



ASTRONOMICAL DATA IN RUSSIA

Oleg Malkov

Institute of Astronomy RAS (INASAN)
on behalf of Russian astronomical community

E-mail: pr@inasan.ru

GENERAL INFO

Peoples

- 7 astronomical observatories and institutes
- >10 physical institutions with astronomical departments (groups)
- >12 high schools with astronomical observatories, groups etc.
- ~1400 professional astronomers (~400 members of the IAU), about 1000 more work in close fields

Funding

- Regular funding – about 1×10^6 roubles (1.5×10^4 EUR) for researcher per year.
- Funding by grants – comparable value.
- Productivity 2.3 WoS publications for researcher (IAU member) per year.

Major prospects

1. Joining the ESO
2. National projects

INFRASTRUCTURE



Optical telescopes:

6 m – SAO RAS, 2.6 m – CrAO, 2.5 m – SAI MSU, 2 m – INASAN,
1.6 (wide field) – ISTP SB RAS + 4 ~1.5 m telescopes



Radio telescopes: RATAN-600 (SAO RAS), QUASAR (IAA RAS), SSRT (ISTP SB RAS), RT-22, RT-64

Russian networks:

MASTER (SAI MSU)

ISON (IAM RAS) there will be
a devoted presentation at this
conference



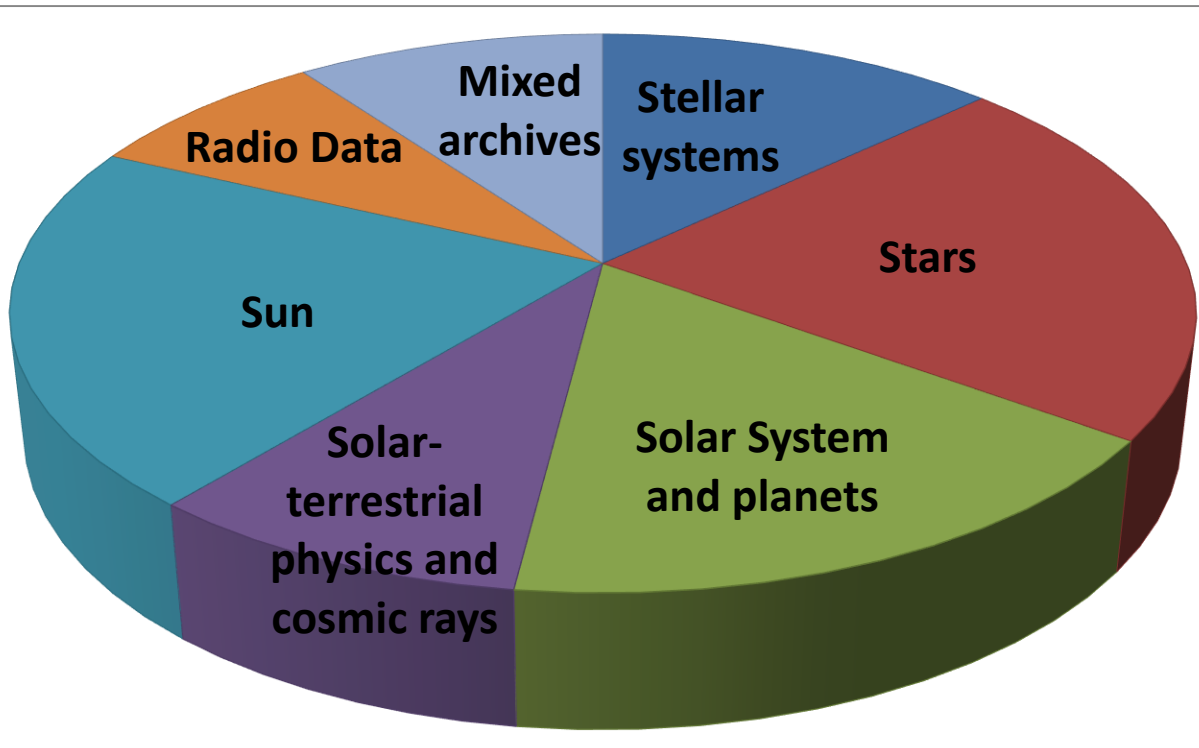
**Neutrino
telescopes**
at Baksan and
Baikal
(INP RAS)



RUSSIAN VIRTUAL OBSERVATORY



- One of the founders of the IVOA
- Purposes:
 - ✓ To provide Russian astronomical community with better access to world astronomical resources
 - ✓ To implement astronomical data from Russian observatories to world astronomical environment.



