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# PHOTOELECTRIC UBV PHOTOMETRY OF NORTHERN CEPHEIDS, III

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# PHOTOELECTRIC UBV PHOTOMETRY OF NORTHERN CEPHEIDS, III


## ABSTRACT

New UBV photoelectric observational data on 25 northern Cepheids with periods longer than 10 days are presented. The period changes and the variations in the light curve of the observed Cepheids are investigated.

Almost half of the programme stars show continuous period change (parabolic O-C curve). Among the Cepheids in binary systems YZ Aur, SV Per and perhaps AN Aur show a period jump and a subsequent rejump to the earlier value of the period. The apparent period changes due to orbital motion around the common centre of gravity can be seen in RW Cam, X Cyg, SZ Cyg and T Mon. The orbital period of RW Cam is about 6600 days. The only new case of secular light curve variation is observed in AN Aur.


## INTRODUCTION

This paper is the third and last part of a series dealing with the new UBV photometry of northern Cepheids performed at the Konkoly Observatory, and it contains the observational data and O-C diagrams of Cepheids with periods longer than 10 days. The previous parts of this survey covered Cepheids with periods shorter than this limit (Szabados, 1977 and 1980; hereinafter these papers are referred to as Paper I and Paper II, respectively).

The main purposes of this survey have been outlined in the introductions to Papers I and II. With the long period Cepheids the most important factor is the knowledge of the period changes because the long period Cepheids tend to exhibit strong period changes. The investigation of the period changes of Cepheids in binary systems is also very important because the O-C diagrams of these variables may show two kinds of peculiarities, viz. a rejumping period and an apparent period change due to the orbital motion (see pp. 112-114 of Paper II).

During the course of this last part of the work 25 Cepheids were observed. Of these variables, 13 were observed in three colours of the UBV system, the other 12 in B and V lights only.

## THE OBSERVATIONS

The stars dealt with in this programme were selected from the General Catalogue of Variable Stars (Kukarkin et al., 1969-1970) with the restrictions that their declination should be north of $0^{o}$ and B magnitude (or $m_{pg}$ for lack of photoelectric observations) at light minimum brighter than $12^{m}.5$ . This sample contains Cepheids of both populations with a period greater than 10 days. Only the variable star RU Cam was omitted because of its well known photometric and spectroscopic peculiarities which raise doubts as to its belonging to CW variables. Moreover, RU Cam has been regularly observed since 1967 at Konkoly Observatory by the members of the Variable Star Department. A detailed analysis on this star will appear in due course.

Table 1 The programme

| Star | N | Col. | Page obs. | Page rem. | Star | N | Col. | Page obs. | Page rem. |
|---|---|---|---|---|---|---|---|---|---|
| SZ Aql | 20 | UBV | 7 | 66 | VX Cyg | 22 | BV | 13 | 70 |
| TT Aql | 23 | UBV | 7 | 47 | BZ Cyg | 21 | BV | 14 | 20 |
| RX Aur | 17 | UBV | 7 | 41 | CD Cyg | 21 | UBV | 14 | 64 |
| SY Aur | 19 | UBV | 8 | 21 | AA Gem | 13 | BV | 15 | 40 |
| YZ Aur | 20 | BV | 8 | 68 | ζ Gem | 16 | UBV | 15 | 24 |
| AN Aur | 17 | BV | 9 | 29 | AP Her | 32 | BV | 16 | 31 |
| RW Cam | 20 | UBV | 9 | 62 | Z Lac | 20 | UBV | 16 | 35 |
| RW Cas | 21 | BV | 10 | 51 | T Mon | 12 | UBV | 17 | 72 |
| RY Cas | 20 | BV | 10 | 43 | SV Mon | 17 | UBV | 17 | 56 |
| SZ Cas | 18 | BV | 11 | 45 | SV Per | 19 | BV | 18 | 38 |
| X Cyg | 24 | UBV | 11 | 58 | VX Per | 16 | UBV | 18 | 37 |
| SZ Cyg | 19 | BV | 13 | 54 | SV Vul | 23 | UBV | 18 | 76 |
| TX Cyg | 23 | BV | 13 | 49 | | | | | |

The stars investigated are listed in Table 1. The number of observations on each star, the colours, serial numbers of the pages where the individual observations and the O-C diagram with additional remarks on the given star can be found are indicated in the successive columns. The total number of observations is close on 500. The observations were made between 1977 and 1980 except for Z Lac. This latter star was observed several years earlier among the stars in the second group of the programme stars, because of the similarity of its coordinates with the shorter period Cepheid RR Lac.

Table 2

| Variable | Comp. | V | B-V | U-B | Check | V | B-V | U-B | Remark |
|---|---|---|---|---|---|---|---|---|---|
| SZ Aql | + 0° 4090 | $8\overset{m}{.}94$ | $1\overset{m}{.}42$ | $1\overset{m}{.}42$ | + 0° 4088 | $6\overset{m}{.}76$ | $1\overset{m}{.}51$ | $1\overset{m}{.}75$ | |
| TT Aql | + 1° 3905 | 7.56 | 0.48 | -0.02 | + 1° 3911 | 8.89 | 0.74 | 0.47 | |
| RX Aur | +39° 1159 | 8.13 | 1.15 | 1.02 | +39° 1157 | 8.39 | 0.15 | -0.43 | |
| SY Aur | +42° 1190 | 8.81 | 1.63 | 2.04 | +42° 1192 | 9.17 | 0.33 | 0.07 | |
| YZ Aur | +39° 1221 | 9.66 | 1.21 | | +40° 1214 | 9.24 | 1.33 | | |
| AN Aur | +40° 1126 | 11.11 | 0.45 | | +40° 1132 | 10.35 | 0.51 | | |
| RW Cam | +58° 670 | 9.13 | 1.22 | 1.00 | +57° 755 | 9.19 | 0.96 | 0.77 | |
| RW Cas | +56° 311 | 9.70 | 1.31 | | +57° 362 | 8.99 | 0.17 | | |
| RY Cas | +57° 2824 | 9.79 | 1.41 | | +57° 2823 | 9.58 | 0.29 | | |
| SZ Cas | +58° 466 | 9.94 | 1.34 | | +58° 461 | 9.74 | 0.46 | | |
| X Cyg | +35° 4219 | 7.42 | 0.65 | 0.12 | +35° 4282 | 6.64 | 1.61 | 2.10 | |
| SZ Cyg | +46° 2971 | 9.80 | 1.29 | | +46° 2976 | 9.46 | 1.13 | | |
| TX Cyg | +41° 3958 | 10.25 | 1.20 | | see Fig.1 | 10.68 | 0.88 | | |
| VX Cyg | +39° 4380 | 9.78 | 1.19 | | +40° 4365 | 9.63 | 0.45 | | 1 |
| BZ Cyg | +44° 3578 | 9.90 | 0.65 | | +44° 3572 | 9.64 | 0.47 | | 2 |
| CD Cyg | +33° 3734 | 8.92 | 1.07 | 0.84 | +33° 3730 | 9.38 | 0.32 | 0.08 | |
| AA Gem | +26° 1083 | 9.89 | 1.39 | | +26° 1080 | 10.51 | 0.14 | | |
| ζ Gem | +22° 1645 | 3.52 | 0.34 | 0.04 | +16° 1443 | 3.57 | 0.10 | 0.10 | |
| AP Her | +15° 3592 | 9.60 | 1.17 | | +15° 3586 | 9.33 | 0.98 | | |
| Z Lac | +55° 2791 | 8.79 | 1.05 | 0.83 | +55° 2792 | 8.71 | 0.24 | -0.06 | |
| T Mon, SV Mon | }+6° 1253 | 7.74 | 1.03 | 0.49 | + 6° 1254 | 7.37 | 1.57 | 1.52 | |
| SV Per | +41° 975 | 9.61 | 1.14 | | +41° 973 | 9.84 | 1.03 | | |
| VX Per | +57° 479 | 9.01 | 0.68 | 0.06 | +58° 375 | 8.87 | 0.73 | 0.11 | |
| SV Vul | +27° 3523 | 6.93 | 0.66 | 0.06 | +27° 3516 | 6.85 | 0.69 | 0.12 | |

Remarks: 1 The comparison star has a faint companion

2 The check star is double

A full description of the observational technique, and the telescope and filters used can be found in Paper I (p. 6). During the course of the present part the observations were performed using the 24" telescope only.

The V magnitudes and colour indices of the comparison and check stars are listed in Table 2. The tie-in observations were made with the aid of UBV standard stars taken from the catalogue of Blanco et al. (1968). All the comparison and check stars are BD stars except for the check star for TX Cyg. This latter check star can be identified using the chart in Fig. 1. The size of this chart is 45'x45', north is at the top; the letter *a* denotes the comparison star and the star marked *b* is the check one.

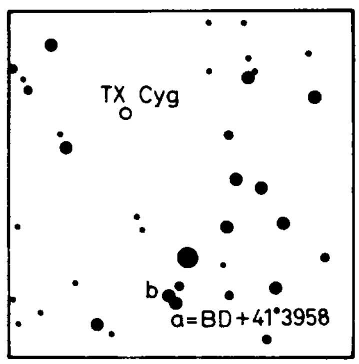


Figure 1  Identification chart for TX Cyg

Table 3 contains the observations in alphabetical order of the constellations. Some unpublished observations made by Prof. L. Detre in 1953 and by Dr. J. Abaffy in 1967 are also listed in Table 3. Unfortunately, since the comparison stars used by them are unknown in several cases these two sets of observations have not been transformed to the standard system, and only the magnitude differences are given in the instrumental system.

Table 3 The observations

SZ Aquilae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3647.526 | 9.22 | 1.82 | | 3761.289 | 8.65 | 1.57 | 1.43 |
| 3679.478 | 9.14 | 1.79 | | 3763.315 | 8.88 | 1.69 | 1.44: |
| 3693.440 | 8.69 | 1.65 | 1.48 | 3798.223 | 8.96 | 1.72: | 1.61: |
| 3701.422 | 9.04 | 1.62 | 1.28 | 3803.213 | 9.17 | 1.66 | 1.42 |
| 3703.518 | 8.77 | 1.46 | 1.03 | 3809.239 | 8.31 | 1.32 | 0.94: |
| 3705.406 | 8.20 | 1.20 | | 4049.529 | 8.34 | 1.32 | 1.19 |
| 3714.383 | 9.15 | 1.83 | 1.67 | 4050.470 | 8.41 | 1.35 | 1.21 |
| 3743.400 | 8.58 | 1.51 | 1.39 | 4102.330 | 8.47 | 1.45 | |
| 3747.311 | 9.00 | 1.76 | 1.71 | 4113.313 | 8.95 | 1.53 | 1.23 |
| 3749.405 | 9.25 | 1.85: | | 4150.264 | 8.04 | 1.07 | 1.04 |

TT Aquilae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3647.546 | 6.77 | 1.13 | 0.82 | 3743.412 | 6.71 | 1.10 | 0.83 |
| 3679.456 | 7.28 | 1.47 | 1.33 | 3747.298 | 7.19 | 1.44 | 1.33 |
| 3690.414 | 6.93 | 1.28 | 1.07 | 3749.417 | 7.45 | 1.55 | 1.50 |
| 3701.407 | 6.65 | 0.98 | 0.76 | 3772.260 | 6.89 | 1.24 | 0.94 |
| 3703.506 | 6.85 | 1.24 | 1.06 | 3781.289 | 7.37 | 1.33 | 1.00 |
| 3705.394 | 7.10 | 1.39 | 1.18 | 3809.228 | 7.33 | 1.33 | 0.99 |
| 3707.443 | 7.32 | 1.47 | 1.36 | 4050.482 | 7.24 | 1.44 | 1.32 |
| 3714.371 | 6.67 | 1.00 | 0.63 | 4126.301 | 7.19 | 1.25 | 0.98 |
| 3722.411 | 7.52 | 1.60 | 1.52 | 4129.330 | 6.79 | 1.20 | 0.83 |
| 3724.437 | 7.56 | 1.50 | 1.60 | 4140.320 | 7.08 | 1.16 | 0.84 |
| 3737.322 | 7.55 | 1.65 | 1.61 | 4155.238 | 6.65 | 1.03 | 0.63 |
| 3739.405 | 7.40 | 1.42 | 1.08 | | | | |

RX Aurigae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3438.607 | 7.76 | 1.12 | 0.74 | 3607.296 | 7.73 | 0.93 | 0.56: |
| 3483.653 | 7.60 | 0.97 | 0.72 | 3777.536 | 7.98 | 1.15 | 0.84 |
| 3490.524 | 7.81 | 0.95 | 0.53 | 3789.619 | 8.02 | 1.14 | 0.88 |
| 3599.311 | 7.55 | 0.96 | 0.57 | 3791.574 | 7.95 | 1.03 | 0.67 |

Table 3 (cont.)

(RX Aur)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3830.399 | 7.37 | 0.83 | 0.54 | 4143.473 | 7.41 | 0.80 | 0.53 |
| 3911.445 | 7.35 | 0.78 | 0.56 | 4162.535 | 8.02 | 1.11 | 0.74 |
| 3926.434 | 7.73 | 1.06 | 0.74 | 4203.324 | 7.50 | 0.98 | 0.59 |
| 3957.302 | 7.43 | 0.80 | 0.47 | 4251.332 | 7.63 | 1.04 | 0.70 |
| 3966.312 | 7.86 | 1.04 | 0.59: | | | | |

SY Aurigae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3424.635 | 9.12 | 1.00 | 0.68 | 3878.315 | 9.36 | 1.21 | |
| 3425.639 | 8.91 | 0.91 | 0.66 | 3928.355 | 9.27 | 1.22 | 0.81 |
| 3438.628 | 8.93 | 1.03 | | 3931.279 | 9.29 | 1.09 | 0.71 |
| 3460.493 | 9.12 | 1.11 | | 3956.290 | 8.98 | 1.05 | 0.79 |
| 3483.620 | 9.36 | 1.21 | 0.89 | 3957.315 | 9.09 | 1.15 | 0.78: |
| 3599.328 | 8.76 | 0.92 | 0.72: | 4132.622 | 9.38 | 1.22 | 0.75 |
| 3789.485 | 9.27 | 1.01 | | 4157.507 | 8.74 | 0.91 | 0.59: |
| 3791.601 | 8.84 | 0.93 | 0.64 | 4166.471 | 8.89 | 0.95 | 0.72: |
| 3803.393 | 8.86 | 0.93 | 0.77: | 4203.346 | 9.37 | 1.24 | 0.87 |
| 3849.454 | 9.33 | 1.14 | 0.78 | | | | |

YZ Aurigae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3420.620 | 10.25 | 1.43 | | 3849.411 | 10.52 | 1.47 | |
| 3423.569 | 10.46 | 1.60 | | 3928.385 | 10.14 | 1.33 | |
| 3424.584 | 10.52 | 1.67 | | 3931.403 | 10.27 | 1.58 | |
| 3425.593 | 10.65 | 1.66 | | 3956.275 | 10.75 | 1.56 | |
| 3483.602 | 10.76 | 1.47 | | 4108.560 | 9.98 | 1.22 | |
| 3490.540 | 10.00 | 1.28 | | 4132.604 | 10.41 | 1.53 | |
| 3598.349 | 9.93 | 1.20 | | 4143.469 | 9.96 | 1.21 | |
| 3777.551 | 10.56 | 1.33 | | 4167.460 | 10.28 | 1.56 | |
| 3791.586 | 10.72 | 1.68 | | 4215.393 | 10.09 | 1.27 | |
| 3793.617 | 10.53 | 1.53 | | 4251.315 | 10.27 | 1.25 | |

Table 3 (cont.)

AN Aurigae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3424.603 | 10.73 | 1.34 | | 3803.408 | 10.81 | 1.40 | |
| 3425.616 | 10.49 | 1.23: | | 3926.386 | 10.76 | 1.43 | |
| 3438.590 | 10.21 | 1.14 | | 3928.369 | 10.79 | 1.36 | |
| 3483.569 | 10.68 | 1.40 | | 3931.394 | 10.30 | 1.21 | |
| 3490.470 | 10.24 | 1.09 | | 3935.298 | 10.50 | 1.36 | |
| 3524.252 | 10.57 | 1.40 | | 4157.487 | 10.30 | 1.18 | |
| 3777.514 | 10.25 | 1.21 | | 4167.445 | 10.29 | 1.18 | |
| 3789.513 | 10.25 | 1.27 | | 4251.351 | 10.19 | 1.17 | |
| 3793.578 | 10.79 | 1.44 | | | | | |

RW Camelopardalis

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3438.520 | 8.88 | 1.47 | 0.91 | 3849.437 | 8.94 | 1.50 | 0.92: |
| 3481.412 | 8.32 | 1.34 | 0.92 | 3878.332 | 8.58 | 1.42 | 0.98: |
| 3483.674 | 8.52 | 1.44 | 1.02 | 3926.451 | 8.52 | 1.42 | 1.00 |
| 3560.320 | 8.47 | 1.24 | 0.82 | 3928.337 | 8.65 | 1.45 | 1.03 |
| 3777.441 | 8.39 | 1.35 | 1.03: | 3935.328 | 8.84 | 1.41 | 0.83 |
| 3788.565 | 8.74 | 1.37 | 0.82 | 3956.303 | 8.20 | 1.27 | 0.91 |
| 3789.442 | 8.75 | 1.37 | 0.88 | 3966.325 | 9.00 | 1.46 | 0.96 |
| 3791.557 | 8.17 | 1.21 | 0.89: | 4143.444 | 8.78 | 1.52 | 0.99 |
| 3803.376 | 8.92 | 1.44 | 0.90 | 4162.510 | 9.01 | 1.48 | 0.89: |
| 3830.367 | 8.70 | 1.53 | 1.01 | 4167.413 | 8.55 | 1.34 | 0.85 |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9777.469 | +0.203 | 1.070 | 1.929 | 9791.442 | -0.021 | 0.832 | 1.634 |
| 9780.574 | +0.392 | 1.234 | 1.755 | 9806.406 | -0.112 | 0.684 | 1.265 |
| 9782.628 | +0.180 | 1.003 | 1.410 | 9821.321 | -0.240: | 0.455: | 0.810: |
| 9786.528 | -0.441 | 0.147 | 0.864 | 9833.334 | +0.117: | 0.820: | |
| 9790.625 | -0.072 | 0.754 | 1.575 | | | | |

Table 3 (cont.)

RW Cassiopeiae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3420.524 | 9.10 | 1.35 | | 3830.246 | 8.60 | 0.92 | |
| 3424.488 | 9.59 | 1.59 | | 3837.421 | 9.44 | 1.52 | |
| 3437.400 | 9.34 | 1.48 | | 3873.362 | 9.41 | 1.32 | |
| 3438.471 | 9.48 | 1.55 | | 3928.249 | 9.70 | 1.56 | |
| 3489.314 | 9.23 | 1.19 | | 3931.265 | 9.49 | 1.41: | |
| 3490.333 | 8.58 | 0.91 | | 4108.500 | 9.50 | 1.51 | |
| 3560.272 | 9.69 | 1.52 | | 4113.377 | 8.81 | 1.21: | |
| 3788.522 | 8.90 | 1.17 | | 4157.391 | 8.79 | 1.08 | |
| 3789.456 | 9.01 | 1.28 | | 4166.370 | 9.73 | 1.62 | |
| 3791.529 | 9.24 | 1.44 | | 4167.302 | 9.62 | 1.46 | |
| 3800.288 | 8.98 | 1.14 | | | | | |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9759.590 | -0.091 | +0.919 | 2.11 | 9781.553 | -0.343 | +0.699 | 2.13 |
| 9762.589 | -0.855 | -0.153 | | 9783.424 | -0.127 | +1.043 | 2.08: |
| 9763.491 | -0.751 | +0.022 | 0.928 | 9786.507 | +0.278 | +1.458 | |
| 9769.530 | +0.006 | +1.152 | 2.61 | 9787.500 | +0.261 | +1.440 | |
| 9770.435 | +0.120 | +1.346 | 2.82 | 9790.490 | -0.108 | +0.844 | 2.03 |
| 9776.515 | -0.776 | -0.089 | 0.761 | 9791.501 | -0.957 | -0.351 | 0.450 |
| 9780.518 | -0.492 | +0.475 | 1.648 | | | | |

RY Cassiopeiae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3420.505 | 10.31 | 1.62: | | 3777.572 | 9.48 | 1.13 | |
| 3424.469 | 9.71 | 1.22 | | 3798.274 | 10.30 | 1.42: | |
| 3438.456 | 9.38 | 1.13 | | 3837.435 | 9.68 | 1.19 | |
| 3483.328 | 10.05 | 1.40 | | 3878.242 | 9.82 | 1.45 | |
| 3489.295 | 9.77 | 1.33 | | 3928.241 | 10.07 | 1.63 | |
| 3490.306 | 9.90 | 1.42 | | 3931.254 | 10.35 | 1.57 | |
| 3524.261 | 9.55 | 1.22 | | 4054.508 | 9.95 | 1.33 | |
| 3743.562 | 9.72 | 1.29 | | 4066.470 | 10.05 | 1.42 | |

Table 3 (cont.)

(RY Cas)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 4111.488 | 10.20 | 1.70: | | 4166.355 | 9.41 | 1.15 | |
| 4159.375 | 10.19 | 1.64 | | 4251.267 | 9.39 | 1.17 | |

<u>SZ Cassiopeiae</u>

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3420.557 | 9.81 | 1.44 | | 3849.423 | 9.87 | 1.49 | |
| 3423.624 | 9.61 | 1.36 | | 3935.248 | 10.03 | 1.53: | |
| 3424.524 | 9.68 | 1.41 | | 4066.528 | 9.78 | 1.50 | |
| 3483.394 | 9.97 | 1.57 | | 4100.541 | 9.93: | 1.51: | |
| 3489.394 | 9.75 | 1.35 | | 4101.520 | 9.85: | 1.43: | |
| 3743.575 | 9.99 | 1.59 | | 4162.438 | 9.88: | 1.42: | |
| 3777.381 | 9.61 | 1.33 | | 4166.439 | 10.02 | 1.59 | |
| 3789.567 | 9.68 | 1.34 | | 4167.509 | 10.03 | 1.52 | |
| 3793.566 | 9.74 | 1.47 | | 4215.373 | 9.78: | 1.37: | |

<u>X Cygni</u>

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3679.429 | 6.64 | 1.21 | 1.00 | 3789.330 | 6.67 | 1.46 | 1.46 |
| 3693.487 | 6.88 | 1.47 | 1.40 | 3795.354 | 6.63 | 1.19 | 0.91 |
| 3704.367 | 6.35 | 1.30 | 1.15 | 3803.243 | 6.42 | 1.32 | 1.22 |
| 3705.462 | 6.43 | 1.36 | 1.27 | 3830.190 | 5.87 | 0.85 | 0.57 |
| 3714.514 | 6.10 | 0.99 | 0.67 | 4102.343 | 6.85 | 1.46 | 1.52: |
| 3722.524 | 6.49 | 1.40 | 1.39 | 4108.358 | 5.91 | 0.88 | 0.54 |
| 3724.535 | 6.72 | 1.47 | 1.51 | 4113.535 | 6.29 | 1.25 | 1.08 |
| 3732.460 | 5.87 | 0.89 | 0.65 | 4126.325 | 5.96 | 0.92 | 0.70 |
| 3739.370 | 6.58 | 1.42 | 1.40 | 4129.356 | 6.24 | 1.22 | 1.12 |
| 3743.450 | 6.87 | 1.39 | 1.41 | 4143.361 | 6.01 | 1.00 | 0.77 |
| 3767.408 | 6.08 | 1.07 | 0.90 | 4155.281 | 6.60 | 1.19 | 0.94 |
| 3777.247 | 6.72 | 1.34 | 1.22 | 4160.371 | 6.07 | 1.07 | 0.89 |

Observations in 1953

| J.D.hel. 2430000+ | Δv | Δb | J.D.hel. 2430000+ | Δv | Δb |
|---|---|---|---|---|---|
| 4575.441 | -0.567 | -0.646 | 4576.421 | -0.484 | -0.450 |

Table 3 (cont.)

(X Cyg)

| J.D.hel. 2430000+ | Δv | Δb | J.D.hel. 2430000+ | Δv | Δb |
|---|---|---|---|---|---|
| 4577.415 | -0.319 | -0.127 | 4606.332 | -0.691 | -0.909 |
| 4579.432 | -0.063 | +0.252 | 4607.510 | -0.552 | -0.700 |
| 4580.410 | +0.094 | +0.453 | 4608.495 | -0.479 | -0.495 |
| 4581.427 | +0.226 | +0.535 | 4609.549 | -0.331 | -0.309 |
| 4583.448 | +0.314 | +0.620 | 4610.421 | -0.259 | -0.140 |
| 4584.551 | +0.194 | +0.458 | 4611.397 | -0.178 | +0.050 |
| 4585.375 | +0.025 | +0.102 | 4614.419 | +0.180 | +0.539 |
| 4587.527 | -0.509 | -0.686 | 4618.483 | +0.012 | +0.019 |
| 4588.377 | -0.825 | -1.105 | 4619.394 | +0.040 | +0.022 |
| 4589.360 | -0.863 | -1.114 | 4619.570 | -0.002 | -0.050 |
| 4590.425 | -0.656 | -0.836 | 4620.539 | -0.579 | -0.874 |
| 4591.419 | -0.552 | -0.590 | 4621.622 | -0.839 | -1.170 |
| 4592.454 | -0.442 | -0.427 | 4622.508 | -0.693 | -1.020 |
| 4595.376 | -0.078 | +0.120 | 4623.545 | -0.542 | -0.791 |
| 4596.398 | +0.028 | +0.234: | 4624.546 | -0.534 | -0.542 |
| 4597.412 | +0.149 | +0.518 | 4625.473 | -0.373 | -0.376 |
| 4598.402 | +0.256 | +0.540 | 4627.548 | -0.131 | -0.014 |
| 4599.392 | +0.241 | +0.582 | 4628.538 | -0.018 | +0.284 |
| 4600.514 | +0.252 | +0.625 | 4629.546 | +0.182 | +0.389 |
| 4601.438 | +0.080 | +0.228 | 4636.583 | -0.318: | -0.531: |
| 4602.422 | -0.008 | +0.020 | 4649.387 | +0.250 | +0.561 |
| 4604.402 | -0.703 | -0.945 | 4652.372 | -0.044 | -0.025 |
| 4605.336 | -0.788 | -1.138 | 4652.545 | -0.096 | -0.119 |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9769.446 | -0.395 | 0.626 | 2.07 | 9788.278 | -0.145 | 1.075 | |
| 9770.397 | -0.293 | 0.796 | 2.38 | 9791.390 | +0.216 | 1.473 | |
| 9776.469 | +0.319 | 1.651 | 3.53: | 9795.247 | +0.285 | 1.506 | |
| 9777.379 | +0.368 | 1.713 | 3.37 | 9796.262 | +0.123 | 1.286 | |
| 9782.481 | -0.636 | 0.189 | 1.279 | 9799.281 | -0.648 | 0.179 | 1.255 |
| 9783.402 | -0.645 | 0.180 | 1.290 | 9814.271 | -0.098 | 0.922 | 2.26: |
| 9787.342 | -0.253 | 0.904 | | | | | |

Table 3 (cont.)

SZ Cygni

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3298.469 | 9.61 | 1.66 | | 3772.407 | 9.54 | 1.52 | |
| 3337.481 | 8.93 | 1.30: | | 3777.279 | 9.06 | 1.36 | |
| 3437.263 | 9.83 | 1.79 | | 3789.425 | 9.31 | 1.39 | |
| 3483.295 | 9.81 | 1.73 | | 3791.364 | 8.97 | 1.31: | |
| 3693.523 | 9.81 | 1.76 | | 3795.367 | 9.36 | 1.59 | |
| 3714.501 | 9.02 | 1.26 | | 3803.270 | 9.56 | 1.52 | |
| 3720.541 | 9.49 | 1.70: | | 4054.395 | 9.66 | 1.73 | |
| 3722.537 | 9.69 | 1.73 | | 4066.408 | 9.26 | 1.59 | |
| 3743.518 | 9.55 | 1.37 | | 4174.228 | 9.46: | 1.68: | |
| 3763.438 | 9.19 | 1.59 | | | | | |

TX Cygni

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3437.281 | 10.01 | 2.11 | | 3800.271 | 9.49 | 2.11 | |
| 3483.310 | 9.84 | 1.98 | | 3803.330 | 9.90 | 2.15 | |
| 3705.540 | 9.62 | 1.93 | | 3830.329 | 9.55 | 2.12 | |
| 3722.494 | 9.09 | 1.73 | | 4049.446 | 9.39 | 1.98 | |
| 3724.519 | 9.33 | 1.91 | | 4054.441 | 10.00 | 2.08 | |
| 3761.409 | 9.95 | 2.10 | | 4100.437 | 9.86 | 2.03 | |
| 3763.464 | 9.72 | 1.99 | | 4111.417 | 9.77 | 2.17 | |
| 3765.370 | 8.90 | 1.62 | | 4147.322 | 9.44 | 1.73 | |
| 3772.364 | 9.68 | 2.13 | | 4150.282 | 9.19 | 1.77 | |
| 3789.345 | 9.99 | 2.09 | | 4162.362 | 9.06 | 1.60 | |
| 3791.350 | 9.92 | 2.03 | | 4166.293 | 9.34 | 1.90 | |
| 3795.381 | 8.88: | 1.71: | | | | | |

VX Cygni

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3693.470 | 10.41 | 1.94 | | 3720.380 | 10.31 | 1.79 | |
| 3703.534 | 9.58 | 1.43 | | 3722.482 | 9.68 | 1.49 | |
| 3705.521 | 9.73 | 1.59 | | 3724.484 | 9.61 | 1.52 | |
| 3714.468 | 10.47 | 1.97 | | 3761.398 | 10.25 | 1.77 | |

Table 3 (cont.)

(VX Cyg)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3765.380 | 9.69 | 1.55 | | 3803.344 | 9.61 | 1.46 | |
| 3772.318 | 10.16 | 1.96: | | 3830.311 | 9.99 | 1.88 | |
| 3777.289 | 10.54 | 2.02 | | 4049.430 | 9.84 | 1.68 | |
| 3788.487 | 9.90 | 1.74 | | 4100.414 | 10.55 | 1.96 | |
| 3789.358 | 9.95 | 1.86 | | 4101.465 | 10.36 | 1.85 | |
| 3791.336 | 10.09 | 1.92 | | 4155.269 | 10.27 | 1.96 | |
| 3800.261 | 10.33 | 1.75: | | 4203.229 | 10.30 | 1.81 | |

BZ Cygni

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3437.246 | 10.12 | 1.56 | | 3777.411 | 10.33 | 1.80 | |
| 3647.502 | 10.53 | 1.67: | | 3788.472 | 10.50 | 1.72 | |
| 3679.517 | 10.28 | 1.68 | | 3795.336 | 10.06 | 1.65 | |
| 3693.506 | 10.08 | 1.54 | | 3803.254 | 10.09 | 1.56 | |
| 3714.449 | 10.11 | 1.61 | | 3868.223 | 10.32 | 1.70 | |
| 3720.550 | 10.20 | 1.60: | | 4049.413 | 10.08 | 1.63 | |
| 3722.467 | 10.06 | 1.63: | | 4050.451 | 10.22 | 1.71 | |
| 3739.383 | 10.52 | 1.66 | | 4100.460 | 10.15 | 1.70 | |
| 3743.529 | 10.05 | 1.51: | | 4102.354 | 10.40 | 1.74: | |
| 3763.446 | 10.05 | 1.60 | | 4113.345 | 10.49 | 1.76 | |
| 3772.393 | 10.06 | 1.52 | | | | | |

CD Cygni

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3630.489 | 8.68 | 1.31 | 1.03 | 3772.419 | 9.36 | 1.60 | 1.55 |
| 3705.500 | 9.45 | 1.68 | 1.46 | 3798.238 | 8.48 | 1.04 | 0.81 |
| 3714.428 | 8.57 | 1.21 | 1.00 | 3803.283 | 8.97 | 1.46 | 1.28 |
| 3720.524 | 9.21 | 1.58 | 1.53 | 3809.253 | 9.51 | 1.62 | 1.39 |
| 3724.561 | 9.54 | 1.63 | | 3830.295 | 9.14 | 1.34 | 1.06 |
| 3743.497 | 9.27 | 1.40 | | 4049.401 | 9.44 | 1.62 | |
| 3761.300 | 9.23 | 1.46 | 1.18 | 4101.451 | 9.34 | 1.43 | 1.23 |
| 3763.423 | 8.41 | 0.99 | 0.65 | 4111.402 | 9.01 | 1.57 | 1.37: |

Table 3 (cont.)

(CD Cyg)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 4126.342 | 8.80 | 1.38 | 1.13 | 4155.253 | 8.58 | 1.07 | 0.79 |
| 4129.343 | 9.12 | 1.57 | 1.44 | 4159.330 | 8.67 | 1.32 | 1.07 |
| 4140.332 | 8.54 | 1.17 | | | | | |

<u>AA Geminorum</u>

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3460.516 | 9.94 | 1.29 | | 3789.580 | 9.97 | 1.24 | |
| 3481.439 | 9.77 | 1.14 | | 3793.590 | 9.47 | 0.92 | |
| 3483.430 | 10.00 | 1.29 | | 3928.405 | 9.69 | 1.02 | |
| 3489.411 | 9.40 | 0.95 | | 3931.412 | 9.49 | 1.03 | |
| 3572.314 | 9.81 | 1.18 | | 3957.343 | 9.89 | 1.26 | |
| 3598.318 | 9.86: | 1.16: | | 3966.301 | 9.59 | 1.12: | |
| 3599.352 | 9.76 | 1.09: | | | | | |

<u>ζ Geminorum</u>

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3481.505 | 3.65 | 0.71 | 0.51 | 3791.614 | 4.14 | 0.90 | 0.69 |
| 3483.492 | 3.87 | 0.84 | 0.68 | 3793.606 | 3.84 | 0.72 | 0.58 |
| 3489.463 | 3.80 | 0.73 | 0.51 | 3849.494 | 3.94 | 0.87 | 0.81 |
| 3572.329 | 3.67 | 0.68 | 0.49 | 3926.403 | 3.75 | 0.71 | 0.56 |
| 3598.336 | 4.16 | 0.90 | 0.87: | 3928.420 | 3.68 | 0.67 | 0.56 |
| 3599.340 | 4.03 | 0.82 | 0.65 | 3935.345 | 3.85 | 0.77 | 0.55 |
| 3607.327 | 4.14 | 0.94 | 0.84 | 3957.331 | 3.70 | 0.69 | 0.57 |
| 3789.594 | 4.06 | 1.00 | 0.86 | 4203.461 | 3.76 | 0.82 | 0.75 |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9776.554 | 0.140: | 0.416: | 0.863: | 9796.536 | 0.164 | 0.444 | 0.873 |
| 9777.550 | 0.232 | 0.592 | 1.063 | 9810.591 | 0.627 | 1.120 | |
| 9782.569 | 0.595 | 1.045 | 1.599 | 9814.631 | 0.376 | 0.745 | 1.197 |
| 9784.553 | 0.314 | 0.647 | 1.074 | 9825.138 | 0.314: | 0.632: | 1.104: |
| 9786.551 | 0.169 | 0.444 | 0.875 | 9864.303 | 0.473 | 0.929 | 1.414 |
| 9791.583 | 0.676 | 1.184 | 1.919 | | | | |

Table 3 (cont.)

