

VESPA: a Virtual Observatory in Planetary Science (progress report)

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with Europlanet-2020/VESPA partners
& data providers



Journées ASOV

Paris, 15/3/2017

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New in 2016-17:

Data Access Protocol updated

EPN-TAP v.2

More flexible, less ambiguous, easier for service implementation

Enlarged content thanks to Europlanet-2020

Currently 32 data services open, more in test

ESA's Planetary Science Archive implemented, in test > 8 million files!

Call for new services just closed

(4 new services selected, to be implemented during workshop in April)

Input to IVOA working groups

New Solar System Interest Group to start next spring (chair: B. Cecconi)

Will provide input in other WG (UCDs, STC, applications, etc)

VESPA relies on international standards

- **IPDA - International Planetary Data Alliance**

Consortium of national space agencies, focuses on access to space mission archives

- **IVOA - International Virtual Observatory Alliance**

Consortium of national VO actions - provides interoperability standards

- **IAU - International Astronomical Union**

Provides standards for nomenclature, physical quantities, coordinate systems, fits data format, etc.

- **SPASE - Space Physics Archive Search Extract**

Provides interoperability standards for planetary plasmas

- **OGC - Open Geospatial Consortium**

Provides industry standards for GIS

VESPA data services

- A table describing each of the service files (using std parameters)
- Stored in postgresql + TAP-handling application at the institutes
- Searches through an optimized interface, connected to VO tools



Results in service titan

Show 10 entries

Column visibility Show all Hide all

granule_uid	dataprodukt_type	target_name	time_min	time_max	access_url
79N_80E_Ls301_profq_C4H2_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C4H2.txt
79N_80E_Ls301_profq_CO2_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_CO2.txt
79N_80E_Ls301_profq_C3H8_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C3H8.txt
79N_80E_Ls301_profq_C2H4_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C2H4.txt
79N_80E_Ls301_profq_C2H2_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C2H2.txt
79N_80E_Ls301_profq_C2H6_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C2H6.txt
79N_80E_Ls301_profq_CH3C2H_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_CH3C2H.txt
79N_80E_Ls301_profq_HCN_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_HCN.txt
79N_80E_Ls301_profq_C6H6_q_votable	profile	Titan	2005-02-14T12:00:00.000	2005-02-14T12:00:00.000	79N_80E_Ls301_profq_C6H6.txt

Plotting tools

TOPCAT

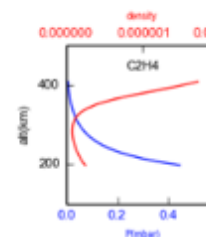
Aladin

SPLAT

CASSIS

Example queries

Saturn in March 2012



VESPA data access

- Global search interface for Planetary Science services
- Supports EPN-TAP + PDAP

<http://vespa.obspm.fr>

The screenshot displays the VESPA web interface. At the top, there is a navigation bar with 'All VO', 'Custom resource', 'Direct Query', 'Advanced Query', and 'Help'. Below this, a search bar shows 'apis' with 15506 results and 'bdip' with 704 results. The main content area is titled 'Results in service apis' and shows a table of search results. A blue arrow points from the table to a box containing the text 'To plot / analysis tools'. On the right side, there are sections for 'Plotting tools' (TOPCAT, Aladin, SPLAT, CASSIS) and 'Example queries' (Saturn in March 2012).

