

Science Analysis in VO Environment A Case Study

(Integrating DAL and WGS for Spectra Disentangling)

Petr Škoda

Astronomical Institute Academy of Sciences
Ondřejov
Czech Republic

IVOA Interoperability meeting Joined Apps and GWS Session,
CDS Strasbourg, 26th May 2009

Spectra Disentangling

For blended spectra of binary (multiple) stars

Very powerful

Requires good orbital coverage, estimate of orbital parameters (SIMBAD)

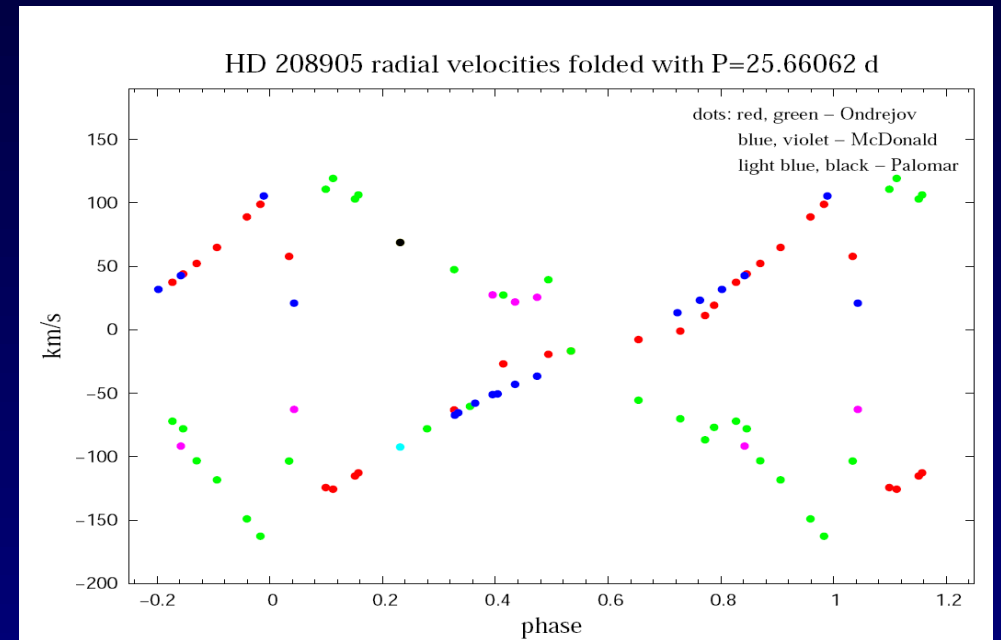
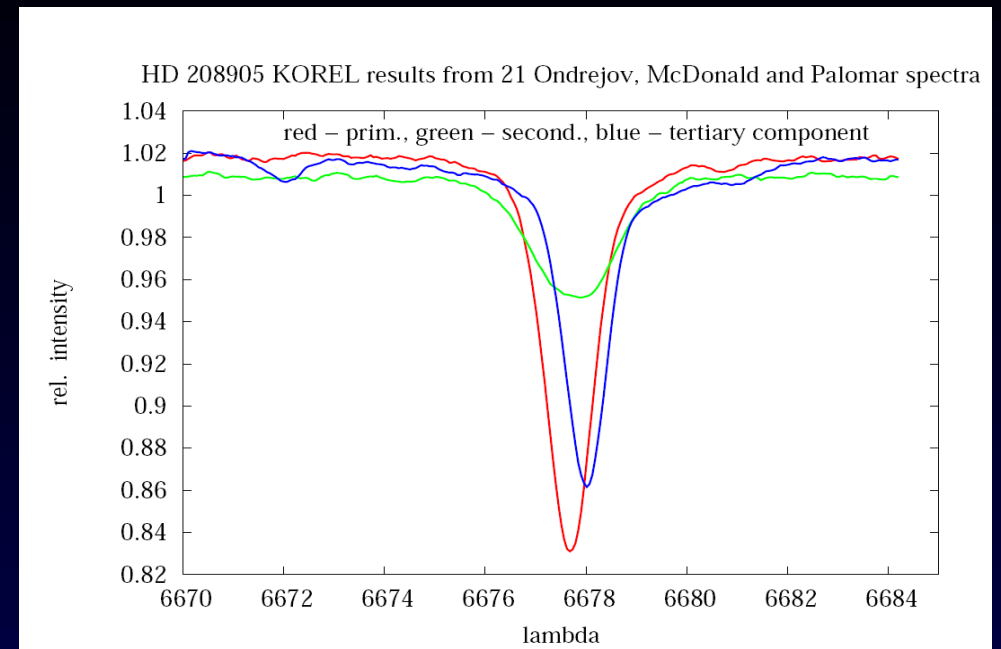
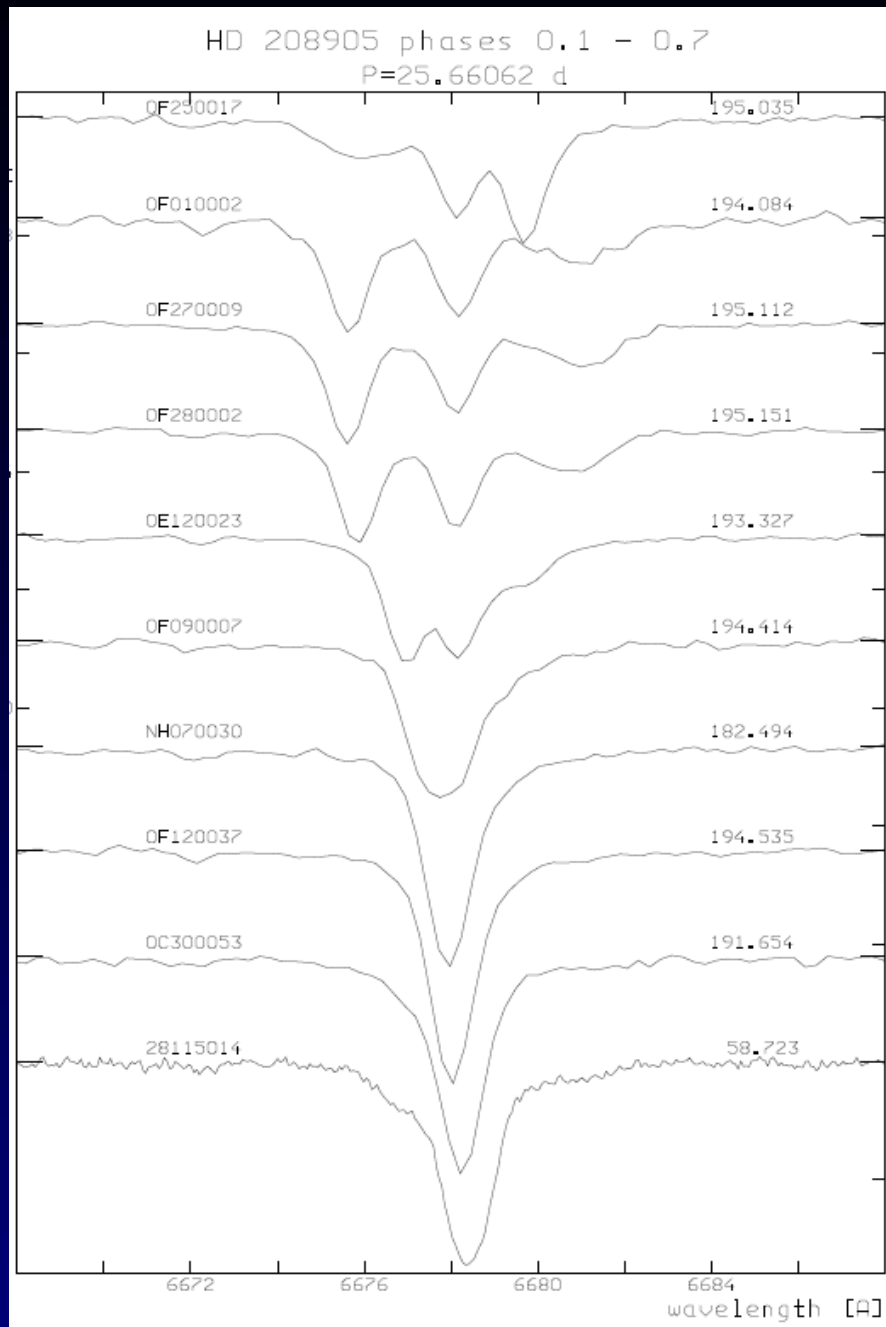
Wavelength space disentangling (Simon&Sturm)