AP Herculis

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3298.450 | 10.74 | 0.80 | | 3749.425 | 10.50 | 0.62 | |
| 3304.495 | 10.95 | 0.70 | | 3753.289 | 10.94 | 0.84 | |
| 3337.439 | 10.50 | 0.60 | | 3761.278 | 10.52 | 0.62 | |
| 3647.457 | 10.49 | 0.56 | | 3772.269 | 10.62 | 0.69 | |
| 3690.395 | 10.75 | 0.79 | | 3777.256 | 11.13 | 0.93 | |
| 3705.422 | 11.08 | 0.84 | | 3789.294 | 10.95 | 0.71 | |
| 3714.413 | 11.12: | 0.82: | | 3791.228 | 10.43 | 0.65 | |
| 3716.355 | 11.10 | 0.77: | | 3800.239 | 10.75 | 0.68 | |
| 3720.355 | 10.56 | 0.66 | | 4049.364 | 10.38 | 0.67 | |
| 3722.436 | 11.01 | 0.80 | | 4054.424 | 11.16: | 0.81: | |
| 3724.448 | 11.13 | 0.89 | | 4108.343 | 11.17 | 0.90 | |
| 3730.319 | 10.54 | 0.64 | | 4111.386 | 10.46 | 0.63 | |
| 3732.433 | 10.87 | 0.81 | | 4113.324 | 10.55 | 0.67 | |
| 3739.325 | 10.46 | 0.59 | | 4157.268 | 10.95 | 0.92 | |
| 3743.308 | 10.96 | 0.88 | | 4159.250 | 11.08 | 0.99 | |
| 3747.320 | 11.03 | 0.78 | | 4167.241 | 11.05 | 0.83 | |

Z Lacertae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 2318.465 | 8.38 | 1.15 | 0.87 | 2728.302 | 8.24 | 1.00 | |
| 2642.405 | 7.92 | 0.90 | 0.55 | 2738.355 | 8.37 | 1.08 | 0.66 |
| 2645.490 | 8.45 | 1.25 | 1.02 | 2756.331 | 8.73 | 1.33 | 1.14 |
| 2646.388 | 8.58 | 1.31 | 1.08 | 2770.213 | 8.50 | 1.15 | 0.79 |
| 2672.546 | 8.48 | 1.09 | 0.69: | 3481.329 | 8.13 | 1.01 | 0.70 |
| 2675.429 | 8.05 | 0.95 | 0.61 | 3489.262 | 8.42 | 1.06 | 0.75 |
| 2676.452 | 8.21 | 1.06 | 0.74 | 3705.479 | 8.71 | 1.23 | 0.97 |
| 2685.497 | 7.92 | 0.81 | 0.62 | 3798.285 | 8.32 | 1.06 | 0.74: |
| 2714.359 | 8.82 | 1.25 | 1.06 | 3878.274 | 8.80 | 1.38 | |
| 2715.399 | 8.55 | 1.16 | 1.00: | 3931.238 | 8.65 | 1.29 | 1.21 |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9732.477 | +0.051 | +0.761 | 1.496 | 9759.390 | -0.331 | +0.319 | 0.941 |

Table 3 (cont.)

(Z Lac)

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9760.524 | -0.152 | +0.576 | 1.340 | 9769.513 | -0.392 | +0.175 | 0.755 |
| 9762.557 | +0.192 | +1.040 | 2.03 | 9789.356 | -0.350 | +0.111 | 0.687 |
| 9763.540 | +0.295 | +1.144 | 2.05 | 9790.469 | -0.593 | -0.114 | 0.355: |
| 9766.562 | -0.182: | +0.432: | | | | | |

T Monocerotis

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3481.462 | 6.54 | 1.43 | 1.01 | 3789.632 | 5.85 | 1.31 | 0.84 |
| 3483.452 | 6.37 | 1.26 | 0.68 | 3791.624 | 6.01 | 1.39 | 0.96 |
| 3489.429 | 5.73 | 1.07 | 0.60 | 3793.636 | 6.11 | 1.42 | 1.07 |
| 3490.454 | 5.77 | 1.19 | 0.70 | 3849.484 | 6.23 | 1.45 | 1.17 |
| 3560.360 | 6.59 | 1.46 | 1.05 | 3935.280 | 6.50 | 1.53 | 1.23 |
| 3777.607 | 6.52: | 1.45: | 0.96: | 4203.483 | 6.41 | 1.49 | 1.20 |

Observations in 1967

| J.D.hel. 2430000+ | Δv | Δb | Δu | J.D.hel. 2430000+ | Δv | Δb | Δu |
|---|---|---|---|---|---|---|---|
| 9784.630 | -0.992 | -0.255 | 0.512: | 9808.546 | -0.107 | +0.958 | 2.21 |
| 9786.592 | -0.973 | -0.176 | 0.671 | 9810.544 | -0.794 | +0.027 | 0.865 |
| 9787.572 | -0.869 | -0.027 | 0.929 | 9812.572 | -1.018 | -0.260 | 0.500 |
| 9790.589 | -0.688 | +0.307 | 1.461 | 9814.603 | -0.904 | -0.024 | 0.833 |
| 9791.571 | -0.622 | +0.403 | 1.680 | 9825.564 | -0.166 | +0.956: | |
| 9796.522 | -0.351 | +0.837 | 2.50: | | | | |

SV Monocerotis

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3481.486 | 8.41 | 1.36 | 0.98 | 3777.624 | 8.46 | 1.17 | 0.63 |
| 3483.473 | 8.67 | 1.40 | 1.12 | 3791.639 | 8.43 | 1.22 | 0.55 |
| 3489.444 | 7.66 | 0.81 | 0.37 | 3793.626 | 7.98 | 0.95 | 0.41 |
| 3490.436 | 7.70: | 0.90: | 0.32: | 3928.280 | 8.61 | 1.21 | 0.58 |
| 3560.383 | 8.75 | 1.42 | 1.08 | 3935.267 | 8.04 | 1.14 | 0.69 |
| 3572.293 | 8.30 | 1.34 | 0.90 | 3957.274 | 8.78 | 1.42 | 1.06 |
| 3599.282 | 7.95 | 1.08 | 0.56 | 3966.282 | 8.14 | 1.16 | 0.67: |

Table 3 (cont.)

(SV Mon)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 4167.530 | 8.47 | 1.39 | 1.00 | 4251.370 | 7.69: | 0.87: | 0.23: |
| 4203.511 | 8.41 | 1.14 | 0.51 | | | | |

SV Persei

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3438.569 | 8.49 | 0.91 | | 3931.292 | 8.93 | 1.10 | |
| 3490.506 | 9.35 | 1.14 | | 3935.313 | 9.35 | 1.18 | |
| 3560.338 | 8.85: | 0.91: | | 3957.287 | 9.35 | 1.17 | |
| 3599.298 | 9.14 | 1.24 | | 4132.588 | 9.02 | 1.18 | |
| 3607.281 | 8.76 | 1.08 | | 4143.456 | 8.97 | 1.19 | |
| 3789.529 | 9.23 | 1.27 | | 4162.416 | 8.59 | 0.94 | |
| 3791.542 | 9.22 | 1.14 | | 4166.421 | 9.05 | 1.22 | |
| 3830.385 | 8.85 | 1.08 | | 4167.430 | 9.20 | 1.18 | |
| 3837.477 | 9.03 | 1.05 | | 4215.417 | 9.05 | 1.12 | |
| 3878.297 | 9.23 | 1.26 | | | | | |

VX Persei

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3438.488 | 9.61 | 1.44 | 0.91 | 3789.549 | 9.08 | 1.09 | 0.76: |
| 3483.371 | 9.38 | 1.23 | 0.83 | 3873.343 | 9.69 | 1.39 | 1.03: |
| 3489.378 | 9.31 | 1.31 | 1.03 | 3878.261 | 9.03 | 1.16 | 0.82 |
| 3490.405 | 9.45 | 1.38 | 1.04 | 3928.260 | 9.62 | 1.45 | 1.02 |
| 3560.303 | 9.20 | 1.17 | 0.84 | 4101.501 | 9.65 | 1.35 | 1.11 |
| 3572.275 | 9.08 | 1.15 | 0.85 | 4108.514 | 9.11 | 1.19 | 0.88 |
| 3737.505 | 8.99 | 1.12 | 0.83 | 4132.571 | 9.42 | 1.36 | 0.98 |
| 3739.413 | 9.29 | 1.19 | 0.97 | 4166.404 | 9.59 | 1.42 | 1.11: |

SV Vulpeculae

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3298.489 | 7.75 | 1.72 | | 3647.477 | 7.39 | 1.72 | 1.63 |
| 3304.462 | 7.64 | 1.61 | 1.48 | 3679.408 | 6.96 | 1.44 | 1.12 |
| 3337.457 | 7.51 | 1.71 | 1.64 | 3701.388 | 7.65 | 1.78 | 1.76 |

Table 3 (cont.)

(SV Vul)

| J.D.hel. 2440000+ | V | B-V | U-B | J.D.hel. 2440000+ | V | B-V | U-B |
|---|---|---|---|---|---|---|---|
| 3705.440 | 7.77 | 1.78 | 1.65 | 3772.293 | 7.07 | 1.54 | 1.31 |
| 3714.353 | 6.75 | 1.13 | 0.78 | 3781.299 | 7.33 | 1.73 | 1.62 |
| 3720.338 | 6.88 | 1.28 | 0.97 | 3789.318 | 7.58 | 1.78 | 1.63: |
| 3722.452 | 6.92 | 1.37 | 1.06 | 3803.229 | 6.92 | 1.24 | 0.84 |
| 3732.449 | 7.22 | 1.64 | 1.55 | 4049.469 | 7.31 | 1.70 | 1.60 |
| 3739.354 | 7.40 | 1.77 | 1.65 | 4066.440 | 7.75 | 1.74 | 1.65 |
| 3753.280 | 7.68 | 1.75 | 1.58 | 4101.490 | 7.53 | 1.70 | |
| 3761.269 | 6.75 | 1.15 | 0.88 | 4150.327 | 7.63 | 1.78 | 1.68 |
| 3763.415 | 6.78 | 1.24 | 0.94 | | | | |

## THE LIGHT CURVES AND PERIOD CHANGES OF THE INDIVIDUAL VARIABLES

This section contains the light curves, the tables and the graphs of the O-C values representing the period variation. Some remarks on the observed Cepheids are also noted on the individual Cepheids. As in Papers I and II, it was not my intention to give the full history of the variables which would have increased considerably the volume of the paper. The variables were arranged according to the length of their period as in the previous papers.

A detailed description of the construction of the O-C diagrams can be found in Paper I (p. 32). The O-C values determined on the basis of visual, photographic and photoelectric observations are marked with open circles, filled circles and triangles, respectively. The size of these marks denotes the weight of the O-C values to be found in the figures of this section.

The columns in the tables of the O-C residuals for each variable contain the following data:

1. The moment of normal maximum (or that of median brightness)
2. The corresponding epoch
3. The O-C residual in days
4. The type of observation (vis for visual, pg for photographic and pe for photoelectric observations)
5. The weight of the O-C residual depending on the type, number

and quality of the observations.

6. The source of the observational data. When the name of the observer is not identical with the name (or one of the names) given in the reference the observer's name is indicated in the footnote to the table.

The determination of the O-C curves was by a weighted least squares fitting procedure. The O-C residuals with zero weight are not plotted in the diagrams, those with 0.5 weight are plotted but were always omitted in the curve fitting procedure.

The formula by which the O-C residuals have been calculated is indicated at each variable. These formulae usually refer to maximum light. If O-C diagrams for both maximum and median brightnesses are presented, the two different calculated ephemerides are marked with $C_{max}$ and $C_{med}$ , respectively.

BZ Cygni

The B light and the B-V colour curves of this small amplitude Cepheid are shown in Fig. 2. The O-C residuals have been computed by the formula:

$$C = 2443774.037 + 10^{d}.141932 \times E \quad .$$

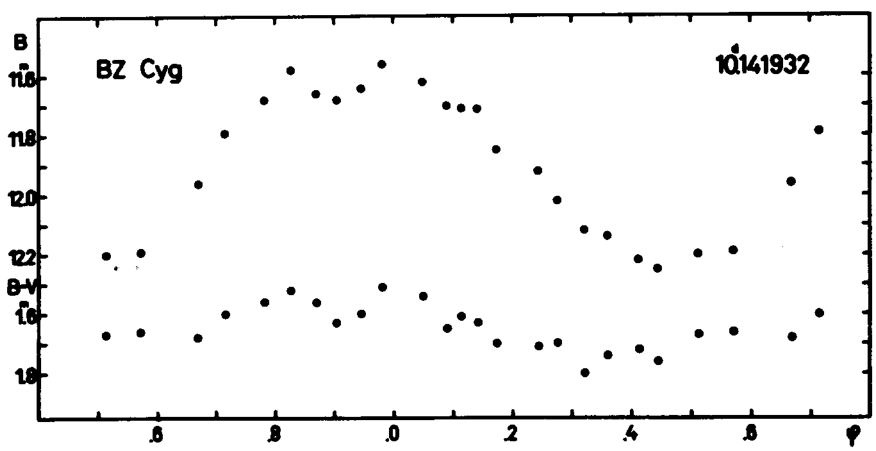


Figure 2 B and B-V curves of BZ Cyg

The period of this Cepheid has remained constant since the discovery of its light variation (see Fig. 3). The O-C value of the points with 0.5 weight is systematically smaller than that of

Table 4 O-C residuals for BZ Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2418571.266 | -2485 | $-0^{d}.070$ | pg | 1 | Furuhjelm (1921) |
| 2423631.4 | -1986 | -0.8 | pg | 0.5 | Rügemer (1933) |
| 2425943.45 | -1758 | -1.07 | pg | 0.5 | Beyer[1] (1934a) |
| 2426673.97 | -1686 | -0.77 | pg | 0.5 | Beyer[1] (1934a) |
| 2426674.10 | -1686 | -0.64 | pg | 0.5 | Lur'ye (1946) |
| 2426826.18 | -1671 | -0.69 | pg | 0.5 | Rügemer (1933) |
| 2427161.806 | -1638 | +0.254 | vis | 1 | Beyer (1934a) |
| 2428043.35 | -1551 | -0.55 | pg | 0.5 | Perova (1956) |
| 2430649.47 | -1294 | -0.91 | pg | 0.5 | Solov'yov (1945) |
| 2431349.85 | -1225 | -0.32 | pg | 0.5 | Perova (1956) |
| 2433073.92 | -1055 | -0.38 | pg | 0.5 | Perova (1956) |
| 2433306.66 | -1032 | -0.90 | pg | 0.5 | Perova (1956) |
| 2433560.64 | -1007 | -0.47 | pg | 0.5 | Perova (1956) |
| 2433976.20 | -966 | -0.73 | pg | 0.5 | Perova (1956) |
| 2434159.608 | -948 | +0.123 | pg | 1 | Nikulina (1970) |
| 2436085.580 | -758 | -0.873 | pg | 0.5 | Korovkina (1958) |
| 2436441.64 | -723 | +0.22 | pg | 0 | Korovkina (1959) |
| 2436786.104 | -689 | -0.142 | pe | 3 | Weaver et al. (1960) |
| 2436796.408 | -688 | +0.020 | pe | 3 | Oosterhoff (1960) |
| 2437191.22 | -649 | -0.70 | vis | 0.5 | Häussler (1965) |
| 2437273.217 | -641 | +0.158 | pe | 1 | Mitchell et al. (1964) |
| 2437922.037 | -577 | -0.105 | pg | 1 | Girnyak (1971) |
| 2438986.726 | -472 | -0.319 | pg | 1 | Girnyak (1971) |
| 2443774.144 | 0 | +0.107 | pe | 3 | present paper |

Remark: [1] Observer: Plaut

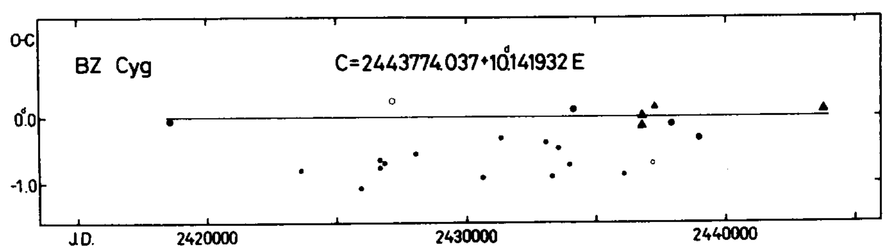


Figure 3 O-C diagram of BZ Cyg

the reliable points. This difference is caused by the fact that the phase of the normal maxima that are published without listing the original observational data is thought to be earlier than the phase of the true normal maximum determined from the photoelectric normal curve.

## SY Aurigae

Its light and colour curves are plotted in Fig. 4. According to Janot Pacheco (1976) this variable has a faint blue compan-

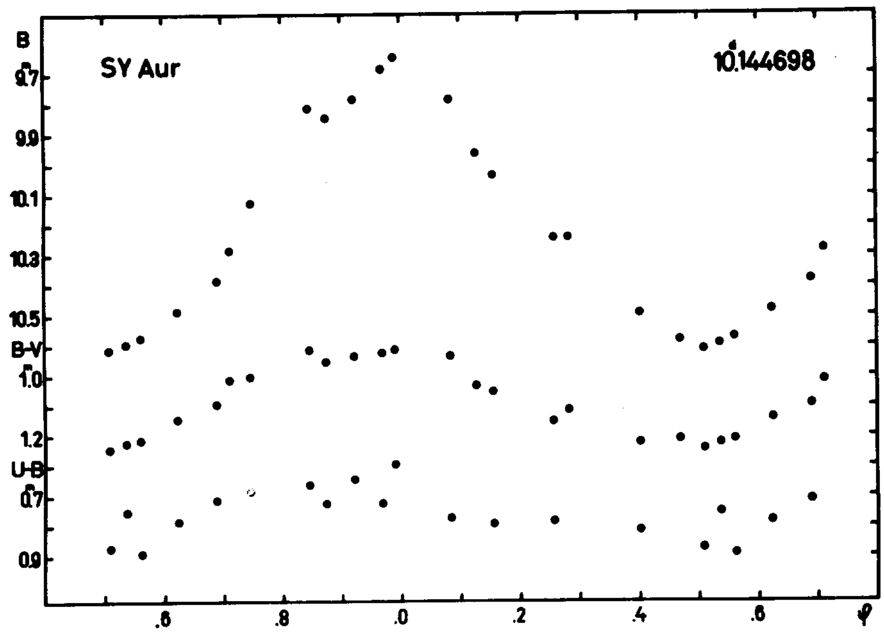


Figure 4 B, B-V and U-B curves of SY Aur

ion. The spectral classification of SY Aur (F5 III in the G.C.V.S. - Kukarkin et al., 1969-1970) may be in error since it suggests much lower luminosity than Cepheids with a period of 10 days usually have.

The O-C residuals for this star have been obtained with the formulae:

$$C_{max} = 2443832.919 + 10^{d}.144698 \times E$$

$$C_{med} = 2443830.379 + 10^{d}.144698 \times E$$

for the maximum and median brightnesses, respectively. As can be seen in Fig. 5, the O-C diagram can well be approximated by a parabola. The equation of the best fitting parabola is as follows:

$$(O-C)_{par} = 1.73 \times 10^{-7} \times E^{2} \quad .$$

Table 5 O-C residuals for SY Aur

(maximum brightness)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2416504.146 | -2694 | $+1^{d}.043$ | pg | 1 | Florya, Kukarkin (1931) |
| 2418036.203 | -2543 | +1.251 | vis | 1 | Enebo (1909) |
| 2418776.770 | -2470 | +1.255 | vis | 1 | Enebo (1911) |

Table 5 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2419172.122 | -2431 | $+0^{d}.964$ | pg | 0.5 | Robinson (1933) |
| 2419800.992 | -2369 | +0.863 | vis | 1 | Enebo (1914) |
| 2421961.887 | -2156 | +0.937 | pg | 1 | Jordan (1929) |
| 2424071.542 | -1948 | +0.495 | vis | 1 | Nielsen[1] (1928) |
| 2425674.508 | -1790 | +0.598 | pg | 1 | Rybka (1930) |
| 2426212.158 | -1737 | +0.579 | vis | 1 | Zakharov (1951) |
| 2426221.88 | -1736 | +0.16 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2426252.969 | -1733 | +0.812 | vis | 1 | Kukarkin (1940) |
| 2426759.901 | -1683 | +0.509 | pg | 1 | Mashnauskas (1961) |
| 2427368.30 | -1623 | +0.23 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2427916.205 | -1569 | +0.317 | vis | 0.5 | Nielsen[2] (1937b) |
| 2428129.02 | -1548 | +0.09 | pg | 0.5 | Fu De-Lian (1964) |
| 2428586.053 | -1503 | +0.615 | pg | 1 | Sokolov (1969) |
| 2429245.098 | -1438 | +0.255 | vis | 0.5 | Nielsen[2] (1941a) |
| 2429265.733 | -1436 | +0.600 | pg | 1 | Sokolov (1969) |
| 2430695.700 | -1295 | +0.165 | vis | 0.5 | Nielsen[2] (1952) |
| 2432298.488 | -1137 | +0.091 | vis | 0.5 | Nielsen[2] (1955) |
| 2436214.295 | -751 | +0.044 | pe | 3 | Bahner et al. (1977) |
| 2436538.771 | -719 | -0.110 | pg | 1 | Makarenko (1969) |
| 2436833.104 | -690 | +0.027 | pe | 2 | Oosterhoff (1960) |
| 2436833.140 | -690 | +0.063 | pe | 3 | Weaver et al. (1960) |
| 2438293.771 | -546 | -0.143 | pg | 1 | Makarenko (1969) |
| 2439075.158 | -469 | +0.102 | pe | 2 | Takase (1969) |
| 2439348.913 | -442 | -0.049 | pe | 2 | Wamsteker (1972) |
| 2443832.981 | 0 | +0.062 | pe | 3 | present paper |

Remarks: [1] Observer: Thorrud; [2] Observer: Arthur Nielsen

Table 6 O-C residuals for SY Aur (median brightness)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2425671.922 | -1790 | $+0^{d}.552$ | pg | 1 | Rybka (1930) |
| 2436211.820 | -751 | +0.109 | pe | 3 | Bahner et al. (1977) |
| 2436830.664 | -690 | +0.127 | pe | 3 | Weaver et al. (1960) |
| 2443830.333 | 0 | -0.046 | pe | 3 | present paper |

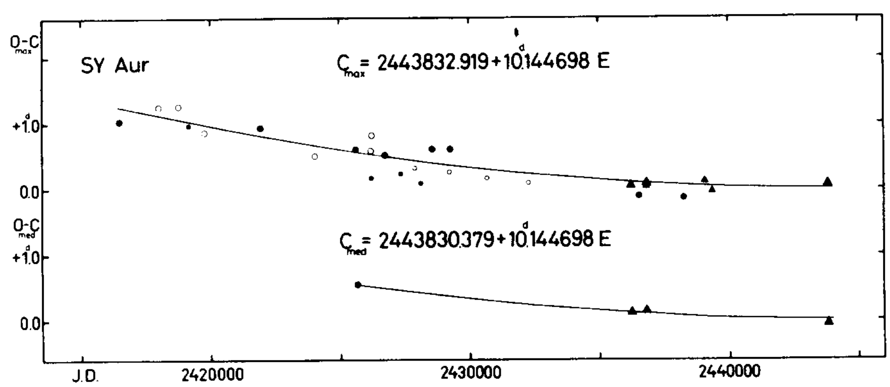


Figure 5 O-C diagram of SY Aur

ζ Geminorum

This star is one of the brightest Cepheids and is the prototype of the small amplitude Cepheids (see Fig. 6).

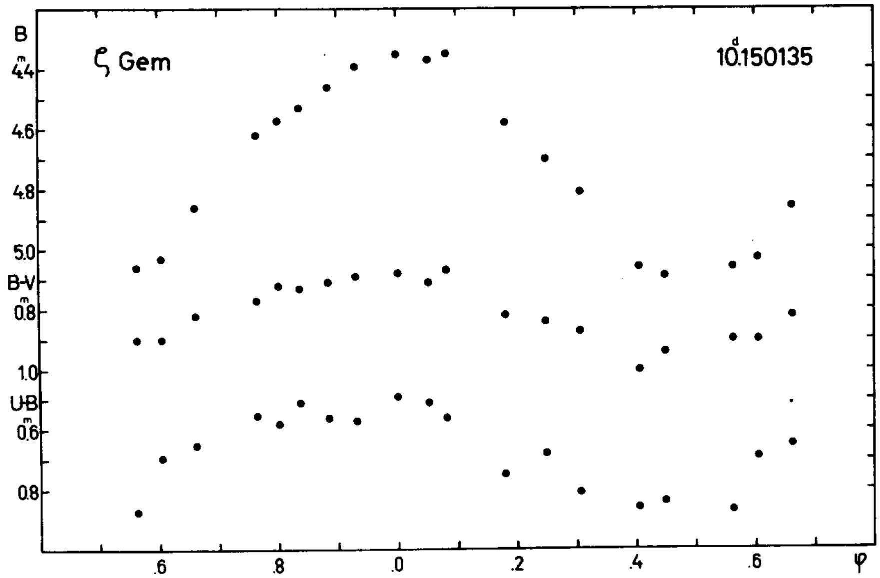


Figure 6 B, B-V and U-B curves of ζ Gem

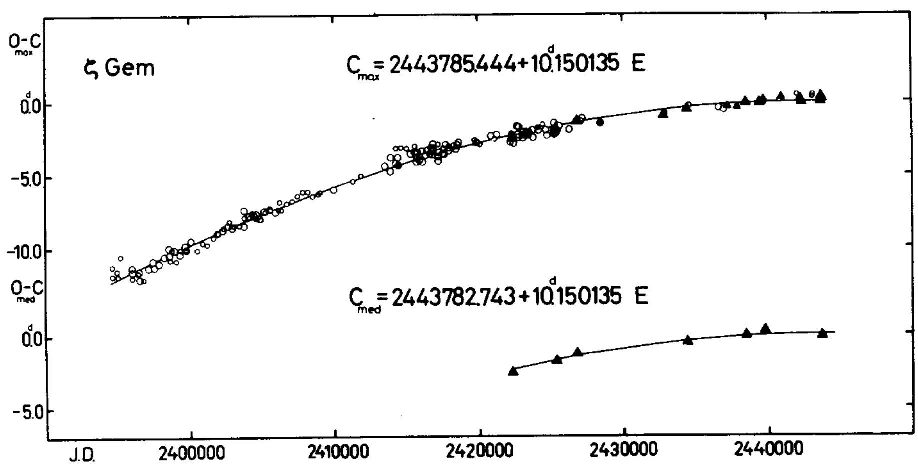


Figure 7 O-C diagram of ζ Gem

The O-C residuals have been computed with the formulae:

$C_{max} = 2443785.444 + 10\overset{d}{.}150135 \times E$

$C_{med} = 2443782.743 + 10\overset{d}{.}150135 \times E$

for the maximum and median brightnesses, respectively. The O-C diagram in Fig. 7 shows a continuous period decrease. The equation of the best fitting parabola is

$$(O-C)_{par} = -5\overset{d}{.}24\times10^{-7}\times E^2 \quad .$$

The deviations of the photoelectric and the reliable photographic O-C values from the above parabola (for maximum brightness) are plotted in Fig. 8. Some systematic trend in these deviations

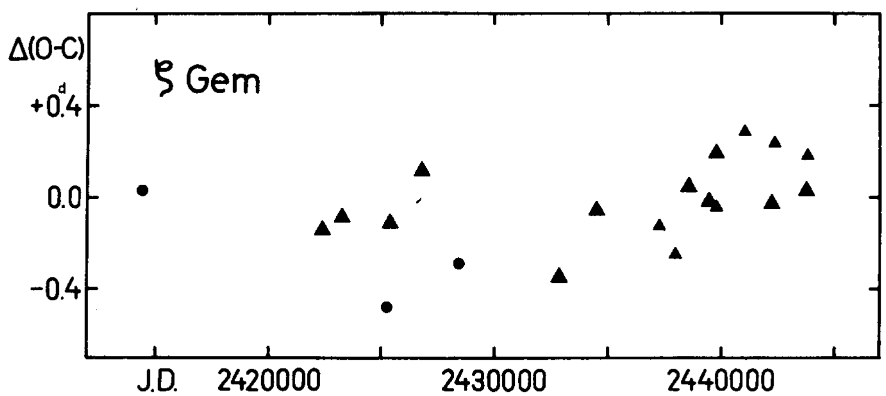


Figure 8 Deviations from the mean O-C curve

can be seen. If the parabolic O-C diagram is interpreted as a result of the stellar evolution, the small deviations from this parabola may be caused by the period noise. The explanation of the Δ(O-C) values in terms of the light-time effect is not satisfactory because the radial velocity measurements (Abt and Levy, 1974; Campbell, 1901; Evans, 1976; Hase, 1929; Henroteau, 1925; Jacobsen, 1926; Scarfe, 1976) do not show any variation in the average value of the radial velocity as would be expected in the case of the component in a binary system. The only deviating average radial velocity value is that of Rufus (1932).

According to Abt and Levy (1974) the rate of the period decrease of ζ Gem is four times greater than that predicted by the evolutionary calculations. Therefore they suggested that the period variation was due to a light-time effect in a long period binary ($P_{orb} > 225$ years) having a low mass secondary. Fernie and Turner (1978) remarked that the closest star to the Cepheid might be a physical companion to ζ Gem. In this case they must have an orbital period in excess of $10^6$ years. In view of the above facts, there is no unambiguous answer as to the binary nature of ζ Gem.

Table 7 O-C residuals for ζ Gem (maximum brightness)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2394667.81 | -4838 | $-11^{d}.28$ | vis | 0.5 | Argelander (1848) |
| 2394677.33 | -4837 | -11.91 | vis | 0.5 | Schmidt (1857) |
| 2394982.19 | -4807 | -11.55 | vis | 0.5 | Argelander (1848) |
| 2395002.05 | -4805 | -11.99 | vis | 0.5 | Schmidt (1857) |
| 2395267.43 | -4779 | -10.52 | vis | 0.5 | Argelander (1848) |
| 2396027.855 | -4704 | -11.354 | vis | 1 | Hagen[1] (1903) |
| 2396077.93 | -4699 | -12.03 | vis | 0.5 | Schmidt (1857) |
| 2396088.465 | -4698 | -11.645 | vis | 1 | Argelander (1869) |
| 2396423.37 | -4665 | -11.69 | vis | 0.5 | Schmidt (1857) |
| 2396474.176 | -4660 | -11.639 | vis | 1 | Argelander (1869) |
| 2396565.026 | -4651 | -12.140 | vis | 1 | Hagen[1] (1903) |
| 2396818.76 | -4626 | -12.159 | vis | 0.5 | Schmidt (1857) |
| 2397154.525 | -4593 | -11.349 | vis | 1 | Argelander (1869) |
| 2397459.537 | -4563 | -10.841 | vis | 1 | Hagen[1] (1903) |
| 2397519.975 | -4557 | -11.304 | vis | 1 | Argelander (1869) |
| 2397875.456 | -4522 | -11.077 | vis | 1 | Argelander (1869) |
| 2398241.363 | -4486 | -10.575 | vis | 1 | Argelander (1869) |
| 2398536.305 | -4457 | -9.987 | vis | 1 | Hagen[1] (1903) |
| 2398586.501 | -4452 | -10.542 | vis | 1 | Argelander (1869) |
| 2398657.28 | -4445 | -10.81 | vis | 0.5 | Schmidt (1857) |
| 2398769.61 | -4434 | -10.13 | vis | 0.5 | Nielsen[2] (1930b) |
| 2398982.738 | -4413 | -10.160 | vis | 1 | Argelander (1869) |
| 2399022.66 | -4409 | -10.84 | vis | 0.5 | Schmidt (1858) |
| 2399317.451 | -4380 | -10.402 | vis | 1 | Argelander (1869) |
| 2399358.34 | -4376 | -10.11 | vis | 0.5 | Schmidt (1858) |
| 2399632.685 | -4349 | -9.822 | vis | 1 | Zinner, Wachmann[3] (1931) |
| 2399723.768 | -4340 | -10.090 | vis | 1 | Argelander (1869) |
| 2399744.06 | -4338 | -10.10 | vis | 0.5 | Schmidt (1859) |
| 2400099.937 | -4303 | -9.476 | vis | 1 | Argelander (1869) |
| 2400525.58 | -4261 | -10.14 | vis | 0.5 | Schmidt (1861) |
| 2400901.66 | -4224 | -9.61 | vis | 0.5 | Schmidt (1861) |
| 2401226.35 | -4192 | -9.73 | vis | 0.5 | Schmidt (1863) |
| 2401632.05 | -4152 | -9.23 | vis | 0.5 | Schmidt (1864) |
| 2401927.501 | -4123 | -8.936 | vis | 1 | Argelander (1869) |
| 2401998.52 | -4116 | -8.97 | vis | 0.5 | Schmidt (1865) |
| 2402313.385 | -4085 | -8.758 | vis | 1 | Valentiner[4] (1900) |
| 2402384.62 | -4078 | -8.57 | vis | 0.5 | Schmidt (1866) |
| 2402648.656 | -4052 | -8.441 | vis | 1 | Valentiner[4] (1900) |
| 2402719.98 | -4045 | -8.17 | vis | 0.5 | Schmidt (1867) |
| 2402993.591 | -4018 | -8.611 | vis | 1 | Valentiner[4] (1900) |
| 2403095.22 | -4008 | -8.48 | vis | 0.5 | Schmidt (1868) |
| 2403470.82 | -3971 | -8.44 | vis | 0.5 | Schmidt (1869) |
| 2403785.426 | -3940 | -8.486 | vis | 1 | Valentiner[4] (1900) |
| 2403786.076 | -3940 | -7.836 | vis | 0.5 | Schmidt (1870) |
| 2403786.543 | -3940 | -7.369 | vis | 1 | Zinner, Wachmann[3] (1931) |
| 2404090.631 | -3910 | -7.785 | vis | 1 | Valentiner[4] (1900) |
| 2404192.05 | -3900 | -7.87 | vis | 0.5 | Schmidt (1871) |
| 2404344.61 | -3885 | -7.56 | vis | 0.5 | Guthnick[5] (1920) |
| 2404466.252 | -3873 | -7.719 | vis | 1 | Valentiner[4] (1900) |

