LIGHT CHANGES OF THE CLOSE BINARY SYSTEM CN ANDROMEDAE

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Abstract. The photoelectric B and V colour observations of the β Lyrae-type eclipsing binary CN And were made on four nights at the Ege University Observatory. The new light elements, which were calculated by adding new times of minima obtained during the observations to the previous ones, were given. The light curve of the system varies cycle by cycle and the variation is discussed in some extent.

1. Introduction

CN And was firstly discovered by Hoffmeister (1949) as a short-period eclipsing binary. Tsesevich (1956), on the basis of photographic data, classified the system as an Algol-type with an orbital period of 2.2599 days. Later Löchel (1960) classified it as a W UMa-type system and determined the orbital period to be 0.462798 day. Bozkurt *et al.* (1976) obtained asymmetric B and V light curves of the system in 1972. Kaluzny (1983) observed the system in B and V colour in 1982. Although the system was on the same region with W UMa systems on the period-colour diagram, he suggested that the light curves of the system were similar to the β Lyrae-type curves because of the difference in the depths of the minima. He also pointed out that both of the maxima were shifted towards secondary minima. In 1981, Yu-lan and Qing-yao (1985) observed two flare events. In this paper, the 1986 observations and the light changes of CN Andromedae are presented and the variations in the light curves are discussed.

2. Observations

CN And (= BD + 39°0059) was observed photoelectrically on four nights from 8 October to 27 November in 1986 using the 48 cm Cassegrain telescope of the Ege University Observatory. B and V filters, which are close to the standard UBV system, and an EMI 9781A photomultiplier were used during the observations. In each colour, a total of 522 individual points was obtained. The effective wavelengths of the filters are 4320 Å for blue light and 5500 Å for yellow light. BD + 39°0065 was taken as the comparison star and BD + 39°0064 as the check star. No evidence for the variability of the comparison star with respect to the check star was found. Nightly first-order coefficients for the atmospheric extinction were calculated from the observations of the comparison star and differential extinction corrections were applied to the magnitude differences between the variable and the comparison stars. The times of the individual observations were reduced to the Sun's centre. No transformation was made to the standard UBV system. The individual observations of CN And are listed in Table I.

