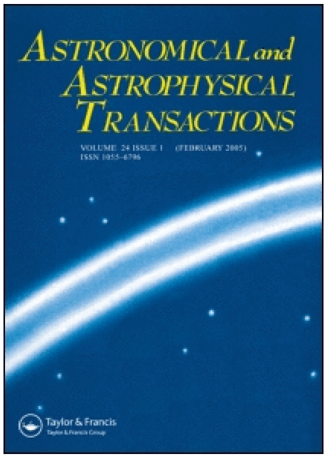

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B. I. Fesenko [a]
[a] Pskov Pedagogical Institute, Pskov, Russia

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THE MOTION AND SMALL-SCALE SPATIAL DISTRIBUTION OF SOME CLASSES OF STARS†

B. I. FESENKO

Pskov Pedagogical Institute, Pskov 180760, Russia

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The distribution of the peculiar velocity components of stars in narrow intervals on the main sequence was found to be a normal law.

KEY WORDS Stellar kinematics – velocity distribution

The distribution of the peculiar velocity components is a normal law. This result was obtained for a sample of 207 stars in narrow intervals on the main sequence. In each interval, the reduced velocity component (w) of the star was calculated using the formulae $w = (W - \langle W \rangle)/\sigma_W$, where $\langle W \rangle$ and σ_W are the mean value and the standard deviation for the distribution of the velocity component, W. Then the distribution of the chance variable, w, was summed on all of the velocity components and all of the main sequence intervals. The normality of the distribution always confirmed by the χ^2-method ($P = 0.36$) and by the order-statistic method ($P = 0.27$). The data of the Woolley catalogue (Woolley *et al.*, 1970) are used.

The small-scale distribution of the stars depends on the nature of irregular forces. For example, a small-scale structure surviving from the time of the origin of the stars would be more pronounced if a very big but not numerous masses dominate in producing the irregular force field. Therefore, the spatial and velocity distribution of stars have to be treated jointly.

This approach we had applied to the sample of the solar type stars using the following criterion for the star selection: $0.62 \leq B - V \leq 0.68$, $0.49 \leq V - R \leq 0.55$ and $G0 \leq Sp \leq G5$. On the base of the Moscow catalogue (Kornilov, 1991) altogether of 116 stars brighter than 7.2^m were selected. The velocity data were taken from the Woolley catalogue (1970). The random variable x was calculated for each star and for each velocity component, Z, with using the formula

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$$x = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp(-t^2/2)\, dt,$$

where z is the reduced velocity component (see above).

It is proved that the distribution of x is a rectangular one. Therefore, the normal distribution for z is confirmed. The application of the order-statistic method leads to the same result. By the way, the peculiar velocity of the Sun relative to the solar type stars was obtained: $V = 34 \pm 5$ km/s, $A = 289 \pm 4°$ and $D = 37 \pm 14°$ (2000.0). On the average, the standard of the peculiar velocity components is equal to 26 km/s.

As for the small-scale space distribution of the stars of that sample, the application of various versions of the nearest neighbour method failed to discover any deviation from the chance fluctuation. But the distribution of these stars on equal area fields of large dimensions does not agree with the Poisson law.

References

Kornilov, V. G. (1991) Catalogue of UBVR magnitudes of bright stars of Northern Sky. *Trudy Gos. Astron. Sternberg Inst.* **63**.

Woolley, R. *et al.* (1970) *Roy. Observ. Ann.*, No. 5.

DISCUSSION

Kirsanov: Which criteria are used to conclude that those are sun-like stars which are likely to have inhabited planets?

Fesenko: For example, our existence in the room.

Chernin: Are σ_z, σ_x and σ_y equal to each other?

Fesenko: No, they are not. Their values correspond to the known ones.

Efremov: Can the excess of the stellar density in the direction along 3^h be connected with the Hyades cluster presence at about 40 pc?

Fesenko: This is a reasonable problem for future research.