- Data resources hosted and maintained by Russian astronomical institutions
- Original data provided by Russian astronomers or with their participation

Aperture	Organization	year	Data availability
6 m	Special Astrophysical Observatory RAS	1975	Online archive
2.6 m	Crimean Astrophysical Observatory RAS	1961	No online archive of recent data Digitized glass library
2.5 m	Sternberg Astronomical Institute MSU	2014	No online archive (yet?)
2 m	Terskol Observatory (Terskol Branch of the Institute of Astronomy RAS)	1985	No online archive, data are submitted to International databases (e.g. MPC)
1.6 m wide field	Institute of Solar-Terrestrial Physics SB RAS	2015	No online archive yet

GLASS LIBRARIES

Glass libraries exist in observatories with rather long history. It is one of the important tasks to digitize them. This work is under way in the following observatories (not complete list):

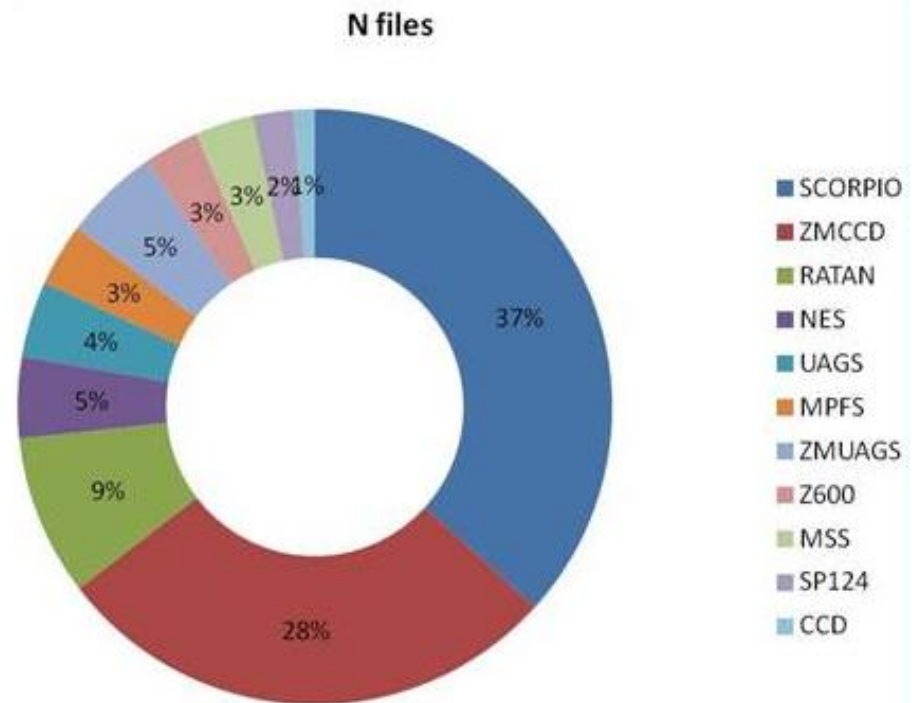
- Pulkovo Observatory RAS
- Crimean Astrophysical Observatory RAS
- Zvenigorod Observatory (Institute of Astronomy RAS)
- Sternberg Astronomical Institute MSU



OBSERVATION ARCHIVE SEARCH INFORMATION SYSTEM (OASIS)

SAO RAS

- Contains digital data collections obtained with various instruments at SAO RAS since 1982
- Volume ~1.5 TB, >1 mln records
- 2 years proprietary period



GENERAL CATALOGUE OF VARIABLE STARS

INASAN + SAI MSU

- The work was initiated and encouraged by the International Astronomical Union in 1946
- More than 70000 variable stars

www.sai.msu.su/gcvs/cgi-bin/search.htm#name

80%

Поиск

GCVS
General Catalogue of Variable Stars

Lomonosov Moscow State University

Institute of Astronomy Russian Academy of Sciences

General Catalog of Variable Stars (GCVS database, Version 2016Nov)

Whenever you use our catalogs, please, give full reference:
Samus N.N., Kazarovets E.V., Durevich O.V., Kireeva N.N., Pastukhova E.N.,
General Catalogue of Variable Stars: Version GCVS 5.1,
Astronomy Reports, 2017, vol. 61, No. 1, pp. 80-88 {2017ARep...61...80S}
in your papers

Query forms

[by GCVS name](#) [by identification](#) [by coordinates](#) [by type](#) [by gl cl var](#) [file query](#)

NEW Attention! Improved coordinates of all named variable stars and of the 11100 NSV stars are available.

