



## Cassini Data in NASA's PDS: Strategies for Usability

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### Abstract

The Cassini Project recently conducted a 'Usability study' with beta testers to assess the ease of use, for investigators who are not part of Cassini, of data archived in NASA Planetary Data System. Many of the data sets, which include detailed instructions for users to perform their own calibrations, were found to be non-trivial to use for a first-time user. Some of the data sets require knowledge of specialized software, including SPICE software - documentation of which is provided but which may be non-trivial to use. In this talk we will present the basic components of each of the data sets, how to get started, lessons learned from the experiences of first-time users, and we welcome feedback from the community.

The PDS Home Page is given at the following URL <http://pds.jpl.nasa.gov>.

### 1. Introduction

Six years after the start of the historic Cassini mission, a wealth of data has accumulated in NASA's Planetary Data System (PDS). Data from the orbiter consists of images from ISS (the camera system), and the Radar system; spectra from remote sensing instruments: UVIS (the ultraviolet spectrometer), and VIMS (the visible/infrared spectrometer); radiometry from CIRS; electron and ion sensor data from CAPS (the plasma instrument); high energy electron, ion, and neutral sensor data as well as images from MIMI (the energetic particle instrument); magnetic field data from MAG (the magnetometer); ion and neutral count data from INMS (the mass spectrometer); dust count data from CDA (the dust detector); plasma wave data from the RPWS (Radio and Plasma Wave System); and raw data from the radio science experiment.

Data from the orbiter is spread across several nodes of the PDS including the Imaging Node, the Rings Node, the Atmospheres Node, the Small Bodies Node, and the Planetary Plasma Interactions Node.

Other relevant PDS nodes, for the purposes of making best use of the data include, the Engineering Node, and the Navigation and Ancillary Information Node. Tools for reading, plotting, finding ephemeris of, and other tools are also available. Prospective users must make themselves aware of gaps, calibration issues, instructions that are part of the documentation, and other nuances of using these data.

### 1.1 Nodes of NASA's Planetary Data System

Cassini Data is available on five Nodes:

1. **Imaging** Node: <http://img.pds.nasa.gov/>
2. **Rings** Node: <http://pds-rings.seti.org/>
3. **Atmospheres** Node: <http://atmos.pds.nasa.gov/>
4. **Plasma** and Particle Interactions Node: <http://ppi.pds.nasa.gov/>
5. **Small Bodies** Node: <http://pdssbn.astro.umd.edu/>

Two other Nodes provide important reference information:

1. **Engineering** Node: <http://pds-engineering.jpl.nasa.gov/>
2. **Navigation and Ancillary Information** Node: <http://naif.jpl.nasa.gov/naif/>

### 2. First-time User Experiences

Though the Cassini Project is compliant with all NASA archiving requirements, archived PDS data can be difficult for even for a trained investigator to access. The learning curve on mission basics (timing of selected science observations; spacecraft orientation and pointing), can be steep, and the interested user may be required to leave the PDS and go to Cassini mission online resources to familiarize themselves with mission basics.

### 3. Auxilliary Tools

The following tools can greatly enhance the first-time users experience of accessing and using PDS data.

•**Planetary Imaging Atlas** (search tool): <http://pds-imaging.jpl.nasa.gov/search/search.html#QuickSearch>

•**Orbit geometry** visualization tool: <http://space.jpl.nasa.gov/>

•**ISIS3**: End-to-end processing routine at USGS for ISS and Radar data (an essential tool for imaging.)

Cassini data sets are accompanied with needed observation geometry computed by the data provider (the instrument team). When such data are not sufficient, or when a researcher needs additional observation geometry data, the use of SPICE\* software and data is needed. The SPICE developers provide many training materials and offer training classes. Nevertheless, learning SPICE is non-trivial, requiring a significant investment in time. \*Spacecraft, Planet, Instrument, Camera-matrix, Events; <http://naif.jpl.nasa.gov>

Other tools include User Manuals such as that provided by reference [1]. The most important tool, however is the telephone. The interested user should avail themselves of the curator for each of these nodes, who is willing and able to answer questions and help. The curator's contact information is located in the node documentation.

### 4. Figures

Below, you will find an example of a figure, publically available, provided by the MIMI instrument in the documentation submitted with the data, which is intended to assist the user with algorithms to properly calibrate the data. Understanding the algorithms is non-trivial, and a time investment is required for the user to create their own rapid-turnaround data reduction codes. Use of the Cassini data in the PDS requires this sort of time investment.

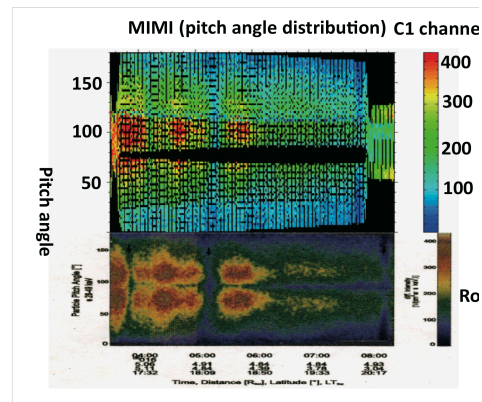


Figure 1: This is the example of a calibration that a user might be required to replicate before they can use the data.

### 5. Summary and Conclusions

Cassini data can be non-trivial for a first-time user to access at the PDS and study, and user must be aware of the resources available to him/her. Cassini is taking steps to address the 'usability' of its data. Funding has been released for User Manuals. New calibration tools (ISIS) have become available. Some instrument team and project software tools may be adapted to the PDS. In order to improve access to all Cassini data an additional search interface is going to be added to the PDS suite of tools. This interface will allow querying of a database containing information from spacecraft files, and geometry based on Spice kernels. Archive data delivered to the PDS will be mapped to this information.

### Acknowledgements

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### References

[1] Wall et al., *User Guide to the Magellan Synthetic Aperture Radar Images*, NASA RP-1356, March 1995

