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H B V 479 - 495, VARIABLES IN A FIELD AROUND S A 18

The archive of the Lippert Astrograph contains about 150 plates of a variable star field centered on SA 18 and mainly taken in the Julian date interval 2429400-2432100. Due to other circumstances these plates neither have been searched for variables nor recent data plates gained. Processing this material 17 new variables were discovered. Four of them turned out to be rediscovered already suspected variables listed in the CSV catalogs I and II. Nevertheless they were given HBV numbers, since nothing except a confirmation of variability was known about these stars.

The results are summarized in the first table. The given accurate (1900) positions depend on measures of two sets of AGK3 reference stars, paired and crossed around each variable.

Estimates of the variables were made by Pickering's method, using a Zeiss binocular microscope with continuously zoom lens magnification. The used sequences were measured on the Becker iris-diaphragm photometer and calibrated by standard B-magnitudes of the open cluster NGC 7160 and photographic magnitudes of SA 18. Table 2 .

As far as the 8 eclipsing variables are concerned nearby minima were combined into normal minima as given under n in table 3, which table also contains the epoch number and the O-C as derived from the respective elements in table 1. For three Mira type and one RR Lyrae variables a similar table is given which presents individual

Table 1.

Summary of Data.

| HBV | α 1900 | δ 1900 | Type | Max | Min I | MinII | E_0 | F | D ore Sp. |
|-----|---|---------------|------|--------------------|--------------------|----------|----------|-----------|-----------|
| 479 | 20 ^P 42 ^m 3 ^S 96 | +62° 8' 40" 6 | EB | 12 ^m 60 | 15 ^m 02 | 2430000 | 0517.339 | 3d3128065 | 0.18: |
| 480 | 43 14.09 | 60 21 15.7 | EB | 12.16 | 12.57 | 0639.300 | 0662 | 0.7763644 | |
| 481 | 21 3 52.14 | 63 20 21.7 | M | 13.7 | 16.0 | 0662 | 181.5 | | |
| 482 | 7 45.59 | 57 18 35.7 | EB | 11.42 | 12.61 | 11.69 | 0729.280 | 1.2358073 | 0.20: |
| 483 | 17 14.82 | 61 17 0.8 | RCB | 13.7 | 15.8 | | | | |
| 484 | 17 15.60 | 60 18 0.8 | FA | 13.66 | 15.02 | 13.79 | 0517.465 | 0.6930642 | 0.16 |
| 485 | 22 49.97 | 60 47 30.2 | M | 14.5 | 15.7 | 0322 | 285.7 | | |
| 486 | 28 0.23 | 61 16 23.7 | J | 11.2 | 11.7 | | | | K5d: |
| 487 | 28 12.12 | 60 40 52.3 | RR | 14.98 | 15.94 | | | | |
| 488 | 28 20.66 | 63 34 10.2 | EA | 14.72 | 15.8 | | 0576.474 | 0.4306951 | 0.20 |
| 489 | 29 16.98 | 61 3 29.9 | EA | 11.80 | 12.63 | | 0590.650 | 3.2655017 | 0.17 |
| 490 | 30 17.26 | 57 21 36.2 | RR? | 14.60 | 15.36 | | | | |
| 491 | 32 32.63 | 60 27 25.3 | J | 12.5 | 13.3 | | | | N |
| 492 | 39 43.24 | 63 34 41.8 | EA | 15.36 | 16.08 | | 0515.399 | 9.7181902 | 0.14 |
| 493 | 40 5.65 | 63 26 8.6 | EA | 14.84 | 15.81 | 14.89 | 0974.386 | 1.4019731 | 0.16 |
| 494 | 55 4.51 | 62 41 22.3 | M | 13.6 | 16.3 | | 0372 | 374 | |
| 495 | 56 3.23 | 62 6 36.8 | EA | 13.86 | 14.19 | | 0693.386 | 1.9479836 | 0.17 |

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2
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maxima (table 4). Normal points of mean light curves for each of the 8 eclipsing and 1 RR variables are listed in table 5 (see also figure). Additional notes on individual variables follow. The identification charts mark the variable and the used sequence stars. North is at top and East to the left. The scale is given by the length of the 5' line.

Table 2.

