

SSA Revisited

(Also SDM and SODA suggestions)

Petr Škoda

Astronomical Institute Academy of Sciences
Ondřejov
Czech Republic

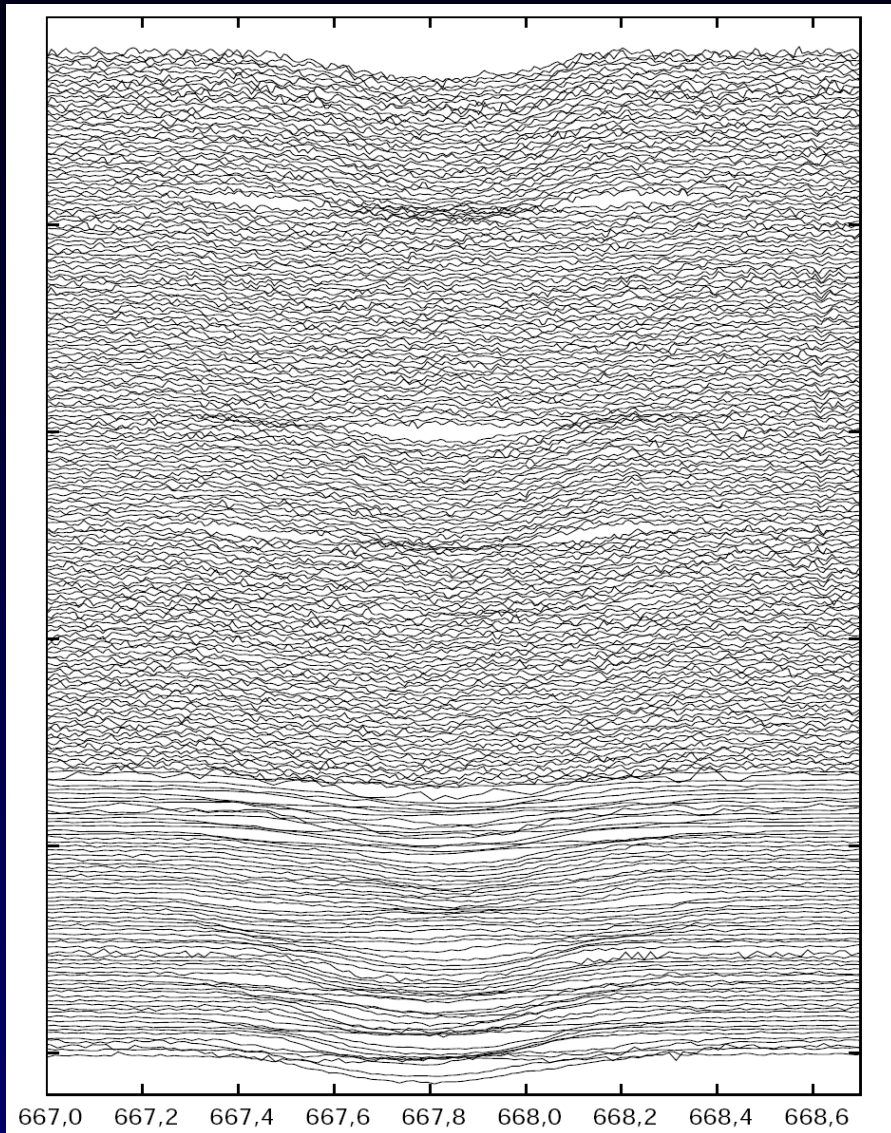
Supported by grant COST LD-15113
of the Ministry of Education, Youth and Sports
of the Czech Republic

