SX Phoenicis (and RR Lyrae) stars in the Kepler field

James Nemec*†[1]

[1]Camosun College, Victoria, British Columbia, Canada – Victoria, British Columbia, Canada

Abstract

In 2012 Balona & Nemec (MNRAS, 426, 1476) identified 34 candidate SX Phe stars in the Kepler field by cross-correlating a list of 1424 Kepler-field delta Scuti stars with the UCAC3 proper motion catalog and selecting those stars with high proper motions and high tangential velocities. Since then we (Nemec, Balona, Kinemuchi, Murphy, Jeon, Kurtz and Pigulski, 2014, in preparation) have used the Canada-France-Hawaii 3.6-m telescope (with ESPaDOnS) and the Apache Point Observatory 3.5-m telescope (with ARCES) to derive radial velocities, space motions, projected rotation velocities, and atmospheric physical characteristics for 32 of the 34 candidate stars. The analysis was based on measurements of over 100 high-dispersion (R_˜65000) echelle spectra. From a Toomre diagram three of the stars are found to have (negative) RVs > 250 km/s and retrograde space motions, and nine stars have total space motions T> 400 km/s. In fact the distribution of the SX Phe stars is not too unlike that of the Kepler-field RR Lyrae stars (Nemec et al. 2013 ApJ, 773, 181). Two thirds of the stars are fast rotators with vsini > 50 km/s, including four stars with vsini > 200 km/s. The spectral types range from A2 to F6, and many of the stars show a marked metal weakness. All but two of the 34 candidates are bona fide halo and thick-disk SX Phe stars (and thus are Pop.II blue stragglers). Also analyzed was all the available Q0-Q17 Kepler photometry (both long- and short-cadence). Based on the observed frequency modulations and time delays, at least eight of the SX_˜Phe stars appear to be in binary systems, several of which exhibit significant RV variations. From the derived orbital properties six of the binaries have secondary masses ranging from 0.3 to 0.7 Msun and orbital periods ranging from 3 to 1600 days. One of the stars appears to be an ellipsoidal variable with orbital period 2.3 days, and for two other systems the orbital periods appear to be longer than the 3.5-year range of the Kepler data.

*Speaker

†Corresponding author: jmn@isr.bc.ca