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NGC 3293: ITS MAIN SEQUENCE STRUCTURE

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Open clusters constitute the most appropriate tool to test the stellar evolution theory. They allow the construction of the Luminosity Function (LF) and the Initial Mass Function (IMF) and to test space or time dependent changes.

The open cluster NGC 3293 is a very young object located north-west of the open cluster Trumpler 14, embedded in the faint nebulosity of HII region NGC 3372. It is a compact and well populated cluster. All these properties are advantageous to make it an excellent target to examine some of the questions related with stellar evolution.

We carried out photometric observations (CCD-$UBVIH_\alpha$) at the University of Toronto Southern Observatory (UTSO), Las Campanas, Chile and at the Complejo Astronómico El Leoncito (CASLEO). We could survey the cluster area and its surroundings.

Our data allowed to see the entire cluster sequence down to $M_V \approx 6$, that reveals the following structure: stars with $M_V < -2$ are found evolving off the main sequence; stars with $-2 < M_V < +1.5$ are located on the main sequence; meanwhile, stars with $M_V > +1.5$ are placed above the main sequence, drawing a parallel sequence.

The following are the main results:

• The cluster size: Using stellar counts we compute a cluster radius of 4.1 arcmins adopting the position of star No 4 (Herbst & Miller 1982) as the cluster center.

• The reddening: Using Schmidt-Kaler's (1982) color relations for stars with spectral classification [luminosity class V], we found a color excess $E_{B-V} = 0.28 \pm 0.05$.

• The R value: Computing the individual E_{V-I}/E_{B-V} ratio for the earliest stars using the relation between MK types and $(V-I)_O$ from Cousins (1978), we adopt $R = A_V/E_{B-V} = 3.2$.

• The distance: By fitting the Schmidt-Kaler's (1982) ZAMS in a free-reddening color-magnitude diagram, we found a distance modulus of $V_O - M_V = 12.1 \pm 0.2$ (error from eye inspection).

• Nuclear age: Superimposing the isochrone set from Schaller et al. (1992) evolutionary models onto the corrected color-magnitude diagram of NGC 3293, we found that the upper sequence stars follow the isochrones of $6.8 - 7.8$ My, though the red supergigant is better fitted for an isochrone of 10 My. We adopted then, 7 My as the average nuclear age of NGC 3293.

• Contraction age: Plotting the Bernasconi (1996) isochrone set to the lower cluster sequence, we found that most of stars are contained between the isochrones from 4 to 12.5 My with a mean value of 10 My approximately.

The small discrepancy between the mean contraction age and the mean nuclear age (only 3 My) is explained in terms of differential reddening, unresolved binaries and photometric errors. When modelling all those effects we conclude that the stellar formation in the cluster area is contemporary and not a sequential one as it has been suggested.

Studying the cluster LF, we do not find evidences that the faint [less massive stars in the cluster] had been segregated to form a star halo as it was earlier suggested. The cluster IMF is characterized by a slope value $x = 1.15 \pm 0.08$ (for $M_V < 2.5$).

Finally, using $H\alpha$ observations, we found ten stars with clear evidences of having $H\alpha$ emission (probable pre-main sequence stars), seven of them are included within the cluster radius and five of those stars are placed in the zone where the dust contribution is more evident.

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