Fourier disentangling - (Hadrava 1995, 1997)

not only multiple stars - Pulsation, telluric lines, models of limb darkening, spots – still new theory

super resolution of spectra (subpixels)

Spectra Disentangling in Fourier Space - KOREL



KOREL program (user view)

Product of ingenious scientist (punchcard culture)

Breaks all SW engineering standards, habits...

KOREL = F77 program of F66 scientist (IBM360)

Static arrays (dim Parameters, 2^n size FFT)

Author does not want to change (too much)

After bad experience not open source anymore

Not an fixed format - ad hoc changes (science)

Parameter file scarce, no comments (1 0 0 2 1..)

Different versions – 2^n , DOS/UNIX CR/LF ^Z

*** Cryptic for newcommer ***

KOREL program (SW developer view)

KOREL is nice backend engine

Works with files as filter (params + data (+templ))

Outputs iterations, output spectra, PS image...

Refeeding part of output to input (multi dim iterat)

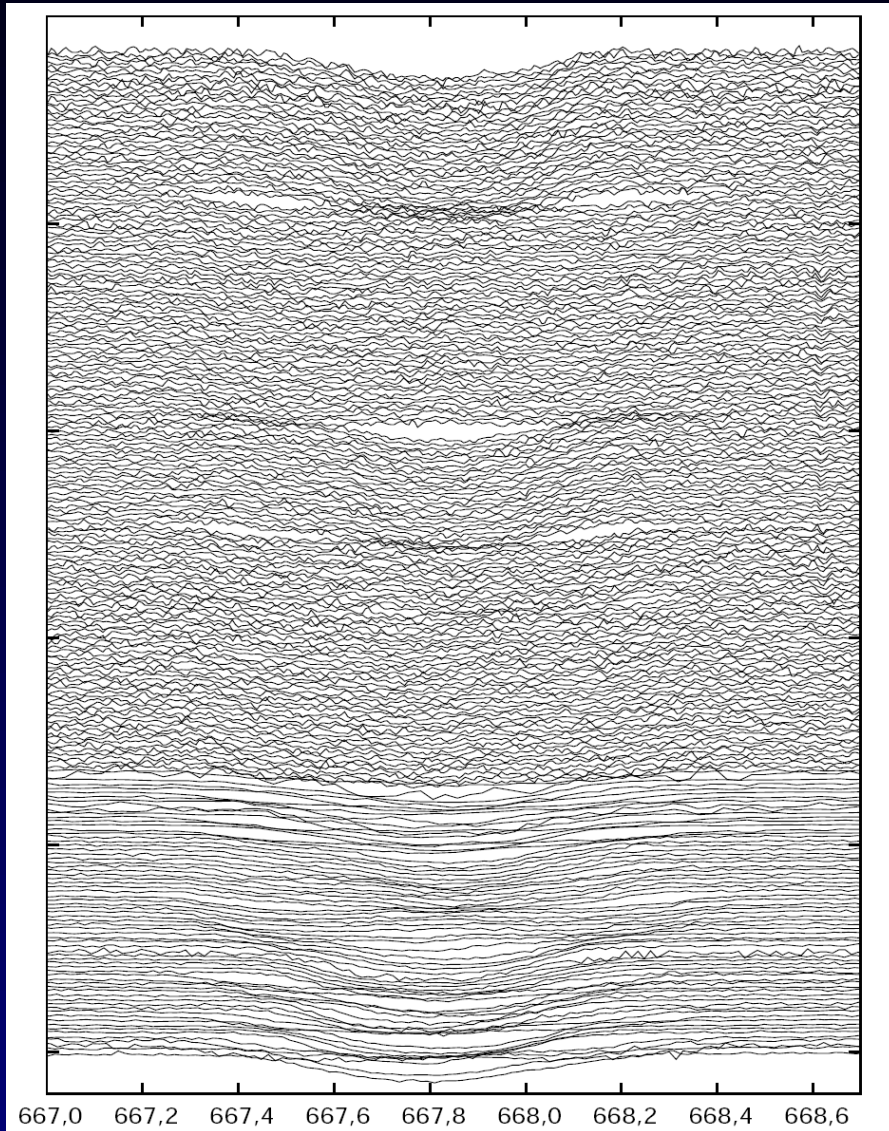
Programmable state automat driven by configuration file
(different units on/off in pars)

Prepare data input (ASCII) - Interaction needed graphics
= PREKOR (DOS, MS FORT)

Spectra visualization, cutout, rebin to ln wave

Access spectra by lists (remove bad SNR)

PREKOR tasks



V436 Per Janík 2003

Select multiple regions

Really 100-1000s spectra

Small regions (at sharp lines)

Stack or overplot

Check ranges before FFT

rebin to common grid in
 $\ln(\lambda)$

PREKOR role solved individually
(Mathematica, MIDAS,
Python)

output KOREL.DAT in ASCII

KOREL as VO service - idea

Run on GRID (dedicated or distributed, parallel)

Using VO for getting data, convert, display (user interaction)

Parameters in web form, upload config

User upload of data

Once run produces growing output

Redirected to graphic visualization

Or simple produce png – refresh

Send component spectra to postproc (classifier using synthetic grids, rotation...

