

THE PHOTOMETRIC STUDY OF TWO FAINT MIRA-TYPE STARS UX CYG AND AP CYG

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ABSTRACT. Two faint Mira-type stars were investigated on the Moscow and Odessa plates collections. The new ephemerids are $T_{max} = 2426875 + 274.^d8 \cdot E$ for AP Cyg and $2442162 + 568.^d \cdot E$ for UX Cyg. For UX Cyg, the multiharmonic variability was detected. Two stars were suspected in variability among the comparison stars.

Key words: Stars: miras; suspected; stars: individual: UX Cyg, AP Cyg.

The stars AP Cyg and UX Cyg have been observed on the Odessa and Moscow collections of the plates. The finding chart is shown in the figure 1. The magnitudes of the 13 comparison stars have been derived from the standard NGC 6633 (Kazanasmas et al., 1981). Their magnitudes are given in the table below. The maximum error estimate for brightest stars reaches $0.^m4$.

Table 1.

Star	m_{pg}	σ	$m_{pg} - m_{vis}$
a	9.40	0.4	+0.6
B	9.62	0.35	+0.3
C	11.35	0.08	+1.85
D	11.50	0.10	+1.6
E	11.63	0.11	+1.7
F	Var.	suspect	
K	12.18	0.12	+1.2
G	12.24	0.11	+1.8
X	12.27	0.10	-
m	12.39	0.15	+0.9
Y	12.43	0.17	-
N	12.51	0.15	+0.5
o	12.75	0.11	+0.15
p	12.95	0.11	-0.25

AP Cyg: The GCVS (1985) data: $20^h52^m23^s$, $+30^\circ25.4$ (eq. 1950.0); $14.^m0 - (15.^m0$ in pg-system; $T_{max} = 2426875$, $P = 274.^d8$, the type - Mira?. Beljawsky (1935) gives the period also $275.^d$

This star is not visible on the Odessa collection plates. Another 38 certain points are available in the AFOEV database.

Only Moscow collection plates were used for the re-

search of the period. The total interval of observation is 31206 days. But two points are very away from the rest. If these points exclude, the interval of observation is only 17374 days. Therefore obtained results are not satisfactory.

For the analysis, the program FO.EXE was used (Andronov, 1994).

UX Cyg: The GCVS data (1985): $20^h53^m00^s$, $+30^\circ13.4$ (eq. 2000.0); $9.^m0-16.^m5$ in visual system; $T_{max} = 2444421$, $P = 565.^d0$, type - Mira, spectral type - M4e-M6.5e. The period is variable. Sometimes rapid light decreases on the ascending branch near maximum are observed.

On the Moscow collection plates, 10 observations have been obtained. These data point to descending branch. On the Odessa collection plates, 189 observations of summary brightness UX Cyg and near star "var1" have been obtained. These objects are not visible separately at one plate. With regard to the investigations "var1" on the Moscow collection plates, the deviations from the mean brightness may think the real variations of light of UX Cyg.

The periodogram analysis has been carried out on the base of the AFOEV (France) and VSOLJ (Japan) data and the multiharmonic variability of UX Cyg has been detected. The parameters of the mean light curve of this star have been calculated used the program FDCN (Andronov, 1994). The light curve is described by a 4^{th} - order trigonometric polynomial with the best fit period $P = 567.^d995 \pm .^d111$; initial epoch for the maximum JD 2442161.8 ± 2.1 ;

initial epoch for the minimum JD 2441953.1 ± 12.5 ; the asymmetry $f = 0.37 \pm 0.02$; $\Delta mag = 4.^m68 \pm .^m08$; The parameters of sharpness:

the ascending branch -

$$dm/dt = -0.058 \pm 0.003; dt/dm = -17 \pm 1;$$

the descending branch -

$$dm/dt = 0.031 \pm 0.003; dt/dm = 32 \pm 3.$$

The amplitude of the wave with main frequency:

$r_1 = 1.^m86 \pm 0.^m08$ and the phase of its maximum: $\phi_{max} = 0^p072 \pm 0^p006$ in respect to the maximum of the light curve.

The amplitudes and the phases of maximum of others: 2: $0.^m99 \pm 0.^m08$; $0^p026 \pm 0^p006$; $r_2/r_1 = 0.53 \pm 0.06$

3: $0^m09 \pm 0^m08$; $-0^p05 \pm 0^p13$; $r_3/r_1 = 0.05 \pm 0.04$
 4: $0^m34 \pm 0^m06$; $-0^p14 \pm 0^p03$; $r_4/r_1 = 0.18 \pm 0.04$

Suspected variables: During the observations of UX Cyg and AP Cyg, two comparison stars were suspected of the variability. These are the stars "v1" and "v2(f)" in the figure 1. The observations are given in the table 2. "v1" shows the variation on 0^m17 , and "v2(f)" shows the variation on 0^m41 during the interval of the observations. However, with regard to the scattering of the magnitudes, the star "v1" may be classified as constant. The variation of the star "v2(f)" is larger, but not exceed 3σ .

