Planetary Science Archive

Users Quick Guide

MEX Data Workshop

11-15th June 2008

ESAC

Dave Heather (dheather@rssd.esa.int)

PSA Definition and Purpose

The *Planetary Science Archive* (PSA) is the initiative, the setup, the process and the implementation to preserve data from ESA's spacecraft to planetary bodies, as well as supplementary information acquired in laboratories or ground-based observatories.

The prime objectives of the PSA are:

- to support the experimenter teams in the preparation for the spacecraft and ground-based long-term archives
- to enable and ensure the (long-term) preservation of these archives
- distribution of scientific useful data to the world wide scientific community
- provision of supplementary data services aiming to maximize the usage of planetary mission data and ease the scientific data analysis.

The PSA will be advised by a PSA Scientific Advisory Group that meets at least yearly.

The PDS Standard

- **All PDS compatible data formats conform to a unified standard format incorporating documentation, calibration, and raw and processed data files.**
- **The format distinguishes:**
  - Data files
    - **The lowest level is that of the data files themselves. At this level each file will have a PDS label either appended to the beginning of the file or, more often, in a separate but proximate file. "One file, one label" is the general rule.**
  - Meta-data Files
    - **At the intermediate level are files which describe the circumstances and parameters of the data collection (for example: the instrument used, the observatory site, the type of data collected, etc.). These files are called "catalog objects" or just "catalog" files.**
  - Volume/Dataset Description Files
    - **These files are included on any distribution medium intended to be an entire, self-contained archive - for example, a set of DVDs or a ZIP file. The volume description files detail the organization of the data in the archive (in terms of directories, e.g.) and any additional documentation and software which might be included.**
- **The PDS Standards are defined in the PDS Standards Reference Document.**
- **A Data Dictionary exists for the PDS and PSA which contains all keywords and values permitted by the Standard. Definitions of all keywords can be found here. A useful online version is also available.**

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```
PDS_VERSION_ID                  = PDS3

/* FILE DATA ELEMENTS */
RECORD_TYPE                     = FIXED_LENGTH
RECORD_BYTES                    = 10420
FILE_RECORDS                    = 60291
LABEL_RECORDS                   = 2

/* POINTERS TO DATA OBJECTS */
^IMAGE_HEADER                   = 3
^IMAGE                          = 4

/* IDENTIFICATION DATA ELEMENTS */
FILE_NAME                       = "H0887_0000_ND2.IMG"
DATA_SET_ID                     = "MEX-M-HRSC-3-RDR-V2.0"
DETECTOR_ID                     = MEX_HRSC_NADIR
...
PROCESSING_LEVEL_ID             = 2
RELEASE_ID                      = 0012
REVISION_ID                     = 0000

/* TIME DATA ELEMENTS */
SPACECRAFT_CLOCK_START_COUNT    = "1/0044420119.56188"
SPACECRAFT_CLOCK_STOP_COUNT     = "1/0044420414.62539"
START_TIME                      = 2004-09-28T02:56:14.637Z
STOP_TIME                       = 2004-09-28T02:59:53.654Z
...
OBJECT                          = IMAGE
  INTERCHANGE_FORMAT            = BINARY
  LINES                         = 60288
  LINE_PREFIX_BYTES             = 68
  LINE_SAMPLES                  = 5176
  SAMPLE_TYPE                   = MSB_INTEGER
  SAMPLE_BITS                   = 16
  BANDS                         = 1
  BAND_STORAGE_TYPE             = BAND_SEQUENTIAL
  MAXIMUM                       = 206
  MEAN                          = 79.8813
  MINIMUM                       = 23
  STANDARD_DEVIATION            = 23.3757
END_OBJECT
```

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FILE_NAME
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REVISION_ID

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SPACECRAFT_CLOCK_STA
SPACECRAFT_CLOCK_STO
START_TIME
STOP_TIME
...
OBJECT
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```
PDS_VERSION_ID                = PDS3
LABEL_REVISION_NOTE           = "2004-09-28: JZ/ESA Draft 1"
RECORD_TYPE                   = FIXED_LENGTH
RECORD_BYTES                  = 80
RELEASE_ID                    = 0001
REVISION_ID                   = 0000
OBJECT                        = INSTRUMENT
  INSTRUMENT_HOST_ID          = MEX
  INSTRUMENT_ID               = HRSC

OBJECT                        = INSTRUMENT_INFORMATION

  INSTRUMENT_NAME             = "HIGH RESOLUTION STEREO CAMERA"
  INSTRUMENT_TYPE             = "CCD CAMERA"
  INSTRUMENT_DESC             = "

    Instrument Overview
    ===================

    The High Resolution Stereo Camera (HRSC), originally developed for the
    Russian-led Mars-96 mission, was selected as part of the Orbiter
    payload for ESA s Mars Express mission. The HRSC is a pushbroom
    scanning instrument with nine CCD line detectors mounted in parallel
    in the focal plane. Its unique feature is the ability to obtain
    near-simultaneous imaging data of a specific site at high resolution,
    with along-track triple stereo, four colours and five different
    phase angles, thus avoiding any time-dependent variations of the
    observational conditions. An additional Super-Resolution Channel (SRC)
    a framing device will yield nested images in the metre-resolution range
    for detailed photogeologic studies. The spatial resolution from the
    nominal periapsis altitude of 250 km will be 10 m px 1, with an image
    swath of 53 km, for the HRSC and 2.3 m px 1 for the SRC.
    During the mission s nominal operational lifetime of 1 martian year
    (2 Earth years) and assuming an average HRSC data transfer share of 40%,
    it will be possible to cover at least 50% of the martian surface at
    a spatial resolution of d 15 m px 1. More than 70% of the surface
    can be obser
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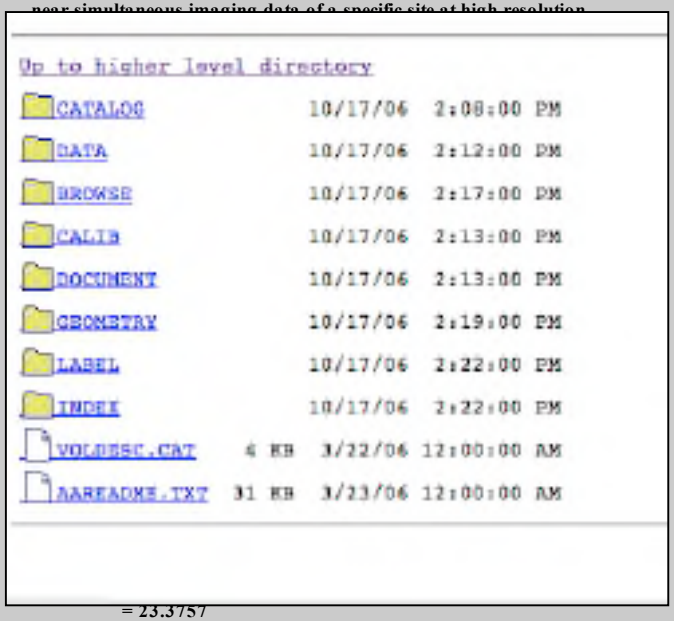

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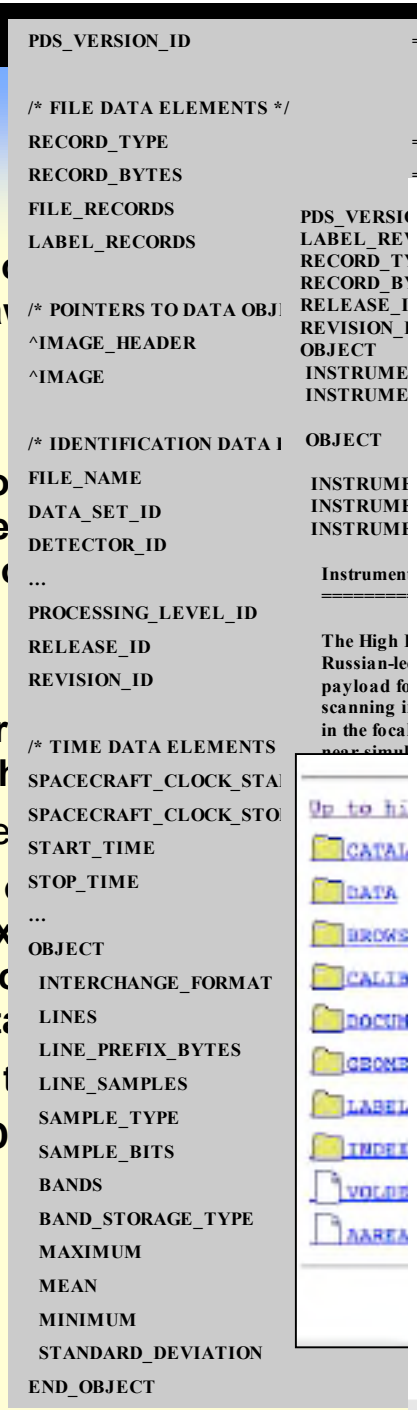

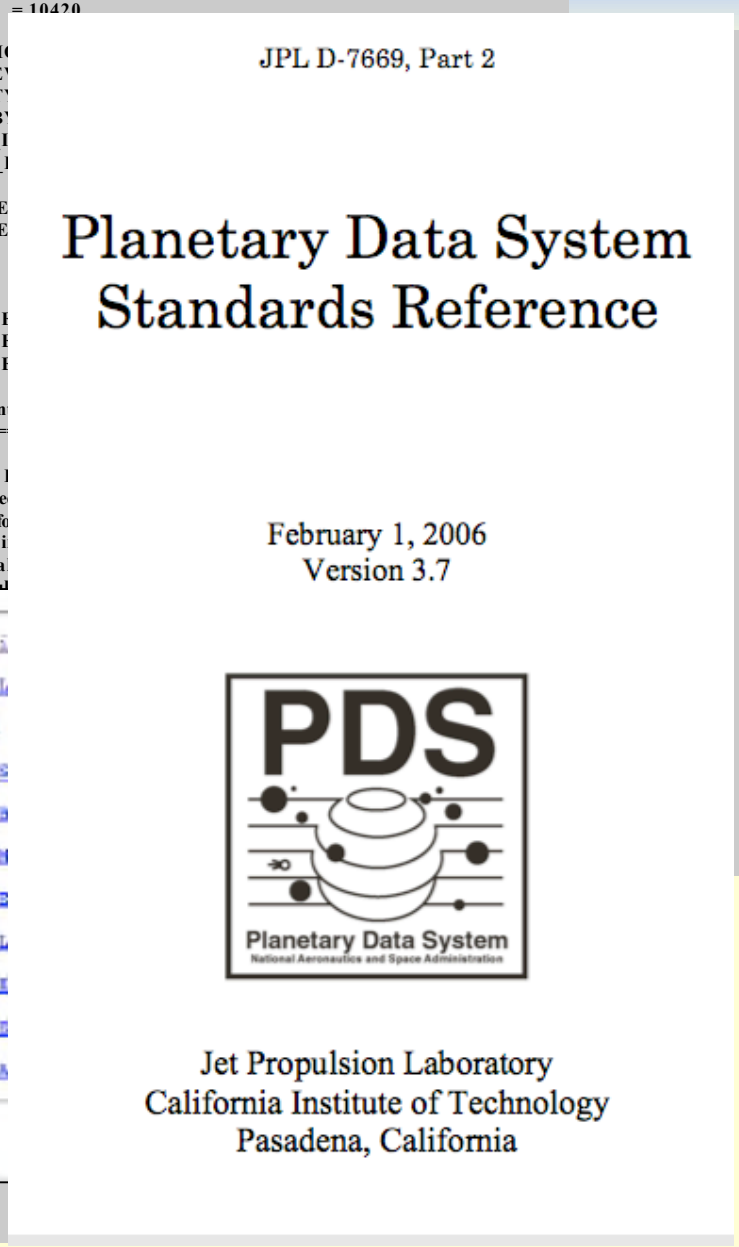

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  MEAN
  MINIMUM
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END_OBJECT
```

V6 MGSS0099-05-01

ELEMENT DEFINITIONS

AVERAGE_INCLINATION [PDS-GEO-SIGN] **REAL <deg>**

The average_inclination element provides the value of the angle of inclination of the predicted orbit with respect to the xy-plane of the J2000 coordinate system.

AVERAGE_ORBIT_PERI_TDB_TIME [PDS-GEO-SIGN] **REAL**

The average_orbit_peri_tdb_time element provides the value of the periapsis time of the predicted orbit. This orbit is based on the elements used to generate the uplink commands for the current mapping pass. It represents an average over the entire orbit, and is not the result of post-orbit navigation solutions. The elements should be used for comparison purposes only, since they may involve large errors. The predicted orbit elements are copied from the orbit header file of the ALT-EDR tape, or, if unavailable, from the orbit header file of the C-BEB.