Photographic Magnitudes of the Sequences

| HBV | a | b | c | d | e | f | g | h |
|-----|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------|
| 479 | 12 ^m .77 | 12 ^m .54 | 12 ^m .78 | 13 ^m .40 | 13 ^m .90 | 14 ^m .20 | 14 ^m .47 | |
| 480 | 11.91 | 12.17 | 12.43 | 12.62 | 12.88 | | | |
| 481 | 13.50 | 13.75 | 14.13 | 14.41 | 14.99 | 15.27 | 15.53 | 15.97: |
| 482 | 11.15 | 11.40 | 11.71 | 12.02 | 12.51 | 12.86 | | |
| 483 | 13.28 | 13.74 | 14.35 | 14.81 | 15.04 | 15.48 | 15.83 | |
| 484 | 13.19 | 13.69 | 14.03 | 14.29 | 14.53 | 14.68 | 14.95 | 15.16 |
| 485 | 14.30 | 14.59 | 14.83 | 14.99 | 15.23 | 15.43 | 15.68 | |
| 486 | 10.97 | 11.27 | 11.44 | 11.54 | 11.71 | | | |
| 487 | 14.71 | 15.00 | 15.23 | 15.44 | 15.78 | 15.99 | | |
| 488 | 14.37 | 14.65 | 14.99 | 15.21 | 15.50 | 15.68 | 15.81 | 16.02: |
| 489 | 11.57 | 11.90 | 12.27 | 12.54 | 12.73 | | | |
| 490 | 14.55 | 14.77 | 14.95 | 15.12 | 15.36 | 15.68 | | |
| 491 | 12.25 | 12.71 | 12.86 | 13.20 | 13.34 | 13.82 | | |
| 492 | 15.10 | 15.39 | 15.57 | 15.82 | 15.98 | 16.13 | | |
| 493 | 14.50 | 14.82 | 15.11 | 15.31 | 15.64 | 15.95 | | |
| 494 | 13.40 | 13.70 | 13.95 | 14.36 | 14.85 | 15.21 | 15.81 | 16.30: |
| 495 | 13.55 | 13.88 | 14.17 | 14.66 | | | | |

Table 3

Normal Minima of 8 Eclipsing Stars

| HBV 479 | n | E | O-C | HBV 488 | n | E | O-C |
|--------------|---|-------|----------------------|--------------|---|-------|----------------------|
| 242 9407.540 | 1 | - 335 | -0 ^d .009 | 242 8337.468 | 2 | - 690 | +0 ^d .014 |
| 243 0517.345 | 4 | 0 | + .006 | 9457.533 | 3 | - 347 | + .012 |
| 1077.195 | 2 | + 169 | - .008 | 243 0590.626 | 5 | 0 | - .024 |
| | | | | 1028.268 | 3 | + 134 | + .041 |
| HBV 480 | | | | HBV 492 | | | |
| 242 9514.350 | 2 | -1449 | +0.002 | 242 9407.515 | 3 | - 114 | -0.010 |
| 243 0021.310 | 2 | - 796 | - .004 | 243 0515.482 | 2 | 0 | + .083 |
| 0639.300 | 5 | 0 | .000 | 1030.433 | 1 | + 53 | - .030 |
| 1028.258 | 4 | + 501 | - .001 | | | | |
| HBV 482 | | | | HBV 493 | | | |
| 242 9660.310 | 1 | - 865 | 0.000 | 242 8421.375 | 1 | -1821 | -0.018 |
| 243 0515.491 | 3 | - 173 | + .005 | 243 0639.322 | 2 | - 239 | + .008 |
| 0729.279 | 3 | 0 | - .001 | 0974.385 | 2 | 0 | - .001 |
| 1028.346 | 2 | + 242 | + .002 | 1061.306 | 3 | + 62 | - .002 |
| 2066.420 | 1 | +1082 | .000 | | | | |
| HBV 484 | | | | HBV 495 | | | |
| 242 8422,331 | 1 | -3023 | -0.001 | 242 9372.633 | 2 | - 678 | -0.020 |
| 9397.474 | 3 | -1616 | + .001 | 243 0021.341 | 2 | - 345 | + .009 |
| 243 0517.465 | 2 | 0 | .000 | 0693.367 | 2 | 0 | - .019 |
| 1030.333 | 1 | + 740 | .000 | 1028.468 | 3 | + 172 | + .029 |
| 2066.463 | 2 | +2235 | - .001 | | | | |

