Gaia DR2 and statistical analysis of the Catalogue of White Dwarfs

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NAS RA V. Ambartsumian Byurakan Astrophysical Observatory (BAO)

The 9th OPTICON Gaia Science Alerts Workshop

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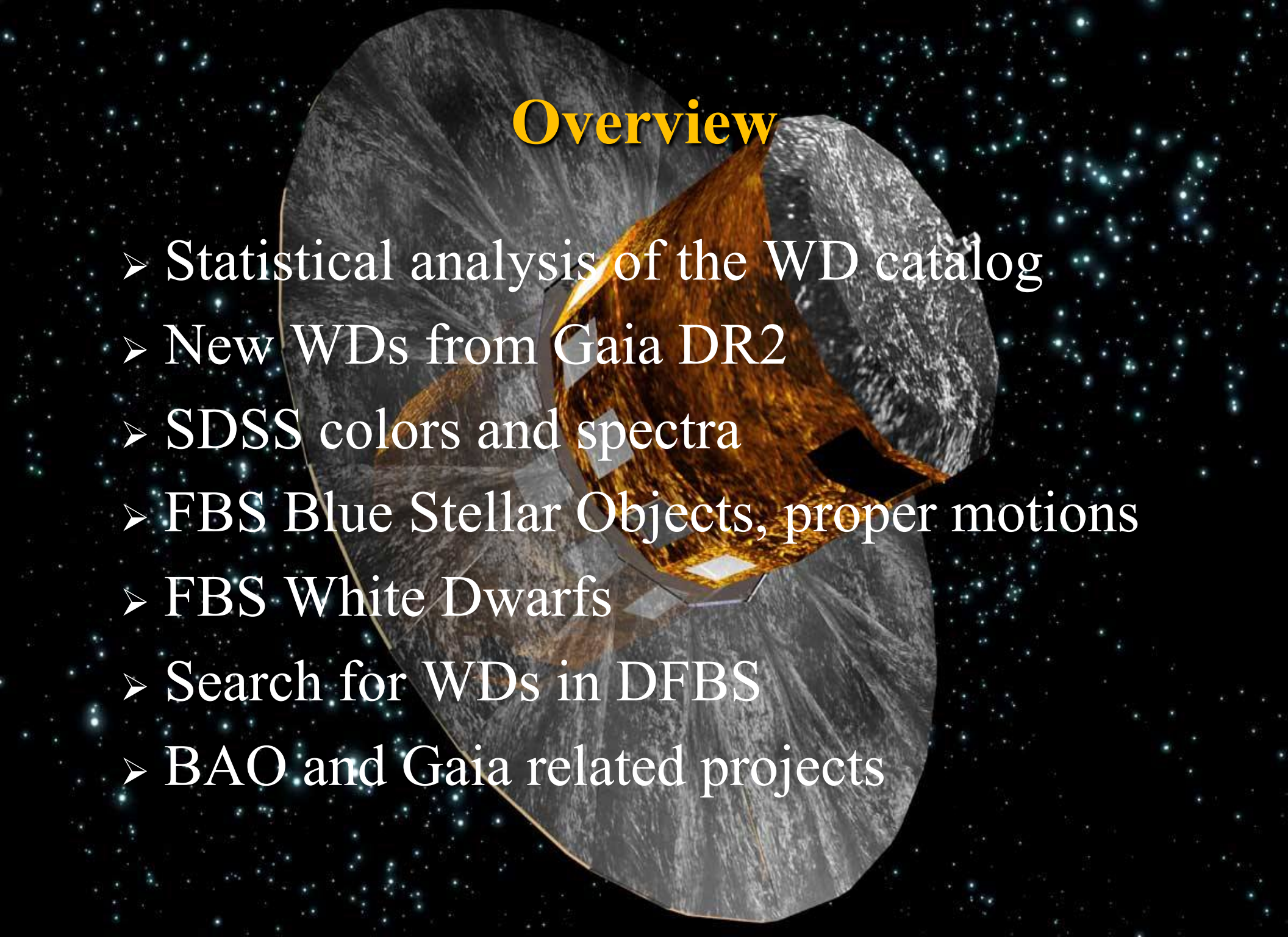


Overview

- Statistical analysis of the WD catalog
- New WDs from Gaia DR2
- SDSS colors and spectra
- FBS Blue Stellar Objects, proper motions
- FBS White Dwarfs
- Search for WDs in DFBS
- BAO and Gaia related projects

The Catalogue of White Dwarfs

The Catalogue of Spectroscopically Identified White Dwarfs (Version April 2014) by G. P. McCook and E. M. Sion

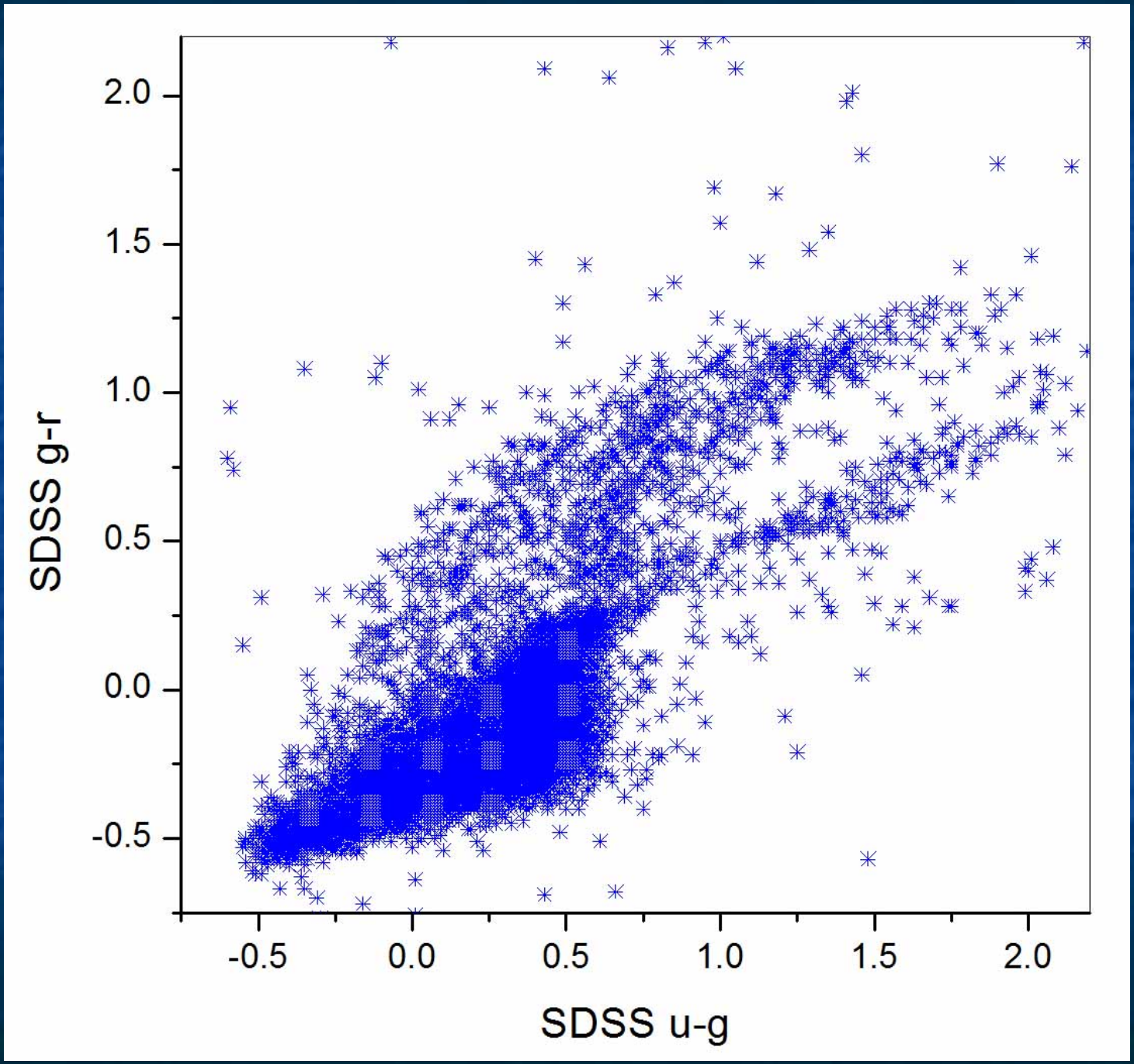
The total number of white dwarfs (WDs) in this version is **14294**:

- Having parallaxes 368, range 0.0001-0.575, average 0.046
- 10871 have total PM in the range of 0.0010-4.0800 arcsec/year;
- only 345 have adopted apparent velocities (Adp-V) in the range of 0.058-97.190 km/s, among them 328 (95.1%) have velocities less than 75 km/s;
- 1937 objects have absolute magnitudes in the range of -0.11…18.10; the distribution by AbsMag shows that we can consider as the limit for WD 7.5^{m} (brighter WDs are extremely rare;
- 1919/1937 are fainter than 7.5^{m}, 99.1%) or even 9.5^{m} (1792/1937, 92.5%). The sample is incomplete after 11.5^{m} (the graph goes down).

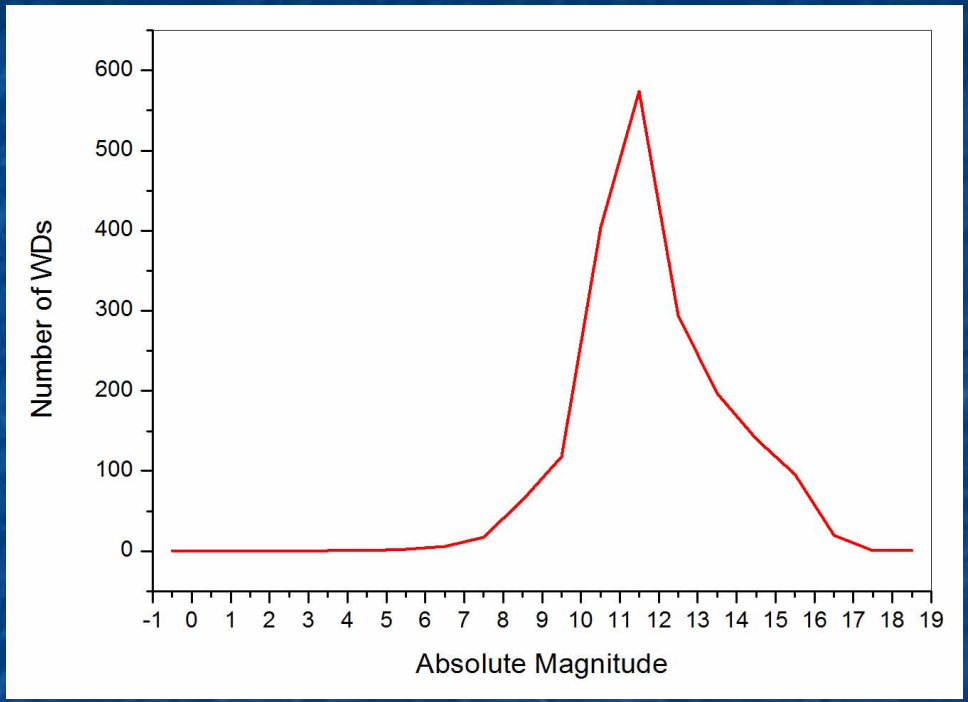
Cross-correlation with Gaia for Parallaxes, PM, Distances and T*eff*.

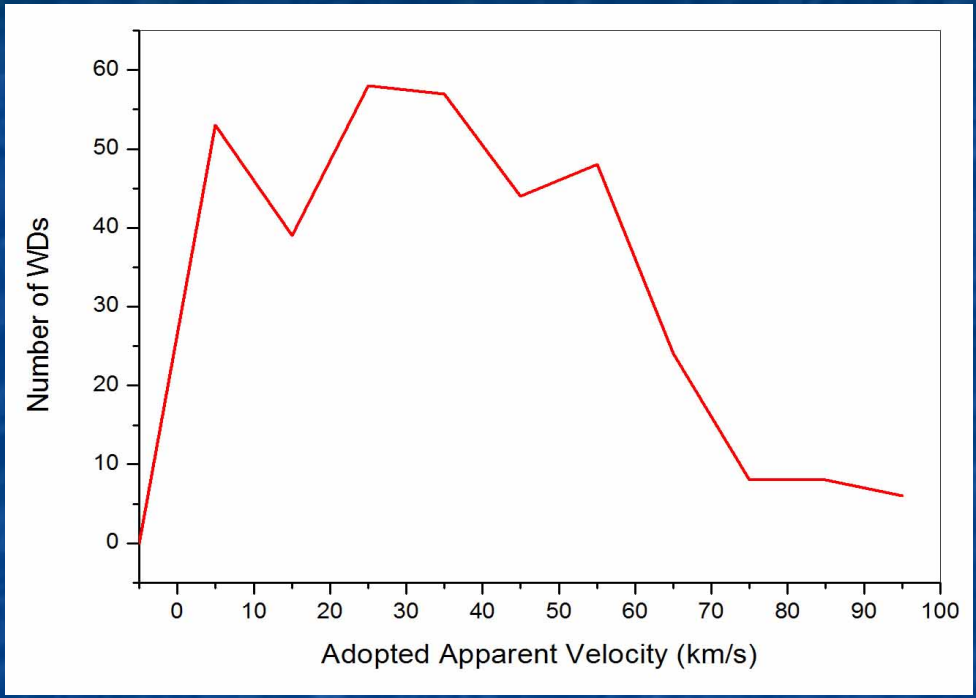
Cross-correlation with SDSS DR14 for photometry and spectra.