AVERAGE_PERIAPSIS_ARGUMENT [PDS-GEO-SIGN] **REAL <deg>**

The average_periapsis_argument element provides the value of the angle in the plane of the predicted orbit from the ascending node in the xy-plane of the J2000 coordinate system to the periapsis.

AVERAGE_PLANETARY_RADIUS [PDS-GEO-SIGN] **REAL <km>**

The average_planetary_radius element provides the value of the planetary radius of the radiometer footprint, used to compute nad_footprint_longitude and nad_footprint_latitude, and also surface_temperature and atmospheric corrections to surface emissivity.

AVERAGE_SEMIMAJOR_AXIS [PDS-GEO-SIGN] **REAL <km>**

The average_semimajor_axis element provides the value of the semi-major axis of the predicted orbit.

AXES **INTEGER(1, 6)**

The axes element identifies the number of axes or dimensions of an array or cube data object.

AXIS_INTERVAL **CONTEXT DEPENDENT**

The axis_interval element identifies the spacing of value(s) for an ordered sequence of regularly sampled data objects along a defined axis. For example, a spectrum measured in the 0.4 to 3.5 micrometer spectral region at 0.1 micrometer intervals, but whose values are stored in descending order in an ARRAY object would have an axis_interval = -0.1. For ARRAY objects with more than 1 axis, a sequence of values is used to identify the axis_interval associated with each axis_name.

AXIS_ITEMS **INTEGER(1:6)**

The axis_items element provides the dimension(s) of the axes of an array data object. For arrays with more than 1 dimension, this element provides a sequence of values corresponding to the number of axes specified. The rightmost item in the sequence corresponds to the most rapidly varying axis, by default.

AXIS_NAME **CHARACTER(30)**

The axis_name element provides the sequence of axis names of a cube or array data object, and identifies the order in which the axes are stored in the object. By default, the first axis name in the sequence identifies the array dimension that varies the slowest, followed by the next slowest, and continuing on the rightmost axis named varies the fastest. The number of names specified must be equal to the value of the axes element. Note: For ISIS cube data objects, the most frequently varying axis is listed first, as leftmost, in the sequence.

AXIS_ORDER_TYPE **CHARACTER**

The AXIS_ORDER_TYPE element is used to identify the storage order for elements of a multidimensional ARRAY object. The default storage order for an ARRAY object parallels the rightmost or last index of a sequence varies the fastest. This is the ordering used in the C programming language and is equivalent to ROW_MAJOR storage order for COLUMN elements within tables. Specifying an AXIS_ORDER_TYPE of FIRST_INDEX_FASTEST may be used for ARRAYs that must be labelled and referenced in the reverse, and is the ordering used in the Fortran programming language.

AXIS_START **CONTEXT DEPENDENT**

The axis_start element identifies the starting value(s) for an ordered sequence of regularly sampled data objects. For example, a spectrum that was measured in the 0.4 to 3.5 micrometer spectral region at 0.1 micrometer intervals, but whose values are stored in descending order would have axis_start = 3.5 and

3-5

PDS Resources

- http://pds.jpl.nasa.gov
- More information on the PDS and complete versions of the Standards Reference and Data Dictionary
- The Data Dictionary can be found here
- Supporting Software Tools can be downloaded here

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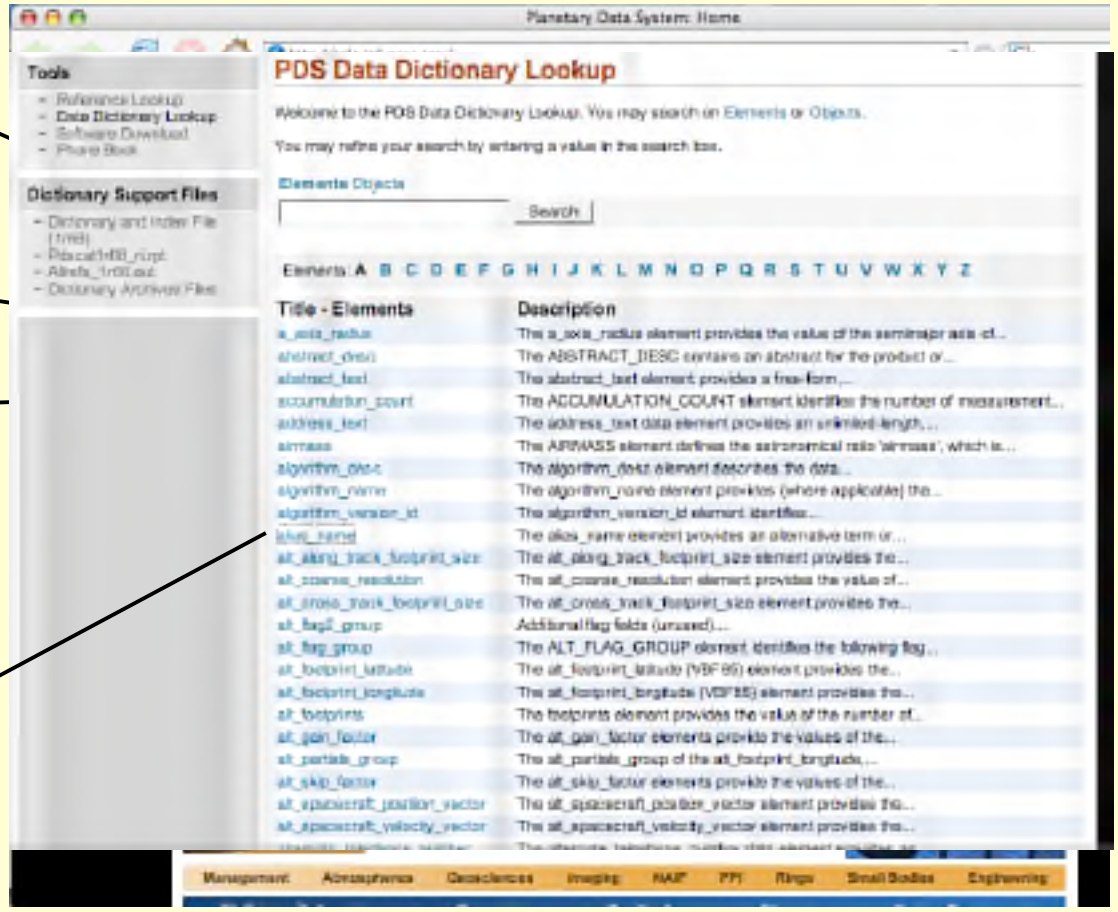
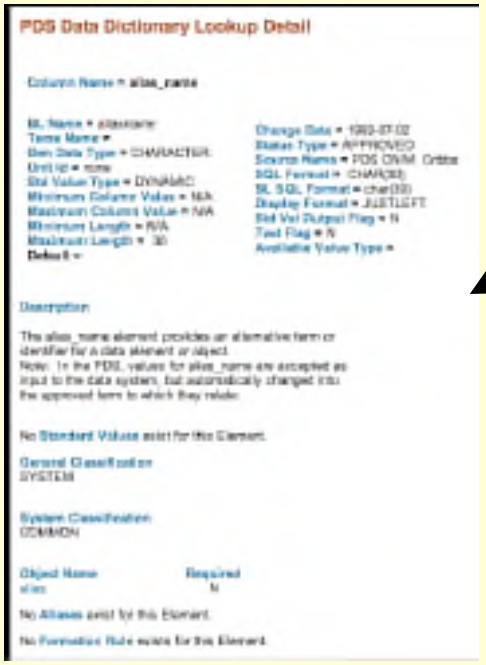
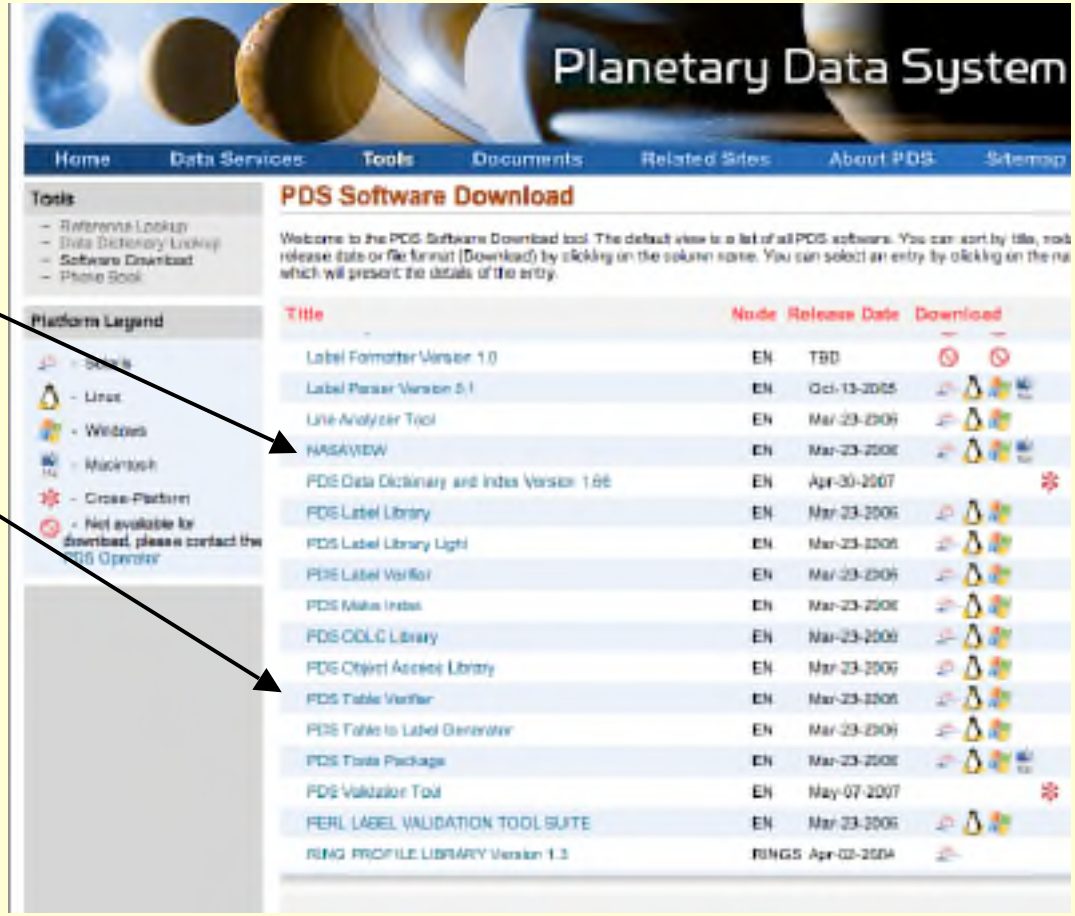




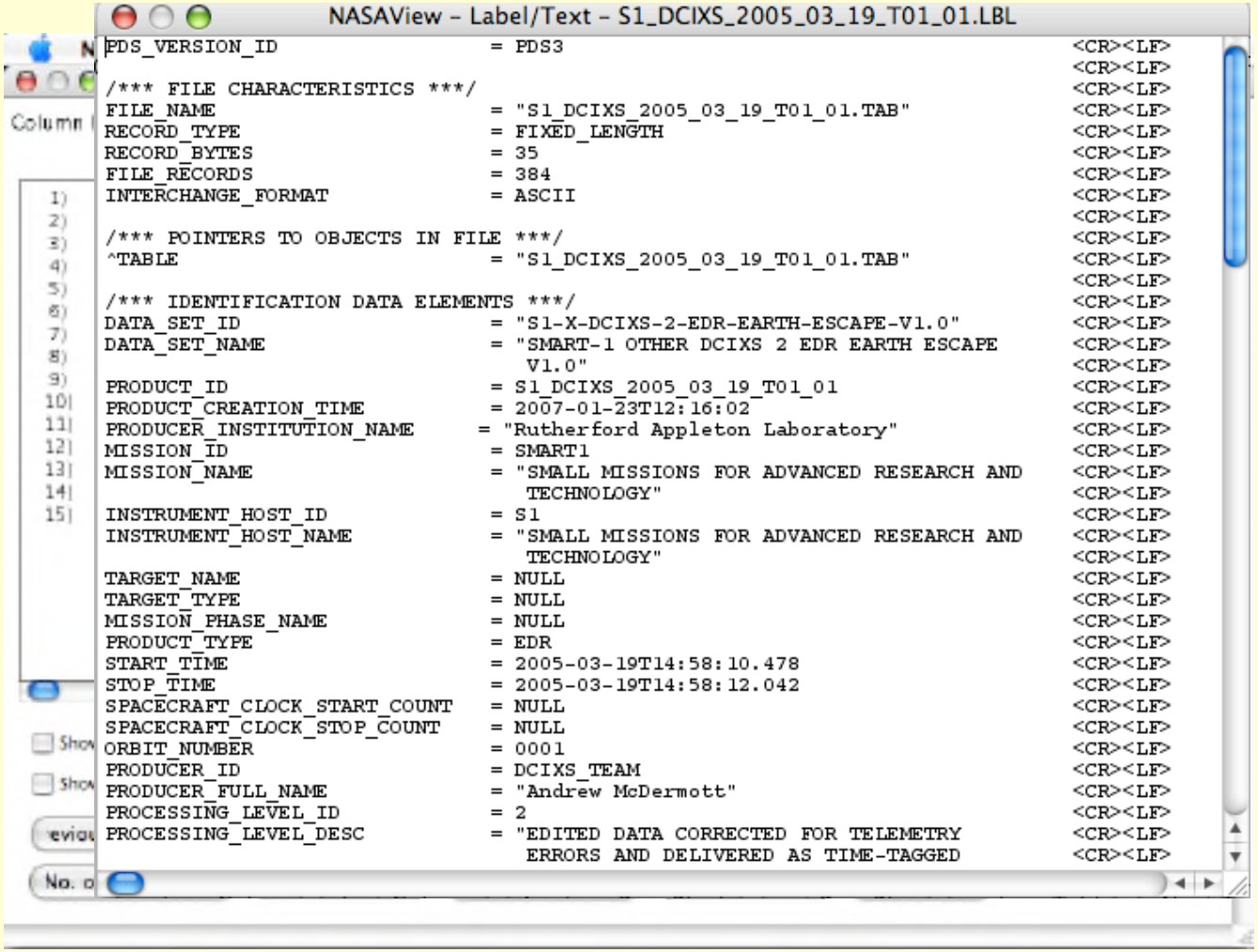
A Few PDS Tools

- http://pds.jpl.nasa.gov
- **Go to the Tools menu**
- **Click on Software Download**
- **NASA View**
  - A useful tool for visualising labels and simple small data products
- **PDS Table Verifier**
  - A tool for reading tables and enduring they are correctly formatted



