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# PHOTOMETRIC OBSERVATIONS OF SELECTED, OPTICALLY BRIGHT QUASARS FOR SPACE INTERFEROMETRY MISSION AND OTHER FUTURE CELESTIAL REFERENCE FRAMES

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## ABSTRACT

Photometric observations of 235 extragalactic objects that are potential targets for the Space Interferometry Mission (SIM) are presented. Mean  $B$ ,  $V$ ,  $R$ ,  $I$  magnitudes at the 5% level are obtained at 1–4 epochs between 2005 and 2007 using the 1 m telescopes at Cerro Tololo Inter-American Observatory and the Naval Observatory Flagstaff Station. Of the 134 sources that have  $V$  magnitudes in the Veron & Veron-Cetty catalog, a difference of over 1.0 mag is found for the observed-catalog magnitudes for about 36% of the common sources, and 10 sources show over 3 mag difference. Our first set of observations presented here form the basis of a long-term photometric variability study of the selected reference frame sources to assist in mission target selection and to support QSO multicolor photometric variability studies in general.

*Key words:* astrometry – galaxies: photometry – quasars: general – reference systems

*Online-only material:* machine-readable and VO tables

## 1. INTRODUCTION

The Space Interferometry Mission (SIM) is a proposed facility of the National Aeronautics and Space Administration (NASA) that will be the first space-based Michelson interferometer for astrometry. The version of SIM described here is SIM-Lite (Unwin et al. 2009). It will have a 6 m baseline and operate in the optical/near-IR wave band. For stars brighter than  $V = 20$ , it will deliver a global astrometric accuracy of  $4 \mu\text{as}$ . When operating in its narrow angle mode, it will achieve a positional accuracy of  $1.0 \mu\text{as}$  for a single measurement, with even smaller errors for differential positional accuracy at the end of five years (the nominal mission lifetime). This performance is at least 2 orders of magnitude better than any existing instrument. Astrometry at these unprecedented levels of precision will significantly impact a broad range of astronomy, from the search for planetary systems to a more accurate value of the Hubble constant, from measurements of dynamical masses of binary stars to the dynamics of accretion disks around supermassive black holes (Unwin et al. 2008).

A key contribution of SIM will be the creation of a new absolute reference frame. The International Celestial Reference Frame (ICRF) is currently the fundamental celestial reference frame and the standard frame for all astrometry. It is defined by the radio positions of 212 extragalactic radio sources with most having errors below 1 mas (Johnston et al. 1995; Ma et al. 1998). SIM will be capable of defining a celestial reference frame at optical/near-IR wavelengths, which will have orders of magnitude greater accuracy than the ICRF with an expected level of about  $4 \mu\text{as}$ . The SIM reference frame will be defined by the positions and motions of 1304 reference grid stars uniformly distributed over the entire sky. The SIM grid stars are selected K0III stars of visual magnitude 10–12. The positions of these grid stars will be determined (end of mission) relative to one another to an accuracy of  $<4 \mu\text{as}$  in position and parallax and

$<4 \mu\text{as yr}^{-1}$  in proper motion, with individual observations being accurate to  $10 \mu\text{as}$ .

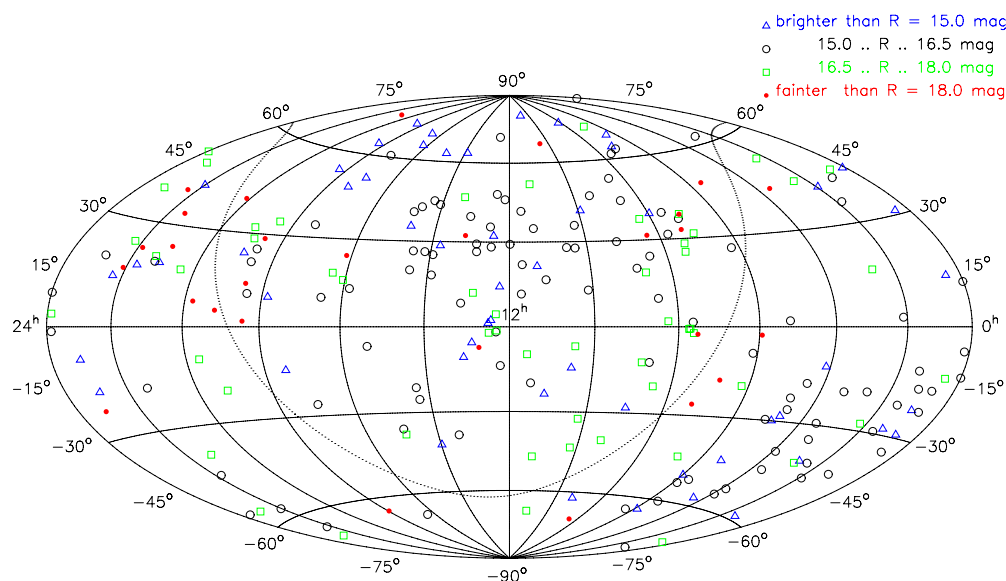
In order to remove any residual rotation in the SIM stellar reference frame, i.e., to make the frame quasi-inertial, and enable the determination of absolute proper motions, a number of extragalactic sources will be observed by SIM. These distant sources are assumed to have negligible proper motions and parallax. In theory, a minimum of two fixed extragalactic objects needs to be observed for this purpose. In practice, possible structure and variability of the extragalactic sources and zonal errors in the SIM stellar grid solution dictate that a global distribution of at least 20–50 extragalactic sources be used (Makarov et al. 2006). Besides making the SIM reference frame inertial for dynamical applications, the orientation of this new reference frame will be aligned to the current ICRF by observing a subset of the ICRF extragalactic sources that display bright, optical counterparts.

SIM is a pointed mission and only a limited number of targets can be observed. Although targets as faint as 20th magnitude can be observed with SIM to full accuracy, the required observing time is prohibitive for a large number of targets. We wish to minimize observing time for SIM by finding the brightest, suitable sources possible and by ensuring a good all-sky distribution required to establish an inertial reference frame for SIM global astrometry. The goal is to select mainly  $R \leq 16^m$  QSO targets with some fainter sources to fill in gaps in the sky coverage.

Here, we present the results from photometric observations of potential SIM quasar targets in the Johnson  $B$ ,  $V$ ,  $R$ , and  $I$  bands. This program is a long-term effort, and we plan on continued observations to study variability. Color information is required to be able to derive the expected brightness of a target in the not yet specified SIM instrumental bandpass.

Of course these observations will also serve the wider astronomical community. For example, the fully funded Joint Milli-Arcsecond Path-finder Survey (J-MAPS) mission (Gaume et al. 2009), whose goal is to generate a nearly 40 million star catalog with better than 1 mas positional accuracy and photometry to the 1% accuracy level or better, will also need to

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**Figure 1.** Sky distribution (Aitoff plot) of observed sources. Symbol types indicate  $R$  magnitude.

**Table 1**  
Summary of Observations

| Telescope | Epoch   | Label | Nights |
|-----------|---------|-------|--------|
| NOFS      | 2005.28 | n51   | 4      |
| NOFS      | 2005.66 | n52   | 3      |
| NOFS      | 2006.15 | n53   | 3      |
| NOFS      | 2007.53 | n54   | 3      |
| CTIO      | 2005.86 | c02   | 4      |
| CTIO      | 2006.29 | c03   | 4      |
| CTIO      | 2006.92 | c05   | 12     |
| CTIO      | 2007.15 | c06   | 5      |

observe quasars. Observations of over 100 quasars (which being at large distances have quasi-zero parallax) will be needed in order to make the J-MAPS parallaxes absolute and to minimize zonal parallax errors. Due to their quasi-zero proper motions, observations of quasars will also be needed to make the J-MAPS coordinate system inertial so that J-MAPS astrometry will be relevant to any dynamics study. Finally, observations of quasars will be needed to align the J-MAPS coordinates to the standard system (ICRF) at the mean epoch of observations. Such an alignment is essential for direct positional comparisons of targets common to the J-MAPS optical and the ICRF radio systems.

Finally, despite lots of recent new observations (Wilhite et al. 2008; Bachev 2009; Bauer et al. 2009), quasar variability remains a poorly understood phenomenon and our data set will allow us to begin addressing questions such as the mechanisms that give rise to quasar variability (e.g., see Vanden Berk et al. 2004 and references therein).

## 2. OBSERVATIONS

With the ultimate goal of selecting suitable, compact, optically bright QSOs for a future astrometric celestial reference frame that will be established by a mission like SIM, 242 extragalactic sources preferably brighter than 16th visual magnitude and with no noticeable asymmetric structure on the Digitized Sky Survey images as compared to nearby stellar objects were chosen by visual inspection from the Veron-Cetty catalog (Véron-Cetty & Véron 2006, hereafter VCV06). Photometric

observations of these sources were carried out in the Johnson  $B$ ,  $V$ ,  $R$ , and  $I$  bands and results for 214 of these sources are presented along with an additional 21 sources which were observed as part of related observing programs.

Objects in the northern hemisphere were primarily observed with the Naval Observatory Flagstaff Station (NOFS) 1.0 m Ritchey-Chretien reflector, using a 2k CCD camera during four observing runs between 2005 and 2007. Objects in the southern hemisphere were observed with the Cerro Tololo Inter-American Observatory (CTIO) Small and Moderate Aperture Research Telescope System (SMARTS) 1.0 m in Chile. The 4k×4k pixel camera Y4KCam was used and four successful observing runs were carried out from 2005 through 2007. The epochs and lengths of all successful observing runs with both telescopes are summarized in Table 1. Standard photometric calibration observations were performed as part of these runs, including dome flats and observations of Landolt calibration stars (Landolt 1992).

## 3. DATA REDUCTION

### 3.1. Raw Data Processing

For the CTIO 1 m data, modified scripts based on the 4k CCD processing pipeline developed by P. Massey<sup>4</sup> in IRAF<sup>5</sup> were used for overscan, trim, bias, and flat-field operations (four-output system from Yale University). Standard IRAF routines were used for the raw data processing from the single output 2k CCD used at the NOFS 1 m telescope. All individual bias and flat frames were looked at and only acceptable data were used for combining.

### 3.2. Astrometric Data Processing

All processed object frames were examined visually and the QSO target was identified with respect to finder charts. Basic statistical information and remarks were entered in a quality control table. The astrometric pipeline of the radio-optical

<sup>4</sup> <http://www.lowell.edu/users/massey/obins/y4kcamred.html>

<sup>5</sup> IRAF is distributed by the National Optical Astronomy Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

