

Обработка астрометрических наблюдений

13. Фундаментальные каталоги, используемые в качестве опорных при оптических астрометрических наблюдениях

кто: Семенцов В.Н.

когда: 30 апреля, 2021

дано характеристики кадра
знаем где искать (CDS, сайты проектов)
надо подобрать каталог

требования к каталогу-реализации опорной системы

инерциальность: в настоящее время инерциальность опорной системы достигается с помощью ее привязки к внегалактическим объектам;

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- равноточность** точность реализации опорной системы в случайном и систематическом отношении не должна существенно зависеть ни от положения конкретных опорных объектов на небесной сфере, ни от блеска, цвета и других характеристик объектов.



Home

About CDS

People

Support

Help and Tutorials
Developer's corner
Publication support

myCDS

Virtual Observatory projects

IVOA
Euro VO
ASTERICS
CoSADIE
Past projects:
Euro-VO ICE
- AIDA - DCA - VOTech
OV France
Europlanet

Other projects

RDA Europe
ARCHES
ASTRODEEP
Gala

Authorities

Strasbourg astronomical
Observatory
CNRS - INSU
University of Strasbourg

Links

ADS
NED
CNES
ESA
ESO



Centre de Données astronomiques de Strasbourg Strasbourg astronomical Data Center



Entry point to all services



Object database



Catalogue database



Interactive sky atlas

Other services



X-match



Dictionary



Sesame



SimPlay

Hosted services



ADS mirror



A&A

TIPTOPbase
INES

Upcoming events

USA VIII conference on theory and information services

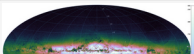
Latest news

- Catalogs added between 11-Mar-2017 and 18-Mar-2017
- Catalogs added between 04-Mar-2017 and 11-Mar-2017
- Catalogs added between 25-Feb-2017 and 04-Mar-2017
- CDS Services Interruption on April 3, 2017
- HTTPS support
- New version of CDS Portal
- Server upgrade for portal and annotations service [DONE]
- Link from SIMBAD to VizieR

More news

Featured news

Gala DR1 at CDS





Access to Astronomical Catalogues

Search catalogue

- Show categories
- Find

- I
- II
- III
- IV
- V
- VI
- VII
- VIII
- IX
- X
- XI
- XII
- XIII
- XIV
- XV
- XVI
- XVII
- XVIII
- XIX
- XX
- XXI
- XXII
- XXIII
- XXIV
- XXV
- XXVI
- XXVII
- XXVIII
- XXIX
- XXX
- XXXI
- XXXII
- XXXIII
- XXXIV
- XXXV
- XXXVI
- XXXVII
- XXXVIII
- XXXIX
- XXXX
- XXXXI
- XXXXII
- XXXXIII
- XXXXIV
- XXXXV
- XXXXVI
- XXXXVII
- XXXXVIII
- XXXXIX
- XXXXX
- XXXXXI
- XXXXXII
- XXXXXIII
- XXXXXIV
- XXXXXV
- XXXXXVI
- XXXXXVII
- XXXXXVIII
- XXXXXIX
- XXXXXX
- XXXXXXI
- XXXXXXII
- XXXXXXIII
- XXXXXXIV
- XXXXXXV
- XXXXXXVI
- XXXXXXVII
- XXXXXXVIII
- XXXXXXIX
- XXXXXXX
- XXXXXXXI
- XXXXXXXII
- XXXXXXXIII
- XXXXXXXIV
- XXXXXXXV
- XXXXXXXVI
- XXXXXXXVII
- XXXXXXXVIII
- XXXXXXXIX
- XXXXXXXx
- other

obsoleted
in preparation
catalog without ftp or
VizieR link

keywords, author names, catalogues ... [\[or browse the list of catalogues\]](#)

The [Strasbourg astronomical Data Center](#) (CDS) collects and distributes astronomical data catalogues, related to observations of stars and galaxies, other galactic and extragalactic objects, solar system bodies and atomic data. It is also a repository of the [IAU Commission 27 Archive of Unpublished Observations of Variable Stars](#)

Access to Catalogues

Alternative accesses:

- [browse the list of catalogues](#), and get access to summary descriptions of each individual catalogue, or restrict to the list of [recently added catalogues](#).
- retrieve the catalogues associated to the [acronyms](#) used throughout the literature, the [Simbad](#) and [NED](#) databases.
- find and query catalogues through [VizieR](#) (or with the [VizieR toolbar](#) below)
- interrogate and query the collection of data with [client routines](#) that can easily be installed on your local Unix workstation.