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TABLE I

The individual observations of CN And

J.D. (Hel.) 2446000.+	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$	J.D. (Hel.) 2446000.+	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$
712.2548	0.5572	0.048	0.263	712.3570	0.7779	−0.068	0.147
.2566	0.5611	0.041	0.258	.3585	0.7810	−0.070	0.140
.2581	0.5642	0.038	0.254	.3608	0.7861	−0.065	0.170
.2596	0.5675	0.045	0.242	.3621	0.7888	−0.068	0.169
.2646	0.5782	0.011	0.242	.3636	0.7921	−0.069	0.171
.2656	0.5804	−0.010	0.198	.3698	0.8056	−0.049	0.160
.2667	0.5828	−0.003	0.223	.3712	0.8085	−0.042	0.166
.2679	0.5854	−0.003	0.217	.3721	0.8106	−0.041	0.168
.2694	0.5887	−0.012	0.205	.3735	0.8136	−0.039	0.174
.2737	0.5980	−0.018	0.184	.3745	0.8157	−0.034	0.173
.2753	0.6014	−0.037	0.171	.3807	0.8291	−0.011	0.214
.2768	0.6046	−0.037	0.185	.3819	0.8316	−0.008	0.193
.2781	0.6074	−0.050	0.182	.3837	0.8355	0.000	0.218
.2795	0.6104	−0.054	0.168	.3852	0.8388	0.010	0.241
.2844	0.6211	−0.070	0.153	.3931	0.8559	0.045	0.272
.2859	0.6242	−0.077	0.169	.3946	0.8592	0.069	0.253
.2873	0.6274	−0.080	0.151	.3959	0.8619	0.061	0.268
.2882	0.6293	−0.080	0.155	.3970	0.8643	0.076	0.281
.2908	0.6349	−0.089	0.140	.3982	0.8670	0.065	0.271
.2956	0.6452	−0.089	0.153	.4057	0.8832	0.115	0.328
.2969	0.6481	−0.088	0.136	.4068	0.8855	0.115	0.322
.2984	0.6512	−0.089	0.141	.4080	0.8882	0.128	0.336
.2996	0.6538	−0.095	0.142	.4091	0.8904	0.120	0.345
.3007	0.6563	−0.101	0.130	.4111	0.8948	0.133	0.351
.3050	0.6656	−0.117	0.138	.4264	0.9278	0.250	0.486
.3067	0.6692	−0.115	0.134	.4275	0.9303	0.271	0.481
.3083	0.6727	−0.119	0.122	.4288	0.9330	0.270	0.474
.3097	0.6757	−0.121	0.129	.4304	0.9365	0.288	0.500
.3108	0.6781	−0.116	0.109	.4316	0.9390	0.304	0.518
.3157	0.6887	−0.120	0.116	.4357	0.9480	0.337	0.547
.3171	0.6916	−0.114	0.119	.4370	0.9507	0.349	0.549
.3185	0.6946	−0.117	0.120	.4387	0.9545	0.358	0.545
.3200	0.6979	−0.119	0.114	.4403	0.9578	0.378	0.538
.3215	0.7012	−0.118	0.105	.4412	0.9597	0.391	0.585
.3260	0.7110	−0.116	0.106	.4464	0.9710	0.423	0.611
.3278	0.7147	−0.121	0.100	.4478	0.9740	0.436	0.643
.3290	0.7174	−0.124	0.098	.4487	0.9761	0.434	0.640
.3306	0.7209	−0.126	0.103	.4500	0.9790	0.442	0.652
.3353	0.7309	−0.122	0.113	.4512	0.9815	0.428	0.688
.3368	0.7342	−0.119	0.122	.4560	0.9917	0.455	0.703
.3381	0.7371	−0.111	0.124	.4570	0.9940	0.452	0.719
.3393	0.7396	−0.108	0.116	.4584	0.9970	0.458	0.697
.3405	0.7423	−0.121	0.115	.4594	0.9992	0.458	0.688
.3453	0.7525	−0.115	0.128	.4607	0.0019	0.463	0.674
.3469	0.7561	−0.113	0.125	.4649	0.0111	0.456	0.655
.3482	0.7590	−0.106	0.157	.4662	0.0138	0.453	0.676
.3495	0.7617	−0.097	0.139	.4675	0.0168	0.440	0.661
.3507	0.7644	−0.085	0.140	.4691	0.0202	0.417	0.632

Table I (continued)