**Table 2**  
Magnitudes of SIM Candidate Quasars

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> − <i>V</i> | <i>V</i> − <i>R</i> | <i>R</i> − <i>I</i> | <i>V</i> − <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 0000−128 | 15.646        | 15.516        | 15.312        | 14.645        | 0.007         | 0.007         | 0.003         | 0.008         | 0.130               | 0.205               | 0.667               | 0.871               | 2         | 3         | 3         | 3         | c05   |
| 0001+113 | 16.354        | 16.155        | 15.894        | 15.244        | 0.028         | 0.014         | 0.015         | 0.015         | 0.199               | 0.261               | 0.650               | 0.911               | 1         | 1         | 1         | 1         | n52   |
| 0001+113 | 16.443        | 16.396        | 16.066        | 15.346        | 0.001         | 0.027         | 0.003         | 0.029         | 0.047               | 0.330               | 0.720               | 1.050               | 2         | 1         | 2         | 1         | c05   |
| 0006+437 | 14.851        | 14.621        | 14.402        | 13.850        | 0.029         | 0.020         | 0.021         | 0.019         | 0.230               | 0.219               | 0.552               | 0.771               | 1         | 1         | 1         | 1         | n52   |
| 0010−063 | 17.438        | 16.555        | 15.973        | 15.367        | 0.029         | 0.019         | 0.004         | 0.001         | 0.882               | 0.582               | 0.606               | 1.188               | 4         | 2         | 4         | 2         | c05   |
| 0010−063 | 17.774        | 16.275        | 15.683        | 14.993        | 0.029         | 0.014         | 0.014         | 0.015         | 1.499               | 0.592               | 0.690               | 1.282               | 1         | 1         | 1         | 1         | n52   |
| 0017+816 | 17.605        | 16.524        | ...           | 15.688        | 0.024         | 0.017         | ...           | 0.017         | 1.081               | 9.900               | 9.900               | 0.836               | 1         | 1         | 0         | 1         | n52   |
| 0028+311 | 15.467        | 15.218        | 14.971        | 14.634        | 0.029         | 0.020         | 0.021         | 0.019         | 0.249               | 0.247               | 0.337               | 0.584               | 1         | 1         | 1         | 1         | n52   |
| 0029+133 | 15.253        | 15.170        | 14.854        | 14.256        | 0.017         | 0.031         | 0.002         | 0.019         | 0.083               | 0.316               | 0.599               | 0.914               | 2         | 1         | 2         | 1         | c05   |
| 0029+133 | 15.354        | 15.096        | 14.812        | ...           | 0.028         | 0.014         | 0.014         | ...           | 0.258               | 0.284               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 0030−134 | 18.350        | 17.345        | 16.728        | 16.043        | 0.032         | 0.023         | 0.010         | 0.003         | 1.005               | 0.617               | 0.686               | 1.302               | 1         | 3         | 3         | 3         | c05   |
| 0034−339 | 17.420        | 16.785        | 16.347        | 15.795        | 0.016         | 0.003         | 0.011         | ...           | 0.635               | 0.438               | 0.552               | 0.990               | 4         | 2         | 4         | 2         | c05   |
| 0034−339 | 17.708        | 16.964        | 16.513        | 15.882        | 0.024         | 0.027         | 0.028         | 0.068         | 0.744               | 0.451               | 0.631               | 1.082               | 1         | 1         | 1         | 1         | c02   |
| 0034−704 | 17.337        | 17.343        | 17.139        | 16.800        | 0.075         | 0.021         | 0.013         | 0.057         | −0.006              | 0.204               | 0.340               | 0.543               | 3         | 1         | 2         | 1         | c05   |
| 0034−704 | 17.474        | 17.425        | 17.171        | 16.824        | 0.022         | 0.019         | 0.023         | 0.079         | 0.049               | 0.254               | 0.347               | 0.601               | 1         | 1         | 1         | 1         | c02   |
| 0037+444 | 17.742        | 17.509        | 17.273        | 16.953        | 0.024         | 0.017         | 0.015         | 0.018         | 0.233               | 0.236               | 0.320               | 0.556               | 1         | 1         | 1         | 1         | n52   |
| 0041−226 | ...           | 16.897        | 16.195        | 15.647        | ...           | 0.021         | 0.037         | 0.055         | 9.900               | 0.702               | 0.548               | 1.250               | 0         | 2         | 3         | 3         | c05   |
| 0043−169 | 16.472        | 16.433        | 16.189        | 15.725        | 0.025         | 0.020         | 0.043         | 0.071         | 0.039               | 0.244               | 0.464               | 0.708               | 2         | 1         | 3         | 1         | c05   |
| 0045−291 | 15.634        | 15.082        | 14.679        | 14.358        | 0.014         | 0.006         | 0.022         | 0.003         | 0.552               | 0.403               | 0.321               | 0.724               | 3         | 3         | 3         | 3         | c05   |
| 0045−291 | 15.797        | 15.166        | 14.817        | 14.435        | 0.023         | 0.027         | 0.028         | 0.068         | 0.631               | 0.349               | 0.382               | 0.731               | 1         | 1         | 1         | 1         | c02   |
| 0056−752 | 16.917        | 16.398        | 15.891        | 15.345        | 0.010         | 0.008         | 0.016         | 0.015         | 0.519               | 0.507               | 0.546               | 1.053               | 3         | 3         | 3         | 3         | c05   |
| 0056−752 | 16.973        | 16.420        | 15.938        | 15.372        | 0.021         | 0.018         | 0.023         | 0.079         | 0.553               | 0.482               | 0.566               | 1.048               | 1         | 1         | 1         | 1         | c02   |
| 0057−224 | 14.598        | 14.493        | 14.283        | 14.084        | 0.017         | 0.014         | 0.015         | 0.018         | 0.105               | 0.210               | 0.200               | 0.409               | 3         | 3         | 3         | 3         | c05   |
| 0101+425 | 16.539        | 16.325        | 16.026        | 15.356        | 0.023         | 0.017         | 0.014         | 0.017         | 0.214               | 0.299               | 0.670               | 0.969               | 1         | 1         | 1         | 1         | n52   |
| 0110−168 | 16.560        | 16.357        | 16.169        | 15.863        | 0.012         | 0.020         | 0.019         | 0.029         | 0.203               | 0.189               | 0.306               | 0.495               | 3         | 3         | 3         | 3         | c05   |
| 0114−424 | 15.783        | 15.631        | 15.353        | 14.864        | 0.018         | 0.014         | 0.015         | 0.031         | 0.152               | 0.278               | 0.489               | 0.767               | 5         | 4         | 5         | 4         | c05   |
| 0114−424 | 16.107        | 15.873        | 15.531        | 15.015        | 0.024         | 0.024         | 0.024         | 0.054         | 0.234               | 0.342               | 0.516               | 0.858               | 1         | 1         | 1         | 1         | c02   |
| 0121−283 | 14.731        | 14.689        | 14.470        | 14.191        | 0.004         | 0.016         | 0.004         | 0.008         | 0.042               | 0.219               | 0.278               | 0.497               | 3         | 3         | 3         | 3         | c05   |
| 0121−283 | 15.151        | 15.039        | 14.826        | 14.558        | 0.024         | 0.024         | 0.024         | 0.054         | 0.112               | 0.213               | 0.268               | 0.481               | 1         | 1         | 1         | 1         | c02   |
| 0123−588 | 13.817        | 13.697        | 13.345        | 13.048        | 0.010         | 0.022         | 0.017         | 0.023         | 0.120               | 0.352               | 0.297               | 0.649               | 2         | 3         | 2         | 3         | c05   |
| 0123−588 | 14.084        | 13.907        | 13.547        | 13.270        | 0.021         | 0.018         | 0.023         | 0.079         | 0.177               | 0.360               | 0.277               | 0.637               | 1         | 1         | 1         | 1         | c02   |
| 0124−120 | 17.293        | 16.506        | 15.991        | 15.397        | 0.027         | 0.030         | 0.024         | 0.036         | 0.787               | 0.515               | 0.594               | 1.109               | 3         | 3         | 3         | 3         | c05   |
| 0131−216 | 16.868        | 16.795        | 16.478        | 15.919        | 0.005         | 0.011         | 0.011         | 0.015         | 0.073               | 0.317               | 0.558               | 0.876               | 2         | 3         | 3         | 3         | c05   |
| 0131−216 | 16.950        | 16.809        | 16.511        | 15.969        | 0.024         | 0.027         | 0.028         | 0.068         | 0.141               | 0.298               | 0.542               | 0.840               | 1         | 1         | 1         | 1         | c02   |
| 0135−294 | 16.475        | 16.303        | 16.176        | 15.867        | 0.015         | 0.005         | 0.017         | 0.033         | 0.171               | 0.127               | 0.310               | 0.437               | 3         | 3         | 3         | 3         | c05   |
| 0150+362 | 17.220        | 16.373        | 15.808        | 15.155        | 0.029         | 0.020         | 0.021         | 0.019         | 0.847               | 0.565               | 0.653               | 1.218               | 1         | 1         | 1         | 1         | n52   |
| 0155−451 | 15.408        | 15.777        | 15.239        | 15.715        | 0.003         | 0.169         | 0.007         | 0.007         | −0.370              | 0.538               | −0.476              | 0.062               | 2         | 3         | 2         | 2         | c05   |
| 0155−451 | 15.593        | 15.507        | 15.366        | 15.321        | 0.021         | 0.018         | 0.023         | 0.079         | 0.086               | 0.141               | 0.045               | 0.186               | 1         | 1         | 1         | 1         | c02   |
| 0157+413 | 17.997        | 15.449        | 14.585        | ...           | 0.032         | 0.020         | 0.021         | ...           | 2.548               | 0.864               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 0207+027 | 15.522        | 15.358        | 15.223        | 14.761        | 0.016         | 0.028         | 0.018         | 0.040         | 0.164               | 0.135               | 0.462               | 0.597               | 3         | 3         | 3         | 3         | c05   |
| 0207+027 | 15.644        | 15.412        | 15.269        | 14.801        | 0.028         | 0.014         | 0.014         | 0.015         | 0.232               | 0.143               | 0.468               | 0.611               | 1         | 1         | 1         | 1         | n52   |
| 0212−279 | 16.985        | 16.854        | 16.676        | 16.327        | 0.024         | 0.027         | 0.028         | 0.068         | 0.131               | 0.178               | 0.349               | 0.527               | 1         | 1         | 1         | 1         | c02   |
| 0212−279 | 17.008        | 16.857        | 16.704        | 16.360        | 0.023         | 0.022         | 0.012         | 0.021         | 0.150               | 0.153               | 0.344               | 0.498               | 6         | 6         | 6         | 4         | c05   |
| 0222+524 | 19.300        | 17.997        | 17.224        | ...           | 0.031         | 0.021         | 0.021         | ...           | 1.303               | 0.773               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 0227+442 | 18.458        | 17.973        | 17.624        | ...           | 0.030         | 0.021         | 0.021         | ...           | 0.485               | 0.349               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 0228−410 | 15.355        | 15.299        | 15.052        | 14.790        | 0.009         | 0.011         | 0.004         | 0.008         | 0.056               | 0.247               | 0.263               | 0.510               | 7         | 5         | 7         | 5         | c05   |
| 0228−410 | 15.396        | 15.246        | 14.992        | 14.775        | 0.152         | 0.151         | 0.137         | 0.120         | 0.150               | 0.254               | 0.217               | 0.471               | 1         | 1         | 1         | 1         | c02   |
| 0238+166 | ...           | 17.963        | 17.184        | 16.159        | ...           | 0.031         | 0.078         | 0.113         | 9.900               | 0.779               | 1.025               | 1.804               | 0         | 4         | 3         | 4         | c05   |
| 0240−189 | 15.390        | 15.319        | 15.182        | 14.844        | 0.021         | 0.011         | 0.012         | 0.006         | 0.071               | 0.137               | 0.337               | 0.474               | 3         | 3         | 3         | 3         | c05   |
| 0244+625 | 19.289        | 17.426        | 16.278        | 15.146        | 0.035         | 0.021         | 0.021         | 0.019         | 1.863               | 1.148               | 1.132               | 2.280               | 1         | 1         | 1         | 1         | n52   |
| 0248−408 | 15.281        | 15.062        | 14.901        | 14.733        | 0.021         | 0.018         | 0.023         | 0.079         | 0.219               | 0.161               | 0.168               | 0.329               | 1         | 1         | 1         | 1         | c02   |
| 0248−408 | 15.357        | 15.101        | 14.948        | 14.736        | 0.006         | 0.029         | 0.010         | 0.049         | 0.256               | 0.152               | 0.213               | 0.365               | 3         | 3         | 3         | 3         | c05   |
| 0254−416 | ...           | 17.919        | 17.245        | 16.484        | ...           | 0.151         | 0.137         | 0.120         | 9.900               | 0.674               | 0.761               | 1.435               | 0         | 1         | 1         | 1         | c02   |
| 0254−416 | 18.708        | 17.854        | 17.251        | 16.572        | 0.069         | 0.016         | 0.020         | 0.031         | 0.855               | 0.602               | 0.679               | 1.282               | 7         | 5         | 7         | 5         | c05   |
| 0318−344 | 16.041        | 15.975        | 15.737        | 15.181        | 0.152         | 0.151         | 0.137         | 0.120         | 0.066               | 0.238               | 0.556               | 0.794               | 1         | 1         | 1         | 1         | c02   |
| 0318−344 | 16.305        | 16.299        | 16.013        | 15.390        | 0.012         | 0.064         | 0.013         | 0.028         | 0.006               | 0.286               | 0.623               | 0.909               | 6         | 5         | 5         | 4         | c05   |
| 0320−194 | 17.366        | 16.621        | 16.149        | 15.603        | 0.067         | 0.023         | 0.018         | 0.032         | 0.746               | 0.472               | 0.546               | 1.018               | 3         | 3         | 3         | 3         | c05   |
| 0331−294 | 15.969        | 15.870        | 15.668        | 15.382        | 0.016         | 0.017         | 0.015         | 0.026         | 0.099               | 0.202               | 0.286               | 0.488               | 5         | 4         | 5         | 4         | c05   |
| 0331−294 | 15.996        | 15.881        | 15.691        | 15.403        | 0.023         | 0.027         | 0.028         | 0.068         | 0.115               | 0.190               | 0.288               | 0.478               | 1         | 1         | 1         | 1         | c02   |
| 0334+435 | 22.366        | 20.987        | 20.803        | ...           | 0.046         | 0.023         | 0.024         | ...           | 1.379               | 0.184               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 0338−452 | 17.009        | 16.564        | 16.200        | 15.702        | 0.152         | 0.151         | 0.137         | 0.120         | 0.445               | 0.364               | 0.498               | 0.862               | 1         | 1         | 1         | 1         | c02   |
| 0338−452 | 17.040        | 16.632        | 16.261        | 15.739        | 0.005         | 0.027         | 0.021         | 0.009         | 0.408               | 0.371               | 0.522               | 0.893               | 4         | 4         | 5         | 4         | c05   |
| 0350−527 | 16.409        | 16.252        | 15.873        | 15.521        | 0.010         | 0.011         | 0.006         | 0.011         | 0.157               | 0.379               | 0.352               | 0.731               | 3         | 3         | 3         | 3         | c05   |
| 0350−527 | 16.420        | 16.257        | 15.882        | 15.545        | 0.024         | 0.024         | 0.024         | 0.054         | 0.163               | 0.375               | 0.337               | 0.712               | 1         | 1         | 1         | 1         | c02   |
| 0355−392 | 16.199        | 15.939        | 15.747        | 15.568        | 0.012         | 0.006         | 0.017         | 0.016         | 0.260               | 0.192               | 0.179               | 0.371               | 5         | 4         | 5         | 4         | c05   |
| 0355−392 | 16.202        | 15.940        | 15.770        | 15.649        | 0.021         | 0.018         | 0.023         | 0.079         | 0.262               | 0.170               | 0.121               | 0.291               | 1         | 1         | 1         | 1         | c02   |
| 0355−549 | 16.331        | 16.274        | 16.027        | 15.539        | 0.021         | 0.018         | 0.023         | 0.079         | 0.057               | 0.247               | 0.488               | 0.735               | 1         | 1         | 1         | 1         | c02   |

