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An Electronic Version of the Second Volume of the General Catalogue of Variable Stars with Improved Coordinates

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Abstract—We present a new electronic version of the second volume of the fourth edition of the General Catalogue of Variable Stars (GCVS), which contains data on 13 480 variable stars in the constellations Cygnus–Orion (the order of constellations in the Catalogue follows the Latin alphabet). The new version takes into account the Name Lists of Variable Stars from no. 67 to 76 for the same constellations. The main distinctive feature of the new version is that it contains improved equatorial J2000.0 coordinates for 13 446 stars (including those for 5052 stars with an allowance made for proper motions), based on the identifications with positional catalogs using finding charts, as well as on our new measurements. We searched for a number of stars on original plates from the collections of several observatories and using digital sky survey images. The new version also includes a file of remarks to the second and third GCVS volumes. Apart from a complete update of the positional information, we took into account several corrections that were found to be necessary after the publication of the second GCVS volume (1985). We present a list of references to new Internet resources. © *2003 MAIK "Nauka/Interperiodica"*.

Key words: *stars—variable and peculiar.*

INTRODUCTION

This paper is a continuation of our previous publication on the new electronic version of Volume I of the General Catalogue of Variable Stars (GCVS) with improved coordinates (Samus' *et al.* 2002) and presents a similar version for Volume II of the GCVS.

The new electronic version is based on the fourth edition of the GCVS (Kholopov *et al.* 1985–1988). Volumes I–III of the latter contain data on 28 435 variable stars of our Galaxy (without including the named variables that proved to be nonexistent, e.g., minor planets mistaken for stars, artifacts due to double plate exposures, etc.). Given the subsequent ten Name Lists of Variable Stars (nos. 67 to 76), the number of Galactic variables named in 2001 exceeded 37 300. The standard accuracy of the variable star coordinates presented in the GCVS (to within 1 s in right ascension and 0.1 arcmin in declination, with a substantial fraction of all GCVS stars having even less accurate coordinates than the standard accuracy or just erroneous coordinates) does not meet the present-day requirements that were formulated in more detail by Samus' *et al.* (2002). Therefore, we decided to prepare a new GCVS version with improved coordinates for all of the catalogued stars, where possible, which also takes into account the proper motions of the stars if they can be found in existing positional catalogs.

METHODS FOR PREPARING THE CATALOGUE

The methods for preparing the Catalogue were described in detail by Samus' *et al.* (2002). In general, they did not change. In the past year, the possibilities for the effective identification of variable stars with positional catalogs have further improved. Apart from the sources listed in Samus' *et al.* (2002), we actively used several new catalogs in our work on the new version of the GCVS Volume II: the US Naval Observatory CCD Astrograph Catalog (Zacharias *et al.* 2000), which contains more than 27 000 000 stars; the 2.2 μm LMASS All Sky Survey (Skrutskie *et al.* 2000), whose current version covers almost half of the sky area and includes more than 162 000 000 stars; and the Guide Star Catalogue, version 2.2 (STScI 2001), which includes more than 435 000 000

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stars. Unfortunately, in most cases where the UCAC1 catalogue could be the only source of a variable star's proper motion, the errors in the catalogued proper motions were too large, so we could not make use of such proper-motion information. By the end of our work on the new version of Volume II, we gained access to the B1.0 Catalog of the US Naval Observatory (Monet *et al.* 2003), which contains more than 1 000 000 000 objects; so far, we have used it only in a few cases.

As before, our main tool for visualizing astronomical catalogs and retrieving data from them was the SIMFOV code written by A.A. Volchkov (A. Volchkov and O. Volchkov 2003). During our work on the electronic version of the GCVS Volume II, changes were made to the code, which allowed us to use also the 2MASS and UCAC1 catalogues for our identifications. Recall that this code makes it possible to display a chart of the selected sky field on the required scale, which shows objects of the catalogs from the selected list, and then view it by zooming in and out and retrieve information in the corresponding catalog pertaining to any image. The same code enables the automatic identification of user lists with catalogs by coordinates with (or without) an allowance for the similarity of the magnitudes. Viewing images, retrieving information, and comparing lists are possible for the coordinates referred to any equinox. Thanks to the database on variable stars supported by the GCVS team, we have at our disposal the most complete information about the published finding charts for variables; unpublished charts for several thousand stars were provided by their discoverers and other researchers. In particular, the photographic finding charts for hundreds of stars in the constellations Libra and Ophiuchus sent to the GCVS team in the 1960s by the discoverer of their variability, Dr. L. Plaut (the Netherlands), helped us immensely in preparing the new version of the GCVS Volume II.

The numerous publications that appeared in recent years and that contain identifications and accurate coordinates of variable stars from selected lists (see, e.g., López and Girard 1990; Kato 1999a, 1999b; Skiff 1999a, 1999b, 1999c; Kinnunen and Skiff 2000a, 2000b, 2000c; López and Lépez 2000; Webbink *et al.* 2002) were very helpful in checking our results. However, we identified all of the stars from these papers independently; we found a number of mistakes both in our original identifications and in some of the cited papers. Examples of the mistakes found in these publications are described below in the remarks on individual stars.