SDSS color-color diagram



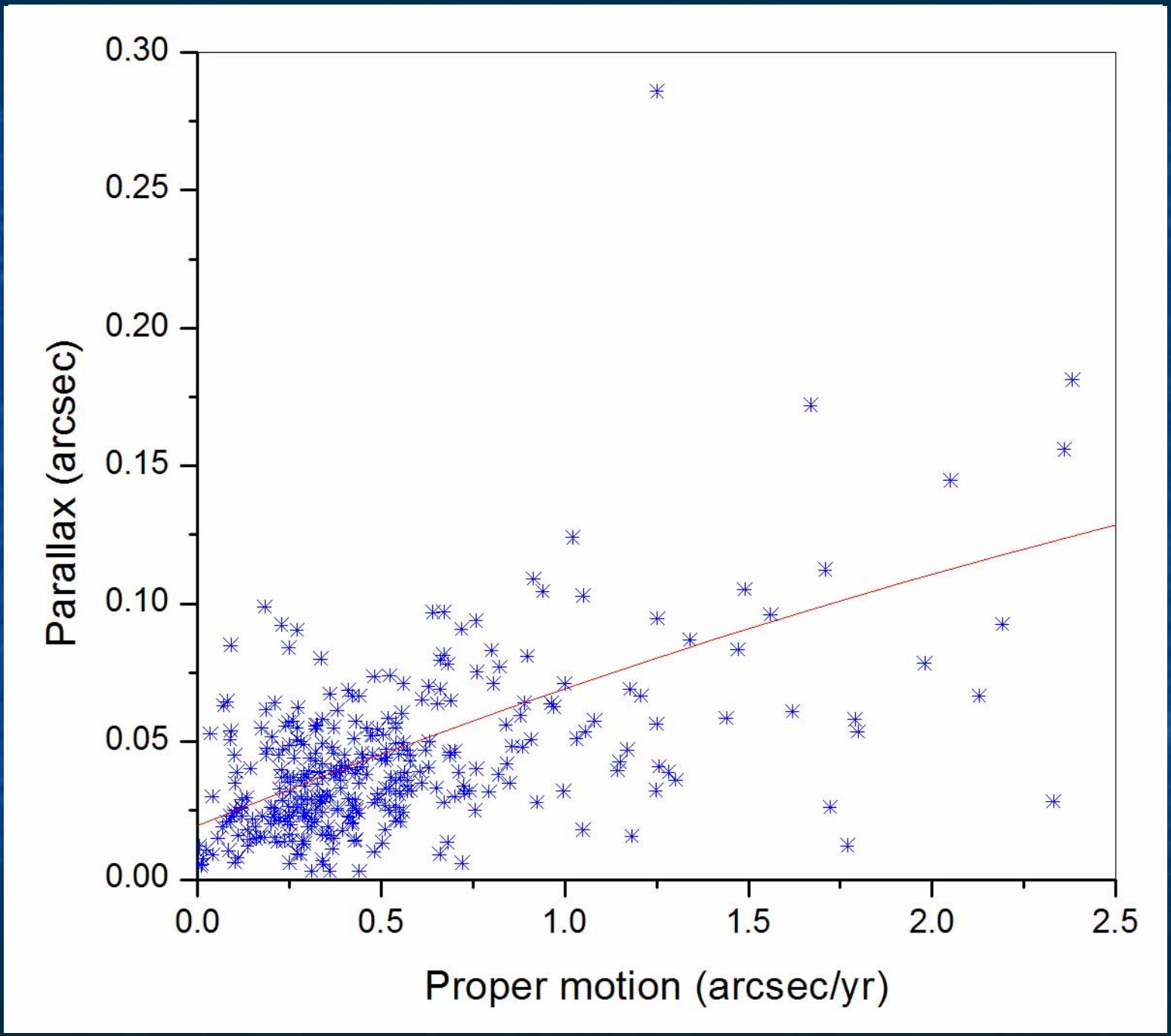
Absolute magnitudes and velocities of WDs



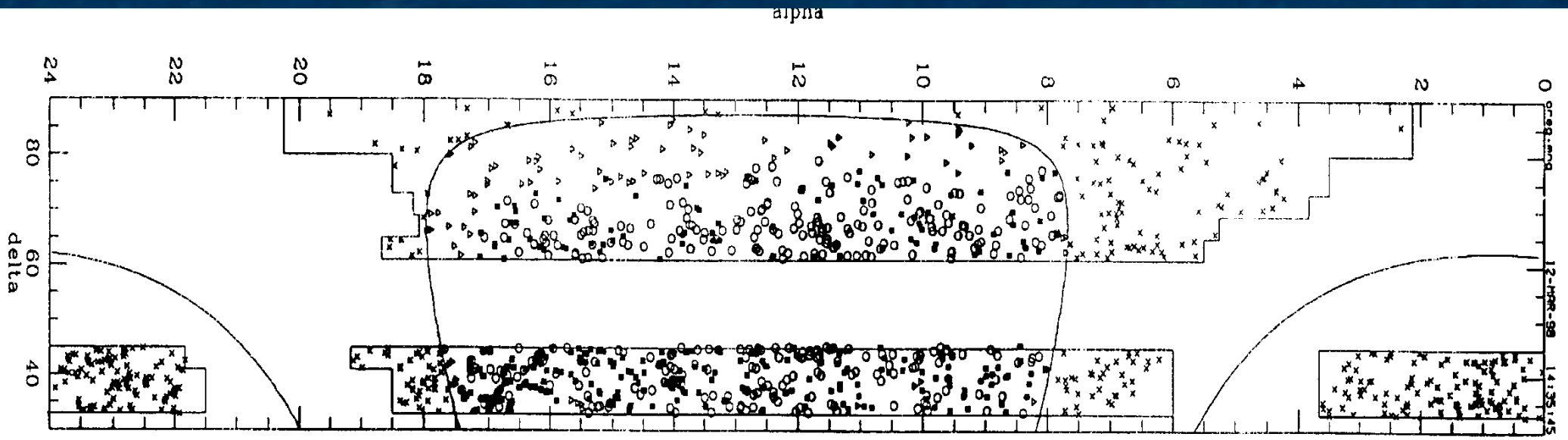


Distribution of absolute magnitudes and adopted apparent velocities for McCook & Sion Catalogue WDs allowing estimate the limit of M_{abs} for white dwarfs (two breaks at 7.5^m and 9.5^m) and the limit of the apparent velocity (the break at 75 km/s). Adopting these values we could distinguish WDs from the other stars.

