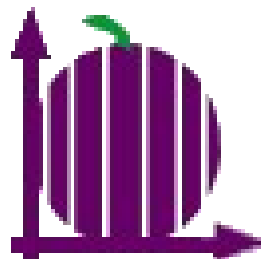


CASSIS functionalities and evolution plan



Jean-Michel Glorian & co

Summary

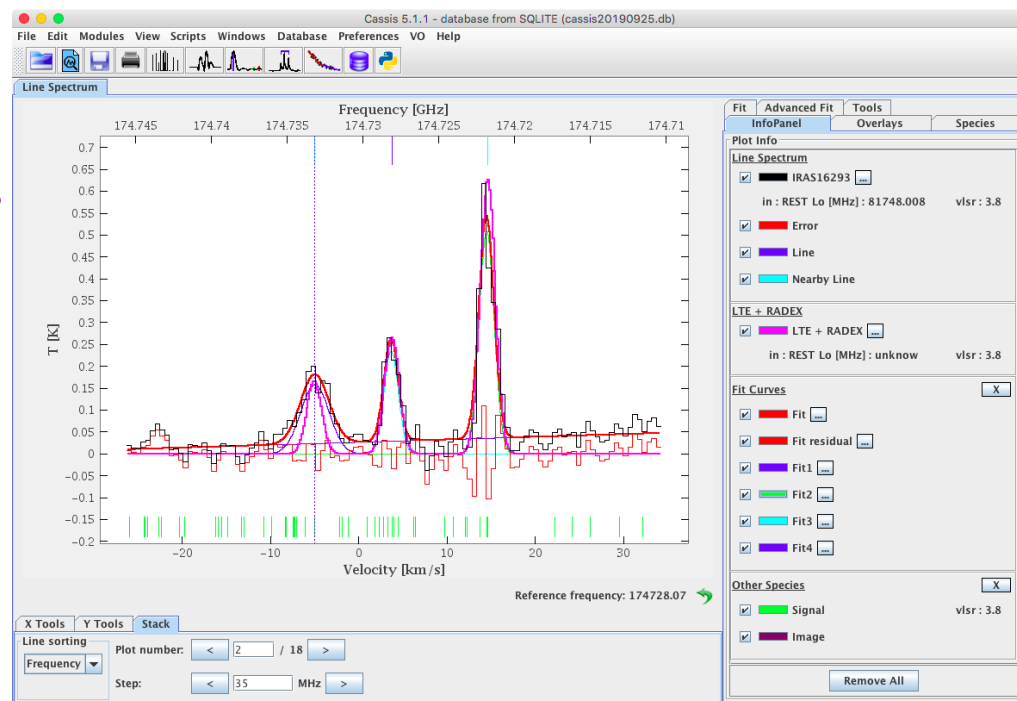
- General presentation
- Tools for spectra
- VO functionalities
- SLAP V2 client implementation :
use case with CASSIS
- What is planned for the future version
- Links

- Tool to access, read, visualize, treat and analyze electromagnetic spectra using chemical species, models and other synthetic or observed spectra

Example of the line analysis tool:
inspecting CCH lines in the



- * observed spectrum from IRAM telescope (black)
- * overlaid with an LTE model (pink)
- * overlaid with a fitting curve with 3 gaussians (red)
- * with other species possible lines (green)



- CASSIS is part of the french structure OVGSO (Great South Western Virtual Observatory)
- Several ways to run it
 - On the fly
 - <http://cassis.irap.omp.eu/online/cassis.jnlp>
 - Via an installer
<http://cassis.irap.omp.eu/download/installCassis.jnlp>
 - Download the tar.gz file and run the jar file by script shell or batch
<http://cassis.irap.omp.eu/?page=installation>
- Regular update every 2 to 6 months normally but
 - Previous version 5,0 : July 2017
 - Last version 5.1,1 : October 2019

=> We are back



▪ Tools

- Addition, subtraction, division, multiplication, average, resample, smooth, apply red shift, change vlsr

▪ Fit

- Fitting Multiple Gaussian, Lorentzian, Voigth, sinus cardianal, polynomial ... profile,

▪ Advanced Fit :

- A Fit module with constraints such as fixing the offset between the positions of the Gaussian peaks

If you need more tools, let me know ...

VO functionalities

- SAMP to exchange with other VO applications
- SSAP, EPN-TAP to retrieve spectra
- Datalink Prototype with SSA result
- Line identification
 - VAMDC with citation using the query store
 - SLAP
 - **SLAPv2 prototype**

- SAMP Connection taking into account all the SAMP metadata

TOPCAT(1): Activation Actions

Window Actions Help

Activation Actions for 1: M31-RCSED_SSAP

Actions

- Send Sky Coordinate
- Display image
- Display image region
- Load Table
- Plot Table
- Send FITS Image
- Send Spectrum
- Display Cutout Image
- Download URL

Description

Send the content of a file or URL column as a Spectrum to an external application using SAMP

Configuration

Spectrum Location:

Spectrum Viewer:

Status

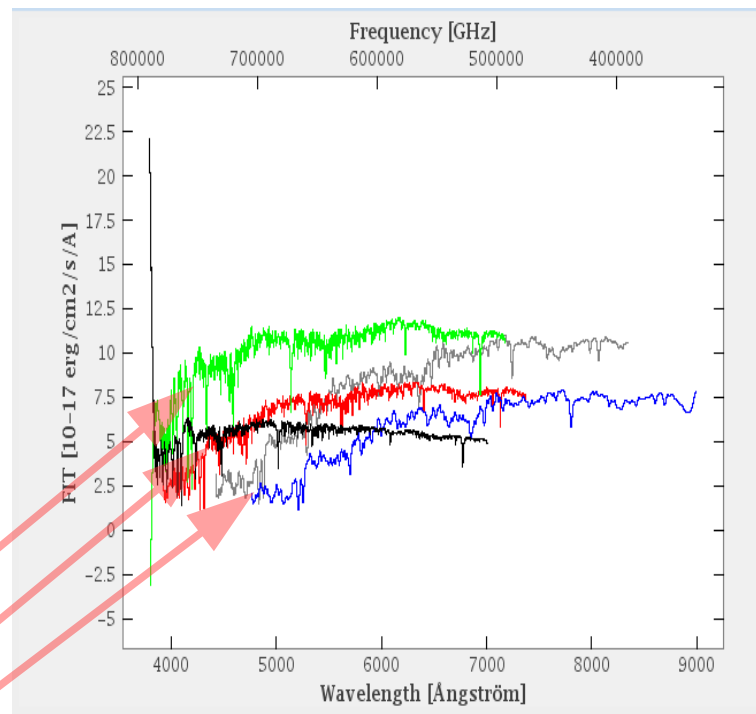
TOPCAT(1): Table Browser

Window Rows Help

Table Browser for 1: M31-RCSED_SSAP

	ssa_specstart	ssa_specend	ssa_le...	fluxaxis	spectralsi	fluxsi
1	3,80000E-7	8,00000E-7	2	FIT	1E-10 L	1E-10 MT-3L-1
2	3,80000E-7	8,00000E-7	2	FIT	1E-10 L	1E-10 MT-3L-1
3	3,80000E-7	8,00000E-7	2	FIT	1E-10 L	1E-10 MT-3L-1
4	3,80000E-7	8,00000E-7	2	FIT	1E-10 L	1E-10 MT-3L-1
5	3,80000E-7	8,00000E-7	2	FIT	1E-10 L	1E-10 MT-3L-1

