Characterizing the Variability of the Nearby Late-Type Dwarf Stars

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The late-type dwarfs are the principal objects of interest for exoplanet detection and subsequent characterization. The nearby F-M dwarfs are high-priority targets since they will be the most accessible to detailed investigation, especially with distance-sensitive methods such as astrometry and coronagraphic imaging in addition to ultra-precise Doppler spectroscopy and photometry at high signal-to-noise ratios.

We propose that the *K2* mission obtain data for nearby dwarf stars that are in the Gliese *Catalogue of Nearby Stars* and present in Field 1. The attached target list includes 9 nearby stars in Field 1 that range in spectral type from F6 V to about M6 V and at distances extending from 3.3 to 26 parsecs. Included is a subgiant-dwarf binary/common proper motion pair of early K spectral types with a separation of about 27 arcsec at a distance of 16.6 parsecs. The inclusion of this target will reveal the nature of variability in a late-type binary system that is slightly evolved. All targets are in the EPIC catalog.

Active flare stars as well as more quiescent stars are included in the target list. The nature of variability in quiescent objects in the solar neighborhood is relatively unknown. The kind of variability that could be expected includes low-amplitude rotational modulation (enabling the measurement of rotation periods for these nearby stars for the first time) and transient activity due to flares or photometric "flickering" in addition to possible new phenomena. Bastien et al. (2013; Nature, 500, 427) find a correlation between photometric flickering and stellar gravity. Thus these proposed observations could yield a fundamental parameter for these field stars. It is also interesting to note that Notsu et al. (2013; ApJ, 771, 127) find that superflares in stars with relatively slow rotation (and therefore expected to be less active) can be as energetic as those in more rapidly rotating stars, though the frequency of occurrence of such exceptionally violent outbursts is lower.

Characterizing the amplitude and frequency of flare events on cool M dwarfs is critical since the Temperate Zones for any exoplanets in these systems begins at less than 0.1 – 0.2 AU. The transient activity that is likely present can have a profound influence on exoplanetary atmospheric structure and evolution. The availability of two bright dwarf F and three K dwarf or subgiant stars, respectively, also offers the opportunity to obtain asteroseismic observations at Short Cadence.

A search of the database in the NASA Exoplanet Archive did not include these targets as stars known to have planetary companions. However, future searches at higher sensitivities with large ground and space-based facilities may eventually yield exoplanet detections for many of the nearby stars.

The monitoring of these targets is an important first step toward characterizing variability in the nearby late-type stars in the field that could become first-priority targets for missions such as JWST as well as objects of interest for future large, ground-based telescopes such as TMT. The results will enable informed planning for future investigations of the nearby stars in an exoplanet system context as well as interesting science in its own right.