Table 7 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2404567.59 | -3863 | -7$^{d}$.88 | vis | 0.5 | Schmidt (1872) |
| 2404608.424 | -3859 | -7.649 | vis | 1 | Zinner, Wachmann[3] (1931) |
| 2404831.417 | -3837 | -7.959 | vis | 1 | Valentiner[4] (1900) |
| 2404932.84 | -3827 | -8.04 | vis | 0.5 | Schmidt (1873) |
| 2405166.882 | -3804 | -7.448 | vis | 1 | Valentiner[4] (1900) |
| 2405288.64 | -3792 | -7.49 | vis | 0.5 | Schmidt (1874) |
| 2405552.714 | -3766 | -7.322 | vis | 1 | Valentiner[4] (1900) |
| 2405603.46 | -3761 | -7.33 | vis | 0.5 | Schmidt (1875) |
| 2405928.082 | -3729 | -7.509 | vis | 1 | Valentiner[4] (1900) |
| 2406121.08 | -3710 | -7.36 | vis | 0.5 | Schmidt (1876) |
| 2406263.759 | -3696 | -6.786 | vis | 0.5 | Belyavsky[6] (1910) |
| 2406395.10 | -3683 | -7.40 | vis | 0.5 | Schmidt (1877) |
| 2406750.83 | -3648 | -6.92 | vis | 0.5 | Schmidt (1878) |
| 2407157.01 | -3608 | -6.75 | vis | 0.5 | Schmidt (1879) |
| 2407492.32 | -3575 | -6.39 | vis | 0.5 | Schmidt (1880) |
| 2407857.98 | -3539 | -6.14 | vis | 0.5 | Schmidt (1881) |
| 2408233.54 | -3502 | -6.13 | vis | 0.5 | Schmidt (1882) |
| 2408578.36 | -3468 | -6.42 | vis | 0.5 | Schmidt (1883) |
| 2408913.44 | -3435 | -6.29 | vis | 0.5 | Schmidt (1884) |
| 2409015.04 | -3425 | -6.19 | vis | 0.5 | Nielsen[7] (1930b) |
| 2410009.990 | -3327 | -5.955 | vis | 1 | Hagen (1891) |
| 2410354.144 | -3293 | -6.905 | vis | 0 | Reed (1888) |
| 2411360.45 | -3194 | -5.46 | vis | 0.5 | Nielsen[7] (1930b) |
| 2411908.99 | -3140 | -5.03 | vis | 0.5 | Nielsen[8] (1930b) |
| 2412851.996 | -3047 | -5.987 | vis | 0 | Markwick (1892, 1894) |
| 2413564.137 | -2977 | -4.355 | vis | 1 | Plassmann (1900) |
| 2413950.417 | -2939 | -3.780 | vis | 1 | Plassmann (1900) |
| 2413979.885 | -2936 | -4.763 | vis | 1 | Pickering (1904) |
| 2414316.42 | -2903 | -3.18 | vis | 0.5 | Luizet (1902b) |
| 2414335.691 | -2901 | -4.211 | vis | 1 | Pickering (1904) |
| 2414478.219 | -2887 | -3.785 | vis | 1 | Plassmann (1900) |
| 2414487.821 | -2886 | -4.333 | pg | 1 | Wirtz (1901) |
| 2414712.31 | -2864 | -3.15 | vis | 0.5 | Luizet (1902b) |
| 2415087.80 | -2827 | -3.21 | vis | 0.5 | Luizet (1902b) |
| 2415320.879 | -2804 | -3.586 | vis | 1 | Plassmann (1900,1901,1908) |
| 2415605.224 | -2776 | -3.445 | vis | 1 | Tass (1925) |
| 2415666.56 | -2770 | -3.01 | vis | 0.5 | Luizet (1902b) |
| 2415777.453 | -2759 | -3.769 | vis | 0.5 | Yendell (1902b) |
| 2415787.268 | -2758 | -4.104 | vis | 1 | Plassmann (1908) |
| 2415787.949 | -2758 | -3.423 | vis | 1 | Nijland (1923) |
| 2415797.704 | -2757 | -3.818 | vis | 1 | Kopff (1902) |
| 2415858.58 | -2751 | -3.84 | vis | 0.5 | McDermott (1902) |
| 2415970.085 | -2740 | -3.989 | vis | 1 | Bilt (1926a) |
| 2416143.288 | -2723 | -3.338 | vis | 1 | Plassmann (1908) |
| 2416172.918 | -2720 | -4.159 | vis | 1 | Lau (1904) |
| 2416406.864 | -2697 | -3.666 | vis | 1 | Götz (1906) |
| 2416508.718 | -2687 | -3.313 | vis | 1 | Plassmann (1908) |
| 2416711.866 | -2667 | -3.168 | vis | 1 | Olivier (1952) |
| 2416721.611 | -2666 | -3.573 | vis | 1 | Bilt (1926a) |
| 2416874.025 | -2651 | -3.411 | vis | 1 | Tass[9] (1925) |
| 2416874.320 | -2651 | -3.116 | vis | 1 | Tass[10] (1925) |
| 2416883.963 | -2650 | -3.623 | vis | 1 | Plassmann (1908) |
| 2416894.896 | -2649 | -2.840 | vis | 1 | Schiller (1906) |
| 2417228.908 | -2616 | -3.783 | vis | 1 | Bilt (1926a) |

Table 7 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417238.785 | -2615 | $-4^{d}.056$ | vis | 1 | Plassmann (1908) |
| 2417270.4 | -2612 | -2.9 | vis | 0.5 | Furness[11] (1913b) |
| 2417310.450 | -2608 | -3.442 | vis | 1 | Lohnert (1909) |
| 2417594.592 | -2580 | -3.504 | vis | 1 | Olivier (1952) |
| 2417604.986 | -2579 | -3.260 | vis | 1 | Nijland (1923) |
| 2417614.853 | -2578 | -3.543 | vis | 1 | Bilt (1926a) |
| 2417777.885 | -2562 | -2.913 | vis | 1 | Plassmann (1908) |
| 2417848.56 | -2555 | -3.29 | vis | 0.5 | Nielsen[12] (1930b) |
| 2417939.841 | -2546 | -3.359 | vis | 1 | Nijland (1923) |
| 2417950.165 | -2545 | -3.185 | vis | 1 | Bilt (1926a) |
| 2418315.716 | -2509 | -3.039 | vis | 1 | Nijland (1923) |
| 2418417.041 | -2499 | -3.216 | vis | 1 | Mündler (1911a) |
| 2418437.485 | -2497 | -3.072 | vis | 0.5 | Scheller (1912) |
| 2418559.427 | -2485 | -2.932 | vis | 1 | Olivier (1952) |
| 2418640.796 | -2477 | -2.764 | vis | 1 | Nijland (1923) |
| 2419250.821 | -2417 | -1.747 | vis | 0 | Hornig (1915) |
| 2419816.565 | -2361 | -4.410 | vis | 0 | Breson (1913) |
| 2419828.452 | -2360 | -2.673 | vis | 0.5 | Hoffmeister (1916a) |
| 2419899.406 | -2353 | -2.770 | vis | 1 | Kaiser (1915) |
| 2419939.979 | -2349 | -2.798 | vis | 0.5 | Olivier (1952) |
| 2420132.75 | -2330 | -2.879 | vis | 0.5 | Nielsen[7] (1930b) |
| 2420904.713 | -2254 | -2.327 | vis | 1 | Luyten (1922) |
| 2421127.79 | -2232 | -2.55 | vis | 0.5 | Nielsen[13] (1930b) |
| 2421320.897 | -2213 | -2.298 | vis | 1 | Luyten (1922) |
| 2422244.104 | -2122 | -2.754 | vis | 1 | Rabe (1923) |
| 2422315.70 | -2115 | -2.21 | vis | 0.5 | Nielsen[7] (1930b) |
| 2422366.187 | -2110 | -2.472 | pe | 3 | Guthnick (1921) |
| 2422375.973 | -2109 | -2.836 | vis | 1 | Bellemin (1922) |
| 2422721.639 | -2075 | -2.275 | vis | 1 | Leiner (1922) |
| 2422731.566 | -2074 | -2.498 | vis | 1 | Rabe (1923) |
| 2422732.368 | -2074 | -1.696 | vis | 1 | Gallisot (1923) |
| 2422803.383 | -2067 | -1.732 | vis | 1 | Bellemin (1922) |
| 2423056.382 | -2042 | -2.486 | vis | 1 | Rabe (1923) |
| 2423137.772 | -2034 | -2.297 | vis | 1 | Nielsen[14] (1927a) |
| 2423168.397 | -2031 | -2.123 | vis | 1 | Zverev (1936) |
| 2423269.793 | -2021 | -2.228 | pe | 3 | Bottlinger (1928) |
| 2423432.08 | -2005 | -2.34 | vis | 0.5 | Nijland (1935) |
| 2423442.428 | -2004 | -2.145 | vis | 1 | Leiner (1928) |
| 2423543.967 | -1994 | -2.108 | vis | 1 | Parenago (1938) |
| 2423736.995 | -1975 | -1.932 | vis | 1 | Hopmann (1926) |
| 2423797.392 | -1969 | -2.436 | vis | 1 | Leiner (1928) |
| 2424193.90 | -1930 | -1.78 | vis | 0.5 | Nielsen[15] (1930b) |
| 2424203.841 | -1929 | -1.993 | vis | 1 | Leiner (1928) |
| 2424529.05 | -1897 | -1.59 | vis | 0.5 | Nijland (1935) |
| 2424711.413 | -1879 | -1.927 | vis | 1 | Leiner (1928) |
| 2424761.751 | -1874 | -2.340 | vis | 1 | Kukarkin (1940) |
| 2425228.769 | -1828 | -2.228 | pg | 1 | Hellerich (1935) |
| 2425280.295 | -1823 | -1.453 | vis | 1 | Leiner (1928) |
| 2425310.362 | -1820 | -1.836 | vis | 1 | Collmann (1930) |
| 2425340.804 | -1817 | -1.845 | pe | 3 | Güssow (1930) |
| 2425411.71 | -1810 | -1.99 | vis | 0.5 | Nijland (1935) |
| 2425462.360 | -1805 | -2.090 | vis | 1 | Kukarkin (1940) |
| 2425625.169 | -1789 | -1.683 | vis | 1 | Zverev (1936) |
| 2426325.312 | -1720 | -1.900 | vis | 1 | Zverev (1936) |

Table 7 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2426802.918 | -1673 | $-1^{d}.350$ | pe | 3 | Hall (1934) |
| 2427056.638 | -1648 | -1.384 | vis | 1 | Florya, Kukarkina (1953) |
| 2427198.938 | -1634 | -1.185 | vis | 1 | Nielsen[16] (1941b) |
| 2428436.956 | -1512 | -1.484 | pg | 1 | Günther (1939) |
| 2432883.249 | -1074 | -0.950 | pe | 3 | Eggen (1951) |
| 2432884.25 | -1074 | +0.05 | vis | 0 | Ahnert (1949) |
| 2432954.5 | -1067 | -0.7 | vis | 0.5 | Pohl[17] (1951) |
| 2434416.368 | -923 | -0.501 | pe | 3 | Harris (1953) |
| 2434609.43 | -904 | -0.29 | vis | 0.5 | Marks[18] (1959) |
| 2434711.76 | -894 | +0.54 | vis | 0 | Marks (1959) |
| 2435948.00 | -772 | -1.54 | vis | 0 | Rudolph[19] (1960) |
| 2436639.347 | -704 | -0.402 | vis | 1 | Azarnova (1960) |
| 2437004.583 | -668 | -0.571 | vis | 1 | Mayall[20] (1964) |
| 2437258.567 | -643 | -0.340 | pe | 1 | Mitchell et al. (1964) |
| 2437979.154 | -572 | -0.413 | pe | 2 | Williams (1966) |
| 2438527.582 | -518 | -0.092 | pe | 3 | Wisniewski, Johnson (1968) |
| 2439420.773 | -430 | -0.113 | pe | 3 | Takase (1969) |
| 2439765.870 | -396 | -0.121 | pe | 2 | Sudzius (1969) |
| 2439796.556 | -393 | +0.115 | pe | 3 | present paper[21] |
| 2440984.10 | -276 | +0.09 | vis | 0.5 | Braune et al.[22] (1972) |
| 2441004.565 | -274 | +0.258 | pe | 2 | Evans (1976) |
| 2442111.17 | -165 | +0.50 | vis | 0.5 | Busch[23] (1980) |
| 2442354.51 | -141 | +0.235 | pe | 1 | Scarfe[24] (1976) |
| 2442465.897 | -130 | -0.029 | pe | 3 | Depenchuk (1980) |
| 2443217.388 | -56 | +0.352 | vis | 0.5 | Busch[25] (1980) |
| 2443258.14 | -52 | +0.50 | vis | 0.5 | Braune et al.[26] (1978) |
| 2443785.473 | 0 | +0.029 | pe | 3 | present paper |
| 2443805.927 | +2 | +0.183 | pe | 2 | Depenchuk (1980) |

Remarks: (observers) [1] Heis; [2] Oudemans; [3] Winnecke; [4] Schönfeld; [5] Argelander; [6] Glasenapp; [7] Plassmann; [8] Knopf; [9] Terkán; [10] Fejes; [11] Whitney; [12] Luizet; [13] Vogelenzang; [14] Johansson; [15] Cecchini; [16] Loreta; [17] Händel; [18] Wroblewski; [19] Masuch; [20] Orchiston; [21] Abaffy; [22] Bischof; [23] Tietz; [24] Winzer; [25] Branzke; [26] Steinbach

Table 8 O-C residuals for ζ Gem

(median brightness)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2422363.426 | -2110 | $-2^{d}.532$ | pe | 3 | Guthnick (1921) |
| 2425338.134 | -1817 | -1.814 | pe | 3 | Güssow (1930) |
| 2426800.309 | -1673 | -1.258 | pe | 3 | Hall (1934) |
| 2434413.637 | -923 | -0.531 | pe | 3 | Harris (1953) |
| 2438524.912 | -518 | -0.061 | pe | 3 | Wisniewski, Johnson (1968) |
| 2439793.968 | -393 | +0.228 | pe | 3 | present paper[1] |
| 2443782.611 | 0 | -0.132 | pe | 3 | present paper |

Remark: [1] Observer: Abaffy

AN Aurigae

This variable has a faint companion within the edge of the diaphragm. The amplitude of the light variation is smaller than that given by Schaltenbrand and Tammann (1971); this is explainable by the effect of the visual companion (see Fig. 9). According to Madore (1977) AN Aur has a B5 photometric companion.

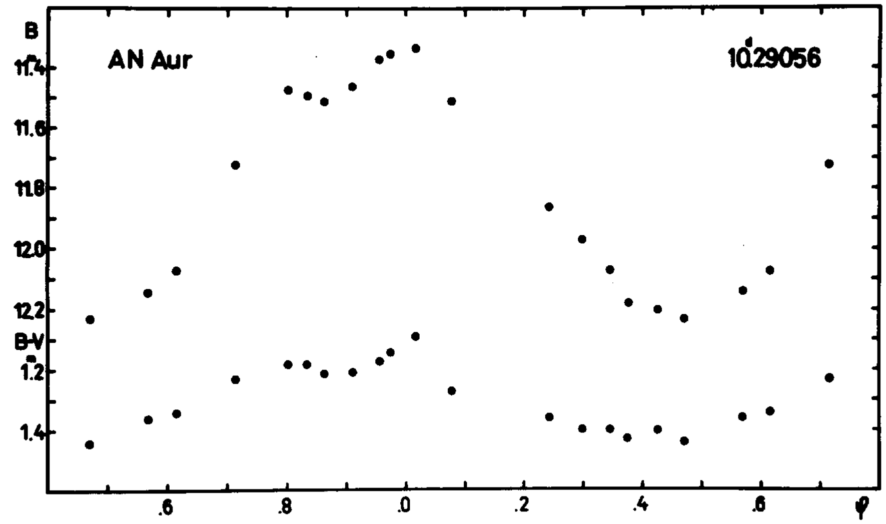


Figure 9 B and B-V curves of AN Aur

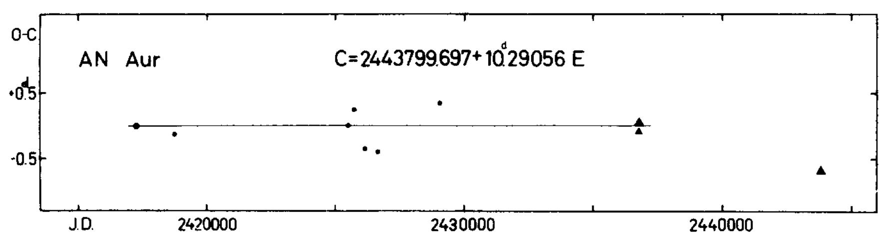


Figure 10 O-C diagram of AN Aur

The O-C residuals have been derived using the formula:

$$C = 2443799.697 + 10^{d}.29056 \times E$$

The O-C diagram in Fig. 10 shows a constant period before J.D. 2437000. After this epoch the behaviour of the period is not known. The existence of a jump in the period followed by a rejump cannot be excluded since the shape of the light curve has changed compared with the photoelectric light curve of Weaver et al. (1960) observed at about J.D. 2437000. Earlier evidence for such a change in the light curve was the case of SU Cyg published in Paper I (p. 77). With AN Aur the ascending branch of the light curve became considerably shorter, the difference between the maximum and median brightnesses being about $0^{d}.4$ smaller at J.D. 2443800 than about 7000 days earlier. A new series of photoelectric observations is urgently needed to prove or reject the existence of the rejump in AN Aur's period.

Table 9 O-C residuals for AN Aur

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417260.340 | -2579 | $-0^{d}.003$ | pg | 1 | Parenago (1933) |
| 2418742.05 | -2435 | -0.13 | pg | 0.5 | Oosterhoff (1935) |
| 2421262.44 | -2190 | -0.93 | pg | 0 | Oosterhoff (1935) |
| 2425513.34 | -1777 | -0.03 | pg | 0.5 | Kukarkin (1932a) |
| 2425524.18 | -1776 | +0.52 | pg | 0 | Guthnick (1928) |
| 2425729.72 | -1756 | +0.25 | pg | 0.5 | Oosterhoff (1935) |
| 2426181.91 | -1712 | -0.35 | pg | 0.5 | Schneller (1932) |
| 2426655.22 | -1666 | -0.40 | pg | 0.5 | Oosterhoff (1935) |
| 2429043.38 | -1434 | +0.35 | pg | 0.5 | Frolov (1949) |
| 2436832.907 | -677 | -0.081 | pe | 2 | Oosterhoff (1960) |
| 2436833.041 | -677 | +0.053 | pe | 3 | Weaver et al. (1960) |
| 2443799.026 | 0 | -0.671 | pe | 3 | present paper |

AP Herculis

The light and colour curves of this Population II Cepheid are plotted in Fig. 11 (the observations made in 1977 are omit-

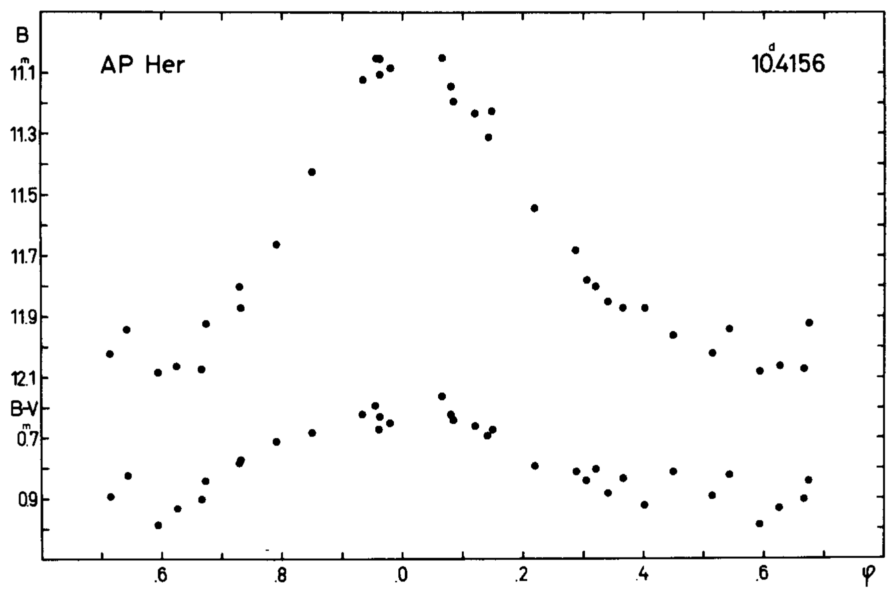


Figure 11 B and B-V curves of AP Her

ted because of their phase difference). The existence of a blue photometric companion cannot be excluded (Madore, 1977).

The O-C residuals have been computed with the formula:

$$C = 2443745.347 + 10\overset{d}{.}4156 \times E \quad .$$

This is the Population II Cepheid showing the strongest period variations (see Fig. 12), the difference between the longest and the shortest values of the period being about 6 per cent of the

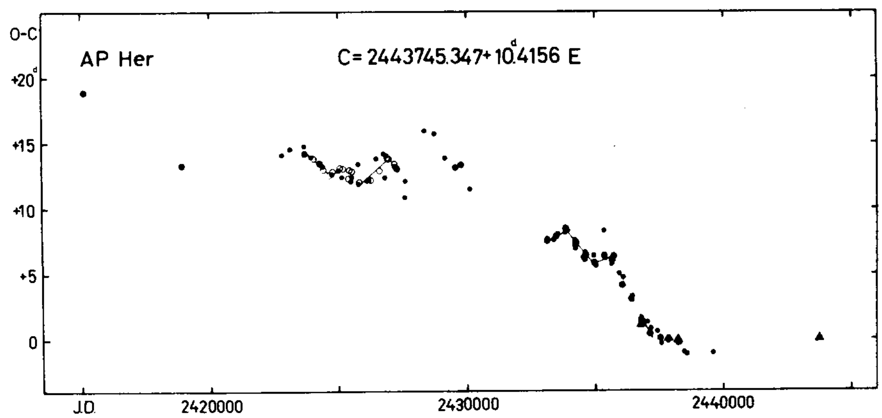


Figure 12 O-C diagram of AP Her

period. There are several intervals when the value of the period cannot be determined with any certainty. The reliable periods are as follows:

between J.D. 2415000 and J.D. 2419000 $P = 10\overset{d}{.}400$
between J.D. 2423700 and J.D. 2424700 $P = 10\overset{d}{.}3970$
between J.D. 2424700 and J.D. 2425300 $P = 10\overset{d}{.}4260$
between J.D. 2425800 and J.D. 2427000 $P = 10\overset{d}{.}4338$
between J.D. 2427000 and J.D. 2427400 $P = 10\overset{d}{.}3945$
between J.D. 2433000 and J.D. 2433850 $P = 10\overset{d}{.}4277$
between J.D. 2433850 and J.D. 2434850 $P = 10\overset{d}{.}3898$
between J.D. 2434850 and J.D. 2435600 $P = 10\overset{d}{.}4209$
between J.D. 2435600 and J.D. 2437200 $P = 10\overset{d}{.}3715$
between J.D. 2437200 and J.D. 2443800 $P = 10\overset{d}{.}4156$

but three observations made in 1977 show that the period in that year might have been smaller than reported here.

Bogdanov (1973) found the period variation to be periodic with $P = 8840^d$. Several pronounced cycles can be seen in Fig. 12

but the period variation is not periodic at all. Nevertheless, AP Her deserves to be subjected to regular photoelectric monitoring because of its extremely strong period changes.

Table 10 O-C residuals for AP Her

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2415163.011 | -2746 | +18.$^d$902 | pg | 1 | Parenago[1] (1951) |
| 2418959.142 | -2381 | +13.339 | pg | 1 | Parenago[1] (1951) |
| 2422855.43 | -2007 | +14.19 | pg | 0.5 | Oosterhoff (1935) |
| 2423168.32 | -1977 | +14.61 | pg | 0.5 | Oosterhoff (1935) |
| 2423720.50 | -1924 | +14.77 | pg | 0.5 | Oosterhoff (1935) |
| 2423730.408 | -1923 | +14.260 | pg | 1 | Bohlin (1925) |
| 2423959.22 | -1901 | +13.93 | pg | 0.5 | Oosterhoff (1935) |
| 2424084.156 | -1889 | +13.877 | vis | 1 | Bohlin (1925) |
| 2424104.992 | -1887 | +13.882 | vis | 0.5 | Beyer (1926) |
| 2424302.443 | -1868 | +13.437 | vis | 1 | Beyer (1926) |
| 2424333.70 | -1865 | +13.45 | pg | 0.5 | Oosterhoff (1935) |
| 2424349.164 | -1864 | +18.495 | vis | 0 | Zakharov (1954b) |
| 2424427.2 | -1856 | +13.2 | pg | 0.5 | Tsessevich (1950) |
| 2424447.842 | -1854 | +13.017 | vis | 1 | Beyer (1926, 1928) |
| 2424686.987 | -1831 | +12.604 | vis | 1 | Beyer (1928) |
| 2424780.73 | -1822 | +12.61 | pg | 0.5 | Oosterhoff (1935) |
| 2424801.735 | -1820 | +12.780 | vis | 1 | Beyer (1928) |
| 2425020.63 | -1799 | +12.95 | pg | 0.5 | Oosterhoff (1935) |
| 2425083.292 | -1793 | +13.116 | vis | 1 | Beyer (1928) |
| 2425155.52 | -1786 | +12.43 | pg | 0.5 | Oosterhoff (1935) |
| 2425197.832 | -1782 | +13.084 | vis | 1 | Beyer (1928) |
| 2425426.194 | -1760 | +12.303 | vis | 1 | Beyer (1934b) |
| 2425447.687 | -1758 | +12.965 | vis | 1 | Zakharov (1954b) |
| 2425509.3 | -1752 | +12.1 | pg | 0.5 | Tsessevich (1950) |
| 2425520.605 | -1751 | +12.974 | vis | 1 | Beyer (1934b) |
| 2425530.50 | -1750 | +12.45 | pg | 0.5 | Oosterhoff (1935) |
| 2425791.87 | -1725 | +13.43 | pg | 0.5 | Huth (1965) |
| 2425800.74 | -1724 | +11.89 | pg | 0.5 | Oosterhoff (1935) |
| 2425853.026 | -1719 | +12.095 | vis | 1 | Beyer (1934b) |
| 2426113.47 | -1694 | +12.15 | pg | 0.5 | Huth (1965) |
| 2426238.53 | -1682 | +12.22 | pg | 0.5 | Oosterhoff (1935) |
| 2426300.945 | -1676 | +12.144 | vis | 1 | Beyer (1934b) |
| 2426500.54 | -1657 | +13.84 | pg | 0.5 | Huth (1965) |
| 2426614.184 | -1646 | +12.915 | vis | 1 | Beyer (1934b) |
| 2426771.73 | -1631 | +14.23 | pg | 0.5 | Huth (1965) |
| 2426842.79 | -1624 | +12.38 | pg | 0.5 | Oosterhoff (1935) |
| 2426907.02 | -1618 | +14.11 | pg | 0.5 | Tsessevich (1950) |
| 2426927.611 | -1616 | +13.874 | vis | 1 | Florya, Kukarkina (1953) |
| 2426979.672 | -1611 | +13.857 | vis | 1 | Beyer (1934b) |
| 2427197.79 | -1590 | +13.25 | pg | 0.5 | Oosterhoff (1935) |
| 2427229.193 | -1587 | +13.403 | vis | 1 | Beyer (1934b) |
| 2427291.412 | -1581 | +13.129 | vis | 1 | Florya, Kukarkina (1953) |
| 2427312.11 | -1579 | +13.00 | pg | 0.5 | Huth (1965) |
| 2427353.818 | -1575 | +13.041 | vis | 1 | Beyer (1934b) |
| 2427601.60 | -1551 | +10.85 | pg | 0.5 | Huth (1965) |
| 2427634.15 | -1548 | +12.15 | pg | 0.5 | Tsessevich (1950) |
| 2427932.71 | -1520 | +19.08 | pg | 0 | Huth (1965) |
| 2428367.02 | -1478 | +15.93 | pg | 0.5 | Huth (1965) |
| 2428752.24 | -1441 | +15.77 | pg | 0.5 | Huth (1965) |

Table 10 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2429156.51 | -1402 | +13ᵈ.83 | pg | 0.5 | Huth (1965) |
| 2429541.12 | -1365 | +13.07 | pg | 0.5 | Huth (1965) |
| 2429562.000 | -1363 | +13.116 | pg | 1 | Parenago[1] (1951) |
| 2429812.230 | -1339 | +13.371 | pg | 1 | Kapko (1949) |
| 2430133.254 | -1308 | +11.512 | pg | 0.5 | Kapko (1949) |
| 2433118.570 | -1021 | +7.551 | pg | 1 | Kapko (1951) |
| 2433149.97 | -1018 | +7.70 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2433379.06 | -996 | +7.65 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2433483.485 | -986 | +7.920 | pg | 1 | Kapko (1951) |
| 2433556.53 | -979 | +8.06 | pg | 0.5 | Huth (1965) |
| 2433827.49 | -953 | +8.21 | pg | 0.5 | Huth (1965) |
| 2433859.047 | -950 | +8.520 | pvis | 1 | Koval' (1955) |
| 2433869.18 | -949 | +8.24 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2433879.676 | -948 | +8.318 | pg | 1 | Kapko (1952) |
| 2434201.85 | -917 | +7.61 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2434211.63 | -916 | +6.97 | pg | 0.5 | Huth (1965) |
| 2434232.747 | -914 | +7.258 | pg | 1 | Koval' (1955) |
| 2434253.698 | -912 | +7.378 | pg | 1 | Kapko (1964) |
| 2434575.472 | -881 | +6.269 | pg | 1 | Koval' (1955) |
| 2434596.10 | -879 | +6.07 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2434606.852 | -878 | +6.402 | pg | 1 | Kapko (1964) |
| 2434607.09 | -878 | +6.64 | pg | 0.5 | Huth (1965) |
| 2434950.62 | -845 | +6.46 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2434970.851 | -843 | +5.855 | pg | 1 | Kapko (1964) |
| 2435012.30 | -839 | +5.64 | pg | 0.5 | Huth (1965) |
| 2435335.87 | -808 | +8.35 | pg | 0.5 | Huth (1965) |
| 2435356.852 | -806 | +6.479 | pg | 1 | Kapko (1964) |
| 2435387.84 | -803 | +6.22 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2435626.97 | -780 | +5.79 | pg | 0.5 | Huth (1965) |
| 2435627.283 | -780 | +6.104 | pe | 2 | Walraven et al. (1958) |
| 2435690.023 | -774 | +6.350 | pg | 1 | Kapko (1964) |
| 2435700.43 | -773 | +6.34 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2435938.70 | -750 | +5.05 | pg | 0.5 | Huth (1965) |
| 2436041.959 | -740 | +4.156 | pg | 1 | Kapko (1964) |
| 2436063.39 | -738 | +4.76 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2436395.029 | -706 | +3.096 | pg | 1 | Kapko (1964) |
| 2436426.34 | -703 | +3.16 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2436457.68 | -700 | +3.25 | pg | 0.5 | Huth (1965) |
| 2436778.772 | -669 | +1.461 | pg | 1 | Kapko (1964) |
| 2436789.29 | -668 | +1.56 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2436799.287 | -667 | +1.145 | pe | 3 | Weaver et al. (1960) |
| 2436810.19 | -666 | +1.63 | pg | 0.5 | Huth (1965) |
| 2437028.62 | -645 | +1.34 | pg | 0.5 | Huth (1965) |
| 2437131.843 | -635 | +0.402 | pg | 1 | Kapko (1964) |
| 2437163.54 | -632 | +0.85 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2437402.87 | -609 | +0.62 | pg | 0.5 | Huth (1965) |
| 2437527.274 | -597 | +0.040 | pg | 1 | Kapko (1964) |
| 2437578.98 | -592 | -0.33 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2437818.73 | -569 | -0.14 | pg | 0.5 | Huth (1965) |
| 2437829.23 | -568 | -0.06 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2437829.325 | -568 | +0.039 | pe | 2 | Michalowska-Smak, Smak (1965) |
| 2437860.538 | -565 | +0.005 | pg | 1 | Kapko (1964) |
| 2437871.009 | -564 | +0.060 | pe | 2 | Williams (1966) |

Table 10 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2438224.72 | -530 | $-0^{d}.36$ | pg | 0.5 | Huth (1965) |
| 2438225.026 | -530 | -0.053 | pe | 3 | Kwee and Braun (1967) |
| 2438245.76 | -528 | -0.15 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2438287.402 | -524 | -0.171 | pg | 1 | Kapko (1964) |
| 2438463.64 | -507 | -1.00 | pg | 0.5 | Huth (1965) |
| 2438578.06 | -496 | -1.15 | pg | 0.5 | Vasil'yan. et al. (1970) |
| 2439598.85 | -398 | -1.09 | pg | 0.5 | Vasil'yan. et al. (1970) |
| 2443745.357 | 0 | +0.010 | pe | 3 | present paper |

Remarks: [1] Observer: Fedorovich; [2] Obs.: Pahomova

Z Lacertae

The light and colour curves of Z Lac are shown in Fig. 13.

