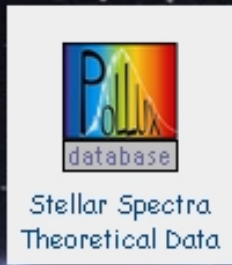


# Simulated Observations Synergy btw TBL Legacy – POLLUX



**A. Palacios, P. Maeght, M. Sanguillon, A. Emeras,  
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**Observatoire Virtuel – Grand Sud Ouest (OV – GSO)**



# A usecase for stellar spectra within the Virtual Observatory

**Goal** *Derive a first estimate of the rotation velocity of a star*

**Back at the Interop' meeting in Naples in 2011**

**Tools :**

- database of observed stellar spectra **TBL Legacy**
- database of stellar synthetic spectra **POLLUX**
- database of stellar parameters from the literature **PASTEL/ Simbad**
- service for visualization of stellar spectra **VOSpec**

**POLLUX** and **TBL Legacy** teams :

Michèle Sanguillon, Patrick Maeght, Ana Palacios, *Agnès Lèbre, Frédéric Paletou*



## *Telescope Bernard Lyot* *Narval archive*

*Science Ready* Archive collecting spectropolarimetric data from the NARVAL instrument @ TBL /Pic du Midi

High resolution spectra in the spectral domain [375 nm; 1050 nm] that may be normalized to the continuum.

Data include spectral information and polarization information (Stokes parameters).



## *Pollux Database for High Resolution Synthetic Stellar Spectra and SEDs*

Database of very high resolution ( $R = 120\,000$ ) synthetic spectra in the optical domain [300 nm; 1200 nm].

Spectra exist for many spectral types (deficit for hot stars, currently being

Data include the absolute flux and the flux normalized to the continuum.

SEDs between 5 nm and 20 000 nm (exact domain depending on the stellar spectral type)

**Databases both registered in the VO as SSAP services**

**Bases part of the same datacenter : OV – GSO (Toulouse, France)**

# The objectives of VOSPECFLOW



Synthetic spectra in theoretical (POLLUX)



Convolution tool

(macroturbulence, rotation, instrumental profile)



**Simulated observation**, directly comparable with **observed spectra** in telescope archives (TBLegacy)

**Main issue :**

Observed and synthetic spectra are stored in files with different structures

The databases and archives to access them do not answer to the same queries

# The specifications of VOSPECFLOW



Starting from the name of a star :

- Perform automated queries to SIMBAD, VizieR, TBLegacy and POLLUX using the OV protocols
- Provide a convolution module (for convolution over a restricted spectral domain of 100 to 500 Å centered on a chosen spectral feature)
- Provide a graphical interface to check the data retrieved and computed
- Export the data to visualization tools of the VO (Vospec)

VOSPECFLOW is designed to perform a rough analysis or to check the nature of a target star.

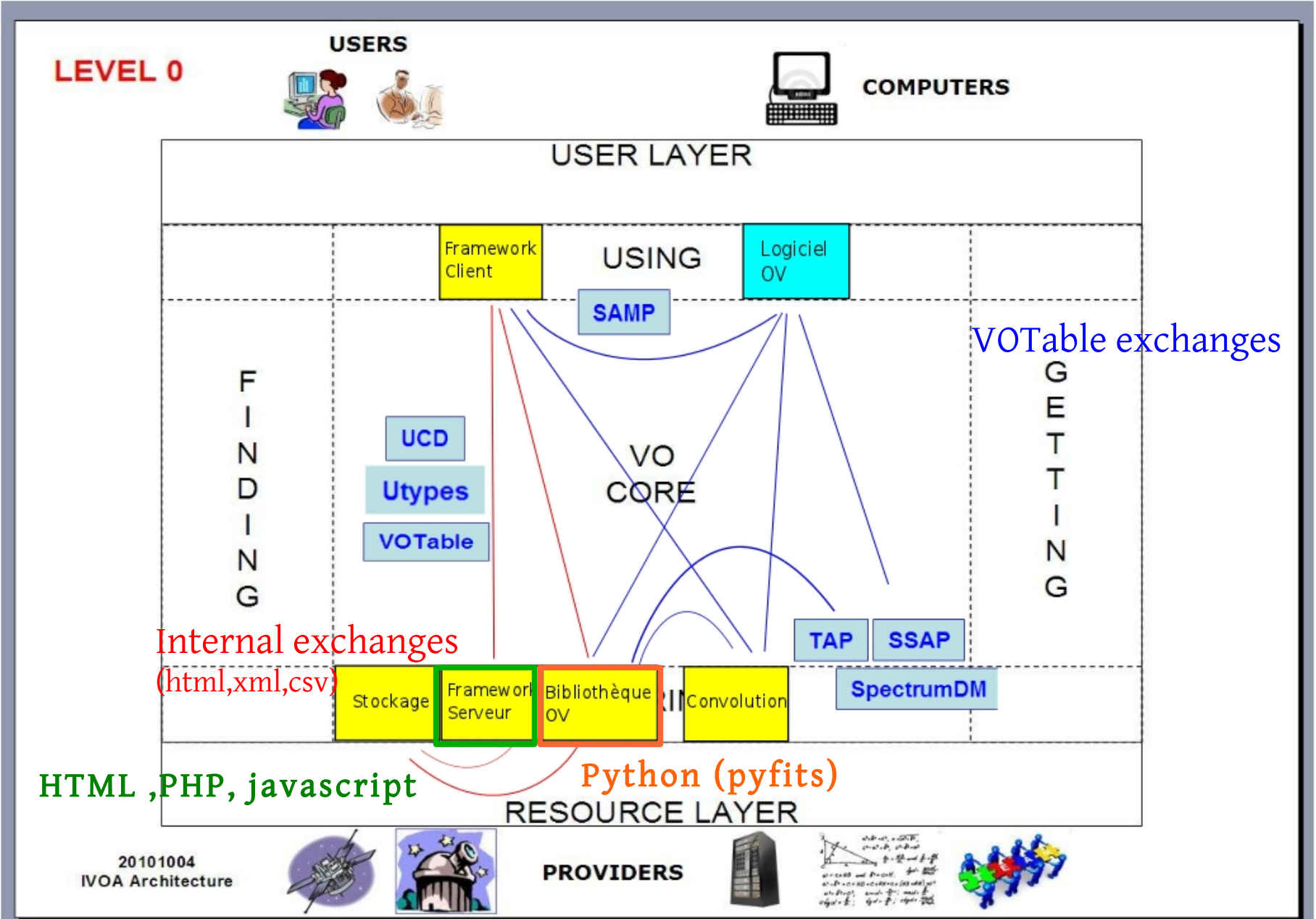
**It is by no means an automated tool to derive stellar parameters.**

