**A&A manuscript no.**
(will be inserted by hand later)

**Your thesaurus codes are:**
**20(08.22.1)**

ASTRONOMY AND ASTROPHYSICS

# $I$- and $JHK$-band photometry of classical Cepheids in the HIPPARCOS catalog

**M.A.T. Groenewegen**

Max-Planck Institut für Astrophysik, Karl-Schwarzschild-Straße 1, D-85740 Garching, Germany

Received 15 June 1999/ Accepted 6 July 1999

**Abstract.** By correlating the Fernie et al. (1995) electronic database on Cepheids with the "resolved variable catalog" of the HIPPARCOS mission and the SIMBAD catalog one finds that there are 280 Cepheids in the HIPPARCOS catalog. By removing W Vir stars (Type II Cepheids), double-mode Cepheids, Cepheids with an unreliable solution in the HIPPARCOS catalog, and stars without photometry, it turns out that there are 248 classical Cepheids left, of which 32 are classified as first-overtone pulsators. For these stars the literature was searched for $I$-band and near-infrared data. Intensity-mean $I$-band photometry on the Cousins system is derived for 189 stars, and intensity-mean $JHK$ data on the Carter system is presented for 69 stars.

**Key words:** Cepheids

## 1. Introduction

Cepheids are important standard candles in determining the extra-galactic distance scale. The results of the HIPPARCOS mission allow, in principle, a calibration of the period-luminosity relation based on the available parallaxes. Feast & Catchpole (1997; hereafter FC) did just that based on pre-released HIPPARCOS data of 223 Cepheids available to them at that time. Now that the full catalog has become available (ESA 1997) it is interesting to have a look at the final sample of Cepheids in the HIPPARCOS catalog. A second topic addressed here is $I$ and $JHK$-band data. The analysis by FC was based on $B$ and $V$ data which was available for all stars in the sample of 220 stars their analysis was based on. However, the intrinsic spread in the $M-P$ relation is smaller in $I$ and $JHK$ than in $V$ (e.g. Tanvir 1999, Gieren et al. 1998), and so it might be interesting to collect data in these bands for further study.

*Send offprint requests to*: Martin Groenewegen (groen@mpa-garching.mpg.de)

## 2. Sample selection

From the HIPPARCOS "resolved variable" catalog all stars were selected classified as "DCEP" (219 stars), "DCEPS" (31 stars), and "CEP" (23 stars). This number is consistent with the quoted number of 270 Cepheids in the HIPPARCOS Input Catalog (ESA 1989), and the discovery of 3 new Cepheids (CK Cam, V898 Cen and V411 Lac). These 273 stars were correlated with the electronic database of Fernie et al. (1995). An error was detected in the HIPPARCOS catalog as HIC 45949 is associated there with W Car, whereas the correct association is V Vel. Ten stars were not found in that catalog. Comparison with the electronic database of Welch (1997), six of them (EN Tra, KL Aql, V733 Aql, BB Her, T Ant, BB Gem) are classified as Type II Cepheids, and KZ Pup is in fact a RR Lyrae variable (see the General Catalog of Variable Stars, Kholopov et al. 1985). These are excluded.

For CK Cam the intensity-mean magnitudes are calculated (in the way described below) from data in Berdnikov et al. (1996), resulting in $<B> = 6.560$, $<V> = 7.541$ and $<B-V> = 0.990$. As no intensity-mean values for $V$ and $B-V$ exist in the literature the values listed in the HIPPARCOS catalog have been adopted for the other objects (V411 Lac, V898 Cen). Periods also come from HIPPARCOS. At this point the carbon-rich CH-like Cepheid V553 Cen is discarded.

The electronic database of Fernie et al. (1995) was also cross-correlated with the SIMBAD catalog, to search for Cepheids in HIPPARCOS which are not in the "resolved variable" catalog. Seven were found, of which one (BD Cas = HIC 796 = Fernie et al. nr. 130.3) is classified as a Type II Cepheid by Fernie et al.. Of the remaining six, two (AU Peg, $\kappa$ Pav) are not listed in Fernie et al. and are classified as Type II in the database of Welch, and hence excluded.

This leaves 270 stars that may be considered Type I Cepheids. As a next step, 10 stars are removed that are classified as Double-Mode Cepheids in Fernie et al. (GZ Car, TU Cas, VX Pup, AP Vel, Y Car, UZ Cen, BK Cen, U Tra, BQ Ser, EW Sct).

Next, stars with an unreliable solution in the HIPPARCOS catalog are removed. Criteria are a large fraction of "Data-Points-Rejected" (DPR, field H29), and/or a large value for the "Goodness-of-Fit (GOF, field H30). The introduction to the HIPPARCOS and Tycho catalogues (ESA 1997) only mentions that a "large" value of DPR indicates a model mismatch without quoting a specific value, and that values of GOF larger than 3 usually indicate a bad fit to the data. Often these stars are also flagged as having a "Number-of-Components (nc, field H58) of 2, indicating a binary system. Stars removed on the basis of their DPR and/or GOF flags are: UX Per (DPR=36, GOF=5.30, nc=2), RW Cam (DPR=12, GOF=2.27, nc=2), BM Pup (DPR=6, GOF=5.75, nc=2), HK Car (DPR=8, GOF= 2.37, nc=2), SU Cru (DPR=20, GOF=2.09, nc=2), SY Nor (DPR=8, GOF=3.23, nc=1), TW Nor (DPR=8, GOF = 2.83, nc=1). In the remaining sample all objects have DPR $\leq 7$; the two stars with DPR=7 have GOF $< 1.32$. There are 2 stars with GOF $>3.0$, however with DPR of only 0 and 2%, that were therefore kept.

Y Lac (DPR=8, GOF=4.44, nc=1) and RY Sco (DPR =13, GOF=1.94, nc=1) are special as their DPR and/or GOF values in the HIPPARCOS catalog indicate an unreliable solution, and would have been discarded for this reason. However, both are among the stars re-analysed by Falin & Mignard (1999) using software from the HIPPARCOS FAST consortium but adding additional data, in particular related to multiplicity. The solution they obtain is remarkably better, with for Y Lac values of DPR = 0 and GOF = $-0.13$ and for RY Sco they derive DPR = 0, GOF = 1.06. This is solely due to the fact that duplicity was allowed for. For Y Lac the binary component is at $2.6''$ distance and has a magnitude difference of 3.0, for RY Sco these numbers are $14.4''$ and 2.4 mag., respectively. None of the other Cepheids in the sample are in Falin & Mignard (1999).

There remain seven stars for which Fernie et al. do not list the intensity-mean $V$ and $B-V$. DP Vel is discarded (as was done by FC) because the photometric data are too sparse, LL Pup, LR Pup and VV CMa because no $B-V$ is listed in the HIPPARCOS catalog (the Welch database does not list references to any photometry either). For HL Pup, FN Vel and LX Pup, $V$ and $B-V$ are taken from HIPPARCOS.

