

# The Digitized First Byurakan Survey (DFBS): a Unique Database for Proper Motion, Variability Studies, and Object Classification

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## Abstract

The Digitized First Byurakan Survey (DFBS) is the digitized version of the famous Markarian survey plates. A few thousand important objects were discovered by means of this database, including the Markarian galaxies, quasars, cataclysmic variables, white dwarfs, carbon stars, etc. Optical identifications for some 1500 IRAS sources have been carried out as well. The DFBS plates were taken in 1965-1980, thus giving additional chance to investigate the high-galactic regions of the northern sky for proper motions, variability, and roughly classify large number of objects in the given area. The astrometric and photometric accuracy of the DFBS plates were proven during the tests of the astrometric solution and photometric consistency. Thus, the DFBS spectra and the derived O and E magnitudes can be used together with the DSS1 and DSS2 for variability studies in a large area (17,000 sq. deg.). A search for proper motion stars and variable objects (both galactic and extragalactic) has been started using the DFBS.

## FBS Blue Stellar Objects: proper motions

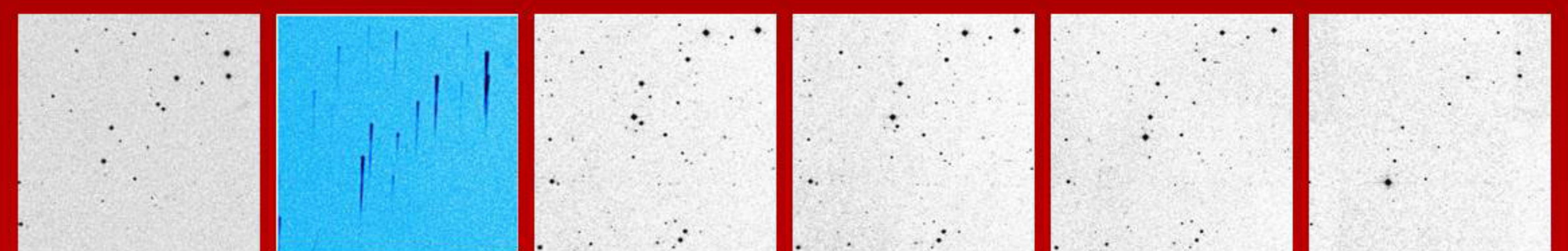
Accurate measurements based on DFBS, DSS1 and DSS2, as well as using data from USNO-B1, etc. 78 objects with PM, including 57 known WDs (McCook & Sion 2003), and 1 known PG sd. 20 new candidate WDs have been revealed.

### 20 new proper motion objects, high-probability WDs

FBS#	FBS name	m	LDS	PM as/yr	PA deg	USNO-B as/yr
449	0106+353	15.0	B2	0.239	337	0.219
20	0150+396	16.0	B2a:	0.122	132	0.000
460	0213+355	15.5	B2	0.109	205	0.100
654	0712+623	15.9	B2	0.143	173	0.205
660	0742+625	11.9	B1	0.094	8	0.004
872	0817+721	15.5	B2a	0.163	191	0.158
885	1048+715	15.7	B3a	0.140	224	0.158
688	1103+619	15.9	B3	0.116	170	0.062
811	1231+680	17.4	N2	0.110	291	0.105
711	1322+627	15.8	B2	0.078	167	0.045
1012	1344+765	16.3	B2	0.101	240	0.589
109	1403+386	17.0	B2	0.118	170	0.104
1015	1405+749	15.5	B1a	0.088	220	0.143
746	1645+649	15.9	B1a:	0.089	181	0.078
157	1743+403	17.0	B2	0.082	151	0.093
158	1749+393	15.5	B1a:	0.078	220	0.000
613	2154+329	13.7	B1	0.090	87	0.035
620	2212+335	15.3	B1	0.159	146	0.000
189	2254+373	17.0	B2a	0.148	119	0.147
203	2354+375	16.0	B1	0.080	150	0.062