In several cases, especially in very crowded star fields, it was difficult to identify the computer-displayed chart showing objects of a catalog(s) with the variable star's published drawn or photographed finding chart. In such situations, we examined images of the Digitized Sky Survey (DSS; the Hubble Space Telescope Science Institute) or images from the Aladin Sky Atlas (the Strasbourg Astronomical Data Center,) and the US Naval Observatory Image and Catalog Archive. These archives contain several images of the same field, which often makes it possible to rediscover a variable star without examining plate stacks. However, if necessary, we used the plate collections of the Sternberg Astronomical Institute and the Harvard Observatory and rediscovered the variable stars that were "lost" because of the absence of finding charts and inaccurate coordinates. We widely used the marks of the discoverers on the plates of the Harvard stacks and the discoverers' notebooks in the Harvard archive (among some 13 000 variable stars discovered at the Harvard Observatory, about 3000 objects have no published finding charts).

If a variable star was absent in the existing positional catalogs, then we measured the coordinates on original plates or available digitized sky images. This was also often done to determine the coordinates for the variable components of visual double stars or the coordinates of variable stars in clusters.

Specific problems were associated with variable stars in nebulae. Whereas solving these problems for numerous stars in nebulae in Monoceros actually reduced to measuring the coordinates for an unusually large fraction of variables in this constellation using DSS images, the images of the DSS and other similar surveys for the region of the Orion Nebula, which is even richer in variable stars, are often overexposed and do not allow the identification of stars.

Jones and Walker (1988) presented photographic *I*-band charts and coordinates for 1053 variable stars in the central part of the Orion Nebula; in the absence of a particular star in the positional catalogues, we used the coordinates measured by these authors. Immediately after the publication of the paper by Jones and Walker (1988), the GCVS authors meticulously compared the photographic charts of Jones and Walker with the available charts of variable stars in the Orion Nebula. As a result, we compiled a table of identifications of the objects from the list of Jones and Walker with known variable stars, which is still used by the GCVS team. We have now opened electronic access to this table, along with other our tables of identifications of variable stars (ftp://ftp.zeus.sai.msu.ru/pub/groups/cluster/gcvs/gcvs/iv). Identifications using the tables at this address are provided to users of the GCVS electronic version when they request information on any variable star via the search engine of our site (http://www.sai.msu.su/groups/cluster/gcvs/cgi-bin/search_new.html).

Table 1. Corrected data for the variable stars in Orion discovered by Maffei (1963)

No. in Maffei's chart	GCVS	Max	Min	Type
25	V796 Ori	15.5	16.4 I	IN
26	V798 Ori	15.2	17.2 P	INS
27	V802 Ori	15.6	18.0 B	UVN
28	V810 Ori	15.5	16.5 I	IN
29	V811 Ori	15.8	16.8 I	IN
30	V814 Ori	15.5	17.3 B	IN
31	V819 Ori	15.6	17.4 P	IN
32	V832 Ori	14.5	16.6 P	INS
33	V838 Ori	16.6	17.3 P	IN

Initially, we took the positions of 163 variables in the Orion Nebula from the list of Jones and Walker (1988) and independently measured the coordinates for 70 other variable stars in this region. Subsequently, we were able to identify 80% of these stars absent in the positional catalogs that we used with the 2MASS catalogue (Skrutskie *et al.* 2000); the identifications were checked by using the J, H, and K images of the 2MASS survey provided by the Aladin Star Atlas.

We also encountered great difficulties in identifying the nine Orion variables discovered by Maffei (1963). In the 1960s, when compiling another Name-List of Variable Stars, P.N. Kholopov noticed that the coordinates of these variables (nos. 25–33 in Table IV from Maffei 1963) published by the discoverer disagreed with the chart presented by this author. According to the GCVS tradition of considering a finding chart as a major tool for identifying variable stars, it was then decided to correct the coordinates in accordance with the chart; all of the other information in each row of the table was taken without any changes. When preparing our new version of the GCVS Volume II, we found that such a correction of the discoverer's table leads to incorrect information about the variability ranges and types, while the remarks to Table IV refer to the correct stars. We have decided not to change the now traditional correspondence between the GCVS names of these stars and their numbers in the chart and in the remarks published by Maffei. Table 1 presents corrected data on the variability ranges and types for the stars of this list. The notation is standard for the GCVS.

Previously (Samus' *et al.* 2002), we noted our cautious attitude toward the charts from the atlas of Tsesevich and Kazanasmas (1971), which, in general, is helpful and, in many cases, the only available tool for identifying variable stars. In compiling the new version of the GCVS Volume II, we again found numerous mistakes in this atlas. Particularly many mistakes were found for variables in Norma. Thus, for example, five of the 12 charts (for BF, CG, CI, CT, and DE Nor) on sheet IV-28 of the atlas alone proved to be erroneous; besides, the chart for AX Nor on the same sheet is upside down.

During our work, we found dozens of omissions in the tables of identifications of variable stars with the principal catalogs (BD, CoD, CPD, HD, etc.) in the GCVS Volume IV. We made appropriate changes to the electronic version of the catalogue. After finishing the preparation of the electronic version of the catalogue, we checked it through its automatic (by coordinates) identification with the GSC; as a result, we revealed and corrected several errors.

