

# EPN-TAP Support at PPI

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# About the Planetary Plasma Interactions (PPI) User Community

- There is no clear division between planetary and interplanetary (Heliophysics) fields and particles (F&P) datasets other than proximity to a planet. Both disciplines use similar instruments and data formats.
  - The PDS Small Bodies Node has a similar affinity with the Astrophysics community
  - PPI has a minor overlap with the Astrophysics community
- The PPI datasets typically fall into two categories:
  1. Simple ASCII tables of time-ordered derived data (magnetic fields, plasma moments, etc.)
  2. CDF formatted multi-dimensional raw and calibrated data (particle and plasma detectors)

# Data Access using the PPI Website

Users can navigate to dataset by selecting targets, spacecraft, and instruments using the Quick Search panel on the left side of the webpage.

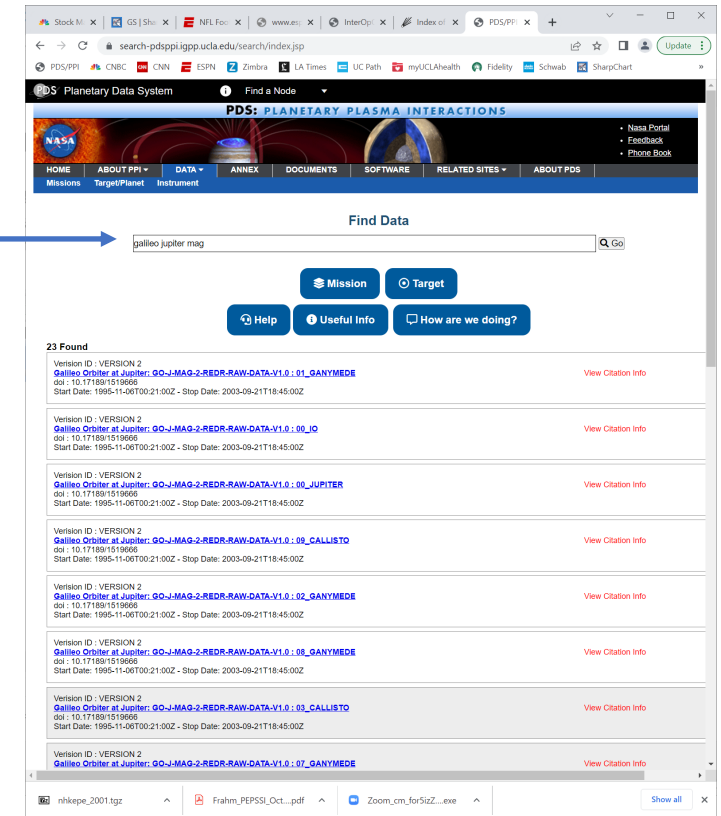


## PPI Home Page



## Two ways to search for Galileo + Jupiter + Mag

Alternatively, users can locate data of interest by using our “Google-like” search interface where keywords are entered and matching datasets are returned



<https://pds-ppi.igpp.ucla.edu/search/?sc=Galileo&t=Jupiter&i=MAG>

<https://search-pdspipi.igpp.ucla.edu/search/index.jsp>

# Why is PPI using EPN-TAP

- Like all of the PDS Nodes, PPI has a strong commitment to the FAIR principles of data sharing and access
  - Our goal is to make our data findable & accessible to users regardless of how they prefer to locate and access the data.
  - PDS assigns DOIs to datasets which facilitates both access and citation.
- PPI users come from a variety of different communities and are used to using different tools (Autoplot, TOPCAT, VISTA, etc. ). Many of these tools work best when the data are streamed using an API or data streaming protocol. PPI does not have the resources to independently develop data visualization and analysis tools so we are trying to make our data compatible with and accessible by existing tools.
  - PPI runs a SAMP (Simple Application Message Protocol) server and a HAPI (Heliophysics API) server although the HAPI server needs some work
  - Starting in December 2021, PPI began making some of its PDS4 data holdings available to users of EPN-TAP (<https://vo-pds-ppi.igpp.ucla.edu>)
- EPN-TAP is also being used by the ESA Planetary Science Archive (PSA) and is widely used by the Europlanet community
  - PPI believes that supporting EPN-TAP will improve our FAIRness with the European planetary F&P science community and our interoperability with international data partners.