VOSPECFLOW can be used to check

stellar activity

excess or deficiency of some chemicals in the atmosphere

# Protocols and operating of VOSPECFLOW in the VO framework





Wave Unit Log

Angstrom

Flux Unit

Counts

RedShift 0.00

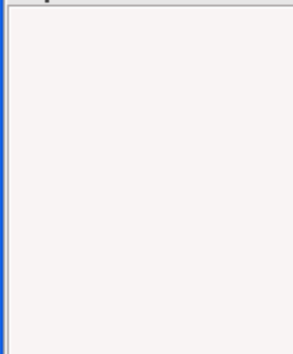
De-reddening

$\lambda$  V 0.00

Y-axis error

X-axis error

Graphic Mode



View

Target  Ra  Dec  Size

Query

**HD 232862**

**Spectral type  
G8II**

Spectra List

Server Selector

Query by Service

Green services are online and support params selected

- Server Selector
  - SSA Services
  - Theoretical Spectra Services

Query Outlook

Refresh Add SSA/TSA  Select All SSA

Query by params

Tree

- Query
  - TARGET.NAME HD232862
  - Simple Query
    - POS 59.34,50.86
    - SIZE 1
  - Advanced Query
  - Service Specific Query

Insert Param Value

Point mouse on param label to see description

Text Param  Add

Query Reset

RETRIEVE

Unmark All

Reset



The screenshot shows the 'Server Selector' application window. It is divided into several sections:

- Query by Service:** A list of services under 'Theoretical Spectra Services'. The 'POLLUX Database' is selected with a checkmark.
- Query Outlook:** A section with buttons for 'Refresh', 'Add SSA/TSA', and 'Select All SSA'. Below these are several lines of URLs, including 'http://mblegacy.bagn.obs-mip.fr/cgi-bin/ssap/ssa\_tbl?&' and 'http://pollux.graal.univ-montp2.fr/ssaserver/tsap?&vtu'.
- Query by params:** A tree view showing the query structure. The selected path is: 'Simple Query' -> 'Advanced Query' -> 'Service Specific Query' -> 'TBL Narval legacy' -> 'POLLUX Database'. The parameters listed are: 'TARGET.NAME HD232862', 'POS 59.34,50.86', 'SIZE 1', 'teff\_min 3000', 'teff\_max 3000', 'logg\_min -1.000', 'logg\_max -1.000', 'vturb\_min 1.000', 'vturb\_max 1.000', 'meta\_min -5.000', 'meta\_max -5.000', and 'model ALL'.
- Insert Param Value:** A section with a text input field and an 'Add' button. Below are 'Query' and 'Reset' buttons.

Very specific requests to access to TBLegacy or to POLLUX.

Different structures for the files stored in TBLegacy and in POLLUX (number of columns, units, ...)