Proper motions and parallaxes

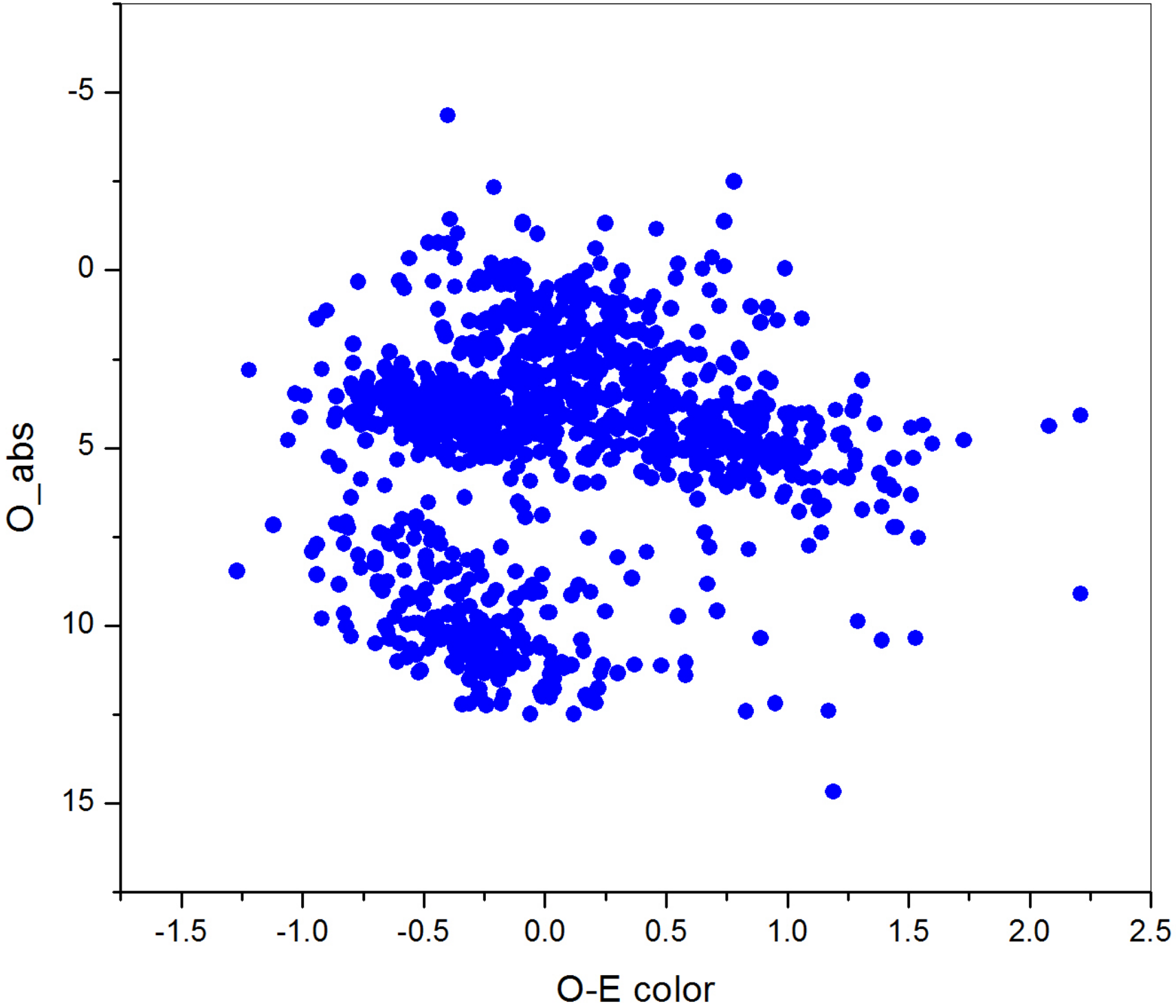


FBS Blue Stellar Objects



Years:	*1987-1996*
Region of sky:	*+33°≤ δ ≤+45°, +61°≤ δ ≤+90°, 11 zones of the FBS*
Total area:	*4,009 deg^2 (278 fields, 438 plates)*
Limiting magn:	*17^m-17.5^m (≤18.5^m)*
Revealed objects:	*O-B5, HBB, sd, WD, PNN, CV, QSO, Sy, compact gals*
Number of objs:	*1103, including 716 new BSOs*
Publication:	*11 lists (1990-1996), Catalog at CDS (Strasbourg)*
New FBS plates:	*28 plates in 19 Milky Way fields, 288 deg^2 (1988)*

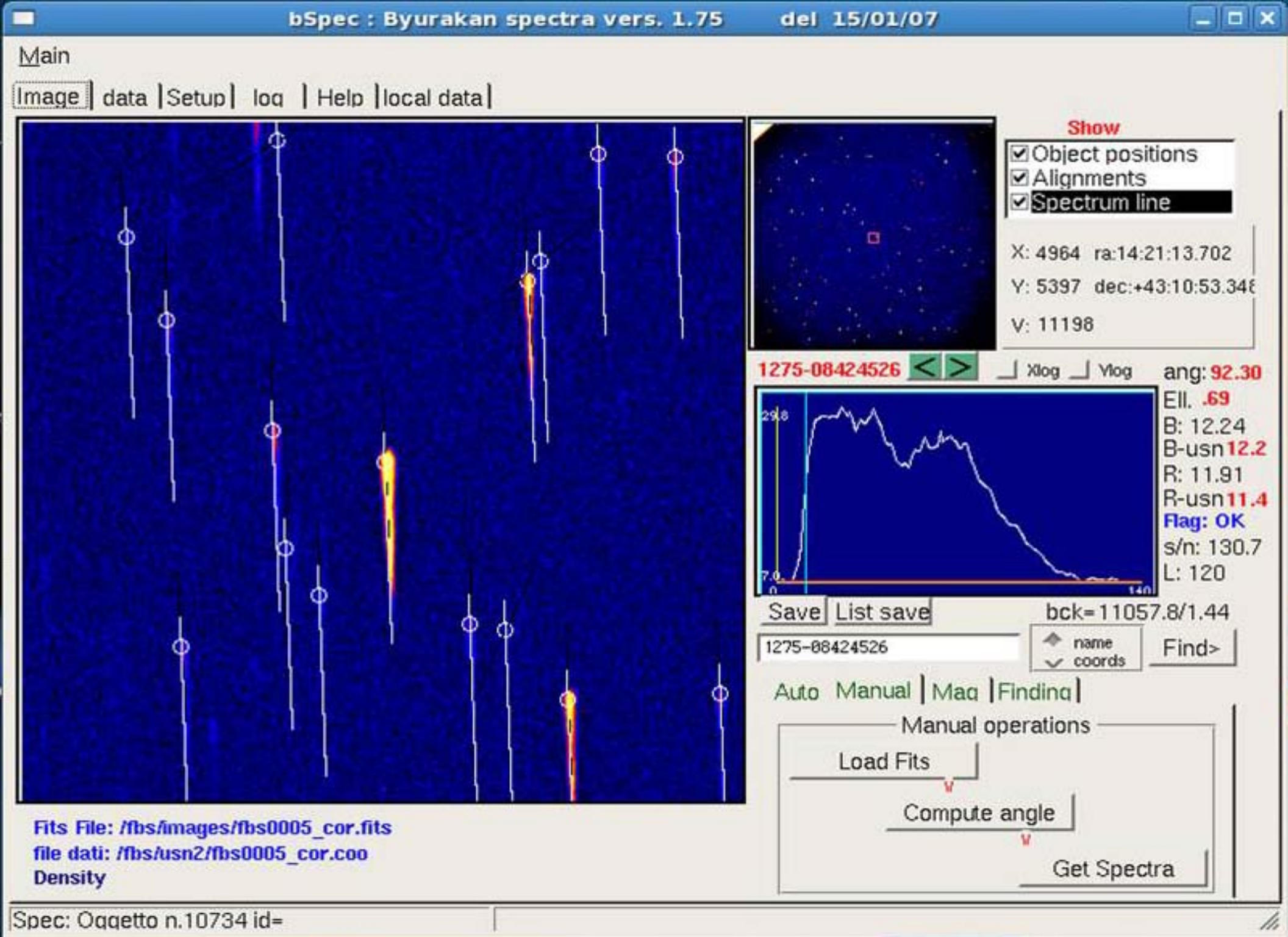
185 white dwarfs


-5
0
5
10
15
O_abs
-1.5
-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
O-E color