J.D. (Hel.) 2446000.+	Phase	Δm (B)	Δm (V)	J.D. (Hel.) 2446000.+	Phase	Δm (B)	Δm (V)
712.4705	0.0232	0.409	0.650	712.5788	0.2572	−0.133	0.094
.4751	0.0331	0.380	0.592	.5802	0.2602	−0.124	0.094
.4766	0.0363	0.365	0.583	.5846	0.2696	−0.125	0.104
.4780	0.0394	0.353	0.582	.5855	0.2716	−0.121	0.107
.4793	0.0421	0.329	0.551	.5868	0.2744	−0.112	0.114
.4807	0.0453	0.326	0.559	.5881	0.2773	−0.113	0.114
.4852	0.0549	0.281	0.484	.5896	0.2806	−0.113	0.126
.4866	0.0579	0.271	0.486	.5941	0.2903	−0.122	0.097
.4879	0.0607	0.266	0.484	.5955	0.2932	−0.121	0.095
.4891	0.0633	0.256	0.462	.5966	0.2956	−0.112	0.100
.4903	0.0658	0.244	0.462	.5979	0.2984	−0.117	0.099
.4963	0.0789	0.185	0.415	.5993	0.3014	−0.109	0.119
.4976	0.0817	0.177	0.408	.6040	0.3116	−0.107	0.108
.4990	0.0847	0.168	0.383	.6055	0.3149	−0.100	0.118
.5003	0.0874	0.151	0.375	.6070	0.3181	−0.097	0.114
.5015	0.0901	0.142	0.389	.6085	0.3212	−0.083	0.116
.5067	0.1014	0.117	0.331	.6100	0.3247	−0.084	0.114
.5079	0.1040	0.108	0.314	.6146	0.3344	−0.083	0.121
.5090	0.1064	0.103	0.326	.6158	0.3371	−0.077	0.136
.5101	0.1088	0.092	0.314	.6173	0.3404	−0.071	0.136
.5116	0.1121	0.086	0.297	.6188	0.3436	−0.068	0.128
.5169	0.1235	0.057	0.257	.6208	0.3479	−0.067	0.135
.5186	0.1271	0.045	0.256	714.2535	0.8759	0.111	0.302
.5202	0.1305	0.044	0.255	.2546	0.8783	0.099	0.314
.5216	0.1335	0.034	0.239	.2557	0.8806	0.100	0.324
.5229	0.1364	0.032	0.257	.2567	0.8827	0.101	0.320
.5280	0.1473	0.003	0.212	.2576	0.8848	0.110	0.325
.5294	0.1503	−0.007	0.215	.2616	0.8933	0.130	0.347
.5305	0.1527	−0.006	0.194	.2626	0.8956	0.133	0.356
.5320	0.1560	−0.011	0.194	.2639	0.8983	0.146	0.366
.5335	0.1592	−0.010	0.198	.2649	0.9005	0.151	0.385
.5423	0.1784	−0.061	0.172	.2694	0.9103	0.211	0.406
.5437	0.1814	−0.059	0.164	.2705	0.9127	0.197	0.413
.5450	0.1841	−0.067	0.161	.2723	0.9164	0.203	0.407
.5464	0.1871	−0.067	0.153	.2735	0.9190	0.213	0.419
.5476	0.1898	−0.073	0.161	.2775	0.9277	0.254	0.446
.5517	0.1986	−0.089	0.139	.2787	0.9304	0.267	0.453
.5531	0.2016	−0.096	0.141	.2798	0.9326	0.277	0.478
.5542	0.2040	−0.081	0.139	.2811	0.9355	0.280	0.463
.5556	0.2070	−0.095	0.127	.2858	0.9457	0.348	0.516
.5569	0.2099	−0.090	0.123	.2871	0.9485	0.356	0.539
.5631	0.2232	−0.102	0.115	.2883	0.9509	0.362	0.538
.5646	0.2265	−0.102	0.113	.2892	0.9530	0.359	0.547
.5664	0.2303	−0.103	0.113	.2928	0.9609	0.381	0.595
.5676	0.2330	−0.108	0.115	.2940	0.9633	0.396	0.593
.5687	0.2354	−0.107	0.119	.2951	0.9658	0.416	0.590
.5736	0.2459	−0.126	0.097	.2962	0.9681	0.419	0.619
.5758	0.2507	−0.129	0.083	.2973	0.9705	0.417	0.610
.5773	0.2539	−0.132	0.103	.3017	0.9801	0.446	0.636

Table I (continued)