# Europlanet Vespa Portal (<https://vespa.obspm.fr/planetary/data/>)

Refine your search

ADQL Query

Data Services ⚙

Main Parameters

**Target Name**

[Target Class](#)

[Dataproduct Type](#)

**Instrument Host Name**

**Instrument Name**  
=

**Processing level**

Time

Location

Spectral

Illumination

Data Reference

Optional

Reset

<a href="#">abs_cs - Data for numerical modeling of planetary atmospheres</a> 13 results			
<a href="#">AMDA - Planetary and heliophysics plasma data at CDPD/AMDA</a> 2539504 results			
<a href="#">APIS - Auroral Planetary Imaging and Spectroscopy</a> 74175 results			
<a href="#">BaseCom - The Nançay Cometary Database</a> 6886 results			
<a href="#">bass2000 - Bass2000 solar survey archive</a> 359441 results			
<a href="#">BDIP - IAU database of historical planetary images</a> 16906 results			
<a href="#">cassini_jupiter - Cassini RPWS/HFR Calibrated Jupiter Flyby Dataset</a> 7 results			
<a href="#">CLIMSO - CLIMSO coronagraphs at Pic du Midi de Bigorre</a> 1033088 results			
<a href="#">cpstasm - CLUSTER STAFF-SA Spectral Matrix Data</a> 11688 results			
<a href="#">DynAstVO - Asteroid orbital database and ephemerides</a> 30095 results			
<a href="#">eit_syn - Synchronous synoptic maps of the solar corona from EIT/SoHO</a> 18482 results			
<a href="#">ExoPlanet - Extrasolar Planets Encyclopaedia</a> 5202 results			
<a href="#">Exotopo - Simulated Topography of Exoplanets</a> 1800 results			
<a href="#">expres - ExPRES Simulation Database</a> 38946 results			
<a href="#">Gaia-DEM - Thermal structure maps of the solar corona from SDO</a> 716868 results			
<a href="#">GEM_Mars - Profiles from Mars Global Climate Model</a> 1399680 results			
<a href="#">HFC1AR - Heliophysics Feature Catalog active regions</a> 1173165 results			
<a href="#">HFC1T3 - Heliophysics Feature Catalog type 3 radio bursts</a> 90845 results			
<a href="#">hisaki - Hisaki Planetary Database</a> 4154 results			
<a href="#">hrsc3nd - HRSC nadir images of Mars</a> 4093 results			
<a href="#">hst_planeto - Planetary data from the Hubble Space Telescope</a> 51692 results			
<a href="#">litateHF - litate HF data</a> 4773 results			
<a href="#">IKS - IR spectroscopy of comet Halley</a> 206 results			
<a href="#">ILLU67P - Illumination maps of 67P</a> 189000 results			
<a href="#">IPRT - IPRT/AMATERAS data</a> 1410 results			
<a href="#">JASMIN - Jovian thermosphere model</a> 6 results			

VESPA provides access to large repositories like AMDA, or the PSA but it also provides access to small data providers like IPRT

PDS/PPI data not currently available using VESPA

# EPN-TAP Implementation at PPI

- PPI is currently producing separate EPN-TAP tables for PDS4 data collections and publishing them using a DaCHS server
  - PPI participated in the VESPA 2021 Workshop to get some initial training and support
  - Not all PDS4 data are currently described in EPN-TAP tables but we're making progress
    - We're starting with calibrated and derived data collections that we feel may be most useful to the European planetary F&P community since EPN-TAP is currently more widely adopted in Europe. This was part of our workshop participation proposal.
  - PPI is in the process of migrating all historical PDS3 data to the PDS4 standard

- The are pros and cons to the PPI approach to EPN-TAP tables

## Pros

- All data in a PDS4 data collection at PPI have the same file structure and contents (processing level, reference frames, sample rate, etc.). They are collections of “like” data files. This makes it easy to stream data to tools like TOPCAT.
- It's easy to implement the EPN-TAP tables when the data files are uniform

## Cons

- PPI has hundreds of data collections. Services like the VESPA portal would be overwhelmed if they tried to list all of the PPI data collections
- Repositories like AMDA and the PSA describe their entire holdings in a single TAP table

# DaCHS Server at <https://vo-pds-ppi.igpp.ucla.edu>

The Planetary Plasma Interactions (PPI) Node of the Planetary Data System (PDS) archives and distributes digital data related to the study of the interaction between the solar wind and planetary winds with planetary magnetospheres, ionospheres and surfaces. The PPI Node is located at the Department of Planetary and Space Sciences at the University of California, Los Angeles (UCLA).

Please check out our [site help](#). Data on this site can also be queried through [TAP](#) and an [ADQL form](#).