RESULTS

The electronic version of Volume II is available at ftp.zeus.sai.msu.ru/pub/groups/cluster/gcvs/gcvs/vol2/ or www.sai.msu.su/groups/cluster/gcvs/gcvs/vol2/.

The new electronic version of the GCVS Volume II contains, in its main table (vol2.dat), information about 13 480 objects (except for the stars that were erroneously named for the second time or proven to be nonexistent) in the constellations Cygnus–Orion, which are mostly variable stars of our Galaxy discovered and named before 2001; i.e., it covers the variable stars of the fourth edition of the GCVS and the Name-Lists nos. 67–76 (for the same constellations). For 13 446 variable stars, our version presents new equatorial J2000.0 coordinates (vol2_pos.dat); proper motions are taken into account for 5052 of these stars. We have not yet been able to determine accurate coordinates for 34 variable stars because of the absence of finding charts or the lack of information for star identification. Recall that the new version of the GCVS Volume I (Samus' *et al.* 2002) did not present accurate coordinates for 209 of the 10 558 stars; given that this version was continuously corrected, the number of GCVS Volume I stars without accurate coordinates reduced to 182 by the end of 2002. The main table is supplemented with a list of remarks to Volumes II and III (rem.txt), which has been published electronically for the first time. A detailed description of the files can be found in the file readme.txt of the electronic version.

The vol2.dat *File*

The structure of the main table (vol2.dat) corresponds to the structure of the combined table in the 4th GCVS edition and the Name Lists (Kholopov *et al.* 1998; see also www.sai.msu.su/groups/cluster/gcvs/gcvs/iii/iii.dat). The differences between these tables were described in detail by Samus' *et al.* (2002); here, we repeat this information for the convenience of users.

(1) Instead of the B1950.0 coordinates, we present new improved equatorial J2000.0 coordinates (right ascensions to within $0^s.1$ and declinations to within $1''$). The coordinates that could not be improved were recalculated to the equinox J2000.0 from old rough coordinates by taking precession into account.

(2) The latest Name Lists, up to no. 76, were included.

(3) We rectified the serious mistakes that were found during our work on the GCVS in other columns of the main table, in the references, and in the remarks. For the stars without published finding charts but identified by us in the GSC (Lasker *et al.* 1990), GSC2.2, or US Naval Observatory (USNO) A1.0/A2.0/B1.0 catalogs, we now give the symbol of the corresponding catalog (GSC, GSC2.2, USNO) as a reference to the finding chart.

The main table is presented in the standard (for the GCVS) form, i.e., in the order of constellations and GCVS variable-star names. The table includes the following information: J2000.0 equatorial coordinates, variability types, magnitudes at maximum and minimum light, photometric systems of magnitudes, epochs of minima or maxima, periods of brightness variations, durations of brightness rise from minimum to maximum or eclipse durations, spectral types, and references. For the stars from the Name List nos. 67–76, which appeared after the publication of the GCVS 4th edition, we present not all of the columns of the table but only the coordinates, variability types, magnitudes, and references; the missing data will be added to the 5th edition of the GCVS.

The vol2_pos.dat *File*

The positional information based on our identifications with principal astrometric catalogs, on published data, or on our new measurements (see below) is provided for 13 446 variable stars of the new version of Volume II (including stars of the new Name Lists in the same constellations) in the table vol2_pos.dat. This table is presented in the same order as the main table and consists of the following columns:

(1) The star number in the system traditional for the electronic GCVS versions;

(2) The GCVS star name;

(3) Improved equatorial J2000.0 coordinates (right ascensions to within $0^s.01$ and declinations to within $0''.1$);

(4) A flag indicating that the coordinates are actually rougher than the new accuracy standard of the catalogue, because we were unable to determine more accurate coordinates and find them in source catalogs or journal publications. The flag is a colon (:) in the position that follows the coordinates;

(5) Proper motions (in arcseconds per year for both coordinates), to within $0''.001$ per year;

(6) The epoch of the given coordinates. No epoch is presented when published coordinates are used unless it was specified in the paper and could be established;

(7) A flag indicating uncertainty in a variable star's identification with the corresponding source catalog (a question mark in the corresponding position);

(8) A brief designation of the source of astrometric data. In several cases, the designation of a catalog is followed by the symbol "+pm," implying that this catalog contains the position for a certain epoch that we reduced to the epoch 2000.0 using information about the star's proper motion from another source.

Below, we provide a list of principal catalogs and data sources approximately in the order of our preference during the identifications of variable stars (see also a description of the catalogs for A.A. Volchkov's SIMFOV visualization code that we used at the site www.simfov.ru). Note that most of the deviations from this order of preference stem from the fact that the SIMFOV code does not yet work with the GSC2.2, FASTT, and USNO B1.0 catalogs. In fact, we considered the coordinates from several positional catalogs based on the plates of Schmidt surveys or catalogs of comparable accuracy as being equal in value.

Hip is the Hipparcos Catalogue (ESA 1997).

Tyc2 is the Tycho Catalogue (Høg *et al.* 2000). In the only case in Volume II (V2238 Cyg) where the star was absent in the second Tycho catalogue but present in the first catalogue (ESA 1997), the source is indicated as Tyc1.

