

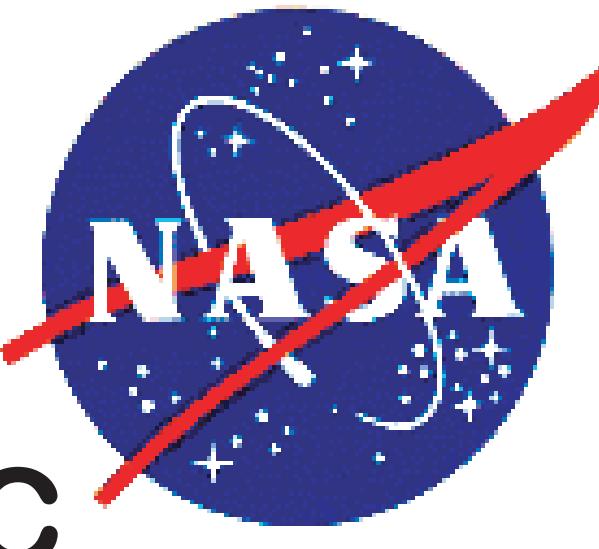


A Virtual Observatory for the ITM Community

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ITM Domain

ITM Science Domain

The ionosphere, thermosphere and mesosphere (ITM)
- A transition region diverse in observables and disciplines

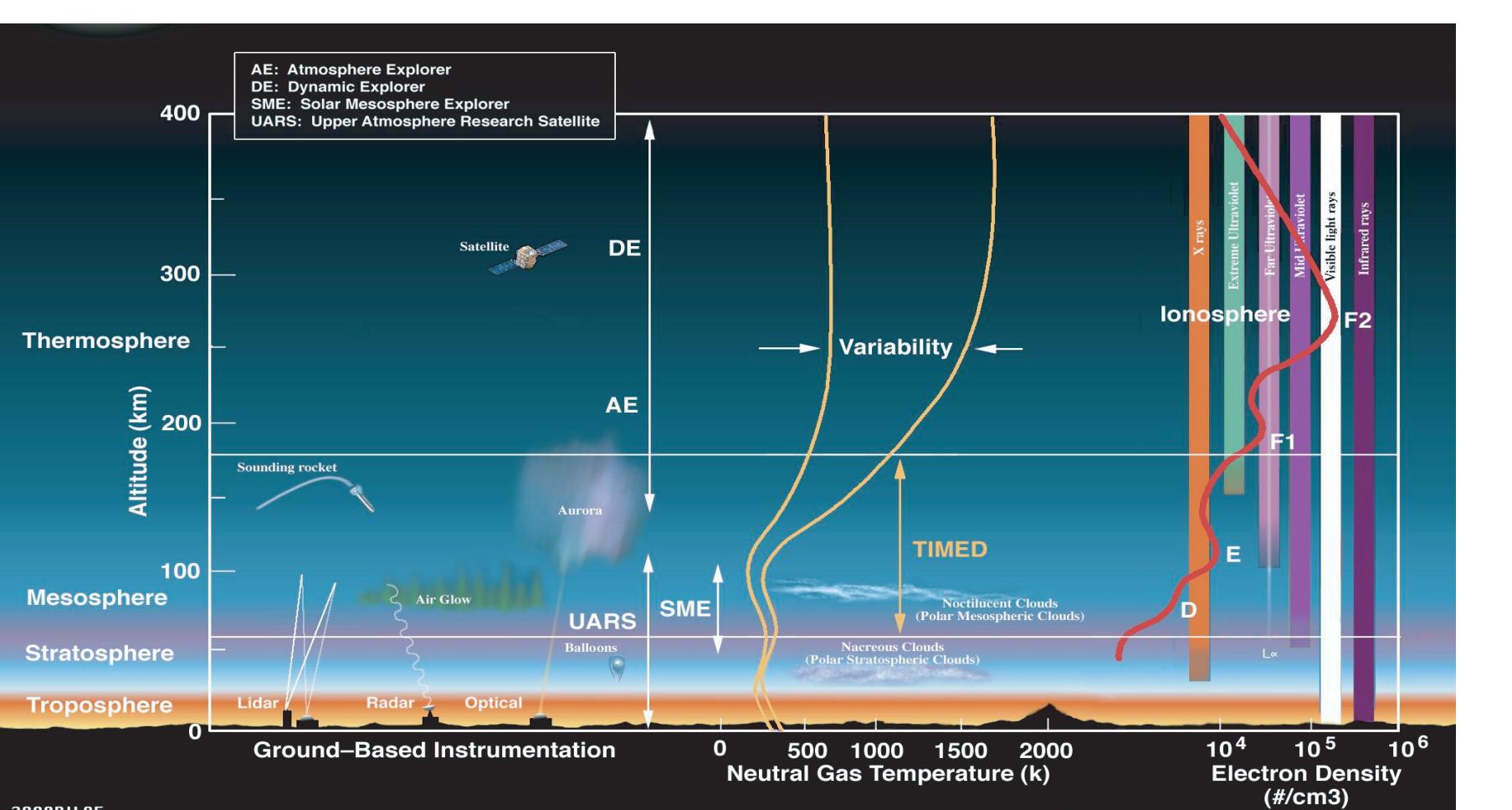
- Need for data from geospace environment as well as lower atmosphere; relevant to future studies of middle-lower atmosphere and magnetosphere-ionosphere coupling