J.D. (Hel.) 2446000. +	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$	J.D. (Hel.) 2446000. +	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$
714.3029	0.9826	0.470	0.651	760.2665	0.3003	−0.135	0.089
.3042	0.9855	0.473	0.658	.2678	0.3032	−0.131	0.090
.3056	0.9885	0.442	0.647	.2859	0.3422	−0.094	0.119
.3099	0.9976	0.472	0.650	.2872	0.3452	−0.094	0.118
.3112	0.0006	0.458	0.654	.2894	0.3499	−0.090	0.118
.3124	0.0030	0.464	0.646	.2908	0.3529	−0.090	0.120
.3137	0.0059	0.467	0.651	.2961	0.3643	−0.074	0.130
.3185	0.0162	0.452	0.627	.2970	0.3662	−0.070	0.145
.3199	0.0192	0.400	0.625	.2988	0.3701	−0.065	0.153
.3210	0.0218	0.427	0.619	.3002	0.3731	−0.070	0.159
.3224	0.0246	0.423	0.622	.3028	0.3788	−0.068	0.156
.3260	0.0326	0.391	0.603	.3040	0.3814	−0.054	0.172
.3269	0.0345	0.401	0.584	.3059	0.3856	−0.049	0.178
.3281	0.0371	0.376	0.579	.3069	0.3877	−0.044	0.182
.3294	0.0398	0.344	0.550	.3098	0.3940	−0.035	0.193
.3330	0.0477	0.326	0.528	.3109	0.3962	−0.032	0.193
.3342	0.0501	0.311	0.522	.3127	0.4001	−0.026	0.196
.3354	0.0528	0.309	0.501	.3138	0.4027	−0.023	0.200
.3367	0.0555	0.284	0.502	.3177	0.4109	−0.010	0.224
760.1759	0.1045	0.146	0.294	.3188	0.4133	−0.008	0.227
.1769	0.1068	0.134	0.288	.3206	0.4172	0.001	0.234
.1790	0.1113	0.109	0.280	.3216	0.4195	0.007	0.236
.1804	0.1144	0.073	0.275	.3227	0.4217	0.014	0.238
.1862	0.1269	0.035	0.252	.3273	0.4318	0.032	0.275
.1876	0.1299	0.027	0.244	.3284	0.4342	0.040	0.276
.1896	0.1342	0.013	0.237	.3302	0.4379	0.054	0.282
.1907	0.1366	0.006	0.232	.3315	0.4408	0.065	0.285
.2090	0.1761	−0.083	0.137	.3324	0.4427	0.072	0.288
.2100	0.1783	−0.084	0.136	.3361	0.4507	0.090	0.313
.2119	0.1824	−0.088	0.135	.3369	0.4525	0.092	0.317
.2134	0.1857	−0.091	0.136	.3387	0.4564	0.102	0.327
.2185	0.1967	−0.103	0.130	.3398	0.4588	0.107	0.334
.2197	0.1994	−0.107	0.116	.3409	0.4611	0.111	0.340
.2216	0.2034	−0.113	0.120	.3447	0.4693	0.123	0.351
.2227	0.2057	−0.113	0.118	.3458	0.4717	0.126	0.355
.2288	0.2189	−0.119	0.119	.3477	0.4758	0.129	0.357
.2303	0.2222	−0.120	0.113	.3486	0.4779	0.132	0.360
.2326	0.2271	−0.122	0.105	.3497	0.4801	0.135	0.362
.2338	0.2298	−0.123	0.100	.3506	0.4821	0.138	0.366
.2401	0.2433	−0.137	0.095	.3545	0.4905	0.146	0.373
.2413	0.2459	−0.140	0.099	.3555	0.4927	0.146	0.374
.2432	0.2499	−0.144	0.095	.3564	0.4947	0.149	0.373
.2444	0.2526	−0.144	0.090	.3582	0.4984	0.148	0.372
.2511	0.2670	−0.139	0.087	.3588	0.4998	0.148	0.373
.2524	0.2699	−0.140	0.087	.3597	0.5017	0.149	0.374
.2547	0.2750	−0.140	0.086	.3609	0.5043	0.149	0.376
.2562	0.2781	−0.144	0.089	.3645	0.5122	0.135	0.370
.2629	0.2927	−0.137	0.091	.3659	0.5152	0.132	0.365
.2642	0.2954	−0.135	0.091	.3670	0.5176	0.129	0.362

Table I (continued)

