A Space Physics Archive Search & Exchange (SPASE) for Data Finding, Comparison, and Retrieval

J. R. Thieman, NASA/GSFC
S. Hughes and D. Crichton, JPL

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OUTLINE

- What is SPASE?
- Objectives
- Participating Groups
- System Elements
- Steps to Completion
- Summary

WHAT IS SPASE?

FORMAL NAME - SPASE

What was:

Space **P**hysics **A**rchive **S**earch **E**ngine or

is now:

Space **P**hysics **A**rchive **S**earch & **E**xchange

To emphasize not just search capabilities, but also data retrieval.

SPASE OBJECTIVES

The main objective is to promote collaboration and coordination of archiving activity for the Space Physics community.

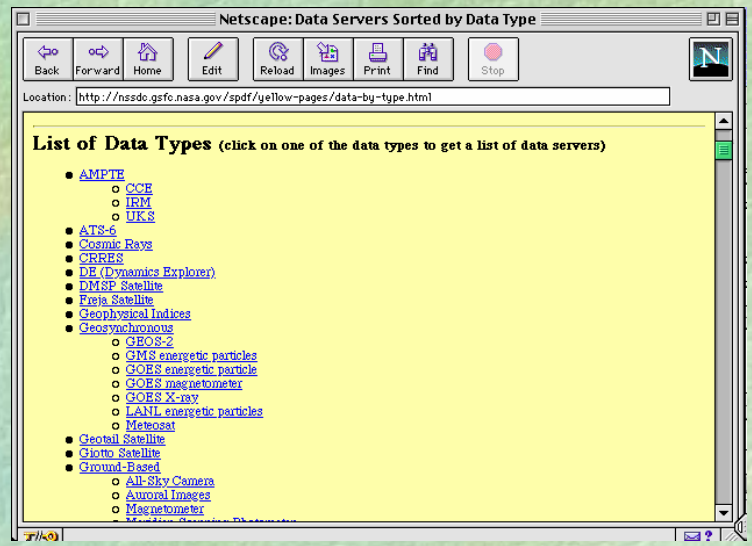
- Build a system that meets the global Space Physics User Requirements.
- Facilitate the circulation of related scientific and technical information.
- Facilitate the (two-way) interface with international technical standards and development organizations.
- Avoid duplication of effort between geographically distant archiving centers.
- Ensure the compatibility of the architectures used for the global distributed system and as many of the individual data centers as possible.
- Reduce costs by development of a system that
  - uses widely approved technical standards,
  - is easy to maintain (both globally, and in each archiving center),
  - can easily evolve so as to profit from future technological developments,
  - can be interfaced with the systems of adjacent disciplines and, hopefully one day, with a global system.

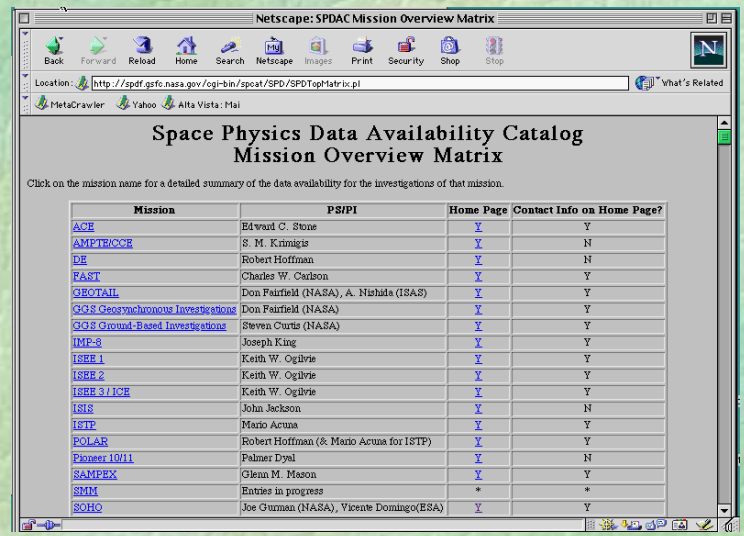
SPACE PHYSICS DATA NEEDS

- Cross Archive Search Capability
- Common Data Dictionary/Terminology
- Easy Method of Data Intercomparison
- Rapid Retrieval of Data of Interest

WHY NOT JUST USE WEB BROWSERS AND LINK LISTS?

- Hundreds of links are applicable
- Difficult for any one group to maintain
- Data information differs at each site
- Data access methods must be learned for each data provider
- No easy method of comparing data from differing sites
- No common method of acquiring data