Total: 10 000 Visible: 10 000 Selected: 1



- Developed on VESPA project
- Target name resolution with Quaero API from IMCCE

EPN-TAP

short_name	res_title
GCP TAP	PVOL EPN-TAP TAP service
IAA and CAB TAP	Cross section values TAP service
IKS	IR spectroscopy of comet Halley
ILLU67P	Illumination maps of 67P
LATMOS TAP	SPICAM TAP service
LMD TAP	MCD TAP service
M4AST	M4AST - Modeling for Asteroids
MagnetodiscRoR	Magnetodisc Run on Request
PADC TAP Maser	PADC TAP Server on voparis-tap-maser.obspm.fr TAP ser
PADC TAP V0Event	PADC TAP Server on voparis-tap-v0event.obspm.fr TAP se

Service URL Table name

Query parameters

Target name

Time min max

Spectral range

Dataproduct type

Query for the selected service(s)

```
SELECT TOP 20 * FROM #tablename# WHERE target_name LIKE 'Jupiter' AND (dataproduct_type LIKE 'spectrum' OR dataproduct_type LIKE 'sp')
```

Send query

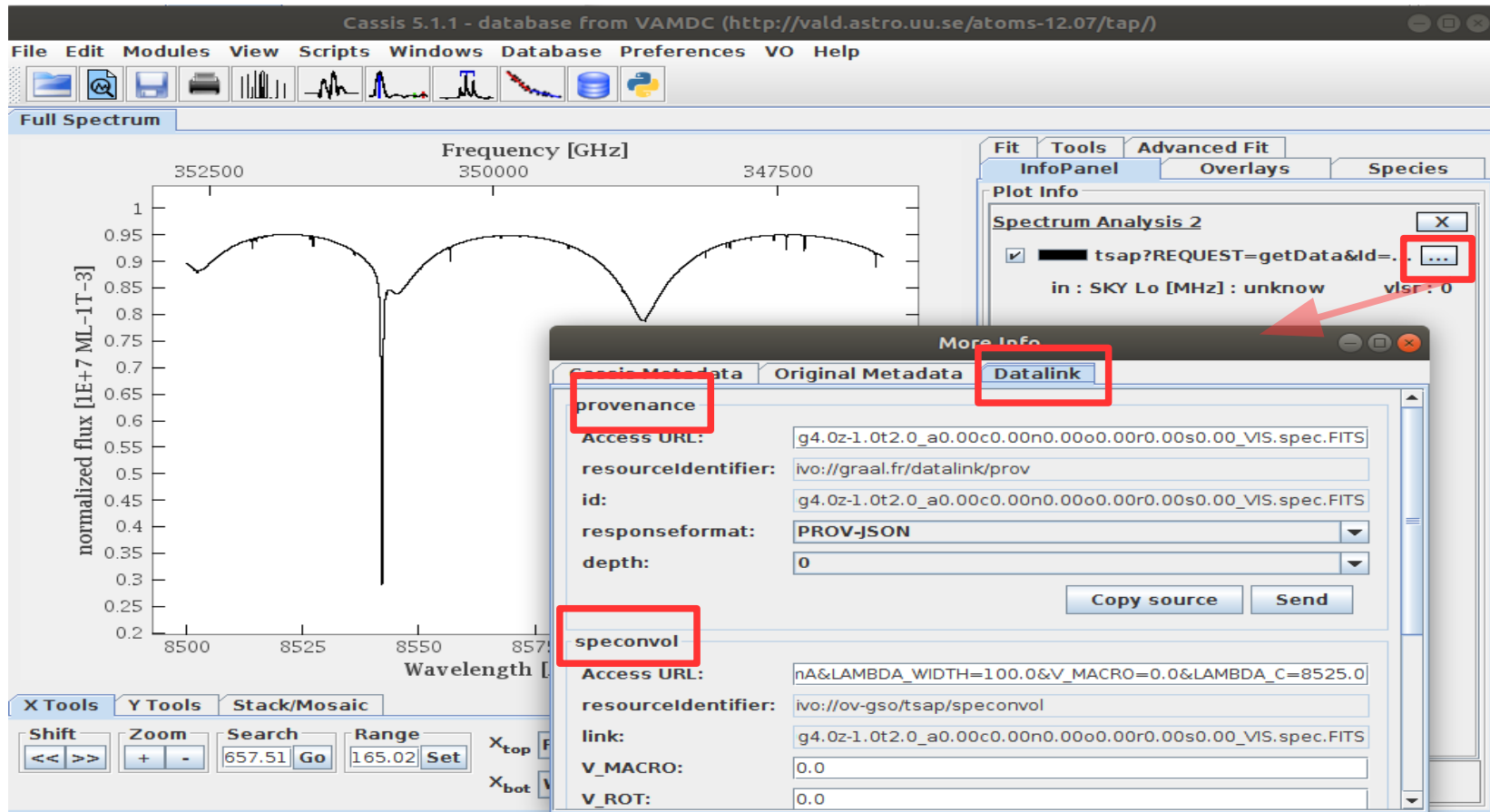
iks
m4ast
apis

granule_uid	file_name	granule_gid	obs_id	dataproduct_type	target_name	target_cl...	time_mi
o5h9020o0_proc	o5h9020o0_proc.fits	processed_data	o5h9020o0	sp	Io	satellite	2451436.3332
objy03090_1D	objy03090_1D.fits	1D_spectra	objy03090	sp	Ganymede	satellite	2455520.5926
ocbui1020_proc_pdf	ocbui1020_proc.pdf	processed_data	ocbui1020	sp	Ganymede	satellite	2456681.4249
o5h902040_x2d	o5h902040_x2d.fits	original_data	o5h902040	sp	Io	satellite	2451436.2450
o5h9020e0_proc_pdf	o5h9020e0_proc.pdf	processed_data	o5h9020e0	sp	Io	satellite	2451436.3074
o4xm01080_1D_pdf	o4xm01080_1D.pdf	1D_spectra	o4xm01080	sp	Io	satellite	2451049.3851
ocjpl1030_proc_pdf	ocjpl1030_proc.pdf	processed_data	ocjpl1030	sp	Europa	satellite	2457076.0806