J.D. (Hel.) 2446000.+	Phase	Δm (B)	Δm (V)	J.D. (Hel.) 2446000.+	Phase	Δm (B)	Δm (V)
760.3688	0.5215	0.127	0.357	760.4659	0.7313	−0.091	0.106
.3699	0.5238	0.126	0.354	.4677	0.7352	−0.089	0.107
.3711	0.5263	0.120	0.351	.4700	0.7400	−0.084	0.114
.3753	0.5355	0.105	0.322	.4713	0.7429	−0.082	0.118
.3765	0.5380	0.100	0.318	.4727	0.7459	−0.078	0.119
.3777	0.5407	0.093	0.313	.4775	0.7564	−0.071	0.136
.3798	0.5452	0.083	0.304	.4789	0.7594	−0.069	0.138
.3813	0.5485	0.076	0.296	.4809	0.7637	−0.065	0.142
.3826	0.5512	0.069	0.292	.4820	0.7661	−0.062	0.144
.3866	0.5598	0.050	0.277	.4832	0.7685	−0.061	0.147
.3879	0.5626	0.042	0.270	.4880	0.7790	−0.046	0.170
.3888	0.5647	0.037	0.266	.4891	0.7813	−0.041	0.155
.3910	0.5694	0.024	0.255	.4913	0.7862	−0.039	0.158
.3925	0.5725	0.017	0.247	.4926	0.7889	−0.036	0.163
.3938	0.5755	0.009	0.239	.4938	0.7916	−0.031	0.165
.3977	0.5838	−0.004	0.216	.4982	0.8009	−0.020	0.182
.3988	0.5862	−0.011	0.210	.4993	0.8035	−0.018	0.185
.4004	0.5898	−0.017	0.201	.5016	0.8084	−0.014	0.192
.4016	0.5922	−0.024	0.194	.5027	0.8108	−0.015	0.195
.4027	0.5946	−0.031	0.188	.5037	0.8129	−0.012	0.201
.4063	0.6026	−0.035	0.182	.5079	0.8219	0.015	0.221
.4074	0.6048	−0.037	0.183	.5091	0.8246	0.021	0.226
.4097	0.6098	−0.041	0.181	.5115	0.8297	0.033	0.235
.4109	0.6123	−0.043	0.181	.5134	0.8338	0.040	0.243
.4122	0.6152	−0.044	0.180	.5179	0.8435	0.043	0.243
.4171	0.6258	−0.062	0.161	.5193	0.8465	0.057	0.249
.4183	0.6284	−0.064	0.161	.5213	0.8509	0.075	0.257
.4202	0.6326	−0.071	0.158	.5223	0.8531	0.086	0.262
.4214	0.6351	−0.076	0.156	.5267	0.8628	0.127	0.302
.4225	0.6375	−0.080	0.155	.5282	0.8695	0.134	0.306
.4264	0.6459	−0.076	0.144	.5308	0.8715	0.149	0.327
.4276	0.6485	−0.079	0.141	.5318	0.8737	0.152	0.332
.4296	0.6528	−0.081	0.137	.5331	0.8764	0.158	0.340
.4307	0.6551	−0.082	0.136	.5378	0.8866	0.186	0.343
.4318	0.6576	−0.082	0.134	.5392	0.8896	0.188	0.349
.4358	0.6662	−0.085	0.131	.5407	0.8929	0.197	0.359
.4368	0.6684	−0.085	0.130	.5422	0.8962	0.203	0.365
.4385	0.6720	−0.086	0.128	.5470	0.9064	0.244	0.400
.4397	0.6746	−0.086	0.126	.5486	0.9099	0.250	0.409
.4441	0.6840	−0.101	0.113	762.1840	0.4437	0.076	0.276
.4454	0.6870	−0.101	0.114	.1854	0.4467	0.084	0.290
.4479	0.6923	−0.100	0.113	.1869	0.4500	0.095	0.301
.4494	0.6956	−0.101	0.113	.1885	0.4535	0.105	0.312
.4509	0.6989	−0.100	0.111	.1934	0.4640	0.117	0.318
.4553	0.7083	−0.093	0.120	.1948	0.4670	0.121	0.326
.4567	0.7113	−0.093	0.114	.1960	0.4697	0.123	0.335
.4588	0.7158	−0.094	0.108	.1972	0.4722	0.126	0.340
.4600	0.7184	−0.095	0.104	.2014	0.4812	0.140	0.357
.4616	0.7220	−0.097	0.102	.2026	0.4839	0.143	0.359

