IVOA standards in IRAP Tools (3DView,AMDA,CASSIS) *in the framework of* EuroPlaNet H2020/VESPA

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OVERVIEW

- EuroPlaNet H2020 – VESPA @ IRAP
- CDPP-3DView
- CDPP-AMDA
- CASSIS
- A scientific use case with 3DView and TOPCat

EuroPlaNet H2020/VESPA

- Continuation of previous attempts to access planetary sciences data archives from:
    - Space agencies (PDS, PSA)
    - Ground based telescopes archives
    - Laboratory data
- Infrastructure and standards adapted from the IVOA
- Relies also on other international standards from IPDA, IAU, SPASE, etc
- Mainly : IVOA **TAP** protocol + **EPNCore** dictionary (set of keywords specific to planetary sciences)

EuroPlaNet H2020

VESPA « Work Package » **@ IRAP/*OVGSO*/CDPP&CASSIS**

– Update of the EPN-TAP <u>server</u> of CDPP-*AMDA* (EPN-TAP v2)

– Development of EPN-TAP <u>clients</u> in CDPP-*AMDA*, CDPP-*3DView and CASSIS*

– Specification of a universal library for the management of *low level* functions of the EPN-TAP protocol

– Development of a Java version used by CDPP-*3DView* and *CASSIS*