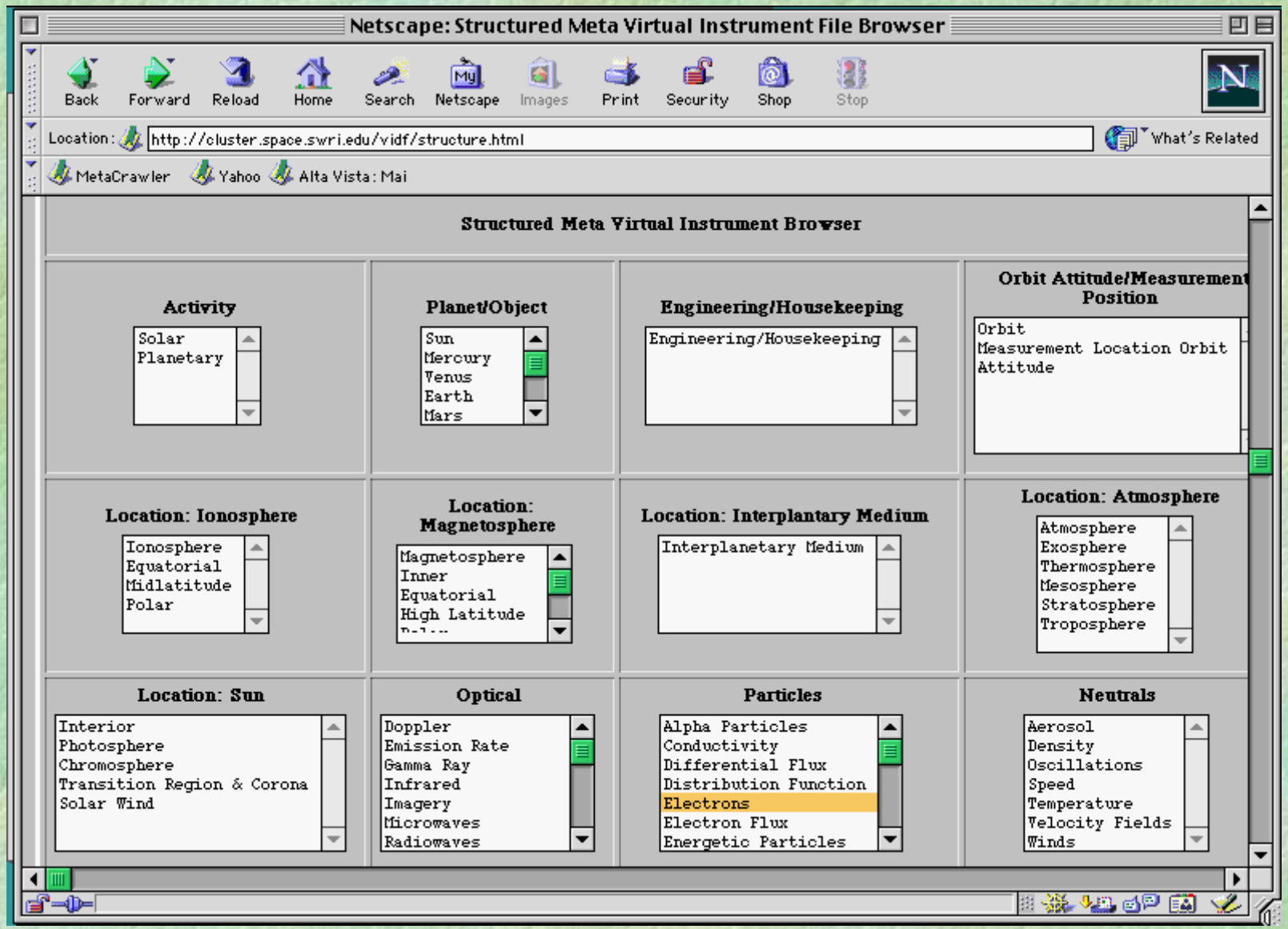
SPASE CONSTRAINTS

- Search and retrieval must work with data centers current search systems and data formats
- Effort necessary for data centers or even individual data holders to be included in SPASE must be minimal
- The data must be freely available to the community (some data may be proprietary for an initial period)

P□RESENT PARTICIPANTS

- CNES/CNSR Plasma Physics (CDPP) Data Archive
- NASA/National Space Science Data Center
- Planetary Data System- UCLA Plasma Physics (IGPP) Node
- Planetary Data System- Technology Group
- Rutherford Appleton Laboratory
- Southwest Research Institute

SOUTHWEST RESEARCH INSTITUTE
VIRTUAL INSTRUMENT FILE BROWSER



SPACE PHYSICS APPROACH

To enable cross system searching in Space Physics we must adopt:

> a common search and retrieval protocol

> a common terminology

The terminology must be mapped to the terms used by each individual system.

TERMINOLOGY COMPARISON

Search System Attribute Comp

	A	B	C	D	E	F
1		**NMD**	**NMC**	**PDS**	**SwRI**	**Astrobrowse**
2						
3	**Spacecraft**	Source	Spacecraft	Instrument_Host_Name		
4				Instrument_Host_Type		
5						
6	**Instrument**	Sensor	Experiment	Instrument_Name		
7				Instrument_Type		
8						
9	**Location/Source**	Location		Target_Name		Target Name
10				Target_Type		RA/DEC
11						
12						
13						
14	**Data Site**	Data Center		Node_Name		
15						
16	**Data Type**			Data_Object_Type		
17						
18	**Time Span**	Start Time	S/C Launch Year	Start_TIme	Time	
19		Stop Time		Stop_Time		
20						
21	**Physical Parameters**	Parameter Group		Dataset Descriptors	Measurements	Wavelength Band
22		Parameter			Physical Quantities	
23						
24	**Discipline**	Discipline				
25		Subdiscipline				
26						
27						

STEPS TO COMPLETION

- Step 1a - Simple cross-system searches enabled by spacecraft, experiment and time with link to data center for requesting data
- Step 1b - Develop a common data dictionary/terminology
- Step 2 - Search by location, parameter measured, instrument type, etc. with link to data center for requesting data
- Step 3 - Information from searches on whole data sets or subsets of the data can be sorted according to criteria of interest and directly ordered
- Step 4 - Search can be set to order only data sets or parts of data sets that follow a given search rule

POTENTIAL TECHNOLOGY U□SAGE

A number of data system technologies are being considered for use with SPASE, standard items as well as systems already developed from standards:

- XML
- SOAP
- OODT
- DITDOS
-
-

EXAMPLE: OODT

USE IN PDS-D (Distribution)

- **Challenge: To integrate a collection of resources and provide seamless access to distributed data repositories**
- **Solution: A system that is fully functional, operationally reliable and extensible, and is capable of:**
  - Adapting to mission(s) having more complex payloads and significantly larger data volumes.
  - Adapting to not yet compliant PDS data sets.
  - Providing unified web based search-and-retrieval user interface to novice and sophisticated users.
  - Using Internet as the primary method of data distribution.
  - Supporting real time (on demand) distribution of data to users.
  - Provide ability for users to subscribe for notification of released data.

PDS-D

What was done

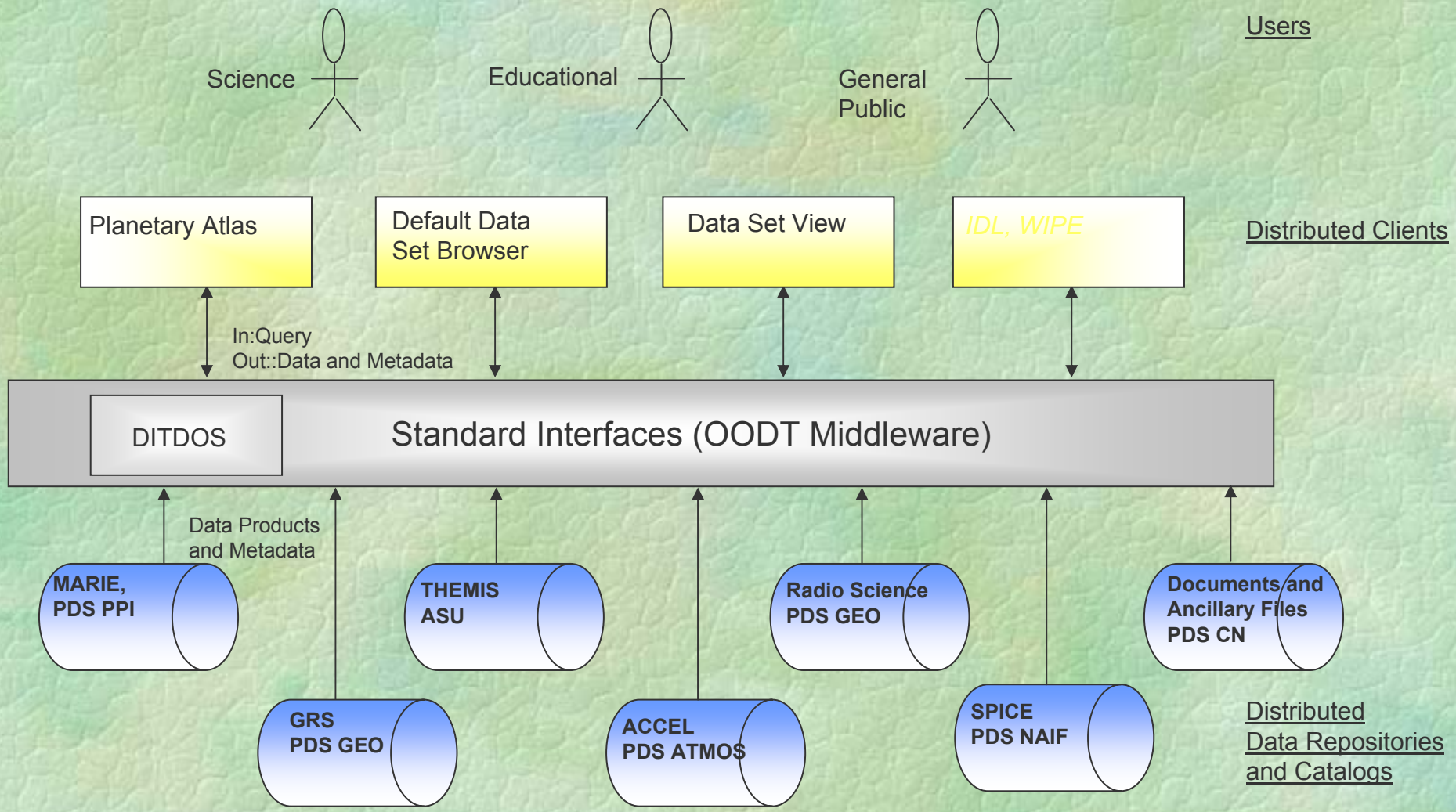
- **Implemented a multi-tiered information architecture**
  - Application Clients (Browsers/Interfaces)
  - Middleware - Object Oriented Data Technology (OODT)
  - Data and Metadata Servers (product server, profile server)
  - Data Repositories and Catalogs

