COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 1536

Konkoly Observatory
Budapest
1979 January 22

ON THE PHOTOMETRIC VARIABILITY OF o Vel AND OF THE He-WEAK STAR HR 3448

Introduction:

A systematic survey for He-weak stars conducted by Jaschek et al. (1969) resulted in eight new objects including HR 3448. He-weak stars are known to show periodic spectrum and light variability (Pedersen and Thomsen 1977). However, Pedersen and Thomsen (1977) did not find variability in the strength of the HeI 4026A line of HR 3448 or in its light.

HR 3448 was on the present observing program of a search for Beta Cephei stars, as a comparison star to o Vel, a suspected Beta Cephei star (van Hoof 1972); variability in HR 3448 was suspected and it was therefore observed independently against HR 3466 (B9III). o Vel is a suspected Beta Cephei star on the basis of its RV variations reported by van Hoof (1972). However, its light variability has yet to be confirmed (Balona 1977). The observations reported here suggest that HR 3448 is photometrically variable with a small amplitude of .01 mag in 'b' and o Vel is constant.

Observations:

The photometric observations were made through the Strömgren 'b' filter during an observing run in March 1977. The University of Toronto 61 cm telescope situated at Las Campanas,Chile, was used. It was equipped with a 1P21 photometer and pulse counting electronics.

Table 1 gives observations of HR 3448 and o Vel against HR 3466 obtained on three nights. These are means of two observations. The differential extinction correction was found to be negligible. These observations clearly indicate that variations in o Vel are not more than .005 mag , supporting Balona's (1977)

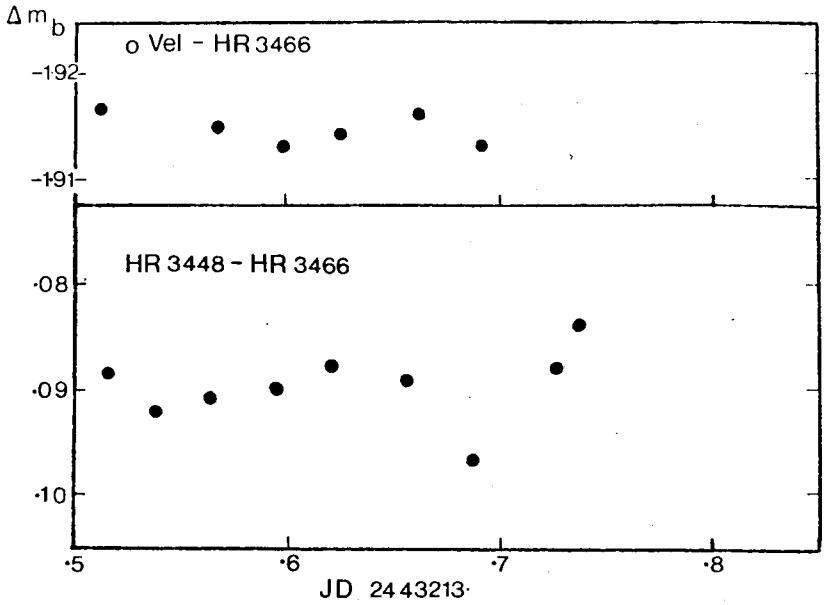

Figure 1: Plots of Δm_b (o Vel-HR 3466, and HR 3448-HR 3466) versus JD.

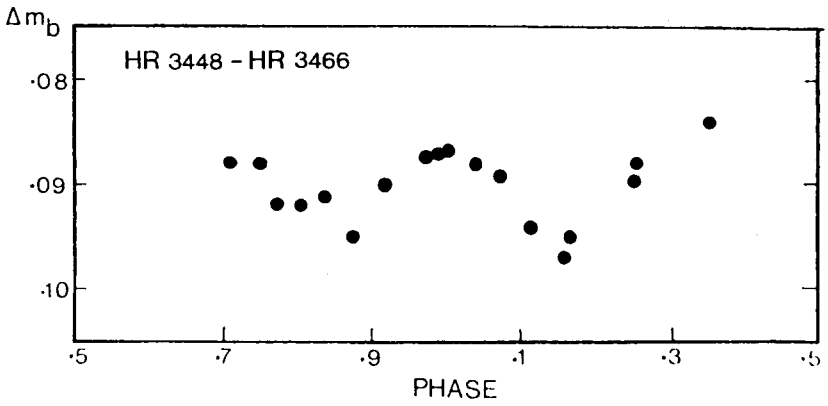

Figure 2: A phase diagram of HR 3448 with P=.3880^d.

conclusion, whereas HR 3448 shows variations of about .01 mag.

