PDS Radio Science

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- Overview
- Activities
  - MC Support
  - PDS-Internal Support (PDS4)
  - Mission Support
  - Node and User Support
  - Local
- Near-future Integrated Concern

- Changes since last report (and issues deserving attention) have been highlighted in red

People and Resources

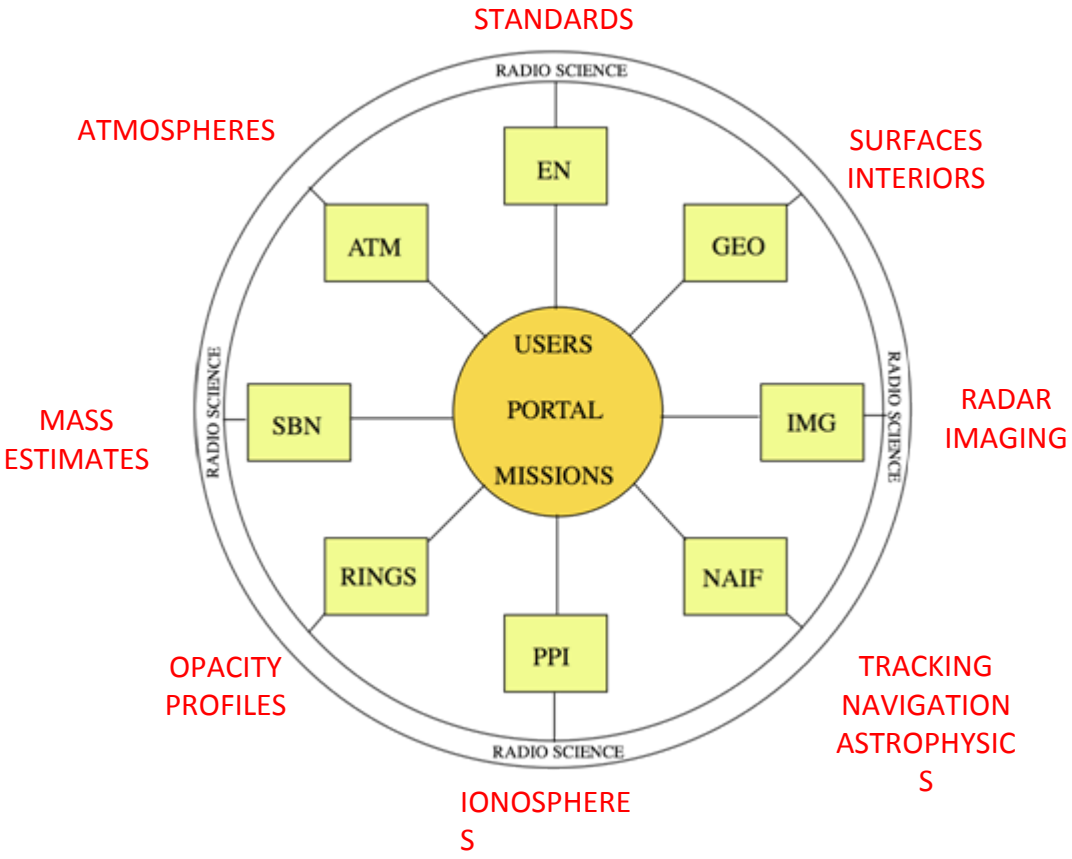
- **3+ People at Stanford**
  - PI Len Tyler (~1% FTE)
  - Manager Dick Simpson (~33% FTE)
  - System Software Analyst Ray Jackson (~5% FTE)
  - Administrative Support
- **Several Networked Computers and a Telephone**
  - Sun Blade 2000 (NASA/MEX funding: being phased out)
  - Mac Mini (PDS funding: being phased in)
- **Library of data, software, and documentation**
- **Funded at ~$150K/year through PDS Management**

Subject Matter

Use of propagating electromagnetic waves to explore, measure, and understand the universe (more narrowly, the solar system)

planetary surface properties and mapping
atmospheric/ionospheric structure, dynamics
ring structure, dynamics, particle properties
interplanetary plasma, solar corona
spacecraft navigation, ephemeris development
mass estimation, gravity models, interior structure
surface/atmosphere volatile exchange
radio emission
plate tectonics, Earth rotation
gravitational waves, relativity
telecommunication, data management
signal processing, radar imaging

RS Role within PDS



PDS/RS Functions

- Advise providers on design of new RS data sets
- Review design of new data sets (DN support)
- Assist users trying to locate RS data
- Assist users with interpretation of RS data
- Support PDS MC, Tech Group, and Working Groups
- Collect and archive RS data from Mars Odyssey (ODY)

MC Support

(since September 2010)

