



CASSIS

Sandrine Bottinelli, Jean-Michel Glorian
on behalf of the CASSIS team

_____ Outline: _____

- CASSIS in a nutshell
- Interoperability in CASSIS
- Technical information

CASSIS is part of the OV-GSO (Observatoire Virtuel du Grand Sud-Ouest : Bordeaux-Toulouse-Montpellier - <http://ov-gso.irap.omp.eu>) : regional center for astrophysical data. Services: CDPP, Bass2000-CDAB, PolarBase, Pollux, KIDA, CASSIS, STORMS.

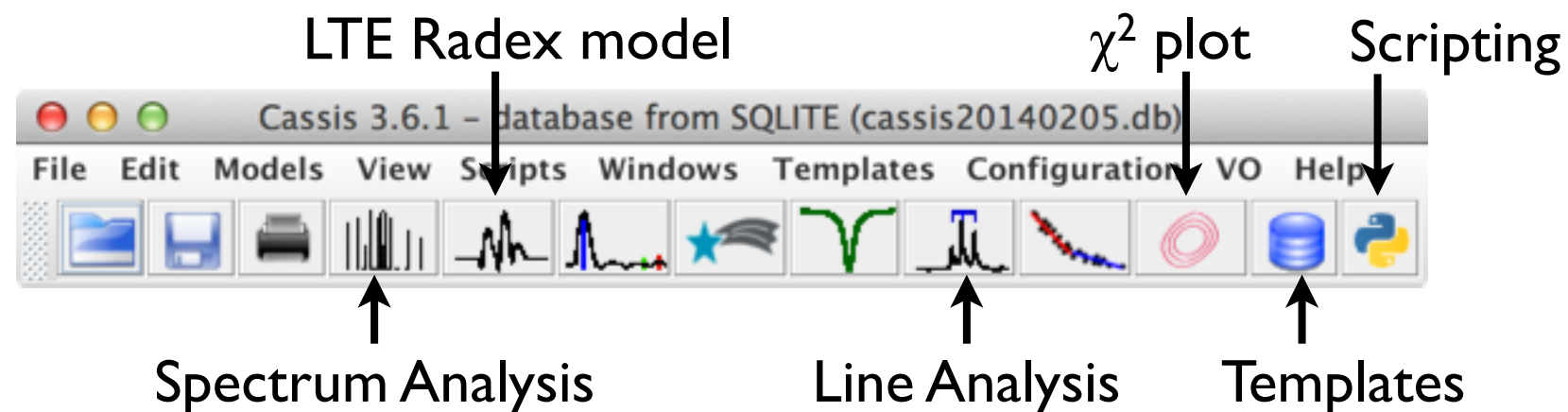


CASSIS

Centre d'Analyse Scientifique de Spectres Instrumentaux et Synthétiques

<http://cassis.irap.omp.eu>

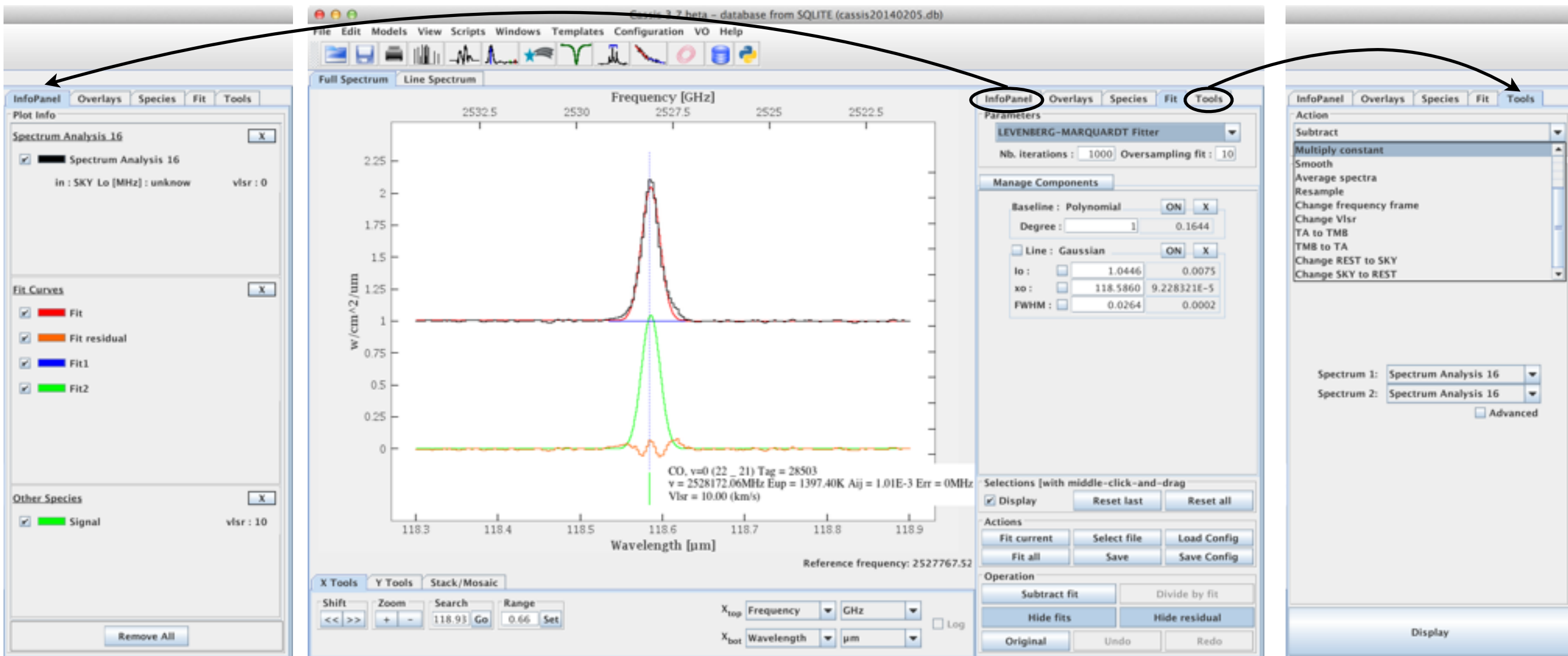
- Free spectrum analysis software developed at IRAP since 2005
- Projects scientists: E. Caux (PI), S. Bottinelli, C. Vastel
- Developers: J.-M. Glorian (Project manager), M. Boiziot, D. Rabois
- Developed in Java
- Features: line identification (large datasets), synthetic spectra, scripting (Jython)
- Interoperability: HIPE (Herschel software) plug-in, SAMP, **SSAP**, **VAMDC**





Why CASSIS?