And

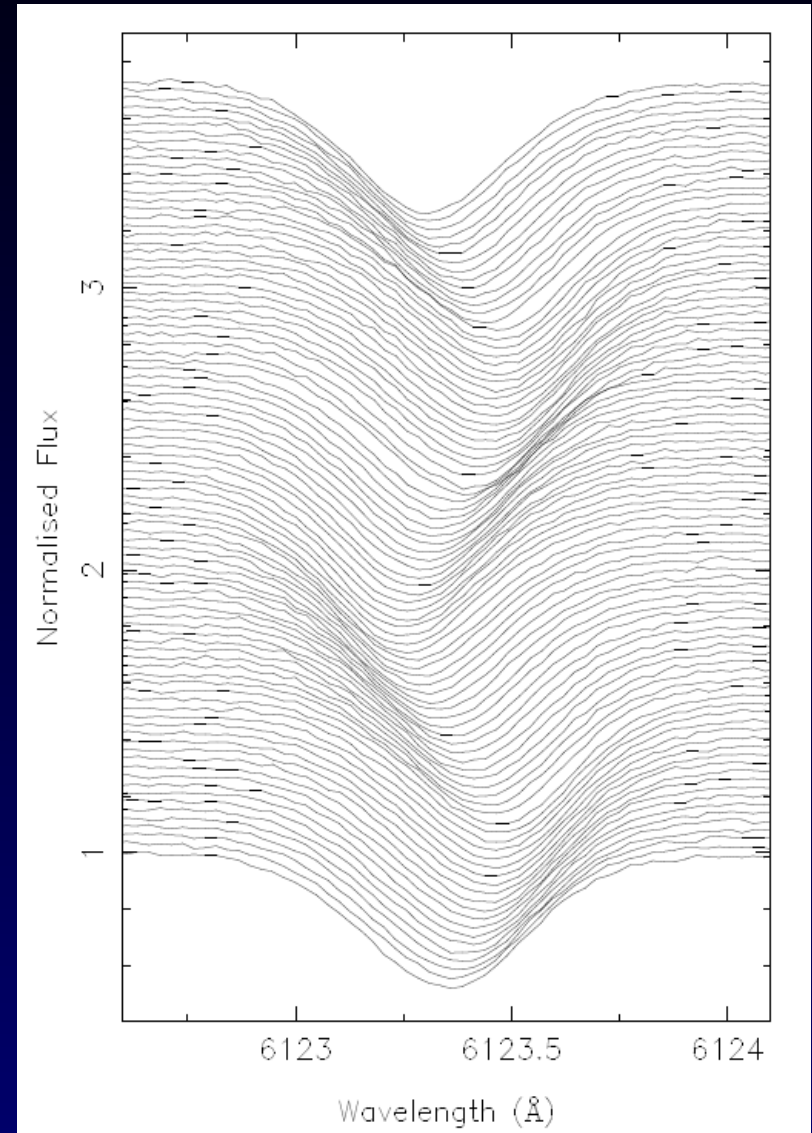
National Science Foundation of China

IVOA Interoperability meeting , DAL Session 1
Shanghai, China, 15th May 2017

Motivation - LPV

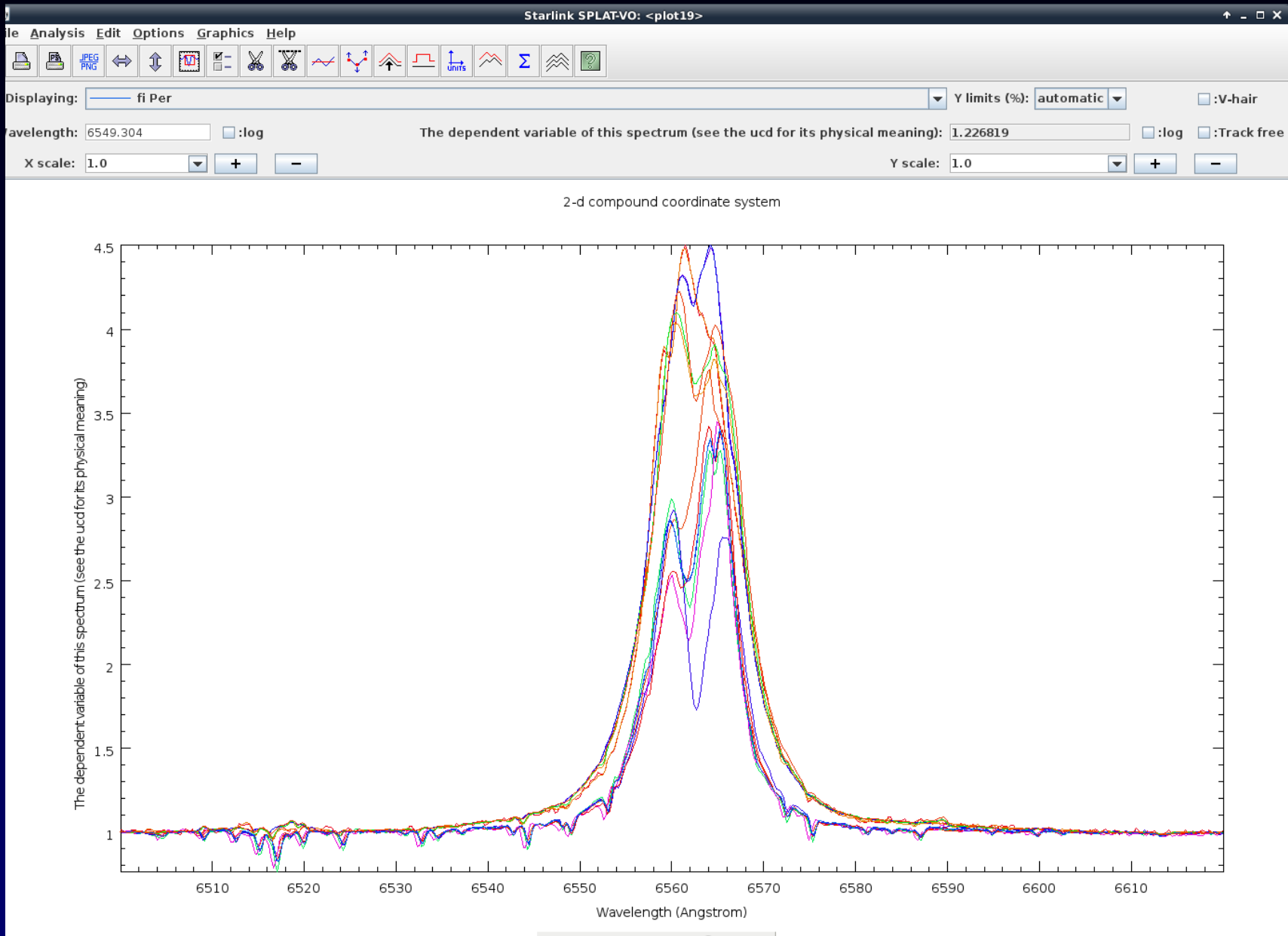


V436 Per Janík 2003



Rho Pup, Aerts et al.

Variability of Line Profile on Be star



Spectra Postprocessing Service

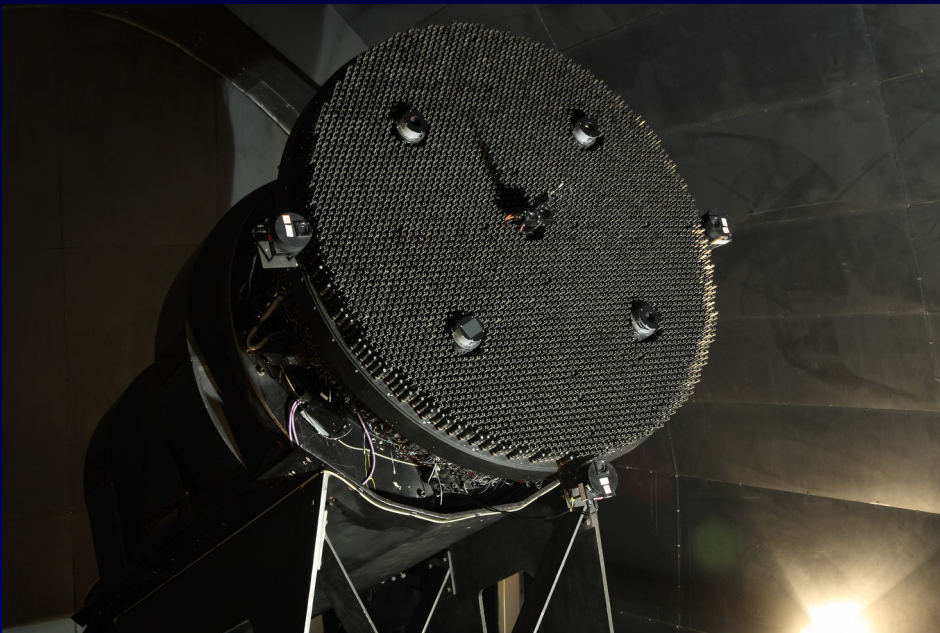
