

CASSIS as a spectroscopy tool for VESPA
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Go to VESPA portal

<http://vespa.obspm.fr>

The screenshot shows the VESPA portal interface. At the top, there's a banner with the VESPA logo and a hand cursor icon pointing at it. Below the banner, the navigation bar includes 'All VO' (which is highlighted with a red oval), 'Custom resource', 'Direct Query', 'Advanced Query', and 'Help'. Below the navigation bar are two buttons: 'Submit' (blue) and 'Reset' (red).

Main Parameters

- Target Name**: An input field with a red oval around it.
- Granule UID**: An input field.
- Granule GID**: An input field.
- Obs ID**: An input field.
- Time selection**: A dropdown menu set to "Data range is included in". It includes fields for "Time Min" and "Time Max" with calendar icons, and dropdowns for "The range between" and "Time Max".
- Location**: A dropdown menu.
- Spectral**: A dropdown menu with a red oval around it.

Target Class

- Asteroid
- Comet
- Dwarf Planet
- Exoplanet

Dataproduct Type: An input field with a red oval around it.

Measurement Type: An input field.

Plotting tools

- TOPCAT
- Aladin
- SPLAT
- CASSIS

Example queries

- Saturn in March 2012

Click "Submit" to search public data services, or first enter query parameters

Ex. query parameters:

Target_Name = Jupiter or Ceres or Lutetia
Dataproduct_type = spectrum

VESPA will search all public data services which use the EPN-TAP protocol

Service results

<http://vespa.obspm.fr>

The screenshot shows the VESPA (Virtual European Solar and Planetary Access) interface. At the top, there's a banner with a hand cursor pointing at a planet, and the text "VESPA" and "Virtual European Solar and Planetary Access". Below the banner is a navigation bar with tabs: "All VO" (selected), "Custom resource", "Direct Query", "Advanced Query", and "Help".

The main area displays a list of services under "EPN Resources":

- IKS - IR spectroscopy of comet Halley** 204 results
- M4AST - M4AST - Modeling for Asteroids** 8 results (highlighted with a red oval)
- VVEx - VIRTIS Venus Express nominal mission (demo)** 15682 results
- abs_cs - Data for numerical modeling of planetary atmospheres** 0 result
- AMDA - CDPP AMDA DataBase** 0 result
- APIS - Auroral Planetary Imaging and Spectroscopy** 0 result
- BASECOM - The Nançay Cometary Database** 0 result
- BDIP - Base de Données d'Images Planétaires** 0 result
- BIRA-IASB TAP - Profiles from SPICAV-SOIR/VEX** 0 result
- CLIMSO - CLIMSO coronagraphs at pic du midi de Bigorre** 0 result

Each service entry has four icons: a table, a magnifying glass, a plus sign, and a search icon. The "M4AST" entry has its first three icons circled in red.

To the right of the service list are two columns:

- Plotting tools**: A list with icons and names: TOPCAT, Aladin, SPLAT, CASSIS, and 3DView.
- Example queries**: A box containing the text "Saturn in March 2012".

On line M4ast, click the "Display results" icon to get result list from this service

You can also click "Advanced query form" to access specific parameters (local time...)

Query results

Result is a list of files matching the query



Results in service M4AST

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_url	granule_gid	obs_id
Zeissia_19920114_697_00_nativ	spectrum	Zeissia	1992-01-14T00:00:00.000	1992-01-14T00:00:00.000	http://cardamine.imc...	native	Zeissia_19920114_697_00_obs
Zeissia_19920114_697_00	spectrum	Zeissia	1992-01-14T00:00:00.000	1992-01-14T00:00:00.000	http://voparis-srv-p...	formatted	Zeissia_19920114_697_00_obs
Zao_20001026_262_00_nativ	spectrum	Zao	2000-10-26T00:00:00.000	2000-10-26T00:00:00.000	http://cardamine.imc...	native	Zao_20001026_262_00_obs
Zao_20001026_262_00	spectrum	Zao	2000-10-26T00:00:00.000	2000-10-26T00:00:00.000	http://voparis-srv-p...	formatted	Zao_20001026_262_00_obs
Wesson_19911028_697_00_nativ	spectrum	Wesson	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://cardamine.imc...	native	Wesson_19911028_697_00_obs
Wesson_19911028_697_00	spectrum	Wesson	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://voparis-srv-p...	formatted	Wesson_19911028_697_00_obs
Viv_19911028_697_00_nativ	spectrum	Viv	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://cardamine.imc...	native	Viv_19911028_697_00_obs
Viv_19911028_697_00	spectrum	Viv	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://voparis-srv-p...	formatted	Viv_19911028_697_00_obs
Vihuri_19911213_697_00_nativ	spectrum	Vihuri	1991-12-13T00:00:00.000	1991-12-13T00:00:00.000	http://cardamine.imc...	native	Vihuri_19911213_697_00_obs
Vihuri_19911213_697_00	spectrum	Vihuri	1991-12-13T00:00:00.000	1991-12-13T00:00:00.000	http://voparis-srv-p...	formatted	Vihuri_19911213_697_00_obs

Showing 1 to 10 of 940 entries 1 row selected

Data Selection ▾ Metadata Selection ▾ All Data ▾ All Metadata ▾

Plotting tools



TOPCAT



Aladin



SPLAT



CASSIS



3DView

Click "Show all" to see other parameters

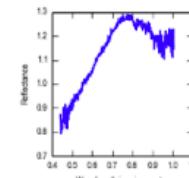
Example queries

Saturn in March 2012

Hover the mouse over the table to see thumbnails



Click to select one or more lines & click "Data selection" / Download to retrieve data files [or click "All metadata" / Send table to send complete table to TOPCAT]



