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PHOTOELECTRIC MINIMA AND NEW LIGHT CURVE OF V566 OPHIUCHI

The W Ursae Majoris-type eclipsing variable V566 Ophiuchi (BD $+5^{\circ}3547$= HD 163611) is a contact binary system, which undergoes complete eclipses. Its secondary eclipse is total. The variability of the star was discovered by Hoffmeister (1935) in 1935. Fresa (1954) was the first who took photoelectric observations for this star without filter. Binnendijk (1959) took photoelectric observations for V566 Oph using B and V filters. He noted that the period of its light variations had remained constant for 14 years.

Purgathofer and Widorn (1959), took series of photoelectric observations for this star. They noted that the primary minimum in yellow light showed an interval of constant light. Lucy (1967) constructed a model for the V566 Oph system. He found that there was a convective transportation of energy from the primary component through a narrow region in the common envelope surrounding the inner Lagrangian point of the secondary component of the system.

Bookmyer (1969,1976) took 2000 photoelectric observations through B and V filters. He also investigated all the available times of minimum light for the star. He found that the period of light variation of V566 Oph had increased after a period of constancy for at least eleven years. He noticed also that there were little variations in the shape of the light curve and deduced new ephemerides for the star. Berthier (1975) developed an accurate automatic numerical method for the analysis of W UMa system in order to determine the parameters of eclipsing systems from their observed light curves. He applied this method to V566 Oph and AB And. His results for V566 Oph were very close to those obtained before by Mochnacki and Doughty (1972).

Bahaev studied the changes in the spectrophotometric gradient and temperature of V566 Oph over its period of light variations in 1968-1970. His studies showed the existence of gaseous streams between the two components of the system.

Recently, V566 Oph attracted the attention of several investigators (Popovici, 1971; Kizilirmak and Pohl, 1974; Ebersberger et al., 1978; Maddox and Bookmyer, 1978; Niarchos, 1979; Dawson and Narayanasamy, 1977). They made series of photoelectric observations and deduced many times of minimum light for the star. These previous observations confirm the fact that the star V566 Oph is well known now to have a variable period and a slight variations in the shape of its light curve. So, it is important to follow the period behaviour of the star and obtain additional light curves.

The present photoelectric observations for V566 Oph were carried out through B and V filters during 10 nights in the time interval between 25 May and 10 August 1981. The observations have been carried out using a one beam photoelectric photometer attached to 74 in. reflector of Kottamia Observatory Egypt. The photometer has an EMI 9558B tube with S-20 photocathode, refrigerated by a propeller fan. The B and V filters are close to the standard system of Johnson and Morgan.

The amplified output of the tube was fed into a Brown recorder. The times of observations were estimated from the starting point and the mean moving speed of the strip chart recorder. A careful checking of the constancy of the chart speed was made every night by referring to the dome's main reference sidereal clock and the maximum error was found to be less than 6.7 sh^{-1}.

Every two groups of observations for V566 Oph were separated by an observation for one of some standard stars with known magnitudes chosen from B. Iriarte et al.'s catalogue, with the aim of the determinations of the extinction coefficients, scale factors and zero points of the equipment. These parameters were used to calculate the magnitudes of the variable and comparison star (BD $+4^{\circ}3553$) which was used before as a comparison by many investigators. During all the nights of observations the seeing conditions were at good photometric quality. Magnitude differences between the variable and comparison stars were measured and yielded 203 observations with B filter and the same number with V filter.

The individual observations of the present work will be deposited in the Archives of Comm. 27. Phases of each set of observations were computed from the ephemerides given by Dawson and Narayarasamy (1977):

$$M\ I = 244\ 0418.4931 + 0.40964431\ E$$

Our observations yielded two light curves for primary eclipse and three light curves for secondary eclipse of V566 Oph. So five heliocentric times of minimum light were determined by the method of bisecting chords which connect the points of equal magnitudes on the opposing branches near the minimum. The obtained heliocentric times of minimum light for V566 Oph are tabulated in Table I with their O-C residuals. The O-C residuals were calculated from the ephemerides given by Dawson and Narayanasamy. A comparison between the present O-C residuals and the other previously published values shows an increase in the period of V566 Oph.

Table I

Min.hel. 244 4000+	E	O-C	Filter	Rem
750.4902	10575.0	$+0^d.0085$	B	Min I
750.4901	10575.0	+0.0084	V	Min I
751.5173	10577.5	+0.0115	B	Min II
751.5162	10577.5	+0.0104	V	Min II
825.2512	10757.5	+0.0094	B	Min II
825.2510	10757.5	+0.0092	V	Min II
826.2742	10760.0	+0.0083	B	Min I
826.2739	10760.0	+0.0080	V	Min I
827.3005	10762.5	+0.0105	B	Min II
827.2992	10762.5	+0.0092	V	Min II

Also from the individual observations a complete light curve for each colour is constructed and both are illustrated in the Figure 1.

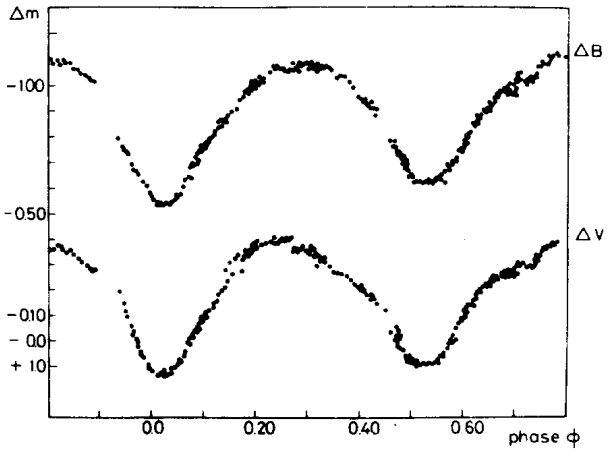

Figure 1 Light curve of V566 Ophiuchi

It can be easily seen that the secondary eclipse of the eclipsing binary V566 Oph is total and there is slight asymmetry in the shape of the light curve. This is in good agreement with the remark noted before by Bookmyer (1976). This means that the present photoelectric observations for the eclipsing binary V566 Oph are in accordance with those published before.

HAMID A. MAHDY and M.A. SOLIMAN

Helwan Institute of Astronomy and
Geophysics
Helwan, Egypt

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