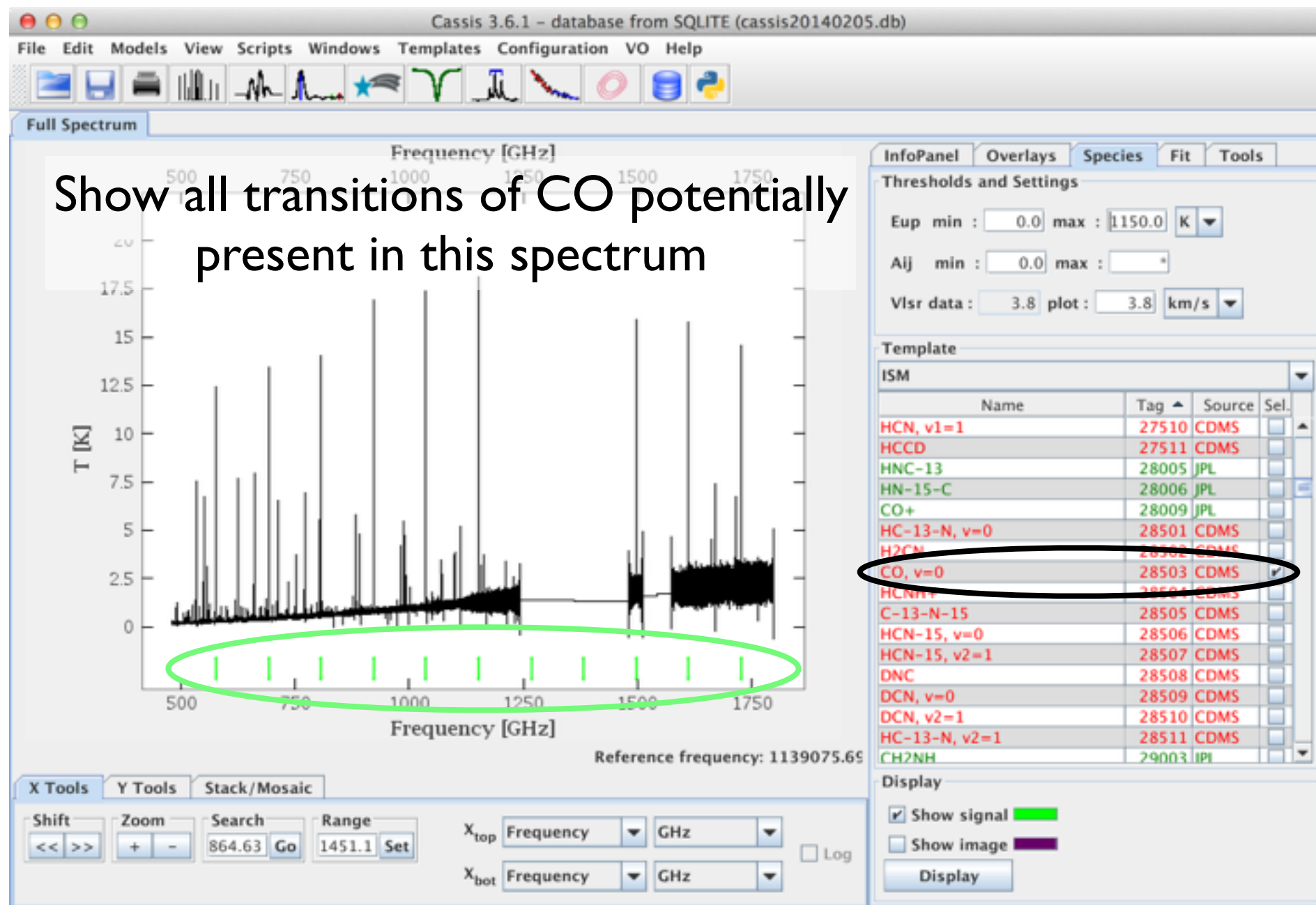
- Display spectra, ***WHATEVER*** their x- and y-axis units
- Manipulate and analyse
↓ re-sampling, average, operations, ... ↓ Line identification, best model (χ^2)





Why CASSIS?

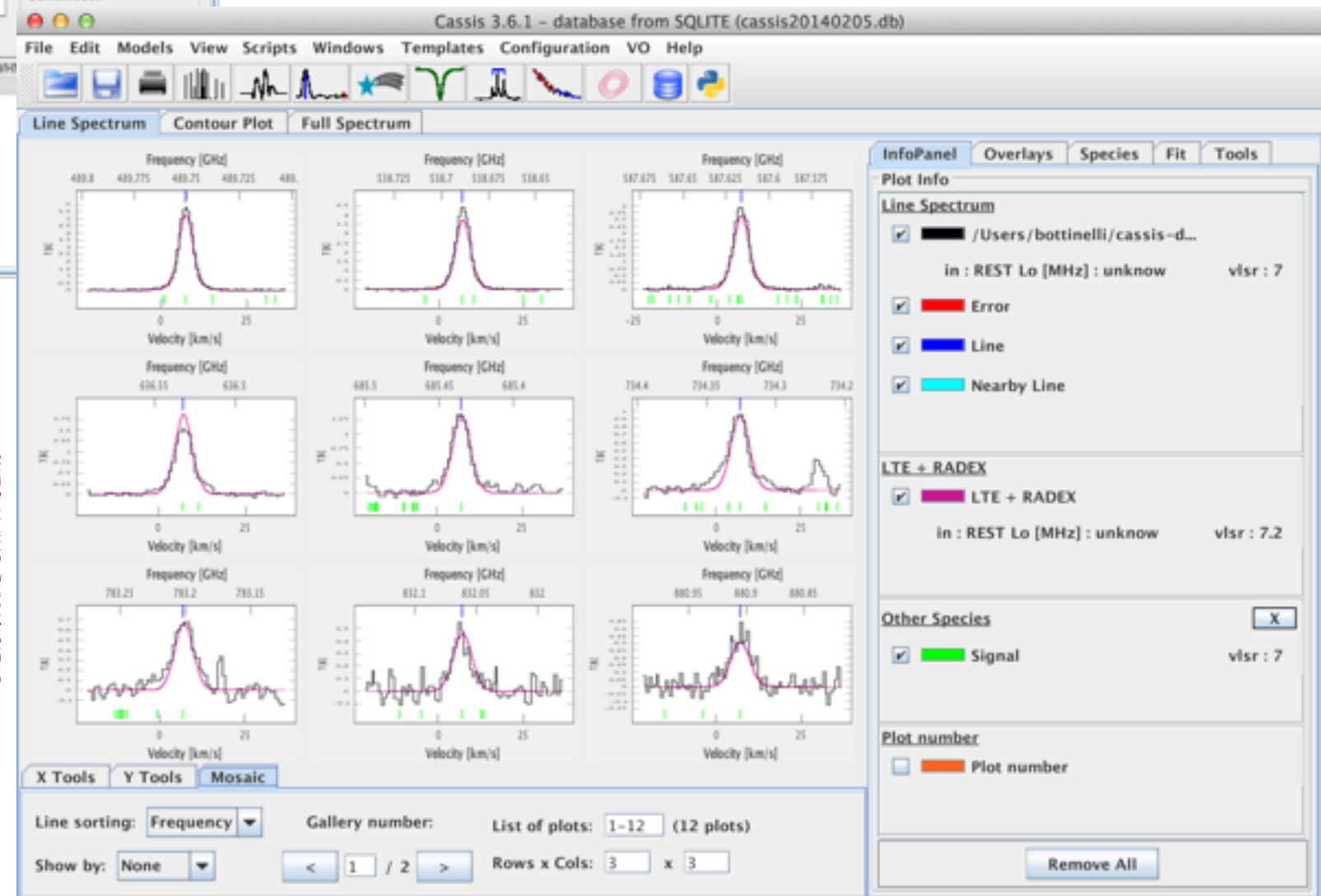
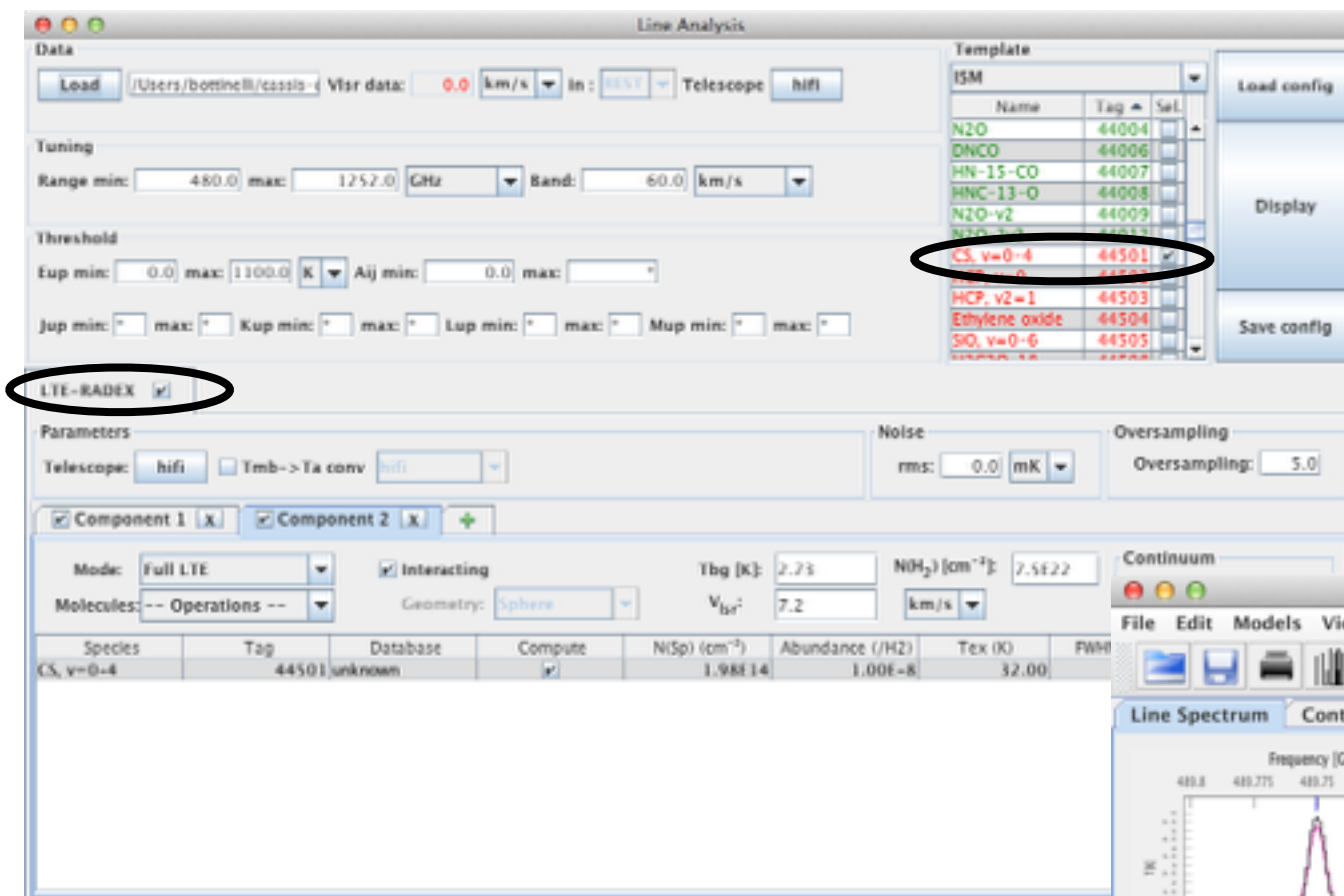
- Line identification : CASSIS especially useful when dealing with large datasets (more and more frequent with the increase in bandwidth and spectral resolution of recent receivers)