- **Simplified and *standardized system interfaces* through middleware**

- **Used existing PDS subsystems but *hide heterogeneity***
  - User Interfaces (Atlas, DITDOS)
  - Data repositories (disk farms)
  - Catalog databases (Sybase, Gatesware,…)
  - Remained geographically distributed and locally managed

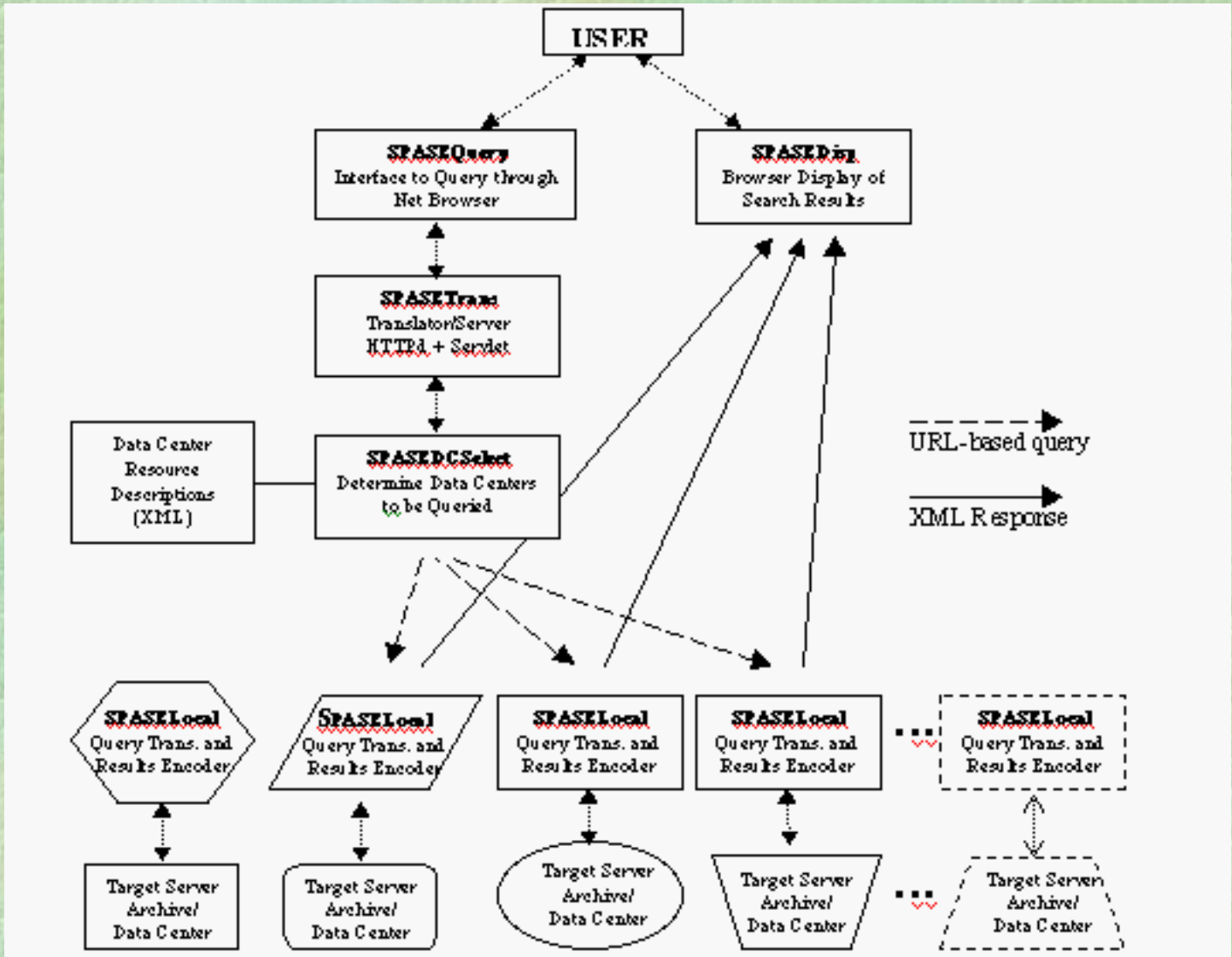
- **Separated Data Architecture from Technology Architecture**
  - Used archive *metadata* to its full potential
  - Evolved technology architecture

PDS-D APPROACH
(MARS ODYSSEY)