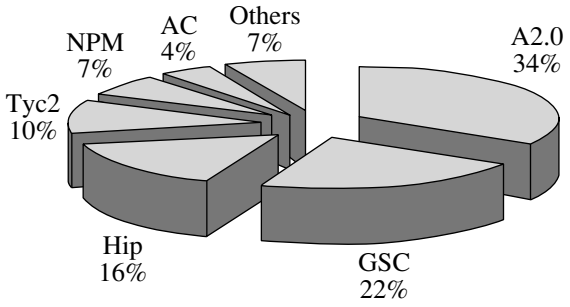
PPM is the Positions and Proper Motions (Röser *et al.* 1991–1993).

NPM is the Lick Northern Proper Motion Program (Klemola *et al.* 1987).

AC is the Four-Million Star Catalogue (see Gulyaev and Nesterov 1992).

ACT is the ACT Reference Catalog (Urban *et al.* 1997).

FASTT lists the coordinates of variable stars (in the equatorial region of the sky) measured with the Flagstaff Astrometric Scanning Transit Telescope of the US Naval Observatory (Henden and Stone 1998).



The sector diagram illustrating the distribution of stars from the new version of the GCVS Volume II in the sources of accurate coordinates.

GSC2.2 is the Guide Star Catalogue, Version 2.2 (STScI, 2001).

UCAC1 is US Naval Observatory CCD Astrograph Catalog (Zacharias *et al.* 2000).

GSC is the Guide Star Catalog (Lasker *et al.* 1990). The symbol "ns" that accompanies the GSC reference means that the object is marked in the cited catalogue as nonstellar.

A2.0, B1.0 is a Catalog of Astrometric Standards (Monet *et al.* 1998) (there are a few cases where the star could be found only in the previous version of the catalog; they are marked as A1.0); The Whole-Sky USNO-B1.0 Catalog of 1 045 913 669 Sources (Monet *et al.* 2003).

2MASS is the Two Micron All Sky Survey (Skrutskie *et al.* 2000).

IRAS is the Infrared Astronomical Satellite Catalogue of Point Sources (Neugebauer *et al.* 1988). We used this catalogue only when it was impossible to identify a star with a positional catalog or to find a star in the optical range and independently measure its coordinates. There is only one such case in Volume II (V2294 Oph).

For some 330 stars (2.5% of all of the stars in the new version), we measured the coordinates using Digitized Sky Survey images, plates from different collections, or other images. In these case, the source of the coordinates is indicated as "GCVS authors." As a rule, we employed the GSC2.2 or A2.0 catalogue stars as reference stars in our measurements using the Digitized Sky Survey. To measure the rectangular coordinates, we manually pointed the cursor at the photometric centers of stars in commercially available image processing applications with a high magnification. The measurements were reduced by Turner's linear method. The accuracy of our measurements was typically about $0''.5$ both in right ascension and declination. The coordinates taken from current astronomical periodicals are marked "Literature."

We present a fragment (the first 20 stars) of the table vol2_pos.dat as a guide to its contents (Table 2).

The distribution of stars from the new version of the GCVS Volume II in the sources of their coordinates is shown in the figure; the GCVS authors and Literature sources as well as some rarely used catalogs were combined into a sector called "Others."

The rem.txt *File*

The list of remarks for Volumes II and III (rem.txt) includes information that supplements the main table for 6362 stars. In contrast to the printed bilingual version of the 4th GCVS edition (Kholopov *et al.* 1985–1988), all remarks in the file are given only in English; in general, they correspond to the English text of remarks in the printed edition or to the remarks from the Name Lists. The remarks provide, in particular, information about variables in binaries, period variations, the secondary minima of eclipsing variables, and a star's proximity on the sky to star clusters or nebulae. The remarks for unique variable stars contain detailed descriptions of the variability pattern.

COMMENTS ON SOME PROBLEM STARS OF THE ELECTRONIC VERSION

Below, we give comments on individual stars of the GCVS Volume II. We did not set the goal of listing here all of the complex cases that we encountered during our work on the catalogue. It seems that the examples collected below give a good idea of the typical problems the compilers of the catalogue have to solve. The coordinates and identifications adopted for the stars described in the comments are presented in Table 3.

IY Gem. The previous attempt to identify this star using its finding chart (Skiff 1999c) failed.

KN Gem. After we reported (Samus 2001) that the classification of this object as a Mira variable resulted from its misidentification (actually, the Mira is the neighboring variable BR Gem), it was identified with the minor planet (123) Brunhild (Schmeer 2002). This object was not included in Table 3.

VW Gru. López and Lépez (2000) misidentified this Mira star. The variable is absent in positional catalogs, because it is close in the sky to the very bright star HD 213009.

V403 Her – V405 Her. Our reliable identifications of these three RR Lyrae variables differ from those suggested by Skiff (1999b).

ZZ Hyi. We identified this object, which was previously classified as a likely RR Lyrae variable (Geßner 1981a), with the poorly studied galaxy PGC 232232 (Pastukhova 2001).

