Tallinna Tehnikaülikooli Füüsikainstituut

TALLINNA TÄHETORN
TALLINN OBSERVATORY

III

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Tallinna Tähetorn
Tallinn Observatory

TALLINNA TEHNIKAÜLIKOOL
FÜÜSIKAINSTITUUT
TALLINNA TÄHETORN

TALLINN TECHNICAL UNIVERSITY
INSTITUTE OF PHYSICS
TALLINN OBSERVATORY

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T. Aas, V. Harvig

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Observations of UU Cancri

P. Kalv
Tallinn Technical University, Institute of Physics, Tallinn Observatory
Tähetorni 2, EE11625 Tallinn, Estonia

T.Oja
Astronomical Observatory, Box 515, SE-751 20 Uppsala, Sweden
tarmo.oja@astro.uu.se

V. Harvig
Tallinn Technical University, Institute of Physics, Tallinn Observatory
Tähetorni 2, EE11625 Tallinn, Estonia
vharvig@hotmail.com

Introduction

The main problem of UU Cancri was brought forth in the first spectroscopic studies (Popper (1956), Popper (1977) and Eggen (1973)) : the component whose lines were measured for velocity is eclipsed at phase zero and must be the hotter component, but its hydrogen lines are too strong for a K4 III star. Furthermore, the hydrogen lines strengthen considerably during primary minimum, i.e. the invisible companion star seems to be earlier than K4. Popper also suggests the component stars to be of nearly equal masses and radii. High-dispersion spectra at H_α obtained by Eaton (1990) and Eaton et al.(1991) as well as IUE spectra only magnified the amount of contradictions: no variations greater than $0\overset{m}{.}3$ in the ultraviolet continuum; the uv flux is lower than expected from a star as massive as the unseen component; the rotational velocity near conjunction requires the optically undetected companion star to be more massive than the K4 giant. The phase-dependent Balmer absorption seemingly implies a semidetached accreting system, but a strong chromosphere or wind from the secondary of a contact system is possible as well.

Photoelectric V light curves were published by Winiarski and Zola (1987), Lee (1988), and B, V light curves by Eaton et al.(1991. From these observations three light curve solutions were presented in which the system is a contact binary with both components overfilling their Roche lobes Winiarski and Zola (1987), Barone et al.(1989), and three semidetached models Winiarski and Zola (1987), Eaton (1990), Eaton et al.(1991). The most important physical parameters are quite different in these models, e.g. the mass ratio was derived from 0.3 to 1.5. Thereafter Zola et al.(1994) rediscussed earlier results and presented an accretion disk model for the system.

Observations

UU Cnc was observed with the Tallinn 50 cm telescope (BV from 1972, $UBVR$ from 1980), the Kvistaberg 40 cm telescope (UBV from 1985), the 60 cm telescope of the Royal Swedish Academy of Sciences at Observatorio Astrofisico del Roque de los Muchachos, La Palma Canary Islands(UBV from 1991) and 2.5 m Nordic Optical Telescope ($UBVRI$ and polarization on seven nights from 1990). Up to 1994 in total 234 observations (one normal point per night, Figure 2) have been obtained. The brightness of the comparison and the check star (also used as extinction stars) given in Table 1 are from measurements with the Nordic Optical Telescope.

Table 1 The comparison and ckeck star for UU Cancri.

Star		V	$U-B$	$B-V$	$V-R$	$R-I$
Comparison star	SAO 97490	9.149	1.461	1.329	0.721	0.680
		±0.003	±0.004	±0.002	±0.001	±0.006
Check star	SAO 97489	9.352	-0.035	0.437	0.269	0.294
		±0.004	±0.002	±0.002	±0.002	±0.010

The mean-square-root errors of the normal points, as calculated from the measurements of comparison and the check stars, are less than $0^{\mathrm{m}}_{.}01$ for V, $B-V$and $V-R$. In the ultraviolet UU Cnc was too faint for the Tallinn and Kvistaberg telescopes. Often the sky background was bright from full or nearly full Moon and we have tried to observe also at relatively poor atmospheric conditions. Therefore in many nights the error in U may reach up to $0^{\mathrm{m}}_{.}04$. On the other hand, some observations made on the same nights at La Palma and Tallinn convince us that it has not happened too often and irregular variations up to $0^{\mathrm{m}}_{.}2$ in the ultraviolet are real.

The observations are given in Table 4, Table 5a and Table 5b.

Period

The times of minimum were determined with the aid of Pogson's tracing paper method in differential mode Albo (1964), computerized by Kalv (1979). We have used all available times of minima beginning from Huth's (1963) photographic determinations from the beginning of last century. The results are given in Table 2 and Figure 1. The quadratic term of the light elements derived from the same data is of the same order of magnitude as its error. Therefore we have used linear light elements derived by the least-squares-method:

$$
\begin{aligned}
Min = J.D.&2425600.6 + 96^{\mathrm{d}}_{.}6760 \times E \\
&\pm 0.4 \quad \pm 0.0019
\end{aligned}
$$

The determination of the weights of the normal minima given in Table 2 was arbitrary in some respects. The weights corresponding to square-root errors σ of normal minima were calculated according to their dispersion in a preliminary nonweighted solution and were adopted as follows: $\pm 3^{\mathrm{d}}_{.}6$ for visual, $\pm 2^{\mathrm{d}}_{.}2$ for photographic and $\pm 0^{\mathrm{d}}_{.}3$ days for photoelectric times of minima. Striving not to be unjust to modern visual observers, whose observations seem to be as accurate as those of earlier photographic measurements, we adopt $\pm 2^{\mathrm{d}}_{.}2$ days for them also. The number of the first photoelectric observations (Eggen (1973)) is too small for determining the accurate moment of minimum. Therefore we have merged Eggen's data with the data of our first series (minimum E=166). We also have determined two minima from the measurements by $HIPPARCOS$. The photoelectric mimimum E=220, with $\mid O-C \mid > 3\sigma$ did not take part in the final levelling off procedure with weights.