SPASE SYSTEM ELEMENTS

EXAMPLE ARCHITECTURE

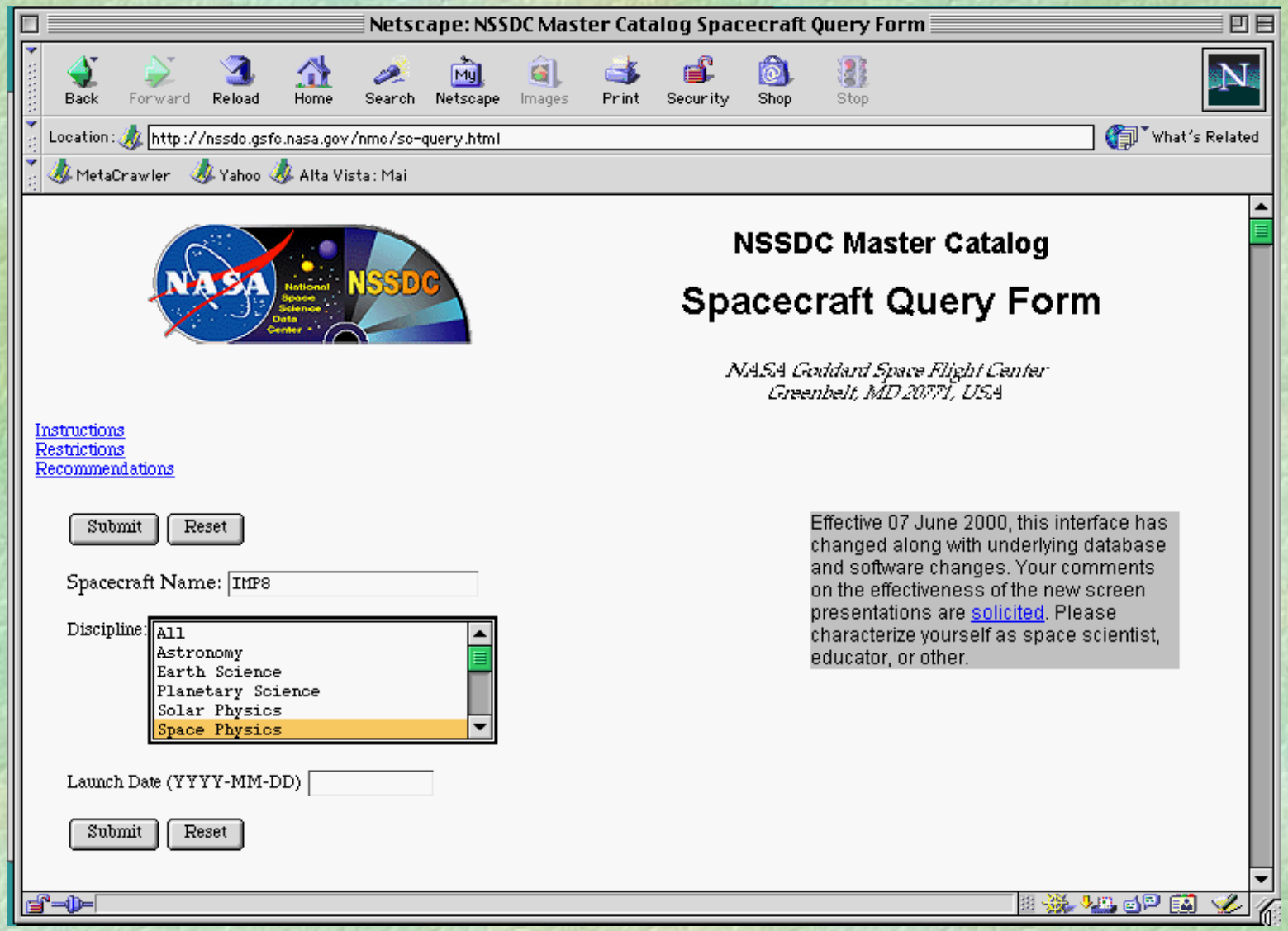


SUMMARY

- The Space Physics Archive Search & Exchange (SPASE) is being developed by CDPP, NSSDC, PDS, RAL, and SwRI
- Common architecture and terminology approaches are being prototyped
- Data set search and information about available data sets will be provided first
- Intercomparison of data sets and elements of data sets is a later phase
- Direct retrieval of comparable data of interest from multiple sites is the final phase
- Other space physics data holders are welcome to join the effort

Background Information

NSSDC MASTER CATALOG



NSSDC MASTER CATALOG (cont.)

Netscape: NSSDC Master Catalog: Spacecraft

Back Forward Reload Home Search Netscape Images Print Security Shop Stop

Location: http://nssdc.gsfc.nasa.gov/nmc/tmp/1973-078A.html What's Related

MetaCrawler Yahoo Alta Vista: Mai

NSSDC Master Catalog: Spacecraft

IMP-J

NSSDC ID:1973-078A

Other Name(s)

- IMP 8
- Explorer 50
- 06893

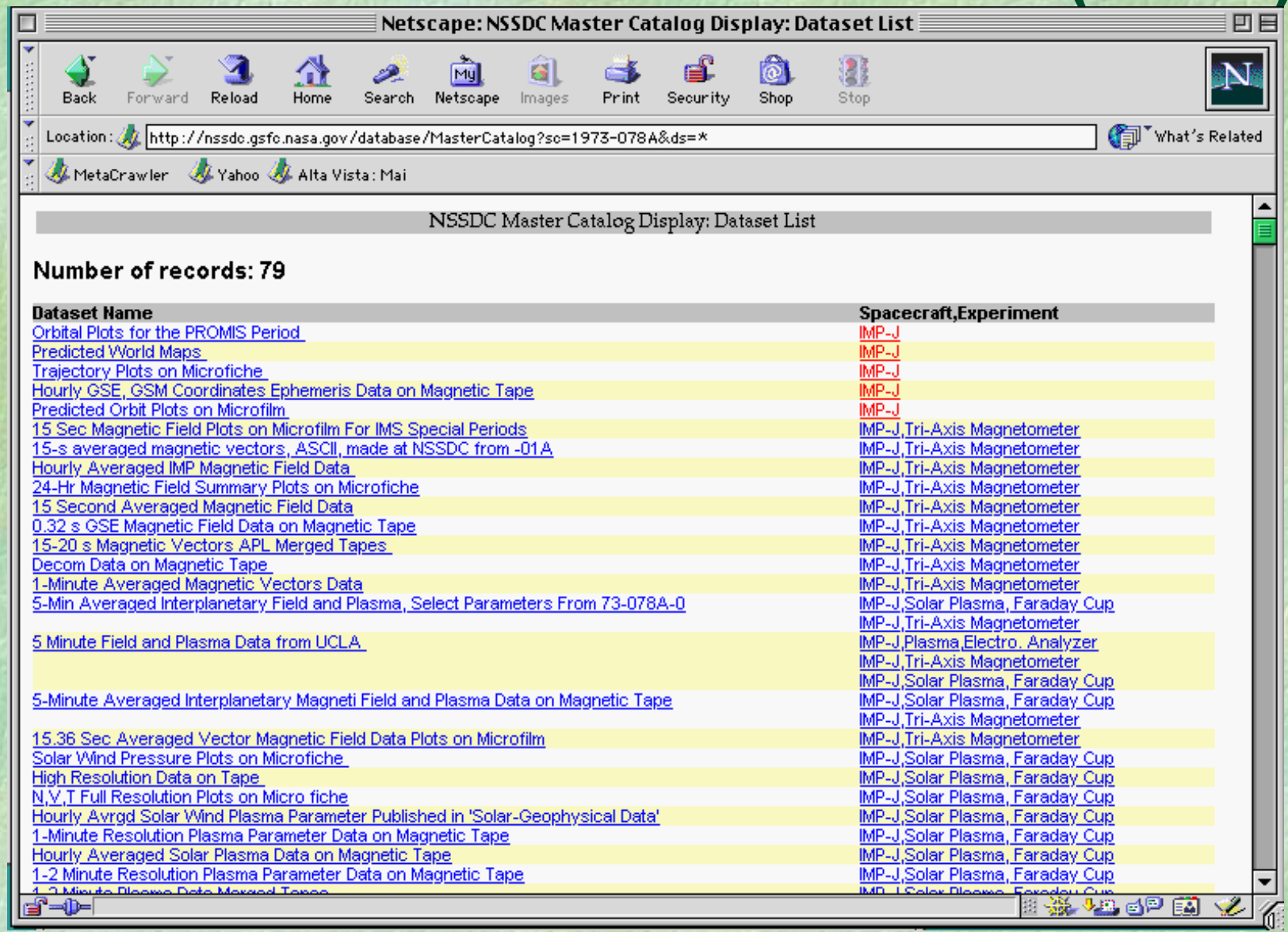
Launch Date/Time: 1973-10-26 at 02:26:00 UTC
On-orbit dry mass: 371 kg
Nominal Power Output: 150 W

