



Identification of isolated post T Tauri stars in the solar neighbourhood

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Abstract

Post T Tauri stars (PTTS) are late-type stars in the age range between 10 and 100 Myrs filling the gap between T Tauri and zero-age main-sequence phases. This period of evolution remains ambiguous and until now different studies of young stars have failed to find the numbers of PTTS that are expected. In the last years some PTTS have been identified among the X-ray detected pre main-sequence stars in some star-forming regions. More recently, additional PTTS have been identified in young associations and moving groups (Beta Pic, TW Hya, Tucana/Horologium, and the AB Dor) However, many isolated PTTS still remain undiscovered. In this contribution, we compiled the PTTS previously identified in the literature, and identified new candidates using the information provided by the high resolution spectra obtained during our surveys of late-type stars possible members to young moving groups and FGK stars in the solar neighborhood. To identify PTTS we applied an age-oriented definition using relative age indicators (Li abundances, chromospheric emission and the kinematics) as well as color-magnitude diagrams and pre-main sequence isochrones.

Observaciones

High resolution spectroscopic observations have been taken during several observing runs in La Palma and Calar Alto observatories from 1999 to 2004 during our spectroscopic survey of possible members of young moving groups. Additional spectra from some south stars have taken with the ESO 2.2m telescope using FEROS spectrograph. In addition, since 2005 we are observing FGK stars in the solar neighbourhood (<25 pc) mainly with FOCES/2.2m and SARG/TNG spectrographs. The obtained spectra have spectral resolution around 40000 – 50000 and cover a spectral range from 3500 to 9000 Å, from the Ca II H & K (3933, 3968 Å) to the Ca II IRT (8498, 8542, 8662 Å) lines. Reference stars of similar spectral type and radial velocity standard stars have also been observed with the same configuration.

Selection from the lithium (Age)

The possible Post Tauri stars (PTTS) and young stars analysed in this contribution have been selected from our catalog of late-type stars (F to M) members of young stellar kinematic groups (Montes et al. 2001, MNRAS, 348, 45). A large number of these stars have been observed by us during the last years with high resolution spectroscopy (Montes et al. 2001, A&A, 379, 976, López-Santiago 2005, PhD Thesis UCM, López-Santiago et al. 2006, A&A, 643, 1160, Montes et al. 2008, CS14).

Using the equivalent width of the Li I line at 6707.8 Å, $EW(Li I)$ determined by us plus additional values taken from the literature we have selected the stars with $EW(Li I)$ above the upper envelope of the Pleiades open cluster (78 Myr), see Figs. 1 and 2. The membership to young moving groups like the Local Association, AB Dor, β Pic and Tuc-Hor is indicated in Fig. 2 with different symbols (see also the U, V diagram in Fig. 4).

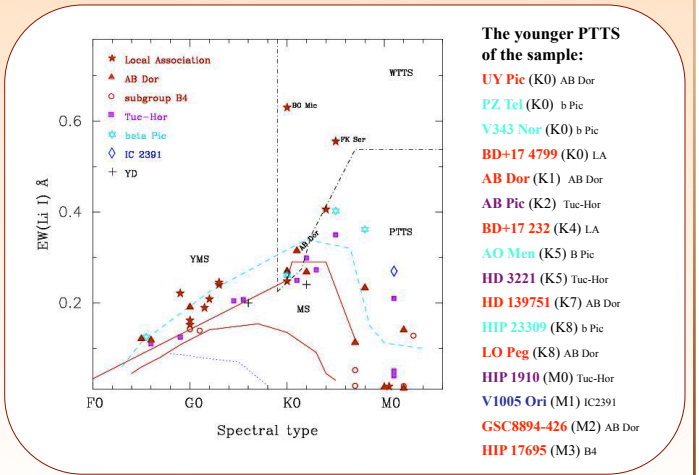
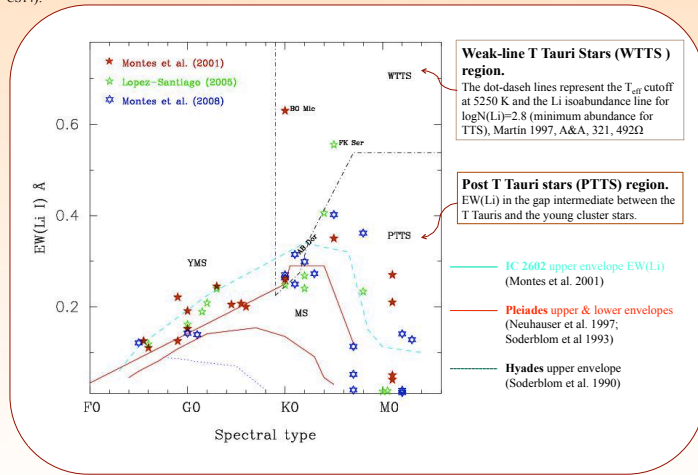


