

BAO Plate Archive digitization, creation of electronic database and its scientific usage

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BYURAKAN ASTROPHYSICAL OBSERVATORY PLATE ARCHIVE PROJECT



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BAO Plate Archive



Byurakan Astrophysical Observatory (BAO) Plate Archive is one of the largest astronomical archives in the world and is considered to be BAO main observational treasure. Taking into account the hard work of Armenian astronomers and the work of BAO telescopes and other expensive equipment, as well as the results of their activities, one can say that the BAO Plate Archive is one of our national scientific values. Due to Viktor Ambartsumian's brilliant ideas and the mentioned observational work, RA Government has recognized BAO as National value.

Today BAO archive holds 37,500 astronomical plates, films or other carriers of observational data. However, previous observational and informational registration methods currently do not make it available to wide range of scientists, and especially its usage for solution of new research problems.

The digitization of astronomical plates and films pursues not only the maintenance task, but also it will serve as a source for new scientific research and discoveries, if only the digitized material runs according to modern standards and, due to its accessibility, it will become an active archive.

The project is aimed at compilation, accounting, digitization of BAO observational archive photographic plates and films, as well as their incorporation in databases with modern standards and methods, providing access for all observational material and development of new scientific programs based on this material.



Armenian Plate Archive and
Digitization Projects

BAO telescopes & observational material

Telescope name	Size (cm)	Years	Observ. methods	Plates
5" double-astrograph	13	1947-1950	photometry	3000
6"	15	1947-1950	photometry	3000
8" Schmidt	20/20/31	1949-1968	photometry	4500
20" Cassegrain	51/800	1952-1991	electrophotometry	
10" tel.-spectrograph	25	1953-	spectra	
nebular spectrograph		1954-	spectra	
16" Cassegrain	41/400	1955-1991	electropolarimetry	
21" Schmidt	53/53/183	1955-1991	photometry	12000
40" Schmidt (AZT-10)	102/132/213	1960-1991	photom., spectra	7500
ZTA-2.6m	264/1016	1975-1991	photom., spectra	7000
All telescopes		1947-1991		37000

Main observational projects

21" (0.5m) Schmidt telescope:

Polarization of cometary nebula NGC 2261

Nuclei of nearby Sa and Sb galaxies

Nuclei of nearby Sc galaxies

Search for flare stars in Pleiades

Search for flare stars in Orion

Search for flare stars in NGC 7000 (Cygnus)

Search for flare stars in Praesepe

Search for flare stars in Taurus Dark Clouds

Variability of Markarian galaxies

Monitoring of extragalactic supernovae in certain areas



Main observational projects

40" (1m) Schmidt telescope:

Detailed colorimetry of bright galaxies

First Byurakan Survey (FBS, Markarian survey)