– Development of a PHP/JavaScript version used by CDPP-*AMDA*

VESPA architecture overview

http://3dview.cdpp.eu
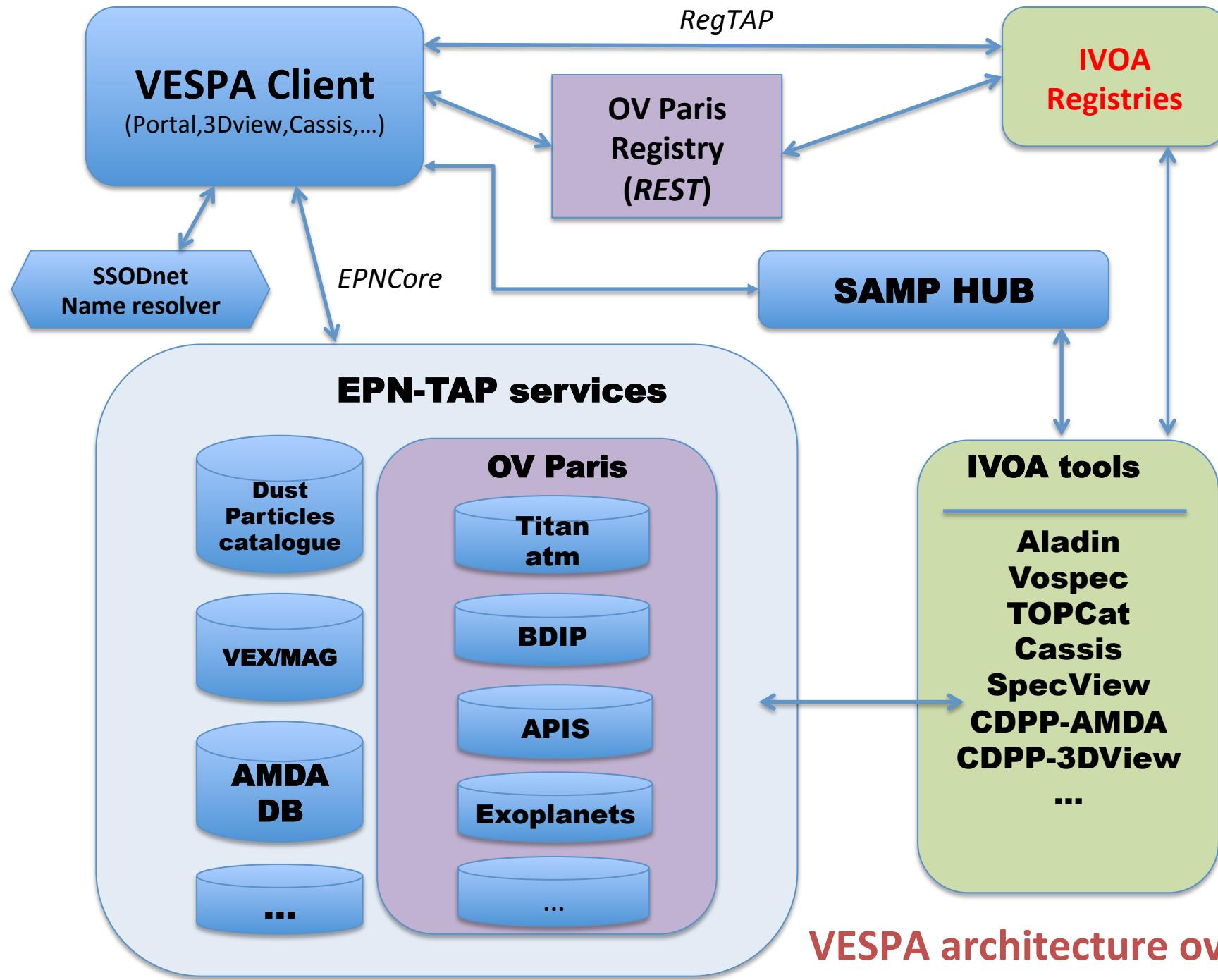
3DView is an open Java application which displays spacecraft and natural bodies orbits in 3D scenes, observational data as well as simulation results (from MHD/Hybrid codes and analytical models) interpolated on s/c trajectories or 2DCuts and magnetic field lines.
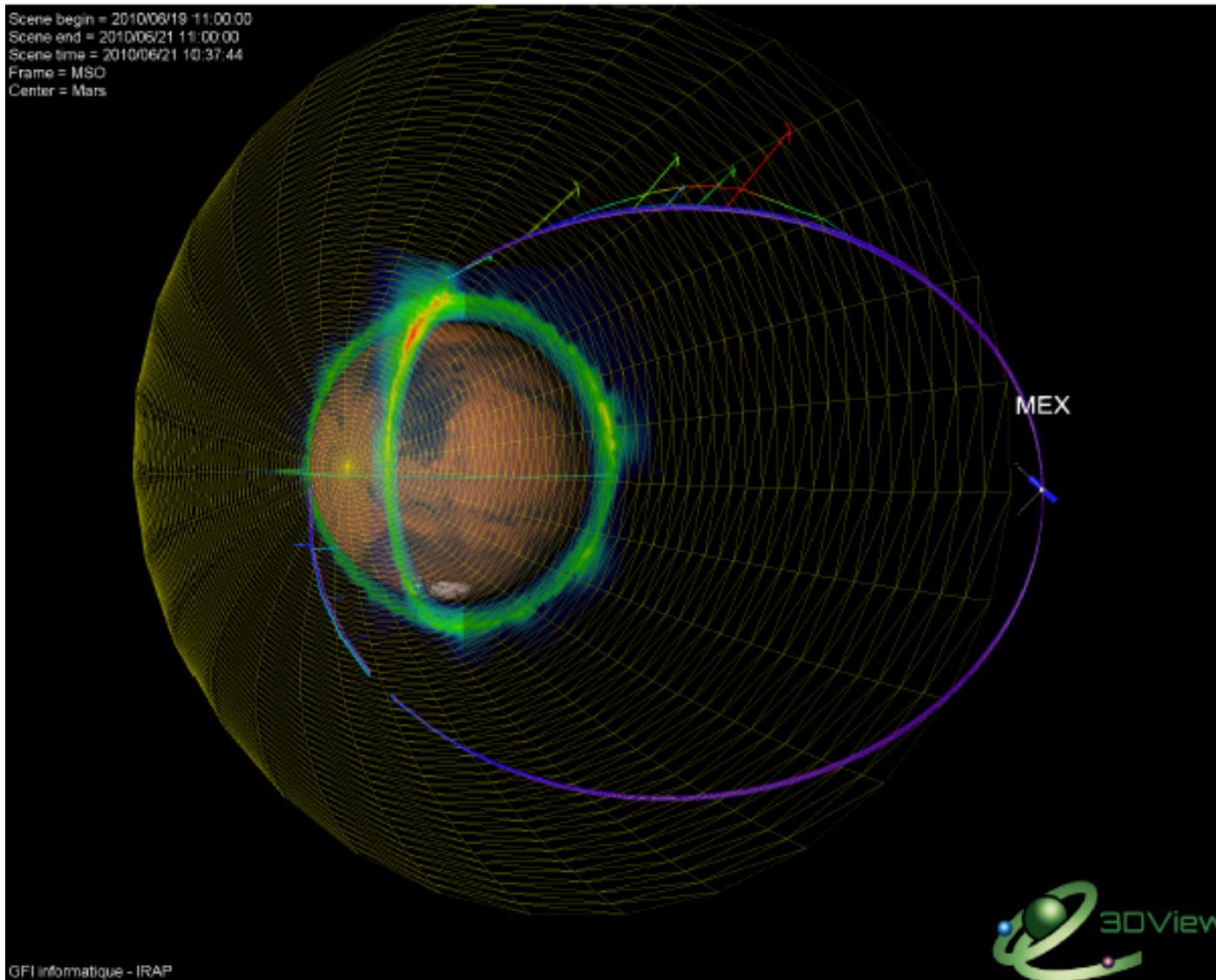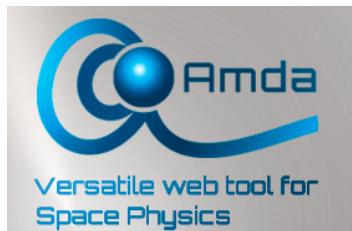
AMDA (Automated Multi-Dataset Analysis) is a web-based facility for on line analysis of **space physics time series** coming from either its local database or distant ones, allowing to perform online classical operations like data *visualization*, *physical parameter creation* or *data extraction,* or innovative ones like *event search* on the contents of data, in either visual or automated way, or management of *event tables.* *http://amda.cdpp.eu*
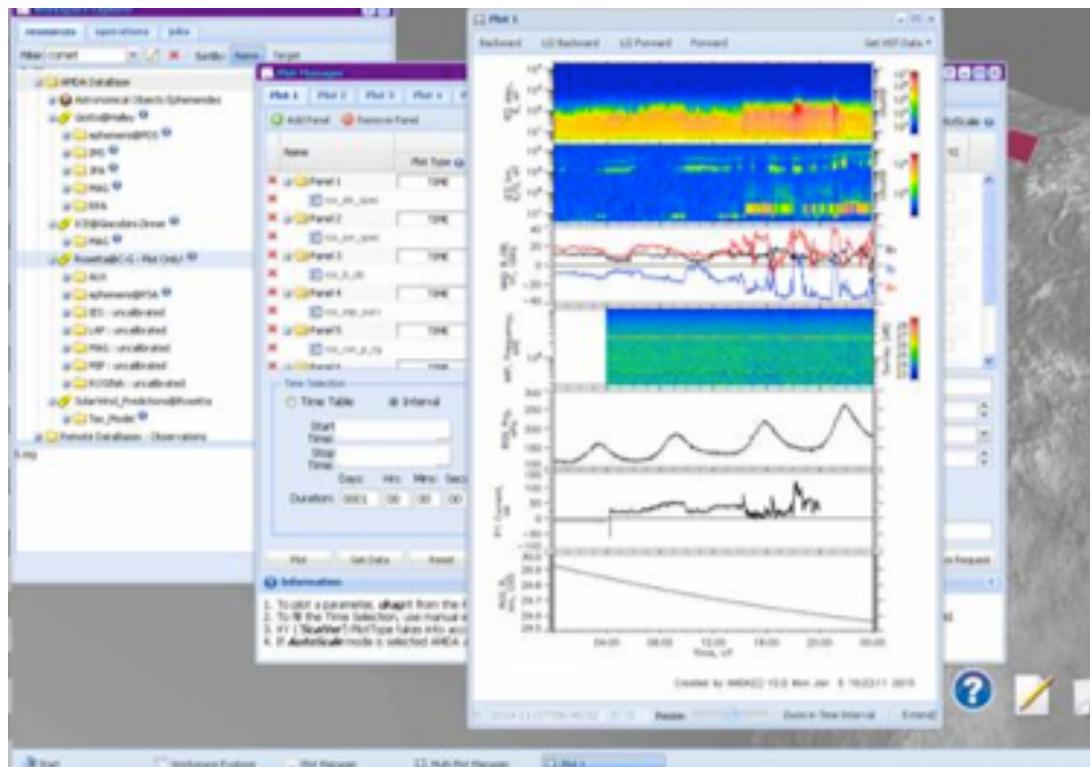
EPN-TAP client will be implemented in the AMDA web tool