**Table 2**  
(Continued)

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> − <i>V</i> | <i>V</i> − <i>R</i> | <i>R</i> − <i>I</i> | <i>V</i> − <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 0355−549 | 16.404        | 16.343        | 16.083        | 15.539        | 0.009         | 0.002         | 0.005         | 0.007         | 0.060               | 0.260               | 0.545               | 0.805               | 3         | 3         | 3         | 3         | c05   |
| 0407−122 | 14.644        | 14.475        | 14.305        | 13.983        | 0.008         | 0.003         | 0.003         | 0.011         | 0.169               | 0.170               | 0.321               | 0.492               | 7         | 6         | 10        | 5         | c05   |
| 0426−572 | 14.375        | 14.274        | 14.085        | 13.915        | 0.021         | 0.018         | 0.023         | 0.079         | 0.101               | 0.189               | 0.170               | 0.359               | 1         | 1         | 1         | 1         | c02   |
| 0426−572 | 14.912        | 14.669        | 14.435        | 14.257        | 0.015         | 0.006         | 0.009         | 0.010         | 0.243               | 0.234               | 0.178               | 0.412               | 4         | 5         | 4         | 5         | c05   |
| 0428−176 | 15.783        | 15.810        | 15.489        | 14.775        | 0.005         | 0.122         | 0.008         | 0.020         | −0.027              | 0.320               | 0.714               | 1.034               | 7         | 6         | 7         | 5         | c05   |
| 0438−261 | 16.630        | 16.424        | 16.206        | 15.801        | 0.015         | 0.008         | 0.013         | 0.014         | 0.206               | 0.219               | 0.405               | 0.624               | 4         | 4         | 3         | 3         | c05   |
| 0438−261 | 16.757        | 16.528        | 16.344        | 16.023        | 0.024         | 0.024         | 0.024         | 0.054         | 0.229               | 0.184               | 0.321               | 0.505               | 1         | 1         | 1         | 1         | c02   |
| 0443−283 | 15.256        | 15.128        | 14.944        | 14.631        | 0.037         | 0.005         | 0.020         | 0.011         | 0.128               | 0.184               | 0.313               | 0.497               | 5         | 4         | 5         | 4         | c05   |
| 0443−283 | 15.283        | 15.121        | 14.974        | 14.674        | 0.023         | 0.027         | 0.028         | 0.068         | 0.162               | 0.147               | 0.300               | 0.447               | 1         | 1         | 1         | 1         | c02   |
| 0444−224 | 17.857        | 17.081        | 16.495        | 15.903        | 0.025         | 0.024         | 0.024         | 0.054         | 0.776               | 0.586               | 0.592               | 1.178               | 1         | 1         | 1         | 1         | c02   |
| 0444−224 | 17.868        | 17.066        | 16.460        | 15.868        | 0.031         | 0.031         | 0.007         | 0.002         | 0.803               | 0.606               | 0.592               | 1.198               | 2         | 3         | 3         | 3         | c05   |
| 0452−299 | 15.311        | 15.057        | 14.748        | 14.301        | 0.028         | 0.019         | 0.039         | 0.030         | 0.253               | 0.310               | 0.446               | 0.756               | 5         | 4         | 5         | 4         | c05   |
| 0452−299 | 15.462        | 15.182        | 14.874        | 14.458        | 0.023         | 0.027         | 0.028         | 0.068         | 0.280               | 0.308               | 0.416               | 0.724               | 1         | 1         | 1         | 1         | c02   |
| 0504−297 | 16.187        | 16.210        | 16.151        | 15.844        | 0.032         | 0.014         | 0.013         | 0.024         | −0.022              | 0.059               | 0.307               | 0.366               | 3         | 3         | 3         | 3         | c05   |
| 0504−297 | 16.239        | 16.173        | 16.113        | 15.873        | 0.024         | 0.024         | 0.024         | 0.054         | 0.066               | 0.060               | 0.240               | 0.300               | 1         | 1         | 1         | 1         | c02   |
| 0504−297 | 16.277        | 16.276        | 16.201        | 15.923        | 0.004         | 0.011         | 0.001         | ...           | ...                 | 0.076               | 0.278               | 0.354               | 2         | 2         | 2         | 2         | c06   |
| 0513+019 | ...           | 17.351        | 16.483        | 15.755        | ...           | 0.153         | 0.038         | 0.019         | 9.900               | 0.869               | 0.727               | 1.596               | 0         | 2         | 2         | 2         | c06   |
| 0517−442 | 15.437        | 15.203        | 14.850        | 14.342        | 0.005         | 0.007         | 0.011         | 0.024         | 0.234               | 0.353               | 0.508               | 0.861               | 2         | 2         | 2         | 2         | c06   |
| 0517−442 | 15.453        | 15.201        | 14.842        | 14.350        | 0.003         | 0.003         | 0.010         | 0.019         | 0.252               | 0.359               | 0.493               | 0.852               | 3         | 3         | 3         | 3         | c05   |
| 0517−442 | 15.536        | 15.253        | 14.913        | 14.368        | 0.023         | 0.027         | 0.028         | 0.068         | 0.283               | 0.340               | 0.545               | 0.885               | 1         | 1         | 1         | 1         | c02   |
| 0533+484 | ...           | 20.445        | 19.860        | 18.975        | ...           | 0.021         | 0.020         | 0.016         | 9.900               | 0.585               | 0.885               | 1.470               | 0         | 1         | 1         | 1         | n53   |
| 0534−603 | 18.064        | 17.088        | 16.475        | 15.910        | 0.153         | 0.151         | 0.137         | 0.120         | 0.976               | 0.613               | 0.565               | 1.178               | 1         | 1         | 1         | 1         | c02   |
| 0534−603 | 18.125        | 17.132        | 16.492        | 15.921        | 0.034         | 0.052         | 0.010         | 0.020         | 0.993               | 0.640               | 0.571               | 1.211               | 4         | 5         | 8         | 5         | c05   |
| 0534−603 | 18.134        | 17.156        | 16.487        | 15.880        | 0.047         | 0.017         | 0.010         | 0.033         | 0.978               | 0.669               | 0.606               | 1.275               | 2         | 2         | 2         | 2         | c06   |
| 0536−517 | 16.679        | 16.148        | 15.745        | 15.148        | 0.024         | 0.027         | 0.028         | 0.068         | 0.531               | 0.403               | 0.597               | 1.000               | 1         | 1         | 1         | 1         | c02   |
| 0536−517 | 16.778        | 16.229        | 15.799        | 15.211        | 0.024         | 0.003         | 0.006         | 0.029         | 0.548               | 0.431               | 0.588               | 1.019               | 3         | 4         | 4         | 3         | c05   |
| 0536−517 | 16.786        | 16.254        | 15.799        | 15.208        | 0.006         | 0.026         | 0.009         | 0.045         | 0.532               | 0.456               | 0.590               | 1.046               | 2         | 2         | 2         | 2         | c06   |
| 0552−532 | 15.901        | 15.729        | 15.349        | 14.975        | 0.007         | 0.019         | 0.009         | 0.009         | 0.172               | 0.381               | 0.374               | 0.754               | 5         | 4         | 5         | 4         | c05   |
| 0552−532 | 15.949        | 15.745        | 15.370        | 14.973        | 0.006         | 0.005         | 0.002         | 0.023         | 0.204               | 0.375               | 0.397               | 0.772               | 2         | 2         | 2         | 2         | c06   |
| 0552−532 | 15.964        | 15.737        | 15.365        | 14.981        | 0.023         | 0.027         | 0.028         | 0.068         | 0.227               | 0.372               | 0.384               | 0.756               | 1         | 1         | 1         | 1         | c02   |
| 0552−640 | 15.354        | 15.153        | 14.906        | 14.493        | 0.007         | ...           | 0.007         | 0.012         | 0.201               | 0.246               | 0.413               | 0.659               | 2         | 2         | 2         | 2         | c06   |
| 0552−640 | 15.392        | 15.176        | 14.939        | 14.528        | 0.006         | 0.012         | 0.011         | 0.004         | 0.216               | 0.237               | 0.411               | 0.649               | 5         | 4         | 5         | 4         | c05   |
| 0552−640 | 15.633        | 15.405        | 14.884        | 14.597        | 0.152         | 0.151         | 0.137         | 0.120         | 0.228               | 0.521               | 0.287               | 0.808               | 1         | 1         | 1         | 1         | c02   |
| 0556−027 | ...           | ...           | 19.071        | 18.119        | ...           | ...           | 0.052         | 0.046         | ...                 | 9.900               | 0.952               | 9.900               | 0         | 0         | 6         | 4         | c05   |
| 0556−027 | ...           | 20.278        | 19.017        | 18.156        | ...           | 0.025         | 0.113         | 0.045         | 9.900               | 1.261               | 0.861               | 2.122               | 0         | 1         | 2         | 2         | c06   |
| 0556−027 | ...           | 20.493        | 19.271        | 18.496        | ...           | 0.021         | 0.037         | 0.045         | 9.900               | 1.222               | 0.775               | 1.997               | 0         | 1         | 1         | 1         | n53   |
| 0559−504 | 15.084        | 14.943        | 14.798        | 14.406        | 0.015         | 0.004         | 0.004         | 0.021         | 0.141               | 0.145               | 0.392               | 0.537               | 2         | 2         | 2         | 2         | c06   |
| 0559−504 | 15.101        | 14.967        | 14.814        | 14.426        | 0.008         | 0.009         | 0.009         | 0.008         | 0.134               | 0.154               | 0.388               | 0.541               | 3         | 3         | 3         | 3         | c05   |
| 0559−504 | 15.131        | 14.979        | 14.836        | 14.482        | 0.024         | 0.024         | 0.024         | 0.054         | 0.152               | 0.143               | 0.354               | 0.497               | 1         | 1         | 1         | 1         | c02   |
| 0607−086 | ...           | 16.764        | 15.782        | 14.504        | ...           | 0.027         | 0.028         | 0.068         | 9.900               | 0.982               | 1.278               | 2.260               | 0         | 1         | 1         | 1         | c02   |
| 0607−086 | 18.133        | 16.682        | 15.658        | 14.480        | 0.076         | 0.001         | 0.008         | 0.016         | 1.451               | 1.024               | 1.179               | 2.202               | 3         | 3         | 3         | 3         | c05   |
| 0607−086 | 18.202        | 16.764        | 15.719        | 14.530        | 0.014         | 0.026         | 0.019         | 0.023         | 1.438               | 1.045               | 1.189               | 2.234               | 2         | 2         | 2         | 2         | c06   |
| 0607−086 | 18.290        | 16.805        | 15.797        | 14.551        | 0.013         | 0.012         | 0.036         | 0.044         | 1.485               | 1.008               | 1.246               | 2.254               | 1         | 1         | 1         | 1         | n53   |
| 0611−194 | ...           | 17.738        | 17.146        | 16.237        | ...           | 0.001         | 0.028         | 0.068         | 9.900               | 0.592               | 0.909               | 1.501               | 0         | 2         | 1         | 1         | c02   |
| 0611−194 | 18.810        | 17.608        | 17.049        | 16.232        | 0.032         | 0.016         | 0.029         | 0.051         | 1.202               | 0.559               | 0.816               | 1.376               | 1         | 2         | 2         | 2         | c06   |
| 0611−194 | 18.879        | 17.864        | 17.013        | 16.177        | 0.001         | 0.148         | 0.026         | 0.017         | 1.015               | 0.851               | 0.836               | 1.686               | 2         | 6         | 1         | 2         | c05   |
| 0613+261 | 18.635        | 17.554        | 16.654        | 16.239        | 0.014         | ...           | 0.258         | 0.043         | 1.081               | 0.900               | 0.415               | 1.315               | 2         | 2         | 3         | 3         | c05   |
| 0623−646 | 16.226        | 15.965        | 15.622        | 15.017        | 0.014         | 0.009         | 0.002         | 0.023         | 0.260               | 0.344               | 0.604               | 0.948               | 2         | 2         | 2         | 2         | c06   |
| 0630+691 | 14.571        | 14.408        | 14.131        | 13.789        | 0.013         | 0.011         | 0.014         | 0.012         | 0.163               | 0.277               | 0.342               | 0.619               | 1         | 1         | 1         | 1         | n53   |
| 0646−443 | ...           | 17.192        | 16.888        | 16.304        | ...           | 0.017         | 0.016         | 0.018         | 9.900               | 0.304               | 0.584               | 0.888               | 0         | 1         | 1         | 1         | c03   |
| 0646−443 | 17.513        | 17.152        | 16.921        | 16.319        | 0.020         | 0.012         | 0.018         | 0.041         | 0.361               | 0.231               | 0.602               | 0.833               | 6         | 4         | 5         | 4         | c05   |
| 0646−443 | 17.550        | 17.198        | 16.911        | 16.283        | 0.025         | 0.024         | 0.024         | 0.054         | 0.352               | 0.287               | 0.628               | 0.915               | 1         | 1         | 1         | 1         | c02   |
| 0646−443 | 17.743        | 17.323        | 17.037        | 16.373        | 0.018         | 0.008         | 0.016         | 0.030         | 0.420               | 0.286               | 0.664               | 0.950               | 2         | 2         | 2         | 2         | c06   |
| 0648−177 | ...           | ...           | 18.644        | ...           | ...           | ...           | 0.029         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 1         | 0         | c02   |
| 0648−177 | ...           | 19.071        | 18.448        | 17.994        | ...           | 0.024         | 0.014         | 0.056         | 9.900               | 0.622               | 0.455               | 1.077               | 0         | 1         | 2         | 1         | c05   |
| 0648−177 | 19.768        | 19.089        | 18.494        | 17.965        | 0.048         | 0.033         | 0.007         | 0.087         | 0.679               | 0.595               | 0.529               | 1.124               | 1         | 2         | 2         | 2         | c06   |
| 0648−177 | 19.944        | 19.195        | 18.575        | 18.168        | 0.063         | 0.026         | 0.018         | 0.020         | 0.749               | 0.620               | 0.407               | 1.027               | 2         | 1         | 1         | 1         | c03   |
| 0654+733 | 19.378        | 17.212        | 16.622        | 15.765        | 0.028         | 0.015         | 0.023         | 0.012         | 2.166               | 0.590               | 0.857               | 1.447               | 1         | 1         | 1         | 1         | n53   |
| 0702+316 | 17.498        | 17.054        | 16.778        | 16.580        | 0.046         | 0.037         | 0.034         | 0.048         | 0.444               | 0.276               | 0.198               | 0.474               | 1         | 1         | 1         | 1         | n51   |
| 0705+636 | 15.605        | 15.378        | 15.164        | 14.591        | 0.012         | 0.013         | 0.022         | 0.011         | 0.227               | 0.214               | 0.573               | 0.787               | 1         | 1         | 1         | 1         | n53   |
| 0705+636 | 15.683        | 15.444        | 15.272        | 14.674        | 0.070         | 0.036         | 0.037         | 0.055         | 0.239               | 0.172               | 0.598               | 0.770               | 1         | 1         | 1         | 1         | n51   |
| 0707+384 | 18.914        | ...           | 19.463        | 18.311        | 0.110         | ...           | 0.095         | 0.085         | 9.900               | 9.900               | 1.152               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 0707+385 | 17.142        | ...           | 17.203        | 16.943        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.260               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 0707+646 | 15.382        | 15.047        | 14.677        | 14.156        | 0.070         | 0.036         | 0.037         | 0.045         | 0.335               | 0.370               | 0.521               | 0.891               | 1         | 1         | 1         | 1         | n51   |
| 0707+646 | 15.605        | 15.163        | 14.693        | 14.175        | 0.013         | 0.012         | 0.014         | 0.012         | 0.442               | 0.470               | 0.518               | 0.988               | 1         | 1         | 1         | 1         | n53   |
| 0713+369 | 15.885        | 15.719        | 15.767        | 15.310        | 0.061         | 0.078         | 0.090         | 0.055         | 0.166               | −0.048              | 0.457               | 0.409               | 1         | 1         | 1         | 1         | n51   |

