

COMMISSION 27 OF THE I. A. U.  
INFORMATION BULLETIN ON VARIABLE STARS

Number 2904

Konkoly Observatory  
Budapest  
5 June 1986  
HU ISSN 0374-0676

STRÖMGREN uvby- $H_{\beta}$  PHOTOMETRY OF THE SOLAR TYPE STAR HD 206860

An observational program is currently being developed to obtain accurate four color uvby- $H_{\beta}$  photometry of some selected Ca II emission solar type stars (Wilson 1978, Vaughan et al. 1981). They have been monitored to check the existence of correlation between the chromospheric Ca II variability and the optical output in the shorter time scale (stellar rotation).

The existence of photometric variations in the group of stars given by Wilson have been reported by Dorren et al. (1982), Radick et al. (1982, 1983), showing the correlations between the chromospheric phenomena and the light fluctuations due the existence of spots associated to the activity centers on the stellar surface.

In this note we present the photometric results of the Ca II variable star HD 206860 = HR 8314 that shows a well defined light curve with a photometric period equal to the previously reported Ca II period (Vaughan et al. 1981).

The observations were carried out from July 21 to 31, 1985, using the 1.5m telescope at the Calar Alto Observatory (Almeria-Spain), located at 2165 m above the sea level. A multipurpose UBVR single channel, pulse-counting photometer was used. A general description of this instrument is given by Lahulla (1982).

Observations were made in each of the four Strömgren passbands and the Crawford  $H_{\beta}$  filters with 16 integration time in each band, followed by sky-background deflections. The observing sequence was the familiar pattern of sky-comparison-variable-comparison-sky.

The effects of differential atmospheric extinction were removed and the data reduced to differential magnitudes with respect to the comparison star HR 8313. Due to the close angular proximity of the comparison, the extinction effects were removed using the mean coefficients for each night. Only one comparison was used due to the nature of standard uvby of the HR 8313 (Crawford and Barnes 1970).

The transformations to the Crawford-Barnes standard system have been determined for stars of spectral type from A2 to G0 and luminosity class V (Reglero et al. 1986) and they can be used to transform the differential photometry to the standard system. In this particular case, the standard transformation could be affected by non negligible errors due to the uncertainties associated with the spectral type and luminosity class of the comparison star HR 8313 G0Ib. In order to preserve the intrinsic quality of the data, the results are given in the instrumental system.

One hour of observations was typically obtained each night and normal points were formed by averaging the individual measurements.

In Table I we list the nightly mean RMS dispersions ( $\bar{\sigma}$ ) for the normal points in the y band and (b-y),  $m_1$ ,  $c_1$  indices. The night-to-night RMS dispersion ( $\sigma$ ) is also given.

Table I

	y	b-y	$m_1$	$c_1$	$H_{\beta}$
$\bar{\sigma}$	.005	.004	.006	.009	.008
$\sigma$	.015	.005	.005	.005	.006

The y instrumental magnitude differences of HD 206860 with respect to the HR 8313 is plotted in Figure 1. The plot shows a well defined sinusoidal light curve with an amplitude  $\Delta y = .04$  mag., that corresponds to eight times the  $\bar{\sigma}$  confidence level for the y band. Period determinations give us a value of  $P = 4.7$  days equal to that previously obtained by Vaughan et al. (1981) with the Ca II emission-line measurements. This photometric period is in good accordance with the spectroscopically determined value of  $V \sin i = 11$  Km/s obtained by Kraft (1967).

Small (b-y) color variations can be deduced from Figure 1, with an amplitude of  $\Delta(b-y) = .012$  mag. This amplitude is correlated with the variations in y in the sense "redder when darker", that is consistent with the model of stellar activity due to the presence of dark spots on the stellar surface.

No noticeable variations are found in the  $m_1$  and  $c_1$  indices below the  $3\sigma$  confidence level.

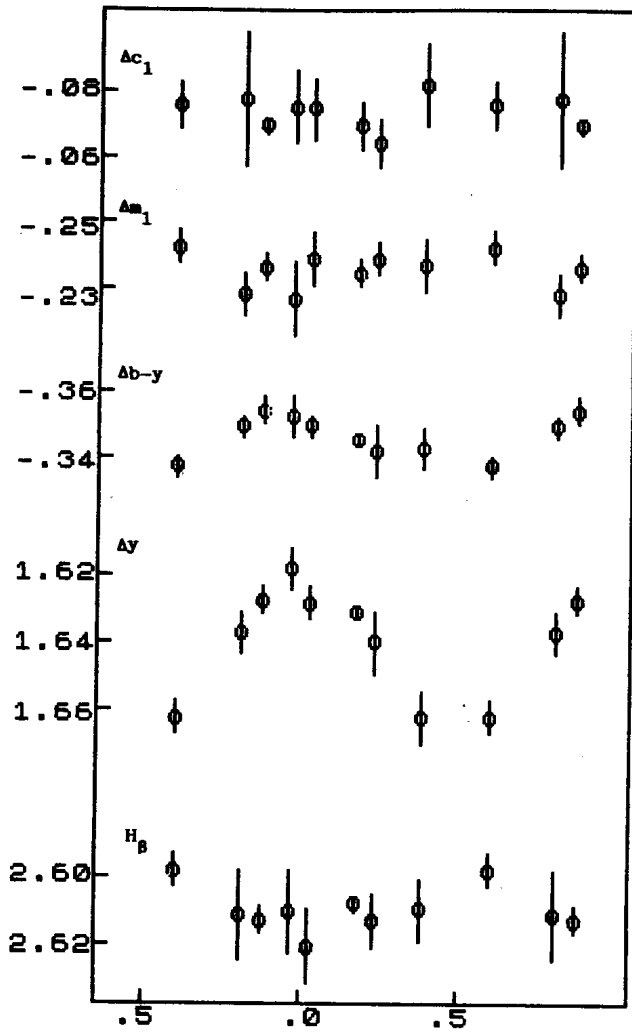


Figure 1: Photometric variations of HD 206860  
vs phase.

Simultaneous  $H_{\beta}$  photometry was made to check the behaviour of the Balmer hydrogen  $\beta$ -line against stellar rotation. The measurements were transformed to the Crawford standard system (Reglero et al. 1986). The plot  $H_{\beta}$  versus orbital phase is shown in the lower curve in Figure 1. A mean value of  $H_{\beta} = 2.610$  with a night-to-night dispersion  $\sigma = .006$  mag. is computed. Following the  $H_{\beta}$  calibration from Crawford and Mander (1986), this value is consistent with the GOV spectral type given by Kraft (1967) for HD 206860.

Further observations of this star and others in Wilson's group are required to establish the nature of the photometric variations.

This work was supported by the grant NO.3455/83 from the CAICYT.

V. REGLERO and J. FABREGAT

Departamento de Astronomía  
Universitat de València  
Valencia, Spain

A. DE CASTRO

Observatorio Astronomico de Madrid  
Madrid, Spain

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