Search for flare stars in Pleiades

Search for flare stars in Orion

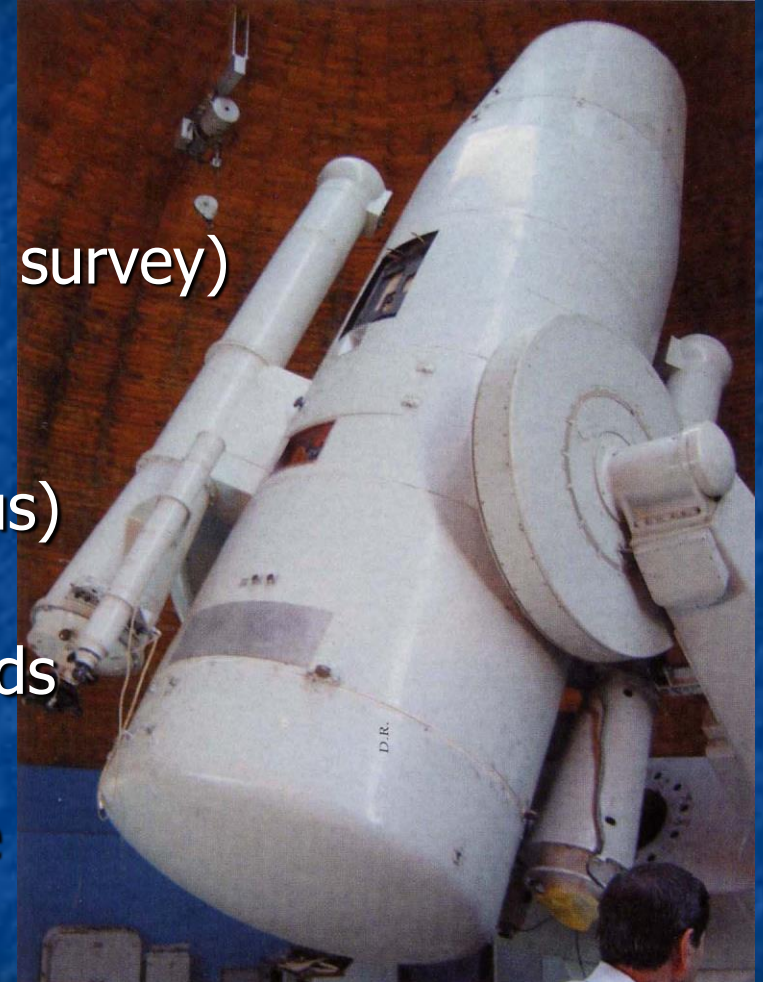
Search for flare stars in NGC 7000 (Cygnus)

Search for flare stars in Praesepe

Search for flare stars in Taurus Dark Clouds

Second Byurakan Survey (SBS)

Extension of the FBS in the Galactic Plane



Main observational projects

ZTA-2.6m telescope:

Morphological study of Markarian galaxies

Investigation of star clusters

Investigation of groups and clusters of galaxies

Spectroscopy FBS blue stellar objects

Spectroscopy FBS late-type stars

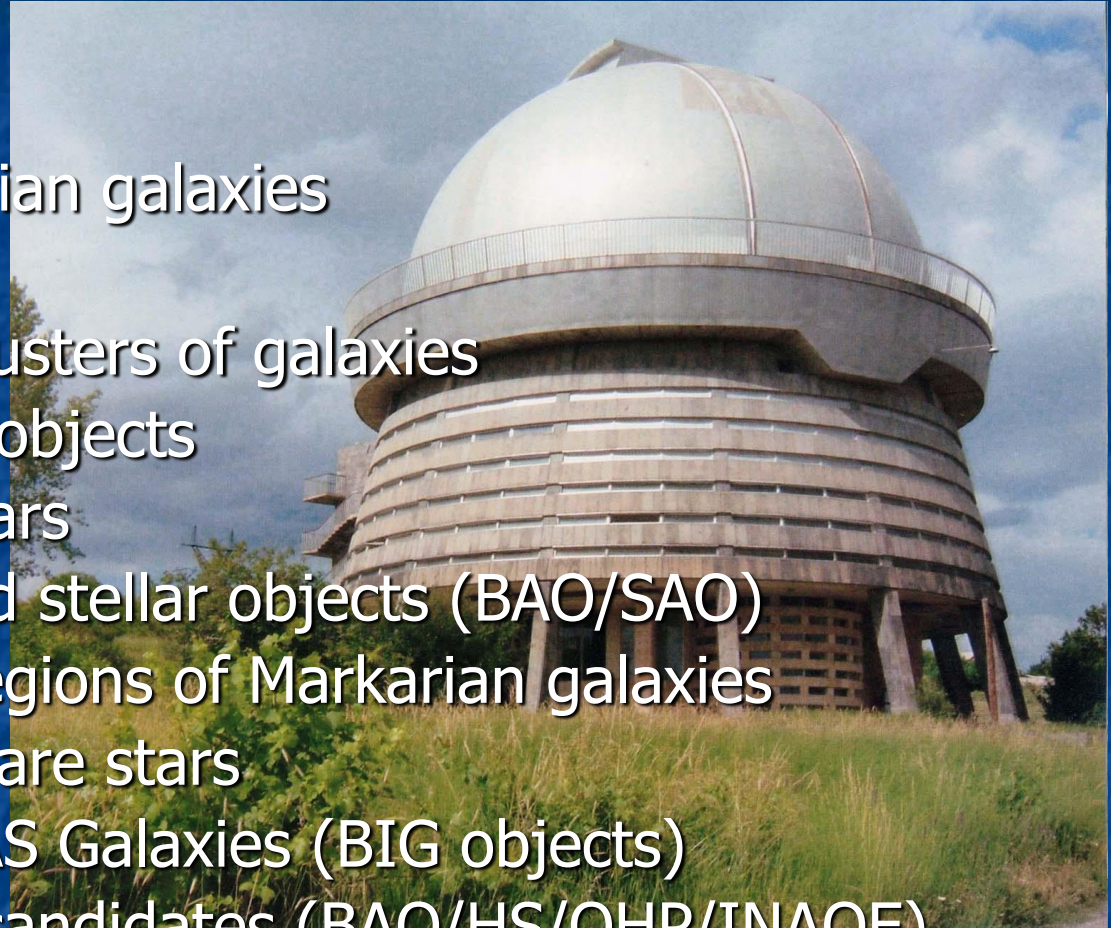
Spectroscopy SBS galaxies and stellar objects (BAO/SAO)