**Table 2**  
(Continued)

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> − <i>V</i> | <i>V</i> − <i>R</i> | <i>R</i> − <i>I</i> | <i>V</i> − <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 0718−261 | 19.021        | 18.544        | 18.143        | 17.711        | 0.026         | 0.025         | 0.024         | 0.055         | 0.477               | 0.401               | 0.432               | 0.833               | 1         | 1         | 1         | 1         | c02   |
| 0718−261 | 19.060        | 18.646        | 18.221        | 17.699        | 0.034         | 0.016         | 0.013         | 0.058         | 0.414               | 0.425               | 0.522               | 0.947               | 3         | 3         | 3         | 3         | c05   |
| 0718−261 | 19.071        | 18.689        | 18.203        | 17.716        | 0.054         | 0.060         | 0.010         | 0.017         | 0.382               | 0.486               | 0.487               | 0.973               | 2         | 2         | 2         | 2         | c06   |
| 0718−261 | 19.078        | 18.627        | 18.152        | ...           | 0.029         | 0.014         | 0.012         | ...           | 0.451               | 0.475               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | c03   |
| 0719+331 | 20.304        | 19.604        | 19.354        | ...           | 0.022         | 0.017         | 0.037         | ...           | 0.700               | 0.250               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 0725+283 | 18.007        | 17.567        | 17.200        | 16.710        | 0.004         | 0.027         | 0.014         | 0.029         | 0.440               | 0.367               | 0.490               | 0.857               | 2         | 1         | 2         | 1         | c05   |
| 0729+254 | 18.194        | ...           | 17.659        | 17.197        | 0.021         | ...           | 0.010         | ...           | 9.900               | 9.900               | 0.462               | 9.900               | 4         | 0         | 4         | 2         | c05   |
| 0729+254 | 18.350        | 17.932        | 17.270        | ...           | 0.003         | 0.134         | 0.036         | ...           | 0.418               | 0.662               | 9.900               | 9.900               | 2         | 2         | 1         | 0         | n53   |
| 0732+620 | 15.790        | 15.538        | 15.300        | ...           | 0.046         | 0.037         | 0.034         | ...           | 0.252               | 0.238               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |
| 0732+620 | 15.811        | 15.592        | 15.298        | 14.980        | 0.012         | 0.013         | 0.022         | 0.012         | 0.219               | 0.294               | 0.318               | 0.612               | 1         | 1         | 1         | 1         | n53   |
| 0732−025 | 19.429        | 19.003        | 18.821        | 18.552        | 0.030         | 0.044         | 0.017         | 0.067         | 0.426               | 0.182               | 0.269               | 0.451               | 1         | 3         | 5         | 2         | c05   |
| 0732−025 | 19.537        | 18.951        | 18.820        | 18.542        | 0.100         | 0.019         | 0.021         | 0.014         | 0.586               | 0.130               | 0.279               | 0.409               | 2         | 2         | 2         | 2         | c06   |
| 0738−021 | 17.819        | 17.410        | 17.131        | 16.892        | 0.042         | 0.019         | 0.005         | 0.027         | 0.409               | 0.279               | 0.239               | 0.518               | 2         | 2         | 2         | 2         | c06   |
| 0738−021 | 17.872        | 17.388        | 17.112        | 16.909        | 0.014         | 0.008         | 0.024         | 0.031         | 0.484               | 0.276               | 0.204               | 0.479               | 3         | 3         | 3         | 3         | c05   |
| 0738−021 | 17.998        | 17.364        | 16.825        | 16.583        | 0.019         | 0.090         | 0.372         | 0.275         | 0.634               | 0.539               | 0.242               | 0.781               | 2         | 1         | 1         | 1         | c03   |
| 0739+016 | 16.906        | 16.528        | 16.034        | 15.303        | 0.022         | 0.003         | 0.007         | 0.016         | 0.378               | 0.494               | 0.731               | 1.226               | 2         | 2         | 2         | 2         | c06   |
| 0739+016 | 17.230        | 16.899        | 16.386        | 15.651        | 0.054         | 0.037         | 0.082         | 0.048         | 0.331               | 0.513               | 0.735               | 1.248               | 3         | 3         | 3         | 3         | c05   |
| 0739+016 | 17.593        | 17.043        | 16.470        | ...           | 0.012         | 0.013         | 0.036         | ...           | 0.550               | 0.573               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 0745+317 | 15.996        | ...           | 15.757        | 15.314        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.443               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 0745−007 | 17.473        | 17.085        | 16.823        | 16.381        | 0.002         | 0.011         | 0.025         | 0.025         | 0.388               | 0.262               | 0.441               | 0.704               | 2         | 2         | 2         | 2         | c06   |
| 0745−007 | 17.522        | 17.196        | 16.844        | 16.471        | 0.022         | 0.002         | 0.017         | 0.009         | 0.325               | 0.352               | 0.373               | 0.725               | 3         | 2         | 1         | 2         | c05   |
| 0745−007 | 17.559        | 17.097        | ...           | 17.630        | 0.021         | 0.017         | ...           | 0.019         | 0.462               | 9.900               | 9.900               | −0.533              | 1         | 1         | 0         | 1         | c03   |
| 0758+393 | 14.765        | 14.334        | 14.093        | 13.553        | 0.070         | 0.036         | 0.037         | 0.083         | 0.431               | 0.241               | 0.540               | 0.781               | 1         | 1         | 1         | 1         | n51   |
| 0810+760 | 14.051        | 13.930        | 13.734        | 13.293        | 0.012         | 0.012         | 0.022         | 0.011         | 0.121               | 0.196               | 0.441               | 0.637               | 1         | 1         | 1         | 1         | n53   |
| 0810+760 | 14.261        | 14.046        | ...           | ...           | 0.045         | 0.037         | ...           | ...           | 0.215               | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | n51   |
| 0815+019 | 16.837        | 16.799        | 16.671        | 16.344        | 0.015         | 0.005         | 0.044         | 0.010         | 0.038               | 0.129               | 0.327               | 0.455               | 3         | 3         | 3         | 3         | c05   |
| 0815+019 | 16.854        | 16.819        | 16.632        | 16.349        | 0.019         | 0.014         | 0.006         | 0.024         | 0.034               | 0.188               | 0.283               | 0.471               | 2         | 2         | 2         | 2         | c06   |
| 0815+019 | 16.964        | 16.830        | 16.390        | 16.136        | 0.012         | 0.090         | 0.372         | 0.275         | 0.134               | 0.440               | 0.254               | 0.694               | 1         | 1         | 1         | 1         | c03   |
| 0820+316 | 20.092        | ...           | 19.011        | 18.840        | 0.113         | ...           | 0.094         | 0.085         | 9.900               | 9.900               | 0.171               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 0820+375 | ...           | 16.915        | 16.617        | 15.461        | ...           | 0.078         | 0.090         | 0.056         | 9.900               | 0.298               | 1.156               | 1.454               | 0         | 1         | 1         | 1         | n51   |
| 0827+097 | 17.215        | 15.975        | 15.201        | 14.426        | 0.033         | 0.008         | 0.011         | 0.013         | 1.239               | 0.774               | 0.775               | 1.549               | 3         | 4         | 4         | 5         | c05   |
| 0827+097 | 17.239        | 15.900        | 14.852        | 14.117        | 0.013         | 0.090         | 0.372         | 0.275         | 1.339               | 1.048               | 0.735               | 1.783               | 1         | 1         | 1         | 1         | c03   |
| 0827+097 | 17.244        | 15.997        | 15.209        | 14.418        | 0.046         | 0.038         | 0.030         | 0.011         | 1.247               | 0.788               | 0.791               | 1.579               | 2         | 2         | 2         | 2         | c06   |
| 0827+097 | 17.353        | 16.075        | 15.275        | ...           | 0.012         | 0.012         | 0.035         | ...           | 1.278               | 0.800               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 0827−204 | 17.900        | ...           | ...           | ...           | 0.029         | ...           | ...           | ...           | 9.900               | ...                 | ...                 | ...                 | 1         | 0         | 0         | 0         | c03   |
| 0827−204 | 18.034        | 17.559        | 17.330        | 16.970        | 0.014         | 0.009         | 0.045         | 0.074         | 0.475               | 0.229               | 0.360               | 0.589               | 5         | 5         | 5         | 4         | c05   |
| 0827−204 | 18.079        | 17.665        | 17.447        | 17.237        | 0.030         | 0.022         | 0.030         | 0.034         | 0.414               | 0.218               | 0.210               | 0.428               | 1         | 1         | 1         | 1         | c06   |
| 0828−708 | ...           | 18.551        | 18.051        | 17.541        | ...           | 0.025         | 0.017         | 0.019         | 9.900               | 0.500               | 0.510               | 1.010               | 0         | 1         | 1         | 1         | c03   |
| 0828−708 | 19.189        | 18.418        | 17.987        | 17.578        | 0.036         | 0.016         | 0.033         | 0.058         | 0.771               | 0.431               | 0.409               | 0.840               | 2         | 2         | 2         | 2         | c06   |
| 0828−708 | 19.399        | 18.475        | 17.970        | 17.421        | 0.129         | 0.027         | 0.034         | 0.034         | 0.923               | 0.506               | 0.548               | 1.054               | 3         | 3         | 3         | 3         | c05   |
| 0830+241 | 17.051        | 16.664        | 16.269        | 15.805        | 0.074         | 0.031         | 0.034         | 0.043         | 0.387               | 0.395               | 0.464               | 0.859               | 1         | 1         | 1         | 1         | c06   |
| 0831+528 | 18.827        | 16.448        | 15.353        | 14.608        | 0.017         | 0.012         | 0.014         | 0.012         | 2.379               | 1.095               | 0.745               | 1.840               | 1         | 1         | 1         | 1         | n53   |
| 0831+528 | 19.111        | 16.552        | 15.271        | 14.534        | 0.051         | 0.037         | 0.034         | 0.048         | 2.559               | 1.281               | 0.737               | 2.018               | 1         | 1         | 1         | 1         | n51   |
| 0836+444 | 15.651        | 15.585        | 15.378        | 14.869        | 0.070         | 0.036         | 0.037         | 0.081         | 0.066               | 0.207               | 0.509               | 0.716               | 1         | 1         | 1         | 1         | n51   |
| 0839−122 | 16.386        | 16.296        | 15.981        | 15.135        | 0.011         | 0.019         | 0.008         | 0.041         | 0.090               | 0.315               | 0.846               | 1.161               | 3         | 4         | 3         | 3         | c05   |
| 0839−122 | 16.490        | 16.321        | 15.706        | 14.867        | 0.012         | 0.090         | 0.372         | 0.275         | 0.169               | 0.615               | 0.839               | 1.454               | 1         | 1         | 1         | 1         | c03   |
| 0839−122 | 16.521        | 16.440        | 16.076        | 15.204        | 0.027         | 0.020         | 0.017         | 0.028         | 0.082               | 0.363               | 0.872               | 1.236               | 2         | 2         | 2         | 2         | c06   |
| 0842+185 | 17.179        | 16.966        | 16.580        | 16.338        | 0.074         | 0.031         | 0.034         | 0.043         | 0.213               | 0.386               | 0.242               | 0.628               | 1         | 1         | 1         | 1         | c06   |
| 0850−122 | 18.014        | 17.349        | 17.232        | 16.266        | 0.074         | 0.175         | 0.001         | 0.164         | 0.665               | 0.117               | 0.966               | 1.084               | 3         | 4         | 2         | 3         | c05   |
| 0850−122 | 18.046        | 17.609        | 17.116        | 16.464        | 0.022         | 0.017         | 0.016         | 0.018         | 0.437               | 0.493               | 0.652               | 1.145               | 1         | 1         | 1         | 1         | c03   |
| 0850−122 | 18.097        | 17.709        | 17.257        | 16.620        | 0.080         | 0.066         | 0.055         | 0.064         | 0.388               | 0.453               | 0.636               | 1.089               | 2         | 2         | 2         | 2         | c06   |
| 0854+201 | 16.147        | 15.666        | 15.180        | 14.567        | 0.029         | 0.021         | 0.030         | 0.033         | 0.481               | 0.486               | 0.613               | 1.099               | 1         | 1         | 1         | 1         | c06   |
| 0900−281 | 15.052        | 14.518        | 14.358        | 14.038        | 0.033         | 0.124         | 0.015         | 0.054         | 0.533               | 0.160               | 0.320               | 0.481               | 3         | 4         | 3         | 3         | c05   |
| 0900−281 | 15.089        | 14.641        | 14.390        | 14.119        | 0.021         | 0.020         | 0.009         | 0.023         | 0.447               | 0.251               | 0.271               | 0.522               | 2         | 2         | 2         | 2         | c06   |
| 0915+295 | 16.602        | 16.236        | 15.874        | 15.384        | 0.046         | 0.039         | 0.037         | 0.044         | 0.366               | 0.362               | 0.490               | 0.852               | 1         | 1         | 1         | 1         | c06   |
| 0916−623 | 13.881        | 13.466        | 12.910        | 12.647        | 0.024         | 0.015         | 0.014         | 0.013         | 0.415               | 0.556               | 0.263               | 0.819               | 3         | 3         | 3         | 3         | c05   |
| 0916−623 | 13.964        | 13.523        | 12.984        | 12.719        | 0.009         | 0.014         | 0.005         | 0.009         | 0.441               | 0.538               | 0.266               | 0.804               | 2         | 2         | 2         | 2         | c06   |
| 0916−623 | 14.013        | ...           | ...           | ...           | 0.011         | ...           | ...           | ...           | 9.900               | ...                 | ...                 | ...                 | 1         | 0         | 0         | 0         | c03   |
| 0922−400 | 17.885        | 17.533        | 17.302        | 16.805        | 0.017         | 0.014         | 0.024         | 0.037         | 0.352               | 0.230               | 0.498               | 0.728               | 3         | 3         | 3         | 3         | c05   |
| 0922−400 | 17.947        | 17.624        | 17.370        | 16.875        | 0.029         | 0.021         | 0.030         | 0.033         | 0.323               | 0.254               | 0.495               | 0.749               | 1         | 1         | 1         | 1         | c06   |
| 0922−400 | 18.062        | 17.712        | 17.463        | 16.963        | 0.028         | 0.013         | 0.012         | 0.011         | 0.350               | 0.249               | 0.500               | 0.749               | 1         | 1         | 1         | 1         | c03   |
| 0929+467 | 16.423        | 16.222        | 16.094        | 15.553        | 0.061         | 0.078         | 0.090         | 0.055         | 0.201               | 0.128               | 0.541               | 0.669               | 1         | 1         | 1         | 1         | n51   |
| 0929+467 | 16.622        | 16.515        | 16.235        | 15.717        | 0.012         | 0.013         | 0.022         | 0.012         | 0.107               | 0.280               | 0.518               | 0.798               | 1         | 1         | 1         | 1         | n53   |
| 0956+413 | 14.605        | 14.610        | 14.452        | 14.066        | 0.013         | 0.011         | 0.014         | 0.012         | −0.005              | 0.158               | 0.386               | 0.544               | 1         | 1         | 1         | 1         | n53   |
| 0956+413 | 14.769        | ...           | ...           | 14.284        | 0.069         | ...           | ...           | 0.103         | 9.900               | ...                 | 9.900               | 9.900               | 1         | 0         | 0         | 1         | n51   |
| 1007+128 | 15.589        | 15.427        | 15.160        | 14.670        | 0.016         | 0.007         | 0.002         | 0.009         | 0.161               | 0.267               | 0.490               | 0.757               | 2         | 2         | 2         | 2         | c06   |

**Table 2**  
(Continued)

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> – <i>V</i> | <i>V</i> – <i>R</i> | <i>R</i> – <i>I</i> | <i>V</i> – <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 1007+128 | 15.631        | 15.452        | 15.179        | ...           | 0.011         | 0.012         | 0.035         | ...           | 0.179               | 0.273               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1007+128 | 15.788        | 15.412        | 14.817        | 14.376        | 0.011         | 0.090         | 0.372         | 0.275         | 0.376               | 0.595               | 0.441               | 1.036               | 1         | 1         | 1         | 1         | c03   |
| 1011–324 | 17.479        | 17.218        | 16.837        | 16.338        | 0.006         | 0.016         | 0.007         | 0.012         | 0.262               | 0.381               | 0.499               | 0.880               | 2         | 2         | 2         | 2         | c06   |
| 1011–324 | 17.697        | 17.379        | 16.969        | 16.394        | 0.028         | 0.013         | 0.011         | 0.011         | 0.318               | 0.410               | 0.575               | 0.985               | 1         | 1         | 1         | 1         | c03   |
| 1012–430 | 17.707        | 17.057        | 16.664        | 16.260        | 0.021         | 0.017         | 0.016         | 0.018         | 0.650               | 0.393               | 0.404               | 0.797               | 1         | 1         | 1         | 1         | c03   |
| 1012–430 | 17.728        | 17.104        | 16.669        | 16.281        | 0.005         | 0.005         | 0.013         | 0.005         | 0.624               | 0.435               | 0.389               | 0.823               | 2         | 2         | 2         | 2         | c06   |
| 1013+359 | 15.867        | 15.573        | 15.253        | 14.852        | 0.012         | 0.013         | 0.022         | 0.012         | 0.294               | 0.320               | 0.401               | 0.721               | 1         | 1         | 1         | 1         | n53   |
| 1013+359 | 16.017        | ...           | 15.375        | ...           | 0.109         | ...           | 0.093         | ...           | 9.900               | 9.900               | 9.900               | ...                 | 1         | 0         | 1         | 0         | n51   |
| 1019+277 | 16.503        | ...           | 15.692        | 15.225        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.467               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1026+678 | 18.715        | ...           | ...           | 17.824        | 0.049         | ...           | ...           | 0.050         | 9.900               | ...                 | 9.900               | 9.900               | 1         | 0         | 0         | 1         | n51   |
| 1026+678 | 19.171        | 18.770        | 18.444        | 18.115        | 0.019         | 0.015         | 0.016         | 0.015         | 0.401               | 0.326               | 0.329               | 0.655               | 1         | 1         | 1         | 1         | n53   |
| 1027–068 | 18.362        | 17.305        | ...           | ...           | 0.017         | 0.090         | ...           | ...           | 1.057               | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | c03   |
| 1027–068 | 18.897        | 17.360        | 16.640        | 15.937        | 0.048         | 0.070         | 0.016         | 0.039         | 1.537               | 0.719               | 0.703               | 1.423               | 1         | 2         | 2         | 2         | c06   |
| 1027–068 | 20.093        | 16.024        | 15.530        | 14.569        | 0.028         | 0.012         | 0.036         | 0.044         | 4.069               | 0.494               | 0.961               | 1.455               | 1         | 1         | 1         | 1         | n53   |
| 1031–143 | 13.985        | 13.896        | 13.580        | 13.362        | 0.028         | 0.024         | 0.016         | 0.018         | 0.089               | 0.316               | 0.218               | 0.534               | 1         | 1         | 1         | 1         | c03   |
| 1031–143 | 14.149        | 14.026        | 13.703        | 13.452        | 0.044         | 0.038         | 0.033         | 0.018         | 0.123               | 0.323               | 0.251               | 0.574               | 2         | 2         | 2         | 2         | c06   |
| 1032+279 | 19.270        | ...           | 16.311        | 15.408        | 0.112         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.903               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1050+802 | ...           | ...           | ...           | 14.175        | ...           | ...           | ...           | 0.048         | ...                 | ...                 | 9.900               | 9.900               | 0         | 0         | 0         | 1         | n51   |
| 1050+802 | 15.329        | 15.067        | 14.865        | 14.250        | 0.012         | 0.013         | 0.022         | 0.011         | 0.262               | 0.202               | 0.615               | 0.817               | 1         | 1         | 1         | 1         | n53   |
| 1107+165 | 16.712        | 16.573        | 16.482        | ...           | 0.011         | 0.012         | 0.036         | ...           | 0.139               | 0.091               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1107+165 | 16.830        | 16.491        | 16.042        | 15.735        | 0.012         | 0.090         | 0.372         | 0.275         | 0.339               | 0.449               | 0.307               | 0.756               | 1         | 1         | 1         | 1         | c03   |
| 1107+165 | 16.890        | 16.715        | 16.538        | 16.137        | 0.183         | 0.125         | 0.075         | 0.040         | 0.176               | 0.177               | 0.401               | 0.578               | 2         | 2         | 2         | 2         | c06   |
| 1107–683 | 18.118        | 17.721        | 17.447        | 16.949        | 0.028         | 0.014         | 0.012         | 0.011         | 0.397               | 0.274               | 0.498               | 0.772               | 1         | 1         | 1         | 1         | c03   |
| 1107–683 | 18.330        | 17.927        | 17.622        | 17.053        | 0.019         | 0.014         | 0.011         | 0.031         | 0.404               | 0.305               | 0.569               | 0.874               | 2         | 2         | 2         | 2         | c06   |
| 1108–236 | 14.811        | 14.564        | 14.227        | 13.946        | 0.028         | 0.024         | 0.016         | 0.018         | 0.247               | 0.337               | 0.281               | 0.618               | 1         | 1         | 1         | 1         | c03   |
| 1108–236 | 14.936        | 14.663        | 14.336        | 14.047        | 0.021         | 0.016         | 0.024         | 0.011         | 0.273               | 0.326               | 0.289               | 0.616               | 2         | 2         | 2         | 2         | c06   |
| 1118–466 | 17.349        | 17.021        | ...           | ...           | 0.021         | 0.017         | ...           | ...           | 0.328               | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | c03   |
| 1118–466 | 17.389        | 17.108        | 16.917        | 16.631        | 0.017         | 0.013         | 0.005         | 0.020         | 0.281               | 0.191               | 0.286               | 0.477               | 2         | 2         | 2         | 2         | c06   |
| 1119+213 | 14.246        | 14.180        | 14.160        | 13.702        | 0.061         | 0.078         | 0.090         | 0.055         | 0.066               | 0.020               | 0.458               | 0.478               | 1         | 1         | 1         | 1         | n51   |
| 1119+213 | 14.662        | 14.597        | 14.377        | 13.726        | 0.136         | 0.088         | 0.038         | 0.012         | 0.065               | 0.220               | 0.651               | 0.872               | 2         | 2         | 2         | 2         | c06   |
| 1119+213 | 14.961        | 14.650        | 14.106        | 13.444        | 0.011         | 0.090         | 0.372         | 0.275         | 0.311               | 0.544               | 0.662               | 1.206               | 1         | 1         | 1         | 1         | c03   |
| 1119+516 | 17.704        | 17.559        | 17.163        | ...           | 0.070         | 0.036         | 0.037         | ...           | 0.145               | 0.396               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |
| 1121+349 | 16.476        | 15.782        | 15.362        | 14.855        | 0.013         | 0.013         | 0.022         | 0.012         | 0.694               | 0.420               | 0.507               | 0.927               | 1         | 1         | 1         | 1         | n53   |
| 1121+349 | 17.964        | ...           | 15.336        | ...           | 0.110         | ...           | 0.093         | ...           | 9.900               | 9.900               | 9.900               | ...                 | 1         | 0         | 1         | 0         | n51   |
| 1129–197 | 15.839        | 15.526        | 15.307        | 15.002        | 0.009         | 0.010         | 0.009         | 0.010         | 0.312               | 0.219               | 0.306               | 0.524               | 2         | 2         | 2         | 2         | c06   |
| 1129–197 | 15.842        | 15.359        | 14.903        | 14.647        | 0.011         | 0.090         | 0.372         | 0.275         | 0.483               | 0.456               | 0.256               | 0.712               | 1         | 1         | 1         | 1         | c03   |
| 1135–096 | 18.124        | 17.556        | 17.069        | 16.531        | 0.067         | 0.059         | 0.035         | 0.007         | 0.568               | 0.487               | 0.538               | 1.024               | 2         | 2         | 2         | 2         | c06   |
| 1135–096 | 18.173        | 17.195        | 16.688        | ...           | 0.014         | 0.013         | 0.036         | ...           | 0.978               | 0.507               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1135–096 | 18.327        | 17.665        | 17.175        | 16.606        | 0.030         | 0.015         | 0.012         | 0.012         | 0.662               | 0.490               | 0.569               | 1.059               | 1         | 1         | 1         | 1         | c03   |
| 1140+413 | 16.580        | 15.663        | 15.210        | 14.652        | 0.014         | 0.012         | 0.014         | 0.012         | 0.917               | 0.453               | 0.558               | 1.011               | 1         | 1         | 1         | 1         | n53   |
| 1141+219 | 15.764        | 15.485        | 15.212        | 15.080        | 0.118         | 0.060         | 0.018         | 0.161         | 0.279               | 0.273               | 0.132               | 0.406               | 2         | 2         | 2         | 2         | c06   |
| 1141+219 | 17.986        | ...           | ...           | ...           | 0.014         | ...           | ...           | ...           | 9.900               | ...                 | ...                 | ...                 | 1         | 0         | 0         | 0         | c03   |
| 1141+219 | 15.979        | 15.368        | 15.182        | ...           | 0.061         | 0.078         | 0.090         | ...           | 0.611               | 0.186               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |
| 1143+115 | 17.119        | 16.777        | 16.470        | 15.974        | 0.029         | 0.024         | 0.017         | 0.018         | 0.342               | 0.307               | 0.496               | 0.803               | 1         | 1         | 1         | 1         | c03   |
| 1143+115 | 17.160        | 16.711        | 16.402        | 15.730        | 0.012         | 0.012         | 0.036         | 0.044         | 0.449               | 0.309               | 0.672               | 0.981               | 1         | 1         | 1         | 1         | n53   |
| 1159+292 | ...           | ...           | 15.641        | 15.081        | ...           | ...           | 0.022         | 0.012         | ...                 | 9.900               | 0.560               | 9.900               | 0         | 0         | 1         | 1         | n53   |
| 1159+292 | 17.219        | ...           | 16.365        | 15.787        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.578               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1208+457 | 15.703        | 15.378        | 15.161        | 14.947        | 0.045         | 0.037         | 0.034         | 0.048         | 0.325               | 0.217               | 0.214               | 0.431               | 1         | 1         | 1         | 1         | n51   |
| 1208+457 | 15.820        | 15.528        | 15.253        | 15.023        | 0.013         | 0.012         | 0.014         | 0.012         | 0.292               | 0.275               | 0.230               | 0.505               | 1         | 1         | 1         | 1         | n53   |
| 1213–136 | 15.861        | 15.552        | 15.305        | 15.054        | 0.019         | 0.001         | 0.001         | ...           | 0.309               | 0.247               | 0.251               | 0.498               | 2         | 2         | 2         | 2         | c06   |
| 1214+141 | 14.383        | 14.107        | 13.960        | 13.649        | 0.061         | 0.078         | 0.090         | 0.055         | 0.276               | 0.147               | 0.311               | 0.458               | 1         | 1         | 1         | 1         | n51   |
| 1214+141 | 14.762        | 14.506        | 14.128        | 13.865        | 0.150         | 0.108         | 0.056         | 0.032         | 0.256               | 0.377               | 0.264               | 0.641               | 2         | 2         | 2         | 2         | c06   |
| 1214+141 | 14.783        | 14.585        | 14.274        | 14.072        | 0.027         | 0.013         | 0.011         | 0.011         | 0.198               | 0.311               | 0.202               | 0.513               | 1         | 1         | 1         | 1         | c03   |
| 1218–013 | 17.654        | 17.271        | 16.815        | 16.263        | 0.043         | 0.039         | 0.040         | 0.032         | 0.383               | 0.456               | 0.552               | 1.008               | 2         | 2         | 2         | 2         | c06   |
| 1218–013 | 18.073        | 17.596        | 17.165        | ...           | 0.013         | 0.013         | 0.036         | ...           | 0.477               | 0.431               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1219–018 | 17.494        | 16.927        | 16.462        | 15.945        | 0.009         | 0.018         | 0.007         | 0.015         | 0.567               | 0.465               | 0.516               | 0.982               | 2         | 2         | 2         | 2         | c06   |
| 1221+044 | 18.198        | 17.938        | 17.707        | 17.390        | 0.030         | 0.022         | 0.030         | 0.034         | 0.260               | 0.231               | 0.317               | 0.548               | 1         | 1         | 1         | 1         | c06   |
| 1223+477 | 17.181        | 16.707        | 16.387        | 15.790        | 0.070         | 0.036         | 0.037         | 0.107         | 0.474               | 0.320               | 0.597               | 0.917               | 1         | 1         | 1         | 1         | n51   |
| 1223+477 | 17.218        | 16.692        | 16.389        | 15.806        | 0.030         | 0.027         | 0.033         | 0.001         | 0.526               | 0.303               | 0.583               | 0.886               | 2         | 2         | 2         | 2         | n53   |
| 1225+322 | 16.555        | 15.011        | 14.424        | 13.679        | 0.013         | 0.013         | 0.022         | 0.011         | 1.544               | 0.587               | 0.745               | 1.332               | 1         | 1         | 1         | 1         | n53   |
| 1225+322 | 17.837        | ...           | 14.356        | 13.995        | 0.110         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.361               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1228+282 | 16.336        | ...           | 15.172        | ...           | 0.011         | ...           | 0.024         | ...           | 9.900               | 9.900               | 9.900               | ...                 | 1         | 0         | 4         | 0         | n53   |
| 1229+021 | 12.686        | 12.627        | 12.475        | 11.974        | 0.027         | 0.013         | 0.011         | 0.010         | 0.059               | 0.152               | 0.501               | 0.653               | 1         | 1         | 1         | 1         | c03   |
| 1229+021 | 12.728        | 12.658        | 12.500        | 12.003        | 0.010         | 0.005         | 0.004         | 0.003         | 0.071               | 0.158               | 0.497               | 0.654               | 2         | 2         | 2         | 2         | c06   |
| 1229+021 | 12.728        | 12.658        | 12.500        | 12.003        | 0.010         | 0.005         | 0.004         | 0.003         | 0.071               | 0.158               | 0.497               | 0.654               | 2         | 2         | 2         | 2         | c06   |
| 1230+013 | 14.681        | 14.516        | 14.358        | 14.108        | 0.009         | 0.013         | 0.002         | 0.008         | 0.165               | 0.158               | 0.250               | 0.408               | 2         | 2         | 2         | 2         | c06   |