Results in service apis

Show 10 entries

Column visibility Show all Hide all

granule_uid	dataprodukt_type	target_name	time_min	time_max	access_url	granule_gid	obs_id	ta
o4bd01ycq_cyl_pdf	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_cyl.pdf	cylindric_proj	o4bd01ycq	pli
o4bd01ycq_pol_n_pdf	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_pol_n.pdf	polar_proj_north	o4bd01ycq	pli
o4bd01ycq_pol_s_pdf	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_pol_s.pdf	polar_proj_south	o4bd01ycq	pli
o4bd01ycq_proc	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_proc.fits	processed_data	o4bd01ycq	pli
o4bd01ycq_proc_pdf	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_proc.pdf	processed_data	o4bd01ycq	pli
o4bd01ycq_x2d	image	Saturn	1997-10-11T03:53:03.524	1997-10-11T04:09:43.724	o4bd01ycq_x2d.fits	original_data	o4bd01ycq	pli
o4bd01yeq_cyl_pdf	image	Saturn	1997-10-11T04:15:43.524	1997-10-11T04:28:37.134	o4bd01yeq_cyl.pdf	cylindric_proj	o4bd01yeq	pli
o4bd01yeq_pol_n_pdf	image	Saturn	1997-10-11T04:15:43.524	1997-10-11T04:28:37.134	o4bd01yeq_pol_n.pdf	polar_proj_north	o4bd01yeq	pli
o4bd01yeq_pol_s_pdf	image	Saturn	1997-10-11T04:15:43.524	1997-10-11T04:28:37.134	o4bd01yeq_pol_s.pdf	polar_proj_south	o4bd01yeq	pli
o4bd01yeq_proc	image	Saturn	1997-10-11T04:15:43.524	1997-10-11T04:28:37.134	o4bd01yeq_proc.fits	processed_data	o4bd01yeq	pli

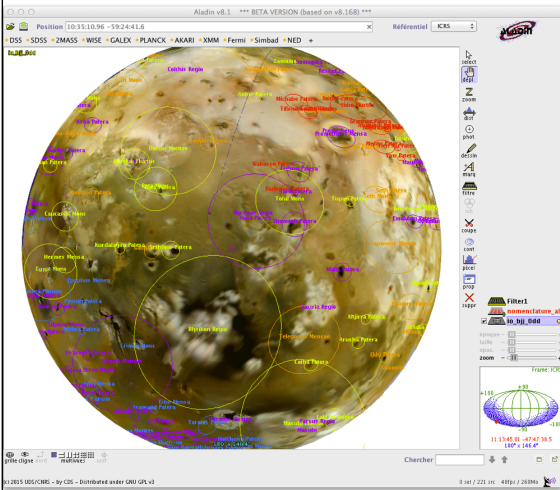
Plotting tools

- TOPCAT
- Aladin
- SPLAT
- CASSIS

Example queries

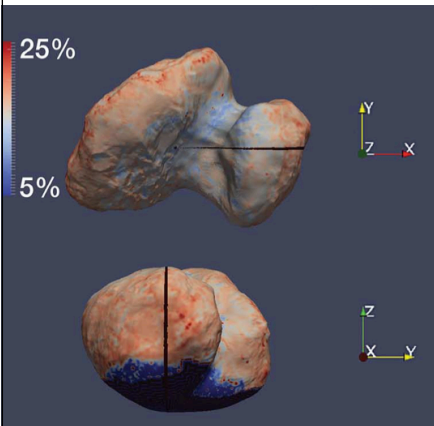
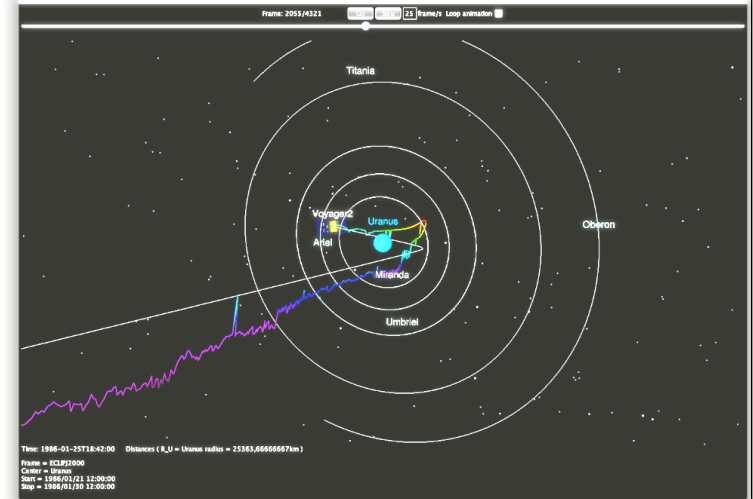
Saturn in March 2012