Note: Some of the catalogues are not (yet) available on-line. These ones should be requested by electronic mail to: question@simbad.u-strasbg.fr

Statistical Summary

- 16939** catalogues available from CDS ...
- ... of which **16304** are available on-line (as full ASCII or FITS files) ...
- ... of which **16039** are also available through the VizieR browser.

Supplying your catalogue

Scientists producing new datasets or astronomical catalogues are encouraged to make their computer-readable material and documentation available for distribution to the worldwide astronomical community, by depositing a copy in one of the international astronomical data centers.

For a rapid insertion into the data center archives and into the [VizieR](#) facility, the authors are advised to have a look at the [guidelines for the preparation and submission](#) of catalogues.

CDS: The Catalogue of Catalogues - Mozilla Firefox

cdsarc.u-strasbg.fr/cats.html

Portal Simbad Vizier Aladin X-Match Other Help

Catalogues and files available at CDS

Version of 13-Feb-2016

- [B. Copies of external databases, regularly updated.](#) (30 catalogues)
- [I. Astrometric Data](#) (285 catalogues)
- [II. Photometric Data](#) (307 catalogues)
- [III. Spectroscopic Data](#) (241 catalogues)
- [IV. Cross-Identifications](#) (29 catalogues)
- [V. Combined data](#) (130 catalogues)
- [VI. Miscellaneous](#) (125 catalogues)
- [VII. Non-stellar Objects](#) (231 catalogues)
- [VIII. Radio and Far-IR data](#) (98 catalogues)
- [IX. High-Energy data](#) (40 catalogues)
- Tables from [Astronomy and Astrophysics](#) (4544 catalogues)
- Tables from [Astronomy and Astrophysics Supplement Series](#) (1091 catalogues)
- Tables from [Astronomical Journal](#) (2141 catalogues)
- Tables from [Astronomische Nachrichten](#) (55 catalogues)
- Tables from [Astronomicheskii Zhurnal \(Russian\)](#) (156 catalogues)
- Tables from [Acta Astronomica](#) (101 catalogues)
- Tables from [Astrophysical Journal](#) (2683 catalogues)
- Tables from [Astrophysical Journal Supplement Series](#) (1168 catalogues)
- Tables from [Baltic Astronomy](#) (54 catalogues)
- Tables from [Monthly Notices of the Royal Astronomical Society](#) (1916 catalogues)
- Tables from [Publications of the Astronomical Society of Japan](#) (86 catalogues)
- Tables from [Publications of the Astronomical Society of the Pacific](#) (194 catalogues)
- Tables from [Pis'ma v Astronomicheskii Zhurnal \(Astronomy Letters\)](#) (163 catalogues)
- Tables from [publications from other journals](#) (371 catalogues)