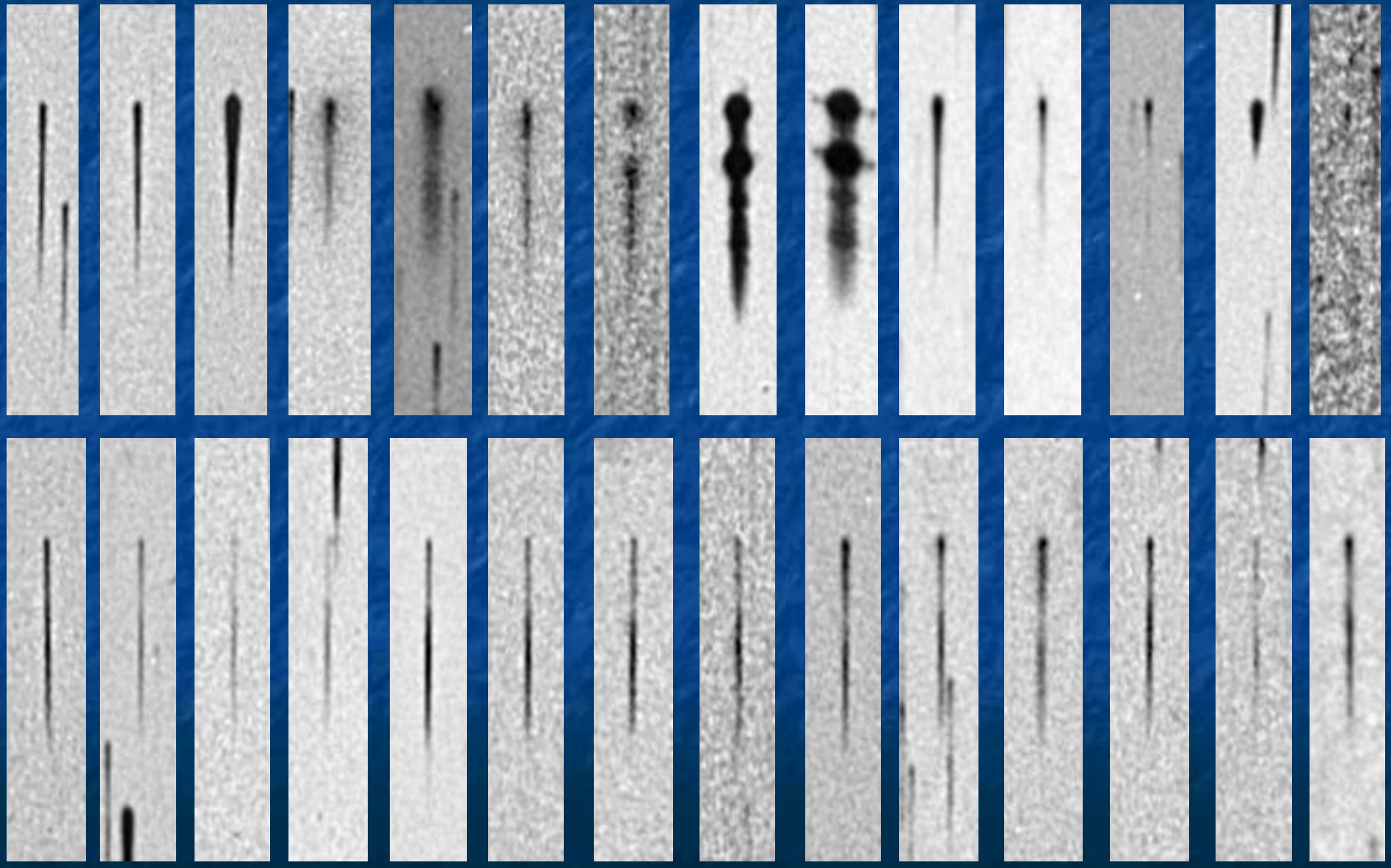
Digitized First Byurakan Survey (DFBS)

Table 4. Main scanning and resulting characteristics of the DFBS.

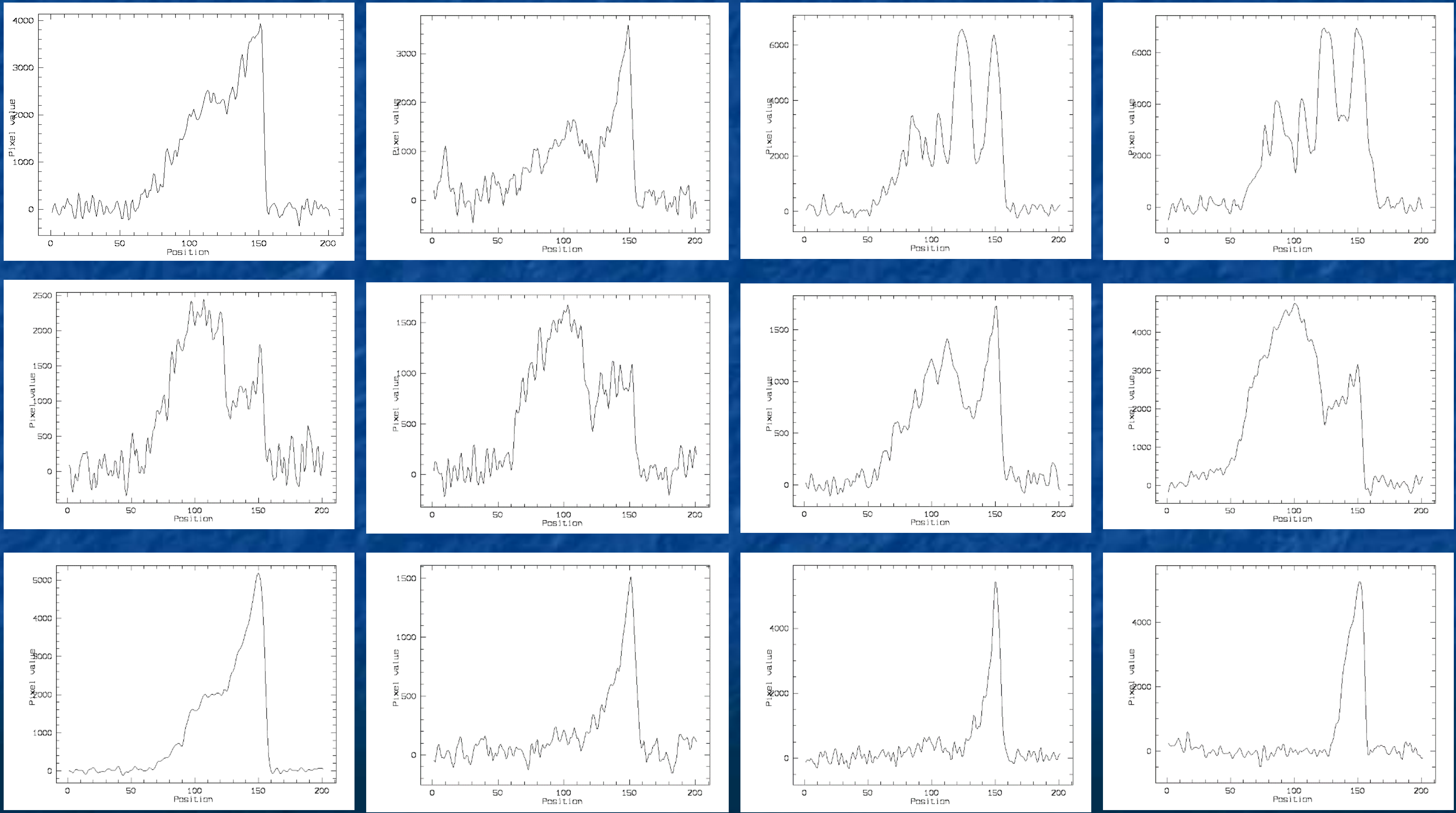
Items	Description
Teams	Byurakan Astrophys. Obs., Univ. Roma "La Sapienza", Cornell Univ.
Years	2002–2005
Instrument	Epson Expression 1680 Pro scanner
Scanning options	1600 dpi (15.875μ pix size), 16 bit, transparency mode, "scanfits"
Plate size	9601×9601 pix, 176 MB file
Spectra	107×5 pix (1700μ in length)
Dispersion	33 $\AA$/pix average (22–60 $\AA$/pix), 28.5 at Hγ
Spectral resolution	50$\AA$ (average)
Astrometric solution	1" rms accuracy
Scale	1.542"/pix
Photometry	0.3^m accuracy
Data volume	1874 plates, ~400 GB
Number of objects	~20,000,000 (~40,000,000