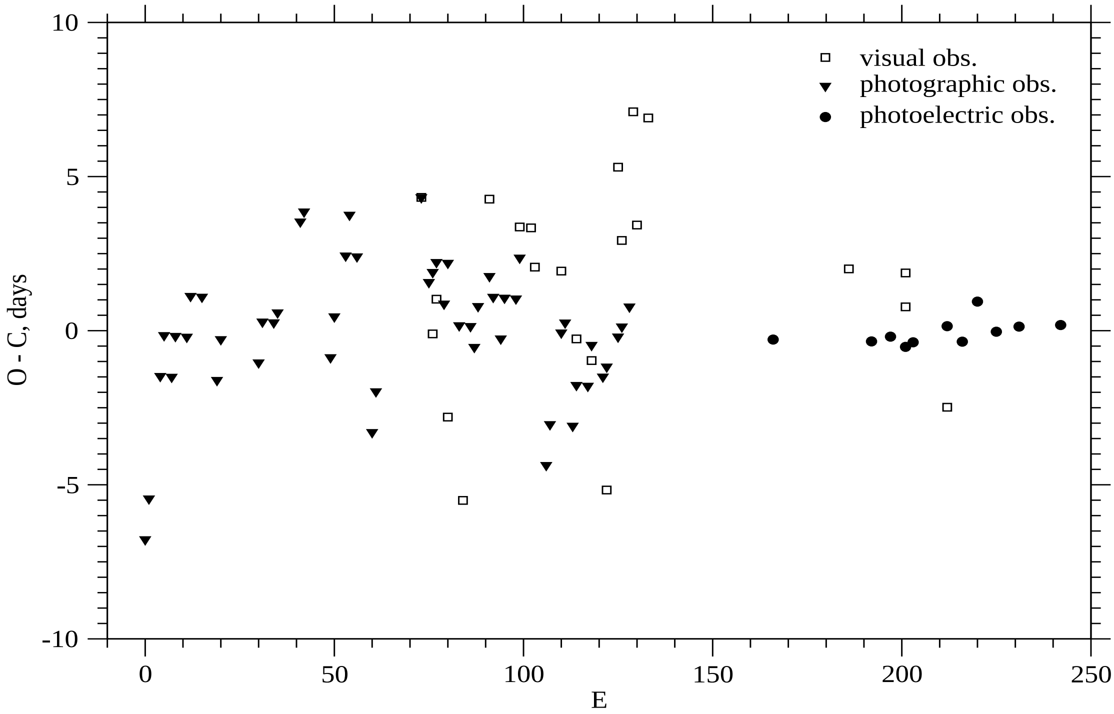

Figure 1   All available times of minima.

Table 2   All available times of minima.

JD Hel. 2400000+	$\pm\sigma$	E	$O-C$	Observer
25594	4.4	0	−6.77	*H*
25692	4.4	1	−5.45	*H*
25986	4.4	4	−1.48	*H*
26084	4.4	5	−0.15	*H*
26276	4.4	7	−1.50	*H*
26374	4.4	8	−0.18	*H*
26664	4.4	11	−0.20	*H*
26762	4.4	12	1.12	*H*
27052	4.4	15	1.10	*H*
27436	4.4	19	−1.61	*H*
27534	4.4	20	−0.28	*H*
28500	4.4	30	−1.04	*H*
28598	4.4	31	0.29	*H*
28888	4.4	34	0.26	*L*
28985	4.4	35	0.59	*L*
29568	4.4	41	3.54	*H*
29665	4.4	42	3.86	*H*
30337	4.4	49	−0.87	*H*
30435	4.4	50	0.46	*H*

Table 2 – continued

JD Hel. 2400000+	$\pm\sigma$	E	$O-C$	Observer
30727	4.4	53	2.43	H
30825	4.4	54	3.76	H
31017	4.4	56	2.40	H
31398	4.4	60	−3.30	H
31496	4.4	61	−1.97	H
32662	6.8	73	4.32	B
32663	4.4	73	4.92	H
32853	4.4	75	1.57	H
32948	6.8	76	−0.10	B
32950	4.4	76	1.90	H, S
33045	6.8	77	1.02	B
33047	4.4	77	2.22	H
33239	4.4	79	0.87	H, S
33332	6.8	80	−2.80	B
33337	4.4	80	2.20	H, S
33625	4.4	83	0.17	H, S
33716	6.8	84	−5.51	B
33915	4.4	86	0.14	H
34011	4.4	87	−0.53	H
34109	4.4	88	0.79	H, S
34400	4.4	91	1.77	H, S
34402.5	6.8	91	4.27	B
34496	4.4	92	1.09	S
34688	4.4	94	−0.26	H
34786	4.4	95	1.06	H
35076	4.4	98	1.04	H
35174	4.4	99	2.36	H
35175	6.8	99	3.36	B
35465	6.8	102	3.34	B
35560.4	6.8	103	2.06	B
35844	4.4	106	−4.36	H
35942	4.4	107	−3.04	H
36235	4.4	110	−0.07	H
36237	6.8	110	1.93	B
36332	4.4	111	0.26	H
36522	4.4	113	−3.09	H
36620	4.4	114	−1.77	H
36621.5	6.8	114	−0.27	B
36910	4.4	117	−1.79	H
37007.5	6.8	118	−0.97	B
37008	4.4	118	−0.47	H
37297	4.4	121	−1.50	H
37390	6.8	122	−5.17	B
37394	4.4	122	−1.17	H
37685	4.4	125	−0.20	H
37690.5	6.8	125	5.30	B
37782	4.4	126	0.13	H

