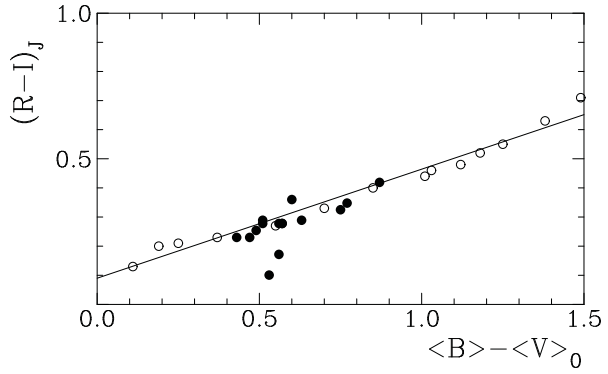


Fig. 7. Derived Johnson system $(R–I)_J$ colors for sample Cepheids (filled circles) relative to intrinsic $(\langle B\rangle–\langle V\rangle)_0$ colors, with derived colors for AFGK supergiants from Johnson (1966) plotted for reference purposes as open circles. The line is a fitted relation for the supergiants. The anomalous Cepheids are V1882 Sgr and YZ CMa.

TABLE 3

UNREDDENED $BV(RI)_C$ COLORS FOR SAMPLE CEPHEIDS

| Cepheid | log $P$ | Type | $\langle B\rangle–\langle V\rangle$ | $V–R_C$ | $V–I_C$ | Deduced Type |
|---|---|---|---|---|---|---|
| UY Mon | 0.380 | DCEPS | +0.43 | +0.28 | +0.51 | DCEPS[1] |
| CN CMa | 0.390 | CWB: | +0.51 | +0.33 | +0.61 | DCEP |
| EW Aur | 0.425 | DCEP | +0.49 | +0.29 | +0.54 | DCEP |
| V1882 Sgr | 0.433 | CEP | +0.53 | +0.30 | +0.42 | CWB |
| BE Pup | 0.458 | CWB: | +0.47 | +0.29 | +0.52 | DCEP |
| YZ CMa | 0.499 | CWB: | +0.56 | +0.28 | +0.46 | CWB? |
| LR Pup | 0.523 | CEP | +0.51 | +0.32 | +0.59 | DCEP |
| BD Pup | 0.593 | DCEP | +0.56 | +0.36 | +0.63 | DCEP |
| IO Cas | 0.748 | DCEP | +0.57 | +0.36 | +0.63 | CWB? |
| AY Sgr | 0.818 | DCEP | +0.57 | +0.31 | +0.58 | DCEP |
| FO Cas | 0.832 | DCEP | +0.60 | +0.44 | +0.78 | CWB? |
| AC Mon | 0.904 | DCEP | +0.63 | +0.35 | +0.63 | DCEP |
| HZ Per | 1.052 | DCEP | +0.77 | +0.40 | +0.73 | DCEP |
| VY Sgr | 1.132 | DCEP | +0.75 | +0.43 | +0.74 | DCEP |
| OT Per | 1.416 | DCEP | +0.87 | +0.49 | +0.88 | DCEP |

[1]Fundamental mode pulsation likely.

With regard to the variable star designations for specific objects in Table 3, the short period Cepheids UY Mon and CN CMa are solar-metallicity stars according to Diethelm (1990), who derived reddenings of $E_{B-V} = 0.15 \pm 0.08$ and $0.61 \pm 0.10$, respectively, for the stars from Walraven photometry. Both values are consistent with the present results, although of lower precision. UY Mon is an s-Cepheid, its light curve being indistinguishable from a sine wave, many of which are overtone pulsators, yet fundamental mode pulsation provides the simplest solution to the variable-extinction study presented here (Figure 3), provided it is a classical Cepheid. CN CMa is a suspected Type II Cepheid because of its unusually large amplitude for a short-period pulsator, but that designation is not consistent with its photometric solar metallicity (Diethelm 1990) or the variable-extinction analysis. Type II Cepheids are known to display a wide range of abundances, from solar to below solar (Harris 1981), so that is not necessarily a good criterion to decide Population type for CN CMa. A better case for it being a classical Cepheid lies in the variable-extinction results (Figure 3). Its $(RI)_C$ and $(RI)_J$ colors are also consistent with those of a classical Cepheid (Figure 7), which is the designation preferred here.

For four of the sample objects the field star variable-extinction data produce results indicating that the Cepheid's luminosity may have been overestimated in the analysis, i.e., it might be a Type II object. The Cepheids are V1882 Sgr, BE Pup, IO Cas, and FO Cas. The latter two objects are identified as classical Cepheids in the GCVS, so either the variable-extinction results for them are anomalous or the classification of the stars is erroneous. The latter possibility is suspected here, so their deduced types as Type II Cepheids in the last column of Table 3 reflect the results of the variable-extinction analysis. V1882 Sgr has the characteristic light curve of a Cepheid, but is of uncertain type. The variable-extinction results suggest that it is a Type II object, while its $V(RI)_C$ colors (Table 3) are slightly bluer than those of classical Cepheids in the sample, which may indicate a metal-poor object. The "CEP" designation for the star in the GCVS is presumably preliminary, and it appears likely to be a Type II object. Similarly, the variable-extinction results for BE Pup are consistent with either a classical or Type II Cepheid, while its $V(RI)_C$ colors (Table 3) are similar to those of classical Cepheids in the sample. BE Pup is also a double-mode pulsator (Wils & Otero 2004), which is suggestive of a classical Cepheid, our preferred designation.

YZ CMa is suspected to be a classical Cepheid according to the variable-extinction analysis, but its $V(RI)_C$ colors are also slightly bluer than those of other classical Cepheids. The "CWB": designation in the GCVS may therefore be correct, although further study is needed to resolve the question. In general, the studies summarized here consistently tend to identify most sample objects (11/15) as classical Cepheids. Two of the likely Type II objects, V1882 Sgr and YZ CMa, appear slightly bluer in $V–R_C$ and $V–I_C$ than other Cepheids in the sample, but the photometry for both stars may suffer from contamination by close companions, so their distinctive dif-