Table 4

Individual Maxima of M and RR Lyr Variables

| HBV 481 | M, m _{pg} | E | O-C | HBV 487 | RR, | | |
|-------------|---------------------|-----|------------------|--------------|-------|----------------------|--|
| 242 8310: | 14 ^m .4: | -13 | + 8 ^d | 243 0021.303 | -1289 | -0 ^d .004 | |
| 9397: | 14.4: | - 7 | + 5 | 0307.297 | - 625 | + .008 | |
| 9580 | 14.4 | - 6 | + 7 | 0366.294 | - 488 | .000 | |
| 243 0285 | 14.0 | - 2 | -14 | 0517.468 | - 137 | - .001 | |
| 0650 | 14.4 | 0 | -12 | 0576.474 | 0 | .000 | |
| 0846: | 14.4: | + 1 | + 2 | 0591.534 | + 35 | - .014 | |
| 1027 | 13.7 | + 2 | + 2 | 0639.385 | + 146 | + .029 | |
| 2122 | 13.9 | + 8 | + 8 | 0698.354 | + 283 | - .007 | |
| | | | | 0704.389 | + 297 | - .002 | |
| HBV 485 (M) | | | | 1028.262 | +1049 | - .012 | |
| | | | | 1030.433 | +1054 | + .005 | |
| 242 8336: | 14.8 | - 7 | +14 | 1031.294 | +1056 | + .005 | |
| 9464 | 14.5 | - 3 | - 1 | 1033.439 | +1061 | - .003 | |
| 243 0015: | 15.0: | - 1 | -21: | | | | |
| 0330: | - | 0 | + 8: | | | | |
| 0621: | 15.0: | + 1 | 13: | | | | |
| 0890: | 15.0: | + 2 | + 3: | | | | |
| HBV 494 (M) | | | | | | | |
| 242 9621 | 13.6 | - 2 | - 3 | | | | |
| 243 0012 | 13.6 | - 1 | +14 | | | | |
| 0390: | - | 0 | +18 | | | | |
| 0741 | 13.7 | + 1 | - 5 | | | | |

Notes on Individual Variables:

HBV

479 CSV 5274 = 94.1934

480 May also be classified as EA.

481 Heights of maxima vary between $13^m.7$ and $14^m.4$.

482 CSV 5373 = SVS 976. Maxima I and II different ($11^m.48$ and $11^m.41$).

483 A typical RCB variable. From long lasting nearly constant maximum brightness of about $13^m.7$ the star faints within some 10 days to $15^m.8$ immediately followed by a slower rise (about 30^d) to normal light. Observed Minima: 242 9407,9614 and 243 2057.

484 CSV 5400 = SVS 681. Min I and II a bit asymmetric, the last one displaced to longer phases ($0^P.55$).

485 Mira type. Only one maximum well observed. The variable is the western component of a double star.

486 BD + $61^{\circ}2146(9^m.0)$. A long-wave variation is superposed by a sort of 50 days fluctuations of smaller amplitude.

487 A typical RRa, b variable.

488 The minimum light of this EA variable could not be observed.

489 Certainly an eclipsing star (EA). Only 3 faintings observed:

| | | |
|--------------|-----------|------------------|
| 242 9607.337 | $12^m.38$ | |
| 243 0633.378 | 12.63 | n.P = $64^d.853$ |
| 0698.231 | 12.10 | |

490 As shown by some night runs this star certainly is of the RR type with a period of about $0^d.5 \pm$. It was not possible to derive the true period from this material due to its scarcity.

Observed Maxima:

| | |
|--------------|---------------|
| 243 0873.475 | 243 1029.230: |
| 0992.350 | 1061.220: |
| 1026.370 | 1076.250 |

491 CSV 102116 = 25.1919 Cep. Very red irregular star of spectral type N. It shows slow variations between

- 12^m.5 and 13^m.3. According to BD and AGK3 a close double.
- 492 An EA variable. Difficult to measure as situated near the north edge of the plates and due to its faintness.
- 493 It looks like there is a secondary minimum of only 0^m.05.
- 494 In minimum light this Mira variable is fainter than 16^m.3.
- 495 An EA type variable of relatively small amplitude (0^m.33). No secondary minimum observed.

A.A. WACHMANN
Hamburg Observatory