каталоги-3

```
* CDS FTP repository for Astronomical Catalogues & Tables *
* Use of the FTP server is restricted only to the search or submission *
* of catalogues. *
* For security reasons, sessions are logged. *
*
* For questions or problems: cds-question@astro.unistra.fr *
-----*
* If you want to deposit files ==> cd incoming *
* If you want to get files ==> cd pub *
-----*
* TIP: if your FTP client is hanging after a message like *
* 229 Entering Extended Passive Mode (|||20572|) *
* ----> the solution can be to disable this mode with the command: *
* epsv4 off *
-----*
```

```
[DIR] Parent Directory
[DIR] B 22-Apr-2021 07:45 4.0K
[DIR] I 19-Mar-2021 11:39 8.0K
[DIR] II 07-Apr-2021 16:23 8.0K
[DIR] III 14-Oct-2020 12:51 8.0K
[DIR] IV 27-Jan-2020 13:45 4.0K
[DIR] IX 25-Jan-2021 09:27 4.0K
[DIR] J 17-Apr-2021 07:38 4.0K
[DIR] V 17-Mar-2020 07:52 4.0K
[DIR] VI 06-Jan-2021 12:46 4.0K
[DIR] VII 25-Nov-2020 10:10 8.0K
[DIR] VIII 14-Apr-2021 13:40 4.0K
[DIR] afoev 15-Apr-2021 18:30 4.0K
[DIR] cat1 20-Apr-2021 18:36 4.0K
[DIR] catj 21-Jul-2009 09:16 200
[DIR] cats 20-Apr-2021 18:36 4.0K
[DIR] catv 20-Apr-2021 18:36 4.0K
[DIR] catx 24-Jun-2012 12:38 4.0K
[DIR] ftp 11-Dec-2017 09:14 4.0K
[DIR] jau27 10-Mar-2021 09:03 4.0K
[ ] ls_LR.gz 10-Nov-2019 22:17 26M
[DIR] mors 20-Jan-2020 09:41 4.0K
[DIR] pub 11-Dec-2017 09:14 4.0K
[DIR] sw 09-Feb-2021 12:57 8.0K
[DIR] vizier 08-Jun-2011 16:17 171
[DIR] vizier.submit.beta 23-Apr-2021 05:11 8.0K
[DIR] g 11-Dec-2017 09:14 4.0K
```

cdsarc.u-strasbg.fr

cdsarc.u-strasbg.fr/ftp/ftp/

Contents of /ftp/ftp/

```
[DIR] Parent Directory
[DIR] A&A 07-Apr-2021 10:12 8.0K
[DIR] A&AS 17-Jul-2016 18:21 4.0K
[DIR] A+A 07-Apr-2021 10:12 8.0K
[DIR] A+AS 17-Jul-2016 18:21 4.0K
[DIR] J 17-Apr-2021 07:38 4.0K
[DIR] aa 07-Apr-2021 10:12 8.0K
[DIR] aas 17-Jul-2016 18:21 4.0K
[DIR] abstract 01-Sep-2015 16:40 145
[DIR] afoev 15-Apr-2021 18:30 4.0K
[DIR] aliases 17-Apr-2021 07:38 4.0K
[DIR] bincats 22-Dec-2013 18:51 177
[DIR] cat1 20-Apr-2021 18:36 4.0K
[DIR] catj 21-Jul-2009 09:16 200
[DIR] cats 20-Apr-2021 18:36 4.0K
[DIR] catv 20-Apr-2021 18:36 4.0K
[DIR] catx 24-Jun-2012 12:38 4.0K
[DIR] dic2 27-Jun-2007 17:23 246
[DIR] ftp 11-Dec-2017 09:14 4.0K
[DIR] iau 15-Dec-2017 16:57 163
[DIR] more 20-Jan-2020 09:41 4.0K
[ ] robots.txt 15-Nov-2017 11:25 26
[DIR] simbad 27-Jun-2007 17:23 4.0K
[DIR] sw 09-Feb-2021 12:57 8.0K
[DIR] topbase 25-Sep-2003 10:08 270
[DIR] ulda 10-May-2012 18:03 93
```

cdsarc.u-strasbg.fr

	Summary	ReadMe	VizieR	Browse	FTP	Tar
I/318	BSCC Brorfelde Schmidt CCD Catalog (BSCC) (Zacharias+ 2010) Brorfelde Schmidt CCD Catalog (BSCC)					
Author(s)	Zacharias N., Einicke O.H., Augustesen K., Clausen J.V., Finch C., Hog E., Wycoff G.L.					
Bibcode	Astron. J. , in press (1006.4602)					
Keywords	Meridian observations; Surveys; Positional data; Photometry, CCD					
Category	Observational catalogue [OC]					
Note	(in preparation)					
Statistics	13771775 stars					
Date	25-Jun-2010					

Contents of /ftp/I/317/

I/317 The PPMXL Catalog (Roeser+ 2010)
The following files can be converted to FITS (extension .fit or fit.gz)
sample.out.dat*