Direct images of the central regions of Markarian galaxies

Spectroscopy of T Tauri and flare stars

Spectroscopy of Byurakan-IRAS Galaxies (BIG objects)

Spectroscopy of ROSAT AGN candidates (BAO/HS/OHP/INAOE)



Digitized DFBS

First Byurakan Survey

Collaboration between
Byurakan Astrophys. Observ.
(BAO, Armenia), La Sapienza
Univ. di Roma (Italy), and
Cornell Univ. (Ithaca, NY, USA)

Main features:

Pixel size 15.875μ or $1.542''$
9601×9601 pixels each plate
180 MB file for each plate
 $107\text{ pix} \times 5\text{ pix}$ spectra (1700μ
length)

Astrometric solution $\sim 1''$ rms

Dispersion: 33Å/pix (22-60
from B to R)

Photometric
accuracy $\sim 0.3\text{m}$

1874 plates, $\sim 400\text{GB}$

40,000,000 spectra for
20,000,000 objects

First Byurakan Survey Database - Mozilla

File Edit View Go Bookmarks Tools Window Help

http://byurakan.phys.uniroma1.it/explore2.php?ra_in=21%3A32%3A03&dec_in=-12%3A47%3A42

Home Bookmarks

DFBS archive
Digitized First Byurakan Survey

EXPLORE GET SPECTRA CREDITS
GET IMAGE TEAM

center
Ra 21:32:03
Dec -12:47:42
get Image

Options
☒ Grid
☒ Label
☒ Position
Compare with.
[dropdown]

Image found in plate fbs1053
centered at (21:31:43.208, -12:45:22.17)

