

The observational databank ODA-B/SS. The first results of development

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Abstract. The first results of development and adoption of the observational databank ODA-B/SS for stellar spectrographs of the 6 m optical telescope BTA are discussed. The content of individual divisions of the integrated informational system is described and the fundamental statistical data on the local archives are presented.

Key words: telescopes: optical — methods: data analysis — methods: numerical

1. Introduction

In late 2003 we completed the next stage of work on the project of creation of the Bank of observational data ODA-B/SS for the stellar spectrographs of the 6 m optical telescope BTA. The project ODA-B/SS (Observational Data Archive – BTA/Stellar Spectrographs) in its final version was formulated in 2001 (Kononov, Panchuk 2001), since 2002 the work on the project has been supported by the RFBR (N 02-07-90245).

The main goal of the project is the creation of a multibase distributed informational system ensuring on-line accumulation of results of all observations conducted at BTA with the stellar spectrographs, long-term storage of observational data obtained and automatic access of users to the archive information. Allowing for the great extent and the problems in the development, all the work has been done by individual and coordinated steps, while specific tasks have been performed depending on the system of introduced priorities.

The Bank ODA-B/SS is oriented at different *types* of standardized optical data. Each type of data refers to the certain astronomical device (stellar spectrograph) and its acquisition system. In the general case the number of types of data is not limited, which gives an opportunity of putting into operation new devices and their maintenance by the informational system provided that a number of standard conventions are obeyed.

Currently the Bank ODA-B/SS provides work with the following types of data (designations corresponding to the classification introduced previously are used (Kononov, Panchuk 200a,b)):

- Bl (LYNX) — high resolution echelle spectrometer at the Nasmyth-2 focus;
- Bs (PFES) — echelle spectrometer at the prime focus;
- Bn (NES) — echelle spectrograph with a collimated beam of big diameter at the Nasmyth-2 focus.

The conception of the Bank ODA-B/SS provides for the maintenance of 2 types of databases: the *main* archive base (DB) and the auxiliary *reference* databases. The main databases contain parameterized digital arrays — results of observations presented in a self-documented format. The multilevel problem-oriented reference databases are established as a superstructure of the main database and are employed in the system to optimize access to the archive information.

2. United archive base

At the first stage we discussed the creation of the most complete main archive base as the highest priority task. In 2002 the first united version was created which comprised data obtained with the stellar spectrographs for many years without division them by their types, but chronologized. Experimental data accumulated in the previous years and stored in some forms on different computer media served as the original information for this DB. As a result of acquisition, analysis and systematization of a bulk of data, a version of the main database was produced, which had the following parameters as of 1.01.2003:

Archive coverage	—	1992–2002
Number of years	—	11
Number of observing dates	—	295
Number of observations	—	6590
Data capacity	—	29.0 Gb

The united main DB thus formed was located on 46 volumes of optical disks CD-R (Compact Disk – Recordable) of 650–700 Mb in capacity and became the basis for further development of the Bank ODA-B/SS and formation of its standardized archive bases.

3. Reorganization of the main archive base

At the second stage, in 2003, complete reorganization of the integrated archive base was performed to establish *local* archives representing the fragmentation of the main DB according to data types. Each local archive is a subset of the main DB intended for support of experimental data of a certain type. It is important here to observe the principle of *homogeneity* which provides for designing structurally identical specialized archive subsystems — divisions of the Bank ODA-B/SS, and each local archive represents the main archive DB of the respective division of the system.

In the reorganization special attention was paid to the common form of representation of experimental arrays. Since the international Basic FITS format was adopted as standard for data of all the stellar spectrographs, the necessary operations were performed for reduction of part of data to the standard archive format. This procedure embraced about 1300 observations (~ 20% of the total number). At the same time, part of the information of auxiliary character or incorrect from the point of view of observing astronomers was eliminated (chiefly for the year 1992). The sorting of data to types was executed by the parameters of the headers of FITS files with additional analysis of observational logs of many years to avoid possible errors. Concurrently with the reorganization of the main archive DB acquisition of new experimental data and their storage were carried out.

