carmenes science preparation: KARMENES, the K2+CARMENES alliance

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The main goal of the CARMENES instrument is to perform high accuracy measurements of stellar radial velocities (1 m/s) with long term stability. It will be installed in 2015 and will be equipped with two spectrographs covering from the visible to the near-infrared. The Kepler K2 mission uses Kepler spacecraft operating with only two reaction wheels to achieve high precision photometry of thousands of objects along the ecliptic. The CARMENES Consortium is proposing M dwarf targets to be observed in each K2 pointing, with the main aim of detecting transiting planets around late-type M dwarfs and pulsations.

The Kepler K2 mission (*http://keplerscience.arc.nasa.gov/K2/*) will perform twelve different pointings around the ecliptic from Mars 2014 to December 2016, observing each field during about 75 days. Currently, the fields 0 and 1 have been observed and the campaing 0 data public release is foreseen at any time.

The CARMENES Consortium has responded to K2 call for proposals with a double program for the low cadence (30 min) and high cadence (1 min) sampling, that suits and complements CARMENES science objectives:

1) **The Low Cadence program** requests observing faint late-type nearby M dwarfs to detect transiting planets.

Late-type M dwarfs show larger flux in the optical red and near IR than earlier types (M0V to M3V) around which most planet candidates lie (*Muirhead et al. 2012, ApJ, L750, 37*). The enhanced nIR flux makes the expected-to-be-detected transiting planets amenable to be confirmed and followed-up by the unique capabilities of CARMENES. Besides, the K2 high-precision photometry will help to anticipate and improve the accuracy of Doppler measurements of very late-type stars.

2) **The High Cadence program** aims at discovering pulsations and very short period, small planets around nearby M dwarfs.

High cadence sampling is non-negotiable to discover theoretically predicted pulsations in M dwarfs in the 20min to 3h range (*Rodríguez-López et al. 2014, MNRAS, 438, 2371*). Furthermore, the high cadence is essential to increase the number of transiting small close-in planets with orbital periods of just a few hours, as KOI-1843b with a 4.25h period (*Ofir & Dreizler, 2013, A&A, 555, A58*).

Moreover, all targets will be subject to characterization of possible photometric variability due to flares and magnetic activity modulated by stellar rotation.
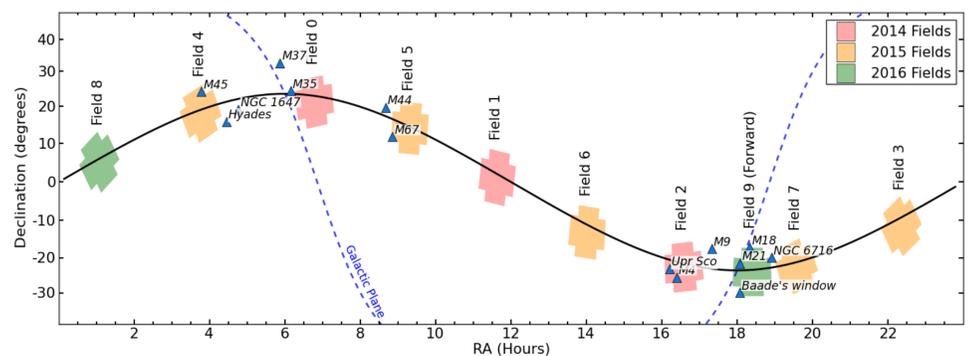
K2 observing scheme. Field 0 & 1 have already been observed and the data release for field 0 is expected to be in any moment (see operations milestones below).
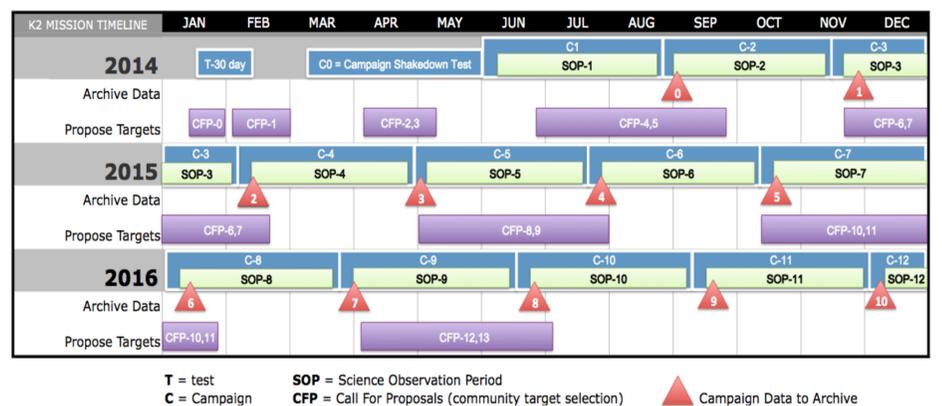
K2 operations milestones.

Campaign 0 data are about to be released. While the degree of processing to which the data will have been subjected is yet unknown, our group has the necessary tools to tackle the analysis from the very basic raw data: extraction of the light curves and processing through SARS pipeline (*Ofir et al. 2010, MNRAS, 404, L99*), search for planet candidates using Optimal Box-Least-Squares (*Ofir & Dreizler, 2013, A&A, 555, A58*), and search for pulsations using Fourier transform analysis with Period04 (*Lenz & Breger, 2005, Comm. Aster., 146, 53*).

We hope that the KARMENES program will result in the first fully characterizable Earth-like planet in the habitable zone of a M dwarf star and in the discovery of pulsations in this object class.

http://carmenes.caha.es/