ITM Science Data Domain

- Legacy and current ground-based and space-borne missions
- Significantly available data; however, different formats not always transparently accessible.
- Heterogeneous heritage of data and models
- ITM is a heterogeneous data community with diverse file formats and granularity of observables
- Need to integrate the complex data/model environment for upcoming ITM science.
- Ground/space, in-situ/remote, outside ITM inputs, observations / models / assimilations
- Ready access to all relevant data/simulations is required for efficient research.

ITM Science Community Needs

- Discovery of Data
- Provide efficient discovery and access to comprehensive and historical data & models
- Easy Browsing - more than data query, enhanced by use of meta-data
- Delivery of / access to readers, and other tools / new services
- ITM is a heterogeneous data community with diverse file formats and granularity of observables
- Access to distributed science expertise
- Integrated view of distributed community resources of data & models and services
- Data providers have an integral role to provide data access, description, and meta-data
- Coordinate with other VOs and data systems of major ITM players (NASA, NSF, NOAA, DoD, International)
- Open access to data and model simulations
- Robust cost-efficient system that evolves to meet changing user needs.



Principles

VO Principles:

- Facilitate cross-discipline, cross-platform, cross-instrument studies to increase science effectiveness.
- Data sources include ground and space-based instruments as well as modeling and data assimilation.
- Use existing technologies and standards where feasible.
- Leverage existing data and service providers.
- Have community involvement from development through implementation.
- Open data policy for both model simulations and data.
- Enabling framework for more and more useful data – legacy and future
- Enabling framework for modular & evolving capabilities

VO Paradigm

Virtual Observatory (VO) - Vision of a future ITM data environment

- Where data, models and services can be highly distributed
- While end users see an integrated view
- Where all potentially-useful data and model simulations are readily findable, accessible, useable
- With appropriate services across mission-instrument boundaries

