COMMISSION 27 OF THE I. A. U.
INFORMATION BULLETIN ON VARIABLE STARS
Number 3211

Konkoly Observatory
Budapest
4 July 1988
HU ISSN 0374-0676

VBI LIGHT CURVES OF CC And[1]

The δ Scuti type pulsating variable CC And was found by Eggen and Lindblad (1953) to have a period of 0.1249 days and a light amplitude V varying between 0.11 and 0.32 magnitudes. Fitch (1960) found a maximum yellow light curve amplitude of 0.25 magnitudes in the fundamental mode. Three other periods due to resonance-excited modes were also detected. Fitch also found a beat period of 5.233 days, based on observations over twenty seven nights.
As part of an ongoing study of large-amplitude δ Scuti stars at the University of Calgary, and in fulfillment of their observing requirements in a senior undergraduate astrophysics laboratory course, C.R. and J.I.B. observed CC And on two nights: 1987 September 28 (85 observations) and October 4 (59 observations) U.T..

The observations were obtained with the 41 cm Cassegrain telescope of the Rothney Astrophysical Observatory near Calgary, Alberta, Canada, using a cooled RCA 31034 gallium-arsenide photomultiplier tube and V, B, I filters closely matching the standard Johnson system. The RADS differential photometry system (Milone et al., 1982) was operated in the 4-channel mode. The comparison star was BD+41°123 (SAO 036623) which has spectral type G5. The differential airmass was less than 0.002 throughout so that the differential extinction was negligible. The integration time was varied between 7 and 10 seconds depending on sky conditions (principally transparency) which were more photometric on September 28 and less so on October 4. The observations covered 2.4 cycles and 1.1 cycles on the first and second night respectively.

The light curve amplitudes for the different filter bands for each night are shown in Table I.

The overlap of consecutive cycles increases the scatter of the data. Minimum light occurs at $\phi \approx 0.55$ and maxima occurs at $\phi \approx 0.00$ for all curves, with the ephemeris given by Wilson and Walker (1956).

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[1]Publication of the Rothney Astrophysical Observatory, Series B, No. 13.

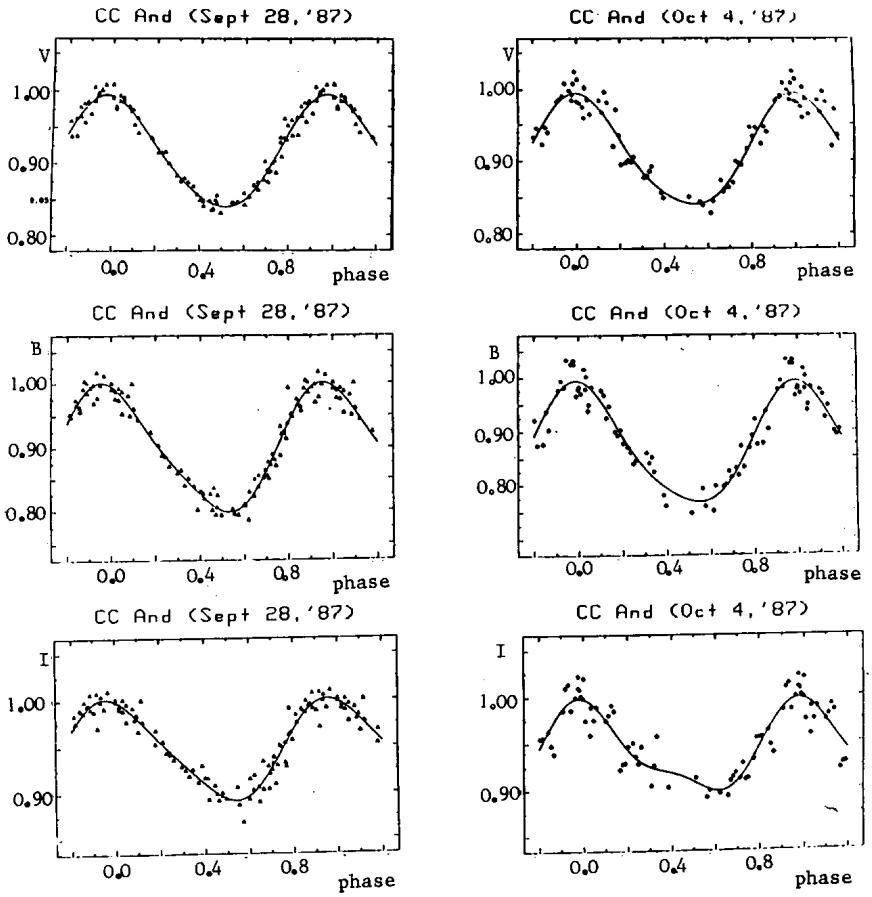

Figure 1 Fourier Fits Plotted on V,B and I Luminosity Curves for CC And on 1987 September 28 and October 4 U.T..

A five-term truncated Fourier series of the form:

$$L=A_0+A_1\cos\theta+A_2\cos2\theta+B_1\sin\theta+B_2\sin2\theta$$

was fit to the luminosity data using the relation:

$$L=L_0*10^{-0.4(m-m_0)}$$

where m_0 is the mean magnitude at maximum brightness and L_0 is normalized to unity. See Table II for Fourier constants, coefficients and error in the fit. Figure 1 shows the Fourier fits plotted on the luminosity data.

Table I
Photometric results for CC And on 1987 September 28 and October 4 U.T.

Julian Date	Filter	Amplitude	σ
2447066.844	V	0.175	0.015
2447066.844	B	0.230	0.018
2447066.844	I	0.109	0.014
2447072.820	V	0.180	0.022
2447072.820	B	0.299	0.039
2447072.820	I	0.111	0.022

Table II
Fourier constants, coefficients and fit error for all light curves

JD	Filter	A_0	A_1	A_2	B_1	B_2	Chi^2(mags)
2447066	V	0.91210	0.07702	0.00429	-0.00467	-0.00594	0.0125
2447066	B	0.89495	0.09741	0.00288	-0.00805	-0.01391	0.0179
2447066	I	0.94576	0.05220	0.00069	-0.00154	-0.00819	0.0130
2447072	V	0.90942	0.07631	0.00886	0.00332	-0.00443	0.0200
2447072	B	0.86795	0.11079	0.01442	0.00395	-0.00877	0.0295
2447072	I	0.94052	0.04415	0.01270	0.00379	-0.00788	0.0186

The present data were calculated to be at 0.15 and 0.29 phase respectively in the beat period of Fitch (1960). The corresponding predicted visual amplitudes are 0.19 ± 0.02 and 0.22 ± 0.02 magnitude. Our observed V and I light curves show a trend towards larger amplitude at 0.29 of the beat period although the increase is not as significant as the expected long period amplitude. The B filter band however, does show a clear variation in amplitude.

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