Simulated Observations
Synergy btw TBL Legacy – POLLUX

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

LEVEL 0

USER LAYER

USERS

COMPUTERS

FINDING

FRAMEWORK CLIENT

LOGICIEL OV

SAMP

UCD

UTYPES

VOTABLE

VO CORE

GETTING

VO TABLE EXCHANGES

INTERNAL EXCHANGES (html,xml,csv)

HTML, PHP, JAVASCRIPT

PYTHON (PYFITS)

RESOURCES LAYER

STORAGE

FRAMEWORK SERVEUR

BIBLIOTHEQUE OV

CONNECTION

SPECTRUMDM

PROVIDERS

IVOA ARCHITECTURE

201001004
HD 232862

Spectral type G8II
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, ...)
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 TB Legacy database or upload your own spectrum
- store the selected spectrum into the VOTSPACE 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 VOTSPACE 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.

collection to a hub using SAMPJS
1. Query for observations using \textit{vizquery}

Retrieve data from Simbad and Vizier from object name and table query
1. Query for observations

Details on the data retrieved from Vizier: possibility to choose the sources to compute mean.
2. Query for data in telescope archive

Position from Simbad used to search in TBLLegacy. Selected spectrum stored in basket.
3. Query for data in the POLLUX database

Mean from Vizier used to query the theoretical database.
Selected spectrum stored in basket
4. Convolve a portion of the theoretical spectrum

Convolution parameters and radial velocity correction applied to a portion of the synthetic spectrum.

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

Checkboxes to select data to be visualized / retrieved
5. Visualize / download the data stored in the basket

Possibility to visualize in situ, send to a VO application, download (csv) (votable) (fits)
6. Quicklook using in situ tool

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 Li-rich!

This star is active!
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 (vsini, Teff, 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 Teff 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

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

Design : Aurélien Emeras – stagiaire info
Nouvelle ergonomie à l'étude pour distribution de l'application

Ajout du décalage en vitesse radiale

Design : Aurélien Emeras – stagiaire  info
Nouvelle ergonomie à l'étude pour distribution de l'application

Broadcast, display ou download depuis le panier

Design : Aurélien Emeras – stagiaire  info