Why CASSIS?


- Show a mosaic of all CS transitions, overlaid with an LTE model and positions of other species.



◆ Key point : CASSIS needs a spectroscopic database.



Databases and interoperability

- Our needs: molecular, atomic and collisional databases 
- Local database: SQLite database (downloaded with CASSIS stand-alone) built from on-line databases (CDMS, JPL, NIST, etc : ascii files) and from contributed databases

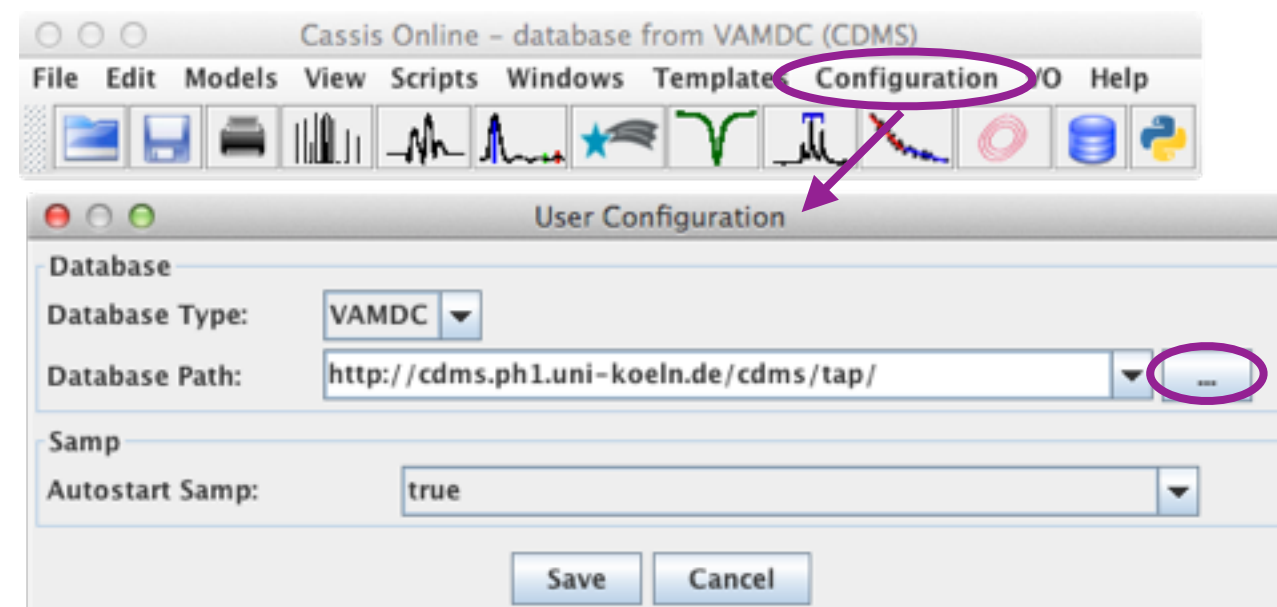
- VAMDC (atomic and molecular database with collisional coefficients):

- default with CASSIS online release
- only CDMS or JPL at the moment

- VAMDC protocol :

→ fully meets our needs : includes all needed keywords and collisional databases

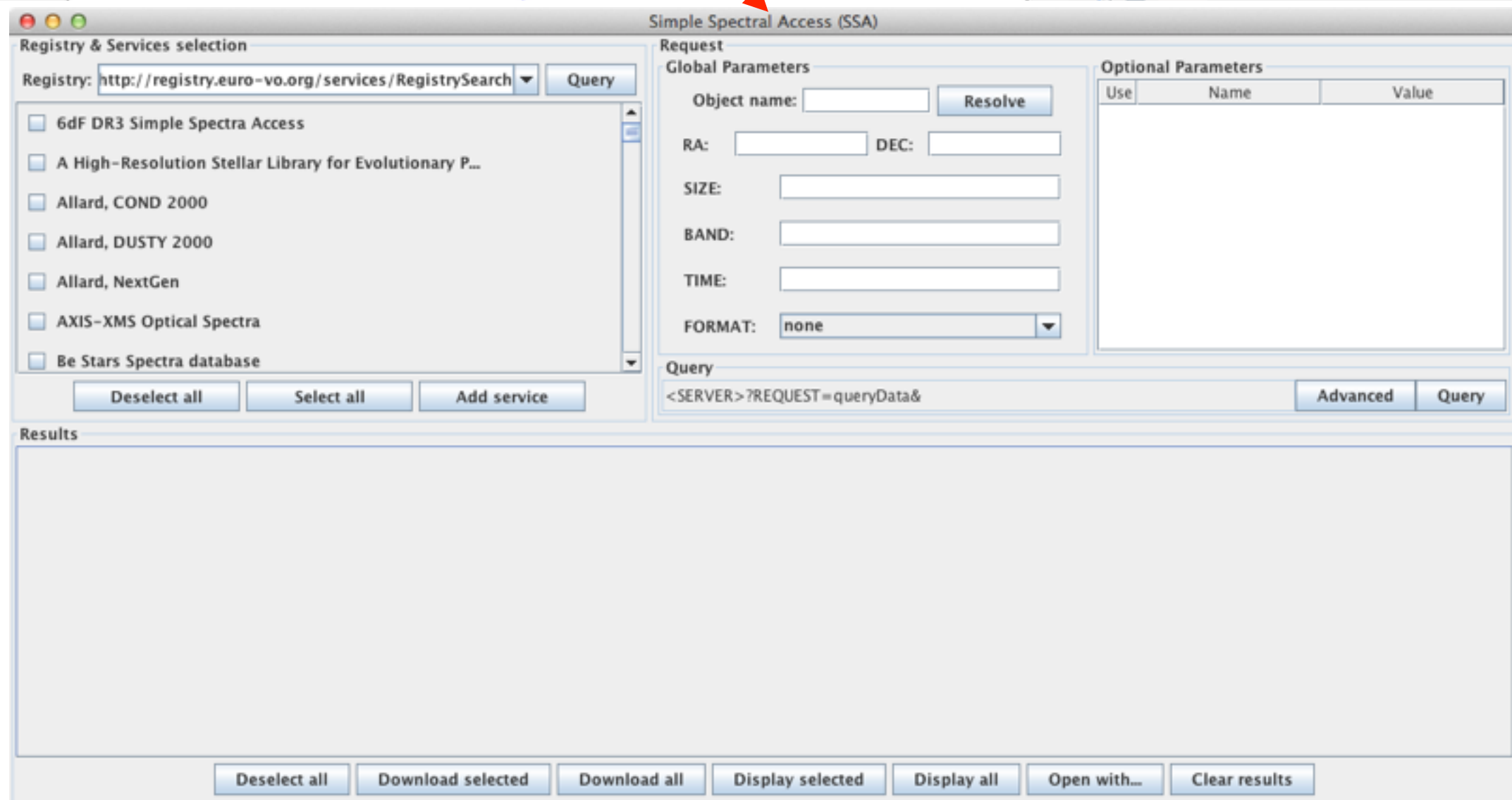
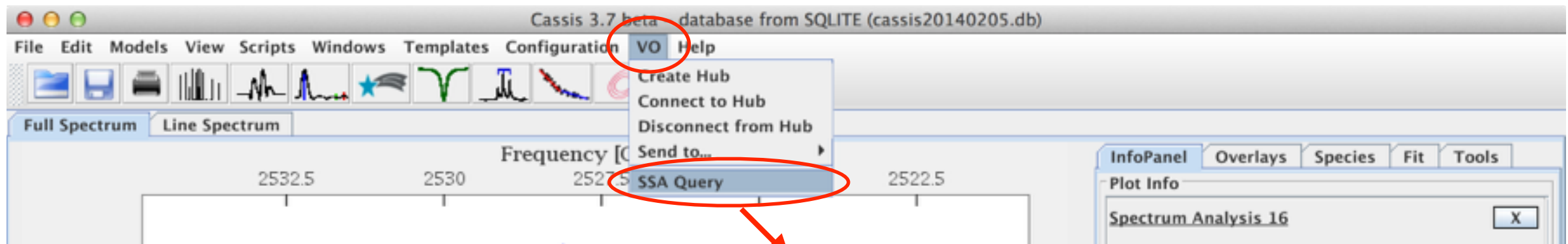
→ makes use of IVOA concepts/ philosophy



