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Photo plates digital archives of the INASAN Zvenigorod Astronomical Observatory

Sergei V. Vereshchagin [1], Natalia V. Chupina [1]
[1] Institute of Astronomy, Russian Academy of Sciences (INASAN)

Abstract. We present the electronic library of the astronomical plates, which were created by telescopes of Zvenigorod observatory (near Moscow). Zvenigorod's Observatory stores large archive of the photos, accumulated from 1972 to 2005. The observatory team is working on create a digital archive of the plate images: a scanning, cataloging and safekeeping. Telescopes: AFU – 75 Camera, Astrograph Carl Zeiss, VAU Camera.

Our plates have the field stars of different types up to 16 magnitude, comets and asteroids, Mars and Pluto, and the galaxy images of different sizes. The plate parameters are on-line available both with INASAN website and with Bulgarian WFPDB. The image in FITS-format (700 Mb) can be ordered by e-mail. Both professionals and amateurs will be use the scans archive for study of variable stars, asteroids, comets and other sky objects.

Archive parameters

Astrograph Carl Zeiss. The 3703 negatives were produced and fixed in log since 1972 to 2005. Now about 2000 scans are accessible.
FON program, about 50% of all archive. Observation was carried out from 1980 to 1992 for FOKAT catalog creation. Sky area from -2° on +90°.
Asteroids program, fbout 30% of archive. The program purpose is the refinement of the position of the vernal equinox.
Comets program, 8% of all archive. Determination of exact coordinates (exposition of 5 - 6 minutes). Studying of a tail of a comet (length of the image is up to 7 ° (25 cm)) with expositions 1 hour and more.
Other programs:
- the catalog of basic stars round 190 radio sources (8%).
- Pluto observation (3%). It is carried out by V.P. Osipenko for specification of its orbit.
- Mars observation (3%) was in 1988 for the needs of two interplanetary stations "Fobos" voyage to Mars.

AFU Camera Plate. 2683 films. All films are obtained by the satellites observation. The full image of a star is a chain from 13 or 7 points with 1 arcsec exposures. Usually limiting magnitude is 8mag. The archive is catalogued and placed in WFPDB. Scanning is not planned.

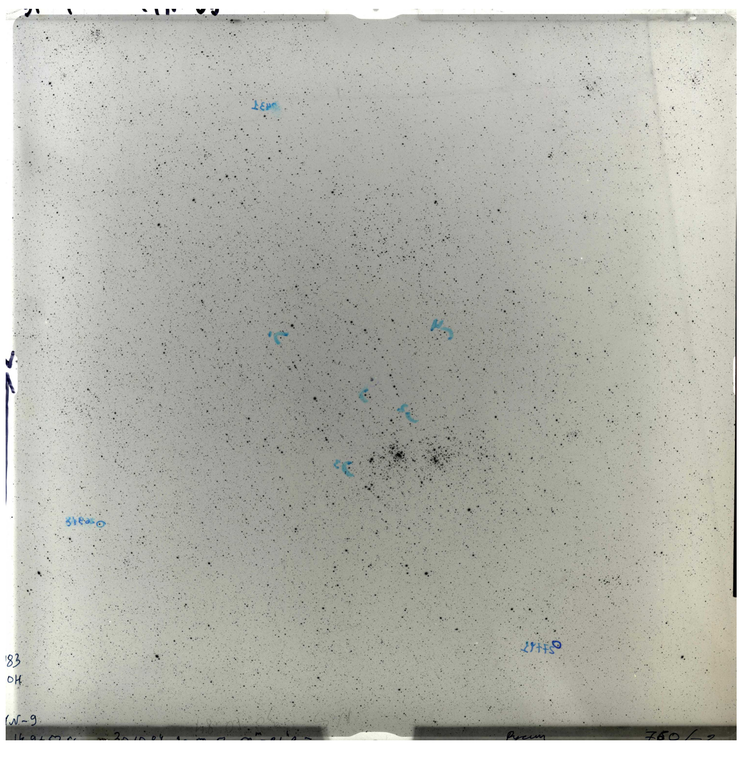

Fig.1. *The typical scan: plate number ZVN040_000983 with a star field and h and hi Persei open cluster near the center. Photographic plate produced by astrograph.*

Parameters of the electronic library

The scan's files are kept on DVD, SATA and USB disks.

File Types:

1. The plates **catalogue** in the WFPDB format (in a computer readable form, ASCII);
2. **Work scan** of the plates (FITS, 1600 dpi, 700 Mb each scan);
3. **Preview** images (for Internet – JPEG, 300 dpi, 3 Mb and for Press – TIFF, 1200 dpi, 600 Mb);
4. Observational **log** page scans (JPEG, 300 dpi and TIFF, 600 dpi, color)

Contacts: S. Vereshchagin: svv@inasan.ru N. Chupina: chupina@inasan.ru

Zvenigorod Astronomical Observatory is a department of Institute of Astronomy of the Russian Academy of Sciences.
Observatory longitude: 36° 45.5' 10, latitude: 55° 41.9'11, altitude: 198 m.

Telescopes:

Carl Zeiss **Astrograph** : D=40 cm, Focus=206 cm.
Detector is photographic plate (**Fig.1**) 30 x 30 cm, 8 x 8 degree, scale 103"/mm. It is established in Zvenigorod in 1972.

AFU – 75 Camera: D = 21.2 cm, F = 73.6 cm,
Detector is film 14 x 20 cm, 10 x 15 degree, scale 208"/mm.

VAU Camera: D in. = 50 cm, D prim.mirr. = 107 cm, F = 70 cm,
Detector is film 6 x 36 cm, 5 x 30 degree. (VAU Camera Film Archive has nearby 10000 films. It is not catalogued. Scanning is not supposed.)

Modern work. At present, the positional observation of near-earth satellites is reopened to solve some fundamental and applied problems. The corresponding software is constructed.
The photometric observation of near-earth satellites using CCD detectors is starting. The location of the Zvenigorod observatory is favorable for observations of sun-synchronous satellites,
http://www.inasan.ru/eng/zvenigorod/tasks.html
The archive materials also are used for the modern main Observatory goals (observation of asteroids, space debris and national education programs).

Service group: Sergei V. Vereshchagin, Natalia V. Chupina, Valentina I. Panferova, Valeri P. Osipenko. Service and support in working order the digital archives, film and glass plate libraries; a scanning and cataloging the plate images for some plates in needed cases. Data reduction to a standard format and it inclusion into WFPDB continue to be in compliance with all requirements of the Data Center in Sofia (WFPDB).
Equipment: A3 EPSON Expression 1640XL professional scanner.
The project: "The service of the electronic library of the astronegatives produced on Zvenigorod Observatory" is in the plan of the **Russian Virtual Observatory (RVO).**

The online information about our work, science groups, tools, volumes and characteristic of the plate and film libraries is presented on:
1) the INASAN site http://www.inasan.ru/rus/scan/;
2) the Wide Field Plate Data Base in Bulgaria
http://wfpdb.org /search/search.cgi
(Getting data about archive and each plate, viewing of the plate images, selection plates by the parameters. In the search to use: IDobs - "ZVN", IDins - "040" for Astrograph, IDins - "021" for AFU.);
3) About the Zvenigorod Observatory Telescopes:
http://www.inasan.ru/eng/zvenigorod/instr.html

Reference for more details

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