Query from: <http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=I/317>

```
[DIR] Parent_Directory
[ ] +footg5.gif          02-Feb-2018 17:42 1005
[ ] +footg5.png         02-Feb-2018 17:43 8.5K
[ ] +footg8.gif          02-Feb-2018 17:42 3.0K
[ ] +footg8.png         02-Feb-2018 17:43 125K
[ ] ReadMe              31-Jan-2018 16:30 31K
[ ] ReadMe_ori          31-Oct-2014 18:22 31K
[DIR] dat               06-Jun-2011 21:48 20K
[ ] dic1317.tst         25-Mar-2011 09:32 249
[ ] ppmxl_fit.htx       11-Jul-2010 14:01 930
[ ] sample.out.gz       06-Jul-2010 17:16 5.5K
```

cdsarc.u-strasbg.fr

Contents of /ftp/I/319/

I/319 XPM-1.0 Catalog of positions and proper motions (Fedorov+ 2011)
The following files can be converted to FITS (extension .fit or fit.gz)
xpm.san

Query from: <http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=I/319>

```
[DIR] Parent_Directory
[ ] +footg5.gif          27-Nov-2015 15:37 1.4K
[ ] +footg5.png         27-Nov-2015 15:37 7.6K
[ ] +footg8.gif          27-Nov-2015 15:37 8.0K
[ ] +footg8.png         27-Nov-2015 15:37 93K
[ ] Paper_3.pdf          23-Jan-2011 13:57 1.3M
[ ] ReadMe              27-Nov-2015 15:36 8.3K
[ ] XPM-MRGA5_Soc_X406X32010_nrf 23-Jan-2011 13:57 3.0M
[ ] XPM_catR3.pdf       07-Apr-2009 20:10 5.6M
[DIR] tsy               13-Nov-2015 15:36 12K
[ ] xpm_san             26-Nov-2015 15:50 185K
```

Zacharias, N., Einicke, O.H., Augustesen, K., Clausen, J.V., Finch, C., Hog, E. & Wycoff, G.L. , «Brorfelde Schmidt CCD Catalog», ApJ, 2010, **140**, 652–661

каталоги-5

The screenshot shows a Mozilla Firefox browser window with the URL `https://vizier.u-strasbg.fr/viz-bin/VizieR-source=I/318`. The page content is as follows:

no

no catalog found
The catalog **I/318** is not integrated in VizieR, but the original files could be available from the [CDS Catalog service](#)

Report:

If you can't find a solution, [report to CDS](#) and insert into your message the following details:

```
.errorfile=/tmp/VR38376.err (2020-04-24T01:35:21)
-0
-source=I/318
```

→ [Thanks for acknowledging the VizieR Service](#)
→ [Rules of usage of VizieR data](#)

© Université de Strasbourg/CNRS
[f](#) [t](#) [v](#) [r](#) [c](#) [Contact](#)

0 Looking

Lip Highlight All Match Case Match Diacritics Whole Words 1 of 1 match

Признаки опорного каталога



[1/192](#) : Tycho Input Catalogue, Revised version (TICR) (Egret et al. 1992)
<http://astro.estec.esa.nl/Hipparcos/catalog.html> : the ESA pages
 on Hipparcos and Tycho Catalogues
[1/246](#) : The ACT Reference Catalog (Urbani-1997)
[1/250](#) : The Tycho Reference Catalogue (Hog-1998)

Byte-by-byte Description of file: [hip_nain.dat](#)