- Can easily switch between VAMDC and local database

Spectra and interoperability

CASSIS now includes a module for SSA queries!



Spectra and interoperability

CASSIS now includes a module for SSA queries!

Upon selection, CASSIS returns a list of unavailable services (at a given moment), and the reason why.

The screenshot shows the Simple Spectral Access (SSA) interface. The 'Registry & Services selection' panel on the left lists various services, with 'Select all' circled in red. The 'Request' panel in the center contains fields for Object name, RA, DEC, SIZE, BAND, TIME, and FORMAT. The 'Optional Parameters' panel on the right lists parameters like -out.max, abundances, AcRef, Age, Age_max, Age_min, alfa, alfa_max, alfa_min, alpha, alpha_max, and alpha_min. A warning message is displayed in the center, stating 'Warning : some services errors'. The 'Results' panel at the bottom lists services returning incorrect results, errors, or not responding.

Use	Name	Value
<input type="checkbox"/>	-out.max	
<input type="checkbox"/>	abundances	
<input type="checkbox"/>	AcRef	
<input type="checkbox"/>	Age	
<input type="checkbox"/>	Age_max	
<input type="checkbox"/>	Age_min	
<input type="checkbox"/>	alfa	
<input type="checkbox"/>	alfa_max	
<input type="checkbox"/>	alfa_min	
<input type="checkbox"/>	alpha	
<input type="checkbox"/>	alpha_max	
<input type="checkbox"/>	alpha_min	

Warning : some services errors

Services returning incorrect result:

- Epic Spectra SSP of the SSC Interface for the 21000 DR3 Catalogue
- Epic Spectra SSP of the SSC Interface for the 21000 Catalogue
- Optical spectra of the 1000-Newton Optical Follow-up results database (NOResults)

Services returning an error:

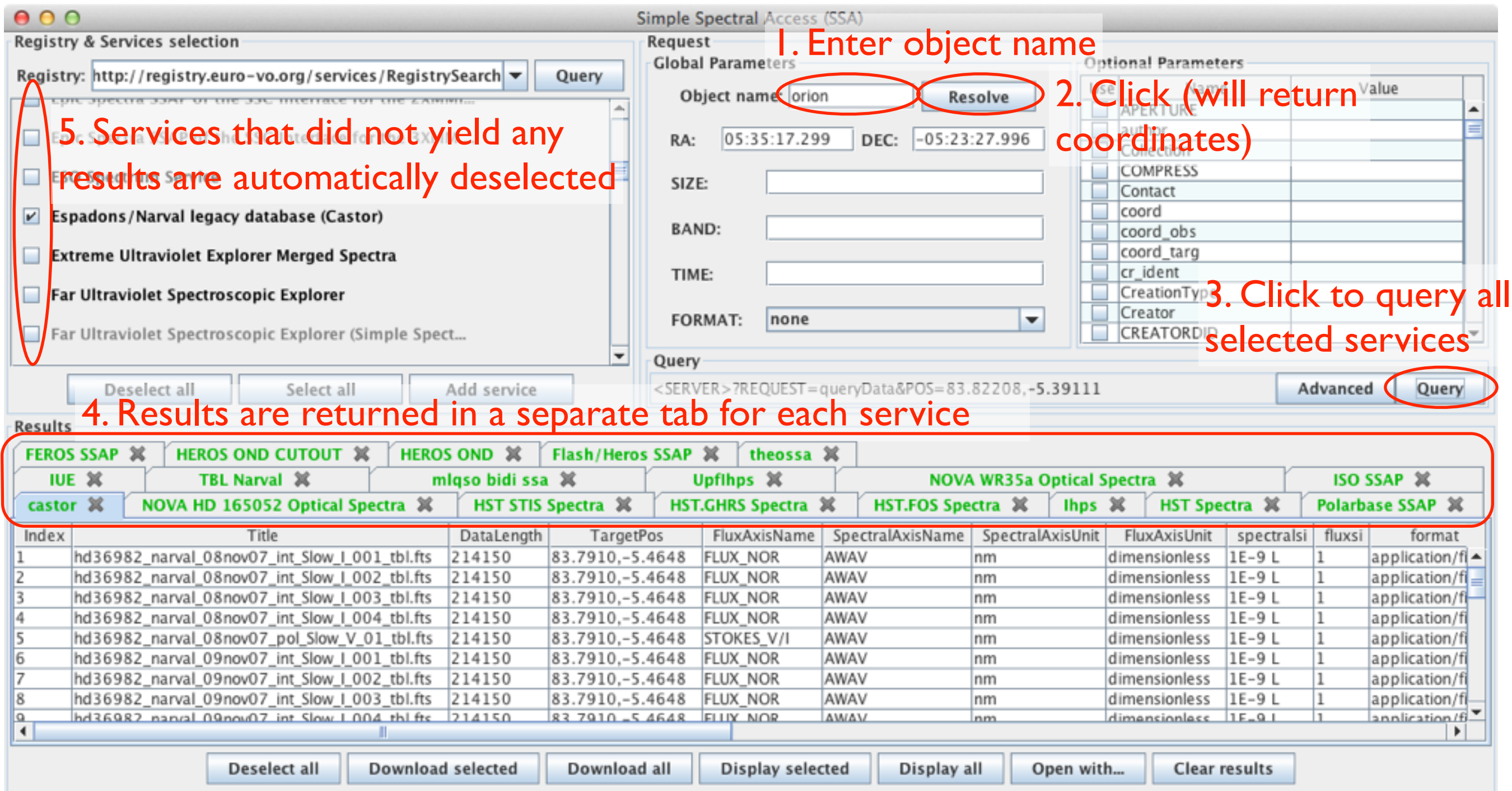
- Be Stars Spectra database
- Galaxy Evolution Explorer
- The NASA/IPAC Extragalactic Database SED Data Discovery Service

Services not responding:

- CMC06-VIS, DEEP SSA (VIS Deep survey)
- CMC06-VIS, DEEP SSA (VIS Deep survey) 2
- Far Ultraviolet Spectroscopic Explorer (Simple Spectrum Data Access)
- HSC - Simple Spectral Access to H (21cm) Spectra of Galaxies
- HyperLeda FITS Archive Simple Spectrum Data Access
- Mining the HEAVENS with the Virtual Observatory
- ST-ECF Hubble Legacy Archive High-Level Spectra
- ST-ECF Hubble Space Telescope Spectra
- Synthetic photometry for COND 2000 models
- Synthetic photometry for DUSTY 2000 models
- Synthetic photometry for Kurucz models
- VIS-PI2 DEEP spectra

Spectra and interoperability

CASSIS now includes a module for SSA queries!