Fig. 1: Equivalent width of the Li I line at 6707.8 Å as a function of spectral type for the selected stars, compared with the envelopes of well-known stellar clusters (ages from 600 Myr to 10 Myr).

Fig. 2: As Fig. 1 but in this case different symbols are used to identify the stars members of the Local Association, AB Dor moving group, and B4 subgroup (see López-Santiago et al. 2006), as well as β Pic and Tuc-Hor associations (Zuckerman & Song 2004).

Spectra of some β Pic Moving Group members

Here we show some representative spectra of one young stellar kinematic group, the β Pic association.

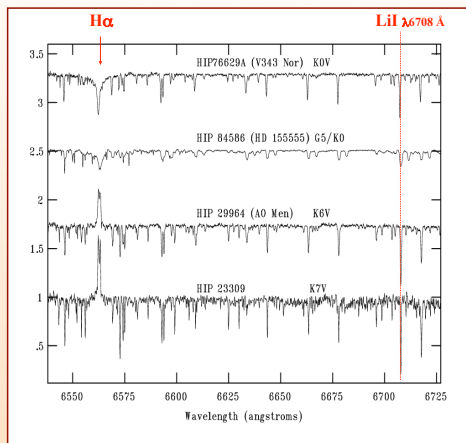


Fig. 3: High resolution spectra of possible members of the β Pic moving group in the H α and Li I λ 6708 Å line region. Note the intense H α emission AO Men and HIP 23309. HD 155555 is a SB2 system and the Li I line from both components is detected.

Kinematics of the possible PTTS

The kinematics (galactic space velocity components, U, V) indicates that all the selected stars are in the region of the young disk stars and very close to the position of the Local association and other very young stellar associations like the AB Dor, subgroup B4 of the Local association, β Pic and Tuc-Hor, IC 2391.

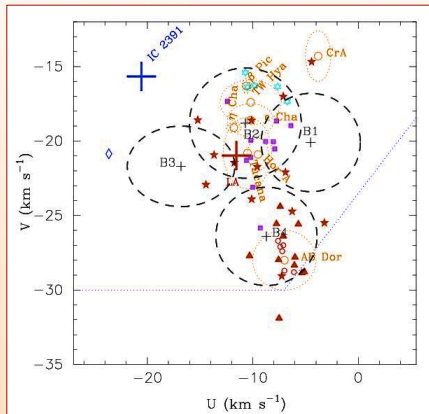


Fig. 4: Position in the (U, V)-plane of the stars selected as possible PTTS.

Additional FGK stars ($d < 25$ pc)

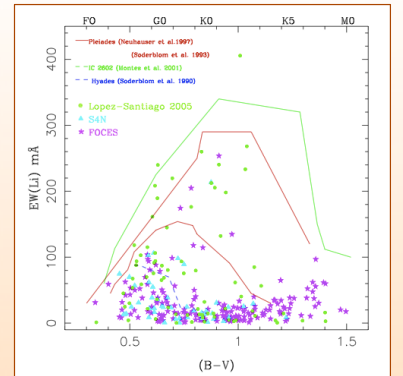


Fig. 5: As Fig. 1, for the stars in our recent survey of FGK stars in the solar neighbourhood ($d < 25$ pc), see Martínez-Arnáiz talk and Maldonado et al. poster. We identify additional stars with ages between the Pleiades and the Hyades, but any new PTTS.

Acknowledgments

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