KOREL Web Service (May 09)

The KOREL.DAT, KOREL.PAR left on user

User authentication and authorization (admin)

Upload parametric and data files (2-3)

check of upload

Run job (synchronous, asynch UWS in prep.)

On-the fly output of png (ps), results on click

List jobs of user – storage for limited time

Re-editing parameters, resubmit

Job control (queue, max mem, time, users ?)

Upload of param and data file

Upload of files - Iceweasel

Soubor Úpravy Zobrazit Historie Záložky Nástroje Nápořádě

http://localhost:1234/

Nejnavštěvovan... Getting Started Latest Headlines ELIAV, a.s. - Firmy.cz

Disable Cookies CSS Forms Images Information Miscellaneous

InterOpMay2009Applications - IV... Upload of files

Chcete, aby si Správce hesel zapamatoval toto přihlášení? Zapamatovat Nikdy pro tento server

KOREL Job preparing Form

Please upload the required files from your local disk using the browser directory tree. The file content must be in UNIX format (only CR, no CTRL-Z at the end). Be sure you did not use PREKOR output for DOS!

Spectra list: (korel.dat): Procházet...

Parameters: (korel.par): Procházet...

Hotovo

Upload of files - Iceweasel

Soubor Úpravy Zobrazit Historie Záložky Nástroje Nápořádě

http://localhost:1234/#

Nejnavštěvovan... Getting Started Latest Headlines ELIAV, a.s. - Firmy.cz

Disable Cookies CSS Forms Images Information Miscellaneous Outline

InterOpMay2009Applications - IV... Upload of files

Chcete, aby si Správce hesel zapamatoval toto přihlášení? Zapamatovat Nikdy pro tento server Nyní ne

KOREL Job preparing Form

Please upload the required files from your local disk using the browser directory tree. The file content must be in UNIX format (only CR, no CTRL-Z at the end). Be sure you did not use PREKOR output for DOS!

Spectra list: (korel.dat): Procházet...

Parameters: (korel.par): Procházet...

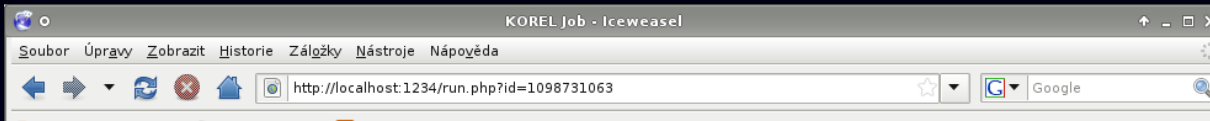
- Sucessfully uploaded

Job 1265004943 is created

[Run job](#)

Hotovo

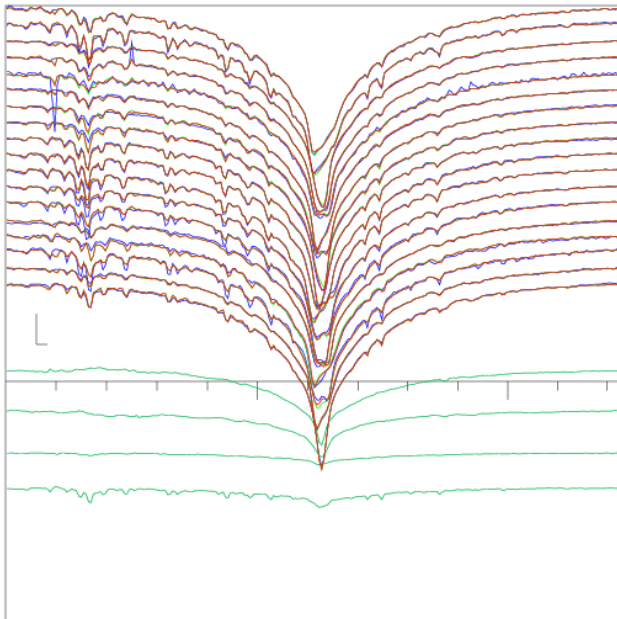
Results and resubmitting



- Starting KOREL job 1098731063 ...
- Job complete

Results:

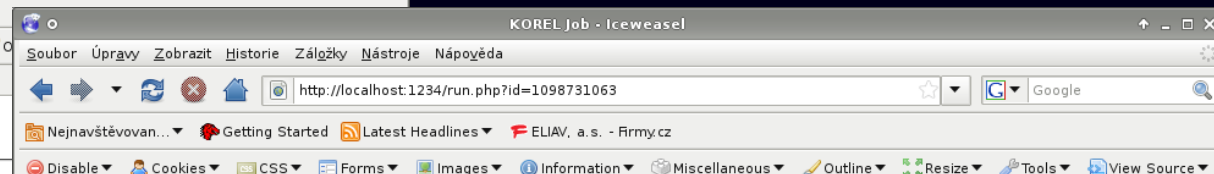
The disentangled spectra :



The result file [korel.res](#)

The whole job directory may be downloaded [here](#)

The parametric file, can be edited [here](#).



