Kinematics of exoplanet host stars: membership in moving groups, associations and the thin/thick disc

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• Context. Young exoplanetary systems with ages $\tau \leq 600$ Ma (i.e. Hyades-like or younger) provide constraints on the time scale and mechanism of planet formation and on the planet evolution (orbital migration, late heavy bombardment...). Apart from the very young “planet” candidates found by direct imaging (around e.g. HR 8799, 2M1207-39 or AB Pic), some young planet candidates have been found with the radial velocity method, such as HD 70573b (Setiawan et al. 2007) in the Hercules-Lyra subgroup of the Local Association or the controversial TW Hyd b and BD+20 1790b (Setiawan et al. 2008; Hernán-Obispo et al. 2010). On the other hand, there may be old exoplanetary systems, whose stars belong to the thick disc or even the Galactic halo (CD-36 1052b, Setiawan et al. 2010).

• Aims. We search for bright Hipparcos stars with radial-velocity planets that are member candidates in young moving groups (Montes et al. 2001), such as the Hyades, IC 2391, Ursa Majoris and Castor superclusters and the Local Association ($\tau = 100$-600 Ma), and very young moving groups like β Pictoris or TW Hydrae ($\tau < 100$ Ma). Generally, these stars are discarded from accurate radial-velocity searches based on activity indicators, but there might be young stars that passed the rejection filter (e.g. HD 81040, $\tau \sim 700$ Ma; Sozzetti et al. 2006). We also look for old exoplanet host stars in the Galactic thick disc and the thin-thick transition.

• Methods. On 2012 Feb 29, the Extrasolar Planets Encyclopaedia (exoplanet.eu) tabulated 699 planet candidates in 558 planetary systems detected by radial velocity (93 multiple planet systems). Of them, over 300 have Hipparcos stars as host stars. We have computed Galactocentric space velocities UVW for 327 planetary systems, derived from star coordinates, proper motions, parallactic distances (from van Leeuwen 2007), and systemic radial velocities, $V_r$, from a number of works, especially the planet discovery papers. We plot the computed UVW velocities onto UV, $W$, and $V(U^2+W^2)^{1/2}$ planes. [Top: Böttlinger diagrams, zoom of UV plane, and Toomre diagram].

• Results. A total of 83 planet host stars satisfy the Eggen criterion for the young disc population in the UV plane (i.e. are young star candidates) [Top: inside or at the boundaries defined by the dotted line]. They are currently subject of a dedicated data compilation, including published values of effective temperature $T_{\text{eff}}$, lithium abundance $\log\epsilon(\text{Li})$, rotational velocities $v\sin(i)$, activity indicators ($X$-rays, $\log R'_{\text{HK}}$) and membership in a moving group. In particular, we identify 7 candidate members in Castor, 7 in IC 2391, 8 in Ursa Majoris, 21 in the Local Association and 22 in the Hyades Supercluster. Interestingly, a relatively large number of stars have been tabulated as probable nearby young stars. Most of them are candidate and confirmed members in the Hyades Supercluster, such as ı Hor, HD 50554, HD 108147 or β Boo, but there also candidate stars in the IC 2391 (94 Cet, HD 168746) or Castor (HD 217107) Superclusters and the Local Association (HD 130322, V376 Peg – the transiting star HD 209458). On the other hand, we also identify one halo star (CD-36 1052), 19 thick-disc stars, and 14 stars in the transition thin-thick disc. The data compilation will finish soon, and we will check if stellar kinematics is consistent with the other (spectroscopic) age indicators.