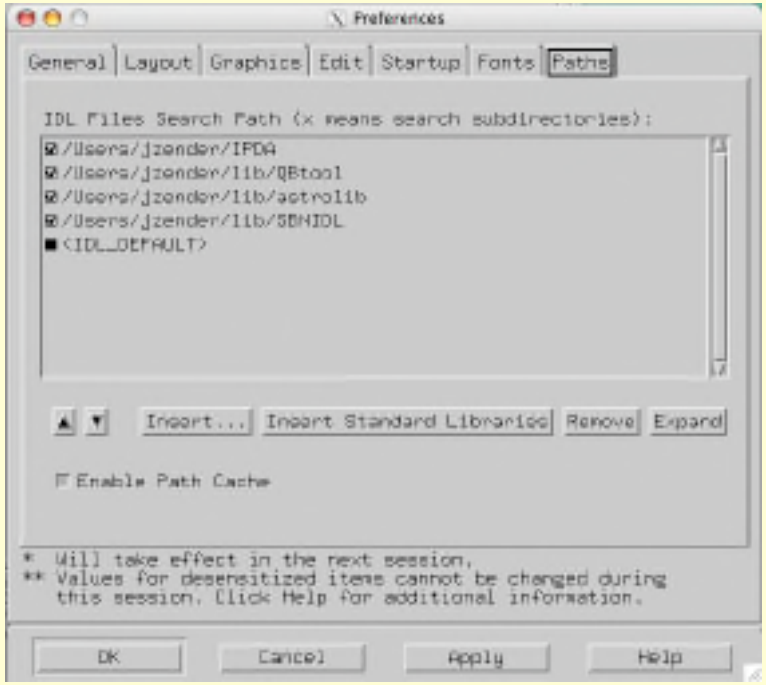
NASA View Example

- NASAView can open simple PDS compliant data
- Click on File -> Open Object and select the product you want to see
- You can also click on Label -> Full Label to view the complete PDS label with full information on the data product being viewed



SBN IDL

- **SBNIDL is an IDL package that is maintained and distributed by PDS's Small Bodies Nodes. It allows most PDS compliant products to be read in to the IDL software.**
- **To retrieve the latest fully tested release or previous releases, check out the page http://pdssbn.astro.umd.edu/nodehtml/software.shtml**
- **Within your IDLDE, select the File->Preferences and check that you path contains the SBNIDL.**



SBN IDL 2

- To run the SBNIDL you also need to have the astrolib library installed. If not already done, you can retrieve the astrolib library at http://idlastro.gsfc.nasa.gov/ .
- Read the aareadme.txt file distributed with the SBNIDL package. There is no further way to test your installation than to call a procedure within IDL. So, on your IDLDE command input, enter e.g.:
- If the routine READPDS is compiled successfully, your installation is ok.

```
IDL> data = readpds('')
% Compiled module: READPDS.
% Compiled module: FILE_WHICH.
% Compiled module: PATH_SEP.
% Compiled module: HEADPDS.
Error: file  could not be opened -
  File either corrupted or invalid file name.
% CLOSE: Variable is undefined: UNIT.
% Error occurred at: HEADPDS            65 /Users/jzender/lib/SBNIDL/headpds.pro
%                    READPDS           186 /Users/jzender/lib/SBNIDL/readpds.pro
%                    $MAIN$
% Execution halted at: $MAIN$
```

Planetary Science Archive

Users Quick Guide

Classical User Interface

By J. Zender and D. J. Heather

8 June 2007, Version 2.0

Step 1

a) Open the PSA www home page at http://www.rssd.esa.int/psa

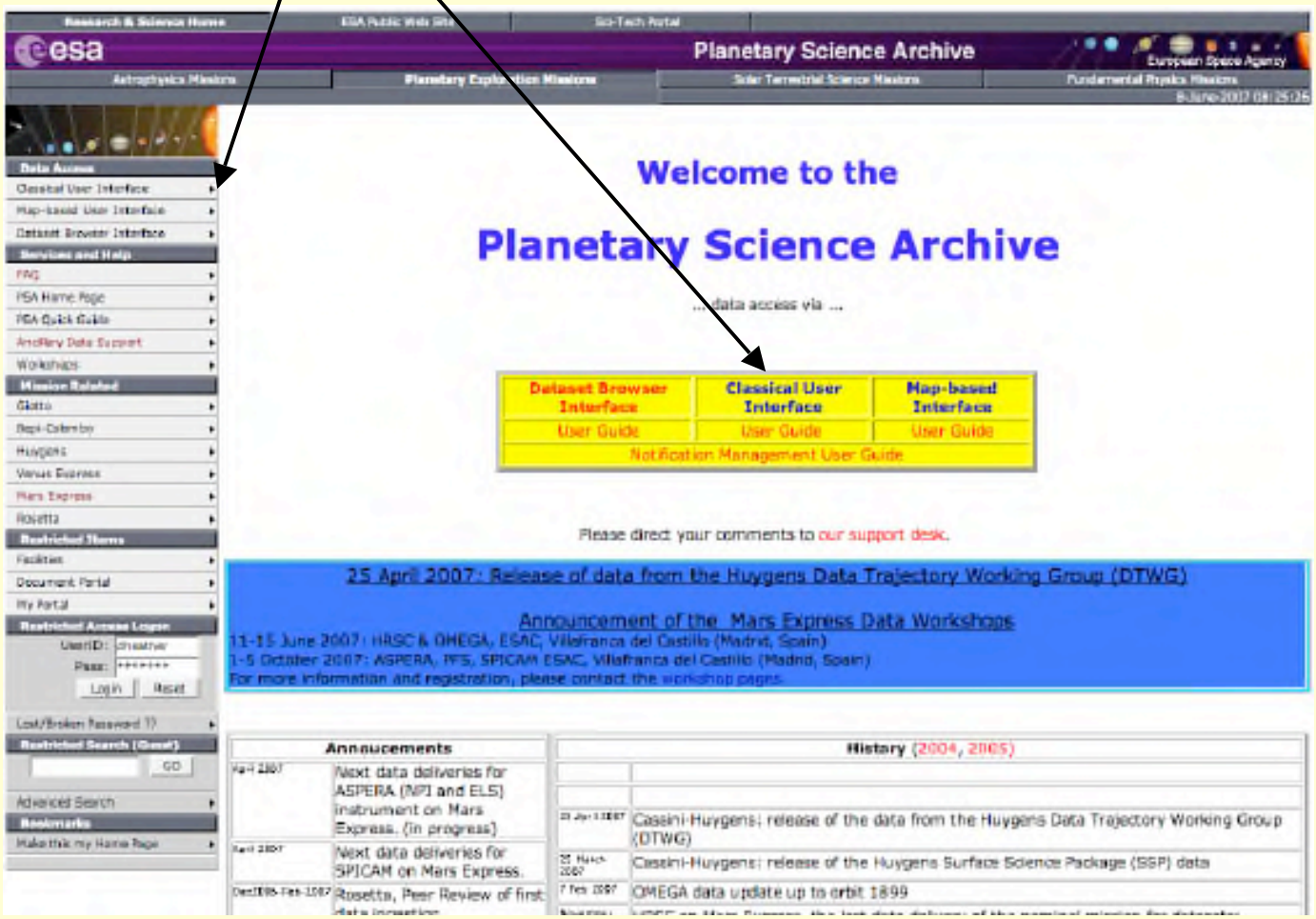
b) Select "Classical User Interface" on your left or in the yellow box

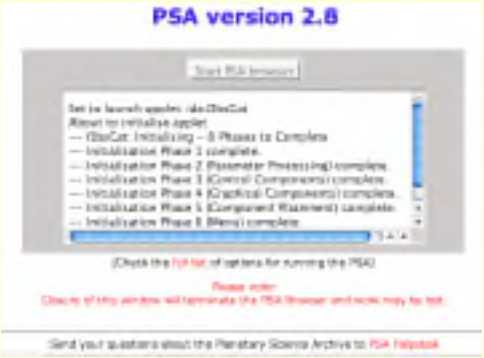
Step 2

a) You must click 'Trust' to accept the certificate and run the PSA applet.

Step 3

The "PSA Browser Start Page" will appear on your screen and will automatically start to load



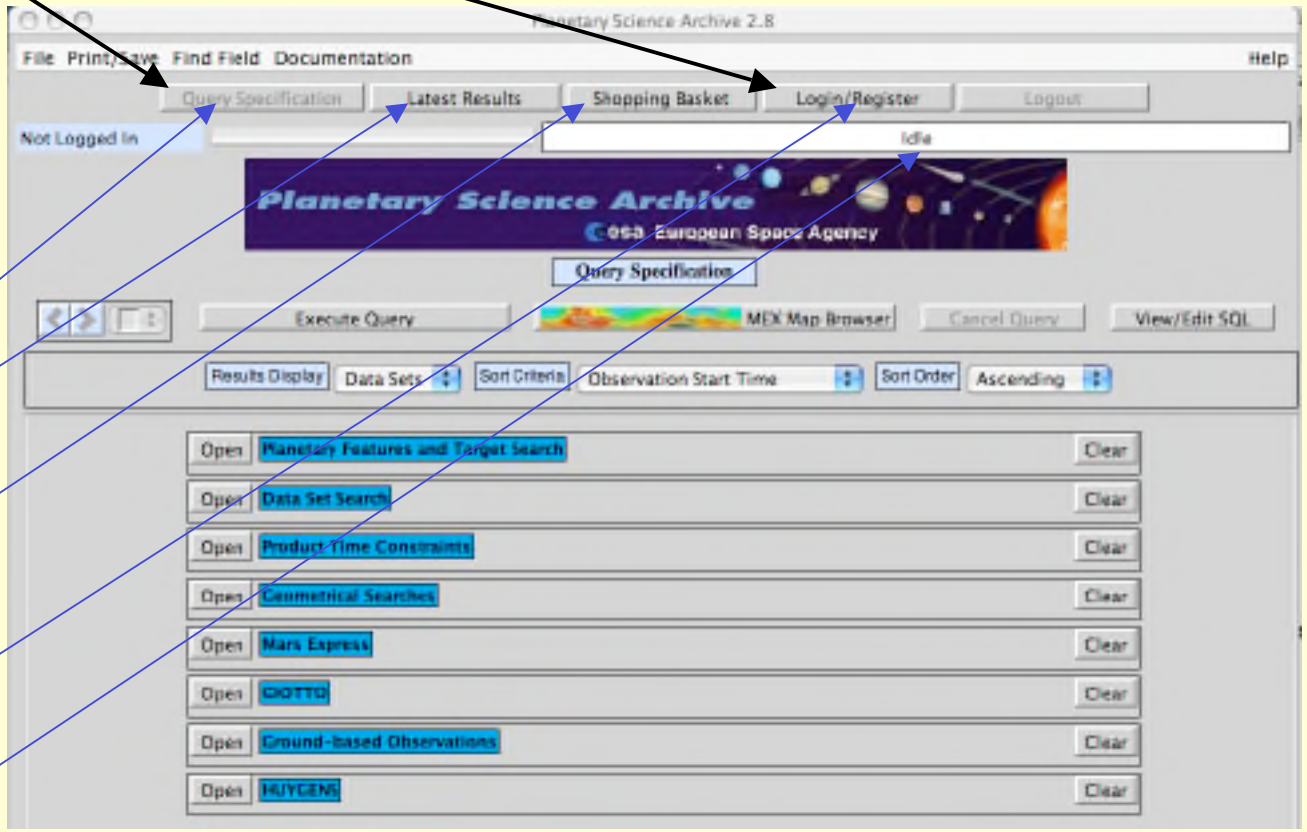


Login/Registering

Step 4

a) Select the "Login/Register" View and login or request new user id.

b) After having logged in, select the "Query Specification" View



The Planetary Science Archive (PSA) is structured in 5 different 'views',

a) The "Query Specification" view, that allows you to define your query against the database

b) The "Latest Result" view, that allows you to view the result of your previous query.

c) The "Shopping Basket" view, that allows you to select your items of interest and order them later (free of charge).

d) The "Login/Register", that you should know by now (if not, please register to have the full functionality of the PSA)

e) The "Request Monitor" view to monitor your requests

By clicking/selecting the individual views you can 'walk around' in the PSA.