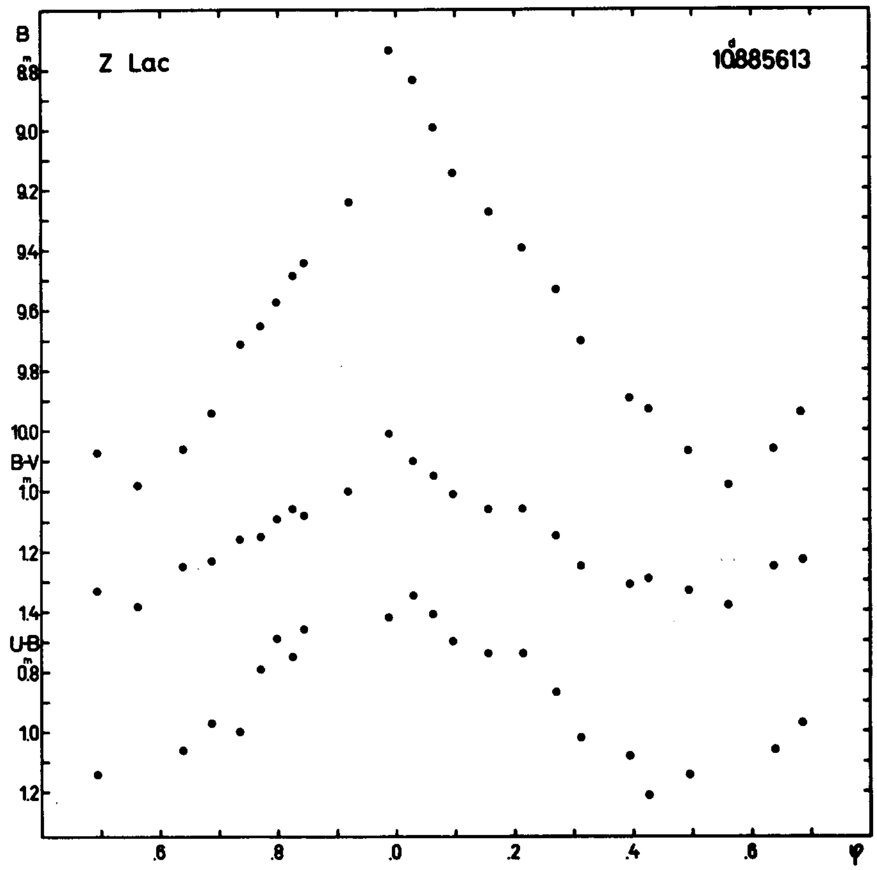


Figure 13 B, B-V and U-B curves of Z Lac

The O-C residuals have been computed using the ephemeris:

$$C = 2442827.123 + 10\overset{d}{.}885613 \times E \quad .$$

The O-C diagram in Fig. 14 shows a continuous decrease of the period. The equation of the fitted parabola is:

$$(O-C)_{par} = -3\overset{d}{.}4 \times 10^{-8} \times E^2 \quad .$$

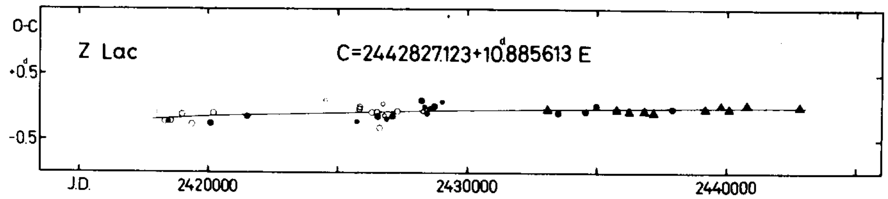


Figure 14 O-C diagram of Z Lac

Table 11 O-C residuals for Z Lac

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417931.642 | -2287 | $-0\overset{d}{.}084$ | vis | 1 | Enebo (1908) |
| 2418334.276 | -2250 | -0.218 | vis | 1 | Enebo (1909) |
| 2418475.781 | -2237 | -0.226 | pg | 0.5 | Robinson (1933) |
| 2418541.107 | -2231 | -0.213 | vis | 1 | Bilt (1926b) |
| 2419009.285 | -2188 | -0.117 | vis | 1 | Enebo (1912) |
| 2419368.365 | -2155 | -0.262 | vis | 1 | Bilt (1926b) |
| 2420108.601 | -2087 | -0.248 | pg | 1 | Hertzsprung (1922) |
| 2420239.373 | -2075 | -0.103 | vis | 1 | Bilt (1926b) |
| 2421534.721 | -1956 | -0.143 | pg | 1 | Hertzsprung (1922) |
| 2424528.5 | -1681 | +0.1 | vis | 0.5 | Selivanov (1929) |
| 2425747.37 | -1569 | -0.23 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2425834.646 | -1561 | -0.035 | vis | 1 | Parenago (1938) |
| 2425845.565 | -1560 | -0.002 | vis | 1 | Beyer (1934b) |
| 2426313.568 | -1517 | -0.080 | vis | 1 | Terkán (1935) |
| 2426542.105 | -1496 | -0.141 | pg | 1 | Zonn (1933) |
| 2426542.171 | -1496 | -0.075 | vis | 1 | Kukarkin (1940) |
| 2426618.132 | -1489 | -0.313 | vis | 1 | Beyer (1934b) |
| 2426760.019 | -1476 | +0.061 | vis | 0.5 | Dziewulski et al. (1946) |
| 2426803.371 | -1472 | -0.130 | vis | 0.5 | Dziewulski et al. (1946) |
| 2426879.52 | -1465 | -0.18 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2427108.157 | -1444 | -0.141 | pg | 1 | Zonn (1933) |
| 2427293.293 | -1427 | -0.060 | vis | 1 | Florya, Kukarkina (1953) |
| 2428229.624 | -1341 | +0.108 | pg | 1 | Gur'yev (1937) |
| 2428283.881 | -1336 | -0.063 | vis | 0.5 | Dziewulski (1947) |
| 2428349.260 | -1330 | +0.002 | pg | 0.5 | Dziewulski et al. (1946) |
| 2428458.01 | -1320 | -0.10 | pg | 0.5 | Fu De-Lian (1964) |
| 2428556.071 | -1311 | -0.013 | pg | 0.5 | Dziewulski et al. (1946) |
| 2428741.160 | -1294 | +0.020 | pg | 1 | Gur'yev (1938) |
| 2429046.02 | -1266 | +0.08 | pg | 0.5 | Katz (1946) |
| 2433084.478 | -895 | -0.021 | pe | 3 | Eggen (1951) |
| 2433519.846 | -855 | -0.078 | pg | 1 | Solov'yov (1952) |
| 2434575.782 | -758 | -0.046 | pg | 1 | Chuprina (1954) |
| 2434967.738 | -722 | +0.028 | pg | 1 | Chuprina (1956) |
| 2435751.452 | -650 | -0.023 | pe | 3 | Bahner et al. (1971) |

Table 11 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2436230.385 | -606 | $-0^{d}.057$ | pe | 3 | Bahner et al. (1971) |
| 2436829.095 | -551 | -0.055 | pe | 3 | Bahner et al. (1962) |
| 2437199.191 | -517 | -0.070 | pe | 3 | Mitchell et al. (1964) |
| 2437928.575 | -450 | -0.022 | pg | 1 | Girnyak (1964) |
| 2439180.423 | -335 | -0.020 | pe | 3 | Takase (1969) |
| 2439768.312 | -281 | +0.046 | pe | 2 | present paper[1] |
| 2440083.936 | -252 | -0.013 | pe | 3 | Asteriadis et al. (1977) |
| 2440791.548 | -187 | +0.035 | pe | 3 | Asteriadis et al. (1977) |
| 2442827.154 | 0 | +0.031 | pe | 3 | present paper |

Remark: [1] Observer: Abaffy

VX Persei

The light and colour curves of this neglected Cepheid variable are plotted in Fig. 15. VX Per is situated in the region of

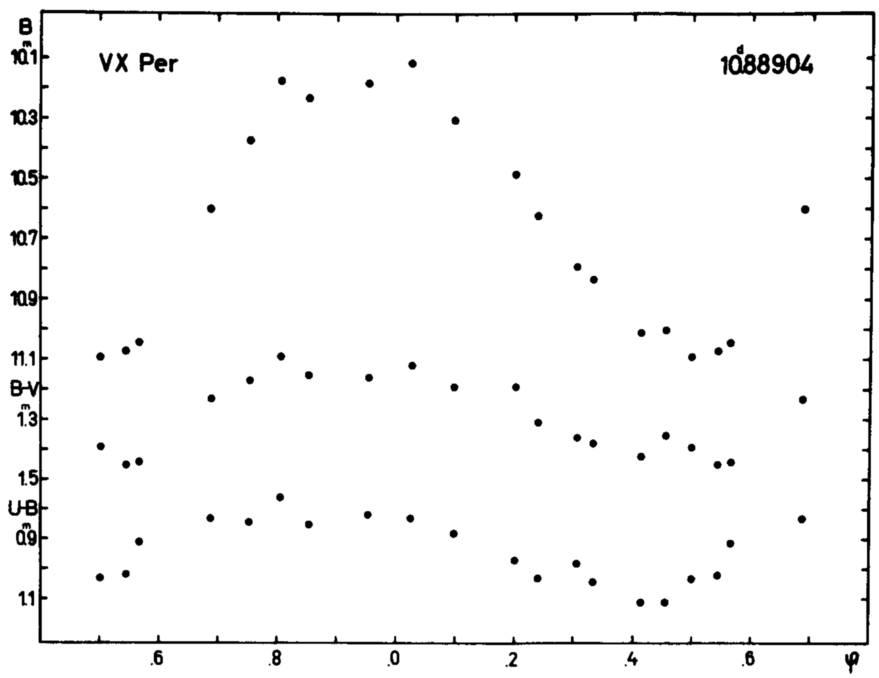


Figure 15 B, B-V and U-B curves of VX Per

the h and χ Per double cluster (Kukarkin et al., 1976). The O-C residuals have been calculated with the formula:

$$C = 2443758.994 + 10^{d}.88904 \times E \quad .$$

The O-C diagram in Fig. 16 shows one change in the period, but both the time of the change and the values of the period are uncertain.

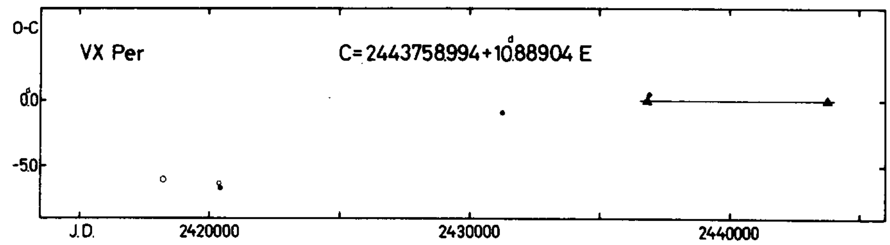


Figure 16 O-C diagram of VX Per

Table 12 O-C residuals for VX Per

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2418229.008 | -2344 | -6.076 | vis | 1 | Pracka (1912) |
| 2420363.01 | -2148 | -6.33 | vis | 0.5 | Hoffmeister (1916b) |
| 2420438.854 | -2141 | -6.705 | pg | 0.5 | Robinson (1933) |
| 2431279.215 | -1146 | -0.939 | pg | 0.5 | Solov'yov (1955) |
| 2436811.804 | -638 | +0.018 | pe | 3 | Oosterhoff (1960) |
| 2436822.654 | -637 | -0.022 | pe | 3 | Weaver et al. (1960) |
| 2436899.368 | -630 | +0.469 | pg | 0.5 | Mauder (1960) |
| 2443758.994 | 0 | 0.000 | pe | 3 | present paper |

SV Persei

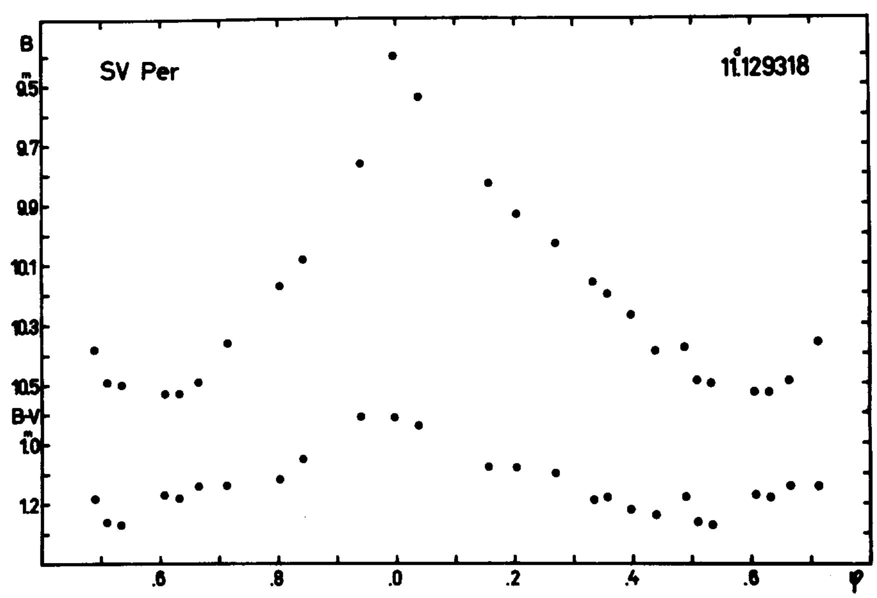


Figure 17 B and B-V curves of SV Per

The light and colour curves of SV Per are plotted in Fig. 17. According to Madore (1977) this Cepheid has a B2 photometric companion.

The O-C residuals have been calculated using the formula:

$$C = 2443839.296 + 11\overset{d}{.}129318 \times E \quad .$$

The O-C diagram in Fig. 18 shows a rejumping period, the sudden changes in the period (jump and rejump) occurred at about J.D. 2426300. The values of the period are as follows:

before J.D. 2426300 $\quad P = 11\overset{d}{.}129289$

after J.D. 2426300 $\quad P = 11\overset{d}{.}129318$ .

Although the rejumping period seems to be the proper interpretation of the O-C diagram, another possibility cannot be excluded, viz. a sinusoidal wave caused by the light-time effect in the binary system. In this latter case the average period would be $P = 11\overset{d}{.}128986$ in the course of the last 70 years.

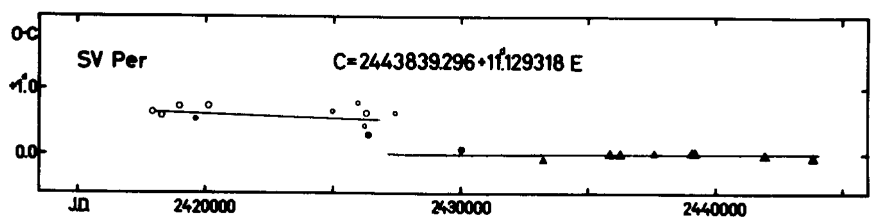


Figure 18 O-C diagram of SV Per

Table 13 O-C residuals for SV Per

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417930.893 | -2328 | +0ᵈ.649 | vis | 1 | Enebo (1908) |
| 2418298.108 | -2295 | +0.597 | vis | 1 | Enebo (1909) |
| 2418977.140 | -2234 | +0.740 | vis | 1 | Enebo (1914) |
| 2419611.313 | -2177 | +0.542 | pg | 0.5 | Robinson (1933) |
| 2420112.339 | -2132 | +0.749 | vis | 1 | Enebo (1914) |
| 2424953.506 | -1697 | +0.663 | vis | 0.5 | Mergentaler[1] (1948) |
| 2425955.263 | -1607 | +0.781 | vis | 0.5 | Mergentaler[2] (1948) |
| 2426210.883 | -1584 | +0.427 | vis | 0.5 | Zakharov (1953) |
| 2426288.996 | -1577 | +0.634 | vis | 1 | Kukarkin (1940) |
| 2426377.692 | -1569 | +0.296 | pg | 1 | Rügemer (1932) |
| 2426623.44 | -1547 | +1.20 | vis | 0 | Mergentaler[3] (1948) |
| 2427401.925 | -1477 | +0.632 | vis | 0.5 | Mergentaler[4] (1948) |
| 2430027.889 | -1241 | +0.077 | pg | 1 | Mergentaler (1948) |
| 2433232.980 | -953 | -0.076 | pe | 2 | Eggen et al. (1957) |
| *2434000.04* | *-884* | *-0.94* | *pg* | *0* | *Fu De-Lian (1964)* |
| 2435848.470 | -718 | +0.024 | pe | 3 | Bahner et al (1977) |
| 2436260.245 | -681 | +0.015 | pe | 3 | Bahner et al. (1977) |
| 2437595.773 | -561 | +0.024 | pe | 2 | Mitchell et al. (1964) |

Table 13 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2439075.985 | -428 | $+0^{d}.037$ | pe | 3 | Takase (1969) |
| 2439209.541 | -416 | +0.041 | pe | 3 | Wamsteker (1972) |
| 2441913.906 | -173 | -0.018 | pe | 3 | Vasil'yanovskaya (1977) |
| 2443839.246 | 0 | -0.050 | pe | 3 | present paper |

Remarks: [1] Observer: Grouiller; [2] Obs.: Grouiller and Bloch; [3] Obs.: Rybka; [4] Obs.: Chang Yuin

AA Geminorum

This variable has two faint companions within the edge of the diaphragm. The light and colour curves in Fig. 19 are not complete since the weather conditions did not permit the coverage of the light curve at the other phases.

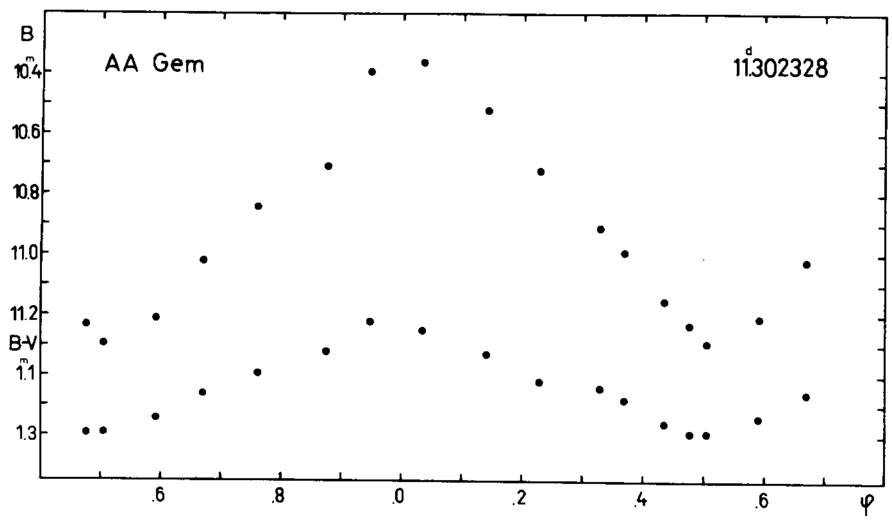


Figure 19 B and B-V curves of AA Gem

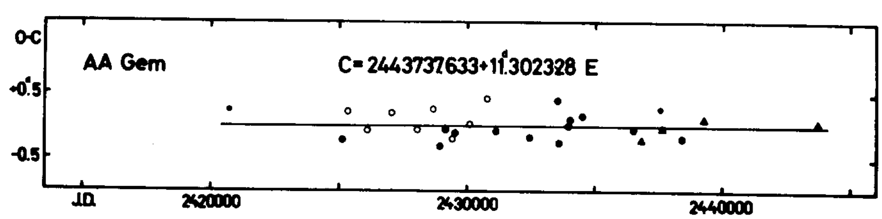


Figure 20 O-C diagram of AA Gem

The O-C residuals have been computed by the formula:

$$C = 2443737.633 + 11^{d}.302328 \times E \quad .$$

The period of the light variation has been constant since its discovery (see Fig. 20).

Table 14 O-C residuals for AA Gem

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2420726.34 | -2036 | +0$^d$.25 | pg | 0.5 | Kukarkin (1930) |
| 2425133.785 | -1646 | -0.216 | pg | 1 | Prager (1929) |
| 2425348.970 | -1627 | +0.225 | vis | 1 | Kukarkin (1940) |
| 2426015.515 | -1568 | -0.068 | vis | 1 | Beyer (1934a) |
| 2427055.602 | -1476 | +0.205 | vis | 1 | Beyer (1934a) |
| 2428061.251 | -1387 | -0.053 | vis | 1 | Martynov (1951) |
| 2428683.197 | -1332 | +0.265 | vis | 1 | Martynov (1951) |
| 2428953.877 | -1308 | -0.311 | pg | 1 | Koshkina (1963) |
| 2429157.579 | -1290 | -0.051 | pg | 1 | Chudovicheva (1952) |
| 2429439.991 | -1265 | -0.197 | vis | 1 | Martynov (1951) |
| 2429530.500 | -1257 | -0.107 | pg | 1 | Koshkina (1963) |
| 2430118.358 | -1205 | +0.030 | vis | 1 | Martynov (1951) |
| 2430785.592 | -1146 | +0.427 | vis | 1 | Martynov (1951) |
| 2431135.468 | -1115 | -0.069 | pg | 1 | Chudovicheva (1952) |
| 2432446.439 | -999 | -0.168 | pg | 1 | Chudovicheva (1952) |
| 2433543.332 | -902 | +0.399 | pg | 1 | Chudovicheva (1952) |
| 2433599.199 | -897 | -0.246 | pg | 1 | Satyvaldiev (1970) |
| 2433972.437 | -864 | +0.015 | pg | 1 | Rosino, Nobili (1955) |
| 2434029.050 | -859 | +0.117 | pg | 1 | Koshkina (1963) |
| 2434537.701 | -814 | +0.163 | pg | 1 | Rosino, Nobili (1955) |
| 2436504.096 | -640 | -0.047 | pg | 1 | Satyvaldiev (1970) |
| 2436831.705 | -611 | -0.206 | pe | 2 | Weaver et al. (1960) |
| 2437566.83 | -546 | +0.27 | pg | 0.5 | Ahnert (1962) |
| 2437634.342 | -540 | -0.034 | pe | 2 | Mitchell et al. (1964) |
| 2438436.673 | -469 | -0.168 | pg | 1 | Satyvaldiev (1970) |
| 2439250.725 | -397 | +0.116 | pe | 2 | Takase (1969) |
| 2443737.679 | 0 | +0.046 | pe | 2 | present paper |

RX Aurigae

The light and colour curves of RX Aur are plotted in Fig. 21. According to the G.C.V.S. (Kukarkin et al., 1969-1970) the spectral type of this Cepheid is G0 III. Apart from the variation in

Table 15 O-C residuals for RX Aur

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2415816.313 | -2410 | -0$^d$.867 | pg | 1 | Williams (1906) |
| 2416222.77 | -2375 | -1.23 | pg | 0.5 | Kukarkin[1] (1931) |
| 2417338.90 | -2279 | -0.96 | vis | 0.5 | Williams (1906, 1907) |
| 2417478.47 | -2267 | -0.88 | vis | 0.5 | Müller, Hartwig (1918-1920) |
| 2417675.843 | -2250 | -1.103 | vis | 1 | Zeipel (1908) |
| 2419698.601 | -2076 | -0.840 | pg | 0.5 | Robinson (1933) |
| 2421883.742 | -1888 | -0.924 | pg | 1 | Jordan (1929) |
| 2425115.469 | -1610 | -0.540 | vis | 0.5 | Dziewulski et al.[2] (1946) |
| 2425243.007 | -1599 | -0.861 | pg | 1 | Hellerich (1935) |
| 2425592.584 | -1569 | +0.010 | vis | 0 | Parenago (1938) |
| 2425650.202 | -1564 | -0.490 | vis | 1 | Kukarkin (1931) |
| 2426219.80 | -1515 | -0.44 | pg | 0.5 | Kiehl, Hopp (1977) |

Table 15 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2426219.952 | -1515 | $-0^d.293$ | vis | 0.5 | Zakharov (1951) |
| 2426405.567 | -1499 | -0.655 | vis | 1 | Terkán (1935) |
| 2426452.003 | -1495 | -0.713 | pg | 1 | Iwanowska et al. (1932) |
| 2426498.823 | -1491 | -0.387 | vis | 1 | Zverev (1936) |
| 2426568.123 | -1485 | -0.829 | vis | 0.5 | Iwanowska et al. (1932) |
| 2426673.385 | -1476 | -0.178 | vis | 1 | Kukarkin (1940) |
| 2426905.458 | -1456 | -0.576 | vis | 0.5 | Dziewulski et al. (1946) |
| 2426997.79 | -1448 | -1.23 | pg | 0 | Kiehl, Hopp (1977) |
| 2427707.442 | -1387 | -0.616 | vis | 0.5 | Dziewulski et al. (1946) |
| 2428370.107 | -1330 | -0.493 | pg | 0.5 | Dziewulski et al. (1946) |
| 2428416.608 | -1326 | -0.486 | pg | 0.5 | Dziewulski et al. (1946) |
| 2428881.32 | -1286 | -0.71 | pg | 0.5 | Karimova[3] (1949) |
| 2430043.972 | -1186 | -0.417 | pg | 1 | Mergentaler (1948) |
| 2433287.54 | -907 | +0.18 | vis | 0.5 | Pohl[4] (1951) |
| 2433461.739 | -892 | +0.030 | pe | 2 | Eggen et al. (1957) |
| 2433982.06 | -847 | -2.71 | pg | 0 | Fu De-Lian (1964) |
| 2436228.158 | -654 | +0.047 | pe | 3 | Bahner et al. (1977) |
| 2436542.00 | -627 | +0.054 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2437611.298 | -535 | -0.014 | pe | 3 | Mitchell et al. (1964) |
| 2437936.922 | -507 | +0.151 | pe | 1 | Williams (1966) |
| 2439064.203 | -410 | -0.051 | pe | 3 | Takase (1969) |
| 2439494.226 | -373 | -0.099 | pe | 3 | Wamsteker (1972) |
| 2441005.307 | -243 | -0.078 | pe | 2 | Evans (1976) |
| 2442365.266 | -126 | -0.072 | vis | 0.5 | Berdnikov (1977) |
| 2443515.872 | -27 | -0.197 | vis | 0.5 | Busch[5] (1980) |
| 2443829.995 | 0 | +0.091 | pe | 3 | present paper |

Remarks: [1] Observer: Blazhko; [2] Obs.: Rybka; [3] Obs.: Ishchenko; [4] Obs.: Mielke; [5] Obs.: Branzke

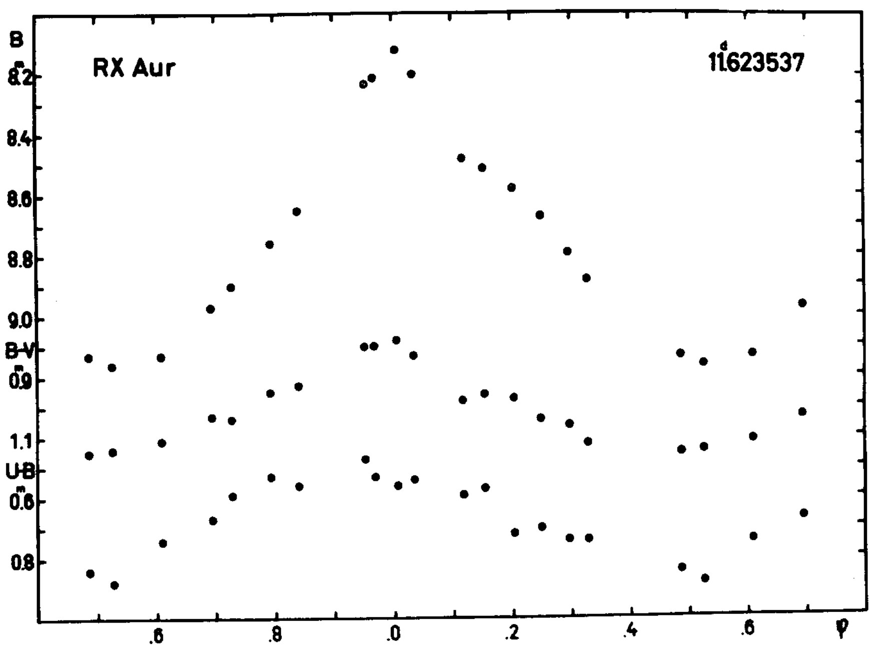


Figure 21 B, B-V and U-B curves of RX Aur

the spectral type during a pulsation cycle, the III luminosity class is not typical for a Cepheid variable.

The O-C residuals have been calculated with the formula:

$$C = 2443829.904 + 11\overset{d}{.}623537 \times E \quad .$$

The O-C diagram in Fig. 22 shows one change in the period:

before J.D. 2434900 $P = 11\overset{d}{.}624230$

after J.D. 2434900 $P = 11\overset{d}{.}623537$ .

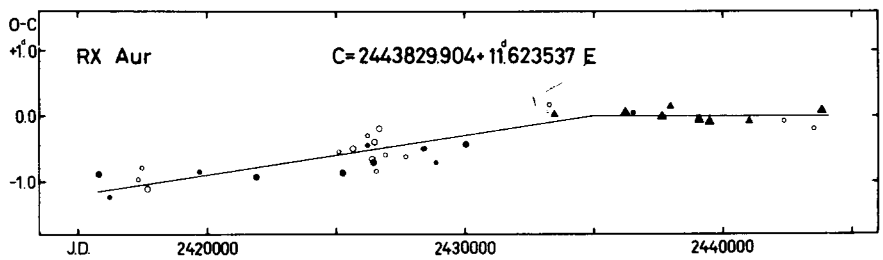


Figure 22 O-C diagram of RX Aur

RY Cassiopeiae

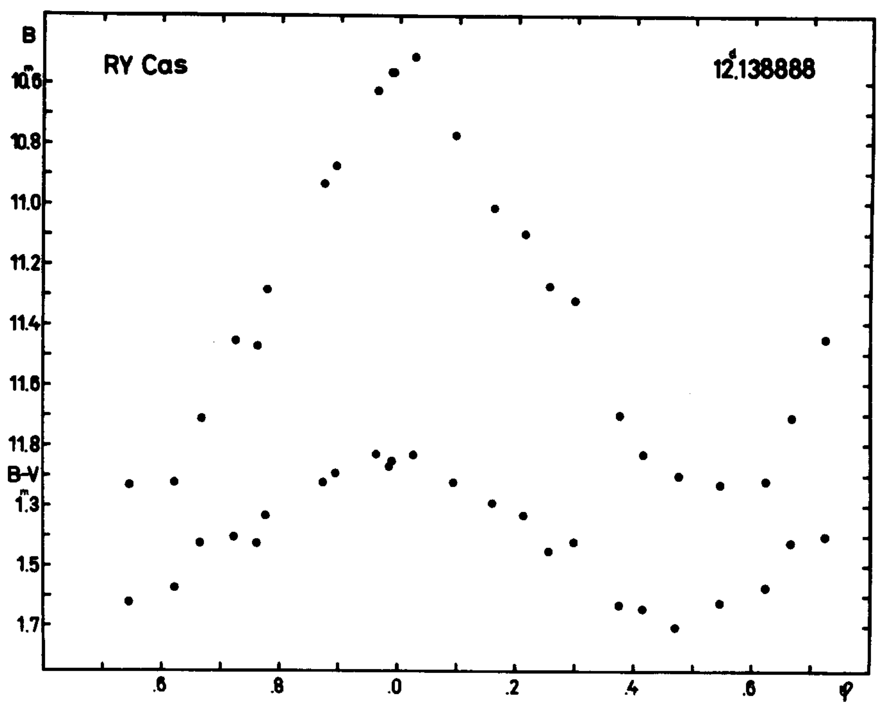


Figure 23 B and B-V curves of RY Cas

The light and colour curves in Fig. 23 show some minor changes in the shape of the light curve in comparison with the earlier photoelectric light curves.

The O-C residuals have been derived using the formula:

$$C = 2443826.530 + 12\overset{d}{.}138888\times E \quad .$$

The period of RY Cas is continuously increasing (see Fig. 24), the approximate parabola being:

$$(O-C)_{par} = 5\overset{d}{.}31\times 10^{-7}\times E^2 \quad .$$

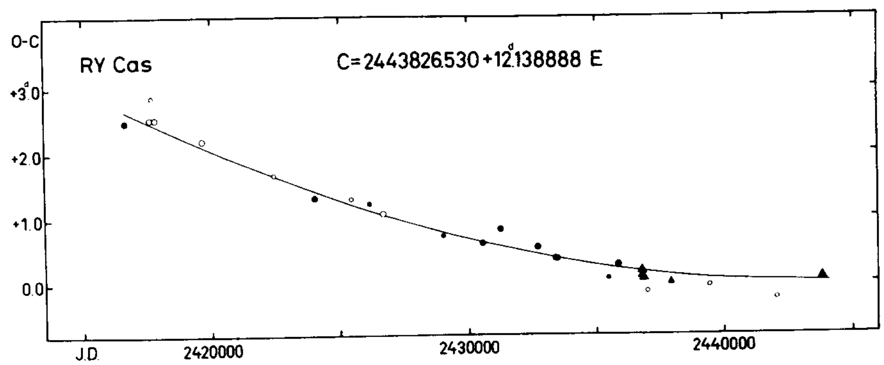


Figure 24 O-C diagram of RY Cas

Table 16 O-C residuals for RY Cas

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2416637.920 | -2240 | $+2\overset{d}{.}494$ | pg | 1 | Kukarkin[1] (1940) |
| 2417284.5 | -2187 | +5.7 | vis | 0 | Dunér et al. (1906) |
| 2417536.9 | -2166 | +3.2 | vis | 0 | Ichinohe (1907) |
| 2417633.346 | -2158 | +2.536 | vis | 1 | Graff (1921b) |
| 2417694.384 | -2153 | +2.880 | vis | 0.5 | Pracka (1910) |
| 2417839.703 | -2141 | +2.532 | vis | 1 | Luizet (1908b) |
| 2419672.345 | -1990 | +2.202 | vis | 1 | Graff (1921b) |
| 2422451.620 | -1761 | +1.672 | vis | 0.5 | Graff (1921b) |
| 2424041.467 | -1630 | +1.324 | pg | 1 | Kukarkin (1940) |
| 2425485.97 | -1511 | +1.30 | vis | 0.5 | Nielsen[2] (1955) |
| 2426165.68 | -1455 | +1.23 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2426699.636 | -1411 | +1.077 | vis | 1 | Kukarkin (1940) |
| 2429017.82 | -1220 | +0.73 | pg | 0.5 | Pevunova (1940) |
| 2430547.208 | -1094 | +0.621 | pg | 1 | Solov'yov (1954) |
| 2431251.473 | -1036 | +0.831 | pg | 1 | Solov'yov (1954) |
| 2432732.134 | -914 | +0.548 | pg | 1 | Solov'yov (1954) |
| 2433423.88 | -857 | +0.38 | vis | 0.5 | Nielsen[3] (1955) |
| 2433472.434 | -853 | +0.375 | pg | 1 | Solov'yov (1954) |
| 2435291.32 | -703 | -1.57 | pg | 0 | Parenago[4] (1956) |
| 2435438.63 | -691 | +0.07 | pg | 0.5 | Romano (1959) |
| 2435875.84 | -655 | +0.28 | pg | 1 | Zonn, Semeniuk (1959) |
| 2436798.286 | -579 | +0.172 | pe | 3 | Weaver et al. (1960) |
| 2436810.350 | -578 | +0.097 | pe | 3 | Oosterhoff (1960) |
| 2436871.012 | -573 | +0.065 | pe | 3 | Bahner et al. (1962) |

Table 16 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2437016.475 | -561 | $-0^{d}.139$ | vis | 0.5 | Sachse (1973) |
| 2437939.164 | -485 | -0.005 | pe | 1 | Williams (1966) |
| 2439055.344 | -393 | -0.783 | vis | 0 | Sachse (1973) |
| 2439444.331 | -361 | -0.060 | vis | 0.5 | Sachse (1973) |
| 2442066.14 | -145 | -0.25 | vis | 0.5 | Small (1974) |
| 2443826.585 | 0 | +0.055 | pe | 3 | present paper |

Remarks: [1] Observers: Blazhko and Parenago; [2] Obs.: Brun; [3] Obs.: Petersen; [4] Obs.: Zhdanova

SZ Cassiopeiae

The light and colour curves of this small amplitude Cepheid can be seen in Fig. 25. SZ Cas is situated in the corona of the double cluster h and $\chi$ Per (Efremov, 1964).

