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PHOTOMETRY OF HD 166181

HD 166181 is a single line spectroscopic binary with strong and narrow H and K emission. Heard (1956) reported its variable radial velocity and classified as G5 V. Nadal et al. (1974) gave the spectroscopic elements and showed that the velocities derived from CaII H and K emission are similar to those derived from absorption lines. They also assign G5 V type to the primary based on the absolute magnitude determined using the Wilson-Bappu's method. Based on eight nights' observation during January to August 1962, Eggen (1978) reported a variation of  $\sim 0.1^m$  in V.

The observation of HD 166181 was undertaken to see whether the "wavelike distortion" seen in most of the binaries with G-K spectra displaying CaII emission, is present. Hall (1976) has shown that these binaries are related to the well known eclipsing systems RS CVn and AR Lac.

HD 166181 was observed on seven nights in V and two nights in B filters from 25th March to 2nd April 1980 with the 34 cm reflector of the Kavalur Observatory. An unrefrigerated 1P21 together with the conventional d.c. set up was used for the observations. All measurements were made with respect to the comparison star HD 166435. Observations were corrected for atmospheric extinction using mean extinction values of  $k_V=0.25$  and  $k_{BV}=0.15$ . The magnitude difference in the sense HD 166181 - HD 166435, was determined and then transformed to the standard UBV system of Johnson and Morgan (Johnson, 1963). The transformation coefficients derived from the standard stars observations are  $c = 0.015 \pm 0.004$  and  $\mu = 1.098 \pm 0.003$ . Mean  $\Delta(B-V)$  of HD 166181 and

HD 166435 was used for the transformation of the visual observations to the standard system.

The constancy of HD 166435 was checked by observing differentially with HD 166093. The mean magnitude difference, HD 166093 - HD 166435, obtained by us is  $\Delta V = 0^m.397 \pm 0^m.004$ .

The results are summarized in Tables I and II.

Table I

B-V values of HD 166181 and comparison stars		
Star	Present Study	Eggen (1964)
HD 166435	$+0.629 \pm 0.005$	+0.62
HD 166181	$+0.697 \pm 0.008$	+0.72
HD 166093	$+1.360 \pm 0.005$	-

Table I gives the B-V values of the variable and comparisons obtained by us. The B-V values of HD 166181 and HD 166435 agree well with those given by Eggen (1964). Table II gives the Julian Day of observation and  $\Delta V$  values for the variable. Each  $\Delta V$  value is a mean of 3-4 independent observations. The total

Table II

Differential magnitudes of HD 166181

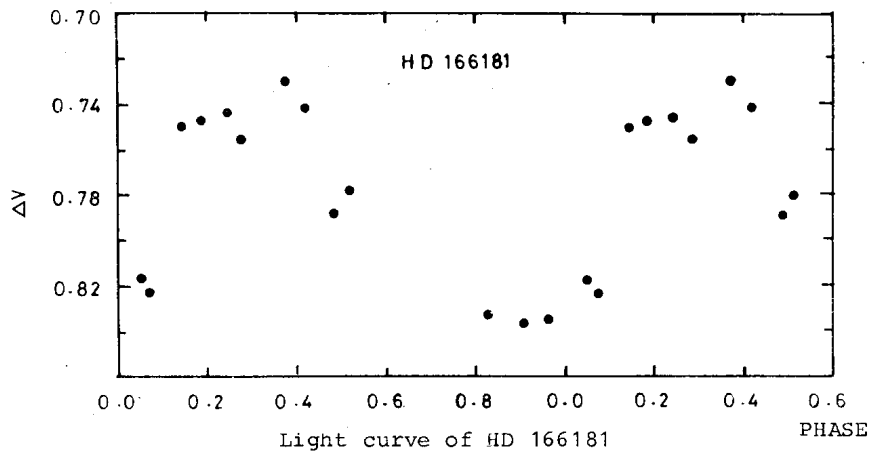
J.D. 2444000.+	$\Delta V$
323.4201	0.832
324.4162	0.729
324.4902	0.742
325.3831	0.836
325.4833	0.835
326.4152	0.788
326.4898	0.778
327.4444	0.816
327.4891	0.823
329.4307	0.750
329.4954	0.747
331.4122	0.746
331.4746	0.756

uncertainty in a  $\Delta V$  given in Table I is  $\pm 0^m.009$ .

The Julian Day of observation is converted to orbital phase using the ephemeris:

$$\text{Phase} = 2441931.127 + 1^d.8098368 \cdot E.$$

The initial epoch which corresponds to the Time of Periastron passage and the period are from Nadal et al. (1974). In the Figure the  $\Delta V$  values are plotted against the orbital phase. Though the phases of light variation are not well covered, the general trend of the variation is clear. The rise to maximum is



steep compared to the fall to the minimum. The minimum occurs at  $\sim 0^{\text{P}}.9$  and maximum at  $\sim 0^{\text{P}}.3$ . The amplitude of the light variation is  $\sim 0^{\text{M}}.1$ , comparable to the value reported by Eggen (1978).

HD 166181 is probably a member of the RS CVn group of binaries where the light variation is attributed to the presence of star spots rotationally modulating the observed flux (Eaton and Hall, 1979). It conforms to the main criteria laid down by Hall (1976). According to Nadal et al. (1974), the companion is an M dwarf. Usually the mass ratio in RS CVn systems is close to unity (Hall, 1976; Popper and Ulrich, 1977). The mass ratio of HD 166181 is far from unity and resembles RT Lac, a well known member of RS CVn group (Popper and Ulrich, 1977).

We are planning to obtain more photometric observations for the next few months.

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