The result file [korel.res](#)

The whole job directory may be downloaded [here](#)

The parametric file, can be edited [here](#).

```
1 1 0 1 1 0 2 2 | key(1,...,5), k= Nr. of spectra>0, filter, plot
0 0 1 0 1 0      2.553798000 .0001 | 55 UMa sum= 8.504271844767466
0 0 2 0 1 1      49735.178839985 .002 |
0 0 3 0 1 1      .319733351 .01 | .357
0 0 4 0 1 1      122.951438877 1.1 |
0 0 5 0 1 1      76.095988350 .2 | 87...
0 0 6 0 1 1      .983388967 .01 |
0 2 1 0 1 0      1891.900000000 10.
0 2 2 0 1 1      52715.641149148 5.
0 2 3 0 1 1      .323942615 .03
0 2 4 0 1 1      243.685345134 5.
0 2 5 0 1 1      11.440382020 1.
0 2 6 0 1 1      .518137882 .1
0 3 1 0 1 1      365.256360000 .1      365.242200000 .1
0 3 2 0 1 1      51547.520600000 10.      49722.000000000 10
0 3 3 0 1 1      .016710220 0.001      .016730100 0.001
0 3 4 0 1 1      219.405411671 10.      220.909574736 2.
0 3 5 0 1 1      .001000000 .0001      .001578379 .001
0 3 6 0 1 1      .000039078 .000001      .000073525 .000001
0 3 7 0 1 1      .000009111 .00000001
s 1 01 0 1 0 -.19610 .1
s 1 02 0 1 0 -.07307 .1
s 1 03 0 1 0 -.10926 .1
s 1 04 0 1 0 -.11544 .1
s 1 05 0 1 0 .01207 .1
s 1 06 0 1 0 -.13162 .1
s 1 07 0 1 0 .07563 .1
s 1 08 0 1 0 .07801 .1
s 1 09 0 1 0 -.08540 .1
s 1 10 0 1 0 .00624 .1
s 1 11 0 1 0 -.03080 .1
```

save

[Run new job](#)

Hotovo

Beta version - jobs control (REST)

Iceweasel

Soubor Úpravy Zobrazit Historie Záložky Nástroje nápověda

http://korel.localhost:1234/service/jobs/?hlight=124321188030

Nejnavštěvovan... Getting Started Latest Headlines ELIAV, a.s. - Firmy.cz

Disable Cookies CSS Forms Images Information Miscellaneous Outline Resize Tools View Sou

InterOpMay2009Applications - IV... http://korel.lo...ht=124321188030

Korel web service ^{BETA}

About Service Login Register FeedBack

Create a new job Jobs preview Current running job Additional tools Statistics and quotes

ID Hash	Note Uploaded
39 123793792630	2009-03-25 00:38:46 RUN DEL
40 124164858030	2009-05-07 00:23:00 RUN DEL
41 124164866730	2009-05-07 00:24:27 RUN DEL
42 124177626430	2009-05-08 11:51:04 RUN DEL
43 124202725130	2009-05-11 09:34:11 RUN DEL
44 124207387535	2009-05-11 22:31:15 RUN DEL
45 124207437535	2009-05-11 22:39:35 RUN DEL
46 124207462035	2009-05-11 22:43:40 RUN DEL
47 124207472535	2009-05-11 22:45:25 RUN DEL
48 124207821636	2009-05-11 23:43:36 RUN DEL
49 124222792930	2009-05-13 17:18:49 RUN DEL
50 124229317630	2009-05-14 11:26:16 RUN DEL
51 124259686330	2009-05-17 23:47:43 RUN DEL
52 124259810530	2009-05-18 00:08:25 RUN DEL
53 124259815530	2009-05-18 00:09:15 RUN DEL
54 124260164230	2009-05-18 01:07:22 RUN DEL
55 124263523830	2009-05-18 10:27:18 RUN DEL
56 124321188030	2009-05-25 02:38:00 RUN DEL

Copyright (C) 2008 SKoodA | (http://www.skooda.org)

Hotovo

Spectra Postprocessing Service

Normalization critical (continuum – long scale FT)

Current functionality

Different ServiceURL for cutout (BAND select/cut)

Future development

Rebinning – how to specify in SSA ?

Orders at echelle ? ASSOCIATION

Transformation described by params (SSAv2???)