The O-C residuals have been computed with the ephemeris:

$$C = 2443818.142 + 13^{d}.637747 \times E \quad .$$

The period of SZ Cas is continuously increasing (see Fig. 26). The least squares fitting procedure has resulted in the parabola:

$$(O-C)_{par} = 1^{d}.01 \times 10^{-5} \times E^{2} \quad .$$

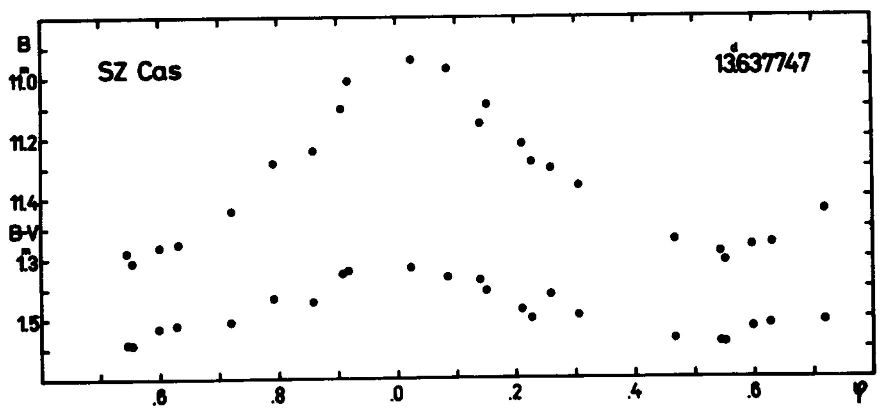


Figure 25 B and B-V curves of SZ Cas

Table 17 O-C residuals for SZ Cas

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2415753.8 | -2061 | $+43^{d}.1$ | pg | 0.5 | Gerasimovic (1927b) |
| 2416039.2 | -2036 | +42.1 | pg | 0.5 | Gerasimovic (1927b) |
| 2416338.4 | -2016 | +41.2 | pg | 0.5 | Gerasimovic (1927b) |
| 2416678.7 | -1993 | +40.6 | pg | 0.5 | Gerasimovic (1927b) |
| 2416738.046 | -1989 | +45.383 | pg | 0 | Kukarkin (1932c) |
| 2417085.8 | -1963 | +38.6 | pg | 0.5 | Gerasimovic (1927b) |
| 2417220.442 | -1953 | +36.820 | vis | 0.5 | Pracka (1910) |

Table 17 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417480.8 | -1934 | $+38^{\mathrm{d}}.1$ | pg | 0.5 | Gerasimovic (1927b) |
| 2417833.6 | -1908 | +36.3 | pg | 0.5 | Gerasimovic (1927b) |
| 2418542.5 | -1856 | +36.0 | pg | 0.5 | Gerasimovic (1927b) |
| 2419017.2 | -1821 | +33.4 | pg | 0.5 | Gerasimovic (1927b) |
| 2419030.229 | -1820 | +32.787 | vis | 0.5 | Mündler (1911b, 1919) |
| 2419805.7 | -1763 | +30.9 | pg | 0.5 | Gerasimovic (1927b) |
| 2420581.0 | -1706 | +28.9 | pg | 0.5 | Gerasimovic (1927b) |
| 2420718.996 | -1696 | +30.473 | pg | 0.5 | Robinson (1933) |
| 2420814.397 | -1689 | +30.410 | vis | 0.5 | Zinner[1] (1932) |
| 2420839.8 | -1687 | +28.5 | pg | 0.5 | Gerasimovic (1927b) |
| 2421084.6 | -1669 | +27.9 | pg | 0.5 | Gerasimovic (1927b) |
| 2421248.225 | -1657 | +27.830 | vis | 0.5 | Zinner[1] (1932) |
| 2421261.961 | -1656 | +27.928 | vis | 0.5 | Luizet (1923) |
| 2421479.3 | -1640 | +27.1 | pg | 0.5 | Gerasimovic (1927b) |
| 2421969.959 | -1604 | +26.763 | vis | 0.5 | Zinner[1] (1932) |
| 2422323.3 | -1578 | +25.5 | pg | 0.5 | Gerasimovic (1927b) |
| 2422582.0 | -1559 | +25.1 | pg | 0.5 | Gerasimovic (1927b) |
| 2422935.7 | -1533 | +24.2 | pg | 0.5 | Gerasimovic (1927b) |
| 2423439.4 | -1496 | +23.3 | pg | 0.5 | Gerasimovic (1927b) |
| 2423806.919 | -1467 | +22.627 | vis | 1 | Beyer (1927) |
| 2424105.6 | -1447 | +21.3 | pg | 0.5 | Gerasimovic (1927b) |
| 2424255.315 | -1436 | +20.978 | vis | 1 | Beyer (1927) |
| 2424390.7 | -1426 | +20.0 | pg | 0.5 | Gerasimovic (1927b) |
| 2424758.807 | -1399 | +19.873 | vis | 1 | Beyer (1927) |
| 2424880.4 | -1390 | +18.7 | pg | 0.5 | Gerasimovic (1927b) |
| 2425166.947 | -1369 | +18.881 | vis | 1 | Beyer (1934a) |
| 2425520.728 | -1343 | +18.080 | vis | 1 | Beyer (1934a) |
| 2426282.663 | -1287 | +16.301 | vis | 1 | Kukarkin (1940) |
| 2426623.239 | -1262 | +15.934 | vis | 1 | Kukarkin (1932c) |
| 2426691.049 | -1257 | +15.555 | vis | 1 | Dunst (1933) |
| 2428458.06 | -1127 | +9.66 | pg | 0 | Fu De-Lian (1964) |
| 2429604.696 | -1043 | +10.724 | pg | 1 | Efremov (1958) |
| 2430638.866 | -967 | +8.425 | vis | 0.5 | Stein (1944) |
| 2430653.134 | -966 | +9.056 | pg | 1 | Filin (1958) |
| 2431525.288 | -902 | +8.394 | pg | 1 | Filin (1958) |
| 2432805.023 | -808 | +6.181 | pg | 1 | Filin (1958) |
| 2433186.576 | -780 | +5.877 | pg | 1 | Filin (1958) |
| 2434249.160 | -702 | +4.716 | pg | 1 | Efremov (1958) |
| 2434893.313 | -655 | +7.895 | pg | 0 | Filin (1958) |
| 2436457.166 | -540 | +3.407 | pg | 1 | Makarenko (1969) |
| 2436484.05 | -538 | +3.02 | pg | 0.5 | Smykov (1980) |
| 2436606.84 | -529 | +3.07 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2436824.793 | -513 | +2.815 | pe | 3 | Oosterhoff (1960) |
| 2436838.243 | -512 | +2.627 | pe | 3 | Weaver et al. (1960) |
| 2436892.930 | -508 | +2.763 | pe | 3 | Bahner et al. (1962) |
| 2437205.92 | -485 | +2.09 | pg | 0.5 | Smykov (1980) |
| 2437615.141 | -455 | +2.174 | pg | 1 | Makarenko (1969) |
| 2437968.44 | -429 | +0.89 | pg | 0 | Smykov (1980) |
| 2438201.44 | -412 | +2.05 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2438295.77 | -405 | +0.92 | pg | 0 | Smykov (1980) |
| 2438664.78 | -378 | +1.71 | pg | 0.5 | Vasil'yan. et al.[2] (1970) |
| 2438665.010 | -378 | +1.936 | pg | 1 | Makarenko (1969) |
| 2439059.47 | -349 | +0.90 | pg | 0.5 | Smykov (1980) |
| 2441500.2 | -170 | +0.5 | vis | 0.5 | Cragg (1976) |

Table 17 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2442303.91 | -111 | $-0^{d}.44$ | pg | 0.5 | Smykov (1980) |
| 2442372.39 | -106 | -0.15 | pg | 0.5 | Smykov (1980) |
| 2442699.48 | -82 | -0.37 | pg | 0.5 | Smykov (1980) |
| 2443817.966 | 0 | -0.176 | pe | 3 | present paper |

Remarks: [1] Observer: Hartwig; [2] Observer: Shakhovskaya

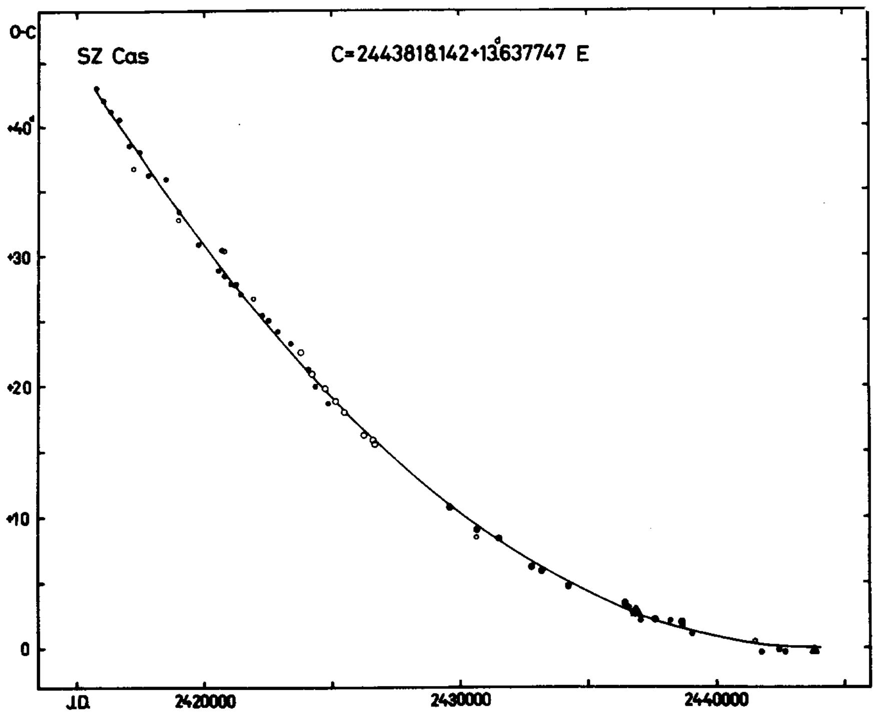


Figure 26 O-C diagram of SZ Cas

TT Aquilae

Its light and colour curves are plotted in Fig. 27. This variable has a faint companion within the edge of the diaphragm.

The O-C residuals have been calculated using the formula:

$$C = 2443810.823 + 13^{d}.754707 \times E \quad .$$

The period of TT Aql has been constant since J.D. 2425000. Before that date the period might have had another value but that part of the O-C diagram (see Fig. 28) is very uncertain.

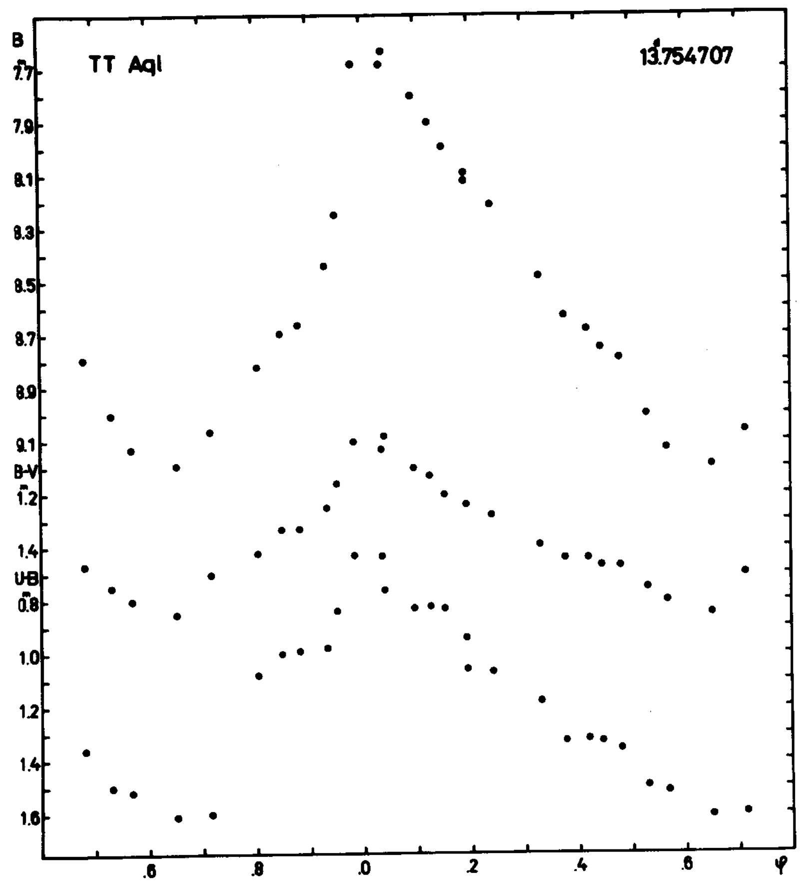


Figure 27 B, B-V and U-B curves of TT Aql

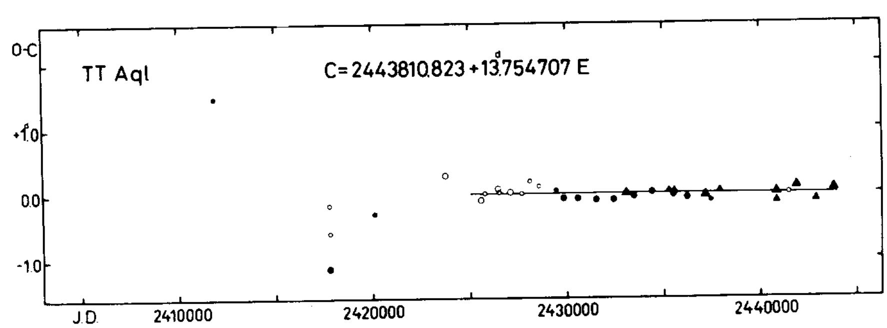


Figure 28 O-C diagram of TT Aql

Table 18 O-C residuals for TT Aql

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2411873.865 | -2322 | $+1\overset{d}{.}472$ | pg | 0.5 | Pickering (1907) |
| 2417744.514 | -1895 | -1.139 | pg | 1 | Jordan (1919) |
| 2417745.486 | -1895 | -0.167 | vis | 0.5 | Ichinohe (1911) |
| 2417800.1 | -1891 | -0.6 | vis | 0.5 | Pickering (1908) |
| 2420097.402 | -1724 | -0.306 | pg | 0.5 | Robinson (1933) |
| 2423742.991 | -1459 | +0.286 | vis | 1 | Kukarkin[1] (1940) |
| 2425613.245 | -1323 | -0.101 | vis | 1 | Kukarkin (1940) |
| 2425805.920 | -1309 | +0.008 | vis | 0.5 | Parenago (1938) |
| 2426466.209 | -1261 | +0.072 | vis | 1 | Kukarkin (1940) |
| 2426521.173 | -1257 | +0.017 | vis | 0.5 | Zverev (1936) |
| 2427085.125 | -1216 | +0.026 | vis | 1 | Florya, Kukarkina (1953) |
| 2427662.80 | -1174 | 0.00 | vis | 0.5 | Krebs[2] (1940) |
| 2428089.378 | -1143 | +0.185 | vis | 0.5 | Dziewulski et al. (1956) |
| 2428584.5 | -1107 | +0.1 | vis | 0.5 | Krebs (1939) |
| 2429519.731 | -1039 | +0.049 | pg | 0.5 | Solov'yov (1944) |
| 2429835.963 | -1016 | -0.078 | pg | 1 | Erleksova (1960) |
| 2430564.956 | -963 | -0.084 | pg | 1 | Erleksova (1960) |
| 2431527.765 | -893 | -0.105 | pg | 1 | Erleksova (1960) |
| 2432449.337 | -826 | -0.098 | pg | 1 | Erleksova (1960) |
| 2433109.654 | -778 | -0.007 | pe | 3 | Eggen (1951) |
| 2433494.741 | -750 | -0.052 | pg | 1 | Erleksova (1960) |
| 2434416.368 | -683 | +0.010 | pg | 1 | Erleksova (1960) |
| 2435282.936 | -620 | +0.031 | pe | 2 | Irwin (1961) |
| 2435502.954 | -604 | -0.026 | pg | 1 | Erleksova (1960) |
| 2435558.014 | -600 | +0.015 | pe | 2 | Walraven et al. (1958) |
| 2436218.152 | -552 | -0.073 | pg | 1 | Erleksova (1960) |
| 2437208.525 | -480 | -0.039 | pe | 3 | Mitchell et al. (1964) |
| 2437469.787 | -461 | -0.116 | pg | 0.5 | Zoj Von Shor (1963) |
| 2437937.601 | -427 | +0.038 | pe | 1 | Williams (1966) |
| 2440867.193 | -214 | -0.123 | pe | 1 | Evans (1976) |
| 2440867.331 | -214 | +0.015 | pe | 3 | Pel (1976) |
| 2441500.0 | -168 | 0.0 | vis | 0.5 | Cragg (1976) |
| 2441912.777 | -138 | +0.104 | pe | 3 | Landis (1976) |
| 2442916.670 | -65 | -0.097 | pe | 2 | Dean (1977) |
| 2443810.884 | 0 | +0.061 | pe | 3 | present paper |

Remarks: [1] Observer: Kanda; [2] Observer: Loreta

TX Cygni

The light and colour curves of this Cepheid are shown in Fig. 29. The O-C residuals have been computed with the formula:

$$C = 2443794.231 + 14\overset{d}{.}708157 \times E \quad .$$

Although the G.C.V.S. (Kukarkin et al., 1969-1970) reported a variation in the period of TX Cyg, the period was constant until the sixties (see Fig. 30) with $P = 14\overset{d}{.}708157$ . The period change can only be seen on the basis of the recent observations. Assuming that the change in the period occurred at about J.D. 2437000, the new period is $P = 14\overset{d}{.}7098$ which can be refined by future observations.

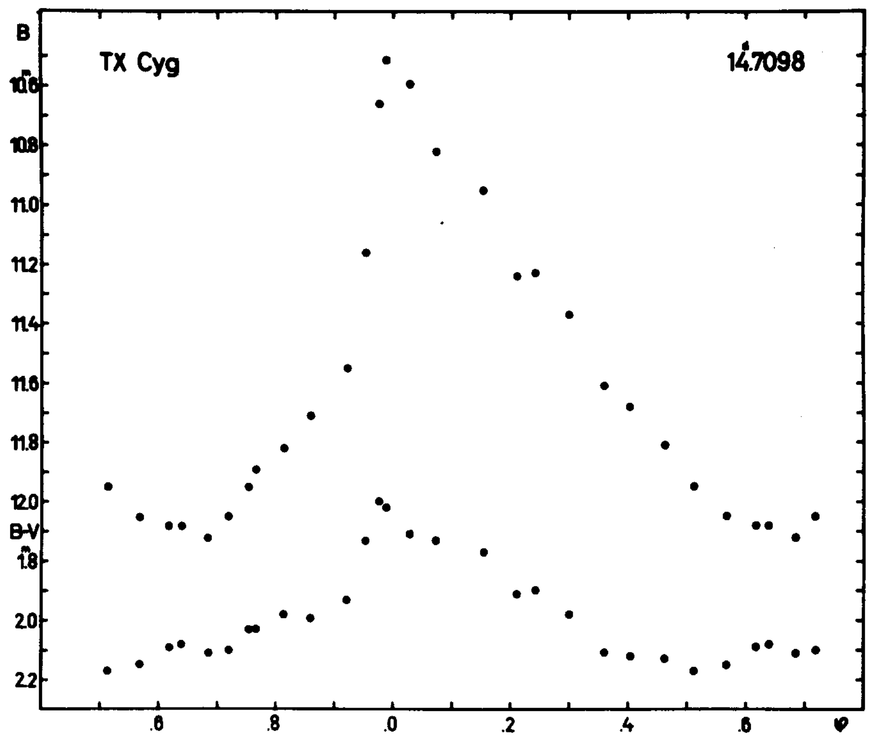


Figure 29 B and B-V curves of TX Cyg

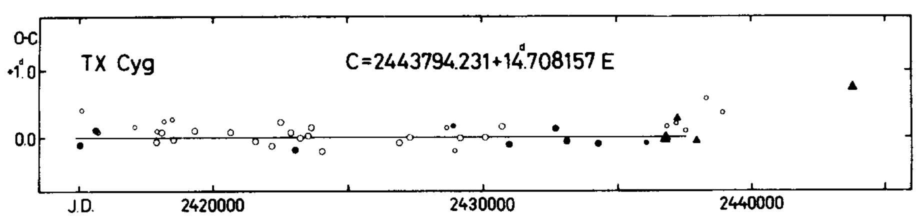


Figure 30 O-C diagram of TX Cyg

Table 19 O-C residuals for TX Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2415054.388 | -1954 | $-0^{d}.104$ | pg | 1 | Williams (1900b) |
| 2415099.03 | -1951 | +0.41 | vis | 0.5 | Williams (1902) |
| 2415613.522 | -1916 | +0.120 | pg | 1 | Kulikovsky (1933) |
| 2415614.51 | -1916 | +1.11 | vis | 0 | Williams (1902) |
| 2415731.144 | -1908 | +0.077 | vis | 0.5 | Zinner[1] (1932) |
| 2415938.65 | -1894 | +1.67 | vis | 0 | Yendell (1904) |
| 2416320.92 | -1868 | +1.53 | vis | 0 | Yendell (1904) |
| 2417084.377 | -1816 | +0.159 | vis | 0.5 | Zinner[1] (1932) |

Table 19 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417511.71 | -1787 | +0.$^d$96 | vis | 0 | Seares (1907) |
| 2417893.095 | -1761 | -0.072 | vis | 1 | Zeipel (1908) |
| 2417908.0 | -1760 | +0.1 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2418099.158 | -1747 | +0.077 | vis | 1 | Bilt (1925) |
| 2418172.86 | -1742 | +0.24 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2418496.46 | -1720 | +0.26 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2418554.996 | -1716 | -0.038 | vis | 1 | Bilt (1925) |
| 2419319.957 | -1664 | +0.099 | vis | 1 | Bilt (1925) |
| 2420395.5 | -1591 | +1.9 | vis | 0 | Yendell (1915) |
| 2420643.670 | -1574 | +0.078 | vis | 1 | Doberck (1920b) |
| 2421570.143 | -1511 | -0.063 | vis | 1 | Doberck (1920b) |
| 2422187.816 | -1469 | -0.132 | vis | 1 | Doberck (1920b) |
| 2422511.750 | -1447 | +0.222 | vis | 1 | Leiner (1925) |
| 2422894.003 | -1421 | +0.063 | vis | 1 | Leiner (1925) |
| 2423040.836 | -1411 | -0.185 | pg | 1 | Henroteau (1924) |
| 2423246.928 | -1397 | -0.008 | vis | 1 | Leiner (1925) |
| 2423526.414 | -1378 | +0.023 | vis | 1 | Doberck (1924b) |
| 2423658.906 | -1369 | +0.142 | vis | 1 | Leiner (1925) |
| 2424040.967 | -1343 | -0.209 | vis | 1 | Leiner (1925) |
| 2426909.179 | -1148 | -0.088 | vis | 1 | Florya, Kukarkina (1953) |
| 2427291.667 | -1122 | -0.012 | vis | 1 | Florya, Kukarkina (1953) |
| 2428674.389 | -1028 | +0.143 | vis | 0.5 | Dziewulski (1949) |
| 2428909.736 | -1012 | +0.160 | pg | 0.5 | Shteiman[3] (1958) |
| 2428982.9 | -1007 | -0.2 | vis | 0.5 | Krebs (1939) |
| 2429174.308 | -994 | -0.015 | vis | 1 | Conceicao-Silva (1949) |
| 2430086.220 | -932 | -0.009 | vis | 1 | Conceicao-Silva (1949) |
| 2430704.128 | -890 | +0.157 | vis | 1 | Conceicao-Silva (1949) |
| 2430998.028 | -870 | -0.106 | pg | 1 | Solov'yov (1950) |
| 2432719.114 | -753 | +0.125 | pg | 1 | Solov'yov (1950) |
| 2433130.754 | -725 | -0.063 | pg | 1 | Solov'yov (1950) |
| 2434307.370 | -645 | -0.100 | pg | 1 | Shteiman (1958) |
| 2436087.069 | -524 | -0.088 | pg | 0.5 | Korovkina (1958) |
| 2436440.72 | -500 | +0.57 | pg | 0 | Korovkina (1959) |
| 2436778.400 | -477 | -0.040 | pe | 3 | Weaver et al. (1960) |
| 2436793.138 | -476 | -0.010 | pe | 3 | Oosterhoff (1960) |
| 2436837.432 | -473 | +0.159 | vis | 0.5 | Busch, Häussler (1968) |
| 2437190.466 | -449 | +0.197 | vis | 0.5 | Busch, Häussler (1968) |
| 2437219.971 | -447 | +0.286 | pe | 1 | Mitchell et al. (1964) |
| 2437543.356 | -425 | +0.092 | vis | 0.5 | Busch, Häussler (1968) |
| 2437955.031 | -397 | -0.062 | pe | 1 | Williams (1966) |
| 2438323.369 | -372 | +0.572 | vis | 0.5 | Busch, Häussler (1968) |
| 2438911.485 | -332 | +0.362 | vis | 0.5 | Busch, Häussler (1968) |
| 2443794.971 | 0 | +0.740 | pe | 3 | present paper |

Remarks: [1] Observer: Hartwig; [2] Obs.: Belyavsky; [3] Obs.: Milstein Nikolayev

RW Cassiopeiae

The light and colour curves of RW Cas are plotted in Fig. 31. The O-C residuals have been calculated using the ephemerides:

$$C_{max} = 2443829.972 + 14\overset{d}{.}791548 \times E$$

$$C_{med} = 2443829.215 + 14\overset{d}{.}791548 \times E$$

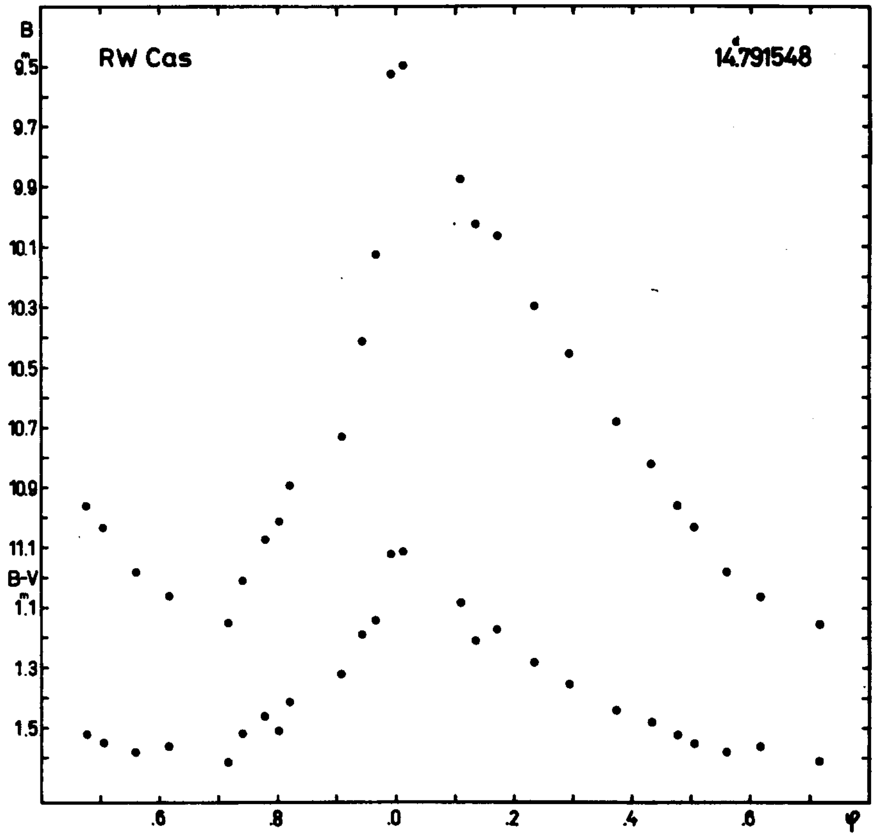


Figure 31 B and B-V curves of RW Cas

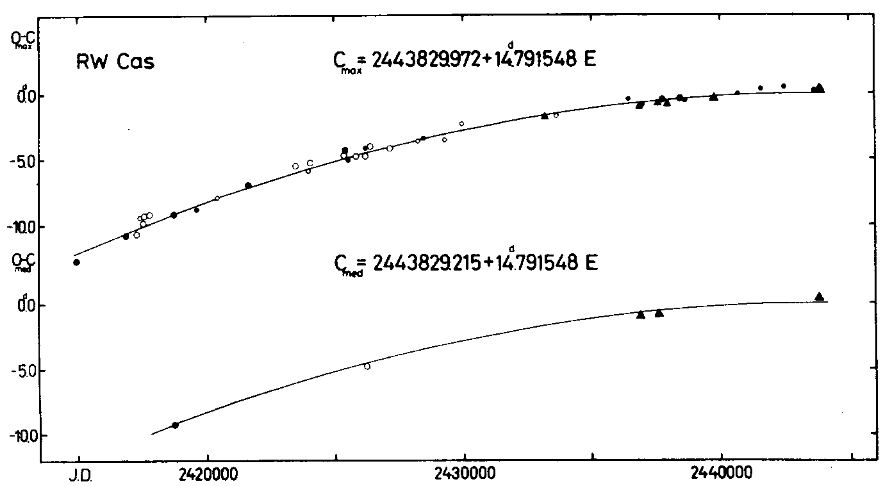


Figure 32 O-C diagram of RW Cas

for the maximum and median brightnesses, respectively. The period of RW Cas is continuously decreasing (see Fig. 32). The least squares fitting procedure has resulted in the formula:

$$(O-C)_{par} = -3\overset{d}{.}20\times10^{-6}\times E^2$$

for the fitted parabola.

Table 20 O-C residuals for RW Cas (maximum brightness)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2414988.475 | -1949 | $-12\overset{d}{.}770$ | pg | 1 | Ceraski (1905) |
| 2416913.376 | -1819 | -10.770 | pg | 1 | Kukarkin (1932b) |
| 2417327.602 | -1791 | -10.708 | vis | 1 | Kulikovsky[1] (1935) |
| 2417461.95 | -1782 | -9.48 | vis | 0.5 | Seares (1907) |
| 2417565.095 | -1775 | -9.879 | vis | 1 | Pracka (1909) |
| 2417610.025 | -1772 | -9.324 | vis | 1 | Hartwig (1910) |
| 2417832.029 | -1757 | -9.193 | vis | 1 | Graff (1921a) |
| 2418763.907 | -1694 | -9.183 | pg | 1 | Whittaker et al. (1911) |
| 2419651.734 | -1634 | -8.849 | pg | 0.5 | Robinson (1933) |
| 2420466.157 | -1579 | -7.961 | vis | 0.5 | Kukarkin[2] (1932b) |
| 2421650.497 | -1499 | -6.945 | pg | 1 | Kukarkin (1932b) |
| 2422125.956 | -1467 | -4.815 | vis | 0 | Graff (1921a) |
| 2423500.864 | -1374 | -5.521 | vis | 1 | Nielsen[3] (1927a) |
| 2424018.179 | -1339 | -5.910 | vis | 0.5 | Kukarkin[4] (1932b) |
| 2424077.975 | -1335 | -5.280 | vis | 1 | Kulikovsky[1] (1935) |
| 2425394.993 | -1246 | -4.710 | vis | 1 | {Kukarkin (1932b) Kulikovsky[5] (1935) |
| 2425424.937 | -1244 | -4.349 | pg | 1 | Kukarkin (1932b) |
| 2425557.29 | -1235 | -5.12 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2425868.248 | -1214 | -4.785 | vis | 1 | Beyer (1934a) |
| 2426208.442 | -1191 | -4.796 | vis | 1 | Lassovszky (1932a) |
| 2426223.87 | -1190 | -4.16 | pg | 0.5 | Kiehl, Hopp (1977) |
| 2426416.318 | -1177 | -4.002 | vis | 1 | Beyer (1934a) |
| 2427155.692 | -1127 | -4.205 | vis | 1 | Beyer (1934a) |
| 2428250.826 | -1053 | -3.646 | vis | 0.5 | Dziewulska (1948) |
| 2428458.06 | -1039 | -3.49 | pg | 0.5 | Fu De-Lian (1964) |
| 2429286.31 | -983 | -3.57 | vis | 0.5 | Parenago[6] (1956) |
| 2429953.14 | -938 | -2.36 | vis | 0.5 | Conceicao-Silva (1948) |
| 2433178.259 | -720 | -1.798 | pe | 2 | Eggen (1951) |
| 2433622.04 | -690 | -1.76 | vis | 0.5 | Parenago[6] (1956) |
| 2436478.11 | -497 | -0.46 | pg | 0.5 | Smykov (1978) |
| 2436891.747 | -469 | -0.989 | pe | 3 | Bahner et al. (1962) |
| 2436995.411 | -462 | -0.866 | pg | 1 | Shinada et al. (1969) |
| 2437587.153 | -422 | -0.786 | pe | 3 | Mitchell et al. (1964) |
| 2437587.24 | -422 | -0.70 | pg | 0.5 | Smykov (1978) |
| 2437779.760 | -409 | -0.469 | pg | 1 | Shinada et al. (1969) |
| 2437956.907 | -397 | -0.820 | pe | 1 | Williams (1966) |
| 2438475.018 | -362 | -0.414 | pg | 1 | Shinada et al. (1969) |
| 2438652.39 | -350 | -0.54 | pg | 0.5 | Smykov (1978) |
| 2439776.710 | -274 | -0.378 | pe | 3 | present paper[7] |
| 2440708.91 | -211 | -0.04 | pg | 0.5 | Smykov (1978) |
| 2441596.78 | -151 | +0.33 | pg | 0.5 | Smykov (1978) |
| 2442085.86 | -118 | +1.29 | vis | 0 | Small (1974) |
| 2442499.16 | -90 | +0.43 | pg | 0.5 | Smykov (1978) |
| 2443667.50 | -11 | +0.24 | pg | 0.5 | Smykov (1978) |
| 2443830.363 | 0 | +0.391 | pe | 3 | present paper |

Table 20 (cont.)

Remarks: [1] Observer: Blazhko; [2] Obs.: Luizet; [3] Obs.: Aage Nielsen; [4] Obs.: Selivanov, [5] Obs.: Kukarkin; [6] Obs.: Latyshev; [7] Obs.: Abaffy

Table 21 O-C residuals for RW Cas

(median brightness)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2418763.063 | -1694 | $-9^{d}.270$ | pg | 1 | Whittaker et al. (1911) |
| 2426207.657 | -1191 | -4.824 | vis | 1 | Lassovszky (1932a) |
| 2436891.022 | -469 | -0.957 | pe | 3 | Bahner et al. (1962) |
| 2437586.399 | -422 | -0.783 | pe | 3 | Mitchell et al. (1964) |
| 2443829.608 | 0 | +0.393 | pe | 3 | present paper |

SZ Cygni

The light and colour curves of SZ Cyg are shown in Fig. 33. The variable has a B4 photometric companion (Madore, 1977).

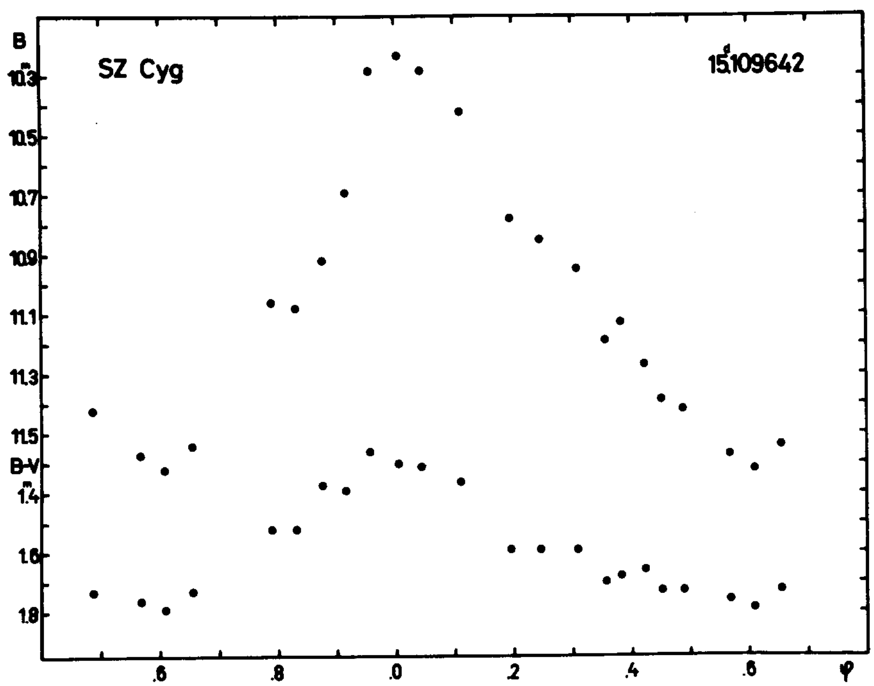


Figure 33 B and B-V curves of SZ Cyg

The O-C residuals have been computed with the formula:

$$C = 2443760.128 + 15^{d}.109642 \times E$$

The O-C diagram of SZ Cyg is plotted in Fig. 34 using the residuals listed in Table 22 except the first one (Deichmüller, 1900a). The O-C diagram has a sinusoidal structure as is to be expected for a member of a binary system with an inclination significantly different from zero, due to the light-time effect. The orbital period of the system is roughly 60-70 years. Spectroscopic observations of SZ Cyg are badly needed since the only radial velocity measurements are those of Joy (1937).