Description

IMP 8 (Explorer 50), the last satellite of the IMP series, was a drum-shaped spacecraft, 135.6 cm across and 157.4 cm high, instrumented for interplanetary and magnetotail studies of cosmic rays, energetic solar particles, plasma, and electric and magnetic fields. Its initial orbit was more elliptical than intended, with apogee and perigee distances of about 45 and 25 earth radii. Its eccentricity decreased after launch. Its orbital inclination varied between 0 deg and about 55 deg with a periodicity of several years. The spacecraft spin axis was normal to the ecliptic plane, and the spin rate was 23 rpm. The data telemetry rate was 1600 bps. The spacecraft was in the solar wind for 7 to 8 days of every 12.5 day orbit. Telemetry coverage was 90% in the early years, but only 60-70% through most of the 1980's and early 1990's. The objectives of the extended IMP-8 operations were to provide solar wind parameters as input for magnetospheric studies and as a 1-AU baseline for deep space studies, and to continue solar cycle variation studies with a single set of well-calibrated and understood instruments.

Discipline(s)

NSSDC MASTER CATALOG (cont.)



NSSDC Master Catalog Display: Dataset List

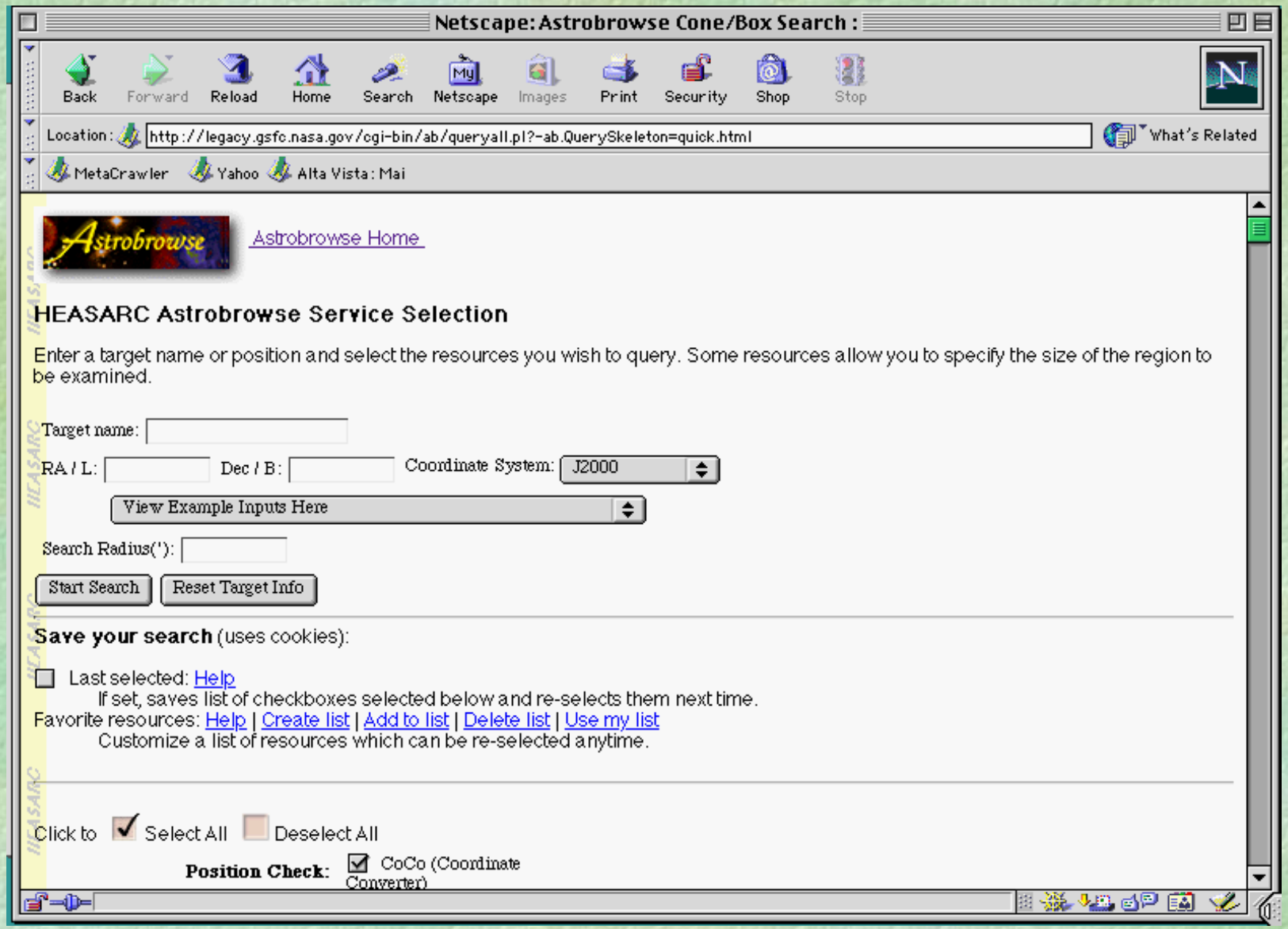
Number of records: 79

Dataset Name	Spacecraft,Experiment
Orbital Plots for the PROMIS Period	IMP-J
Predicted World Maps	IMP-J
Trajectory Plots on Microfiche	IMP-J
Hourly GSE, GSM Coordinates Ephemeris Data on Magnetic Tape	IMP-J
Predicted Orbit Plots on Microfilm	IMP-J
15 Sec Magnetic Field Plots on Microfilm For IMS Special Periods	IMP-J,Tri-Axis Magnetometer
15-s averaged magnetic vectors, ASCII, made at NSSDC from -01A	IMP-J,Tri-Axis Magnetometer
Hourly Averaged IMP Magnetic Field Data	IMP-J,Tri-Axis Magnetometer
