

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

Number 2691

Konkoly Observatory
Budapest
25 March 1985
HU ISSN 0374 - 0676

HD 102077 - A NEW BY DRACONIS STAR? *

HD 102077 was proposed to be a southern RS CVn candidate by Weiler and Stencel (1979) on account of the strong emission in the H&K/CaII lines. Bopp and Hearnshaw (1983) found also the H_{α} absorption line nearly totally filled with an emission feature, confirming the outstanding chromospheric activity of this star. According to Houk and Cowley (1975) the spectral type of HD 102077 is KO/1 Vp.

HD 102077 was included in our photometric observing program of the southern chromospherically active stars. The discovery of its optical variability was recently reported by us (Udalski and Geyer, 1984). Here we present the full light and colour curves of HD 102077 obtained in 1984.

UBVRI photometry of HD 102077 was carried out during 10 nights between 14 and 24 April, 1984, at the European Southern Observatory - La Silla. The ESO 50 cm telescope, equipped with a single beam photometer and thermoelectrically cooled gallium-arsenide RCA 31034 photomultiplier, was used. The standard set of filters as described by Bessell (1979) approximates the standard UBVRI Cousins-Bessell system. HD 102076 served as the primary and HD 102202 as a secondary comparison star. Both stars turned out to be constant within $0^m.01$. The UBVRI-values of the comparison stars were obtained during 8 nights under the best sky conditions by observing up to 30 standard stars per night to derive the extinction-and the instrumental transformation coefficients. The relevant V-magnitudes and colours of the comparison stars are listed in Table I. The obtained standard errors for the single observations are $0^m.015$, $0^m.008$, $0^m.007$, $0^m.006$ and $0^m.005$ in the UBVRI colour bands, respectively. They include the error of observations and transformation to the standard system.

The variability of HD 102077 could be established beyond any doubt. During our observing run, the star changed its brightness in the range of $0^m.08$ in V band. We tried to derive the photometric period using the PDM ("phase dispersion minimization") method, described by Stellingwerf (1978).

* Based on observations collected at European Southern Observatory La Silla, Chile