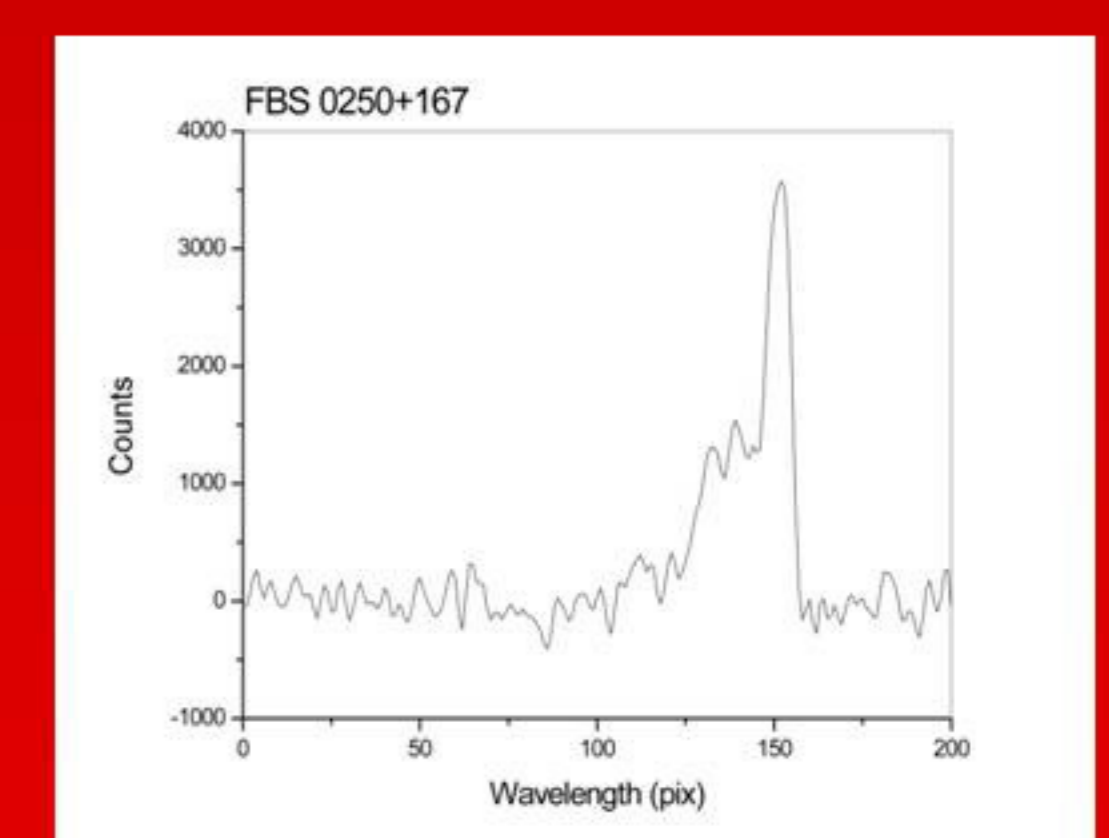
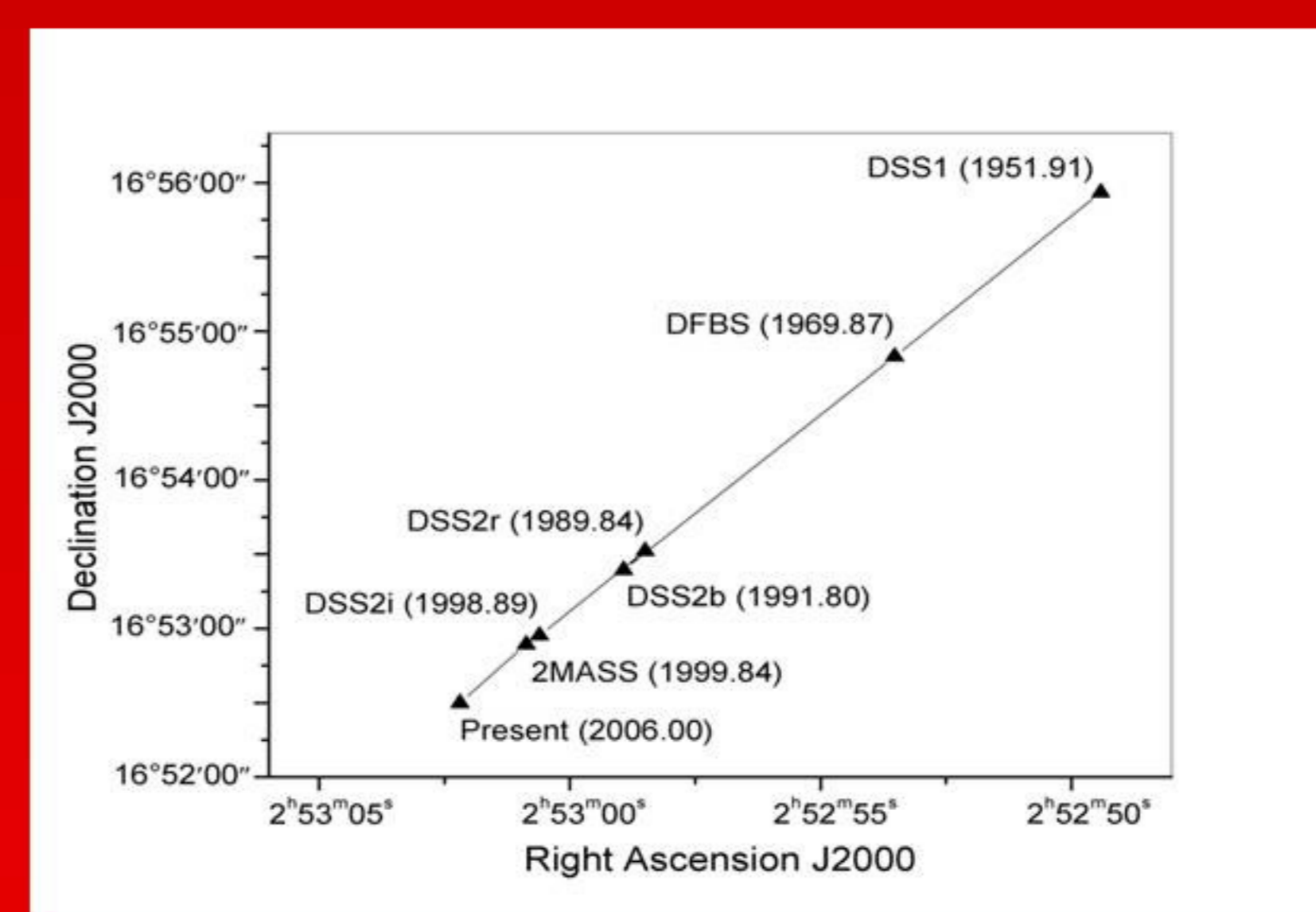
## FBS late-type objects: high proper motion and variability