VOTable data parsed

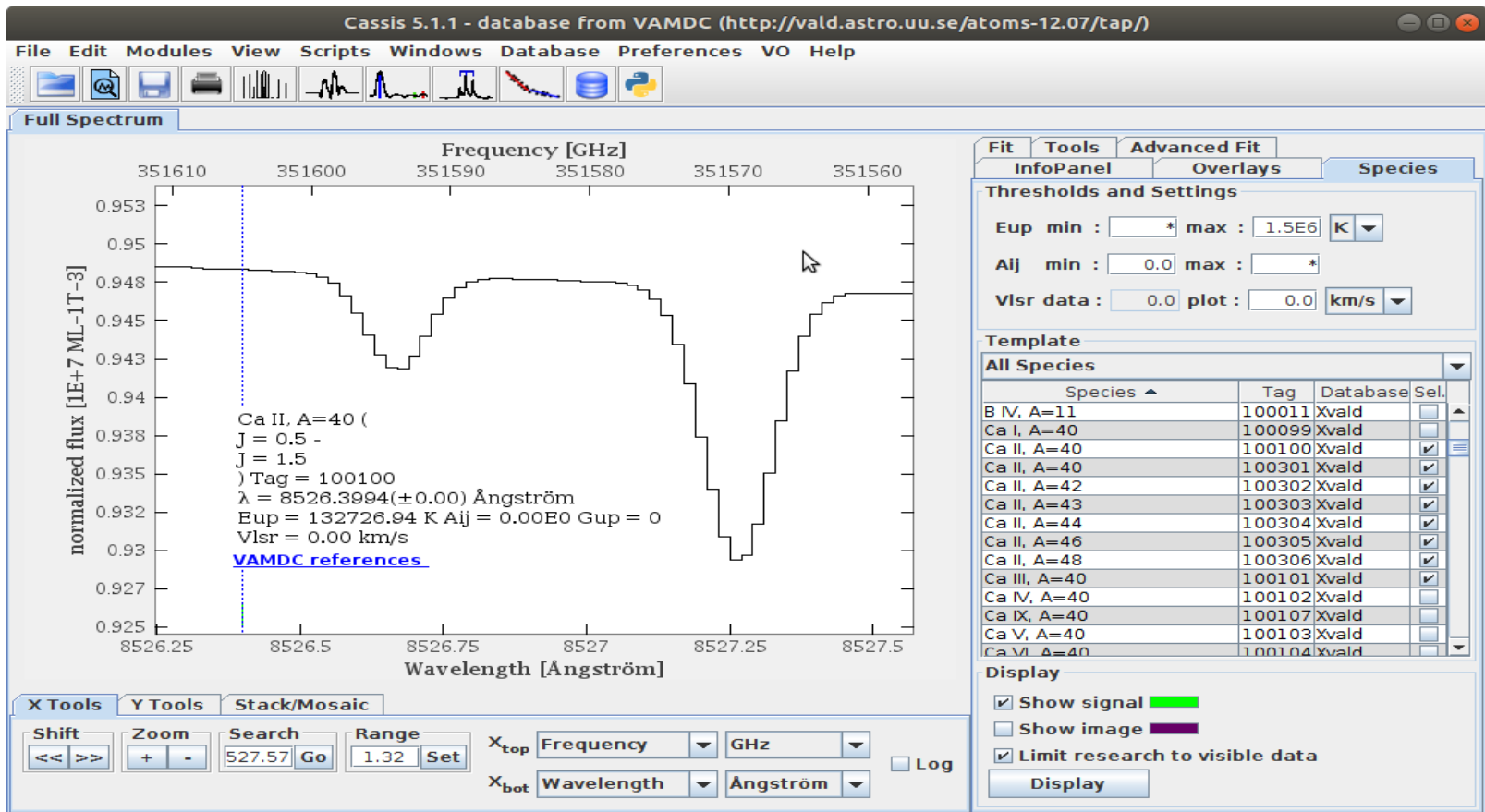
Download...
Display...
Open result

- Collaboration with the Pollux service (Michèle Sanguillon) to compute a convolution or get the provenance on spectra



VAMDC client

- Interrogate the atomic VALD database with the VAMDC protocol
- Interrogate the query store of VAMDC to obtain a link to the references of the lines and the DOI



SLAP V2 client implementation : use case with CASSIS

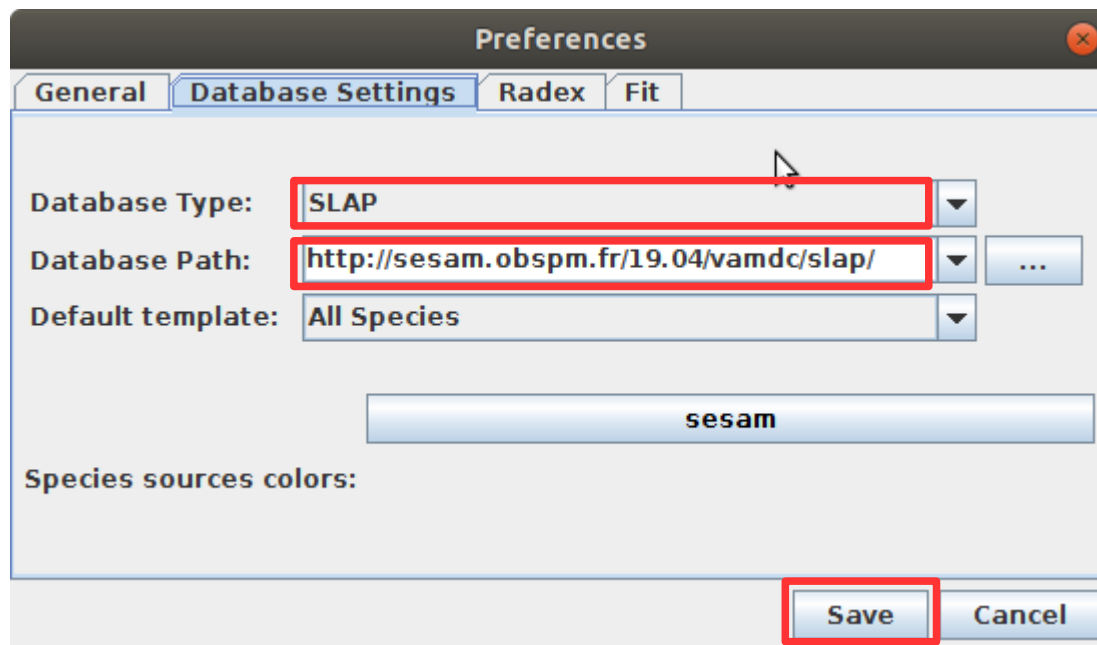
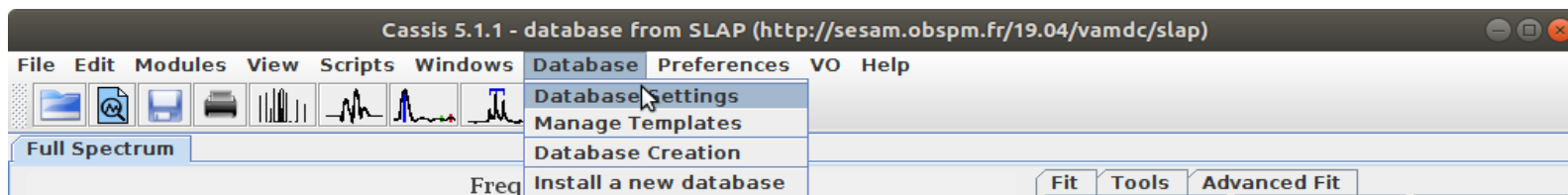
- Collaboration with
 - Nicolas Moreau, Franck Lepetit, Evelyne Roueff
 - Based on article THE ASTROPHYSICAL JOURNAL, 555 : 839-849, 2001 July 10
- Prototype using a service implemented by Nicolas Moreau using SLAP v2 : SESAM
 - SpEctroScopy of Atoms and Molecules
 - Dedicated to electronic spectra
 - <http://sesam.obspm.fr/19.04/vamdc/slap>

SLAP V2 client implementation : use case with CASSIS

- Select the SESAM service
- Get and display a FUSE spectrum
- Zoom on range 1073 to 1082 Angstrom
- Display the lines of Di hydrogen
- Filter the lines
- Customize the display of the line