Visualising results

Launch VO tools
either from buttons
or from your system



Results in service M4AST

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_url	granule_gid	obs_id
Zeissia_19920114_697_00_nativ	spectrum	Zeissia	1992-01-14T00:00:00.000	1992-01-14T00:00:00.000	http://cardamine.imc...	native	Zeissia_19920114_697_00_obs
Zeissia_19920114_697_00	spectrum	Zeissia	1992-01-14T00:00:00.000	1992-01-14T00:00:00.000	http://voparis-srv-p...	formatted	Zeissia_19920114_697_00_obs
Zao_20001026_262_00_nativ	spectrum	Zao	2000-10-26T00:00:00.000	2000-10-26T00:00:00.000	http://cardamine.imc...	native	Zao_20001026_262_00_obs
Zao_20001026_262_00	spectrum	Zao	2000-10-26T00:00:00.000	2000-10-26T00:00:00.000	http://voparis-srv-p...	formatted	Zao_20001026_262_00_obs
Wesson_19911028_697_00_nativ	spectrum	Wesson	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://cardamine.imc...	native	Wesson_19911028_697_00_obs
Wesson_19911028_697_00	spectrum	Wesson	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://voparis-srv-p...	formatted	Wesson_19911028_697_00_obs
Viv_19911028_697_00_nativ	spectrum	Viv	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://cardamine.imc...	native	Viv_19911028_697_00_obs
Viv_19911028_697_00	spectrum	Viv	1991-10-28T00:00:00.000	1991-10-28T00:00:00.000	http://voparis-srv-p...	formatted	Viv_19911028_697_00_obs
Vihuri_19911213_697_00_nativ	spectrum	Vihuri	1991-12-13T00:00:00.000	1991-12-13T00:00:00.000	http://cardamine.imc...	native	Vihuri_19911213_697_00_obs
Vihuri_19911213_697_00	spectrum	Vihuri	1991-12-13T00:00:00.000	1991-12-13T00:00:00.000	http://voparis-srv-p...	formatted	Vihuri_19911213_697_00_obs

Showing 1 to 10 of 940 entries 1 row selected

Data Selection ▾ Metadata Selection ▾ All Data ▾ All Metadata ▾

Plotting tools

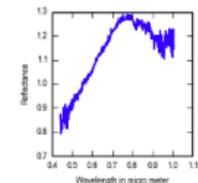
- TOPCAT
- Aladin
- SPLAT
- CASSIS
- 3DView

Example queries

- Saturn in March 2012

CASSIS is the tool of choice for spectra

TOPCAT is an all-purpose tool for tables



CASSIS as a spectrum visualizer in VESPA

In service IKS, select iksfinal and iksfig7 spectra in VOtable format
Or use "granule_gid = corrected" in the query

VESPA Query Interface

vespa.obspm.fr/planetary/data/display/?resource_id=ivo://vopdc.obspm/lesia/iks/epn&resource_type=epn&query_condition=

ay/VES/D11.2+-+First+VESPA+incremental+report

Les plus visités Google eBay LESIA Actualités mail Stick wiki, etc OVParis

VESPA Virtual European Solar and Planetary Access

All VO Custom resource Direct Query Advanced Query Help

Results in service IKS

Show 10 entries

Column visibility Show all Hide all

Select All in current page Reset Selection

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_url
iksfinalC	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://voparis-srv.o...
iksfinalA	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://pdssbn.astro...
iksfig7C	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://voparis-srv.o...
iksfig7A	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://pdssbn.astro...
iks193C	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://voparis-srv.o...
iks193A	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://pdssbn.astro...
iks192C	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://voparis-srv.o...
iks192A	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://pdssbn.astro...
iks191C	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://voparis-srv.o...
iks191A	spectrum	1P	1986-03-06T00:00:00.000	1986-03-06T00:00:00.000	http://pdssbn.astro...

Plotting tools

- TOPCAT
- Aladin
- SPLAT
- CASSIS
- 3DView

Example queries

Saturn in March 2012

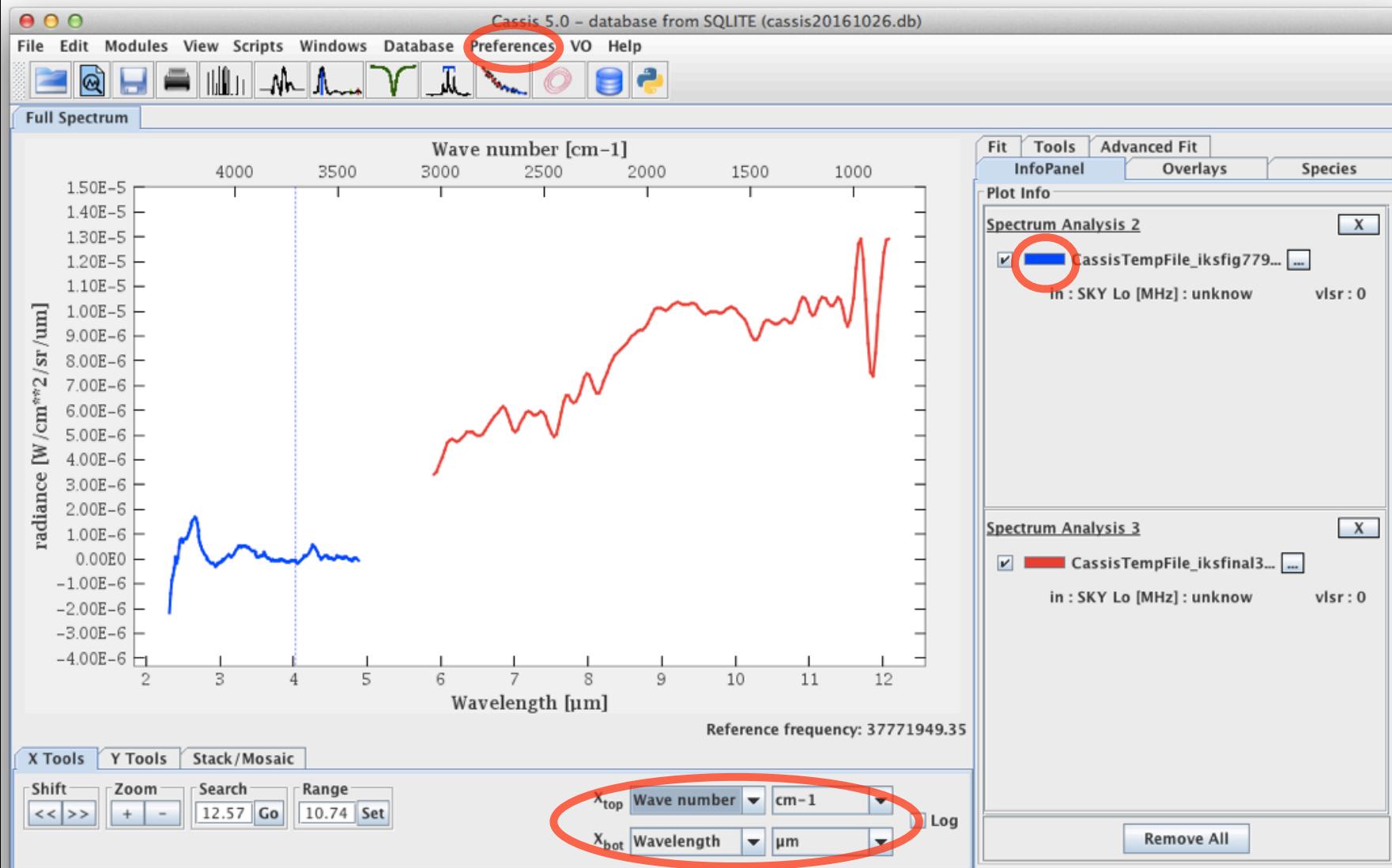
radiance

wavelength

Click to select one or more lines & click "Data selection" / Send spectra to load data into CASSIS [or / Send Table to load in TOPCAT]