There remain 248 stars of which 22 are classified as overtone pulsators in the Fernie et al. database. Recently, Sachkov (1997) identified some new overtone pulsators; FN Aql, V1162 Aql, SU Cas, X Lac, SZ Tau are in our list and not identified as overtone pulsators by Fernie et al. Furthermore, V473 Lyr is a second overtone pulsator based on the analysis of Van Hoolst & Waelkens (1995) and Andrievsky et al. (1998) and we have added four more overtone pulsators (IR Cep, BP Cir, AV Cir, DX Gem) from Antonello et al. (1990). In total there are therefore 32 overtone pulsators and 216 fundamental mode pulsators in the sample.

## 3. $I$-band photometry

The largest database on $I$-band photometry is that of Caldwell & Coulson (1987, hereafter CC). However, they list *magnitude*-mean $V-I$ values instead of the traditional intensity-mean. Gieren et al. (1998) mention they add a correction of $-0.03$ mag. to the magnitude-mean $I$ to estimate the intensity-mean. However, by comparing some entries in Gieren et al.'s Table 3 to the data in CC it turns out that they actually added $+0.03$ mag.

In view of this, I decided to perform a literature study and to calculate whenever possible the intensity-mean $<I>$ magnitude, as well as the intensity-mean $<V>$-magnitude (all $V$ magnitudes are on the Johnson system) for the same dataset as the available $I$-band data, from the original sources. The intensity-mean magnitude is calculated according to Tanvir (1997):

$$<m> = -2.5 \log \sum_{i=1}^{n} 0.5\,(\phi_{i+1} - \phi_{i-1})\,10^{-0.4\,m_i} \qquad (1)$$

where $\phi_i$ and $m_i$ are the phase and magnitude of the $i$-th epoch after folding with the period, and with $\phi_{n+1} = 1 + \phi_1$ and $\phi_0 = \phi_n$.

Johnson-$I$ photometry was transformed to Cousins-$I$ using the formula presented in CC. Washington photometry was transformed following Coulson et al. (1985). If necessary, the phases of the individual observations were calculated, and/or the phases ordered, in order to apply Eq. (1).

The intensity-mean $<I>$, and $<V> - <I>$ are presented in Table 1. It contains 283 datasets for 189 stars. Also listed are the number of data points in the light curve used, the reference to the data, and the original photometric system (C = Cousins, J = Johnson, W = Washington). In three cases ($l$ Car, $\beta$ Dor and S Nor) the data of Dean et al. (1977) and Dean (1981) were combined beforehand to calculate the intensity-means. The data in Table 1 does not contain *all* known $I$-band datasets, but is intented to contain all published datasets with photometry in the Cousins system, and all datasets in any system when no Cousins photometry exists, except datasets which contain very few (of order 5 or less) data points. When more than one entry exists for a star, the first one may be considered the "best" one, which is a subjective balance between the original photometric system (Cousins being preferred over other photometric systems to avoid possible systematic effects due to the transformation) and the number of points in the light curve.

From this dataset I find that the difference magnitude-mean minus intensity-mean is $0.0070 \pm 0.034$ in the $I$-band taking all datasets; $0.0048 \pm 0.033$ taking the 193 datasets which contain $\geq 20$ data points in the light curve and $-0.0025 \pm 0.036$ taking the 41 datasets which contain $\geq 40$ points in the light curve. The correction value of 0.03 used by Gieren et al. (1998) is therefore not confirmed.

One can ask the question if there are any systematic differences between the datasets. For example, there are 26 stars for which both original datasets in the Johnson and Cousins system are available, and with $\geq 10$ points in the light curve. The difference between the "transformed Johnson" - "Cousins" datasets is $-0.007 \pm 0.019$ in $< I >$, and $-0.004 \pm 0.026$ in $< V > - < I >$. There are 24 stars with (at least) 2 datasets in the Cousins system, and $\geq 10$ points in the light curve. The difference "first dataset - second dataset" is $0.0009 \pm 0.0120$ in $< I >$ and $-0.008 \pm 0.014$ in $< V > - < I >$. This suggests that there are no systematic differences due to the transformation from the Johnson to the Cousins system, and among the different observations in the Cousins system themselves, and that the spread in $< I >$ and $< V > - < I >$ are consistent with the typical error quoted in a single observation which is of order 0.01 magnitude.

The intensity-mean $< V >$ (only the "best" dataset in the case of more than one entry) was also compared to the corresponding value listed in the Fernie et al. database. In 23 cases the difference was more than 0.03 mag. However, in 9 of those cases there are fewer than 10 points in the light curve and this difference is probably due to the poor sampling of the light curve. Since the $< V >$ and $< I >$ have been calculated from the same dataset, the $< V > - < I >$ magnitude should still be reliable. In 13 other cases the difference in magnitude is between 0.03 and 0.052, which seems large but still acceptable. There is one odd case, and that is RW Cas where the difference in $< V >$ is 0.101 mag. and in $< B > - < V >$ 0.1 magnitude. The Welch (1997) database indicates that the dataset of Moffett & Barnes (1984) is the largest single dataset for this star, and it was used by me, as it also is the only dataset containing $I$-data. From this datset I find $< V > = 9.218$, and $< B > - < V > = 1.196$. The Fernie et al. database lists $< V > = 9.117$ and $< B > - < V > = 1.096$. From the combined data set of Berdnikov (1992, 1993) with 63 points in the light curve I obtain $< V > = 9.229$ and $< B > - < V > = 1.243$, in agreement with the magnitudes from the Moffett & Barnes (1984) data. This leaves little doubt that the data used in the Fernie et al. database is in fact from Moffett & Barnes (1984), however listed with an off-set of 0.1 mag. in $< V >$ and $< B > - < V >$, possibly a typographical error.

Table 2 contains data for which $I$-band data exists but no intensity-mean values could be derived. Two stars come from Arellano Ferro (1984) who does not list the original individual observations. The values listed are in the Cousins system transformed from the original Johnson photometry. All the other stars are listed in CC but the original data could not be traced. Very likely there are in unpublished material quoted by CC. The values listed are magnitude-means on the Cousins system.

Table 3 lists the Type I HIPPARCOS Cepheids without $I$-band data.

## 4. Near-infrared data

The single largest database with NIR data on Cepheids is Laney & Stobie (1992) who provide data for 51 Cepheids on the Carter system. Intensity-mean magnitudes have been calculated by me following the recipe outlined above, and agree exactly or within one unit in the last decimal with the number published by them.

The other two datasets used are Welch et al. (1984) and Barnes et al. (1997). Both provide magnitudes in the CIT system and these have been converted to the Carter system using the formula in Table 3 of Laney & Stobie (1993). From Welch et al., only stars with $\geq 8$ points in the light curve have been considered. This leaves out as many as about 40 stars, but with 2-5 points in the light curve no sufficiently accurate (that is at a level of 0.01 mag.) intensity-mean (or magnitude-mean) can be determined.

Data from the following sources is not considered: Lloyd Evans (1980) because of large error in individual measurements (> 0.06 mag); McGonegal et al. (1983) and Schechter et al. (1992), because they observed only few points in the light curve; Fernley et al. (1989) because of the photometric system.

