DEFINING THE DEPENDENCIES OF ROTATION FOR OLD COOL STARS

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Rotation is a fundamental observable characteristic of a star and of its evolution, and the basis for stellar magnetic activity. It can even tell us the age of a cool main sequence field star in a distance-independent way. Consequently, it is imperative to develop our knowledge of stellar rotation, not only from the Kepler viewpoint of deriving ages for planet host stars, but also from a general astrophysical perspective. Prior ground-based work has shown that stellar rotation periods are essential to this development, rather than v sin i measurements. It is particularly useful to obtain them in open clusters, whose stars are coeval, because this fixes one of the two most important dependencies of rotation (age), the other one being mass. However, the precisions of ground-based observations are inadequate to measure rotation periods in intermediate age or old clusters. Accordingly, no rotation periods are available for coeval populations of stars between 600 Myr (Hyades) and Solar age.

Luckily, the Kepler Field contains a 2.5 Gyr-old cluster, NGC 6819, which we have been studying intensively over the past decade. This (ongoing) work includes radial velocity membership and binarity information, and has already identified ~500 members of NGC 6819. We have chosen 134 of the most isolated members in the field of NGC 6819 as targets for the derivation of rotation periods from the Kepler data. Our team is prepared to undertake special efforts to extract the results beyond the analysis of the pipeline-produced light curves. By taking advantage of Kepler's superb precision, cadence, and duration, we will leap forward in our understanding of stellar rotation by measuring the relationship between stellar rotation, age, and mass to 2.5 Gyr. Specifically, we propose to empirically define the period-mass-age surface for intermediate age stars by measuring 134 FGK dwarfs in the 2.5 Gyr old cluster NGC 6819.