THE SHORT-PERIOD PHOTOMETRIC VARIABILITY OF BE STARS

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INTRODUCTION

The fact that some Be stars have periodic light variations with time scales of the order of one day is well established (eg. Balona and Engelbrecht 1986). The cause of this variability is not yet understood. The explanation which seems to have gained the most acceptance is nonradial pulsation (NRP). It is of great importance to ascertain the proportion of Be stars which are short-period variables and to determine the link between the variations and the emission-line phase. We have started a photometric project to investigate these problems. In this note we present some preliminary results and tentative conclusions.

RESULTS

All observations were made with the 0.5-m reflector of the SAAO through the Johnson B or Strŏmgren b filters. Nearby B stars were used as local standards.

The most important quantity to be derived is the period of variation. This is complicated by the somewhat erratic long term variations in Be stars, making it sometimes difficult to discern the true period. Fortunately this was not a serious problem except for 28 CMa. At first we used a Fourier periodogram technique to search for periods. The highly non-sinusoidal or double-wave shape of some light curves renders this technique of dubious value, so we have re-analysed the data using the phase minimization method (Stellingwerf 1978).

Our preliminary results are shown in the table. Although we are fairly confident that we have extracted the correct period in most cases, further observations are certainly required before these can be accepted.

It is perhaps significant that none of the Be stars are multiperiodic. An exception is ζ Oph which could be a β Cep variable as well. The periods are all comparable to the expected period of rotation. These facts and the frequent occurence of double-wave light curves suggests rotational

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TABLE 1
Periods of Be stars observed photometrically during the 1985/6 season at the SAAO.

Star	Sp. type	Δm	P(d)	Remarks
α Ara	B2.5Ve	0.04	0.658	DW?
ι Ara	B3ne	0.05	0.515	DW
o Aqr	B8Ve	0.03	1.449	DW
α Eri	B3Vp	0.03	1.260	(1)
λ Eri	B2IVne	0.02	0.408	(2)
27 CMa	B3IIIe	0.02	1.274?	
28 CMa	B2IV-Ve	-	-	(3)
ε Cap	B3Ve	0.03	0.769	DW
ζ Oph	O9.5Ve	0.03	1.075?	(4)
		0.02	0.193?	
χ Oph	B1.5Ve	0.05	0.935	
ω Ori	B3IIIe	0.05	1.910	DW
η PsA	B8Ve	0.02	0.774	

Notes
(1) The light curve appears to have changed shape in the course of about a month while keeping the same period.
(2) There is some evidence for a double-wave (DW) light curve with twice the above period. The quoted period is the one-day alias of that derived by Bolton (1981).
(3) Rapid fading during the period of observation precludes the determination of a period.
(4) The short period suggests that this star could be classified as a β Cep variable as well as a Be star. Both periods are uncertain due to aliasing problems.

modulation rather than NRP as an explanation for the variations. Whether the line profile variations can be explained in this way remains to be investigated.

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DISCUSSION FOLLOWING BALONA

Sareyan:

Most of the stars you studied are in the range of mid-B variables (as studied by Waelkens and Rufener). Could you please comment on that?

Balona:

The non-emission stars studied by Waelkens and Rufener have similar periods and are also singly periodic. It is possible that the same physical mechanism is responsible for the variation in these stars and the Be Stars. This suggests that the variation may not be the cause of the Be star phenomenon. The stars studied by Waelkens and Rufener have rather small projected rotational velocities which may cause difficulties in interpreting the variation as a rotational modulation.

Buscombe:

We can also observe o Aqr from northern countries. It has a particularly symmetrical double-peak emission at Hα (longward and shortward displaced).

Balona:

This star seems to be a good candidate for intensive study as it is well placed and is quite bright.

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