Instrument profile (de)convolution

Broadening functions (rotation, limb dark)

RV shift

Not all in client – several servers (transform pipe)

NORMALIZED spectra in VO

Most optical spectra in two versions

Raw counts (unrectified, but wavelength calib)

Normalized (1.0) – most of final reports (even artistic continuum – novae , molecular bands)

How to present in VO ?

2 files, same metadata, FLUXCALIB=NORMALIZED → other directory?

How to refer continuum curve

Ratio, reference continuum ?

Conclusions ???

Is it **feasible** with current :

standards (protocols, data formats

clients

Web services (REST)

Is it **efficient** ?

One server for all

distributed postprocessing with remote accref:

All in client (interaction crucial)

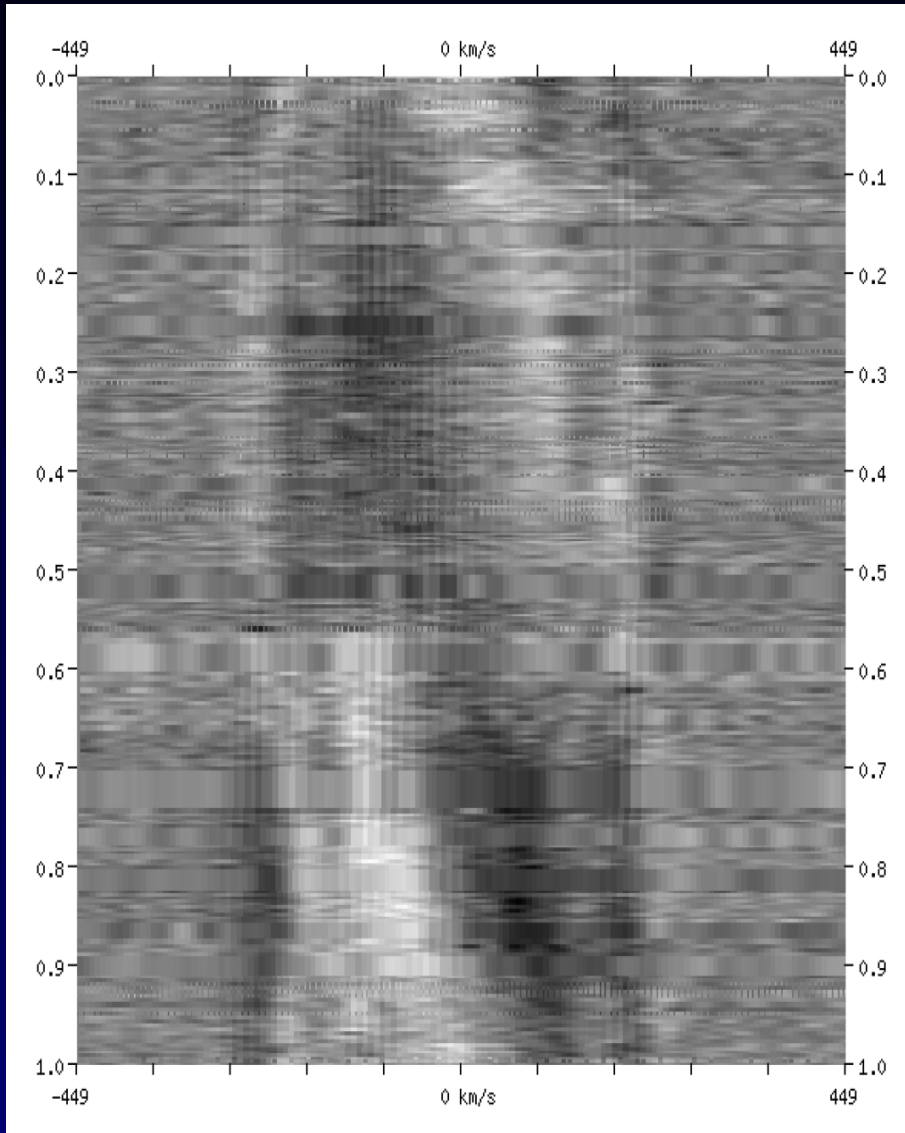
Is it **worth** to do it in VO way ?

