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ON THE SPACE DISTRIBUTION OF FLARE STARS IN PLEIADES

Recently we have reported (1) that according to our study of the distribution of the known flare stars in the Pleiades region there is a "cavity" in the distribution of flare stars in the central part of the cluster around Alcyone.

Later P.N.Kholopov (2) has found that the results of his own study of the same problem contradict this conclusion and has tried to explain our result as "an apparent one" caused "by using too narrow zones for star counts and by neglecting the natural uncertainty of the derived F (r) values".

Here we would like to show that P.N.Kholopov's inference is the consequence of a misunderstanding.

1. It is evident that if there is a concentration or a cavity of stellar space density in some system, then for its detection and study it is important to find exactly its centre and to use it for the determination of space density distribution. Any displacement from this centre must bring to the misrepresentation of the true distribution.

In our study (1) we have tested different points as the centre of the subsystem of flare stars in the Pleiades cluster and have at last chosen Alcyone which turned out as the best one in the sense of the manifestation of the observed cavity of flare stars in the subsystem.

Meanwhile, as one can judge from P.N.Kholopov's article (3), in his study the surface density distribution of flare stars has been determined taking as the centre of their concentration a point which is 5'.25 to the west from Alcyone.

The possible influence of this difference in the choice of the centre on the surface density distribution of flare stars derived by the method of concentric zones can be illustrated by the following example. Of 165 known flare stars in the Pleiades region brighter than $18^m.5$ (pg) (4-9) only one lies in the central circle of radius $0^\circ.2$ around Alcyone. While in the circle of the same radius around the point served as the centre in (3) there are 8 flare stars brighter than $18^m.5$. Hence the ratio of the corresponding surface densities will be 8. At the same time 6 out of 8 flare stars in the second case are placed in the ring $0^\circ.18$-$0^\circ.20$ from the centre and none of two others is situated nearer than $0^\circ.12$.

Thus the displacement of the centre from Alcyone only by 0°1 can yield serious changes in the surface density distribution of flare stars derived when the method of concentric zones is used for star counts.

2. However, it is clear that in order to find the stellar space density in the central region of the cluster we must use not only the surface distribution of flare stars in the central part around Alcyone but also their surface distribution in the peripheric regions (for example to exclude the influence of the outher shell of flare stars).

Nevertheless, the knowledge of the surface density distribution in the central part can give some information about the existence of a cavity in the space distribution. In particular it can be shown that when there is a cavity in the central region of a system then surface stellar density in its central part must not decreasing one (constant or increasing) with the distance from the centre. As one can see from the data followed it is what we observe in the central part of the Pleiades cluster around Alcyone in projection (4-9).

Distance pc	Area of zone (π^{-1} pc^2)	Number of stars all	$\leq 18^m5$
0-1.0	1.00	25	21
1.0-1.4	0.96	24	14
1.4-1.7	0.93	23	20

Of course, the natural uncertainties of the numbers of flare stars presented here are not negligible, but these data can be considered as a qualitative evidence in favour of the existence of the cavity in the space distribution of flare stars in the Pleiades cluster.

3. It is well known that the method of concentric zones for star counts used in P.N.Kholopov's study (2,3) is very sensible to the choice of the width of these zones, and the influence of this choice is significant for the stellar distribution derived.

Taking into account this fact in our study (1) we have used another method (10) which is based only on the "averaged" onedimensional distribution of stellar density. Being free from the influence of the choice of the zone width for starcounts, it can be used successfully for detection of finer details in the radial distribution structure.

4. Thus we have seen that the conclusion that the minimum in the distribution of flare stars in the Pleiades cluster obtained in (2,3) is absent, is possible only if one uses a centre which is at some distance from the centre of the cavity and applies the method of concentric zones for star counts. Therefore P.N.Kholopov's incorrect conclusion

(2) is the consequence of the roughness of his solution of the discussed problem (3). The study of this problem by the correct method shows that the cavity of flare stars in the Pleiades cluster is detected even in the case of P.N.Kholopov's choice of the centre.

In conclusion it is necessary to note that in spite of the evidences in favour to the existence of a cavity in the space distribution of the known flare stars in the Pleiades cluster it can not be excluded yet that it is an observed phenomenon only, but not a real one. What is the true cause of such peculiarity in the derived space distribution of flare stars we don't know. May be, it is caused by some selection effect. But independently of its interpretation it is important to mention that when we consider the distribution of observed flare stars in the Pleiades region in the correct way, and neglect the possible selection effects, we come inevitably to the idea of a cavity or at least of a minimum of the space density of flare stars in the central part of this system.

The details of our study of the considered problem with a discussion of the possible interpretations of the observed phenomenon will be published later.

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