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BD +4° 4009, A NEW BRIGHT CEPHEID VARIABLE

While observing the cepheid variable FN Aql, the star BD +4° 4009 = HD 179315 served as a check star for verifying the constancy of the comparison star BD +3° 3938. These observations revealed the variability of BD +4° 4009. The observations were made with the 24 inch reflector of the Konkoly Observatory using an uncooled EMI 9502B photomultiplier and standard B and V filters. 56 differential BV observations were made with respect to BD +3° 3938 (see Table 1). The adopted magnitudes of this comparison star are as follows:

$$V = 9^m.31, \quad B-V = 1^m.26$$

Frequency analysis of the data set was performed by using Deeming's (1975) technique of Fourier analysis of unequally spaced data. The calculation of the spectral window enabled us to identify the alias peaks in the power spectrum due to data sampling.

There were no prominent peaks in the power spectrum (from 0.01 c/d to 0.5 c/d) other than the peak at 0.133725 c/d and its aliases at the frequencies 0.131060 c/d and 0.136169 c/d (see Fig. 1). These subsidiary frequencies are due to the just

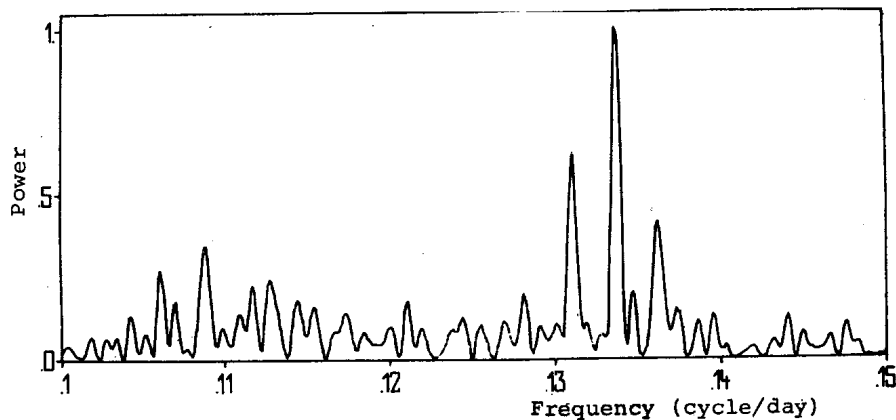


Figure 1

over one year's periodicity (368.75 days) in the data sampling. All the other smaller peaks (not exceeding one half of the value of the largest peak) can easily be explained due to aliasing of the main period by other smaller (lower than 0.18) peaks in the spectral window. Though the frequency of the data sampling was less than 1 c/d the power spectrum was computed up to 2 c/d. There were some peaks with considerable power value in the interval 0.5 - 2.0 c/d but all these are 1 day and 1 year aliases of the fundamental frequency. Moreover, the only reliable light curve, when using different frequencies, is the one plotted with  $f=0.133725$  c/d, that is, with a period of  $7^d.47803$ .