Potencial users = very conservative stellar astronomers (test BIN Brno June 2009)

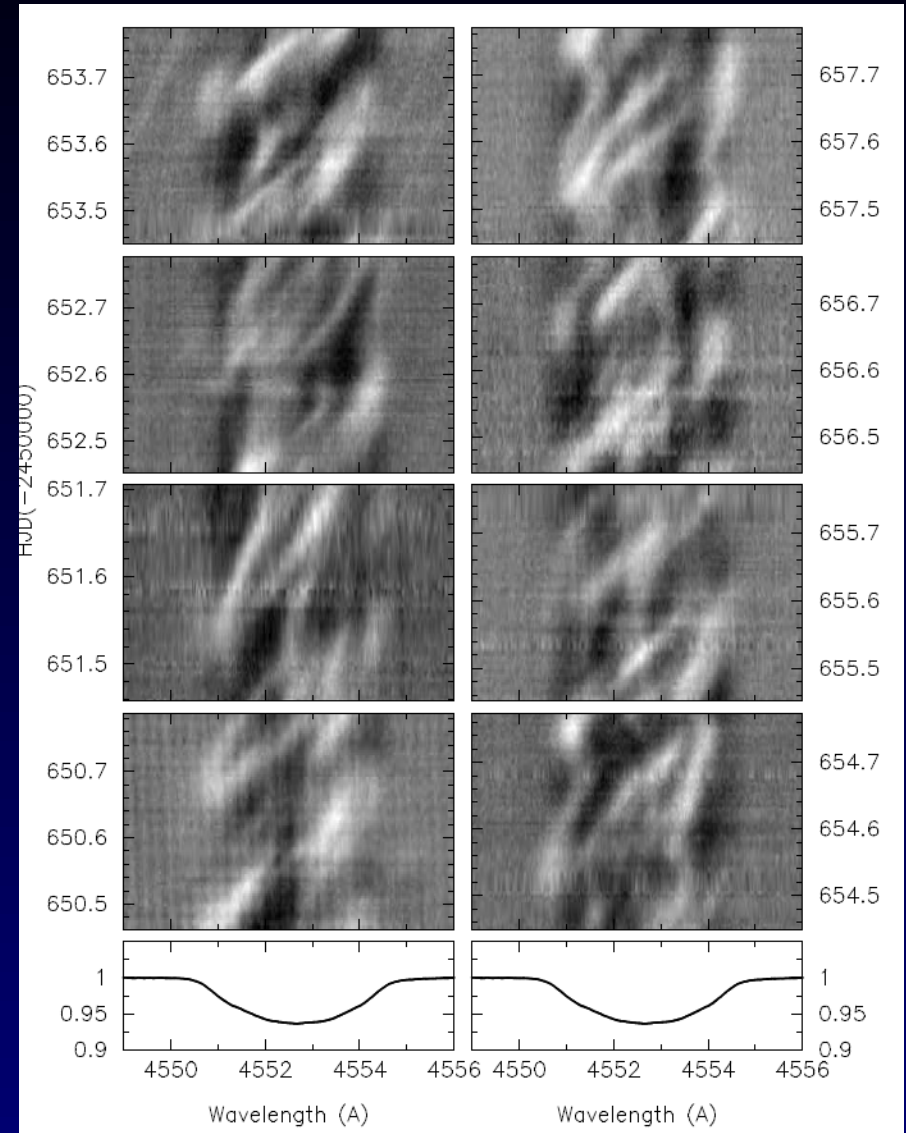
What does it bring NEW to current users ? (spectrum conversion, rebinning, selection, GUI)

Prototype for other services (dynamical spectra, automatic RV, EW, model best fit) - see 2 examples:

Postprocessing - Dynamic Spectra

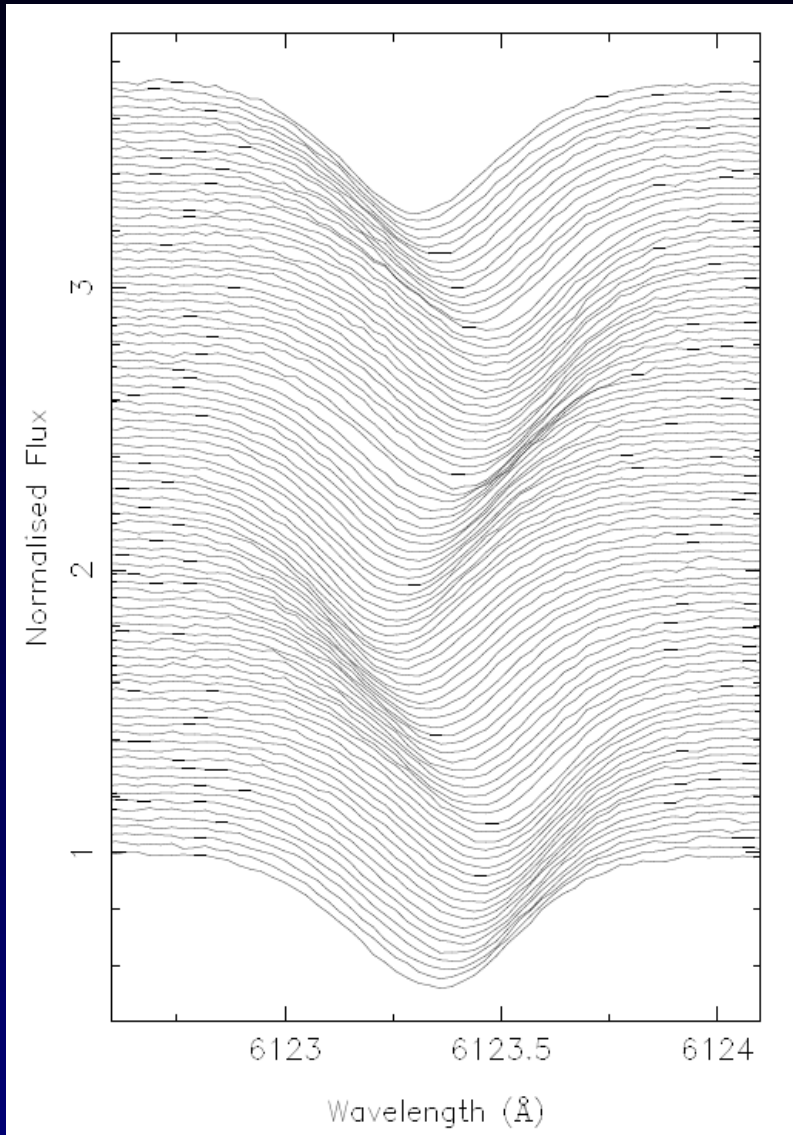


Netolický 2004

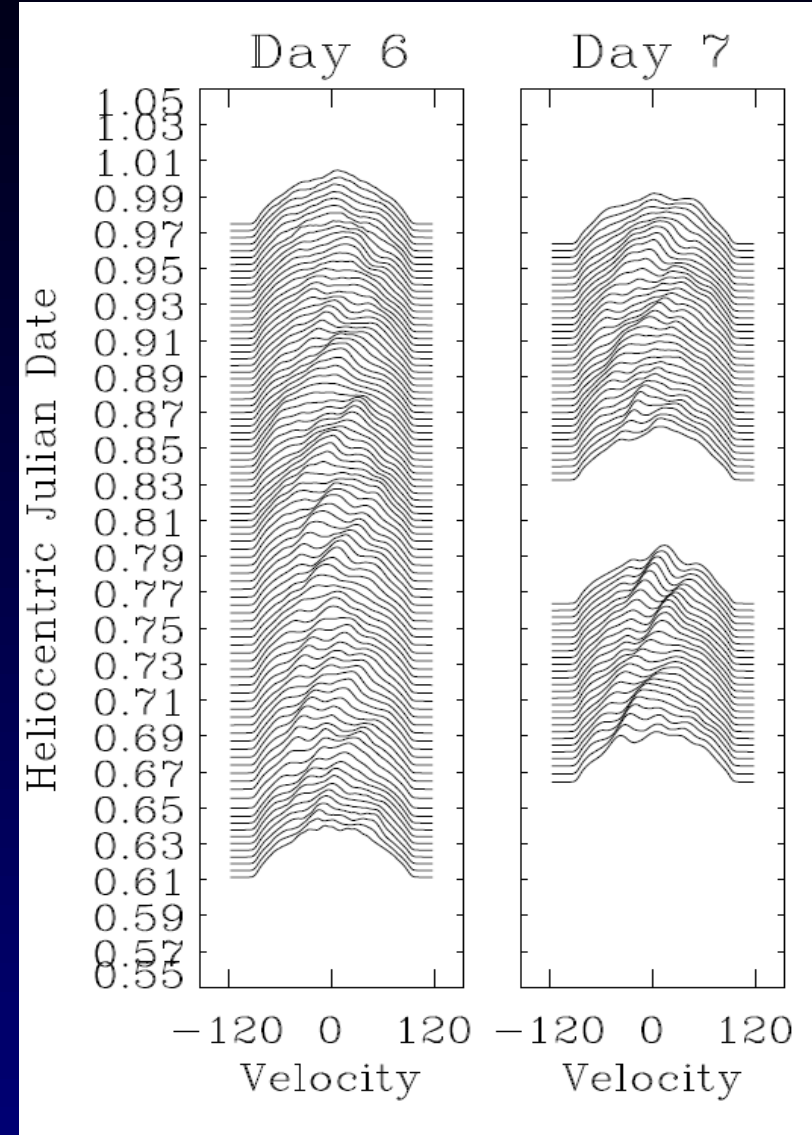


Lambda Sco: Uytterhoeven 2004

Disentangle modes - Pulsations



Rho Pup – δ Sct type



Eps Cep - δ Sct type