Table 2. A fragment of the electronic table vol2_pos.dat

GCVS			J2000.0		pm (as/yr)		Epoch	Source
310001	R	Cyg	193649.38	+501159.5	+0.003	−0.009	2000.0	PPM
310002	S	Cyg	200529.85	+575909.5			1952.617	A2.0
310003	T	Cyg	204710.75	+342226.8	+0.039	+0.008	2000.0	Hip
310004	U	Cyg	201936.59	+475339.1	−0.002	+0.001	2000.0	Hip
310005	V	Cyg	204118.27	+480828.8	−0.006	−0.013	2000.0	Hip
310006	W	Cyg	213602.49	+452228.5	+0.064	+0.002	2000.0	Hip
310007	X	Cyg	204324.19	+353516.1	−0.006	−0.003	2000.0	Hip
310008	Y	Cyg	205203.58	+343927.5	+0.003	−0.017	2000.0	Hip
310009	Z	Cyg	200127.46	+500232.6			1983.449	GSC
310010	RR	Cyg	204604.56	+445209.7	+0.001	−0.001	2000.0	Tyc2
310011	RS	Cyg	201323.66	+384344.5	+0.008	+0.002	2000.0	Hip
310012	RT	Cyg	194337.77	+484641.3	−0.009	+0.014	2000.0	Hip
310013	RU	Cyg	214039.09	+541928.9	−0.008	−0.012	2000.0	Hip
310014	RV	Cyg	214316.33	+380103.0	−0.006	−0.008	2000.0	Hip
310015	RW	Cyg	202850.59	+395854.4	−0.003	−0.006	2000.0	Hip
310016	RX	Cyg	201049.59	+474847.2	−0.004	−0.002	2000.0	Hip
310017	RY	Cyg	201023.42	+355649.4	+0.003	+0.001	2000.0	Tyc2
310018	RZ	Cyg	205153.19	+472120.4	−0.000	−0.002	2000.0	AC
310019	SS	Cyg	214242.79	+433509.9	+0.107	+0.030	2000.0	Tyc2
310020	ST	Cyg	203233.48	+545700.5	−0.011	−0.001	2000.0	Tyc2

DM Lac and HQ Lac. Miller and Wachmann (1971) give accurate coordinates for these two stars, but the designations in their charts were mixed up. We adopted the identification based on the coordinates rather than the charts; it is also confirmed by the fact that the number of comparison stars presented by Miller and Wachmann in their table for DM Lac corresponds to their chart for HQ Lac, and vice versa.

EG Lac. As was noted by Kinnunen and Skiff (2000c), Downes and Shara (1993) gave the wrong chart. The object that was classified as a UGSS dwarf nova is bright on the infrared plates of the second Palomar survey (epochs 1993.6003 and especially 1993.7070). Thus, its classification should be refined. Appropriate changes based on our information have presently been made to the catalog of Downes *et al.* (2003).

EU Lac. The chart of Miller and Wachmann (1971) is wrong, but it was possible to make the identification using other published charts and the sufficiently accurate coordinates given by Miller and Wachmann.

IS Lac and PU Lac. The variability of IS Lac was discovered by Miller and Wachmann (1971), who pointed out the star's very red color. The discoverers provide the star's coordinates with a high formal accuracy. There are no red stars at this position, and the chart of Miller and Wachmann corresponds to the carbon variable star PU Vul discovered by Alksne and Alksnis (1972), which lies more than 8′ to the south. In our new GCVS version, we declare that these two stars are identical, retaining PU Lac as the main designation. We were able to find IS Lac thanks to the notes left by the late A.P. Gulyaev (Sternberg Astronomical Institute).

EN Lib and GT Lib. The variability of GT Lib was first announced by Lampland (1914). The star was included in the GCVS based on data of Luyten (1937), who reported its independent discovery and large variability amplitude. Hoffmeister (1949) found the Mira variable EN Lib whose coordinates differed from the adopted position of GT Lib by 3′.5. The identity of Luyten's star and EN Lib was confirmed by our searches in the Harvard Observatory archives.

Although, strictly speaking, it is not known what star was observed by Lampland, we declared that these two stars are identical in the new GCVS version.

EX Lib. This star was identified using the unpublished chart of L. Plaut. The coordinates of this star in our paper (Antipin *et al.* 1994a) on the positions of variable stars in Plaut's field 1 (Plaut 1966) are erroneous by 1^m in right ascension because of a misprint.

AZ Lup. The star could be identified using its correct chart from Tsesevich and Kazanasmas (1971) only after our search in the Harvard Observatory archives that revealed an error of 3° in declination in the coordinates published by the discoverers (Swope and Caldwell 1930). The star lies north of their position.

DY Lup and DZ Lup. These two variable stars were discovered by Hoffleit (1936). She indicated a large (about 3^m) variability amplitude for the first star (HV 7442) and a comparatively small ($0\overset{m}{.}4$) amplitude for the second star. Subsequently, McLeod and Swope (1941) pointed out that HV 7441 was a Mira variable with a variability amplitude of larger than $3\overset{m}{.}5$ and a period of 434^d. The atlas of Tsesevich and Kazanasmas (1971) contains charts for both stars. Using the Harvard Observatory archives, we found that Hoffleit erroneously gave the coordinates of the low-amplitude variable for the Mira star and vice versa. We retained the traditional name DY Lup for the Mira variable and the name DZ Lup for the lower-amplitude variable. It turns out for these identifications that the chart for the bona fide DY Lup is labeled DZ Lup in the atlas of Tsesevich and Kazanasmas (1971). The chart labeled DY Lup is incorrect for both of these two variables.