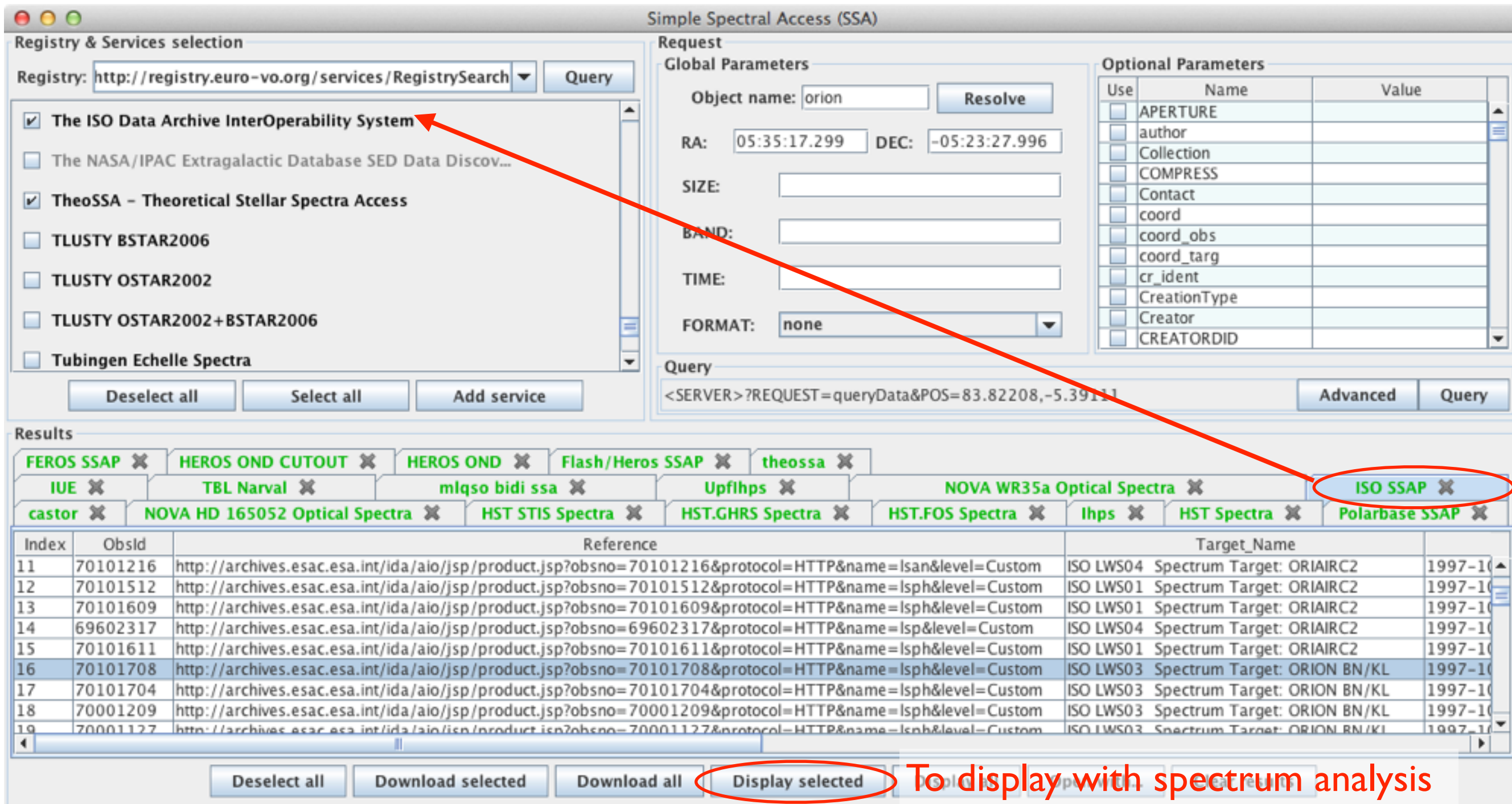
The screenshot shows the Simple Spectral Access (SSA) interface. The interface is divided into several sections:

- Registry & Services selection:** A list of services is shown, with "Espadons/Narval legacy database (Castor)" selected. A red circle highlights the "Deselect all" button, with the annotation "5. Services that did not yield any results are automatically deselected".
- Request Global Parameters:** The "Object name" field contains "orion" and the "Resolve" button is highlighted with a red circle and the annotation "1. Enter object name".
- Optional Parameters:** A table of optional parameters is shown, with the "Query" button highlighted and the annotation "2. Click (will return coordinates)".
- Query:** The "Query" button is highlighted with a red circle and the annotation "3. Click to query all selected services".
- Results:** A table of results is shown, with the "Query" button highlighted and the annotation "4. Results are returned in a separate tab for each service".

Index	Title	DataLength	TargetPos	FluxAxisName	SpectralAxisName	SpectralAxisUnit	FluxAxisUnit	spectralsi	fluxsi	format
1	hd36982_narval_08nov07_int_Slow_I_001_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
2	hd36982_narval_08nov07_int_Slow_I_002_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
3	hd36982_narval_08nov07_int_Slow_I_003_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
4	hd36982_narval_08nov07_int_Slow_I_004_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
5	hd36982_narval_08nov07_pol_Slow_V_01_tbl.fts	214150	83.7910,-5.4648	STOKES_V/I	AWAV	nm	dimensionless	1E-9 L	1	application/fi
6	hd36982_narval_09nov07_int_Slow_I_001_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
7	hd36982_narval_09nov07_int_Slow_I_002_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
8	hd36982_narval_09nov07_int_Slow_I_003_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi
9	hd36982_narval_09nov07_int_Slow_I_004_tbl.fts	214150	83.7910,-5.4648	FLUX_NOR	AWAV	nm	dimensionless	1E-9 L	1	application/fi

Spectra and interoperability

CASSIS now includes a module for SSA queries!



Registry & Services selection

Registry:

- The ISO Data Archive InterOperability System
- The NASA/IPAC Extragalactic Database SED Data Discov...
- TheoSSA - Theoretical Stellar Spectra Access
- TLUSTY BSTAR2006
- TLUSTY OSTAR2002
- TLUSTY OSTAR2002+BSTAR2006
- Tübingen Echelle Spectra

Request

Global Parameters

Object name:

RA: DEC:

SIZE:

BAND:

TIME:

FORMAT:

Optional Parameters

Use	Name	Value
<input type="checkbox"/>	APERTURE	
<input type="checkbox"/>	author	
<input type="checkbox"/>	Collection	
<input type="checkbox"/>	COMPRESS	
<input type="checkbox"/>	Contact	
<input type="checkbox"/>	coord	
<input type="checkbox"/>	coord_obs	
<input type="checkbox"/>	coord_targ	
<input type="checkbox"/>	cr_ident	
<input type="checkbox"/>	CreationType	
<input type="checkbox"/>	Creator	
<input type="checkbox"/>	CREATORID	