Define Your Query

Step 3

a) Open a "Query Panel" and select your search criteria

b) Select your "Result Display" view options

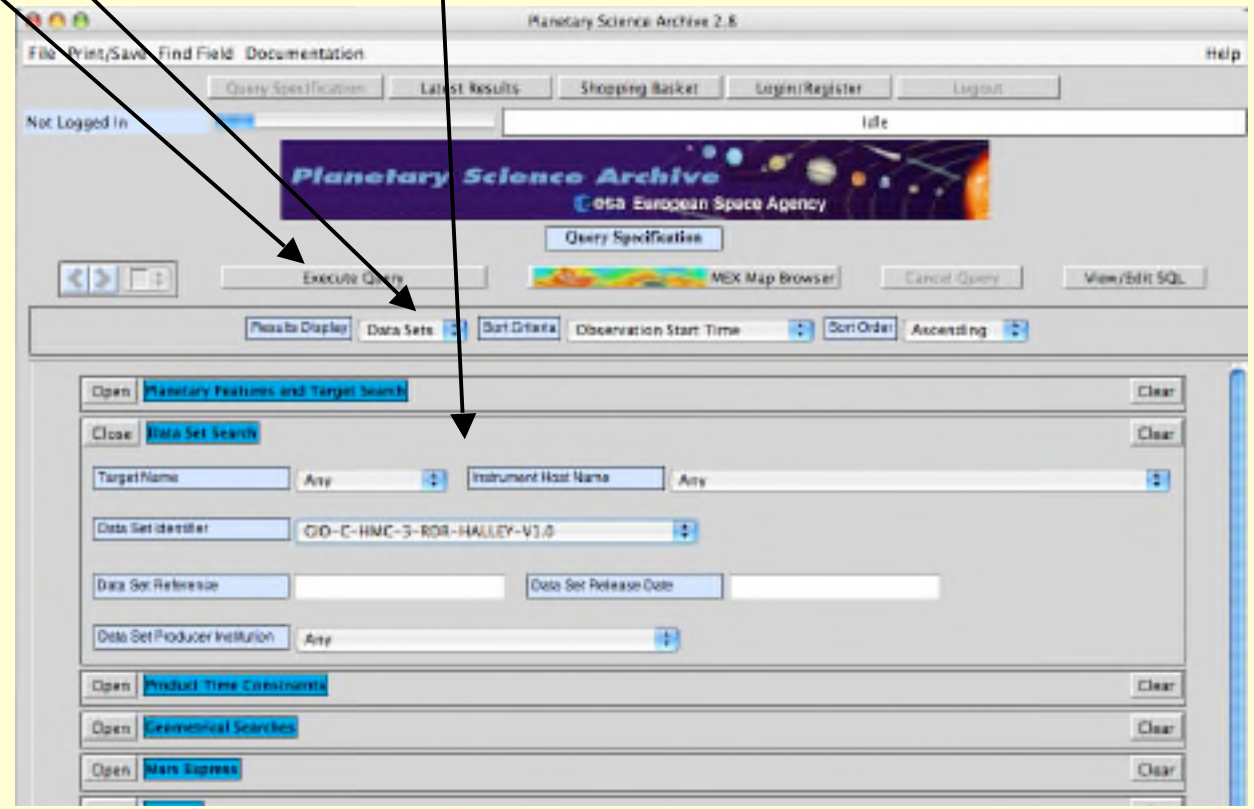
c) Execute the query

Opening several "Query Panels" will logically-AND the constraints within the individual query panels.

Not opening any "Query Panel" will result in the display of all available datasets

The PSA contains data conform to the Planetary Data System Standard. A 'Data Product' is e.g. a PDS-labeled file containing an image. A 'Data Set' is a full directory hierarchy containing documentation, catalogues, indexes, data products and any other information.

In the "Result Display" view options, you can select to see Data Products, Data Sets or both in the "Result Panel"

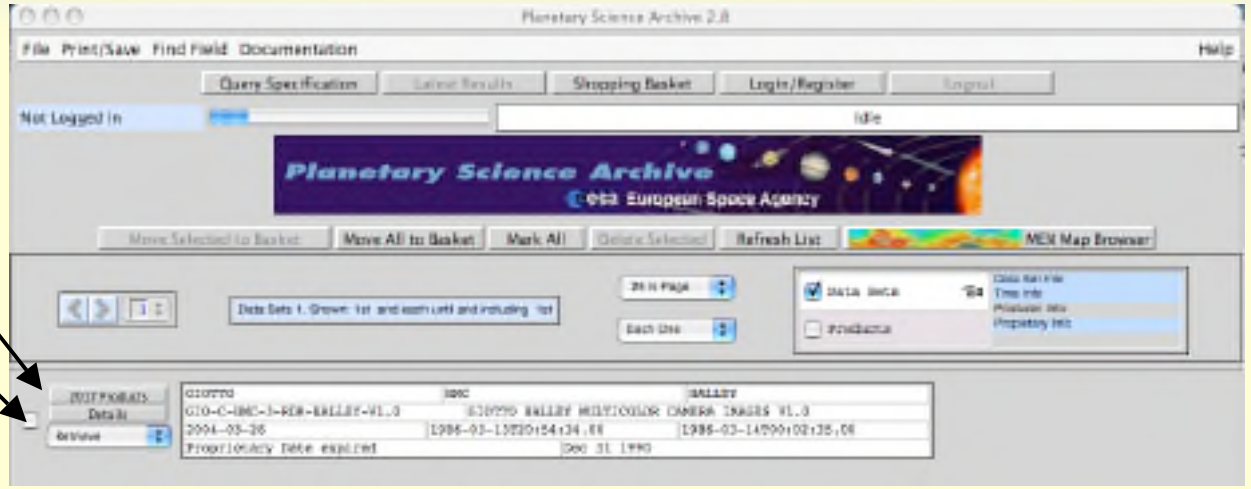


Browse your Results and Select

Step 4

a) If you want individual data products, 'view' the products by clicking on 'xxx Products'

b) If you want to download the whole data set, 'mark' the dataset as selected and move it to the Shopping Basket

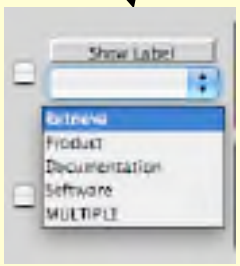


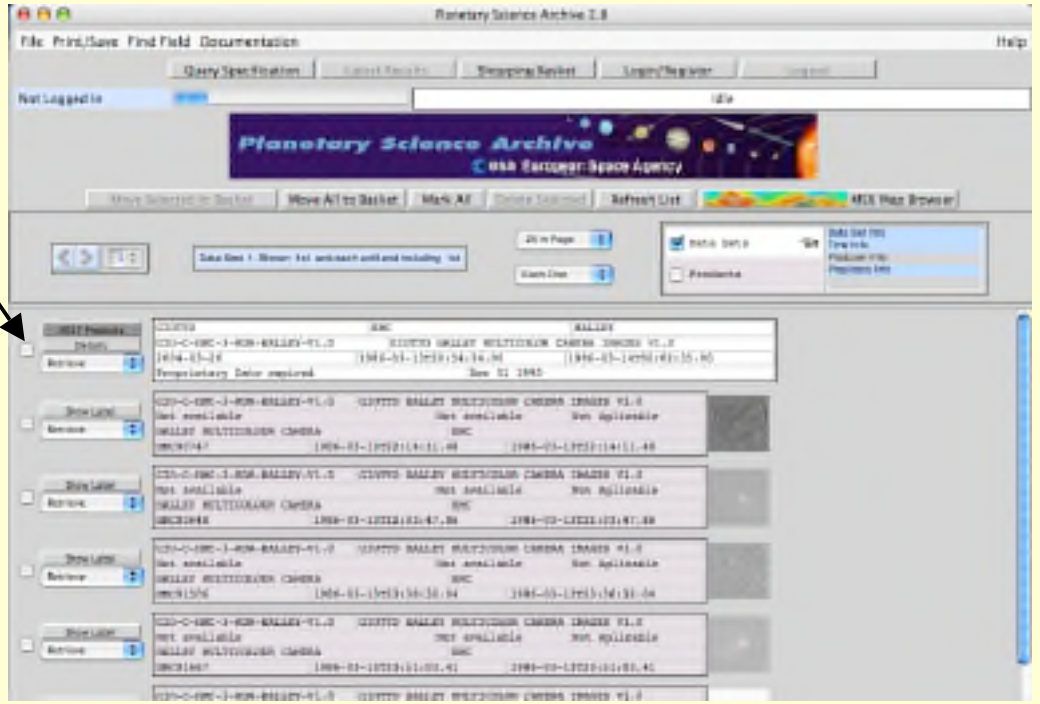
Step 4:

c) 'mark' the data products that you want to download as selected and move them into the 'Shopping' Basket

Step 4 Alternative:

You can download a Data Products, associated software and documentation directly, using the 'Retrieve' menu on the left side of each Data Product





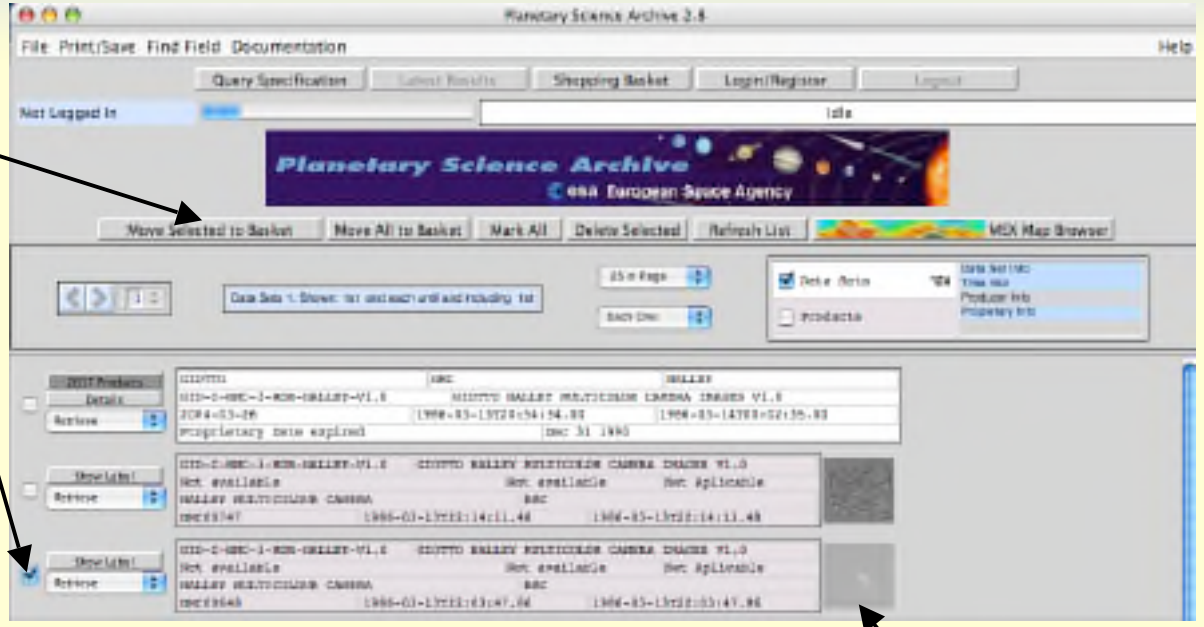
Order via the Shopping Basket

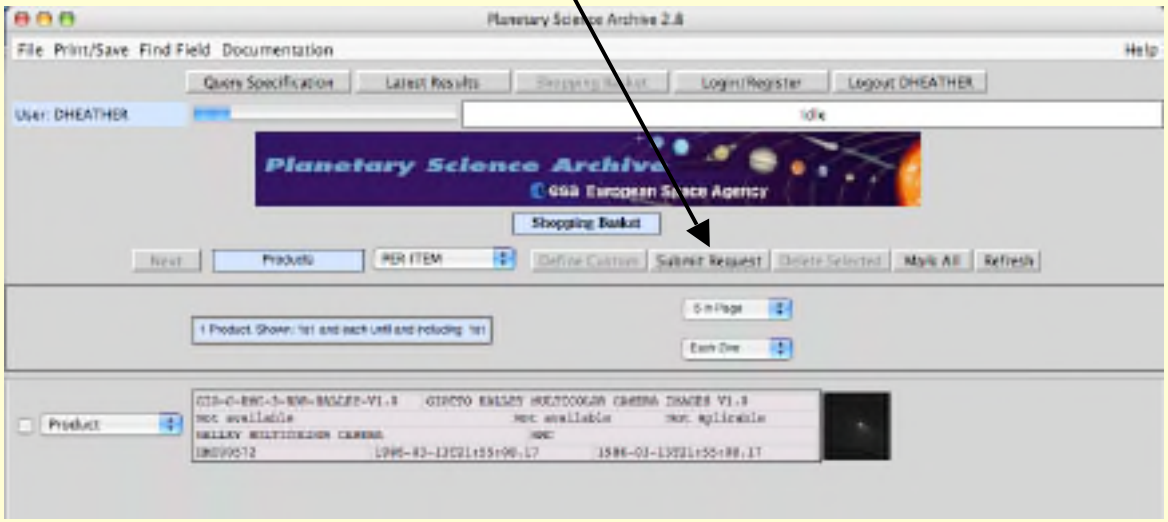
Step 5:

a) ‘mark’ the Data Product that you want to download and move it to the basket

b) You can then open the Shopping Basket window

c) When you are happy with your selections, click on ‘Submit Request’