GCVS name :

Enter GCVS Designations: with following [format](#)

Samples:

R And
alf And
omi 1 Cen
pi. Cas
V500 Cyg
NSV 2

CATS DATABASE OF RADIOSOURCES

SAO RAS

>1 mln records

Browser address bar: <https://www.sao.ru/cats/>

50% [Refresh] [Search] Поиск

CATS База данных CATS – система поддержки астрофизических каталогов
CATS Database - Astrophysical CAtalogs support System

CELESTIAL 20 YEARS 1995 RFBR project No 96-07-89075

Дела в системе есть, смотрите в. Паша Фиринский

- [CATS list of catalogs \(~120 kb\)](#)
- Search of catalogs with JavaScript Control panels:
[Ordered with Author's name](#) | [Ordered with directory name](#)
- [Table of the major radio catalogs](#) ^{new}
- [The CATS descriptions: \[English\], \[Russian\]](#)
- [Context search in the catalogs descriptions](#)
- [Coordinate search of objects: \[Select in celestial area\] and \[Match around celestial point\]](#)
- [Search of objects by name in NED database](#)


Radio spectra on-line plotting:

Bright sources (with CATS-identifications)	Galactic plane sources	Multi-frequency catalogs	RATAN studies
PCR sources (Sescaud*, 1982)	230 Galactic SNRs (Trushkin, 1999)	1J-sources (Kukla* 1979,1981)	"COLD"-sources, DEC=5d (Baryou, 1996)
PC sources (Waldram*, 2003)	Pulsars (Lorimer*, 1995)	PKSCAT90 (Wright*, 1990)	AGN (Kovalen*, 1997)
VSCP sources (Tirabevachi, 2000) ^{new}	KR-Survey (Kellus, Reich, 1980)	VLA calibrators (Terzian, 2001)+CATSide	PMN-sources (Mazzelev* 1999)+CATSide
CLASS sources (Flux<0.3Jy)	WMAP sources (Trushkin, 2003) ^{new}	MCP-sources (Mazzelev* 2001)+CATS idn	Z2-catalog (Kondakova*, 1999)+CATS idn ^{new}

Daily spectra of the microquasar SS433 ^{updated!}

- [Plotting linear polarization of the sources from:](#)
◦ [Tabara&Inoue, 1980](#)
- [Plotting of Kuhr's sources spectra \(Java applets\)](#)
- [1200 radio maps and RATAN-scans, X-rays and optical images of the Galactic supernova remnants](#)
- [The clusters of galaxies database](#)

[\[News \(in Russian\)\]](#) [\[How to send E-mail request\]](#) [\[FTP download\]](#)

[RATAN-600](#) 

Authors:

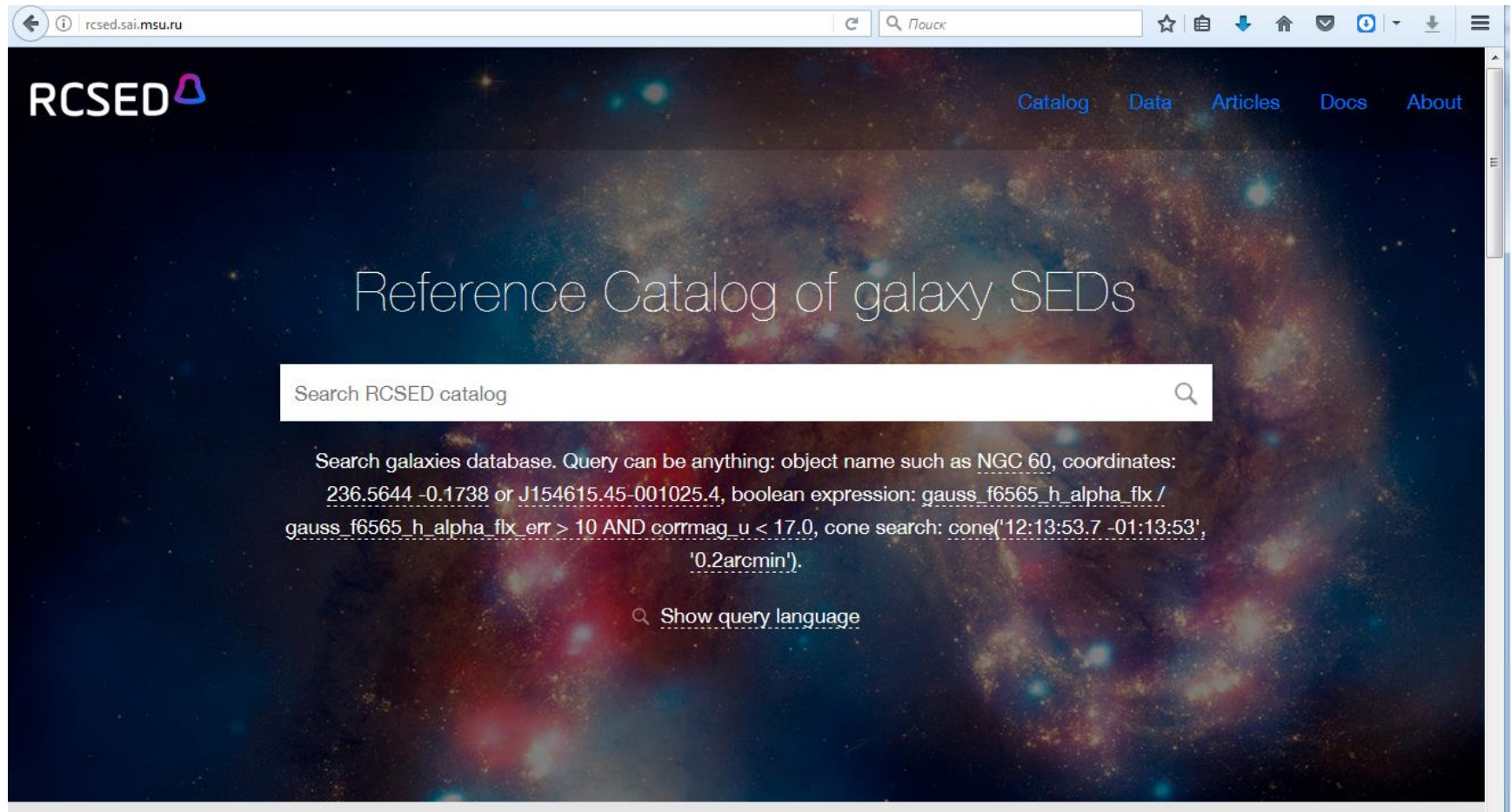
[Vladimir N. Chernenkov vch@sao.ru](mailto:vch@sao.ru), [Sergei A. Trushkin cat@sao.ru](mailto:cat@sao.ru), [Olga V. Verkhodanov vo@sao.ru](mailto:vo@sao.ru)
in collaboration with [Heinz Andernach \(maitho\)](mailto:maitho)

SPECIAL ASTROPHYSICAL OBSERVATORY RAS
N.Ashby, Zhukovskiy sp., Karachaj-Cherkessian Republic, Russia 369167
t [+7] 878-78-46326 – fax [+7] 878-78-46315

REFERENCE CATALOG OF GALAXY SEDs (RCSED)

SAI MSU+

~800000 galaxies



BINARY STAR DATABASE (BDB)

INASAN

120000 binary and multiple systems

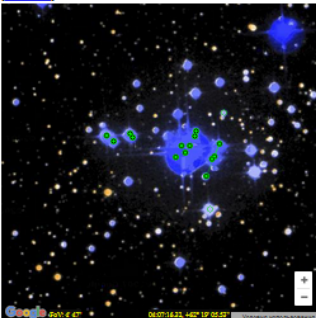
bdb.inasan.ru/?

Welcome to
The Binary Star Database

Binary star Database (BDB) is the database of binary/multiple systems of various observational types. BDB contains data on physical and positional parameters of 260,000 components of 120,000 stellar systems of multiplicity 2 to more than 10, taken from a large variety of published catalogues and databases.