CASSIS as a visualizer

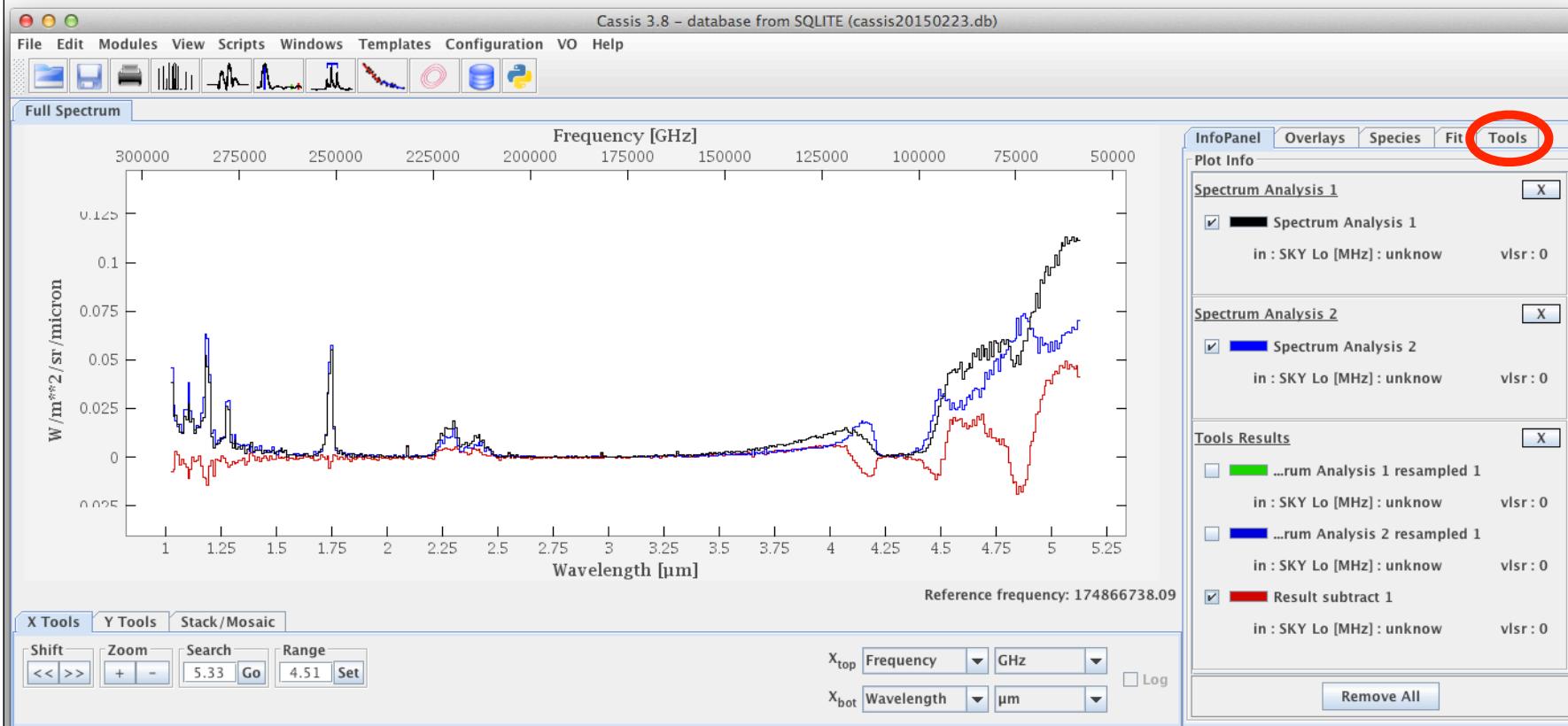
CASSIS receives spectra from search interface, can overplot selections



In Preferences > General set "Force direct opening" to True (this will bypass dialogues)
Adjust color and line style in the panel under the color box
Change units and navigate with lower panel buttons

Visualization and arithmetics in CASSIS

CASSIS can overplot a selection of spectra and manipulate them



Press "shift" to see level at mouse location
Left click or "Comm"-drag to set plotting region
"Alt"-drag to select a region (used in "Fit" tab)
"Alt"-click to set markers (& remove them in InfoPanel)
Mouse-wheel to zoom in/out

Click the "Tools" tab to combine spectra
Spectra are resampled to a common wvl vector on the fly
The "Species" tab accesses line databases (most of them related to the ISM)
Also includes LTE and RADEX modeling

Spectral comparisons from different services

In VESPA, ask for spectra of asteroid Vesta and look in M4ast result page:

Use "target_name = vesta" & "granule_gid = formatted" in the query

The screenshot shows the VESPA Query Interface in a web browser. The title bar says "VESPA Query Interface". The main content area displays the results of a query for asteroid Vesta. The results are presented in a table with columns: granule_uid, dataproduct_type, target_name, time_min (d), time_max (d), and access_url. There are 10 entries listed, all corresponding to spectrum type and target_name Vesta. The access URLs point to various astronomical databases like Cardamine, Voparis, and IMCCE. To the right of the table, there are sections for "Plotting tools" (TOPCAT, Aladin, SPLAT, CASSIS, 3DView) and "Example queries" (Saturn in March 2012), which includes a small plot of reflectance versus wavelength.

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_url
Vesta_20030331_568_01_nativ	spectrum	Vesta	2003-03-31T11:44:59.999	2003-03-31T11:44:59.999	http://cardamine.imcce...
Vesta_20030331_568_01	spectrum	Vesta	2003-03-31T11:44:59.999	2003-03-31T11:44:59.999	http://voparis-srv-p...
Vesta_20030331_568_00_nativ	spectrum	Vesta	2003-03-31T10:20:00.000	2003-03-31T10:20:00.000	http://cardamine.imcce...
Vesta_20030331_568_00	spectrum	Vesta	2003-03-31T10:20:00.000	2003-03-31T10:20:00.000	http://voparis-srv-p...
Vesta_20030330_568_02_nativ	spectrum	Vesta	2003-03-30T13:09:59.999	2003-03-30T13:09:59.999	http://cardamine.imcce...
Vesta_20030330_568_02	spectrum	Vesta	2003-03-30T13:09:59.999	2003-03-30T13:09:59.999	http://voparis-srv-p...
Vesta_20030330_568_01_nativ	spectrum	Vesta	2003-03-30T12:15:59.999	2003-03-30T12:15:59.999	http://cardamine.imcce...
Vesta_20030330_568_01	spectrum	Vesta	2003-03-30T12:15:59.999	2003-03-30T12:15:59.999	http://voparis-srv-p...
Vesta_20030330_568_00_nativ	spectrum	Vesta	2003-03-30T10:03:00.000	2003-03-30T10:03:00.000	http://cardamine.imcce...
Vesta_20030330_568_00	spectrum	Vesta	2003-03-30T10:03:00.000	2003-03-30T10:03:00.000	http://voparis-srv-p...