bSpec : Byurakan spectra vers. 1.75 del 15/01/07
Main
Image
data
Setup
log
Help
local data
Show
Object positions
Alignments
Spectrum line
X: 4964 ra:14:21:13.702
Y: 5397 dec:+43:10:53.348
V: 11198
1275-08424526
Xlog
Ylog
ang: 92.30
Ell. .69
B: 12.24
B-usn 12.2
R: 11.91
R-usn 11.4
Flag: OK
s/n: 130.7
L: 120
Save
List save
bck= 11057.8/1.44
1275-08424526
name
coords
Find>
Auto
Manual
Mag
Finding
Manual operations
Load Fits
Compute angle
Get Spectra
Fits File: /fbs/images/fbs0005_cor.fits
file dati: /fbs/usn2/fbs0005_cor.coo
Density
Spec: Oggetto n.10734 id=

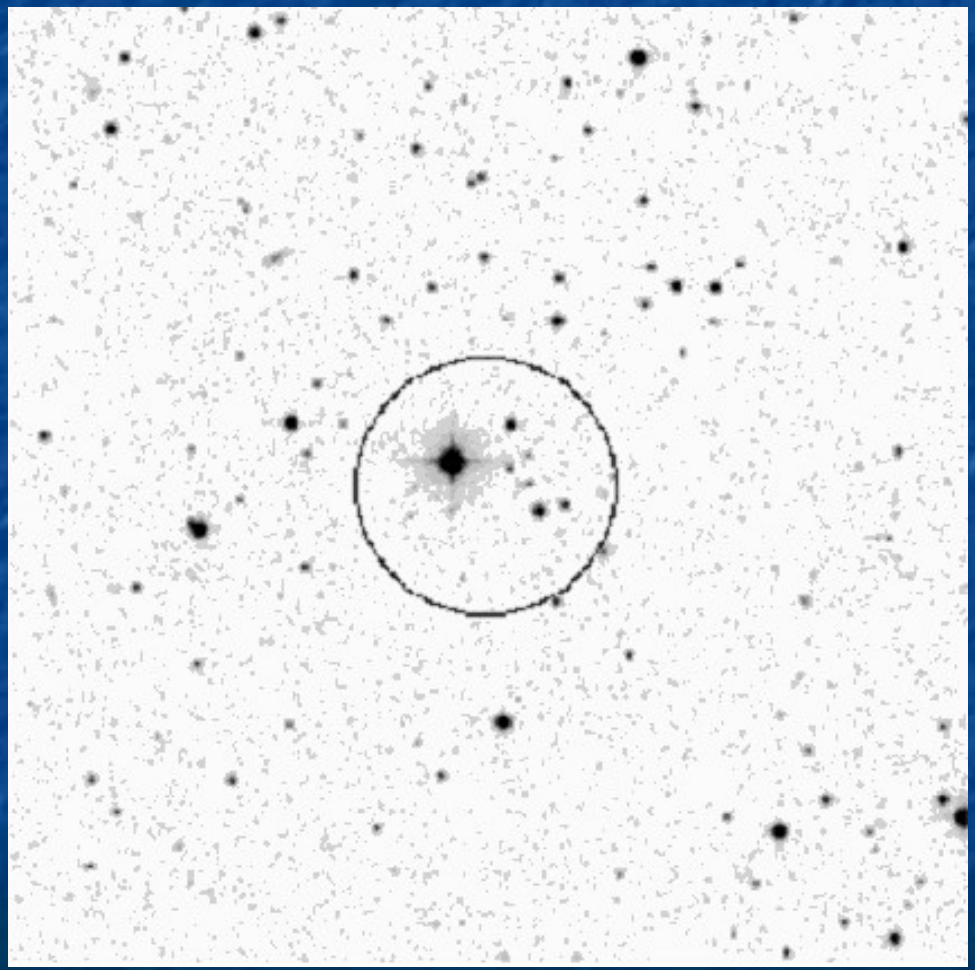
DFBS low dispersion spectra

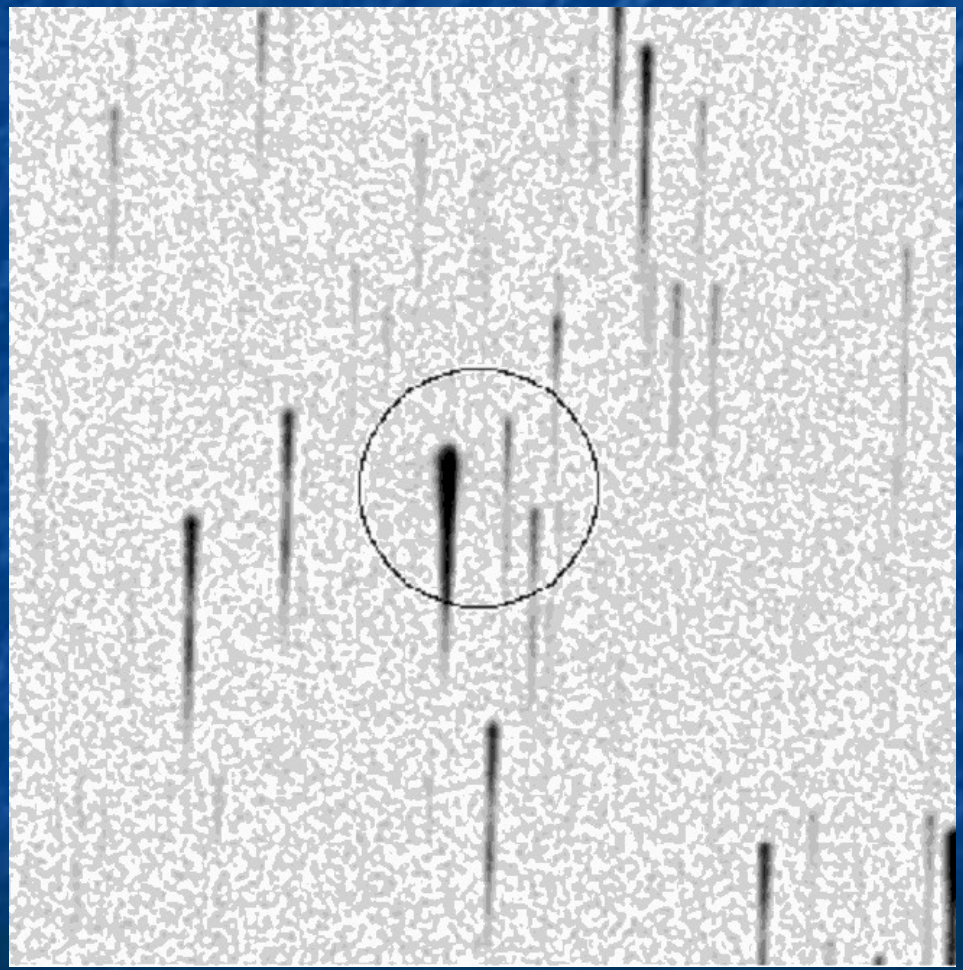


DFBS low dispersion spectra