Planetary data in the AMDA database

ULYSSES : Ephemeris, MAG, SWOOP, URAP (Io tous)
STEREO : Ephemeris, SWEA, MAG, PLASTIC
ACE : Ephemeris, MAG, SWEPAM
WIND : Ephemeris, MAG, SWE

MESSENGER : Ephemeris, MAG, FIPS, EPS
Mariner 10: MAG

Venus Express : Ephemeris, IMA, ELS, MAG
PVO : Ephemeris, MAG

THEMIS : Ephemeris, ESA, MAG
CLUSTER : Ephemeris, MAG, CIS, PEACE, RAPID, EFW, WHISPER, STAFF
Double Star 1 : Ephemeris, MAG, HIA
IMP-8 : Ephemeris, MAG, MIT
GEOTAIL : Ephemeris, MGF, LEP
POLAR : Ephemeris, MFE
INTERBALL-TAIL: Ephemeris, MAG, CORALL
ISEE : Ephemeris, MAG, FVA
Indices : AE, DST, ASY-SYM, PC North, AM, AA

ARTEMIS : Ephemeris, ESA, MAG

MARS EXPRESS: Ephemeris, IMA, ELS, MARSIS
MARS GLOBAL SURVEYOR: Ephemeris, MAG, ER, PROXY

GALILEO : Ephemeris, MAG, EPD, PLS, PWS
VOYAGER 1 & 2 : Ephemeris, MAG, PLS, PWS
PIONEER 10 & 11: MAG
ULYSSES : Ephemeris, MAG, SWOOPS

CASSINI : Ephemeris, RPWS (SKR, Langmuir Probe), MAG, CAPS
VOYAGER 1 & 2 : Ephemeris, MAG
PIONEER 11 : MAG