The intensity-mean $JHK$ magnitudes are listed in Table 4. It contains 89 determinations for 69 stars. When more than one dataset exists, they are listed in the following order: Laney & Stobie (1992), Barnes et al. (1997), Welch et al. (1984). This can be thought of as an order of preference, prefering the largest single dataset in the Carter system over the other two sources of photometry which had to be transformed from the CIT to the Carter system, and then prefering Barnes et al. (1997) over Welch et al. (1984) because their light curves contain more data points.

In about a dozen cases there is photometry available from 2 or more sources. Comparing the datasets suggests consistency at a level of 0.01 magnitudes, although larger differences (up to 0.04 mag.) exist.

*Acknowledgements*

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France.

**Table 1.** Intensity-mean $I$-band data

| Name | points | $<I>$ | $<V>-<I>$ | Reference | system |
|---|---|---|---|---|---|
| U Aql | 39 | 5.284 | 1.164 | Moffett & Barnes (1984) | J |
| | 6 | 5.265 | 1.173 | Dean (1977) | C |
| | 7 | 5.205 | 1.247 | Berdnikov & Turner (1995a) | C |
| SZ Aql | 21 | 7.066 | 1.545 | Moffett & Barnes (1984) | J |
| | 6 | 6.957 | 1.503 | Dean (1977) | C |
| | 7 | 7.150 | 1.568 | Berdnikov & Turner (1995a) | C |
| | 19 | 7.112 | 1.607 | Barnes et al. (1997) | J |
| TT Aql | 51 | 5.722 | 1.409 | Coulson et al. (1985) | C |
| | 16 | 5.759 | 1.468 | Barnes et al. (1997) | J |
| | 36 | 5.726 | 1.403 | Moffett & Barnes (1984) | J |
| FF Aql | 42 | 4.509 | 0.864 | Moffett & Barnes (1984) | J |
| | 10 | 4.515 | 0.853 | Berdnikov & Turner (1995b) | C |
| FM Aql | 35 | 6.765 | 1.506 | Moffett & Barnes (1984) | J |
| | 6 | 6.814 | 1.531 | Berdnikov & Turner (1995a) | C |
| FN Aql | 29 | 6.987 | 1.395 | Moffett & Barnes (1984) | J |
| | 7 | 6.970 | 1.389 | Berdnikov & Turner (1995a) | C |
| | 4 | 6.978 | 1.380 | Dean (1977) | C |
| | 18 | 6.987 | 1.392 | Barnes et al. (1997) | J |
| V496 Aql | 37 | 6.485 | 1.262 | Gieren (1981) | C |
| | 7 | 6.436 | 1.298 | Berdnikov & Turner (1995a) | C |
| | 30 | 6.473 | 1.278 | Moffett & Barnes (1984) | J |
| V600 Aql | 37 | 8.270 | 1.767 | Moffett & Barnes (1984) | J |
| V1162 Aql | 11 | 6.847 | 0.962 | Berdnikov & Turner (1995b) | C |
| $\eta$ Aql | 46 | 3.028 | 0.870 | Moffett & Barnes (1984) | J |
| | 9 | 3.034 | 0.852 | Shobbrook (1992) | C |
| | 18 | 3.000 | 0.913 | Barnes et al. (1997) | J |
| V340 Ara | 7 | 8.522 | 1.626 | Harris (1980) | W |
| RT Aur | 30 | 4.764 | 0.683 | Moffett & Barnes (1984) | J |
| | 27 | 4.794 | 0.689 | Barnes et al. (1997) | J |
| RX Aur | 29 | 6.642 | 1.029 | Moffett & Barnes (1984) | J |
| SY Aur | 22 | 7.871 | 1.205 | Moffett & Barnes (1984) | J |
| YZ Aur | 5 | 8.820 | 1.513 | Harris (1980) | W |
| AN Aur | 13 | 9.057 | 1.409 | Harris (1980) | W |
| RX Cam | 45 | 6.263 | 1.419 | Moffett & Barnes (1984) | J |
| RY CMa | 54 | 7.131 | 0.978 | Dean et al. (1977) | C |
| | 28 | 7.133 | 0.971 | Moffett & Barnes (1984) | J |
| RZ CMa | 35 | 8.496 | 1.201 | Moffett & Barnes (1984) | J |
| SS CMa | 55 | 8.492 | 1.449 | Coulson & Caldwell (1985) | C |
| TW CMa | 25 | 8.441 | 1.120 | Moffett & Barnes (1984) | J |
| VZ CMa | 37 | 8.155 | 1.229 | Stobie & Balona (1979) | C |
| | 17 | 8.177 | 1.238 | Berdnikov & Turner (1995b) | C |
| U Car | 26 | 5.070 | 1.233 | Coulson & Caldwell (1985) | C |
| | 25 | 5.047 | 1.224 | Berdnikov & Turner (1995b) | C |
| V Car | 7 | 6.435 | 0.944 | Dean (1977) | C |
| UX Car | 29 | 7.546 | 0.735 | Stobie & Balona (1979) | C |
| VY Car | 23 | 6.279 | 1.183 | Coulson & Caldwell (1985) | C |
| WZ Car | 37 | 7.964 | 1.297 | Coulson & Caldwell (1985) | C |
| | 26 | 7.972 | 1.297 | Berdnikov & Turner (1995b) | C |
| XX Car | 67 | 8.119 | 1.210 | Coulson et al. (1985) | C |
| XY Car | 58 | 7.952 | 1.342 | Coulson et al. (1985) | C |
| XZ Car | 39 | 7.239 | 1.358 | Coulson et al. (1985) | C |
| YZ Car | 65 | 7.436 | 1.261 | Coulson & Caldwell (1985) | C |
| AQ Car | 63 | 7.869 | 0.982 | Coulson et al. (1985) | C |
| ER Car | 6 | 5.932 | 0.865 | Dean (1977) | C |
| FR Car | 29 | 8.430 | 1.242 | Coulson & Caldwell (1985) | C |
| GH Car | 28 | 8.057 | 1.105 | Berdnikov & Turner (1995b) | C |

