

THE INASAN ZVENIGOROD OBSERVATORY PLATE COLLECTION

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Abstract. Description of the astronomical wide-field plate- and film-collection of the Zvenigorod Observatory of the Institute of Astronomy of the Russian Academy of Sciences is presented. The archives of the collection are the result of photographic observations conducted for more than thirty years from 1972 to 2005. They included:

- 1) photographic plates obtained with the 40 cm Carl Zeiss astrograph (the half of the plates are included in the Sofia WFPDB). The plates are now in process of digitization in FITS-formats, 700 MB each scan. Two EPSON 1640XL scanners are used. The observational programs include the FON photographic north sky survey, small bodies in the Solar system - asteroids and comets;
- 2) film archive from the AFU-75 camera;
- 3) archive of artificial satellites monitoring observations with wide-field camera VAU.

1. INTRODUCTION

In 1958 near Zvenigorod (in Moscow region) the experimental station of Astronomical Council of the USSR Academy of Sciences (nowadays the Zvenigorod Observatory) was created with the order of the Presidium of the Academy of Sciences of the USSR. Throughout many years it was the main scientific base for working out of new techniques, equipment and observers for the Earth artificial satellites observations. Later on traditional telescopes for observations of common astronomical objects: stars, planets, comets and asteroids, were installed too.

We describe the astronomical wide-field plate- and film-collection of the Zvenigorod Observatory of the Institute of Astronomy of the Russian Academy of Sciences, as well as the digitization projects.

2. AVAILABLE ARCHIVES OF THE ZVENIGOROD OBSERVATORY

The plate archives are results of the photographic observations carried out at the Zvenigirod Observatory for more than thirty years from 1972-2005. The parameters of the instruments and characteristics of the archives are presented in Table 1.

Brief information on archives is given below:

1) Photographic plates taken with the 40 cm **Carl Zeiss astrograph**, totally about 4500 plates, plate size is 30x30 cm. For the majority of the plates the used exposures allow stars up to 16.5 magnitudes to be well visible. The half of the plates is included into the Sofia WFPDB (Tsvetkov, 2006). The plates are in process of digitization in FITS-format, each scan has size of 700 MB. Two EPSON 1640XL scanners are used.

Table 1: Plate collections and the used instrument parameters of the Zvenigorod Observatory.

Instrument	D cm	F cm	Field deg	Plate/film size, cm	Years	Plate number
Astrograph Zeiss-400	40	206	8 x 8	30 x 30	1972 - 2005	4500
AFU camera	21.2	73.6	10 x 15	20 x 14	1973 - 1985	2800
VAU camera	107	70	5 x 30	6 x 36	1971 - 2005	10000

2) **AFU-75 camera** with about 2800 films. All films are obtained during the satellites observations. The film is displaced during the exposure with speed of movement of the satellite, but with periodic stops through 3 or 6 mm. The full image of a star represents a chain from 13 or 7 images with 1 arcsec exposures. Usually limiting magnitude was 8 magnitudes. This archive is catalogued. It scanning is not provided.

3) Monitoring observations with very wide-field 107 cm **VAU camera**. On the whole field the images are not distorted by aberrations due to the location of the film on a spherical focal surface. The archive has nearly 10000 films. It is not catalogued. The scanning is not supposed.

4) **FZT** photographic plates – the geodynamics observations were carried out in 1980. The catalogue of stars of the Moscow zenith zone is a result of these observations. It has been decided to keep only the archive.



Figure 1. The Zvenigorod astrograph Carl Zeiss-400.²



Figure 2. The camera VAU.¹



Figure 3. The camera AFU-75 and the FZT in the background.

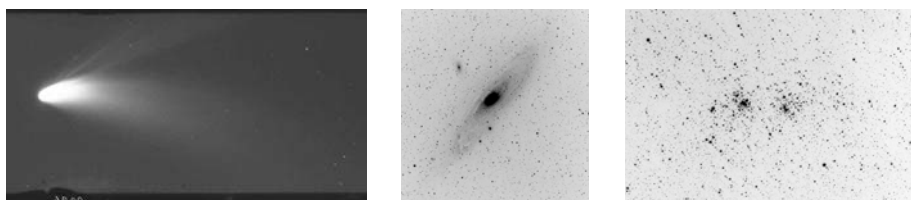


Figure 4. Picture of Hale-Bopp comet taken in the beginning of April 1997 with a length of a tail of 15 degrees, the observer is N.S.Bahtigaraev (left); The Andromeda galaxy (in the middle) and h and hi Persei open cluster (right) received by the astrograph.

¹ Nauchnye Informacii Astrosovet, Moscow, 1986, **60**, 84.

² Zvenigorod Observatory Instruments (<http://www.inasan.ru/rus/zvenigorod/instr.html>).

3. DIGITIZATION OF THE PHOTOGRAPHIC PLATES

The basic result from the plate digitization will be a digital plate archive including about 4000 scans of the plates received by the astrograph.

The image archive structure includes:

1. Scans in FITS-format, approximately 700Mb each one as a main part of the digital archive;
2. Preview scans archive with images in JPG and TIF file formats with the size of 3MB and 600MB correspondingly;
3. Original page scans of the observational logs in JPG and TIF file formats;
4. Catalogue of the plates in the WFPDB format (in ASCII file format given in <http://cdsarc.u-strasbg.fr/viz-bin/Cat?VI/90>).

The equipment for the project includes the two EPSON EXPRESSION 1640 XL scanners with the scanning parameters given in Table 2. The scanning plate was put with the emulsion downwards on the glass plane of the scanner.

Table 2: Scanning parameters

Parameter	Work scan	Small preview	Large preview
Image Type:	16-bit Grey	24-bit color	24-bit color
Resolution	1600 dpi	300 dpi	1200 dpi
Format of the image	fits	jpg	tiff
Scale	100%		
Document Type	Transparency		
Film Type	Positive film		
Trimming	Off		
Auto Exposure	On		

The accuracy of the coordinate measurements was checked in the Byurakan observatory. For Schmidt plates the root-mean-square deviation is equal of 0.33 arcsec. The photometric scan accuracy is 0.14mag (Nesci et al., 2003).

Acknowledgements

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References

- Nesci R., et al.: 2003, Digitization and electronic distribution of the astronomical plate archives of Italian astronomical observatories, *Mem. S. It. Suppl.*, **3**, 364.
- Tsvetkov M.: 2005, Wide-Field Plate Database: a Decade of Development, in Virtual Observatory: Plate Content Digitization, Archive Mining and Image Sequence Processing, iAstro workshop, Sofia, Bulgaria, 2005, pp. 10-41 (2006, <http://www.skyarchive.org>)