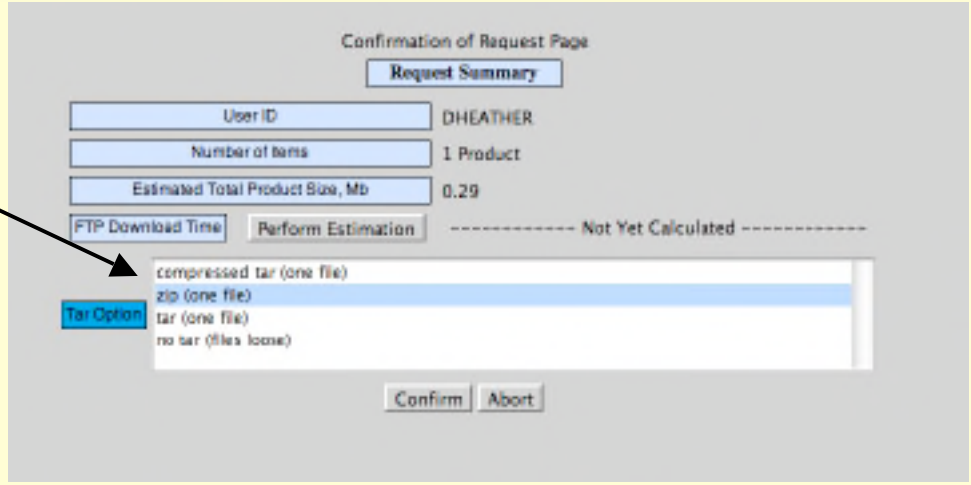
To have a somewhat larger view of the data product, click on the icon and it will be displayed in a separate window.

Downloading / Retrieving the Data

Step 6:

a) 'select' your data packing option

b) 'Confirm' and wait for an email that will inform you on the ftp retrieval of the data you have selected



To: dheather@rssd.esa.int

Dear Planetary Science Archive User,

Your retrieval request has been successfully processed.

Please follow the instructions below to access/browse the ftp area where your data is located:

```
ftp psa.esac.esa.int
anonymous
<your email address as password>
prompt
cd /pub/dheather
binary
dir
```

Alternatively, you can also access your files directly from your browser at:

ftp://psa.esac.esa.int/pub/dheather/DHEATHER6231.zip

where you will be able to see some of the products on-line.

Your data will remain at this location for 7 days.

The Planetary Science Archive (PSA) can be accessed at

http://www.rssd.esa.int/psa

You can also get more information about the PSA project by accessing the PSA web pages at the same address.

If you have any comments or questions, please contact the PSA HelpDesk at the following email address:

psahelp@rssd.esa.int

Regards,

The PSA Team

Your email confirmation contains all you need to know to download the data within the next week from the PSA server.

Planetary Science Archive

Users Quick Guide

Map Based User Interface

By J. Zender and D. J. Heather

08 June 2007, Version 1.1

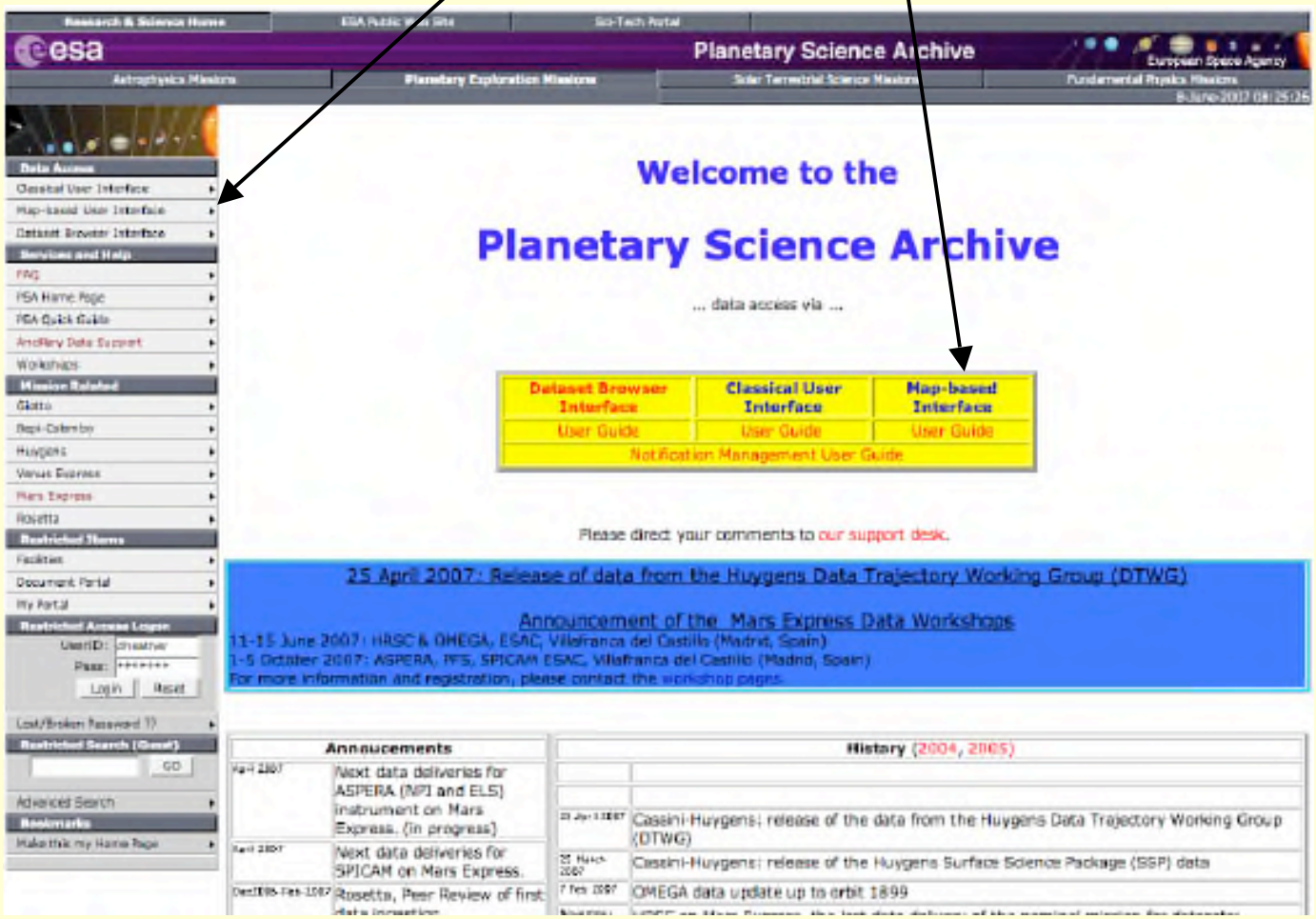
Step 1

a) Open the PSA www home page at http://www.rssd.esa.int/psa

b) Select "Map-based User Interface" on your left or in the yellow box

Step 2

The "PSA Browser Start Page" will appear on your screen. Click 'Start PSA Map' to initiate the applet.



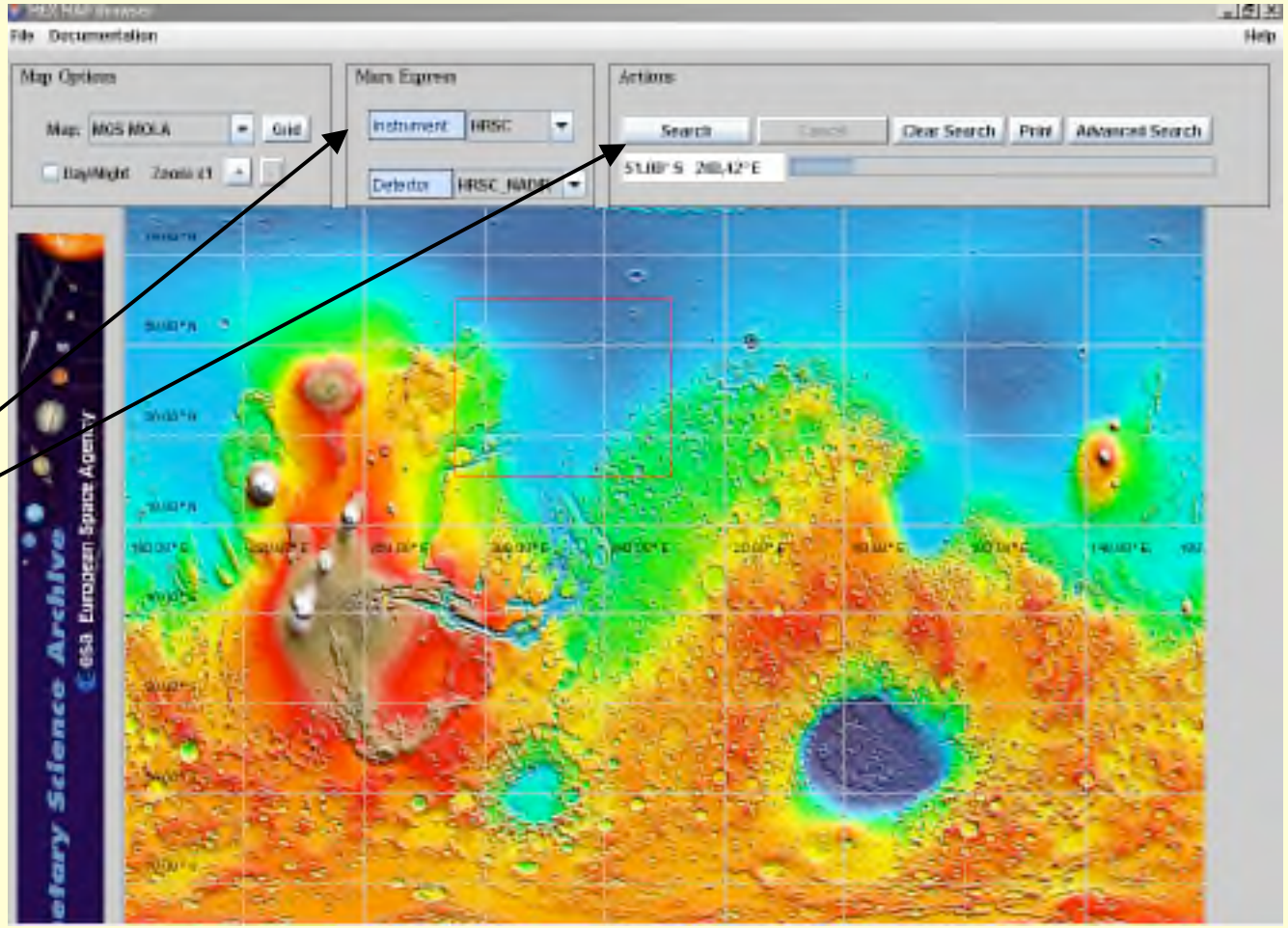
Step 1

a) Define a Region of Interest (ROI) by marking an area on the map with your mouse.