**Table 1.** continued

| Name | points | $<I>$ | $<V>-<I>$ | Reference | system |
|---|---|---|---|---|---|
| GI Car | 36 | 7.475 | 0.847 | Gieren (1985) | C |
| | 28 | 7.484 | 0.848 | Berdnikov & Turner (1995b) | C |
| IT Car | 31 | 7.084 | 1.012 | Gieren (1985) | C |
| $l$ Car | 25 | 2.557 | 1.177 | Dean et al. (1977)+Dean (1981) | C |
| RW Cas | 50 | 7.900 | 1.318 | Moffett & Barnes (1984) | J |
| RY Cas | 11 | 8.352 | 1.582 | Harris (1980) | W |
| SU Cas | 43 | 5.103 | 0.868 | Moffett & Barnes (1984) | J |
| | 23 | 5.086 | 0.860 | Barnes et al. (1997) | J |
| SW Cas | 39 | 8.421 | 1.283 | Moffett & Barnes (1984) | J |
| SZ Cas | 28 | 8.110 | 1.744 | Moffett & Barnes (1984) | J |
| UZ Cas | 9 | 10.051 | 1.268 | Harris (1980) | W |
| VV Cas | 19 | 9.412 | 1.340 | Harris (1980) | W |
| VW Cas | 15 | 9.361 | 1.383 | Harris (1980) | W |
| CF Cas | 32 | 9.731 | 1.405 | Moffett & Barnes (1984) | J |
| CH Cas | 14 | 8.987 | 1.988 | Harris (1980) | W |
| CY Cas | 9 | 9.604 | 2.004 | Harris (1980) | W |
| DD Cas | 28 | 8.543 | 1.336 | Moffett & Barnes (1984) | J |
| DL Cas | 34 | 7.611 | 1.357 | Moffett & Barnes (1984) | J |
| FM Cas | 29 | 8.003 | 1.125 | Moffett & Barnes (1984) | J |
| V Cen | 30 | 5.797 | 1.041 | Berdnikov & Turner (1995b) | C |
| | 35 | 5.803 | 1.017 | Gieren (1981) | C |
| VW Cen | 36 | 8.767 | 1.476 | Coulson & Caldwell (1985) | C |
| XX Cen | 65 | 6.735 | 1.082 | Coulson et al. (1985) | C |
| AZ Cen | 28 | 7.842 | 0.791 | Berdnikov & Turner (1995b) | C |
| | 20 | 7.853 | 0.776 | Gieren (1981) | C |
| | 31 | 7.812 | 0.794 | Stobie & Balona (1979) | C |
| BB Cen | 29 | 8.920 | 1.141 | Stobie & Balona (1979) | C |
| | 29 | 8.934 | 1.161 | Berdnikov & Turner (1995b) | C |
| KK Cen | 12 | 9.939 | 1.501 | Berdnikov & Turner (1995a) | C |
| KN Cen | 47 | 8.000 | 1.860 | Coulson & Caldwell (1985) | C |
| | 29 | 7.994 | 1.881 | Berdnikov & Turner (1995b) | C |
| V339 Cen | 35 | 7.392 | 1.314 | Coulson & Caldwell (1985) | C |
| V378 Cen | 28 | 7.273 | 1.193 | Gieren (1985) | C |
| | 27 | 7.263 | 1.221 | Berdnikov & Turner (1995b) | C |
| V381 Cen | 6 | 6.880 | 0.964 | Dean (1977) | C |
| V419 Cen | 27 | 7.340 | 0.850 | Berdnikov & Turner (1995b) | C |
| CR Cep | 37 | 7.991 | 1.663 | Moffett & Barnes (1984) | J |
| $\delta$ Cep | 50 | 3.209 | 0.747 | Moffett & Barnes (1984) | J |
| | 17 | 3.190 | 0.783 | Barnes et al. (1997) | J |
| AX Cir | 11 | 4.974 | 0.879 | Shobbrook (1992) | C |
| | 9 | 4.979 | 0.912 | Dean (1977) | C |
| BP Cir | 5 | 6.639 | 0.892 | Balona (1981) | C |
| R Cru | 27 | 5.909 | 0.873 | Dean et al. (1977) | C |
| S Cru | 42 | 5.751 | 0.846 | Gieren (1981) | C |
| T Cru | 31 | 5.613 | 0.958 | Dean et al. (1977) | C |
| BG Cru | 27 | 4.762 | 0.712 | Berdnikov & Turner (1995b) | C |
| | 31 | 4.753 | 0.710 | Stobie & Balona (1979) | C |
| X Cyg | 130 | 5.248 | 1.143 | Moffett & Barnes (1984) | J |
| | 17 | 5.290 | 1.183 | Barnes et al. (1997) | J |
| SU Cyg | 47 | 6.188 | 0.673 | Moffett & Barnes (1984) | J |
| SZ Cyg | 26 | 7.812 | 1.617 | Moffett & Barnes (1984) | J |
| TX Cyg | 45 | 7.261 | 2.253 | Moffett & Barnes (1984) | J |
| VX Cyg | 14 | 8.123 | 1.898 | Harris (1980) | W |
| VY Cyg | 35 | 8.122 | 1.470 | Moffett & Barnes (1984) | J |
| VZ Cyg | 33 | 7.956 | 1.002 | Moffett & Barnes (1984) | J |
| | 18 | 7.932 | 1.007 | Barnes et al. (1997) | J |

**Table 1.** continued

| Name | points | $<I>$ | $<V>-<I>$ | Reference | system |
|---|---|---|---|---|---|
| CD Cyg | 35 | 7.492 | 1.454 | Moffett & Barnes (1984) | J |
| DT Cyg | 56 | 5.171 | 0.602 | Moffett & Barnes (1984) | J |
| MW Cyg | 33 | 7.926 | 1.563 | Moffett & Barnes (1984) | J |
| V386 Cyg | 31 | 7.819 | 1.815 | Moffett & Barnes (1984) | J |
| V402 Cyg | 31 | 8.695 | 1.178 | Moffett & Barnes (1984) | J |
| V459 Cyg | 31 | 8.902 | 1.697 | Moffett & Barnes (1984) | J |
| V532 Cyg | 35 | 7.845 | 1.241 | Moffett & Barnes (1984) | J |
| V924 Cyg | 26 | 9.734 | 0.976 | Moffett & Barnes (1984) | J |
| $\beta$ Dor | 27 | 2.943 | 0.809 | Dean et al. (1977)+Dean (1981) | C |
| | 17 | 2.943 | 0.807 | Shobbrook (1992) | C |
| W Gem | 30 | 5.917 | 1.036 | Moffett & Barnes (1984) | J |
| RZ Gem | 39 | 8.696 | 1.320 | Moffett & Barnes (1984) | J |
| AA Gem | 38 | 8.556 | 1.169 | Moffett & Barnes (1984) | J |
| AD Gem | 38 | 9.043 | 0.811 | Moffett & Barnes (1984) | J |
| | 26 | 9.057 | 0.812 | Barnes et al. (1997) | J |
| DX Gem | 19 | 9.586 | 1.149 | Berdnikov & Turner (1995b) | C |
| | 35 | 9.596 | 1.146 | Moffett & Barnes (1984) | J |
| $\zeta$ Gem | 34 | 3.082 | 0.834 | Moffett & Barnes (1984) | J |
| | 10 | 3.096 | 0.797 | Shobbrook (1992) | C |
| V Lac | 54 | 7.884 | 1.053 | Moffett & Barnes (1984) | J |
| X Lac | 52 | 7.341 | 1.064 | Moffett & Barnes (1984) | J |
| | 16 | 7.325 | 1.078 | Barnes et al. (1997) | J |
| Y Lac | 35 | 8.289 | 0.856 | Moffett & Barnes (1984) | J |
| | 18 | 8.275 | 0.867 | Barnes et al. (1997) | J |
| Z Lac | 38 | 7.179 | 1.236 | Moffett & Barnes (1984) | J |
| | 16 | 7.172 | 1.248 | Barnes et al. (1997) | J |
| RR Lac | 40 | 7.793 | 1.052 | Moffett & Barnes (1984) | J |
| BG Lac | 32 | 7.806 | 1.076 | Moffett & Barnes (1984) | J |
| | 18 | 7.802 | 1.079 | Barnes et al. (1997) | J |
| GH Lup | 50 | 6.375 | 1.259 | Coulson & Caldwell (1985) | C |
| V473 Lyr | 13 | 5.409 | 0.710 | Berdnikov & Turner (1995a,c) | C |
| T Mon | 28 | 4.969 | 1.162 | Coulson & Caldwell (1985) | C |
| | 23 | 4.992 | 1.139 | Moffett & Barnes (1984) | J |
| | 25 | 4.982 | 1.152 | Berdnikov & Turner (1995b) | C |
| SV Mon | 37 | 7.137 | 1.119 | Coulson & Caldwell (1985) | C |
| | 25 | 7.146 | 1.118 | Moffett & Barnes (1984) | J |
| TX Mon | 23 | 9.629 | 1.328 | Berdnikov & Turner (1995b) | C |
| | 38 | 9.644 | 1.317 | Moffett & Barnes (1984) | J |
| TZ Mon | 21 | 9.468 | 1.323 | Berdnikov & Turner (1995b) | C |
| AC Mon | 19 | 8.706 | 1.393 | Berdnikov & Turner (1995b) | C |
| CV Mon | 23 | 8.647 | 1.644 | Berdnikov & Turner (1995b) | C |
| | 30 | 8.674 | 1.624 | Moffett & Barnes (1984) | J |
| EK Mon | 21 | 9.608 | 1.451 | Berdnikov & Turner (1995b) | C |
| V465 Mon | 20 | 9.473 | 0.895 | Berdnikov & Turner (1995b) | C |
| V508 Mon | 24 | 9.460 | 1.039 | Berdnikov & Turner (1995b) | C |
| V526 Mon | 24 | 7.899 | 0.730 | Berdnikov & Turner (1995b) | C |
| R Mus | 7 | 5.499 | 0.825 | Dean et al. (1977) | C |
| S Mus | 7 | 5.129 | 0.912 | Dean (1977) | C |
| RT Mus | 35 | 7.967 | 1.029 | Stobie & Balona (1979) | C |
| UU Mus | 35 | 8.485 | 1.294 | Coulson & Caldwell (1985) | C |
| S Nor | 32 | 5.427 | 1.001 | Dean et al. (1977)+Dean (1981) | C |
| U Nor | 40 | 7.351 | 1.874 | Coulson & Caldwell (1985) | C |
| GU Nor | 5 | 8.793 | 1.529 | Harris (1980) | W |
| Y Oph | 29 | 4.559 | 1.592 | Coulson & Caldwell (1985) | C |
| | 39 | 4.564 | 1.606 | Moffett & Barnes (1984) | J |
| BF Oph | 34 | 6.363 | 0.969 | Gieren (1981) | C |
| | 38 | 6.382 | 0.958 | Moffett & Barnes (1984) | J |