IVAO tools updated for VESPA



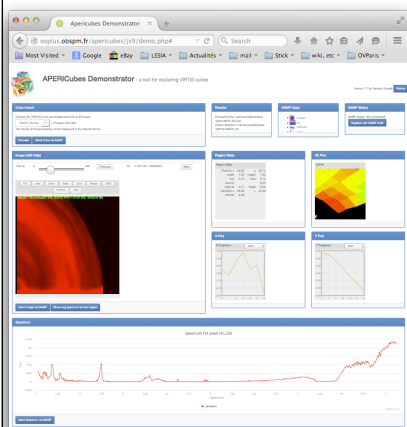
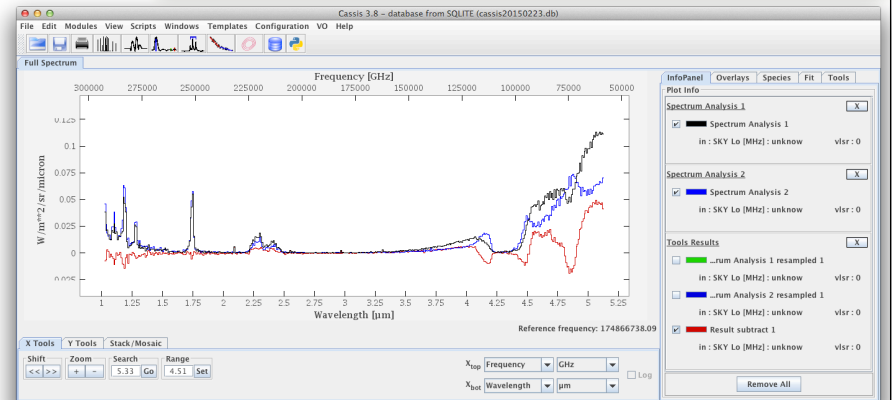
Aladin (CNRS): add coordinate systems

