COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 2409

Konkoly Observatory
Budapest
10 October 1983
HU ISSN 0374-0676

HD 37824 : A NEW VARIABLE STAR

Because Bidelman and MacConnell (1973) reported Ca II H and K emission, we suspected HD 37824 might be an RS CVn binary and therefore might show the photometric wave characteristic of most stars of that type. According to their table VII, $m_v = 7^m.2$ and the spectral type is K1 III + F. In a preprint sent us by Bopp (1983), a spectral scan shows the H and K reversals extending somewhat above the continuum.

During three observing seasons we obtained differential photometry in V of the UBV system using BD +4°1008 as the comparison star. In 1980/81 54 observations were obtained on 18 nights at Dyer, Louth, and Scuppernong Observatories. In 1981/82 36 observations were obtained on 12 nights at Cloudcroft Observatory. In 1982/83 44 observations were obtained at McDonald Observatory. The telescope apertures at those five observatories were 24-inch, 11-inch, 10-inch, 48-inch, 36-inch, and 30-inch, respectively, with the last two both at McDonald.

HD 37824 is definitely variable. The 1982/83 photometry showed the largest variation, $0^m.11$ in V, and the most clearly defined light curve. Inspection of that photometry indicated a period of about 26 days and a nearly sinusoidal shape or about 52 days and a double-humped sinusoidal shape. Two lines of reasoning led us to favor a period around 52 days. (1) Although the 1980/81 and 1981/82 light curves showed smaller amplitudes and were less well defined, the 1980/81 light curve plotted with respect to a 52-day period showed one minimum considerably deeper than the other. (2) Not-yet-published radial velocity measures obtained by Fekel (1983), when analyzed with a period-finding program of Bopp et al. (1970), indicated equally good fits with orbital periods of $53^d.6$ and $25^d.1$. The shorter period, however, implied a very large (and hence unlikely) orbital eccentricity.

If the orbital period indeed is around $53^d.6$ and if the photometric variation is a consequence of nearly synchronous rotation, then the correct photometric period should be around 52 days. To refine that value we de-

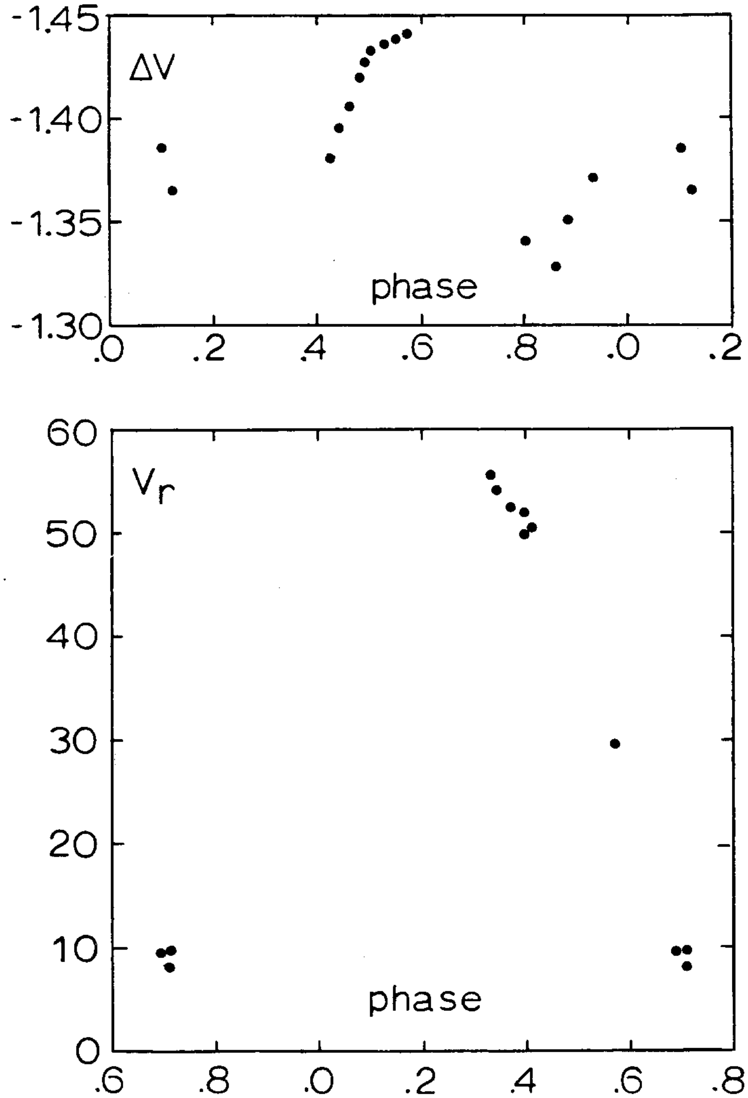

Figure 1

The light curve (top) and the radial velocity curve (bottom).

termined times of minimum light from our three seasons of photometry, although gaps in the coverage made some of those determinations uncertain. The result was $52^{d}.6$. The difference between P(phtm.) = $52^{d}.6$ and P(orb.) = $53^{d}.6$ indicates rotation 2% faster than synchronous.

The upper part of Figure 1 shows the 1982/83 observations from McDonald Observatory plotted versus phase computed with the ephemeris

$$\text{JD } 2,445,000.0 + 52^{d}.6\ n\ ,$$

where the initial epoch has been chosen arbitrarily. Each point is a nightly mean. The lower part of Figure 1 shows the radial velocity measures of Fekel plotted versus phase computed with the ephemeris

$$\text{JD } 2,444,000.0 + 53^{d}.6\ n\ ,$$

where again the initial epoch has been chosen arbitrarily. The ordinate has units of km/sec.

HD 37824 would profit from additional observation, both photometric and spectroscopic. Better phase coverage would verify that the above periods are not in error by a factor two, and a longer baseline in time would improve our determination of the difference between P(phtm.) and P(orb.). A complete radial velocity curve would yield a solution for the orbital elements. And additional photometry might reveal interesting changes in the shape of the double-humped light curve, which we suspect already occurred between 1980/81 and 1982/83.

We are all very grateful to Dr. Francis C. Fekel, Jr. for letting us examine his radial velocity measures before they are published.

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References:

Bidelman, W. P. and MacConnell, D. J. 1973, A.J. 78, 687.

Bopp, B. W. 1983, private communication.

Bopp, B. W., Evans, D. S., and Laing, J. D. 1970, M.N. 147, 355.

Fekel, F. C. 1983, private communication.