Services available here

- ADQL Query
- Cassini CAPS Moments Data Collection
- Cassini RPWS Electron Densities from Uper Hybrid and Plasma Wave Frequencies
- Cassini-Huygens Cassini Plasma Spectrometer (CAPS) Derived Ion Moments Data Collection
- Cassini-Huygens Cassini Plasma Spectrometer (CAPS) Derived Spacecraft Potential Data Collection
- Cassini-Huygens Plasma Spectrometer (CAPS) Calibrated Electron Spectrometer Data Collection
- Cassini-Huygens Plasma Spectrometer (CAPS) Calibrated Ion Beam Spectrometer Data Collection
- Cassini-Huygens Plasma Spectrometer (CAPS) Calibrated Ion Mass Spectrometer Time of Flight Linear Electric Field Data Collection

On this page, you can use [ADQL](#) to query [some of our tables](#). This is mainly for dabbling; use [TAP](#) for larger jobs (e.g., using [TAPHandle](#) within your browser).

To learn what ADQL is or for further information on this implementation, see the [service info](#).

ADQL query

**Link to PPI Data Collections**

PDS-PPI VO server Public Tables

Result

Matched: 157

Send via SAMP Quick Plot

Tablename	Info	Table desc.	Res desc.
cassini_caps_calibrated_els.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated electron spectrometer data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_calibrated_ibs.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated ion beam spectrometer data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_calibrated_ion.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated Ion Mass Spectrometer ion data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_calibrated_sng.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated ion mass spectrometer singles data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_calibrated_tofef.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated ion mass spectrometer 'time of flight' linear electric field data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_calibrated_tofst.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the calibrated ion mass spectrometer 'time of flight' straight through data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.
cassini_caps_derived_ele_mom.epn_core	<a href="#">Table Info</a>	N/A	This collection consists of all of the electron moments data generated from the Cassini Plasma Spectrometer (CAPS) electron spectrometer uncalibrated data.
cassini_caps_derived_ion_mom.epn_core	<a href="#">Table Info</a>	N/A	CASSINI ORBITER SAT/SW CAPS DERIVED ION MOMENTS V1.0

Table information for 'cassini\_caps\_calibrated\_ion.epn\_core'

General

This table is available for [ADQL](#) queries and through the [TAP](#) endpoint.

Metadata

Resource Description: This collection consists of all of the calibrated Ion Mass Spectrometer ion data from the Cassini Plasma Spectrometer (CAPS) on-board the Cassini spacecraft during the entire Cassini mission.

For a list of all services and tables belonging to this table's resource, see [Information on resource 'Cassini-Huygens Plasma Spectrometer \(CAPS\) Calibrated Ion Mass Spectrometer Ion Data Collection'](#)

Citing this table

This table has an associated publication. If you use data from it, it may be appropriate to reference [2009asou.book.....4 \(ADS BibTeX entry for the publication\)](#) either in addition to or instead of the service reference.

To cite the table as such, we suggest the following BibTeX entry:

```
@misc{vo-co_caps_ion,
  year=2022,
  title={cassini-huygens Plasma Spectrometer ((CAPS)) Calibrated Ion Mass Spectrometer Ion Data Collection},
  author={In Sook Moon},
  url={http://vo-pds-ppi.igpp.ucla.edu/tableinfo/cassini_caps_calibrated_ion.epn_core},
  howpublished={VO resource provided by the (PDS)-(PPI) VO server}
}
```

Columns

Sorted by DB column index. [\[Sort alphabetically\]](#)

Name	Table Head	Description	Unit	UCD
granule_uid	Granule_uid	Internal table row index, which must be unique within the table. Can be alphanumeric.	N/A	meta.id
granule_gid	Granule_gid	Common to granules of same type (e.g. same map projection, or geometry data products). Can be alphanumeric.	N/A	meta.id
obs_id	Obs_id	Associates granules derived from the same data (e.g. various representations/processing levels). Can be alphanumeric, may be the ID of original observation.	N/A	meta.id,obs
dataprodct_type	Dataprodct_type	The high-level organization of the data product, from a controlled vocabulary (e.g., 'im' for image, 'sp' for spectrum). Multiple terms may be used, separated by '#' characters. <a href="#">[Note et al. 2004]</a>	N/A	meta.code,class
target_name	Target_name	Standard IAU name of target (from a list related to target class), case sensitive	N/A	meta.id,src
target_class	Target_class	Type of target, from a controlled vocabulary.	N/A	src.class

# PPI DaCHS Server Implementation at PPI

Running DaCHS server requires running dachs and a postgres server together. The PPI DaCHS Server is implemented in a docker container.