Table I (continued)

J.D. (Hel.) 2446000. +	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$	J.D. (Hel.) 2446000. +	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$
762.2039	0.4866	0.146	0.361	762.3313	0.7620	−0.089	0.138
.2053	0.4898	0.151	0.362	.3326	0.7648	−0.086	0.141
.2110	0.5019	0.151	0.376	.3340	0.7678	−0.085	0.148
.2119	0.5040	0.151	0.373	.3379	0.7762	−0.079	0.158
.2137	0.5078	0.151	0.372	.3397	0.7801	−0.072	0.163
.2149	0.5105	0.150	0.371	.3408	0.7825	−0.068	0.170
.2161	0.5130	0.150	0.372	.3425	0.7862	−0.064	0.176
.2236	0.5293	0.112	0.339	.3476	0.7971	−0.059	0.183
.2250	0.5323	0.105	0.333	.3490	0.8003	−0.052	0.184
.2262	0.5350	0.100	0.330	.3503	0.8030	−0.046	0.187
.2272	0.5371	0.097	0.324	.3515	0.8057	−0.041	0.191
.2347	0.5533	0.056	0.281	.3569	0.8174	−0.011	0.205
.2361	0.5563	0.050	0.280	.3585	0.8208	−0.003	0.211
.2374	0.5591	0.043	0.276	.3599	0.8238	0.001	0.217
.2387	0.5618	0.035	0.272	.3611	0.8264	0.008	0.223
.2437	0.5726	0.012	0.243	.3661	0.8372	0.027	0.242
.2451	0.5756	0.006	0.236	.3675	0.8402	0.034	0.249
.2460	0.5777	0.000	0.230	.3687	0.8429	0.039	0.257
.2474	0.5807	−0.006	0.226	.3701	0.8459	0.047	0.262
.2523	0.5914	−0.020	0.211	.3753	0.8571	0.063	0.285
.2537	0.5942	−0.023	0.208	.3767	0.8601	0.070	0.292
.2551	0.5972	−0.027	0.205	.3781	0.8631	0.075	0.299
.2566	0.6005	−0.032	0.198	.3795	0.8661	0.085	0.307
.2623	0.6128	−0.070	0.167	.3846	0.8771	0.099	0.326
.2635	0.6155	−0.070	0.166	.3857	0.8796	0.102	0.335
.2649	0.6185	−0.070	0.164	.3870	0.8823	0.109	0.343
.2664	0.6217	−0.072	0.162	.3885	0.8856	0.120	0.350
.2720	0.6338	−0.093	0.146	.3936	0.8966	0.156	0.388
.2734	0.6368	−0.092	0.131	.3948	0.8991	0.166	0.392
.2746	0.6395	−0.092	0.127	.3961	0.9020	0.174	0.402
.2759	0.6422	−0.091	0.108	.3972	0.9044	0.183	0.410
.2771	0.6449	−0.091	0.104	.4019	0.9146	0.214	0.438
.2948	0.6832	−0.102	0.126	.4031	0.9171	0.223	0.441
.2962	0.6861	−0.105	0.118	.4046	0.9203	0.235	0.454
.2972	0.6883	−0.105	0.118	.4057	0.9229	0.240	0.460
.2984	0.6909	−0.110	0.120	.4103	0.9326	0.281	0.492
.3031	0.7011	−0.114	0.127	.4114	0.9352	0.293	0.500
.3044	0.7038	−0.115	0.125	.4128	0.9380	0.305	0.510
.3057	0.7066	−0.115	0.122	.4141	0.9409	0.317	0.519
.3070	0.7095	−0.115	0.120	.4192	0.9518	0.364	0.571
.3119	0.7201	−0.116	0.132	.4204	0.9545	0.379	0.583
.3135	0.7236	−0.114	0.128	.4223	0.9587	0.395	0.597
.3151	0.7269	−0.111	0.127	.4237	0.9617	0.406	0.613
.3167	0.7303	−0.109	0.123	.4283	0.9716	0.436	0.630
.3212	0.7401	−0.104	0.120	.4296	0.9745	0.443	0.641
.3225	0.7429	−0.101	0.125	.4309	0.9772	0.447	0.659
.3238	0.7458	−0.099	0.126	.4324	0.9805	0.455	0.661
.3250	0.7382	−0.098	0.128	.4370	0.9904	0.476	0.682
.3298	0.7588	−0.092	0.131	.4382	0.9331	0.476	0.683

