

KARMENES : The K2+CARMENES M-dwarf sample

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Low mass stars in the K2 field are relatively faint at optical wavelengths. However, they have stronger fluxes in the nIR. Planets as small as the Earth will cause transits with depths of 0.5-2%. The CARMENES instrument is expected to start operations at the end of 2015. It is a stabilized optical+infrared spectrograph covering from 0.5 to 1.7 microns at R=82,000, whose Doppler precision is at 1 m/s level and will use 600 nights of GTO time at the 3.5m Calar Alto telescope between 2015 and 2018). Such precision and amount of telescope time will allow for the systematic detection of Earth-mass planets in the HZ of low mass stars. M dwarfs, even appearing faint at optical wavelengths (e.g. V,r' ~ 14-15 mag), have sufficient flux in the optical red and nIR to attain the m/s precision. We kindly request to the K2 team to observe as many late type M stars in the field as possible. This proposal contains a sample of mid to late M-stars that we could quickly identify in the field. Several planet candidates have been reported in the original Kepler field but they tend to be early type M stars (M0V to M3V, Muirhead et al. 2012 ApJ, Dressing & Charbonneau 2013 ApJ, Martin et al. 2013 A&A). As a result, not much is gained in the red-nIR in terms of flux and follow-up is difficult, if not impossible, with current means such as HARPS-N.

The K2 equatorial mission is a rather unique opportunity to acquire high quality photometry before CARMENES and, hopefully, early planet detections that will benefit both projects. Photometric variability and activity on such late type stars is quite unknown. CARMENES will obtain measurements of active stars to better quantify the Doppler-activity connection. Thus, even if no planet detection occurs in this sample of M dwarf stars, the photometric time-series will have an enormous value to the low mass stars community. CARMENES could also follow-up on very interesting targets on earlier type stars (G & K dwarfs) if necessary.

Mid M-type stars (M2 - M4) were strongly underrepresented in the initial Kepler sample and later M-types (M4-M8) completely inexistent. The habitable zones of such stars have orbital periods of a few days, thus enabling several potential transit detections within each K2 pointing. We propose three samples of well identified M stars around the K2 position that can be efficiently followed-up with CARMENES. The first sample is composed of bright and extremely high priority targets that (hopefully) other groups might have already proposed. The second sample is composed of M-dwarfs for which we have verified their spectral type through the CARMENES preparatory observational campaigns but are a bit fainter. The third sample (~200 objects) consists on all stars in the field that are likely to be unclassified late-type M dwarfs. They have been selected by assuming high proper motion (>100 mas/yr), brightness (V<15) and color (V-K>2.5) using the 'SIMBAD search criteria' form.

If this program is eventually selected, the CARMENES consortium will be happy to discuss with the K2 science team how to organize follow-up and potential exploitation of this sample.

Sample description

- Primary targets, bright and inactive: KARMENES_Field0_Sample1.csv
- Verified nearby M-dwarfs : KARMENES_Field0_Sample2.csv
- Suspected nearby M-dwarfs : KARMENES_Field0_Sample3.csv

Given magnitude is V, r' depending on availability. Positions are in the JD2000 equinox system and account for proper motion between 2000 and 2014.4 (most stars have PM>100 mas/yr).