VOYAGER 2 : MAG

http://amda.cdpp.eu
for an up-to-date list
of available datasets

Data provided by the
AMDA EPN-TAP server

AMDA metadata workflow
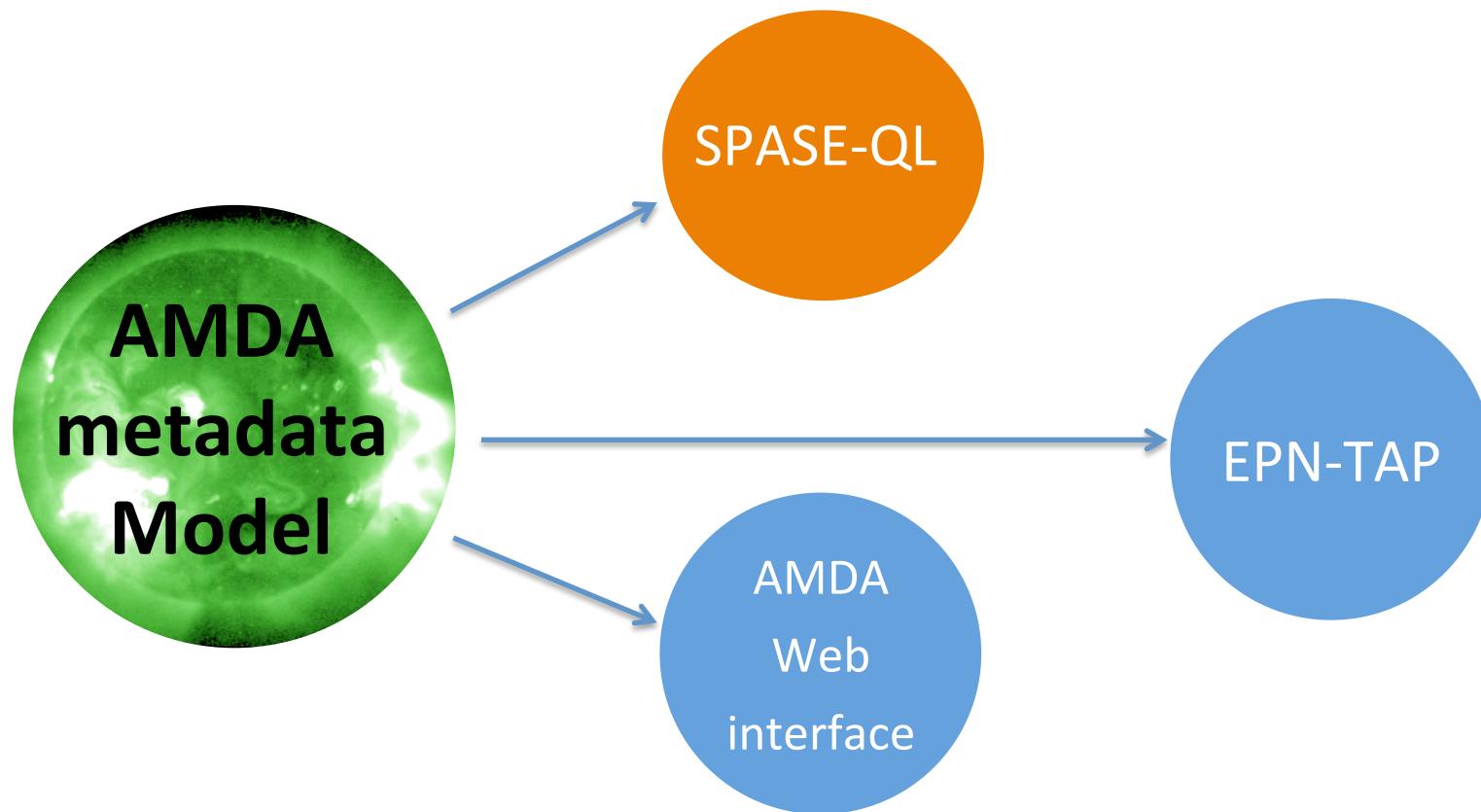
The metadata model of AMDA is an extension of SPASE (http://www.spase-group.org/)
It describes all the metadata necessary to manage SPASE-QL, The AMDA Web interface
and the EPN-TAP protocol (version 1 and 2)
For the XML serialization of the model, the OVERRIDE function of XML schema is used

AMDA EPN-TAP server

SPASE Registry Metadata related to _datasets_ and _granules_ of DD server

granules

PostGreSQL database

EPNCore View

Virtual machine

GAVO DaCHS

DD server AMDA database

EPN-TAP Client
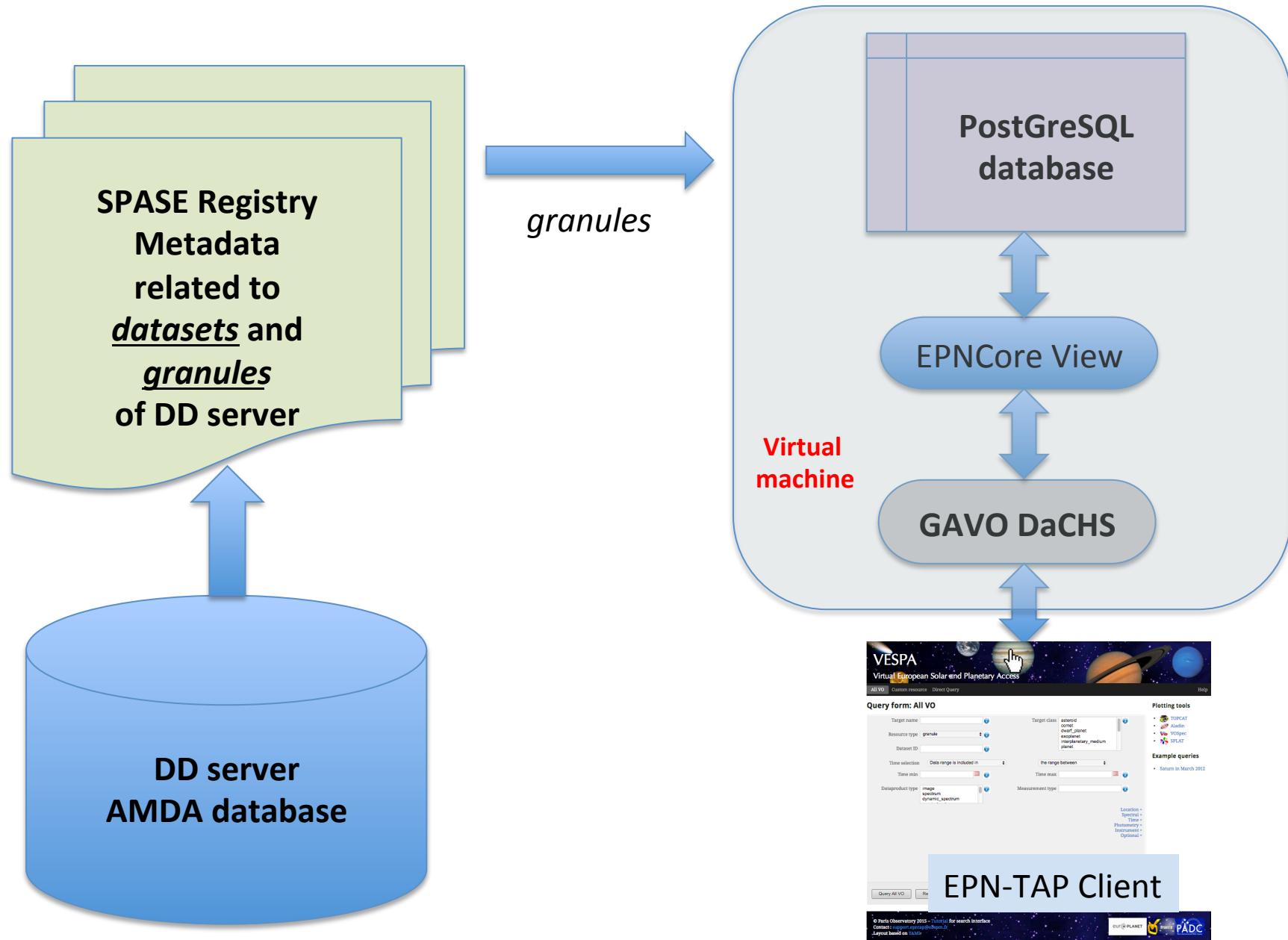
CASSIS
A free interactive spectrum analyser