**Table 1.** continued

| Name | points | $<I>$ | $<V>-<I>$ | Reference | system |
|---|---|---|---|---|---|
| RS Ori | 49 | 7.277 | 1.129 | Moffett & Barnes (1984) | J |
| GQ Ori | 49 | 7.881 | 1.082 | Moffett & Barnes (1984) | J |
| SV Per | 32 | 7.761 | 1.224 | Moffett & Barnes (1984) | J |
| SX Per | 12 | 9.822 | 1.346 | Harris (1980) | W |
| VX Per | 31 | 7.953 | 1.350 | Moffett & Barnes (1984) | J |
| AS Per | 44 | 8.144 | 1.575 | Moffett & Barnes (1984) | J |
| AW Per | 35 | 6.227 | 1.261 | Moffett & Barnes (1984) | J |
| X Pup | 19 | 7.134 | 1.314 | Moffett & Barnes (1984) | J |
| | 23 | 7.171 | 1.365 | Berdnikov & Turner (1995b) | C |
| RS Pup | 25 | 5.489 | 1.531 | Berdnikov & Turner (1995b) | C |
| | 21 | 5.485 | 1.514 | Moffett & Barnes (1984) | J |
| VZ Pup | 39 | 8.304 | 1.336 | Coulson & Caldwell (1985) | C |
| | 22 | 8.293 | 1.350 | Berdnikov & Turner (1995b) | C |
| WX Pup | 24 | 7.958 | 1.101 | Moffett & Barnes (1984) | J |
| WZ Pup | 23 | 9.419 | 0.917 | Moffett & Barnes (1984) | J |
| AD Pup | 22 | 8.709 | 1.187 | Berdnikov & Turner 1995b) | C |
| AP Pup | 7 | 6.466 | 0.939 | Dean (1977) | C |
| AQ Pup | 20 | 7.150 | 1.526 | Coulson & Caldwell (1985) | C |
| | 24 | 7.140 | 1.546 | Berdnikov & Turner (1995b) | C |
| | 30 | 7.191 | 1.600 | Moffett & Barnes (1984) | J |
| AT Pup | 32 | 7.067 | 0.905 | Gieren (1985) | C |
| BN Pup | 34 | 8.551 | 1.334 | Coulson & Caldwell (1985) | C |
| EK Pup | 22 | 9.630 | 1.034 | Berdnikov & Turner (1995b) | C |
| LS Pup | 40 | 9.091 | 1.378 | Coulson & Caldwell (1985) | C |
| | 25 | 9.072 | 1.391 | Berdnikov & Turner (1995b) | C |
| MY Pup | 31 | 4.908 | 0.758 | Stobie & Balona (1979) | C |
| | 23 | 4.900 | 0.763 | Berdnikov & Turner (1995b) | C |
| S Sge | 43 | 4.784 | 0.839 | Moffett & Barnes (1984) | J |
| | 8 | 4.801 | 0.847 | Berdnikov & Turner (1995b) | C |
| | 17 | 4.770 | 0.847 | Barnes et al. (1997) | J |
| U Sgr | 46 | 5.449 | 1.238 | Gieren (1981) | C |
| | 11 | 5.438 | 1.271 | Berdnikov & Turner (1995b) | C |
| | 12 | 5.412 | 1.268 | Berdnikov & Turner (1995a) | C |
| | 36 | 5.465 | 1.230 | Moffett & Barnes (1984) | J |
| W Sgr | 39 | 3.868 | 0.804 | Moffett & Barnes (1984) | J |
| | 7 | 3.855 | 0.819 | Dean (1977) | C |
| | 9 | 3.843 | 0.798 | Shobbrook (1992) | C |
| X Sgr | 44 | 3.663 | 0.899 | Moffett & Barnes (1984) | J |
| | 7 | 3.653 | 0.892 | Dean (1977) | C |
| | 10 | 3.659 | 0.878 | Shobbrook (1992) | C |
| Y Sgr | 38 | 4.821 | 0.925 | Moffett & Barnes (1984) | J |
| | 8 | 4.781 | 0.948 | Dean (1977) | C |
| WZ Sgr | 37 | 6.586 | 1.449 | Coulson & Caldwell (1985) | C |
| | 37 | 6.544 | 1.483 | Moffett & Barnes (1984) | J |
| XX Sgr | 34 | 7.504 | 1.350 | Moffett & Barnes (1984) | J |
| YZ Sgr | 20 | 6.217 | 1.128 | Moffett & Barnes (1984) | J |
| | 12 | 6.217 | 1.125 | Berdnikov & Turner (1995b) | C |
| AP Sgr | 35 | 6.038 | 0.905 | Gieren (1981) | C |
| | 13 | 6.049 | 0.930 | Berdnikov & Turner (1995b) | C |
| | 38 | 6.052 | 0.898 | Moffett & Barnes (1984) | J |
| AY Sgr | 7 | 8.683 | 1.785 | Harris (1980) | W |
| BB Sgr | 45 | 5.829 | 1.106 | Gieren (1981) | C |
| | 14 | 5.841 | 1.108 | Berdnikov & Turner (1995b) | C |
| | 27 | 5.838 | 1.108 | Moffett & Barnes (1984) | J |
| | 28 | 5.805 | 1.139 | Berdnikov & Turner (1995a) | C |
| V350 Sgr | 34 | 6.421 | 1.041 | Gieren (1981) | C |
| | 16 | 6.430 | 1.049 | Berdnikov & Turner (1995b) | C |
| | 23 | 6.430 | 1.052 | Moffett & Barnes (1984) | J |

