NEARBY STARS AND THE HISTORY OF THE GALACTIC DISK

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A first version of the *Fourth Catalogue of Nearby Stars* (CNS4) has been completed now and is publicly available on the internet (http://www.ari.uni-heidelberg.de/aricns/). The construction of the catalogue by emulating Hipparcos data (ESA 1997) as well as the principal results on the luminosity function of nearby stars, their kinematics etc. are described in detail by Jahreiß & Wielen (1997) and Jahreiß et al. (1998). In this *note* we report on two recent extensions of the catalogue.

The Hipparcos Survey made an extension of the distance limit to 50 pc possible for nearby stars having $M_V \leq 4^m$ without any loss of completeness. For most of these stars radial velocities could be collected from the literature in order to determine reliable space velocities.

This indeed provided an eightfold increase of the initially rather small sample size for the young ($\leq 1 \cdot 10^9$yr) CM groups (formed according to the position of the stars in the CM diagram) as well as for the 'old' K giants. Consequently, the kinematical parameters of the corresponding age groups became more reliable. Especially, the former odd behaviour of the CM group with age $1 \cdot 10^9$yr is now changed and the total velocity dispersion fits now much better to the age-velocity relation shown in Fig. 1 where the full line represents a diffusion process with constant diffusion coefficient (Wielen 1977).

For 206 main-sequence stars with $0.5 \leq B-V \leq 1.0$ the S-measurements (Duncan et al. 1991, Henry et al. 1996) of the stellar Ca II H and K line intensity were transformed (Noyes et al. 1984) to $\log R'_{hk}$, a measure of the chromospheric emission (CE). Apart from six high-velocity stars showing anomalously strong CE emission the remaining stars were divided in seven different CE groups. For each CE group a mean age could be determined from the relative sample size under the assumption of a constant rate of star formation. The resulting total velocity dispersions are shown as open squares in Fig. 1. It is evident that apart from the youngest and oldest

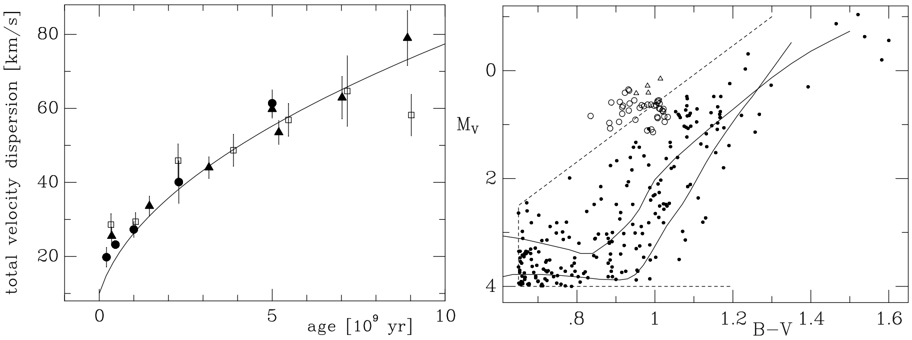

Figure 1. Left panel: Total velocity dispersion versus age. Full circles: CM groups; full triangles: HK groups of the Mc Cormick K and M dwarfs; open squares: CE groups of main-sequence stars ($0.5 \leq B-V \leq 1.0$).
Right panel: CM-diagram of 288 K giants in the solar neighbourhood. Dotted lines indicate the old giant branch window in the CMD. The full lines indicate the giant branch of the old open clusters M 67 and NGC 188, respectively.

group the remaining CE groups fit rather satisfactory to the data of the unrelated HK groups formed according to the chromospheric emission of the Mc Cormick K and M dwarfs or the CM groups of early type main sequence stars that were defined by different B–V intervals.

In Fig. 1 the colour-magnitude diagram of the 228 'old' K giants within 50 pc is shown. Besides 4 giants (open triangles) belonging to the Hyades cluster, clump giants (open circles) show up very distinctly in the CMD at $M_V \approx 0.7^m$ in the range $B-V = 0.8^m$ to 1^m. Interestingly, the 40 clump giants have velocity dispersions, $\sigma_U, \sigma_V, \sigma_W$ = (34, 23, 12 km/s) which are much lower than that of the remaining 197 K giants, $\sigma_U, \sigma_V, \sigma_W$ = (42, 33, 23 km/s). This seems to indicate that the clump giants are much younger than the other 'old' K giants.

References

Duncan, D.K., Vaugham, A.H., Wilson, O.C., et al.: 1991, ApJS **76**, 383
Henry, T.J., Soderblom, D.R., Donahue, R.A., Baliunas, S.L.: 1996, AJ **111**, 439
ESA: 1997, *The Hipparcos and Tycho Catalogues*, ESA SP-1200
Jahreiß, H., Wielen, R.: 1997, in *Hipparcos-Venice '97'*, M.A.C. Perryman, P.L. Bernacca (eds.), ESA SP-402, p. 675
Jahreiß, H., Fuchs, B., Wielen, R.: 1998, in *The Message of the Angles. Astrometry 1798 – 1998*, P. Brosche, W.R. Dick, O. Schwarz, R. Wielen (eds.), Reviews of Modern Astronomy, Astron. Ges. (in press)
Noyes, R.W., Hartmann, L.W., Baliunas, S.L., et al.: 1984, ApJ **279**, 763
Wielen, R.: 1977, A&A **60**, 263