Bytes	Format	Units	Label	Explanations	
1	A1	---	Catalog	[H] Catalogue (H=Hipparcos)	(H0)
9-14	I6	---	HIP	Identifier (HIP number)	(H1)
16	A1	---	Proxy	[HT] Proximity flag	(H2)
18-28	A11	---	RAHms	Right ascension in h m s, ICRS (J1991.25)	(H3)
30-40	A11	---	DEdms	Declination in deg ", ICRS (J1991.25)	(H4)
42-46	F5.2	mag	Vmag	? Magnitude in Johnson V	(H5)
48	I1	---	VarFlag	[1,3]? Coarse variability flag	(H6)
50	A1	---	r_Vmag	[GHT] Source of magnitude	(H7)
52-63	F12.8	deg	RAdeg	? alpha, degrees (ICRS, Epoch=J1991.25)	(H8)
65-76	F12.8	deg	DEdeg	? delta, degrees (ICRS, Epoch=J1991.25)	(H9)
78	A1	---	AstroRef	[1=A-Z] Reference flag for astrometry	(H0)
80-86	F7.2	---	Plx	? Trigonometric parallax	(H11)
88-95	F8.2	mas/yr	pmRA	? Proper motion mu_alpha*cos(delta), ICRS(H12)	(H12)
97-104	F8.2	mas/yr	pmDE	? Proper motion mu_delta, ICRS	(H13)
106-111	F6.2	mas	e_RAdeg	? Standard error in RA*cos(DEdeg)	(H14)
113-118	F6.2	mas	e_DEdeg	? Standard error in DE	(H15)
120-125	F6.2	mas	e_Plx	? Standard error in Plx	(H16)
127-132	F6.2	mas/yr	e_pmRA	? Standard error in pmRA	(H17)
134-139	F6.2	mas/yr	e_pmDE	? Standard error in pmDE	(H18)
141-145	F5.2	---	DE:RA	[-1/1]? Correlation, DE/RA*cos(delta)	(H19)
147-151	F5.2	---	Plx:RA	[-1/1]? Correlation, Plx/RA*cos(delta)	(H20)
153-157	F5.2	---	Plx:DE	[-1/1]? Correlation, Plx/DE	(H21)
159-163	F5.2	---	pmRA:RA	[-1/1]? Correlation, pmRA/RA*cos(delta)	(H22)
165-169	F5.2	---	pmRA:DE	[-1/1]? Correlation, pmRA/DE	(H23)
171-175	F5.2	---	pmRA:Plx	[-1/1]? Correlation, pmRA/Plx	(H24)
177-181	F5.2	---	pmDE:RA	[-1/1]? Correlation, pmDE/RA*cos(delta)	(H25)
183-187	F5.2	---	pmDE:DE	[-1/1]? Correlation, pmDE/DE	(H26)
189-193	F5.2	---	pmDE:Plx	[-1/1]? Correlation, pmDE/Plx	(H27)
195-199	F5.2	---	pmDE:pmRA	[-1/1]? Correlation, pmDE/pmRA	(H28)
201-203	I3	%	F1	? Percentage of rejected data	(H29)
205-209	F5.2	---	F2	? Goodness-of-fit parameter	(H30)
211-216	I6	---	---	HIP number (repetition)	(H31)
218-223	F6.3	mag	BTmag	? Mean BT magnitude	(H32)
225-229	F5.3	mag	e_BTmag	? Standard error on BTmag	(H33)
231-236	F6.3	mag	VTmag	? Mean VT magnitude	(H34)
238-242	F5.3	mag	e_VTmag	? Standard error on VTmag	(H35)
244	A1	---	m_BTmag	[A-Z*] Reference flag for BT and VTmag	(H36)
246-251	F6.3	mag	B-V	? Johnson B-V colour	(H37)
253-257	F5.3	mag	e_B-V	? Standard error on B-V	(H38)
259	A1	---	r_B-V	[GT] Source of B-V from Ground or Tycho	(H39)
261-264	F4.2	mag	V-I	? Colour index in Cousins' system	(H40)
266-269	F2	---	e_V-I	? Standard error on V-I	(H41)
271	A1	---	r_V-I	[A-T] Source of V-I	(H42)
273	A1	---	CombMag	[*] Flag for combined Vmag, B-V, V-I	(H43)
275-281	F7.4	mag	Hpmag	? Median magnitude in Hipparcos system	(H44)
283-288	F6.4	mag	e_Hpmag	? Standard error on Hpmag	(H45)
290-294	F5.3	mag	Hpscat	? Scatter on Hpmag	(H46)
296-298	I3	---	o_Hpmag	? Number of observations for Hpmag	(H47)