3Dview (CNES): add all space missions



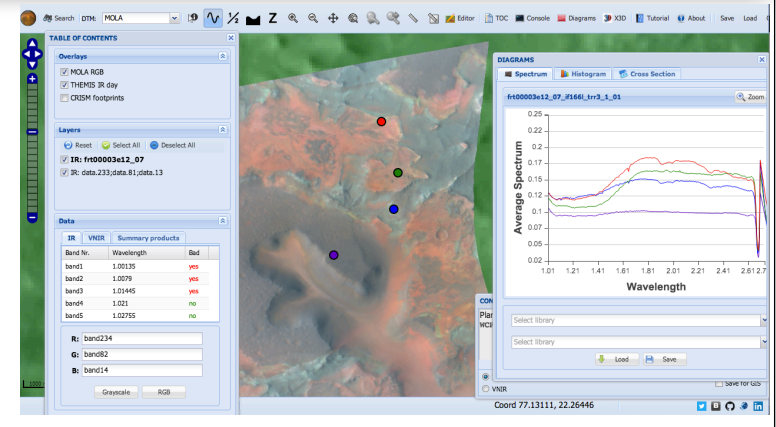
MATISSE (ASI): mapping on shape models

CASSIS (CNRS): add reflectance

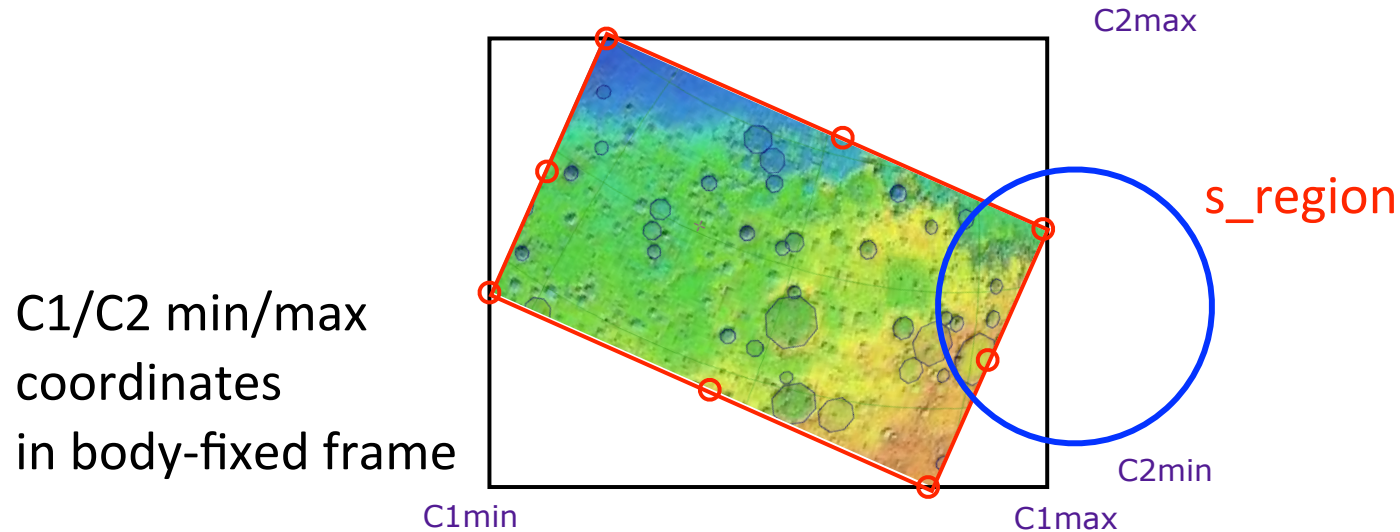


APERICubes: Browse PDS spectral cubes

PlanetServer (EU contract): VO-interfaced GIS



VESPA new standard: footprint formats

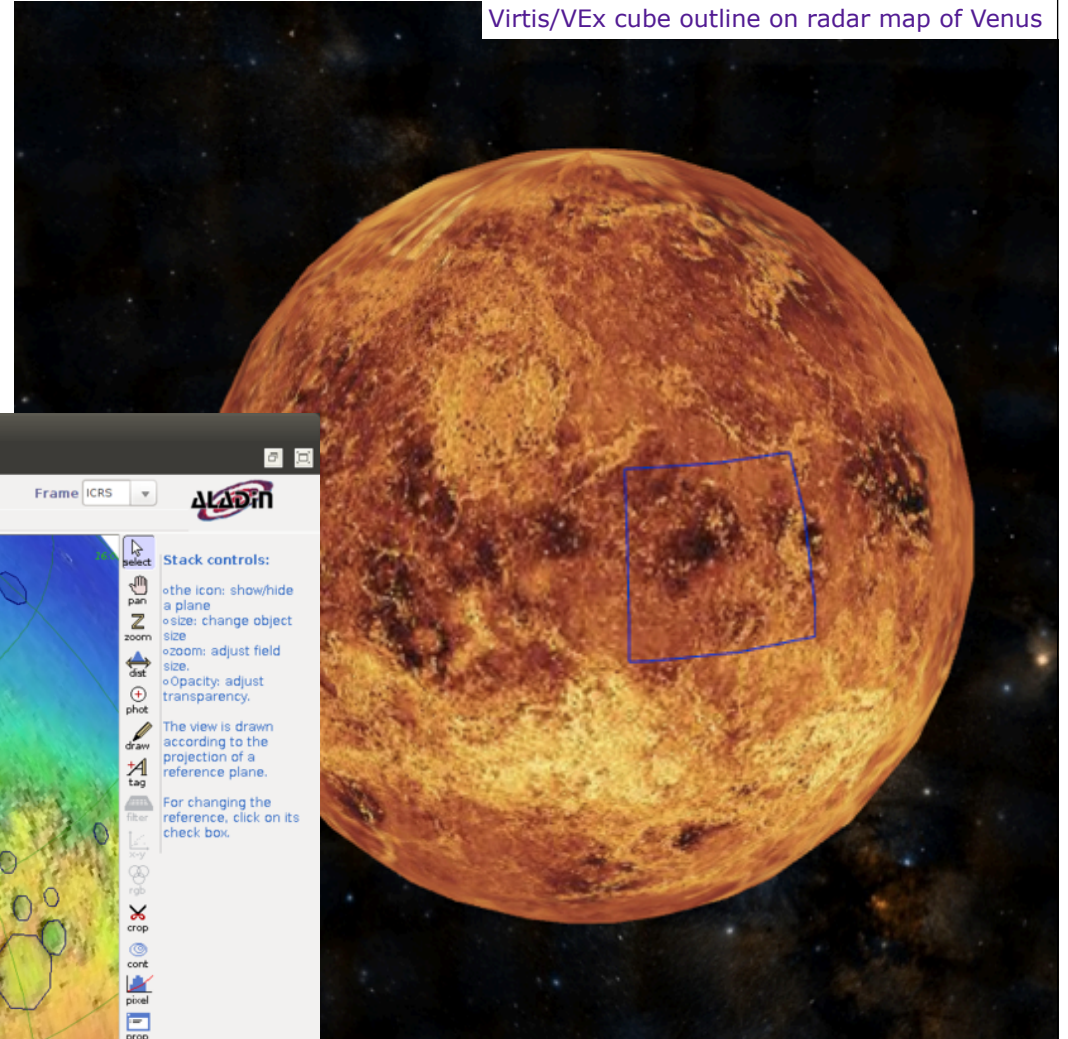


- PDS3-like limits
=> provide very rough estimate of footprint as a lon/lat bounding box
- IVOA's s_region parameter (sampling the contour)
=> provides much more accurate footprints with tunable resolution
+ support for footprint shape, polar views, etc
+ allows for very powerful searches on intersections, etc

VESPA news: one-click footprints visu on planets

Mizar: overplots
PDS footprints on 3D maps
on CNES tool

Virtis/VEx cube outline on radar map of Venus



Aladin v9.0
File Edit Image Catalog Overlay Coverage Tool View Interop Help

Location [] Frame ICRS

DSS SDSS 2MASS WISE GALEX PLANCK AKARI XMM Fermi Simbad NED +

Mars-ELATLON ICRS

Stack controls:
the icon: show/hide a plane
size: change object size
zoom: adjust field size.
Opacity: adjust transparency.

