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VBLUW PHOTOMETRY OF THE NEW BRIGHT O TYPE ECLIPSING
BINARY HD 167971 IN NGC 6604

During a photometric program of high luminous OB type stars for the investigations of optical micro variations, the star HD 167971 in NGC 6604 of spectral type O7.5 IF (Cruz-Gonzalez et al. 1974) attracted attention because of the relative large light amplitude amounting to $\sim 0.3^m$.

The observations were made with the 90-cm Dutch telescope at the ESO, equipped with the WBLUW photometer of Walraven during several occasions in 1981 by M.D.P. van der Bij and in 1984 by E. Damen.

The variability was also noticed by Leitherer et al. (1984) on account of photometric observations made in 1983 and later on Forbes (1984) obtained new observations, but the type of variability was still unknown.

Additional observations by Stahl et al. (1985) proved that the star is a short-period eclipsing binary with two possible periods viz. 1.6607^d and 3.3212^d .

The table lists our observations V_j (the V of the UBV system), which were transformed from the V of the VBLUW system with the aid of a formula given by Pel (1983). Each observation is an average of a series of eight measurements of the variable relative to the nearby comparison star HD 170719 (B9). The mean error of the average of such a series amounts to $\pm 0.004^m$.

Combining our observations with those of Leitherer et al., Forbes and Stahl et al. and by using the second period of Stahl et al., but slightly revised, we obtained the light curve as shown in the figure (upper panel). Phases were derived with the aid of the formula:

$$\phi = \frac{J.D. - 2445555.0}{3.3215}$$

in which the zero point is taken from Stahl et al.. The estimated error in the period amounts to $\pm 0.0005^d$. The bracketed observation is from Forbes and has a larger uncertainty than his other observations, viz. $\pm 0.1^m$ (Forbes, priv. comm.).

Table I

The visual magnitudes of HD 167971 in the UBV system.

J.D.-	V_J	J.D.-	V_J
4774.875	7.418	5971.524	7.435
4779.847	7.430	5972.538	7.375
4786.785	7.380	5973.528	7.660
4795.792	7.513	5974.556	7.393
5955.615	7.448	5978.559	7.595
5964.566	7.393	5979.542	7.393
5965.542	7.443	5981.566	7.468
5970.514	7.463		

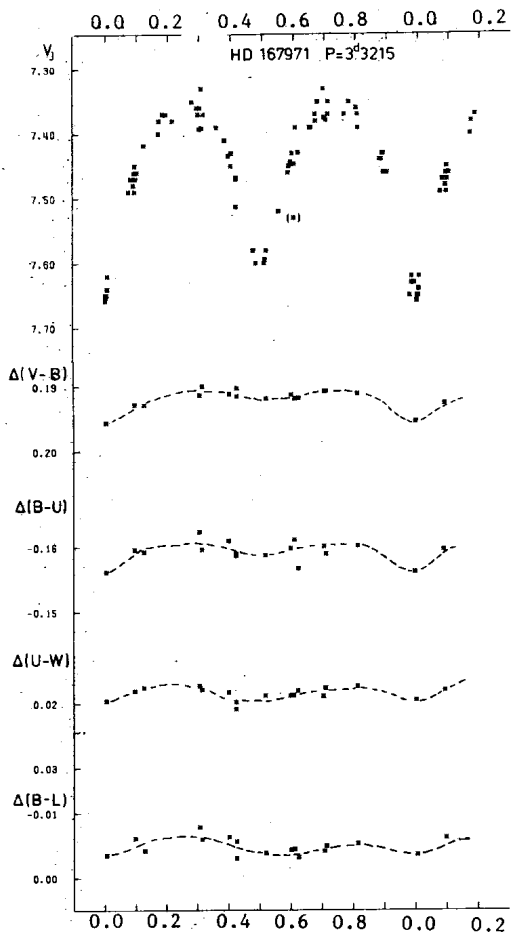


Figure 1

The primary and secondary minima have depths of $0^m.30$ and $0^m.25$, respectively. The other panels show in log intensity scale the relative colour variations with respect to the comparison star. The mean errors are usually ± 0.0005 . The primary minimum is deeper in V-B (equivalent to $(B-V)_j$) and perhaps also in B-U than the secondary one. The depths are roughly $0^m.012$ and $0^m.004$, respectively.

Although the number of observations is actually still too low to draw definite conclusions, the B-U curve appears to show the largest scatter. Other hot luminous stars also show a relative large scatter in the B-U index (the U band contains the Balmer limit) (van Genderen et al. 1985, van Genderen 1985). This fact suggests the presence of short time scale temperature - and/or density variations in the outer parts of these stars. Further observations are planned to enlarge the number of data.

HD 167971 is obviously a member of the small group of early type massive interacting systems to which also HD 57060 = UWCMA in NGC 2362 belongs (cf. Parthasarathy 1978; Herczeg et al. 1981).

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References:

- Cruz-Gonzalez, C., Recillas-Cruz, E., Costero, R., Peimbert, M., Torres-Peimbert, S.: 1974, *Rev. Mexicana Astron. Astrof.* 1, 211.
Forbes, D.: 1984, *Inf. Bull. Var. Stars* No. 2605.
van Genderen, A.M., Alpenaar, P., van der Bij, M.D.P., Deul, E.R., van Driel, W., van Heerde, G.M., de Lange, L., van Leeuwen, F., Meys, J.J.M., Oppe, J., Thé, P.S., Wiertz, M.J.J.: 1985, *Astron. Astrophys. Suppl.* (in press).
van Genderen, A.M.: 1985, *Astron. Astrophys.* (in press).
Herczeg, T., Drechsel, H., Rahe, J.: 1981, *Astron. Astrophys.* 104, 256.
Leitherer, C., Stahl, O., Zickgraf, F.-J., Klare, G., Wolf, B.: 1984, *Inf. Bull. Var. Stars* No. 2539.
Parthasarathy, M.: 1978, *Monthly Not. Roy. Astron. Soc.* 185, 485.
Pel, J.W.: 1983, Internal report.
Stahl, O., Forbes, D., Klare, G., Leitherer, C., Wolf, B., Zickgraf, F.-J.: 1985, *Inf. Bull. Var. Stars* No. 2726.