Признаки опорного каталога-2

- расположен в I разделе хранилища CDS

Признаки опорного каталога-2

- расположен в I разделе хранилища CDS
- погрешности координат на порядки меньше размера PSF

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- в координатах и собственных движениях приводятся «лишние» значащие цифры

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- как можно больше кинематических характеристик
- в координатах и собственных движениях приводятся «лишние» значащие цифры
- каталог делался долго и сделан «давно»

Признаки опорного каталога-3

конкретно, в цифрах

1 число опорных объектов: $2 \cdot 10^6 \div 5 \cdot 10^7$

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- 1 число опорных объектов: $2 \cdot 10^6 \div 5 \cdot 10^7$
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- 3 точность 1mas — $10\mu\text{as}$

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конкретно, в цифрах

- 1 число опорных объектов: $2 \cdot 10^6 \div 5 \cdot 10^7$
- 2 содержит звезды $V \in [12^m; 20^m]$
- 3 точность 1mas — $10\mu\text{as}$
- 4 шесть кинематических параметров

Признаки опорного каталога-3

конкретно, в цифрах

- 1 число опорных объектов: $2 \cdot 10^6 \div 5 \cdot 10^7$
- 2 содержит звезды $V \in [12^m; 20^m]$
- 3 точность $1\text{mas} - 10\mu\text{as}$
- 4 шесть кинематических параметров
- 5 прямая привязка к ICRF

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- 6 фотометрия и спектры объектов

Опора на космос

- возможность измерения больших дуг

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- производительность

UCAC4

- I/322A, 2012

UCAC4

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UCAC4 is a compiled, all-sky star catalog covering mainly the 8 to 16 magnitude range in a single bandpass between V and R. Positional errors are about 15 to 20 mas for stars in the 10 to 14 mag range. Proper motions have been derived for most of the about 113 million stars utilizing about 140 other star catalogs with significant epoch difference to the UCAC CCD observations. These data are supplemented by 2MASS photometric data for about 110 million stars and 5-band (B,V,g,r,i) photometry from the APASS (AAVSO Photometric All-Sky Survey) for over 50 million stars. UCAC4 also contains error estimates and various flags. All bright stars not observed with the astrograph have been added to UCAC4 from a set of Hipparcos and Tycho-2 stars. Thus UCAC4 should be complete from the brightest stars to about R=16, with the source of data indicated in flags. UCAC4 also provides a link to the original Hipparcos star number with additional data such as parallax found on a separate data file included in this release.

The proper motions of bright stars are based on about 140 catalogs, including Hipparcos and Tycho, as well as all catalogs used for the Tycho-2 proper motion construction. Proper motions of faint stars are based on re-reductions of early epoch SPM data (-90 to about -20 deg Dec) and NPM (PMM scans of early epoch blue plates) for the remainder of the sky. These early epoch SPM data have also been combined with late epoch SPM data to arrive at proper motions partly independent from UCAC4 (Girard et al. [2011AJ....142...156](#), Cat. [I/320](#)). The NPM data used in UCAC4 are not published. No Schmidt plate data are used in UCAC4.

The unpublished plate measure data obtained by StarScan from the AGK2, the Hamburg Zone Astrograph, the USNO Black Birch Astrograph, and the Lick Astrograph have contributed to considerable improvement in proper motions for stars mainly in the 10 to 14 mag range (down to the UCAC limit for Lick data); however, these data do not cover all sky.

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не каталог астрометрический

UCAC5

- I/340, 2017

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New astrometric reductions of the US Naval Observatory CCD Astrograph Catalog (UCAC) all-sky observations were performed from first principles using the TGAS stars in the 8 to 11 magnitude range as reference star catalog. Significant improvements in the astrometric solutions were obtained and the UCAC5 catalog of mean positions at a mean epoch near 2001 was generated. By combining UCAC5 with Gaia DR1 data new proper motions on the Gaia coordinate system for over 107 million stars were obtained with typical accuracies of 1 to 2mas/yr (R=11 to 15mag), and about 5mas/yr at 16th mag. Proper motions of most TGAS stars are improved over their Gaia data and the precision level of TGAS proper motions is extended to many millions more, fainter stars. External comparisons were made using stellar cluster fields and extragalactic sources. The TGAS data allow us to derive the limiting precision of the UCAC x, y data, which is significantly better than 1/100 pixel.