Select preferred results visually from thumbnails

Pick-up VOtable versions (if not already selected in the query)
& send as spectra

Spectral comparisons from different services

In VESPA, ask for spectra of SNC meteorites and look in pds_speclib result page:
Use "granule_gid=natural_meteorite_rock" in the query

VESPA Query Interface

vespa.obspm.fr/planetary/display/?resource_access_url=http://voparis-cdpp-new.obspm.fr/_system_/tap/run/tap&r=

Virtual European Solar and Planetary Access

All VO Custom resource Direct Query Advanced Query Help

Results in service pds_speclib

Show 10 entries

Column visibility Show all Hide all

Select All in current page Reset Selection

granule_uid	dataproduct_type	target_name	time_min (d)	time_max (d)	access_url
SNC_ZAG1_CP_L_C4S47031_0101	spectrum	ZAGAMI	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
SNC_ZAG1_CP_0_C4S41272_0101	spectrum	ZAGAMI	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
SNC_SHG1_CP_0_C4S41275_0101	spectrum	SHERGOTTY	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
SNC_NAK1_CP_0_C4S47028_0101	spectrum	NAKHLA	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
SNC_LAF1_CP_0_C4S47030_0101	spectrum	LAFAYETTE	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
SNC_GOVAL1_CP_C4S47058_0101	spectrum	GOVERNADOR_VALADARES	1970-01-01T00:00:00.000	1970-01-01T00:00:00.000	http://voparis-srv.o...
MGP075	spectrum	CHASSIGNY	1989-12-15T00:00:00.000	1989-12-15T00:00:00.000	http://voparis-srv.o...
LAMT05	spectrum	LOS_ANGELES	2000-04-14T00:00:00.000	2000-04-14T00:00:00.000	http://voparis-srv.o...
CGP071	spectrum	EETA79001	1987-07-01T00:00:00.000	1987-07-01T00:00:00.000	http://voparis-srv.o...
CBLM07	spectrum	ALH84001	1988-05-24T00:00:00.000	1988-05-24T00:00:00.000	http://voparis-srv.o...

Showing 1 to 10 of 23 entries 3 rows selected

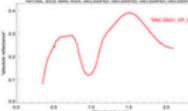
thumb Tout surligner Respecter la casse Mots entiers Occurrence 1 sur 1

Plotting tools

-  TOPCAT
-  Aladin
-  SPLAT
-  CASSIS
-  3DView

Example queries

Saturn in March 2012



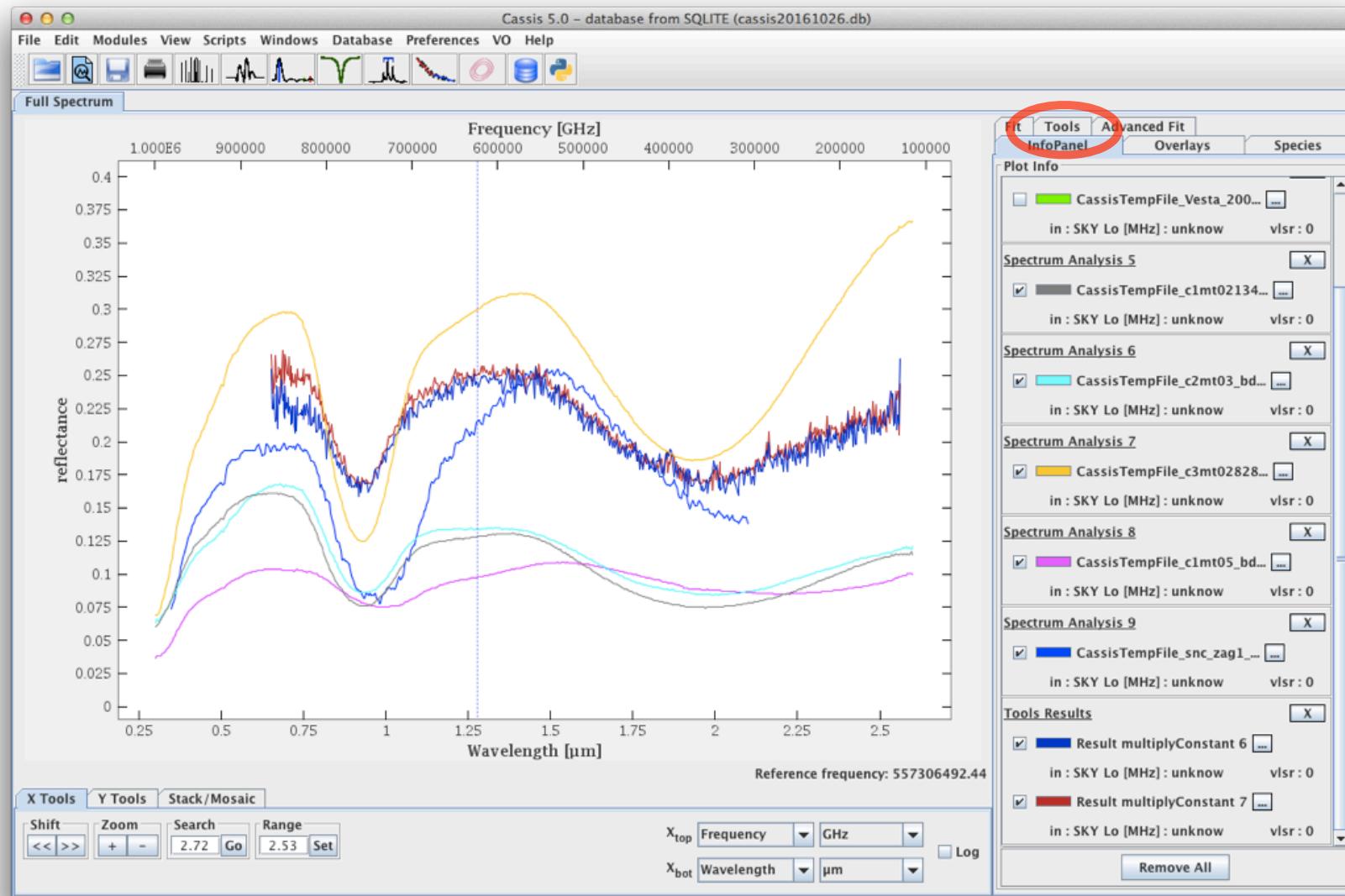
The plot shows a red curve representing the reflectance spectrum of the EETA79001 meteorite. The x-axis is labeled 'Wavelength (nm)' with values 0.0, 0.5, 1.0, 1.5, 2.0, and 2.5. The y-axis is labeled 'Reflectance' with values 0.0, 0.2, 0.4, and 0.6. The curve exhibits several absorption features, notably around 0.5 nm, 1.0 nm, and 1.8 nm.

