Eclipsing binaries are excellent laboratories for the study of stellar evolution and interactions. By combining high resolution spectra taken by the Sloan Digital Sky Survey (SDSS) APO Galactic Evolution Experiment (APOGEE) and the high-precision photometry taken by the Kepler Telescope, close binary stars may be well characterized. We examine a subset of eclipsing binaries listed in the Villanova Kepler Eclipsing Binary Catalog by cross-correlating with the Apogee APOKASC catalog. We found that infrared color magnitude and color-color diagrams, especially the H-K vs J-K diagram, allowed for a relatively clean separation of giants and dwarf stars. Presumably, dominated by the primary star in these eclipsing binaries. A catalog of well characterized eclipsing binaries is presented. In addition, a number of interesting binaries have been identified and progress towards their characterization is reported. This program is supported by SDSS/FAST grant from the Sloan Foundation.

Global Properties of Sample

Figure 1. J-K vs. Log P_{orb} for 201 Kepler eclipsing binaries. The size of the dots scales as 1/Log g and the pattern follows for Figures 2 and 3. The color scale is SDSS T_{eff}.

Figure 2. A color-color plot for the sample. Dot size indicates star size. The grey dots on the are cases where the SDSS T_{eff} could not be fit.

Figure 3. Metallicity vs. Log P_{orb}. Note one low metallicity star.

We intend to model all of the binaries with SDSS APOGEE data in order to determine additional parameters of each binary in the catalog and to identify source confusion.

SDSS APOGEE Spectra

Our merged binary catalog includes links to APOGEE spectral fits, see Figure 4. Th SDSS spectral pipeline is able to fit single-star spectral models (red) to the spectra SDSS/APOGEE spectra of many of our sample of eclipsing binaries, but most it does not.

The binary KIC 9181877 yields a great fit, see top panel of Figure 4. From the Kepler Eclipsing binary Catalog, (Prsa et al 2011, Slawson et al. 2011), this binary consists of twins with T_{2}/T_{1} = 0.99926. The APOGEE spectral fit yields log g = 3.57. We suggest that this log g may not be physical. In the middle panel of figure 7, I the APOGEE spectrum of KIC 7871200 is shown. This spectral fit is poor. This may be expected in this case as the Kepler light curve indicates T_{2}/T_{1} = 1.047, so the stars have similar, but not identical luminosities.

In the bottom of Figure 4, the data reduction pipeline found a good single star fit when according to the Kepler Eclipsing Binary Catalog this source is a close binary with a 0.3 day orbital period, KIC 11135978. The spectrum is well fit to a giant. The Kepler light curve model yields a nearly twin binary with T_{2}/T_{1} = 0.98431.

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References

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