As a result a new version of the main archive base with redistribution of information over 3 local archives for the 3 stellar spectrographs (LYNX, PFES and NES) was created by 1.01.2004. As a whole, this version of the base is presently characterized as follows (Kononov, Klochkova 2003):

Archive coverage	—	1993–2003
Number of years	—	11
Number of observing dates	—	329
Number of observations	—	8234
Data capacity	—	42.5 Gb
Number of types of data	—	3

As an illustration of the current state of the DB Figs. 1, 2 and 3 show the distributions of the combined bulks of the data, the number of observing dates and the number of observations for the three stellar spectrographs against years.

Fig. 4 presents a comparison of the 3 established divisions of the Bank ODA-B/SS in the capacities of the main DBs, the number of observing dates and the number of observations.

4. FLEX standards of identification

The principle of homogeneity in designing the local subsystems of archiving of the Bank ODA-B/SS is intimately related to the matter of standard identification of output data of the acquisition system of the stellar spectrographs. This problem is a part of the general task of establishment of the unified FLEX interface (Flexible EXchange) for the organization of intersystem exchange including the realization of effective interaction of the Databank with different experimental data acquisition system. Here the key point is recognition of input data flows from the file names by the components of the Bank for subsequent decoding and check of the information and fast sorting of the material. With this end, a set of local FLEX- N_k standards of *identification* was elaborated which were based on version 2 of the common FLEX- N standard intended for description of information outputs of any acquisition systems (Kononov, 2002a).

The FLEX standards of data identification are unified systems of conventions on the names of output files of the acquisition systems. These standards specify unique and well structured names and enable to define at the level of file names individual hierarchically associated parameters of experiments, including the type of data, the observing date, the number and type of observation etc. Now the FLEX- N standard of identification is completely realized for the echelle spectrograph NES, which has been the leader both in the number of observations and in the bulk of data over the past three years (see Fig. 4). Similar standards for the spectrograph LYNX and PFES are presumed to be introduced as new versions of the acquisition systems are reduce to practice.

5. Filling the local archives

At the present time the interaction of the Databank ODA-B/SS with the acquisition systems of the stellar spectrographs is maintained by means of automated pipelines of data transmission between the computers on the basis of the local area network of the observatory. The canonical variant of intersystem exchange is provided by a 2-layered network buffering system ODA/BS-2L (Observational Data Archive/Buffering

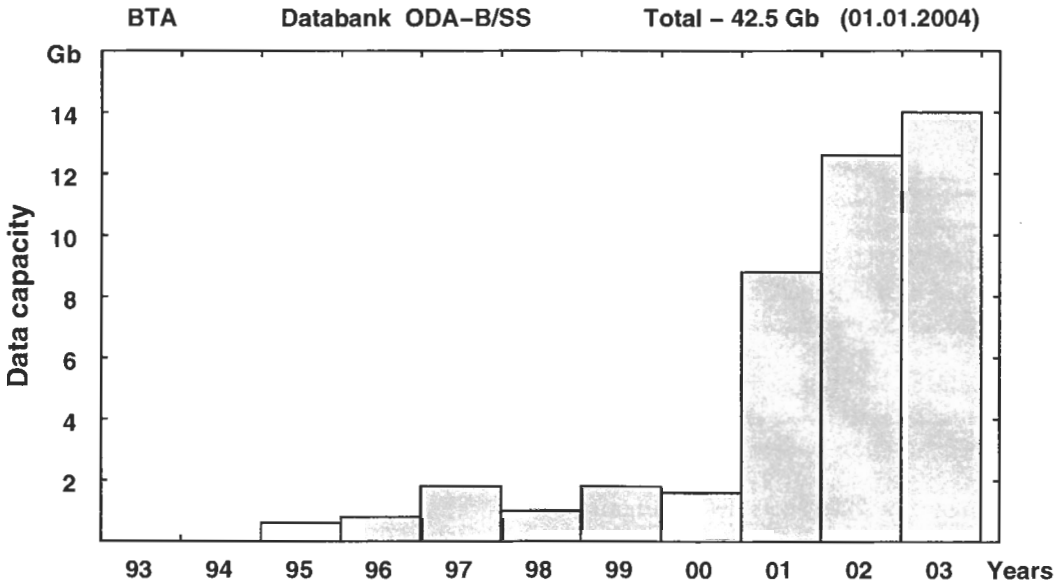


Figure 1: The distribution of archive data for 3 stellar spectrographs against years.