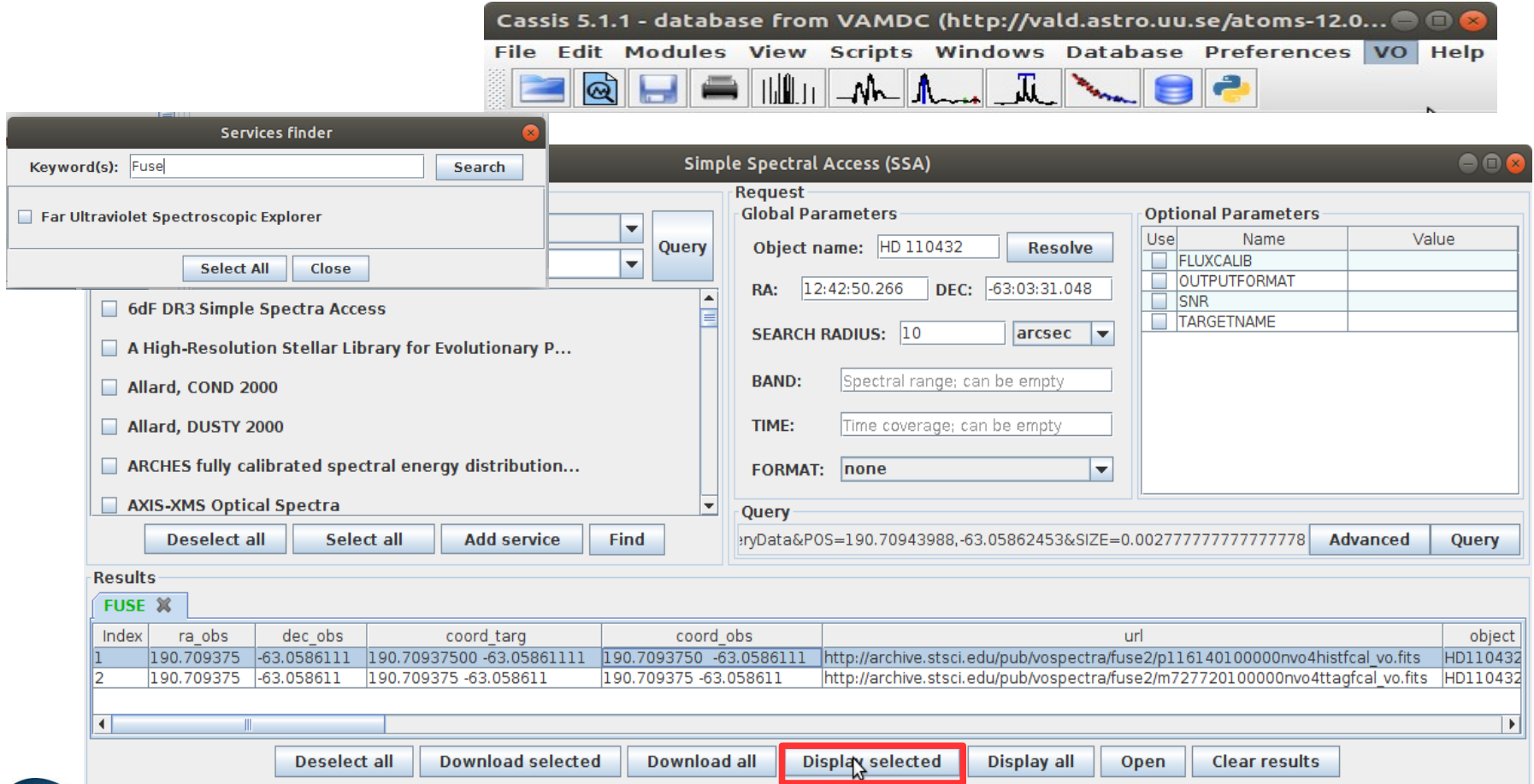
SLAP V2 client implementation : use case with CASSIS

- Select the SESAM service implementing SLAPv2 (not yet in the registry)



SLAP V2 client implementation : use case with CASSIS

- Get and display a FUSE spectrum from SSAP with Target HD 110432



Cassis 5.1.1 - database from VAMDC (http://vald.astro.uu.se/atoms-12.0...)

File Edit Modules View Scripts Windows Database Preferences VO Help

Services finder

Keyword(s): Fuse Search

Far Ultraviolet Spectroscopic Explorer

Select All Close

Simple Spectral Access (SSA)

Request

Global Parameters

Object name: HD 110432 Resolve

RA: 12:42:50.266 DEC: -63:03:31.048

SEARCH RADIUS: 10 arcsec

BAND: Spectral range; can be empty

TIME: Time coverage; can be empty

FORMAT: none

Optional Parameters

Use	Name	Value
<input type="checkbox"/>	FLUXCALIB	
<input type="checkbox"/>	OUTPUTFORMAT	
<input type="checkbox"/>	SNR	
<input type="checkbox"/>	TARGETNAME	

Query

aryData&POS=190.70943988,-63.05862453&SIZE=0.0027777777777777778 Advanced Query

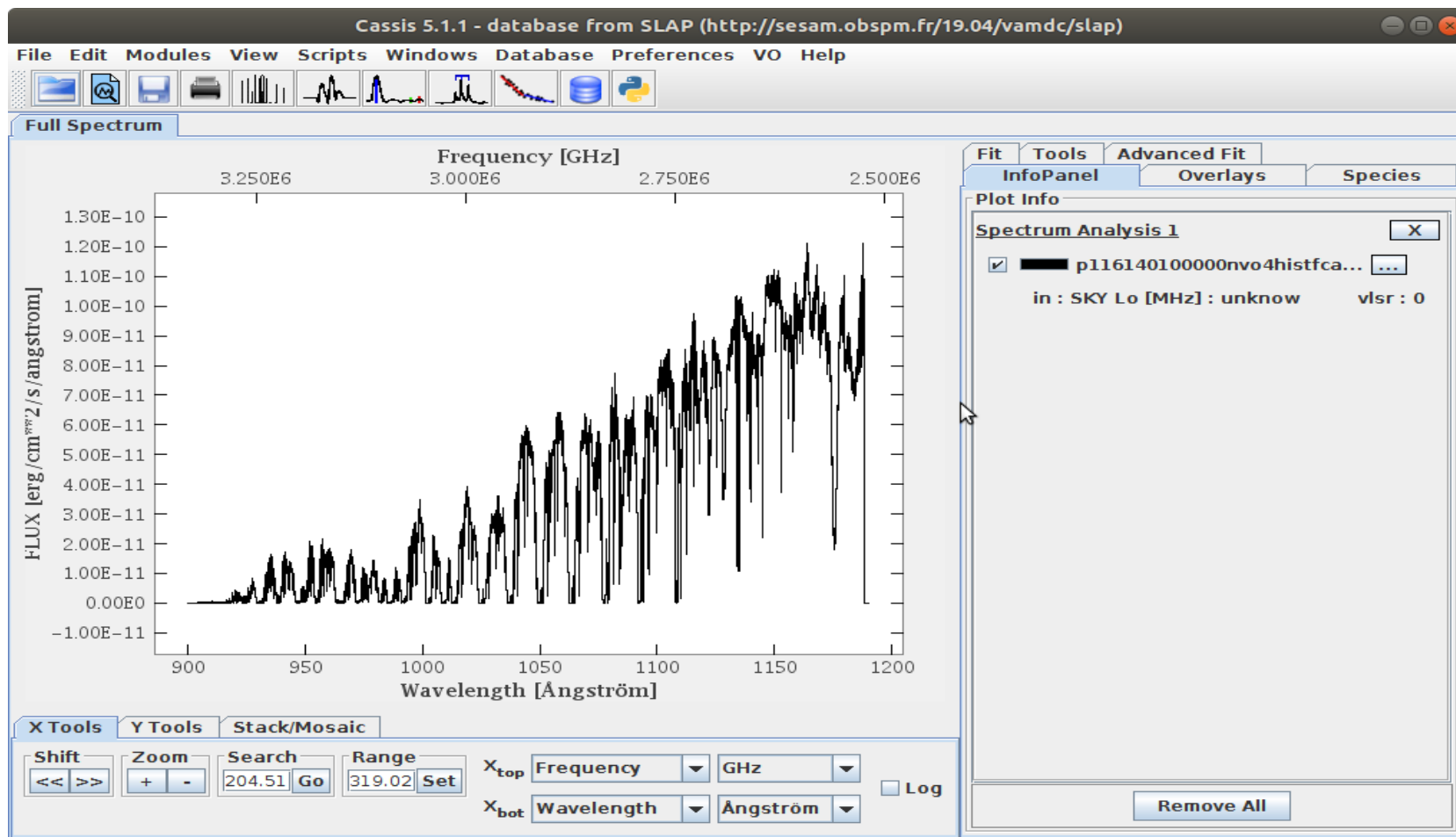
Results

FUSE X

Index	ra_obs	dec_obs	coord_targ	coord_obs	url	object
1	190.709375	-63.0586111	190.70937500 -63.05861111	190.7093750 -63.0586111	http://archive.stsci.edu/pub/vospectra/fuse2/p11614010000nvo4histfcal_vo.fits	HD110432
2	190.709375	-63.058611	190.709375 -63.058611	190.709375 -63.058611	http://archive.stsci.edu/pub/vospectra/fuse2/m72772010000nvo4tagfcal_vo.fits	HD110432