VO Model

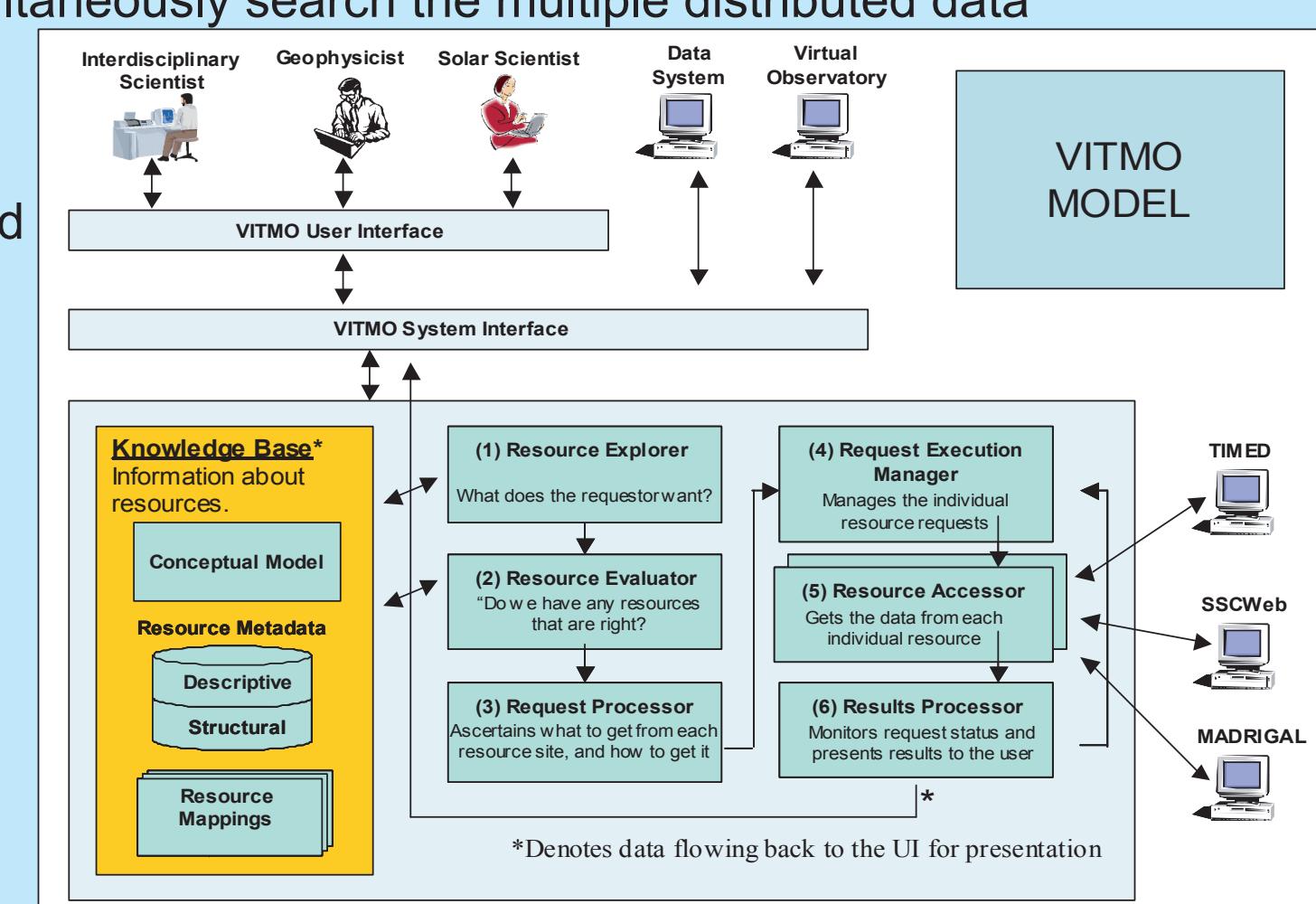
Characteristics:

- Functions as a broker for data search, discovery and delivery between these users and data resources.
- Provides users with a user-friendly interface to simultaneously search the multiple distributed data sources of the ITM community.

- Provides efficient and easy access to all existing and future ITM data regardless of file type or granularity.
- Routes data delivery from the source directly to the user and not through VIO.
- Relies upon industry-standard protocols; e.g. TCP/IP, http, XML, SOAP, Web Services.

Extensions to the VO model:

- Support for browsing data characteristics
- Ready access to data display services



Data and Services customized to users needs:

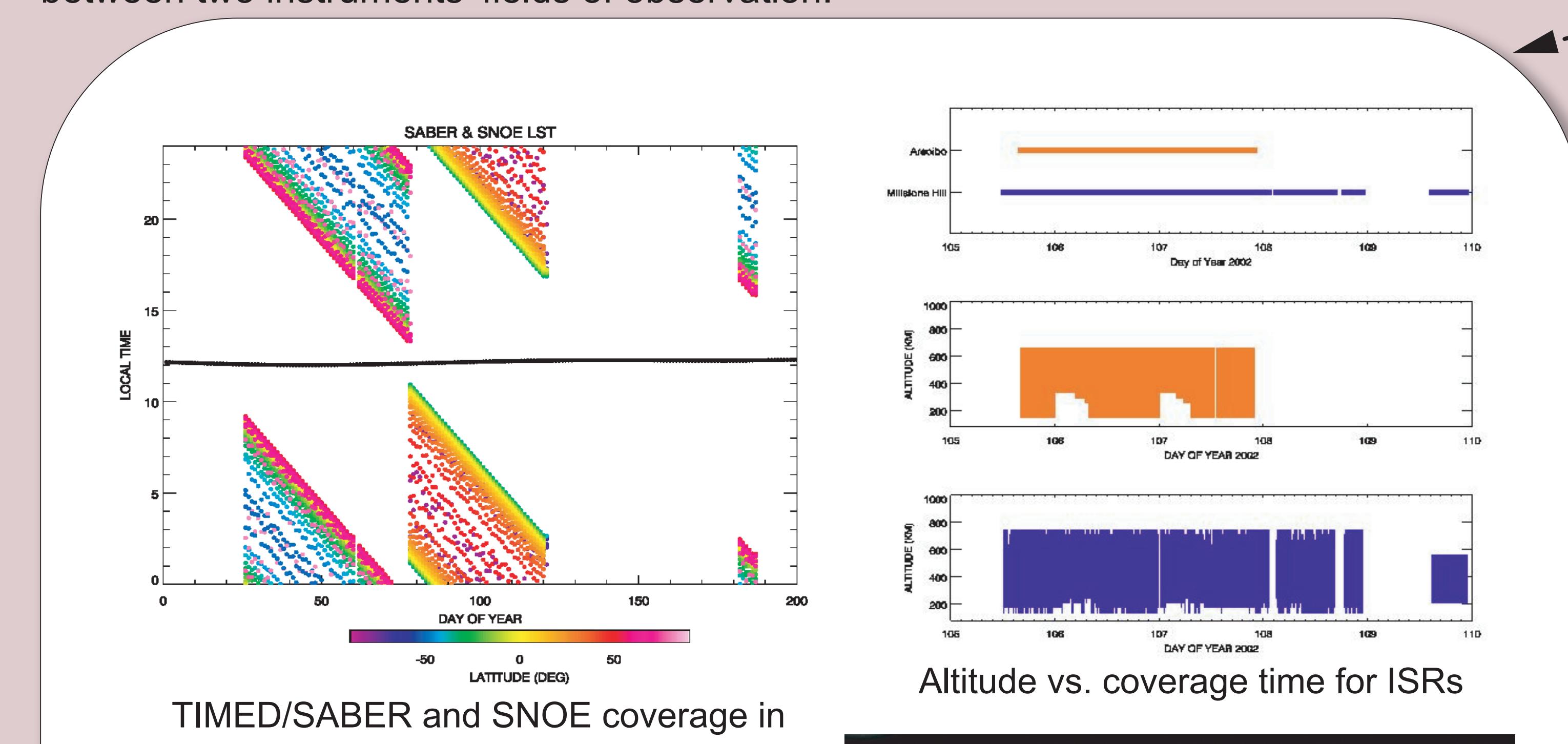
- **Inquiring user** - Starts with step 1.
Starts by learning which time periods, parameters, altitudes, etc., are of use.

- **Informed user** - Starts at step 2.
Is aware of the data or desired parameters so begins with data query.