HD 102077

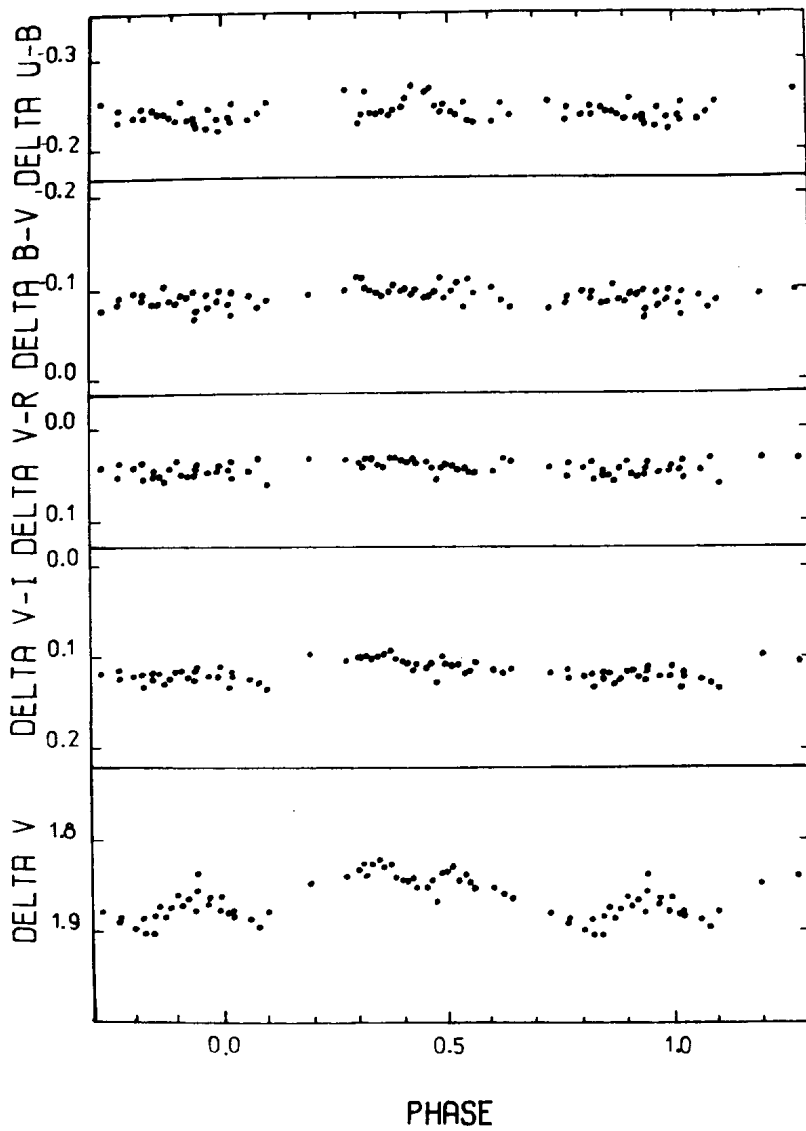


Figure 1

Table I. V magnitudes and colours of the comparison stars for HD 102077

Star	V	B-V	U-B	V-R	V-I
HD 102076	7. ^m 110	1. ^m 004	0. ^m 751	0. ^m 514	0. ^m 971
m.e.	.011	.006	.011	.005	.007
HD 102202	8.849	0.676	0.187	0.380	0.716
m.e.	.016	.008	.017	.007	.008

Table II. The average colours and V magnitudes of HD 102077 in 1984

	V	B-V	U-B	V-R	V-I
HD 102077	8. ^m 97	0. ^m 91	0. ^m 51	0. ^m 56	1. ^m 09

The light curve dispersion - period dependence resulting from the PDM method, yields two minima corresponding to periods 1.^d84 and 2.^d2. The accuracy of the thus derived periods is about 9% and is a consequence of the short duration of our run. We prefer rather $P=1.^d84$ as the photometric period because the V and colour curves seem to be smoother than with the 2.^d2 trial period. Further observations will certainly solve this ambiguity.

Figure 1 shows the V and colour curves based on the light elements:

$$J.D.hel. = 2445805.4 + 1.^d84 \cdot E.$$

Here the initial epoch was chosen arbitrarily. The magnitude differences are given in the sense variable minus comparison star. The shape of the V light curve is somewhat complicated: there are two maxima - a broad one with some irregularities (light curve depression) around the phase 0.4 and a small secondary maximum at phase 0.95. The colour changes are marginal, and only in the V-I colour weak variations are noticeable. They seem to be correlated with the V luminosity, i.e. the star seems to be bluer during the broad maximum of light.

The late spectral type, the fast rotation, the complicated light curve shape and the correlation between the V magnitude and the V-I colour suggest that the photometric light variations are due to the presence of subluminal areas on the photosphere of HD 102077 being also the cause for the enhanced chromospheric activity of the object. Unfortunately, up to now there is no further information about the spectral behaviour of HD 102077 like radial velocity variations confirming the duplicity, or the presence of some lines which are characteristic for spot activity. Therefore, it is not possible to classify properly HD 102077 among the chromospherically active stars. We believe, if the spectral classification for HD 102077 is correct to be a

main sequence KO/1 dwarf (Houk and Cowley, 1975), HD 102077 fulfils the criteria for a BY Draconis type object of chromospherically active stars (Bopp and Fekel, 1977).

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References:

- Bessell, M.S.: 1979, Pub. A.S.P., 91, 589
 Bopp, B.W. and Fekel, F.: 1977, A.J., 82, 490
 Bopp, B.W. and Hearnshaw, J.B.: 1983, Ap.J., 267, 653
 Houk, N., and Cowley, A.: 1975, Michigan Catalogue of Two-Dimensional Spectral Types for the HD Stars, Vol.1
 Stellingwerf, R.F.: 1978, Ap.J., 224, 953
 Udalski, A., and Geyer, E.H.: 1984, Inf.Bull.Var.Stars, No.2525
 Weiler, E.J., and Stencel, R.E.: 1979, A.J., 84, 1372