Table 2 – continued

JD Hel. 2400000+	$\pm\sigma$	E	$O-C$	Observer
37784.8	6.8	126	2.93	B
37976	4.4	128	0.78	H
38079	6.8	129	7.10	B
38172	6.8	130	3.43	B
38465.5	6.8	133	6.90	B
41648.6	1.0	166	-0.29	$E+KO$
43584.4	4.4	186	2.00	T
44162.1	1.0	192	-0.35	KO
44645.63	1.0	197	-0.19	WZ
45032.0	1.0	201	-0.53	WZ
45033.3	4.4	201	0.77	T
45034.4	4.4	201	1.87	Br
45225.5	1.0	203	-0.38	KO
46096.1	1.0	212	0.14	KO
46093.47	4.4	212	-2.49	I
46482.3	1.0	216	-0.36	KCL
46870.3	1.0	220	0.94	KCL
47352.7	1.0	225	-0.04	KO
47932.92	1.0	231	0.13	EHH
48996.4	1.0	242	0.18	KO
41695.8	–	166.5	-0.92	$E+KO$
43630.5	–	186.5	0.12	KO
44596.2	–	196.5	-1.01	KO
46047.9	–	211.5	0.45	KO
46821.20	–	219.5	0.28	KCL
46918.78	–	220.5	1.18	KCL
47111.5	–	222.5	0.53	KO
48562.1	–	237.5	0.79	KO

Observers:

B - Beyer 1964
Br - Brelstaff 1985
E - Eggen 1973
EHH - Eaton, Hall, Honeycutt 1991
H - Huth 1963
I - Isles 1986
KCL - Kim, Chun, Lee 1988
KO - this paper
L - Lause 1938
S - Schachowskoi 1956
T - Taylor 1984, 1985
WZ - Winiarski, Zola 1987

Light curves

It is obvious from Figure 2 that the dispersion around a mean curve is consisiderably higher that the errors of observation. Figure 3 shows the residuals as a function of time.

It appears that the orbital light-variations are modulated with a wave lasting at least 8000 days. These intrinsic variations are colour-dependent with an amplitude of about $0\overset{\mathrm{m}}{.}10$ in B and $0\overset{\mathrm{m}}{.}06$ in V. In U the amplitude is probably greater than $0\overset{\mathrm{m}}{.}11$ whereas in R these variations are imperceptible.

Evidently the same variations were mentioned already by Eaton et al (1991) as a difference between Winiarski's and Zola's (1987) lightcurve (observed at around the maximum of the 8000 day cycle) and that measured with Vanderbilt-Tennessee State APT near the minimum of the cycle.

The long-period changes were approximated with polynomial (except R) and for further use deviations from the polynomial were taken. We have combined all available observations. Thereafter the observations were joined to normal points and normalized by max II of the orbital light curve.

The normalized light curves are showing contradictory behaviour of depths of minima. From Table 3 it appears that from R to U in every light curve the depth of both minima is increasing.

For this phenomenon the only explanation we could imagine is some kind of third light in the system.

Table 3 Depths of minima from orbital light-curves, corrected for intrinsic variations and normalized by max II.

	Flux	
Band	min I	min II
U	0.535	0.755
B	0.595	0.763
V	0.636	0.791
R	0.645:	0.805

We hope to publish the results of the investigation in near future.

The autors are grateful to Toomas Aas for his persistent help.