The view is drawn according to the projection of a reference plane.

For changing the reference, click on its check box.

Drawing
Mars-ELATLON

epoch []
size []
opac []
zoom []

Frame: ICRS
+180
+90
-90
-180
22:58:56.29 +90:53:41.0
107.4° x 77.13°

Mars crater catalogue on MOLA/MGS map

Aladin: adapt IVOA footprints to planetary bodies, with some OGC-like processing

Data services connected via EPN-TAP

Currently (12 March 2017):

- 32 data services connected**
- ~ 10 being designed**
- All (12) pre-existing services updated to v2 in 2016**
- 20 new services added since last ASOV meeting (2016)**

- 4 teams/projects invited to implementation workshop in Graz, end of March**
- On going projects with ESA/PSA and NASA/PDS**

Data services connected via EPN-TAP / field

Open
Open in test
In development
Being studied

* New in 2016-17

Atmospheres

- Titan profiles - CIRS (Cassini, LESIA)
- Venus spectroscopy - VIRTIS (VEx, LESIA)
- * - Mars Climate Database (modeling, LMD-LESIA)
- * - Venus profiles - SPICAV/SOIR (VEx, IASB-BIRA)
- * - Mars profiles - SPICAM (MEx, LATMOS)
 - All MEx derived atmospheric products (via MEx IDS)
 - EuroVenus derived products (via C. Wilson)

