

COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2323

Konkoly Observatory
Budapest
26 April 1983
HU ISSN 0374 - 0676

OBSERVATIONS OF THE RS CVn STAR HD 26337
WITH THE INTERNATIONAL ULTRAVIOLET EXPLORER SATELLITE

HD 26337 ($m_v = +7.05$; G5 IV) was recently discovered to be a single-line spectroscopic binary and a low amplitude light variable by Fekel et al. (1982). This star had been previously listed by Bidelman and MacConnell (1973) as having noticeable Ca II H+K emission. Fekel et al. confirm this result and report moderately strong Ca II H+K emission and rotationally broadened absorption features indicating a $v \sin i$ of about 40-45 km/s. A preliminary analysis of radial velocity observations obtained on 10 nights by Fekel et al. indicates an orbital period of $2^d.04414 \pm 0^d.00047$ with a velocity amplitude of about 50 km/s. Their photoelectric photometry, obtained chiefly in the V-bandpass, on 4 nights during 1979/80 and 24 nights during 1980/81 reveal the star to be a light variable having a quasisinusoidal light curve with an amplitude of about $0^m.16$. In addition, the photometric period, presumably marking stellar evolution, appears to be slightly shorter (by 0.3%) than the orbital period, where the light elements given by Fekel et al. are:

$$t_{\min} = \text{JD } 2444635.65 + 2^d.038 E \quad (1)$$

The strong Ca II H+K emission, the mid-G spectral type, and the $2^d.04$ quasi-sinusoidal light variation with a period nearly synchronous with its orbital period reported for HD 26337 all are characteristics of RS CVn variables as defined by Hall (1976).

HD 26337 was observed on 4 days between 1982 December and 1983 March with the International Ultraviolet Explorer (IUE) satellite in order to obtain ultraviolet spectra in the vicinity of the chromospheric Mg II h+k features at $\lambda 2800$. A comprehensive description of the IUE satellite and its scientific instrumentation is given by Boggess et al. (1978). During our observations of the star, the Fine Error Sensor (FES) on board the satellite was used as a photometer to measure the optical brightness of the star. Because the absolute sensitivity of the FES can vary up to $\sim 0^m.10$ over a day, we measured the brightness of HD 26337 with respect to the nearby comparison star 37 Eri (HD 26409). This is the same comparison star used in the ground-based photometry

for which Nicolet (1978) gives $V = +5.44^m$ and $B-V = +0.94^m$. The comparison star was observed before and after the variable star with both stars placed at the same reference position of the detector. The relative brightness of each star was obtained by averaging the count rates from multiple scans of the image dissector of the FES where the precision of the relative magnitudes is about $\pm 0.01^m$. The counts were converted to V-magnitudes of the UBV system by using the calibration of Holm and Crabb (1979). In making differential measures, the transformation equation simplifies to:

$$\Delta V_{1-2} = -2.5 \log (C_1/C_2) - 0.24 \Delta(B-V)_{1-2} \quad (2)$$

where C_1 , C_2 are the FES count rates for stars 1 and 2, and $\Delta(B-V)_{1-2}$ is the difference in the (B-V) colors of the two stars. Fekel et al. report a mean color difference between the variable and comparison stars of $\Delta(B-V)_{V-C} = -0.27^m$, and we adopted that value in the reductions. The similarity of the B-V indices of the comparison and variable stars diminishes the effect of the color term of the transformation equation and increases the accuracy of the ΔV determination.

The differential V magnitudes, in the sense variable minus comparison, are plotted against the photometric phase in Fig. 1. The 1979/80 and 1980/81 ΔV measures of HD 26337, reported by Fekel et al., also are plotted in the figure. As shown, the mean brightness of the star has decreased from $\Delta V = +1.62$ during 1980/81 to $\Delta V = +1.81$ during 1982/83. Furthermore, there is an indication from the 1979/80 data that the star was brighter during that year with an estimated mean brightness of $\Delta V = +1.57^m$.