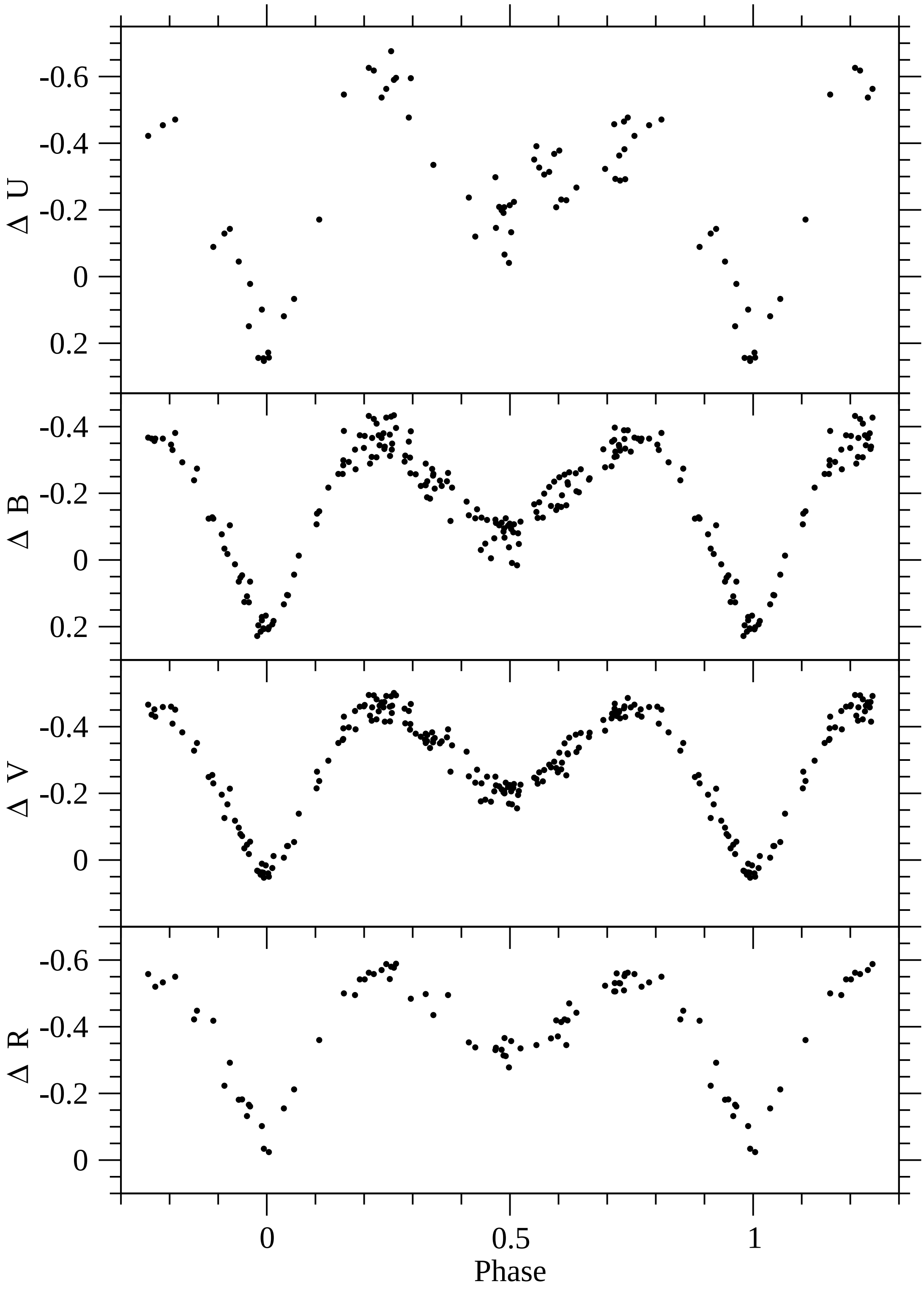

Figure 2 All our observations.

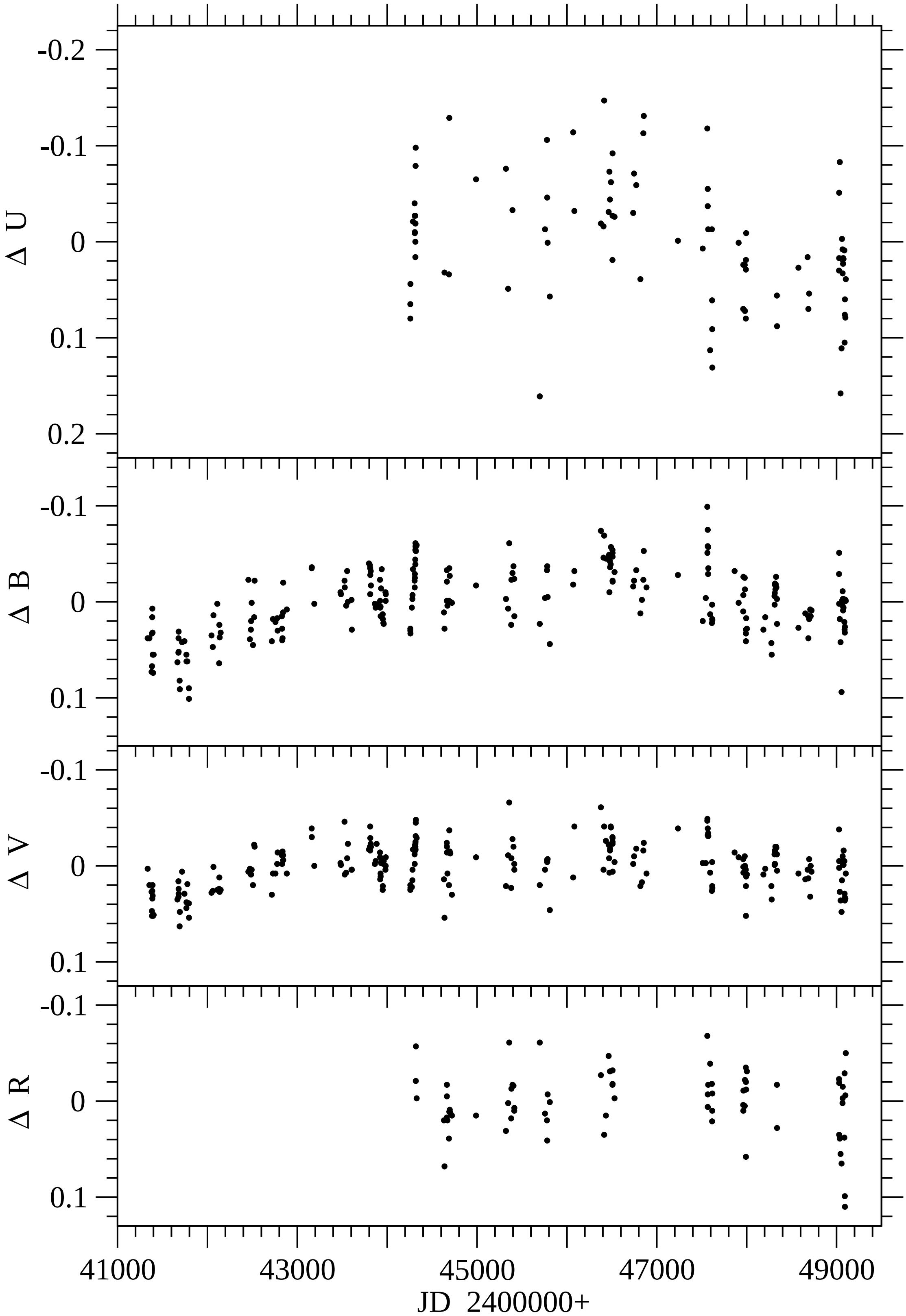

Figure 3 All our residuals.