[back](#)

Zoom out of the screen if you do not see background picture
[report error](#)



Components (c) and unresolved pairs (p):

IDs	Right Ascension	Proper motion RA (mas/y)	Magnitude	Spectral Type	Velocity amplitude (km/sec)	Systemic radial velocity (km/sec)	Source
CCDM 2984A, WDS 04078+6220N, SZ Cam A, SBC9 2052A, BSDB J040751.38+621948.4:c14	04 07 44.07 +62 18 4.0						ILB
SZ Cam A			-7.65	O			Stechnikov99
A, SZ Cam A			-7.5	O			Stechnikov94
A, SZ Cam A							Stechnikov94
WDS 04078+6220N, HZG 2	04 07 44.073 +62 18 4.05	-1.0-2.0	9.62				WDS
SZ Cam A				B			Brancovica
BSDB J040751.38+621948.4:c15							
TDSC 8749A							TDSC
TDSC 8749A	04 07 51.396 +62 19 48.452		6.91				TDSC
CCDM 2984A, WDS 04078+6220O, BSDB J040751.38+621948.4:c15, TDSC 8749A	04 08 10.85 +62 20 17.2						ILB
WDS 04078+6220O, HZG 2, STF 485	04 08 10.885 +62 20 17.279	0.0-2.0	9.4				WDS

[show selected data](#)

System (19 components):
SZ Cam, SZ Cam AB, HD 25638, WDS 04078+6220, CCDM 04078+6220, ADS 2984, HIP 19272, ES 2603A, SBC9 2052, BSDB J040751.38+621948.4:x, HD 25639, HIP 19270, DM BD+61 676

Pairs:

IDs	Evolutionary class	Observational type	Theta (deg)	Angular separation (arcsec)	Parallax (mas)	Orbital period (days)	Semi-major axis (arcsec)	Eccentricity	Inclination (deg)	Systemic radial velocity (km/sec)	Source
BSDB J040751.38+621948.4:p1A-1B											
SZ Cam, SZ Cam AB		Eclipsing				2.6985439					GCVS
SZ Cam	Detached	Eclipsing				2.6985					CEV
WDS 04078+6220AaAa, ADS 2984, SZ Cam, HD 25638, HD 26639, HIP 19270, HIP 19272, DM +61 676, CHR 209, ES 2603, HLM 3, HZG 2, STF 484, STF 485, WSI 20, SBC9 2052AB, BSDB J040751.38+621948.4:p1A-1B		Spectral									ILB
WDS 04078+6220AaAa, ADS 2984, SZ Cam, HD 25638, HD 26639, HIP 19270, HIP 19272, DM +61 676, CHR 209, ES 2603, HLM 3, HZG 2, STF 484, STF 485, WSI 20, SBC9 2052AB, BSDB J040751.38+621948.4:p1A-1B		Interferometric									ILB
WDS 04078+6220AaAa, ADS 2984, SZ Cam, HD 25638, HD 26639, HIP 19270, HIP 19272, DM +61 676, CHR 209, ES 2603, HLM 3, HZG 2, STF 484, STF 485, WSI 20, SBC9 2052AB, BSDB J040751.38+621948.4:p1A-1B		Orbital									ILB
SZ Cam, SZ Cam AB	Detached				0.0	2.69944					Brancovica
SZ Cam, SZ Cam AB		Eclipsing				2.6994708			77.0		Stechnikov99

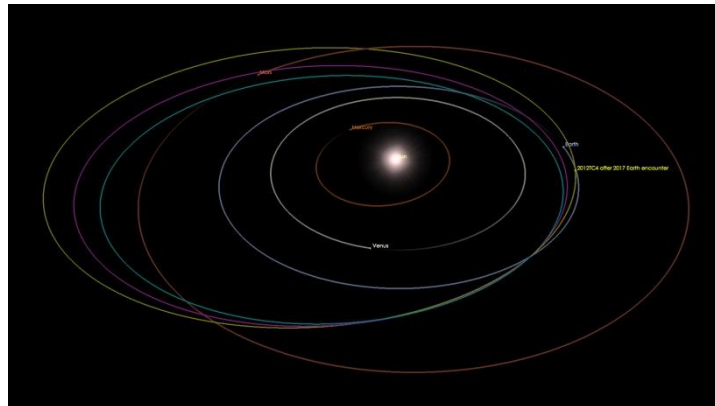
CONTRIBUTING TO INTERNATIONAL RESOURCES

- Submission of data to databases (VizieR, Minor Planet Center, AAVSO, etc)
- Participation in international programs.