**Table 2**  
(Continued)

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> − <i>V</i> | <i>V</i> − <i>R</i> | <i>R</i> − <i>I</i> | <i>V</i> − <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 1230+013 | 14.700        | 14.564        | 14.388        | 14.128        | 0.021         | 0.017         | 0.016         | 0.018         | 0.136               | 0.176               | 0.260               | 0.436               | 1         | 1         | 1         | 1         | c03   |
| 1231+355 | 16.865        | ...           | 15.978        | 15.363        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.615               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1231+707 | 16.615        | 16.475        | 16.279        | ...           | 0.046         | 0.037         | 0.034         | ...           | 0.140               | 0.196               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |
| 1232−024 | 17.293        | 16.892        | 16.639        | 16.476        | 0.029         | 0.021         | 0.030         | 0.034         | 0.401               | 0.253               | 0.163               | 0.416               | 1         | 1         | 1         | 1         | c06   |
| 1246−075 | 20.492        | 20.125        | 19.598        | 19.163        | 0.037         | 0.026         | 0.032         | 0.036         | 0.367               | 0.527               | 0.435               | 0.962               | 1         | 1         | 1         | 1         | c06   |
| 1250+265 | 15.817        | 15.722        | 15.433        | ...           | 0.011         | 0.012         | 0.036         | ...           | 0.095               | 0.289               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1251+293 | 16.424        | 16.045        | 15.812        | ...           | 0.011         | 0.012         | 0.036         | ...           | 0.379               | 0.233               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1251+293 | 16.469        | 16.208        | 16.153        | 15.638        | 0.061         | 0.078         | 0.090         | 0.055         | 0.261               | 0.055               | 0.515               | 0.570               | 1         | 1         | 1         | 1         | n51   |
| 1254+117 | 17.144        | 16.846        | 16.675        | 16.533        | 0.047         | 0.039         | 0.038         | 0.045         | 0.298               | 0.171               | 0.142               | 0.313               | 1         | 1         | 1         | 1         | c06   |
| 1256−058 | 15.321        | 14.821        | 14.328        | 13.687        | 0.046         | 0.039         | 0.037         | 0.044         | 0.500               | 0.493               | 0.641               | 1.134               | 1         | 1         | 1         | 1         | c06   |
| 1305−106 | 15.173        | 15.132        | 14.934        | 14.594        | 0.006         | 0.003         | 0.005         | 0.024         | 0.040               | 0.199               | 0.340               | 0.539               | 2         | 2         | 2         | 2         | c06   |
| 1305−106 | 15.238        | 15.217        | 14.961        | 14.681        | 0.028         | 0.024         | 0.016         | 0.018         | 0.021               | 0.256               | 0.280               | 0.536               | 1         | 1         | 1         | 1         | c03   |
| 1306+393 | 16.306        | ...           | 15.930        | 15.742        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.188               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1309+083 | 15.590        | 15.525        | 15.321        | 14.703        | 0.059         | 0.034         | 0.023         | 0.047         | 0.065               | 0.204               | 0.618               | 0.822               | 2         | 2         | 2         | 2         | c06   |
| 1309+083 | 15.786        | 15.702        | 15.468        | 14.788        | 0.028         | 0.013         | 0.011         | 0.011         | 0.084               | 0.234               | 0.680               | 0.914               | 1         | 1         | 1         | 1         | c03   |
| 1310+323 | 19.784        | 19.275        | 18.803        | 18.367        | 0.074         | 0.039         | 0.039         | 0.112         | 0.509               | 0.472               | 0.436               | 0.908               | 1         | 1         | 1         | 1         | n51   |
| 1323+465 | 18.031        | 17.022        | 16.613        | 15.995        | 0.070         | 0.036         | 0.037         | 0.106         | 1.009               | 0.409               | 0.618               | 1.027               | 1         | 1         | 1         | 1         | n51   |
| 1325−384 | 16.608        | 16.081        | 15.619        | 15.101        | 0.021         | 0.017         | 0.016         | 0.018         | 0.527               | 0.462               | 0.518               | 0.980               | 1         | 1         | 1         | 1         | c03   |
| 1325−384 | 16.615        | 16.125        | 15.646        | 15.135        | 0.005         | 0.017         | 0.025         | 0.033         | 0.491               | 0.479               | 0.511               | 0.990               | 2         | 2         | 2         | 2         | c06   |
| 1347+286 | 15.182        | 14.602        | 14.279        | 14.131        | 0.061         | 0.078         | 0.090         | 0.055         | 0.580               | 0.323               | 0.148               | 0.471               | 1         | 1         | 1         | 1         | n51   |
| 1353+638 | 14.858        | 14.531        | ...           | ...           | 0.045         | 0.037         | ...           | ...           | 0.327               | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | n51   |
| 1353+638 | 14.982        | 14.660        | 14.397        | 13.961        | 0.013         | 0.011         | 0.014         | 0.012         | 0.322               | 0.263               | 0.436               | 0.699               | 1         | 1         | 1         | 1         | n53   |
| 1354+181 | 16.185        | 16.107        | 16.132        | 15.280        | 0.027         | 0.023         | 0.233         | 0.034         | 0.078               | −0.025              | 0.852               | 0.827               | 1         | 1         | 2         | 1         | c06   |
| 1354+181 | 16.579        | 16.395        | ...           | ...           | 0.012         | 0.013         | ...           | ...           | 0.184               | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | n53   |
| 1356+253 | 16.517        | 16.223        | 16.039        | 15.383        | 0.061         | 0.078         | 0.090         | 0.055         | 0.294               | 0.184               | 0.656               | 0.840               | 1         | 1         | 1         | 1         | n51   |
| 1356+253 | 16.529        | 16.283        | 16.062        | ...           | 0.011         | 0.012         | 0.036         | ...           | 0.246               | 0.221               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1359−419 | 15.071        | 15.123        | 14.900        | 14.483        | 0.036         | 0.050         | 0.039         | 0.048         | −0.052              | 0.224               | 0.417               | 0.640               | 2         | 2         | 2         | 2         | c06   |
| 1404+435 | 15.635        | 15.420        | 15.132        | 14.852        | 0.070         | 0.036         | 0.037         | 0.111         | 0.215               | 0.288               | 0.280               | 0.568               | 1         | 1         | 1         | 1         | n51   |
| 1409+263 | 15.812        | ...           | 15.469        | 15.280        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.189               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1416−254 | 15.544        | 15.509        | 15.285        | 14.693        | 0.047         | 0.026         | 0.030         | 0.012         | 0.035               | 0.224               | 0.592               | 0.816               | 2         | 2         | 2         | 2         | c06   |
| 1417+449 | 16.478        | 15.905        | 15.610        | 15.033        | 0.070         | 0.036         | 0.037         | 0.101         | 0.573               | 0.295               | 0.577               | 0.872               | 1         | 1         | 1         | 1         | n51   |
| 1418−212 | 16.913        | 16.515        | 16.019        | 15.464        | 0.024         | 0.010         | 0.005         | 0.019         | 0.398               | 0.496               | 0.555               | 1.051               | 2         | 2         | 2         | 2         | c06   |
| 1427+198 | 15.433        | 15.233        | 14.843        | 14.476        | 0.158         | 0.104         | 0.031         | 0.034         | 0.200               | 0.390               | 0.367               | 0.757               | 2         | 2         | 1         | 1         | c06   |
| 1427+198 | 15.504        | 15.259        | 14.976        | ...           | 0.012         | 0.013         | 0.022         | ...           | 0.245               | 0.283               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n53   |
| 1427+198 | 15.516        | 15.361        | 15.072        | 14.697        | 0.028         | 0.024         | 0.016         | 0.018         | 0.155               | 0.289               | 0.375               | 0.664               | 1         | 1         | 1         | 1         | c03   |
| 1427+265 | 16.450        | ...           | 16.269        | 15.877        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.392               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1435+425 | 19.019        | 16.576        | 15.775        | 15.035        | 0.064         | 0.078         | 0.090         | 0.055         | 2.443               | 0.801               | 0.740               | 1.541               | 1         | 1         | 1         | 1         | n51   |
| 1442+354 | 14.781        | 14.541        | 14.258        | 13.833        | 0.069         | 0.036         | 0.037         | 0.103         | 0.240               | 0.283               | 0.425               | 0.708               | 1         | 1         | 1         | 1         | n51   |
| 1446+406 | 15.709        | ...           | 15.477        | 15.162        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.315               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1449+633 | ...           | 13.901        | ...           | 12.858        | ...           | 0.037         | ...           | 0.048         | 9.900               | 9.900               | 9.900               | 1.043               | 0         | 1         | 0         | 1         | n51   |
| 1454−378 | 17.374        | 17.268        | 16.800        | 16.181        | 0.021         | 0.017         | 0.016         | 0.018         | 0.106               | 0.468               | 0.619               | 1.087               | 1         | 1         | 1         | 1         | c03   |
| 1454−378 | 17.388        | 17.276        | 16.851        | 16.217        | 0.047         | 0.049         | 0.069         | 0.070         | 0.112               | 0.425               | 0.635               | 1.059               | 2         | 2         | 2         | 2         | c06   |
| 1455−358 | 16.988        | 16.328        | 15.686        | 15.059        | 0.029         | 0.024         | 0.016         | 0.018         | 0.660               | 0.642               | 0.627               | 1.269               | 1         | 1         | 1         | 1         | c03   |
| 1455−358 | 17.104        | 16.364        | 15.733        | 15.137        | 0.035         | 0.051         | 0.067         | 0.040         | 0.740               | 0.631               | 0.596               | 1.227               | 2         | 2         | 2         | 2         | c06   |
| 1522−067 | ...           | 16.235        | 15.883        | 15.464        | ...           | 0.017         | 0.016         | 0.018         | 9.900               | 0.352               | 0.419               | 0.771               | 0         | 1         | 1         | 1         | c03   |
| 1522−067 | 16.559        | 15.943        | 15.617        | 15.062        | 0.012         | 0.013         | 0.022         | 0.012         | 0.616               | 0.326               | 0.555               | 0.881               | 1         | 1         | 1         | 1         | n53   |
| 1522−067 | 16.617        | 16.276        | 15.859        | 15.431        | 0.009         | 0.008         | 0.010         | 0.026         | 0.341               | 0.417               | 0.428               | 0.845               | 2         | 2         | 2         | 2         | c06   |
| 1553+129 | ...           | ...           | 15.444        | ...           | ...           | ...           | 0.080         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 1603+159 | ...           | 18.051        | 17.129        | 16.379        | ...           | 0.015         | 0.012         | 0.012         | 9.900               | 0.922               | 0.750               | 1.672               | 0         | 1         | 1         | 1         | c03   |
| 1603+159 | ...           | 18.093        | 17.091        | 16.480        | ...           | 0.024         | 0.031         | 0.034         | 9.900               | 1.002               | 0.611               | 1.613               | 0         | 1         | 1         | 1         | c06   |
| 1610+242 | ...           | ...           | 20.245        | ...           | ...           | ...           | 0.054         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 1         | 0         | n54   |
| 1613+657 | 14.874        | ...           | ...           | ...           | 0.045         | ...           | ...           | ...           | 9.900               | ...                 | ...                 | ...                 | 1         | 0         | 0         | 0         | n51   |
| 1613+657 | 15.119        | ...           | ...           | 13.933        | 0.032         | ...           | ...           | 0.036         | 9.900               | ...                 | 9.900               | 9.900               | 1         | 0         | 0         | 1         | n54   |
| 1621+183 | 17.726        | 17.255        | 16.823        | 16.198        | 0.029         | 0.024         | 0.017         | 0.019         | 0.471               | 0.432               | 0.625               | 1.057               | 1         | 1         | 1         | 1         | c03   |
| 1621+183 | 17.813        | 17.181        | 16.936        | 16.237        | 0.062         | 0.078         | 0.090         | 0.055         | 0.632               | 0.245               | 0.699               | 0.944               | 1         | 1         | 1         | 1         | n51   |
| 1621+183 | 18.003        | 17.403        | 16.924        | 16.289        | 0.031         | 0.022         | 0.030         | 0.034         | 0.600               | 0.479               | 0.635               | 1.114               | 1         | 1         | 1         | 1         | c06   |
| 1624−682 | 16.774        | 16.537        | 16.117        | 15.704        | 0.027         | 0.023         | 0.031         | 0.034         | 0.237               | 0.420               | 0.413               | 0.833               | 1         | 1         | 1         | 1         | c06   |
| 1624−682 | 16.851        | 16.553        | 16.126        | 15.719        | 0.021         | 0.017         | 0.016         | 0.018         | 0.298               | 0.427               | 0.407               | 0.834               | 1         | 1         | 1         | 1         | c03   |
| 1631+099 | 16.676        | 16.333        | 16.024        | 15.624        | 0.029         | 0.024         | 0.016         | 0.018         | 0.343               | 0.309               | 0.400               | 0.709               | 1         | 1         | 1         | 1         | c03   |
| 1631+099 | 16.891        | 16.367        | 16.002        | 15.471        | 0.021         | 0.016         | 0.026         | 0.017         | 0.524               | 0.365               | 0.531               | 0.896               | 1         | 1         | 1         | 1         | n54   |
| 1634+705 | 14.942        | 14.752        | 13.690        | 14.111        | 0.032         | 0.043         | 0.063         | 0.036         | 0.190               | 1.062               | −0.421              | 0.641               | 1         | 1         | 1         | 1         | n54   |
| 1634+705 | 14.970        | 14.653        | ...           | 14.021        | 0.045         | 0.037         | ...           | 0.048         | 0.317               | 9.900               | 9.900               | 0.632               | 1         | 1         | 0         | 1         | n51   |
| 1700−262 | ...           | ...           | ...           | 15.756        | ...           | ...           | ...           | 0.011         | ...                 | ...                 | 9.900               | 9.900               | 0         | 0         | 0         | 1         | c03   |
| 1701+518 | 15.267        | 15.012        | 14.692        | 14.280        | 0.029         | 0.020         | 0.021         | 0.019         | 0.255               | 0.320               | 0.412               | 0.732               | 1         | 1         | 1         | 1         | n52   |
| 1701+518 | 15.374        | 14.980        | 14.714        | 14.269        | 0.045         | 0.037         | 0.034         | 0.048         | 0.394               | 0.266               | 0.445               | 0.711               | 1         | 1         | 1         | 1         | n51   |
| 1704+607 | 15.697        | 15.460        | 15.155        | ...           | 0.045         | 0.037         | 0.034         | ...           | 0.237               | 0.305               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |



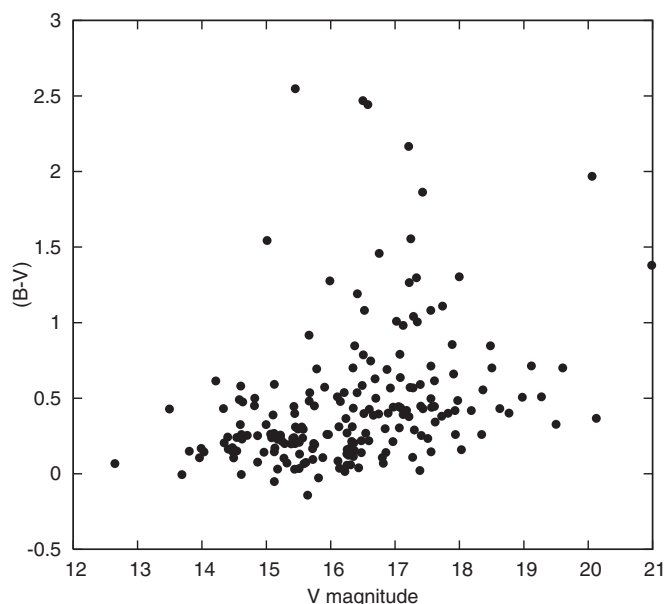
**Table 2**  
(Continued)

| Source   | Mean <i>B</i> | Mean <i>V</i> | Mean <i>R</i> | Mean <i>I</i> | Stdd <i>B</i> | Stdd <i>V</i> | Stdd <i>R</i> | Stdd <i>I</i> | <i>B</i> − <i>V</i> | <i>V</i> − <i>R</i> | <i>R</i> − <i>I</i> | <i>V</i> − <i>I</i> | <i>nB</i> | <i>nV</i> | <i>nR</i> | <i>nI</i> | Epoch |
|----------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------------|---------------------|---------------------|---------------------|-----------|-----------|-----------|-----------|-------|
| 1704+607 | 15.743        | 15.564        | 15.187        | 14.859        | 0.029         | 0.020         | 0.021         | 0.019         | 0.179               | 0.377               | 0.328               | 0.705               | 1         | 1         | 1         | 1         | n52   |
| 1719+481 | 15.265        | 14.815        | 14.514        | ...           | 0.070         | 0.036         | 0.037         | ...           | 0.450               | 0.301               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n51   |
| 1723+343 | 16.046        | ...           | 15.679        | 15.000        | 0.109         | ...           | 0.093         | 0.084         | 9.900               | 9.900               | 0.679               | 9.900               | 1         | 0         | 1         | 1         | n51   |
| 1728−143 | 14.759        | 14.199        | 13.760        | 12.979        | 0.021         | 0.017         | 0.016         | 0.018         | 0.560               | 0.439               | 0.781               | 1.220               | 1         | 1         | 1         | 1         | c03   |
| 1728−143 | 14.896        | 14.228        | 13.816        | 13.048        | 0.021         | 0.016         | 0.025         | 0.017         | 0.668               | 0.412               | 0.768               | 1.180               | 1         | 1         | 1         | 1         | n54   |
| 1751+097 | 17.982        | 17.391        | 16.741        | 15.964        | 0.029         | 0.024         | 0.016         | 0.018         | 0.591               | 0.650               | 0.777               | 1.427               | 1         | 1         | 1         | 1         | c03   |
| 1803−651 | ...           | ...           | 16.614        | 16.120        | ...           | ...           | 0.011         | 0.042         | ...                 | 9.900               | 0.494               | 9.900               | 0         | 0         | 1         | 4         | c03   |
| 1818+537 | 15.117        | 14.865        | 14.750        | 14.473        | 0.061         | 0.078         | 0.090         | 0.055         | 0.252               | 0.115               | 0.277               | 0.392               | 1         | 1         | 1         | 1         | n51   |
| 1821+643 | 13.682        | 13.688        | 13.568        | 13.172        | 0.069         | 0.036         | 0.037         | 0.072         | −0.006              | 0.120               | 0.396               | 0.516               | 1         | 1         | 1         | 1         | n51   |
| 1824+107 | 17.363        | ...           | 16.508        | 16.135        | 0.021         | ...           | 0.016         | 0.018         | 9.900               | 9.900               | 0.373               | 9.900               | 1         | 0         | 1         | 1         | c03   |
| 1824+107 | 17.598        | 17.179        | 16.665        | 16.309        | 0.021         | 0.016         | 0.026         | 0.017         | 0.419               | 0.514               | 0.356               | 0.870               | 1         | 1         | 1         | 1         | n54   |
| 1826+018 | ...           | ...           | 18.615        | 17.740        | ...           | ...           | 0.018         | 0.019         | ...                 | 9.900               | 0.875               | 9.900               | 0         | 0         | 1         | 1         | c03   |
| 1827+345 | 18.568        | 17.908        | 17.456        | 16.937        | 0.062         | 0.078         | 0.090         | 0.055         | 0.660               | 0.452               | 0.519               | 0.971               | 1         | 1         | 1         | 1         | n51   |
| 1832+139 | ...           | ...           | 19.562        | ...           | ...           | ...           | 0.160         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 1830+732 | 14.177        | 14.033        | 13.880        | 13.294        | 0.069         | 0.036         | 0.037         | 0.045         | 0.144               | 0.153               | 0.586               | 0.739               | 1         | 1         | 1         | 1         | n51   |
| 1832+286 | 19.203        | 18.503        | 18.455        | 17.999        | 0.063         | 0.078         | 0.091         | 0.056         | 0.700               | 0.048               | 0.456               | 0.504               | 1         | 1         | 1         | 1         | n51   |
| 1834+209 | 18.485        | 17.220        | 16.697        | 16.125        | 0.030         | 0.024         | 0.016         | 0.018         | 1.265               | 0.523               | 0.572               | 1.095               | 1         | 1         | 1         | 1         | c03   |
| 1850+284 | 18.190        | 18.031        | 17.840        | 17.383        | 0.022         | 0.017         | 0.026         | 0.018         | 0.159               | 0.191               | 0.457               | 0.648               | 1         | 1         | 1         | 1         | n54   |
| 1853+237 | 16.116        | 15.776        | 13.318        | 14.920        | 0.032         | 0.043         | 0.063         | 0.036         | 0.340               | 2.458               | −1.602              | 0.856               | 1         | 1         | 1         | 1         | n54   |
| 1853+237 | 16.302        | 15.571        | 15.159        | 14.731        | 0.028         | 0.024         | 0.016         | 0.018         | 0.731               | 0.412               | 0.428               | 0.840               | 1         | 1         | 1         | 1         | c03   |
| 1902+320 | 17.804        | 17.233        | 16.506        | 15.376        | 0.022         | 0.016         | 0.026         | 0.017         | 0.571               | 0.727               | 1.130               | 1.857               | 1         | 1         | 1         | 1         | n54   |
| 1912+053 | ...           | ...           | 19.421        | ...           | ...           | ...           | 0.053         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 1         | 0         | n54   |
| 1911−201 | 18.920        | 18.365        | 17.862        | ...           | 0.023         | 0.018         | 0.017         | ...           | 0.555               | 0.503               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | c03   |
| 1939−100 | 18.613        | 17.185        | 16.512        | 15.696        | 0.030         | 0.024         | 0.016         | 0.018         | 1.428               | 0.673               | 0.816               | 1.489               | 1         | 1         | 1         | 1         | c03   |
| 1939−100 | 18.985        | 17.303        | 17.442        | 16.437        | 0.035         | 0.043         | 0.063         | 0.036         | 1.682               | −0.139              | 1.005               | 0.866               | 1         | 1         | 1         | 1         | n54   |
| 1950+081 | ...           | ...           | 20.143        | ...           | ...           | ...           | 0.053         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 1         | 0         | n54   |
| 2007+405 | 22.028        | 20.060        | 19.375        | ...           | 0.049         | 0.024         | 0.023         | ...           | 1.968               | 0.685               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 2024+173 | 18.602        | 18.184        | 17.825        | 17.669        | 0.023         | 0.018         | 0.017         | 0.019         | 0.418               | 0.359               | 0.156               | 0.515               | 1         | 1         | 1         | 1         | c03   |
| 2024+173 | 19.163        | 19.571        | ...           | ...           | 0.025         | 0.021         | ...           | ...           | −0.408              | 9.900               | ...                 | 9.900               | 1         | 1         | 0         | 0         | n54   |
| 2051+747 | ...           | ...           | 19.477        | ...           | ...           | ...           | 0.143         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 2100+238 | 19.828        | 19.501        | 19.324        | 19.231        | 0.032         | 0.018         | 0.018         | 0.019         | 0.327               | 0.177               | 0.093               | 0.270               | 1         | 1         | 1         | 1         | n52   |
| 2112−387 | ...           | 17.364        | 16.905        | 16.201        | ...           | 0.025         | 0.024         | 0.054         | 9.900               | 0.459               | 0.704               | 1.163               | 0         | 1         | 1         | 1         | c02   |
| 2115+191 | 16.308        | 16.252        | 16.025        | 15.817        | 0.029         | 0.020         | 0.021         | 0.019         | 0.056               | 0.227               | 0.208               | 0.435               | 1         | 1         | 1         | 1         | n52   |
| 2124−177 | 15.787        | 15.491        | 15.235        | 14.909        | 0.023         | 0.027         | 0.028         | 0.068         | 0.296               | 0.256               | 0.326               | 0.582               | 1         | 1         | 1         | 1         | c02   |
| 2130+335 | ...           | 22.648        | 21.451        | ...           | ...           | 0.046         | 0.030         | ...           | 9.900               | 1.197               | 9.900               | 9.900               | 0         | 1         | 1         | 0         | n52   |
| 2149−447 | 16.646        | 16.335        | 15.997        | 15.683        | 0.022         | 0.019         | 0.023         | 0.079         | 0.311               | 0.338               | 0.314               | 0.652               | 1         | 1         | 1         | 1         | c02   |
| 2155+228 | ...           | ...           | 20.467        | ...           | ...           | ...           | 0.053         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 1         | 0         | n54   |
| 2202−570 | 17.072        | 16.488        | 16.024        | 15.472        | 0.024         | 0.024         | 0.024         | 0.054         | 0.584               | 0.464               | 0.552               | 1.016               | 1         | 1         | 1         | 1         | c02   |
| 2207+169 | ...           | ...           | 20.674        | ...           | ...           | ...           | 0.143         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 2213−649 | 17.317        | 16.689        | 16.138        | 15.614        | 0.024         | 0.027         | 0.028         | 0.068         | 0.628               | 0.551               | 0.524               | 1.075               | 1         | 1         | 1         | 1         | c02   |
| 2217+243 | ...           | ...           | 17.757        | ...           | ...           | ...           | 0.015         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 2217+142 | 15.107        | 14.632        | 14.147        | ...           | 0.028         | 0.014         | 0.014         | ...           | 0.475               | 0.485               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 2220+398 | 18.483        | ...           | 18.024        | 17.578        | 0.029         | ...           | 0.021         | 0.019         | 9.900               | 9.900               | 0.446               | 9.900               | 1         | 0         | 1         | 1         | n52   |
| 2245−469 | 15.405        | 15.177        | 14.950        | 14.420        | 0.152         | 0.151         | 0.137         | 0.120         | 0.228               | 0.227               | 0.530               | 0.757               | 1         | 1         | 1         | 1         | c02   |
| 2245−606 | 16.195        | 15.746        | 15.500        | 15.219        | 0.152         | 0.151         | 0.137         | 0.120         | 0.449               | 0.246               | 0.281               | 0.527               | 1         | 1         | 1         | 1         | c02   |
| 2248−681 | ...           | 17.148        | 16.570        | 15.942        | ...           | 0.027         | 0.028         | 0.069         | 9.900               | 0.578               | 0.628               | 1.206               | 0         | 1         | 1         | 1         | c02   |
| 2253+197 | ...           | ...           | 16.340        | ...           | ...           | ...           | 0.056         | ...           | ...                 | 9.900               | 9.900               | ...                 | 0         | 0         | 2         | 0         | n54   |
| 2300−558 | ...           | 17.340        | 16.743        | 15.992        | ...           | 0.020         | 0.014         | 0.054         | 9.900               | 0.597               | 0.751               | 1.348               | 0         | 1         | 2         | 1         | c05   |
| 2300−558 | 18.274        | 17.233        | 16.708        | 15.982        | 0.026         | 0.024         | 0.024         | 0.054         | 1.041               | 0.525               | 0.726               | 1.251               | 1         | 1         | 1         | 1         | c02   |
| 2304−087 | 14.549        | 14.345        | 13.899        | 13.595        | 0.009         | 0.033         | 0.001         | 0.062         | 0.204               | 0.446               | 0.304               | 0.750               | 2         | 1         | 2         | 1         | c05   |
| 2312+388 | 18.605        | 18.345        | 17.942        | 17.280        | 0.030         | 0.021         | 0.022         | 0.019         | 0.260               | 0.403               | 0.662               | 1.065               | 1         | 1         | 1         | 1         | n52   |
| 2313+472 | 18.106        | 17.725        | 17.288        | ...           | 0.029         | 0.021         | 0.021         | ...           | 0.381               | 0.437               | 9.900               | 9.900               | 1         | 1         | 1         | 0         | n52   |
| 2339−554 | 15.639        | 15.456        | 15.186        | 15.042        | 0.012         | 0.014         | 0.007         | 0.005         | 0.183               | 0.269               | 0.144               | 0.414               | 3         | 3         | 3         | 3         | c05   |
| 2339−554 | 15.655        | 15.439        | 15.205        | 15.066        | 0.023         | 0.027         | 0.028         | 0.068         | 0.216               | 0.234               | 0.139               | 0.373               | 1         | 1         | 1         | 1         | c02   |
| 2351−012 | 15.469        | 15.439        | 15.174        | 14.487        | 0.002         | 0.031         | 0.011         | 0.019         | 0.030               | 0.265               | 0.687               | 0.952               | 2         | 1         | 2         | 1         | c05   |
| 2352+033 | 18.269        | 17.556        | 17.004        | 16.453        | 0.041         | 0.030         | 0.005         | 0.031         | 0.713               | 0.552               | 0.551               | 1.103               | 1         | 1         | 2         | 1         | c05   |
| 2358+494 | 17.660        | 17.407        | 17.070        | 16.620        | 0.024         | 0.017         | 0.014         | 0.017         | 0.253               | 0.337               | 0.450               | 0.787               | 1         | 1         | 1         | 1         | n52   |
| 2359+086 | 17.184        | 16.278        | 15.772        | 15.193        | 0.008         | 0.031         | 0.002         | 0.020         | 0.906               | 0.506               | 0.579               | 1.085               | 2         | 1         | 2         | 1         | c05   |
| 2359+086 | 17.209        | 15.948        | 15.416        | 14.761        | 0.029         | 0.014         | 0.014         | 0.015         | 1.261               | 0.532               | 0.655               | 1.187               | 1         | 1         | 1         | 1         | n52   |