Table 4 All our observation data of the UU Cancri

JD Hel. 2400000+	ΔU	ΔB	ΔV	ΔR	ΔI
41334.5651		−0.325	−0.458		
41354.4074		0.126	−0.035		
41379.4097		−0.289	−0.433		
41382.3477		−0.340	−0.415		
41383.3788		−0.312	−0.416		
41386.4143		−0.313	−0.410		
41387.3588		−0.307	−0.391		
41390.3436		−0.225	−0.361		
41391.3376		−0.184	−0.336		
41395.3958		−0.117	−0.265		
41402.3123		−0.049	−0.181		
41666.5725		−0.272	−0.392		
41677.4593		−0.260	−0.408		
41678.5132		−0.257	−0.379		
41679.5263		−0.222	−0.370		
41680.5042		−0.224	−0.351		
41691.4696		−0.030	−0.176		
41693.4857		−0.005	−0.175		
41717.4591		−0.281	−0.425		
41744.3761		0.215	0.044		
41766.4400		−0.309	−0.418		
41767.3799		−0.308	−0.422		
41777.4354		−0.188	−0.357		
41794.3283		0.009	−0.167		
41795.3501		0.016	−0.155		
42045.4984		−0.107	−0.215		
42060.4635		−0.331	−0.441		
42067.5097		−0.236	−0.375		
42109.3846		−0.364	−0.436		
42130.3915		0.228	0.032		
42133.3865		0.193	0.024		
42136.3350		0.105	−0.042		
42147.3618		−0.258	−0.360		
42455.3727		−0.253	−0.353		
42472.4311		−0.048	−0.207		
42484.3467		−0.203	−0.337		
42486.3650		−0.241	−0.369		
42492.3049		−0.345	−0.443		
42507.4271		−0.124	−0.249		
42520.3300		0.183	−0.012		
42525.3523		−0.013	−0.139		
42716.5656		0.106	−0.042		
42728.6328		−0.294	−0.398		
42757.5588		−0.065	−0.206		
42776.5201		−0.245	−0.382		
42781.4848		−0.309	−0.454		
42828.3305		−0.336	−0.461		
42831.4374		−0.344	−0.463		

Table 4 – continued

JD Hel. 2400000+	ΔU	ΔB	ΔV	ΔR	ΔI
42832.3796		−0.333	−0.474		
42836.4072		−0.295	−0.454		
42842.3969		−0.214	−0.366		
42843.4263		−0.238	−0.350		
42883.3484		−0.357	−0.452		
43160.4660		−0.260	−0.376		
43161.4573		−0.272	−0.381		
43189.3957		0.013	−0.118		
43480.4877		0.053	−0.078		
43485.5390		0.167	0.016		
43525.4622		−0.175	−0.325		
43528.4175		−0.127	−0.230		
43544.4314		−0.194	−0.292		
43554.4010		−0.355	−0.439		
43563.3924		−0.346	−0.460		
43603.3639		−0.366	−0.458		
43607.3473		−0.349	−0.463		
43797.5948		−0.409	−0.482		
43808.6360		−0.273	−0.383		
43810.5360		−0.222	−0.356		
43811.5804		−0.236	−0.368		
43812.6085		−0.217	−0.344		
43817.5637		−0.152	−0.271		
43819.5593		−0.120	−0.250		
43863.4783		−0.077	−0.196		
43871.4632		0.181	0.011		
43882.4382		−0.139	−0.265		
43920.4189		−0.103	−0.219		
43921.4546		−0.083	−0.216		
43922.3990		−0.080	−0.195		
43926.2980		−0.126	−0.229		
43927.3224		−0.127	−0.236		
43932.3148		−0.226	−0.317		
43939.3377		−0.332	−0.420		
43950.3709		−0.330	−0.409		
43952.3175		−0.293	−0.383		
43958.2798		−0.128	−0.255		
43961.2915		−0.018	−0.167		
43981.3691		−0.217	−0.298		
43983.3371		−0.258	−0.351		
43984.3407		−0.299	−0.395		
44257.4718	0.244	0.196	0.034		
44258.4780	0.245	0.205	0.038		
44259.4275	0.228	0.208	0.040		
44274.3512		−0.284	−0.363		
44281.4006		−0.374	−0.446		
44282.3557		−0.380	−0.458		

