INMS-12 Update user’s manuals -agrees with what I have on a memory stick

**About INMS**

The Ion and Neutral Mass Spectrometer (INMS) was capable of determining the chemical, elemental and isotopic composition of the gaseous and volatile components of neutral particles and low energy ions in key regions of the Saturn system. The primary focus of the INMS was on Titan's upper atmosphere and its interaction with the surrounding magnetospheric plasma. The instrument accomplished these measurements with its open ion source (ions and neutrals), closed ion source (neutrals only) and quadrupole mass analyzer and deflector. INMS' construction was the result of a collaboration between NASA's Goddard Space Flight Center and the University of Michigan.

Scientific objectives for the INMS include the following:

* Measure the ion and neutral species composition and structure in the upper atmosphere of Titan
* Study Titan's atmospheric chemistry
* Investigate the interaction of Titan's upper atmosphere with the magnetosphere and solar wind
* Measure the ion and neutral species compositions during ring plane crossings and icy satellite flybys

**INMS modes:**

* Closed-source Neutral: Non-reactive Neutrals
* Open-source Neutral: Reactive Neutrals
* Open-source Ion: Positive Ions < 100 eV

**INMS Instrument Characteristics\***

INMS was typically operated in one of three different modes: a closed source neutral mode, an open source neutral mode, or an open source ion mode. The closed source neutral mode, which measured non-reactive neutrals such as N2 and CH4, was the most sensitive of the three. It was capable of detecting concentrations on the order of

≥104 cm-3. The open source neutral mode, in which the instrument detects reactive neutrals like atomic nitrogen, made measurements at concentrations an order of magnitude higher, ≥105 cm-3. The open source ion mode was used to measure positive ions with energies less than 100 eV. The detection threshold in the open source ion mode was ~10-2 cm-3 at a velocity of 6 km/s relative to Titan. INMS detected masses between 1-99 Daltons with a mass resolution M/ΔM of 100 at 10% of mass peak height, sufficient for the detection of heavier organic species and cyclic organics like C6H6.

The engineering details of the INMS instrument and the science objectives it was built to address are described in further detail in the Space Science Reviews paper by Waite et al. (2004). Users may also find the 2015 Space Science Reviews paper by Teolis et al. helpful for calibrating data.

**INMS Data**

**Data Search Tools**

The Event Calendar is an interactive event finding-tool that can be used to search for data associated with particular events.

The Master Schedule is a time-ordered listing of observations by all instruments. This can be used to find data based on particular events.

Preliminary Fields and Particles and Auroral Schedules to help find data at the planned observation dates **Move this to the top of list** Asked Marcia Burton for and update

**Browse Raw Data Products**

Level 1A Data (REDRs)

Telemetry Packet Data

**Derived Data Products**

**Titan Hybrid Simulations** INMS-17 INMS claims this was delivered – asked MAFI for a link.

**Titan Neutral and Ion Density Profiles I**NMS-18 asked if PPI has gotten this?

**Selecting Data Products**

Table INMS Satellite Observations (CSV) includes Dione, Enceladus, Methone, Rhea and Titan

The Event Calendar is an interactive event finding-tool that can be used to search for data associated with particular events.

~~Users can find specific observations in the~~ **~~Cassini Information Management System (CIMS) Catalog~~** ~~of observations. CIMS provides the date and time of acquisition of the instrument observations, which can then be used for cross-referencing the archived raw data products.~~

**Analyzing INMS Data**

Once data products have been selected and retrieved, users will need to read, manipulate and display that data. Resources that will enable users to make use of INMS data are listed below.

* Teolis et al. (2015) may help understand the data calibration process
* **User's Notes** for inner magnetosphere, Enceladus, and proximal orbit data INMS-16
* Baseline Analysis Report and Instrument Checkout Report from 1999
* **Summaries of Algorithms** used to calibrate and process data
* Software Analysis Guide
* White Papers

**INMS Flight Software Activities** 2000 to 2006 link to file

**CASSINI INMS Exploration of the Upper Atmosphere and Ionosphere of Saturn and Rings** – June 2014 link to file

* SPICE WebGeocalc allows users to search for observation computations by geometry. Be aware that since INMS was able to articulate its pointing relative to the spacecraft, SPICE will display this information as well.

**INMS** Products (12 Total, 3 open, 3 team internal, 2 deleted, 3 completed, 1 CAS archive) – Per Rebecca on 12/3/18: **ONE ITEM INMS-17 DELIVERED**

**December 31 completion/delivery date for the following items:**

* INMS-12:  Update User’s Manuals for Titan (ions, neutrals)
* INMS-16:  Create User’s Notes for innermag, Enceladus, and proximal orbits
* INMS-18:  Titan Neutral and Ion Density Profiles

**INMS-17 product is complete and was delivered as ASCII files.  Steve Ledvina (INMS team member) was requested by PDS to work with NASA Ames to have the products converted from ASCII to CDR.  He has provided all necessary info but is now waiting for NASA Ames to reformat the files.**

* **DELIVERED**: **INMS-17:  Output from Titan hybrid simulations**

**ASK KATHRYN FOR INMS-13**

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| --- | --- | --- | --- | --- | --- |
| **INMS-12** | Update User’s Manuals for Titan (ions, neutrals) | \*Mark Perry, Lead | Users Manuals, white papers | PDS | 2017-12-19: on track for 3/31/18 delivery 2018-07-17: to be complete by July |
| **INMS-13** | Annotated baseline | \*Rebecca Perryman | Science investigation support files | PDS | 2018-01-03: complete, zip sent to Rudy |
| **INMS-14** | White paper(s) | \*Rebecca Perryman | Users Manuals, white papers | PDS | 2018-01-03: complete, zip sent to Rudy |
| **INMS-16** | Create User’s Notes for innermag, Enceladus, and proximal orbits | \*Mark Perry, Rebecca Perryman, Hunter Waite, and Ben Teolis | Users Manuals, white papers | PDS | 2017-12-19: on track for 3/31/18 delivery 2018-07-17: to be complete by mid-August |
| **INMS-17** | Output from Titan hybrid simulations | \*Ledvina | Science Investigation support files | PDS |  |
| **INMS-18** | Titan Neutral and Ion Density Profiles |  | Higher Order Products | PDS | 2017-12-19: on track for 3/31/18 delivery 2018-04-19: on track for mid-May 2018-07-17: to be complete by July |