Abstract

THESIS: Modeling of Eclipsing Binary Star Systems NSVS 5060083 and NSVS 5354761

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I present modeling of two eclipsing binary star systems. We define a binary star system as a system whose individual stellar components are gravitationally bound together. My purpose is to model these systems using the software suite entitled Physics of Eclipsing Binaries (PHOEBE), which uses the Wilson-Devinney code. All of the systems I am looking at are part of the Northern Sky Variability Survey (NSVS). The NSVS catalog is a large-area survey generated using observations from April 1999 to March 2000 covering the sky northward of $\delta > -38°$ declination. The data used to generate the NSVS was taken using the first generation Robotic Optical Transient Search Experiment (ROTSE-I). The imaging system for ROTSE-I has a wide, unfiltered spectral response that covers the wavelengths from B to I of the Johnson-Cousins system.

The intent of the NSVS was to search for variable star systems over a wide area of the sky and it succeeded in discovering many such systems. I purposefully targeted systems that have not been extensively studied and have short orbital periods ($\sim$12 hours). Due to the large area of the sky covered by the NSVS, time resolutions for these systems are poor, ($\sim$24 hours). For systems whose orbital periods vary on the order of hours rather

than days, finer time resolutions are necessary to complete an extensive photometric study. I targeted and examined two of these systems with much finer time resolutions, (~a few minutes) in order to accurately determine their stellar orbital parameters.

I present observations taken in the three band-pass filters Johnson B and V and Cousins R. The observations of these binary star systems were carried out using both the 0.4 m and 0.6 m telescopes at the Ball State University Observatory located on the rooftop of the Cooper Science building as well as the Southeastern Astronomical Research Association's (SARA) 0.9 m telescope located at the Kitt Peak National Observatory in Arizona. All light curves generated from this data were modeled using the PHOEBE software suite. This analysis allowed me to determine several of the orbital parameters of each system, which can be used as a baseline in future studies.