**Targeting M dwarfs with K2**

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One of the primary goals of the *Kepler* mission was to "Determine the abundance of terrestrial and larger planets in or near the habitable zone *of a wide variety of spectral types of stars.*" However, ~70% of *Kepler*'s target stars had masses within 20% of the Sun's, while 70% of the stars in the Galaxy have less than 50% the mass of the Sun (Batalha et al. 2010; Brown et al. 2011). Of the 190,000 *Kepler* stars with at least one quarter of observations, only 5500 are M dwarfs, and only 2400 M dwarfs were observed during all 16 *Kepler* observing quarters. Expanding the sample of M dwarfs will allow us to probe the smallest planets accessible to K2 while broadening our understanding of planet populations around the most numerous and closest stars in the Galaxy.

The *Kepler* science team has identified M dwarfs as a vital set of targets for the K2 mission. Two of the first three "science motivation" topics on the K2 website are to "provide a yield of small planets around bright and small stars in order to facilitate...follow-up measurements" and to "identify locations and characteristics of potentially-habitable planets around bright M dwarfs in the solar neighborhood." This has been borne out in the Field 0 selections, with approximately 2,000 late-type stars being selected for observations. Here, we provide a list of 9,300 M dwarfs that could be observed in Field 1 to further the above goals

Previously, we estimated a noise floor four times that of *Kepler*. From Howell et al. (2014), K2 data appear to be less noisy: 16$^{th}$ magnitude stars appear to have noise levels 3 times that of *Kepler*. Thus, we select targets slightly fainter than our previous call, down to 17$^{th}$ magnitude. Here, we use the *r*-band as a proxy for Kp. We expect to detect planets of 1.3 Earth radii, the most common type of planet around M dwarfs (Morton and Swift 2013).

For Field 0 we selected targets photometrically using 2MASS color-color relations and UCAC proper motions. For Field 1, we make use of M dwarf data from the Sloan Digital Sky Survey (e.g. West et al. 2011) which cover nearly the entire K2 field (Fig. 1). The bulk of our sample is photometric. We select all SDSS point sources with red colors ($r$-$i$ > 0.5; Bochanski et al. 2007) and $r$ < 17.0. We filter for giants by removing all targets with 2MASS J-K > 0.8 or proper motions less than 4 mas/yr. We list all proper motions in the comments of our table.

A total 522 of our targets in K2 Field 1 have SDSS spectra. We select all such targets brighter than $r$=17. To highlight mid-Ms, we then extend to fainter stars: If the star has a spectroscopically measured spectral type of M4 or later, we extend to $r$ = 20. Otherwise, if the star has photometric data consistent with an M4 or later spectral type ($r$-$i$ > 1.46), we extend to $r$ = 19. The original *Kepler* mission targeted 30 M4 dwarfs; we encourage the team to consider observing more late dwarfs despite the faintness if feasible. These targets would be some of the first mid/late M dwarfs observed continuously for months. We note our magnitudes are often 0.5 mag fainter than EPIC for the faintest targets, possibly suggesting a systematic offset from EPIC to SDSS for faint stars.

We expect to detect many eclipsing binary stars in this sample, with eclipses deep enough to detect and characterize for extremely faint targets. Such binaries are useful for calibration of M dwarf mass-radius relations. The late M sample all have proper motions derived by comparing SDSS and 2MASS data. We require there be at least a 1 year baseline and a change in position of 0.5" (> 5 times the 2MASS absolute astrometric precision).

**We apply the K2fov tool to all three samples. We find:**

| **Sample** | **On silicon** | **"Near" silicon** |
|---|---|---|
| Photometric; $r$ < 17.0 | 9128 | 9134 |
| Spectroscopic (bright + late) | 13+18 | 25+29 |
| Photometric; late-type Ms | 133 | 177 |

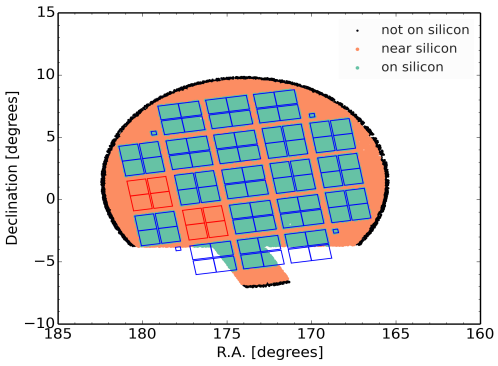


Fig. 1: We use K2fov to identify SDSS targets that fall on silicon.

*References*

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