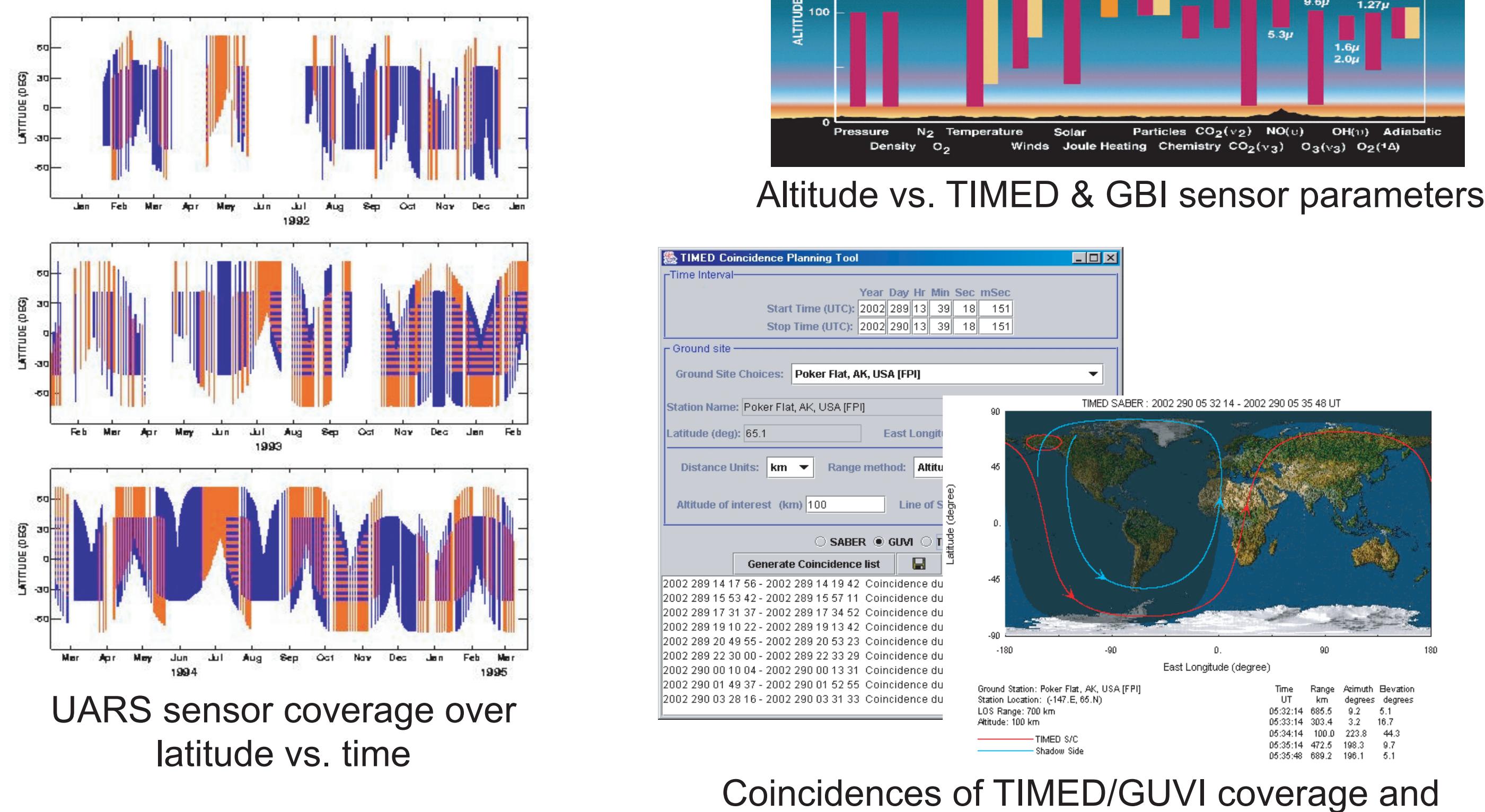
- **Focused user** - Relies upon step 5.
The focused user wishes to ask for detailed queries. They may ask for coincidences between different satellites, ground-based sites, and geophysical conditions. They will use detailed querying capabilities provided by many sites, with the results integrated by the VITMO.

Browsing Data Characteristics

Often before data query can occur, it is necessary to first plan what information would be useful to study. Views to support this might be as simple as plots of the characteristics of one or more data sources or as complex as computations and maps of the coincidence between two instruments' fields of observation.



