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STRÖMGREN uvby-H_β PHOTOMETRY OF THE SOLAR TYPE STARS HD 152391 and HD 154417

An observational program is currently being developed to obtain accurate four color uvby-H_β photometry of some selected Ca II emission solar type stars (Wilson,1978). The existence of photometric variations in a selected sample of the Wilson's group have been reported by Dorren and Guinan (1982) and Radick et al. (1982,1983) in the shorter time scale (stellar rotation).

In this note we present the photometric results of the Ca II variables HD 152391 (SAO 121921) and HD 154417 (SAO 122056). HD 152391 has been monitored with particular interest due to the existing contradiction between the Ca II period P_{CaII} = 11 days (Vaughan et al., 1981, Baliunas et al., 1983) and the photometric period P_{ph} = 37 days suggested by Dorren and Guinan (1982).

The observations were carried out from July 16 to 29, 1984 for both stars and July 21 to 31, 1985 for HD 152391, using the 1.5 m telescope at the Calar Alto Observatory (Almeria, Spain), located at 2165 m over the sea level. A general purpose UBVRI single channel, pulse-counting, computer-controled photometer was used. A general description of the photometer and data acquisition equipment can be found in Lahulla (1982).

Observations were made in each of the four Strömgren passbands and Crawford n and w bands centered in the Balmer H_β line, with 16 sec integration time. The observing sequence was the familiar pattern of sky-comparison-variable-variable-comparison-sky.

The effects of differential atmospheric extintion were removed and the data reduced to differential magnitudes with respect to the comparison stars.

For HD 152391 two comparison stars were selected. Comparison = HD 152449 (spectral type F8, V=7.4) and chek = BD -01° 3268 (spectral type F0V, V=6.2). These stars were previously used by Radick et al. (1983) and Dorren and Guinan (1982).

For HD 154417 the comparisons are: comparison = BD $+00^\circ$ 3649 = SAO 122146 (spectral type G5IV, V = 6.1) and check = BD $+00^\circ$ 3654 (spectral type F5, V = 6.5).

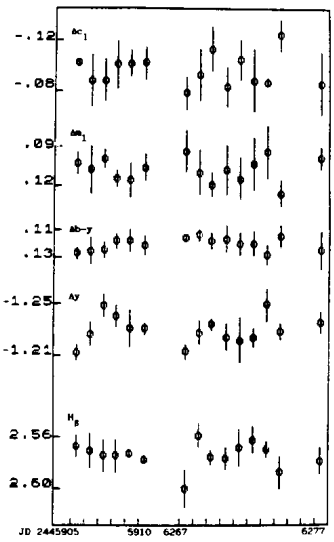

Figure 1 Photometric variations of HD 152391 versus Julian Date.

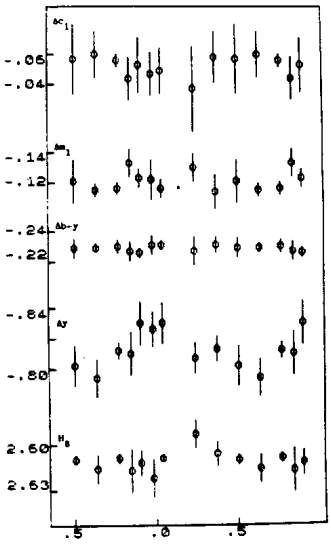

Figure 2 Photometric variations of HD 154417 versus phase.

Both pairs of comparison-check stars were plotted as a function of time and the residuals were used to test the possible sensitivity changes, variable extinction and intrinsic variability in the comparisons.

An hour of observations was tipically obtained each night and normal points were formed by averaging the individual measurements. The σ night-to-night RMS dispersion for the normal points of pairs comparison-check for the y band and b-y, m_1, c_1 indices are given in Table I.

Table I

	σ(y)	σ(b-y)	σ(m_1)	σ(c_1)
(c-ck) HD 152391 1984	.010	.004	.008	.014
(c-ck) HD 152391 1985	.011	.004	.006	.012
(c-ck) HD 154417 1984	.006	.003	.006	.006

The reduced magnitude differences HD 152391 - C and HD 154417 - C in the y band and b-y, m_1, c_1 indices versus Julian Date and phase, respectively, are plotted in Figures 1 and 2.

From Fig. 1 we can see a remarkable constancy in the 1985 y data over an observational period equal to the previously computed Ca II period. The absence of well defined photometric variations can be interpreted as a consequence of the long term variations (cycles). Wilson (1978) gives a P_{cyc} = 12 years for the HD 152391 with a minimum in the year 1975 which predicts a new minimum in 1987. If the spot activity is correlated with the Ca II emission, like in the Sun, the absence of photometric variations (or below the observational uncertainties) in the 1985 data is consistent with the predicted stellar cycle. More observations are needed in the next years to confirm it.

The scatter is higher in the 1984 data, showing an amplitude variation of .03 - .04 in the y band which is in the same range that the amplitudes calculated by Radick et al. (1983). Unfortunately the period coverage is not long enough to compute a defined photometric period and associated amplitude.

Fig. 2 shows the light curve for the HD 154417 in 1984 season. An amplitude of .03 - .04 in y band with a period around 8 days can be deduced. If this amplitude is compared with the RMS errors given in Table I, we can see that it is over 5σ level. No significant color variations can be deduced from the data. On the other hand the photometric period is consistent with the Ca II data from Vaughan et al. (1981).

A more detailed discussion of the complete uvby and H_β photometry will be published elsewhere. This work was supported by grant nº 3455/83 from CAICYT.

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