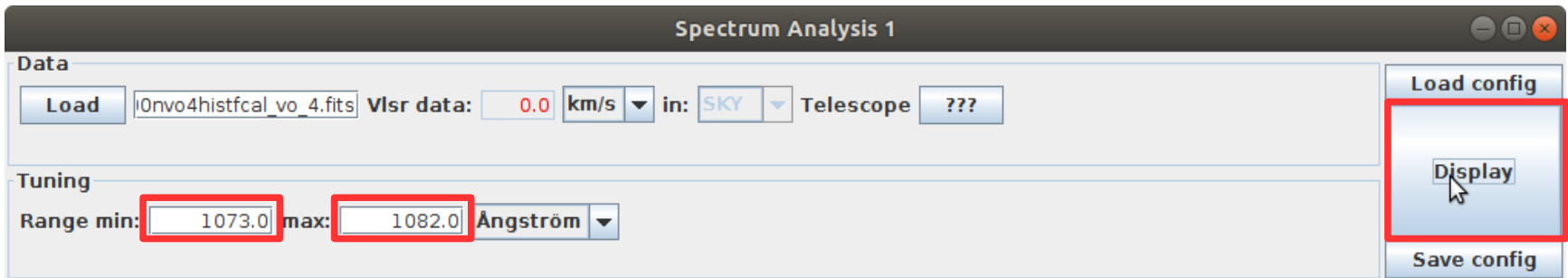
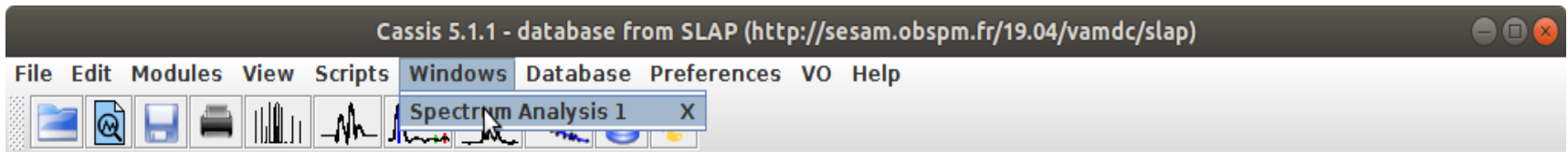
Deselect all Download selected Download all Display selected Display all Open Clear results