Select preferred results visually from thumbnails
& send as spectra

Spectral comparisons from different services

All spectra will plot immediately in the same window

Spectral axis units will be converted if needed



Use Tools tab to scale flux axis (multiply M4ast spectra by 0.25)

Scaling is required, as Vesta spectra are provided as normalized I/F, and SNC spectra as reflectance factor

Analyzing spectral cubes with APERICubes & CASSIS

APERICubes is a PDS spectral cube viewer for the VIRTIS instrument

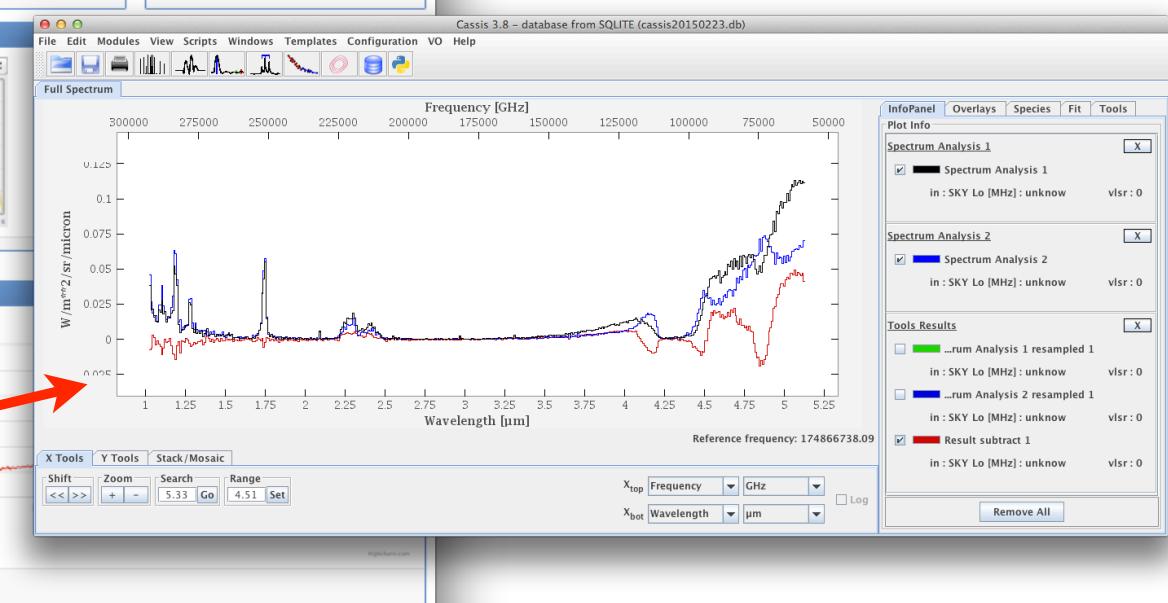
see Tuto_TopCat_VEx for details - <http://voplus.obspm.fr/apericubes/js9/demo.php>

The screenshot shows the APERICubes Demonstrator interface. It includes:

- Cube Import:** Choose PDS file to process.
- Results:** Processing file: /var/www/apericubes/Atel/V0072_05.CAL. Output directory: /var/www/apericubes/Atel/V0072_05.
- SAMP Apps:** Cassis, Ira, VOspec.
- SAMP Status:** Not connected. Register with SAMP HUB.
- Region Stats:** Position x: 26.50, y: 36.13, width: 7.50, height: 7.50, min: 0.10, max: 0.12, counts: 0.54, bgnd: 0.11, noise: 0.30, centroid x: 26.49, y: 34.28, FWHM: 4.29.
- 3D Plot:** A 3D surface plot.
- X Proj:** X Projection plot.
- Spectrum:** Spectrum for pixel (41,28) showing a plot of Flux vs Wavelength.
- Full Spectrum:** A large plot showing Intensity (W/m²/sr/micron) vs Frequency (GHz) and Wavelength (μm). A red arrow points to the "Send Spectrum via SAMP" button at the bottom left of this panel.

Extract a spectrum and click on the "Send spectrum via SAMP" button (this can be averaged in a region of interest)

