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A new look at the OB associations and star clusters in the Puppis-Vela region using HIPPARCOS data

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The Puppis-Vela region contains a few OB associations and young star clusters which are the imprints of recent star formation. As this region comprises of many star clusters in the line of sight, accurate distance and proper motion estimates of the stars are necessary to assign membership. Due to the lack of such estimates, the identity as well as the member stars of the association as well as star clusters could not be estimated. We study the kinematics of this region lying between, 1~230–290 and b~–20–20 using the HIPPARCOS data.

1. Input data and method

The HIPPARCOS catalogue (1997) gives the position, parallax, proper motion, V magnitude and (B–V) colour of stars observed. We use some of these measurements to determine the membership. The coordinates in RA and DEC are converted to galactic longitudes and latitudes, proper motion components in the galactic coordinates are determined from the RA and DEC components using the formulae given in volume 1 of the catalogue. The galactic component of the proper motion and the solar rotation component are subtracted using the method used by Comeron et al. (1998).

To determine the membership and to identify the moving groups, we use the method of Jones (1970). The proper motions of a group of stars converge to a vertex either if their space motions are parallel or if they are expanding uniformly from a moving point. If the stars were really moving towards the vertex then the proper motion component in the direction perpendicular to the direction of vertex, $\mu_\perp$, would be an error of observation sampled from a parent population with standard error $\sigma_\perp$. By assuming a normal law of errors, the probability of $t_\perp=\mu_\perp/\sigma_\perp$ occurring is given by $P = (1/\sqrt{(2\pi)}) \exp(-t_\perp^2/2)$. The sum $\Sigma t_\perp^2$ is distributed as x^2 with n–2 degrees of freedom when t is normally distributed. Initially the value of x^2 will be very high and the stars with very high values of t are rejected. This process is continued till a reasonable value of x^2 is obtained. This method determines the members of the group and the direction of the vertex. Recently, a similar method has been used by de Zeeuw et al. (1997) to identify the nearby OB associations.

2. Results

The members of the two OB association, Vela OB2 and CO1 121 are already identified by de Zeeuw et al. (1999). We identify the same members but fewer ones. This may be due to the difference in the method of analysis. The star cluster members are identified for the first time, based on the HIPPARCOS data. The Puppis moving group (PMG) has been earlier identified by Roser & Bastian (1994). We identify the same members as them. This moving group lies close to NGC 2451, but this is not NGC 2451. The kinematic search for the cluster NGC 2451 indicates that the stars in that area do not form a moving group, confirming the result of Roser & Bastian (1994). The space velocity of all the groups are calculated using the available radial velocity. The space motion with respect to Sun indicates that all the groups have similar motion. As seen from the literature, all these groups are young and have fairly similar age. The above two facts together indicate that these groups are formed from the same episode of star formation.

Table 1. The OB associations, star clusters and moving group are listed here along with the location, observed number of stars, mean distance, mean proper motion and the mean velocity.

Group	l	b	N	D	$<\mu_l \cos b>$	$<\mu_b>$	Tran.vel	Rad.vel
VOB2	261.9	–9.0	50	412	–2.1	0.85	4.4	18.0
coll 121	237.2	–7.7	73	460	–1.4	–1.8	5.8	26.0
NGC 2547	264.1	–5.7	99	342	–1.6	–2.3	5.4	15.0
Coll 140	264.9	–2.5	278	321	–4.3	–4.1	8.9	17.0
NGC 2516	272.6	–16.3	29	377	–1.1	3.0	5.8	19.0
IC 2391	270.4	–6.6	71	150	–3.6	–11.2	10.5	15.0
TR-10	263.1	–0.2	25	356	–4.1	–3.9	9.7	21.0
PMG	252.6	–6.6	14	185	–11.8	–6.4	12.1	27.0

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