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Hunting exoplanets around latest M dwarfs with RV NIR-spectrographs

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Abstract

The ultracool dwarf stars (red dwarfs later than M6.0 V) are frequent in the solar neighbourhood, but so far only three systems with exoplanets have been confirmed, TRAPPIST-1, LP 890-9 and Teegarden's star. There are several reasons: (i) these stars are faint and the flux peaks in the near-infrared, but the radial velocity (RV) information available in this part of the spectrum is lower than in the visible. Thus, we need more stable NIR spectrographs (CARMENES-PLUS) and larger telescopes (MARCOT). (ii) They are usually fast rotators, which intrinsically results in bigger uncertainties, since the spectral lines get broadened. There is nothing to be done except to select the slowest ones. (iii) Additionally, the planets around these stars are expected to be small, showing low RV amplitudes. Nevertheless, the detectability expected for transits is around 2 % whereas it increases to 55 % with RV.

Up to now, the community have being facing slow-rotating and earlier spectral-type stars (from M0.0 to M6.0), and mainly in the optical range. In order to go to redder and more active stars, a step forward dealing with fast rotators is needed, as well as a better understanding of the near-infrared part of the spectrum. The spectral order selection to compute the RV is a key factor to succeed; in the visible picking the reddest orders, and for the near-infrared finding those orders with the highest amount of RV information. Additionally, correcting the spectra from telluric contributions will be fundamental.

My poster in zenodo.org can be found here.