The Globular Clusters of the Small Magellanic Cloud in the general Diagram Magnitude-Diameter

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Resumen: En el diagrama general magnitud-diámetro los cúmulos globulares de la Pequeña Nube Magallánica se alistan paralelamente a la línea de los cúmulos globulares de nuestro propio sistema galáctico, pero casi siempre de magnitud y diámetro algo más débil.

Abstract: In the magnitude-diameter diagram the globular clusters in the Small Magellanic Cloud lie parallel to the line of the galactic globular clusters. As a result, the magnitudes and diameters of these clusters appear lower than in our galactic system.

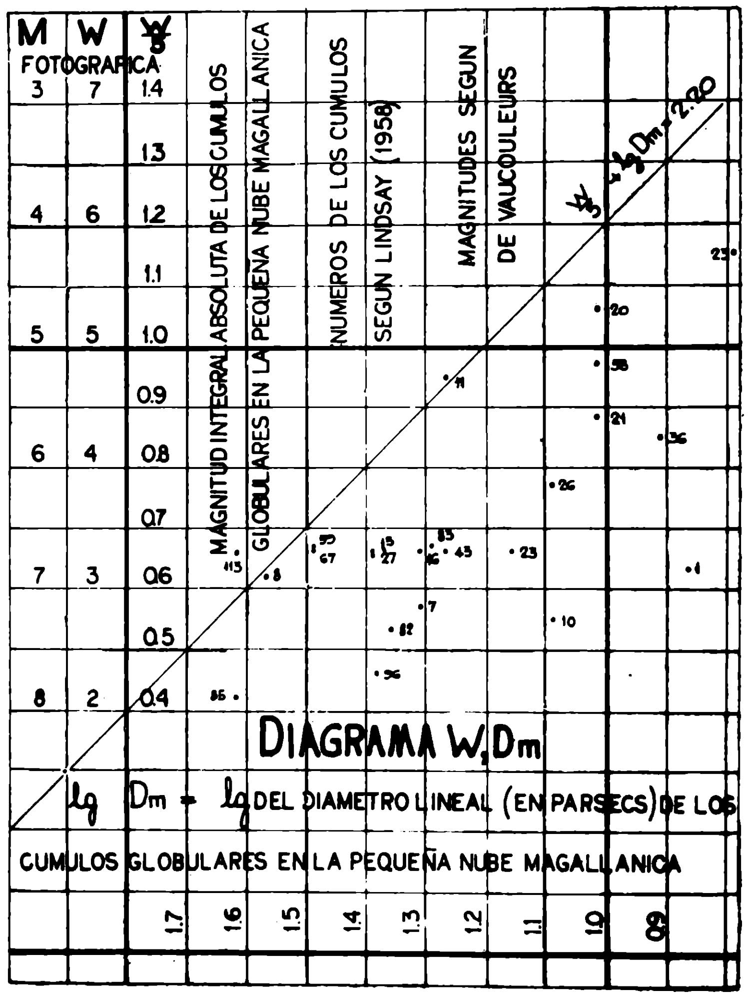
By an earlier report (Wilkens 1971) we know that the globular clusters of our Milky Way system are well accumulated in a magnitude-diameter diagram. There the coordinates are: in the direction of the ordinates is the absolute integral magnitude $W = M + 10$ and in the direction of the abscissae is the logarithm of the linear diameter D_m. Using the so-called "interior" (see the preceeding article) linear diameter, the globular clusters accumulate themselves strictly to a right line which passes by the center of this diagram according to the known formula

$$\frac{W}{5} + \log D_m = 2.20 \quad \text{(H. Wilkens 1960, 1970).}$$

The mean error of the constant in this formula had resulted very small, that is to say, $\pm$ 0.01 according to a previous publication of the author (Wilkens 1960). However, in every case, it would be interesting to see what would happen with respect to this problem, with other globular clusters in other galactic systems. The first occasion, which will be offered to us in this sense, are the globular clusters in the Small Magellanic Cloud. For this investigation we need nothing more than the following observational data: the apparent integral magnitudes and the apparent diameters. In order to transform these apparent values into absolute ones we would need also the distances of these objects. However, with respect to this point of the work, our task is mostly simplified by the fact that all the globular clusters of the Small Magellanic Cloud — in contrast to what happens in our galactic system — are practically all at the same distance R from us. We have adopted R = 63 Kpc which corresponds to a modulus of distance $m_0 - M = 19.0$.