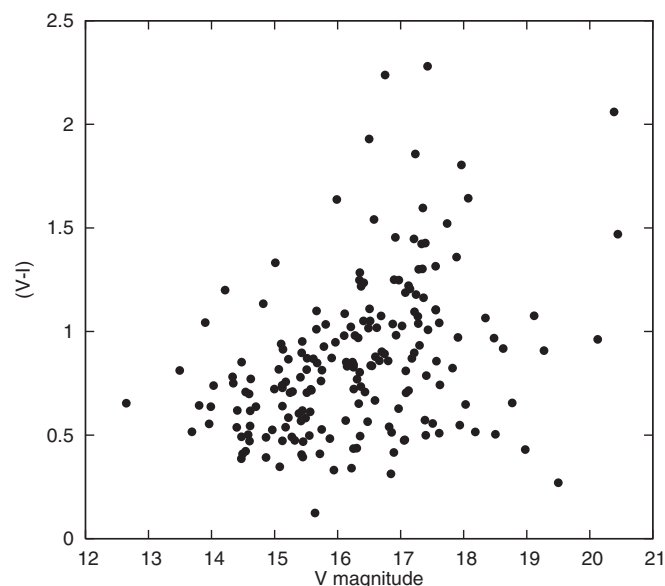
(This table is also available in machine-readable and Virtual Observatory (VO) forms in the online journal.)

reference frame link program (Zacharias & Zacharias 2005) was adopted for processing of both the CTIO 1 m and NOFS 1 m

data. Image centroids were obtained from two-dimensional Gaussian profile least-squares fits to the pixel counts of detected



**Figure 2.** Plot of observed  $(B-V)$  color vs. observed  $V$  magnitude.



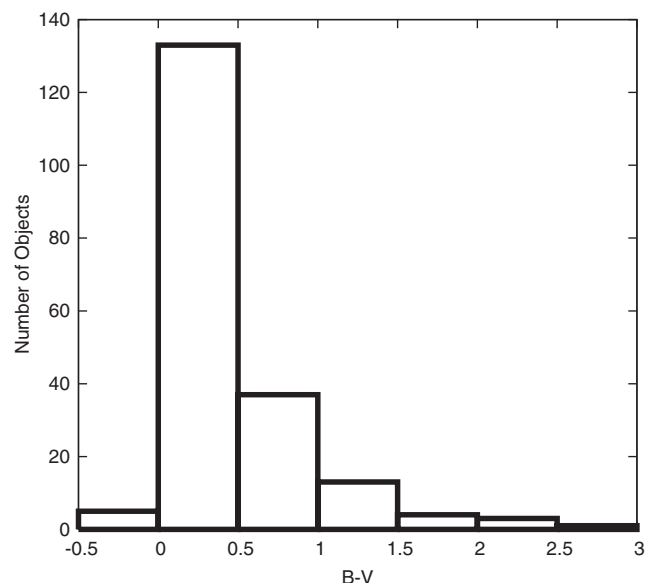
**Figure 3.** Plot of observed  $(V-I)$  color vs. observed  $V$  magnitude.

sources. The UCAC2 catalog (Zacharias et al. 2004) provided the reference stars for the astrometric reductions. An eight-parameter plate model was used for astrometric reduction after determining and applying corrections for atmospheric refraction and mean optical field angle distortion.

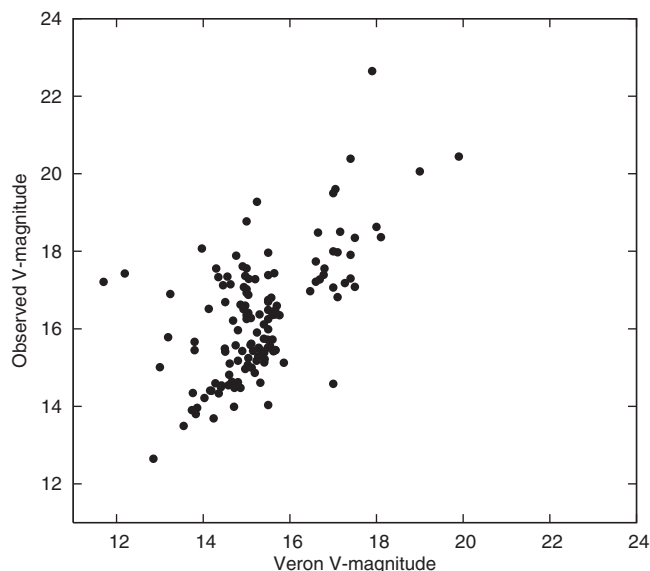
There are dedicated, high accuracy, astrometric observations going on at the 61 inch telescope at NOFS (Zacharias & Zacharias 2008; Zacharias et al. 2008) with results to be published in 2010 for about 12 sources on the few milliarcsecond level. A set of over 200 QSOs has been observed at somewhat lower accuracy with respect to UCAC3 reference stars, which will be published in 2009.

### 3.3. Photometric Data Processing

Instrumental magnitudes were obtained from aperture photometry performed on each detected object as part of the astrometric pipeline. Pixel counts in the background ring were

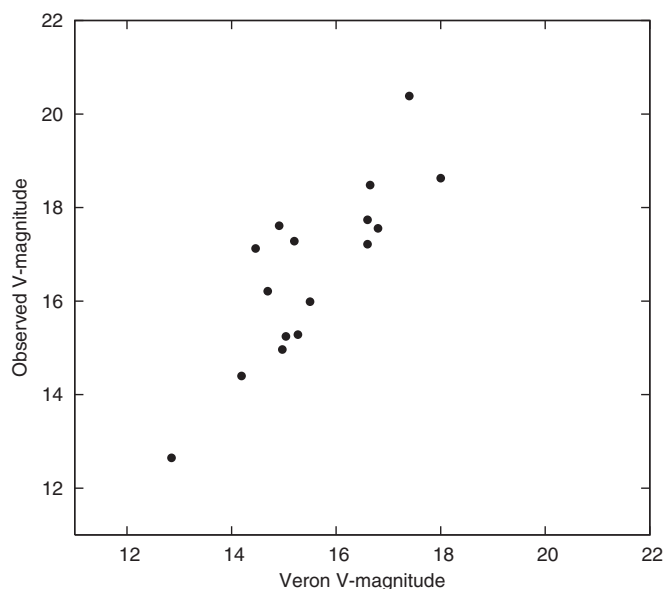


**Figure 4.** Histogram of observed  $(B-V)$  color distribution.

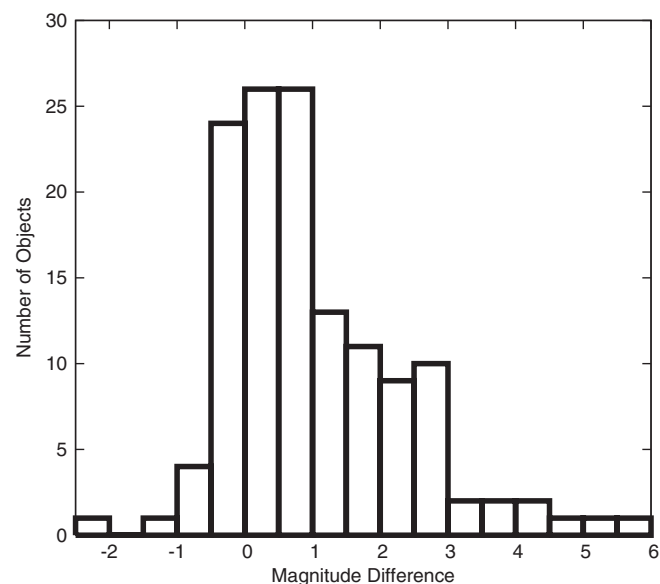


**Figure 5.** Plot of observed  $V$  magnitudes vs. Veron catalog  $V$  magnitudes.

sorted and outliers excluded before deriving the mean local background. Photometric standard fields were observed typically 3–5 times a night at various air masses. Photometric calibration per filter was performed with the Landolt stars (Landolt 1992) and a two- or three-parameter model determining the zero point and linear terms as a function of air mass and color (if needed), respectively, was constructed. The decision to include a color term was based on results from test reductions for each filter and night, at which time also outliers and potential problems were identified. Least-square fit results and residuals were examined to determine the photometric quality of the night. The  $1\sigma$  error on the photometric fit had a median value of 35, 32, 37, and 35 mmag, and the extinction had a median value of  $-0.268$ ,  $-0.155$ ,  $-0.105$ , and  $-0.056$  for the  $B$ ,  $V$ ,  $R$ , and  $I$  bands, respectively. Color coefficients were not used for 60% of our nights. Their typical value, when used, was  $-0.058$ . For acceptable data, the derived photometric calibration parameters were applied to the QSO target observations to obtain individual  $B$ ,  $V$ ,  $R$ , and  $I$  magnitudes.



**Figure 6.** Plot of observed  $V$  magnitudes vs. Veron catalog  $V$  magnitude for those sources observed at three or more epochs.



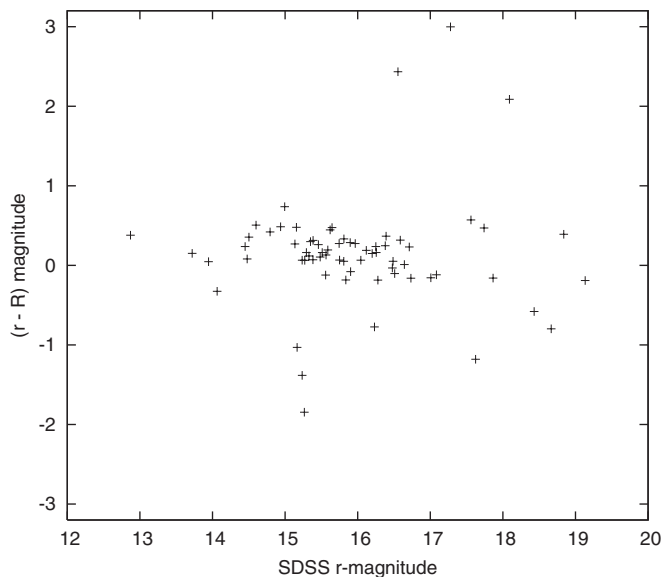
**Figure 7.** Histogram of magnitude differences between observed  $V$  magnitudes and Veron catalog  $V$  magnitudes. A positive difference indicates a larger observed  $V$  magnitude (fainter) as compared to the Veron value.

Color information of the QSO targets were initially not available, and a mean color was adopted for the first photometric calibration step. After deriving preliminary magnitudes in all bands, colors were derived and iteratively used in the photometric calibrations for subsequent processing to arrive at the final target magnitudes.

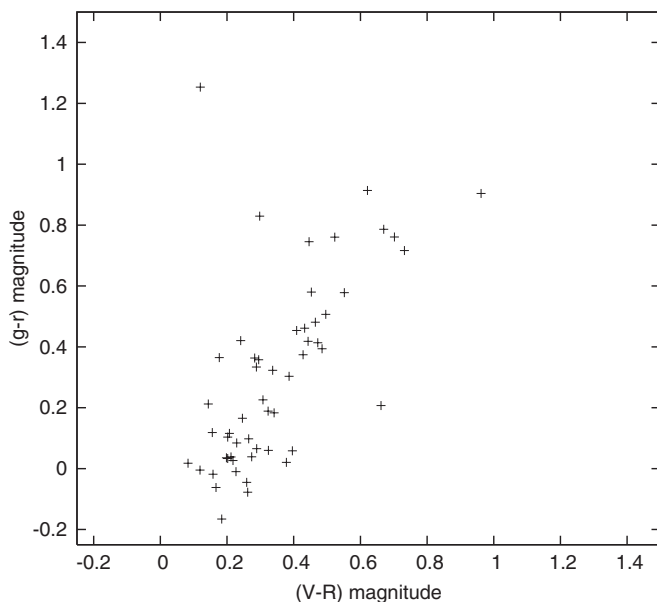
## 4. RESULTS

### 4.1. Distribution of Targets

Figure 1 shows the observed sources in the sky, coded by symbol for groups of  $R$  magnitude. The plot shows that the sources are well distributed over the sky; however, the area near the galactic plane (as expected) is significantly more sparsely populated than the rest of the sky. In sky areas with a large number of sources, a reference frame target source can be



**Figure 8.** Plot of  $(r-R)$ , the difference of the SDSS  $r$  magnitude and observed  $R$  magnitude, against SDSS  $r$  magnitude



**Figure 9.** Color-color plot of SDSS  $(g-r)$  against observed  $(V-R)$ .

selected from a number of candidates depending on further investigations. For areas close to the galactic plane, the choices are limited and often only a target of 18th or fainter magnitude is available. However, even if a relatively bright target cutoff limit has to be adopted, the sky distribution of sources is sufficiently homogeneous to support a highly accurate future reference frame (V. V. Makarov 2008, private communication).