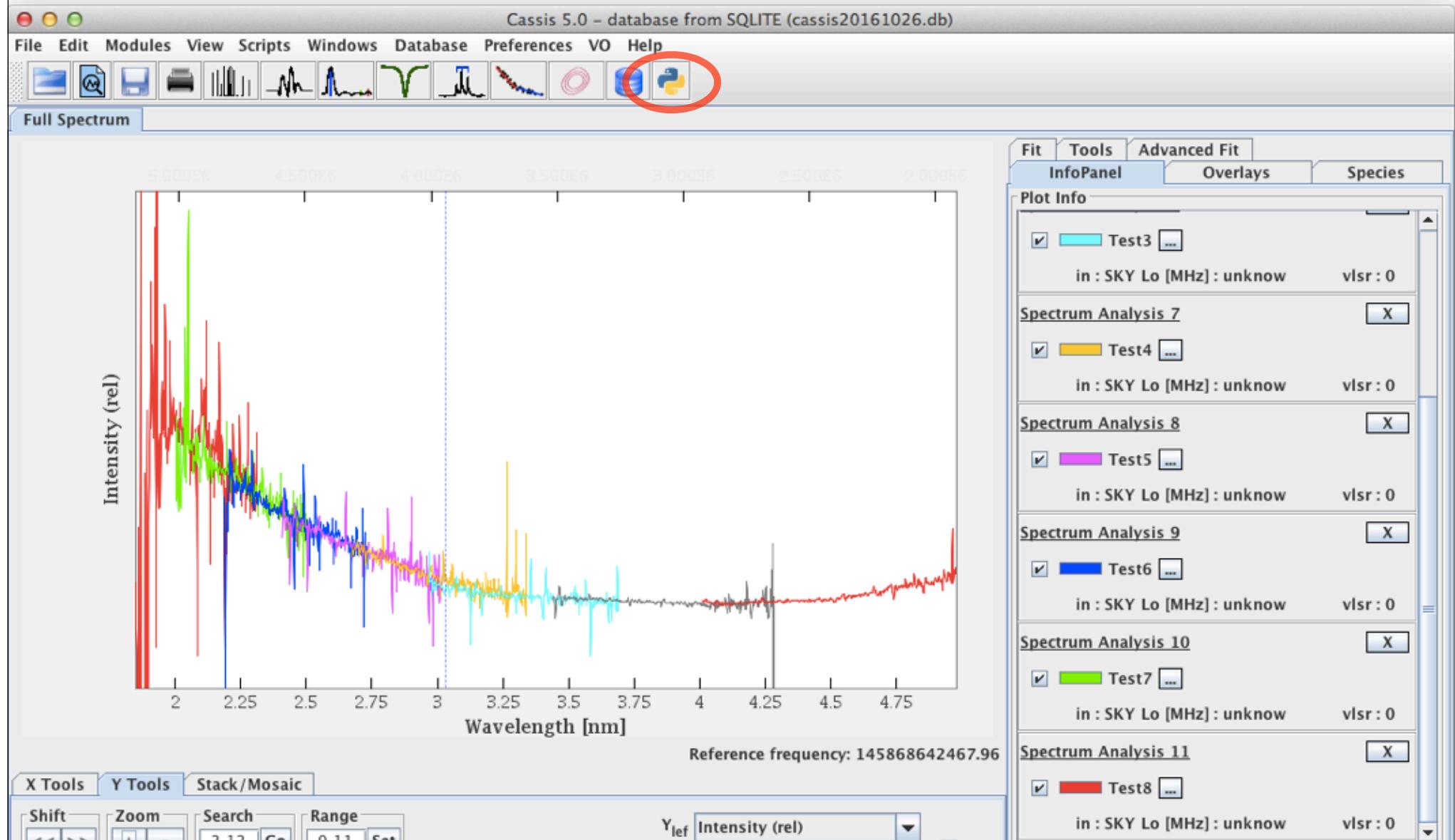
The spectrum extracted from the cube will be sent to CASSIS (as well as TOPCAT, SpecView, etc) for further analysis



Special uses in CASSIS

With adequate script CASSIS can plot spectral segments independently

In this case, 8 overlapping spectral orders from VIRTIS-H/Rosetta in the same file
(the default is to merge overlapping regions)



CASSIS as a VO search tool

Select EPN-TAP under the VO menu to access VESPA-compliant data services

The ADQL query is filled automatically from exposed parameter fields, but can be edited manually

You can select several services (Comm-click) in the left list to query them together

An SSA client is also available for more general astronomy services (SSA protocol)

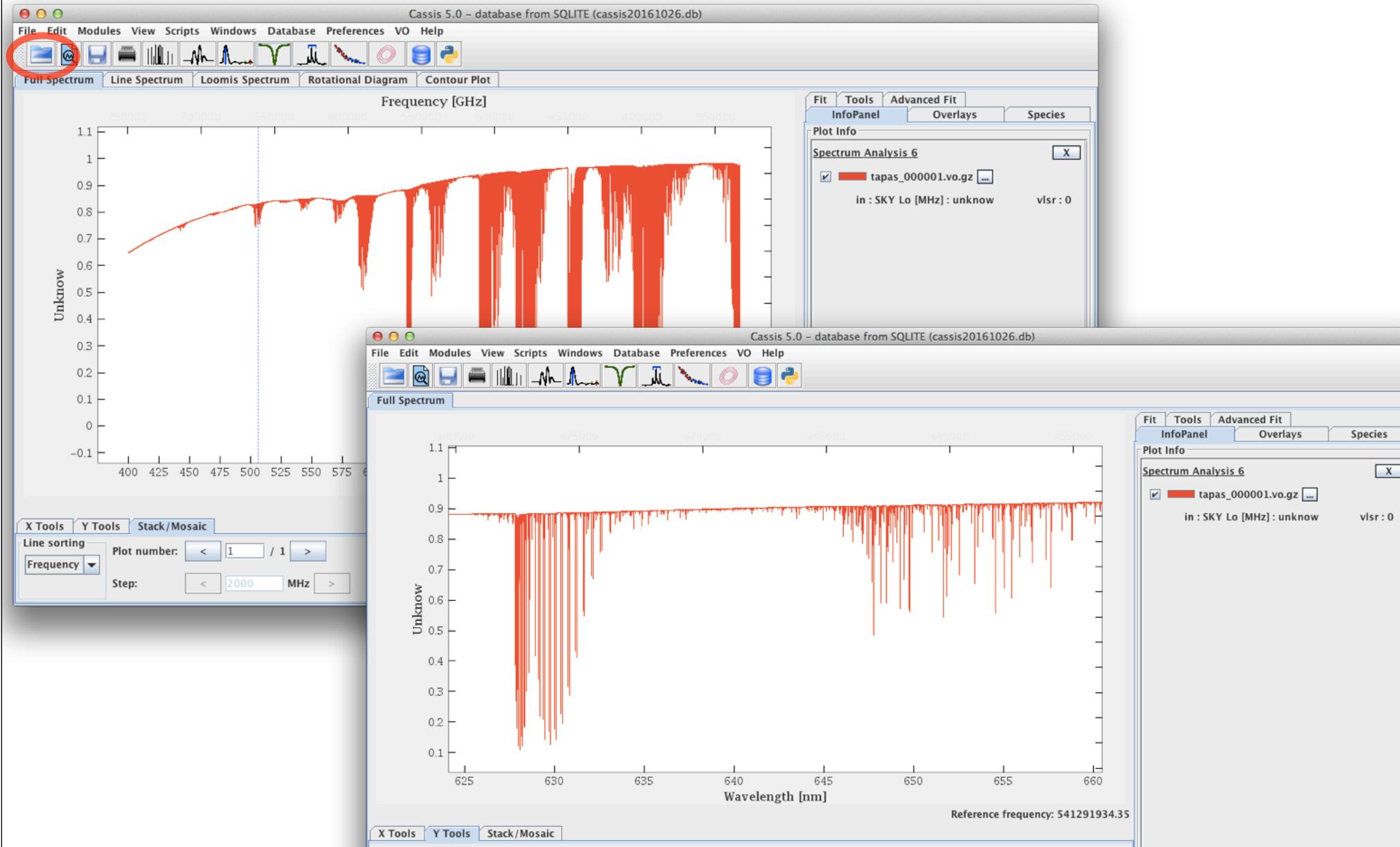
The screenshot shows the CASSIS 5.0 application window. The menu bar at the top includes File, Edit, Modules, View, Scripts, Windows, Database, Preferences, VO (which is circled in red), and Help. Below the menu is a toolbar with various icons. The main workspace is divided into sections: a left panel titled "Full Spectrum" showing a list of services like AMDA, APIS, and BASECOM; a central panel titled "EPN-TAP" showing "Query parameters" (Target name, Time, Spectral range, Dataproduct type set to "Spectrum") and a query editor with an ADQL query; and a right panel displaying a table of data with columns like short_name, res_title, and Service URL. A blue oval highlights the ADQL query text. At the bottom, there's a table viewer showing data for the "iks" service, and buttons for "Download...", "Display..." (circled in red), and "Open result". A status bar at the bottom left says "VOTable data parsed".

