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CCD LIGHT CURVES OF V865 CYGNI

Wachmann (1961) discovered the thirteenth magnitude W UMa variable, V865 Cygni (HBV 235) as a result of his photographic search for variables in the Cygnus star cloud. Thirty-two epochs of minimum of light and a finder chart are included in his paper. Since his observations, V865 Cyg has been neglected.

The present observations of V865 Cyg were made from 16-19 June, 1990, inclusive. The RCA CCD camera system attached to the 1.07 m F/16 Hall reflector telescope was used at Lowell Observatory, Flagstaff, Arizona. The CCD local system approximated the standard Johnson-Cousins VR_cI_c photometric system and observations were transformed to determine R-I standard magnitudes. The chip was cooled with liquid Nitrogen throughout the observing interval to -130 ^{o} C. Approximate coordinates of the check, comparison and the variable star are given in Table 1. Neither the check nor the comparison star are known to have a catalog identification. About 80 images in V and R and 65 in I were obtained with integration times ranging from one to five minutes. Our observations failed to cover phases 0.6 to 0.85, inclusive, but they suffice to reveal important characteristics of the system.

TABLE 1

Star	R. A. (1990.5)	Dec. (1990.5)
V865 Cygni	$19^h\ 27^m\ 02.8^s$	$33^o\ 01'\ 58''$
Comparison	$19^h\ 27^m\ 06.2^s$	$33^o\ 02'\ 46''$
Check	$19^h\ 27^m\ 06.3^s$	$33^o\ 01'\ 08''$

Four mean epochs of minimum light were determined from the observations made during two primary and two secondary eclipses. The tracing paper method was used to determine the epochs of minimum

light in V, R and I on the first two nights. The bisection of chords technique was utilized to determine the primary epoch in V, R and I and the secondary epoch in V on the last night. An iterative technique based on the Hertzsprung method (1928) was used to determine the remaining epochs. The mean times of minimum light are given in Table 2. These epochs along with those by Wachmann (1961) were introduced into a least squares solution to obtain both a linear and a quadratic ephemeris. Our linear solution included only recent epochs from JD 2436000 on. The quadratic solution included all epochs except for three by Wachmann which were discordant. The improved ephemerides are:

$$\text{JD Hel Min. I} = 2448060.8912(15) + 0.36530170(9)d \cdot E \quad \text{and,}$$

$$\text{JD Hel Min. I} = 2448060.8912(9) + 0.3653026(2) \cdot E - 5.4(1.2) \times 10^{-11} d \cdot E^2$$

TABLE 2

JD HEL. 2400000+	Minimum	Cycles	$(O-C)_1$	$(O-C)_2$
48060.8921	I	0.0	0.0009	0.0009
48061.8061	II	2.5	0.0016	0.0016
48062.7158	I	5.0	-0.0020	-0.0020
48062.8998	II	5.5	-0.0006	-0.0006

The linear ephemeris was used to calculate the $(O-C)_1$ residuals in Table 2 and the phases of the present observations. The quadratic ephemeris was used to calculate the $(O-C)_2$ residuals.

The V, R light curves of V865 Cyg defined by the individual observations are shown in Figure 1 as normalized intensity versus phase. The light curves in Figure 1 are overlaid by our synthetic light curve solution. Our spotted solution reveals that the system is a contact binary with a mass ratio of about 0.45 and a fillout of 19 percent. The less massive component appears to undergo a brief occultation at the secondary minimum. The early analysis of this system was done by Scott Herr as part of his 1991 senior honors thesis. The final solution and hot spot parameters were determined largely by another undergraduate student, Jim Zetzl. Further details of the solution, along with a complete analysis will be discussed elsewhere.

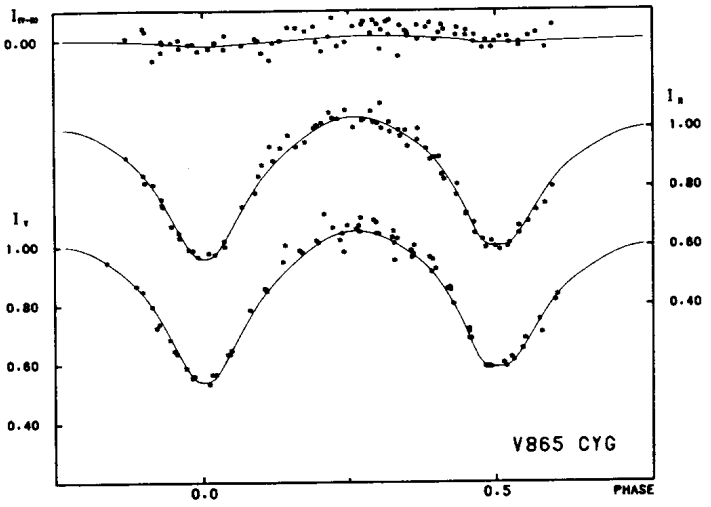

Fig. 1 - CCD Light curves of V865 Cyg as defined by the individual normalized intensities.

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