Table I (continued)

J.D. (Hel.) 2446000.+	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$	J.D. (Hel.) 2446000.+	Phase	$\Delta m\,(B)$	$\Delta m\,(V)$
762.4396	0.9959	0.481	0.681	762.4767	0.0762	0.214	0.418
.4412	0.9995	0.484	0.675	.4780	0.0791	0.204	0.407
.4462	0.0102	0.462	0.647	.4834	0.0906	0.167	0.352
.4475	0.0130	0.456	0.643	.4848	0.0936	0.154	0.346
.4486	0.0154	0.451	0.639	.4864	0.0972	0.139	0.336
.4496	0.0177	0.444	0.638	.4878	0.1002	0.131	0.332
.4578	0.0354	0.380	0.586	.4932	0.1118	0.087	0.296
.4591	0.0381	0.373	0.583	.4948	0.1152	0.075	0.289
.4603	0.0406	0.367	0.570	.4963	0.1185	0.064	0.286
.4617	0.0436	0.359	0.558	.4979	0.1220	0.051	0.280
.4656	0.0522	0.307	0.522	.5042	0.1355	0.051	0.258
.4669	0.0549	0.301	0.512	.5057	0.1388	0.043	0.251
.4680	0.0574	0.292	0.507	.5073	0.1424	0.035	0.246
.4686	0.0586	0.284	0.501	.5137	0.1560	0.038	0.223
.4694	0.0605	0.282	0.495	.5153	0.1595	0.041	0.214
.4738	0.0699	0.232	0.451	.5171	0.1635	0.048	0.208
.4754	0.0734	0.222	0.431	.5187	0.1670	0.052	0.194

3. Light Curve Variations and Conclusions

The light curves shown in Figure 1, each consist of 522 individual B and V magnitude differences between the variable star and the comparison star, have been plotted against the orbital phases calculated from the following light elements:

$$\text{J.D. Hel. Min. I} = 2446711.5342 + 0^{d}.46279321E\,.$$

It can be seen from the O–C variation of CN And that it shows nonlinear period changing (Evren *et al.*, 1987). To determine this period change, we collected 71 minima and by including to these our 6 Min. I and 4 Min. II we calculated the new light elements using the epoch 2433570.465 given by Löchel (1960), and the period 0.46279475 day given by Michaels *et al.* (1984) in a quadratic form as

$$\text{J.D. Hel. Min. I} = \underset{\pm 25}{2433570.4618} + \underset{\pm 35}{0^{d}.46279731}E - \underset{\pm 1.1}{7.1 \times 10^{-11}}E^{2}\,.$$

The light curves of the system were secured on the nights 8–9, 10–11 October and 25–26, 27–28 November, 1986. The phase coverage of the observations are 0.56–0.37 for the first night, 0.86–0.11 for the second, 0.11–0.92 for the third and 0.44–0.17 for the fourth. A glance at Figure 1 immediately reveals cycle to cycle light curve variations in each colour. Both of the minima show partial eclipses. The depth of the primary minimum is nearly twice the depth of the secondary regardless to the filters used. This is an interesting phenomenon for CN And since it is known to be a W UMa-type binary. Considering this fact together with the shape of the light curve, which is nearly of a β Lyrae-type, it can be noted that the system is a β Lyrae-type eclipsing binary. Another