Small bodies

- M4ast (ground based spectroscopy, IMCCE)
- 1P/Halley spectroscopy - (IKS / Vega-1, LESIA)
- BaseCom - (Nançay obs, LESIA)
- * - TNOs are cool - (Herchel & Spitzer + compilation, LESIA & LAM & Utinam)
 - Cometary lines catalogue (IAPS)
 - Vesta & Ceres spectroscopy - VIR/DAWN (IAPS)
 - Small bodies orbital catalogues:
- * DynAstVO: NEO refined parameters (IMCCE)
- * MPCorb (MPC / Heidelberg)
 - Rosetta ground-based support (via C. Snodgrass)
 - Support for 3D shape models (IMCCE)
- * - 67P illumination config (IRAP)

Surfaces

- * - Mars GIS (CRISM, Marsis... Jacobs, GEOPS)
- * - Mars craters (Jacobs, GEOPS)
- * - USGS planetary maps (Jacobs)
 - OMEGA data (MEx, IAS, via SIttools2)
 - MarsSI GIS (Lyon)

Solid spectroscopy

- SSHADE: ices & minerals (IPAG & network)
- Minerals emission db (DLR)
- PDS/MRO support db (LESIA)

Magnetospheres / radio

- APIS - HST (LESIA)
- * - RoutineJupiter (Nançay, LESIA)
- AMDA (CDPP / IRAP)
- * - MAG data (VEx, IWF Graz)
 - MASER & Juno support (LESIA)
- * - RadioJove (LESIA & US amateur network)
- * - Iltate HF data of Jupiter (Tohoku Univ)
 - Juno Ground support (Kharkiv, Ukr.)
 - Coupled Giant Planet Systems (modeling, UCL)
 - Generic wave polar. & propag. (modeling, IAP Prague)
- * - Interface with IMPEX models (IWF Graz)
 - Hisaki (Tohoku Univ.)

Exoplanets

- Encyclopedia of exoplanets (compilation, LUTH/LESIA)
- Transit observations (Bern)
- Interface with DACE (Geneva)

Solar

- HELIO AR & 1T3 solar features catalogues (LESIA)
- Bass2000 (LESIA)
- Radio Solar db (Nançay, LESIA)
- * - CLIMSO (Pic du Midi, IRAP)
- * - Iltate PPARC_R (Tohoku Univ)

Generic / interdisciplinary

- BDIP (LESIA)
- Planets, then satellites characteristics (LESIA/IMCCE)
- * - PVOL (EHU Bilbao & network)
- * - Gas absorption cross-sections (Granada)
 - Nasa dust catalogue (IAPS)
 - Stellar spectra, support for observations & exopl. (LESIA)
 - Telescopic planetary spectra collection (LESIA)
 - Interface with VAMDC (TBD)
- * - PSA complete archive (ESA)
 - DARTS (JAXA - currently via PDAP)
 - On-going discussions with PDS & IPDA

National level

"VESPA portal" proposed for labelling in ANO5

- **Search interface + tool connections**
- **Definition / maintenance of standards (IVOA + IPDA, SPASE...)**
- **A set of data services at Observatory of Paris**
 - Currently 15 open & >5 in dev (+ access to 4 ANO5-labelled services)
 - Also used as a repository for older ANO2 (e.g., space instruments)
restrained to data distribution services
- **Access to external services** (the portal also connects other services in France and elsewhere)
- Plus **training activities**, e.g. participation to doctoral training week in 2017 at PADC

VESPA documentation / codes / training material

- On our web site: <http://www.europlanet-vespa.eu/>
- On our GitHub: <https://github.com/ejn-vespa>
- Search interface: <http://vespa.obspm.fr>