Optical identification of X-ray, IR and radio sources





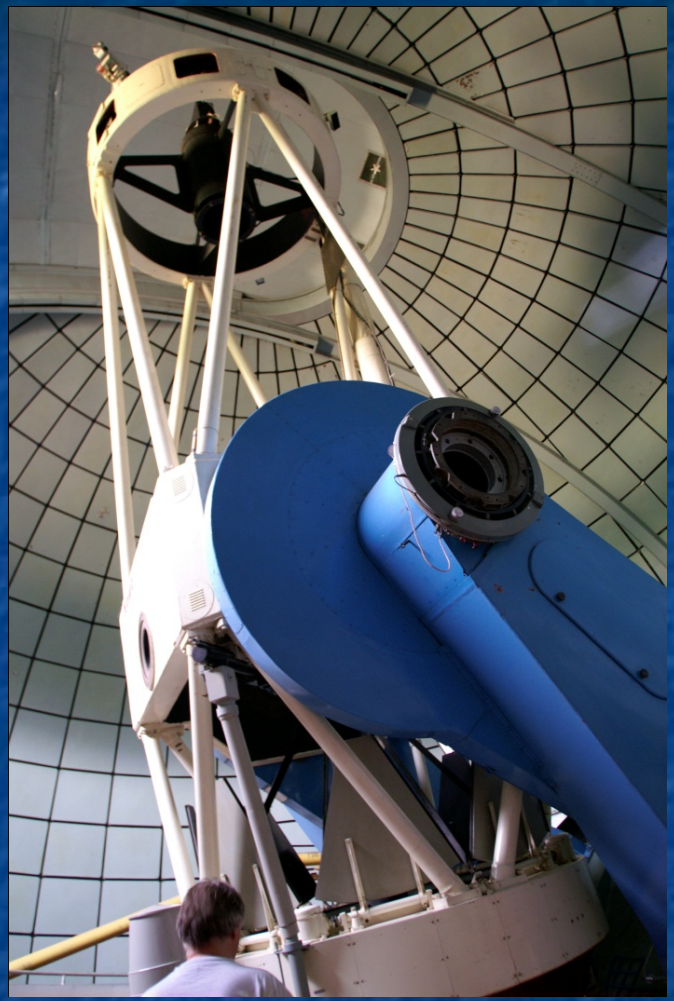
ROSAT FSC, IRAS PSC & FSC, NVSS, FIRST sources

Byurakan Astrophysical Observatory

Discovery of new objects

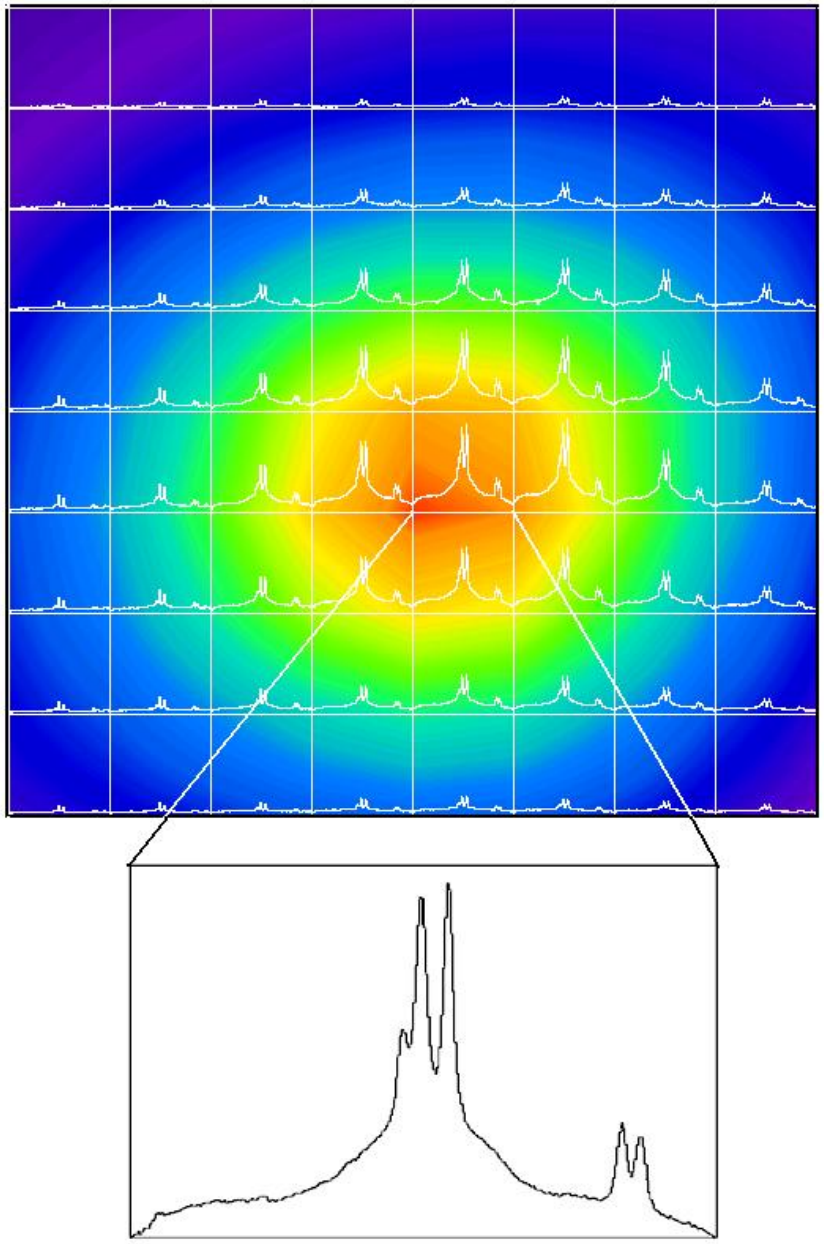
- T Tau and flare stars
- HH objects
- cometary nebulae
- carbon stars
- white dwarfs
- cataclysmic variables
- Supernovae
- UV-excess galaxies
- AGN
- Starbursts
- compact groups of compact galaxies

BAO 2.6m telescope



2.6m telescope (in operation since 1976)

Main observing equipment: *ByuFOSC* and *SCORPIO focal reducers, VAGR multi-pupil spectrograph*



Grid of spectra from each micro-pupil superposed on the restored Hα image of the central part of Mrk 744.