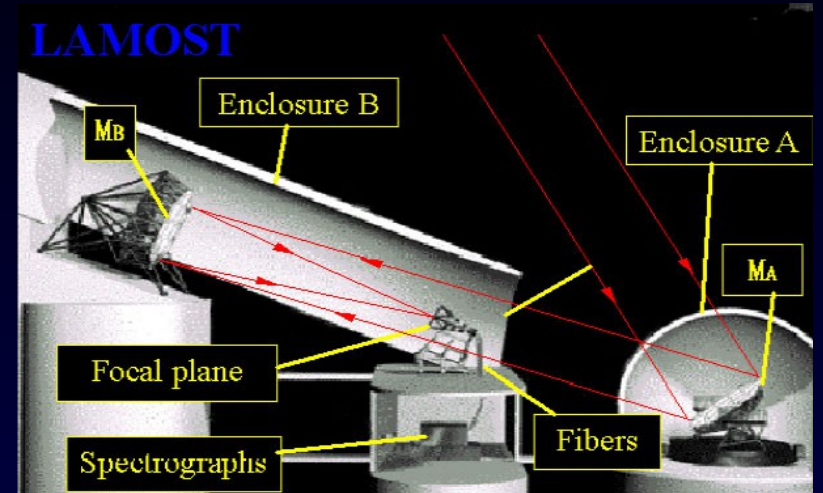
- Normalization - rectification (FT, Crosscor, RV, LPV)
- Cutouts
 - Data volume, several lines – short ranges
- Future development
 - Rebinning
 - Instrument profile convolution
 - Broadening functions (rotation, limb dark) for TSAP
 - RV/z shift
 - Combining different spectra – resolution power
Using SPECPRP