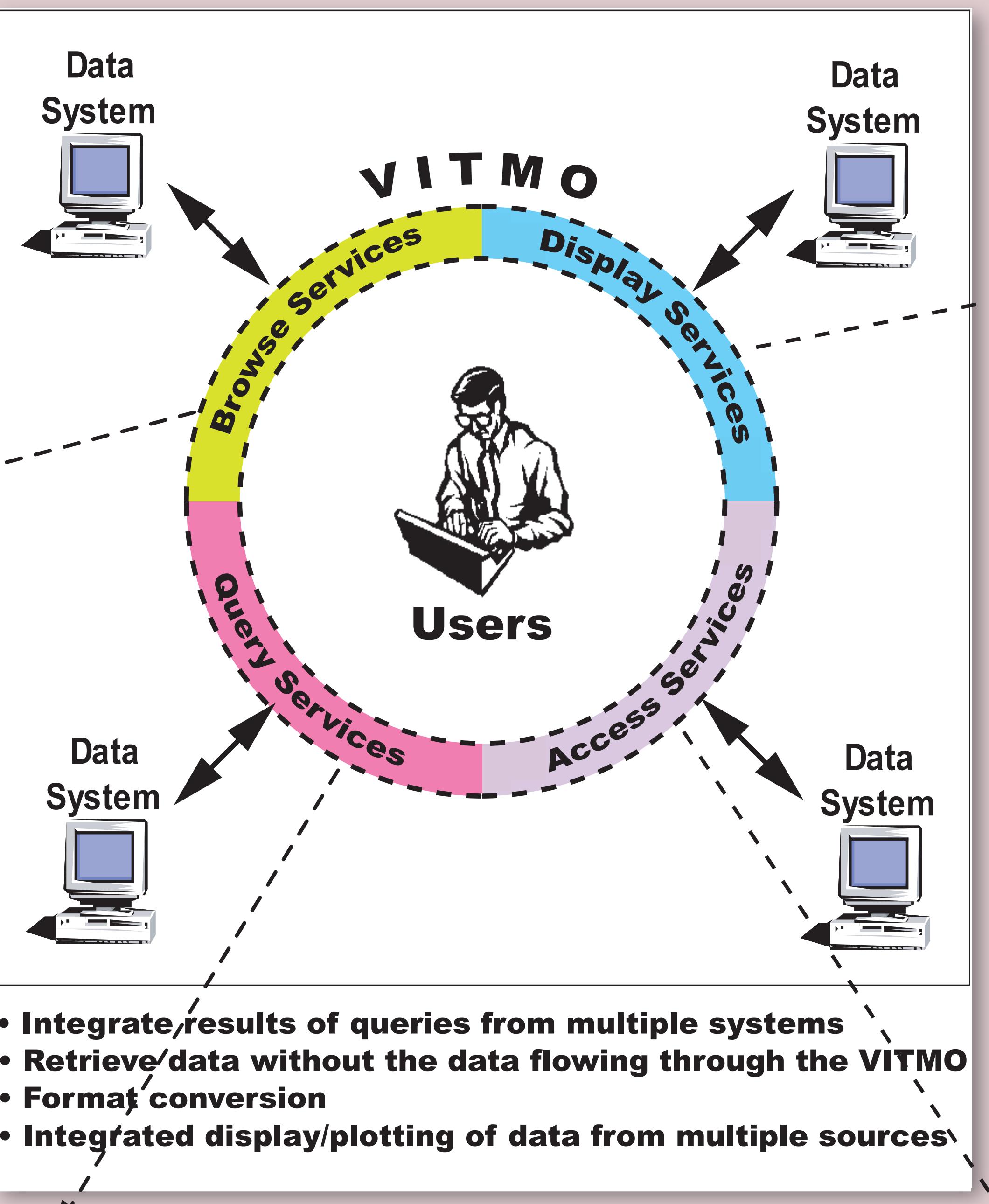
TIMED/SABER and SNOE coverage in local time vs. time