http://cassis.irap.omp.eu

Java WebStart application (JNLP) or Standalone version

Observed and theoretical spectra (laboratory or telescope)

CASSIS

- →
- → **Spectra visualization**
- → **LTE and Radex model**
- → **Jython Scripting**
- → **Spectra treatment tools**
- → **Lines and spectra overlaid**
- → **Spectrum Manager (Metadata)**
- → **Database Manager**
- → **...**

Files → **Astrophysical template (fixed parameters N, TK, Tex, NH2, choice of the molecule, ...)**

Sqlite CASSIS → **Spectroscopic and molecular databases (JPL, CDMS, Basecol, LAMDA, NIST, VALD, ...)**

VAMDC
SLAP

SSAP CASSIS
SAMP
EPN-TAP
OBS-TAP
Files

Files **SAMP**

Synthetic spectra, Line identification, Adjustment of the source parameters

An example of the line analysis tool: inspecting o-H2CO lines in the observed spectrum (black) overlaid with an LTE model (pink)
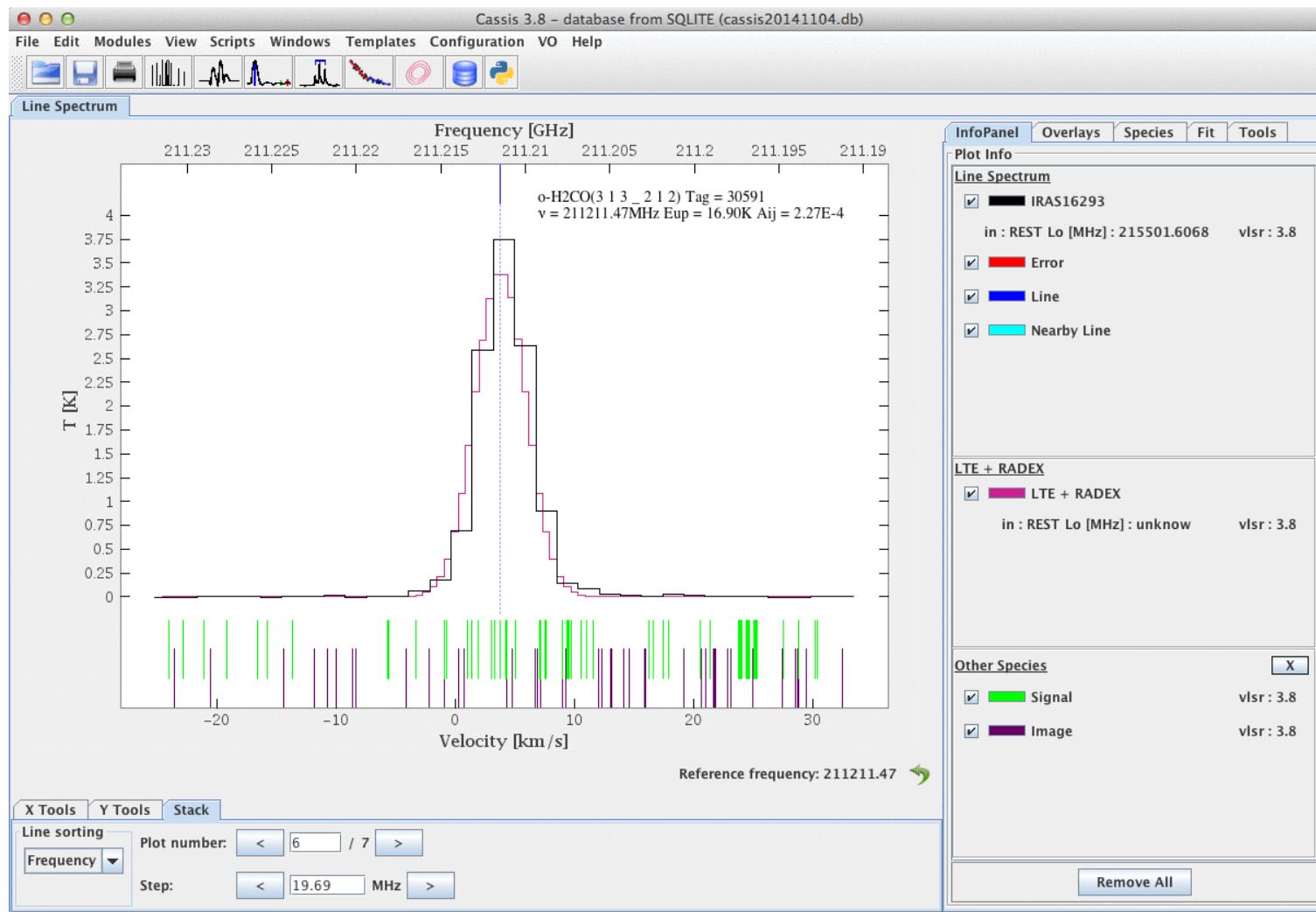
A generic library to find and access EPN-TAP services

