

STARSPOT EVOLUTION ON ACTIVE LATE-TYPE STARS IN THE KEPLER FIELD - CYCLE 3

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Starspots on late-type stars are a direct manifestation of the photospheric emergence of strong dynamo-generated magnetic fields. We propose to extend our Cycle 1 and 2 projects of 30 minute cadence Kepler photometry, in which we are investigating how activity phenomena such as the growth, migration, and decay of starspots, differential rotation, activity cycles, and flaring operate on single and binary stars with a wide range of mass (and hence convection zone depth). We expect that such investigations will stimulate and enable theoretical studies of magnetic flux generation and transport processes in the regime of moderate to fast rotation, which any successful theory must be able to address. Our Kepler Cycle 1 data shows a rich variety of photometric variability including starspot rotational modulation, pulsations (both simple and very complex), flaring, and eclipses. Our proposed Cycle 3 sample of 219 active stars is based on GALEX Cycles 4 and 5 FUV and NUV imaging of the Kepler field. Accurate measurements of starspot longitudes and spot filling-factor maps can be obtained from the Kepler photometry using our newly-developed light-curve inversion methods that fully utilize the powerful diagnostic capabilities of Kepler time series data. We check results from our new inversion code, which -- given the high quality of the Kepler lightcurves -- can directly model the differential rotation, with results from our previous inversion codes. A full suite of supporting high resolution optical echelle spectroscopy is being obtained using the Hobby-Eberly, MMT, NOT, and Apache Point Observatory telescopes. These observations will provide accurate determinations of the stellar properties, such as effective temperature, surface gravity, and projected rotational velocity, and also which stars are spectroscopic binaries and measure their radial velocity curves. Supporting X-ray imaging will commence in 2011 with an approved XMM Large Project and ultraviolet spectroscopy of several Kepler targets will be proposed in the coming months. Our sample includes stars for which Doppler imaging, both conventional and magnetic, is feasible using current technology.