SLAP V2 client implementation : use case with CASSIS

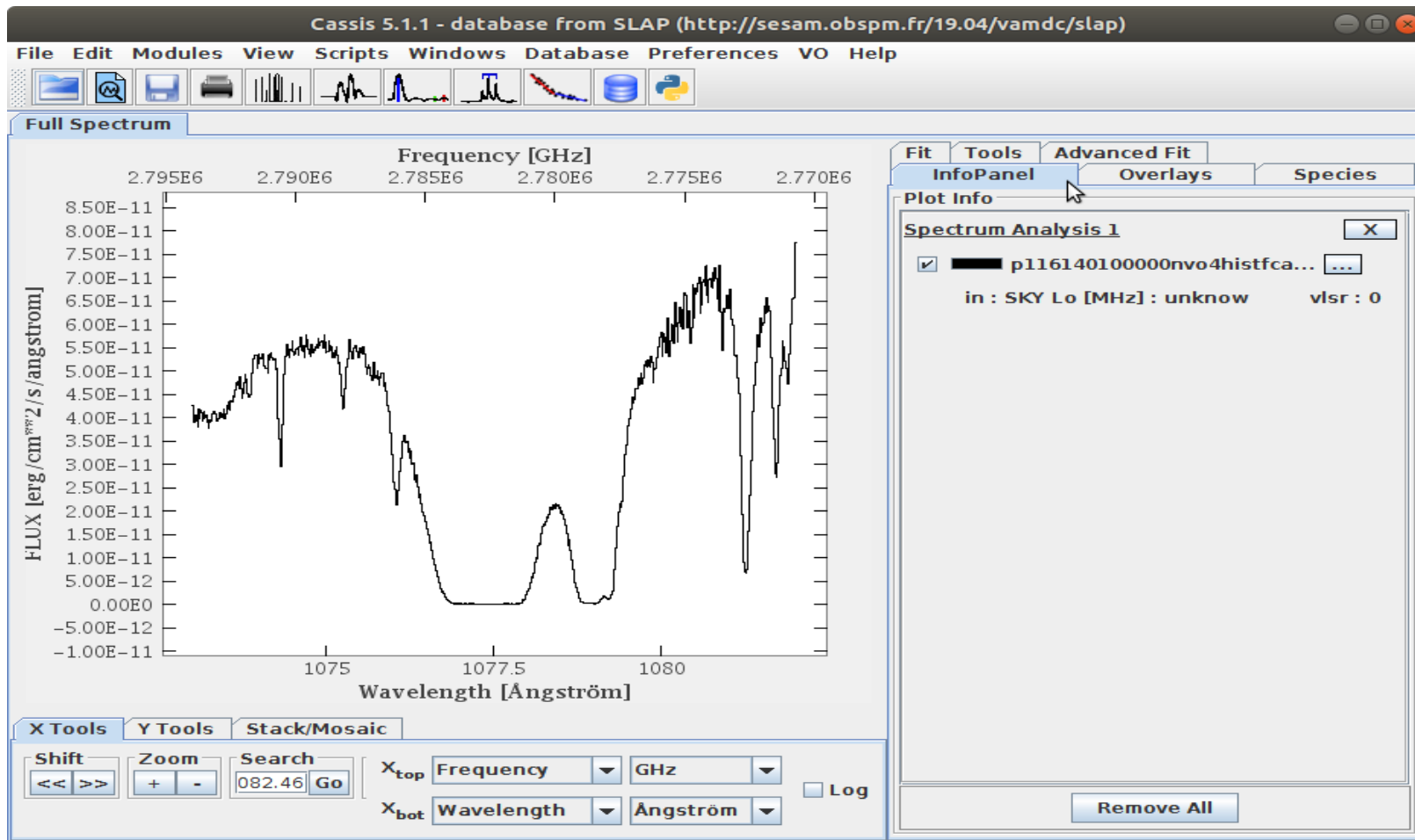


SLAP V2 client implementation : use case with CASSIS

- Zoom on range 1073 to 1082 Angstrom

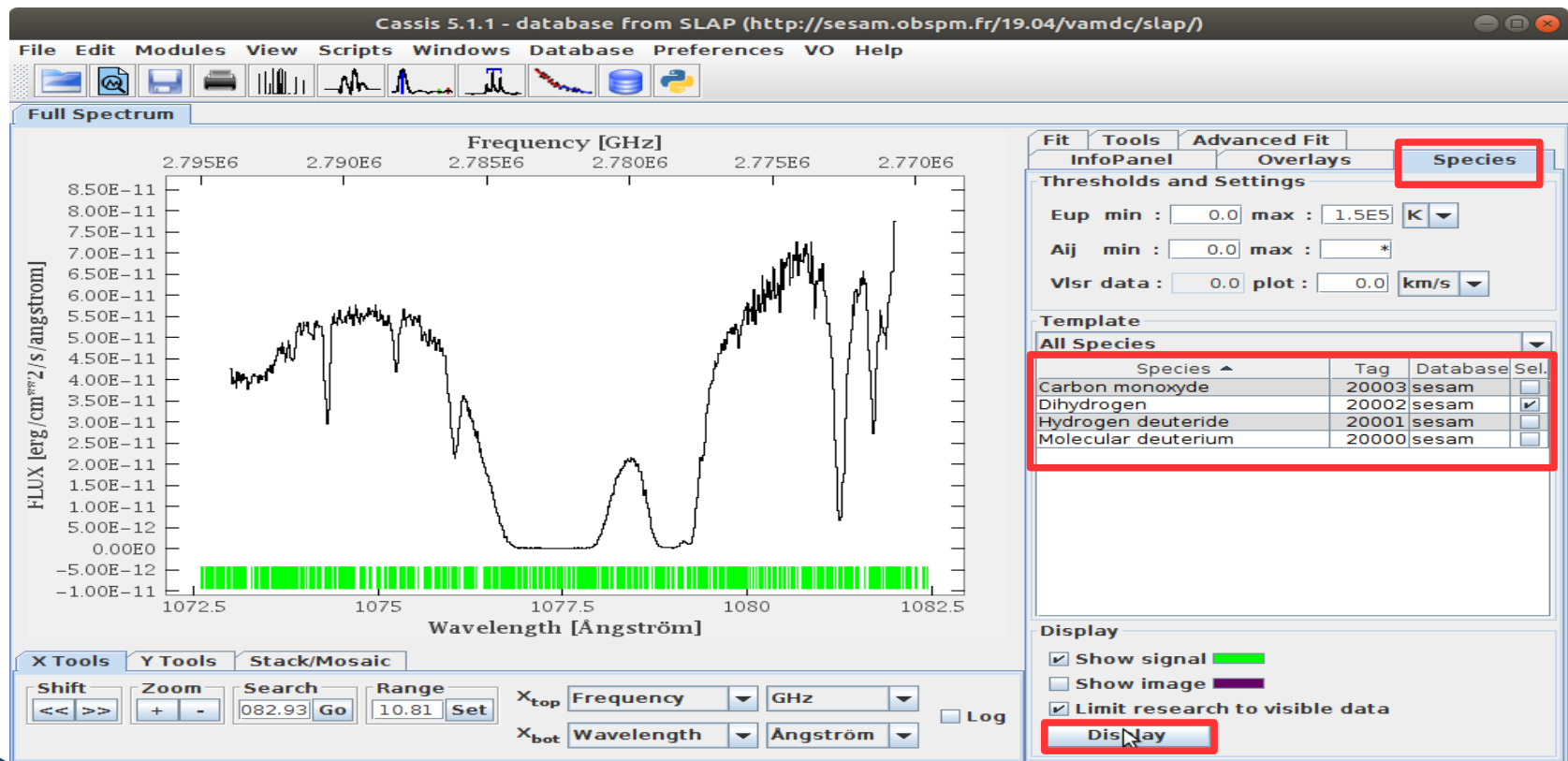


SLAP V2 client implementation : use case with CASSIS



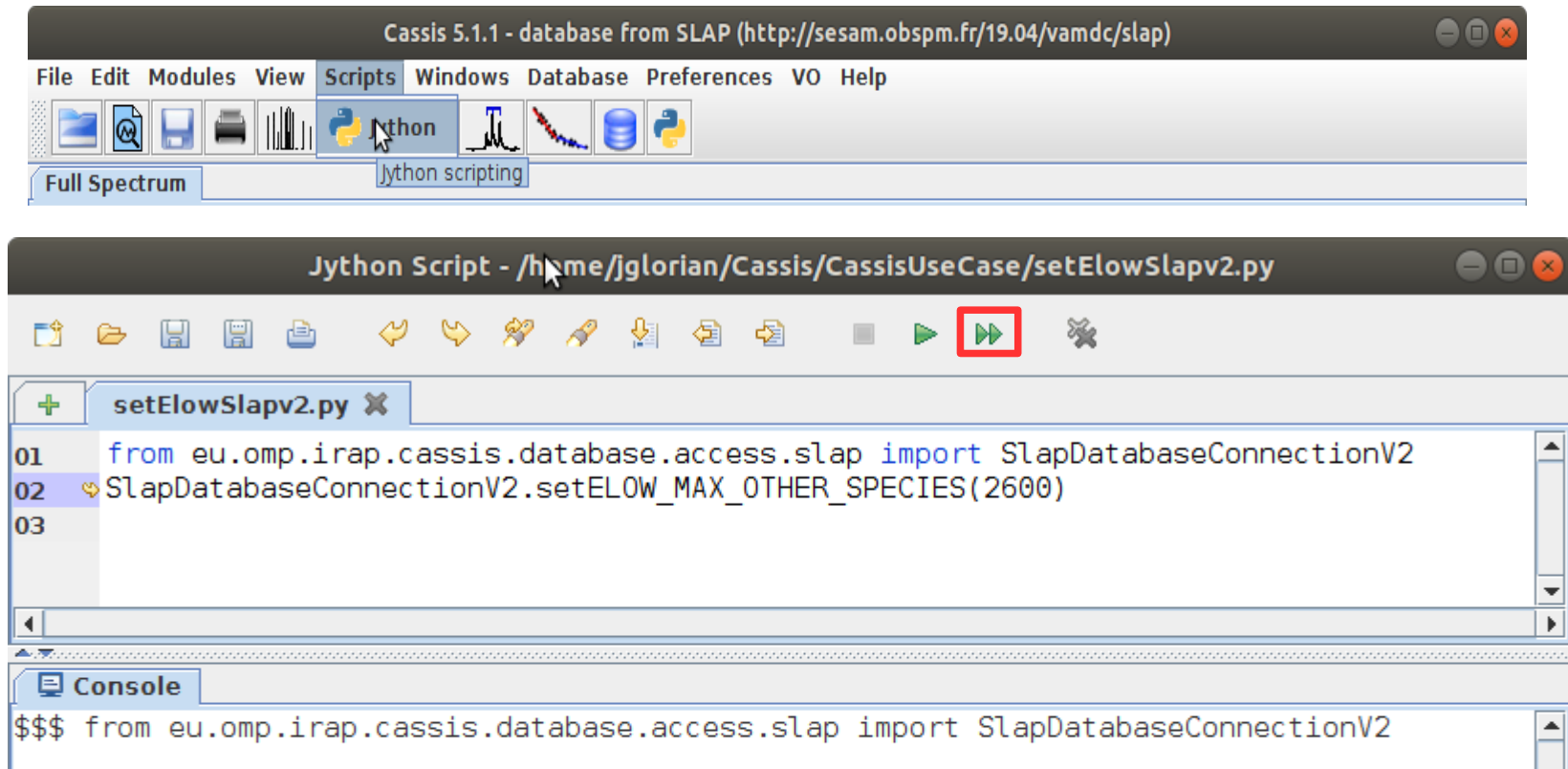
SLAP V2 client implementation : use case with CASSIS

- Click on specie DiHydrogen from the list of species retrieved with SLAPv2 protocol in the Species CASSIS tab to display the line



SLAP V2 client implementation : use case with CASSIS

- Filter the line changing the max low energy of lines with the jython module of CASSIS (prototype version)



The image shows two overlapping windows from the CASSIS 5.1.1 software. The top window is titled "Cassis 5.1.1 - database from SLAP (http://sesam.obspm.fr/19.04/vamdc/slap)" and has a menu bar with "File", "Edit", "Modules", "View", "Scripts", "Windows", "Database", "Preferences", "VO", and "Help". The "Scripts" menu is open, showing a "Jython" option. The bottom window is titled "Jython Script - /home/jglorian/Cassis/CassisUseCase/setElowSlapv2.py" and shows a code editor with the following Python code:

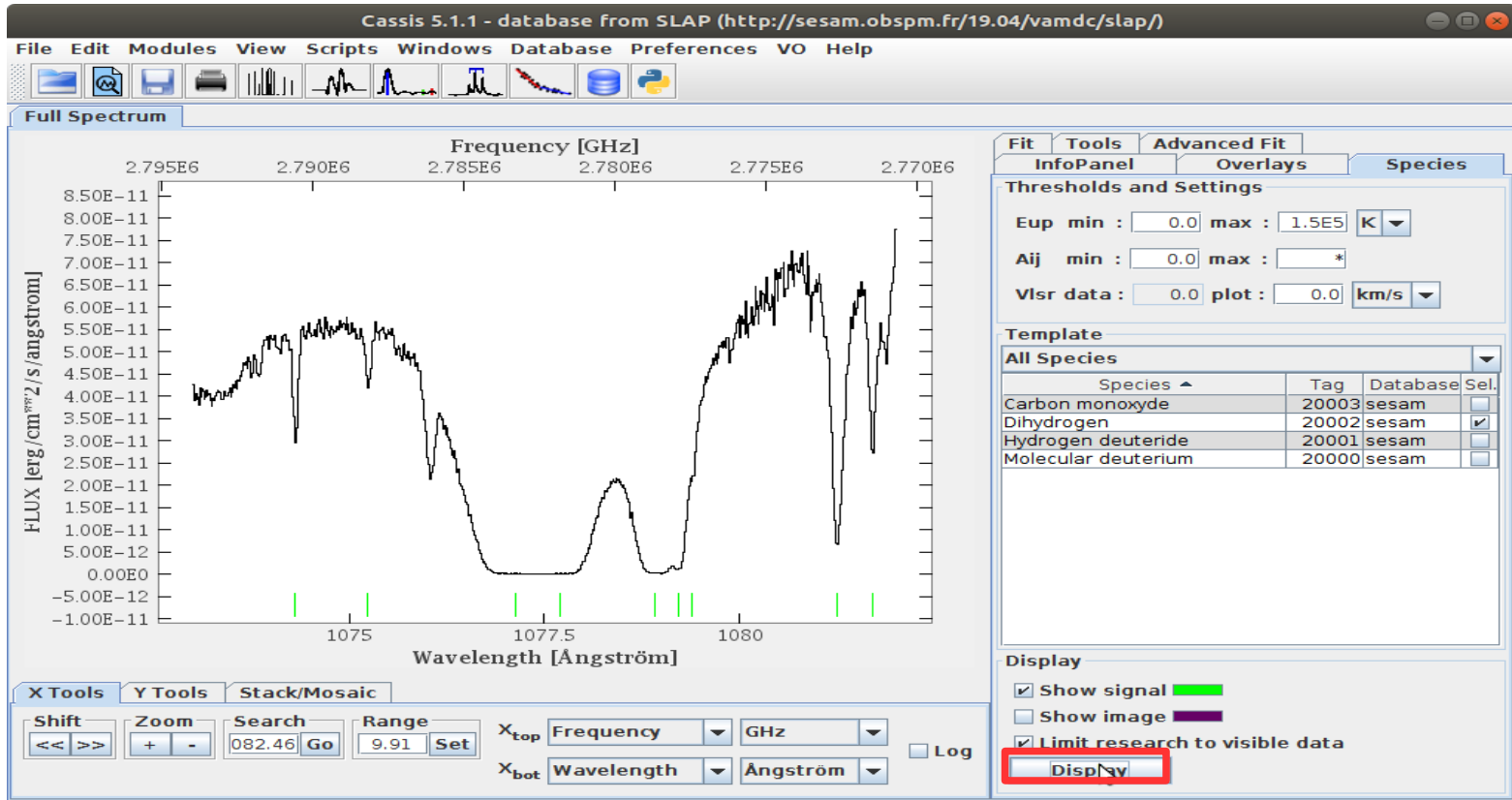
```
01 from eu.omp.irap.cassis.database.access.slap import SlapDatabaseConnectionV2
02 SlapDatabaseConnectionV2.setELOW_MAX_OTHER_SPECIES(2600)
03
```

The code editor has a toolbar with a red box around the "Run" button (a green play icon). Below the code editor is a "Console" window showing the execution output:

```
$$$ from eu.omp.irap.cassis.database.access.slap import SlapDatabaseConnectionV2
```

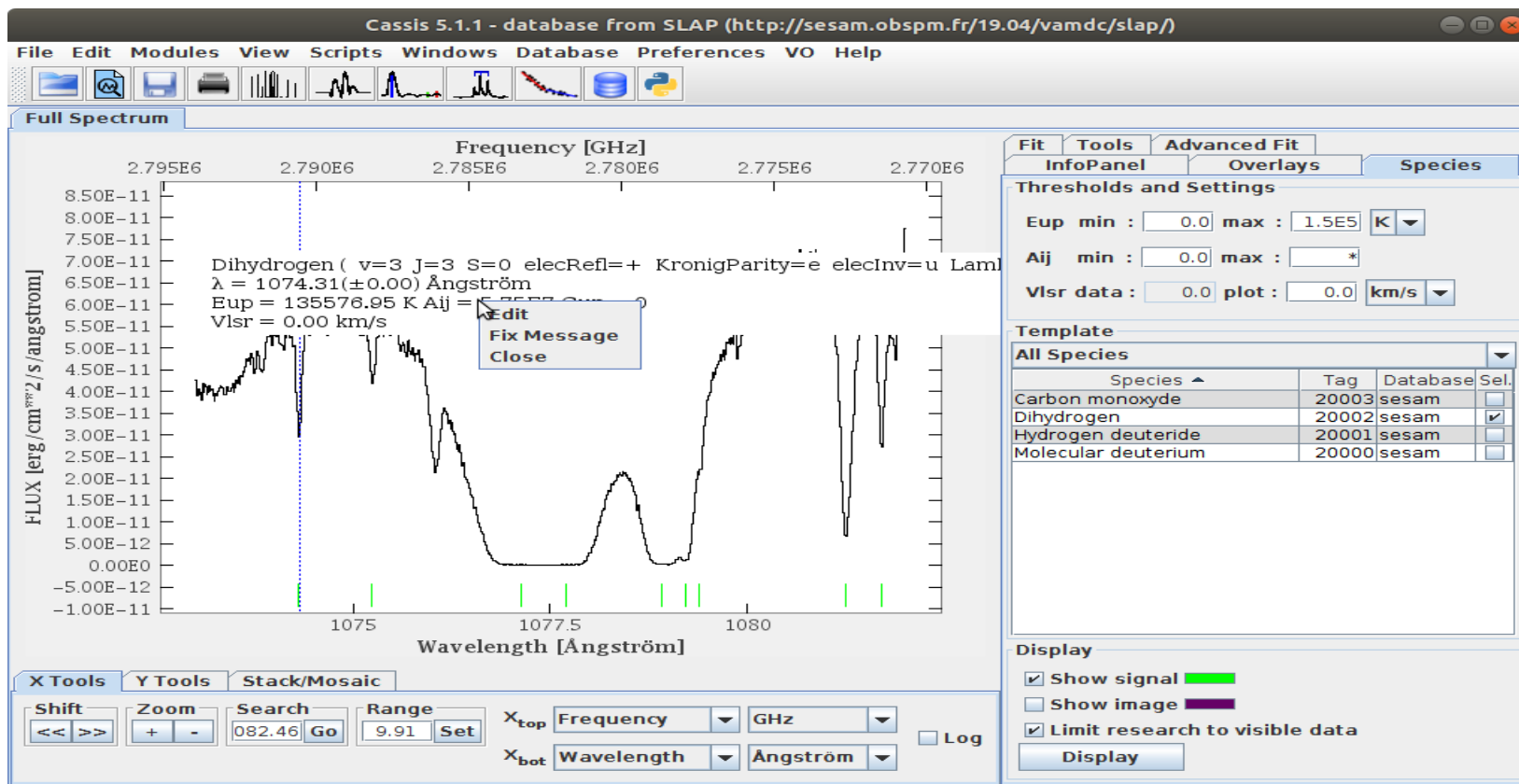
SLAP V2 client implementation : use case with CASSIS