Table 4 – continued

JD Hel. 2400000+	ΔU	ΔB	ΔV	ΔR	ΔI
44287.3871	−0.477	−0.355	−0.447		
44305.3485	−0.209	−0.104	−0.221		
44306.3467	−0.208	−0.095	−0.208		
44307.4391	−0.214	−0.109	−0.225		
44308.2945	−0.224	−0.107	−0.228		
44312.3188	−0.351	−0.167	−0.247		
44313.2991	−0.327	−0.173	−0.263		
44314.2892	−0.306	−0.199	−0.270		
44315.2938	−0.314	−0.219	−0.286		
44316.2885	−0.368	−0.235	−0.295		
44317.3102	−0.378	−0.248	−0.322		
44318.3385		−0.256	−0.350	−0.422	
44319.2669		−0.263	−0.367	−0.470	
44328.3346		−0.397	−0.469	−0.531	
44631.4050		−0.239	−0.328	−0.422	
44637.4302	−0.129	−0.034	−0.126	−0.223	
44663.3913		−0.331	−0.447	−0.495	
44664.3461		−0.374	−0.460	−0.542	
44665.3076		−0.372	−0.465	−0.542	
44670.3090		−0.376	−0.460	−0.543	
44687.2977	−0.120	−0.125	−0.232	−0.338	
44691.2868	−0.298	−0.121	−0.250	−0.330	
44696.2987		−0.115	−0.226	−0.335	
44702.3489		−0.162	−0.278	−0.365	
44720.3588		−0.364	−0.430	−0.520	
44989.4832	−0.391	−0.144	−0.243	−0.345	
45321.6002	0.099	0.171	0.037	−0.102	
45345.3943	−0.537	−0.366	−0.473	−0.570	
45358.6004		−0.261	−0.392	−0.495	
45380.4417		−0.162	−0.263	−0.371	
45382.3569		−0.233	−0.320	−0.419	
45394.3304	−0.477	−0.389	−0.486	−0.562	
45405.3631		−0.274	−0.351	−0.448	
45414.3429		0.046	−0.072	−0.182	
45415.3119		0.109	−0.046	−0.132	
45698.6506	−0.089	−0.124	−0.230	−0.418	
45756.3360	−0.191	−0.085	−0.203	−0.314	
45778.3369	−0.457	−0.360	−0.440	−0.506	
45780.2894	−0.465	−0.389	−0.455	−0.509	
45785.2853	−0.454	−0.364	−0.459	−0.533	
45809.3408	0.119	0.133	−0.007	−0.155	
46069.4950	−0.494	−0.364	−0.434		
46082.4320	−0.382	−0.262	−0.365		
46378.6706	−0.143	−0.104	−0.214	−0.292	
46407.5760	−0.599	−0.413	−0.460		
46414.6264	−0.595	−0.386	−0.468	−0.484	
46433.5142		−0.125	−0.232	−0.312	

Table 4 – continued

JD Hel. 2400000+	ΔU	ΔB	ΔV	ΔR	ΔI
46464.4655	−0.471	−0.381	−0.451	−0.550	
46469.5030		−0.270	−0.324		
46472.4460	−0.311	−0.135	−0.227		
46479.3742	0.022	0.065	−0.055	−0.161	
46480.3460		0.091	−0.041		
46487.2730		0.023	−0.116		
46489.3530	−0.131	−0.050	−0.160		
46506.4257	−0.563	−0.427	−0.492	−0.588	
46507.3972	−0.676	−0.430	−0.491	−0.580	
46508.3234		−0.421	−0.490		
46508.3750	−0.596	−0.396	−0.494	−0.589	
46509.4079		−0.384	−0.452		
46529.3641	−0.199	−0.112	−0.212	−0.331	
46737.6609	−0.289	−0.241	−0.339		
46747.6304	−0.508	−0.378	−0.464		
46771.6326	0.114	0.139	−0.004		
46817.4601	−0.132	−0.085	−0.203		
46834.4787		−0.228	−0.322		
46850.3740	−0.563	−0.371	−0.455		
46855.3339	−0.495	−0.297	−0.360		
46885.3244		−0.316	−0.388		
47235.2979	−0.456	−0.389	−0.493		
47510.5625	−0.249	−0.198	−0.332		
47544.4954		0.159	0.004		
47561.4334	−0.546	−0.387	−0.430	−0.500	
47563.3963		−0.375	−0.466		
47566.3884	−0.626	−0.432	−0.495	−0.562	
47567.3798	−0.618	−0.423	−0.494	−0.558	
47570.4281		−0.402	−0.493		
47571.3915	−0.590	−0.434	−0.501	−0.577	
47573.3603		−0.391	−0.484		
47593.3736	−0.066	−0.067	−0.200	−0.366	
47613.3628	−0.323	−0.278	−0.388	−0.523	
47615.3894	−0.293	−0.325	−0.439	−0.506	
47616.3486	−0.288	−0.328	−0.425	−0.530	
47617.3609	−0.292	−0.334	−0.429	−0.559	
47865.5009		−0.338	−0.433		
47910.4469	−0.448	−0.365	−0.470		
47961.3718	−0.383	−0.309	−0.436	−0.517	−0.433
47962.3965	−0.397	−0.309	−0.416	−0.500	−0.507
47964.4049		−0.289	−0.379	−0.498	
47978.3664	−0.146	−0.111	−0.224	−0.337	
47981.4091	−0.133	−0.093	−0.206	−0.357	
47990.3451	−0.208	−0.150	−0.276	−0.419	
47991.3477	−0.231	−0.159	−0.272	−0.414	
47992.3710	−0.229	−0.164	−0.254	−0.345	
47994.3600	−0.267	−0.206	−0.324	−0.442	