Search for EPN-TAP services

REST interface to the "Observatoire de Paris" Registry

List of EPN-TAP services with the REST interface of the "Observatoire de Paris" Registry
➜ in JSON format, a header followed by an array called "resources" containing
the list of EPN-TAP services with their description

Contents of the header:
total: number of VOResource elements compliant with the query
numberReturned: number of VOResource elements returned
from: in case of pagination, starting VOResource, default value is 1
Full specification of the Restful interface *http://api.vo.obspm.fr/registry/*

RegTAP interface to IVOA Registries

List of EPN-TAP services with the **RegTAP** interface of several IVOA registries.
A RegTAP interface is actually an interface implementing the TAP interface, with RegTAP as model.

Methods of the library

getEPNVOResources () returns a set of VOResource elements (one per EPN-TAP service)

getEPNVOResources (keywords) returns a set of VOResource elements (one per EPN-TAP service corresponding to the keywords).The way keywords are defined is still to be defined

getEPNVOresource (ivoid) returns the VOResource element of the service identified by the ivoID

getEPNServices() returns a VOTable containing the list of EPN-TAP services and their attributes (from a predefined list)

getEPNServices(list of attributes) returns a VOTable containing the list of EPN-TAP services and their attributes (from the list of attributes)

getEPNServices(keywords, list of attributes) returns a VOTable containing the list of EPN-TAP services corresponding to the keywords and their attributes (from the list of attributes)

getEPNService(ivoID) returns a VOTable containing the attributes of the corresponding service (from a predefined list)

getEPNService(ivoID, list of attributes) returns a VOTable containing the attributes of the corresponding service (from the list of attributes)

getEPNCoreTableName(service_ivoid) returns the name of the EPNCore Table related to a service.

getTAPURL(service_ivoid) returns the Access URL of an EPN-TAP Service.

sendADQLQuery(TAPURL,ADQLQuery) returns the list of granules which are compliant with the ADQL Query, in VOTable format . TAPURL is build from elements taken in VOResource.

"ADQLQuery" is created by the Client. It is a full query containing the name of the EPNCore table, taken in VOResource.

sendQuery(TAPURL,schema_name,Query) returns the list of granules which are compliant with the Query, in VOTable format. "Query" is not an ADQL query. It is taken from a list of predefined queries. This list must be created.

A scientific use case

T117 Titan Fly by by Cassini with *3DVIEW, VESPA portal* and *TOPCAT*

Start point: setup a scene in 3DView
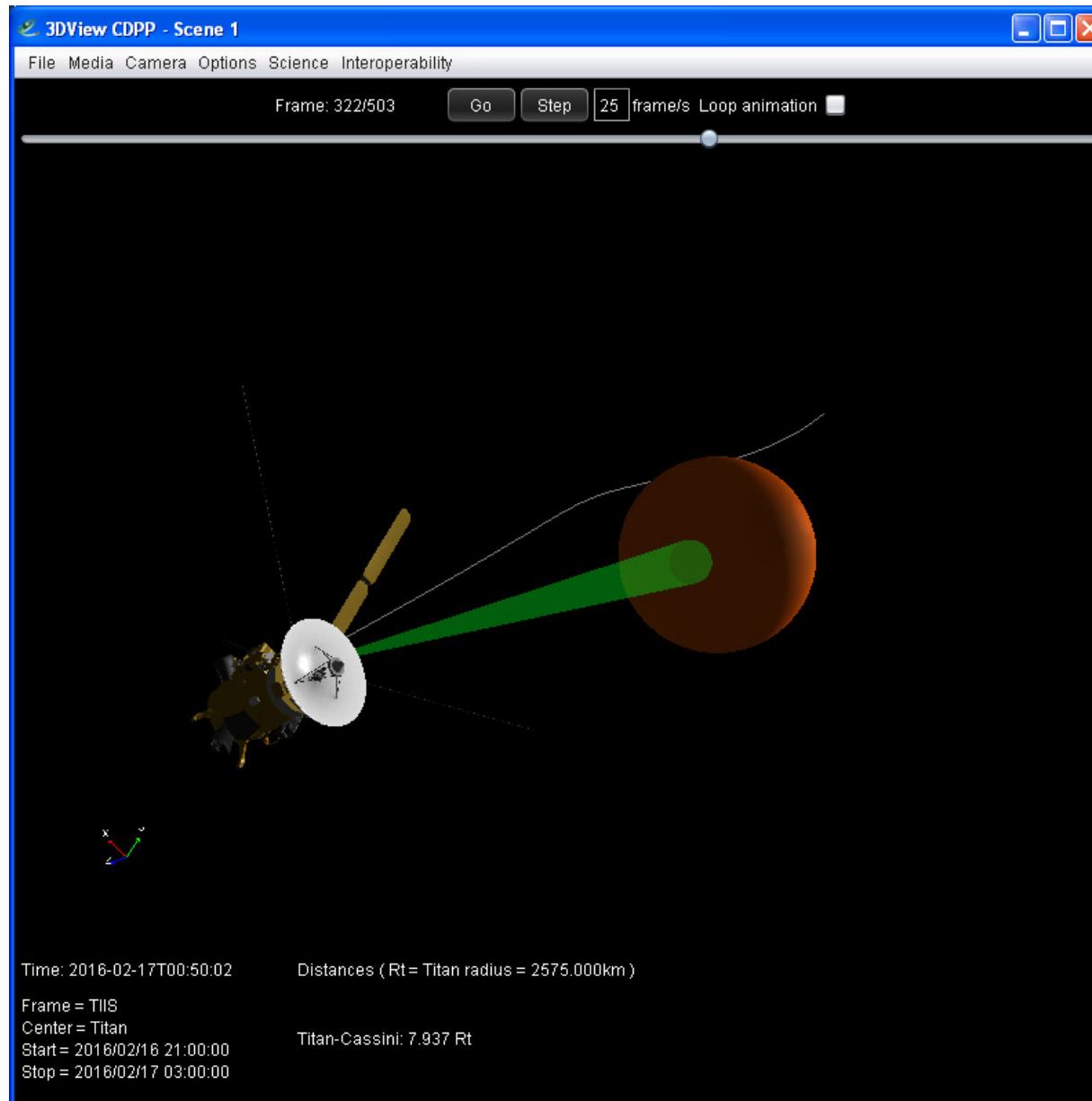
- Centered on TITAN
- ～3hours before and after the TITAN fly by of CASSINI