## Data volume organization

The TAP data volume is attached to the `ppi_vespa` container located under `/var/gavo/inputs/`

There is a list of data collection folders below that level.

Each collection folder contains a resource descriptor file (`ppi.rd`) that stores the collection level metadata (title, description, authors, etc.) and a collection data product access listing (`data.csv`). The `data.csv` file contains product-level metadata including the access URL for streaming the data.

PPI uses a java program that reads the PDS collection and product-level metadata and translates it into the required EPN-TAP parameters to create the `ppi.rd` and `data.csv` files. This code will be in GitHub and can be shared with any interested parties. At present, it focuses on the extraction of PDS metadata relevant to F&P data.

Publishing new data to the DaCHS server requires that the resource file is validated and imported using DaCHS tools:

*dachs val ppi.rd* to validate a resource file and

*dachs imp ppi.rd* to import the data into the server

PPI Plans to implement DaCHS `pub//services` in the near future

```
/var/gavo/inputs
  collection_1
    ppi.rd
    data.csv
  collection_2
    ppi.rd
    data.csv
  collection_3
    .
    .
```

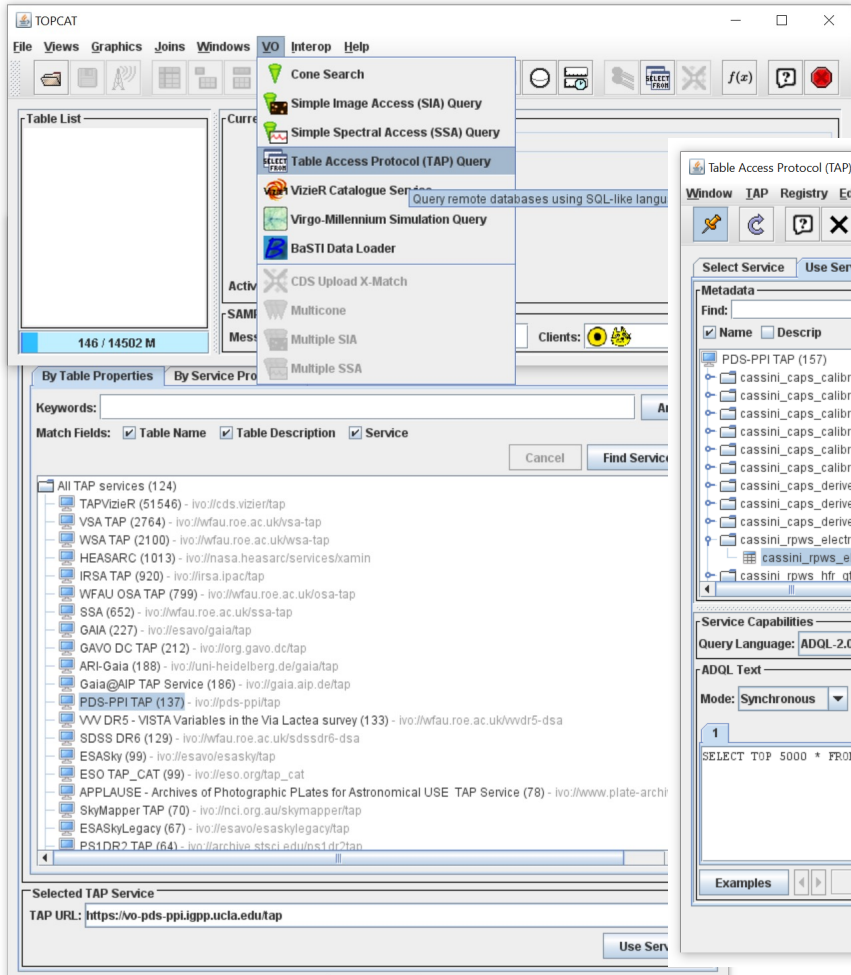


# Accessing PPI Data in Topcat using EPN-TAP

Display

