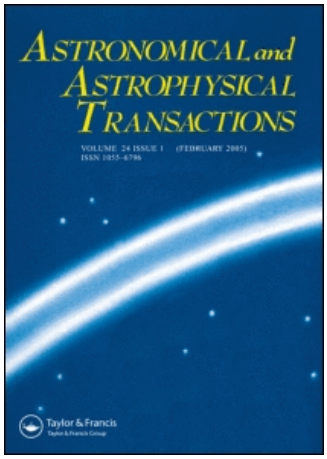

Astronomical & Astrophysical Transactions
The Journal of the Eurasian Astronomical Society
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713453505

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Online Publication Date: 01 April 1995
To cite this Article: Shatsova, R. B. (1995) 'Stellar files for the NGC 457 cluster', Astronomical & Astrophysical Transactions, 7:2, 143 - 145
To link to this article: DOI: 10.1080/10556799508205407
URL: http://dx.doi.org/10.1080/10556799508205407

Astronomical and Astrophysical Transactions, 1995,
Vol. 7, pp. 143–145
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STELLAR FILES FOR THE NGC 457 CLUSTER†

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(Received December 25, 1993)

A fine structure of the open cluster NGC 457 is studied. Stellar files similar for their physical parameters: brightness, colour, mass, and, perhaps, age are found.

KEY WORDS Open clusters (individual): structure

We examined the NGC 457 cluster using the Lavdovsky [1] and Piskunov [2] catalogues. At first sight the cluster's structure is smeared, with a faint concentration towards two or more nuclei. But with the aid of the code selected we can see a highly regular system, where the structure is combined with the kinematics and physical composition of stars. This code is the stellar files, as if stringed over some closed curves. Each file is the sequence of stars with almost identical photographic magnitudes. They unite about 10 the most bright stars ($m \approx 11^m$) and about 22 the most weak ones ($m \approx 14^m.5$).

The file system breaks up into two symmetrical parts with co-ordinate $x < 0$ and $x > 0$ (Figure 1). By the shape and position, they resemble the system of field lines of two nearly parallel magnetic dipoles, passing through the main cluster's nuclei. The narrow bunch of files (their straight line sections, parallel between themselves) plays the role of the dipole axis. The last part of each file ("line of force") is turned to the west from the axis, if $x < 0$, or to the east, if $x > 0$. Some files have the bandage near the nuclei. The two transversal (to the axis) oval rings connect here the two symmetric parts of the cluster. In the space, the cluster fills a thin disk inclined to the picture plane.

The cluster's kinematics cannot be described by the canonical scheme of a stellar stream with the interval velocities dispersion about 1 km/s. When the stream's velocities are $\langle \mu_x \rangle = 0''.0001 \pm ''.0003$ and $\langle \mu_y \rangle = 0''.0009 \pm ''.0003$, the most of stars have the full proper motion $\overline{\mu}_1 \approx 0''.0030$, and about 15% stars have $\overline{\mu}_2 \approx 0''.0080$. At the cluster's distance about 3 kps, the tangential velocities are $\langle v_t \rangle \approx 15$, $\overline{v}_{t_1} \approx 50$, $\overline{v}_{t_2} \approx 120$ km/s. This sign tells us that the cluster consists of two subsystems. And, for each subsystem, $(\overline{\mu}_x - \langle \mu_x \rangle, \overline{\mu}_y - \langle \mu_y \rangle)$ have a significant