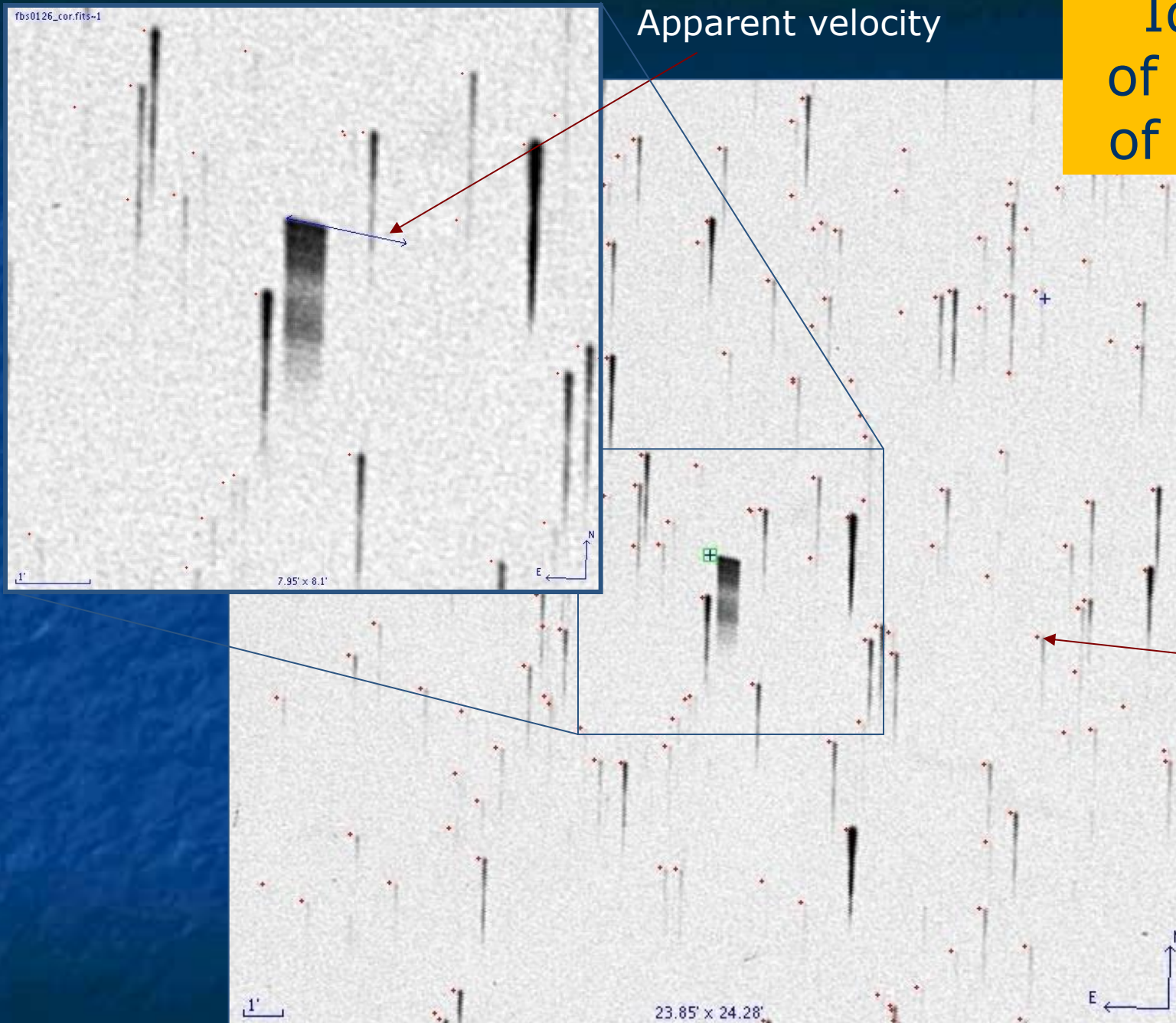
id: 213217-124720
wavelength (nm)
2.8 1.8 0.8 -0.1
837 486 401 316
10 30 50 80 120
pixels

collect view collection

(J2000) 21:32:17.373
ra:
(J2000) -12:47:20.34
dec:
R: 14.22
B: 15.24
Class: OK
Length: 101.0

Document: Done (0.967 secs)