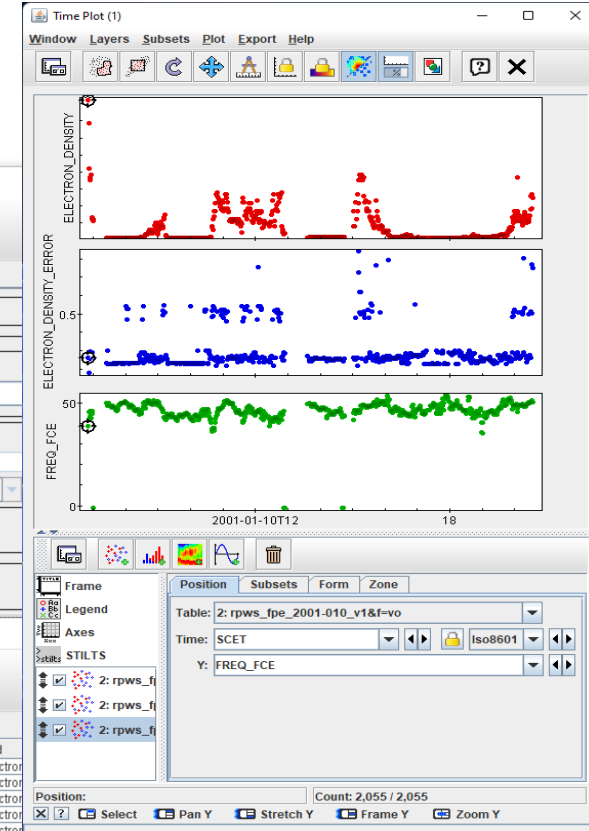
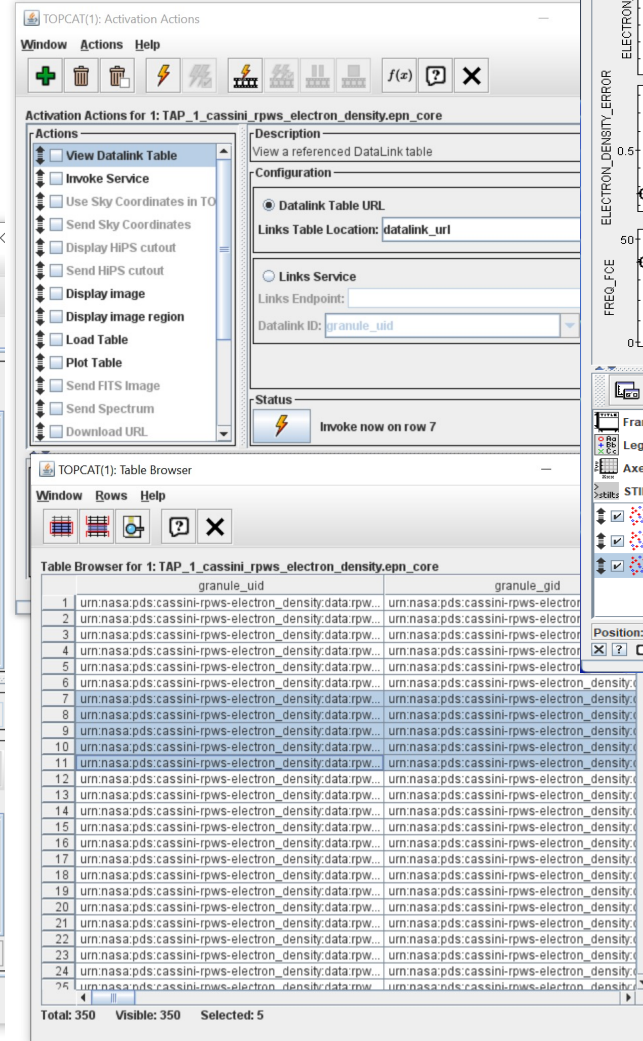
Start TOPCAT

Select VO – TAP server, then PDS-PPI TAP



Select a Collection & Run Query

Select Products



Cassini RPWS derived electron density, error, and cut-off freq.

# PPI Path Forward

- There is still a lot of work to go in implementing EPN-TAP at PPI
  - PPI needs to complete the descriptions of all PDS4 data collections
    - TAP data descriptions need to be edited to provide complete information in a more compact and uniform display.
  - PPI needs to include creating the EPN-TAP descriptions part of the PDS3 data migration process
  - PPI would love to show up in the VESPA data portal
  - PPI would like to provide our users with access to data at the PSA or other IPDA member locations using EPN-TAP for interoperability. Similarly, PPI would like its data collections to be available to PSA (DARTS, etc.) users
    - A multi-repository PDS4 data registry could provide an alternative mechanism for interoperability
    - EPN-TAP is available now and is supported by various data display and analysis tools, it's not clear that the PDS4 registry will have the same tool support that EPN-TAP currently enjoys
  - PPI hopes to become a model for other PDS nodes that might choose to support EPN-TAP

# Questions / Discussion