The observations of HR 3448 and o Vel, obtained on JD 2443213 are plotted in Figure 1. Constancy of HR 3466 is well demonstrated against o Vel. The light curve of HR 3448 shows a characteristic double minimum similar to the light curve of σ Ori E (Pedersen and Thomsen 1977). Although the observations are not sufficient to determine the period accurately, a period of $P=.388^d$ resulted from a statistical technique of period search; it was found to fit very well to all the observations of HR 3448 listed in the Table 1. This period is also supported by the two times of minima observed: JD_{min} 2443210.5861 and 2443213.6896. This phase diagram is shown in the Figure 2. If this period is right then HR 3448 will be the shortest period He-weak variable.

The He-weak variability being a surface phenomenon, in general the period can be accounted for by the rotational velocity of the variable (Pedersen and Thomsen 1977). We could not find in the literature a v.sin i value for HR 3448, which would have provided some kind of indirect check on this proposed period. From the published uvbyβ values for HR 3448 (Crawford et al.1978) one can estimate its luminosity (Mv=-.42, Crawford 1978) and temperature (log Te=4.164, Shaw 1975) and hence its radius ($R=3R_\odot$). Thus to account for a period of $P=.388^d$, a v.sin i value for HR 3448 is estimated to be of the order of 250 km/s which is slightly large for a normal B8 star. It should be noted that the uvbyβ indices used here are not averaged over a cycle and relations used are applicable to normal stars.

Another feature of HR 3448 which it shares with σ Ori E is the fact that HR 3448 also lies away from the zero age main sequence on the $[c_1]$, β plane (Pedersen and Thomsen 1977).

More observations are needed to confirm the period and to obtain a complete light curve for HR 3448. The possibility of it being the shortest period He-weak variable and the similarity of the light curve with that of σ Ori E, a He-rich star, should make this object important.

TABLE 1

Observations of HR 3448 and o Vel Against HR 3466

HR 3448-HR 3466		o Vel-HR 3466	
JD 2443200+	Δm_b	JD 2443200+	Δm_b
10.5208	.087	10.5444	-1.913
10.5368	.088	10.5659	-1.913
10.5653	.094	10.5882	-1.913
10.5861	.095	10.6076	-1.914
10.6201	.090	10.6146	-1.917
13.5157	.088	10.6271	-1.913
13.5402	.092	10.6493	-1.914
13.5659	.091	10.6569	-1.913
13.5965	.089	10.6618	-1.915
13.6215	.087	10.6680	-1.914
13.6576	.089	10.6771	-1.915
13.6896	.097	10.7097	-1.914
13.7285	.088	10.7146	-1.916
13.7646	.084	10.7194	-1.915
20.5229	.088	13.5135	-1.917
20.5444	.091	13.5694	-1.915
20.5736	.095	13.5986	-1.913
20.6166	.087	13.6257	-1.914
		13.6618	-1.916
		13.6924	-1.913

SHYAM M. JAKATE
Department of Astronomy
University of Toronto
Toronto, Ont.
Canada. M5S 1A7

References:

Balona, L.A. 1977, Mem. R. Astron. Soc. 84, 101

Crawford, D.L. 1978, Astron. J. 83, 48

Crawford, D.L., Barnes, J.V., and Golson, J.C. 1971, Astron. J. 76, 621

Jaschek, M., Jaschek, C. and Arnal, M. 1969, Publ. Astron. Soc. Pacific 81, 650

Pedersen, H., and Thomsen, B. 1977, Astron. Astrophys. Suppl. 30, 11

Shaw, J.S. 1975, Astron. Astrophys. 41, 367

van Hoof, A. 1972, Astron. Astrophys 18, 51