Pros and Cons of current DaCHS DataLink

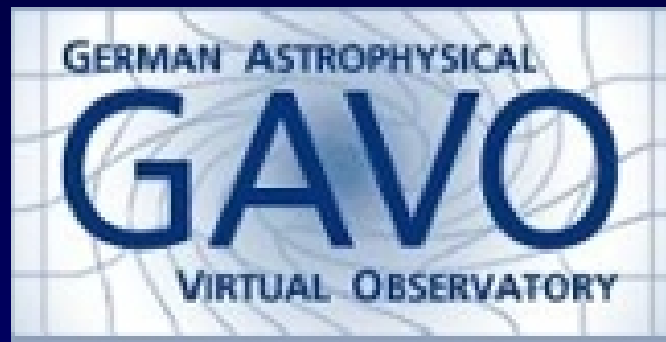
- Two step process – lost query params in accref
- Separated query and process params
- You cannot simply request only Halpha line from many services - complication in
 - Client – must remember big list in VOTable
 - Can it work for 8 mil records in 1 VOTable ?
 - How query sky – instead of all DR4 FITS files
- IMPOSSIBLY SLOW for VOICLOUD download

LAMOST (Guoshoujing)

Xinglong- China
4m mirror (30 deg meridian)
4000 fibers
10 mil spectra / 5 yr
Automatic RV-z



VO-compatible LAMOST Archive in Ondřejov

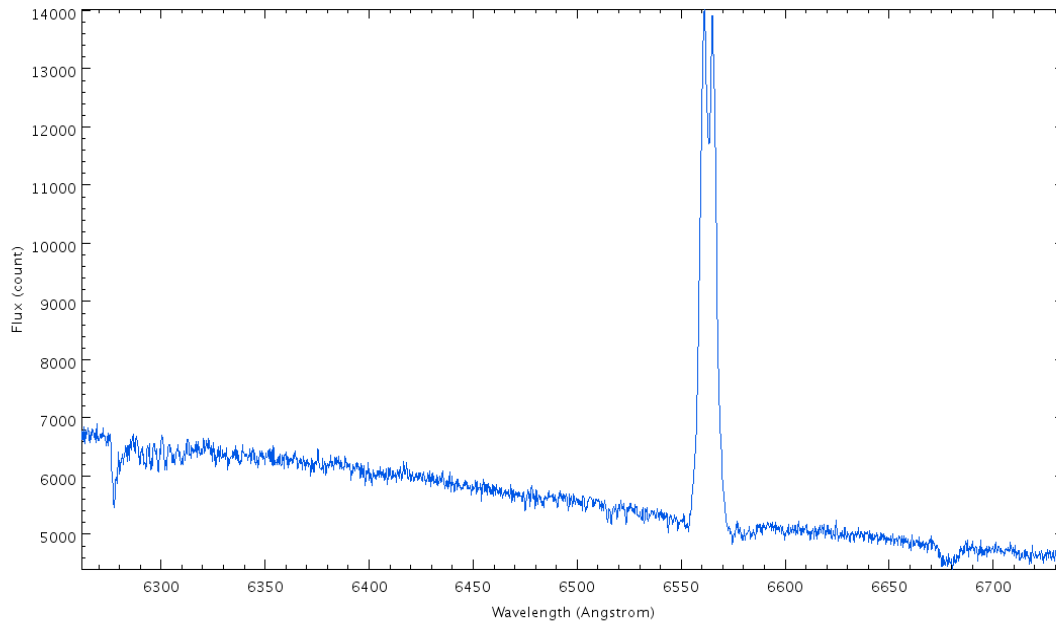
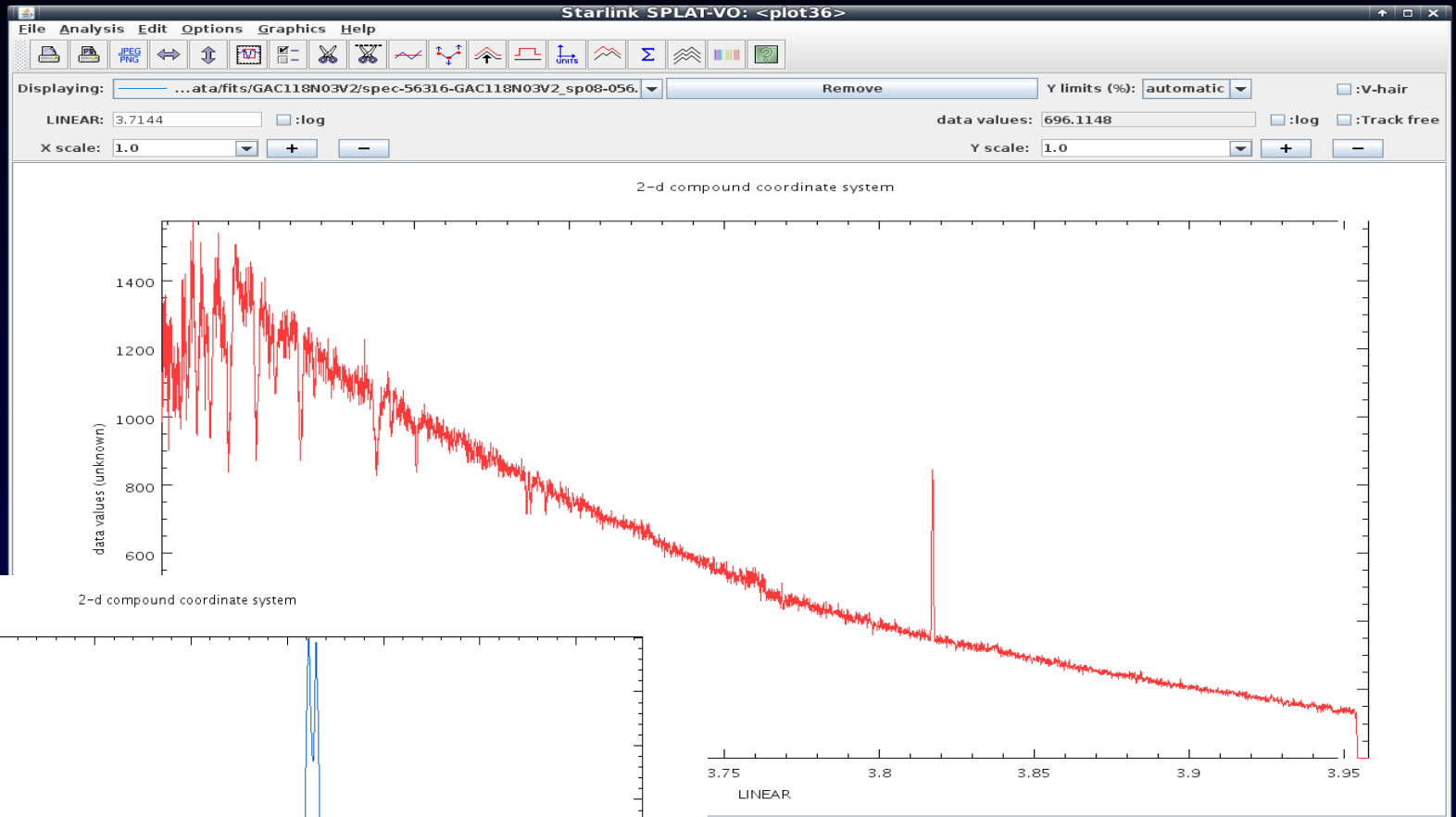


