CORRIDORS IN THE REGIONS OF YOUNG OPEN STELLAR CLUSTERS

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The results of an analysis of the distribution of the brightest stars in the regions of the young stellar clusters the Pleiades and h and χ Persei in Galactic longitude are given. The existence of corridors in these clusters is pointed out. A list of about 18 young stellar clusters that, with high probability, also have corridors is also given. According to Ambartsumian’s idea, these clusters are decaying stellar systems.

1. Introduction

As is well known, back in 1950 Ambartsumian [1] pointed out that the open stellar cluster M25 has a corridor that separates this cluster into two parts.

In analyzing the form of M25 in detail, we found that the star distribution in the region of M25 has the form of a bipolar nebula. The cluster h and χ Persei has a similar form. Moreover, the direction of the axis connecting the central parts of h and χ Persei coincides with the direction of the electric vector of the plane of polarization of starlight (θg = 116°) in this region, while the latter coincides with the direction of the Galactic plane.

In 1995, Subramaniam et al. [2] found that a number of open stellar clusters form pairs. One such pair is the cluster h and χ Persei. According to Ambartsumian [1], such stellar systems are decaying with time.

The purpose of the present work is to find stellar clusters having corridors. We also investigated the distribution of the brightest stars in the region of the Pleiades cluster.

2. On the Bipolar Form of the Distribution of the Brightest Stars in the Pleiades Region

To analyze the form of the stellar distribution in the Pleiades region, we used a map of the star distribution in Kulikovskii’s book [3], in which the brightest stars down to magnitude V = 11m.0 are numbered (Fig. 1). On this map a straight line parallel to the Galactic plane is drawn through the center of the Pleiades (α1900 = 3h40m.5, δ1900 = 23°53').

Around this center (O) a circle of radius R = 36' is drawn so that most of the brightest stars lie inside the circle. This circle intersects the straight line (parallel to the Galactic plane) at the points O1 and O2. Then, taking O1 and O2 as the centers of two new circles, we draw two semicircles of radius R = 36' that pass through the center O. We finally have a picture (see Fig. 1) consisting of the square ABCD which encompasses the area of the two semicircles and the corridor. The area of the two semicircles is S = πR^2 while that of the corridor is S_{cor} = 4R^2 - πR^2. The ratio of these areas is

\[ K = \frac{\pi R^2}{4 R^2 - \pi R^2} = 3.65. \]

We now determine the ratio of the number of brightest members located in the semicircles to the number of brightest stars lying in the corridor of the Pleiades cluster. Calculations show that this ratio exceeds 45. Actually, not one bright star falls in the Pleiades corridor. For clarity, in Fig. 2 we give the distribution of numbers of brightest stars in intervals with a width ΔL = 8'.3 along the O1O2 axis. As seen from Fig. 2, only one bright star falls in the band in the central part (O) of the Pleiades.


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Fig. 1. Map of the brightest member stars (numbered) of the Pleiades cluster.

Fig. 2. Distribution of numbers of the brightest member stars \( (N) \) of the Pleiades counted in each \( \Delta L = 8' .3 \) interval along Galactic longitude (from \( O_1 \) to \( O_2 \)).

From the foregoing, we can conclude that the distribution of brightest [omitted material] which is parallel to the Galactic plane. From this standpoint, it would be interesting to examine the distribution of flare stars in the regions of the semicircles and in the corridor.

According to a private communication from O. Chavushian and A. Oskanian, the distribution of flare stars in azimuth has two maxima and two minima, with the minimum number of flare stars being observed in the direction of the corridor found from the distribution of the brightest stars in the Pleiades region (see Fig. 1).

Let us consider the distribution of stars in the region of the open stellar cluster \( h \) and \( \chi \) Persei in more detail.