Description:

The UCAC5 positions on the Gaia coordinate system provide additional data of similar quality to the Hipparcos mission Tycho star observations and thus have the potential to improve the TGAS proper motions. UCAC5 provides new, accurate proper motions for millions of more stars fainter than TGAS, which will allow astronomers to have a preview into research possible only with the next Gaia data release. At the faint end UCAC5 proper motion errors are relatively large due to the low S/N ratio of these observations. Better proper motions for stars fainter than about 15th mag are available from proper motions obtained by combining NOMAD (Cat. [I/297/](#)) with Gaia DR1 (Cat. [I/337/](#)) (catalog of 503 million stars is available upon request), or the recently published PPMXL re-reduction, called the HSOY (Altmann et al., 2017, Cat. [I/339/](#)) catalog.

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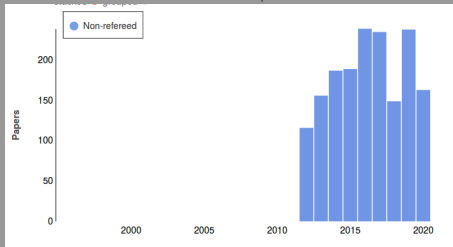
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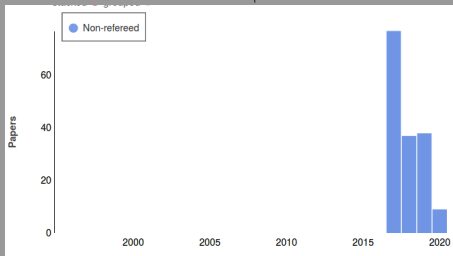
УСАС4 против УСАС5

глас народа образца прошлого года, Web Of Knowledge (?)

УСАС4 — 125 цитат с 2012



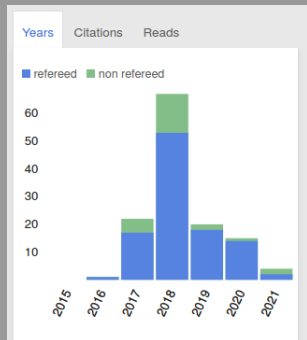
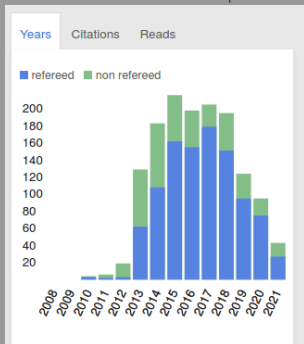
УСАС5 — 16 цитат с 2017



UCAS4 против UCAS5

глас народа обновленный, ADS

UCAS4 — 1418 цитат с 2010



UCAS5 — 130 цитат с 2016

Дополнительная литература

- Kenneth J. Johnston, David Boboltz, Alan Fey, Ralph Gaume and Norbert Zacharias, *Astrophysics of reference frame tie objects*, // *Interferometry in Space*, ed. by Michael Shao, SPIE, **4852**, pp. 143 – 151, 2003
- М.В. Сажин, В.Е. Жаров, Т.А. Калинина, В.Н. Семенцов. *Космология и астрометрия*. // *Астрономический журнал*, 95(12):926–930, 2018
- Кореikin S. M., Makarov V. V., *The Science of Fundamental Catalogs* // 2021, arXiv, arXiv:2101.04175
Astrophysics of Fundamental Catalogs: the Oort constants, the secular aberration, the secular parallax, asteroseismology and parallax zero-point.
Gravitational Physics of Fundamental Catalogs: testing general relativity, gravitational waves, gravitational microlensing.

Задания к семинару

- HCRF
- Tycho-2
- TGAS
- URAT

доступность, характеристики

спасибо за внимание