24-Hr Magnetic Field Summary Plots on Microfiche	IMP-J,Tri-Axis Magnetometer
15 Second Averaged Magnetic Field Data	IMP-J,Tri-Axis Magnetometer
0.32 s GSE Magnetic Field Data on Magnetic Tape	IMP-J,Tri-Axis Magnetometer
15-20 s Magnetic Vectors APL Merged Tapes	IMP-J,Tri-Axis Magnetometer
Decom Data on Magnetic Tape	IMP-J,Tri-Axis Magnetometer
1-Minute Averaged Magnetic Vectors Data	IMP-J,Tri-Axis Magnetometer
5-Min Averaged Interplanetary Field and Plasma, Select Parameters From 73-078A-0	IMP-J,Solar Plasma, Faraday Cup IMP-J,Tri-Axis Magnetometer
5 Minute Field and Plasma Data from UCLA	IMP-J,Plasma,Electro. Analyzer IMP-J,Tri-Axis Magnetometer IMP-J,Solar Plasma, Faraday Cup
5-Minute Averaged Interplanetary Magneti Field and Plasma Data on Magnetic Tape	IMP-J,Solar Plasma, Faraday Cup IMP-J,Tri-Axis Magnetometer
15.36 Sec Averaged Vector Magnetic Field Data Plots on Microfilm	IMP-J,Tri-Axis Magnetometer
Solar Wind Pressure Plots on Microfiche	IMP-J,Solar Plasma, Faraday Cup
High Resolution Data on Tape	IMP-J,Solar Plasma, Faraday Cup
N,V,T Full Resolution Plots on Micro fiche	IMP-J,Solar Plasma, Faraday Cup
Hourly Avrgd Solar Wind Plasma Parameter Published in 'Solar-Geophysical Data'	IMP-J,Solar Plasma, Faraday Cup
1-Minute Resolution Plasma Parameter Data on Magnetic Tape	IMP-J,Solar Plasma, Faraday Cup
Hourly Averaged Solar Plasma Data on Magnetic Tape	IMP-J,Solar Plasma, Faraday Cup
1-2 Minute Resolution Plasma Parameter Data on Magnetic Tape	IMP-J,Solar Plasma, Faraday Cup

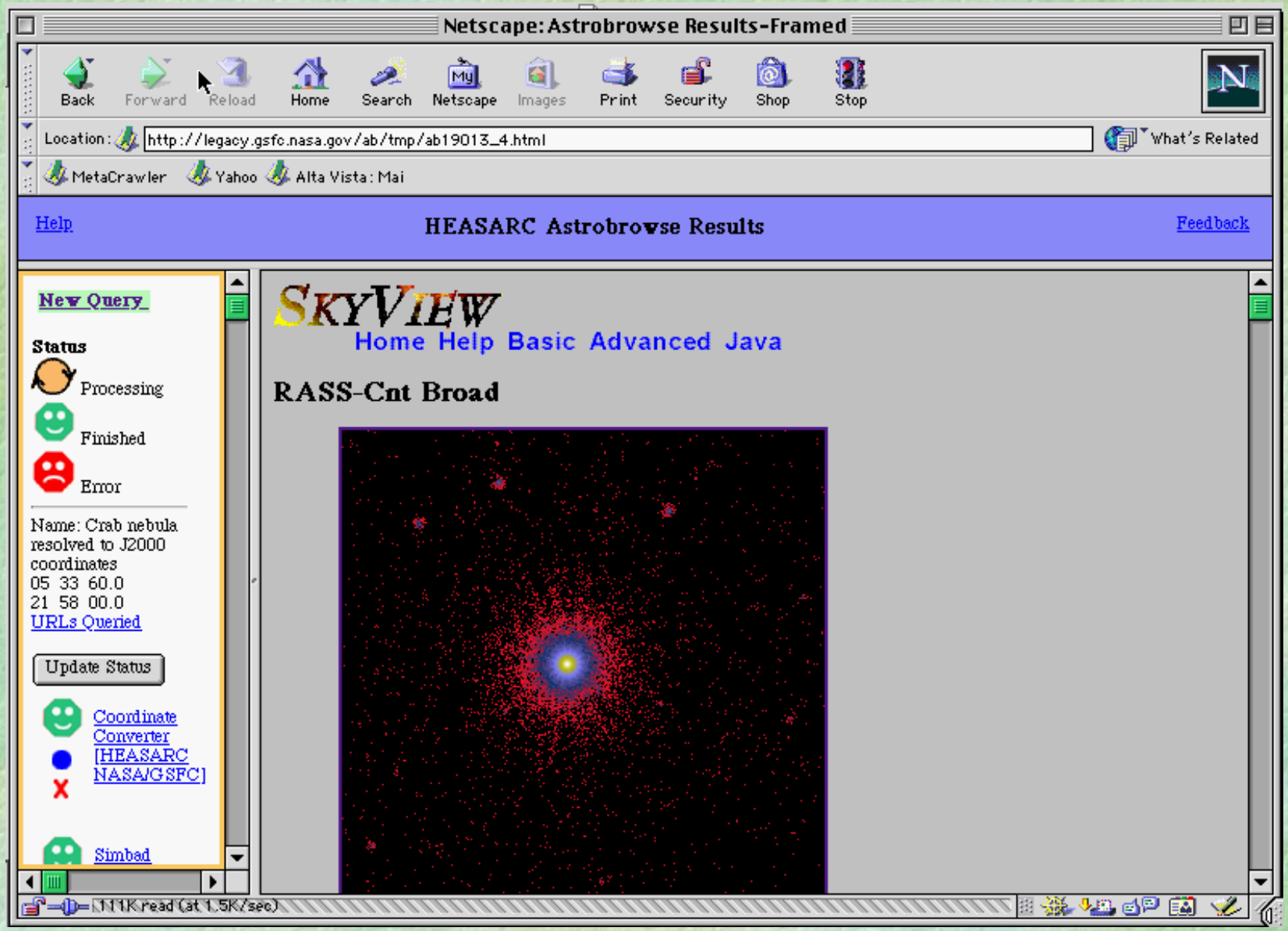
ASTROBROWSE

- Permits search for astronomy data by:
  - Object location (RA/Dec)
  - Object name (lookup translation to location)
- Object search is done at all or selected data centers
- Results are displayed in a common interface and often include the actual images or other data of interest