- Click again on Display species button



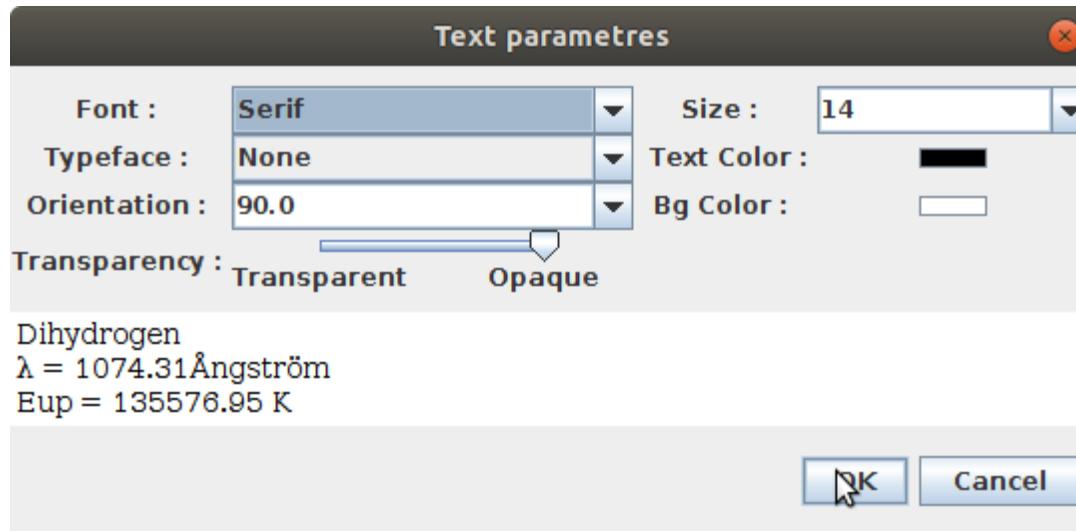
SLAP V2 client implementation : use case with CASSIS

- Click on a green line and right click to edit

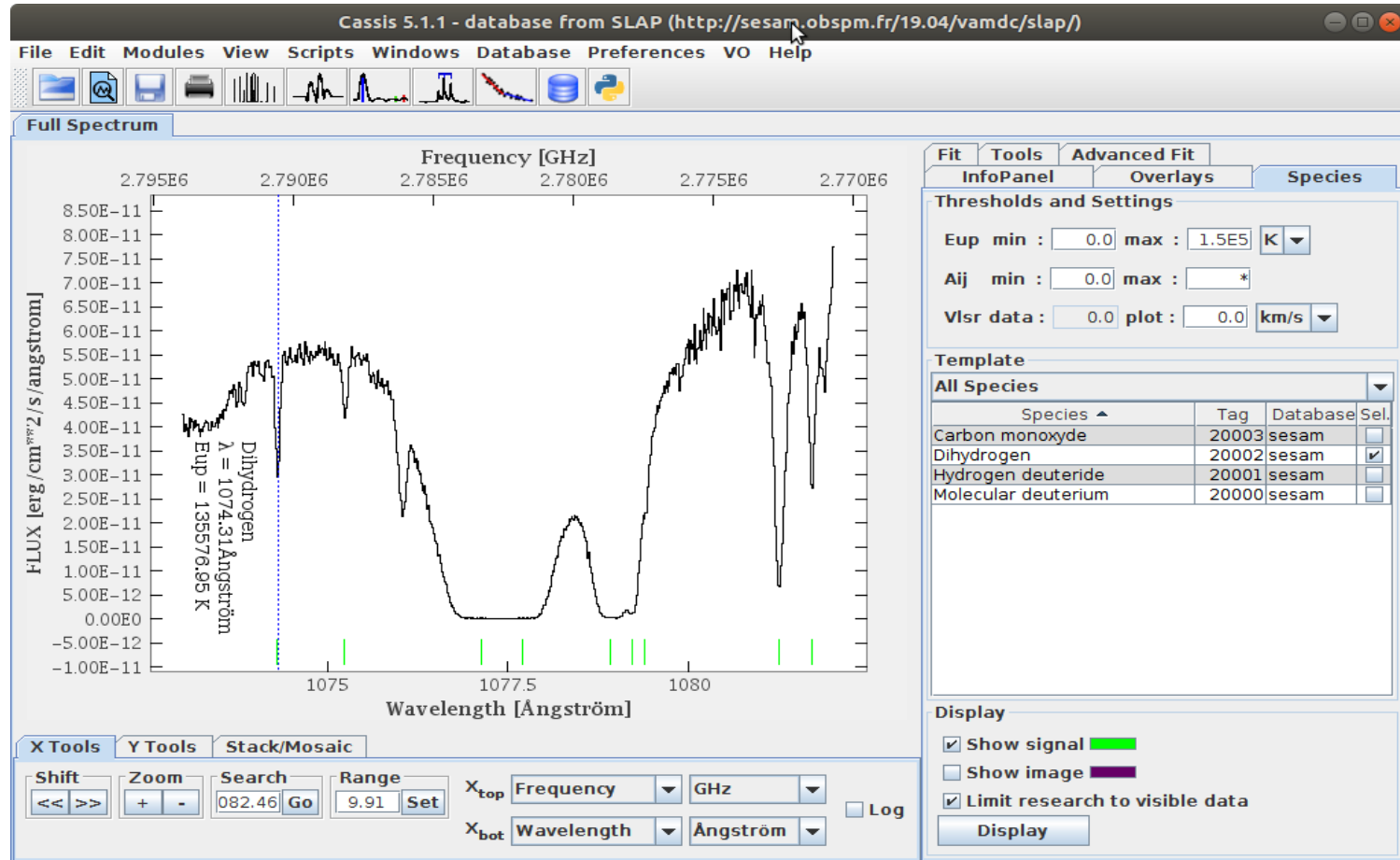


SLAP V2 client implementation : use case with CASSIS

- Customize the display of the line



SLAP V2 client implementation : use case with CASSIS



Improvement on the SLAPv2 client implementation

- Automatically add filters using the capabilities offered by the service
- Possibility to display directly on the plot all the information of all the lines
- Change the default template of lines information
- Add link to the references as VAMDC for the citation (if service provided it)

What is planned for the future version

- Externalize modelization in python
- Development of a SIMDAL access module
 - Collaboration with Franck Le Petit to interrogate the ISM database
- Read more types of files containing spectra
- Interface with new chemical species databases

Links

- CASSIS
<http://cassis.irap.omp.eu>
- OVGSO-DC
<https://ov-gso.irap.omp.eu/>
- POLLUX
<http://pollux.oreme.org>
- IVOA
<http://www.ivoa.net>
- VAMDC
<http://portal.vamdc.org>
- VALD
<http://vald.astro.uu.se/~vald/php/vald.php>
- Topcat
<http://www.star.bris.ac.uk/%7Embt/topcat/>
- VESPA
<http://www.europlanet-vespa.eu/EPN2020.shtml>
- Quaero API
<https://doc.ssodnet.imcce.fr/index.html>
- SESAM
<http://sesam.obspm.fr/>