We present here some of the results of our ongoing long-term high resolution spectroscopic study of nearby stars (d < 25 pc) in particular the star-formation history. The level of chromospheric activity of these stars have been determined using different activity indicators, such as Hα, Ca II H&K lines or Ca II IRT lines. The chromospheric contribution has been determined using the spectral subtraction technique. The

The determination of rotational velocities (vsini) when handling precise radial velocity (RV) measurements is crucial. Given that RV is determined by measuring the position of the centre of the spectral lines, the processes that produce a modification of their shape will have an effect on the measured values. Knowledge of the star is thus essential to test whether detected RV variations have a stellar or a planetary origin. We have determined the vsini for all the star of the sample using a method based in the information provided by the cross-correlation function (CCF), for details see Martínez-Arnáiz et al. (2009, in preparation).

We now analyse 322 cool stars (3A, 50 F, 101 G, 165 K and 3 M type stars). These stars are potential targets of future projects aiming at detecting Earth-like planets or exo-zodiains. In this way, most of our stars will be observed in the framework of DUNES (Diapositive of Nearby Stars) an approved Herschel Open Time Key Project with the aim of detecting cool dust around nearby stars. In this way, most of our stars will be observed in the framework of DUNES (Diapositive of Nearby Stars) an approved Herschel Open Time Key Project with the aim of detecting cool dust around nearby stars.

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The traditional index, RHK, defined as the ratio of the emission from the chromosphere in the cores of the Ca II H&K to the total bolometric emission of the star can be determined as the ratio of our chromospheric excess flux, F\(_{\text{Ca II H+K}}\), and \(\tau_{\text{Ca II, H,K}}\).

In order to test whether our \(\tau_{\text{Ca II, H,K}}\) is consistent with those values of \(\tau_{\text{Ca II, H,K}}\) computed using photometry (or a technique to mimic photometric results using spectroscopic data) we have compared our data to that obtained by Duncan et al. (1991), Strassmeier et al. (2000), Wright et al. (2004), Hall et al. (2007) and Mamajek & Hillenbrand (2008). Fig. 5 shows that the discrepancies are larger for less active stars but a systematic difference must be discriminated. \(\tau_{\text{Ca II, H,K}}\) can be used as a proxy of the stellar activity to infer the expected \(\tau_{\text{Ca II, H,K}}\) noise a star might present (\(\sigma_{\tau_{\text{Ca II, H,K}}})

In Table 3 we give the expected \(\sigma_{\tau_{\text{Ca II, H,K}}}) values (within 1 σ) obtained with the empirical relationships derived by Saar et al. (1998) and Santos et al. (2000). When the \(\tau_{\text{Ca II, H,K}}\) are not available in our spectra we derived \(\tau_{\text{Ca II, H,K}}\) from the Ca II H\&K indices, see Figs. 2 & 3 and Martínez-Arnáiz et al. (2009, in preparation).

Chromospheric Activity

Chromospheric activity produces both photometric and spectroscopic variations that can be mistaken as planets. Large spots crossing the stellar disc can produce planet-like periodic variations in the light curve of a star. Moreover, spots clearly affect the spectral line profiles. Such perturbations will in turn affect the line centroids creating a radial velocity jitter that might “contaminate” the variations induced by a planet. Precise chromospheric activity measurements are needed to estimate the activity induced noise that should be expected for a given star.

Our team leads a high resolution echelle spectroscopic program with the aim of achieve a fair picture of the local star formation history by characterizing the FGK local population (d < 25 pc) in terms of the kinematics and chromospheric activity-age/rotation/stellar parameters relationships in groups of stars with different ages. Until now we have analysed 322 cool stars (3A, 50 F, 101 G, 165 K and 3 M type stars).

Chromospheric activity in the different activity indicators, such as Hα, Ca II H & K or Ca II IRT lines (see Fig. 4) has been determined using the spectral subtraction technique described in detail by Montes et al. (1995, 2000). The synthesized spectrum was constructed using the program STARMOD developed at Penn State (Barden 1985). The inactive stars used as reference stars in the spectral subtraction were observed during the same observing run as the active stars. Surface fluxes, \(F_s\) (see Table 2), were determined from the measured excess emission equivalent widths using the continuum flux determined with the empirical relationships given by Hall (1996). Figs. 2 & 3, shown the relationships between \(F_s\) (Ca II H + K) and \(F_s\) (H\&K) and \(F_s\) (Ca II IRT), for more details Martínez-Arnáiz et al. (2009, in preparation).

Stellar Sample

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