Resolving the Retired A Star Controversy with K2 Asteroseismology

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Radial velocity planet searches have shown a strong increase in the frequency of planet occurrence around massive stars, and that massive stars are deficit in short period planets [Bowler et al., 2010, Johnson et al., 2007, 2008, 2010, 2011a,b]) . These planet searches have relied on giant stars for a sample of high mass stars, which are hostile to precision Doppler measurements while on the main sequence. There are now nearly 30 radial velocity planet hosts known as "retired A stars": stars that are evolved off the main sequence to the sub-giant branch with inferred mass $> 1.5\ M_{\odot}$. Lloyd [2011] compared the mass distribution of planet hosting sub-giants with a galactic model mass distribution, and showed that a sample of stars in the same region of the HR diagram as the exoplanet hosts cannot have this many retired A stars, concluding the mass of these stars have been systematically over-estimated are more likely to have originated from a main sequence population with mass 1.1–1.3 $M_{\odot}$, comparable to F/G dwarfs with Doppler detected planets. The conclusion of Lloyd [2011] has been called in to question by Johnson et al. [2013]. However, as shown in Lloyd [2013], **there remains a major discrepancy that is far too large to be attributed to planet occurrence rates**. Consensus in the community is now converging on the conclusion that indeed many, if not all, of the retired A star planet hosts stellar masses have been over-estimated. The subgiant planet hosts being evolved from stellar masses comparable to the main sequence RV Doppler detected planets implies the existence of a new migration mechanism that modifies the orbital elements of planets at periods beyond the influence of plausible tidal theories.

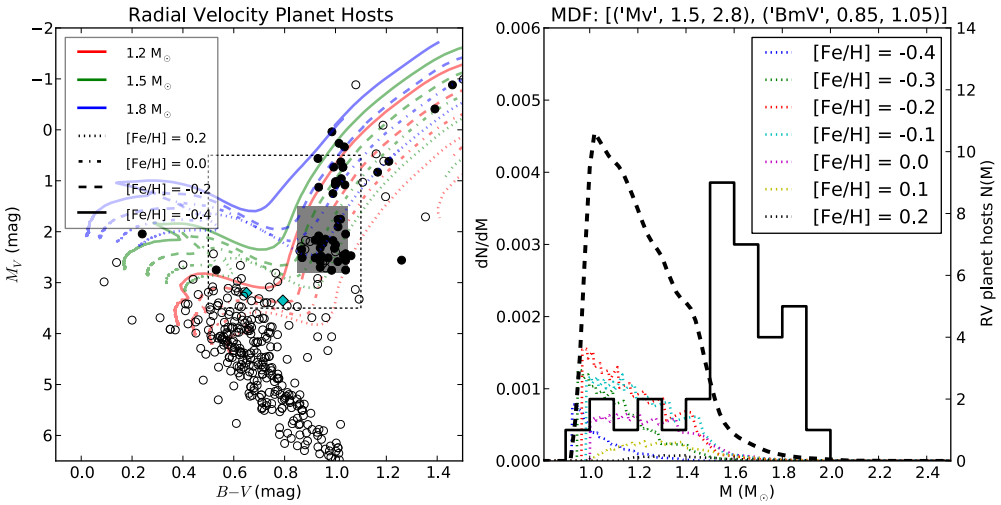

Figure 1: Left: CMD of RV exoplanet host stars. Stars with mass $<1.5 M_{\odot}$shown as open symbols, stars with M$>1.5 M_{\odot}$shown as filled symbols. The shaded region shows the subgiant region from which the sample of retired A stars has been drawn. Right: Mass distribution function for exoplanet host stars in the shaded region (solid line) and distribution that for a simple galactic model (dashed line; described in detail in Lloyd [2011].)

Asteroseismology with K2 can resolve debate by confirming the masses of the stellar population that has been identified as being "retired A stars". 10 targets have been selected in a color magnitude diagram to be likely subgiants as defined in the sample of [Johnson et al., 2010]. A further 10 second priority targets (listed as second priority in the comment field) identified as probable subgiants, but due to uncertainty in the distance are possibly not first ascent giants but core helium burning stars.