Query

Results

FEROS SSAP HEROS OND CUTOUT HEROS OND Flash/Heros SSAP theossa **ISO SSAP**

IUE TBL Narval mlqso bidi ssa Upfilhps NOVA WR35a Optical Spectra

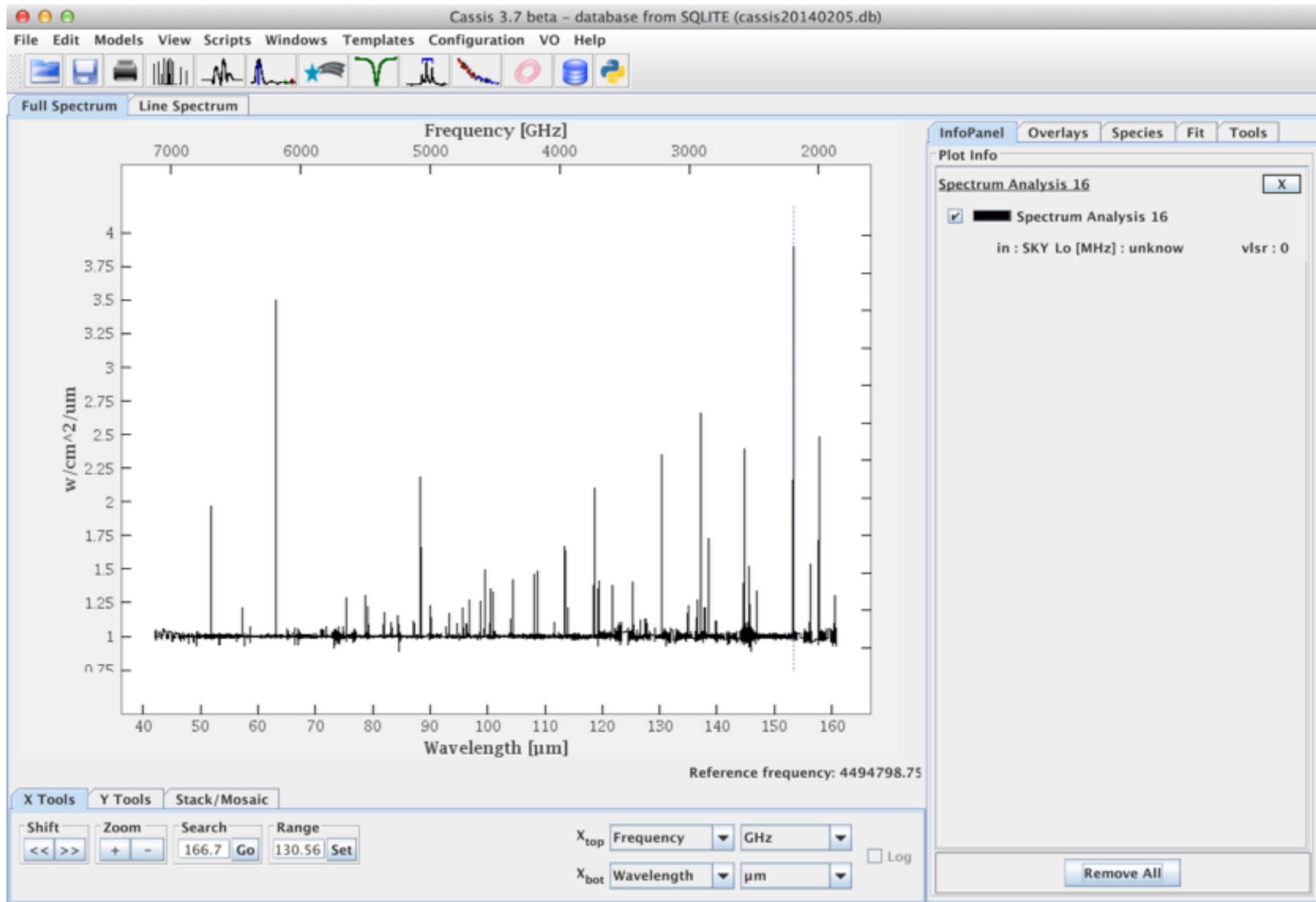
castor NOVA HD 165052 Optical Spectra HST STIS Spectra HST.GHR5 Spectra HST.FOS Spectra lhps HST Spectra Polarbase SSAP

Index	ObsId	Reference	Target_Name
11	70101216	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101216&protocol=HTTP&name=lsan&level=Custom	ISO LWS04 Spectrum Target: ORIAIRC2 1997-10
12	70101512	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101512&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2 1997-10
13	70101609	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101609&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2 1997-10
14	69602317	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=69602317&protocol=HTTP&name=lsph&level=Custom	ISO LWS04 Spectrum Target: ORIAIRC2 1997-10
15	70101611	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101611&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2 1997-10
16	70101708	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101708&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL 1997-10
17	70101704	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101704&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL 1997-10
18	70001209	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70001209&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL 1997-10
19	70001127	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70001127&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL 1997-10

To display with spectrum analysis
(overview of full spectrum)

