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A PROBABLE PERIODICITY IN THE LIGHT VARIATION  
OF THE LMC SUPERGIANT HD 33579

Summary. Photometry of the brightest supergiant of the LMC HD 33579 in 1971, 1972, 1973 and 1974 shows evidence for a periodicity of around 90 days. The nature is probably pulsation.

1. Introduction

In connection with the earlier and very recent investigations on the theory of stellar evolution of very massive stars (Ledoux, 1941; Schwarzschild and Härm, 1959; Simon and Stothers, 1970; Ziebarth, 1970; Appenzeller, 1970 a,b; Talbot, 1971 a, b; Larson and Starfield, 1971, Barbaro, Bartelli, Chiosi and Nasi, 1973) it is of extreme interest to know whether such stars show any long or short term light variation and whether these variations are periodic. Rosendahl and Snowden (1971) carried out a photometric program on five LMC supergiants amongst others HD 33579 ( $V_j = 9.1$ , A3 Ia-O (Feast, Thackeray and Wesselink, 1960)) and detected for all of them light variations of less than 0.1mag, probably caused by pulsation. The first observers to discover that HD 33579 was slightly variable were Walraven and Walraven (1966, 1971). Przybylski (1968) and Aller, Ross and Wares (1968) analyzed the spectrum and Walraven and Walraven (1971) obtained some atmospheric parameters with the same five-colour photometer with which the observations presented here have been made. Wolf (1972) made an extensive fine analysis of the atmosphere. Until the present work there has been no evidence of periodicity in the light variation.

2. The Observations

The observations have been made with the Walraven five-colour simultaneous photometer, attached to the 90-cm light-collector of the Leiden Southern Station (at the SAAO-Annexe, formerly the Republic Observatory Annexe) Hartebeestpoortdam, South Africa. A description of the photometer and the photometric system is given by Walraven and Walraven (1960) and Rijn, Tinbergen and

Walraven (1969). The comparison star was HD 33486 (8.1, B9). To check its constancy a second comparison star was often used, viz. HD 33117 (8.7, G5). Generally the variable was observed ten times on the average, alternated by the comparison star. The average of the brightness differences revealed one normal point. The integration time for one observation was 0.5 or 1 min. The figure shows these normal points (in log intensity) in the Walraven V (5590 Å) and U (3620 Å) bands, plotted against the calendar date. The error bars indicate roughly the maximum mean error in one normal point. Points connected with a line indicate normal points obtained in the same night. In the near future the final reductions in all five pass-bands will be published.

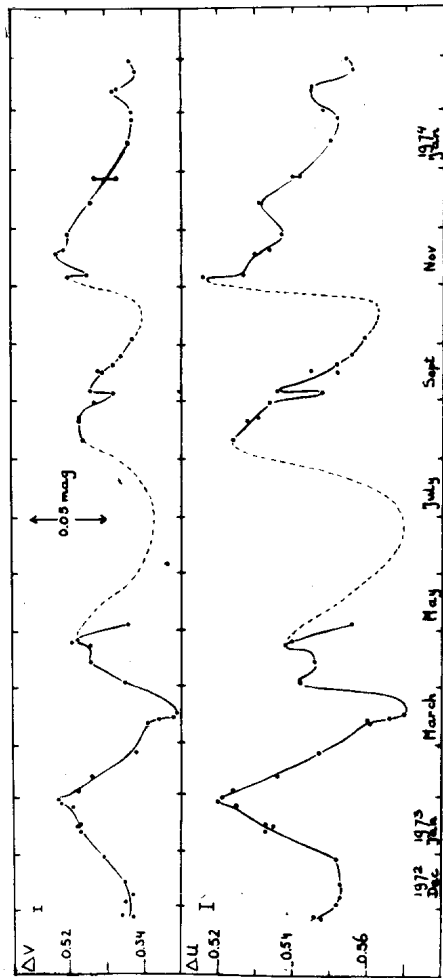
### 3. Discussion of light-curves and period

The figure shows at least four cycles. Unobserved parts have been dashed. The amplitudes are roughly 0.09 mag in V and 0.15 in U. The B (4260 Å) and L (3900 Å) curves, which are not shown, have a range of roughly 0.11 and 0.12 mag. There is certainly no strict periodicity, but there seems to be some kind of regularity, with an average period somewhere near 90 days. Some observations made in October and November 1971 fit rather well when we extrapolate the average light-curve with a period of 95 days.

It is likely that the light variation is mainly caused by pulsation. This can be concluded by the general shape of the light- and colour curves and the fact that the star is blue at maximum, a conclusion already reached by Rosendahl and Snowden. However the light-curves are highly variable from cycle to cycle and sudden drops or rises are present. These sudden changes are often much more pronounced in U or sometimes seem to be only present in the U band. Probably emission lines mainly active in this band, caused by special atmospheric phenomena are here of account. In the first cycle the rise in V and B started much earlier than in U and also but less pronounced in L. However the U rise is generally much more violent and reaches the maxima sometimes many days earlier than that in V.

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The brightnesses HD 33579 minus comparison star (in log intensity) plotted against the calendar date for the Walraven V (5590 Å) and U (3620 Å) bands.

References:

- Aller, L.H., Ross, J.E., Wares, G.W. 1968, *Astrophys.Space Sci.* 2, 344.  
Appenzeller, I. 1970 a, *Astron.Astrophys.* 5, 355.  
Appenzeller, I. 1970 b, *Astron.Astrophys.* 9, 216.  
Barbaro, G., Bertelli, G., Chiosi, C., Nasi, E. 1973 *Astron.Astrophys.* 29, 185.  
Feast, M.W., Thackeray, A.D., Wesselink, A.J. 1960 *Mon.Not.R.Astron. Soc.* 121, 337.  
Larson, R.B., Starfield, S. 1971, *Astron.Astrophys.* 13, 190.  
Ledoux, P. 1941, *Astrophys.J.* 94, 537.  
Przybylski, A. 1968, *Mon.Not.R.Astron.Soc.* 139, 313.  
Rosendahl, J.D., Snowden, M.S. 1971, *Astrophys.J.* 169, 281.  
Rijf, R., Tinbergen, J., Walraven, Th. 1969, *Bull.Astron.Inst.Netherl.* 20, 279.  
Schwarzschild, M., Härm, R. 1959, *Astrophys.J.* 129, 637.  
Simon, N.R., Stothers, R. 1970, *Astron.Astrophys.* 6, 183.  
Talbot, R.J. 1971 a, *Astrophys.J.* 163, 17.  
Talbot, R.J. 1971 b, *Astrophys.J.* 165, 121.  
Walraven, Th., Walraven, J.H. 1966, private communication.  
Walraven, Th., Walraven, J.H. 1960, *Bull.Astron.Inst.Netherl.* 15, 67.  
Walraven, Th., Walraven, J.H. 1971, *The Magellanic Clouds 117* (Ed. A.B. Muller, Reidel Publ.Co. Dordrecht, Holland.).  
Wolf, B. 1972, *Astron.Astrophys.* 20, 275.  
Ziebarth, K. 1970, *Astrophys. J.* 162, 947.

A.M. van GENDEREN  
Leiden Southern Station  
P.O.Box 13, Broederstroom 0240  
Transvaal, South-Africa.