# Homepage to VOSPECFLOW v2.0

**VOSPECFLOW**

Home Observed spectra Synthetic spectra

**WELCOME TO VOSPECFLOW**

This application is meant to transform portions of synthetic spectra (100 AA to 500 AA) into simulated observations to compare them with observed spectra.

To achieve this, VOSPECFLOW allows to perform a convolution of the synthetic spectra with a rotation profile, an instrumental profile and a turbulent microturbulence velocity profile, and to doppler shift it according to the radial velocity of the star it is meant to represent.

Through the tab "Observed spectra", you will be able to:

- select a star, retrieve its parameters from a query to SIMBAD and the catalogs in Vizier
- select the temperature, metallicity, gravity and microturbulence velocity from the results of the Vizier's catalogs query
- select and observed spectrum of the selected star from the TBLegacy database or upload your own spectrum
- store the selected spectrum into the VOTPSpace for further plotting (with VOSPEC or with a local display device) and/or downloading

Through the tab "Synthetic spectra", you will be able to:

- select a range in temperature, metallicity, gravity and microturbulence velocity according to the results of the Vizier's catalogs query
- search the POLLUX database for high resolution synthetic spectra corresponding to these parameters or upload your own spectra
- convolve portions of the selected spectra to transform them into simulated observations
- apply the doppler shift associated to the radial velocity of the star selected in the "Observed Spectra" tab
- store the resulting spectra into the VOTPSpace for further plotting (with VOSPEC or with a local display device) and/or downloading

Please connect to the VO-tool of your choice to further visualize your data

**CART**

DRAG DROP

**TOOLS**

TOPCAT

VOSpec

Splat VO

VOPlot

Cassis

RESET

Last update : Friday, May 10 2013 @ 20:55 (CEST +2:00)

VO TOOLS



connection to a hub using SAMPJS

# 1 . Query for observations

The screenshot displays the VOSPECFLOW web interface. At the top, there are navigation tabs: "Home", "Observed spectra" (highlighted with a red box), and "Synthetic spectra". Below the navigation is a search bar for stellar parameters. The main content is divided into two columns: "QUERY" and "RESULTS".

**QUERY**

Star ID:

Catalog:

**RESULTS**

**Simbad**

Source : Simbad query  
Description :  
meta.main : None  
src.class : \*\*  
pos.eq.ra;meta.main : 059.333275  
pos.eq.dec;meta.main : +50.855156

**Vizier**

Average

phys.temperature.effective : 4900.0  
phys.gravity : None  
phys.abund.Fe : None  
phys.veloc.microTurb : None

using vizquery

At the bottom of the interface, there is a "RESET" button, a search bar for observed spectra, and a footer with logos for OV-GSO, LUPM (LABORATOIRE MONTPELLIER UNIVERS & PARTICULES), and OIRAP (astrophysique & planétologie). A "CART" section on the right contains a shopping cart icon and a "TOOLS" section with buttons for TOPCAT, VOSpec, Splat VO, VOPlot, and Cassis. The footer also includes the text "Last update : Friday, May 10 2013 @ 20:55 (CEST +2:00)".

Retrieve data from Simbad and Vizier from object name and table query

# 1 . Query for observations

The screenshot displays the VOSPECFLOW web interface. The main content area is divided into a 'QUERY' section on the left and a 'RESULTS' section on the right. In the 'QUERY' section, the 'Star ID' field contains 'HD232862' and the 'Catalog' dropdown is set to 'All'. Below these are buttons for 'Get parameters' and 'Show details'. The 'RESULTS' section shows the source 'Simbad' with the following description: 'Source : Simbad query', 'Description : meta.main : None', 'src.class : \*\*', 'pos.eq.ra;meta.main : 059.333275', and 'pos.eq.dec;meta.main : 150.955156'. A red-bordered pop-up window titled 'Show details' is overlaid on the results, showing the 'Mean of stellar parameters' with input fields for '4900.0', 'None', 'None', and 'None'. Below this, a 'Details' section lists parameters with checkboxes: 'Source', 'phys.temperature.effective', 'phys.gravity', 'phys.abund.Fe', and 'phys.veloc.microTurb' are all checked. A table below shows the values for these parameters: 'I/61B', '4900', 'None', 'None', and 'None'. A red arrow points from the bottom right of the pop-up window towards the bottom right of the main interface. The interface also includes a 'CART' section with a shopping cart icon and a 'TOOLS' section with buttons for 'TOPCAT', 'VOSpec', 'Splat VO', 'VOPlot', and 'Cassis'. At the bottom, there are logos for 'OV-GSO', 'LUPM LABORATOIRE MONTPELLIER UNIVERS & PARTICULES', and 'airap astrophysique & planétologie'. The footer text reads 'Last update : Friday, May 10 2013 @ 20:55 (CEST +2:00)'.

