CHEMICAL COMPOSITIONS OF PLANET-HARBOURING STARS IN M67

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At the forefront of observational astronomy is the search for stars containing planetary companions. The majority of planets have been discovered through eclipsing methods. However, this method is unable to detect planets that either don't block a sufficient amount of light from the star, or don't orbit the star with an orientation that causes an eclipse for the observer. This project analyzes the possibility of a correlation between a star's probability to contain planetary companions and the star's stellar abundance of elements with high melting points. We study a sample of stars in the open cluster M67, a cluster noted for being very similar to solar age and overall chemical enrichment. At least two stars in M67 have shown evidence through eclipsing to contain planetary companions, and have been studied with the sample of M67 stars with no noticeable eclipsing planets.

Using stellar spectra from the instrument APOGEE (Apache Point Observatory Galactic Evolution Experiment), a project in the international SDSS (Sloan Digital Sky Survey) collaboration of which the University of Utah is an active member, the absorption features were measured for 20 individual stars in M67. These 20 stars were chosen after studying their radial velocities to indicate their true membership in the cluster. These measurements, along with the star's temperature, surface gravity, and overall chemical enrichment, were used to derive the abundance of elements such as aluminum, titanium, calcium, nickel, chromium, and zirconium. Literature searches were also done and abundances from previous studies of M67 were adopted for comparison. Comparing these abundances with those of the two planet-harboring stars in M67 from this study, it appears reasonable to conclude that stars harboring planets are higher than average in chemical composition for at least calcium and titanium. Further study of the spectra, and closer examination of the stars' stellar parameters will help determine how accurate this conclusion is.

Figure 1:

This figure combines the data from three separate studies with the data we've obtained for two stars, all in M67. To help make each data point visible some of the points were slightly moved to the side. It plots abundance with respect to the three elements aluminum, calcium, and titanium. Calcium and titanium show that the two planet-harboring stars are higher than the average abundance, and similar results were obtained for silicon and nickel. The next step is to compare these two stars with the rest of our sample to see if there is a similar trend.