Identification of the spectrum of 104 Klymene



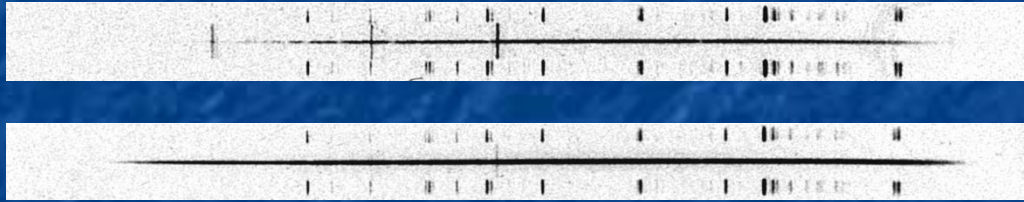
Other digitization projects:

Second Byurakan Survey (SBS)

- Authors:** *B.E.Markarian, J.A.Stepanian, L.K.Erastova, V.H.Chavushyan*
- Years:** *1978-1991*
- Instruments:** *102/132/213 cm Byurakan Schmidt, 1.5°, 3° & 4° prisms (1800 Å/mm, 900 Å/mm & 280 Å/mm at H γ)*
- Emulsions:** *Baked Kodak IIIa-J, IIIa-J+GG495, IIIa-F+RG2, IV-N*
- Spectral range:** *3400-5300 Å, 4950-5400 Å, 6300-6950 Å*
- Field:** *4.1° × 4.1° (plates: 16 × 16 cm)*
- Scale:** *96.8 "/mm*
- Region of sky:** *49° ≤ δ ≤ 61°, |b| > 30° (7^h43^m ≤ α ≤ 17^h15^m)*
- Total area:** *965 deg² (65 fields, 550 plates)*
- Limiting magn:** *18^m-20^m in V (completeness is ≤ 17.5^m)*
- Main goal:** *Extension of the FBS to fainter magnitude limits*
- Methods:** *UVX / emission lines / SED*
- Digitization:** *since 2003: 16 bit, 2400 dpi (10 μ pixel size); 180 SBS plates*

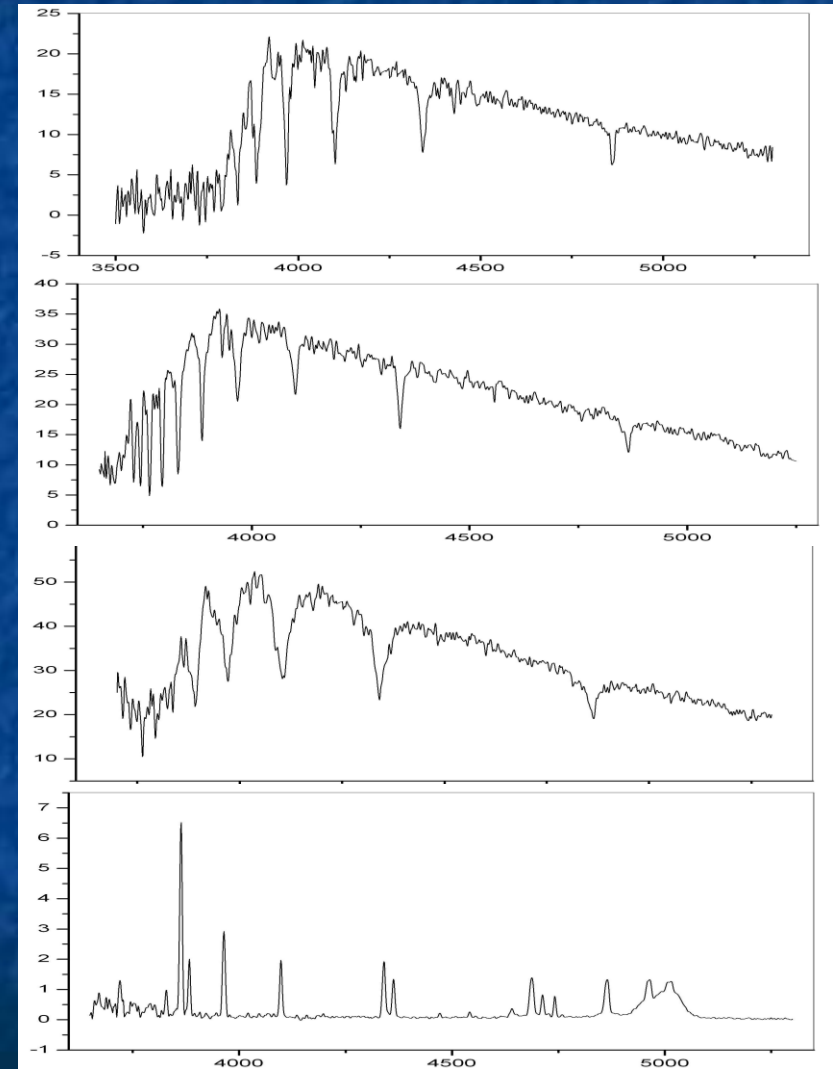
Other digitization projects:

Photographic spectra of the FBS BSOs



Scanning spectra: 1600 dpi,
16 bit, 650x21 pix sizes
~700 spectra have been
digitized (FBS blue stellar
objects & late-type stars), 101
published

A new PN (FBS 2323+421), 7
white dwarfs (DA, DAB, DZ),
78 hot subdwarfs, 9 HBB
stars have been revealed.

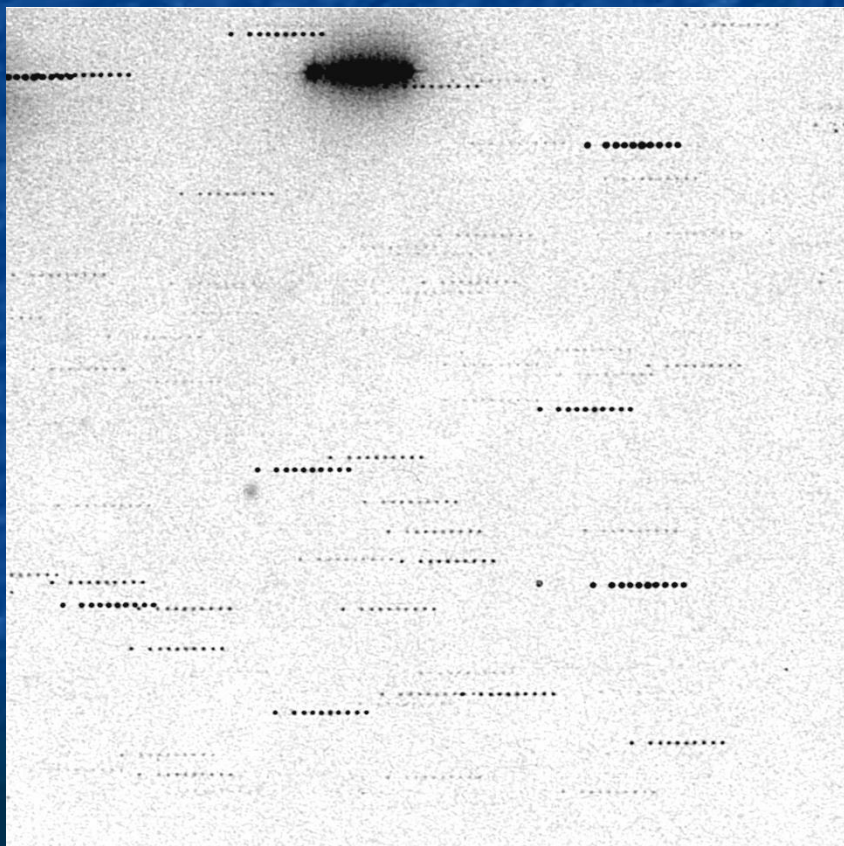


Other digitization projects:

Study of long-term variability of ON 231

Photographic chains for discovery of flare stars in stellar clusters

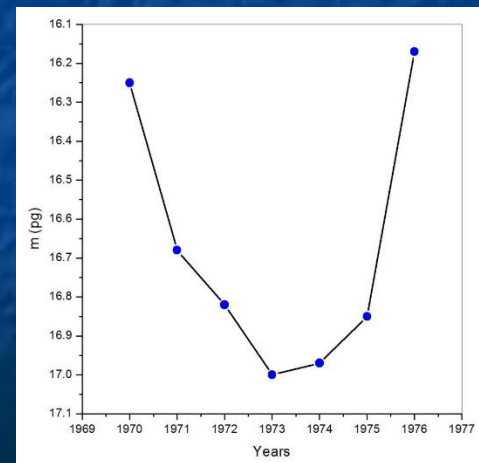
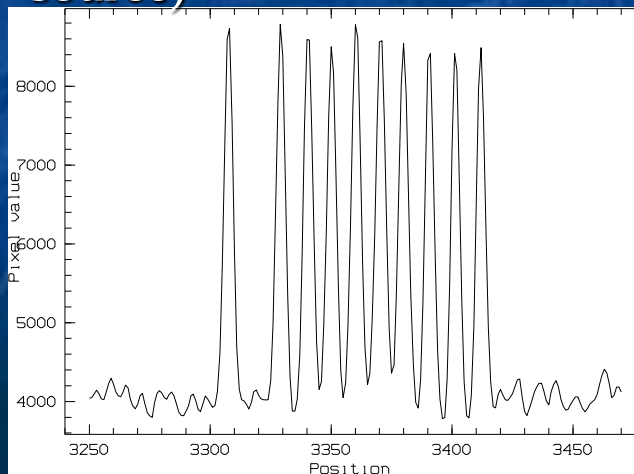
Coma: 189 plates with a total number of more than 1200 exposures in 1965-1976 with the Byurakan 21" and 40" Schmidt telescopes



Two other AGN in the field (will be studied later for possible variability):

FBQS J122424.3+243623 ($z=0.218$, a 87GB and ROSAT source)

FBQS J123014.1+251804 ($z=0.135$, a ROSAT source)



EPSON Perfection V750 Pro

Scanner Type: Flatbed color image scanner

Optical Sensor: Color Epson MatrixCCD™ line sensor

Optical Resolution: Epson Dual Lens System 4800 dpi and 6400 dpi

Hardware Resolution: 4800 x 9600 dpi, 6400 x 9600 dpi with Micro Step Drive™ technology

Maximum Resolution: 12,800 x 12,800 dpi

Effective Pixels:

40,800 x 56,160 (4800 dpi)

37,760 x 62,336 (6400dpi)

Color Bit Depth: 48-bits per pixel internal / external1

Grayscale Bit Depth: 16-bits per pixel internal / external1

Optical Density: 4 Dmax

Maximum Scan Area: 8.5" x 11.7"

Light Source: White cold cathode flourescent lamp

Scanning Speed: High-speed mode: 4800 dpi, Color 10.8 msec / line, Monochrome 10.8 msec / line

Transparency Adapter

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Transparency Size: 8" x 10"

Supported Film Size: 35 mm mounted slides (12 frames), 35 mm film strips (24 frames)

Medium format strips 2 1/4", 120 / 220, 6 x 20 cm (2-6 frames), 4" x 5" film (2 frames), 8" x 10" film area guide

Dust/Scratch Removal: Fluid mount tray and film guide for wet mount film scanning (Mounting fluid and supplies not included)



Follow-up projects

- Correction of ephemerides of known asteroids and search for new asteroids
- Discovery and study of variable stars
- Revealing high proper motion stars
- Study of variability of known blazars and discovery of new blazars
- Revealing Novae and Supernovae progenitors
- Discovery of new QSOs
- Discovery of optical sources of gamma-bursts
- Optical identifications of X-ray, IR and radio sources

THE END

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