

## Russian and fSU Resources to be Integrated in the IVO

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**Abstract.** The goal of the Russian Virtual Observatory<sup>1</sup> (RVO) initiative is to provide every astronomer with on-line access to the rich volumes of data and metadata that have been and will continue to be produced by astronomical survey projects. The information hub of the RVO has a main goal of integrating resources of astronomical data accumulated in Russian observatories and institutions, and providing transparent access for scientific and educational purposes to the distributed information and data services that comprise its content.

One of the general purpose data centres for astronomy is the Moscow Centre for Astronomical Data (CAD). CAD has been systematically collecting and distributing astronomical data for more than 20 years. The CAD staff will carry out the activities on construction of the information hub of the Russian Virtual Observatory.

### 1. Introduction

A virtual observatory (VO) is a collection of interoperating data archives and software tools which utilize the Internet to form a scientific research environment in which astronomical research programs can be conducted. The VO consists of a number of data centres each with unique collections of astronomical data, software systems and processing capabilities. In the past months, three major international projects (NVO,<sup>2</sup> AVO,<sup>3</sup> AstroGrid<sup>4</sup>) and a number of smaller ones have been funded to develop and realize the vision of using astronomical data repositories as virtual observatories.

Recently, the Scientific Council on Astronomy of the Russian Academy of Sciences (RAS) strongly endorsed the RVO initiative with CAD (Institute of Astronomy, RAS) and Special Astrophysical Observatory (RAS) as coordinators. The RVO will be an integral component of the International Virtual Observatory (IVO), which will link the archives of all the world's major observatories into one

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<sup>1</sup><http://www.inasan.rssi.ru/eng/rvo/>

<sup>2</sup><http://us-vo.org/>

<sup>3</sup><http://www.eso.org/projects/avo/>

<sup>4</sup><http://www.astrogrid.org/>

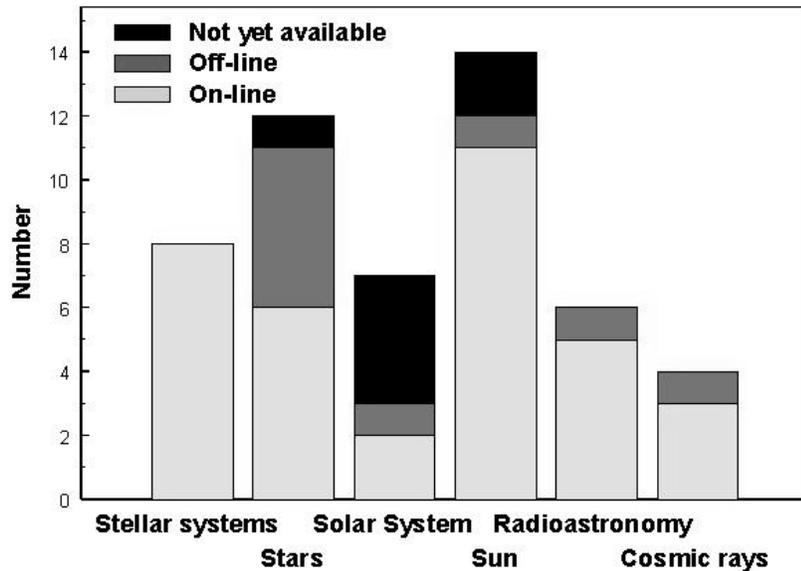


Figure 1. Main Russian and fSU astronomical data resources.

distributed database, with powerful tools to optimize the extraction of science from the data.

The Russian contribution will be in the following areas:

- To provide the Russian astronomical community with a convenient access to the world data grid.
- To unite Russian and former Soviet Union (fSU) data, to provide them to the rest of the world and to integrate them into the IVO.
- To take part in developing of software, techniques, standards, and formats necessary for the establishment of the IVO.
- To use Russian instrumentation to provide observational data in remote mode when needed.
- To strengthen education and public applications of world astronomical data.

CAD contributes mostly in the first three points. The first is one of the main tasks of CAD as the national data centre and the work in this direction has been carried out for many years. The activity is rather manifold: mirroring of principal world databases (e.g., ADS,<sup>5</sup> VizieR,<sup>6</sup> INES<sup>7</sup>), providing access to off-line astronomical resources, visualization and cross-identification of catalogues, review and expert evaluation of data sets, etc.

CAD contribution to the second and the third items of the list is described below in two corresponding chapters.