Details on the data retrieved from VizieR : possibility to choose the sources to compute mean

## 2 . Query for data in telescope archive

VOSPECFLOW

Home Observed spectra Synthetic spectra

Search for stellar parameters

Search for observed spectra

QUERY

From local disk

Choisissez un fichier Aucun fichier choisi

Import

From TBLegacy database

RA

059.333275

DEC

+50.855156

Search

RESULTS

TBLegacy

20 files

hd232862\_narval\_14sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_15sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_16sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_19sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_20sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_21sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_25sep08\_pol\_Normal\_V\_01.tif

**hd232862\_narval\_26sep08\_int\_Normal\_I\_001.tif**  
STORED

hd232862\_narval\_26sep08\_int\_Normal\_I\_002.tif

hd232862\_narval\_26sep08\_int\_Normal\_I\_003.tif

hd232862\_narval\_26sep08\_int\_Normal\_I\_004.tif

hd232862\_narval\_26sep08\_pol\_Normal\_V\_01.tif

hd232862\_narval\_27sep08\_int\_Normal\_I\_001.tif

CART

DRAG DROP

TOOLS

TOPCAT

VOSpec

Splat VO

VOPlot

Cassis

RESET

Last update : Friday, May 10 2013 @ 20:55 (CEST+2:00)

OV-GSO

LUPM  
LABORATOIRE MONTPELLIER  
UNIVERS & PARTICULES

airap  
astrophysique & planétologie

Position from Simbad used to search in TBLLegacy. Selected spectrum stored in basket

### 3 . Query for data in the POLLUX database

The screenshot displays the VOSPECFLOW web interface. At the top, there are navigation tabs: 'Home', 'Observed spectra', and 'Synthetic spectra' (highlighted with a red box). Below the tabs is a search bar for synthetic spectra. The main area is divided into 'QUERY' and 'RESULTS' sections.

**QUERY Section:**

- From: **Pollux** database
- Min/max range of stellar parameters: - +
- teff:** 5390, 4410 (with - N + buttons)
- logg:** 3, 3 (with - N + buttons)
- meta:** 0, -0.5 (with - N + buttons)
- vturb:** None, None (with - N + buttons)
- Search** button

**RESULTS Section:**

- 6 files
- 6 files listed:

  - NORMFLUX\_M\_s5000g3.0z-0.25t1.0\_a0.10c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS
  - NORMFLUX\_M\_s5250g3.0z-0.25t1.0\_a0.10c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS
  - NORMFLUX\_M\_s5000g3.0z-0.50t1.0\_a0.20c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS
  - NORMFLUX\_M\_s5250g3.0z-0.50t1.0\_a0.20c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS
  - NORMFLUX\_M\_s5000g3.0z0.0t1.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_STORED** (highlighted)
  - NORMFLUX\_M\_s5250g3.0z0.0t1.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS

**Right Sidebar:**

- CART:** Shopping cart icon with 'DRAG' and 'DROP' labels.
- TOOLS:** Buttons for TOPCAT, VOSpec, Splat VO, VOPlot, and Cassis.

**Footer:**

- RESET button
- Color selection icons
- Navigation icons
- Last update: Friday, May 10 2013 @ 20:55 (CEST +2:00)

Mean from Vizier used to query the theoretical database.  
Selected spectrum stored in basket

## 4 . Convolve a portion of the theoretical spectrum

The screenshot displays the VOSPECFLOW web interface. The top navigation bar includes 'Home', 'Observed spectra', and 'Synthetic spectra'. The main content area is divided into 'QUERY' and 'RESULTS' sections.

**QUERY Section:**

- Synthetic spectrum selected from Pollux Database (FITS file): `NORMFLUX_M_s5000g3.0z0.0t1.0_a0.00c0.00n0.00o0.00r0.00`
- Central wavelength (Å):
- Wavelength width (Å):
- Macroturbulence velocity:  km/s
- Rotational velocity:  km/s
- Instrumental profile:  mA
- Radial velocity (km/s):
- Output file format:
- 

**RESULTS Section:**

- Convolution: `CONV_T2R20.6G105mA_L8525_W100_M_s5000g3.0z0.0t1.0_a0` STORED

Red text overlay: **convolution parameters and radial velocity correction applied to a portion of the synthetic spectrum**

**Right Sidebar:**

- CART:** DRAG DROP (Shopping cart icon)
- TOOLS:** TOPCAT, VOSpec, Splat VO, VOPlot, Cassis

Bottom status bar: Last update : Friday, May 10 2013 @ 20:55 (CEST +2:00)

convolved portion of the spectrum stored in basket.  
The name bears the information of the convolution.