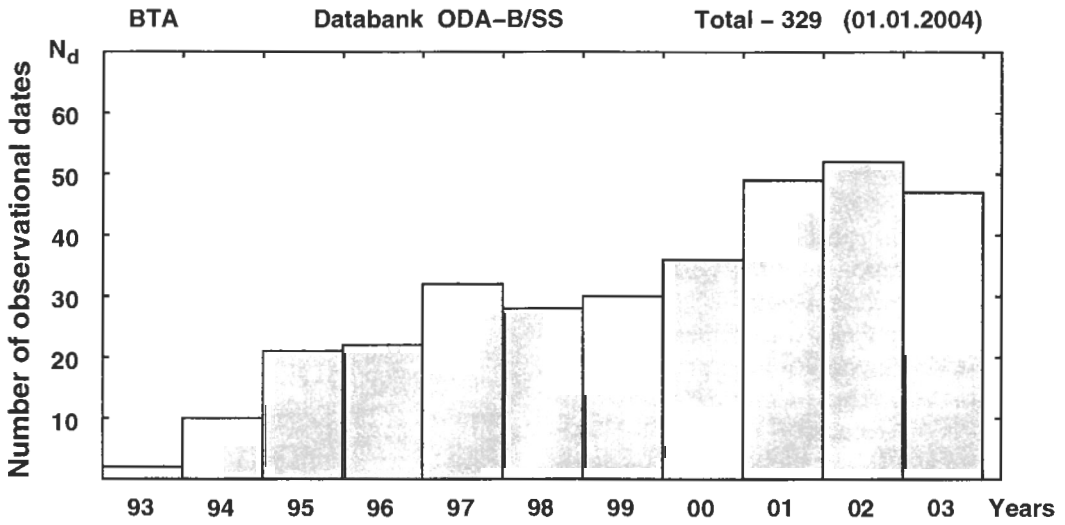


Figure 2: The distribution of the number of observing dates for 3 stellar spectrographs vrs years.

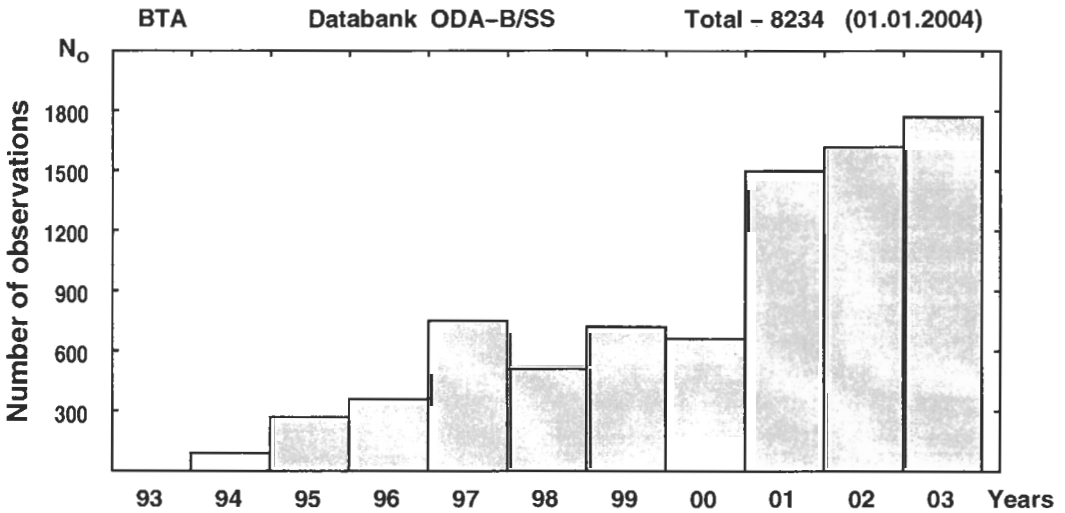


Figure 3: The distribution of the number of observations for 3 stellar spectrographs vrs years.