Select spectra, click on
"Display" and confirm
default access parameter

Use with external (not VO) services

Get a simulated Earth atmosphere transmission spectrum from TAPAS

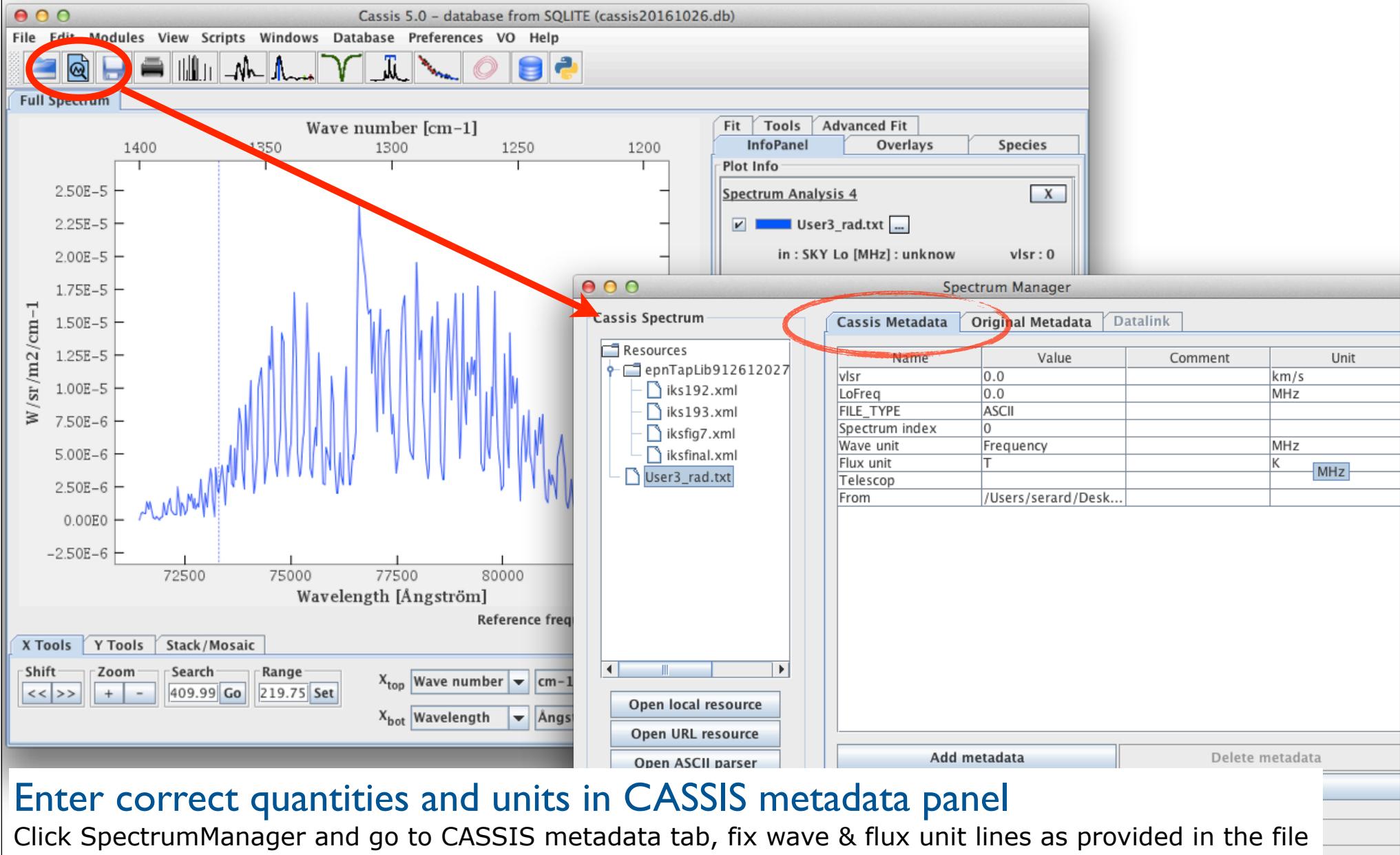
<http://www.pole-ether.fr/tapas/> (requires registration) - ask for a VOTable output, open it in CASSIS