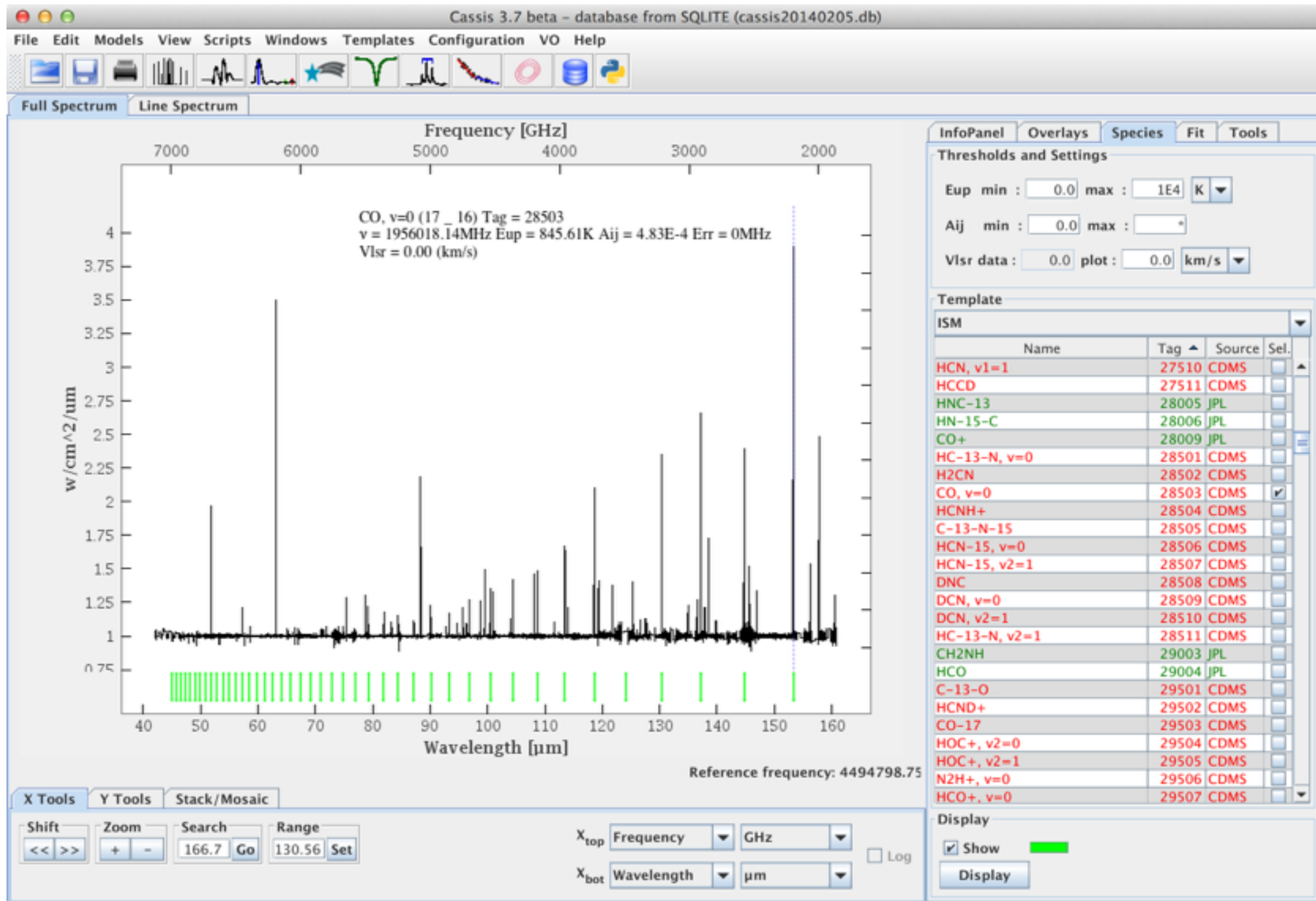
Spectra and interoperability

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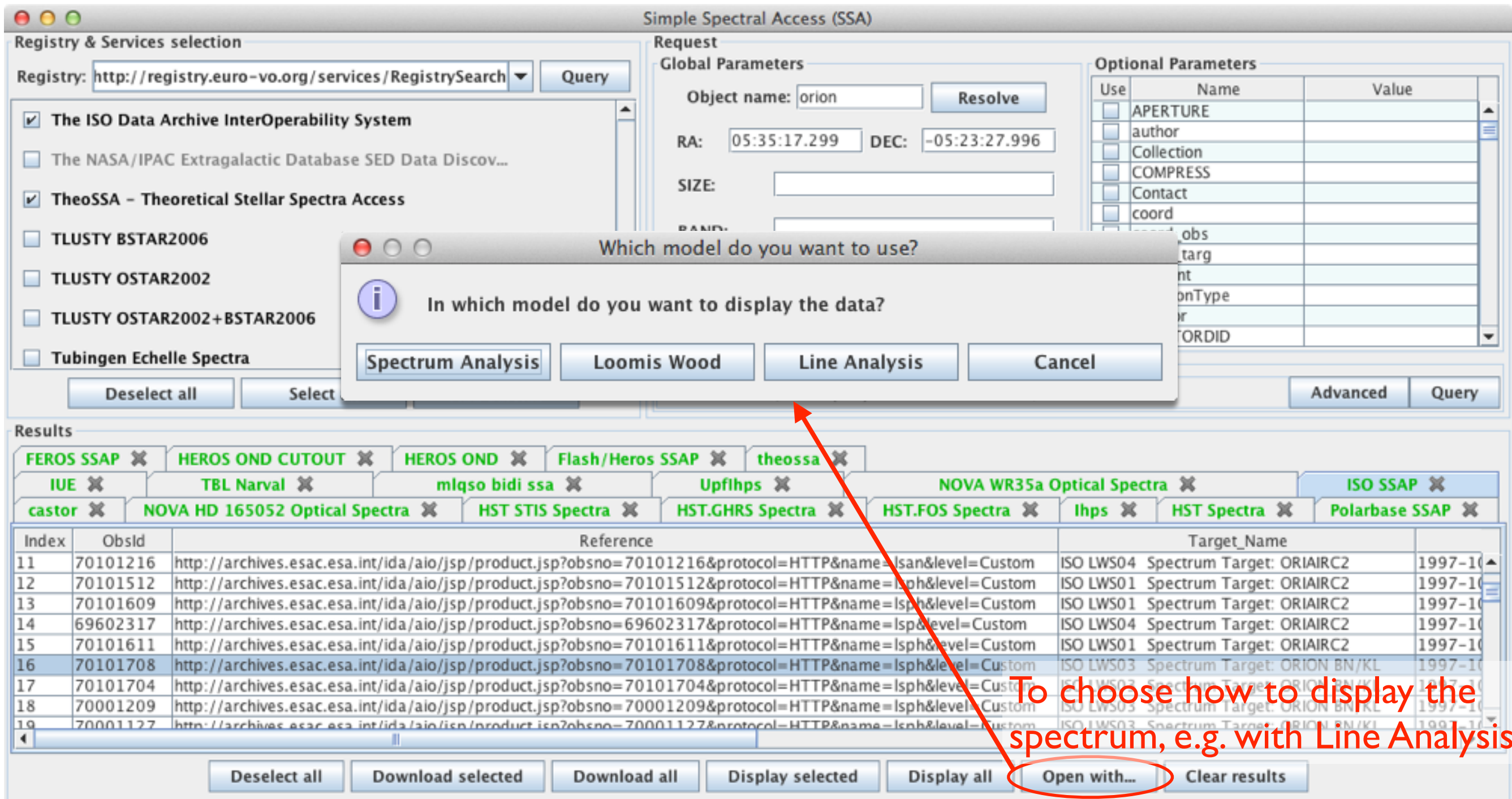
Spectra and interoperability

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Spectra and interoperability

CASSIS now includes a module for SSA queries!



The screenshot shows the Simple Spectral Access (SSA) interface. The main window is titled "Simple Spectral Access (SSA)" and contains several sections:

- Registry & Services selection:** A list of services with checkboxes. "The ISO Data Archive InterOperability System" and "TheoSSA - Theoretical Stellar Spectra Access" are checked.
- Request:** Fields for "Object name" (orion), "RA" (05:35:17.299), and "DEC" (-05:23:27.996). A "Resolve" button is next to the object name.
- Optional Parameters:** A table with columns "Use", "Name", and "Value".
- Results:** A table with columns "Index", "ObsId", "Reference", and "Target_Name".

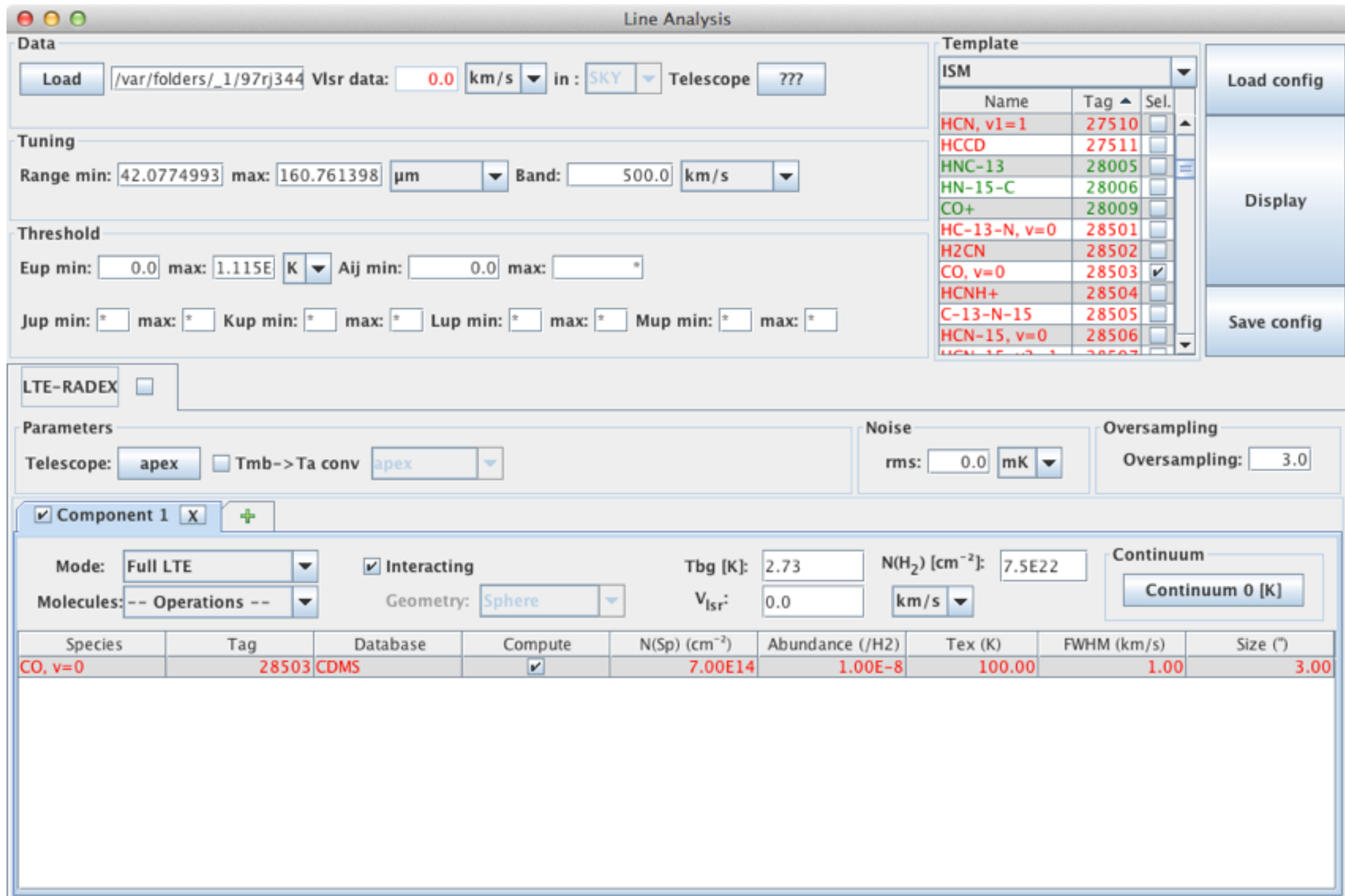
A dialog box titled "Which model do you want to use?" is overlaid on the interface. It contains the question "In which model do you want to display the data?" and four buttons: "Spectrum Analysis", "Loomis Wood", "Line Analysis", and "Cancel". A red arrow points from the "Line Analysis" button to the "Open with..." button in the Results section.