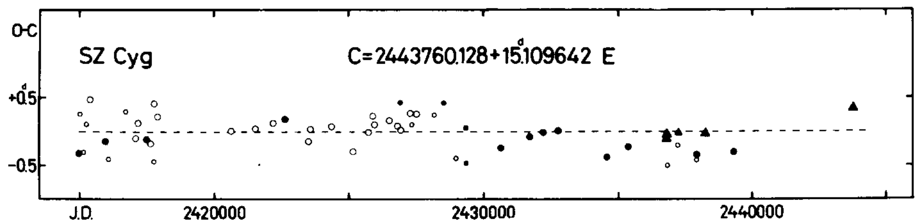


Figure 34 O-C diagram of SZ Cyg

Table 22 O-C residuals for SZ Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2406484.5 | -2467 | $-0^d.1$ | vis | 0.5 | Deichmüller (1900a) |
| 2414991.044 | -1904 | -0.326 | pg | 1 | Williams (1900a) |
| 2415021.853 | -1902 | +0.264 | vis | 0.5 | Williams (1900a) |
| 2415172.363 | -1892 | -0.322 | vis | 0.5 | Esch (1936) |
| 2415278.6 | -1885 | +0.1 | vis | 0.5 | Deichmüller (1900b) |
| 2415399.359 | -1877 | +0.468 | vis | 1 | Zinner[1] (1932) |
| 2415973.353 | -1839 | -0.143 | pg | 1 | Florya, Parenago (1933) |
| 2416078.85 | -1832 | -0.41 | vis | 0.5 | Yendell (1904) |
| 2416441.125 | -1808 | -0.770 | vis | 0 | Furness[2] (1913b) |
| 2416714.161 | -1790 | +0.292 | vis | 0.5 | Lau (1907) |
| 2417091.500 | -1765 | -0.110 | vis | 1 | Nijland (1923) |
| 2417182.386 | -1759 | +0.118 | vis | 1 | Zinner[1] (1932) |
| 2417499.452 | -1738 | -0.118 | pg | 1 | Florya, Parenago (1933) |
| 2417665.585 | -1727 | -0.191 | vis | 1 | Nijland (1923) |
| 2417771.959 | -1720 | +0.415 | vis | 1 | Luizet (1908a) |
| 2417786.208 | -1719 | -0.445 | vis | 0.5 | Graff (1914) |
| 2417907.751 | -1711 | +0.220 | vis | 1 | Zeipel (1908) |
| 2420657.495 | -1529 | +0.010 | vis | 1 | Doberck (1920a) |
| 2421548.993 | -1470 | +0.039 | vis | 1 | Doberck (1920a) |
| 2422198.794 | -1427 | +0.125 | vis | 1 | Doberck (1920a) |
| 2422667.246 | -1396 | +0.178 | pg | 1 | Henroteau (1924) |
| 2423028.962 | -1372 | -0.737 | vis | 0 | {Eaton[3] (1920,1921,1922, 1923) and Walker[3] (1921) |
| 2423513.067 | -1340 | -0.141 | vis | 1 | Doberck (1924a) |
| 2423573.673 | -1336 | +0.027 | vis | 1 | Eaton[4] (1922,1923,1924) |
| 2424374.528 | -1283 | +0.071 | vis | 1 | Campbell[4] (1925, 1926) |
| 2425174.974 | -1230 | -0.294 | vis | 1 | Campbell[4] (1927, 1928) |
| 2425749.422 | -1192 | -0.013 | vis | 1 | Beyer (1934a) |
| 2425900.762 | -1182 | +0.231 | vis | 1 | Campbell[4] (1929, 1930) |
| 2425976.176 | -1177 | +0.097 | vis | 1 | Lassovszky (1932b) |
| 2426520.192 | -1141 | +0.166 | vis | 1 | Beyer (1934a) |
| 2426626.566 | -1134 | +0.772 | vis | 0 | Campbell[4] (1931, 1932) |
| 2426822.299 | -1121 | +0.080 | vis | 1 | Lassovszky (1932b) |

Table 22 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2426912.898 | -1115 | $+0^d.021$ | vis | 1 | Florya, Kukarkina (1953) |
| 2426913.31 | -1115 | +0.43 | pg | 0.5 | Sandig (1948) |
| 2427275.777 | -1091 | +0.268 | vis | 1 | Florya, Kukarkina (1953) |
| 2427351.2 | -1086 | +0.1 | vis | 0.5 | Miczaika (1934b) |
| 2427517.521 | -1075 | +0.258 | vis | 1 | Campbell[4] (1933,1934,1935) |
| 2427576.71 | -1071 | -0.99 | pg | 0 | Sandig (1948) |
| 2427593.60 | -1070 | +0.79 | vis | 0 | Solov'yov (1935) |
| 2428197.437 | -1030 | +0.240 | vis | 0.5 | Dziewulski (1948a) |
| 2428530.03 | -1008 | +0.42 | pg | 0.5 | Sandig (1948) |
| 2428997.6 | -977 | -0.4 | vis | 0.5 | Krebs (1939) |
| 2429330.464 | -955 | +0.044 | pg | 0.5 | Uranova (1950) |
| 2429360.17 | -953 | -0.47 | pg | 0.5 | Sandig (1948) |
| 2430659.819 | -867 | -0.249 | pg | 1 | Filin (1951) |
| 2431702.567 | -798 | -0.067 | pg | 1 | Filin (1951) |
| 2432201.239 | -765 | -0.013 | pg | 1 | Kulikov (1957) |
| 2432820.760 | -724 | +0.013 | pg | 1 | Filin (1951) |
| 2434588.194 | -607 | -0.381 | pg | 1 | Kulikov (1957) |
| 2435389.154 | -554 | -0.232 | pg | 1 | Kulikov (1957) |
| 2436779.369 | -462 | -0.104 | pe | 3 | Oosterhoff (1960) |
| 2436794.540 | -461 | -0.043 | pe | 3 | Weaver et al. (1960) |
| 2436839.40 | -458 | -0.51 | vis | 0.5 | Busch et al. (1964) |
| 2437202.34 | -434 | -0.20 | vis | 0.5 | Busch et al. (1964) |
| 2437217.632 | -433 | -0.021 | pe | 2 | Mitchell et al. (1964) |
| 2437927.38 | -386 | -0.43 | vis | 0.5 | Busch et al. (1964) |
| 2437942.574 | -385 | -0.342 | pg | 1 | Girnyak (1971) |
| 2438229.979 | -366 | -0.020 | pe | 3 | Kwee, Braun (1967) |
| 2439302.479 | -295 | -0.305 | pg | 1 | Girnyak (1971) |
| 2443760.486 | 0 | +0.358 | pe | 3 | present paper |

Remarks: [1] Observer: Hartwig; [2] Obs.: Whitney; [3] Obs.: McAteer; [4] Obs.: Peltier

SV Monocerotis

The light and colour curves of SV Mon are shown in Fig. 35. The O-C residuals have been calculated using the formula:

$$C = 2443794.338 + 15^d.232780 \times E \quad .$$

The period has been constant with the value used in the ephemeris since J.D. 2433000; earlier reliable values for the period cannot be determined (see Fig. 36).

Table 23 O-C residuals for SV Mon

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2419041.759 | -1625 | $+0^d.689$ | pg | 0.5 | Robinson (1933) |
| 2422621.464 | -1390 | +0.690 | vis | 1 | Esch (1921) |
| 2422728.089 | -1383 | +0.686 | vis | 1 | Leiner (1921) |
| 2423047.978 | -1362 | +0.686 | vis | 1 | Leiner (1926b) |
| 2423459.184 | -1335 | +0.607 | vis | 1 | Leiner (1926b) |
| 2423809.690 | -1312 | +0.759 | vis | 1 | Leiner (1926b) |
| 2424419.659 | -1272 | +1.417 | vis | 0.5 | Leiner (1926b) |
| 2427008.827 | -1102 | +1.013 | vis | 1 | Florya, Kukarkina (1953) |

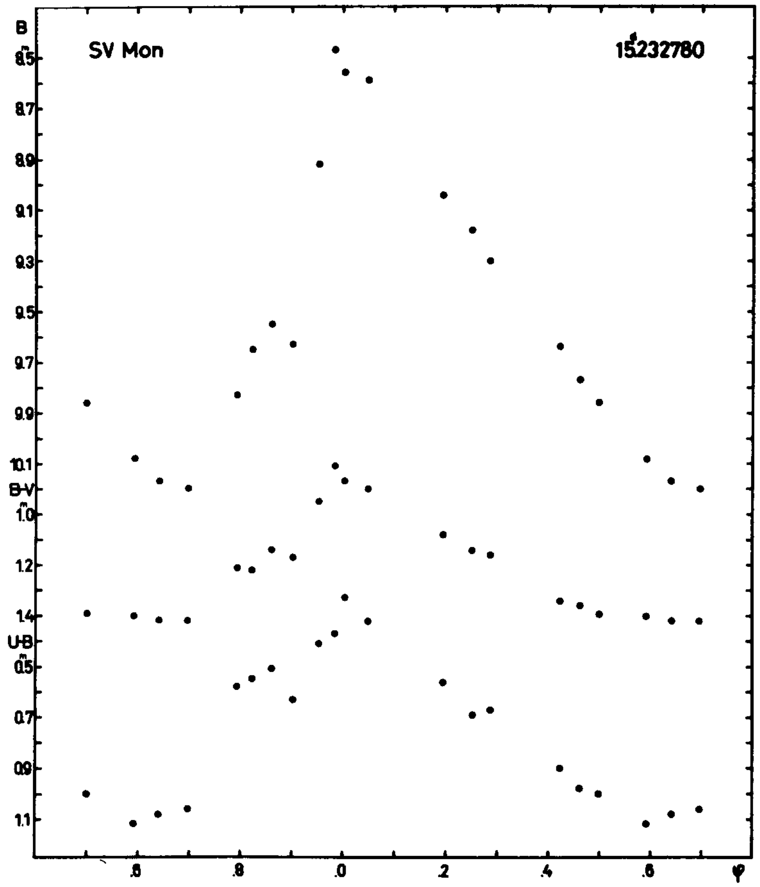


Figure 35 B, B-V and U-B curves of SV Mon

Table 23 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2429964.707 | -908 | +1.$^{d}$733 | vis | 0 | Esch (1936) |
| 2431608.67 | -800 | +0.56 | vis | 0.5 | Nielsen[1] (1955) |
| 2433192.420 | -696 | +0.097 | pg | 1 | Satyvaldiev (1970) |
| 2434045.326 | -640 | -0.033 | pg | 1 | Satyvaldiev (1970) |
| 2435477.219 | -546 | -0.021 | pe | 3 | Walraven et al. (1958) |
| 2435538.224 | -542 | +0.053 | pg | 1 | Satyvaldiev (1970) |
| 2436848.276 | -456 | +0.086 | pg | 1 | Satyvaldiev (1970) |
| 2437564.109 | -409 | -0.022 | pe | 3 | Mitchell et al. (1964) |
| 2437899.291 | -387 | +0.039 | pe | 2 | Eggen (1969) |
| 2438097.263 | -374 | -0.015 | pg | 1 | Fridel' (1971) |
| 2438386.627 | -355 | -0.074 | pg | 1 | Satyvaldiev (1970) |
| 2439209.191 | -301 | -0.080 | pe | 2 | Wamsteker (1972) |
| 2439346.203 | -292 | -0.163 | pe | 2 | Takase (1969) |
| 2440732.705 | -201 | +0.156 | pe | 3 | Pel (1976) |
| 2441493.5 | -151 | -0.7 | vis | 0 | Cragg (1976) |

Table 23 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2442865.108 | -61 | $-0^{d}.030$ | pe | 2 | Dean (1977) |
| 2443794.342 | 0 | +0.004 | pe | 3 | present paper |

Remark: [1] Observer: Arthur Nielsen

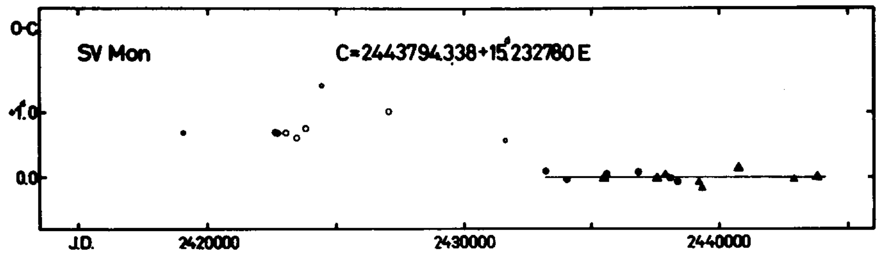


Figure 36 O-C diagram of SV Mon

X Cygni

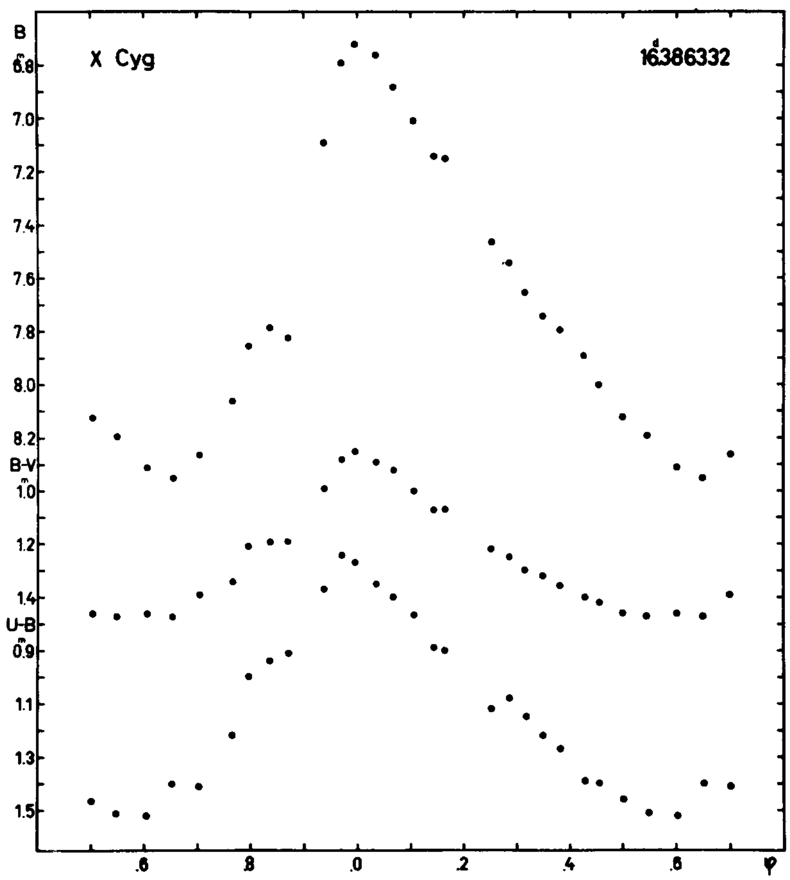


Figure 37 B, B-V and U-B curves of X Cyg

The light and colour curves of this bright Cepheid are shown in Fig. 37. According to Madore (1977) X Cyg has a B4 photometric companion.

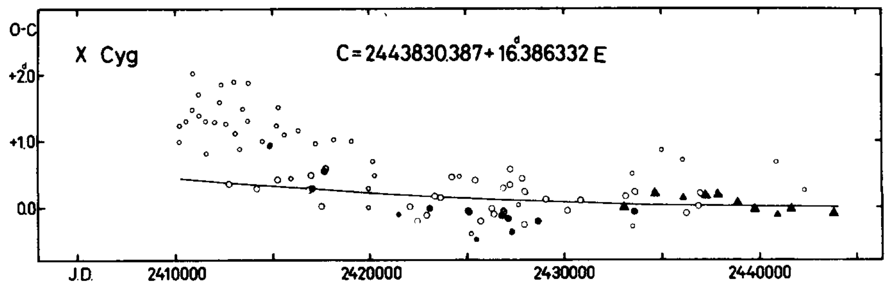


Figure 38 O-C diagram of X Cyg

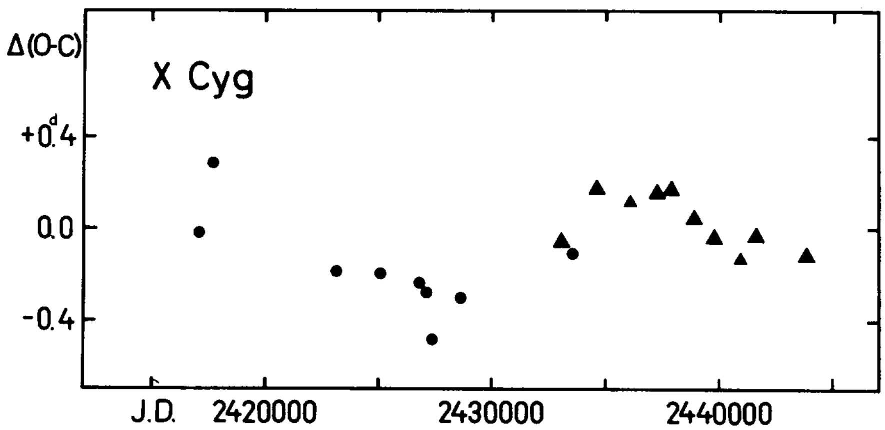


Figure 39 Deviations from the mean O-C curve

The O-C residuals have been computed using the formula:

$$C = 2443830.387 + 16\overset{d}{.}386332 \times E \quad .$$

The O-C diagram in Fig. 38 shows a slow period increase. The equation of the approximate parabola is as follows:

$$(O-C)_{par} = 1\overset{d}{.}01 \times 10^{-7} \times E^2 \quad .$$

The O-C residuals based on photoelectric and photographic observations show some systematic deviations from the above mentioned parabola. These Δ(O-C) deviations as a function of time are plotted in Fig. 39. Although a sinusoidal wave can be seen in this latter figure as if it were a result of the light-time effect, no variation can be found in the mean radial velocity of the star (Abt, 1978; Duncan, 1921; Evans, 1976). Only radial velocity observations made at different phases of the 55 year long cycle can resolve the problem.

Table 24 O-C residuals for X Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2410255.77 | -2049 | +0ᵈ.98 | vis | 0.5 | Chandler (1887) |
| 2410256.02 | -2049 | +1.23 | vis | 0.5 | Sawyer (1896) |
| 2410551.04 | -2031 | +1.29 | vis | 0.5 | Sawyer (1896) |
| 2410568.28 | -2030 | +2.15 | vis | 0 | Chandler (1887) |
| 2410895.34 | -2010 | +1.48 | vis | 0.5 | Sawyer (1896) |
| 2410928.65 | -2008 | +2.02 | vis | 0.5 | Yendell (1889a) |
| 2411239.67 | -1989 | +1.70 | vis | 0.5 | Yendell (1890a) |
| 2411272.12 | -1987 | +1.38 | vis | 0.5 | Sawyer (1896) |
| 2411616.15 | -1966 | +1.29 | vis | 0.5 | Yendell (1891a) |
| 2411632.0 | -1965 | +0.8 | vis | 0.5 | Gore (1892) |
| 2411927.45 | -1947 | +1.25 | vis | 0.5 | Dunér (1892) |
| 2412009.41 | -1942 | +1.28 | vis | 0.5 | Yendell (1892a) |
| 2412321.05 | -1923 | +1.58 | vis | 0.5 | Dunér (1893) |
| 2412354.09 | -1921 | +1.85 | vis | 0.5 | Yendell (1893a) |
| 2412648.46 | -1903 | +1.26 | vis | 0.5 | Corder (1894) |
| 2412778.634 | -1895 | +0.346 | vis | 1 | Moraes Pereira (1894) |
| 2412829.563 | -1892 | +2.116 | vis | 0 | Porro (1896) |
| 2413025.97 | -1880 | +1.89 | vis | 0.5 | Yendell (1895a) |
| 2413107.12 | -1875 | +1.11 | vis | 0.5 | Sawyer (1896) |
| 2413336.29 | -1861 | +0.87 | vis | 0.5 | Sperra (1895, 1896) |
| 2413517.15 | -1850 | +1.48 | vis | 0.5 | Hisgen (1896) |
| 2413746.38 | -1836 | +1.30 | vis | 0.5 | Sperra (1897b) |
| 2413763.35 | -1835 | +1.88 | vis | 0.5 | Yendell (1897) |
| 2414204.170 | -1808 | +0.271 | vis | 1 | Pickering (1904) |
| 2414516.24 | -1789 | +1.00 | vis | 0.5 | Luizet (1902a) |
| 2414860.26 | -1768 | +0.91 | vis | 0.5 | Luizet (1902a) |
| 2414876.68 | -1767 | +0.94 | vis | 0.5 | Yendell (1900) |
| 2415204.68 | -1747 | +1.22 | vis | 0.5 | Luizet (1902a) |
| 2415269.413 | -1743 | +0.403 | vis | 1 | Prittwitz (1907) |
| 2415336.06 | -1739 | +1.50 | vis | 0.5 | Yendell (1902a) |
| 2415630.60 | -1721 | +1.09 | vis | 0.5 | Luizet (1902a) |
| 2415941.28 | -1702 | +0.43 | vis | 0.5 | Yendell (1904) |
| 2416351.66 | -1677 | +1.15 | vis | 0.5 | Luizet (1912) |
| 2416832.0 | -1648 | +6.8 | vis | 0 | Furness[1] (1913a) |
| 2416907.893 | -1643 | +0.249 | vis | 1 | Prittwitz (1907) |
| 2417039.215 | -1635 | +0.481 | vis | 1 | Nijland (1923) |
| 2417055.372 | -1634 | +0.251 | pg | 1 | Wilkens (1906) |
| 2417252.71 | -1622 | +0.95 | vis | 0.5 | Luizet (1912) |
| 2417530.338 | -1605 | +0.014 | vis | 1 | Nijland (1923) |
| 2417694.729 | -1595 | +0.542 | pg | 1 | Jordan (1919) |
| 2417743.921 | -1592 | +0.575 | vis | 1 | Zeipel (1908) |
| 2417810.20 | -1588 | +1.31 | vis | 0 | Sperra (1909) |
| 2418203.17 | -1564 | +1.01 | vis | 0.5 | Luizet (1912) |
| 2419104.41 | -1509 | +1.00 | vis | 0.5 | Luizet (1912) |
| 2419939.103 | -1458 | -0.012 | vis | 0.5 | Kaiser (1915) |
| 2419988.558 | -1455 | +0.284 | vis | 0.5 | Kaiser (1915) |
| 2420201.98 | -1442 | +0.68 | vis | 0.5 | Dziewulski (1924a) |
| 2420300.083 | -1436 | +0.469 | vis | 0.5 | Hoffmeister (1916a) |
| 2421512.089 | -1362 | -0.114 | pg | 0.5 | Robinson (1933) |
| 2422134.891 | -1324 | +0.008 | vis | 1 | Leiner (1926b) |
| 2422478.780 | -1303 | -0.216 | vis | 1 | Leiner (1926b) |

Table 24 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2422970.460 | -1273 | $-0^{d}.126$ | vis | 1 | Hellerich (1922) |
| 2423183.584 | -1260 | -0.025 | pg | 1 | Henroteau (1924) |
| 2423364.017 | -1249 | +0.159 | vis | 1 | AFOEV[2] (1922, 1923) |
| 2423675.346 | -1230 | +0.147 | vis | 1 | Hellerich (1925) |
| 2424314.718 | -1191 | +0.452 | vis | 1 | Parenago (1938) |
| 2424675.22 | -1169 | +0.46 | vis | 0.5 | Azarnova[3] (1956) |
| 2425117.137 | -1142 | -0.059 | pg | 1 | Hellerich (1935) |
| 2425133.508 | -1141 | -0.074 | vis | 1 | Kukarkin (1940) |
| 2425231.5 | -1135 | -0.4 | vis | 0.5 | Lause (1937) |
| 2425478.101 | -1120 | +0.406 | vis | 1 | Parenago (1938) |
| 2425559.129 | -1115 | -0.498 | pg | 0.5 | Iwanowska et al. (1932) |
| 2425690.504 | -1107 | -0.213 | vis | 1 | Zverev (1936) |
| 2426296.989 | -1070 | -0.023 | vis | 1 | Kukarkin (1940) |
| 2426428.000 | -1062 | -0.102 | vis | 1 | Zverev (1936) |
| 2426804.859 | -1039 | -0.129 | pg | 1 | Kox (1935) |
| 2426903.261 | -1033 | -0.045 | vis | 0.5 | Dziewulski et al. (1948) |
| 2426919.614 | -1032 | -0.078 | vis | 1 | Florya, Kukarkina (1953) |
| 2426919.975 | -1032 | +0.283 | vis | 1 | Parenago (1938) |
| 2427148.928 | -1018 | -0.173 | pg | 1 | Dziewulski (1948b) |
| 2427264.372 | -1011 | +0.567 | vis | 1 | Jaschek (1938) |
| 2427280.529 | -1010 | +0.337 | vis | 1 | Florya, Kukarkina (1953) |
| 2427328.968 | -1007 | -0.383 | pg | 1 | Liau (1935) |
| 2427624.336 | -989 | +0.031 | vis | 0.5 | Dziewulski et al. (1948) |
| 2427886.915 | -973 | +0.429 | vis | 1 | Jaschek (1938) |
| 2427951.757 | -969 | -0.274 | vis | 1 | Miczaika (1937) |
| 2428001.425 | -966 | +0.235 | vis | 1 | Krebs (1936) |
| 2428672.816 | -925 | -0.214 | pg | 1 | Dziewulski (1948b) |
| 2429050.036 | -902 | +0.120 | vis | 1 | Conceicao-Silva (1949) |
| 2430164.128 | -834 | -0.058 | vis | 1 | Conceicao-Silva (1949) |
| 2430819.740 | -794 | +0.101 | vis | 1 | Conceicao-Silva (1949) |
| 2433031.783 | -659 | -0.011 | pe | 3 | Eggen (1951) |
| 2433146.670 | -652 | +0.171 | vis | 1 | Chadov (1953) |
| 2433490.3 | -631 | -0.3 | vis | 0.5 | Domke, Pohl[4] (1953) |
| 2433491.1 | -631 | +0.5 | vis | 0.5 | Domke, Pohl[5] (1953) |
| 2433605.249 | -624 | -0.067 | pg | 1 | Romano (1951) |
| 2433638.317 | -622 | +0.229 | vis | 1 | Chadov (1953) |
| 2434605.093 | -563 | +0.211 | pe | 3 | present paper[6] |
| 2435015.398 | -538 | +0.858 | vis | 0.5 | Azarnova (1956) |
| 2435196.43 | -527 | +1.64 | vis | 0 | Marks (1959) |
| 2436096.180 | -472 | +0.142 | pe | 1 | Svolopoulos (1960) |
| 2436129.522 | -470 | +0.711 | vis | 0.5 | Azarnova (1959) |
| 2436259.812 | -462 | -0.090 | vis | 1 | Latyshev (1969) |
| 2436898.988 | -423 | +0.019 | vis | 1 | Azarnova (1962) |
| 2436964.715 | -419 | +0.201 | vis | 1 | Mayall[7] (1964) |
| 2437226.867 | -403 | +0.172 | pe | 3 | Mitchell et al. (1964) |
| 2437898.718 | -362 | +0.183 | pe | 3 | Williams (1966) |
| 2438881.767 | -302 | +0.052 | pe | 3 | Wisniewski, Johnson (1968) |
| 2439782.931 | -247 | -0.032 | pe | 3 | present paper[8] |
| 2440914.30 | -178 | +0.68 | vis | 0.5 | Braune et al.[9] (1972) |
| 2440929.879 | -177 | -0.127 | pe | 2 | Evans (1976) |
| 2441618.198 | -135 | -0.034 | pe | 3 | Landis (1973) |
| 2442372.254 | -89 | +0.251 | vis | 0.5 | Berdnikov (1977) |
| 2443830.274 | 0 | -0.113 | pe | 3 | present paper |

Remarks: (Observers) [1] Whitney; [2] Ellsworth, Bernard, Houdard; [3] Vorontsoy-Veliaminov; [4] Mielke; [5] Sofronijewic; [6] Detre; [7] Oravec; [8] Abaffy; [9] Bauer

RW Camelopardalis

The light and colour curves of RW Cam are plotted in Fig. 40. The amplitude of the light variation is smaller than that given by Schaltenbrand and Tammann (1971). According to Madore (1977) this variable has a B2 photometric companion. The presence of an early type companion was also reported by Miller and Preston (1964).

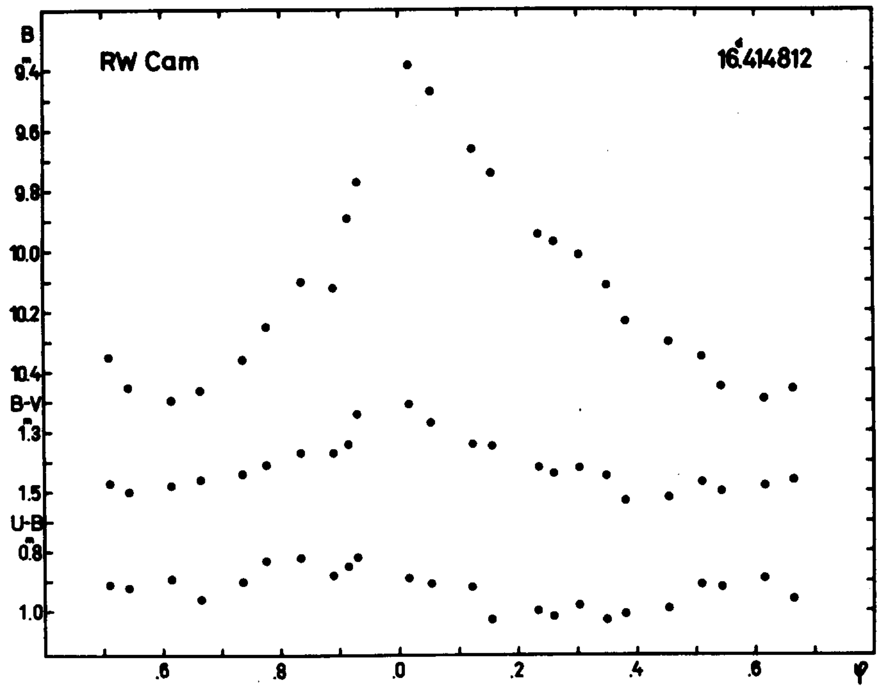


Figure 40 B, B-V and U-B curves of RW Cam

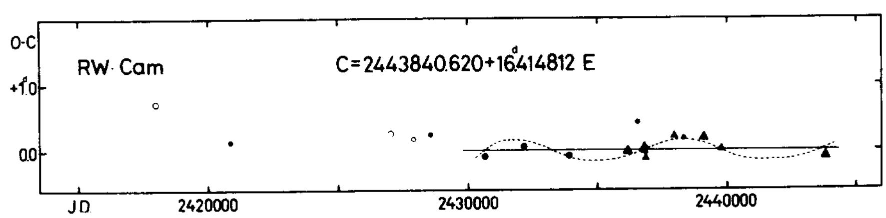


Figure 41 O-C diagram of RW Cam

The O-C residuals have been calculated with the ephemeris:

$$C = 2443840.620 + 16\overset{d}{.}414812 \times E \quad .$$

The O-C diagram in Fig. 41 also shows the presence of the com-

Table 25 O-C residuals for RW Cam

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417955.185 | -1577 | $+0^{d}.724$ | vis | 1 | Enebo (1908) |
| 2420876.433 | -1399 | +0.135 | pg | 0.5 | Robinson (1933) |
| 2427015.703 | -1025 | +0.265 | vis | 1 | Florya, Kukarkina (1953) |
| 2427130.150 | -1018 | -0.191 | vis | 0 | Dziewulski et al. (1946) |
| 2427902.012 | -971 | +0.174 | vis | 0.5 | Dziewulski (1947) |
| 2428575.084 | -930 | +0.239 | pg | 0.5 | Dziewulski et al. (1946) |
| 2430643.017 | -804 | -0.094 | pg | 1 | Filin (1958) |
| 2432169.750 | -711 | +0.061 | pg | 1 | Filin (1958) |
| 2433909.575 | -605 | -0.084 | pg | 1 | Filin (1958) |
| 2436174.873 | -467 | -0.030 | pe | 3 | Bahner et al. (1977) |
| 2436552.861 | -444 | +0.418 | pg | 0.5 | Nikulina (1970) |
| 2436831.480 | -427 | -0.015 | pe | 3 | Oosterhoff (1960) |
| 2436831.546 | -427 | +0.051 | pe | 3 | Weaver et al. (1960) |
| 2436880.608 | -424 | -0.132 | pe | 3 | Bahner et al. (1962) |
| 2437964.318 | -358 | +0.201 | pe | 1 | Williams (1966) |
| 2438358.045 | -334 | -0.028 | pg | 0.5 | Nikulina (1970) |
| 2439113.340 | -288 | +0.186 | pe | 3 | Wamsteker (1972) |
| 2439786.182 | -247 | +0.021 | pe | 2 | present paper[1] |
| 2443840.515 | 0 | -0.105 | pe | 3 | present paper |

Remark: [1] Observer: Abaffy

Table 26

| Obs.Max.J.D. | O-C | Phase | Obs.Max.J.D. | O-C | Phase |
|---|---|---|---|---|---|
| 2430643.017 | $-0^{d}.094$ | .097 | 2436880.608 | $-0^{d}.132$ | .043 |
| 2432169.750 | +0.061 | .329 | 2437964.318 | +0.201 | .207 |
| 2433909.575 | -0.084 | .592 | 2439113.340 | +0.186 | .381 |
| 2436174.873 | -0.030 | .936 | 2439786.182 | +0.021 | .483 |
| 2436831.480 | -0.015 | .035 | 2443840.515 | -0.105 | .097 |
| 2436831.546 | +0.051 | .035 | | | |

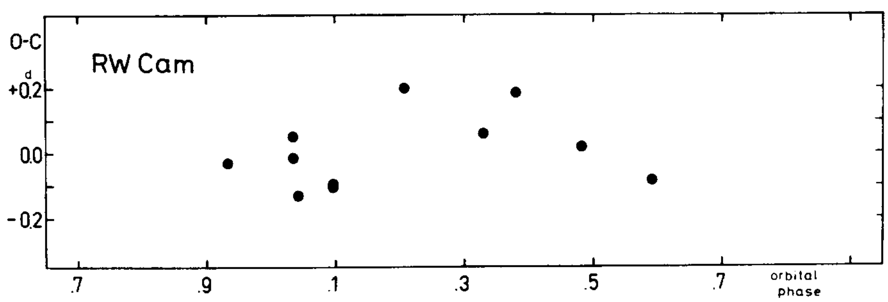


Figure 42 O-C variations due to orbital motion

panion. After J.D. 2430000 a wave-like structure can clearly be seen. The probable orbital period is $P_{orb}=6600^{d} \pm 300^{d}$ (see Table 26 and Fig. 42). Radial velocity measurements would be needed to check this value of the orbital period since the only series of radial velocity measurements is that of Joy (1937). Before J.D.

2430000 the period was shorter than that used in the ephemeris but the accurate value cannot be determined in lack of a satisfactory number of data points in the O-C diagram.