BV Lyr. Several existing charts do not confirm the identification by Skiff (1999a).

V369 Lyr. We found and measured this possible Nova discovered by Kurochkin (1968) on the original plates of the Sternberg Institute's stacks.

V408 Lyr. The discoverer, Kurochkin (1971), published erroneous coordinates. The star was found on the Sternberg Institute's plates using the marks of N.E. Kurochkin on the plates.

V479 Lyr and V480 Lyr. In the report on the discovery of these two stars (S 10845 and S 10846) (Geßner 1981b), preliminary numbers in the Sonneberg Observatory system were assigned to them and to one more object in order of increasing right ascensions. The chart for S 10845 corresponds to the coordinates for S 10846 and vice versa. We retained the traditional names V479 Lyr (according to Geßner (1983), this is a reddish slow irregular variable fainter in photographic light than V480 Lyr) and V480 Lyr (Geßner (1983) believes it to be a possible β Lyrae variable with a period of about 100^d) in order of their right ascension. This identification is supported by the magnitudes in positional catalogs. According to the ROTSE1 catalogue (Akerlof *et al.* 2000), the star at the position that we adopted for V480 Lyr is a Cepheid with a period of $44\overset{d}{.}5$, which also most likely argues for our identification. Note, however, that Geßner (1983) mentions a faint companion to V479 Lyr, while our identification suggest a faint companion to V480 Lyr.

UW Men. Our quite reliable identification differs from that suggested by López and Girard (1990).

V567 Mon. It was identified reliably. Kato (1999b) identified this variable with another star in the same group of faint objects.

RV Mus and FI Mus. By the suggestion of A.P. Gulyaev, we assume that the Mira star FI Mus, which was identified using the chart of Goossens *et al.* (1980) who announced its discovery, is identical to the Mira RV Mus discovered by Bailey (1923) much earlier. For the latter star, its discoverer gave coordinates that were virtually identical to the accurate coordinates of FI Mus and a possible period that did not differ too much from the period found by Goossens *et al.* but did not publish a finding chart. Our identification of this star, which is confirmed by its variability revealed on DSS images, differs from that suggested for FI Mus by López and Girard (1990). Note that the large errors of the coordinates from Goossens *et al.* (1980) caused significant difficulties in identifying other variable stars as well.

RX Mus and FN Mus. This case, which is similar to the previous one, was found by us. The identification by López and Girard (1990) is correct. This identification was also confirmed by our findings in the Harvard archives.

YZ Mus and GH Mus. Another similar case: the first discovery was by Swope (1931); the Mira period is virtually equal to the value given by Goossens *et al.* (1980). The identification is based on the chart from Shapley and Swope (1931).

AV Mus. Our identification, which was confirmed by information from the Harvard Observatory archives, differs from that suggested by López and Girard (1990).

CR Mus and FP Mus, DY Mus and FX Mus. The stars were named for the second time because of the erroneous coordinates in Goossens *et al.* (1980); their identity was first noted by López and Girard (1990).

SS Nor and QR Nor. The identity of the stars was confirmed by information from the Harvard archive. Morel (1994) gives two different identifications for these stars. His identification of SS Nor is correct, and his candidate for QR Nor is a new, as yet unstudied, red variable whose variability is confirmed by

Table 3. Examples of the coordinates and identifications for problem stars

Star	$\alpha_{2000.0}$	$\delta_{2000.0}$	Epoch	μ_α	μ_δ	Source	Identifications
IY Gem	$06^h28^m53^s.52$	$+18°09'54''.3$	1955.861			A2.0	
VW Gru	22 29 03.2	−43 29 01	1990.781			GCVS authors	IRAS 22260−4344
V403 Her	17 27 28.94	+22 14 30.3	2000.0	$-0''.010$	$+0''.004$	NPM	
V404 Her	17 27 41.47	+26 57 49.8	1950.462			A2.0	
V405 Her	17 27 46.96	+26 55 52.2	2000.0	−0.002	−0.002	NPM	
ZZ Hyi	00 27 48.07	−78 37 44.8	1977.769			A2.0	GSC 9350.01587
DM Lac	22 04 35.65	+52 53 58.8	1952.702			A2.0	IRAS 22027+5239
EG Lac	22 50 38.89	+55 14 52.1	1991.7			B1.0	
EU Lac	22 25 31.93	+51 43 38.9	2000.0	0.005	−0.001	AC	GSC 3619.01864
HQ Lac	22 04 25.04	+52 54 26.4	1952.702			A2.0	
PU Lac	22 09 05.52	+50 27 57.8	1952.713			A2.0	IS Lac, GSC 3614.00609, IRAS 22071+5013
EN Lib	15 44 41.06	−28 39 55.1	2000.0	+0.003	−0.003	AC	GT Lib, GSC 6789.00928, IRAS 15416−2830
EX Lib	15 55 41.00	−12 47 33.8	1954.268			A2.0	
AZ Lup	15 22 38.85	−43 06 18.4	1978.227			A2.0	IRAS 15193−4255
DY Lup	14 39 57.20	−43 14 09.2	1980.819			A2.0	IRAS 14367−4301
DZ Lup	14 39 46.13	−43 15 46.7	2000.0	−0.011	−0.004	Tyc2	Tyc2 7818 118 1, GSC 7818.00118, IRAS 14365-4302
BV Lyr	19 17 42.92	+32 57 30.7	2000.0	−0.002	+0.004	Tyc2	Tyc2 2657 1380 1, GSC 2657.1380
V369 Lyr	19 11 55.40	+32 12 07.5	1960.619			GCVS authors	
V408 Lyr	18 59 02.34	+27 28 19.8	1992.422			GSC2.2	
V479 Lyr	18 37 14.65	+42 49 28.5	1982.389			GSC	GSC 3113.00241
V480 Lyr	18 40 23.37	+43 56 20.8	1993.393			GSC2.2	GSC 3130.01641, ROTSE1 J184023.50 +435622.4
UW Men	07 14 09.36	−84 45 47.2	1978.102			GSC	GSC 9497.01189, IRAS 07229−8440
V567 Mon	07 01 56.54	−01 46 30.2	1992.908			GSC2.2	
RV Mus	12 49 07.92	−70 02 46.2	1978.103			A2.0	FI Mus
RX Mus	12 54 13.78	−72 12 24.7	1978.103			A2.0	FN Mus

