAP THE CONVECTION ZONES OF GAMMA DORADUS VARIABLES

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We propose to use the nonlinearities present in the light curves of large-amplitude Gamma Doradus variables to constrain the depth of their convection zones. The basis of this technique is the strong temeperature dependence of stellar convection zones: relatively small variations in the surface temperature due to pulsation can result in large changes in the size of the convection zone during a pulsation cycle, and this in turn introduces nonlinearities into the light curves. This technique has been successfully applied to pulsating white dwarf stars and should be straightforward to apply to the Gamma Doradus stars. In addition, we seek to monitor changes in the convection zones of these objects over multiple epochs. We therefore request continuing long-cadence observations for four such Gamma Doradus stars in the upcoming Kepler observing cycle. At present there are two competing proposed mechanisms concerning the source of mode driving based on completely different assumptions regarding the physics of convection in these objects; our analysis will help resolve this long-standing question. Finally, we note that our approach is one of only two techniques that can be used to measure the depth of the convection zone of a pulsating star, and it is the only one available for stars such as the Gamma Doradus variables which have only a handful of excited modes. As a result, this investigation will provide important data with which to test the results of hydrodynamical simulations of convection in this part of the HR diagram.