KEPLER OBSERVATIONS OF MASS TRANSFER ACTIVITY IN DIRECT-IMPACT ALGOL-TYPE INTERACTING BINARY SYSTEMS

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We propose a combination of high and low cadence Kepler observations of seven direct-impact Algol-type binaries in the Kepler fields to study the physics of mass accretion in these interacting systems. Included are the identification of a hot accretion spot at the site of the gas stream impact and a determination of its size and longitude, a search for accretion- induced photospheric oscillations, and a search for micro-flaring that might result from variable shocks due to a clumpy gas stream. Since a splash from a direct impact and the radiative energy from hot spots can precipitate systemic mass loss, their existence influences the evolution of close binaries. We expect that a hot spot and micro-flaring will be visible only on the trailing hemisphere of the system. Oscillations should be global, but perhaps of an irregular nature on hemisphere experiencing the impact. Although we have a general understanding of how Algol systems are formed and their evolutionary state, little is known about the details of the mass accretion. We will investigate both short and long-term variability over many orbital cycles to identify unique light curve structure that will provide insight into the physics of mass transfer. Since observing time on the GALEX spacecraft has been approved for two of the systems, UZ Lyr and BR Cyg, we have the opportunity to acquire simultaneous UV and Kepler photometry that will aid in the modeling of mass transfer activity. The Kepler photometry will be analyzed with the latest version of the Wilson-Devinney light curve analysis program. The residual light will be analyzed using standard Fourier techniques. Frequencies found in the residuals will be interpreted with the aid of current asteroseismology software. The project addresses NASA's Strategic Subgoal 3D, Discover the origin, structure, evolution, and destiny of the universe, and search for Earth-like planets, as it will advance our understanding of the evolution of early-type close binary stars.