Post T Tauri stars in the solar neighborhood: isolated or members of young associations and moving groups?

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Abstract

Post T Tauri stars (PTTS) are late-type stars in the age range between 10 and 100 Myr 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 (Montes et al. 2001a, López-Santiago et al. 2005, 2006), FGK stars in the solar neighborhood (Martínez-Arnáiz et al. 2008), and stars in the Rastyc sample (cross-correlation of the ROSAT All-Sky Survey (RASS) with the TYCHO catalog, Guillout et al. 2008). To identify PTTS we applied an age-oriented definition using relative age indicators (Lithium abundance, chromospheric emission and kinematics) as well as color-magnitude diagrams and pre-main sequence isochrones.


Selection from the Lithium (Age) catalog.

The obtained spectra have spectral resolution around 40000 and cover a spectral range from 3500 to 9000 Å. Note the intense H\textsc{ii} 6563 Å line region. Plotting the 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 Weak-line T Tauri stars (WTTS) and the Isoabundance region. This work was supported by the Spanish Ministerio de Ciencia e Innovación (CICYT) under grants AYA2005-02750, AYA2007-67005 and the ERDF programme (FEDER funds) under project S-0505/ESP-0237 (ASTROCAN).

Selection of young stellar associations and moving groups.

We here show some representative spectra of one young stellar kinematic group, the $\beta$ Pic association.

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 (70 Myr), see Figs. 1 and 2. The membership to young moving groups like the Local Association, AB Dor, $\beta$ Pic and Tuc-Hor is indicated in Fig. 2 with different symbols (see also the U, V diagram in Fig. 4).

The younger PTTS of the sample.

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The kinematics (galactic space velocity components, U, V, W) indicate that the whole selected stars are in the region of the young disk stars and vary close to the position of the Local Association and other very young stellar associations and moving groups like AB Dor, subgroup B4 of the Local Association, $\beta$ Pic, Tuc-Hor, R. 2391 and Castor.

Acknowledgments

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 southern stars have been taken with the ESO 2.2 m telescope using FEROS spectrograph. In addition, since 2005 we are observing FGK stars in the solar neighborhood (< 25 pc) mainly with FOCEV/2.2m and SARAT/NGO spectrographs. Spectra of the Rastyc sample have been obtained at OHP (Observatorio de Haute Provence), TNG, and OAC (Osservatorio Astrofisico di Catania). 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 (1933 Å) to the Ca II HRT (6408, 8542, 8662 Å) lines. Reference stars of similar spectral type and radial velocity standard stars have also been observed with the same configuration.

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