b) A red-colored rectangle will be visualize your ROI

c) Select your Instrument of choice and, if required, an instrument detector

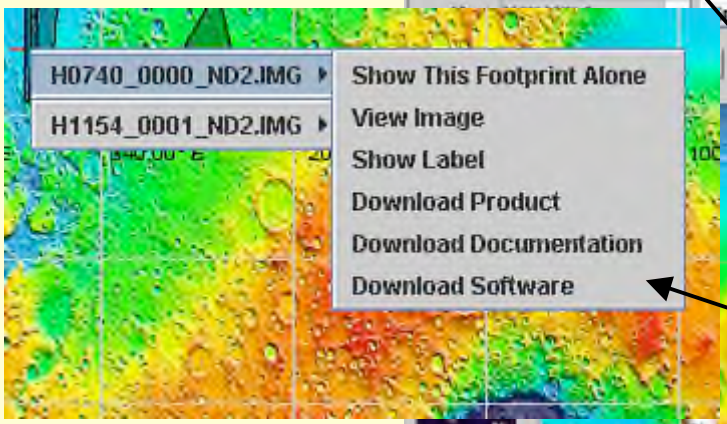
d) Execute the query



Step 2

a) Analyze the footprint resulting from your query

b) Select a footprint by moving the mouse over it and pressing a mouse button



Step 3

a) Select a service offered to you

  a) View browse image, if available

  b) Download data product

  c) Download all documentation related to this data product

Step 4

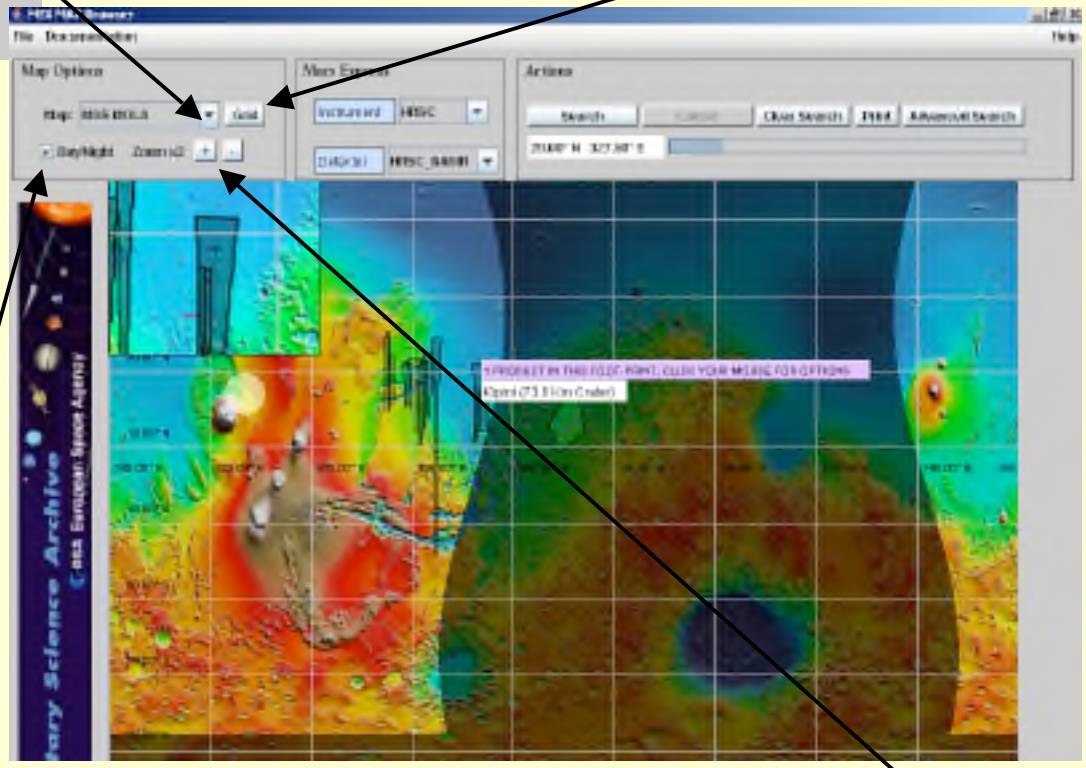
a) Clear your search, reselect a region of interest and run your query

Options

Option 1: Background map

- Select between several background maps
- Load an own map via the FILE entry of the Main Menu.

Option 4: visualize a grid on top of your background image



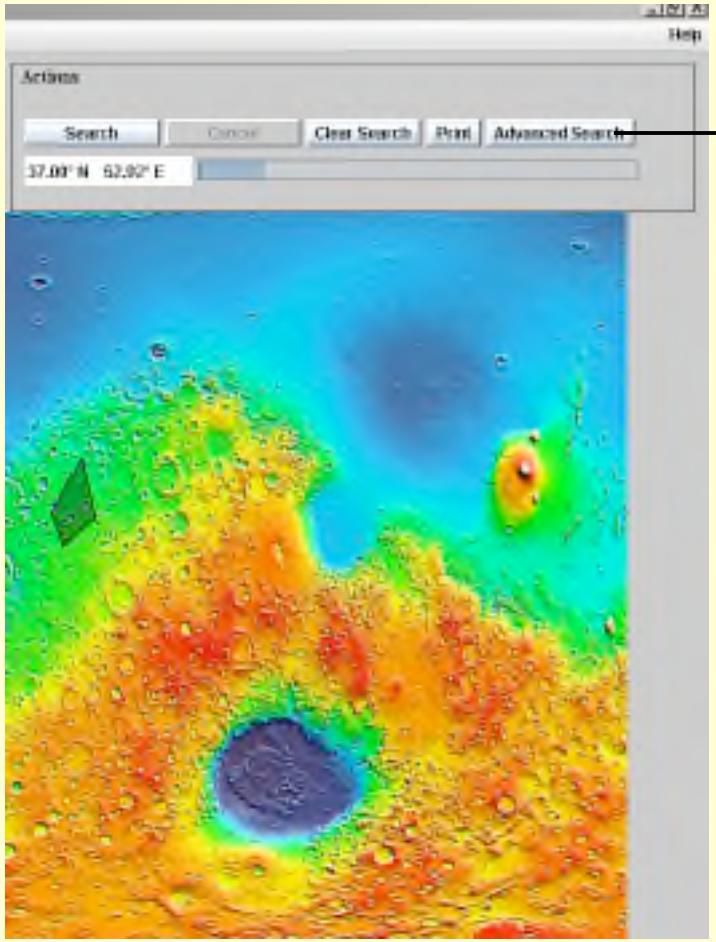
Option 2: visualize day night boundary and the intersection of the Sun to the center of Mars.

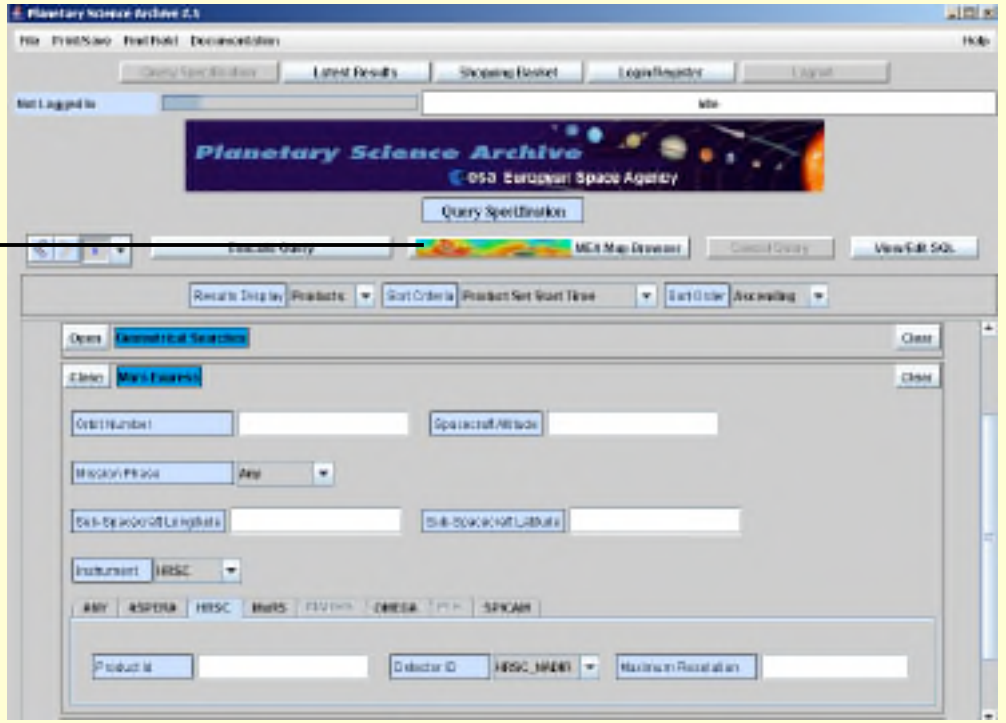
Option 3: display a zoom window that allows you to better select individual data products

Map-based Interface vs Advanced Interface

Switch between the map-based interface to the advanced interface of the PSA and vice versa.

The results you receive from your queries from within the advanced interface are taken over to the map-based interface and displayed there in case of Mars data for which geometry information is existing (HRSC, OMEGA) is available. This gives you the full flexibility of the advanced interface coupled to the visual power of the map-based concept.





Planetary Science Archive

Users Quick Guide

PSA Data Set Browser Interface

By J. Zender and D. J. Heather

08 June 2007, Version 1.1

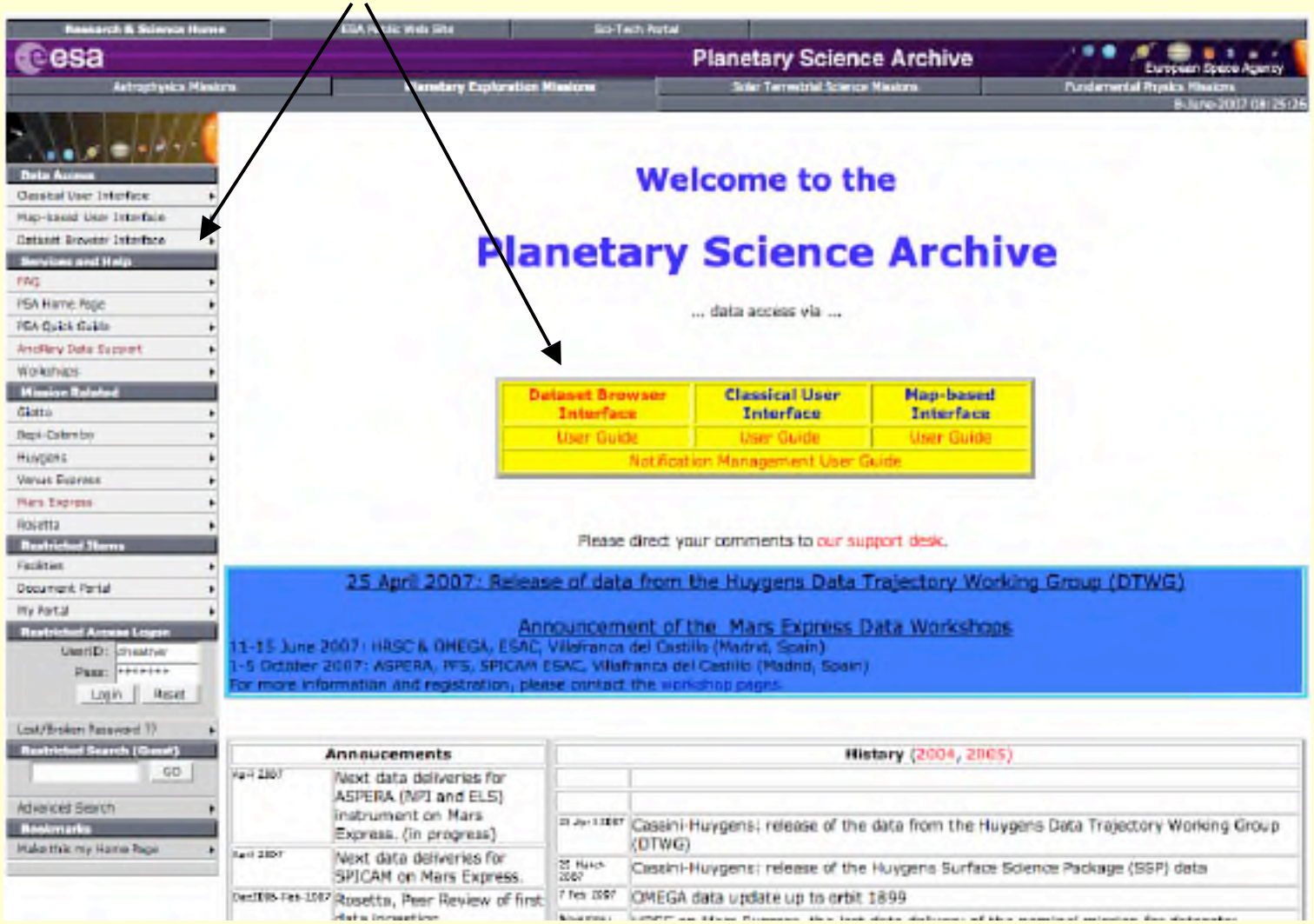
Overview

- Direct Browsing of Datasets
- Data Downloads
- Accessing the PSA archive with an FTP-client
- Automatic Download Scripts / Mirror Scripts
- Your Comments