# 5. Visualize / download the data stored in the basket

The screenshot displays the VOSPECFLOW web interface. At the top, there are navigation tabs for 'Home', 'Observed spectra', and 'Synthetic spectra'. Below this is a search bar and a section for 'Convolutions of chosen synthetic spectrum'. The main area is divided into 'QUERY' and 'RESULTS' sections. A 'Cart spectras' dialog box is open, showing a list of selected spectra with checkboxes for each. The dialog also includes input fields for 'Central wavelength' (8525) and 'Wavelength width' (100). Below the list, there are icons for visualization and download, and a 'Message Type' section with radio buttons for 'votable (TOPCAT)' and 'ssa (VOSpec)'. On the right side of the interface, there is a 'CART' section with a shopping cart icon and a 'TOOLS' section with buttons for 'TOPCAT', 'VOSpec', 'Splat VO', 'VOPlot', and 'Cassis'. A red bracket on the left side of the image points to the checkboxes in the 'Cart spectras' dialog box.

Checkboxes to select data to be visualized / retrieved



# 5. Visualize / download the data stored in the basket

The screenshot shows the VOSPECFLOW web interface. At the top, there are navigation tabs for 'Home', 'Observed spectra', and 'Synthetic spectra'. Below this is a search bar and a section for 'Convolutions of chosen synthetic spectrum'. A 'QUERY' section contains various parameters like 'Central wavelength' (8525), 'Wavelength width' (100), 'Macroturbulence velocity' (2), 'Rotational velocity' (21), and 'Instrumental profile' (105). A 'RESULTS' section shows a list of 'Cart spectras' with checkboxes for each item. At the bottom of the dialog, there are three icons: a plot icon, a monitor icon, and a download icon. A 'Message Type' section has radio buttons for 'votable (TOPCAT)' and 'ssa (VOSpec)'. On the right side of the interface, there is a 'CART' section with a shopping cart icon and a 'TOOLS' section with buttons for 'TOPCAT', 'VOSpec', 'Splat VO', 'VOPlot', and 'Cassis'. Red arrows point from the bottom text to the three icons in the dialog box.

Possibility to visualize in situ, send to a VO application, download (csv) (votable) (fits)

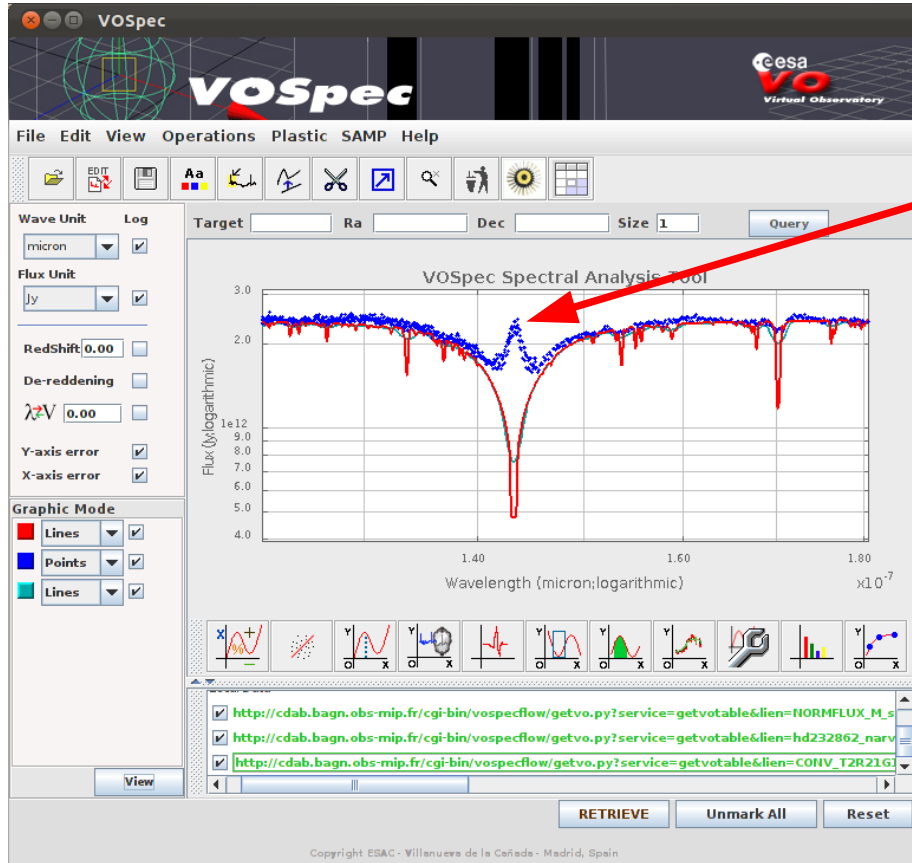
## 6. Quicklook using in situ tool

The screenshot displays the Vospecflow web interface in a Mozilla Firefox browser. The browser's address bar shows the URL `cdab.bagn.obs-mip.fr/vospecflow/`. The page features a dark blue header with the 'VOSPECFLOW' logo and a search bar. The main content area is divided into several sections:

