

## THE SOVIET CENTER OF ASTRONOMICAL DATA

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On the basis of the current French-Soviet cooperation in science and technology, the Astronomical Council of the U. S. S.R. Academy of Sciences and the Strasbourg Center signed in 1977 an agreement on setting up the Soviet Center of Astronomical Data as its filial branch. The Soviet Center was created on the basis of a computation center at the Zvenigorod station of the Astronomical Council of the U. S. S.R. Academy of Sciences, which had already had considerable experience of working with stellar catalogues. In 1979 the Center was equipped with a EC-1033 computer.

In 1978-1979 the Soviet Center of Astronomical Data (C.A.D.) received from Strasbourg 96 of the most important catalogues. By September 1981 the list of catalogues available at the Soviet Center has reached 140 catalogues.

The Soviet Center has the following aims :

1. to obtain from Strasbourg, copy, keep and distribute in the U. S. S.R. the stellar catalogues and other astronomical data recorded on magnetic tape ;
2. the preparation, tape-recording, technical control and exchange with Strasbourg of the astronomical catalogues compiled by Soviet astronomers ;
3. to undertake astronomical investigations and research work based on data available.

As has been mentioned, the main tasks are those of accumulating, keeping and computer-processing of astronomical data files with the purpose of their subsequent distribution in the U. S. S.R., and centralizing the data exchange with Strasbourg. At present 140 catalogues are included into the files. All the data are recorded on EC computer magnetic tapes (the volume of information on one tape may reach 20-22 megabytes).

The work with catalogues is carried out on an EC-1033 computer at the Astronomical Council of the U. S. S. R. Academy of Sciences. The computer speed is 180000 operations per second, the working storage is 512 kilobytes. The external memory includes magnetic discs of 7.25 megabytes and magnetic tapes with a record density of 32 bytes per mm (800 bit per inch). The computational process is controlled by an operational system OC Ec.

All the available catalogues are systematized in agreement with the classification of the Strasbourg Center. Due to limited possibilities in manpower and technological means the C.A.D. cannot cover all branches of astronomy. We have in view first of all the branches covered by the Strasbourg Center and even in them we have so far given preference to the fields close to the research interests of the Astronomical Council namely photometry and spectroscopy of stars and stellar systems, data on non-stellar objects (radio sources, nebulae, etc...). In the field of astrometry the C.A.D. needs several large fundamental catalogues, in particular, for solving problems in satellite geodesy. The main work in the critical analysis and distribution of astrometric data is carried out by the Center of Astrometric Data at the Main Astronomical Observatory (Pulkovo) of the U. S. S. R. Academy of Sciences. We have also included, or are going to include, in our files various tables of astrophysical interest: tables of oscillator strength, tables of stellar opacities, etc... Besides, the files will include catalogues of photographic and laser-ranging observational data on satellites which are being compiled now. So far we do not have any data on Solar system objects. A small part of this information may also be included in our files later. Recently we have received a magnetic tape with data on solar activity from the World Center of Geophysical Data at the Joint Geophysical Committee of the U. S. S. R. Academy of Sciences.

One of the most important aspects in the activity of the Center is the service which is being set up for correcting errors found in published and machine-readable versions of catalogues.

Specialized software was developed at the C.A.D. It includes several isolated programs and the "SPARTAK" system which, with the help of a set of simple instructions, makes it possible, for example, to prepare various catalogue samples and to keep a record of entering inquiries.

Further development of the software is now aimed at a complex utilization of the available data files. A catalogue of star identification (of the Strasbourg type) will serve as a basis of this astronomical data base, which will solve the problem of cross references between different catalogues.

One of C.A.D.'s main tasks is the distribution of astronomical data presented on computer media in the U. S. S. R. Information on the services offered by the Center and the available opportunities of work with data files is regularly circulated to all observatories. At the present the

CAD upon request copies data or prepares various samples, provides assistance and helps in a unified preparation of Soviet astronomical catalogues. In 1980 the CAD granted 17 requests of different organizations for copying and processing of 68 catalogues on magnetic tapes. As a rule a request is granted within a month.

Another important task of the CAD is the centralized preparation of Soviet astronomical catalogues on magnetic tapes and subsequent exchange of these data with the Strasbourg Center. Advice is given to observatories which can tape-record their catalogues themselves.

By now, with the help of the CAD staff, the following Soviet astronomical catalogues in the machine-readable form have been prepared and sent to the Strasbourg Center of Stellar Data :

1. A.E. Piskunov, "Catalogue of Stellar Masses and Ages for 68 Open Clusters", where evolutionary masses and ages of 7000 stars are given determined from stellar positions on the H-R theoretical diagram.
2. Z. Kraitcheva, E.I. Popova, A.V. Tutukov, L.R. Yungelson, "Catalogue of physical parameters of spectroscopic binaries", in which besides the data given in Batten's Catalogue (6th edition) and its extensions, the following stellar characteristics are determined : masses and mass ratios of components, semiaxes of orbits, orbital angular momentum, specific orbital momentum.
3. R.A. Bartaya, "Catalogue of spectral types and luminosity classes of 10396 stars in Kapteyns areas Nos. 2-43".
4. Z. Alksne, A. Alksnis, "Catalogue of cool carbon stars discovered at the Radio Astrophysical Observatory of the Latvian Academy of Sciences" (219 stars).
5. M. Muminov, "Proper motions and UBV-photometry of stars in the field of the clusters  $\eta$  and  $\chi$  Persei".
6. V.N. Frolov, "Photometry and proper motions of stars of four open clusters in Cassiopeia".

