Stellar parameters and chemical tagging of nearby FGK stars: testing membership to stellar kinematic groups

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Abstract

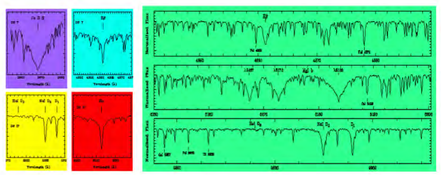
During the last years our group have undertake several high resolution spectroscopic surveys of nearby FGK stars. A large number of stars have been already observed and we have already determine spectral types, rotational velocities as well as radial velocities, Lithium abundance and several chromospheric activity indicators. We are working now in an homogeneous determination of the fundamental stellar parameters ($T_{\rm eff}$, log***g***, ξ and **[Fe/H]**) and differential abundance analysis (**chemical tagging**) of all these stars. All this information will allowed us to ascribe these stars to moving groups and associations of different ages, and could lead to a better understanding of star formation history in the solar neighborhood discerning between field-like stars (associated with dynamical resonances (bar) or spiral structure) and young coeval stars (debris of star-forming aggregates in the disk). In addition, all this work and methods will be very useful for preparation for the huge amount of data will be available with Gaia.

Nearby FGK stars

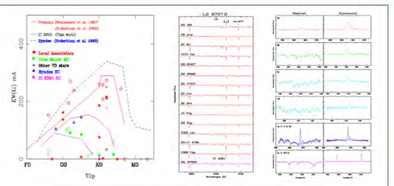
Montes et al.

High resolution *echelle* spectra, R= 85000 – 22000 (0.08-0.3 Å)
WHT-**UES**, 2.2m-**FOCES**, NOT-**SOFIN**, INT-**MUSICOS**, TNG-**SARG**, HET-**HRS**, NOT-**FIES**, Mercator-**HERMES**

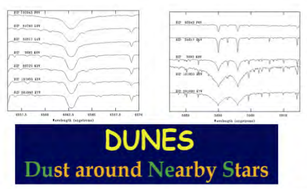
★ **Libraries of high resolution spectra of cool stars**
1997- 1999 - 329 FGKM stars
Montes et al. 1997, A&ASS, 123, 473;
Montes & Martín 1998, A&ASS, 128, 485;
Montes, Ramsey & Welty 1999, ApJS, 123, 283



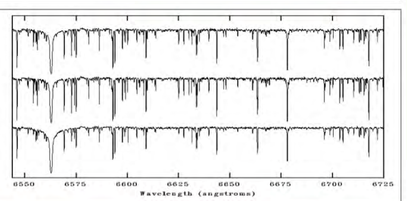
★ **Survey late-type stars in Moving Groups** (MGs)
1999- 2002 - 144 FGKM stars
Montes et al. 2001 A&A, 379, 976;
López-Santiago et al. 2005, PhD Thesis UCM;
2006 ApJ, 643, 1160; 2009 A&A, 499, 129; 2010 A&A, 514, A97



★ **Survey of FGK stars in the solar neighborhood**
(d < 25 pc), including the DUNES sample
2005- 2009 – 450 FGKM stars
Martínez-Arnáiz et al. 2010, A&A, 520, A79; 2011, MNRAS, in press, 2011, PhD Thesis UCM;
Maldonado et al. 2010, A&A, 521, A12



★ **Survey for Chemical Tagging of FGK stars in MGs**
Hyades and Ursa Major MGs
2010- 2011 – 61 F6-K4 stars
Tabernero, Montes, González Hernández 2010, CS16;
Tabernero, Montes, González Hernández 2011, A&A, submitted



Plan to make available all the spectra and derived parameters in the VO

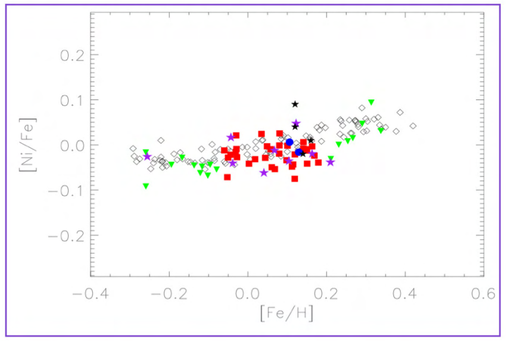
Chemical Tagging

Tabernero, Montes, González Hernández

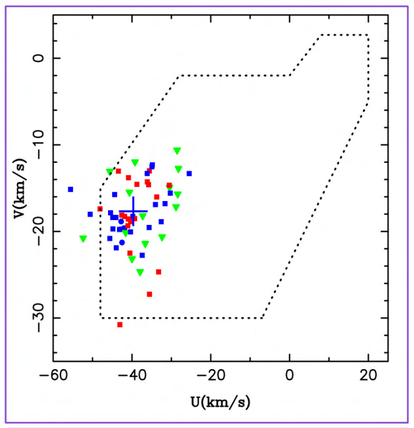
The detailed analysis of the chemical signatures **chemical tagging** is a powerful method that provide clear constrains to the membership of FGK stars to MGs.

➔Stellar atmospheric parameters ($T_{\rm eff}$, log ***g***, ξ and **[Fe/H]**) have been determined with a own-developed code (*StePar*, see Tabernero et al. 2011) which iterates until the slopes of χ *vs* log(ϵ(Fe I)) and log(EW/λ) *vs* log(ϵ(Fe I)) where zero and imposing ionization equilibrium: log(ϵ(Fe I)) = log(ϵ(Fe II)).

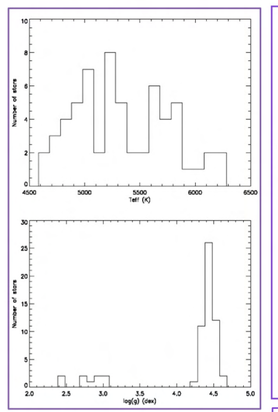
➔ Result of our abundance analysis (**Fe**, **Na**, **Mg**, **Al**, **Si**, **Ca**, **Sc**, **Ti**, **V**, **Cr**, **Mn**, **Co**, and **Ni**) of possible members of the **Hyades Super Cluster** (**41%** homogeneity).



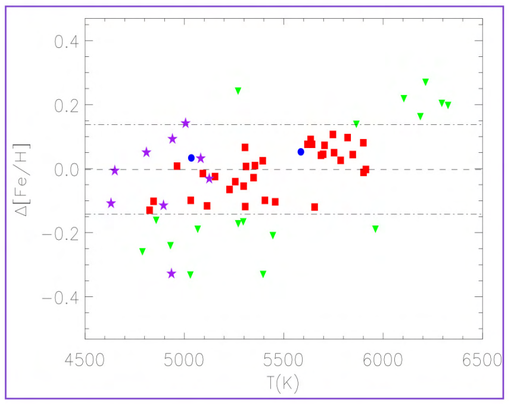
[Ni/Fe] vs [Fe/H]: open diamonds represent the thin disk data (González Hernández et al. 2010).



U, *V* velocities for late-type stars candidate members of the Hyades SC



Histograms for the determined $T_{\rm eff}$ and **log g** for the candidate stars.



Δ[Fe/H] differential abundance vs $T_{\rm eff}$. Dashed-dotted lines represent 1-rms level for the Hyades cluster.

Plan to apply chemical tagging to other moving groups like Ursa Major, etc...

Acknowledgments: This work was supported by the Universidad Complutense de Madrid (UCM), the Spanish Ministerio de Ciencia e Innovación (MICINN) under grant AYA2008-000695, and the Comunidad de Madrid under PRICIT project S2009/ESP-1496 (AstroMadrid).