Step 1

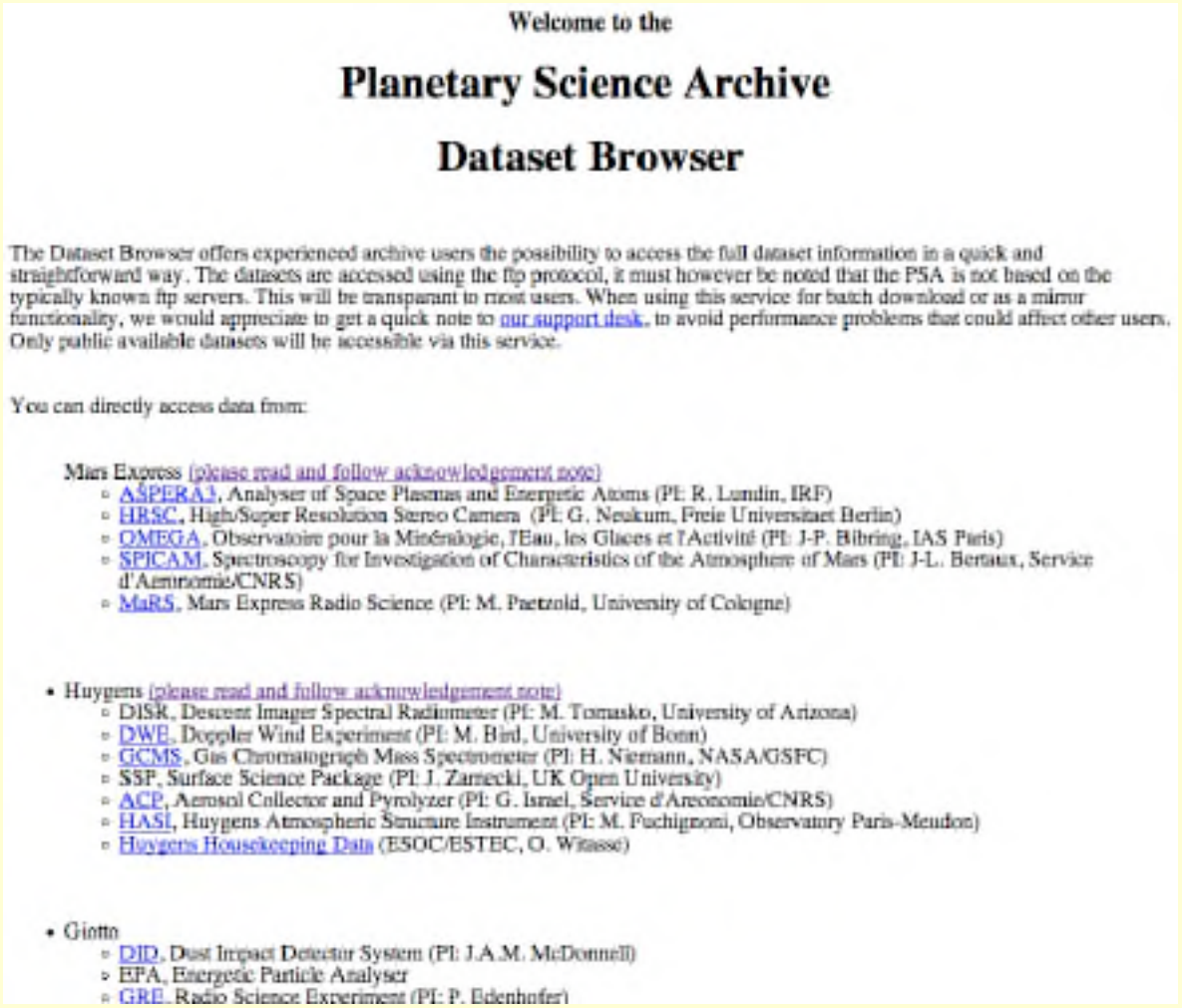
a) Open the PSA www home page at http://www.rssd.esa.int/psa

b) Select "Data set Browser Interface" on your left or in the yellow box



Direct Browsing of Datasets

- **From the Dataset Browser entry page, select the instrument of interest.**
- **Only public datasets are available through this interface! So you will not find**
  - Datasets before public release
  - Datasets in Peer Review



Welcome to the

Planetary Science Archive

Dataset Browser

The Dataset Browser offers experienced archive users the possibility to access the full dataset information in a quick and straightforward way. The datasets are accessed using the ftp protocol, it must however be noted that the PSA is not based on the typically known ftp servers. This will be transparant to most users. When using this service for batch download or as a mirror functionality, we would appreciate to get a quick note to our support desk, to avoid performance problems that could affect other users. Only public available datasets will be accessible via this service.

You can directly access data from:

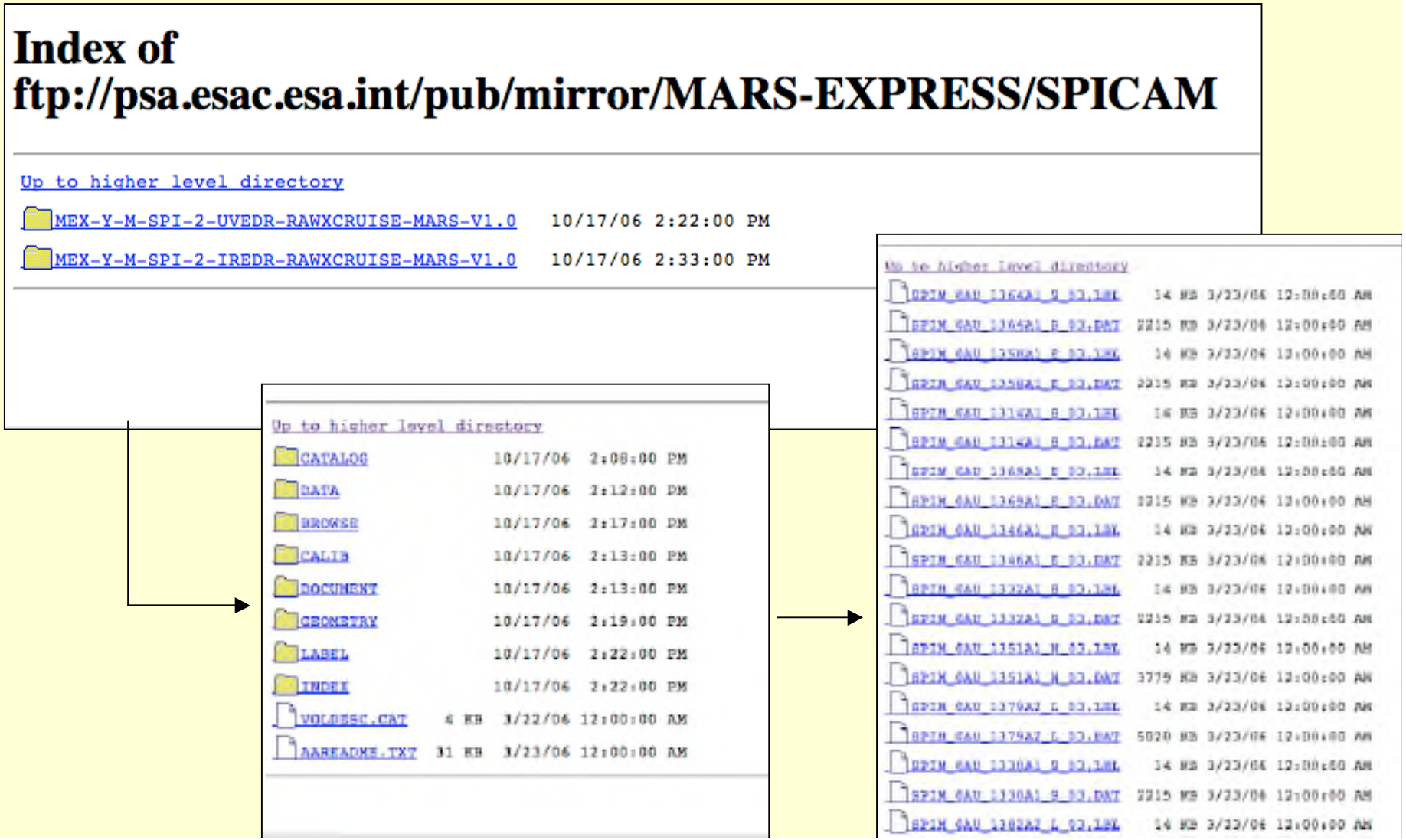
Mars Express (please read and follow acknowledgement note)
- ASPERA3, Analyser of Space Plasmas and Energetic Atoms (PI: R. Lundin, IRF)
- HRSC, High/Super Resolution Stereo Camera (PI: G. Neukum, Freie Universitaet Berlin)
- OMEGA, Observatoire pour la Minéralogie, l'Eau, les Glaces et l'Activité (PI: J-P. Bibring, IAS Paris)
- SPICAM, Spectroscopy for Investigation of Characteristics of the Atmosphere of Mars (PI: J-L. Bertaux, Service d'Aeronomie/CNRS)
- MaRS, Mars Express Radio Science (PI: M. Paetzold, University of Cologne)

- Huygens (please read and follow acknowledgement note)
  - DISR, Descent Imager Spectral Radiometer (PI: M. Tomasko, University of Arizona)
  - DWE, Doppler Wind Experiment (PI: M. Bird, University of Bonn)
  - GCMS, Gas Chromatograph Mass Spectrometer (PI: H. Niemann, NASA/GSFC)
  - SSP, Surface Science Package (PI: J. Zarnecki, UK Open University)
  - ACP, Aerosol Collector and Pyrolyzer (PI: G. Israel, Service d'Aeronomie/CNRS)
  - HASI, Huygens Atmospheric Structure Instrument (PI: M. Fuchignoni, Observatory Paris-Meudon)
  - Huygens Housekeeping Data (ESOC/ESTEC, O. Witasse)

- Giotto
  - DID, Dust Impact Detector System (PI: J.A.M. McDonnell)
  - EPA, Energetic Particle Analyser
  - GRE, Radio Science Experiment (PI: P. Edenhofer)

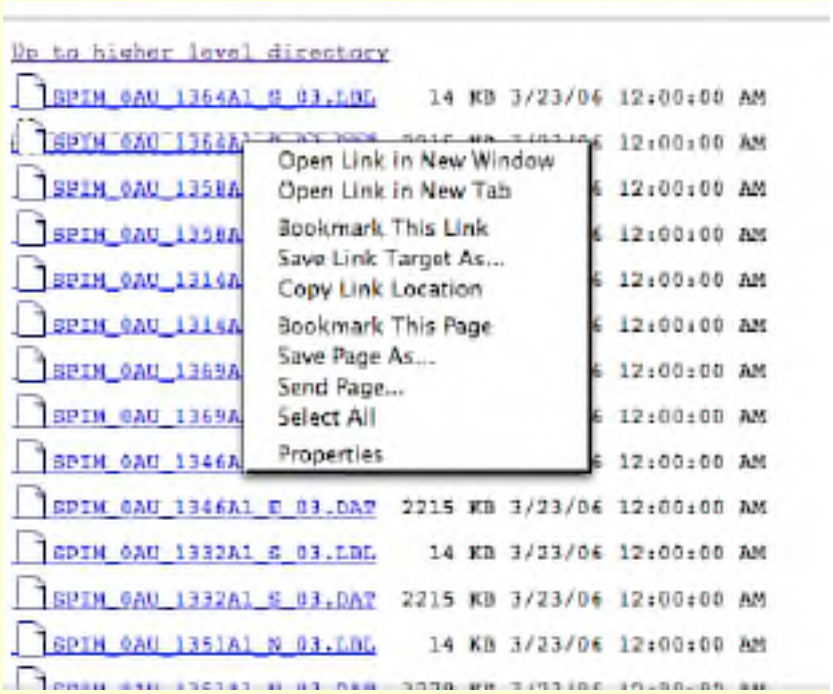
Direct Browsing of Datasets II

> Browse through the dataset in the usual way.



Data Download

- **When using a web browser, please insure to use an appropriate method to download your data,**
  - E.g. in MOZILLA the 'Save Link Target As…"
- **Be aware that you download only the file selected, …**
  - Detached label files (e.g. LBL and DAT) need to be both downloaded to get the full data product!
  - Any linked files, .e.g. ^DESCRIPTION = "INSTRUMENT.PDF" will not be attached to the downloaded file!



