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PHOTOMETRIC VARIATIONS OF THE SUPERGIANT B3 Ia : HD 178129 *

The B and A supergiants are now known to exhibit semi-periodic photometric variations with semi-amplitudes up to 0.07 magnitude (Sterken, 1977). The semi-periods tend to increase with the absolute visual magnitudes (Sterken, 1977). Until now, to our knowledge, only 32 stars have known semi-periods and only 3 of them have spectral types comprised between B2 I and B8 I (Burki, 1978). So it is useful to complete this sample by more observations and to check whether the new observed supergiants share the properties already derived for this class of objects. In that context it is interesting to report the observations of the B3 Ia star HD 178129, though more data would be useful to better determine its semi-period.

Actually the detection of the photometric variations of HD 178129 is a by-product of observations obtained for another purpose and it is why its publication was delayed. Incidentally the B3 Ia star HD 178129 was used as one of the two comparison stars in a search for photometric variations of a mild Ap star HD 179761. At the time of our observations (1970), photometric variations were detected only for two B supergiant stars and no general trend was reported (Sterken, 1977). It turned out that the variations of the differential magnitude between the second comparison HD 178484 and HD 179761 is less than 0.02 m whereas it is as large as 0.1 m (in the *u* filter) between the supergiant and the second comparison.

The photometric observations were performed in Strömberg's *uvby* photometric system during nine nights from the 18th to the 26th of August 1970 at the ESO. We used the standard equipment at the 50 cm telescope. The sequence of the observations already described in Mégessier-Garnier (1972) was C₁-C₂-A_p-C₁-C₂-A_p-C₁, the recording time being 20 s in each filter. It was followed by a measurement of the sky in the four filters.

The main characteristics of the three stars are given in Table I and the journal of observations is given in Table II as well as the instrumental differential magnitudes in the four filters. The variation curves are represented in Fig. 1 where a free-hand curve is drawn to show the likely semi-period of the supergiant. The

* The observations have been performed at ESO, Chile.

Table I

star	spectral type	m_v	M_v
HD 178129	B3 Ia	7.41	-6.1
HD 178484	K0	6.56	
HD 179761	B8 III, A _p	5.15	

Table II

uvby instrumental differential magnitudes between HD 178129 and HD 178484.

date August 1970	JD 2 440 000 +	Δu	Δv	Δb	Δy
18	817.565	1.479	0.583	- 0.372	- 0.811
	817.587	1.489	0.586	- 0.376	- 0.816
19	818.533	1.494	0.598	- 0.347	- 0.795
	818.655	1.483	0.605	- 0.356	- 0.796
20	819.533	1.485	0.591	- 0.365	- 0.798
	819.555	1.489	0.593	- 0.370	- 0.803
21	820.522	1.450	0.564	- 0.400	- 0.832
	820.541	1.443	0.543	- 0.402	- 0.834
		1.467	0.549	- 0.402	- 0.837
22	821.527	1.422	0.531	- 0.421	- 0.857
	821.550	1.422	0.531	- 0.427	- 0.855
23	822.526	1.470	0.590	- 0.367	- 0.814
	822.545	1.477	0.584	- 0.381	- 0.811
26	825.531	1.526	0.611	- 0.339	- 0.776
	825.551	1.513	0.604	- 0.345	- 0.783
		1.517	0.627	- 0.332	- 0.773

instrumental differential magnitudes between HD 178484 and HD 179761 (Fig. 1, bottom) indicates the precision of the differential measurements. Their small variations ($\Delta m < 0.02 m$) during the observational period should be due to the A_p star variations.