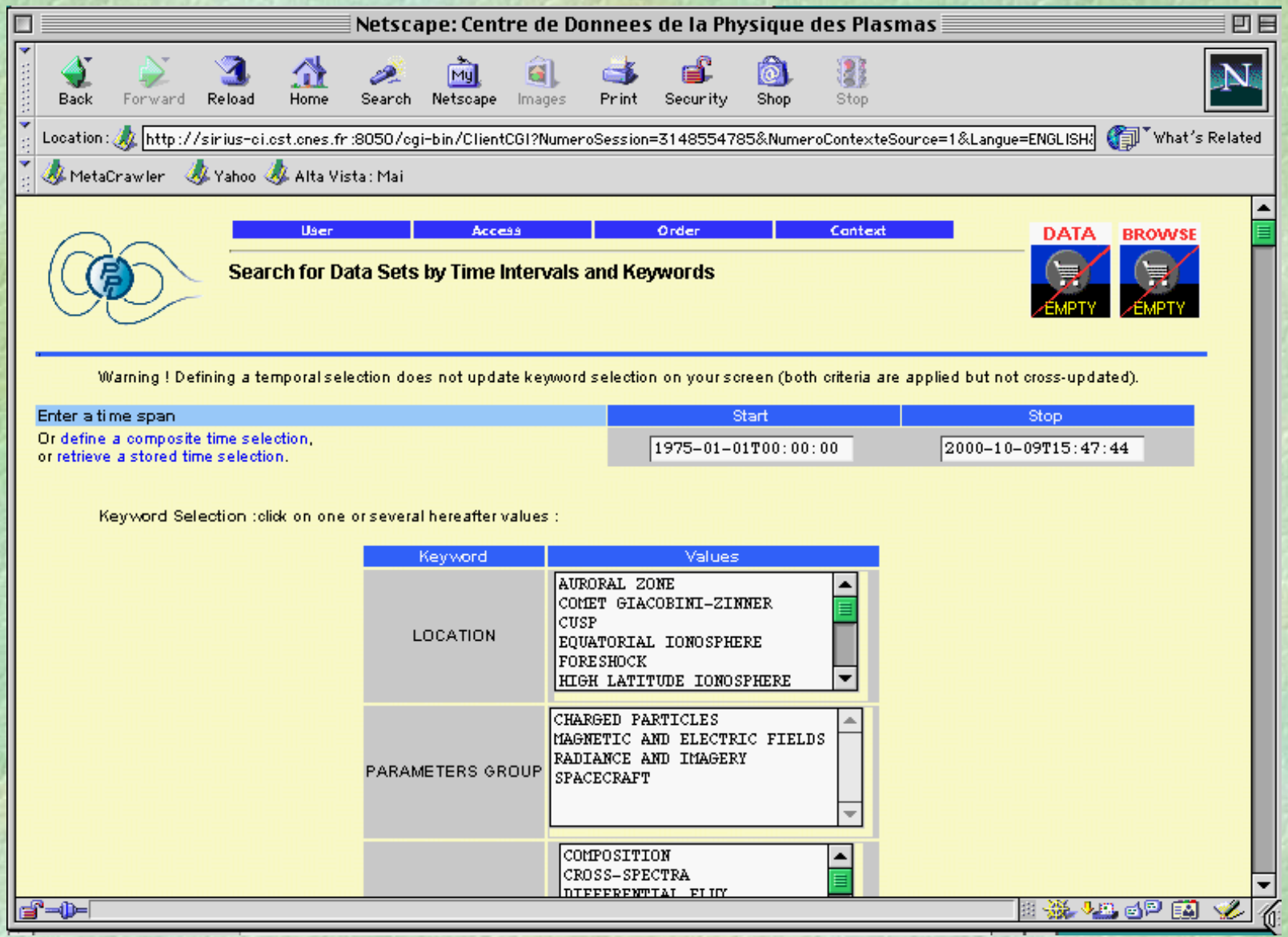
ASTROBROWSE INTERFACE



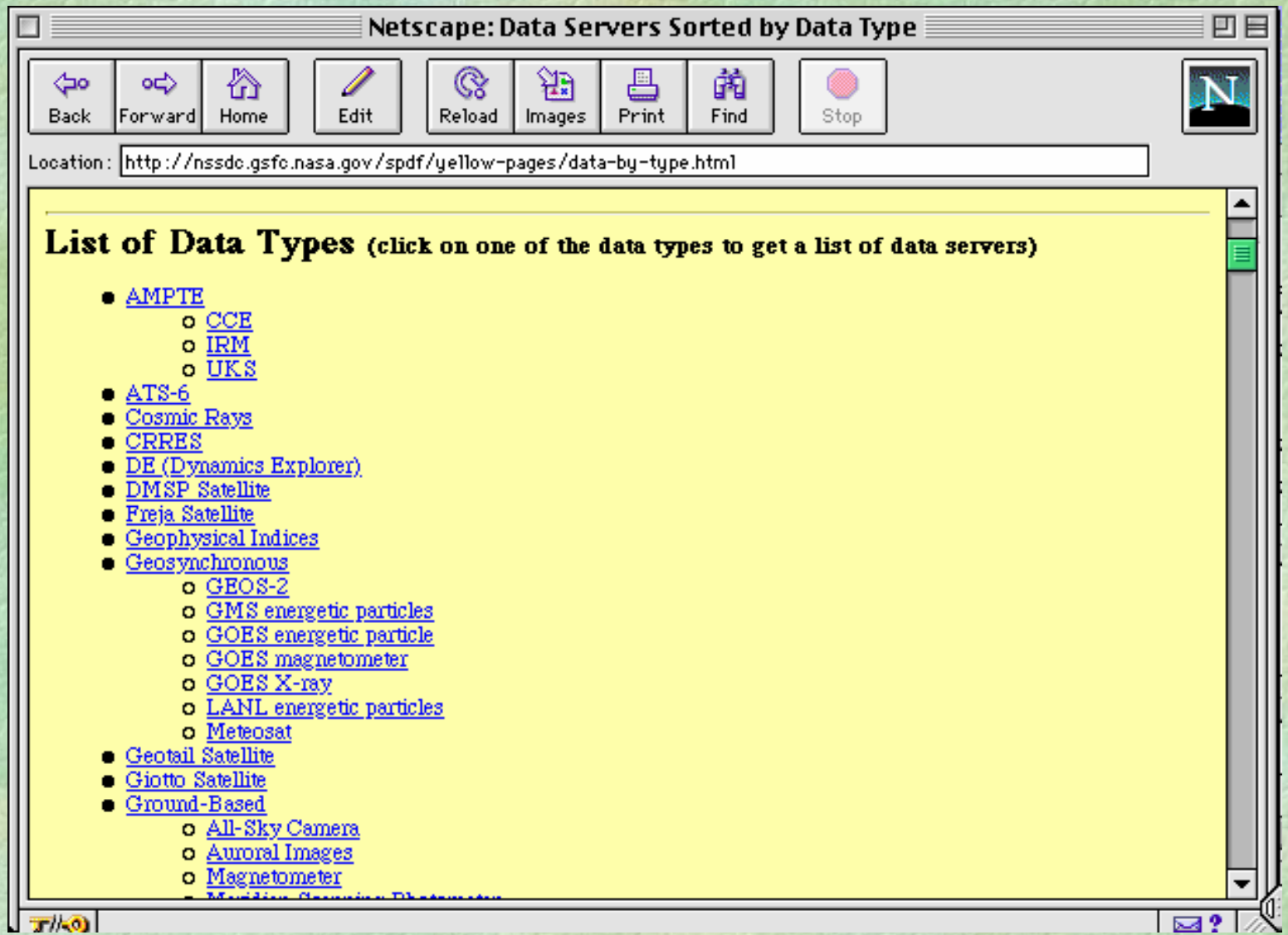
ASTROBROWSE INTERFACE (cont.)



