

Understanding the Pulsation Structure in the Delta Scuti Stars via Eclipsing Binaries

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The known information about the interior stellar structure improves our knowledge of the stellar formation, evolution and the hydrodynamic processes occurring in stars. The seismic waves of stars are the most important way to probe the interior stellar structure. Many stars in the Hertzsprung-Russell diagram exhibit variations with these seismic waves and they are known as pulsating variables. One of the most known groups of these pulsating stars is the Delta Scuti variables. The Delta Scuti stars show oscillation modes occurring in the upper and inner envelopes of a star. By the different pulsation modes and relatively larger pulsating amplitude of Delta Scuti variables, information about the inner layers of a star close to the stellar surface and the core can be obtained. The high-quality data of recent space missions show us that the previously known information about the pulsation stars, including Delta Scuti variables, has to be changed. The examinations of high-quality space photometry were showed that Delta Scuti type pulsations may take place outside of the Delta Scuti instability strip where the pulsations theoretically are not expected. Additionally, it was revealed that Delta Scuti stars present different pulsation characteristic than known from the ground-based observations. These arisen problems related to the Delta Scuti variables show that the pulsation mechanism and the borders of the Delta Scuti instability strip should be re-investigated. To answer these problems some detailed analyses would be performed and these analyses require precise fundamental (mass, radius) and atmospheric (effective temperature, metallicity) parameters. To accurately derive these fundamental stellar parameters, the only useful way is the analysis of the eclipsing binary systems. Therefore, in this project, we focus on the detailed photometric and spectroscopic studies of the eclipsing binary systems with a Delta Scuti component to answer the available questions associated with the Delta Scuti stars.