

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

Number 3693

Konkoly Observatory
Budapest
2 January 1992
HU ISSN 0374 - 0676

TWO-SPOT MODELLING OF HD 106225 = HU Vir IN 1990 AND 1991

HD 106225 was found to be variable by Fekel, Hall, and Henry (1984) and later given the name HU Vir in the 68th Name List of Variable Stars. Their 1982 photometry showed a range of 0^m25 in V and a period of $10^d6 \pm 0^d1$. As No. 82 in the Catalogue of Chromospherically Active Binaries (Strassmeier et al. 1988), it is a KO III SB1 with an orbital period of 10^d330 , a negligible eccentricity, and a $V \sin i$ of 25 km/sec.

Differential photoelectric photometry obtained in the B and V band-passes during 1990 and 1991 with the 16-inch automatic telescope described by Henry, Nagarajan, and Busby (1991) confirms the variability. The Julian date ranges covered were 2,447,987.8 to 2,448,042.7 and 2,448,292.9 to 2,448,437.7 and the comparison star was HD 105796, the same one used by Fekel, Hall, and Henry (1984).

We fit the two years of data, separately, with the two-spot modelling procedure developed by Hall, Henry, and Sowell (1990). The resulting parameters are shown in Table 1 (for the V-band data) and Table 2 (for the B-band data). In both years there were two starspots on the KO III star, one larger than the other. In both years and for both spots the light loss was a little greater in B than in V. The two spots in 1990 had rotation periods which were equal within their uncertainties but the two spots in 1991 had significantly different rotation periods. The brightness at maximum, when both spots were turned away from view, increased by about 0^m03 in V and 0^m02 in B between 1990 and 1991. The rms deviation from the four fits ranged from $\pm 0^m006$ to $\pm 0^m013$.

Figure 1 shows the V-band light curves in 1990 and 1991, with the individual observations as points and the parameters from Table 1 as solid curves.

The four different spots show rotation periods which span a range of 2.3 percent. If this is presumed to result from differential rotation, then we can follow the procedure of Hall and Busby (1990, figure 2) to estimate the differential rotation coefficient k . With four spots, we have $n = 4$ and hence $f = 0.45$. The result is then $k = 0.023/0.45 = 0.05$. Note that this value fits almost perfectly on the k vs. $P(\text{rot.})$ relation established by Hall (1991, eqtn. 2) for a larger sample of spotted stars. For the Sun, by comparison, $k = 0.19$.

This work was supported by N.A.S.A. research grant N.A.G. 8-111.

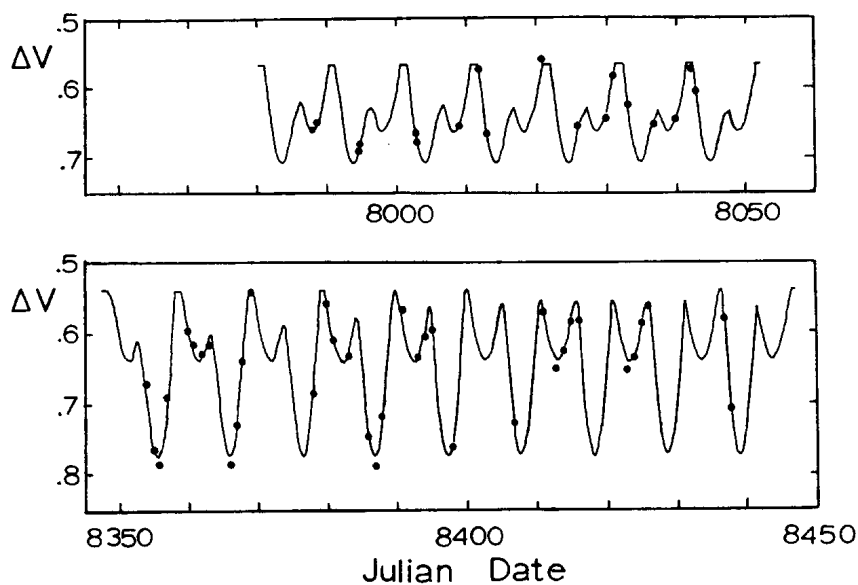


Figure 1. Light curve of HD 106225 = HU Vir in 1990 (top) and 1991 (bottom). Each point is differential magnitude in V with respect to HD 105796. The solid curves represent the two-spot model fits, taken from Table 1.

Table 1. Parameters of the two-spot model fits - V bandpass

epoch	rms	max.	spot	period	JD(min.)	ampl.
1990.34	± 0.006	0.568 ± 0.002	A	10.22 ± 0.01	7993.68 ± 0.03	0.142 ± 0.004
			B	10.18 ± 0.02	7997.83 ± 0.15	0.097 ± 0.004
1991.30	± 0.012	0.541 ± 0.002	A	10.44 ± 0.01	8365.80 ± 0.03	0.232 ± 0.004
			B	10.27 ± 0.04	8371.81 ± 0.08	0.098 ± 0.004

Table 2. Parameters of the two-spot model fits - B bandpass

epoch	rms	max.	spot	period	JD(min.)	ampl.
1990.34	± 0.011	0.481 ± 0.003	A	10.20 ± 0.02	7993.72 ± 0.05	0.168 ± 0.007
			B	10.20 ± 0.03	7997.75 ± 0.11	0.113 ± 0.006
1991.30	± 0.013	0.458 ± 0.002	A	10.43 ± 0.01	8365.81 ± 0.03	0.264 ± 0.004
			B	10.27 ± 0.02	8371.83 ± 0.07	0.108 ± 0.005

DOUGLAS S. HALL

Dyer Observatory
 Vanderbilt University
 Nashville, Tennessee 37235
 U.S.A.

GREGORY W. HENRY

Center of Excellence in Information Systems
 Tennessee State University
 Nashville, Tennessee 37203
 U.S.A.

References:

- Fekel, F.C., Hall, D.S., and Henry, G.W. 1984, I.B.V.S. No. 2543.
 Hall, D.S. 1991, in The Sun and Cool Stars: Activity, Magnetism, Dynamos,
 edited by I. Tuominen, D. Moss, and G. Rüdiger (Berlin: Springer-
 Verlag), p. 353.
 Hall, D.S. and Busby, M.R. 1990, in Active Close Binaries, edited by
 C. Ibanoglu (Dordrecht: Kluwer), p. 377.
 Hall, D.S., Henry, G.W., and Sowell, J.R. 1990, A. J. **99**, 396.
 Henry, G.W., Nagarajan, R., and Busby, M.R. 1991, I.A.P.P.P. Comm.
 No. 45, 11.
 Strassmeier, K.G., Hall, D.S., Zeilik, M., Nelson, E., Eker, Z., and
 Fekel, F.C. 1988, Astr. Astrophys. Suppl. **72**, 291.