# PHOTOMETRIC CHARACTERIZATION OF ULTRA COOL DWARFS: EXPLORING THE EXOPLANETARY ENVIRONMENTS

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**Ultra-cool dwarfs (UCDs) are objects with effective temperatures below 3000 K that include fully-convective very-low mass stars and brown dwarfs (Kirkpatrick et al. 1995). According to the core-accretion theory (Pollack et al. 1996), these objects are ideal candidates for hosting terrestrial planets. Hence, it is crucial to describe and quantify their activity to explore and characterize the environments to which potential planets would be exposed.** With this idea in mind, in this contribution, we present preliminary results of a search for flares and rotation periods in a sample of 157 UCDs with spectral types between M4 and L3, observed in 2-minute cadence with the space mission TESS (Ricker et al. 2015).

We searched for signs of activity in the PDC_SAP photometric data, processed with the TESS SPOC pipeline (Jenkins 2002). For each UCD, we used the *Altaipony* code (Davenport 2016) for flares detection, and the Lomb-Scargle periodogram (Scargle 1982) and the Auto-Correlation Function (ACF, McQuillan et al. 2013) to find significant peaks that might indicate periodic sinusoidal modulations. Our preliminary results are:

1- For the 157 UCDs analyzed so far, we have detected both flares and periodic modulations in 41 objects ($\sim 26\%$), only flares in 72 ($\sim 46\%$), and only periodic modulations in 63 of them ($\sim 40\%$).

2- The values of the detected periods range from 0.09 to 2.48 days, while their amplitudes span from $\sim 0.0014$ to 0.2 mag. This is in agreement with the findings of previous studies (e.g. Miles-Páez et al. 2017).

3- A Kolmogorov Smirnov test performed on the different distributions presented in Figure 1 indicates that all of them would represent the same population. Therefore, given the low number of stars studied in this contribution, it is not possible to identify
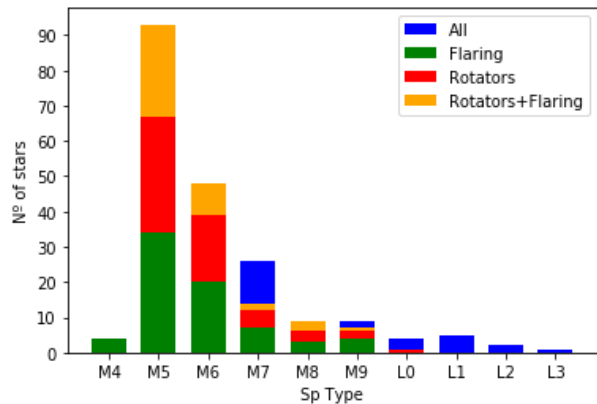


Fig. 1. Histograms of the number of flaring objects (green), objects with detected rotation periods (red), and objects with flares and rotation periods detected (orange) compared to those of the full sample analyzed here (blue). Bins indicate different spectral types.

any correlation. It is necessary to compile a statistically significant sample of UCDs in order to analyze any trends in the data.

As future prospects, we expect i) To perform a similar search for activity in the remaining UCDs of our sample ($\sim 300$ objects), ii) To determine if the results of previous studies between stellar activity and spectral type based on FGKM stars (e.g. Günther et al. 2020) are valid in a sample twice the size, and, iii) To explore how the frequency and energy released by flares would affect the atmospheric chemistry of hypothetical terrestrial planets.

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