Thanks: Chenzhou Cui + all China-VO and LAMOST team
Jiří Nádvorník and Markus Demleitner

LAMOST with VO in Ondřejov

- Download all FITS in multiple subdirs
- Prepare DaCHS RD
- Tricks during import
 - Convert from log lamda to lambda
 - Normalized accessed by FITS extension
- DL + SODA
 - Cutout in lambda (need auto conversion to vot)
 - Redshift (using computed z – what with bad ?)
- Tested on SPLAT-VO + DaCHS

LAMOST emission candidate



LAMOST Query Ha region

Starlink SPLAT-VO: Query VO for Spectra

File Options Resolver Interop Help

Service selection options
Data Source
 Observed data Theoretical data

Wave Band
 Radio Millimeter Infrared
 Optical UV EUV
 X-ray Gamma-ray ALL

Tags

SSAP Servers

short name	title
HFA	HyperLeda FITS Archive...
INES ARCHIVE	INES: The IUE Newly Ext...
IUE	International Ultraviolet...
ISO SSAP	ISO ESA Archive SSAP
IUE highly processed s...	IUE highly processed s...
LAMOST.DR1.SSAP	LAMOST DR1 SPECTRUM...
M4AST	M4AST - Modeling for A...
Magic SSAP	Magic Public Spectra S...
MAGIC	MAGIC Spectrum Service
HEAVENS @ ISDC	Mining the HEAVENS wi...
NOVA Spectral Catalog	NOVA Spectral Catalog
OMC SSA	OMC: The INTEGRAL Opt...
CCD700 OND voarchive	Ondrejov CCD700 spect...
CCD700 OND vos2	Ondrejov CCD700 spect...
LAMOST DR1 OND voarc...	Ondrejov copy of LAMO...
LAMOST DR1 OND vos2	Ondrejov copy of LAMO...
LAMOST DR3 OND vos2	Ondrejov copy of LAMO...
HEROS OND voarchive	Ondrejov HEROS spectr...
HEROS OND vos2	Ondrejov HEROS spectr...
XIDResult SSA	Optical spectra of the X...
CDFS SSAP	Optical Spectroscopy in...
Polarbase SSAP	Polarbase SSAP service...
mlqso bidi ssa	Spectra of lensed QSO...
ELODIEinterp	Spectrum interpolator f...
GAUDIVO	SSAP for GAUDI
RCSED_SSP	SSA service for RCSED ...
SubaruHDS	Subaru HDS Spectrum ...
SVO HERBIG AeBe	SVO EXPORT HERBIG Ae...
TBL Narval	TBL Narval legacy
COROT ARCHIVE	The COROT PUBLIC ARC...
The Mark-I solar spectr...	The Mark-I solar spectr...
NED/SED	The NASA/IPAC Extragal...
PCSLG SSAP	The Panchromatic High...
VIPERS Spectra	The VIMOS Public Extra...
TUES	Tubingen Echelle Spect...
Ultraviolet photometry...	Ultraviolet photometry...
VizieR SSA	VizieR SSA service
VUDS COSMOS DR1	VUDS-COSMOS (DR1) - ...

