BCD SPECTROPHOTOMETRY OF THE Be-SHELL STAR 88 Her

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I. INTRODUCTION.

The spectrophotometric behavior of the Be/shell stars seems to be different when their second Balmer discontinuity is in emission from that when it is in absorption. We have analysed here a particular case in which the second Balmer jump is in absorption. In this note we compare the results of a BCD analysis concerning the variations of the Be-Shell star 88 Her (HD162732), to the results of the UBV photometry.

This star is a spectroscopic binary, which has displayed a long-term light variation, that did not correspond to an eclipsing pattern (Harmanec et al., 1978, 1980 ; Nakagiri and Hirata, 1979 ;Magalashvili and Kumsishvili, 1980). The light variations were as large as 0.15 in V and B band and about 0.30 in the U magnitude, simulating a change in the spectral type (photometrically determined) from B6 to B8 and back (Harmanec et al., 1978). These variations are shown in Fig.1.

It is interesting to note the apparent change in the B-V colors, the star being redder when its photometric spectral type is later.

The light curves (Harmance et al., 1978 ;Magalashvili and Kumsishvili, 1980) show that the photometric spectral types are different for two states of the star corresponding to the same V magnitude (before and after the light minimum). This apparently paradoxal result is discussed below.

II . RESULTS AND DISCUSSION

The Be-shell star 88 Her has been observed in the BCD system in July 1977 and July 1980 (cycles 275 and 288 ; before and after the light minimum) at two dates corresponding approximately to the same V magnitude, but showing some important differences in the energy distribution.

The BCD parameters (Divan, 1979 ; Divan et al., 1982) obtained at both observing epochs are listed in table 1. We first note that the spectral type of the underlying star, given by D_o and λ_1 (Chalonge and Divan, 1973), is exactly the same in the two cases, B6 IV. However, between the two observations of 88 Her, a great change occurs in the Balmer region. In july 1977 only one Balmer discontinuity is visible, that due to the underlying star. In july 1980 (see Fig.2) a second Balmer discontinuity

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Table 1

	D	d	D_o	λ_1-3700 Å	$\emptyset_{rb}$	$\emptyset_{uv}$
July 1977	0.29	0.00	0.29	48	0.90	1.03
July 1980	0.40	0.09	0.31	50	0.90:	0.93 :

d, due to the enveloppe has appeared.

The second discontinuity (d ~ 0.1 dex) is situated in the domain of the U filter (as can be seen in Fig.2) and should produce an increase of 2.5d = 0.25 in the U magnitude of 88 Her. For july 1977, UBV photometric gives U =-0.45. In July 1980, U should then be equal to -0.45 + 0.25 = -0.20, a value which corresponds to an apparent photometric spectral type around B9 (if the small possible interstellar reddening is ignored), later than the real spectral type B6 by several subclasses. Thus, for 88 Her and for all Be/shell stars which have the second Balmer discontinuity in absorption, the apparent photometric spectral type is too late. Inversely, for Be/Shell stars which have the second Balmer discontinuity in emission, the apparent photometric spectral type is too early, when the parameters λ_1 and D_o define unambiguously the non-variable spectral type of the photospheric part of these objects.

The B-V color variation of 88 Her is not very well established (see Fig.1, in which error bars are indicated). A reddening in B-V between cycles 275 and 280 seems to be indicated, but this would be in contradiction with the constancy of the gradient $\emptyset_{rb}$ (Table 1.).

In Figure 1. we have plotted the reddening vector corresponding to the color excess deduced from the absorption bump at λ 2200 Å (Beeckmans, 1978). If 88 Her was dereddened with this vector in the U-B, B-V plane, the points corresponding to the different states of 88 Her would be on the left side of the main sequence line. The reddening may have been overestimated, and more observations are necessary to know the real intrinsic positions of 88 Her in the (U-B,B-V) plane.