CD Cygni

The light and colour curves of this Cepheid are plotted in Fig. 43. The O-C residuals have been derived using the formula:

$$C = 2443831.167 + 17^{d}.073967 \times E \quad .$$

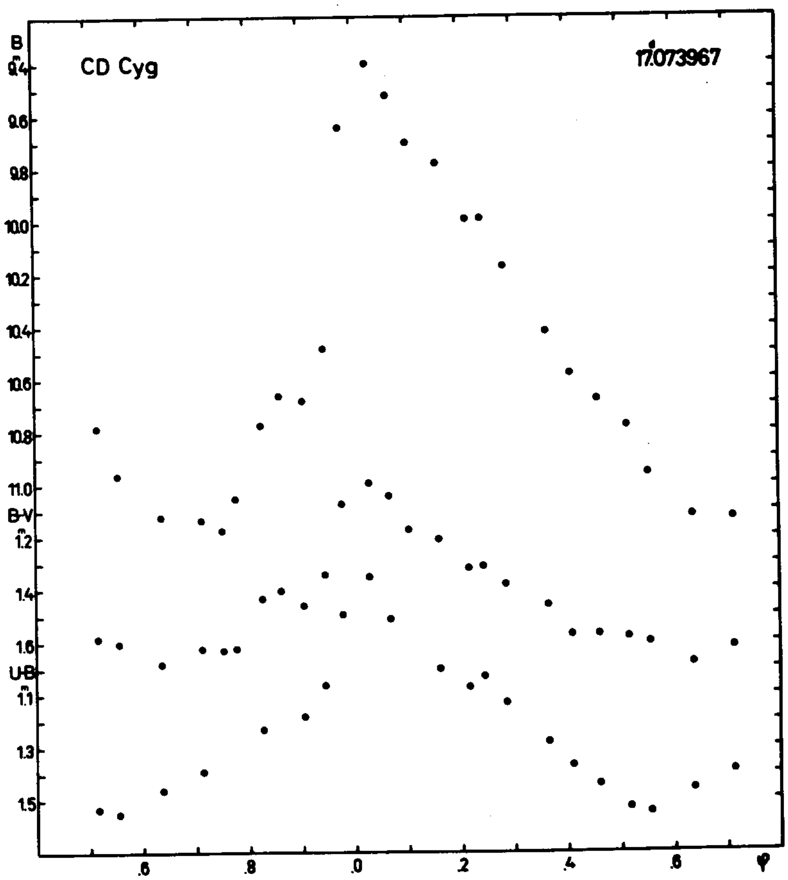


Figure 43 B, B-V and U-B curves of CD Cyg

The period of CD Cyg is continuously increasing. The positive parabola shown in Fig. 44 is a least squares fitted parabola to the O-C residuals. The equation of this parabola is

$$(O-C)_{par} = 1^{d}.54 \times 10^{-6} \times E^2 \quad .$$

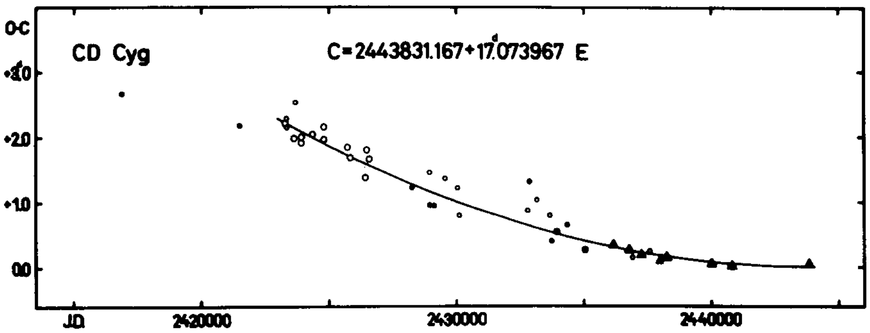


Figure 44 O-C diagram of CD Cyg

Table 27 O-C residuals for CD Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2416891.124 | -1578 | +2.677 d | pg | 0.5 | Kukarkin (1932d) |
| 2421500.608 | -1308 | +2.190 | pg | 0.5 | Robinson (1933) |
| 2422972.7 | -1222 | +5.9 | vis | 0 | Kristensen[1] (1923b) |
| 2423276.338 | -1204 | +2.227 | vis | 1 | Leiner (1924a) |
| 2423327.6 | -1201 | +2.3 | vis | 0.5 | Kristensen[2] (1923b) |
| 2423344.570 | -1200 | +2.163 | vis | 0.5 | Kristensen (1923b) |
| 2423634.659 | -1183 | +1.995 | vis | 1 | Leiner (1924a, 1926a) |
| 2423686.431 | -1180 | +2.545 | vis | 0.5 | Nielsen[1] (1933) |
| 2423907.775 | -1167 | +1.927 | vis | 1 | Nielsen[2] (1933) |
| 2423924.936 | -1166 | +2.015 | vis | 1 | Leiner (1926a) |
| 2424368.905 | -1140 | +2.060 | vis | 1 | Leiner (1926a) |
| 2424795.868 | -1115 | +2.174 | vis | 1 | Nielsen[2] (1933) |
| 2424812.738 | -1114 | +1.970 | vis | 1 | Nielsen[1] (1933) |
| 2425734.623 | -1060 | +1.861 | vis | 1 | Nielsen[2] (1933) |
| 2425853.978 | -1053 | +1.698 | vis | 1 | Nielsen[1] (1933) |
| 2426434.190 | -1019 | +1.395 | vis | 1 | Kukarkin (1932d) |
| 2426468.767 | -1017 | +1.824 | vis | 1 | Nielsen[1] (1933) |
| 2426588.139 | -1010 | +1.679 | vis | 1 | Nielsen[2] (1933) |
| 2428193.727 | -916 | +2.314 | vis | 0 | Dziewulski (1950) |
| 2428260.945 | -912 | +1.236 | pg | 0.5 | Wachmann (1966) |
| 2428944.133 | -872 | +1.465 | vis | 0.5 | Nielsen[2] (1952) |
| 2428960.700 | -871 | +0.958 | pg | 0.5 | Wachmann (1966) |
| 2429148.50 | -860 | +0.95 | pg | 0.5 | Smirnov (1946) |
| 2429541.628 | -837 | +1.371 | vis | 0.5 | Nielsen[1] (1952) |
| 2430053.703 | -807 | +1.227 | vis | 0.5 | Nielsen[3] (1952) |
| 2430121.57 | -803 | +0.80 | vis | 0.5 | Ashbrook (1943) |
| 2432768.11 | -648 | +0.87 | vis | 0.5 | Nielsen[4] (1955) |
| 2432888.071 | -641 | +1.317 | pg | 0.5 | Wachmann (1966) |
| 2433160.98 | -625 | +1.04 | vis | 0.5 | Nielsen[1] (1955) |
| 2433672.96 | -595 | +0.80 | vis | 0.5 | Nielsen[5] (1955) |
| 2433740.850 | -591 | +0.398 | pg | 0.5 | Jagott (1954) |
| 2433928.810 | -580 | +0.544 | pg | 1 | Shteiman (1958) |
| 2434151.462 | -567 | +1.234 | pg | 0 | Wachmann (1966) |
| 2434355.773 | -555 | +0.658 | pg | 0.5 | Jagott (1954) |
| 2435055.408 | -514 | +0.260 | pg | 1 | Shteiman (1958) |
| 2435107.498 | -511 | +1.128 | pg | 0 | Wachmann (1966) |
| 2436165.306 | -449 | +0.350 | pe | 3 | Bahner et al. (1971) |

Table 27 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2436779.890 | -413 | $+0^{d}.271$ | pe | 3 | Weaver et al. (1960) |
| 2436796.966 | -412 | +0.273 | pe | 3 | Oosterhoff (1960) |
| 2436899.29 | -406 | +0.15 | vis | 0.5 | Busch et al. (1964) |
| 2437257.891 | -385 | +0.201 | pe | 3 | Mitchell et al. (1964) |
| 2437582.34 | -366 | +0.25 | vis | 0.5 | Busch et al. (1964) |
| 2437940.36 | -345 | -0.29 | vis | 0 | Busch et al. (1964) |
| 2437957.816 | -344 | +0.094 | pé | 1 | Williams (1966) |
| 2438231.052 | -328 | +0.146 | pe | 3 | Kwee, Braun (1967) |
| 2440006.657 | -224 | +0.059 | pe | 3 | Asteriadis et al. (1977) |
| 2440792.027 | -178 | +0.026 | pe | 3 | Asteriadis et al. (1977) |
| 2443831.224 | 0 | +0.057 | pe | 3 | present paper |

Remarks: [1] Observer: Kierulff; [2] Obs.: Vaaben; [3] Obs.: Sjögren; [4] Obs.: Buhl; [5] Obs.: Darnell

SZ Aquilae

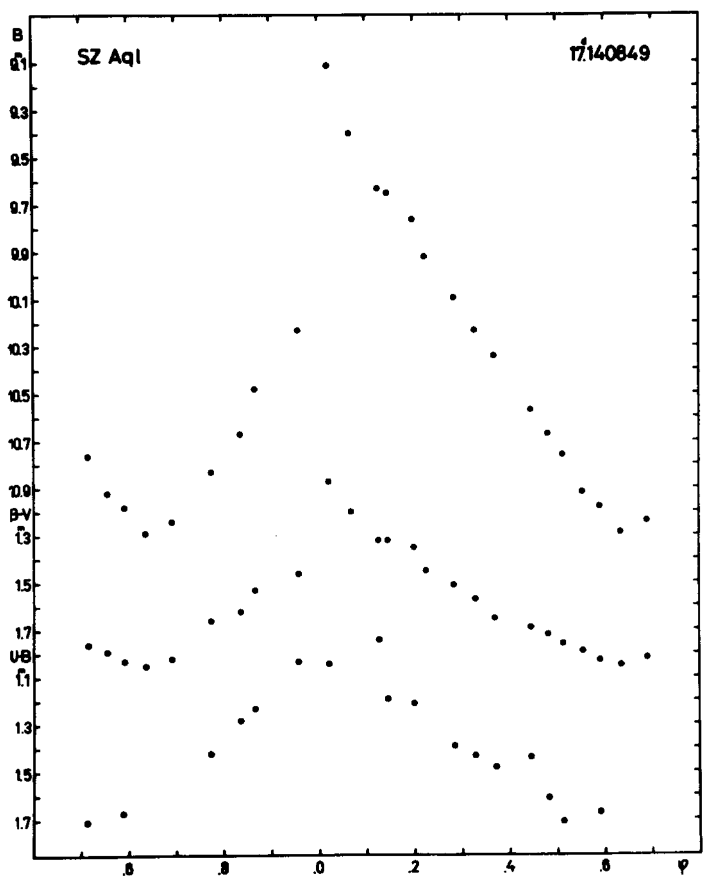


Figure 45 B, B-V and U-B curves of SZ Aql

Its light and colour curves are shown in Fig. 45. The O-C residuals have been calculated with the ephemerides:

$$C_{max} = 2443807.183 + 17\overset{d}{.}140849 \times E$$
$$C_{med} = 2443806.524 + 17\overset{d}{.}140849 \times E$$

for the maximum and median brightnesses, respectively. The period of SZ Aql is continuously increasing. The equation of the least squares fitted parabola shown in Fig. 46 is

$$(O-C)_{par} = 2\overset{d}{.}02 \times 10^{-6} \times E^2 \quad .$$

It is worth mentioning that the rate of the period increase is almost the same as in CD Cyg. This is important since the difference in the period of the two stars is less than 0.5 per cent.

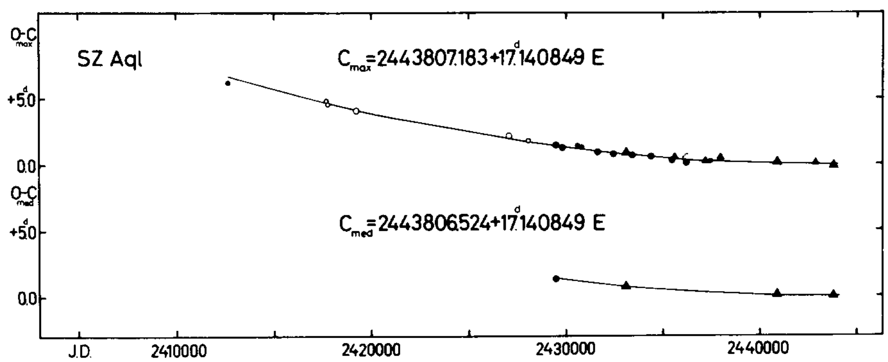


Figure 46 O-C diagram of SZ Aql

Table 28 O-C residuals for SZ Aql (maximum brightness)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2412685.63 | -1816 | $+6\overset{d}{.}23$ | pg | 0.5 | Pickering (1907) |
| 2417740.811 | -1521 | +4.859 | vis | 0.5 | Ichinohe (1910) |
| 2417809.1 | -1517 | +4.6 | vis | 0.5 | Pickering (1908) |
| 2419265.600 | -1432 | +4.113 | vis | 1 | Biesbroeck et al. (1914) |
| 2420258.765 | -1374 | +3.109 | pg | 0 | Robinson (1933) |
| 2423601.8 | -1179 | +3.7 | vis | 0 | Hacar (1925) |
| 2427097.073 | -975 | +2.218 | vis | 1 | Florya, Kukarkina (1953) |
| 2428125.097 | -915 | +1.791 | vis | 0.5 | Dziewulski (1956b) |
| 2429513.184 | -834 | +1.469 | pg | 1 | Ahnert (1951) |
| 2429547.473 | -832 | +1.476 | pg | 0.5 | Solov'yov (1944) |
| 2429838.681 | -815 | +1.290 | pg | 1 | Erleksova (1960) |
| 2430610.179 | -770 | +1.450 | pg | 0.5 | Erleksova (1960) |
| 2430832.873 | -757 | +1.313 | pg | 0.5 | Filin (1948) |
| 2431638.130 | -710 | +0.950 | pg | 1 | Erleksova (1960) |
| 2432460.734 | -662 | +0.793 | pg | 1 | Erleksova (1960) |
| 2433112.198 | -624 | +0.905 | pe | 3 | Eggen (1951) |
| 2433454.820 | -604 | +0.710 | pg | 1 | Erleksova (1960) |
| 2434414.613 | -548 | +0.615 | pg | 1 | Erleksova (1960) |

Table 28 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2435494.235 | -485 | $+0^{d}.364$ | pg | 1 | Erleksova (1960) |
| 2435580.096 | -480 | +0.521 | pe | 1 | Walraven et al. (1958) |
| 2436231.149 | -442 | +0.221 | pg | 1 | Erleksova (1960) |
| 2437156.786 | -388 | +0.252 | pe | 2 | Mitchell et al. (1964) |
| 2437465.336 | -370 | +0.267 | pg | 0.5 | Zoj Von Shor (1963) |
| 2437945.611 | -342 | +0.598 | pe | 1 | Williams (1966) |
| 2440910.526 | -169 | +0.146 | pe | 3 | Pel (1976) |
| 2441495.7 | -135 | +2.5 | vis | 0 | Cragg (1976) |
| 2442898.836 | -53 | +0.118 | pe | 2 | Dean (1977) |
| 2443807.095 | 0 | -0.088 | pe | 3 | present paper |

Table 29 O-C residuals for SZ Aql

(median brightness)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2429512.395 | -834 | $+1^{d}.339$ | pg | 1 | Ahnert (1951) |
| 2433111.359 | -624 | +0.725 | pe | 3 | Eggen (1951) |
| 2440909.789 | -169 | +0.068 | pe | 3 | Pel (1976) |
| 2443806.512 | 0 | -0.012 | pe | 3 | present paper |

## YZ Aurigae

YZ Aur has a faint companion within the edge of the diaphragm. This may be the reason that the amplitude of the light variation is less than that derived by Schaltenbrand and Tammann

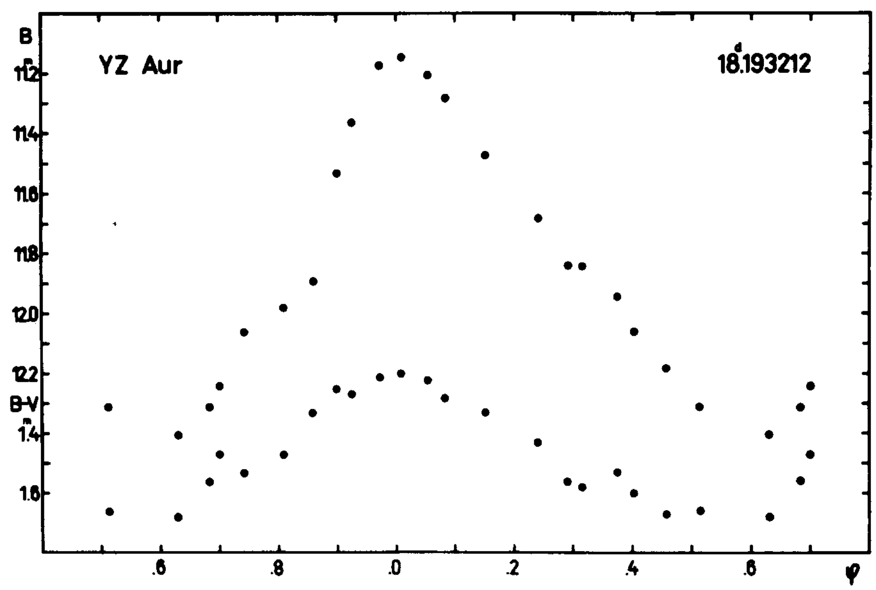


Figure 47 B and B-V curves of YZ Aur

(1971). The light curve in Fig. 47 shows the presence of a bump at the bottom of the ascending branch which is normal for a Cepheid with a period of 18 days but was unnoticed on the previous incomplete light curves. The Cepheid variable YZ Aur has a B3 photometric companion (Madore, 1977).

The O-C residuals have been computed with the formula:

$$C = 2443816.490 + 18^{d}.193212 \times E \quad .$$

The O-C diagram in Fig. 48 shows a rejumping period:

before J.D. 2428000 $\quad P = 18^{d}.193121$

after J.D. 2429000 $\quad P = 18^{d}.193212$ .

The sudden period change and the rejump of the period took place between J.D. 2428000 and J.D. 2429000.

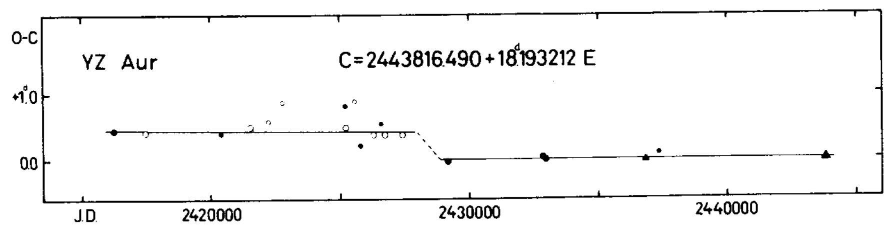


Figure 48 O-C diagram of YZ Aur

Table 30 O-C residuals for YZ Aur

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2416290.613 | -1513 | $+0^{d}.453$ | pg | 1 | Yakimov (1962) |
| 2417509.537 | -1446 | +0.432 | vis | 1 | Williams (1918) |
| 2420420.436 | -1286 | +0.417 | pg | 0.5 | Robinson (1933) |
| 2421548.525 | -1224 | +0.526 | vis | 1 | Williams (1918) |
| 2422239.93 | -1186 | +0.59 | vis | 0.5 | Nijland (1935) |
| 2422786.02 | -1156 | +0.88 | vis | 0.5 | Nijland (1935) |
| 2423386.79 | -1123 | +1.28 | vis | 0 | Nijland (1935) |
| 2425205.66 | -1023 | +0.83 | pg | 0.5 | Oosterhoff (1935) |
| 2425241.720 | -1021 | +0.499 | vis | 1 | Beyer (1930) |
| 2425587.785 | -1002 | +0.893 | vis | 0.5 | Beyer (1930) |
| 2425823.62 | -989 | +0.22 | pg | 0.5 | Oosterhoff (1935) |
| 2426315.010 | -962 | +0.390 | vis | 1 | Kukarkin (1940) |
| 2426606.26 | -946 | +0.55 | pg | 0.5 | Oosterhoff (1935) |
| 2426751.640 | -938 | +0.383 | vis | 1 | Detre (1935) |
| 2427424.795 | -901 | +0.389 | vis | 1 | Detre (1935) |
| 2428567.99 | -838 | -2.59 | pg | 0 | Fu De-Lian (1964) |
| 2429170.930 | -805 | -0.024 | pg | 1 | Yakimov (1962) |
| 2430245.058 | -746 | +0.704 | vis | 0 | Lagrula (1941, 1942) |
| 2432846.025 | -603 | +0.042 | pg | 1 | Filatov (1958) |
| 2432973.338 | -596 | +0.002 | pg | 1 | Yakimov (1962) |
| 2436830.288 | -384 | -0.009 | pe | 2 | Weaver et al. (1960) |
| 2437376.2 | -354 | +0.1 | pg | 0.5 | Ahnert (1961) |
| 2443816.489 | 0 | -0.001 | pe | 3 | present paper |

VX Cygni

The light and colour curves of this variable are shown in Fig. 49. According to Madore (1977) VX Cyg has a B7 photometric companion.

The O-C residuals have been calculated using the formula:

$$C = 2443783.642 + 20\overset{d}{.}133407\times E \quad .$$

The O-C diagram in Fig. 50 shows a continuous increase in period. The equation of the fitted parabola is:

$$(O-C)_{par} = 8\overset{d}{.}02\times10^{-7}\times E^2 \quad .$$

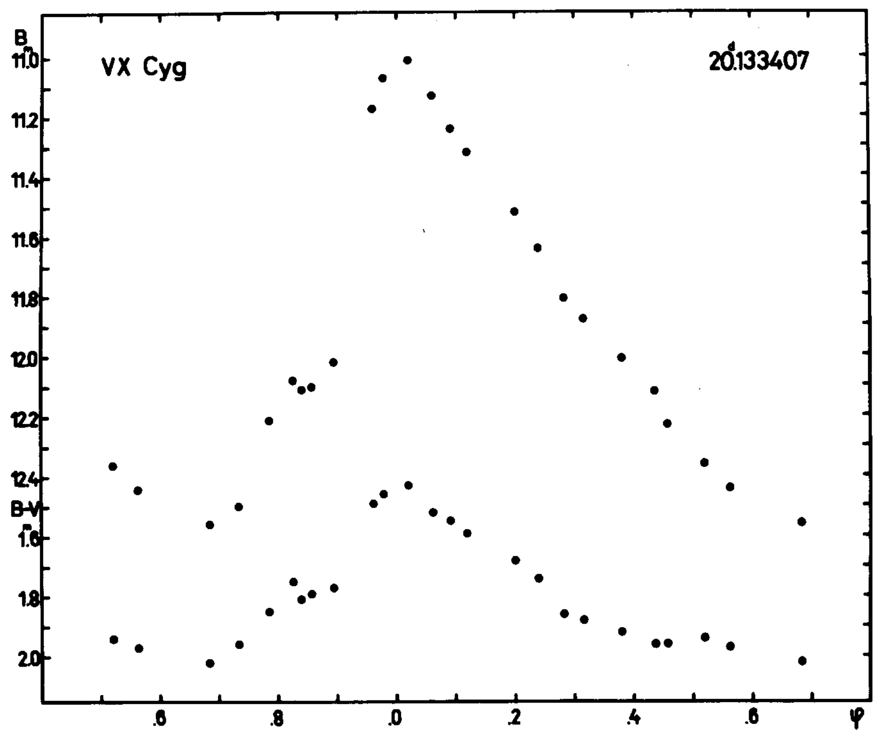


Figure 49 B and B-V curves of VX Cyg

Table 31 O-C residuals for VX Cyg

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2414976.2 | -1431 | $+3\overset{d}{.}5$ | pg | 0 | Williams (1905) |
| 2415337.4 | -1413 | +2.3 | pg | 0.5 | Williams (1905) |
| 2415477.663 | -1406 | +1.591 | pg | 1 | Kulikovsky (1933) |
| 2415681.0 | -1396 | +3.6 | pg | 0 | Williams (1905) |
| 2416423.86 | -1359 | +1.52 | vis | 0.5 | Williams (1905) |
| 2416424.0 | -1359 | +1.7 | vis | 0.5 | Hartwig (1903) |
| 2416726.78 | -1344 | +2.44 | vis | 0 | Williams (1905) |

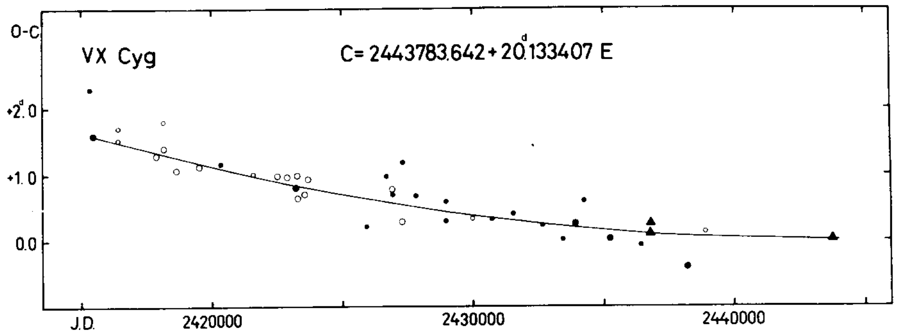


Figure 50 O-C diagram of VX Cyg

Table 31 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417471.81 | -1307 | +2.53 | vis | 0 | Seares (1907) |
| 2417492.5 | -1306 | +3.1 | vis | 0 | Müller, Hartwig (1918-1920) |
| 2417873.230 | -1287 | +1.283 | vis | 1 | Bilt (1925) |
| 2417914.44 | -1285 | +2.23 | vis | 0 | Müller, Hartwig[1] (1918-1920) |
| 2418175.75 | -1272 | +1.80 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2418195.480 | -1271 | +1.398 | vis | 1 | Bilt (1925) |
| 2418658.210 | -1248 | +1.060 | vis | 1 | Bilt (1925) |
| 2419524.000 | -1205 | +1.113 | vis | 1 | Bilt (1925) |
| 2420369.659 | -1163 | +1.169 | pg | 0.5 | Robinson (1933) |
| 2421597.62 | -1102 | +0.99 | vis | 0.5 | Parenago[2] (1949) |
| 2422523.743 | -1056 | +0.979 | vis | 1 | Leiner (1924b) |
| 2422906.248 | -1037 | +0.949 | vis | 1 | Leiner (1924b) |
| 2423228.236 | -1021 | +0.803 | pg | 1 | Henroteau (1924) |
| 2423268.681 | -1019 | +0.981 | vis | 1 | Leiner (1924b) |
| 2423308.602 | -1017 | +0.635 | vis | 1 | Doberck (1924c) |
| 2423570.397 | -1004 | +0.696 | vis | 1 | Leiner (1924b) |
| 2423691.429 | -998 | +0.927 | vis | 1 | Doberck (1924c) |
| 2425925.52 | -887 | +0.21 | pg | 0.5 | Oosterhoff (1935) |
| 2426349.5 | -866 | +1.4 | vis | 0 | Miczaika (1936) |
| 2426711.48 | -848 | +0.97 | pg | 0.5 | Oosterhoff (1935) |
| 2426792.37 | -844 | +1.32 | pg | 0 | Sandig (1948) |
| 2426912.623 | -838 | +0.776 | vis | 1 | Florya, Kukarkina (1953) |
| 2426932.67 | -837 | +0.69 | pg | 0.5 | Oosterhoff (1935) |
| 2427294.665 | -819 | +0.283 | vis | 1 | Florya, Kukarkina (1953) |
| 2427315.68 | -818 | +1.17 | pg | 0.5 | Oosterhoff (1935) |
| 2427818.52 | -793 | +0.67 | pg | 0.5 | Sandig (1948) |
| 2428985.88 | -735 | +0.29 | pg | 0.5 | Sandig (1948) |
| 2429006.30 | -734 | +0.58 | pg | 0.5 | Milstein (1946) |
| 2429992.579 | -685 | +0.321 | vis | 0.5 | Conceicao-Silva (1948) |
| 2430717.381 | -649 | +0.320 | pg | 0.5 | Nikulina (1970) |
| 2431542.930 | -608 | +0.399 | pg | 0.5 | Nikulina (1970) |
| 2432670.232 | -552 | +0.231 | pg | 0.5 | Nikulina (1970) |
| 2433455.217 | -513 | +0.013 | pg | 0.5 | Nikulina (1970) |
| 2433918.520 | -490 | +0.247 | pg | 1 | Shteiman (1958) |
| 2434261.138 | -473 | +0.598 | pg | 0.5 | Nikulina (1970) |
| 2435226.968 | -425 | +0.024 | pg | 1 | Shteiman (1958) |

Table 31 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2436093.605 | -382 | $+0^{d}.924$ | pg | 0 | Korovkina (1958) |
| 2436375.695 | -368 | +1.147 | pg | 0 | Nikulina (1970) |
| 2436434.88 | -365 | -0.07 | pg | 0.5 | Korovkina (1959) |
| 2436777.320 | -348 | +0.104 | pe | 3 | Weaver et al. (1960) |
| 2436797.613 | -347 | +0.263 | pe | 3 | Oosterhoff (1960) |
| 2436858.84 | -344 | +1.09 | vis | 0 | Busch, Häussler (1968) |
| 2437402.084 | -317 | +0.732 | pg | 0 | Nikulina (1970) |
| 2438206.277 | -277 | -0.411 | pg | 1 | Dultsev (1967) |
| 2438670.39 | -254 | +0.63 | vis | 0 | Busch, Häussler (1968) |
| 2438911.49 | -242 | +0.13 | vis | 0.5 | Busch, Häussler (1968) |
| 2443783.660 | 0 | +0.018 | pe | 3 | present paper |

Remarks: [1] Observer: Belyavsky; [2] Observer: Doberck

T Monocerotis

The light and colour curves (Fig. 51) of this long period Cepheid are incomplete because the weather conditions during the

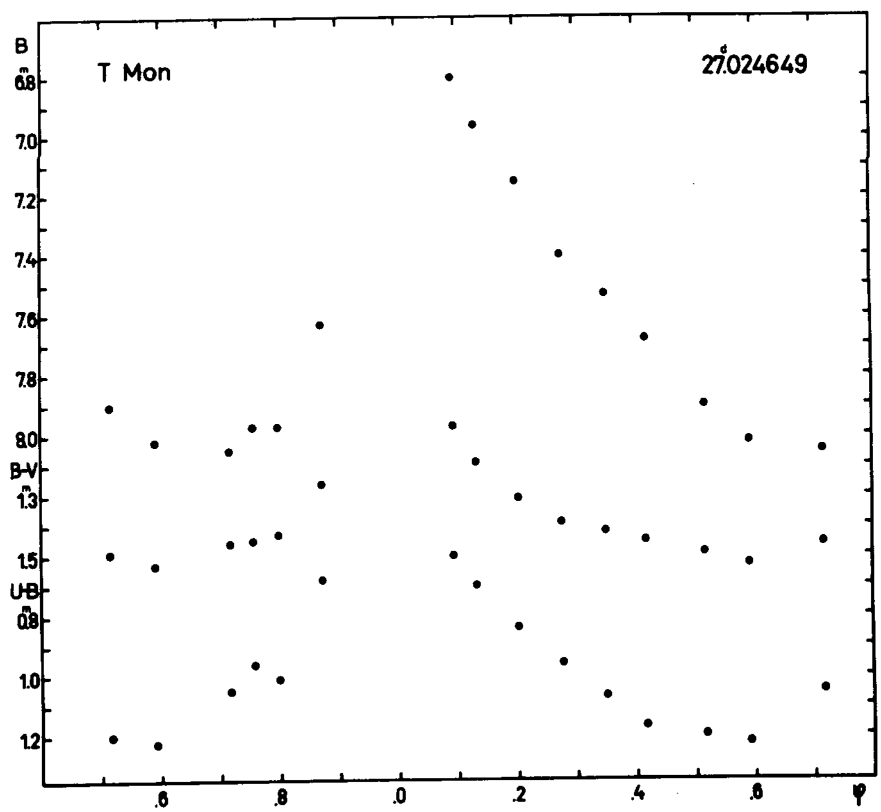


Figure 51 B, B-V and U-B curves of T Mon

observing runs did not permit observation of the star at the missing light curve phases. Based on IUE observations, Mariska et al. (1980) pointed out that T Mon has an A0 III companion.

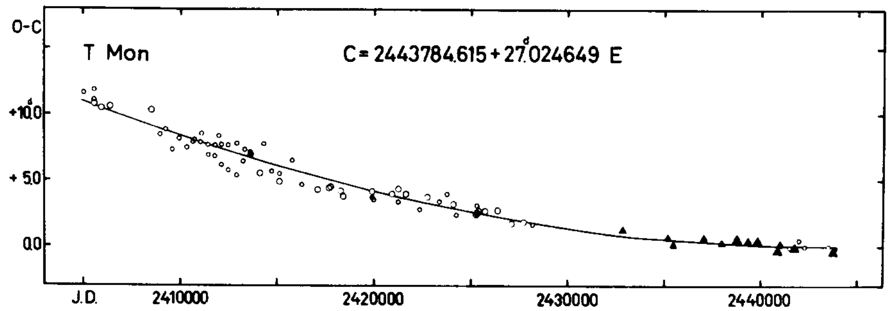


Figure 52 O-C diagram of T Mon

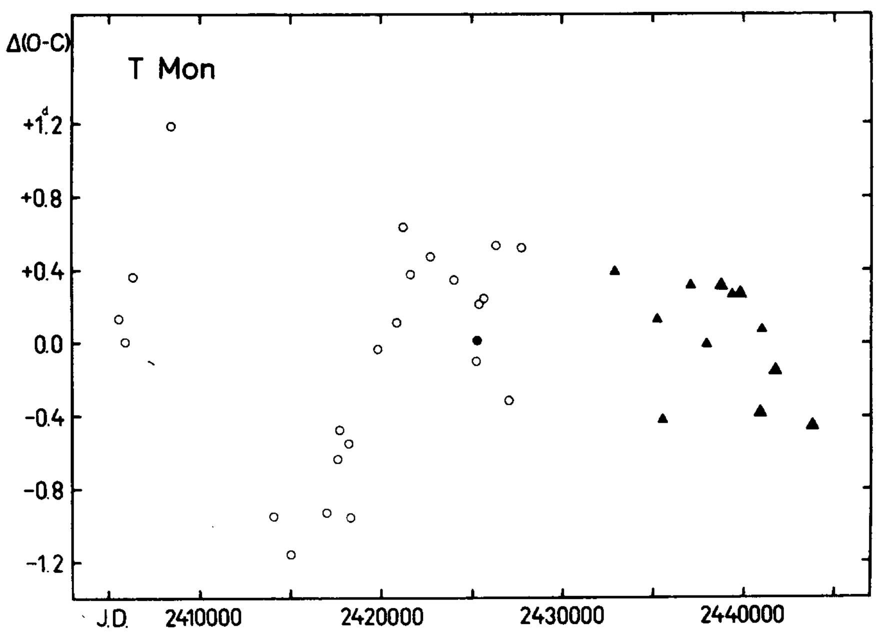


Figure 53 Deviations from the mean O-C curve

The O-C residuals have been computed with the formula:

$$C = 2443784.615 + 27\overset{d}{.}024649 \times E \quad .$$

The O-C diagram in Fig. 52 can well be approximated by the parabola:

$$(O-C)_{par} = 5\overset{d}{.}34 \times 10^{-6} \times E^2 \quad .$$

The deviation of each reliable O-C residual from this parabola is plotted in Fig. 53. These deviations have a wave-like trend. If this wave is attributed to the light-time effect, the orbital period would be about 100 years. Although the available radial velocity data are not very homogeneous (Evans, 1976; Sanford, 1927 and 1956, Wallerstein, 1972), the two series of Sanford's observations show a difference of about 2 km/sec in the average value of the radial velocity, thereby supporting the observability of the orbital motion.