EXAMPLE






PARTICIPATION IN TC4 EXPERIMENT

2m telescope of Terskol observatory has recently taken active part in the «TC4 Observation Campaign» - the first global exercise using a real asteroid to test global response capabilities.



DATA FROM SPACE MISSIONS

PAST AND CURRENT SPACE MISSIONS

	ASTRON	1983-1989	UV and X-Ray data on various astrophysical objects Astron data have recently been submitted to the CDS (VizieR).
	PAMELA	2006-	Cosmic rays ~15 GB of data per day (telemetry)
	NUCLEON	2015- (expected lifetime – 5 years)	Cosmic rays. ~10 GB of data per day (telemetry). should increase the worldwide statistics collected over the previous 50 years at least 2 times
	INTEGRAL	2002-	Gamma-ray data Russian center for scientific data 1 year proprietary period
	KONUS-WIND	1994-	Gamma-ray bursts and solar flares joint US-Russian experiment Data are available here: http://www.ioffe.ru/LEA/index.ru.html

RADIOASTRON

RADIOASTRON is a space interferometer launched on June 18, 2011. It is 10 m diameter radio telescope, working at 0.3, 1.6, 5, 22 (18-25) GHz.

Raw data volume – up to 2 PB/year.

Processed data volume is expected to be up to 100 TB.



Any science team that got observing time at RADIOASTRON has a proprietary period of 12 months. Groups can suggest data sharing in their proposals and/or the RADIOASTRON Program Evaluation Committee (RPEC) may recommend it. After the expiration of the proprietary period, RADIOASTRON data will be made publicly available from the archive.



LOMONOSOV SMALL SATELLITE

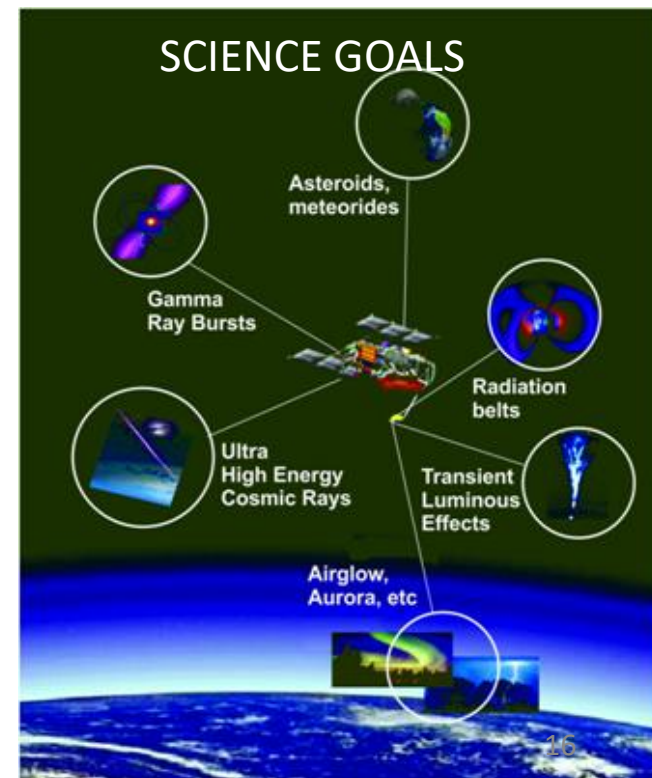
LOMONOSOV small satellite was launched in 2016.

It is science and educational project aimed at optical, X-ray and gamma studies of ultra high energy cosmic rays and transient processes in the upper atmosphere as well as in the Universe.

Data from Lomonosov satellite are coming to Moscow State University Space Data Centre.