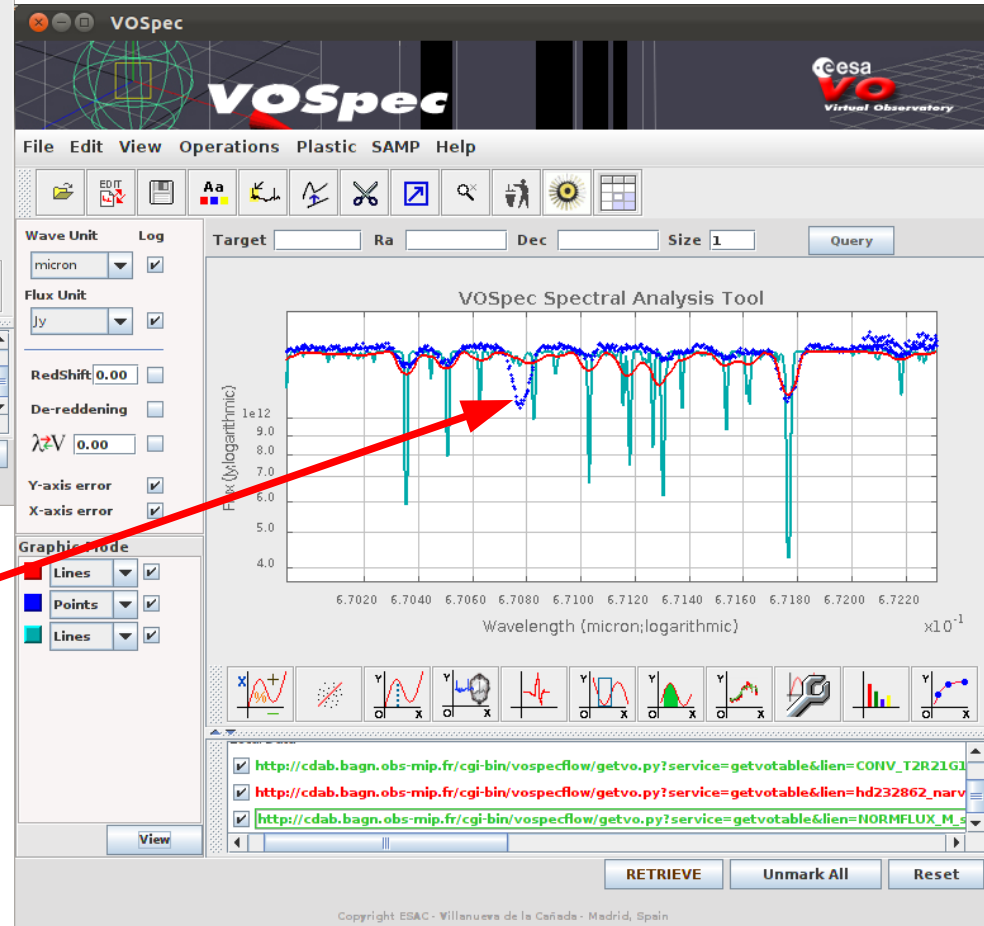
- Left Panel:** Contains search and configuration options. The 'Synthetic spectrum selected from' dropdown is set to 'NORMFLUX\_M\_s5000g3.0z0.0t'. Below this, several parameters are set: Central wave (6700), Wavelength (100), Macroturbulence velocity (2), Rotational velocity (21), Instrumental profile (105), Radial velocity (0), and Output file format (Proc).
- Plot spectras:** A central plot showing a spectrum with a y-axis from 0.4 to 1.1 and an x-axis from 6702 to 6712. The plot displays a series of data points (green dots) and a fitted curve (purple line). A red box highlights the bottom of the plot area, containing two icons: a magnifying glass (representing 'in situ view') and a download icon (representing 'download'). To the right of these icons is a 'Message Type' section with two radio buttons: 'votable (TOPCAT)' (selected) and 'ssa (VOSpec)'.
- Right Panel:** Features a 'CART' section with a shopping cart icon and a 'TOOLS' section with buttons for 'TOPCAT', 'VOSpec', 'Splat VO', 'VOPlot', and 'Cassio'.