<sup>5</sup><http://ads.harvard.edu/>

<sup>6</sup><http://vizier.u-strasbg.fr/viz-bin/VizieR>

<sup>7</sup><http://ines.vilspa.esa.es/>

## Main Russian astronomical organisations

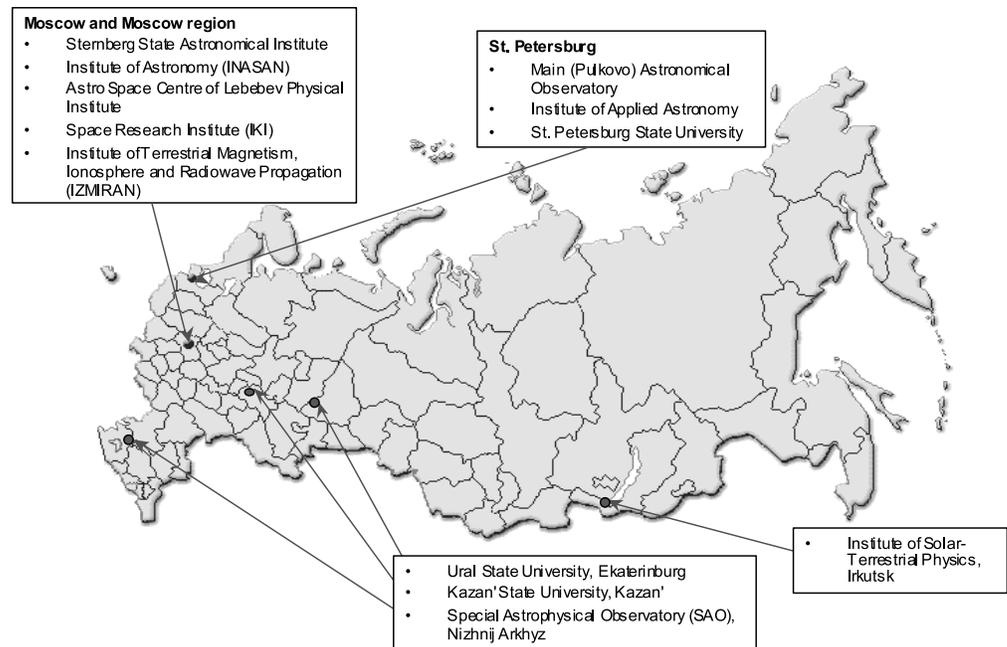


Figure 2. Main Russian astronomical organisations holding astronomical data resources.

## 2. Russian Data to be Integrated into the IVO

There are about 30 astronomical institutes and organizations in Russia. Many of them maintain extensive data archives. But the main value of Russian astronomical observational data is their large time scale of observation. Russia is the most extended in latitude country in the world (11 time zones) and lies just on the opposite site of the globe in respect to the major world observational facilities. This allows, for instance, to obtain continuous observations of variable objects.

We collect information about all available (both Russian and some former Soviet Union) resources and classify them. Figure 1 presents distribution of the resources, kept in a dozen of Russian (see Figure 2) and some fSU astronomical organisations, according to the types and to a degree of availability.

The list of Russian and fSU astronomical resources is compiled for the first time and will be kept up to date. This list is available on the RVO web page.

Other CAD activities in this direction are:

- To provide an access to electronic tables published in main Russian astronomical journals.
- To produce (in collaboration with Russian astronomical organizations) machine-readable versions of catalogues, glass libraries, printed papers.
- To construct catalogues and databases and to provide scientific and technical support to authors of catalogues.

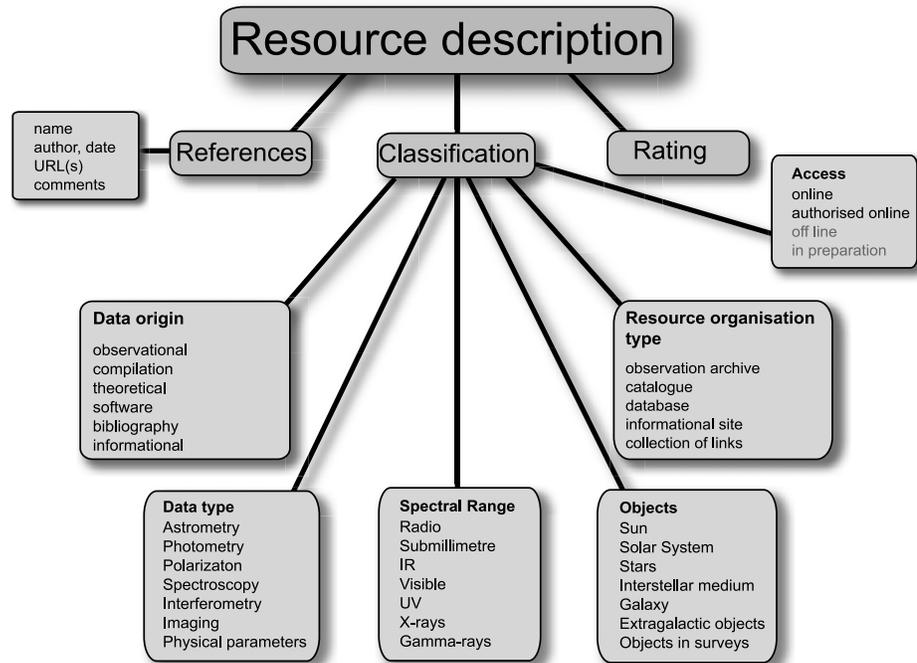


Figure 3. Resource classification scheme.

### 3. Standards and Formats Development

The RVO project starts a couple of years later than other principal VOs, and, therefore, should follow interoperability standards of various kinds already established. We must enable the open exchange of information and share our experiences among other VO projects.

One of CAD's immediate tasks in the frame of this project is standardization and unification of information on national resources, their rating and completing of a (meta-)database of Russian astronomical resources.

The development of a special collection of links to useful astronomical data resources, called Internet Resources in Astronomy (IRinA), is under way. This collection will be based on an original multi-level classification scheme and will include reviews and expert analysis, comprehensive list of national resources and bilingual resource descriptions.

The classification scheme for astronomical resources has been worked out and is presented in Figure 3. This scheme will be used as a foundation for the two described databases: IRinA and the database of Russian astronomical resources. The only difference in schemes for these databases is that in the case of Russian resources we collect information about all the resources available (off-line and online), while IRinA will contain only online ones.

Another our future goal is to construct interoperability tools, particularly, for national observational archives.

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