We present kinematical properties of X-ray sources identified as field late-type stars with good resolution spectroscopic observations. These presumably young stars were selected as optical counterparts of ROSAT All-Sky Survey (RASS) sources by means of the cross-correlation of the RASS and TYCHO catalogues (called the RassTycho sample). During the last 20 years, many studies have shown that a fraction of X-ray active and lithium-rich stars are members of young stellar kinematic groups (SKGs). Presently, the SKGs are mainly defined by early-type stars and few studies have focused on the late-type stellar component so far. We have therefore developed two methods based on the space-velocity coordinates (\(U, V, W\)) to determine the membership of our candidates to already known moving groups. The reliability of our methods was tested with Monte Carlo simulations and compared with results derived using Eggen’s kinematic criteria. Chromospheric activity level and lithium abundance were subsequently used to confirm membership for candidates with high probability entries. The identification of a significant number of late-type members of young SKGs would be extremely important to investigate deviations from local mean star formation history during the last billion years and to search for exoplanets just after the planetary formation stage.

I) Moving groups and RasTyc sample

- Moving groups (MGs): During the last 20 years, many studies (see, e.g., Jeffries 1995, Montes et al. 2001) have shown that a fraction of X-ray active and lithium-rich stars are members of young stellar kinematic groups which are kinematically coherent and composed of stars with a common origin (e.g. the evaporation of an open cluster). The main and best documented SKG is listed by Montes et al. (2001, Table 1). Eggen (1994) defined the supercluster as a gravitationally-unbound group of stars with the same kinematics occupying extended regions of the Galaxy and the moving group as the part of a supercluster that enters the solar neighborhood and can be observed at all.
- Sample: The RasTyc sample is the result of the cross-correlation of the ROSAT All-Sky Survey with the Tycho catalogue (Guillot et al. 1999) and represents the largest (\(\approx 14000\)) active stars and most comprehensive set of late-type stellar X-ray sources constructed so far. Presently, the confirmed members of the known SKG are mainly early-type stars and few studies have focused on late-type stellar component. Thus, we have started a campaign of spectroscopic observations aimed at a deep characterization of a representative subsample of the RasTyc population in the northern hemisphere. The first results from this ambitious ground-based observing program are presented by Guillot et al. (2009).

II) Membership methods and Monte Carlo simulations

We have developed two probabilistic methods (Klutsch et al. in prep) based on the space–velocity coordinates (\(U, V, W\)) to determine the membership’s probability of our candidates for each of five well-known stellar kinematics groups:

- **3D Method**: We defined the locus of each MG in the \((U, V, W)\) space. Accounting for the typical MG’s shape and V coordinate, we fitted each velocity distribution with one Gaussian (Fig. 1) whose properties allow us to compute the membership’s probability \(P_M\).
- **2D Method**: We characterized the MG through its centroid in the \((U, V)\) space and defined a new coordinate system \((V_{MG}, \alpha)\) as illustrated in Fig. 2. Conceptually, a candidate has a greater chance to be a new MG member, if the distances \(V_{CG}\) to the MG centroid and \(V_{MG})\) to each member of the MG are small and the maximum angle \(\alpha_{max}\) is close to \(360^\circ\). Contrarily, if these distances are very large and \(\alpha_{max}\) is very small, a star can not be physically associated to the MG studied. On this basis, we can study the configuration of the vector \(\mathbf{V}_G\) with each vector \(\mathbf{V}_G\) forming a plane in which the above membership criteria can be given. Finally, we grouped them into the single \((V_{MG}, \cos \alpha, V_{MG}, \alpha)\) space.

### Table 2: Comparison of the age class of stars and the MGs found with our procedures.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Young disc (55)</th>
<th>MGs (in %)</th>
<th>Membership (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleiades-like</td>
<td>73</td>
<td>57</td>
<td>94.7</td>
</tr>
<tr>
<td>UMa-like</td>
<td>24</td>
<td>26</td>
<td>94.7</td>
</tr>
<tr>
<td>Hyades-like</td>
<td>39</td>
<td>51</td>
<td>94.7</td>
</tr>
</tbody>
</table>

### IV) Conclusions and perspectives

- **Together with stellar parameters (Teff, logg, [Fe/H], v sin i, Li abundance, activity), the kinematic methods we have developed allowed us to identify new MG members (Klutsch 2008; Guillot et al. 2009) and to quantify the contamination of young MGs by old moving groups (López-Santiago 2009).**
- **We found a possible new young association (Guillot et al. 2010; Klutsch et al. poster in this session) and we continue to search for new unknown young co-moving groups.**
- **The identification of late-type members of young MGs is extremely important to investigate deviations from local mean star formation history during the last gigayear and to search for exoplanets just after planetary formation stage.**
- **Moreover, a statistical comparison of similar star samples will be of valuable interest to better understand the kinematics of young field stars in relation with already known or new young MGs (López-Santiago et al. 2009).**