Spectrum from one pupil is shown below.

Current Observing Projects

2.6m telescope

Abrahamyan H. (BAO) – Spectral study of blazars, SCORPIO

Andreasyan H. (BAO) – Investigation of pre-main-sequence eruptive stars, SCORPIO

Gigoyan K. (BAO) – Spectral Study of Carbon Stars in the Halo, SCORPIO

Gyulzadyan M. (BAO) – Spectral Study of new SBS galaxies, SCORPIO

Yeghiazaryan A. (BAO) – Spectral study of galaxies with UV-excess, SCORPIO

Karapetian E. (YSU) – Galaxies with UV excess, SCORPIO

Hakopian S. (BAO) – Galaxies with star-forming activity, SCORPIO

Magakian T. (BAO) – Spectral study of active young stellar objects, SCORPIO

Magakian T. (BAO) – Study of PMS stars and their outflows, SCORPIO

Melikian N. (BAO) – Hα emission stars, SCORPIO

Melikian N. (BAO) – Speckle interferometry of binary stars, EMCCD

Movsessian T. (BAO) – 2D spectroscopy of HH- objects and jets, VAGR

Movsessian T. (BAO) – Spectral study of young stellar objects outflow, VAGR

Nikoghosyan E. (BAO) – Search of outflows in young stellar clusters, SCORPIO

Petrosyan G. (YSU) – Spectral study of M-type stars, SCORPIO

Paronyan G. (BAO), Mazaeva E. (IKI, Russia) – Gamma-ray burst follow up observations, SCORPIO

Amirkhanyan V. (SAO, Russia) – Optical identification of extended radio sources, SCORPIO

Dodonov S. (SAO, Russia) – AGN evolution, SCORPIO

1m Schmidt telescope

Movsessian T. (BAO), Dodonov S. (SAO, Russia) – Search for distant quasars by means of multiband photometry

BAO 1m Schmidt telescope

1m Schmidt telescope (in operation since 1960) *3 objective prisms*

IAU Symposium #304

Multiwavelength AGN Surveys and Studies

7-11 October 2013, Byurakan, Armenia

Dedicated to B.E. Markarian's 100th anniversary

Scientific Topics

Historical surveys
AGN from IR/submm surveys
AGN from radio/mm surveys
AGN from X-ray/gamma-ray surveys
Multiwavelength AGN surveys
Unification and other models of AGN
AGN feedback in galaxies and clusters
Binary AGN and merging SMBH
Physics between AGN and microquasars
Study of unique AGN and AGN variability
Future large projects
The phenomena of activity

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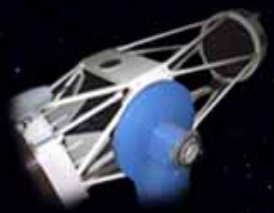

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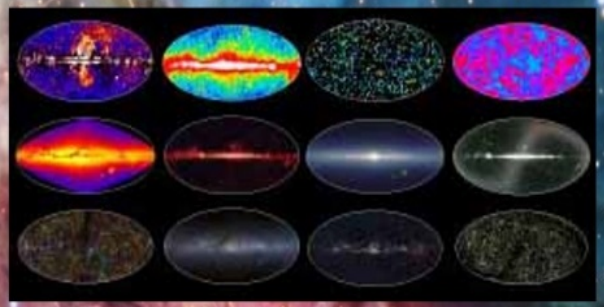
International Symposium dedicated to
50th Anniversary of Markarian Survey and
10th Anniversary of Armenian Virtual Observatory

Digitized DFBS First Byurakan Survey

ArVO Armenian Virtual Observatory

ASTRONOMICAL SURVEYS AND BIG DATA

5-8 October 2015
Byurakan, Armenia



Topics

- Historical surveys; Byurakan surveys for active galaxies (Markarian, Arakelian, Kazarian) and others
- Surveys for exoplanets
- Surveys for stars and nebulae
- Extragalactic and cosmological surveys
- Cross-identifications between surveys and discovery of new objects
- Future large-area surveys
- Digitization of astronomical data
- Astronomical catalogues, archives and databases
- Computational astrophysics and virtual observatories

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- Science State Committee of Science (SCS)
- National Academy of Sciences (NAS RA)
- Byurakan Astrophysical Observatory (BAO)
- Armenian Virtual Observatory (ArVO)

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Joachim Wambsganss (GAVO, Germany)

LOC

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32nd International School for Young Astronomers

ISYA-2010

September 12 - October 2, 2010, Byurakan, Armenia

TOPICS

Planetary Atmospheres
Extrasolar planets
Stars and nebulae
Active Galactic Nuclei, galaxy formation, extragalactic surveys
IR and radio astronomy
Astronomical databases, archives, and Virtual Observatories
Astronomical instrumentation and observing techniques
Data reduction and analysis: optical, IR, and radio

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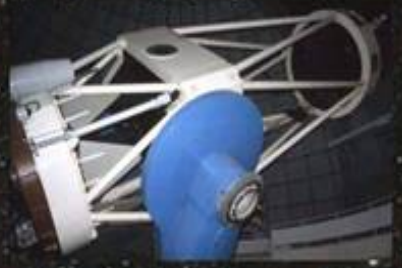

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http://www.aras.am/SS2010/ss_index.htm

Gaia related observing projects

Lukasz Wyrzykowski (Warsaw Univ. AO, Poland)

Black holes in the Milky Way and beyond from Gaia transients

Detailed photometric and spectroscopic follow-up of candidates for two particular types of transients: microlensing candidates due to black hole lenses and tidal disruption events on black holes in centres of galaxies. The target-of-opportunity and monitoring observations will lead to the discovery and studies of black hole populations at a range of masses.

Michel Dennefeld (IAP and Sorbonne Univ., France)

Classification of transients

Many all-sky surveys are presently going on, from space (Gaia) or from the ground (Atlas, ASSAS-SN, PAnStarrs, etc...) delivering several alerts per day on photometric variability. Most of these objects are unknown and need a spectral classification. We propose to do this on a few selected cases, mainly Supernovae or AGNs.

Thank you for attention!