### FBS 0250+167: a very high proper motion star



DSS1, DFBS, DSS2rbi, and 2MASS images of FBS 0250+167 with a PM 5.13 as/year.

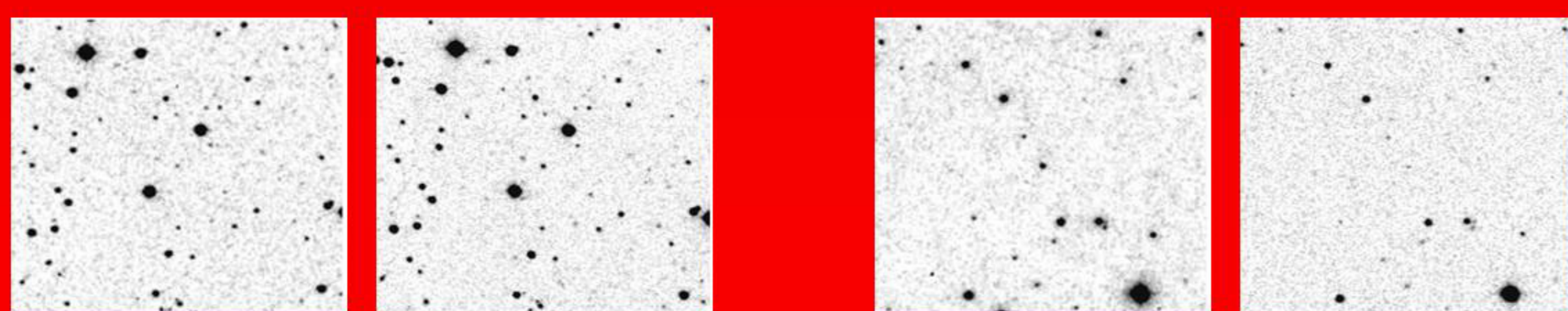
FBS 0250+167 is an M7-M8 type dwarf, with 13.5-14.0 magnitude on the DFBS, and  $M_{abs} = 17.89$ . Its distance is estimated as 2.8 pc, and the tangential velocity, 68.1 km/sec. This is the 12<sup>th</sup> known high proper motion star, and the faintest both in apparent and absolute magnitude.



