SIMULTANEOUS *uvbyβ* PHOTOMETRY AND Hα SPECTROSCOPY OF Be STARS IN OPEN CLUSTERS

J. FABREGAT, J.M. TORREJÓN and P. REIG
Dep. de Matemática Aplicada y Astronomía, Universidad de Valencia, 46100 Burjassot, Valencia, Spain

and

G. BERNABEU
Dep. de Ingeniería de Sistemas y Comunicaciones, Universidad de Alicante, Apdo. 99, 03080 Alicante, Spain

1. Introduction

The usual methods of spectral clasification, equivalent widths of Balmer lines or photometric calibrations are not suitable for the determination of the astrophysical parameters of the underlying star in Be-type objects. The spectrum is distorted by the circumstellar envelope lines, while the contribution of the envelope continuum radiation contaminates the photometric indices.

The aim of the present work is to develop a method to determine such intrinsic parameters from *uvbyβ* photometry and Hα equivalent widths. We are currently carrying out simultaneous photometric and spectroscopic observations of Be stars in open clusters. The main pourpose is the decoupling of the underlying star contribution to the photometric indices from the circumstellar disc contribution, and the elaboration of a photometric calibration for the physical parameters of the underlying star. A first exposition of this method has been already published (Fabregat & Reglero 1990).

As a preliminary result, in this paper we present the analysis of the *uvbyβ* photometric diagrams for the h and χ Persei clusters (NGC 869 and NGC 884).

2. Discussion and conclusions.

The photometric HR diagrams are presented in Fig 1. We have represented with an open square the Be stars observed in an active fase, i.e. with the Hα line observed in emission or with the photometric index β lower than 2.55, which implies that the Hβ line is in emission. With a filled square we represent the stars previously classified as Be but which have been observed whit Hα in absorption, indicating the occurrence of a non-active phase. Finally, we represent with asterisks the "normal" absorption-line B stars. We

L. A. Balona et al. (eds.), Pulsation, Rotation and Mass Loss in Early-Type Stars, 309–310.

https://doi.org/10.1017/S0074180900215179 Published online by Cambridge University Press

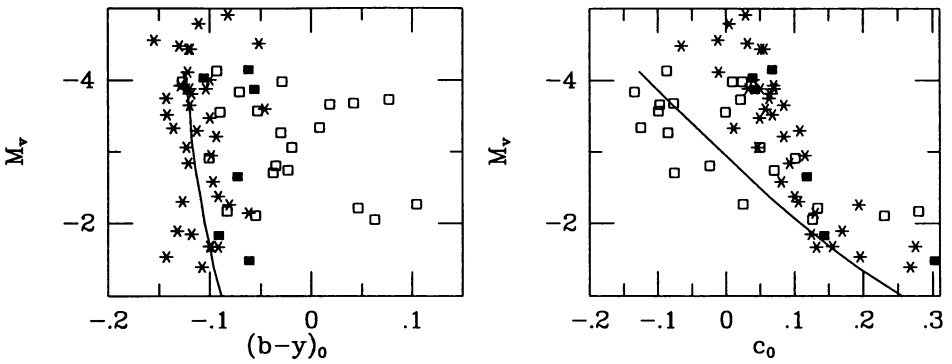

Fig. 1. M_V–(b-y)$_0$ and M_V–c_0 photometric diagrams for the h and χ Persei clusters. Open squares represent active Be stars, filled squares non-active Be stars and asterisks absorption-line B stars. Lines represent the ZAMS.

have included, as well as our own data, stars non classified as Be observed by Crawford *et al.* (1970), in order to obtain a better definition of the locus of the normal stars in the photometric diagrams.

In both diagrams Be stars in a non-active phase are placed in the same position than the normal B stars. This implies that the usual anomalous position of Be stars in the photometric diagrams affects only the Be stars in an active phase, and then it is an effect of the circumstellar emission, and not due to the underlying star itself. In consecuence, such anomalous positions should not be considered as differencies in evolutionary status between Be and absorption-line B stars.

Be stars in active phase deviate systematicaly in both diagrams. In the M_V–(b-y)$_0$ plane they deviate towards redder (b-y) values, showing a significant continuum contribution of the circumstellar emission to the photometric indices. In the M_V–c_0 plane active Be stars deviate to lower "bluer" c_0 values. As the c_0 index is a measure of the Balmer discontinuity strength, this deviation is produced by the Balmer discontinuity emission, the so-called "Balmer jump" described, for instance, by Kaiser (1990).

We can conclude that the anomalous position usualy showed by Be stars in the photometric diagrams is produced by the contribution of the circumstellar continuum emission, an does not imply any particular evolutionary status.

References

Crawford, D.L., Glaspey, J.W. and Perry, C.L.: 1970, *AJ* **75**, 822
Fabregat, J. and Reglero, V:: 1990, *MNRAS* **247**, 407
Kaiser, D: 1990, *A&A* **222**, 187