In the BCD system, 88 Her shows approximately constant values of $\emptyset_{rb}$ and $\emptyset_{uv}$, with a slight indication of a bluer color when the second discontinuity exists. The actual values of $\emptyset_{rb}$ and $\emptyset_{uv}$ for July 1980 are provisionnal and shall be improved, but quite similar results are obtained for another star, Pleione, which has an increasingly strong second Balmer discontinuity in absorption, the colors becoming only very slightly bluer, in contrast with the important reddening which accompanies the apparition of a second Balmer jump in emission. In modeling objects like 88 Her, it will be necessary (and probably difficult) to imagine emission-absorption compensating mechanisms that conserve an almost constant slope of the energy distribution around the Balmer discontinuity when its magnitude is strongly affected.

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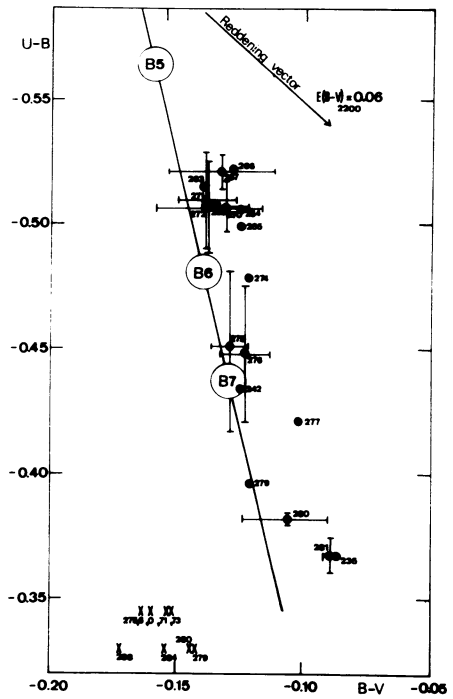

Fig. 1.

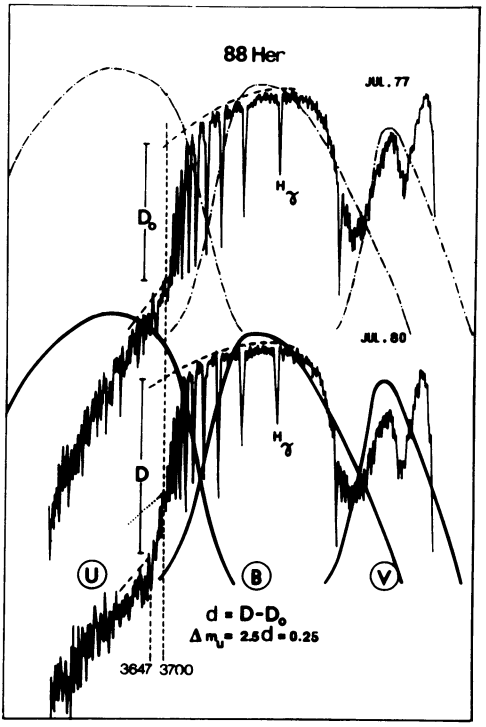

Fig. 2.

REFERENCES

Beeckmans, F.: 1978, Thesis, University of Liège, Belgium
Chalonge, D., Divan, L.:1973, Astron. Astrophys. 23, 69
Divan, L.: 1979 IAU Colloq. 47, Ed. G.V. Coyne, M.F. McCarthy, A.G.D. Philip
Divan, L., Zorec, J., Briot, D.: 1982, IAU Symposium N°98, Be Stars, 53.
Harmanec, P. Horn, J., Koubshy, P., Kriz, S., Zdarsky, F., Papousek, J., Doazan, V., Bourdonneau, B., Baldinelli, L., Ghedini, S., Pavlovski, K.:1978, Bull. Astron. Inst. Czech. Vol 29,278
Harmanec, P. Horn, J., Koubsky, F., Zdarsky, F., Kriz, S., Pavlovsky, K.: 1980, Bull. Astron. Inst. Czech. Vol 31,144
Magalashvili, N.L., Kumsishvili, J.I.: 1980, IAU IBVS N° 1868
Nakagiri, M., Hirata, R.: 1979, IAU IBVS N° 1565

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