DFBS 1D spectrum of the FBS 0250+167

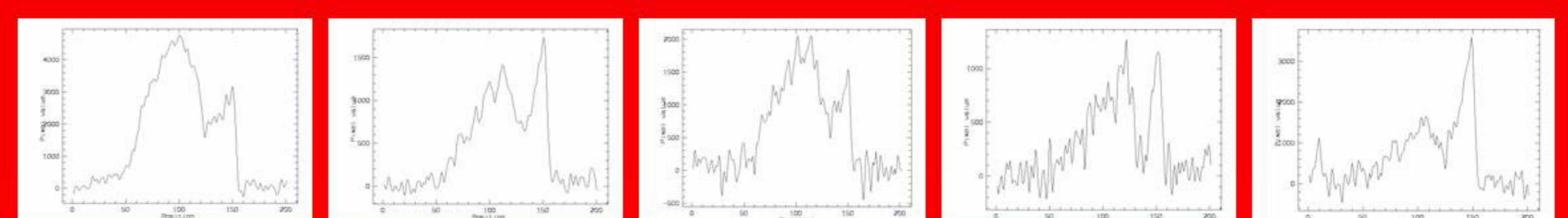
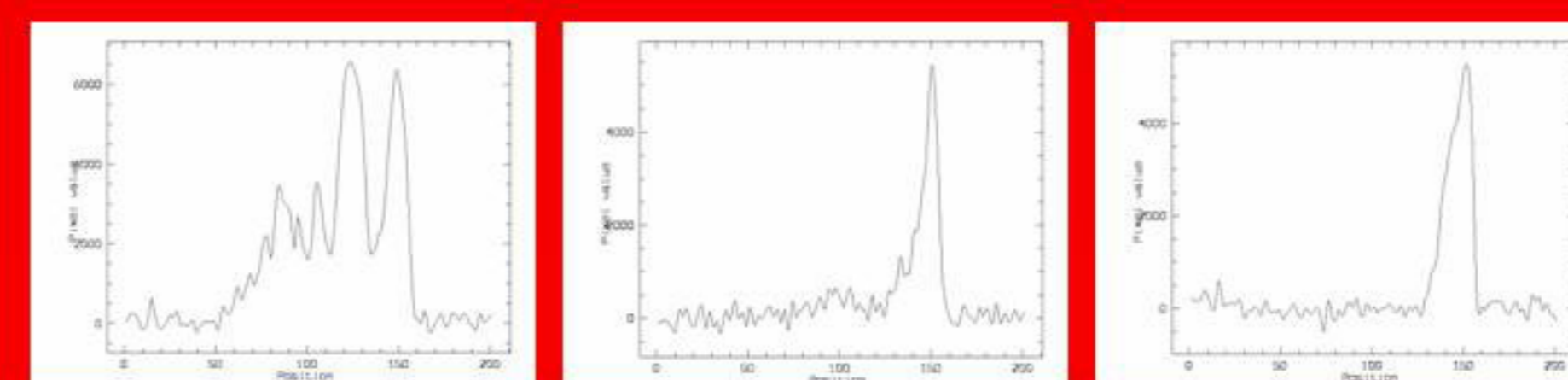
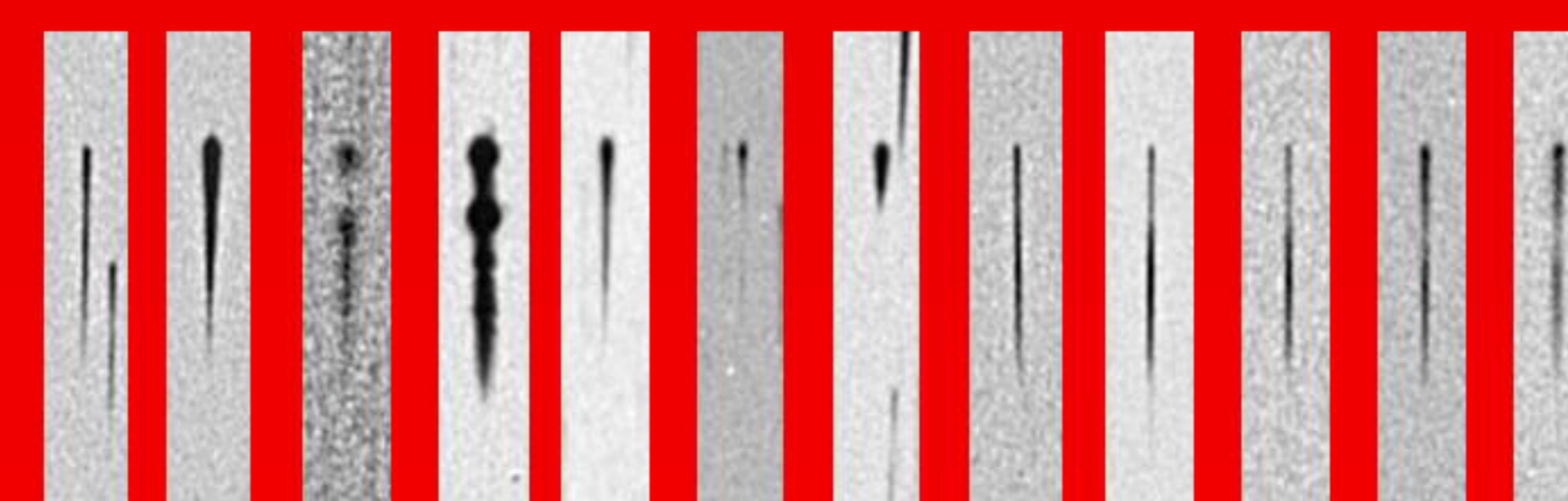
## FBS Blue Stellar Objects: variability