Display a Mercator map
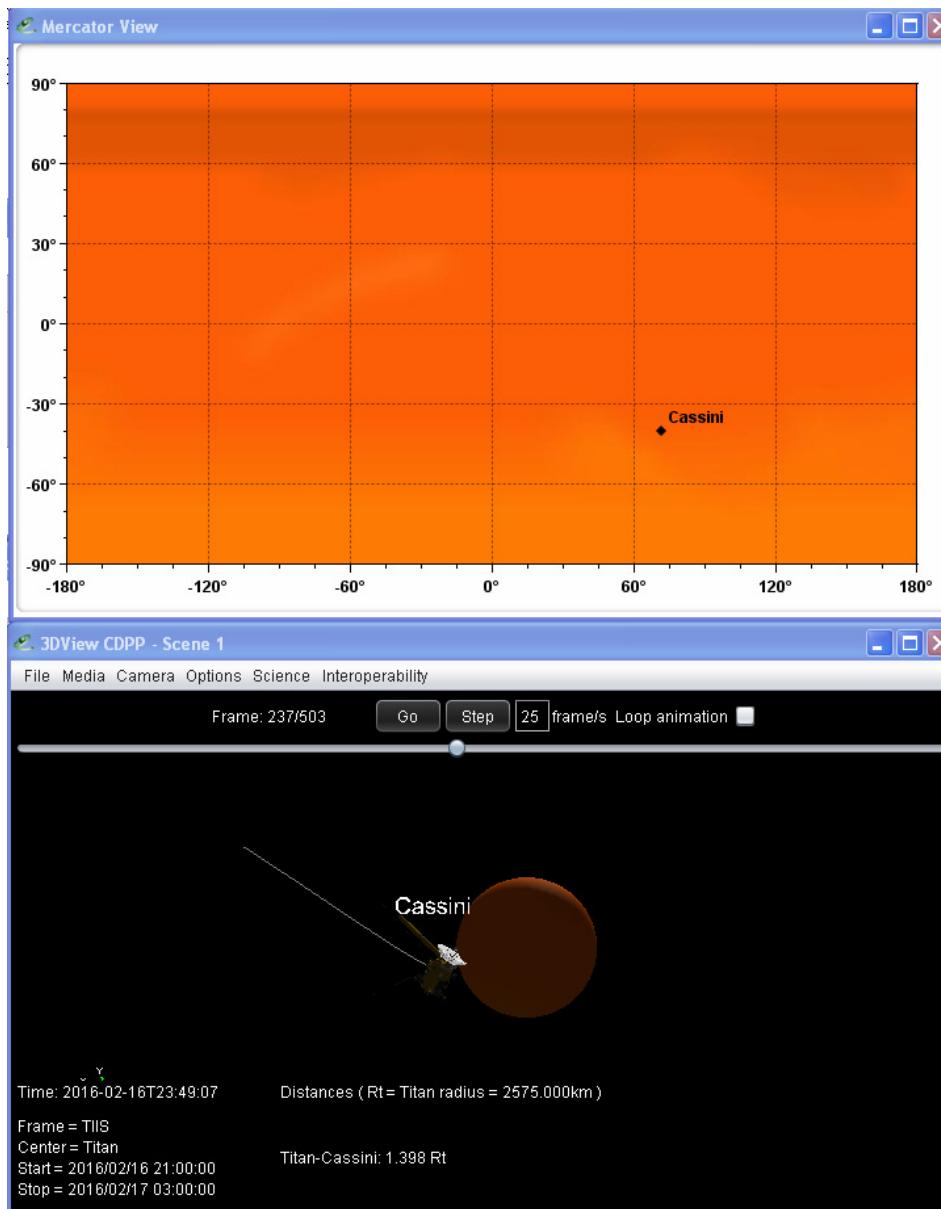
At closest approach (CA)

Query on VESPA portal

Reply of the service on VESPA portal

Vertical Profiles in Titan Middle Atmosphere ✓

Results : 10
DISPLAY RESULTS   DISPLAY VOTABLE   SAMP VOTABLE   ADVANCED QUERY FORM
► Description :
Credits: Creator: S. Vinatier | Contributors: VOPDC