No hub connected hence only in situ view and download are proposed

# Observed spectrum, theoretical spectrum and simulated observations seen in VOSpec

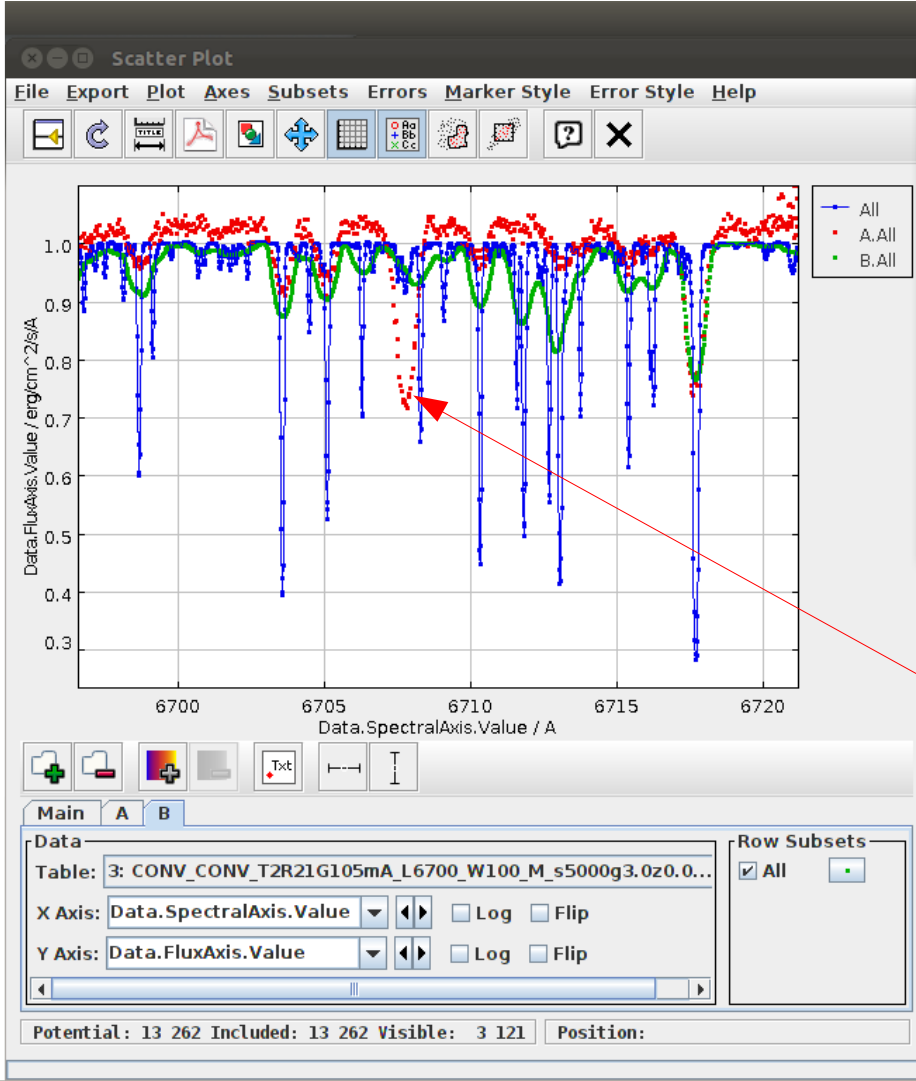


This star is active!



This star is Li-rich!

# Observed spectrum, theoretical spectrum and simulated observations seen in TOPCAT



The star is Li-rich!



## Examples of Use

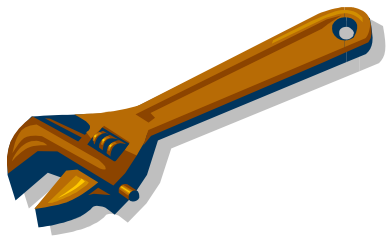


Tool to accompany spectroscopic observations (available to observers and telescope operators ), for instance, to check the pointing of the right object

Earlier in the process to simulate an observation  
– (then comes the ? of the noise modelling)

Afterwards to

produce rough constraints on stellar parameters ( $v_{\text{sin}i}$ ,  $T_{\text{eff}}$ ,  $\log g$ , metallicity ...),  
allow to get a first grip on an analysis ,  
rapidly identify the presence/absence of specific spectral lines.



## What's next



Make the tool available to the community via the VO

Add a module to guess  $T_{\text{eff}}$  and  $\log g$  from spectral type and luminosity class

Provide a simple VO service for convolution

**Add other archives and theoretical databases**

# Nouvelle ergonomie à l'étude pour distribution de l'application

**VOSPECFLOW**

Observed spectra Synthetic spectra

**CART**

DRAG DROP

Welcome to VOSPECFLOW

This application is meant to transform portions of synthetic spectra (100 AA to 500 AA) into simulated observations to compare them with observed spectra.  
To achieve this, VOSPECFLOW allows to perform a convolution of the synthetic spectra with a rotation profile, an instrumental profile and a turbulent microturbulence velocity profile, and to doppler shift it according to the radial velocity of the star it is meant to represent.