Brightness differences between DFBS, DSS1 and DSS2, as well as using data from MAPS, USNO-B1, etc. 16 objects with MAPS-FBS >2.5<sup>m</sup>, all candidate CVs. FBS 882 and FBS 218: extremely variable objects; FBS 882 has MAPS O=18.14 (DSS1 epoch), but in DSS2r it is near the plate limit and should be ~21<sup>m</sup>. FBS 218 has no MAPS detection, but its FBS magnitude is 15.5<sup>m</sup>, which is much brighter than DSS1 (near the plate limit, ~21<sup>m</sup>, as well as the estimated DSS2r magnitude ~18<sup>m</sup>).



FBS 218 and FBS 882: two bright objects in the DFBS, and extremely faint in DSS1 and DSS2

## Object classification by means of the DFBS



The DFBS 2D and 1D spectra of various types of objects: A and G type stars, planetary nebulae, late-type M and C stars, QSOs, WDs, and CVs. It is possible to distinguish the spectra by the comparison of red and blue parts, spectral lines and SED.

## Related papers

Mickaelian A.M., Balayan S.K., Ilovaisky S.A., Chevalier C., Véron-Cetty M.P., Véron P., *Astron. Astrophys.* 381, 894-904, 2002

Mickaelian A.M., *Astron. Astrophys.* 426, 367-377, 2004

Mickaelian A.M., *Baltic Astronomy* 13, 655-660, 2004

Mickaelian A.M., *IAU XXV General Assembly, JD 05: White Dwarfs: Cosmological and Galactic Probes*, Eds. E.M.Sion, S.Vennes & H.L.Shipman, Springer, *Astrophys. and Space Science Library*, 332, 61-72, 2005

Gigoyan K.S., Mickaelian A.M., *Astrophysics* 49, 2006, in press