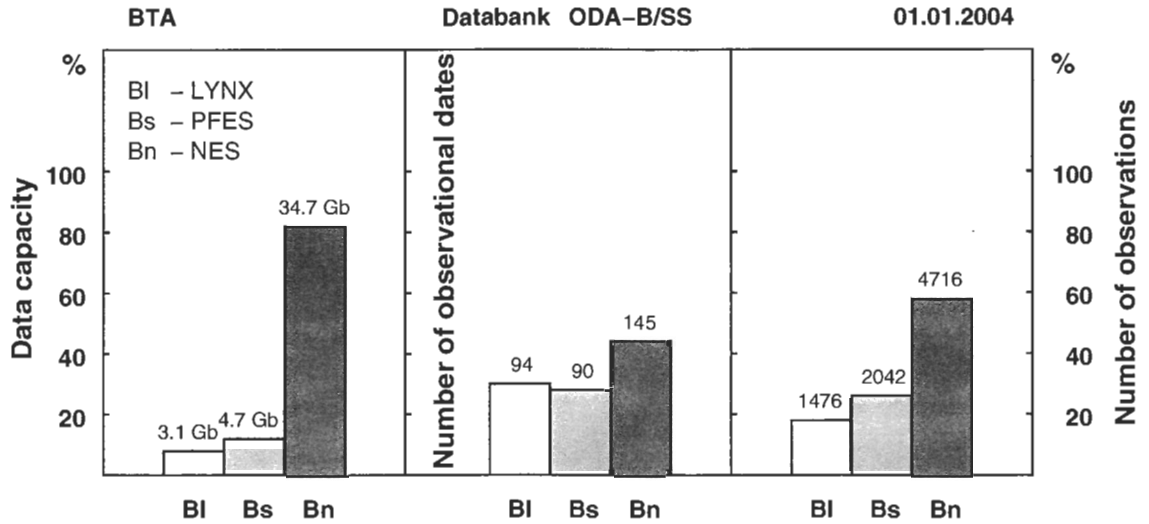


Figure 4: The comparison of the 3 divisions of the Bank ODA-B/SS in the capacities of the main DBs, the number of observing dates and the number of observations.

System – 2-Layered). The system is being developed within the framework of the project ODA-B/SS as unified input interface shell of the Bank, and its approved ideology has wholly been adopted from the respective subsystem of the observational Databank ODA-R of the radio telescope RATAN-600 (Kononov 2002b).

At the present stage the buffering system ODA/BS-2L is fully configured for the last version of the acquisition system of the spectrograph NES. That is, a completely automatic pipeline of on-line data transmission and archiving without intervention of the administrator is functioning for the data of this facility. For the spectrographs LYNX and PFES the semiautomatic modes of intersystem exchange have been in use so far, and the procedures of data transmission from these devices will be rendered completely automatic after the appropriate acquisition system are renewed and their information outputs are reduced to the earlier adopted standards.

Thus, the employment of the specialized shell ODA/BS-2L will make possible to make the process of archiving experimental data completely automatic and maintain independently the continuously extending local archives of the Bank ODA-B/SS.

6. Conclusions

As a result of fulfillment of a totality of work, including the setting up of the necessary hardware, the development of software, the systematized to the utmost and accessible to astronomers archive base of

the BTA stellar spectrographs has been formed for the first time and is maintained.

The principal outcome of the first two stages was the creation of the standardized local archives of the Bank ODA-B/SS and organization of automatic pipelines for operational completion of these archives with new experimental data. The involvement of the Bank ODA-B/SS into the observational cycle enhances considerably the capabilities of the entire system of automation of astrophysical observations because it ensures reliable centralized on-line storage of unique information.

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