**Table 1.** continued

| Name | points | $<I>$ | $<V> - <I>$ | Reference | system |
|---|---|---|---|---|---|
| RV Sco | 32 | 5.897 | 1.129 | Gieren (1981) | C |
| | 23 | 5.921 | 1.122 | Moffett & Barnes (1984) | J |
| RY Sco | 28 | 6.278 | 1.738 | Coulson & Caldwell (1985) | C |
| | 29 | 6.306 | 1.706 | Moffett & Barnes (1984) | J |
| KQ Sco | 56 | 7.659 | 2.150 | Coulson & Caldwell (1985) | C |
| V482 Sco | 46 | 6.850 | 1.125 | Gieren (1981) | C |
| | 24 | 6.848 | 1.116 | Moffett & Barnes (1984) | J |
| V500 Sco | 25 | 7.234 | 1.504 | Moffett & Barnes (1984) | J |
| V636 Sco | 7 | 5.645 | 1.012 | Dean (1977) | C |
| V950 Sco | 26 | 6.404 | 0.906 | Berdnikov & Turner (1995b) | C |
| X Sct | 8 | 8.560 | 1.452 | Harris (1980) | W |
| Y Sct | 46 | 7.825 | 1.801 | Moffett & Barnes (1984) | J |
| Z Sct | 50 | 8.103 | 1.481 | Moffett & Barnes (1984) | J |
| RU Sct | 31 | 7.467 | 2.006 | Moffett & Barnes (1984) | J |
| SS Sct | 42 | 7.116 | 1.086 | Gieren (1981) | C |
| | 29 | 7.116 | 1.094 | Moffett & Barnes (1984) | J |
| TY Sct | 7 | 8.749 | 2.005 | Harris (1980) | W |
| CK Sct | 9 | 8.715 | 1.840 | Harris (1980) | W |
| CM Sct | 27 | 9.458 | 1.648 | Moffett & Barnes (1984) | J |
| EV Sct | 33 | 8.667 | 1.470 | Moffett & Barnes (1984) | J |
| | 10 | 8.677 | 1.471 | Berdnikov & Turner (1995b) | C |
| CR Ser | 12 | 8.893 | 1.968 | Berdnikov & Turner (1995b) | C |
| ST Tau | 55 | 7.157 | 1.061 | Moffett & Barnes (1984) | J |
| | 32 | 7.241 | 1.125 | Barnes et al. (1997) | J |
| SZ Tau | 35 | 5.539 | 0.992 | Moffett & Barnes (1984) | J |
| | 42 | 5.523 | 1.001 | Barnes et al. (1997) | J |
| EU Tau | 213 | 7.296 | 0.797 | Gieren et al. (1989) | J |
| R Tra | 43 | 5.846 | 0.808 | Gieren (1981) | C |
| | 11 | 5.842 | 0.822 | Dean (1981) | C |
| S Tra | 33 | 5.588 | 0.796 | Gieren (1981) | C |
| $\alpha$ UMi | 10 | 1.370 | 0.609 | Arellano Ferro (1983) | J |
| T Vel | 32 | 6.983 | 1.044 | Gieren (1985) | C |
| V Vel | 36 | 6.724 | 0.862 | Gieren (1985) | C |
| RY Vel | 42 | 6.833 | 1.532 | Coulson & Caldwell (1985) | C |
| | 26 | 6.827 | 1.550 | Berdnikov & Turner (1995b) | C |
| RZ Vel | 27 | 5.880 | 1.208 | Coulson & Caldwell (1985) | C |
| | 26 | 5.860 | 1.231 | Berdnikov & Turner (1995b) | C |
| SV Vel | 26 | 7.328 | 1.255 | Berdnikov & Turner (1995b) | C |
| SW Vel | 27 | 6.845 | 1.272 | Coulson & Caldwell (1985) | C |
| | 26 | 6.846 | 1.283 | Berdnikov & Turner (1995b) | C |
| SX Vel | 5 | 7.248 | 0.996 | Dean (1977) | C |
| AH Vel | 23 | 5.051 | 0.658 | Berdnikov & Turner (1995b) | C |
| BG Vel | 7 | 6.350 | 1.323 | Dean (1977) | C |
| DR Vel | 32 | 7.829 | 1.687 | Coulson & Caldwell (1985) | C |
| T Vul | 57 | 5.052 | 0.701 | Moffett & Barnes (1984) | J |
| | 17 | 5.054 | 0.695 | Barnes et al. (1997) | J |
| U Vul | 33 | 5.595 | 1.532 | Moffett & Barnes (1984) | J |
| | 18 | 5.575 | 1.522 | Barnes et al. (1997) | J |
| X Vul | 36 | 7.199 | 1.650 | Moffett & Barnes (1984) | J |
| SV Vul | 34 | 5.721 | 1.507 | Moffett & Barnes (1984) | J |
| | 17 | 5.678 | 1.486 | Barnes et al. (1997) | J |

**Table 2.** Cepheids without intensity-mean $I$-band data

| Name | $V$ | $I$ | $V-I$ | Reference |
|---|---|---|---|---|
| V336 Aql | | | 1.522 | Caldwell & Coulson (1987) |
| SX Car | | | 1.136 | Caldwell & Coulson (1987) |
| UW Car | | | 1.205 | Caldwell & Coulson (1987) |
| UZ Car | | | 0.988 | Caldwell & Coulson (1987) |
| WW Car | | | 1.097 | Caldwell & Coulson (1987) |
| GX Car | | | 1.221 | Caldwell & Coulson (1987) |
| AY Cen | | | 1.142 | Caldwell & Coulson (1987) |
| V496 Cen | | | 1.397 | Caldwell & Coulson (1987) |
| V1334 Cyg | 5.885 | 5.275 | | Arellano Ferro (1984) |
| IQ Nor | | | 1.627 | Caldwell & Coulson (1987) |
| V440 Per | 6.247 | 5.273 | | Arellano Ferro (1984) |
| WY Pup | | | 0.882 | Caldwell & Coulson (1987) |
| ST Vel | | | 1.388 | Caldwell & Coulson (1987) |
| AE Vel | | | 1.565 | Caldwell & Coulson (1987) |

