EVIDENCE FOR A MAIN SEQUENCE WIDENING FOR MASSIVE STARS

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Theoretical isochrones, in the interval 3 to 25 10^6 y., have been obtained from the grid of stellar models with mass loss computed by Maeder (1980, 1981). They cover the main sequence evolution, the red supergiant region and the first blue loop. These isochrones have been compared to composite colour magnitude diagrams of young open clusters drawn by Mermilliod (1981).

The models correctly reproduce the main features of the observed sequences, in particular, the number of Ia supergiants and their location on the first blue loop. However, the observed number of Ib supergiants is significantly larger than the theoretically expected numbers. This phenomenon is especially noticeable in the colour magnitude diagram of clusters like NGC 884, 3293, 4755, 6871. These clusters exhibit B Ib supergiants on the first crossing trajectory, which is, according to the models, a phase of rapid evolution.

An overall comparison has been performed with a composite diagram (fig. 1) collecting all 25 open clusters considered. Two isochrones (3 and 24 10^6 y.) have been drawn, as well as the theoretical upper main sequence envelope, the binaries upper limit and the blue extremity of the loops. The supergiants whose occurrence is not predicted by the models are located between the binaries limit and the loop extremity.

We conclude that the observed main sequence of very young open clusters is subjected to some extension or widening, which is not theoretically predicted. This effect is quite similar to that found by Maeder and Mermilliod (1981) for intermediate age open clusters.

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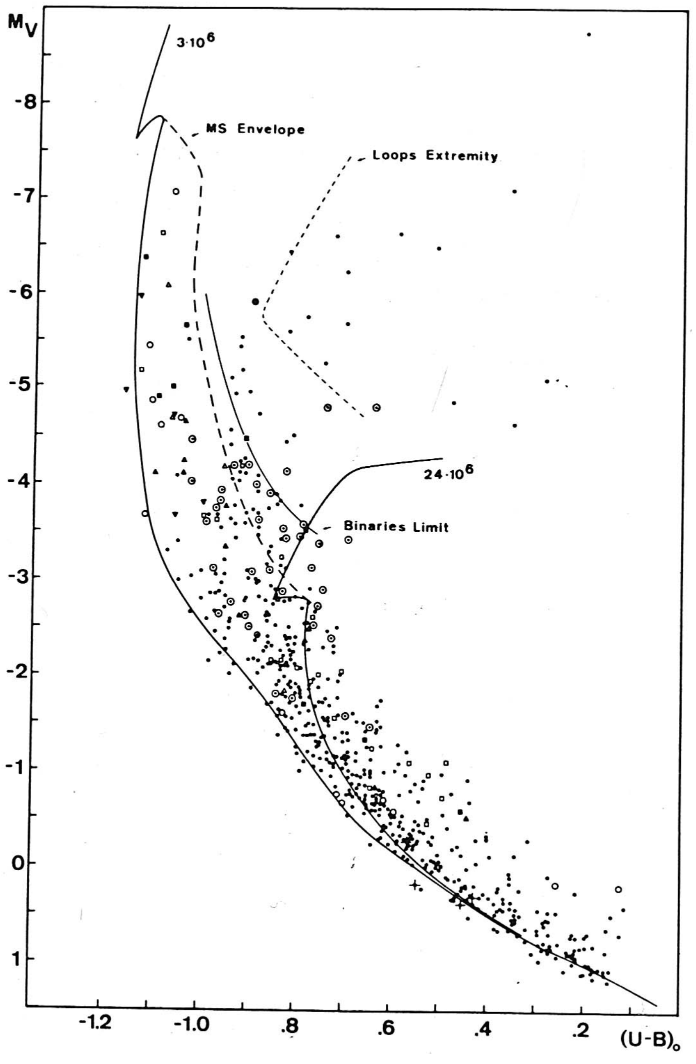

Fig. 1 Composite colour magnitude diagram for 25 young open clusters. The supergiant stars located between the binaries limit and the blue extremity of the loops are significantly more numerous than predicted by the models.

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DISCUSSION

Jakobsen: In the poster, you show evolutionary tracks in CM diagrams for different age groups, composed of stars from different clusters, assuming that all the stars in these clusters are almost coeval.
a) Where are the photoelectric data from, and what was the selection criteria for the sample of stars in each cluster?
b) Which criteria did you use in dividing the clusters into age groups?

Comment to b): Several of the clusters you have used, I have observed extensively, and depending on which "cluster age" criteria I use, I do not get the same division.

Mermilliod: The UBV data have been taken from my compilation (Astron. Astrophys. Suppl. 24, 159 (1976)) and are mostly photoelectric ones. Membership of the stars was mainly judged from the analysis of the photoelectric diagrams, in absence of other criteria.
Since the discriminating power of the U-B colour index as a temperature parameter, and hence as an age indicator decreases, I have used the published MK classifications for evolved stars to separate the clusters. This procedure has been described in Astron. Astrophys. Suppl. 44, 467 (1981).