Table 3. (Contd.)

Star	$\alpha_{2000.0}$	$\delta_{2000.0}$	Epoch	μ_α	μ_δ	Source	Identifications
YZ Mus	$13^h31^m13\overset{s}{.}18$	$-67°41'36\overset{''}{.}2$	1978.103			A2.0	GH Mus
AV Mus	13 47 12.64	−70 38 11.8	1999.140			GSC2.2	
CR Mus	12 58 38.12	−74 17 10.7	2000.0	$-0\overset{''}{.}018$	$+0\overset{''}{.}013$	AC	FP Mus
DY Mus	13 16 58.04	−67 52 30.9	1987.083			GSC	FX Mus, GSC 9242.00218, IRAS 13135−6736
SS Nor	16 13 21.89	−59 46 56.6	1987.384			GSC	QR Nor, GSC 8723.00573, IRAS 16090−5939
EG Nor	16 22 11.68	−61 15 55.0	2000.0	−0.004	−0.008	Tyc2	Tyc2 9037 2327 1, GSC 9037.2327, IRAS 16177−6108
QT Nor	16 34 03.96	−59 05 12.8	1997.318			GSC2.2	GG Nor
RR Oct	20 55 42.61	−74 58 22.3	2000.0	−0.003	−0.019	Tyc2	SV Oct, Tyc2 9333 1112 1, GSC 9333.01112, IRAS 20500−7509
PU Oph	17 01 24.74	−30 06 31.7	1988.395			GSC2.2	V29, V28 (NGC 6266)
V362 Oph	17 09 39.59	−28 45 58.6	1997.321			GSC2.2	NSV 20993
V483 Oph	18 01 19.57	+02 58 01.5	1991.458			GSC2.2	GSC 434.02819, IRAS 17588+0258
V586 Oph	18 27 13.95	+04 17 15.3	2000.0	−0.001	+0.007	AC	GSC 441.00699
V838 Oph	18 01 44.73	+10 23 42.6	2000.0	+0.007	−0.006	Tyc2	Tyc2 1012 997 1, GSC 1012.00997, IRAS 17593+1023
V886 Oph	18 24 14.90	+09 59 43.0	1950.541			A2.0	Uncertain identification
V898 Oph	18 38 27.64	+07 05 21.7	1991.387			GSC2.2	
V1069 Oph	17 41 56.33	−01 01 27.6	1982.627			GSC	GSC 5081.02167
V1077 Oph	17 52 09.68	+06 58 13.0	1953.613			A2.0	
V1110 Oph	18 36 02.59	+07 27 08.8	1990.633			GSC2.2	IRAS 18336+0724
V1111 Oph	18 37 19.26	+10 25 42.4	1991.387			GSC2.2	IRAS 18349+1023
V1113 Oph	18 39 16.55	+08 39 41.0	1991.387			GSC2.2	IRAS 18368+0836
V1496 Oph	17 10 01.87	−17 25 17.9	1980.896			A2.0	
V2040 Oph	18 27 30.89	+10 09 05.9	1993.535			GSC2.2	GSC 1027.01788 (NE component)
V2137 Oph	17 09 59.97	−26 33 56.9	1997.326			GSC2.2	V2 (NGC 6293); Uncertain identification

the Schmidt sky survey images presented by the US Naval Observatory archive.

EG Nor. This virtually unstudied variable, discovered by Hoffleit (1931), was found thanks to the Harvard archives, 1° south of the discoverer's position. The same result was also reported by Webbink *et al.* (2002), who noted that, with corrected coordinates, the star is in the constellation Triangulum Australe. We retain its traditional name.