**Table 3.** Cepheids without $I$-band data

| | | | | |
|---|---|---|---|---|
| V493 Aql | Y Aur | BK Aur | CK Cam | RW CMa |
| TV CMa | CN Car | CY Car | EY Car | FN Car |
| HW Car | RS Cas | SY Cas | XY Cas | BP Cas |
| BY Cas | CD Cas | DF Cas | DW Cas | V636 Cas |
| V659 Cen | V737 Cen | V898 Cen | AK Cep | CP Cep |
| IR Cep | AV Cir | AD Cru | GH Cyg | V495 Cyg |
| V520 Cyg | V538 Cyg | V1154 Cyg | V411 Lac | BE Mon |
| RS Nor | CS Ori | VW Pup | WW Pup | HL Pup |
| LX Pup | XX Vel | DK Vel | FN Vel | BR Vul |

## References


Andrievsky S.M., Kovtyukh V.V., Bersier D., et al., 1998, A&A 329, 599
Antonello E., Poretti E., Reduzzi L., 1990, A&A 236, 138
Arellano Ferro A., 1983, ApJ 274, 755
Arellano Ferro A., 1984, MNRAS 209, 481
Balona B.A., 1981, The Observatory 101, 163
Barnes T.G., Fernley J.A., Frueh M.L., et al., 1997, PASP 109, 645
Berdnikov L.N., 1992, Astron. and Astrophys. Transactions 2, 43
Berdnikov L.N., 1993, Pis'ma Astron. J. 19, 210
Berdnikov L.N., Turner D.G., 1995a, Pis'ma Astr. J. 21, 603
Berdnikov L.N., Turner D.G., 1995b, Pis'ma Astr. J. 21, 803
Berdnikov L.N., Turner D.G., 1995c, IBVS 4212, 1
Berdnikov L.N., Vozyakova O.V., Ignatova V.V., 1996, IBVS 4375
Caldwell J.A.R., Coulson I.M., 1987, AJ 93, 1090
Coulson I.M., Caldwell J.A.R. 1985, SAAOC 9, 5
Coulson I.M., Caldwell J.A.R., Gieren W.P., 1985, ApJS 57, 595
Dean J.F., 1977, MNASSA 36, 3
Dean J.F., 1981, SAAOC 6, 10
Dean J.F., Warren P.R., Cousins A.W.J., 1977, MemRAS 83, 69
ESA, "The Hipparcos Mission, volume II: The Input Catalogue", 1989, ESA SP-1111, p. 104
ESA, "The Hipparcos and Tycho Catalogues", 1997, ESA SP-1200
Falin J.L., Mignard F., 1999, A&AS 135, 231
Feast M.W., Catchpole R.M., 1997, MNRAS 286, L1
Fernie J.D., Beattie B., Evans N.R., Seager S., 1995, IBVS 4148
Fernley J.A., Skillen I., Jameson R.F., 1989, MNRAS 237, 947
Gieren W.P., 1981, ApJS 47, 315
Gieren W.P., 1985, ApJ 295, 507
Gieren W.P., Matthews J.M., Moffett T.J., et al., 1989, AJ 98, 1672
Gieren W.P., Fouqué P., Gómez M., 1998, ApJ 496, 17
Harris H.C., 1980, PhD. Thesis, University of Washington
Kholopov P.N., et al., 1985, General Catalog of Variable Stars (GCVS), Nauka, Moscow
Laney C.D., Stobie R.S., 1992, A&AS 93, 93
Laney C.D., Stobie R.S., 1993, MNRAS 263, 921
Lloyd Evans, T., 1980, SAAO Circular, Vol. 1, 163
McGonegal R., McAlary C.W., McLaren R.A., Madore B.F., 1983, ApJ 269, 641
Moffett T.J., Barnes T.G., 1984, ApJS 55, 389
Sachkov M.E., 1997, IBVS 4522
Schechter P.L., Avruch I.M., Caldwell J.A.R., Keane M.J., 1992, AJ 104, 1930
Shobbrook R.R., 1992, MNRAS 255, 486
Stobie R.S., Balona L.A., 1979, MNRAS 189, 641
Tanvir N.R., 1997, in: "The extra-galactic distance scale", Eds. M. Livio, M. Donahue, N. Panagia, Cambridge UP, p. 91
Tanvir N.R., 1999, in: "Harmonizing Distance scales in a post-Hipparcos Era", eds. D. Egret & A. Heck, ASP, p. 84
Van Hoolst T., Waelkens C., 1995, A&A 295, 361
Welch D.L., 1997, http://www.physics.mcmaster.ca/Cepheid/
Welch D.L., Wieland F., McAlary C.W., et al., 1984, ApJS 54, 547