At present the GRB catalogue is available at

https://downloader.sinp.msu.ru/grb_catalog/



FEDERAL SPACE PROGRAM OF RUSSIA 2016-2025



47%

**Moon, planets,
minor bodies of
the Solar
System**

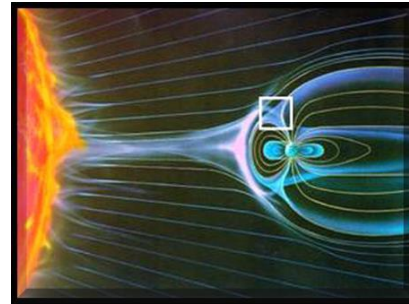


26%

**Space
astronomy**



**SPECTRUM-RG
WSO-UV (SPEKTR-UF)**



13%

**Space plasma
and solar
physics**

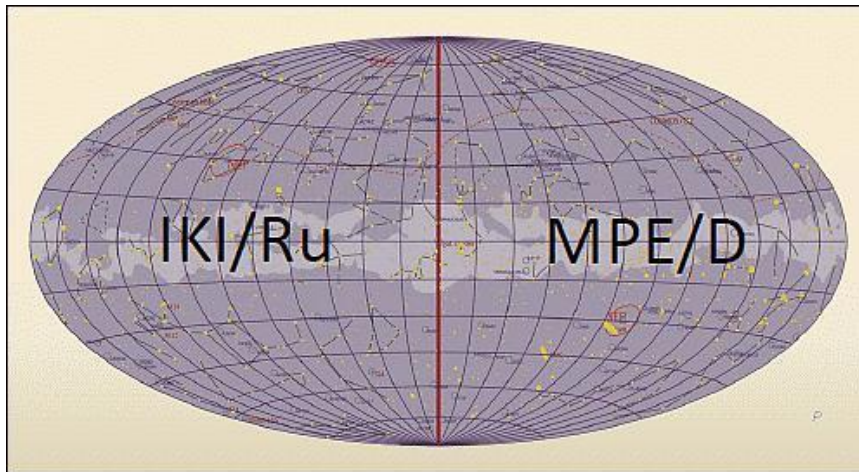
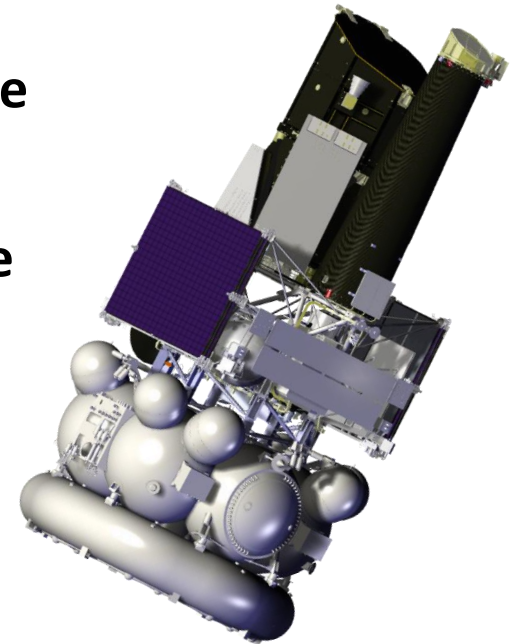


14%

**Basic problems
of space
biology and
medicine**

SPECTRUM-RG

Spectrum-RG is a Russian – German X-ray astrophysical observatory scheduled for launch in 2018. All-sky survey in the 0.5 – 11 keV band with the imaging telescopes eROSITA and ART-XC is planned. We expect discovery of all obscured accreting BHs in nearby galaxies, millions of new distant AGN, and the detection of all massive clusters of galaxies in the Universe. In addition to the all-sky survey, dedicated sky regions will be observed with higher sensitivity.



**Proprietary period – 2 years.
Open to world wide community at
Pointed phase.
Raw data rates: Survey ~1.5 GB/day,
Pointed phase ~5GB/day.
Processed data volume: ~40 TB.**



WORLD SPACE OBSERVATORY - ULTRAVIOLET



WSO-UV



The aim of the WSO-UV mission is to study the Universe in the 115 - 310 nm ultraviolet wavelengths range, which is beyond the reach of ground-based instruments. WSO-UV is a major international collaboration with Russia playing the leading role. The launch is planned for 2023.

The WSO-UV Science Archive will provide easy and efficient access to the contents, as well as basic processing capabilities. It is planned that WSO-UV Science Archive will be VO compliant.

The total volume of data ~200 TB, the expected volume of processed data is ~1 TB.

Proprietary period – 1 year.



CONCLUSIONS

A brief review of main Russian astronomical data sources is presented. Format of this talk does not allow making detailed description of all the astronomical data sources in Russia, so some areas (Sun, Solar system, solar-terrestrial relations data) were not discussed.

Basically, main part of astronomical data from ground based sources is either integrated into VO, or moving toward it. Situation with data from space missions is different.

We work on making the data available to the world astronomical community.

Thank you for your attention!