GG Nor and QT Nor. As was correctly pointed out by Webbink *et al.* (2002), the coordinates of GG Nor published by its discoverer (Hoffleit 1931) were erroneous by 1° in declination (the star lies north of the published position). After its coordinates were corrected, the variable could be identified with the star QT Nor (Luyten 1935; Hoffmeister 1963) that later received its GCVS name. Since correct coordinates were adopted for the latter star from the outset, and we adopted QT Nor as the main name for this object.

RR Oct and SV Oct. The discoverer of the Mira SV Oct, Gerasimovich (1927), published a position for this star that was in error by more than 1° in declination. The bona fide SV Oct, which is located north of the earlier position, was found using Gerasimivich's notebooks stored at the Harvard Observatory and turned out to be identical to the Mira RR Oct, as confirmed by the similarity of the periods in the catalogue. We adopt RR Oct as the primary name.

BE Oph. We failed to find any variable stars at the position given by the discoverer (Beljawsky 1927). Thus, this star was not included in Table 3. Hughes Boyce (1942) reported the study of BE Oph, a Mira variable. However, we found the star that she studied by using information from the Harvard archives at 20′ from the position published by Beljawsky. We consider it impossible to identify this star with BE Oph. On the other hand, the star studied by Hughes Boyce is undoubtedly identical to the variable NSV 07549 = BV 1679, whose discovery was reported by Strohmeier and Knigge (1975). We will include this star in one of the next Name Lists as a new variable.

PU Oph. For historical reasons, this GCVS name refers to a blend of two RR Lyrae variables, V28 and V29, in the globular cluster NGC 6266. The coordinates in Table 3 correspond to V29; the star V28 lies four arcseconds to the north.

V362 Oph. After its coordinates were improved, the object NSV 20993 turned out to be identical to this variable.

V483 Oph. Our identification of this Mira star using the discoverer's chart (Hoffmeister 1957) lead to a significant change in the right ascension. The identification is confirmed by the unusual color index ($B_J - R = -0.8$) in the GSC2.2 catalogue. Richter (1965) pointed out that the star is very red and close to the limit of the "blue" Palomar print; this description contradicts our identification.

V586 Oph. Kinnunen and Skiff (2000a) correctly identified this variable with the GSC, but their coordinates based on the Tyc2 catalogue are inaccurate. A large proper motion is given for the object named Tyc2 441 1241 1 in the latter catalogue; this proper motion is probably due to the erroneous combination of the second epoch for GSC 0441.01241 with the first epoch for V586 Oph = GSC 0441.00699.

V838 Oph. The two finding charts available for this variable in the literature (Hoffmeister 1933; Tsesevich 1952) seem incompatible. We think that they refer to the same star but are severely distorted. This star is identical to a variable point source in the IRAS catalogue. Paloque *et al.* (1961) adopted a different identification , which, in our opinion, is erroneous.

V886 Oph. Our slightly unreliable identification differs from that suggested by Kinnunen and Skiff (2000b).

V898 Oph. We identify this object with a star whose variability was confirmed by using electronic image archives. The identification of Kinnunen and Skiff (2000b) is wrong.

V1069 Oph. The identification problems resulted from the wrong sign of the declination in the report on the discovery of this near-equator variable (Hoffmeister 1966).

V1077 Oph. Layden (1998) identifies this variable incorrectly.

V1110 Oph, V1111 Oph, and V1113 Oph. In our opinion, the identifications of these three red variables by Kato (1999a) are erroneous. In the case of V1110 Oph, the variability of our candidate was confirmed by digital survey images.

V1496 Oph. The coordinates published by the discoverer (Plaut 1968) contradict the unpublished chart that he made available to us. Based on the star's brightness, we preferred the identification in accordance with the chart.

V1548 Oph. Schmeer (2000) identified this dubious Nova (Plaut 1968), for which Plaut sent to us a wrong chart (Antipin *et al.* 1994b), with the minor planet (336) Lacadiera. This object was not included in Table 3.

V2040 Oph. Our identification, which is confirmed by the presence of a close companion southwest of the variable (Götz and Wenzel 1956), differs from that suggested by Kinnunen and Skiff (2000b).

V2061 Oph. The coordinates published by Kukarkin (1962) are, probably, seriously in error. The field shown in the finding chart from this paper could not be found in a rather wide neighborhood on plates of

the Moscow stacks. This star was not included in Table 3.

V2063 Oph. It was found on the Harvard plate of July 19–20, 1932, where it was discovered by Luyten (1937), and identified with the minor planet (64) Angelina. This object was not included in Table 3.

V2137 Oph. Our identification with a star in a blend of two or more components is based on the chart from Clement *et al.* (1982). It remains unreliable, because the chart from Sawyer (1943) leads to a different star.

CONCLUSIONS

Below, we list the Internet addresses that correspond to the new resources presented in this paper.

The version of the GCVS Volume II with improved coordinates is available at ftp://ftp.zeus.sai.msu.ru/pub/groups/cluster/gcvs/gcvs/vol2/ or at http://www.sai.msu.su/groups/cluster/gcvs/gcvs/vol2/. The corrections made to the new version of the GCVS Volume II were taken into account in the catalogue's search engine at http://www.sai.msu.su/groups/cluster/gcvs/cgi-bin/search_new.html.

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