Table 4 – continued

JD Hel. 2400000+	ΔU	ΔB	ΔV	ΔR	ΔI
48002.3618		−0.311	−0.432	−0.560	
48186.6230		−0.182	−0.311		
48206.5960		−0.289	−0.396		
48274.4233		−0.052	−0.194		
48278.4003		−0.092	−0.216		
48310.4368		−0.098	−0.217		
48311.4444		−0.056	−0.178		
48312.4395		−0.035	−0.151		
48313.4500		−0.009	−0.136		
48314.4784		0.042	−0.093		
48315.4615		0.069	−0.058		
48319.4407		0.162	−0.003		
48324.4163		0.039	−0.092		
48326.4477		−0.023	−0.144		
48330.4335		−0.176	−0.279		
48336.3714	−0.414	−0.319	−0.421	−0.489	−0.512
48337.3864	−0.408	−0.309	−0.419	−0.485	−0.489
48575.7032	−0.241	−0.210	−0.344		
48652.4805		−0.100	−0.226		
48678.4519	−0.327	−0.308	−0.427		
48686.4562	−0.387	−0.319	−0.435		
48694.3635	−0.246	−0.171	−0.294		
48707.3283		0.181	0.047		
48712.3554		0.041	−0.105		
48721.3457		−0.273	−0.372		
49027.4945	−0.345	−0.300	−0.430	−0.515	−0.539
49029.3576	−0.335	−0.258	−0.362	−0.435	−0.512
49029.4322	−0.264	−0.233	−0.368	−0.488	
49036.4011	−0.237	−0.134	−0.251	−0.353	
49044.3830	−0.041	−0.038	−0.169	−0.278	
49055.4450	−0.141	−0.106	−0.253	−0.334	−0.519
49060.5554	−0.284	−0.260	−0.361		
49066.3200	−0.363	−0.340	−0.447	−0.531	
49067.3498	−0.382	−0.363	−0.461	−0.552	
49069.3373	−0.422	−0.367	−0.466	−0.558	
49072.3999	−0.432	−0.351	−0.456		
49073.4025	−0.439	−0.355	−0.451		
49077.4265	−0.380	−0.285	−0.386		
49078.5005		−0.259	−0.364		
49087.3484	−0.045	0.065	−0.097	−0.181	
49089.3521	0.149	0.127	−0.018	−0.166	
49092.3277	0.253	0.207	0.053	−0.034	
49093.3388	0.243	0.202	0.050	−0.024	
49098.3342	0.067	0.044	−0.054	−0.212	
49103.3377	−0.171	−0.146	−0.237	−0.360	

Table 5a Instrumental polarization at NOT (March 1990)

fil	PX	EPX	PY	EPY	POL	EPOL	NOBS
1	0.018	0.009	−0.034	0.010	0.039	0.010	344
2	0.009	0.008	−0.005	0.008	0.010	0.008	344
3	−0.008	0.008	−0.007	0.008	0.011	0.008	344
4	0.009	0.011	0.006	0.011	0.011	0.011	141
5	−0.044	0.018	0.009	0.021	0.044	0.018	141

Table 5b Polarization data of UU Cancri at NOT

Star	f	d	JD2440000+	Pq	Pu	Err1	Err2	mag	smag	emag
151733	1	1	7961.3643	−0.444	−0.096	0.412	0.385	11.301	0.011	0.004
	2			−0.053	−0.182	0.170	0.204	9.656	0.004	0.002
	3			0.104	−0.023	0.131	0.159	9.147	0.004	0.001
	4			0.053	−0.104	0.063	0.115	7.579	0.003	0.001
	5			−0.082	−0.425	0.120	0.092	8.984	0.012	0.004
	1		.3667	−0.085	−0.111	0.417	0.289	11.320	0.013	0.005
	2			0.010	−0.122	0.171	0.099	9.666	0.002	0.001
	3			−0.068	−0.075	0.131	0.099	9.153	0.006	0.002
	4			−0.207	−0.277	0.063	0.120	7.575	0.005	0.002
	5			−0.419	−0.121	0.120	0.233	8.980	0.014	0.005
	1		.3691	−0.793	0.503	0.411	0.145	11.295	0.007	0.003
	2			0.135	0.142	0.171	0.203	9.658	0.004	0.001
	3			0.605	0.158	0.131	0.096	9.150	0.003	0.001
	4			1.158	0.186	0.063	0.240	7.569	0.002	0.001
	5			0.846	−0.093	0.119	0.272	8.951	0.003	0.001
	1		.3711	−0.208	1.248	0.412	0.443	11.298	0.006	0.002
	2			−0.032	−0.393	0.171	0.326	9.664	0.007	0.002
	3			−0.056	−0.657	0.131	0.213	9.157	0.004	0.001
	4			−0.286	0.234	0.063	0.281	7.569	0.003	0.001
	5			−0.580	0.551	0.118	0.459	8.943	0.006	0.002
151733	1	1	7962.3892	0.162	0.260	0.391	0.350	11.287	0.008	0.003
	2			−0.141	−0.189	0.168	0.104	9.653	0.003	0.001
	3			0.046	−0.054	0.129	0.126	9.133	0.004	0.001
	4			−0.109	−0.076	0.063	0.066	7.563	0.004	0.001
	5			−0.060	−0.083	0.108	0.131	8.743	0.004	0.002
	1		.3911	0.557	−0.305	0.390	0.350	11.280	0.006	0.002
	2			0.110	0.218	0.168	0.104	9.657	0.002	0.001
	3			−0.068	−0.121	0.129	0.098	9.133	0.003	0.001
	4			−0.112	−0.055	0.063	0.067	7.559	0.004	0.001
	5			−0.245	−0.168	0.108	0.106	8.745	0.005	0.002
	1		.3936	−0.840	−1.516	0.389	0.152	11.278	0.008	0.003
	2			0.192	−0.159	0.168	0.106	9.657	0.003	0.001
	3			0.065	−0.038	0.129	0.169	9.132	0.004	0.001
	4			−0.001	0.023	0.063	0.086	7.559	0.002	0.001
	5			0.047	−0.217	0.107	0.109	8.736	0.003	0.001