Well; in the literature there are two principal authors, who have selected among more than 100 objects in the Small Magellanic Cloud those objects which by their circular form etc., are the most suspected ones to be globular clusters in reality. Kron (1956) found 10 globular clusters and Lindsay (1956 and 1958) found 14 globular clusters. Among these suspected globular clusters de Vaucouleurs (1959) selected finally 21 clusters, which at this moment are those which mostly art suspected to be globular.

On the basis of these 21 suspected globular clusters, their diagram W, D_m has been completed. The diagram has been calculated twice on the basis of



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1) the apparent magnitudes of Lindsay

2) „ „ „ „ de Vaucouleurs.

Here we only publish the second case for the reason that in it the points are distributed even more strictly in a stripe parallel to the ancient right line $\frac{W}{5} + \lg D_m = 2.20$. The globular clusters of the Small Magellanic Cloud are themselves more or less approximate to a right line $\frac{W}{5} + \lg D_m = 2.00$; they are smaller and in magnitude weaker too. This result can have two explanations.

1) From these globular clusters, lying directly in the rich stellar background of the Small Magellanic Cloud, are visible only the nuclei of maximal stellar concentration, which generally are much minor than the interior diameters of the globular clusters of our Galactic System.

2) The distance or its modulus respectively of the Small Magellanic Cloud will be even greater than those adopted till now, we would say by one stellar magnitude.

On the other hand, it would be necessary to adopt as a definite fact, that the globular clusters of the Small Magellanic Cloud are far more weaker and of minor dimensions than the same objects of our Milky Way.

LITERATURE

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The natural double sequence of globular clusters

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Abstract: The existence of two radii for every globular cluster is established; thus the correspondent theory of I. R. King (1962, etc.), is prooved by using old and new observational data from various authors.

Resumen: Se establece la existencia de dos radios para cualquier cúmulo globular, comprobando así mediante observaciones antiguas y nuevas de varios autores la correspondiente teoría de I. R. King (1962, etc.).

In an earlier report (Wilkens 1971), the author had published for the first time "The diagram of absolute integral magnitudes (W) and of linear diameters (D_m)" designed jointly for associations of stars of spectral types O and B and for globular and open clusters.

In this diagram the names of the *associations* are preceeded by AS; *globular clusters* are indicated by only two ciphers (suppressing HW); for identification see: H. Wilkens (1960) or (1970); *open clusters* are indicated generally by their numbers (suppressing NGC); in some cases by IC or by M(essier) or by C(ollinde)r or any other name with the corresponding numbers. Generally the symbols of objects with positive galactic latitude are orientated vertically, and those of objects with negative galactic latitude are orientated horizontally.

We must remember that in this diagram the globular clusters —contrary to associations of O and B type stars and contrary too to open clusters— had accumulated themselves fairly well along an unique right line according to the formula $\frac{W}{5} + \lg D_m = 2.20$. The absolute integral magnitude M is given by $W = M + 10$ and the linear diameter by D_m, measured in parsecs. In this way, practically all the globular clusters existing in our galaxy appear to be accumulated very "naturally" on this right line, and therefore the author calls this sequence "The natural Sequence of Globular Clusters". This right line of globular clusters runs with an angle of 45° from the center of the diagram till the left corner below the diagram, that is, from the weakest and smallest clusters till the brightest and greatest. At this final point of the line, the culmination is marked by ω Centauri.

Well; while elaborating this right line, some few exceptional cases already appeared, that is to say, globular clusters which evidently are located very distant from the general right line. These had been the following three globular clusters: NGC 5466 and 3201 and 5824 (indicated in the diagram by the respective numbers of +5 and +30 and +17). In order to "normalize" the position of these three clusters, that is to say, in order to get them too located on the general right line of all the others, their symbols had received a demonstrative arrow in that diagram. But, later on it appeared that there could exist more excepcional cases, as for example the clusters marked with the numbers +3 and +13a and +1. This is to say that the cases which before had been termed "exceptional" gradually turned to be so abundantly till to form a new regular group.

The definitive impulse in order to form this new regular group of still greater linear diameters gave the recent elaboration of new observational data referred to the apparent diameters of globular clusters according to the following authors:

M3	from 22.'1	Augment of apparent diameter ω in Shapley and Sayer 1935
	till 42'	Kholópov 1955 and Zhúkov 1969
IC4499	from 3.'3	estimated by H Wilkens in the photos of Fourcade and Laborde 1969
	till 6.'2	published by Sawyer Hogg 1947 and 1963