- Management Council Meetings/Telecons
  - Represent radio science community
  - Compile, distribute minutes, action items
- Draft/edit policy statements
  - Accumulating/Superseded/Draft data
  - Processing Levels

PDS-Internal Activities

(since September 2010)

- PDS4 Data Design Working Group
  - Weekly telecons and occasional face-to-face meetings
  - Data Dictionary scrubs
    - terse, but meaningful, definitions
    - consistent usage
    - definitions for enumerated values
  - Document writing/editing/review
    - *Data Provider's Handbook* (inactive)
    - *PDS4 Glossary* (stable, but will need future upgrade)
    - *Data Dictionary Tutorial* (stable, but will need future upgrade)
    - *Jumpstart Guide* (stable, but will need future upgrade)
- PDS4 Build 1/2 Assessments
  - Focusing on binary 'table' data type for Build 2c tests
  - Document review
  - Digestion of results
- Face-to-face Tech and DDWG meetings

Mission Support

(past missions)

- Magellan Tracking Data Archive (GEO)
  - Assembled data
  - Responded to Round 1 Reviews
  - Awaiting Round 2 review and ingestion
- Galileo (ATM)
  - Cleared liens on GORS_0201 through 0205
    - awaiting JPL RSST completion of GORS_0206 through 0208
    - will be first lien-resolved GLL raw RS data fully ingested in PDS
  - Review process TBD
- Many other data sets in restoration queue

Mission Support

(ongoing missions)

- MRO – almost no RS activity required (GEO)
- MESSENGER – quarterly DAWG telecons (PPI)
- LRO Radio Science Archive (GEO)
  - Reviewed and approved design and example products
- Cassini Radio Science (ATM)
  - Reviewed User Guide concepts; recommended direction
  - Reviewed initial volume of reduced data (CORS_1001)
- 2001 Mars Odyssey (GEO)
  - Archive raw radio tracking data
  - Monthly deliveries ~15-45 days after acquisition
- Mars Express (with NASA/MEX funding)
  - Archive DSN data to MEX RS PI in Germany
  - L1/2/3 current through end of 2011
- Venus Express (with NASA/VEX funding)
  - Archive DSN data to VEX Deputy PI in Germany
  - Archive DSN data to PDS ATM
  - L1 (and some L2/3) current through 2011
  - How to get data into public domain (through either PSA or PDS) still TBD
- PDS MIWG: participate in monthly telecons (as time permits)

Mission Support

(future missions)

- MSL (GEO)
  - Reviewed APXS design/documents
- GRAIL (GEO)
  - Reviewed Archive Volume and Data Product SISs
  - Mission is behind after requesting revised schedule
- JUNO (ATM)
  - Reviewed gravity SISs

Node and User Support

(since September 2010)

- No RS node or web site
  - Radio science data are distributed by other nodes
    - Radio occultations – neutral atmosphere (ATM)
    - Radio occultations – ionosphere (PPI)
    - Radio occultations – rings (RINGS)
    - Bistatic radar (GEO)
    - Gravity (GEO, SBN)
    - Gravitational waves/astrophysics (NAIF)
- PPI Node Advisory Committee meeting (December)
- Various radio tracking data inquiries:
  - ISRO request for Mars DDOR data

Local Activities

(since September 2010)

- Acquired new Mac Mini system
  - Installed basic system and user software
  - Need to port and debug QC and archiving software
  - Sun maintenance ended 31 August
  - 3rd party took over and has responded to one service call
- Continuing to archive Mars Odyssey tracking data
- Restoration queue remains static
  - Data from mid-1070s through 1990s
  - PDS3 vs PDS4?

Near-Future Integrated Concern

- Need to port 30 years of software from Sun to Mac (soon!)
  - Radio science data processing (mostly FORTRAN, some C)
  - UNIX scripts
  - QDDB data base supports MGS, ODY, MEX, VEX, and CAS
  - Transition already delayed 12 months in favor of PDS 2010
- Need to develop parallel support for PDS4
  - Mostly labeling and collection/bundle management
  - Complex products can no longer have 'minimal' labels
- Need to make better progress on the restoration queue
- PDS support is ~33% FTE + 5% System Administrator
- Need help from DNs on PDS4 and restoration activities
  - Recent track record is not reassuring

Restorations

- Apollo bistatic radar (intermediate and reduced)
- Mariner 9 and Viking Orbiter 1 and 2 radio occultation profiles (from microfiche)
- Arecibo Mars radar (intermediate and reduced)
- Viking Orbiter 1 and 2 raw radio tracking data
- Viking Orbiter 1 and 2 bistatic radar (intermediate and reduced)
- Voyager 1 and 2 data from Jupiter, Uranus, and Neptune/Triton; most of Saturn is done (raw)
- Arecibo Galilean satellite radar (raw)