VESPA
Virtual European Solar and Planetary Access

All VO   Custom resource   Direct Query   Help

Results in service titan

Plotting tools

- 🐱 TOPCAT
- 🔴 Aladin
- 🆚 VOSpec
- ✳️ SPLAT

Example queries

- Saturn in March 2012

SELECTED DATA

No data selected

PREVIEW

Show 20 ▾ entries   Search: [   ]   Show / hide columns   Select all   Deselect all

Full Text

dataproduct_type	target_name	time_min (d)	time_max (d)	access_url
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_C2H6.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_C4H2.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_CO2.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_C2H4.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_CH3C2H.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_C2H2.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_C3H8.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_HCN.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:00	46S_57E_Ls31_profq_HC3N.txt
profile	Titan	2012-02-18T12:00:00	2012-02-18T12:00:0	46S_57E_Ls31_profT.txt

Showing 1 to 10 of 10 entries   First | Previous | 1 | Next | Last
Download selection   SAMP selection as ▾   Samp VOTable selectio   **Samp all VOTable**

Open TOPCAT and SAMP this file

© Paris Observatory 2015 – Tutorial for search interface
Contact : support.epntap@oBspm.fr
Layout based on YAMI.

europlanet   France PADC

Display the selected profile in **TOPCAT**
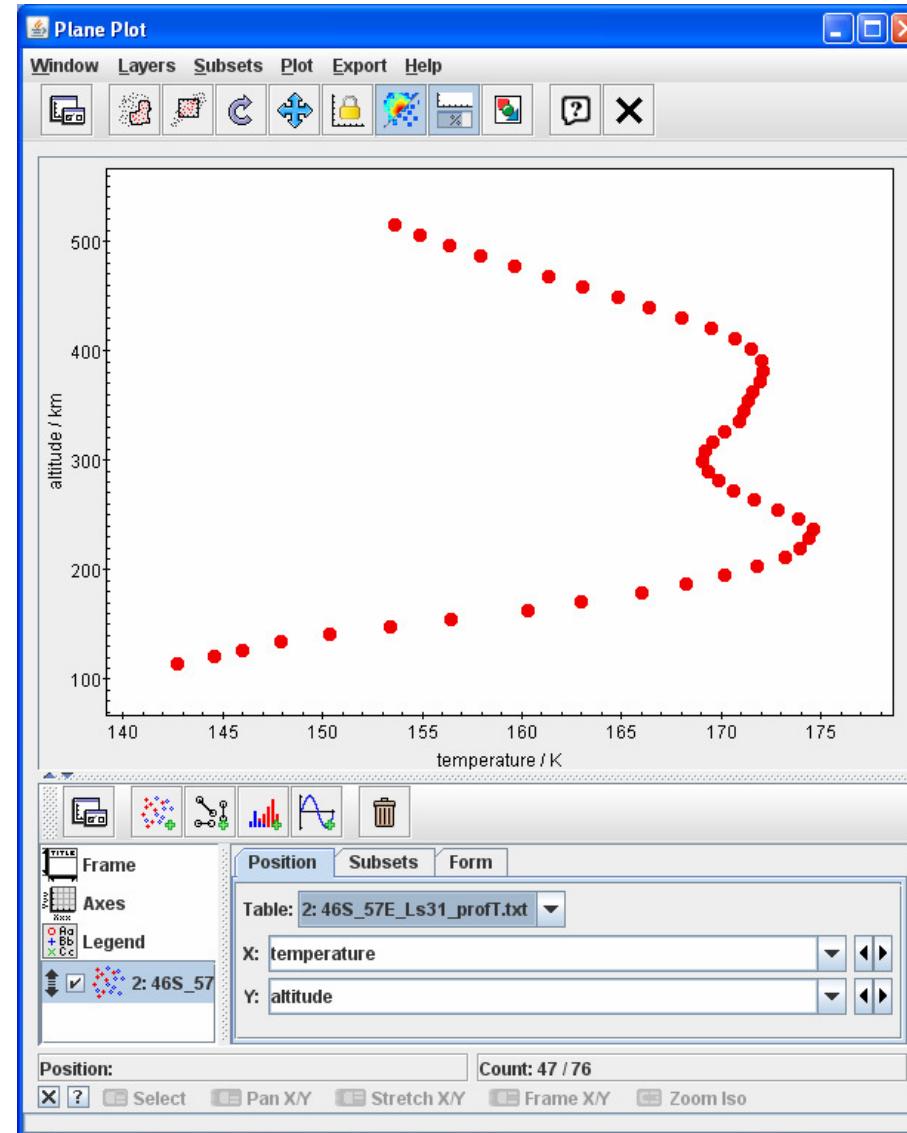
With EPN-TAP in CDPP-3DView

- Searching for data of interest in the VESPA framework is made directly

- The context of the scene is preselected

- Services are directly queried by 3DView

- Responses of services are displayed in 3DView

- Data of interest may be displayed in the 3DView scene or sent to another tool (via SAMP)

Also applicable with EPN-TAP *in* **CDPP-*AMDA and CASSIS***

Agenda

- EPN-TAP library publicly available -- *May 2016*
- EPN-TAP in Cassis *– May 2016*
- Upgrade of AMDA-DB EPN-TAP server *– Mid 2016*
- EPN-TAP in CDPP-3Dview *– August 2016*
- EPN-TAP client in CDPP-AMDA *– End of 2016*