Search parameters:
Simple Query
Object:
RA: Dec:
Radius: MAXREC:
Band:
Time:

Optional Parameters

Use	Name	Value	UCD
<input type="checkbox"/>	SPECRP		spect.resolution;em.wl
<input type="checkbox"/>	SPATRES		pos.angResolution
<input type="checkbox"/>	PUBDID		
<input type="checkbox"/>	CREATORID		meta.id
<input type="checkbox"/>	WILDTARGET		
<input type="checkbox"/>	WILDTARGETCASE		
<input type="checkbox"/>	TOP		

Query Format:
Wavelength calibration:
Flux calibration:

Query: <SERVER>?REQUEST=queryData&POS=119.2666416666667,2.9508444444444444&FORMAT=ALL&SIZE=0.008333333333333333

Query results:

CCD700 OND vos2 LAMOST DR1 OND vos2

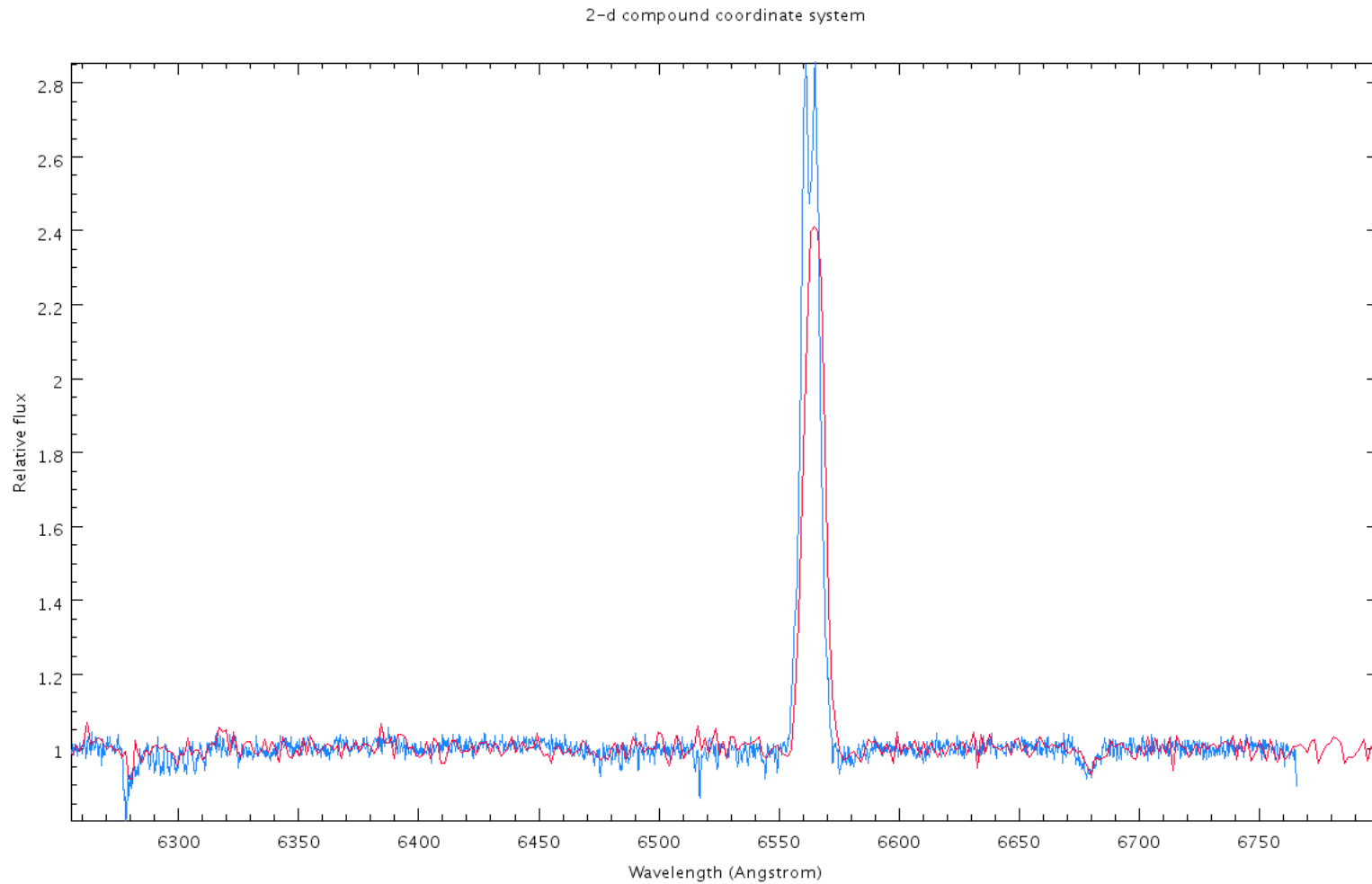
l...	ssa_specstart	ssa_specend	ssa_dstitle	ssa_targname	ssa_dateObs	ssa_timeExt	ssa_snr	ssa_length	accref
1	3.69999E-7	9.07403E-7	lamost_dr1/data/fits/GAC118N...	LAMOST J075704.05+025652.5	56315.65115	1200.		3897	http://vos2.asu.cas.cz/getpro...
2	3.69999E-7	9.07403E-7	lamost_dr1/data/fits/GAC118N...	LAMOST J075704.05+025652.5	56315.65115	1200.		3897	http://vos2.asu.cas.cz/getpro...
3	3.69999E-7	9.07403E-7	lamost_dr1/data/fits/GAC118N...	LAMOST J075704.21+025655.6	56315.67766	1200.		3897	http://vos2.asu.cas.cz/getpro...
4	3.69999E-7	9.07403E-7	lamost_dr1/data/fits/GAC118N...	LAMOST J075704.21+025655.6	56315.67766	1200.		3897	http://vos2.asu.cas.cz/getpro...
5	3.69999E-7	9.07821E-7	lamost_dr1/data/fits/GAC121N...	LAMOST J075703.80+025653.6	56341.66307	1200.		3899	http://vos2.asu.cas.cz/getpro...
6	3.69999E-7	9.07821E-7	lamost_dr1/data/fits/GAC121N...	LAMOST J075703.80+025653.6	56341.66307	1200.		3899	http://vos2.asu.cas.cz/getpro...