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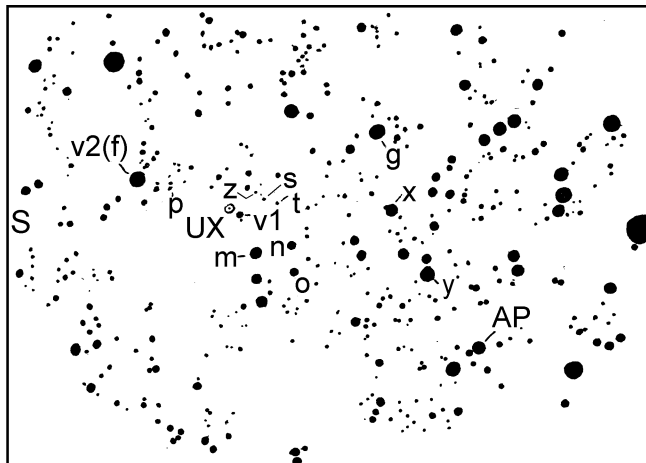


Figure 1: The finding chart for UX and AP Cyg.

Table 2.

v1	v2(f)	JD 243	v1	v2(f)	JD 243
12.69	12.00	9024.383	12.72	12.07	9027.264
12.68	12.07	.348	12.70	11.93	9035.398
12.64	12.13	.311	12.69	12.02	.364
12.74	12.02	.277	12.68	11.83	9034.421
12.72	12.02	.241	12.70	11.99	9033.427
12.72	11.93	9023.400	12.68	11.80	9032.417
12.66	12.04	.371	12.74	11.87	.380
12.68	12.02	.231	12.69	11.99	9031.445
12.72	11.99	9022.370	12.66	11.95	.409
12.72	12.07	.340	12.71	11.84	9030.421
12.78	12.13	9027.235	12.68	11.87	9029.439
12.68	12.02	9026.449	12.70	11.94	40499.251
12.69	11.96	9025.439	12.74	12.01	0478.424
12.65	12.07	.404	12.77	11.97	.389
12.66	12.00	.368	12.79	11.92	0473.416
12.70	12.06	.328	12.76	11.97	.416
12.68	11.98	.279	12.66	11.97	0153.374
12.69	12.02	.235	12.69	12.07	0122.364
12.70	11.91	9024.455	12.68	11.98	0097.537
12.72	12.01	.417	12.75	11.97	0093.507
12.68	12.00	9029.370	12.71	12.16	0071.461
12.71	11.75	9028.4	12.67	12.04	39036.329
12.81	11.94	.38	12.73	11.96	40530.269
12.67	11.97	.3	12.76	11.98	0510.357
12.78	11.99	.27	12.72	12.02	0538.172
12.73	12.02	.231	12.74	11.98	0530.236
12.73	11.97	9027.419	12.69	11.97	0499.286
12.69	11.99	.360	12.79	12.04	0538.206
12.72	11.93	.3			

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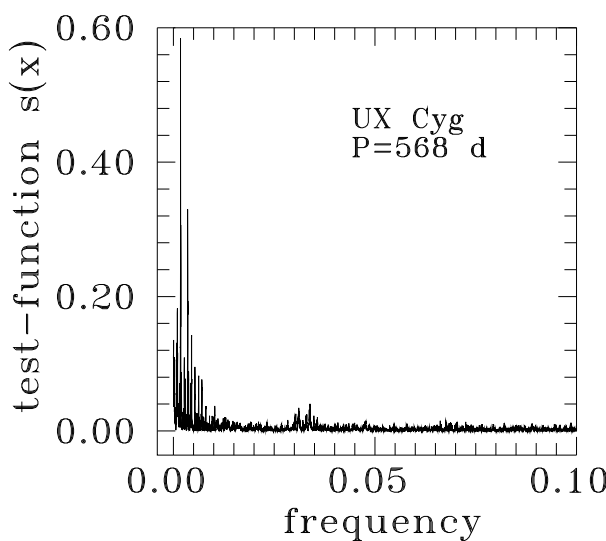


Figure 2: The periodogram for UX Cyg.

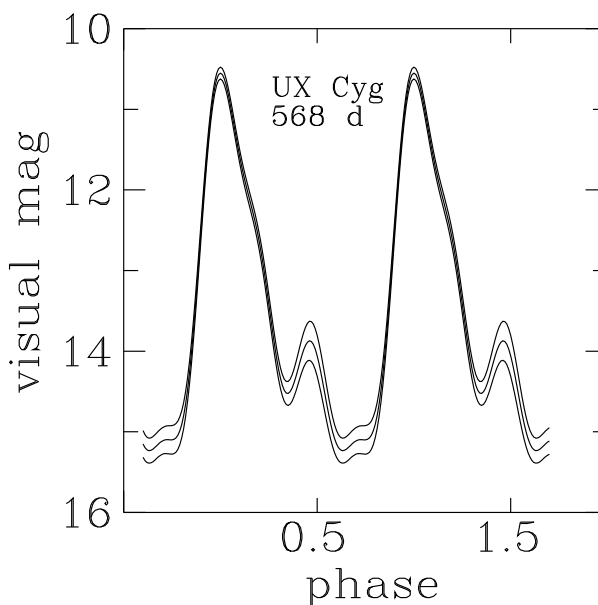


Figure 3: The mean light curve of UX Cyg and $\pm 1\sigma$ limits of the smoothing function.