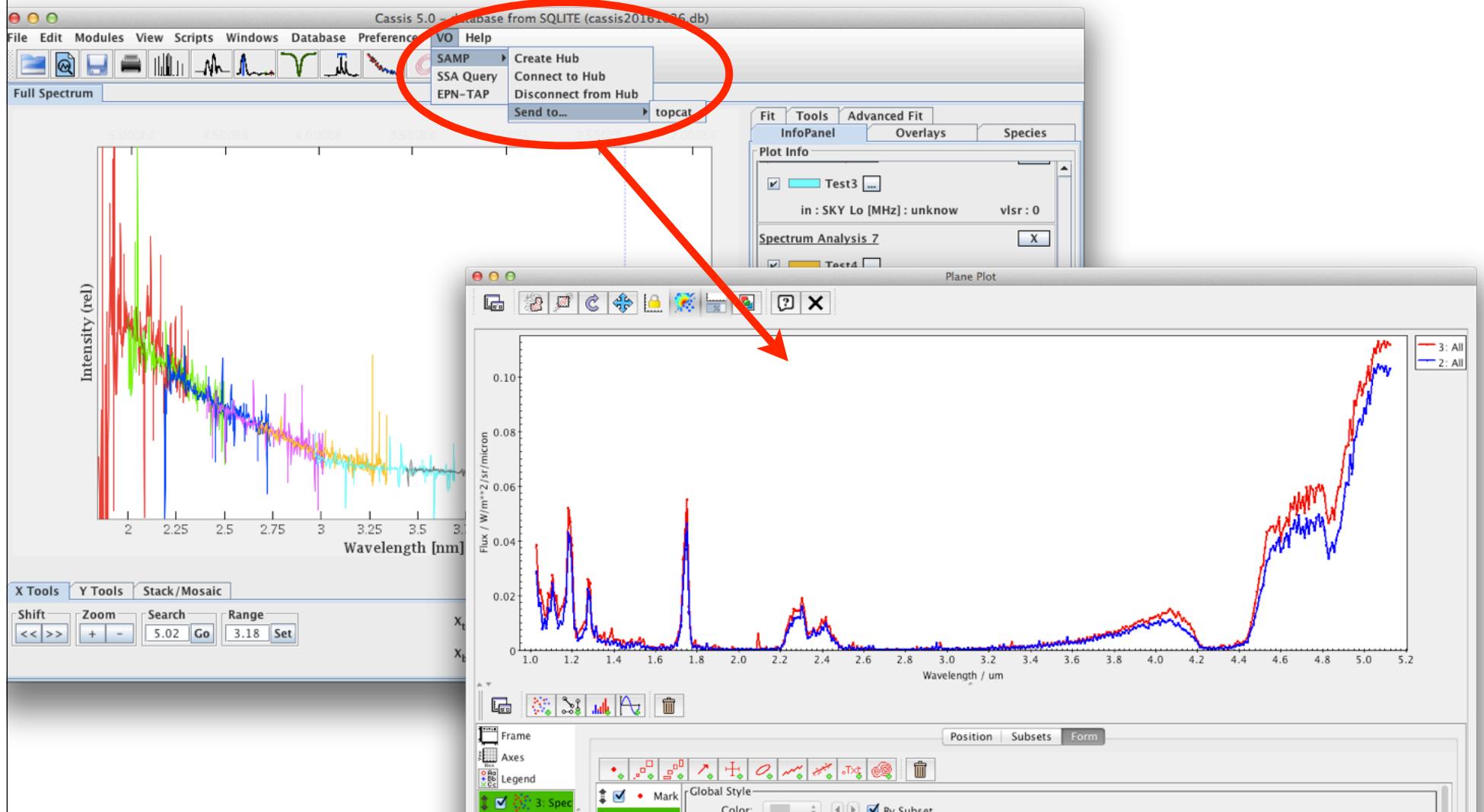
Use with external (not VO) services

Get a Titan atmosphere spectrum from Planetary Spectrum Generator

<https://ssed.gsfc.nasa.gov/psg/> (requires manual configuration) and retrieve the standard ascii output



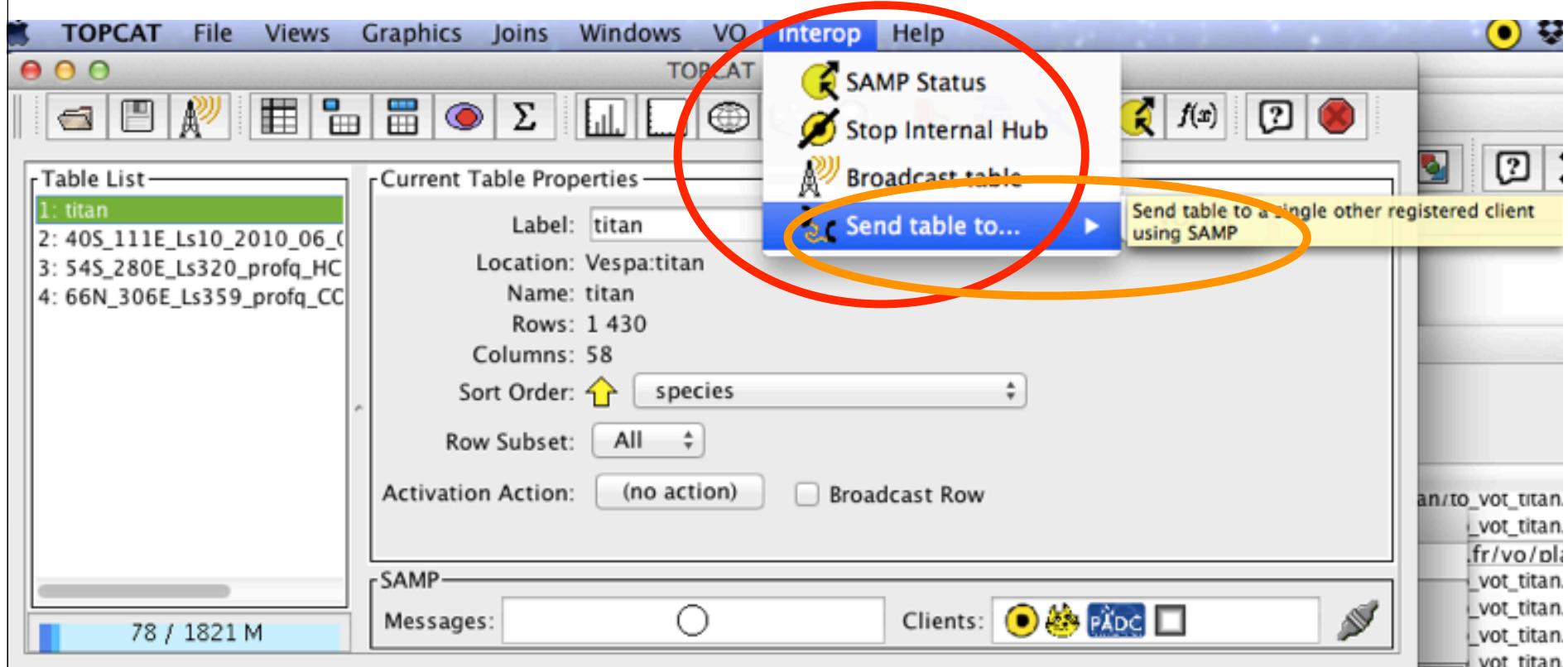
Sending data from CASSIS



With TOPCAT (or SPLAT-VO, VOspec, SpecView, etc) activated, select
SAMP > Send to... > topcat in VO menu

In TOPCAT, click on PlanePlot (units may be converted in the process)

Sending data from TOPCAT



Use menu item Interop > Send table to.... in TOPCAT
A table is transmitted to other VO plotting tools
Will open in CASSIS if format is adequate (2 columns with known units)

Going through TOPCAT may help ingesting spectral data that do not enter CASSIS easily

Other relevant tutorials

Tuto_Spectro

EPN-TAP spectroscopy data services in VESPA,
use with various spectral tools

Tuto_TopCat_VEx

Imaging spectroscopy from Venus-Express,
CASSIS interaction with APERICubes

QGIS_plugin

https://github.com/epn-vespa/tutorials/blob/master/vo_qgis_plugin/vo-qgis-plugin.md

Imaging spectroscopy of Mars from CRISM,
sending spectra from TAPhandle or QGIS to CASSIS

The Europlanet 2020 Research Infrastructure project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654208.

<http://www.europlanet-vespa.eu/>