

# Documenting the Legacy of Cassini's Instrument Teams in NASA's Planetary Data System



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## Motivations for Development of the Cassini Science Research Support System

### Cassini Research Issues

- Future inaccessibility of Cassini science experts
- Cassini Data Highly Complex
- Cassini Data Not Easy to Find or Use
- Cassini Data in PDS not organized by Science Discipline
- Unanticipated Archive Responsibilities for Future Projects

### Cassini / PDS Solutions

- Science Teams and Discipline Experts: Generate and deliver most valuable research support data
- Project: Generate and deliver search & visualization tools to aid in science research
- Project: Develop Architecture to organize data by disciplines and science teams. House tools & data in Help Pages at the PDS.

### Cassini-Huygens: Mission to Saturn BY THE NUMBERS



### Abstract

In September 2017, the Cassini mission to Saturn concluded its unprecedented thirteen-year exploration of that system with a dramatic end-of-mission impact into the planet. In addition to data collected en route to Saturn, Cassini returned over five terabits of data on the Saturn system collected by its twelve science instruments. This science data, which is available to the planetary science community and the general public via NASA's Planetary Data System archives, represents the legacy left by Cassini for decades to come. Ancillary and engineering data also provide key information that supports the interpretation of Cassini's science data and potentially serve as the basis for other scientific analyses (e.g. Lorenz *et al.* 2018).

Beyond archived data, the PDS also provides a wealth of information about the missions that collected it. The PDS Atmospheres Node, where the Cassini archive is stored, hosts webpages that contain information about the Cassini project and the science instruments that were onboard Cassini. To enhance the value of this archive, the Cassini Project embarked upon an effort to revamp the pages associated with the Cassini project. The upgraded Cassini mission page contains additional overview material on the project, including resources used by project members during spacecraft operations. Each Cassini mission science discipline has its own page featuring general information pertinent to that discipline, links to reference documents that describe archived data and links to higher order data products.

This poster will focus on the enhanced Cassini PDS webpages for the individual instrument teams. These instrument webpages were designed for consistency among each of the dozen pages and intended to provide users with an introduction to each instrument and its dataset. We will explain how our design principles for these webpages are meant to facilitate access to the PDS Cassini archives for future scientists and propagate Cassini's legacy into the future.

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### Introduction

The Cassini Project made it a priority to generate high-quality archival products commensurate with the legacy of this unprecedented mission. This effort extended to the webpages on the Planetary Data System describing the twelve science instruments on Cassini and the data they returned. The goals of this effort included

- *facilitating access to resource material, particularly for inexperienced researchers*
- *directing users towards the data they want to use*
- *and creating a consistent look and feel across each of the 12 instrument webpages.*

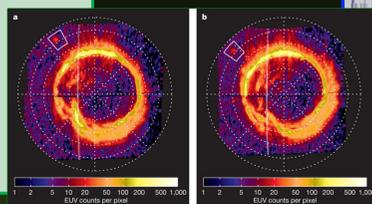
The image of the CAPS webpage at right serves as an archetype for all 12 pages.

CAPS	ISS	RPWS
CDA	MAG	RSS
CIRS	MIMI	UVIS
INMS	RADAR	VIMS

### About Instrument Data

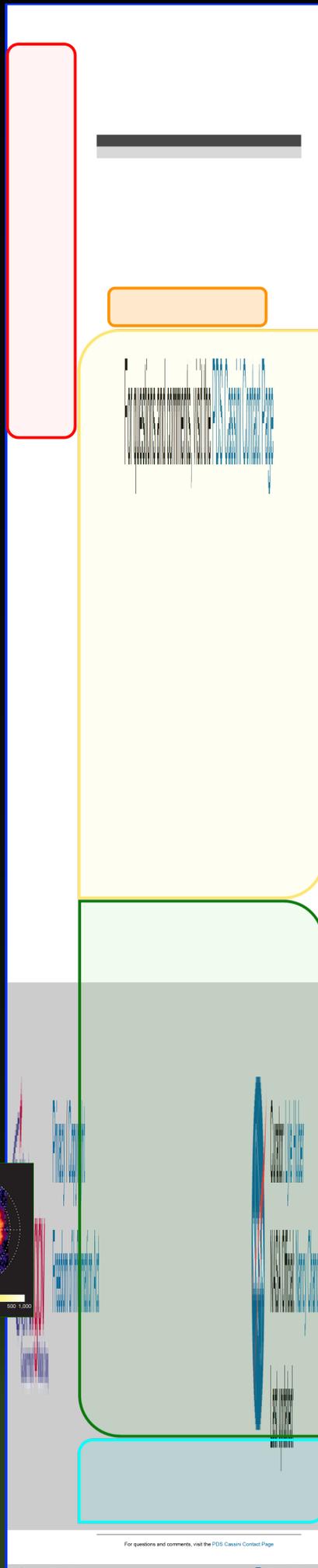
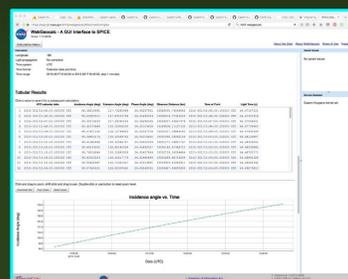
Finding specific datasets within the PDS archive can be a daunting task. PDS volumes are typically organized by timestamp. Finding data of interest often requires knowledge of when a dataset was obtained. In this section one can find links to:

- data search tools, including the Cassini Event Calendar and archived CIMS database information (see the [Sidebar](#) section)
- PDS data volumes (calibrated and uncalibrated)
- higher order data products – *produced by Cassini instrument teams* -- available on the PDS and
- other useful ancillary products to identify and find instrument data.



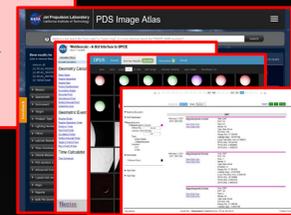
### Data Analysis

The Cassini instrument teams have made available many of their calibration and data analysis routines. Links to such products are located in this section. Other tools available to the public, such as NAIF's WebGeocalc and the USGS' ISIS software suite, also have links in this section of the instrument team help pages.



### Sidebar

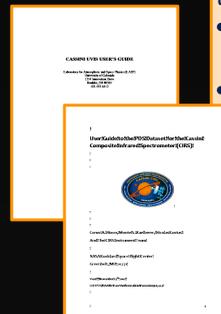
- The sidebars of the instrument pages contain links to:
- general Cassini reference pages
  - other Cassini instrument pages (including a link to the Huygens site)
  - pages specific to each Cassini science discipline and
  - useful on-line data and event search tools, including Cassini's Event Calendar



### Key Instrument Reference Documents

Links to key reference documents are included on (most of) the instrument pages:

- instrument User's Guide and/or Interface Specification Document
  - the instrument paper from the 2004 *Space Science Reviews* special edition highlighting each Cassini instrument (including Huygens)
- Users should be familiar with the information in documents like these before analyzing data from these instruments.



Telescope diameter (cm)	50.8	Far IR	Mid IR
Interferometers	Far IR	Mid IR	Mid IR
Type	Polarizing	Michelson	Michelson
Spectral range (cm <sup>-1</sup> )	10–600	600–1400	600–1400
Spectral range (μm)	17–1000	7–17	7–17
Spectral resolution (cm <sup>-1</sup> )	0.5–15.5	0.5–15.5	0.5–15.5
Integration time (s)	2–50	2–50	2–50
Focal planes	FP1	FP2	FP3
Spectral range (cm <sup>-1</sup> )	10–600	600–1100	1100–1400
Detectors	Thermopile	PC HgCdTe	PV HgCdTe
Pixel size	2"	1 × 10	1 × 10
Focal FWH (mm)	3.9	0.273	0.273
Peak ID (cm Hz <sup>1/2</sup> W <sup>-1</sup> )	4 × 10 <sup>6</sup>	2 × 10 <sup>6</sup>	5 × 10 <sup>11</sup>
Data telemetry rate (kbits)	170	2 and 4	2 and 4
Instrument temperature (K)	75–90		
Focal planes 3 and 4 Temperature (K)			

\*Single FWH, two polarizations. from Flasar *et al.* (2004)

### About the Instrument(s)

This section includes:

- a brief background on the instrument
- a list of Cassini Saturn science objectives for the instrument
- a table giving key details and instrument parameters and
- a more detailed discussion on instrument details.

The instrument tables are meant to give users a way to quickly ascertain the type of data that the instrument collected.

More details on the instruments and their operation can be found in the Space Science Review papers, which are also linked at the end of this section.

SRS System houses unique science research support data that cannot be found anywhere else except within the PDS Help Pages:



<https://go.nasa.gov/2AU79O3>

(Revamped Instrument PDS Help Pages available in late 2018)

### References

- Flasar, F.M., V.G. Kunde and 43 Authors 2004. Exploring the Saturn System in the Thermal Infrared: the Composite Infrared Spectrometer. *Space Science Reviews* **115**, 169–297
- Lorenz, R.L., C. Paranicas, P. Kollmann, E. Woodfield, E. Roussos, S. Adamiak 2018. Memories of Saturn's Radiation Belts: Spatial Distribution of Bit-Errors on the Cassini Solid State Recordings. In *Proceedings of the 42nd COSPAR Assembly*.
- Young D.T., J.J. Berthelier and 56 authors 2004. Cassini Plasma Spectrometer Investigation. *Space Science Reviews* **114**, 1–112
- NAIF WebGeocalc tool: <https://naif.jpl.nasa.gov/naif/webgeocalc.html>