UARS sensor coverage over latitude vs. time

The VITMO Prototype

1



2

Data Query

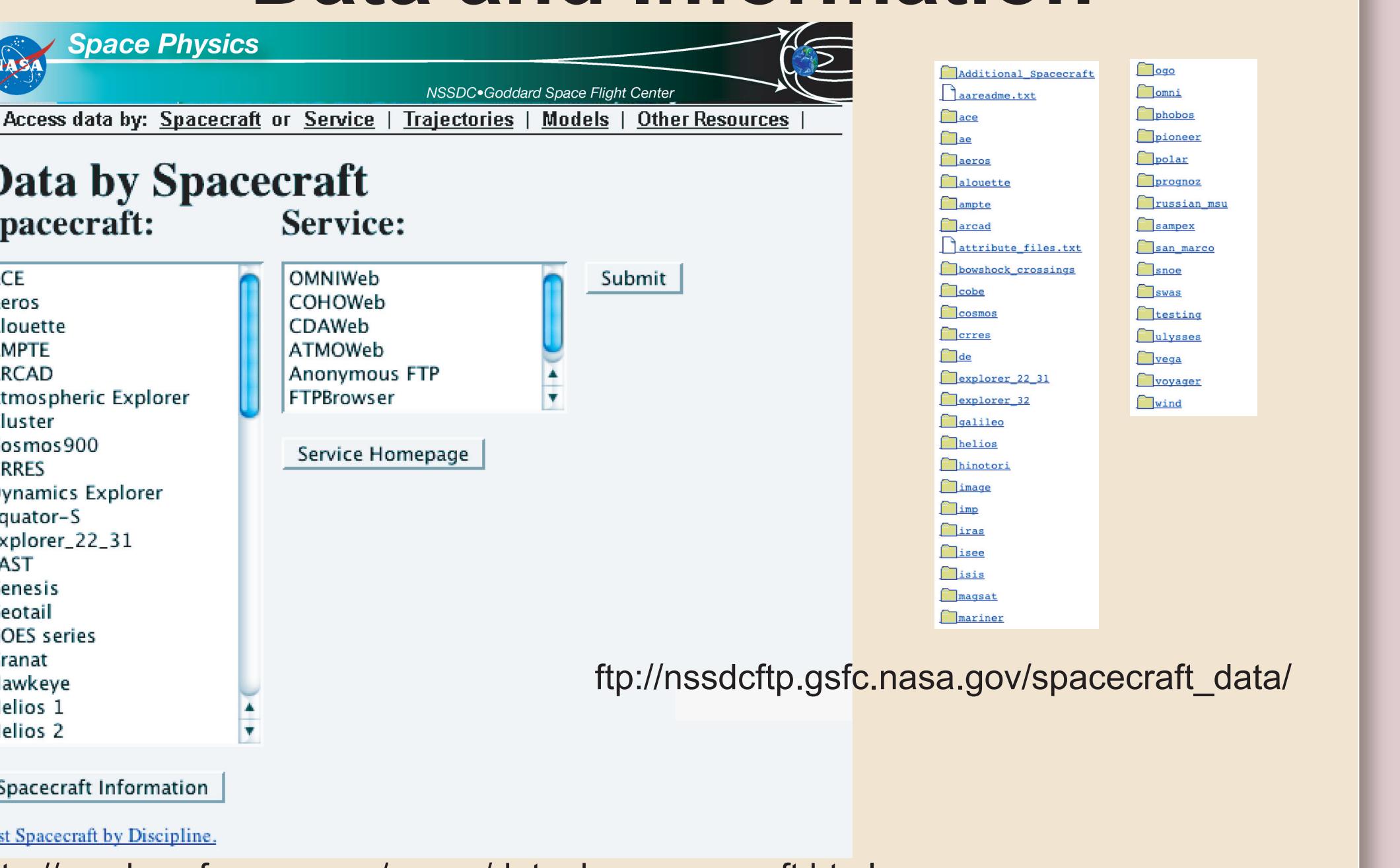
In a widget-based interface through a browser, or an API, the user selects and answers criteria that qualify the data of interest. These specifications are then passed to the Query Construction Engine which determines all applicable Data Providers and sends them a translated query that is specific for each provider.

4

Integration of Data Services

Since many more services and resources are further furnished at the providers' host sites, it is essential that these services be made available through the VITMO interface. This will allow other sites to function as much more than data providers, allowing the extensive services provided by the other sites to be available to the ITM community.

NSSDC/SECAA Access to Data and Information



http://nssdcftp.gsfc.nasa.gov/spacecraft_data/

http://nssdc.gsfc.nasa.gov/space/data_by_spacecraft.html

Data Delivery

Requested data is sent directly from the data provider to the user via Internet protocols (ftp, http, etc.), not through the VIO. Additionally, read routines and other software (listing or plotting programs) can be delivered along with the data.

Query Results

The Query Results Engine assembles the responses returned from the Data Providers into a single uniform list of choices from which the user makes selections for downloading to their system.

The results of your query are:

Row Number	Product Type	Data Start Time	Data End Time	URL
1	SABER Level 1a	1997 268 00:47:00	2002 093 06:17:59	http://sabreweb.hao.ucar.edu
2	Condestron Michelson Interferometer OH temperature	2002 001 00:00:00	2002 117 23:59:59	http://sls.jhuapl.edu
3	Escalite	2002 001 00:00:00	2002 174 23:59:59	http://sisko.Colorado
4	Alouette	2002 001 00:00:00	2002 230 23:59:59	http://sisko.Colorado
5	AMTE	2002 001 00:00:00	2002 230 23:59:59	http://sisko.Colorado
6	ARCAD	2002 001 00:00:00	2002 127 23:59:59	http://sisko.Colorado
7	Atmospheric Explorer	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
8	Cluster	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
9	CRC	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
10	Dynamics Explorer	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
11	Equator-S	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
12	Explore-22_31	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
13	FAST	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
14	Gedtail	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
15	GOES series	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
16	Granat	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
17	Hawkeye	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
18	Helios 1	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
19	Helios 2	2002 001 00:00:00	2002 161 23:59:59	http://sisko.Colorado
20	Spacecraft Information			
21	List Searcher by Discipline			
22	http://nssdcftp.gsfc.nasa.gov/spacecraft_data/			
23	http://nssdc.gsfc.nasa.gov/space/data_by_spacecraft.html			

VIO information and user feedback is to be available at <http://www.vioconcept.jhuapl.edu>

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