Table 32 O-C residuals for T Mon

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2405015.8 | -1435 | +11.$^d$6 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2405555.8 | -1415 | +11.1 | vis | 0.5 | Müller, Hartwig[1] (1918-1920) |
| 2405556.62 | -1415 | +11.88 | vis | 0.5 | Sanford[2] (1927) |
| 2405582.574 | -1414 | +10.813 | vis | 1 | Valentiner[3] (1900) |
| 2405933.570 | -1401 | +10.488 | vis | 1 | Valentiner[3] (1900) |
| 2406366.087 | -1385 | +10.611 | vis | 1 | Valentiner[3] (1900) |
| 2408473.713 | -1307 | +10.314 | vis | 1 | Sawyer (1883) |
| 2408931.31 | -1290 | +8.49 | vis | 0.5 | Sawyer (1885) |
| 2409228.94 | -1279 | +8.85 | vis | 0.5 | Sawyer (1885) |
| 2409578.72 | -1266 | +7.31 | vis | 0.5 | Sawyer (1887a) |
| 2409930.90 | -1253 | +8.17 | vis | 0.5 | Sawyer (1887b) |
| 2410335.59 | -1238 | +7.49 | vis | 0.5 | Sawyer (1888b) |
| 2410660.29 | -1226 | +7.90 | vis | 0.5 | Sawyer (1888a) |
| 2410714.50 | -1224 | +8.06 | vis | 0.5 | Yendell (1888) |
| 2411038.63 | -1212 | +7.89 | vis | 0.5 | Yendell (1889b) |
| 2411066.28 | -1211 | +8.52 | vis | 0.5 | Sawyer (1890a) |
| 2411415.95 | -1198 | +6.87 | vis | 0.5 | Sawyer (1890b) |
| 2411416.76 | -1198 | +7.68 | vis | 0.5 | Yendell (1890b) |
| 2411767.19 | -1185 | +6.78 | vis | 0.5 | Sawyer (1891) |
| 2411768.05 | -1185 | +7.64 | vis | 0.5 | Yendell (1891b) |
| 2411957.926 | -1178 | +8.348 | vis | 0.5 | Markwick (1892, 1894) |
| 2412117.89 | -1172 | +6.16 | vis | 0.5 | Sawyer (1896) |
| 2412119.37 | -1172 | +7.64 | vis | 0.5 | Yendell (1892b) |
| 2412468.78 | -1159 | +5.73 | vis | 0.5 | Sawyer (1896) |
| 2412470.67 | -1159 | +7.62 | vis | 0.5 | Yendell (1893b) |
| 2412819.31 | -1146 | +4.94 | vis | 0 | Sawyer (1896) |
| 2412846.711 | -1145 | +5.319 | vis | 0.5 | Porro (1896) |
| 2412876.16 | -1144 | +7.74 | vis | 0.5 | Yendell (1894) |
| 2413226.16 | -1131 | +6.42 | vis | 0.5 | Yendell (1895b) |
| 2413308.11 | -1128 | +7.30 | vis | 0.5 | Sperra (1895) |
| 2413604.93 | -1117 | +6.85 | vis | 0.5 | Hisgen (1897) |
| 2413605.20 | -1117 | +7.1 | vis | 0.5 | Yendell (1897) |
| 2413606 | -1117 | +8 | vis | 0 | Müller, Hartwig[4] (1918-1920) |
| 2413659.0 | -1115 | +6.9 | vis | 0.5 | Sperra (1897a) |
| 2414090.032 | -1099 | +5.506 | vis | 1 | Pickering (1904) |
| 2414308.49 | -1091 | +7.77 | vis | 0.5 | Yendell (1900) |
| 2414711.75 | -1076 | +5.66 | vis | 0.5 | Luizet (1902b) |
| 2415089.305 | -1062 | +4.867 | vis | 1 | Wendell (1909) |
| 2415089.90 | -1062 | +5.46 | vis | 0.5 | Luizet (1902b) |
| 2415766.55 | -1037 | +6.50 | vis | 0.5 | Yendell (1902b) |
| 2416278.19 | -1018 | +4.67 | vis | 0.5 | Nielsen[5] (1930a) |

Table 32 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2417061.531 | -989 | +4.ᵈ294 | vis | 1 | Nijland (1923) |
| 2417173.63 | -985 | +8.29 | vis | 0 | Furness[6] (1913b) |
| 2417656.144 | -967 | +4.365 | vis | 1 | Zeipel (1908) |
| 2417764.361 | -963 | +4.483 | vis | 1 | Nijland (1923) |
| 2418277.561 | -944 | +4.215 | vis | 1 | Nijland (1923) |
| 2418385.211 | -940 | +3.766 | vis | 1 | Bemporad (1910) |
| 2419844.940 | -886 | +4.164 | vis | 1 | Kaiser (1915) |
| 2419871.505 | -885 | +3.704 | pg | 0.5 | Robinson (1933) |
| 2419979.4 | -881 | +3.5 | vis | 0.5 | Dziewulski (1924b) |
| 2420925.705 | -846 | +3.943 | vis | 1 | Luyten (1922) |
| 2421249.41 | -834 | +3.35 | vis | 0.5 | Nielsen[7] (1930a) |
| 2421250.411 | -834 | +4.353 | vis | 1 | Luyten (1922) |
| 2421628.374 | -820 | +3.971 | vis | 1 | Luyten (1922) |
| 2422383.89 | -792 | +2.80 | vis | 0.5 | Nielsen[8] (1930a) |
| 2422736.133 | -779 | +3.720 | vis | 1 | Gallisot (1923) |
| 2423357.40 | -756 | +3.42 | vis | 0.5 | Nielsen[9] (1930a) |
| 2423790.35 | -740 | +3.98 | vis | 0.5 | Sanford (1927) |
| 2424086.834 | -729 | +3.188 | vis | 1 | Eaton[10] (1924), Campbell[10] (1925) |
| 2424221.16 | -724 | +2.39 | vis | 0.5 | Nielsen[11] (1930a) |
| 2425275.141 | -685 | +2.411 | vis | 1 | Kukarkin (1940) |
| 2425302.270 | -684 | +2.515 | pg | 1 | Hellerich (1935) |
| 2425302.9 | -684 | +3.1 | vis | 0.5 | Lause (1937) |
| 2425383.521 | -681 | +2.692 | vis | 1 | Ahnert (1929) |
| 2425680.746 | -670 | +2.646 | vis | 1 | Zverev (1936) |
| 2426356.475 | -645 | +2.759 | vis | 1 | Zverev (1936) |
| 2427085.110 | -618 | +1.728 | vis | 1 | Florya, Kukarkina (1953) |
| 2427734.385 | -594 | +2.412 | vis | 1 | Krebs (1935) |
| 2428193.05 | -577 | +1.66 | vis | 0.5 | Nielsen (1941b) |
| 2432840.908 | -405 | +1.276 | pe | 2 | Eggen (1951) |
| 2435191.449 | -318 | +0.672 | pe | 2 | Irwin (1961) |
| 2435488.134 | -307 | +0.086 | pe | 2 | Walraven et al. (1958) |
| 2435736.940 | -298 | +5.670 | pg | 0 | Nikulina (1972) |
| 2437056.133 | -249 | +0.656 | pe | 2 | Mitchell et al. (1964) |
| 2437974.560 | -215 | +0.245 | pe | 1 | Williams (1966) |
| 2438758.533 | -186 | +0.503 | pe | 3 | Wisniewski, Johnson (1968) |
| 2439352.984 | -164 | +0.411 | pe | 1 | Takase (1969) |
| 2439812.386 | -147 | +0.394 | pe | 3 | present paper[12] |
| 2440919.687 | -106 | -0.315 | pe | 3 | Pel (1976) |
| 2441001.207 | -103 | +0.131 | pe | 1 | Evans (1976) |
| 2441514.4 | -84 | -0.1 | vis | 0.5 | Cragg (1976) |
| 2441730.626 | -76 | -0.116 | pe | 3 | Landis (1976) |
| 2442001.5 | -66 | +0.5 | vis | 0.5 | Böhme (1976) |
| 2442298.250 | -55 | -0.009 | vis | 0.5 | Berdnikov (1977) |
| 2443214.40 | -21 | -2.70 | vis | 0 | Busch[13] (1977) |
| 2443541.383 | -9 | -0.010 | vis | 0.5 | Busch[14] (1980) |
| 2443784.184 | 0 | -0.431 | pe | 3 | present paper |
| 2443838.47 | +2 | -0.19 | vis | 0.5 | Busch[15] (1980) |

Remarks: [1] from Uranometria Argentina; Observers: [2] Davis; [3] Schönfeld; [4] Prittwitz; [5] Worsell; [6] Whitney; [7] de Roy; [8] Bemporad; [9] Bernard; [10] Schuller; [11] Aurino; [12] Abaffy; [13] Rümmler; [14] Branzke; [15] Richter

SV Vulpeculae

The light and colour curves of the longest period programme star are shown in Fig. 54. The O-C residuals have been calculated with the formulae:

$$C_{max} = 2443715.321 + 44\overset{d}{.}994772 \times E$$
$$C_{med} = 2443711.336 + 44\overset{d}{.}994772 \times E$$

for the maximum and median brightnesses, respectively. The O-C diagram can well be approximated by a parabola after J.D. 2423000, indicating a continuous period shortening (see Fig. 55). The equation of the fitted parabola is

$$(O-C)_{par} = -2\overset{d}{.}063 \times 10^{-4} \times E^2 \quad .$$

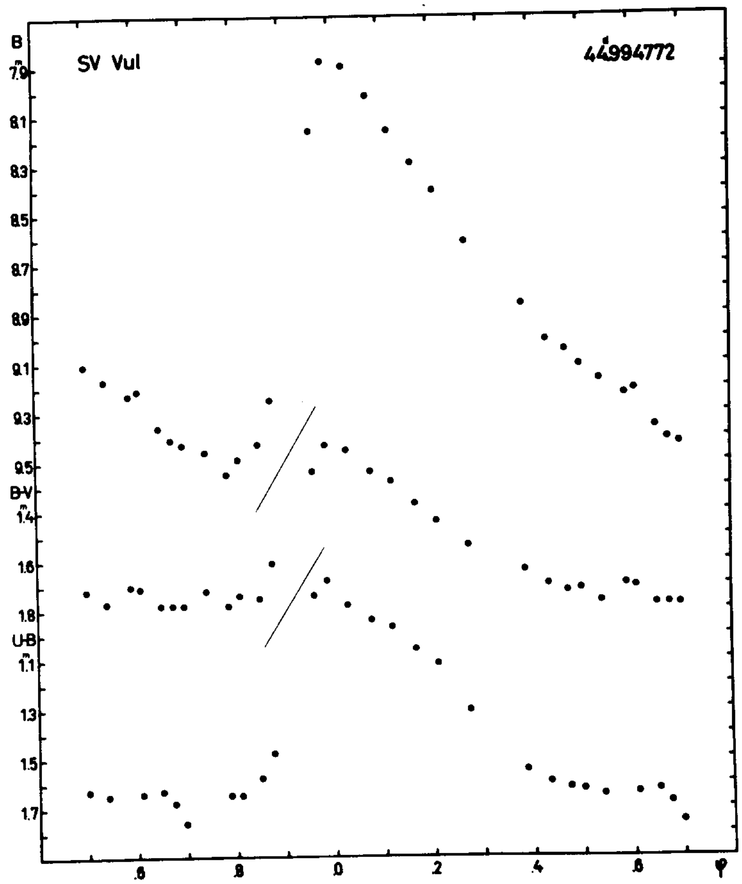


Figure 54 B, B-V and U-B curves of SV Vul

The deviations from this parabola are plotted in Fig. 56. Although there is a slight indication of a periodicity with P≈9000 days in this Δ(O-C) diagram, no other indication of the binary nature of SV Vul exists. The available radial velocity measurements (Fernie, 1979; Joy, 1937; Sanford, 1956) show the constancy of the average value of the radial velocity.

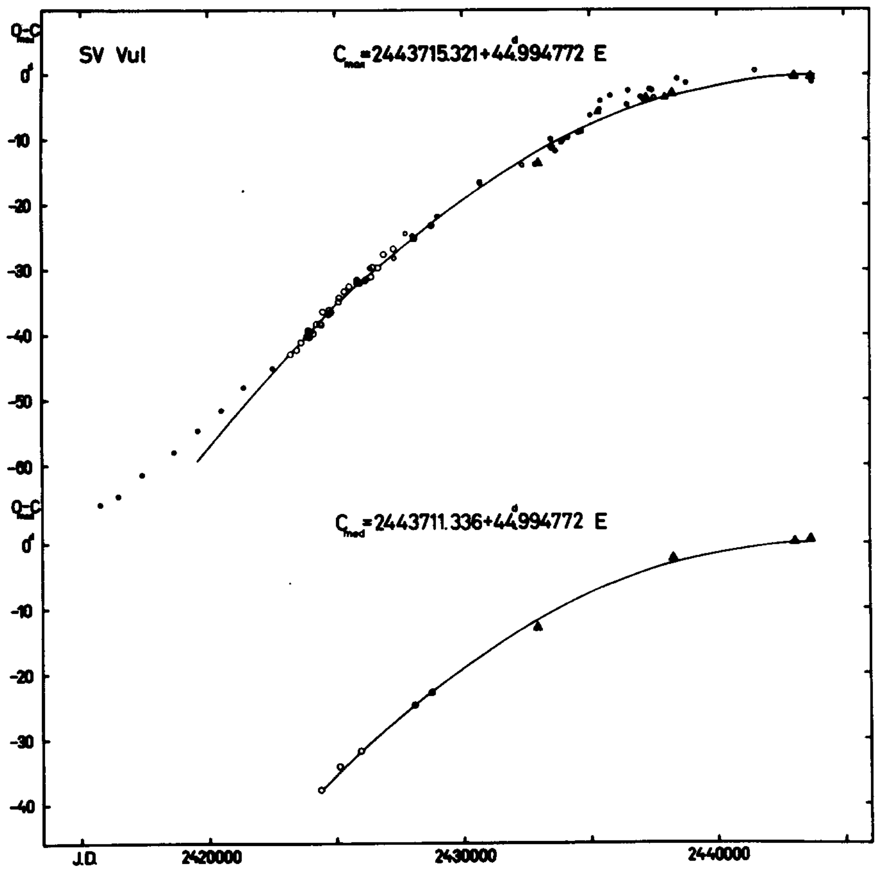


Figure 55 O-C diagram of SV Vul

Table 33 O-C residuals for SV Vul
(maximum brightness)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2415752.59 | -620 | $-65^{d}.97$ | pg | 0.5 | Gerasimovic (1927a) |
| 2416473.78 | -604 | -64.70 | pg | 0.5 | Gerasimovic (1927a) |
| 2417422.04 | -583 | -61.33 | pg | 0.5 | Gerasimovic (1927a) |
| 2418685.27 | -555 | -57.95 | pg | 0.5 | Gerasimovic (1927a) |
| 2419588.63 | -535 | -54.49 | pg | 0.5 | Gerasimovic (1927a) |
| 2420536.48 | -514 | -51.53 | pg | 0.5 | Gerasimovic (1927a) |

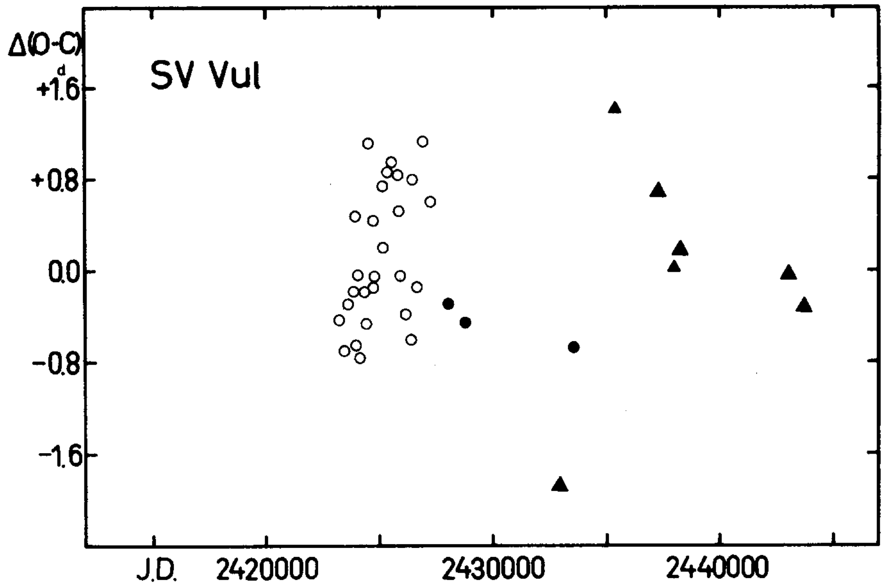


Figure 56 Deviations from the mean O-C curve

Table 33 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2421394.85 | -495 | $-48\overset{d}{.}06$ | pg | 0.5 | Gerasimovic (1927a) |
| 2422522.70 | -470 | -45.08 | pg | 0.5 | Gerasimovic (1927a) |
| 2423244.750 | -454 | -42.945 | vis | 1 | Kristensen[1] (1923a, 1924) |
| 2423470.375 | -449 | -42.293 | vis | 1 | Leiner (1924c) |
| 2423651.506 | -445 | -41.141 | vis | 1 | Zakharov (1924a, 1924b) |
| 2423877.492 | -440 | -40.129 | vis | 1 | Kristensen[1] (1926) |
| 2423923.337 | -439 | -39.279 | vis | 1 | Beyer (1930) |
| 2423967.382 | -438 | -40.229 | vis | 1 | Ahnert (1931) |
| 2424013.182 | -437 | -39.424 | vis | 1 | Zakharov (1928) |
| 2424147.972 | -434 | -39.618 | vis | 1 | Leiner (1929) |
| 2424329.238 | -430 | -38.331 | vis | 1 | Zakharov (1928) |
| 2424374.408 | -429 | -38.156 | vis | 1 | Beyer (1930) |
| 2424419.308 | -428 | -38.251 | vis | 1 | Nielsen (1927b) |
| 2424511.224 | -426 | -36.324 | vis | 1 | Ahnert (1931) |
| 2424735.814 | -421 | -36.708 | vis | 1 | Leiner (1929) |
| 2424736.399 | -421 | -36.123 | vis | 1 | Beyer (1930) |
| 2424781.074 | -420 | -36.443 | vis | 1 | Zakharov (1928) |
| 2425142.660 | -412 | -34.815 | vis | 1 | Beyer (1930) |
| 2425143.200 | -412 | -34.275 | vis | 1 | Ahnert (1931) |
| 2425369.141 | -407 | -33.308 | vis | 1 | Leiner (1929) |
| 2425549.866 | -403 | -32.562 | vis | 1 | Beyer (1930) |
| 2425865.562 | -396 | -31.829 | vis | 1 | Ahnert (1931) |
| 2425865.877 | -396 | -31.514 | vis | 1 | Kukarkin (1940) |
| 2425955.316 | -394 | -32.065 | vis | 1 | Zakharov (1954a) |
| 2426180.58 | -389 | -31.77 | pg | 0.5 | Nassau, Townson (1932) |
| 2426180.762 | -389 | -31.593 | vis | 1 | Ahnert (1931) |
| 2426362.56 | -385 | -29.77 | vis | 0.5 | Nielsen (1937a) |

Table 33 (cont.)

| Obs.Max.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2426406.297 | -384 | -31$^d$.032 | vis | 1 | Zverev (1936) |
| 2426452.863 | -383 | -29.460 | vis | 1 | Terkán (1935) |
| 2426677.678 | -378 | -29.619 | vis | 1 | Kukarkin (1940) |
| 2426904.699 | -373 | -27.572 | vis | 1 | Florya, Kukarkina (1953) |
| 2427265.340 | -365 | -26.889 | vis | 1 | Florya, Kukarkina (1953) |
| 2427309.0 | -364 | -28.2 | vis | 0.5 | Miczaika (1934a) |
| 2427762.809 | -354 | -24.363 | vis | 0.5 | Dziewulski et al. (1947) |
| 2428032.45 | -348 | -24.69 | vis | 0.5 | Nielsen[2] (1952) |
| 2428077.005 | -347 | -25.130 | pg | 1 | Nassau, Ashbrook (1942) |
| 2428422.03 | -340 | +4.93 | pg | 0 | Fu De-Lian (1964) |
| 2428753.872 | -332 | -23.185 | pg | 1 | Dziewulski et al. (1946) |
| 2429025.37 | -326 | -21.65 | pg | 0.5 | Kholopov (1946) |
| 2430695.04 | -289 | -16.79 | vis | 0.5 | Nielsen[3] (1952) |
| 2430695.11 | -289 | -16.72 | vis | 0.5 | Kukarkin (1951) |
| 2432362.68 | -252 | -13.96 | vis | 0.5 | Nielsen[3] (1955) |
| 2432857.74 | -241 | -13.84 | pg | 0.5 | Wachmann (1966) |
| 2432947.901 | -239 | -13.669 | pe | 3 | Eggen (1951) |
| 2433491.61 | -227 | -9.90 | pg | 0.5 | Nikulina (1970) |
| 2433535.293 | -226 | -11.210 | pg | 1 | Chuprina (1953) |
| 2433669.72 | -223 | -11.77 | pg | 0.5 | Wachmann (1966) |
| 2433896.09 | -218 | -10.37 | vis | 0.5 | Nielsen[4] (1955) |
| 2433941.34 | -217 | -10.12 | vis | 0.5 | Dziewulski (1953) |
| 2434166.73 | -212 | -9.70 | pg | 0.5 | Wachmann (1966) |
| 2434527.62 | -204 | -8.77 | pg | 0.5 | Nikulina (1970) |
| 2434617.73 | -202 | -8.65 | pg | 0.5 | Dziewulski (1956a) |
| 2434662.83 | -201 | -8.54 | pg | 0.5 | Wachmann (1966) |
| 2435025.01 | -193 | -6.32 | pg | 0.5 | Wachmann (1966) |
| 2435340.566 | -186 | -5.727 | pe | 1 | Walraven et al. (1958) |
| 2435387.87 | -185 | -5.37 | pg | 0.5 | Wachmann (1966) |
| 2435432.40 | -184 | -3.88 | pg | 0.5 | Nikulina (1970) |
| 2435838.11 | -175 | -3.13 | pg | 0.5 | Huth (1966) |
| 2436466.60 | -161 | -4.56 | pg | 0.5 | Nikulina (1970) |
| 2436513.77 | -160 | -2.39 | pg | 0.5 | Huth (1966) |
| 2437007.76 | -149 | -3.34 | pg | 0.5 | Wachmann (1966) |
| 2437232.486 | -144 | -3.588 | pe | 3 | Mitchell et al. (1964) |
| 2437368.90 | -141 | -2.16 | pg | 0.5 | Huth (1966) |
| 2437458.83 | -139 | -2.22 | pg | 0.5 | Nikulina (1970) |
| 2437547.5 | -137 | -3.5 | vis | 0.5 | Lohsen (1964a) |
| 2437952.641 | -128 | -3.349 | pe | 1 | Williams (1966) |
| 2438268.111 | -121 | -2.843 | pe | 3 | Fernie et al. (1965) |
| 2438450.46 | -117 | -0.47 | pg | 0.5 | Huth (1966) |
| 2438809.70 | -109 | -1.19 | pg | 0.5 | Nikulina (1970) |
| 2441511.4 | -49 | +0.8 | vis | 0.5 | Cragg (1976) |
| 2443085.325 | -14 | -0.069 | pe | 3 | Fernie (1979) |
| 2443715.004 | 0 | -0.317 | pe | 3 | present paper |
| 2443759.32 | +1 | -1.00 | vis | 0.5 | Busch[5] (1980) |

Remarks: [1] Observer: Axel Nielsen; [2] Obs.: Moller Nicolaisen; [3] Obs.: Arthur Nielsen; [4] Obs.: Darsenius; [5] Obs.: Branzke

Table 34 O-C residuals for SV Vul (median brightness)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2424370.940 | -429 | -37$^d$.639 | vis | 1 | Beyer (1930) |
| 2425139.462 | -412 | -34.028 | vis | 1 | Beyer (1930) |

Table 34 (cont.)

| Obs.Med.J.D. | E | O-C | Type | w | Reference |
|---|---|---|---|---|---|
| 2425951.669 | -394 | $-31^{d}.727$ | vis | 1 | Zakharov (1954a) |
| 2428073.392 | -347 | -24.758 | pg | 1 | Nassau, Ashbrook (1942) |
| 2428750.349 | -332 | -22.723 | pg | 1 | Dziewulski et al. (1946) |
| 2432944.568 | -239 | -13.017 | pe | 3 | Eggen (1951) |
| 2438264.733 | -121 | -2.236 | pe | 3 | Fernie et al. (1965) |
| 2443081.677 | -14 | +0.268 | pe | 3 | Fernie (1979) |
| 2443711.761 | 0 | +0.425 | pe | 3 | present paper |

## GENERAL REMARKS

### Period changes, instability of the period

From the point of view of stellar evolution, it is even more important to study the period changes of the long period Cepheids than the short period ones. The tendency of the long period Cepheids to undergo a considerable amount of period change has been known for a long time (e.g. Parenago, 1956). Parenago, however, found that all the period changes were sudden. In this part of this series on Cepheids there are 17 stars for which Parenago also published O-C diagrams. On the basis of the newly constructed O-C diagrams for 11 stars out of the 17, the diagrams can be approximated by parabolas, thereby supporting the existence of Cepheids with continuously changing (increasing or decreasing) period.

The statistics of the observed period changes based on the whole programme (Papers I and II and the present paper) as well as the comparison of the theoretically calculated evolutionary period changes with the observed changes in the period will be published in a separate paper.

### Cepheid binaries

The role of binaries in Cepheid research has seen an increase of late, since the frequency of Cepheids with companions is estimated to be at least as high as 20 per cent (Madore, 1977). Recent discoveries, viz. that AU Peg (Harris et al., 1979) and T Mon (Mariska et al., 1980) are also members in binary systems, indicate that the above mentioned frequency is really a lower limit of the true value.

Cepheids in binaries are important in several respects. They may serve as fundamental stars in deriving Cepheid masses and in a new calibration of the period - luminosity - colour relation. Moreover, their existence stresses the importance of some theoretical investigations to be made concerning the pulsational behaviour of a Cepheid in a binary system (non-radial pulsation) and their evolutionary status.

The membership of a Cepheid in a binary system causes two effects which can be observed in the O-C diagram:

1. Periodic quasi sinusoidal variation due to the light-time effect. The present sample contains at least four stars (RW Cam, X Cyg, SZ Cyg, T Mon) showing this kind of apparent period change. The duplicity of ζ Gem and SV Vul is rather doubtful. The value of the orbital period of RW Cam has been able to be determined using the O-C diagram (see p. 63): $P_{orb} = 6600 \pm 300$ days. In the other three cases less accurate (and considerably longer) values for the orbital period could be determined.
2. Rejumping period (or "stepwise" O-C diagram). YZ Aur is a very clear example showing this kind of period change (see Fig. 48). The O-C diagram of SV Per can be interpreted as showing either a rejumping period or a ligth-time effect (but based on the shape of the O-C diagram in Fig. 18, the former interpretation is preferred). In the case of AN Aur the occurrence of the rejump can only be suspected since the period change was accompanied by a change in the shape of the light curve – as in the case of SU Cyg (Paper I, p. 77).

If both the orbital period and the amount of the apparent O-C variation can be determined from the O-C diagram, some conclusions can be drawn as to the mass of the binary system without using any spectroscopic data. A detailed description of these results along with a summary of the other data on Cepheid binaries will be published in a separate paper.

Summary of the observations

The fundamental parameters of the light variations of the observed Cepheids are summarized in Table 35. The successive columns contain the following data:

1. Name of the Cepheid
2. Period of light variation
3. Decimal logarithm of the period

4-5. The moments of the normal maximum and normal median bright-

Table 35 Summary

| Name | Period | $\log P$ | Norm.Max. Hel.J.D. | Norm.Med. 2440000+ | Max.-Med. / P | Type |
|---|---|---|---|---|---|---|
| SZ Aql | 17$^d$.140849 | 1.2340 | 3807.095 | 3806.512 | 0.034 | I |
| TT Aql | 13.754707 | 1.1385 | 3810.884 | 3810.059 | 0.060 | I |
| RX Aur | 11.623537 | 1.0653 | 3829.995 | 3828.182 | 0.156 | I |
| SY Aur | 10.144698 | 1.0062 | 3832.981 | 3830.333 | 0.251 | I |
| YZ Aur | 18.193212 | 1.2599 | 3816.489 | 3814.233 | 0.124 | I |
| AN Aur | 10.29056 | 1.0124 | 3799.026 | 3795.918 | 0.302 | I |
| RW Cam | 16.414812 | 1.2152 | 3840.515 | 3839.070 | 0.088 | I |
| RW Cas | 14.791548 | 1.1700 | 3830.363 | 3829.608 | 0.051 | I |
| RY Cas | 12.138888 | 1.0842 | 3826.585 | 3824.218 | 0.195 | I |
| SZ Cas | 13.637747 | 1.1347 | 3817.966 | 3815.594 | 0.174 | Is |
| X Cyg | 16.386332 | 1.2145 | 3830.274 | 3828.783 | 0.091 | I |
| SZ Cyg | 15.109642 | 1.1793 | 3760.486 | 3758.688 | 0.119 | I |
| TX Cyg | 14.7098 | 1.1676 | 3794.971 | 3794.235 | 0.050 | I |
| VX Cyg | 20.133407 | 1.3039 | 3783.660 | 3782.050 | 0.080 | I |
| BZ Cyg | 10.141932 | 1.0061 | 3774.144 | 3770.970 | 0.313 | Is |
| CD Cyg | 17.073967 | 1.2323 | 3831.224 | 3830.490 | 0.043 | I |
| AA Gem | 11.302328 | 1.0532 | 3737.679 | 3735.147 | 0.224 | I |
| ζ Gem | 10.150135 | 1.0065 | 3785.473 | 3782.611 | 0.282 | Is |
| AP Her | 10.4156 | 1.0177 | 3745.357 | 3743.441 | 0.187 | II |
| Z Lac | 10.885613 | 1.0369 | 2827.154 | 2825.369 | 0.164 | I |
| T Mon | 27.024649 | 1.4318 | 3784.184 | - | - | I |
| SV Mon | 15.232780 | 1.1828 | 3794.342 | 3793.352 | 0.065 | I |
| SV Per | 11.129318 | 1.0465 | 3839.246 | 3838.322 | 0.083 | I |
| VX Per | 10.88904 | 1.0370 | 3758.994 | 3755.650 | 0.307 | I |
| SV Vul | 44.994772 | 1.6532 | 3715.004 | 3711.761 | 0.072 | I |

nesses derived from the observations listed in Table 3

6. Fractional period between the moment of median brightness and that of the subsequent light maximum (a measure of the asymmetry of the light curve)

7. Type of Cepheid

8-10. The maximum and minimum magnitudes and the amplitude in V

11-13. The corresponding quantities for B as under 8-10

14-16. The corresponding quantities for U as under 8-10

17. Name of Cepheid

of the observations

| $V_{max}$ | $V_{min}$ | $A_V$ | $B_{max}$ | $B_{min}$ | $A_B$ | $U_{max}$ | $U_{min}$ | $A_U$ | Name |
|---|---|---|---|---|---|---|---|---|---|
| $7^{m}.95$ | $9^{m}.24$ | $1^{m}.29$ | $8^{m}.99$ | $11^{m}.08$ | $2^{m}.09$ | $10^{m}.18$: | $12^{m}.76$: | $2^{m}.58$: | SZ Aql |
| 6.56 | 7.58 | 1.02 | 7.52 | 9.19 | 1.67 | 8.20 | 10.81 | 2.61 | TT Aql |
| 7.34 | 8.03 | 0.69 | 8.12 | 9.17 | 1.05 | 8.67 | 10.05 | 1.38 | RX Aur |
| 8.73 | 9.37 | 0.64 | 9.64 | 10.60 | 0.96 | 10.33: | 11.43: | 1.10: | SY Aur |
| 9.94 | 10.75 | 0.81 | 11.13 | 12.41 | 1.28 | | | | YZ Aur |
| 10.20 | 10.80 | 0.60 | 11.33 | 12.24 | 0.91 | | | | AN Aur |
| 8.16 | 9.00 | 0.84 | 9.37 | 10.48 | 1.11 | 10.24 | 11.44 | 1.20 | RW Cam |
| 8.55 | 9.75 | 1.20 | 9.45 | 11.36 | 1.91 | | | | RW Cas |
| 9.38 | 10.35 | 0.97 | 10.52 | 11.94 | 1.42 | | | | RY Cas |
| 9.61 | 10.03 | 0.42 | 10.94 | 11.59 | 0.65 | | | | SZ Cas |
| 5.87 | 6.87 | 1.00 | 6.72 | 8.34 | 1.62 | 7.29 | 9.79 | 2.50 | X Cyg |
| 8.94 | 9.82 | 0.88 | 10.22 | 11.61 | 1.39 | | | | SZ Cyg |
| 8.82 | 10.00 | 1.18 | 10.41 | 12.11 | 1.70 | | | | TX Cyg |
| 9.57 | 10.54 | 0.97 | 10.98 | 12.54 | 1.56 | | | | VX Cyg |
| 10.05 | 10.53 | 0.48 | 11.54 | 12.24 | 0.70 | | | | BZ Cyg |
| 8.34 | 9.52 | 1.18 | 9.29 | 11.15 | 1.86 | 9.98 | 12.58 | 2.60 | CD Cyg |
| 9.40 | 10.00 | 0.60 | 10.35 | 11.30 | 0.95 | | | | AA Gem |
| 3.66 | 4.17 | 0.51 | 4.35 | 5.10 | 0.75 | 4.87 | 5.94 | 1.07 | ζ Gem |
| 10.43 | 11.15 | 0.72 | 11.06 | 12.08 | 1.02 | | | | AP Her |
| 7.89 | 8.82 | 0.93 | 8.73 | 10.18 | 1.45 | 9.33 | 11.23 | 1.90 | Z Lac |
| 5.61: | 6.60 | 0.99: | 6.49: | 8.05 | 1.56: | 7.08: | 9.28 | 2.20: | T Mon |
| 7.63 | 8.78 | 1.15 | 8.43 | 10.21 | 1.78 | 8.79 | 11.26 | 2.47 | SV Mon |
| 8.49 | 9.35 | 0.86 | 9.38 | 10.53 | 1.15 | | | | SV Per |
| 8.98 | 9.68 | 0.70 | 10.08 | 11.09 | 1.01 | 10.85 | 12.12 | 1.27 | VX Per |
| 6.74 | 7.76 | 1.02 | 7.86 | 9.53 | 1.67 | 8.66 | 11.20 | 2.54 | SV Vul |

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