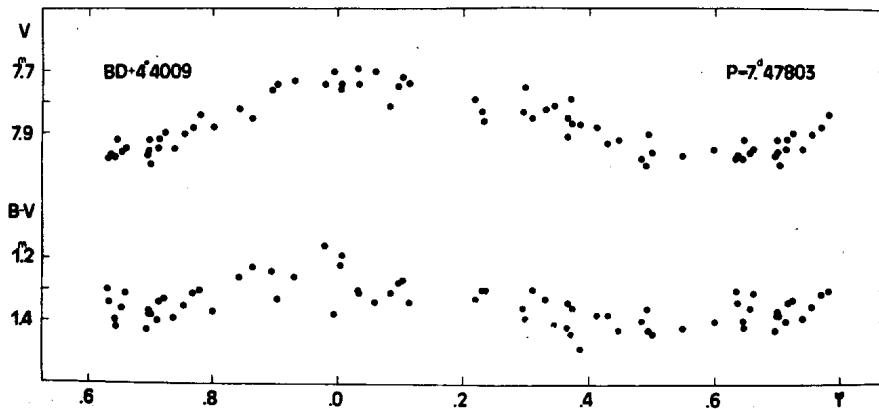


Figure 2

According to the light and colour curves in Fig. 2 the new variable is a cepheid. Though the amplitudes of the light and colour variations are smaller than would be expected for a cepheid with a period of  $7^d.5$ , a small bump is suspected on the descending branch of the light curve ( $0^d.3$  after the maximum), the presence of which is characteristic of cepheid variables with such a value of the period. The reduced amplitudes ( $A_V = 0^m.26$ ,  $A_{B-V} = 0^m.16$ ) are likely to be due an unseen companion. The light curve is not symmetrical (or sinusoidal). This fact and the likelihood of a bump on the descending branch excludes this star belonging to the Cs subgroup of cepheids (small amplitude cepheids). The HD spectral type is K2, which is in accordance with the cepheid type variability, but more precise spectroscopic observations are desirable to prove the binary

Table 1

J.D.Hel. 2440000+	V	B-V	J.D.Hel. 2440000+	V	B-V
2297.325	7 <sup>m</sup> .88	1 <sup>m</sup> .37	3693.455	7 <sup>m</sup> .96	1 <sup>m</sup> .44
2304.329	7.95	1.39	3712.398	7.69	1.30
2523.591	7.70	1.34	3717.366	7.92	1.38
2589.449	7.85	1.23	3721.354	7.83	1.30
2620.392	7.76	1.22	3750.316	7.72	1.27
2623.440	7.88	1.38	3769.324	7.92	1.42
2669.323	7.97	1.42	3778.278	7.82	1.26
2673.330	7.81	1.31	3790.275	7.92	1.43
2675.277	7.81	1.41	3792.268	7.92	1.34
2708.253	7.90	1.35	4011.528	7.74	1.31
2871.605	7.95	1.40	4020.493	7.86	1.30
2904.570	7.74	1.19	4021.482	7.91	1.42
2960.475	7.98	1.40	4021.535	7.87	1.36
3287.538	7.79	1.33	4049.389	7.75	1.28
3304.527	8.00	1.36	4049.516	7.74	1.34
3337.523	7.74	1.33	4054.412	7.88	1.31
3340.485	7.75	1.39	4054.501	7.84	1.30
3350.449	7.98	1.30:	4066.393	7.79:	1.44:
3363.416	7.85	1.34	4066.507	7.87	1.49:
3364.371	7.90	1.43	4083.385	7.98	1.40
3382.331	7.76	1.24	4083.463	7.96	1.36
3385.327	7.83	1.36	4088.372	7.85	1.30
3386.324	7.93	1.38	4088.518	7.82	1.33
3388.315	7.97	1.43	4108.331	7.74	1.16:
3388.363	8.00	1.38	4108.436	7.70	1.38:
3403.297	7.96	1.37	4128.388	7.95	1.31
3403.400	7.95	1.40	4130.406	7.73	1.26
3679.505	7.97	1.34	4136.324	7.90	1.33

nature of this cepheid variable.

The current elements of the light variation are:

$$\text{Max.} = \text{J.D. } 2443398.071 + 7^{\text{d}}.47803 \text{ E} .$$

It is worth mentioning that the star BD +4<sup>o</sup> 4010 which is near the new variable BD +4<sup>o</sup> 4009 was reported to be variable by Kurochkin (1950). The former of the two stars was denoted SVS 1070. The new cepheid variable BD +4<sup>o</sup> 4009 was used as the only brighter comparison star during the investigation which led to the discovery of the light variations in SVS 1070. Its published photographic amplitude (0.<sup>m</sup>4) is equal to the amplitude of BD +4<sup>o</sup> 4009 in B. It is possible that the observed light variations in SVS 1070 are not real but are (at least partly) caused by the variability of its comparison star.

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