Accessing the PSA archive with an FTP-client

- **You will be able to connect to the PSA archive with any ftp client, e.g. ncftp, ftp, fuqu, etc**
  - Using ftp://psa.esac.esa.int/pub/mirror
  - Or directly the mission related subpage ftp://psa.esac.esa.int/pub/mirror/MARS-EXPRESS

Automatic Download Scripts / Mirror Scripts

- You can use any automatic download script (mirror, etc) to recursively download the data on the PSA.
- Before installing a regular download scheme on your side (mirror, etc), please inform us by sending a short note to psahelp@rssd.esa.int. We will keep an eye on the load of network and server such that other users are not disturbed. In such cases, we will contact you and propose alternative time periods and options to download the data you are interested in.
- Be aware that the files that you see in your www-browser or your ftp-client are not the physical files, but a link into the PSA database system. When downloading data, the PSA server resolves the link on the fly and delivers the data back to you.
- When building mirror scripts, you can compare your data items against size or time with the ones on the PSA server.

Be careful when using automatic downloads, as the size of the datasets can be huge (several 100GBytes or larger)! Please contact the PSA Helpdesk beforehand.

Planetary Science Archive

Users Quick Guide

Notification Management

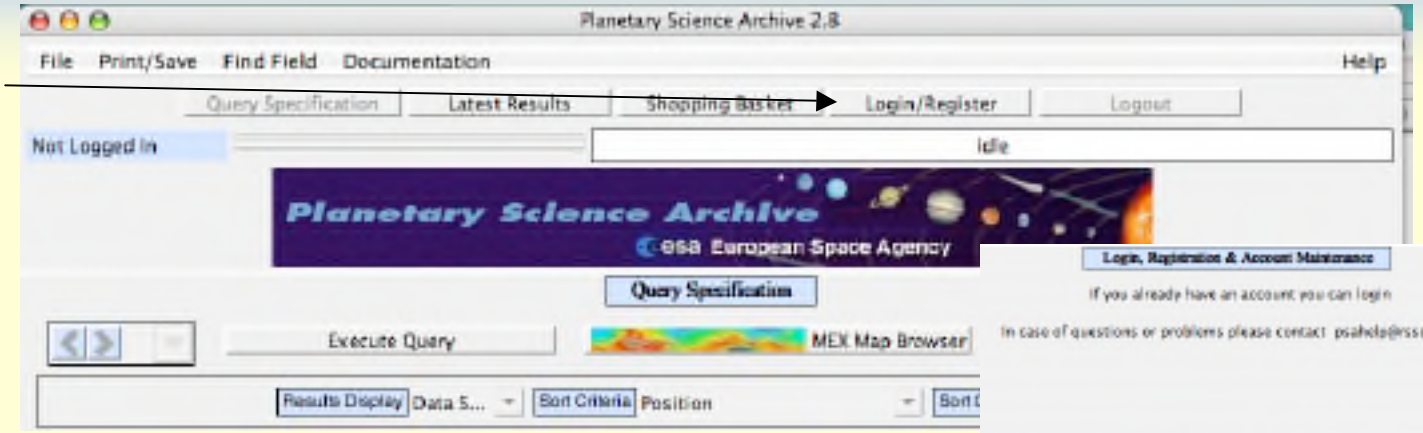
By J. Zender and D. J. Heather
08 June 2007, Version 1.1

Overview

- Registration
- Notification Rules
- Notification via Email
- Comments and Suggestions

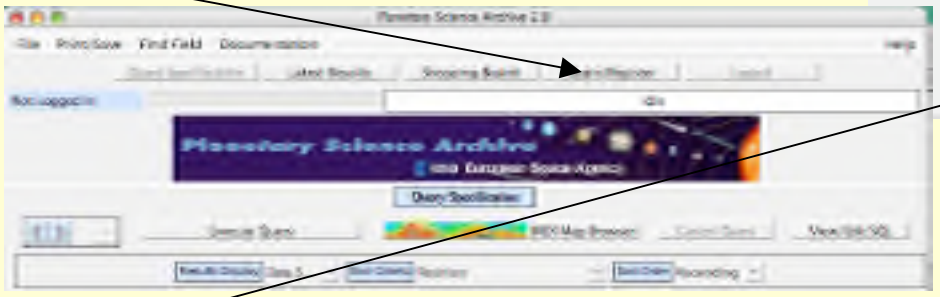
Registration I

1. **Goto Login Page**



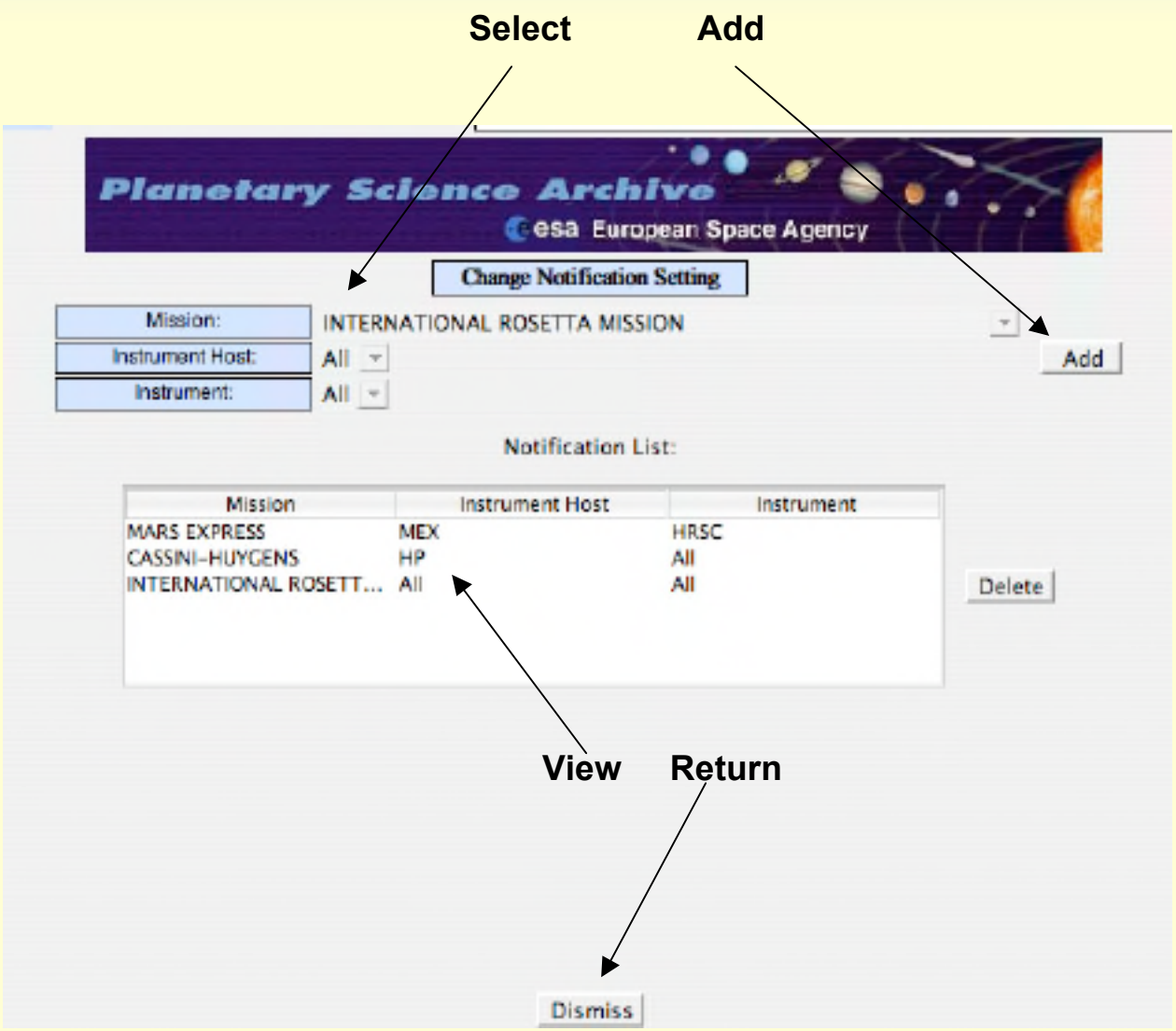
2. **Login with your user id / password**

3. **Goto Login Page**



4. **Select 'Change Notification Setting'**

Registration II



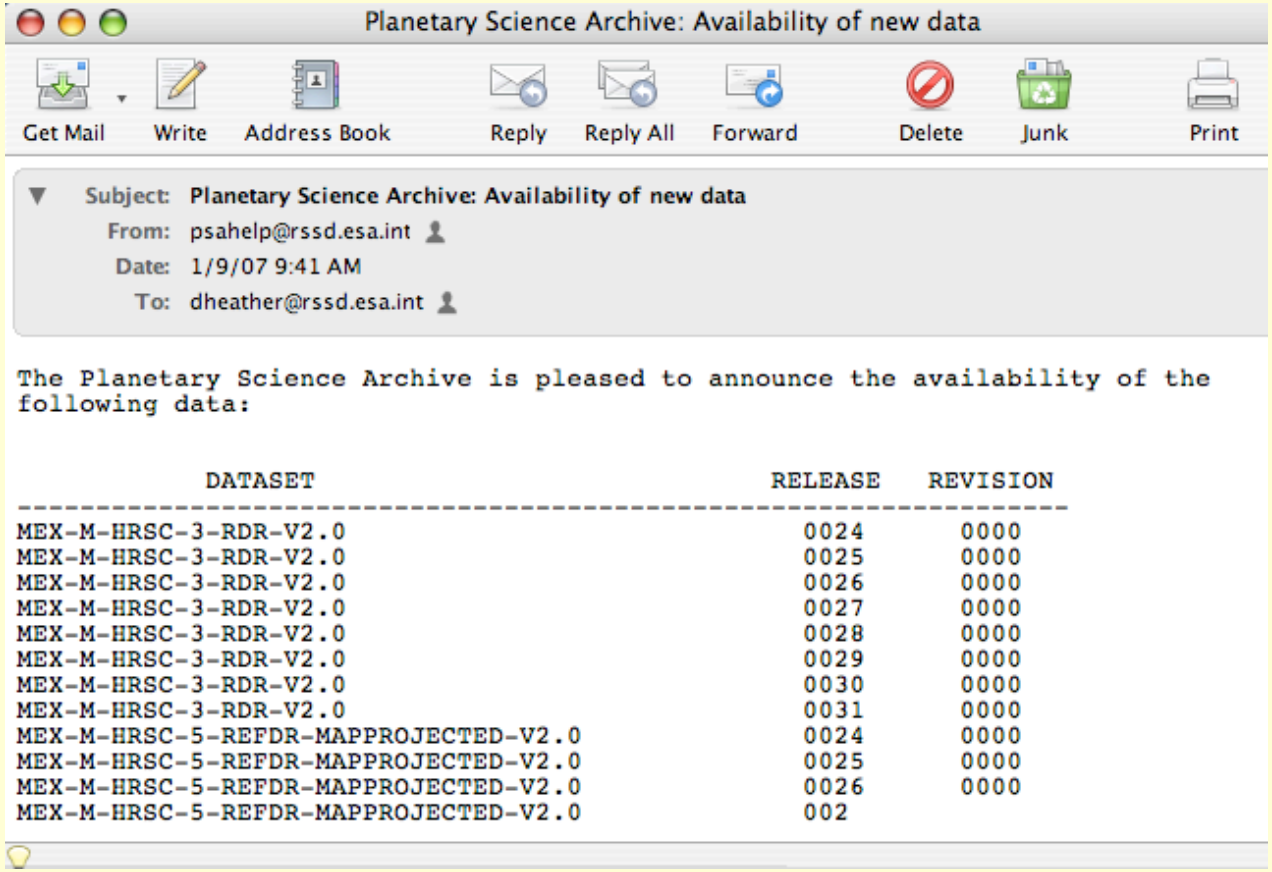
Notification Rules

- **Notification will be done shortly after**
  - A new dataset was ingested into the archive
  - A new dataset release was ingested into the archive
  - The ERRATA.TXT was modified, in other words an important piece of information about the dataset was made available.
- **Notification will be done using email service**
  - Ensure that your PSA account setting, especially your email address is correct
- **You will be informed on the following changes:**

Mission	Instrument Host (Spacecraft)	Instrument	Notification
ALL	ALL	ALL	You will be informed on any change in the archive.
SPECIFIC	ALL	ALL	You will be informed an any change relating to data for a specific mission.
SPECIFIC	SPECIFIC	ALL	You will be informed on any change relating to data obtained from a specific spacecraft.
SPECIFIC	SPECIFIC	SPECIFIC	You will be informed on any change relating to a specific instrument.

Notification via Email

Once you have registered, you will receive e-mails with announcements of the new data in the archive that you are interested in.



Comments and Suggestions

- **Please send us your remarks** psahelp@rssd.esa.int
- **In case of problems, please visit the FAQ page before contacting us**
- **In case you can not find the data you are looking for, please read the Mission Specific pages on the PSA home page (http://www.rssd.esa.int/psa)**