Through the tab "Observed spectra", you will be able to:

- select a star, retrieve its parameters from a query to SIMBAD and the catalogs in Vizier
- select the temperature, metallicity, gravity and microturbulence velocity from the results of the Vizier's catalogs query
- select and observed spectrum of the selected star from the TBLegacy database or upload your own spectrum
- store the selected spectrum into the VOTPSpace for further plotting (with VOSPEC or with a local display device) and/or downloading

Through the tab "Synthetic spectra", you will be able to:

- select a range in temperature, metallicity, gravity and microturbulence velocity according to the results of the Vizier's catalogs query
- search the POLLUX database for high resolution synthetic spectra corresponding to these parameters or upload your own spectra
- convolve portions of the selected spectra to transform them into simulated observations
- apply the doppler shift associated to the radial velocity of the star selected in the "Observed Spectra" tab
- store the resulting spectra into the VOTPSpace for further plotting (with VOSPEC or with a local display device) and/or downloading

Please connect to the VO-tool of your choice to further visualize your data

**VO TOOLS**

TOPCAT

VOSpec

Splat VO

VOPlot

Last update : 2013 / 03 / 05

Design : Aurélien Emeras – stagiaire info

# Nouvelle ergonomie à l'étude pour distribution de l'application

**VOSPECFLOW** Home **Observed spectra** **Synthetic spectra** **CART**

**Search for stellar parameters**

Star ID:

Catalog:

**Results of request**

**Average of stellar parameters**

Temperature	Gravity	Velocity
8829.83	3.94	2.0

**Source**   **Temperature**   **Gravity**   **Velocity**

<input checked="" type="checkbox"/> I/34	9790	4.1	None
<input checked="" type="checkbox"/> I/40	0.53	4.0	2.0

**Search for observed spectra**

**From local disk**

**From a database**

RA:    DEC:

**Results of request**

- vega\_narval\_04jul09\_pol\_Fast\_V\_01\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_02\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_03\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_04\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_05\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_06\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_07\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_08\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_09\_tbl.fts
- vega\_narval\_04jul09\_pol\_Fast\_V\_10\_tbl.fts

Last update : 2013 / 03 / 05

**VO TOOLS**

- 
- 
- 
- 

Design : Aurélien Emeras – stagiaire info



# Nouvelle ergonomie à l'étude pour distribution de l'application

**VOSPECFLOW**

Observed spectra Synthetic spectra

Search for synthetic spectra

Convolutions of choosen synthetic spectras

NORMFLUX\_A\_p10000g5.0z-1.0t2.0\_a0.00c0.00n0.00o0.00

Central wavelength  A

Wavelength width  A

	Value	Unit	Function
Macroturbulence velocity	<input type="text"/>	km/s	radial tangent
Rotational velocity	<input type="text"/>	km/s	rotational
Instrumental profile	<input type="text"/>	mÅ	Gaussian
<b>Radial velocity</b>	<input type="text"/>	km/s	

Output file format

Process

RESET

Results of request

Results of request

CONV\_T2\_L8525\_A.p8000g4.0z-1.0t2.0\_a0.00c0.00n0.00o0.00

CART

VO TOOLS

TOPCAT

VOSpec

Splat VO

VOPlot

Last update : 2013 / 03 / 05

Ajout du décalage en vitesse radiale

# Nouvelle ergonomie à l'étude pour distribution de l'application

The screenshot displays the VOSPECFLOW application interface. At the top, there are navigation tabs for 'Observed spectra' and 'Synthetic spectra'. A central 'CART' window lists four files with checkboxes: 'vega\_narval\_04jul09\_pol\_Fast\_V\_03\_tbl.fits' (checked), 'NORMFLUX\_A\_p10000g3.5z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.s0.00\_VIS.spec.FITS' (unchecked), 'NORMFLUX\_A\_p10000g4.5z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS' (checked), and 'CONV\_T2\_L8525\_A.p8000g4.0z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS' (checked). To the right, a 'CART' sidebar features a shopping cart icon and a 'DRAG DROP' instruction. Below this is a 'VO TOOLS' section with buttons for 'TOPCAT', 'VOSpec', 'Splat VO', and 'VOPlot'. At the bottom of the cart window, three icons are visible: a monitor (green), a plot (orange), and a download arrow (blue). A red text overlay 'Broadcast, display ou download depuis le panier' has three arrows pointing to these icons. The footer shows 'Last update : 2013 / 03 / 05'.

VOSPECFLOW

Observed spectra Synthetic spectra

CART

DRAG DROP

VO TOOLS

TOPCAT

VOSpec

Splat VO

VOPlot

vega\_narval\_04jul09\_pol\_Fast\_V\_03\_tbl.fits

NORMFLUX\_A\_p10000g3.5z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.s0.00\_VIS.spec.FITS

NORMFLUX\_A\_p10000g4.5z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS

CONV\_T2\_L8525\_A.p8000g4.0z-1.0t2.0\_a0.00c0.00n0.00o0.00r0.00s0.00\_VIS.spec.FITS

Broadcast, display ou download depuis le panier

Last update : 2013 / 03 / 05