In addition to a decrease in the mean brightness of the star with time, it also appears that the amplitude of the light curve has lessened from about 0.16^m in 1980/81 to about 0.10^m in 1982/83. The phase of light minimum is not well determined by the 1982/83 observations, but from the few observations obtained, it appears to be close to that predicted using Eq. (1).

As in the case of other RS CVn variables, if the light variation of HD 26337 arises from the presence of a nonuniform longitudinal distribution of surface inhomogeneities (=starspots) on a rotating star, then the observed changes in the light curves with time imply substantial changes in the relative spot distribution as well as in the total spotted area. To a first approximation, the observed decrease in the mean light of the star implies an overall increase in the total area of starspots that are in view. The decrease in light amplitude coupled with the decrease in mean brightness indicates an increase in the spotted area along with a net movement of the spot centers toward higher latitudes (i.e. toward the rotational pole of the star that is in view). Similar light curve changes were reported by Dorren and Guinan

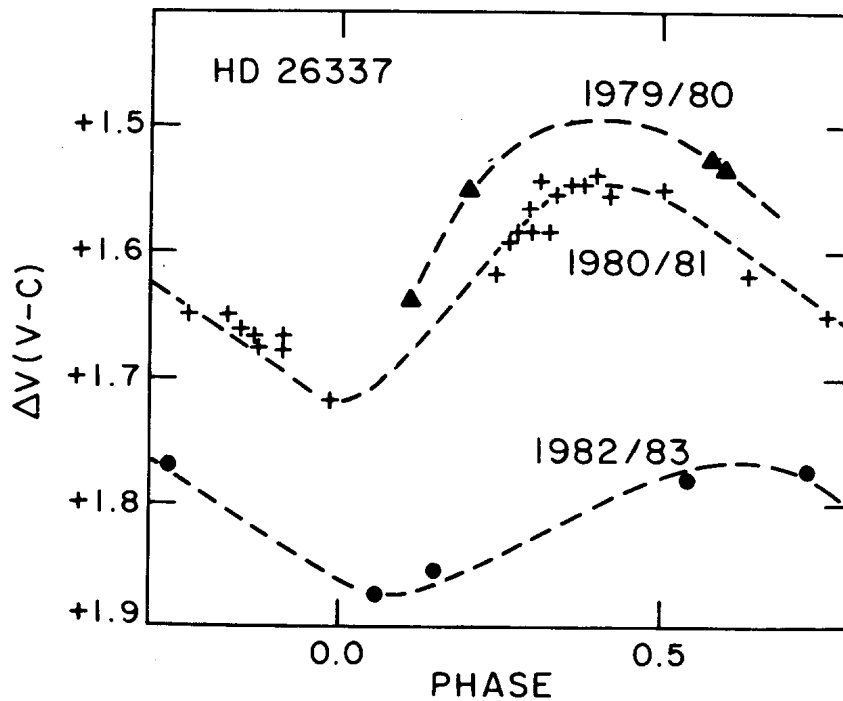


Figure 1. The differential V-magnitudes of HD 26337 (measured relative to 37 Eri) plotted against photometric phase, where the phases were computed from Eq. (1). The 1979/80 and the 1980/81 observations are from Fekel et al. The 1982/83 observations were obtained with the Fine Error Sensor (FES) on board the IUE satellite.

(1982) for the bright RS CVn variable V 711 Tau (=HR 1099) and by Guinan et al. (1982) for UX Ari.

Preliminary reductions of the ultraviolet spectra of HD 26337 reveal moderately strong and variable Mg II h+k λ 2800 emission, indicative of a chromospherically active star. We plan to report on the ultraviolet observations in a subsequent paper. More photometry of HD 26337 is certainly desirable to define the nature of the long-term changes in the light curve suggested by the existing data.

We are happy to acknowledge support for this work from NASA research grant NAG5-87.

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