†Proceedings of the Conference held in Kosalma

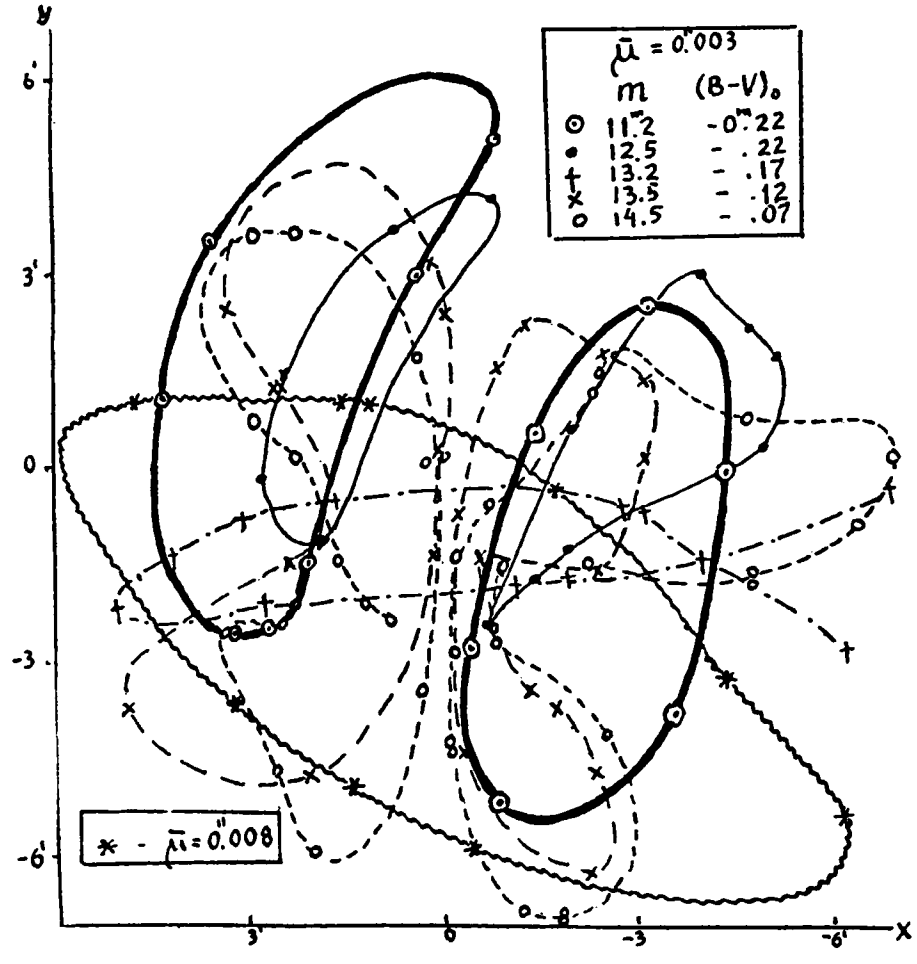

Figure 1 The main stellar files.

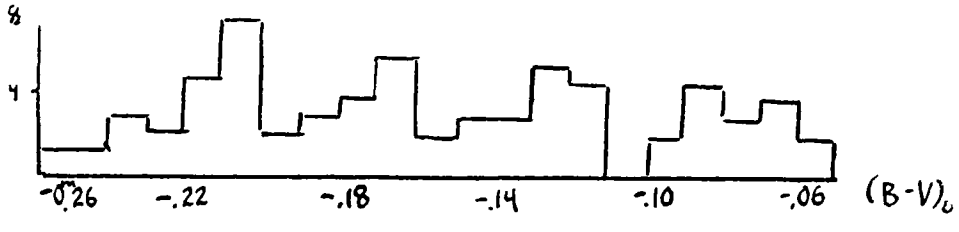

Figure 2 The histogram of the $(B-V)_0$ distribution for the cluster members.

Table 1. The modes of the physical parameter distributions and the peculiar motions of the files' groups

Group	m_p	V_0	$(B-V)_0$	$\lg L$	$M/M_\odot$	$\tau \times 10^{-7}$ y.	$\lvert\overline{\mu}_x - \langle\mu_x\rangle\rvert$	$\lvert\overline{\mu}_y - \langle\mu_y\rangle\rvert$
I	$11^m.8$	$10^m.0$	$-0^m.21$	3.2	7.0	22	$0''.0014$ $\pm''.0005$	$0''.0007$ $\pm''.0005$
II	13.0	11.0	−0.17	2.7	5.0	26	0.0007 ±.0006	0.0006 ±.0006
III	13.5	12.0	−0.13	2.3	4.0	40	0.0009 ±.0006	0.0010 ±.0006
IV	14.4	13.0	−0.09	1.8	3.0	37	0.0015 ±.0006	0.0014 ±.0006

difference for individual files, often exceeding the mean errors by several times. Apparently, this reflects an oscillatory motion of stars and files in the cluster.

The values of physical parameters in the files (the visual magnitude V_0 and colour index $(B-V)_0$, brightness $\lg L$, mass M and age τ) depend on the location of the stars along the main sequence in the $H-R$ diagramm. For all this, each parameter has a multimodal distribution. The $(B-V)_0$ distribution is shown in Figure 2. The character of the distributions can be considered to be discrete and spread out by the observation errors. And as a consequence, the files of subsystem μ_1 unite into groups I–IV with a small dispersion of parameters. The rounded off modes are cited in Table 1. Moreover, a physical distinction combines with kinematic one for spacely separated files. Together they form the harmonious system of cluster.

The stellar files helped to complete the list of cluster's stars by tens of new members.

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2. Piskunov, A. E. (1977) *Catalogue of Masses and Ages of Stars in 68 Open Clusters*. Publ. Astron. Sov. AN SSSR, Moscow.