Several other Soviet catalogues are under preparation for being recorded on the EC computer magnetic tape :

1. M.A. Svechnikov, "Catalogue of orbital elements, masses and luminosities of close binary stars" (about 200 systems).
2. N.G. Kogoshvili, "Morphological catalogue of galaxies".
3. P.N. Kholopov et al., "New catalogue of suspected variable stars". This catalogue contains data on 15000 stars and is already tape-recorded with the help of an BESM-4M computer. Its rewriting to fit the international standards is being completed.

4. P.N. Kholopov et al., "General catalogue of variable stars" (4th edition) where data on 40000 stars will be collected.

According to the Agreement between the Astronomical Council of the U. S. S. R. Academy of Sciences, the Budapest University (Hungary), and the Astronomical Institute of the Czechoslovakian Academy of Sciences, the Soviet Center is tape-recording the Catalogue of clusters and associations by B. Balasz, J. Ruprecht and V. Vanysek. The part of the catalogue containing data on associations is already tape-recorded and will be sent to Strasbourg in the near future.

Recently the CAD has prepared a list of existing Soviet catalogues in astrophysics and after a critical analysis some of these catalogues will be tape-recorded and also sent to Strasbourg.

There exists a large number of astronomical problems to solve for which it is necessary to use catalogue data. The use of computers makes it possible to improve considerably the efficiency of this work, since for example it guarantees against accidental errors made during data processing, allows an easy repeatable processing of the material (which is rather important for large catalogues containing several tens or even hundreds of thousands of stars), allows to include into the procedure of data analysis complex reduction algorithms which cannot be used in hand processing, and finally it is promising for mass utilization of combined data obtained merging several different catalogues.

Investigations have been carried out at the Astronomical Council using stellar catalogues in machine-readable form, including catalogues prepared by the CAD (M0001, M0002). Thus, paper /1/ devoted to the study of distributions of stars in open clusters over mass  $m$  and age  $t$  is based on the catalogue of  $m$  and  $t$  values for about 8 000 stars in 68 clusters (M001). Since stars of open clusters have common origin and evolutionary history, the study of mass and age functions in clusters can provide valuable information on peculiarities of the star formation process in these groups.

Using the catalogue of physical parameters for spectroscopic binaries (M002), Z.T. Kraitcheva, E.I. Popova, A.V. Tutukov and L.R. Yungelson have studied the distribution of these stars over component masses, mass ratios, periods, orbital momenta, and also studied correlations between the above quantities /2,3/.

The same authors have studied the sample of eclipsing binary stars with  $V \leq 10^m$  using the catalogue by Wood et al. /4/ and shown that for these stars basically the same laws are observed as for spectroscopic systems /5/.

Papers /6/ and /7/ are devoted to the study of mass function peculiarities for different objects of the disk galactic population and belong also to the studies mentioned above.

Paper /6/ discusses the question if the initial mass function of population I type stars is monotonic. Analysis of a number of catalogues received from the Strasbourg Center (Michigan Catalogue of Spectral Classification S 3031, Philip and Egret Catalogue based on uvby $\beta$ -photometric data S 5014, altogether 20000 stars) and also of several other catalogues, has shown that there is a number of independent evidences that the initial mass function of stars is nonmonotonic.

Paper /7/ is devoted to the study of the distribution of B-stars over mass in the association Orion OBI. For this sample, Strömgren photometric data of the Warren and Hesser Catalogue S 2036 have been used for about 500 stars.

Some aspects of the chemical evolution of the galactic disc have been studied from the data of catalogues S 5014 and S 3032 in papers /8/, /9/, and /10/. In paper /8/ an integral distribution is obtained for the dwarfs of the S 3032 catalogue over metallicity indices (Fe/H) determined by the spectral method.

The study of various catalogues is being carried out at the Astronomical Council. In particular, the present mass distribution is investigated for population I stars from the solar vicinity over a wide range of masses ( $M_{\odot} \approx 0.3 - 30 M_{\odot}$ ). To do so, we use data from several spectral, photometric and combined catalogues (S 3011, S 5014, S 5004, S 5001, S 5051, etc...) containing altogether up to hundred thousands of stars.

In the immediate future the Center will continue and deepen its activity in all directions.

The establishment of the Soviet Center of Astronomical Data is an important event for Soviet astronomers whom it renders systematic assistance in obtaining and partial processing machine-readable astronomical data. Scientists of socialist countries are also interested in its activity and we hope that in the near future many interesting catalogues will be added to the data bank. The main data bank has been kindly placed at the disposal of the Soviet Center by the Strasbourg C.D.S. for which we are very grateful.

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