### 4.2. Mean Magnitudes

Individual magnitudes of our target sources were collected and averaged (per filter) for multiple observations over the period of an observing run, which typically extended to a few nights. In a few cases, a larger than expected scatter was observed. From the combined data, a fraction of the nights were identified with nonphotometric conditions and all data points obtained during that period of time were excluded. The final results for each object and each observing run are presented in

**Table 3**  
Magnitude Variability

| Source   | Runs | <i>B</i> magnitude |                    |         | <i>V</i> magnitude |       |         | <i>R</i> magnitude |       |         | <i>I</i> magnitude |       |         |
|----------|------|--------------------|--------------------|---------|--------------------|-------|---------|--------------------|-------|---------|--------------------|-------|---------|
|          |      | Mean               | Error <sup>a</sup> | Scatter | Mean               | Error | Scatter | Mean               | Error | Scatter | Mean               | Error | Scatter |
| 0504–297 | 3    | 16.234             | 0.032              | 0.032   | 16.220             | 0.024 | 0.037   | 16.155             | 0.024 | 0.031   | 15.880             | 0.054 | 0.028   |
| 0517–442 | 3    | 15.475             | 0.023              | 0.038   | 15.219             | 0.027 | 0.021   | 14.868             | 0.028 | 0.027   | 14.353             | 0.068 | 0.009   |
| 0534–603 | 3    | 18.108             | 0.153              | 0.027   | 17.125             | 0.151 | 0.024   | 16.485             | 0.137 | 0.006   | 15.904             | 0.120 | 0.015   |
| 0536–517 | 3    | 16.748             | 0.024              | 0.042   | 16.210             | 0.027 | 0.039   | 15.781             | 0.028 | 0.022   | 15.189             | 0.068 | 0.025   |
| 0552–532 | 3    | 15.938             | 0.023              | 0.023   | 15.737             | 0.027 | 0.006   | 15.361             | 0.028 | 0.008   | 14.976             | 0.068 | 0.003   |
| 0552–640 | 3    | 15.460             | 0.152              | 0.107   | 15.245             | 0.151 | 0.099   | 14.910             | 0.137 | 0.020   | 14.539             | 0.120 | 0.037   |
| 0556–027 | 3    | ...                | ...                | ...     | 20.386             | 0.025 | 0.152   | 19.120             | 0.113 | 0.095   | 18.257             | 0.046 | 0.147   |
| 0559–504 | 3    | 15.105             | 0.024              | 0.017   | 14.963             | 0.024 | 0.013   | 14.816             | 0.024 | 0.013   | 14.438             | 0.054 | 0.028   |
| 0607–086 | 4    | 18.208             | 0.076              | 0.056   | 16.754             | 0.027 | 0.030   | 15.739             | 0.036 | 0.037   | 14.516             | 0.068 | 0.018   |
| 0611–194 | 3    | 18.845             | 0.032              | 0.049   | 17.737             | 0.148 | 0.091   | 17.069             | 0.029 | 0.046   | 16.215             | 0.068 | 0.024   |
| 0646–443 | 4    | 17.602             | 0.025              | 0.087   | 17.216             | 0.024 | 0.043   | 16.939             | 0.024 | 0.038   | 16.320             | 0.054 | 0.022   |
| 0648–177 | 4    | 19.856             | 0.063              | 0.124   | 19.118             | 0.033 | 0.047   | 18.540             | 0.029 | 0.050   | 18.042             | 0.087 | 0.078   |
| 0718–261 | 4    | 19.058             | 0.054              | 0.015   | 18.627             | 0.060 | 0.035   | 18.180             | 0.024 | 0.022   | 17.709             | 0.058 | 0.006   |
| 0745–007 | 3    | 17.518             | 0.022              | 0.031   | 17.126             | 0.017 | 0.043   | 16.834             | 0.025 | 0.015   | 16.827             | 0.025 | ...     |
| 0827+097 | 4    | 17.263             | 0.046              | 0.035   | 15.987             | 0.090 | 0.042   | 15.228             | 0.035 | 0.028   | 14.426             | 0.013 | 0.006   |
| 0828–708 | 3    | 19.294             | 0.036              | ...     | 18.481             | 0.027 | 0.047   | 18.003             | 0.034 | 0.030   | 17.513             | 0.058 | 0.058   |
| 0850–122 | 3    | 18.052             | 0.080              | 0.030   | 17.556             | 0.175 | 0.131   | 17.202             | 0.055 | 0.053   | 16.450             | 0.164 | 0.125   |
| 0922–400 | 3    | 17.965             | 0.029              | 0.064   | 17.623             | 0.021 | 0.063   | 17.378             | 0.030 | 0.057   | 16.881             | 0.037 | 0.056   |
| 1135–096 | 3    | 18.208             | 0.067              | 0.075   | 17.472             | 0.059 | 0.174   | 16.977             | 0.036 | 0.181   | 16.569             | 0.012 | 0.053   |
| 1214+141 | 3    | 14.643             | 0.150              | 0.159   | 14.399             | 0.108 | 0.181   | 14.121             | 0.090 | 0.111   | 13.862             | 0.055 | 0.150   |
| 1229+021 | 3    | 12.714             | 0.027              | 0.017   | 12.648             | 0.013 | 0.013   | 12.492             | 0.011 | 0.010   | 11.993             | 0.010 | 0.012   |
| 1427+198 | 3    | 15.484             | 0.158              | 0.032   | 15.284             | 0.104 | 0.048   | 14.964             | 0.031 | 0.081   | 14.587             | 0.034 | 0.156   |
| 1522–067 | 3    | 16.588             | 0.012              | 0.041   | 16.151             | 0.017 | 0.128   | 15.785             | 0.022 | 0.104   | 15.319             | 0.026 | 0.158   |
| 1621+183 | 3    | 17.847             | 0.062              | 0.100   | 17.280             | 0.078 | 0.080   | 16.894             | 0.090 | 0.044   | 16.241             | 0.055 | 0.032   |

**Note.**

<sup>a</sup> The largest formal error is shown.

**Table 4**  
Formal Error Statistics

| Filter   | Number of<br>Objects | Error<br>≤ 5% | Median<br>Error | Largest<br>Error |
|----------|----------------------|---------------|-----------------|------------------|
| <i>B</i> | 130                  | 107           | 0.021           | 0.44             |
| <i>V</i> | 128                  | 102           | 0.020           | 0.54             |
| <i>R</i> | 142                  | 112           | 0.018           | 0.56             |
| <i>I</i> | 131                  | 100           | 0.025           | 0.60             |

Table 2. In this table, the first column has the J2000.0 name of the target, columns 2–5 have the mean magnitudes per run for *B*, *V*, *R*, and *I* filters, respectively. Columns 6–9 have the respective standard errors per epoch, a value of “...” indicates no measurement through that particular filter. Columns 10–13 show the (*B* – *V*), (*V* – *R*), (*R* – *I*), and (*V* – *I*) colors, respectively. Columns 14–17 show the number of times the object was observed with a particular filter. The final column records the epoch label (observing run, see Table 1).

#### 4.3. Colors

Figures 2 and 3 show the observed (*B* – *V*) and (*V* – *I*) colors, respectively. A large range of colors is observed with five targets having (*B* – *V*) ≤ 0, 170 targets in the 0–1 range, and 21 targets in the ≥ 1 range, respectively (Figure 4). This is expected for a sample of QSOs with a large spread in redshift. This color knowledge is important for future reference frame target selection. To optimize the expensive integration time of missions like SIM, a prediction of the target brightness in the instrumental system will be required on the few tenths magnitude level. Our *B*, *V*, *R*, and *I* results span the expected bandpass of the SIM mission to allow this brightness estimate; however, more observations

near the mission epoch will be required to take variability into account.

#### 4.4. Comparison with Veron

Figure 5 shows our observed *V* magnitudes compared with *V* magnitudes from the VCV06 for the 134 sources where they were available. Figure 6 shows our observed *V* magnitudes for those 16 sources which were observed at three or more epochs and for which VCV06 *V* magnitudes were available. Both Figures 5 and 6 show large differences between the Veron-Cetty and our observed magnitudes, sometimes exceeding 2 mag in either direction. The histogram in Figure 7 shows the distribution of *V* magnitude difference between our observations and the Veron catalog. The internal errors of our observations are typically below 0.1 mag, while the errors of the Veron magnitudes are typically not known. Still differences of more than 2 mag suggest mainly not a random observational error issue, rather being a physical change in brightness of the targets. This underlines the requirement for more, dedicated observations at an epoch of interest and clearly shows that a brightness lookup in some published table is not adequate for the task of scheduling SIM mission time to observe those targets or even to select targets to a desired limiting magnitude.

#### 4.5. Comparison with SDSS

We also made a comparison of our results with a dedicated sample, the Sloan Digital Sky Survey (SDSS DR5; Adelman-McCarthy et al. 2007). Using a list of our object right ascensions and declinations in decimal degrees, we made an “object cross id” type of search of the SDSS DR5 which yielded ~85 matches. We then checked that the positions of these matches were within

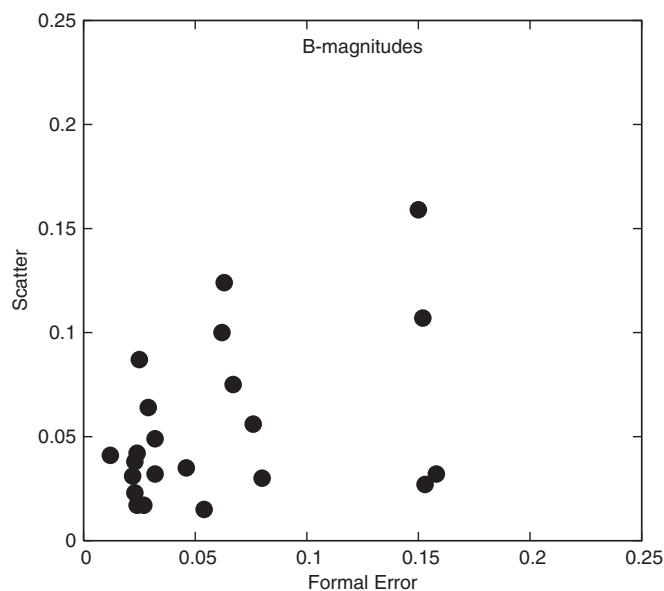


Figure 10. Scatter in the  $B$ -band data as a function of largest formal error.

1 arcsec of our quasar positions and were left with a list of 71 matches we could use for comparison.

Figure 8 is a plot of  $(r - R)$ , the difference of the SDSS  $r$  magnitude and our  $R$  magnitude, against SDSS  $r$  magnitude for the 71 sources they were available. It shows relatively small differences between our observed  $R$  magnitudes and the SDSS  $r$  magnitudes down to  $r$  magnitudes of about 19. The three sources fainter than this were outliers and are not included in the plot. It is possible that these three are mismatches. Figure 9 shows a color-color plot of the SDSS  $(g - r)$  against our  $(V - R)$ . Two outliers, both with very large negative  $(g - r)$  value, are not shown. This plot shows good agreement between the SDSS magnitudes and those presented here.

#### 4.6. Variability

All our 235 sources are observed at least once in most of the filters. Many sources have multiple epoch observations. There were 24 sources that were observed in 3 or more observing runs and the scatter in their mean magnitudes was calculated and is shown in Table 3 together with their overall mean magnitudes, i.e., averaged over all observing runs, and the largest formal error of a magnitude per observing run. The formal error and the scatter columns are directly comparable to look for a possible, physical variability of a source. However, at this point we have only few epochs of a light curve and we are dealing with small number statistics.

### 5. DISCUSSION

The goal of about 5% photometric error per epoch was achieved for most sources, which is sufficient for the purpose of predicting the brightness of our targets in any instrumental system between  $B$  and  $I$  on the 10% level to optimize future mission target selection and integration time.

Internal, photometric errors were calculated for single observations. The errors given are the RSS (root-square-sum) of an assumed systematic error floor of 0.01 mag, the Poisson noise error, and the nightly fit error to the standard stars. Most targets are well exposed with low random noise errors (about 0.01 mag); thus, the nightly fit error dominates the photometric error of individual observations.

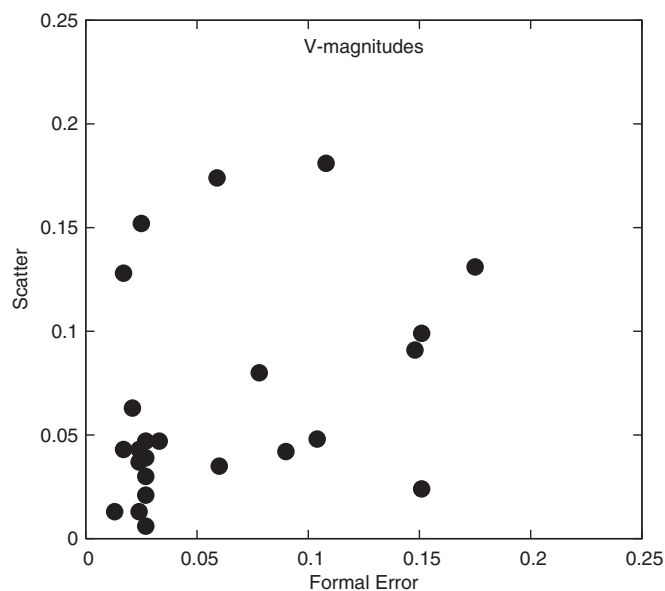


Figure 11. Scatter in the  $V$ -band data as a function of largest formal error.

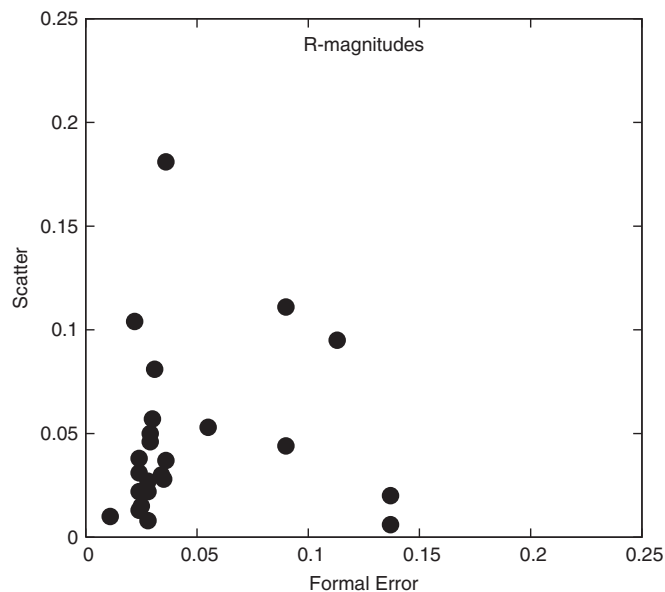


Figure 12. Scatter in the  $R$ -band data as a function of largest formal error.

Table 4 lists results for cases with formal error estimates from more than 1 observation per epoch and filter. Columns 2 and 3 show the total number of such cases (per filter) and the number of cases with a formal photometry error ( $1\sigma$ ) of less than or equal to 5%. The last two columns give the median and largest formal error of each sample, respectively. This shows that our goal of reaching a few percent precision has been achieved on most targets.

Figures 10–13 display our variability investigation results. For each filter ( $B$ ,  $V$ ,  $R$ , and  $I$ ), the observed scatter (over different epochs) is plotted versus the largest, internal, formal error of all observed epochs. The strongest indication of variability is seen for source 0552-640 with  $B$  and  $V$  scatter of about 0.1 mag and formal error of 0.01 mag. Several other sources show a ratio of scatter to formal error of about 3, but more observations are required to characterize the photometric data for variability or draw any conclusions.

The largest observed scatter is about 0.2 mag over the few years of our observing program, which is in stark contrast to

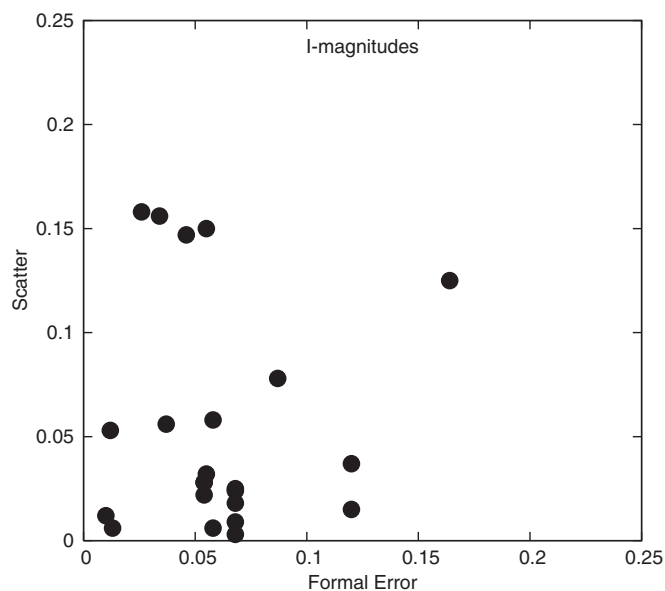


Figure 13. Scatter in the *I*-band data as a function of largest formal error.

some of the differences seen between the Veron-Cetty listed magnitudes and our observations.

The errors in the photometric calibration of the data of a typical acceptable night are on the order of 20–50 mmag for all filters. This holds for the least-squares fit error as well as for the standard error of the derived photometric zero-point constant. Thus, the observed discrepancies between our observations and the Veron-Cetty catalog, as well as the indication for variability seem to be of physical nature.

## 6. CONCLUSIONS/SUMMARY

A sample of extragalactic, compact sources, mainly QSOs, has been observed to characterize the photometric stability of these sources to better than 5%. Of the 134 sources that have *V* magnitudes in the Veron & Veron-Cetty catalog, a difference of over 1.0 mag is found for the observed-catalog magnitudes for about 36% of the common sources, and 10 sources show over 3 mag difference. As expected, the largest problem in this context is the intrinsic photometric variability of these sources, which will require multiple observations at different epochs to downselect “stable” candidates and furthermore will likely require additional observations close to the epoch of a future mission.

Although this program is driven by SIM preparatory science goals, our observations are of general interest provid-

ing accurate magnitudes and colors for a large sample of QSO targets at current epochs. An optical quasar monitoring program, as, e.g., proposed by J. Schramm (about 1980; Borgeest & Schramm 1994) is desirable. The current paper mainly forms the baseline providing mean *B*, *V*, *R*, and *I* measures at one or few epochs. At least for the brighter subset of our candidates such a program could be undertaken in a collaboration with adequately equipped amateur astronomers. We plan to continue our photometric quasar monitoring program in order to obtain optical variability information on these targets.

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