Parameters for Server-Generated data processing

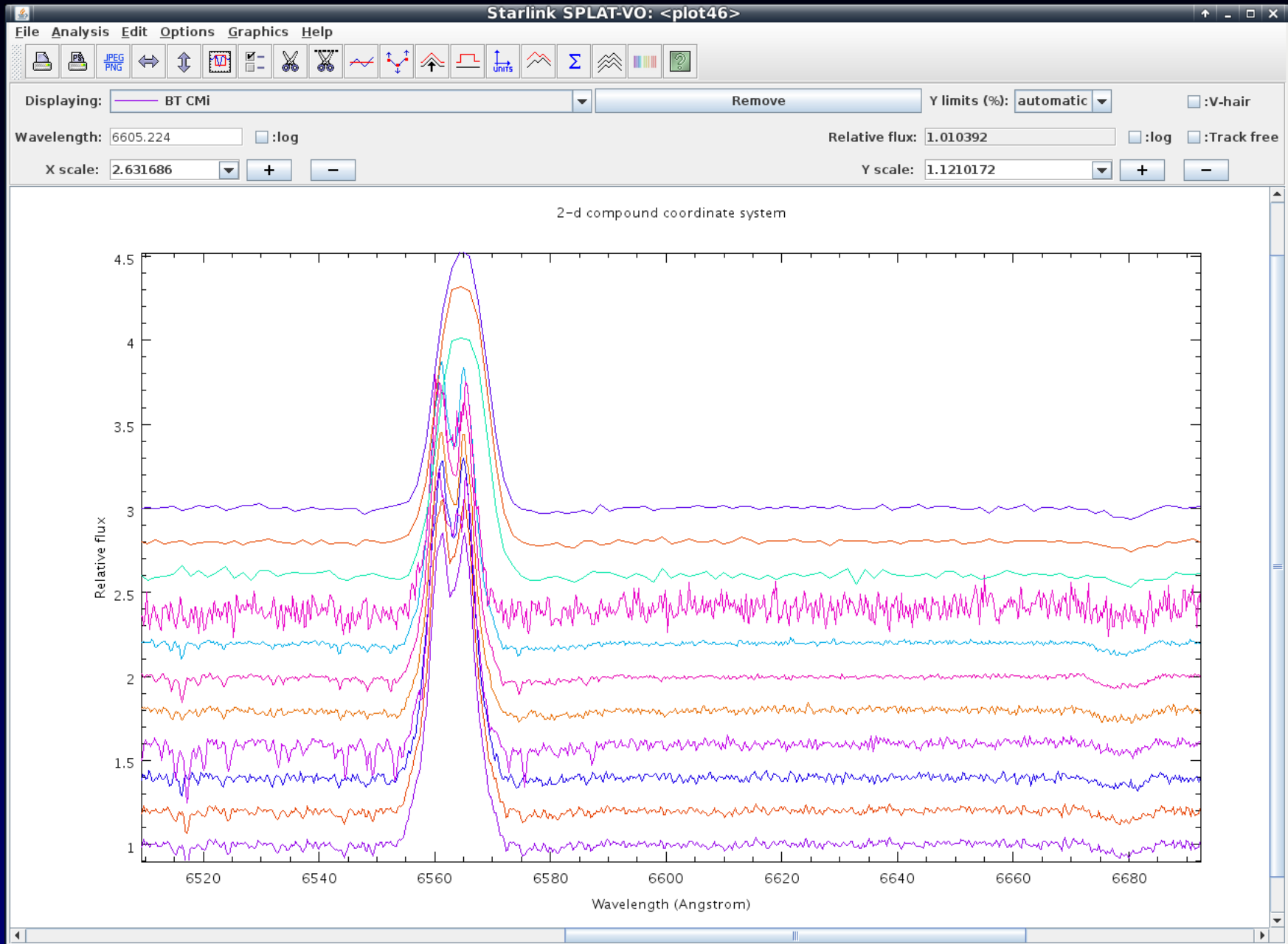
FLUXCALIB:
 REDSHIFT:
 BAND: / [3.69999e-07..9.07821e-07] m
 FORMAT:

Display selected Display all Download selected Download all Deselect table Deselect all DataLink Services

LAMOST emission candidate



LAMOST emission candidate



SSA issues

- Query by POS is insufficient
 - Theoretical spectra - need different approach
 - Observed – no coordinates available
 - Secret exoplanets – Kepler 15, TRESS-1
 - Multiple stars on slit (extraction of two files)
 - HR1847A,B – bad seeing - A+B
 - Imprecise telescope coordinates
 - Exotic objects – solar system or clusters (WEBDA 17) - finding charts in galaxies
- Must support TARGET NAME (but WILDCARD, Sgr A *)
- WHEN Name resolver not available ?????
- How query by BAND echelle with multiple orders (e.g. BeSS,STIS) and how to CUT by SODA ?

SSA issues

- Original format NATIVE (IRAF WCS -image/fits)
- LAMOST, SDSS in log lambda (better for precision)
- VO – supported format is VOTABLE or application/fits
 - Binary table
 - Loosing dispersion function (processing)
- To return results – must create virtual accref + conversion
 - VOTable link + image/fits link
 - Query by FORMAT = COMPLIANT – only VOT
 - Default (implied FORMAT) or FORMAT=ALL - both

SSA + DL + SODA issues

- If FORMAT=image/fits (Native)
How to convert by DL SODA FORMAT processing ?
- If native – should return native ?
 - Image/fits understood by client SPLAT-VO only
- Should convert to votable to process
- If application/fits – should process ? It is VO supported !
- If Result is votable to SODA FORMAT app/fits – convert ?
- DL + SODA does not give names and extensions to files
 - Problem if using DL to create files for ML (lists)

SSA + SDM issues

- SSAP requires VACUUM wavelenght (easy vac-->air)
- But original files from ground in AIR

Conversion not precise but approximate formulae

www.as.utexas.edu/~hebe/apogee/docs/air_vacuum.pdf

- No metadata to express the nature (air/vacuum)
- No param to query by this (is vacuum?)
- Air/vacuum lambda – who has to convert it
 - client or DL service ? - massive scripting
- The precision on echelle spectra + I2 cell requires
 - Knowledge of dispersion (nonlinear)
 - WCS III support not common [arXiv:astro-ph/0507293](https://arxiv.org/abs/astro-ph/0507293)

SSA + SDM issues

- How to handle two BAND ?
 - Query by BAND=I1/I2 in SSA to SELECT
 - SODA BAND = minI1 „space“ minI2 to CUT
- What if data not contained in cutout request
 - Error or auto convert the SSA query and redo?
User wants to get only given region to compare
- Continuum normalization
 - Query by (virtual generation ?)
 - Process (on the fly , preselect files ?)
 - In theoretical spectra (TSAP) – another column

Conclusions

- The community needs VO way for precise spectroscopy – task for CSP !
- Current SSA + SDM not fulfills the requirements of precision on subpixel level (bintable insufficient – dispersion interpolation)
- SSA seems to be confusing with SODA
- It is time to replace SSA but many spectra HARDLY in VO still !!!!

Should TAP + SODA work better ?