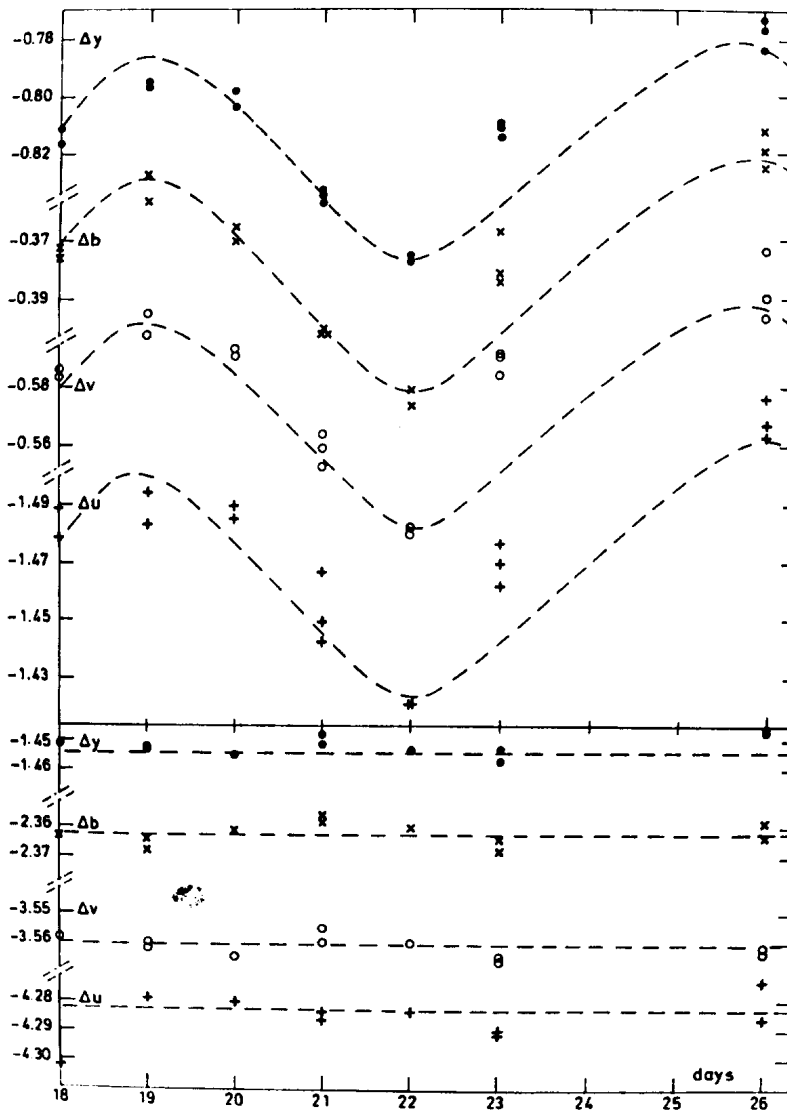


Figure 1. Top: Instrumental differential magnitudes between the supergiant HD 178129 and HD 178484;
 Bottom: Instrumental differential magnitudes between HD 178484 and HD 179761

The amplitudes of the variations of the supergiant are of the same order of magnitude in the four filters ($\Delta y_{\max} \approx 0.08$, $\Delta v_{\max} \approx 0.08$, $\Delta b_{\max} \approx 0.09$, $\Delta u_{\max} \approx 0.10$ magnitude). More data are needed to determine the semi-period with some accuracy. Nevertheless these observations show that variations with some periodicity are certainly present and an order of the semi-period T may be eye-estimated. The free-hand curve in Fig. 1 corresponds to $T = 7$ days.

Since its absolute visual magnitude was determined by Hutchings (1971) (see Table I) we can place the representative point of HD 178129 in the M_v vs $\log T$ diagram given by Sterken (1977). It fits very well the general trend and it is the lowest point in the diagram. In the same way HD 178129 takes a logical place in both diagrams M_v / spectral type and M_v / $\log T$ given by Burki (1978). The half amplitude of the y variations $A(y)$ is about 0.04 which is in agreement with the general feature suggested by Sterken (1977), i.e. an increase of $A(y)$ with increasing luminosity.

We reported evident large photometric variations for the supergiant B3 Ia HD 178129. Although we have not a large number of measurements we can suggest a likely semi-period of the order of 7 days. If one adopts that semi-period the star shares the already derived properties for B supergiants. So, even if more observations are needed to confirm the semi-period, these facts support the estimated value.

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