**Table 4.** Intensity-mean $JHK$ data

| Name | points | $<J>$ | $<H>$ | $<K>$ | Reference |
|---|---|---|---|---|---|
| U Aql | 21 | 4.484 | 4.005 | 3.893 | Welch et al. (1984) |
| SZ Aql | 37 | 5.953 | 5.346 | 5.159 | Laney & Stobie (1992) |
| | 30 | 5.994 | 5.359 | 5.181 | Barnes et al. (1997) |
| | 25 | 5.971 | 5.377 | 5.200 | Welch et al. (1984) |
| TT Aql | 34 | 4.783 | 4.202 | 4.053 | Barnes et al. (1997) |
| | 22 | 4.761 | 4.202 | 4.053 | Welch et al. (1984) |
| FF Aql | 21 | 3.929 | 3.575 | 3.489 | Welch et al. (1984) |
| FM Aql | 34 | 5.794 | 5.215 | 5.060 | Barnes et al. (1997) |
| | 20 | 5.776 | 5.233 | 5.071 | Welch et al. (1984) |
| FN Aql | 32 | 6.077 | 5.499 | 5.355 | Barnes et al. (1997) |
| | 20 | 6.057 | 5.502 | 5.361 | Welch et al. (1984) |
| V496 Aql | 22 | 5.649 | 5.142 | 5.037 | Welch et al. (1984) |
| $\eta$ Aql | 26 | 2.471 | 2.053 | 1.977 | Barnes et al. (1997) |
| | 23 | 2.453 | 2.063 | 1.985 | Welch et al. (1984) |
| RT Aur | 12 | 4.254 | 3.961 | 3.904 | Barnes et al. (1997) |
| U Car | 33 | 4.193 | 3.669 | 3.521 | Laney & Stobie (1992) |
| V Car | 26 | 5.805 | 5.388 | 5.285 | Laney & Stobie (1992) |
| VY Car | 44 | 5.463 | 4.945 | 4.806 | Laney & Stobie (1992) |
| WZ Car | 48 | 7.008 | 6.456 | 6.290 | Laney & Stobie (1992) |
| $l$ Car | 31 | 1.765 | 1.210 | 1.091 | Laney & Stobie (1992) |
| SU Cas | 31 | 4.531 | 4.197 | 4.127 | Barnes et al. (1997) |
| V Cen | 30 | 5.073 | 4.628 | 4.509 | Laney & Stobie (1992) |
| VW Cen | 41 | 7.655 | 7.015 | 6.819 | Laney & Stobie (1992) |
| XX Cen | 36 | 5.992 | 5.531 | 5.407 | Laney & Stobie (1992) |
| KN Cen | 42 | 6.515 | 5.754 | 5.489 | Laney & Stobie (1992) |
| $\delta$ Cep | 27 | 2.748 | 2.382 | 2.321 | Barnes et al. (1997) |
| X Cyg | 29 | 4.478 | 3.957 | 3.831 | Barnes et al. (1997) |
| | 20 | 4.444 | 3.950 | 3.835 | Welch et al. (1984) |
| SU Cyg | 21 | 5.713 | 5.383 | 5.332 | Welch et al. (1984) |
| VZ Cyg | 30 | 7.290 | 6.860 | 6.750 | Barnes et al. (1997) |
| | 12 | 7.261 | 6.865 | 6.762 | Welch et al. (1984) |
| CD Cyg | 19 | 6.451 | 5.880 | 5.712 | Welch et al. (1984) |
| DT Cyg | 20 | 4.749 | 4.469 | 4.430 | Welch et al. (1984) |
| $\beta$ Dor | 42 | 2.438 | 2.029 | 1.959 | Laney & Stobie (1992) |
| AD Gem | 17 | 8.525 | 8.133 | 8.060 | Barnes et al. (1997) |
| X Lac | 26 | 6.607 | 6.149 | 6.042 | Barnes et al. (1997) |
| Y Lac | 28 | 7.706 | 7.307 | 7.222 | Barnes et al. (1997) |
| Z Lac | 28 | 6.344 | 5.819 | 5.688 | Barnes et al. (1997) |
| BG Lac | 31 | 7.112 | 6.650 | 6.539 | Barnes et al. (1997) |
| GH Lup | 26 | 5.492 | 4.960 | 4.813 | Laney & Stobie (1992) |
| T Mon | 29 | 4.185 | 3.653 | 3.525 | Laney & Stobie (1992) |
| CV Mon | 26 | 7.404 | 6.792 | 6.576 | Laney & Stobie (1992) |
| S Mus | 26 | 4.553 | 4.125 | 4.015 | Laney & Stobie (1992) |
| UU Mus | 47 | 7.529 | 6.990 | 6.828 | Laney & Stobie (1992) |
| S Nor | 31 | 4.729 | 4.275 | 4.162 | Laney & Stobie (1992) |
| | 8 | 4.753 | 4.306 | 4.198 | Welch et al. (1984) |
| U Nor | 40 | 5.930 | 5.236 | 4.990 | Laney & Stobie (1992) |
| Y Oph | 22 | 3.437 | 2.869 | 2.682 | Laney & Stobie (1992) |
| | 30 | 3.445 | 2.881 | 2.715 | Welch et al. (1984) |
| BF Oph | 20 | 5.700 | 5.285 | 5.178 | Laney & Stobie (1992) |
| X Pup | 31 | 6.180 | 5.600 | 5.431 | Laney & Stobie (1992) |
| RS Pup | 30 | 4.432 | 3.815 | 3.634 | Laney & Stobie (1992) |
| | 9 | 4.434 | 3.867 | 3.688 | Welch et al. (1984) |
| VZ Pup | 33 | 7.371 | 6.829 | 6.669 | Laney & Stobie (1992) |
| AQ Pup | 40 | 6.098 | 5.481 | 5.298 | Laney & Stobie (1992) |
| BN Pup | 46 | 7.624 | 7.076 | 6.922 | Laney & Stobie (1992) |
| LS Pup | 45 | 8.094 | 7.517 | 7.354 | Laney & Stobie (1992) |
| S Sge | 31 | 4.233 | 3.833 | 3.758 | Barnes et al. (1997) |
| | 22 | 4.225 | 3.845 | 3.773 | Welch et al. (1984) |

**Table 4.** Continued

| Name | points | $< J >$ | $< H >$ | $< K >$ | Reference |
|---|---|---|---|---|---|
| RY Sco | 29 | 4.999 | 4.365 | 4.143 | Laney & Stobie (1992) |
| KQ Sco | 27 | 6.024 | 5.216 | 4.946 | Laney & Stobie (1992) |
| RU Sct | 40 | 6.018 | 5.312 | 5.068 | Laney & Stobie (1992) |
| SS Sct | 22 | 6.382 | 5.943 | 5.845 | Welch et al. (1984) |
| EV Sct | 12 | 7.664 | 7.171 | 7.029 | Laney & Stobie (1992) |
| | 8 | 7.662 | 7.151 | 6.972 | Welch et al. (1984) |
| U Sgr | 30 | 4.586 | 4.092 | 3.953 | Laney & Stobie (1992) |
| | 29 | 4.602 | 4.089 | 3.990 | Welch et al. (1984) |
| Y Sgr | 26 | 4.137 | 3.695 | 3.612 | Welch et al. (1984) |
| XX Sgr | 21 | 6.496 | 5.959 | 5.834 | Welch et al. (1984) |
| YZ Sgr | 26 | 5.471 | 4.994 | 4.898 | Welch et al. (1984) |
| BB Sgr | 19 | 5.099 | 4.639 | 4.511 | Laney & Stobie (1992) |
| | 27 | 5.113 | 4.634 | 4.542 | Welch et al. (1984) |
| AP Sgr | 27 | 5.417 | 4.975 | 4.893 | Welch et al. (1984) |
| V350 Sgr | 26 | 5.709 | 5.243 | 5.158 | Welch et al. (1984) |
| ST Tau | 10 | 6.401 | 5.956 | 5.838 | Barnes et al. (1997) |
| SZ Tau | 17 | 4.831 | 4.408 | 4.311 | Laney & Stobie (1992) |
| | 19 | 4.837 | 4.430 | 4.330 | Barnes et al. (1997) |
| T Vel | 37 | 6.225 | 5.768 | 5.641 | Laney & Stobie (1992) |
| RY Vel | 33 | 5.703 | 5.122 | 4.928 | Laney & Stobie (1992) |
| RZ Vel | 40 | 4.979 | 4.461 | 4.309 | Laney & Stobie (1992) |
| SW Vel | 36 | 5.933 | 5.393 | 5.234 | Laney & Stobie (1992) |
| SX Vel | 27 | 6.554 | 6.120 | 6.001 | Laney & Stobie (1992) |
| T Vul | 35 | 4.604 | 4.259 | 4.198 | Barnes et al. (1997) |
| | 19 | 4.598 | 4.263 | 4.215 | Welch et al. (1984) |
| U Vul | 27 | 4.630 | 4.093 | 3.953 | Barnes et al. (1997) |
| SV Vul | 27 | 4.668 | 4.077 | 3.921 | Laney & Stobie (1992) |
| | 26 | 4.662 | 4.104 | 3.936 | Welch et al. (1984) |
| | 30 | 4.682 | 4.074 | 3.917 | Barnes et al. (1997) |