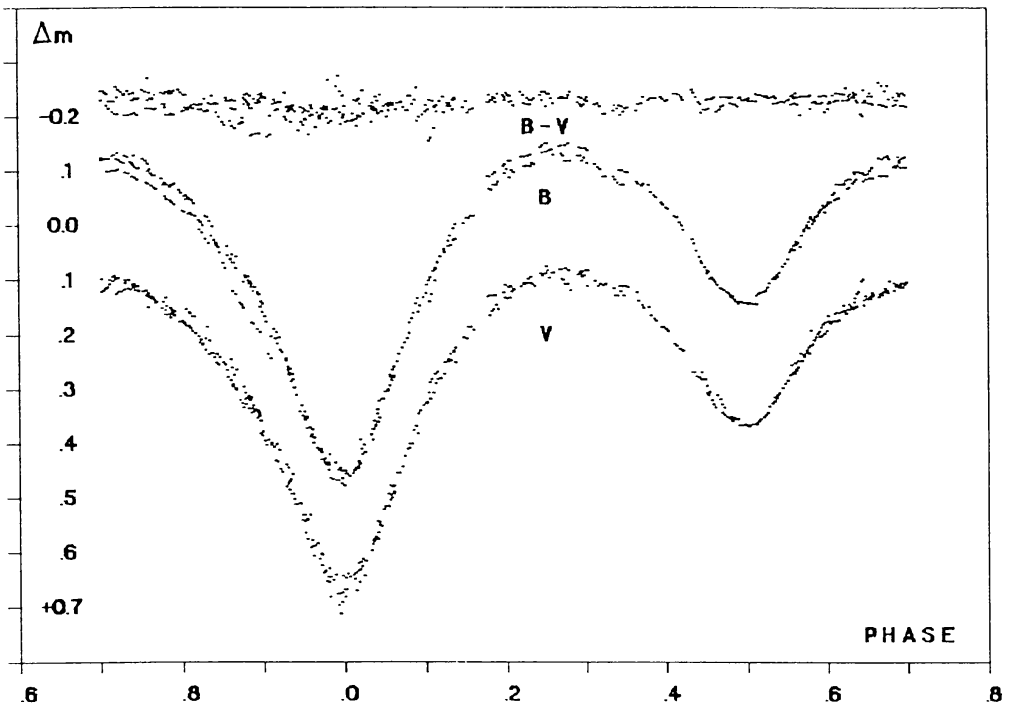

Fig. 1. B and V light curves and $B - V$ variation of CN And.

distinct feature of the light curves is that maximum brightnesses do not coincide with 0.25 and 0.75, instead, Max. I occurs at 0.30 while Max. II at 0.70. Furthermore, the light levels at maxima differ slightly from each other in both colours. In blue light it amounts to nearly 0.04 mag and in yellow nearly 0.03 mag. In each case Max. I is brighter than Max. II. Kaluzny (1986) indicated the evidence of hotter regions near the contact point which can be observed at 0.25 and 0.75 during the orbital motion. On the other hand, hot or cold spots located on the component stars at convenient areas can produce the same effect.

Figure 1 also reveals cyclic variations in the light of the system. In the descending branch of Min. I, nightly brightness differences show no systematic trend and exhibit small-amplitude fluctuations. This phenomenon is more evident in B colour. Being more pronounced in V, light fluctuations also exist in the primary mid-eclipse. In the ascending branch of Min. I, however, nightly brightness differences are not well distinguished perhaps partly due to the lesser quantity of the observations relative to the descending branch. In Max. I and Max. II, brightness differences and small fluctuations are rather much.

Analysis of the light curves is being made by the method of Wilson–Devinney and the results will be puslished elsewhere.

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