Centre de Données de la Physique des Plasmas (CDPP)



MAGNETOSPHERIC YELLOW PAGES



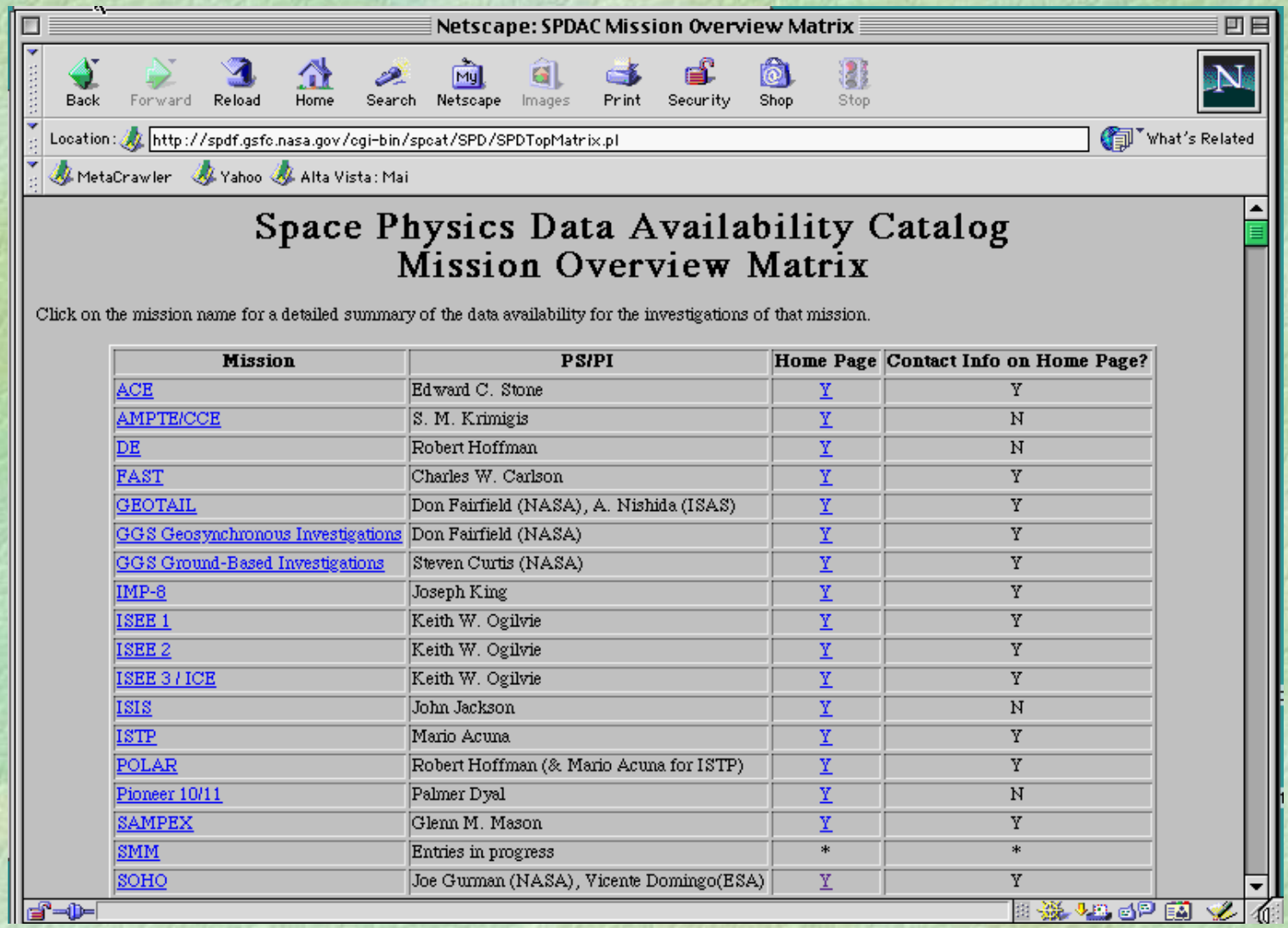
TERMINOLOGY COMPARISON - IN□TERLINGUA

DISCIPLINE SPACE PHYSICS, CONCEPT = LOCATION

(Column 2 needs to be improved, its shown here for "the idea")

ID	Definition	CDPP	NSSDC	SwRI
401010 0	Location = Solar Wind	Solar Wind		Interplanetary Medium
401010 1	Location = Interplanetary	Interplanetary (Deep Space)	Interplanetary (deep space)	
401010 2	Location = Interplanetary	Interplanetary (Near Earth)	Interplanetary (near Earth)	
401	Location = Foreshock	Foreshock		
0105				
401020 0	Location = Magnetosphere > Bow shock			Magnetosphere > Bow Shock
401030 0	Location = Magnetosheath	Magnetosheath		Magnetosphere > Magnetosheath

SPACE PHYSICS DATA AVAILABILITY CATALOG



Space Physics Data Availability Catalog
Mission Overview Matrix

Click on the mission name for a detailed summary of the data availability for the investigations of that mission.

Mission	PS/PI	Home Page	Contact Info on Home Page?
ACE	Edward C. Stone	Y	Y
AMPTE/CCE	S. M. Krimigis	Y	N
DE	Robert Hoffman	Y	N
FAST	Charles W. Carlson	Y	Y
GEOTAIL	Don Fairfield (NASA), A. Nishida (ISAS)	Y	Y
GGS Geosynchronous Investigations	Don Fairfield (NASA)	Y	Y
GGS Ground-Based Investigations	Steven Curtis (NASA)	Y	Y
IMP-8	Joseph King	Y	Y
ISEE 1	Keith W. Ogilvie	Y	Y
ISEE 2	Keith W. Ogilvie	Y	Y
ISEE 3 / ICE	Keith W. Ogilvie	Y	Y
ISIS	John Jackson	Y	N
ISTP	Mario Acuna	Y	Y
POLAR	Robert Hoffman (& Mario Acuna for ISTP)	Y	Y
Pioneer 10/11	Palmer Dyal	Y	N
SAMPEX	Glenn M. Mason	Y	Y
SMM	Entries in progress	*	*
SOHO	Joe Gurman (NASA), Vicente Domingo(ESA)	Y	Y