Table 5b – continued

Star	f	d	JD2440000+	Pq	Pu	Err1	Err2	mag	smag	emag
	1		.3960	0.823	0.446	0.389	0.367	11.277	0.014	0.005
	2			−0.458	0.186	0.168	0.179	9.658	0.003	0.001
	3			−0.137	−0.195	0.129	0.110	9.134	0.003	0.001
	4			−0.111	−0.071	0.063	0.088	7.559	0.002	0.001
	5			−0.212	−0.127	0.108	0.167	8.739	0.004	0.001
151731	1	1	7961.3799	0.197	0.391	0.159	0.139	9.506	0.007	0.003
	2			−0.355	0.187	0.142	0.202	9.296	0.002	0.001
	3			−0.304	0.133	0.162	0.134	9.606	0.004	0.001
	4			−0.673	−0.058	0.113	0.133	8.826	0.002	0.001
	5			−1.123	−0.118	0.246	0.251	10.536	0.005	0.002
	1		.3823	−0.004	−0.168	0.159	0.290	9.510	0.005	0.002
	2			−0.282	0.208	0.142	0.160	9.297	0.006	0.002
	3			−0.453	−0.033	0.162	0.099	9.611	0.007	0.002
	4			−0.308	0.027	0.113	0.129	8.824	0.004	0.001
	5			−0.429	−0.048	0.246	0.391	10.532	0.009	0.003
	1		.3843	−0.210	0.381	0.159	0.097	9.505	0.004	0.001
	2			−0.341	0.198	0.142	0.122	9.296	0.004	0.002
	3			−0.284	0.535	0.162	0.133	9.608	0.005	0.002
	4			−0.488	0.240	0.113	0.161	8.826	0.003	0.001
	5			−0.651	0.429	0.245	0.343	10.525	0.007	0.002
	1		.3867	0.189	0.028	0.159	0.097	9.510	0.007	0.003
	2			0.161	0.473	0.142	0.159	9.297	0.005	0.002
	3			−0.014	0.174	0.162	0.087	9.610	0.007	0.002
	4			0.052	0.295	0.113	0.194	8.827	0.003	0.001
	5			−0.123	0.517	0.245	0.245	10.521	0.008	0.003
151731	1	1	7962.3823	0.127	0.029	0.156	0.199	9.491	0.002	0.001
	2			−0.123	0.052	0.141	0.140	9.290	0.002	0.001
	3			0.010	0.112	0.158	0.162	9.572	0.004	0.001
	4			−0.197	0.135	0.111	0.051	8.798	0.005	0.002
	5			−0.150	−0.091	0.226	0.326	10.351	0.008	0.003
	1		.3848	−0.148	0.275	0.156	0.164	9.488	0.002	0.001
	2			0.074	−0.005	0.141	0.142	9.288	0.004	0.001
	3			0.083	0.156	0.158	0.184	9.574	0.002	0.001
	4			0.032	−0.059	0.111	0.094	8.799	0.005	0.002
	5			−0.471	0.511	0.228	0.226	10.365	0.007	0.003
161614	1	1	7961.3965	−0.828	0.326	0.530	0.341	11.708	0.009	0.003
	2			−0.119	0.058	0.199	0.245	9.979	0.004	0.001
	3			−0.204	0.311	0.159	0.172	9.570	0.002	0.001
	4			−0.224	0.100	0.081	0.111	8.109	0.004	0.001
	5			−0.277	0.019	0.148	0.268	9.428	0.006	0.002
	1		.3989	0.395	0.999	0.524	0.682	11.690	0.007	0.002
	2			0.193	−0.523	0.198	0.181	9.970	0.013	0.005
	3			0.144	−0.119	0.159	0.316	9.567	0.003	0.001
	4			0.359	−0.073	0.081	0.334	8.109	0.002	0.001

Table 5b – continued

Star	f	d	JD2440000+	Pq	Pu	Err1	Err2	mag	smag	emag
	5			0.599	−0.102	0.146	0.441	9.403	0.004	0.001
	1		.4014	−0.293	−0.260	0.521	0.516	11.680	0.010	0.003
	2			−0.338	−0.385	0.199	0.253	9.976	0.005	0.002
	3			0.172	−0.458	0.159	0.431	9.566	0.005	0.002
	4			−0.326	−1.224	0.081	0.734	8.106	0.005	0.002
	5			−1.670	−0.313	0.146	1.024	9.402	0.007	0.002
	1		.4033	0.590	−0.700	0.525	0.602	11.692	0.011	0.004
	2			−0.181	−0.250	0.198	0.185	9.973	0.010	0.003
	3			−0.202	−0.230	0.159	0.141	9.566	0.003	0.001
	4			0.165	−0.118	0.081	0.145	8.107	0.004	0.002
	5			−0.327	0.162	0.146	0.275	9.400	0.004	0.001
161614	1	1	7962.4023	−0.617	−0.286	0.494	0.310	11.686	0.013	0.005
	2			0.283	−0.372	0.197	0.150	9.981	0.004	0.001
	3			−0.053	0.058	0.156	0.136	9.541	0.003	0.001
	4			−0.046	−0.040	0.080	0.193	8.092	0.004	0.001
	5			−0.072	−0.683	0.139	0.233	9.289	0.006	0.002
	1		.4063	0.523	−0.080	0.500	0.537	11.693	0.016	0.006
	2			−0.059	−0.313	0.196	0.210	9.972	0.014	0.005
	3			0.024	0.315	0.155	0.155	9.538	0.003	0.001
	4			0.011	0.153	0.080	0.184	8.090	0.004	0.001
	5			1.006	0.609	0.139	0.230	9.297	0.006	0.002

UU Cancri = BD 15*1733
comparison star = BD 16*1614
check/extinction star = BD 15*1731

UU Cancri vaatlused.

UU Cnc vaadeldi Tallinna 50 cm teleskoobiga alates 1972. aastast, Kvistabergi 40 cm teleskoobiga alates 1985. aastast, Rootsi Kuningliku Teaduste Akadeemia Kanaari saarte 60 cm teleskoobiga alates 1991. aastast ja 2.5 m Põhjamaade Optilise Teleskoobiga (NOT) seitsmel ööl alates 1990. aastast. Kokku vaadeldi 234 ööl.

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