To choose how to display the spectrum, e.g. with Line Analysis

Index	ObsId	Reference	Target_Name
11	70101216	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101216&protocol=HTTP&name=lsan&level=Custom	ISO LWS04 Spectrum Target: ORIAIRC2
12	70101512	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101512&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2
13	70101609	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101609&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2
14	69602317	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=69602317&protocol=HTTP&name=lsph&level=Custom	ISO LWS04 Spectrum Target: ORIAIRC2
15	70101611	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101611&protocol=HTTP&name=lsph&level=Custom	ISO LWS01 Spectrum Target: ORIAIRC2
16	70101708	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101708&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL
17	70101704	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70101704&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL
18	70001209	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70001209&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL
19	70001127	http://archives.esac.esa.int/ida/aio/jsp/product.jsp?obsno=70001127&protocol=HTTP&name=lsph&level=Custom	ISO LWS03 Spectrum Target: ORION BN/KL

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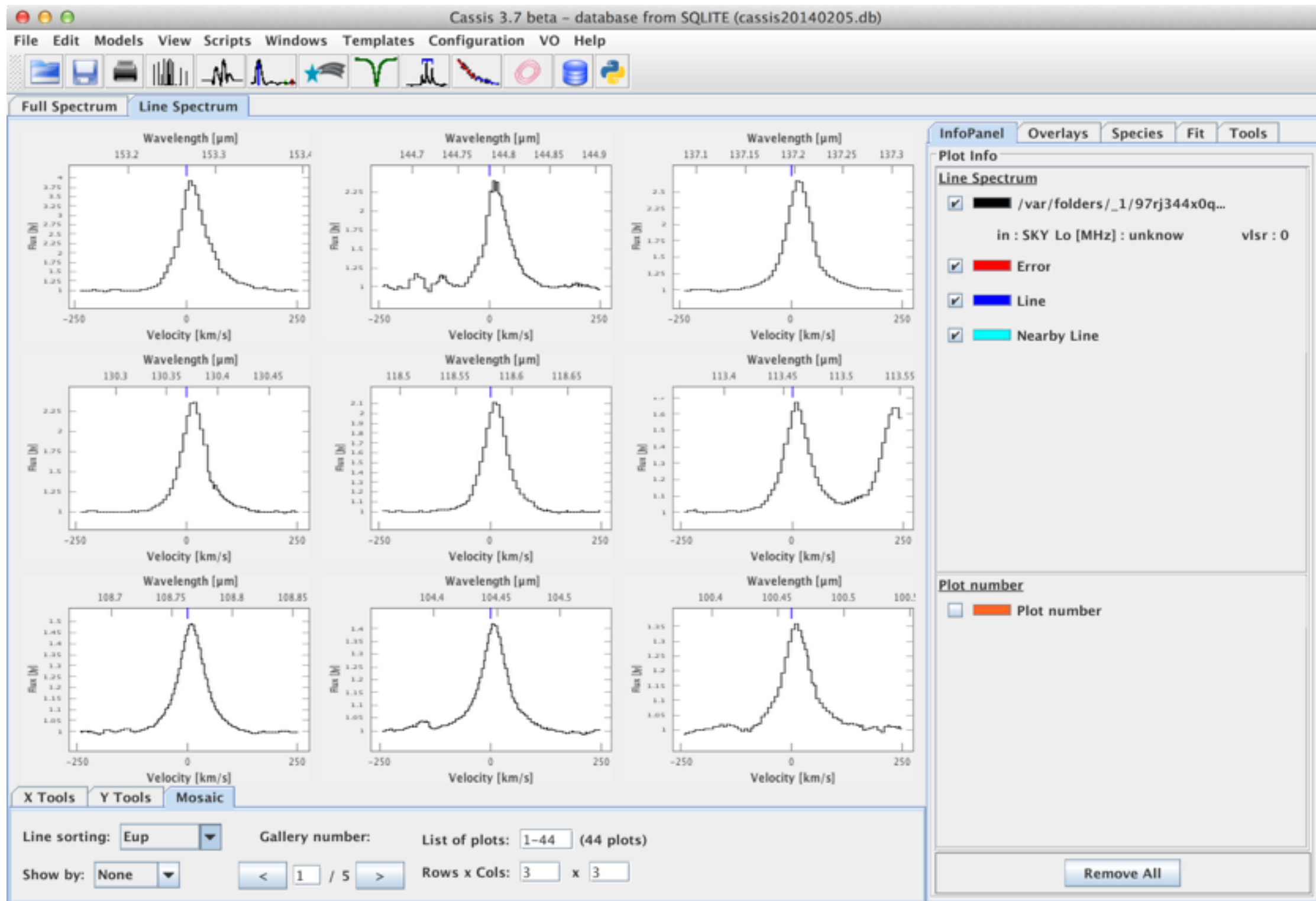


The screenshot shows the 'Line Analysis' window in CASSIS. It is divided into several sections:

- Data:** Includes a 'Load' button, a file path field (currently empty), 'Vlsr data' set to 0.0 km/s, 'in' set to SKY, and 'Telescope' set to ???.
- Tuning:** 'Range min' is 42.0774993, 'max' is 160.761398, 'Band' is 500.0 km/s.
- Threshold:** 'Eup min' is 0.0, 'max' is 1.115E, 'Aij min' is 0.0.
- Template:** A table of molecular species with columns for Name, Tag, and Sel. The 'CO, v=0' entry is selected.
- Parameters:** 'Telescope' is apex, 'Noise rms' is 0.0 mK, 'Oversampling' is 3.0.
- Component 1:** 'Mode' is Full LTE, 'Molecules' is -- Operations --, 'Geometry' is Sphere, 'Tbg [K]' is 2.73, 'N(H₂) [cm⁻²]' is 7.5E22, 'V_{lsr}' is 0.0 km/s, and 'Continuum' is Continuum 0 [K].
- Table:** A table with columns: Species, Tag, Database, Compute, N(Sp) (cm⁻²), Abundance (/H₂), Tex (K), FWHM (km/s), and Size ("). The row for 'CO, v=0' has values: Tag 28503, Database CDMS, Compute checked, N(Sp) 7.00E14, Abundance 1.00E-8, Tex 100.0, FWHM 1.00, and Size 3.00.

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Questions / Issues

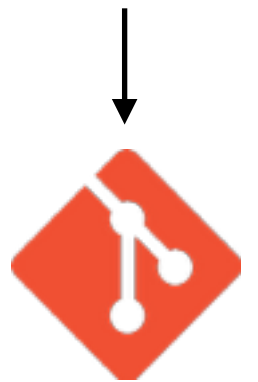
1. Update of registries needed : too many services are constantly unavailable.
2. Problem with validation/compliance of protocole : we had to implement several exceptions to be able to retrieve/display data from certain services.
 - For example, in the same service, have x-axis in 'um' or in 'microns'!!! → unify and impose?
 - Some fits files are not "self-contained"
3. Evolution of registry : implement filter for services based on, e.g., keyword, wavelength? how to make this standard?



Tools for the development

Platform of development :

- Version Control Systems :
SVN → GIT : use Gitlab to manage the repository
- Test :
Unit test : Junit
Graphic test : Fest
- Continuous integration :
Jenkins
- Metrics and Control quality :
SONAR
- Build systems :
ANT → Maven





Future plans ...

- Divide CASSIS into independent modules and provided them separately
 - Jython, Database Access
 - Line Analysis, Synthetic model
 - ...
 - Already doable for SSA Module:
 - developed independently of CASSIS
 - only two external librairies : regclient (M.Taylor) and ivoaregistry (R. Plante)
- Open the access to a part of the platform
 - Maven and Git repositories
 - Jenkins and sonar reporting



Collaborations

Several collaborations :

- CASSIS is now part of the applications available in Specflow (project part of OV-GSO)
<http://bass2000.bagn.obs-mip.fr/specflow/>
- CASSIS will be included in the next version of AppLauncher (provided by JMMC)
- On-going: use JMCS (library provided by JMMC)
<https://github.com/JMMC-OpenDev/jMCS>
- Visualise spectrum from EuroPlanet TAP client

Who will be the next ?



Conclusions

- CASSIS useful to astronomers outside FIR/submm/mm field
- Working hard on interoperability ; since september, we have implemented:
 - CASSIS online (java web start / JNLP) with VAMDC
 - SSAP : search all services based on source name
- Need for : update of registries, validation/compliance of protocoles, filter services, other tools/apps to display Kelvins
- What's next : interface to select/combine different databases (VAMDC, sqlite, user-owned)
- **Feedback much needed/appreciated!** Comments, suggestions, ... :
bug report page : <http://cassis.irap.omp.eu/?page=bugsreport>
or send us an email : cassis-team@irap.omp.eu

Links

<http://ov-gso.irap.omp.eu/>
(see this page for links to all OV-GSO services)
<http://www.vamdc.eu/>

http://portal.vamdc.eu/vamdc_portal/home.seam
http://www.jmmc.fr/applauncher_page
<http://bass2000.bagn.obs-mip.fr/specflow/>